

Aşırı Plastik Deformasyon Teknikleri ve Uygulama Yöntemleri

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İçindekiler

Bölüm Yazarları	iii
Kısaltmalar	ix
Semboller	xi

1.

AŞIRI PLASTİK DEFORMASYON (APD) NEDİR? MALZEME ÖZELLİKLERİNİ NASIL DEĞİŞTİRİR?	1
1.1. APD'de Mikro Yapı Değişimi	2
1.2. Ultra İnce Tanelerin (UİT) Oluşum Mekanizması	2
1.3. Tane İnceltme Doygunluğu	5
1.4. Doğrusal ve Düzlemsel Kafes Kusurları	7
1.5. Boşluklar	9
1.6. Tane Sınırı Ayrımı	11
1.7. Doku	12

2.

EŞİT KANAL AÇISAL PRESLEME (EKAP) İŞLEM PARAMETRELERİ	15
2.1. Kalıp Açılıları	15
2.2. İşlem Rotasyonları ve Çevrim Sayıları	18
2.3. Presleme Hızı	19
2.4. Presleme Sıcaklığı	20
2.5. Geri Presleme	21
2.6. Malzemenin Geometrik Kesiti	22

3.

GELENEKSEL APD YÖNTEMLERİ	25
3.1. Eşit Kanal Açısal Presleme - EKAP	25
3.1.1. Eşit Kanal Açısal Presleme Tarihiçesi	27
3.1.2. Eşit Kanal Açısal Presleme Metodu ve İşlemi	28
3.2. Yüksek Basınç Burulma (YBB)	30
3.2.1. Metodun Uygulanması	30

3.2.2. Bulgular.....	32
3.3. Birikimli Hadde Yapıştırması (BHY)	35
3.3.1. BHY Çalışma Prensibi	35
3.3.2. Bulgular.....	40
3.4. Bükümlü Ekstrüzyon (BE).....	44
3.4.1. Metodun Uygulanması.....	46
3.4.2. Bulgular.....	47
3.4.2.1. OM İncelemeleri.....	47
3.4.2.2. Tensile Test	48

4.

MODİFİYE APD YÖNTEMLERİ.....	51
4.1. Genişlemeli Eş Kanallı Açısal Ekstrüzyon (GEN-EKAP)	51
4.1.1. Metodun Uygulanması.....	52
4.1.2. Bulgular.....	54
4.1.2.1. OM Görüntüleri ve Ortalama Tane Boyutları.....	54
4.1.2.2. SEM Görüntüleri	59
4.1.2.3. TEM Görüntüleri	62
4.1.2.4. XRD Grafikleri.....	65
4.1.2.5. Çekme Test Sonuçları	69
4.1.2.6. Sertlik Test Sonuçları.....	73
4.2. İnce Cidarlı Açık Kanallı Açısal Presleme (İCA-KAP)	77
4.2.1. Uygulanması.....	77
4.2.2. Bulgular.....	80
4.2.2.1. Sertlik Test Sonuçları.....	80
4.2.2.2. Çekme Test Sonuçları	81
4.2.2.3. OM Görüntüleri	85
4.2.2.4. SEM Görüntüleri	89
4.2.2.5. TEM Görüntüleri	96
4.3. Tekrarlayan Oluklama ve Doğrultma (TOD).....	101
4.3.1. Metodun Uygulanması.....	101
4.3.1.1. Sürekli bir TOD makinesinin tasarımı ve deneysel prosedürler.....	102
4.3.2. Bulgular.....	104
4.3.2.1. Sertlik Test Sonuçları.....	106
4.3.2.2. Çekme Test Sonuçları	107
4.3.2.3. Yorulma Test Sonuçları	109
4.3.2.4. OM Görüntüleri	109
4.3.2.5. SEM Görüntüleri	111

4.3.2.6. TEM Görüntüleri	111
4.4. Tüp Kanal Açışal Presleme (TKAP)	112
4.4.1. Metodun Uygulanması	113
4.4.2. Bulgular	115
4.4.2.1. Sertlik Test Sonuçları	115
4.4.2.2. Çekme-Basma Test Sonuçları	117
4.4.2.3. SEM Görüntüleri	119
4.5. Değişken Bükümlü Kanallı Açışal Presleme (DB-KAP)	120
4.5.1. Metodun Uygulanması	121
4.5.2. Bulgular	124
4.5.2.1. Sertlik Test Sonuçları	124
4.5.2.2. Çekme Test Sonuçları	125
4.5.2.3. Yorulma Test Sonuçları	127
4.5.2.4. OM Görüntü Analizleri	129
4.5.2.5. SEM Görüntü Analizleri	130
4.5.2.6. TEM Görüntü Analizleri	133
4.6. Vortex Ekstrüzyon (VE)	134
4.6.1. Metodun Uygulanması	136
4.6.2. Bulgular	139

5.

APD UYGULAMA ESASLARI	143
5.1. Kalıp Tasarımı	143
5.2. Malzeme Seçimi	148
5.3. Yağlayıcılar	149
5.4. Kalıp Isıtma Seçenekleri	149
5.5. Hidrolik Pres ve Fikstür	150

6.

APD ANALİZLERİ	153
6.1. Analitik Denklemler	153
6.1.1. EKAP Analitik Gerinim Denklemi	153
6.1.2. YBB Analitik Gerinim Denklemi	154
6.1.3. BHY Analitik Gerinim Denklemi	155
6.2. Sonlu Elemanlar Analizi (SEA)	156
6.3. Mekanik Özellik Analizleri	157
6.3.1. Sertlik	157
6.3.1.1. Rockwell Sertlik Testi	158

6.3.1.2. Brinell Sertlik Testi.....	159
6.3.1.3. Vickers Sertlik Testi.....	159
6.3.2. Çekme-Basma.....	162
6.3.3. Yorulma	165
6.3.3.1. Yorulma Deneyi Türleri	166
6.3.3.2. Yorulma Deneyi Standartları.....	168
6.3.3.3. Yorulma Deneyinde Dikkat Edilmesi Gereken Önemli Hususlar.....	168
6.3.4. Aşınma.....	169
6.4. Metalografi ve Mikro Yapı Analizleri.....	170
6.4.1. Hassas Kesme İşlemi	170
6.4.2. Bakalite Alma İşlemi	171
6.4.3. Zımparalama ve Parlatma İşlemi	172
6.4.4. Optik Mikroskop İncelemeleri.....	173
6.4.5. Tarama Elektron Mikroskop (SEM) İncelemeleri.....	175
6.4.6. Geçirimli Elektron Mikroskop (TEM) İncelemeleri	176
6.4.7. APD Uygulamaları Kapsamında Kullanılan Dağlayıcılar	178
6.4.8. Enerji Dağılımlı X Işını Spektroskopisi (EDX / EDS).....	180
6.4.9. XRD.....	182
6.4.10. Elektron Geri Saçılım Kırınımı (EBSD).....	183

7.

APD KULLANIM ALANLARI VE SANAYİLEŞME ADIMLARI.....	185
7.1. Kompozitler Metallerle Karşı	185
7.2. Yüksek Entropili Alaşımlar.....	188
7.3. Camlar.....	190
7.4. İletkenler	191
7.5. Seramik	193
7.6. Polimerler.....	195
7.7. Biyomedikal Uygulamalar.....	196
7.8. Aşırı Plastik Deformasyonun Ticarileştirilmesi.....	198
Kaynaklar	201
Yazarlar Hakkında	240

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İçindekiler

Ön Söz	iii
Teşekkür	v

Bölüm 1

Kümeler	1
1.1. Venn Şemaları	4
1.2. Altkümeler	4
1.3. Bir Kümenin Büyüklüğü	5
1.4. Kuvvet Kümeleri	6
1.5. Küme İşlemleri	7
1.6. Küme Özdeşlikleri	9
Alıştırmalar	11

Bölüm 2

İlişkiler (Bağıntılar)	13
2.1. Kartezyen Çarpım	13
2.2. İkili İlişkiler	14
2.3. Denklik İlişkileri	18
2.4. Kısmi Sıralamalar	22
Alıştırmalar	26

Bölüm 3

Fonksiyonlar	29
3.1. Temel Terminoloji	29
3.2. Mutlak Değer Fonksiyonu	34
3.3. Taban ve Tavan Fonksiyonları	34
3.4. Ters Fonksiyonlar ve Fonksiyonların Bileşkeleri	35
Alıştırmalar	37

Bölüm 4

Önermeli Mantık	41
4.1. Önermeler	41
4.2. İyi Biçimlendirilmiş Önermeler	49
Alıştırmalar	54

Bölüm 5

Boole Cebri	57
5.1. Giriş	57
5.2. Boole Fonksiyonları	58
5.3. Mantık Kapıları ve Mantık Şemaları	58
5.4. Çarpımların Toplamı ve Toplamların Çarpımı Açılımları	62
5.5. Boole Cebri'nin Temel Teoremleri	69
5.6. Karnaugh Haritaları	70
Alıştırmalar	80

Bölüm 6

Tümevarım	85
6.1. Zayıf Tümevarım	85
6.2. Kuvvetli Tümevarım	90
Alıştırmalar	91

Bölüm 7

Özyineli İlişkiler	93
7.1. Giriş	93
7.2. Özyineli Diziler	93
7.3. Bazı Özel Diziler	95
7.4. Özyineli İlişkiler	97
Alıştırmalar	100

Bölüm 8

İçerme-Dışlama İlkesi	105
Alıştırmalar	111

Bölüm 9

Sayma	113
9.1. Toplama ve Çarpma Kuralları	113
9.2. Güvencin Yuvası İlkesi	115
9.3. Permütasyonlar	117
9.4. Kombinasyonlar	121
9.5. Tekrarlı Permütasyon ve Kombinasyonlar	126
9.6. Ayırt Edilemez Nesnelere İçin Permütasyon	128
9.7. Düzensizlikler	129
9.8. Binom Teoremi	131
Alıştırmalar	136

Bölüm 10

Çizgeler ve Ağaçlar	141
10.1. Giriş	141
10.2. Temel Terminoloji	142
10.3. Bazı Özel Çizgeler	147
10.4. Komşuluk ve Bağlılık Matrisleri	149
10.5. Çizge Eşyapılılığı	151
10.6. Bağlantılılık ve Euler Çizgeleri	154
10.7. Hamilton çizgeleri	159
10.8. Ağaçlar	162
10.9. Kapsayan Ağaçlar	163
10.10. En Az Maliyetli Kapsayan Ağaç Algoritmaları	164
Alıştırmalar	168

Ek A Önerilen Kaynaklar	175
--------------------------------------	------------

Ek B Alıştırmaların Çözümleri	178
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Kaynaklar	214
------------------------	------------

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İÇİNDEKİLER

ÖN SÖZ	vii
1. Klasik Gitarın Yapısı ve Özellikleri	1
2. Tellerin Değiştirilmesi	2
3. Gitarın Bakımı ve Korunması	4
4. Gitarın Akort Edilmesi.....	4
5. Gitarda Tutuş-Oturuş Pozisyonu	6
5.1. Sağ El Pozisyonu	8
5.2. Sol El Pozisyonu.....	11
6. Tırnaklar.....	12
7. Temel Çalım Teknikleri.....	15
8. Motivasyon ve Çalışma Yöntemi.....	15
9. Temel Teorik Bilgiler.....	16
9.1. Nota	16
9.2. Vuruş	16
9.3. Nota Süre (Vuruş) Değerleri.....	17
9.4. Notaların Ses Yüksekliği.....	19
9.5. Anahtar.....	19
9.6. Ölçü	20
9.7. Zaman Belirteci (Ölçü Birimi).....	21
9.8. Tempo.....	21
9.9. Sus (Es).....	23
10. Uygulamalı Klasik Gitar Öğretimi.....	24
Alıştırma No.1*.....	24
10.1. Bitiş Çizgisi:.....	25
Alıştırma No.2*.....	25
Alıştırma No.3*.....	25
Alıştırma No.4*.....	25
Alıştırma No.5*	26
Alıştırma No.6*.....	26
Alıştırma No.7*.....	27
Alıştırma No.8*.....	27
Alıştırma No.9*	27
Alıştırma No.10*.....	28
Alıştırma No.11*.....	28
Alıştırma No.12*.....	29
Alıştırma No.13*	29
Çalışma Parçası No.1*.....	30
10.2. Ölçü Numarası:.....	30
Alıştırma No.14*.....	31
Alıştırma No.15*	31

	Alıştırma No.16*	32
	Çalışma Parçası No.2*	32
	Alıştırma No.17*	33
	Alıştırma No.18*	33
	Alıştırma No.19*	34
	Çalışma Parçası No.3*	34
	Çalışma Parçası No.4*	35
10.3.	Tekrar (Röpriz):	35
	Alıştırma No.20*	36
	Alıştırma No.21*	36
	Çalışma Parçası No.5*	37
10.4.	Dolap:	37
	Alıştırma No.22*	38
10.5.	Uzatma (Çoğaltma) Noktası:	38
	Alıştırma No.23*	39
	Alıştırma No.24*	39
	Çalışma Parçası No.6*	40
10.6.	Uzatma Bağı:	40
	Alıştırma No.25*	41
10.7.	Ek Çizgiler:	41
	Alıştırma No.26*	42
	Alıştırma No.27*	43
	Alıştırma No.28*	43
10.8.	Çoksesli Müziğe Giriş:	43
10.9.	Aynı Anda Çalınan Sesler:	44
10.10.	Parti:	44
	Alıştırma No.29*	46
	Alıştırma No.30*	46
	Alıştırma No.31*	47
	Alıştırma No.32*	48
	Alıştırma No.33*	49
	Alıştırma No.34*	49
	Alıştırma No.35*	51
	Alıştırma No.36*	51
	Çalışma Parçası No.7*	52
10.11.	D.C. (Da Capo) al Fine:	52
	Alıştırma No.37*	53
	Alıştırma No.38*	53
	Çalışma Parçası No.8*	54
10.12.	Akor ve Arpej:	54
	Alıştırma No.39*	55
	Alıştırma No.40*	56
	Alıştırma No.41*	56
	Alıştırma No.42*	57
	Alıştırma No.43*	57

Alıştırma No.44*	58
Çalışma Parçası No.9*	58
10.13. Diyez-Bemol-Natürel:	59
10.14. Bir Notanın Diyez ya da Bemolünü Bulma	59
Alıştırma No.45*	60
Çalışma Parçası No.10*	61
Alıştırma No.46*	62
Çalışma Parçası No.11*	62
Çalışma Parçası No.12*	63
Çalışma Parçası No.13*	64
10.15. Donanım:	64
Alıştırma No.47*	65
Çalışma Parçası No.14*	65
Alıştırma No.48*	66
Çalışma Parçası No.15*	66
10.16. Ritardando (rit.):	67
10.17. A Tempo:	67
Çalışma Parçası 16*	68
10.18. Bir Notayı Farklı Telde Seslendirme:	68
10.19. 8'lik Zaman Belirteci	69
Alıştırma No. 49*	70
Alıştırma No.50*	71
Çalışma Parçası 17*	72
10.20. Üçleme:	73
10.21. Bare:	74
Alıştırma No.52*	76
10.22. Pozisyon:	76
Çalışma Parçası 18*	78
Çalışma Parçası No.19*	79
10.23. 12 Perdede Yer Alan Tüm Notalar	81
KAYNAKÇA	82
ÖZGEÇMİŞ	83

KAYNAKÇA

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İÇİNDEKİLER

GİRİŞ VE ÖN SÖZ.....	XII
Bölüm 1 Yönetim ve İnsan	1
1. GEÇMİŞTEN GÜNÜMÜZE YÖNETİM VE İNSAN.....	3
ENDÜSTRİ DEVRİMİ ÖNCESİ YÖNETİM.....	4
ORTA ÇAĞ VE ENDÜSTRİYEL DEVRİM	7
ENDÜSTRİ DEVRİMİNDE TEMEL SORUNLAR	9
OSMANLI İMPARATORLUĞU VE YÖNETİCİ EĞİTİMİ.....	12
KLASİK YÖNETİM YAKLAŞIMI	13
DAVRANIŞSAL YÖNETİM YAKLAŞIMI VE SOSYAL İNSAN KURAMI	25
HAWTHORNE ARAŞTIRMALARI	25
İNSAN İLİŞKİLERİ YAKLAŞIMI.....	32
2. GÜNCEL VE MODERN YÖNETİM YAKLAŞIMLARI	35
KANTİTATİF YÖNETİM VE YÖNETİM BİLİMİ YAKLAŞIMI	36
YÖNETİM BİLİMİ YAKLAŞIMINDA SERT VE YUMUŞAK MODELLER	42
PARETO İLKESİ	45
SİSTEM YAKLAŞIMI	46
GENEL SİSTEM KURAMI	49
SİSTEM OLARAK ORGANİZASYON	50
SİSTEM İÇİNDE YÖNETİCİ	52
DURUMSALLIK (KOŞUL BAĞIMLILIK) YAKLAŞIMI.....	55
ÇEVRE, ÖRGÜT YAPISI VE STRATEJİ	57
GÖREV VE TEKNOLOJİ.....	60
YENİ NORMAL.....	63
TEKNOLOJİK GELİŞMELER.....	67
KÜRESELLEŞME.....	69
DEMOGRAFİK VE SOSYAL DEĞİŞİMLER.....	70
BİLGİNİN ÖNEMİ VE GÜCÜ.....	71
MÜŞTERİ İLİŞKİLERİ YÖNETİMİ (CRM).....	72
EKİP KAYNAK YÖNETİMİ(CRM)	73
YALIN YATAY ORGANİZASYONLAR	74

3. BİLGİ YÖNETİMİ İŞLETMESİ	77
ENDÜSTRİ 4.0 VE BİLGİ EKONOMİSİ	78
MAKİNE İŞÇİSİ.....	79
ENDÜSTRİ 4.0	80
KUŞAKLAR VE BİLGİ YÖNETİMİ	81
İŞ YERİNDE KUŞAKLAR VE YÖNETİM.....	83
BİLGİNİN TRANSFERİ.....	86
ENTELEKTÜEL SERMAYE VE BİLGİ YÖNETİMİ.....	89
BİLGİNİN SINIFLAMASI.....	90
BİLGİ ÇALIŞANI VE İNSAN SERMAYESİ YÖNETİMİ.....	91
Bölüm 2 İnsan Davranışının Temel Faktörleri	97
4. ALGILAMA, BELLEK VE ÖĞRENME	99
DAVRANIŞIN TEMELLERİ VE ALGILAMA.....	99
DİKKAT VE ALGI.....	101
ZİHİN VE ALGILAMA.....	103
SINIFLAMA VE SOSYAL ALGILAMA	107
ATIF KURAMI	111
BELLEK	113
ÇALIŞAN BELLEK VE UZUN DÖNEMLİ BELLEK	115
BELLEK, ÖĞRENME VE YETKİNLİK	118
ÖĞRENME	120
KLASİK KOŞULLANMA – UYARANLAR ARASI EŞLEŞTİRME.....	123
EDİMSSEL KOŞULLANMA – DAVRANIŞ İLE SONUCU EŞLEŞTİRME.....	127
PEKİŞTİRME TARİFELERİ	129
ADALET VE CEZA.....	130
SOSYAL ÖĞRENME	132
ÖZ YETKİNLİK	133
5. YETENEK, MOTİVASYON VE YETKİNLİK	138
YETENEK.....	138
FİZİKSEL YETENEKLER	143
ZEKANIN TANIMI VE TEMEL KAVRAMLAR	148
ZEKA İLE İLİŞKİLİ FAKTÖRLER	154
ZEKANIN BİLEŞENLERİ VE SÜREÇLERİ	156
ZEKANIN ÖLÇÜMÜ.....	160
DUYGUSAL ZEKA.....	168
DUYGULARIN YÖNETİMİ VE DUYGUSAL EMEK	178
SOSYAL ZEKA	180
SÖZEL OLMAYAN İLETİŞİM VE SOSYAL ZEKA	185
SOSYAL MÜHENDİS	189
KÜLTÜREL ZEKA	192

MOTİVASYON	194
MASLOW İHTİYAÇLAR HİYERARŞİSİ	194
HERZBERG ÇİFT FAKTÖR KURAMI	196
McGREGOR X ve Y KURAMI	196
VROOM BEKLENTİ KURAMI	198
EŞİTLİK KURAMI	200
McCLELLAND SOSYAL İHTİYAÇLAR KURAMI	202
YETKİNLİK	204
YETKİNLİKLERİN ÖLÇÜMÜ	207
YETKİNLİK SETLERİ	211
MOTİVASYON, YETKİNLİK VE PERFORMANS	213
6. TUTUMLAR, KİŞİLİK VE DEĞERLER	218
DAVRANIŞ ÖN EĞİLİMİ: TUTUMLAR	219
TUTUMLARIN BİLEŞENLERİ VE FONKSİYONLARI	222
AÇIK, ÖRTÜK TUTUMLAR VE TUTUMLARIN ÖLÇÜMÜ	224
TUTUMLARIN DEĞİŞİMİ.....	233
TUTUM DEĞİŞİMİNDE ÖĞRENME VE KARAR YAKLAŞIMLARI.....	234
TUTUM DAVRANIŞ İLİŞKİLERİ	244
KİŞİLİK	249
PSİKODİNAMİK YAKLAŞIM	251
TEMEL SAVUNMA MEKANİZMALARI	253
PSİKODİNAMİK YAKLAŞIM: HORNEY, JUNG VE ADLER	255
İNSANCIL YAKLAŞIM	258
DAVRANIŞSAL YAKLAŞIM	263
ÖZELLİKLER YAKLAŞIMI.....	267
İŞ YERİNDE KİŞİLİK	273
DEĞERLER	281
DEĞERLERİN SINIFLAMASI VE ÖLÇÜMÜ	282
DEĞERLERİN OLUŞUMU VE ÖNEM SIRASI	294
DEĞERLER VE DAVRANIŞLAR ARASINDAKİ İLİŞKİLER	297
DEĞERLER VE İŞ YERİNDE DAVRANIŞ	301

Bölüm 3 Örgüt ve İnsan**307**

7. İŞLETMELERDE GRUPLAR VE TAKIMLAR	309
DIŞLANMA VE ETKİLERİ	311
GRUP DİNAMİKLERİ	313
OTORİTEYE UYMA DAVRANIŞI	316
GÜÇ, SORUMLULUK VE GRUP NÖRMLERİ	316
ORGANİZASYON İÇİNDE GRUPLAR	317
BİÇİMSEL OLMAYAN GRUPLAR VE SOSYOMETRİ	320
ÇEKİM GÜCÜ (KOHEZYON)	322
GRUP OLUŞUM SÜREÇLERİ	326

GRUP YAPISI: NORMLAR VE ROLLER	329
TAKIM ÇALIŞMASI	332
TAKIM PERFORMANSI	334
TAKIM KURMA VE GELİŞTİRME	336
TAKIM GÖREVLERİ.....	337
TAKIM ROLLERİ	342
TAKIMLARDA GÜVEN VE İLETİŞİM	344
8. LİDERLER VE LİDERLİK	351
YÖNETİCİLİK VE LİDERLİK.....	353
LİDERİN ÖZELLİKLERİNE YÖNELİK YAKLAŞIMLAR	355
ÖZELLİKLER KURAMI	356
YETKİNLİK KURAMI	358
LİDERİN DAVRANIŞLARINA YÖNELİK YAKLAŞIMLAR	363
OHIO STATE VE UNIVERSITY OF MICHIGAN LİDERLİK ÇALIŞMALARI	363
BLAKE VE MOUTON YÖNETİM KAFESİ YAKLAŞIMI	368
LİDERLİKTE DURUMSALLIK YAKLAŞIMLAR	370
DURUMSAL LİDERLİK MODELİ (SLII) MODELİ	370
FIEDLER DURUMSAL LİDERLİK YAKLAŞIMI	373
AMAÇ YOL LİDERLİK YAKLAŞIMI	375
LİDER ÜYE ETKİLEŞİM YAKLAŞIMLARI	378
LİDER ÜYE ETKİLEŞİM MODELİ	378
DÖNÜŞÜMSSEL LİDERLİK	384
OTANTİK LİDERLİK	388
HİZMETKÂR LİDERLİK	390
TAKIM LİDERLİĞİ.....	393
9. ÖRGÜT KÜLTÜRÜ	397
TOPLUMSAL KÜLTÜR	399
GÜÇ MESAFESİ	403
BİREYCİLİK – KOLEKTİVİZM	405
ERİLLİK DİŞİLİK	407
BELİRSİZLİKTEN KAÇINMA.....	409
UZUN DÖNEM – KISA DÖNEM ORYANTASYON	411
HOŞGÖRÜ – KISITLAMA	413
TOPLUMSAL KÜLTÜR VE ÖRGÜT YAPISI	414
TOPLUMSAL KÜLTÜR, ÖRGÜT KÜLTÜRÜ VE ETKİLİ LİDERLİK	417
ÖRGÜT İKLİMİ VE ÖRGÜT KÜLTÜRÜ	420
ÖRGÜT KÜLTÜRÜ FAKTÖRLERİ	425
GÜÇLÜ KÜLTÜR VE ÖRGÜT KÜLTÜRÜNÜN ÖLÇÜMÜ.....	428
ÖRGÜT KÜLTÜRÜ VE ÖRGÜT PERFORMANSI	437

Bölüm 4 Sistem ve İnsan.....	443
10. PERSONEL SEÇİM SİSTEMLERİ	444
GÖREV ANALİZİ	445
İŞ DEĞERLEME	452
SEÇİM SİSTEM VE TEKNİKLERİ	455
YETENEK: ZİHİNSEL VE FİZİKSEL BECERİLER	455
GÖREV PERFORMANSINI ETKİLEYEN KİŞİLİK BOYUTLARI	463
YETKİNLİK TEMELLİ DEĞERLENDİRME	468
11. PERFORMANS YÖNETİMİ.....	479
PERFORMANS YÖNETİMİ	480
PERFORMANS YÖNETİM SÜRECİ	484
HEDEFLER: KANTİTATİF DEĞERLENDİRME.....	488
DAVRANIŞLAR, YETKİNLİKLER: KALİTATİF DEĞERLENDİRME.....	491
GÖZLEM, DOKÜMANTASYON VE DEĞERLENDİRME GÖRÜŞMESİ	493
PERFORMANS DEĞERLENDİRME HATALARI	496
YETENEK YÖNETİMİ	497
DENGELİ KURUM KARNESİ	502
YETENEK VE PERFORMANS YÖNETİM SİSTEMLERİNİN ÖTESİ	509
ÖRGÜTSEL VATANDAŞLIK DAVRANIŞI.....	509
İŞ TATMİNİ	511
ÖRGÜTE BAĞLILIK	512
12. BİLGİ TEMELLİ ORGANİZASYON	513
YALIN ORGANİZASYON	516
YALIN ORGANİZASYONDA İNSAN	526
ÇEVİK ORGANİZASYON	529
YALIN VE ÇEVİK ORGANİZASYON	536
ÖĞRENER ORGANİZASYON	540
ÖĞRENER ORGANİZASYONUN TEMEL BİLEŞENLERİ	542
ÖRGÜTSEL ÖĞRENME.....	543
ORGANİZASYON VE ÖĞRENME	549
İNSAN VE ÖĞRENME.....	551
BİLGİ VE ÖĞRENME	554
TEKNOLOJİ VE ÖĞRENME	558
KAYNAKÇA.....	561

KAYNAKÇA

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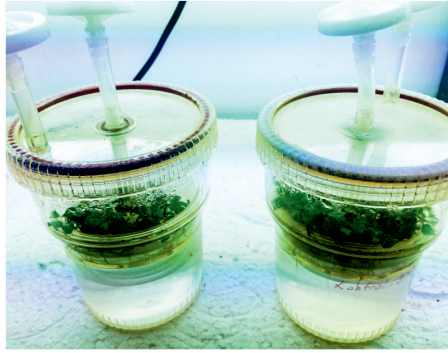
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İÇİNDEKİLER

ÖN SÖZ	iii
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BÖLÜM 1

Bitki Doku Kültürü Tanımı ve Tarihçesi

Betül Bürün, Ergun Kaya

1.1. Giriş	1
1.1.1. Bitki Doku Kültürü Teknolojisindeki Gelişmeler	4
1.1.2. Bitki Doku Kültürlerinin Türkiye'deki Durumu	13
1.2. Sonuç	13
Kaynaklar	14

BÖLÜM 2

Bitki Doku Kültürü Laboratuvarı için Temel Tasarım ve Gereksinimler

Meltem Bayraktar, Aynur Gürel

2.1. Giriş	17
2.2. Bitki Doku Kültürü Laboratuvarı Kurulumunda Dikkat Edilmesi Gereken Hususlar	17
2.2.1. Amaç ve Hedeflerin Belirlenmesi	17
2.2.2. Laboratuvar Büyüklüğü ve Yerine Karar Verilmesi	18
2.2.3. Laboratuvarın Dizayn Edilmesi	19
2.3. Bitki Doku Kültürü Laboratuvarını Oluşturan Alanlar	20
2.3.1. Hazırlık Odası	21
2.3.2. Transfer Odası	23
2.3.3. Kültür Odası/Bitki Büyüme Odası/İklim Odası	26
2.3.4. Soğuk Depolama	29
2.3.5. Genel Depolama Alanı	29
2.3.6. Personel Odası	29
2.3.7. Ofis	30
2.3.8. Cihaz Odası	30
2.3.9. Seralar	30
2.4. Bitki Doku Kültürü Laboratuvarında Kullanılan Cihazlar	32
2.4.1. Laminar Hava Akışlı Kabin	32
2.4.2. Otoklav	35
2.4.3. Teraziler	39

2.4.4.	Saf Su Cihazları	40
2.4.5.	Etüv	42
2.4.6.	Soğutucular	43
2.4.7.	Çalkalayıcılar	44
2.4.8.	Isıtıcılı Manyetik Karıştırıcı	45
2.4.9.	pH Metre	45
2.4.10.	Aseptik Transfer İşlemleri Sırasında İhtiyaç Duyulan Aletlerin Sterilizasyonunda Kullanılan Cihazlar	47
2.4.11.	Mikroskoplar	47
2.4.12.	İnkübatör ve İklimlendirme Kabini	48
2.5.	Bitki Doku Kültürü Laboratuvarında Kullanılan Kültür Kapları	49
2.6.	Bitki Doku Kültürü Laboratuvarında Kullanılan Diğer Malzemeler	55
2.7.	Sonuç	57
	Kaynaklar	57

BÖLÜM 3

Bitki Doku Kültürü Besin Ortamları

Sultan Köşkeroğlu, Atilla Levent Tuna

3.1.	Giriş	59
3.2.	<i>In Vitro</i> Kültür Ortamlarının Bileşenleri	60
3.2.1.	Bitki Besin Elementleri	61
3.2.2.	Karbon ve Enerji Kaynakları	67
3.2.3.	Vitaminler	69
3.2.4.	Amino Asitler	70
3.2.5.	Bitki Büyüme Düzenleyicileri (Sentetik veya Doğal)	71
3.2.6.	Tanımlanmamış Organik Takviyeler	77
3.2.7.	Jelleştirici (Katılaştırıcı) Ajanlar	80
3.2.8.	Biyostimülanlar	81
3.3.	<i>In Vitro</i> Kültür Ortamının Hazırlanması ve Stok Solüsyonlar	82
3.3.1.	İnorganik Tuzlar ve Stok Solüsyonları	82
3.3.2.	Bitki Büyüme Düzenleyiciler ve Stok Solüsyonları	85
3.3.3.	Vitaminler ve Stok Solüsyonları	86
3.3.4.	<i>In Vitro</i> Kültür Ortamı Hazırlama Protokolü	87
3.4.	Yaygın Olarak Kullanılan <i>In Vitro</i> Kültür Ortamları	87
3.5.	Kültür Ortamı Bileşenlerine Alternatifler	91
3.5.1.	Besin Elementi Alternatifleri	91
3.5.2.	Karbon ve Enerji Kaynağı Alternatifleri	91
3.5.3.	Jelleştirici Ajan Alternatifleri	92
3.5.4.	Bitki Büyüme Düzenleyicileri İçin Alternatifler	93
3.5.5.	Besin Ortamı Alternatifi	94
3.6.	Sonuç	94
	Kaynaklar	94

BÖLÜM 4

Sterilizasyon ve Kültür Başlatılması

Emel Yılmaz Gökdoğan, Aysu Besler, Mert Metin

4.1.	Giriş	103
4.2.	<i>In Vitro</i> Kültürlerde Sterilantların Kullanılması	104
4.3.	Dezenfektan-Sterilant Çeşitleri ve Etki Mekanizmaları	106
4.4.	Sterilizasyon Teknikleri	110
4.4.1.	Sıcaklık	110
4.4.2.	Filtrasyon (Süzme ile Sterilizasyon).....	113
4.4.3.	Işın (Radyasyon) ile Sterilizasyon	114
4.4.4.	Kimyasal Maddelerle Sterilizasyon (Yüzey Sterilizasyonu)	114
4.4.5.	Geleneksel Yöntemle Sterilizasyon	115
4.5.	<i>In Vitro</i> Kültür Materyallerinin, Alet-Ekipman ve Besin Ortamının Sterilizasyonu	115
4.5.1.	Besin Ortamı	116
4.5.2.	Cam ve Plastik Malzemeler	116
4.5.3.	Ekipmanlar	117
4.5.4.	Eksplant	117
4.5.5.	Transfer Ortamı	119
4.6.	Bitkisel Materyalin Sterilizasyonu Konusunda Örnekler	120
4.7.	Sonuç	126
	Kaynaklar	126

BÖLÜM 5

Bitki Doku Kültürü Uygulamaları

Yonca Surgun Acar

5.1.	Giriş	131
5.2.	Hücre, Doku ve Organ Kültürünün Temel İlkeleri	132
5.3.	Bitki Doku Kültürü Teknolojisi Uygulama Alanları.....	132
5.3.1.	Bitki Doku Kültürünün Temel Araştırmalarda Kullanımı ve Potansiyeli	132
5.3.2.	Kallus Kültürü	133
5.3.3.	Mikroçoğaltım	134
5.3.4.	Somatik Embriyogenez ve Organogenez	135
5.3.5.	Protoplast Füzyonu	135
5.3.6.	Haploid Bitki Üretimi	136
5.3.7.	Triploid Bitki Üretimi	137
5.3.8.	Embriyo Kültürü ve/veya Embriyo Kurtarma	137
5.3.9.	Hastaliksız Bitki Üretimi	137
5.3.10.	Bitki Doku Kültürlerinde Somaklonal Varyasyon ve Epigenetik	138
5.3.11.	Genetik Transformasyon	139
5.3.12.	Omik Bilimler ve Bitki Doku Kültürü	140

5.3.13. Bitki Germplazmalarının Korunması	140
5.3.14. Sekonder Metabolitlerin Üretimi	141
5.3.15. Sentetik Tohum Teknolojisi	141
5.4. Sonuç	142
Kaynaklar	142

BÖLÜM 6

Mikroçoğaltım

Bengi Erdağ

6.1. Giriş	147
6.2. Mikroçoğaltım Aşamaları	149
6.3. Mikroçoğaltım Metotları	152
6.3.1. Aksillar Tomurcuklardan Sürgünlerin Mikroçoğaltımı	152
6.3.2. Adventif Sürgün Oluşumu ile Mikroçoğaltım	155
6.3.3. Somatik Embriyogenez Yolu ile Mikroçoğaltım	159
6.4. Mikroçoğaltımda Başarıyı Etkileyen Faktörler	160
6.4.1. Bitkisel Materyalin Seçimi, Hazırlanması ve Sterilizasyonu	161
6.4.2. Kültür Ortamı Bileşenlerinin Belirlenmesi	163
6.4.3. Kültür Odası ve Kültür Kaplarındaki Fiziksel Çevre Koşullarının Optimizasyonu	167
6.5. Mikroçoğaltım Süreçlerinde Karşılaşılan Problemler ve Çözümleri	171
6.5.1. Kontaminasyon	172
6.5.2. Sürgün Ucu Nekrozu	173
6.5.3. Fenolik Oksidasyon	173
6.5.4. Hiperhidrisite (Aşırı Sulu Olma Durumu)	174
6.5.5. Köklenme ve Aklimatizasyon	175
6.5.6. Mikroçoğaltım Tekniği ile Elde Edilen Bireylerdeki Varyasyonlar	177
6.6. Mikroçoğaltım Çalışmalarında Maliyeti Belirleyen Unsurlar ve Maliyeti Azaltma Önerileri	177
6.7. Sonuç	180
Kaynaklar	182

BÖLÜM 7

Somatik Embriyogenez ve Sentetik Tohum Üretimi

Emel Yılmaz Gökdoğan

7.1. Somatik Embriyogenez	195
7.1.1. Giriş	195
7.1.2. Somatik Embriyogenezin Genel Özellikleri	196
7.1.3. Embriyonik Kültür Aşamaları	200
7.1.4. Somatik Embriyogenez (SE) İndüksiyonunu Etkileyen Faktörler	201

7.1.5.	Somatik Embriyogenez Sürecinde Gen İfadesi ve Gerçekleşen Moleküler Değişimler	204
7.2.	Sentetik (Yapay) Tohum Üretimi	206
7.2.1.	Giriş	206
7.2.2.	Sentetik Tohum Üretiminin Nedeni	206
7.2.3.	Sentetik Tohum Üretiminin Amacı	207
7.2.4.	Sentetik Tohum Üretiminde Kullanılan Alternatif Bitki Parçaları	208
7.2.5.	Sentetik Tohum Çeşitleri	211
7.2.6.	Sentetik Tohum Üretiminin Aşamaları	213
7.2.7.	Sentetik Tohumların Genetik Benzerliği	215
7.2.8.	Sentetik Tohumun Yararları ve Uygulama Alanları	216
7.2.9.	Tarımsal Üretimi Yapılan Çeşitli Bitkilerde Sentetik Tohum Uygulamaları	217
7.2.10.	Sentetik Tohum Teknolojisinin Sınırlamaları	220
7.3.	Sonuç	221
	Kaynaklar	221

BÖLÜM 8

Meristem Kültürü

Ergun Kaya, Selin Galatalı

8.1.	Giriş	227
8.2.	Meristem Kültürü	233
8.2.1.	Apikal Sürgün Ucu Meristem Kültürü	234
8.2.2.	Kök Ucu (Apikal) Meristem Kültürü	238
8.2.3.	Nodal (Aksillar) Meristem Kültürü	239
8.3.	Virüs Eliminasyonu	240
8.3.1.	Meristem Kültürü Yöntemiyle Virüs Eliminasyonu	240
8.3.2.	Termoterapi	240
8.3.3.	Kriyoterapi	241
8.3.4.	Kemoterapi	241
8.4.	Sonuç	242
	Kaynaklar	243

BÖLÜM 9

Embriyo Kültürü

Nazan Dağüstü

9.1.	Giriş	251
9.2.	Embriyo Gelişimi	252
9.2.1.	Embriyo Gelişim Aşamaları ve Bitki Rejenerasyonu	253
9.3.	Embriyo Kültür Tekniği	257
9.3.1.	Embriyo İzolasyonu, Sterilizasyonu ve Kültürü	258

9.4.	Embriyo Kültüründe Etkili Olan Faktörler	262
9.5.	Embriyo Kültürünün Pratikte Uygulama Alanları	266
9.6.	Sonuç	272
	Kaynaklar	272

BÖLÜM 10

Endosperm Kültürü

Betül Bürün

10.1.	Giriş	279
10.1.1.	Çift Döllenme ve Endosperm Oluşumu	279
10.1.2.	Gelişimlerine Göre Endosperm Tipleri	280
10.1.3.	Endospermli ve Endospermsiz Tohumlar	282
10.2.	Endosperm Kültürünün Tarihiçesi	282
10.3.	Endosperm Kültürünün Uygulama Alanları ve Avantajları	285
10.3.1.	Triploid ve Daha Yüksek Poliploid Bitkilerin Elde Edilmesi	285
10.3.2.	Farklı Ploidi Düzeylerinde Genomik Araştırmalar	286
10.3.3.	Biyosentez ve Metabolizma Araştırmaları	286
10.4.	Endosperm Dokusundan Triploid Rejenerantların Gelişiminin Sağlanması	287
10.5.	Endosperm Kültür Tekniğı	290
10.5.1.	Endosperm Kültürünü Etkileyen Faktörler	290
10.6.	Endosperm Kültür Prosedürü	296
10.7.	Endosperm Kültürlerinde Kallusun Histolojisi, İndirekt ve Direkt Bitki Rejenerasyonu	301
10.8.	Endosperm Kültürlerinin Sitolojisi	303
10.9.	Sonuç	304
	Kaynaklar	305

BÖLÜM 11

Anter ve Mikrospor Kültürleri

Ülkü Emiroğlu

11.1.	Giriş	309
11.2.	Mikrosporların Oluşumu ve Polen Gelişimi	311
11.2.1.	Mikrospor Oluşumu	311
11.2.2.	Polen Gelişimi	312
11.3.	Androgenik Gelişme Potansiyeli Olan Mikrosporlar	314
11.4.	Mikrosporogenez ve Mikrogametogenez Sürecinde Çevreye Duyarlılık ve Donör Bitkilerin Yetiştirilmesi	317
11.5.	Anter ve İzole Polen Kültürlerinin Uygulanması	319
11.5.1.	Besin Ortamının Bileşimi ve Hazırlanması	319
11.5.2.	Çiçek Tomurcuklarına Ön Uygulamalar	323

11.5.3. Yüzeysel Sterilizasyon	324
11.5.4. Anterlerin ve Mikrosporların <i>In Vitro</i> Kültüre Alınması	325
11.5.5. Anter ve Mikrospor Kültürlerinde Sıcaklık Şokları ve İnkübasyon Koşulları	328
11.6. Androenez	329
11.6.1. Mikrospor Embriyogenezinin İlk Safhaları	330
11.6.2. Androjenik Embriyoların Gelişmesi	333
11.6.3. Sekonder Embriyogenez	335
11.6.4. Androjenik Embriyoların Çimlenmesi ve Haploid Bitkilerin Gelişmesi	337
11.6.5. Embriyonik Kallustan Rejenerasyonlar	340
11.6.6. Androjenize Rekalsitrans	342
11.7. Spontan Diploid Androjenik Embriyolar/Bitkicikler	344
11.7.1. Kültür Öncesi Diploid Mikrosporların Meydana Gelmesi	344
11.7.2. Spontan DH Mikrosporların Oluşum Mekanizmaları	347
11.8. Antimitotik Ajanlarla DH Bitkilerin Elde Edilmesi	348
11.9. Haploid Eksplantlardan Kallus Rejenerasyonu ile DH Bitkilerin Elde Edilmesi	349
11.10. Islah Açısından DH Hatlar	350
11.11. Sonuç	354
Kaynaklar	354

BÖLÜM 12

Protoplast Kültürü

Hatice Çölgeçen

12.1. Giriş	363
12.2. Protoplast İzolasyonu	364
12.2.1. Eksplant Kaynağı Seçimi	364
12.2.2. Hücre Çeperinin Protoplasttan Uzaklaştırılması	368
12.2.3. Protoplast İzolasyonu	369
12.3. Protoplast Kültürü	374
12.3.1. Kültür Yoğunluğu	375
12.3.2. Kültür Ortamı	375
12.3.3. Protoplasttan Bitki Rejenerasyonu	377
12.4. Protoplast Füzyonu	377
12.4.1. Somatik Hibrid ve Sibirid	379
12.4.2. Heterokaryonların Kültürü	380
12.4.3. Somatik Melez Bitkilerin Karakterizasyonu	380
12.5. Sonuç	381
Kaynaklar	381

BÖLÜM 13

Kallus Kültürü

Filiz Altan

13.1. Giriş	383
13.2. Kallus Oluşumu	384
13.3. Kallus Oluşumunda Kültür Gereksinimleri	386
13.4. Kallus Kültürlerinden Ticari Amaçlı Yararlanma	387
13.4.1. Kallus Kültürleri Kullanılarak Terapötik Amaçlar için Sekonder Metabolitlerin Üretimi	388
13.4.2. Kallus Kültürleri Kullanılarak Terapötik Antikorların Üretimi	394
13.4.3. Kallustan Rejenerasyonla Tarımsal Bitki Üretimi	396
13.5. Epigenetik ve Somaklonal Varyasyon	399
13.6. Sonuç	400
Kaynaklar	401

BÖLÜM 14

Hücre Süspansiyon Kültürleri

Yonca Surgun Acar

14.1. Giriş	413
14.2. Kallus Kültürü	414
14.3. Hücre Süspansiyon Kültürü	415
14.3.1. Hücre Süspansiyon Kültürünün Başlatılması	415
14.3.2. Hücre Süspansiyon Kültürünün Sürdürülmesi	416
14.4. Hücre Süspansiyon Kültürlerinde Büyüme Ölçümü	417
14.5. Hücre Süspansiyon Kültürünün Kriyoprezervasyonu	419
14.6. Deneysel Tasarım ve Diğer Hususlar	420
14.7. Tek Hücre Kültürleri	422
14.7.1. Tek Hücrelerin İzolasyonu	422
14.7.2. Tek Hücrelerin Kültürü	423
14.7.3. Tek Hücre Kültürünü Etkileyen Faktörler	425
14.8. Hücre Süspansiyon Kültürlerinin Kullanım Alanları	425
14.9. Sonuç	429
Kaynaklar	429

BÖLÜM 15

Biyoreaktörler ile Bitki Sekonder Metabolitlerinin Üretimi

Hatice Çölgeçen

15.1. Giriş	435
15.2. Bitki Sekonder Metabolitlerinin Sınıflandırılması	436
15.2.1. Alkaloidler	436
15.2.2. Terpenoidler	437

15.2.3. Fenolikler	438
15.3. Bitki Sekonder Metabolitlerinin Üretimi Neden Önemlidir?	439
15.4. Biyoreaktörlerle Üretim	440
15.4.1. Tarihçe	442
15.4.2. Biyoreaktör Çeşitleri	443
15.5. Sonuç	452
Kaynaklar	453

BÖLÜM 16

Bitkilerde *In Vitro* Seleksiyon

Meltem Bayraktar, Pervin Güntürkün, Aynur Gürel

16.1. Giriş	455
16.2. <i>In Vitro</i> Seleksiyon Tekniği	456
16.2.1. <i>In Vitro</i> Seleksiyon Yoluyla Abiyotik Strese Dayanıklı Bitkilerin Geliştirilmesi	457
16.2.2. <i>In Vitro</i> Seleksiyon Yoluyla Biyotik Strese Dayanıklı Bitkilerin Geliştirilmesi	495
16.3. Sonuç	503
Kaynaklar	503

BÖLÜM 17

Somaklonal Varyasyon: Mekanizması ve Bitki Islahında Uygulama Alanları

Nazan Dağüstü

17.1. Giriş	511
17.2. Somaklonal Varyasyon Kaynağı ve Orijini	513
17.3. Somaklonal Varyasyonun Tanımı	514
17.4. <i>In Vitro</i> Kültür Tekniklerinde Ortaya Çıkan Varyasyon Çeşitleri	515
17.5. Somaklonal Varyasyona Neden Olan Faktörler	516
17.5.1. Genotip ve Stres Etkisi	517
17.5.2. Kullanılan Doku, Eksplant Kaynağı ve Başlangıç Materyali Türü	519
17.5.3. Ploidi Seviyesindeki Varyasyon	521
17.5.4. Hücre Döngüsünü Düzenleyen Mekanizmalar	522
17.5.5. Altkültürlerin Süresi ve Sayısı	523
17.5.6. Kriptik Transpozonların Aktivasyonu ve Transpozonal Sıçramalar	524
17.5.7. Uygulanan Doku Kültürü Yöntemleri ve Yeniden Kromozom Yapısının Düzenlenmesi	525
17.5.8. Uygulanan Bitki Büyüme Düzenleyicilerinin Cinsi ve Konsantrasyonu	527
17.5.9. Kültür Koşulları	528
17.6. Çeşit Geliştirmede Somaklonal Varyasyonun Kullanımı	528
17.6.1. Hastalıklara Dayanıklılık	529
17.6.2. Herbisit ve insektisitlere Dayanıklılık	531

17.6.3. Biyokimyasal Mutantlar	531
17.6.4. Tuza Dayanıklılık	532
17.7. Somaklonal Varyasyonun Bitki Islahında Kullanılabilirliği	532
17.7.1. Somaklonal Varyasyon Çeşide Bağlıdır	532
17.7.2. Değişikliklerin Spesifik Özelliklerde Olacağı Garanti Değildir	533
17.7.3. Birçok Değişiklik Yararlı Değildir	533
17.7.4. Faydalı Varyasyonlar Meydana Gelir	534
17.8. Somaklonal Varyantları Belirleme Metotları	536
17.8.1. Morfolojik Tespit	536
17.8.2. Fizyolojik/Biyokimyasal Tespit	537
17.8.3. Sitolojik Metotlar.....	538
17.8.4. Moleküler Tespit	539
17.9. Genel Değerlendirme	547
Kaynaklar	548

BÖLÜM 18

Bitki Doku Kültürlerindeki Problemler

Filiz Altan

18.1. Giriş	565
18.2. Bitki Doku Kültüründe Karşılaşılan Problemler ve Çözümleri	567
18.2.1. Eksplant Seçimi	567
18.2.2. Sterilizasyon	568
18.2.3. Besin Ortamı	569
18.2.4. Kontaminasyon	569
18.2.5. Eksplantın Kararması	579
18.2.6. Vitrifikasyon	580
18.2.7. Dış Ortama Alıştırma	580
18.3. Genetik ve Epigenetik Etkiler	580
18.3.1. Doku Kültüründeki Genetik Değişiklikler.....	581
18.3.2. Doku Kültüründeki Epigenetik Değişiklikler	582
18.3.3. Bitki Doku Kültüründe Bitki Rejenerasyonunda Etkili Stres Faktörleri .	584
18.3.4. DNA Metilasyon Modeli Değişiklikleri	585
18.3.5. Transpozonlar	588
18.4. Ekonomik Kaygılar	589
18.4.1. Enerji ve Çalışma İçin Düşük Maliyet Seçenekleri	590
18.4.2. Çalışma Giderlerinin Azaltılması	592
18.4.3. Genel Giderlerin Azaltılması.....	593
18.4.4. Mikroçoğaltılan Bitkilerin Pazarlanması	594
18.5. Sonuç	597
Kaynaklar	597

BÖLÜM 19**Bitki Doku Kültürü Araştırmalarında Planlama, Verilerin Toplanması ve Değerlendirilmesi***Ülkü Emiroğlu, Aynur Gürel, Betül Bürün*

19.1. Giriş	609
19.2. Doku Kültürü Denemelerinin Planlanması	610
19.3. Denemenin Kurulması ile İlgili Bazı Kavramlar	612
19.3.1. Deneme Ünitesi	613
19.3.2. Gözlem Ünitesi	613
19.3.3. Parsel	614
19.3.4. Muamele ve Kontrol	615
19.3.5. Tekerrür, Denemenin Tekrarlanması ve Ardışık Denemeler	615
19.3.6. Blok Oluşturma	616
19.3.7. Faktör ve Seviye	617
19.4. Doku Kültürlerinde Kullanılan Deneme Desenleri	617
19.4.1. Tesadüf Parselleri Deneme Deseni (Tam Randomize Desen)	617
19.4.2. Tesadüf Blokları Deneme Deseni	619
19.4.3. Faktöriyel Denemeler İçin Deneme Desenleri	622
19.4.4. Bölünmüş Parseller (Split Plot) Deseni	627
19.5. Verilerin Toplanması	628
19.6. Veri Transformasyonları	634
19.6.1. Logaritmik Transformasyon	635
19.6.2. Açık Değeri Transformasyonu (Arcsin Transformasyonu)	635
19.6.3. Karekök Transformasyonu	637
19.6.4. Resiprokal Transformasyon	637
19.6.5. Kuvvet Transformasyonu	637
19.7. Verilerin Analizi	638
19.7.1. Varyans Analizi (ANOVA)	639
19.7.2. Poisson Regresyonu	639
19.7.3. Lojistik Regresyon	639
19.8. Muamele Ortalamalarını Karşılaştırma Yöntemleri	640
19.8.1. Ortalamanın Standart Hatası	640
19.8.2. Çoklu Karşılaştırma ve Çoklu Sıra Testleri	641
19.8.3. Bir Respons (Cevap) Modeline Uydurma	641
19.8.4. Planlı Kontrastlar	642
19.9. Geçici Daldırma Sistemlerine Dayalı Biyoreaktör Araştırmalarında Kullanılan Deneme Desenleri ve Verilerin Değerlendirilmesi	642
19.10. Veri Analizleri İçin Bilgisayar Programları	652
19.11. Biyolojik Süreçlerde ve In Vitro Doku Kültürlerinde Yapay Sinir Ağlarının Kullanımı	652
19.11.1. Genel Bilgi	652
19.11.2. Biyolojik Süreçlerde Yapay Sinir Ağları	655

19.11.3. Doku Kültürlerinde Yapay Sinir Ağları	656
19.11.4. Yapay Sinir Ağı Teknolojisinin Doku Kültürü Araştırmaları Açısından Geleceği	660
19.12. Sonuçların Sunulması	663
19.13. Sonuç	665
Kaynaklar	666

BÖLÜM 20

Bitki Biyoçeşitliliğinin Korunması

Ergun Kaya, Selin Galatalı, Damla Ekin Özkaya, Onur Çelik

20.1. Giriş	673
20.2. <i>In Situ</i> ve <i>Ex Situ</i> Koruma	677
20.2.1. Bitki Genetik Kaynaklarının <i>In Situ</i> Korunması	677
20.2.2. Bitki Genetik Kaynaklarının <i>Ex Situ</i> Korunması	678
20.3. Sonuç	695
Kaynaklar	695
Dizin	705
ÖZ GEÇMİŞLER	715

BÖLÜM 1

Bitki Doku Kültürü Tanımı ve Tarihçesi

Betül Bürün, Ergun Kaya

1.1. Giriş

Bitki biyoteknolojisi alanındaki uygulamalardan biri olan bitki doku kültürlerinde 20. yüzyılın ikinci yarısından itibaren gerçekleştirilen çalışmaların sonucu olarak kaydedilen ilerlemeler bitki üretim sistemlerinde önemli gelişmelere yol açmıştır. Bitki doku kültürü teknolojisi, bitkilerin çoğaltılması, ıslahı, orta ve uzun süreli korunması konusunda karşılaşılan sorunları çözmek üzere yararlanılan tekniklerdir. Kısaca **bitki doku kültürü**, hücrelerin, dokuların, organların kontrollü koşullar altında (besin maddeleri ve çevre koşulları) aseptik kültürü olarak tanımlanabilir (Thorpe, 2007).

Doku kültürünün geçmişine bakıldığında ilk raporlar, 20. yüzyılın başlarında Alman Botanikçi Gottlieb Haberlandt'ın (1902) *Lamium purpureum* L. yapraklarından, *Eichhornia crassipes* (Mart.) Solms-Laub. yaprak saplarından, *Pulmonaria mollissima* A. Kern. salgı tüylerinden ve *Tradescantia* spp. stamen tüylerinden izole ettiği tek bitki hücrelerinin yine Alman Kimyacı Knop tarafından 1861 yılında geliştirilen yapay besin ortamında kültürü üzerine olan denemeleri ile “**bitki hücrelerinin totipotent özelliğini**” ispatsız doğru kabul etmesine dayanmaktadır. Böylece **bitki doku kültürünün teorik temelleri atılmış** ve bunu, konu ile ilgili çalışmalarda sürekli gelişmeler izlemiştir. Klonal çoğaltım, ıslah programlarına doku kültürü tekniklerinin uygulanması, genetik biyoçeşitliliğin korunması ve biyolojik kökenli ilaçların üretilmesi ile ilgili olarak doku kültürü teknolojisinden yararlanmaya ilişkin pek çok çalışma yapılmıştır (Thorpe, 2007; Vasil, 2008; García-González ve ark., 2010). Doku kültüründeki gelişmeler bitki hücrelerinin iki özelliğine dayanmaktadır. Bunlar: Totipotensi ve plastisitedir. **Totipotensi**, tüm canlı hücrelerin genetik olarak aynı (identik) bir hücreden kaynaklanması ve hücre bölünmeleri ve farklılaşma süreçlerinden sonra doku, organ, sistem ve tam bir bireyin meydana gelmesi için hücrenin sahip olduğu ve genetik olarak da korunan bir yeteneğidir (García-González ve ark., 2010). **Plastisite** ise bir doku

1.1.2. Bitki Doku Kültürlerinin Türkiye'deki Durumu

Türkiye'de bitki doku kültürü çalışmaları 1970'li yıllarda başlamış ve öncelikle üniversitelerde ve araştırma merkezlerinde olmak üzere hızla genişlemiştir. İlk uygulamalar Ege Üniversitesi, Ankara Üniversitesi, Menemen Ziraî Araştırma Enstitüsü ve Bornova Ziraî Araştırma Enstitüsü tarafından hayata geçirilmiş olup günümüzde pek çok kamu ve vakıf üniversiteleri ile TÜBİTAK, T.C. Tarım ve Orman Bakanlığı bünyesinde araştırmalar yürüten laboratuvarlarda ve ticari amaçlı faaliyet gösteren özel sektör laboratuvarlarında farklı alanlarda bitki doku kültürü çalışmaları yürütülmektedir. Üniversitelerimizde kurulan bitki doku kültürü laboratuvarlarında genellikle araştırma ve lisansüstü öğrenci yetiştirme amacı doğrultusunda çalışmalar yapılmaktadır. Dünyada doku kültürü tekniklerini ticari amaçlı kullanan uluslararası firmaların 1980'li yıllarda kurulmaya başlamış olmasına karşın ülkemizde ise doku kültürü tekniklerini kullanarak çeşitli bitkilerde (patates, muz, çeşitli meyve anaç ve fidanları ile süs bitkileri) ticari üretim yapan ulusal firmaların faaliyetleri 2000'li yıllardadır (Gözükırmızı ve Demir, 1995; Onay ve ark., 2012).

Öktem (2006), İstanbul, Sabancı, Boğaziçi, Yıldız Teknik, Uludağ, Ege, Akdeniz, Çukurova, Ankara, Ortadoğu Teknik Üniversiteleri ile İzmir Yüksek Teknoloji Enstitüsü, TÜBİTAK, Tarım ve Köyişleri Bakanlığı Antalya ve Eskişehir Araştırma Enstitüleri ve Ankara Tarla Bitkileri Araştırma Enstitüsünün doku kültürü temelli faaliyetlerini çizelge olarak vermiştir. Bu faaliyetler çeşitli bitkilerde mikroçoğaltım, biyoreaktör uygulamaları, anter kültürü, tıbbi bitkilerde sekonder metabolitlerin üretimi, çeşitli bitkilerde moleküler markör (RAPD, SSR ve AFLP) uygulamaları ile polimorfizmin değerlendirilmesi, çeşitli bitkilerde genetik transformasyonlar ve GDO'ların tespit edilmesi, ozmotik stres ve nematodlara karşı genetik manipülasyonlar, buğdayda kuraklığa tolerans ve absisik asit üretiminden sorumlu genlerin belirlenmesi, biberde tütün mozaik virüsü (TMV), patates Y virüsü (PVY) ve hıyar mozaik virüsü (CMV) gibi virüslere direnç kazandıran genlerin tanımlanması konularındaki projelerdir (Öktem, 2006). Bugün için ülkemizdeki hemen hemen tüm üniversitelerde, araştırma enstitüleri ve araştırma laboratuvarlarında çeşitli bitkilerde doku kültürü sistemlerinin kurulması ve karşılaşılan sorunların giderilmesi üzerine mikroçoğaltımdan, anter kültürü, embriyo kültürü, protoplast kültürü, meristem kültürü, kallus kültürü, sekonder metabolit üretimi, sentetik tohum üretimi ve kriyoprezervasyona kadar doku kültürlerinin tüm uygulama alanlarında *in vitro* kültür çalışmaları yapılmaktadır. Gerek üniversite gerekse kurumların araştırma laboratuvarlarında yürütülmüş olan pek çok başarılı çalışma ulusal ve uluslararası dergilerde yayımlanmış ve/veya kongrelerde sunulmuştur.

1.2. Sonuç

Doku kültürü teknolojisi ile mevsimden bağımsız olarak yıl boyunca üretim yapılabilmekte, bitkilerin hastaliksız ve kaliteli olarak hızlı klonal çoğaltılması mümkün

olabilmekte ve ayrıca biyoreaktörler ile kitlesel çoğaltım yapılabilmektedir. Tüm bunlar ticari üretim için büyük önem taşımaktadır. Ayrıca bitki doku kültürlerinin hastaliksız bitki üretiminden gen kaynaklarının korunmasına kadar tarımsal üretimdeki uygulamaları ve bitki ıslahındaki avantajları ile bugün tarımsal biyoteknoloji bilim dalından söz edilmektedir. Bitki biyoteknolojisi çalışmalarında öncelikle elverişli bir *in vitro* bitki rejenerasyon sistemini ortaya koymak gerekli olduğuna göre bitki doku kültürü tekniklerinin önemi açıkça görülmektedir.

Kaynaklar

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BÖLÜM 2

Bitki Doku Kültürü Laboratuvarı için Temel Tasarım ve Gereksinimler

Meltem Bayraktar, Aynur Gürel

2.1. Giriş

Bitki doku kültürü laboratuvarları, diğer laboratuvar tiplerine göre farklılık gösteren kendine özgü tasarımlara sahiptirler. Tüm bitki doku kültürü tekniklerini kapsayan prosedürleri gerçekleştirmek amacıyla bu laboratuvarlar belirli temel kısımları içermelidir. Laboratuvarların genel tasarımında, aseptik koşulların sağlanmasına ve muhafaza edilmesine odaklanılmaktadır (Gamborg ve Phillips, 1995).

2.2. Bitki Doku Kültürü Laboratuvarı Kurulumunda Dikkat Edilmesi Gereken Hususlar

2.2.1. Amaç ve Hedeflerin Belirlenmesi

Bir bitki doku kültürü laboratuvarının kurulmasından önce, üretim amaçları veya hedefleri, gerçekleştirilmek istenen üretim miktarı ve kültürü yapılacak bitkiler planlanmalıdır. İnşa edilecek laboratuvarın ne ölçüde detaylandırılacağı ve yeterli finansal kaynağa sahip olunma durumu iyi belirlenmelidir. Yerel pazara veya yurt dışına ürünlerini sunmak isteyen büyük bir laboratuvarın kurulmasında, potansiyel pazar payı ve laboratuvarın potansiyel müşterilere uzaklığı dikkate alınmalıdır. Potansiyel pazarlar hususunda ön değerlendirmelerin yapılması, oldukça önemli olan bir erken adımdır. Ürünlerin kimler tarafından hangi fiyatlarla alınacağını önceden belirlenmesi de uygun bir adımdır (Kyte ve ark., 2013).

Bir doku kültürü laboratuvarının kurulması ve sonrasındaki faaliyetler nispeten maliyetli olduğundan, dikkatli planlama yapmak çok önemlidir. İşlevsel bir laboratu-

2.7. Sonuç

Uygulamalı biyoteknolojinin önemli bir bölümünü oluşturan bitki doku kültürü teknolojisi, bitki bilimi açısından gerek temel gerekse de uygulamalı araştırmalar için vazgeçilmez bir konumdadır. Yakın gelecekte, altyapıya yönelik yeni gelişmelerin gerçekleşmesi, kullanılmakta olan cihaz ve aletlerin yerine ihtiyaçlara göre tasarlanmış ve kolaylık sağlayıcı yenilerinin geliştirilmesi, yeni doku kültürü metodlarının keşfi, geniş çapta kitlesel üretimi sağlayan yeni biyoreaktör tasarımlarının yapılması, yapay zekâya dayalı otomasyon sistemlerinin özellikle seralarda devreye girmesi, uygun maliyetli yeni malzeme tiplerinin elde edilmesi gibi teknolojiye dayalı yeniliklerin sağlanması ile elbette emek yoğun olan bu alandaki tüm aşamalar daha kolaylaşacak ve daha hızlı ilerlemeler kaydedilecektir.

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BÖLÜM 3

Bitki Doku Kültürü Besin Ortamları

Sultan Köşkerođlu, Atilla Levent Tuna

3.1. Giriş

Bitki doku kültürü teknolojileri, araştırma ve geliřtirmede çok çeřitli temel ve uygulamalı problemlerin çözümü için hayati derecede önemli hâle gelmesinin yanı sıra bitki çođaltım yöntemi olarak da giderek yaygınlaşmaktadır. Teknikler, belirli amaçlar için kullanılan çeřitli prosedürleri kapsar.

Bitki doku kültürü sistemleri, laboratuvarında kontrollü aseptik koşullar altında bütün bitki, organ, doku veya hücrelerin yetiřtirilmesine olanak sağlar (Phillips ve Garda, 2019). Bitki dokuları ve organları, büyüme için gerekli besinleri sağlayan yapay ortamlarda *in vitro* olarak büyütülür (George ve ark., 2008). Doku kültürü sistemi, temel besin ortamı yoluyla bitki veya eksplant büyümesi için gerekli tüm besinleri, enerjiyi ve suyu sağlar. Ek olarak kontrollü inkübasyon koşulları, büyümeyi desteklemek için optimize edilmiş ışık ve sıcaklık ayarları sağlar. Bitki gelişimi, daha sonra, belirli büyüme veya olgunlaşma aşamalarında bitki büyüme düzenleyicilerinin (dođal fitohormonlar veya sentetik versiyonlar) eklenmesiyle manipüle edilebilir (Phillips ve Garda, 2019).

Bitki çođaltma yöntemi olarak bitki doku kültürünün başarısı, kullanılan kültür ortamının dođasından büyük ölçüde etkilenir (George ve ark., 2008). Dokuların optimal büyümesi ve morfogenezi, beslenme gereksinimlerine göre farklı bitkiler için deđiřebilir. Ayrıca, bitkilerin farklı kısımlarından alınan dokular da yeterli büyüme için farklı gereksinimlere sahip olabilir (Murashige ve Skoog, 1962).

Bitki doku kültüründe bir bitki hücresinin, dokusunun veya organının kültür başarısı derecesi bazı önemli faktörlere bađlıdır. Bu önemli faktörler; besin bileşenleri ve büyüme düzenleyicilerinin seçimidir. Bir bitki doku kültürü ortamı, kullanılan bitki türü ve çeřidi veya eksplant tipine göre deđiřen ve her bir özel durum için deneysel

kesitlerinden 2-3 haftalık kültür sonrası %60'tan fazla adventif sürgün oluşumu verdiği bildirilmiştir (Plana ve ark., 2006). Yine diğer bir çalışmada, bürülce bitkisinin embriyo kültüründe hormon takviyesi olarak domates suyunun etkileri incelenmiştir. *In vitro* kültür ortamında %15 domates suyunun kullanılmasının, kök uzunluğu, sürgün sayısı, kök sayısı ve yaprak sayısı açısından en etkin bileşen olduğu, fakat kontrol (MS ortamı) uygulaması ile karşılaştırıldığında, bitki boyunda ve sürgün uzunluğunda bir azalmaya yol açtığı sonucuna varılmıştır (Naik ve ark., 2020).

3.5.5. Besin Ortamı Alternatifi

Stimufol, en yaygın kullanılan MS ortamına alternatif olarak 0, 0,5, 1, 1,5 ve 2 g l⁻¹ seviyelerinde kullanılmıştır. Ayrıca, ortamı 3,5 mg l⁻¹ de kendi kendine sterilize eden bir ürün olan Assiutmix, ortama ilave edilmiştir. İstatistiksel analiz hem MS'nin hem de Stimufol'un sarımsak büyümesi üzerinde aynı etkiye sahip olduğunu göstermiş ve temel MS ortamına iyi ve ucuz bir alternatif olarak kullanılabileceği önerilmiştir (Abdalaziz ve ark., 2016).

3.6. Sonuç

Bitki doku kültürü teknolojileri, koruma, seri üretim, genetik manipülasyon, biyoaktif bileşik üretimi ve bitki gelişimi için önemli olan bitki biyolojisinin temel taşıdır. Bu noktada bitki doku kültür ortamı doku kültürü çalışmalarında başarıyı belirleyen en önemli faktör olarak karşımıza çıkmaktadır. Besin ortamının içeriğinde yer alan bileşenlerin karşılıklı etkileşimleri, bitki türü ve genotipi kültür ortamı seçilimini zorlaştıran faktörlerdir. Bu nedenle her ne kadar doku kültürü çalışmaları için uzun yıllardır kullanılan temel besin ortamları bulunsa da gerek bilimsel ve gerekse ticari üretim amaçlı yapılan çalışmalarda bu ortamların modifiye edilmesi gerekmektedir.

Doku kültür ortamının temel bileşenlerinin yanı sıra, bu bileşenlere düşük maliyetli alternatifler de dikkat çekmektedir. Bu alternatifler seçilirken dikkat edilmesi gereken en önemli noktalar ise kontaminasyonun engellenmesi ve kaliteli bitki üretimini sağlamak olmalıdır. Yeni çalışmalar yapıldıkça kültür ortamının temel bileşenlerine alternatifler, temel besin ortamlarına ilave çeşitli maddeler eklenmiş ve eklenmeye devam etmektedir. Bu sayede istenilen niteliğe sahip bitkinin üretimini gerçekleştirmek ve süreç boyunca karşılaşılabilecek problemlerin önüne geçmek mümkün olacaktır.

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BÖLÜM 4

Sterilizasyon ve Kültür Başlatılması

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4.1. Giriş

Doku kültürü teknolojisi, eksplant olarak isimlendirilen çeşitli bitki kısımlarının steril şartlar altında yapay besin ortamında kültüre alınması ile yeni bitkiciklerin ve çeşitli ürünlerin elde edilmesini amaçlamaktadır. Bu amaçlar doğrultusunda bitki doku kültürlerinde kullanılan besin ortamları organik bileşikler, mineraller, bitki büyüme düzenleyicileri, vitamin ve karbon kaynağı olan çeşitli şekerleri içerdiğinden kültürde, bakteri ve mantarlar hızla üremektedirler. Mikroorganizmalar kültür ortamına bir kez girdiğinde, hem besin ortamı bileşenlerini kullanarak hem de toksinlerini üreterek kısa sürede hızla gelişim göstermektedirler ve kültüre alınan bitkisel dokularda nekroz oluşumuna neden olarak kök-sürgün gelişimini engellemektedirler (Misra ve Misra, 2012). Steril olan bir ortamda, canlı doku veya materyalde mikroorganizmaların üreyerek meydana getirdikleri enfeksiyona **kontaminasyon** denir (Tırnaksız, 2009). *Agrobacterium*, *Bacillus*, *Lactobacillus*, *Pseudomonas*, *Staphylococcus*, *Enterobacter*, *Xanthomonas*, *in vitro* kültürlerde yaygın enfeksiyon oluşturan bakteri cinsleridir (Babaoğlu ve ark., 2001). *In vitro* kültürlerde gözlenen olası kontaminasyonlar, kültür kabı, besiyeri, eksplant, transfer alanının çevresi, aktarım için kullanılan alet ve ekipmanlar, kültür odası ve tüm bu işlemleri gerçekleştiren kişilerden kaynaklı olabilmektedir (Bhojwani ve Razdan, 1996; Sivanesan ve ark., 2021). Canlılar-cansız yüzey, ortam ve materyal üzerinde veya içinde bulunan tüm mikroorganizmaların vejetatif ve spor formlarının yok edilmesi işlemi **sterilizasyon** olarak adlandırılmaktadır. Sterilizasyon işlemi uygulanmış malzeme, ortam ve canlı yüzeyi **steril** olarak adlandırılmaktadır (Tırnaksız, 2009). Canlı organizmalar ve tüm cansız yüzeylerin üzerinde veya içinde bulunan zararlı ve zararsız mikroorganizmaların tüm hayat formlarının yok edilmesi amacı ile kullanılan kimyasallara **sterilant** adı verilmektedir. *In vitro* kültür uygulamalarının başarısında, kültür sistemlerinin hazırlanması, başlatılması ve sürdür-

4.7. Sonuç

Bitki doku kültürü çalışmalarında steril koşulların sağlanması çok önemlidir. *In vitro* kültürlerde enfeksiyona neden olabilecek mikroorganizmalar, kullanılan bitkisel materyal, besin ortamı, kullanılan alet ve ekipmanlar, kültür koşulları ve çalışan personelden kaynaklı olabilmektedir. Farklı amaçlara yönelik olarak yapılan çalışmalarda, *in vitro* kültürlerden gelen bitkiciklerin farklı eksplantları başlangıç materyali olarak kullanılabilmesi gibi dış ortamlardan alınan çeşitli bitkisel dokulardan da yararlanılmaktadır. Özellikle dış ortamlardan sağlanan başlangıç materyallerinde mikroorganizmalar bitkisel dokuların dış yüzeylerinde veya iç dokularında da bulunabileceğinden, *in vitro* kültürlerin başarısında, farklı dezenfektanların kullanıldığı etkili sterilizasyon protokollerinin uygulanması çok önemlidir. Geliştirilen sterilizasyon protokollerinde, bitki türü hatta genotipi, kullanılacak dezenfektanların tipi, kombinasyonları, konsantrasyonları ve uygulama süresinin etkin belirlenmesi gerekmektedir.

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BÖLÜM 5

Bitki Doku Kültürü Uygulamaları

Yonca Surgun Acar

5.1. Giriş

Bitki doku kültürü, bir bitkinin herhangi bir kısmının (hücre, doku veya organ) yapay ortamda, steril koşullarda ve kontrollü şartlarda kültürünü ifade eden geniş ve kapsamlı bir terimdir (Loyola-Vargas ve Ochoa-Alejo, 2018). Sürekli gelişmekte olan bitki doku kültürü teknolojisi hem tarım hem de endüstride önemli etkilere sahiptir (Hussain ve ark., 2012). Bitki biyoteknolojisi bitki büyüme ve gelişiminin kontrolü, sürekli artan abiyotik ve biyotik stres tehditlerine karşı bitkileri koruma, dayanıklı çeşitler geliştirme ve özel farmasötik ürünlerin üretimi gibi birçok alanda yeni ufuklar açmaktadır (Altman, 1999).

In vitro ortamda bitki hücrelerini kültüre almayı ilk deneyen Alman botanikçi Gottlieb Haberlandt olmuştur. Haberlandt'ın (1902) izole ettiği yaprak hücreleri uzun süre canlı kalmasına rağmen besin ortamı gerekli bitki büyüme düzenleyicilerinden yoksun olduğu için bölünme göstermemiştir. Bitki hücre kültüründe ilk başarılı deney aseptik koşullar altında domates köklerini kültüre alan White (1934) tarafından gerçekleştirilmiştir. Bitki doku kültürü, her canlı hücrenin uygun koşullar altında tam bir organizma hâline gelmek için gerekli tüm bileşenlere sahip olduğunu varsayan totipotensi teorisinin geliştirilmesiyle gerçek bir destek elde etmiştir (Vasil ve Vasil, 1972). Bitki ıslah programları için önemli olan izogenik hatların daha hızlı elde edilmesine olanak veren haploid üretimi; bitki türleri arasındaki seksüel uyumsuzluğun (eşeyssel uyumsuzluk) üstesinden gelmek amacıyla hibrid embriyoların kurtarılması; bitki hücre duvarlarının enzimatik olarak parçalanarak protoplastların elde edilmesi ve bu protoplastların füzyonu ile intraspesifik (türüçi) veya interspesifik (türlerarası) somatik melezlerin elde edilmesi, hücre veya organ kültürlerini kullanarak sekonder (ikincil) bileşiklerin üretilmesinin yanı sıra genetik transformasyon sistemlerinin kurulumu ve geliştirilmesi bitki doku kültüründe önemli gelişmeler olarak sıralanabilir (Loyola-

5.4. Sonuç

Bitki doku kültürü teknolojileri, mikroçoğaltım başta olmak üzere çeşitli amaçlar için ticari düzeyde uygulama alanına sahiptir ve bugün modern tarımda vazgeçilmez bir araç olmuştur. *In vitro* kültürlerde özellikle de kallus dokusunda meydana gelen genetik ve epigenetik değişimler tarımsal veya endüstriyel özellikler bakımından istenen değişiklikler olması durumunda genetik ve bitki ıslahı programları için önemli bir avantajdır. Kontrollü koşullarda hücre süspansiyonuna farklı stres uygulamaları sonucu dayanıklı hücrelerden bitki rejenerasyonu ile dayanıklı bitkilerin elde edilmesi mümkün olmaktadır. Bu şekilde abiyotik faktörlere (kuraklık, tuzluluk, soğuk vb.) toleranslı bitkiler üretmek özellikle de kuraklığa dayanıklı bitkilerin elde edilmesi küresel ısınmanın olumsuz etkilerini azaltmaktadır. Genetik transformasyonlar ile insektisit veya herbisitlere toleranslı bitkilerin elde edilmesi verim artışı ile birlikte toksik olan insektisit ve herbisitlerin daha az kullanılmasını sağlamak çevre kirliliği bakımından avantaj olmaktadır.

Hibrid tohumları elde etmede ebeveyn hatlar olarak kullanılan homozigot hatlar ıslah programları için önemli materyallerdir ve geleneksel ıslah yöntemlerinde 5-10 jenerasyon kendileme ile elde edilebilen homozigot hatlar anter ve izole polen kültürleri ile bir yıl gibi çok daha kısa sürede elde edilmektedir.

Seksüel olarak üretilmeyen hibrid bitkilere embriyo kültürü ile embriyo kurtarma tekniği ile ulaşılmaktadır.

Eşeyssel uyumsuzluk olan bitki türlerinde türlerarası veya türüçü hibrid bitkiler, farklı bitki protoplastlarının kaynaşması ile (somatik melezleme) ile elde edilmektedir (somatik melezler).

Hücre kültürleri, endüstriyel ve farmasötik olarak önemli olan sekonder metabolitlerin üretimi için giderek daha önemli hâle gelmektedir.

Doku kültürü teknolojisinde genom düzenleme gibi yeni teknolojiler genetik manipülasyon için umut verici alternatiflerdir. Genomik, transkriptomik ve proteomik gibi yaklaşımlarla bitki doku kültüründe organogenez ve embriyogenez gibi süreçlerin yanı sıra *in vitro* koşullarda indüklenen genetik değişikliklerin anlaşılması da kolaylaşmaktadır.

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BÖLÜM 6

Mikroçoğaltım

Bengi Erdağ

6.1. Giriş

Dünya nüfusunun 2019 yılında 7,7 milyar insandan oluştuğu tahmin edilmektedir. 1950'den bu yana herhangi bir zamandan daha yavaş olsa da artmaya devam eden nüfusun 2030'da 8,5 milyar, 2050'de 9,7 milyar ve 2100 yılında 10,9 milyara çıkabileceği öngörülmektedir (United Nations, 2019). Artan dünya nüfusuna karşılık çevre kirliliği, kullanılabilir içme suyu ve fosil yakıtları da içeren doğal kaynaklar, bitki biyokütlesi, gıda ve yem yetersizliği önümüzdeki yıllarda daha da ciddi bir biçimde kendini gösterecektir. Gıda, enerji, bitki biyokütlesi ve çevre kirliliği ile ilgili sorunları çözenin zorluğu; bu sorunların geniş ve uzun vadeli bakış açılarından oluşturulan ortak ve yenilikçi bir kavram ve metodolojiye dayalı, aynı zamanda eş zamanlı olarak çözülmek istenmesi, sonuçta yeni bir endüstri geliştirme gereksinimidir (Kozai ve ark., 2000a, b). Sadece gıda, yem ve çevre koruma için değil, aynı zamanda biyoenerji, biyobozunur plastik ve diğer pek çok endüstriyel ürünü üretmek için her yıl milyarlarca bitkinin elde edileceği teknikleri geliştirmek gerekmektedir (Kozai ve ark., 2005).

Hücre, doku, organ veya bunların bileşenlerinin *in vitro* olarak tanımlanan fiziksel ve kimyasal koşullar altında gerçekleşen aseptik kültürü **bitki doku kültürü teknikleri** olarak tanımlanmaktadır ve bu teknikler temel ve uygulamalı çalışmalar ile çok sayıda bitkiyi üretmeye olanak sağlamaktadır.

Bitki doku kültürü teknikleri bitki hücrelerinin tam bir bitkiye dönüşebilme yeteneği olan totipotensi fenomenine dayanır. 1902 yılında Gottlieb Haberlandt tarafından sunulan totipotensi hipotezine göre her bir hücre tam bir bitki üretebilmek için gereken tüm genetik bilgiye sahiptir (Haberlandt, 1902). Totipotensi fenomeninde hücreler tüm gelişimsel kapasitelerini korur ve uygun koşullar altında çoğalarak yeni bir organizmayı oluşturan tüm hücre tiplerini ortaya çıkarabilir (Grafı ve ark., 2011). Bazı farklılaşmış hücre tipleri hariç (trakeal elemanlar, kalburlu borular, olgun lif ve sklereidler

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BÖLÜM 7

Somatik Embriyogenez ve Sentetik Tohum Üretimi

Emel Yılmaz Gökdoğan

7.1. Somatik Embriyogenez

7.1.1. Giriş

Bitki genetiği ve biyoteknolojisi alanlarındaki gelişmelerde, *in vitro* kültürlerin kullanımına dayalı etkin bitki rejenerasyon sistemlerinin kurulması büyük önem arz etmektedir. Uygulanan çeşitli *in vitro* sistemler arasında **somatik embriyogenez (SE)** ilk sıralarda yer almaktadır (Gaj, 2004). SE, farklılaşmamış somatik hücrelerin somatik embriyolara dönüşmesi sürecidir (von Arnold ve ark., 2002). *In vitro* kültür koşullarında, SE sürecinin indüklenmesi ile bir bitkinin somatik hücre, doku veya organlarından elde edilen, bağımsız vasküler sistemi olan, kök ile sürgün aksini içeren iki kutuplu embriyolara **somatik embriyo** denmektedir (Temiz ve Özgüven, 2010). İlk kez Steward ve ark. (1958), havuç kallus kültürlerinde somatik embriyo elde etmeyi başarmışlardır ve bu gelişme hem bitki embriyogenezi olarak adlandırılan morfogenez olayların gerçekleştiği bir model hem de hücre kültürü sistemlerinden bitki rejenerasyonu için önemli bir yolak olarak kabul edilmiştir (Zimmerman, 1993). SE, klonal çoğaltım, transformasyonla genetik olarak modifiye edilmiş bitkilerin rejenerasyonu, somatik melezleme, *in vitro* mutant indüksiyonu ve seleksiyonda kullanılmakta olup bitki morfogenezin deneysel oluşumu ve totipotensi üzerine yapılan temel araştırmalar için yararlı bir araçtır (Gaj, 2004). Geleneksel ıslah, moleküler ve hücre biyolojisi teknikleri birleştirildiğinde, SE ticari öneme sahip türlerin genetik olarak geliştirilmesi ve bitki hücrelerinde totipotensi ifadesi için iyi bir mekanizma olmaktadır (Rai ve ark., 2010). SE, biyoreaktörler kullanılarak hücre kültürlerinden kısa sürede büyük ölçekte çoğaltım, odunsu bitki türlerinde yaşam döngüsünü kısaltarak melez embriyoların çimlenmesi, biyotik ve abiyotik stres faktörlerine karşı transgeniklerin kullanılması, somatik embriyo indüksiyonu ve olgunlaşması sırasında meydana gelen biyokimyasal

7.3. Sonuç

Son yıllarda bitki biyoteknolojisi ve bitki moleküler genetiği alanlarında önemli gelişmeler kaydedilmiştir. Özellikle *in vitro* kültürlerin kullanımına dayalı etkin bitki rejenerasyon sistemlerinin kurulması mikroçoğaltım, sekonder metabolit üretimi, transgenik bitkilerin elde edilmesi, tehlike altındaki türlerin korunması, üreme problemi olan türlerin bitki doku kültürü teknolojisi ile çoğaltımında büyük önem arz etmektedir. Söz edilen amaçlara yönelik olarak uygulanan *in vitro* sistemler arasında somatik embriyogenez ilk sıralarda yer almaktadır. Somatik embriyogenez, çeşitli vejetatif bitki eksplantlarından başlatılan gelişimsel bir program sonucunda eşeyli üreme ve döllenme olmaksızın gerçekleşmektedir ve SE başarısını, bitki türü, genotipi, eksplant tipi, besin ortamı kompozisyonu, BBD çeşidi, kombinasyon ve konsantrasyonu, ABA'nın indüklediği çeşitli abiyotik stres faktörleri etkilemektedir. SE sürecinde pek çok moleküler değişim gözlenmekte olup organize olmamış kallus hücrelerinden somatik embriyo oluşumuna geçişte, aktif RNA sentezi oluşmakta ve transkripsiyonel düzeyde yeniden programlanmış bir gen ifadesi gerçekleşmektedir. Histon modifikasyonları, DNA'nın yeniden şekillenmesi ve DNA metilasyonu gözlenen diğer moleküler değişimler arasındadır. SE'yi düzenleyen önemli genler veya gen aileleri olarak *LEA*, *BABYBOOMI (BBMI)*, *LEAFY COTYLEDON1 (LEC1)* ve *LEC2*, *WUSCHEL*, *WUS*, *CLAVATA (CLV)*, *SERK* bilinmektedir.

Direkt veya indirekt SE süreci sonucunda oluşan somatik embriyoların yanı sıra bitkinin meristem, nod, sürgün ucu, tomurcuk, kallus gibi embriyonik olmayan bitki parçalarının hidrojel bir madde ile kaplanması sonucu da sentetik tohumlar üretilmektedir. Sentetik tohum teknolojisinin ışığında bitkinin tohum oluşumundan generatif aksamı bitki gelişimine kadar devam eden gelişimsel süreçlerin aydınlatılması, embriyonik anomali ve nedenlerinin araştırılması, nesli tükenmekte olan veya tehdit altındaki bitkilerin mikroçoğaltımı, yavaş büyümeye dayalı kısa süreli muhafaza veya kriyoprezervasyon ile uzun süreli olarak korunması mümkün olabilmektedir. Sentetik tohum, steril (kısır) bitkilerin, hibrid süs bitkilerinin, elit poliploid türlerin, *in vitro* kültürlerle cevap vermeyen bitki germplazmaların muhafazası ve değişiminde de rol oynamaktadır. Ayrıca, hastaliksız özellikle virüssüz bitki üretimi, somaklonal varyasyonun moleküler tekniklerle saptanması ve hibrid varyetelerin ıslahında başarı ile uygulanmaktadır. Günümüzdeki sınırlamalarına rağmen avantajlarını göz önünde bulundurarak yapılan çalışmalardan elde edilecek sonuçlardan yararlanarak geliştirilecek yeni tekniklerle sentetik tohum teknolojisi daha da ileriye gidecektir.

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BÖLÜM 8

Meristem Kültürü

Ergun Kaya, Selin Galatalı

8.1. Giriş

Meristemler sürekli ve hızlı bölünme yeteneğine sahip olan hücrelerdir ve bu hücreler arasında vasküler doku farklılaşması gerçekleşmemiştir. Enfekte olan bitki dokularında virüslerin hareketi vasküler elementler yoluyla gerçekleşebildiği ve bitkinin uç/meristem bölgelerinde vasküler elementler henüz oluşmadığı için virüsler bu bölgelere ulaşamazlar. Diğer taraftan meristem hücrelerinin metabolizma hızlarının virüslerin bu hücrelerde çoğalmasını baskılayacak kadar yüksek olması ve virüs gelişimini baskıladığı kabul edilen oksin bitki büyüme düzenleyicilerinin meristematik bölgelerde konsantrasyonlarının fazla olması meristematik bölgelerin virüsten ari veya bu bölgelerdeki virüs yoğunluğunun düşük olmasının temel sebepleridir. Sürgün uçlarındaki virüsten ari veya virüs dağılımının düşük olduğu bilgisi, enfekte bitkilerden meristematik bu bölgelerin kesilip yapay besin ortamına transferiyle virüsten ari bitkilerin elde edildiği meristem kültürü tekniğinin gelişmesini sağlamıştır. Bu *in vitro* teknik, kısa süre sonra virüsle enfekte olmuş bir bitkiden kısa sürede virüsten ari bitki elde edebilmeyi sağlayan en popüler teknik hâline gelmiş ve bu amaç için yaygın olarak kullanılan tekniklerden biri olmuştur (Raychaudhuri, 1967).

Bitki sürgün uçlarından meristem çıkartılması ve bu meristemlerin *in vitro* rejenerasyonu yoluyla patojenden ari bitki üretimi etkili bir yöntem olarak uygulanmaktadır. Doğal ortamlarda ya da klonal olarak çoğaltılan bitkiler mikrofungus, bakteri ve/veya virüsler (Şekil 8.1a) tarafından enfekte edildiğinde, patojen anaç bitkiden klon bitkiye geçmektedir ve belirli bir klonal çeşidin tüm popülasyonu aynı patojen ile enfekte olabilmektedir (Şekil 8.1b). Verim azalması veya bitki kalitesinin düşmesine sebep olan latent virüslerde, semptomların tespit edilmesi ve bu tür enfeksiyonların ortadan kaldırılması zor olabilmektedir (Panattoni ve ark., 2013).

laştırır. Tekniğin ileri uygulamaları, değerli ve nadir türlerin germplazmını korumaya yönelik meristem ve sürgün uçlarının *in vitro* depolanması, eşeyli ve eşeysiz olarak üretilmiş kültür ve yabancı türlerin orta ve uzun süreli depolanması için, geleneksel yöntemlere uygun ve çekici bir alternatif olarak ortaya çıkmaktadır. Bununla birlikte, yöntemin başarıyla uygulanması için, kültürün devamlılığı, patojen indekisleme ve *in vitro* aktif gen bankalarında muhafaza edilen bitkilerinin genetik kararlılıklarının izlenmesi için verimli prosedürlerin geliştirilmesine de ihtiyaç vardır. Ayrıca, uzun süreli koruma aracı olarak meristem ve sürgün uçları için, uygun kriyoprezervasyon tekniklerinin geliştirilmesine de gereksinim duyulmaktadır. Diğer taraftan *Agrobacterium* aracılı genetik transformasyon için meristem ve sürgün ucu kültürü tekniğinin kullanılması cesaret vericidir ve türlerinin genetik modifikasyonu için faydalı olabilir.

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BÖLÜM 9

Embriyo Kültürü

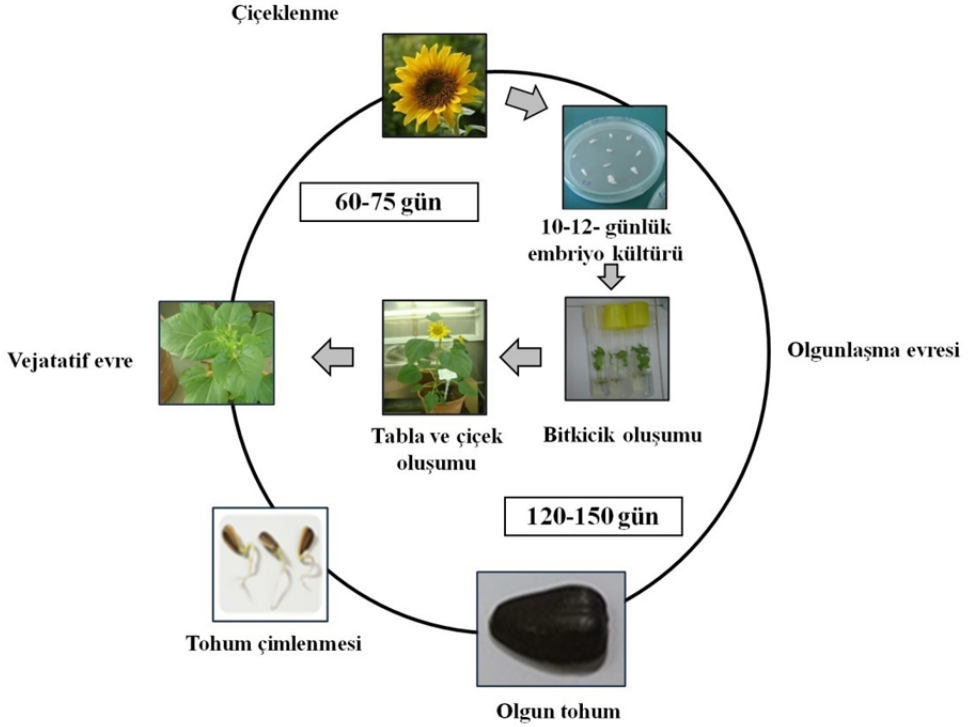
Nazan Dağüstü

9.1. Giriş

Embriyo kurtarma tekniği olarak da bilinen embriyo kültürü olgunlaşmamış veya olgun zigotik embriyoların tohum ve tohum taslaklarından steril koşullarda izolasyonu ve optimum koşullar altında gelişmeleri için endosperm koşullarının sağlandığı yapay besin ortamlarında kültüre alınması ve tam bitki elde edilmesini kapsayan bir yetiştirme tekniğidir (Bridgen, 1994; Pierik, 1997; Bürün ve Gürel, 2001). Geleneksel anlamda embriyo kültürü seksüel olarak üretilen zigotik embriyo kültürünü ifade eder. Bu tekniğin temel dayanağı, embriyo kültürünün, doğal koşullarda meydana gelen melezlerde, erken embriyo gelişim aşamasında seksüel üretimde başarıyı engelleyen problemlerin çözümünde kullanılan en önemli yöntemlerden birisi olmasıdır. Bu koşullarda tozlanma ve döllenme gerçekleşir fakat zigot sadece birkaç hücreli embriyo oluşturmak üzere bölünür, büyüme yeteneğini kaybeder ve daha ileri gelişme gösteremez veya ölür. Endosperm embriyonun gelişimini destekleyecek yapıda değildir ve embriyo gelişmesinde küçük kalır ve olgunlaşamaz (George ve Sherrington, 1984; Bajaj 1990).

In vitro izole edilen embriyolar genellikle erken çimlenme göstermektedirler (Jensen, 1976). Bunun iki nedeni vardır birincisi tohum kabuğu uzaklaştırıldığında çimlenmeye olumsuz etki yapan inhibitörlerinde (engelleyiciler) uzaklaştırılmış olması, diğeri ise *in vivo* negatif ozmotik potansiyelin (su potansiyeli üzerinde etki yapan ve çözünmüş madde miktarının yüksek olması) *in vitro* olandan daha yüksek bir değere sahip olabilmesidir.

Embriyo kültürü yöntemi ile tam bitki elde edilmesi ya doğrudan yani direkt olarak embriyodan (Örn. ayçiçeği bitkisi Şekil 9.1A) ya da indirekt olarak yani önce kalus oluşumu ve bunu takiben sürgün ve kök oluşumu ile gerçekleşir (örn. buğday bitkisi Şekil 9.1B).



Şekil 9.10. Ayçiçeği (*H. annuus* L.) bitkisinde olgunlaşmamış embriyo kültürü ile 1 yılda 4-5 jenerasyon alınarak yaşam çemberinin kısaltılması

9.6. Sonuç

Sonuç olarak embriyo kültürü sayesinde ıslah çalışmalarında klasik metotlarla başarı sağlanamadığı türler ve cinslerarası melezlemelerde ve farklı poliploidi düzeyindeki bitkilerin melezlenmesinde uyumsuzluk nedeni ile embriyoların gelişemediği veya embriyonun yetersiz gelişmesi durumlarında normal embriyo gelişmesini sağlamak amacıyla embriyo kültürü yöntemi ile daha kısa sürede daha etkin sonuçlar alınabilmektedir. Embriyo kültürü tekniği ile ayçiçeği, fasulye, keten, pamuk, domates, çeltik ve arpada türlerarası melez bitkiler elde edilebilmiştir. Bitki ıslah çalışmalarında klasik ıslah yöntemlerinin embriyo kültürü tekniği ile kombine edilmesi sonucu bugün olduğu gibi gelecekte de alternatif yeni çalışmaların yapılabilmesi kaçınılmazdır.

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BÖLÜM 10

Endosperm Kültürü

Betül Bürün

10.1. Giriş

Angiospermelerde (kapalı tohumlu bitkiler) çift döllenme ile embriyo ve endosperm meydana gelir. Yani endosperm bir döllenme ürünüdür ve embriyonun gelişmesi için besin kaynağıdır. Farklı taksonomik gruplarda, endospermin gelişme sürecinde ve olgun tohumlardaki durumunda farklılıklar bulunmaktadır.

10.1.1. Çift Döllenme ve Endosperm Oluşumu

Çift döllenme; bir polen tüpü ile embriyo kesesine ulaşan haploid iki sperm çekirdeğinden birinin yumurta hücresi ile, diğerinin kutup çekirdekleri ile birleşmesidir. İlk defa 1898'de Navashin tarafından *Lilium martagon*'da keşfedilmiş olan çift döllenmenin, daha sonra farklı evrim soylarını temsil eden hemen hemen bütün angiosperm türlerinde bulunduğu ortaya koyulması, çiçekli bitkiler için çift döllenme olayının hem evrensel ve hem de eşsiz olduğunu göstermiştir (Kordyum ve Mosyakin, 2020).

Döllenmede, polen tüpü ile embriyo kesesine ulaşan haploid iki sperm çekirdeği (polen tüpü sitoplazması ile birlikte) öncelikle sinergitlerden birine boşalır ve bu sinergit dejenere olur, ölür. Embriyo kesesine salınan bu iki sperm çekirdeğinden biri (n , ♂ gamet), yumurta hücresi (n , ♀ gamet) ile birleşir ve yumurtanın döllenmesi ile **diploid zigot ($2n$)**; diğer sperm çekirdeği (n , ♂ gamet) de iki kutup çekirdeği ile kaynaşarak (üçlü kaynaşma), **endospermi** yapacak olan **triploid primer endosperm ($3n$) hücresi** meydana gelir. Ancak, üç haploid çekirdek her zaman aynı anda kaynaşmaktadır. En çok görülen, generatif çekirdekle birleşmeden önce kutup çekirdeklerinin birleşerek merkezî (sentral) hücrede **sekonder çekirdek ($2n$)** durumuna gelmesidir. İzole ettikleri sperm ve sentral hücrenin *in vitro* koşullarda kaynaşmalarını sağlayan

Endosperm kültüründe eksplant olarak olgun veya olgunlaşmamış endospermiler kullanılmaktadır. Olgun endosperm kültürlerinde sürgün tomurcuğu farklılaşması endospermden direkt olarak meydana gelebilir (örn. *Passiflora* türleri) veya kallus şekillenmesinden sonra (örn. kivi, kroton) meydana gelebilir. Bununla beraber olgunlaşmamış endosperm kültürlerinde ise önce kallus şekillenmesi kallustan embriyogenez (örn. ceviz, portakal, akasya) veya organogenez (örn. dut, nim ağacı) ile bitkicikler meydana gelmektedir.

Kültürde karşılaşılan bazı sorunlar (ploidi varyasyonlarının görülmesi vb.) nedeniyle endosperm kültürü ile triploidleri elde etmek kolay olmamakla beraber tarımsal olarak önemli olan ve bitki ıslahında yararlanılan triploidlerin elde edilmesinde uygun yöntemlerden biri yine de endosperm kültürüdür. Özellikle son yıllardaki başarılı çalışmalar ile triploidlerin yüksek oranda elde edildiği başlıca türler *Citrus sinensis* (portakal), *Morus alba* (dut), *Azadirachta indica* (nim ağacı), *Carica papaya* (papaya), *Sapium sebiferum* (Çin'de yetişen dekoratif bir ağaç), *Phlox drummondii* (alev çiçeği), *Melia azedarach* (tespik ağacı) ve *Passiflora edulis*, *P. cincinnata*, *P. foetida*'dır (çarkıfelek).

Endosperm kültürleri şimdilik ticari olarak kullanılmıyor olsa da triploidinin avantajlı olduğu bitkilerde (çekirdeksiz olma, istilacı türlerin yayılmasını azaltma, hızlı büyüme ve biyokütle artışı vb.) endosperm dokudan sürgün gelişiminin artırılması ve bitkiye göre başarılı protokollerin oluşturulması (bitkiye göre protokolleri optimize etme çalışmaları) yaygın olarak kullanımı sağlayacaktır. Son yıllardaki başarılı çalışmalar, melezlemeye gerek kalmadan kısa sürede triploidlerin elde edilmesinde endosperm kültür tekniğinin kullanılabileceğini ve ıslah programlarında geleneksel yöntemler ile birlikte kullanılmasının önemli avantajlarını ortaya koymaktadır.

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BÖLÜM 11

Anter ve Mikrospor Kültürleri

Ülkü Emirođlu

11.1. Giriş

Anter kültürü, mikrosporlardan haploid ve katlanmış haploidlerin elde edilmesi amacıyla uygulanan bir *in vitro* kültür tekniđidir. Mikrosporlar farklı prosedürlerle anterden çıkarılarak *in vitro* kültüre alındığında **izole mikrospor kültürü** ya da **polen kültürü** olarak adlandırılır.

Anter içinde oluşan **mikrospor ana hücreleri** ve yumurtalıkta tohum taslakları içinde oluşan **megaspor ana hücreleri**, somatik hücreler gibi, o tür için karakteristik kromozom sayısı kadar kromozoma sahiptir. Bu ana hücrelerden mayoz bölünme ile meydana gelen mikrosporlar ve megasporlar ile bunlardan mitoz bölünmelerle oluşan erkek gametler ve yumurta hücreleri haploiddir. Bitkinin diploid olması durumunda ($2n=2x$, AA), haploidlerde bir kromozom takımı vardır (spor ve gametler $n=x$, A; haploid bitkiler $2n=x$, A).

Resesif mutasyonların aynı jenerasyonda fenotipe yansması; heterozigot yapıdaki bir bitkinin haploidlerinde istenen rekombinantların seçilebilmesi; kromozom katlanması ile bir jenerasyonda tam homozigot katlanmış haploidlerin (DH) elde edilebilmesi vb. avantajlarıdır. O nedenle, **haploidi**, moleküler arařtırmalar, genetik çalışmalar ve **ankonvansiyonel** ıslahta önemli bir yere sahiptir.

Normal döllenmeden sapmalar sonucu doğada spontan olarak oluşan haploidlerin oranı çok düşük olduğundan, bunu artırmak için arařtırmacılar, uzak akraba türlerle veya çekirdeđi inaktive edilmiş mentor polenlerle tozlama yapmak vb. farklı uygulamalara yönelmişlerdir. Yumurta kökenli haploidler, **ginogenik haploid** (ginogenetik haploid); kökeni mikrospor olanlar ise **androjenik haploid** (androjenetik haploid) olarak tanımlanır.

Androenez (androjenik gelişme), melez jenerasyonda yalnız tozlayıcı ebeveynin özelliklerini taşıyan bir bitkinin/bitkilerin çıkması ile tahminlenebilir, sitolojik

11.11. Sonuç

Sağladığı avantajları ile haploidi, moleküler araştırmalar, genetik çalışmalar ve ıslahta önemli bir yere sahiptir. Bitki ıslahı için haploidi ve DH'ler, daha az iş gücü ile daha kısa sürede sonuca ulaşmayı sağlaması bakımından büyük bir potansiyeldir. Günümüzde androgenik haploidler birçok bitki türünde elde edilmiş ve haploid üretimi için anter/izole polen kültür tekniği, bitki ıslahı programlarının ayrılmaz bir parçası olmuştur. Bununla beraber, tarımsal olarak önemli bazı türler (baklagiller ve kabakgiller gibi) androgeneze rekalsitranıdır. Ancak, baklagillerden nohutta haploid bitkilerin elde edilmiş olması, rekalsitransın nedenini araştıran bazı çalışmaların bulunması, diğer rekalsitran genotipler adına umut vericidir. Tahıllarda ise androgenezin düşük oranda gerçekleşmesi ve rejenerantlar arasında albinizmin yüksek frekanslarda görülmesi bu teknolojinin kullanımını sınırlamaktadır. Ayrıca kültürde haploidler yanında farklı ploidi düzeyinde ve anöploid bitkilerin elde edilmesi de istenmeyen bir olgudur.

DH bitkilerin elde edilmesi amacıyla haploid eksplant orijinli kallus rejenerantları arasından DH seçimi, ve farklı gelişme dönemlerindeki haploidlere antimitotik uygulamaları yerine, diploid mikrospor orijinli bitkiciklerin moleküler testlerle tanımlanması, mikrosporda spontan kromozom katlanmalarını tetikleyebilen soğuk ön uygulamalarından yararlanması daha avantajlıdır.

Mikrospor embriyogenezini daha iyi anlamak ve kontrol edebilmek için moleküler çalışmalar yapılmaktadır ve bu çalışmalarla androgenez ile ilgili birçok genin belirlenmesinin ve mikrosporum yeniden programlanmasının mümkün olabileceği ümit edilmektedir. Böylece tarımsal olarak önemli pek çok bitkide anter kültürü ve izole polen kültürü teknikleri çok daha yaygın kullanılacaktır.

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BÖLÜM 12

Protoplast Kültürü

Hatice Çölgeçen

12.1. Giriş

Bitkilerde dokuları oluşturan hücreler orta lamel aracılığı ile bir arada bulunurlar. Maserasyon veya mekanik yollarla, enzimatik yollarla dokuları oluşturan bitki hücreleri birbirinden ayrılabilirler. Primer hücre çeperi farklı uygulamalarla uzaklaştırıldığında ise hücre zarı ve protoplazmadan oluşan bitki hücresine **protoplast** denir. Protoplastlar uygun fiziksel koşullarda canlılığını koruyabilir. Örneğin izotonik ortamlarda yeniden hücre duvarı oluşturabilirler. Mitozla bölünebilirler. Hatta yeniden bitki hücresi yığınları oluştururlar. İşte bu hücrelerden farklı uygulamalara gidilebilir. Elde edilen bu hücresel materyal bitkilerde önemli bir hücresel kaynak olarak kullanılabilir.

Bu hücresel kaynaktan hangi konularda fayda sağlanabilir? Tek bir protoplasttan bir bitki elde etmek yani tek hücre kaynaklı bitki rejenerasyonu en önemli kazanımların başında gelir. Diploid veya farklı poliploidi seviyesine sahip tek bir hücreden bitki klonları üretilebilir. Aynı zamanda elde edilen protoplastlardan füzyon yani hücre birleşimi (somatik melezleme) işlemleriyle bitki ıslahının modern bir yaklaşımı kullanılarak farklı bitki hatları, melezleri üretilebilir ve bunlar klonlanarak çoğaltılabilir. Protoplasttan klonlama yapmak için, bitki rejenerasyonu yöntemlerinin çözümlenerek uygulanabilir hâle gelmiş olması gerekir. Bu protoplastlardan somatik embriyo üretimi, hücre kültürleri ve hücre hatları, sekonder metabolit üretimi, moleküler tarım gibi çok farklı biyoteknolojik ve genetik mühendisliği uygulamalarına geçilebilir. Bitki moleküler çalışmaları açısından en önemli konular içinde sayılan gen aktarımı, genetik transformasyon, mutant izolasyonu çalışmalarına geniş bir kolaylık sağlar. Bitki fizyolojisi ve sitolojisi alanlarında gazlardan besin maddelerine kadar farklı moleküllerin hücre zarından girişi ve taşınması, hücre organellerinin (nukleusdan vakuole kadar) izolasyonu, hücre döngüsü ve farklılaşması gibi çalışmalarda kullanılabilirler.

Protoplast terimi ilk kez 1880'de Hanstein tarafından kullanılmıştır. Protoplastların ilk izolasyonu von Klercker (1892) tarafından mekanik bir yöntem kullanılarak

linden türetilmiş protoplastları ile elektrofüzyonunu takiben elde edilen türlerarası somatik hibridlerin genom bileşimi ve stabilitesi, çeşitli moleküler belirteçler ve flow sitometri kullanılarak karakterize edilmiştir. AFLP ve ISSR analizleri, 21 hibrid bitkinin ve 3 hibrid kallus hattının hepsinin *G. kurroo*'dan ziyade *G. cruciata*'ya genetik olarak daha yakın olduğunu göstermiştir. CAPS markörlerinin kullanımı ile kloroplast DNA analizinin sonuçlarına göre, tüm somatik hibridler, kloroplastları “mezofil” füzyon partneri *G. cruciata*'dan miras almıştır. Flow sitometri, poliploidleşmenin meydana geldiğini ve muhtemelen füzyon sonrası kültürün erken aşamasında gerçekleştiğini ortaya çıkarmıştır. Sonuç olarak sonraki 4 yıllık *in vitro* kültür izlemi sonucunda hibrid bitki ve kalluslarda yüksek genetik kararsızlık gözlemlenmiştir (Tomiczak ve ark., 2017). Başka bir örnekte kerevizde hibrid tohum üretimi karmaşık sorunlar taşıdığından protoplast füzyonunda farklı uygulama yolları denenmiştir. Asimetrik protoplast füzyonu ve hibrid tarama yöntemi ile kereviz süspansiyon hücreleri protoplastların alıcısı olarak kullanılmıştır. Havuç, kişniş ve beyaz kereviz mezofil protoplastları ise protoplast füzyon deneyleri için donör olarak seçilmiştir. Alıcı sitoplazmik kalıtım, iyodoasetamid tedavisi ile inhibe edilmiş ve donör nükleer genom kalıtımı UV maruziyeti ile önlenmiştir. Her iki grup protoplastlar elektroporasyon ve polietilen glikol kullanılarak kaynaştırılmış, hibrid sürgünler elde edilmiştir. Füzyon olaylarından sonra elde edilen 600'den fazla bitkiyi karakterize etmek için bir kloroplast ve alıcı ve verici organelleri ayırt edebilen üç mitokondriyal markör kullanılmıştır (herhangi bir sibirid tanımlamadan). Kereviz ve havuç arasında füzyonun gerçekleştiği gösterilmiş olup bu da çok düşük bir frekansta da olsa canlı melezlerin elde edilmesinin mümkün olduğunu kanıtlamıştır (Bruznican ve ark., 2021).

12.5. Sonuç

Son yıllarda yapılan çalışmalar bitki tür ve çeşitleri arasında üretim problemleri bulunsa bile protoplast füzyonu çalışmalarının alternatif çözümler sunduğunu göstermektedir.

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BÖLÜM 13

Kallus Kültürü

Filiz Altan

13.1. Giriş

Bitki doku kültürü, temel bilimler ve ticari uygulamalarda yaygın olarak kullanılan önemli bir tekniktir. Bitki doku kültürleri, 20. yüzyılın başında ilk kallus veya embriyo kültürlerini kuran Gottlieb Haberlandt'a (1854-1945) kadar dayanır (Efferth, 2019). 1940'larda ve 1960'larda, teknolojik gelişmeler, sitoloji, beslenme, metabolizma, morfogenez, embriyogenez ve patoloji dâhil olmak üzere hücre davranışını, patojen içermeyen bitkilerin oluşumunu ve germplazmanın depolanması ve klonal çoğaltım koşullarını araştırmak için bitki doku kültürü tekniklerinin daha da geliştirilmesine olanak sağlamıştır. 1960'lardan günümüze kadar, sekonder metabolitlerin biyosentezi merak konusu olmuştur. Gen bazlı teknolojik yöntemlerin ortaya çıkmasıyla, kallus kültürleri ve diğer bitki doku kültürü teknolojileri için yeni uygulamalar geliştirilmiştir. Bitki hücre kültürleri, antikanser ilaçları gibi terapötik olarak değerlendirilebilecek ilgili sekonder metabolitlerin biyoreaktörler kullanılarak büyük ölçekli üretimin sağlanmasında etkili bir yolu temsil etmektedir (Efferth, 2019).

Kallus; farklılaşmamış ve organize olmamış hücreler yığıdır. Kallus kültürü, *in vitro* koşullarda bitkilerden alınan organ veya doku eksplantlarının karbon kaynağı ve bitki büyüme düzenleyicileri ilaveli çoğunlukla yarı-katı besin ortamlarında kültüre alınan ve organize olmamış hücre yığınlarının oluşturulduğu bir tekniktir (Gürel ve ark., 2016). Karasal bitkilerin tüm büyük aileleri, farklılaşmamış (non-differentiated) kallus hücreleri tarafından geri kazanılmaktadır. Bu kallus hücreleri biyoteknolojik uygulamalar için son derece önemlidir ve *in vitro* olarak sürekliliği sağlanabilir. Bitkinin bölünebilme özelliğine sahip hücrelerin bulunduğu herhangi bir kısmı (endosperm, polen, embriyo, yaprak sapı, kök kısımları, internodlar vs.) kallus kültürleri üretmek için eksplant kaynağı olarak kullanılabilir (Dağüstü, 2018). Kallus kültürlerinde hücreler düzenli olarak altkültüre alma ile *in vitro* şartlarda süresiz olarak muhafaza edilebilir. Besin ortamının azalması, kuruması, sıvı forma dönüşmesi, kahverenge dönüşmesi,

için ilgi uyandıran bir yoldur. Tüm dünyada olduğu gibi ülkemizde de tıbbi bitkiler ile yapılan çalışmalarda kallus kültürlerinden yararlanılmaktadır. Bu alanda biyomühendislik ve gen tabanlı tekniklerin gelişimini daha da artıracak olan, arzu edilen doğal ürünlerin biyosentetik yolları hakkında giderek daha fazla bilgi toplanması gerekliliğidir. Aynı şey, tarla ve bahçecilikte genetik olarak değiştirilmiş bitkilerin üretimi için de geçerlidir. Böylece kallus kültürü temelli ürünlerin geliştirilmesi ve pazarlanması yönünde de ticari anlamda girişimlerinde önü açılmış olacaktır.

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BÖLÜM 14

Hücre Süspansiyon Kültürleri

Yonca Surgun Acar

14.1. Giriş

Hücre süspansiyon kültürleri, farklı tipte steril eksplantların bitki büyüme düzenleyicileri içeren besin ortamına aktarımı ile başlamakta, kültür ortamı üzerinde farklılaşmamış hücre kümelerinin oluşumu (kallus) ve ardından sürekli çalkalanan sıvı kültür ortamında hücrelerin gelişimi ile meydana gelmektedir (Neumann ve ark., 2020). Hücre süspansiyon kültürünün başlatılması ve büyütülmesi için gereken süre, bitki türüne ve büyüme ortamına bağlı olarak değişmektedir. Hücre süspansiyon kültürlerine kıyasla daha yavaş büyüyen kallus kültürleri, bitki hücre hatlarının uzun süreli muhafazasına izin vermekte ve hücre süspansiyon kültürlerinin kontaminasyonu durumunda araştırmacılara materyal kaynağı sağlamaktadır (Evans ve ark., 2003).

Bitki hücre kültürleri, memeli hücre kültürlerine göre önemli farklılıklar sergilemektedir. Bunlardan ilki kültüre alınan bitki hücreleri *in vitro* olarak sınırsız çoğalırken, memeli hücre kültürleri genellikle sınırlı sayıda hücre bölünmesi geçirmektedir. İki farklı hücre kültürü arasında ayrıca sıcaklık, organik karbon kaynağı, pH ve ışık gereksinimi gibi farklılıklar da bulunmaktadır (Hall, 2000).

Popülasyonunun homojenliği, materyalin farklı alanlarda kullanılabilirliği, yüksek oranda hücre büyümesi ve koşulların tekrarlanabilirliği hücre süspansiyon kültürlerini, hücresel ve moleküler çalışmalar için basitleştirilmiş bir model sistem hâline getirmektedir (Neumann ve ark., 2020). Bitki hücre kültürlerinin son yıllarda uygulama alanları, temel araştırmaların yanı sıra sekonder metabolitlerin büyük ölçekli üretimine yönelik olmuştur (Raj ve Saudagar, 2019). Bu bölümde kallus kültürü, hücre süspansiyon kültürünün aşamaları, büyüme ölçümleri ve kriyoprezervasyonunun yanı sıra tek hücre kültürleri ve hücre süspansiyon kültürlerinin kullanım alanları hakkında araştırmalar derlenmiştir.

Tütün hücre kültüründe ilk kompleks rekombinant proteinin (insan serum albümini) ekspresyonundan sonra (Sijmons ve ark., 1990) bitki hücrelerinde çoğunluğunun biyolojik aktivitesi olan çeşitli farmasötik proteinler üretilmiştir.

Biyoaktif ekstraktlar: Kallus ve hücre süspansiyon kültürleri aracılığıyla biyoaktif bileşiklerin üretimine ilişkin çok sayıda araştırmaya ek olarak bu kültürlerden hazırlanan özütlerin farmakolojik olarak da önemli aktiviteler gerçekleştirdiği belirlenmiştir. Örneğin, pirinç kallus süspansiyon kültüründen elde edilen ekstraktın, akciğer, göğüs ve kolon tümörlerinden türetilen dört kanser hücre hattına karşı da aktif olduğu bildirilmiştir (Deshpande ve ark., 2012; Rahman ve ark., 2016).

Renkli pigmentlerin üretimi: Antosiyaninler, birçok meyveye ve çiçeğe kırmızı, mor veya mavi renklerini veren, yaygın olarak dağılmış, suda çözünür bitki pigmentleridir. Antosiyaninlerin diyet bağlamındaki yararlı etkilerinin yanı sıra gıda ve kozmetik endüstrilerinde doğal renklendiriciler olarak kullanımı giderek artmaktadır. Bununla birlikte, ticari olarak sınırlı bulunurluğu ve çeşitliliği, bu doğal renklendiricilerin alternatif kaynakları için araştırmaları başlatmıştır. Bitkilerde, antosiyaninler gibi sekonder metabolitlerin yüksek düzeyde üretimi, regülatör genlerin yanı sıra biyosentetik enzimleri kodlayan genlerin modifikasyonu ile sağlanabilmektedir. Tütün hücre süspansiyon kültürleri kullanılarak yüksek seviyelerde birçok farklı antosiyanin elde edilmiş ve hücre kültürlerinin antosiyaninlerin endüstriyel ve tıbbi uygulamalarında kullanımı için önemli bir potansiyele sahip olduğu belirtilmiştir (Appelhaugen ve ark., 2018).

14.9. Sonuç

Hücre süspansiyon kültürleri, hücresel ve moleküler çalışmalar için uygun bir model sistemdir. Bitki ıslahında özellikle mutasyon ıslahı çalışmalarında, kozmetik, farmasötik ve tarımsal açıdan değerli sekonder metabolitlerin üretiminde bir takım avantajları da olan alternatif bir yöntemdir. Ayrıca hücre kültürleri, protoplast kültürleri için iyi bir başlangıç materyali olduğu gibi gen aktarımında da kullanılmakta olup transgenik bitki hücre kültürleri ile de büyük ölçekte sekonder metabolit üretme potansiyeline sahip tıbbi bitkilerin hızlı klonal çoğaltılması da mümkün olmaktadır.

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BÖLÜM 15

Biyoreaktörler ile Bitki Sekonder Metabolitlerinin Üretimi

Hatice Çölgeçen

15.1. Giriş

Bitki metabolitleri tüm canlılardaki gibi temel olarak primer ve sekonder metabolitler olmak üzere ikiye ayrılmaktadır. Primer metabolitler yaşamsal faaliyetlerin sürdürülmesi için temel organik bileşikleridir. Tüm canlılarda hemen hemen ortaktır. Büyüme, gelişme ve üreme için karbonhidratlar, proteinler, yağlar ve nükleik asitler gerekli primer metabolitlerdir. Sekonder metabolitlerin temel yaşamsal faaliyetlerle ilgili görevleri bulunmaz. Fakat bitkilerin büyüme, gelişme ve üremesini kolaylaştıran, işlevleri artıran etkileri vardır. Bitkilerin yaşadıkları ortama uyumlarını sağlama, tozlaşma (polinizasyon) gibi üreme sürecindeki olaylara yardımcı olma, fungus, bakteri ve virüs gibi patojenlere karşı savunmada önemli görevleri olan moleküllerdir. Aslında sekonder metabolitlerin bitki metabolizmasında sentezlenmemesi, eksikliği gibi durumlarda bitki yaşamının kötü yönde etkilenmesi söz konusudur. Hatta yaşamlarının sona ermesi görülebilir bir sonuçtur. Sekonder metabolitler dediğimiz bu organik moleküllerin sentez yolları itibarıyla yapıları primer metabolitlere göre daha karmaşıktır (Bartwal ve ark., 2012; Alvarez, 2014).

Biyoloji biliminde sekonder metabolit terimi ilk kez Kossel (1891) tarafından literatürde kullanılmıştır. İnsanlık tarihinin başlangıcından bugüne aslında, insanlar tarafından iyileştirici etkileri bilinen bitkilerden yazılı kaynaklarda bahsedilmiştir. Tarihte bilinen en eski tıbbi bitki haşhaştır. Sümer (MÖ 4000) tabletlerinde haşhaşın ağrı kesici etkisi yanında dinsel ritüellerde kullanıldığı görülmektedir Modern bilimin gelişmesi sürecinde sekonder metabolitler hep artık ürünler olarak görülsede 20. yüzyılın ortalarından itibaren etkin bir şekilde insan sağlığı ve uygarlığının korunması ve ilerlemesi için kullanılmışlardır.

gıda, farmakoloji ve tıp alanında kullanılan bitkilerin ekonomik anlamda verimli ve sürdürülebilir üretimi biyoteknolojinin biyoreaktör gibi uygulamalarıyla genişleyecek ve yayılacaktır. Biyokütle ve bitki sekonder metabolitlerinin, moleküler tarım ürünlerinin üretiminde büyük değişimler ve ilerlemeler bugüne kadar yaşanmış ve bundan sonra da yaşanacaktır. Bunların endüstriyel ölçekte uygulanabilir üretimlerinin artırılması küresel ölçekte gıda ve ilaç sorunlarının çözümü olarak görülmektedir.

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BÖLÜM 16

Bitkilerde *In Vitro* Seleksiyon

Meltem Bayraktar, Pervin Güntürkün, Aynur Gürel

16.1. Giriş

Bitkilerin yaşamlarını sürdürdükleri alanlarda, metabolizmalarını, büyüme ve gelişmelerini ve metabolizmalarını etkileyen ya da engelleyen çeşitli uygun olmayan herhangi bir durum veya maddeye stres adı verilmektedir (Gürel ve Avcıoğlu, 2001; Yılmaz ve ark., 2011). Bir çevrede devamlı olarak ya da arada sırada meydana gelen çok sayıdaki olumsuz, fakat hemen öldürücü olmayan koşullar stres olarak ifade edilir (Gürel ve Avcıoğlu, 2001). Stres faktörleri, orijinlerine göre abiyotik ve biyotik stres olarak iki gruba ayrılmaktadır. Abiyotik stres faktörleri; soğuk, sıcak, kuraklık, tuzluluk, su fazlalığı, radyasyon, çeşitli kimyasallar, oksidatif stres, rüzgâr ve toprakta besin yetersizliği gibi çevresel faktörleri içerirler. Biyotik stres faktörleri ise virüs, bakteri ve fungusları içeren patojenler, böcekler ve herbivorlardır (Yılmaz ve ark., 2011).

Tarım için büyük bir tehdit oluşturan biyotik ve abiyotik stresler, çeşitli tarım ürünlerinin tam genetik potansiyellerine ulaşmalarını engelleyerek ve onların üretimleri ile verimliliklerini sınırlandırarak olumsuz etkilere yol açarlar. Bu durum, dünya çapında oldukça büyük ekonomik kayıplara neden olmaktadır (Mahajan ve Tuteja, 2005). Bu açıdan, strese dayanıklı bitki geliştirme çabaları, ürün verimliliğini artırmak için büyük önem taşımaktadır. Geleneksel ıslah programları, ürün iyileştirilmesinde hayati bir rol oynamaya devam etmektedir ve stres toleransını indüklemek amacıyla cinsler ve türlerarası çaprazlamalarla uygun genleri istenilen bitkiye entegre etmek için kullanılırlar. Bununla birlikte, geleneksel ıslah yöntemleri ile çok az başarı elde edilmekte ve arzu edilen sonuçlara ulaşmada bu yöntemler yetersiz kalabilmektedir. Ayrıca, geleneksel ıslah yöntemlerinde prosedürler uzundur ve yüksek maliyetler gerektirmektedir. Bu nedenle, sürdürülebilir tarım için ürün iyileştirilmesinde/ıslahında karşılaşılan kritik sorunlara odaklanılarak çözmek üzere biyoteknolojik araçlara ihtiyaç duyulmaktadır (Rai ve ark., 2011; Rao ve Sandhya, 2019).

16.3. Sonuç

Biyotik ve abiyotik stresler, tarım ürünlerinin verimliliğini azaltmakta ve dünya çapında oldukça büyük ekonomik kayıplara neden olmaktadır. Bu nedenle, strese dayanıklı bitki üretimi her geçen gün daha önemli hâle gelmektedir. Geleneksel ıslah yöntemleri ile strese dayanıklı bitki üretim programları devam etse de bu yöntemler ile başarı son derece yoğun emek ve çaba sonucu kazanılabilmekte, prosedürler oldukça uzun ve yüksek maliyetli olmaktadır. Bu açıdan, alternatif olarak biyoteknolojik araçlar ön plana çıkmaktadır. Bitki doku kültürü teknolojisi hem biyotik hem de abiyotik streslere dayanıklı bitkiler geliştirmede pratik bir bitki ıslah aracı olarak görülmektedir. Doku kültürü temelli *in vitro* seleksiyon yöntemi kullanılarak strese toleranslı bitkiler elde edilebilmektedir. Bu yöntem ile seleksiyon ajanları içeren besin ortamlarında kültüre alınan bitkisel eksplantlardan istenilen özelliklere sahip *in vitro* bitkiler rejenere olabilmektedir. Şimdiye kadar *in vitro* seleksiyon tekniği kullanılarak birçok bitki türünde biyotik ve abiyotik streslere dayanıklı bitkilerin elde edildiği rapor edilmiştir. Bu durum, *in vitro* seleksiyonu strese dayanıklı bitkisel materyalin geliştirilmesinde ve üretiminde ümit var alternatif bir teknik hâline getirmiştir.

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BÖLÜM 17

Somaklonal Varyasyon: Mekanizması ve Bitki Islahında Uygulama Alanları

Nazan Dağüstü

17.1. Giriş

Rekombinant DNA tekniklerinin gelişmesi, doku kültürleri yolu ile bitki rejenerasyonu ve bu iki tekniğin birlikte kullanılması yani genetik mühendisliği çalışmaları üretimi yapılan önemli bitki türlerinde dikkate değer ilerlemelerin kaydedilmesine neden olmuştur. Bununla beraber bu teknolojinin ilerlemesinde karşılaşılan mevcut problemler arasında kontrol edilemeyen stabilite veya *in vitro* kültürler sırasında ortaya çıkan somaklonal varyasyonlar gelmektedir. Bitki hücrelerinin *in vitro* büyümesi ve aseksüel olarak tam bir bitkiye dönüşmesi için geçirdiği evreler sadece hücrenin mitotik bölünmesini içeren aseksüel bir gelişmedir ve teorik olarak herhangi bir varyasyonun olmaması gerekmektedir. İdeal anlamda genetik olarak üniform bitkilerin klonal çoğaltımı beklenmektedir (Larkin, 1998). Ancak modern teknolojilerin kullanılması ile birlikte beklenmeyen ve kontrol edilemeyen varyasyonlar da ortaya çıkabilmektedir.

Fakat son yıllarda çeşitli mikroçoğaltım yöntemlerinin kullanılması ile birlikte indirekt rejenerasyonun (kallus oluşumundan sonra meydana gelen rejenerasyon) gerçekleştiği durumlarda önemli derece farklılaşma ve yeni varyantların ortaya çıkması söz konusu olmuştur. Bu durumda somaklonal varyasyon adventif olarak meydana gelen meristem oluşumunu da içine alan protoplast, organ vb gibi eksplantların *in vitro* kültüre alınmasıyla bu dokulardan rejenere edilen tüm bitkilerde görülebilir. Farklı mikroçoğaltım yöntemlerinin uygulanması sonucu meydana gelen kallus yapısı önemli derecede orijinal materyalden farklı varyantların açığa çıktığını göstermiş olup somaklonal varyasyonun daha yakından incelenmesi ve detaylı araştırmaların yapılması gerektiğini ortaya çıkarmıştır (Mgbeze ve Iserhienrhien, 2014).

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BÖLÜM 18

Bitki Doku Kültürlerindeki Problemler

Filiz Altan

18.1. Giriş

Daha fazla gıda ürünü elde edilmesi, bitki bazlı ilaç üretiminin gerçekleştirilmesi, tarım alanındaki talebin karşılanması, tarımsal ve ekonomik açıdan önemli, nadir bulunan, nesli tükenmekte olan bitkilerin korunması oldukça önemlidir. Bu alanda yapılacak düzenlemelerin tıbbi ve ekolojik açıdan etkileri yüksektir ve geleneksel yöntemlerde başarı kaydedilmediğinde biyoteknolojik yollarla üretimin gerçekleştirilmesi sağlanabilir. Bitki doku kültürleri, modern biyoteknolojide, bitki gelişim süreçleri (Firm ve ark., 1994), gen işleyişi (Deng ve ark., 2010), mikroçoğaltım (Kumar ve Redd 2011) ve spesifik endüstriyel ve agronomik özelliklere (Loyola-Vargas ve Ochoa-Alejo 2018; Bednarek ve Orłowska 2020) sahip transgenik bitkilerin üretilmesi çalışmalarında yaygın olarak kullanılmaktadır. Bu nedenle, bitki doku kültürü teknolojisi, sağlıklı bitki materyali için virüslerin eliminasyonunu (Perotto ve ark., 2009; Taşkın ve ark., 2013), vejetatif olarak çoğaltılan bitki germplazmasının korunması (Rajasekharan ve Sahijram 2015) ve tehlike altındaki veya nesli tükenmekte olan bitki türlerinin kurtarılmasını amaçlamaktadır (Sarasan ve ark., 2006; Tazeb, 2017; Bednarek ve Orłowska 2020). Ayrıca, ticari olarak önem arz eden sekonder metabolitlerin üretimi için de ilgi çekicidir (Loyola-Vargas ve Ochoa-Alejo 2018). Hücre totipotensisi ve hücresel plastisite, bitki doku kültürünün arkasındaki ana fizyolojik prensiptir. Hücre plastisitesi kültür hücrelerinin bölünme ve farklılaşma kapasitesinden etkilenir (Garcia- Gonzales ve ark., 2010). Tek bir hücre ana bitki gibi bütün bir bitkiye dönüşebilir (Bhoite ve Palsikar 2014). Çoğaltma işleminin kontrollü ortamda olması nedeniyle mevsimsel problemler ile karşılaşılmaz. Bitkiler büyük ölçekte yetiştirilmesine rağmen genetik olarak değişmeyecektir, türüne uygun olacaktır (Abass, 2013). Bitki doku kültüründe, bitkiler besin ortamlarında yetiştirilir, burada bitkiler için gerekli besin maddeleri mevcuttur ve ayrıca zengin besinlere sahip olduklarından mikroorganizma-

lemesi ve gelişmesi gerekmektedir. Bütün insanların gerekli nitelikteki ve kalitedeki ürüne ihtiyacı tarımdan karşılanmaktadır, fakat günümüzde tarımın karşılaştığı bazı sınırlamalar söz konusudur. Mikroçoğaltım yoluyla geleneksel bazı vejetatif üretimle elde edilecek üründen daha çok ve kaliteli ürün alınarak tarımın bazı sorunları ortadan kaldırılabilecektir. Bunun için:

- Eğitimli personelin artırılması sağlanmalı,
- Standart mikroçoğaltım prosedürlerinin oluşturulması için gerekli olan araştırma geliştirme çalışmalarının sayısı artırılmalı,
- Bu konuda daha ileri durumda olan ülkelerle teknoloji ve bilgi alışverişi yapılmalı,
- *In vitro* üretim tekniğinde var olan kontaminasyon, yüksek maliyet vs. sorunların ortadan kaldırılması için gerekli çalışmalar yapılmalıdır.

18.5. Sonuç

In vitro bitki kültürü, bitki bilimi araştırmalarındaki ilerlemelerin ayrılmaz bir parçası hâline gelmiştir. Bitki doku kültürü teknikleri, bitki büyümesi ve gelişiminin yakından izlenmesine ve hassas bir şekilde manipüle edilmesine, spesifik varyasyon kaynağını/kaynaklarını analiz etmek için *in vitro* olarak kontrollü bir ortamın varlığına ve hücre, doku ve organ seviyelerinde büyümeye imkân tanır. Bitki doku kültürü, bitki bilimi araştırmalarının ilerlemesindeki rolüne ek olarak gıda üretimi, mahsulün iyileştirilmesi, sekonder metabolitlerin üretimi ve nesli tükenmekte olan türlerin korunmasında da büyük katkılar sağlamaktadır. Doku kültürü protokollerinin geliştirilmesi, büyümenin çeşitli kimyasal, fiziksel ve çevresel faktörlerinin optimize edilmesini içeren titiz bir prosedürdür. Bitkilerin *in vitro* olarak büyütülmesi konusundaki titiz çabalara ve bitki doku kültüründe kaydedilen ilerlemelere rağmen, bu tekniğin uygulanması hâlâ çeşitli fizyolojik ve gelişimsel problemlerden etkilenmektedir. Sorunlar anormal büyümeden artan genetik değişkenlik/kararsızlığa kadar değişmektedir. Bu bölümde doku kültüründeki fizyolojik ve gelişimsel sorunların ciddiyeti vurgulanmış ve karşılaşılan problemler dikkate alınarak çözüm önerileri sunulmaya çalışılmıştır.

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BÖLÜM 19

Bitki Doku Kültürü Araştırmalarında Planlama, Verilerin Toplanması ve Değerlendirilmesi

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19.1. Giriş

“Yaşayan organizmaları, bu organizmaların ürünlerini, biyolojik malzemeyi ve sistemi kullanarak insana ya da çevreye yararlı bir ürün üretmek, bir problemi çözmek için yapılan sanayi ölçeğinde üretim yöntemleri ve bilgisi” olarak tanımlanan biyoteknoloji, temel biyoloji bilimleri, mühendislik ve bilişim teknolojilerinin iç içe geçtiği ve bir arada kullanıldığı geniş bir disiplindir (Anonim, 2020a,b). Çeşitli alanlarda, özellikle de ilaç, tohum, gıda ve petrol endüstrilerindeki biyoproseslerin incelenmesinde gerekli ilerlemeleri sağlayan biyoteknoloji, son zamanlarda genetik sekanslamanın zorluklarını gidermek, genler ve proteinler arasındaki ilişkileri tanımlamak için kullanılabilir güçlü bir matematiksel temelli yazılım geliştirmek üzere bilgisayar mühendisliğini kullanan biyoinformatik bilim dalına dayandırılmaya başlanmıştır. Ayrıca matematik, özellikle de istatistik, her bilimsel süreçte yer alarak araştırma sonuçlarının güvenilirliğini artırmaktadır (Pereira ve ark., 2018).

Genetik mühendisliği ile birlikte, bitki biyoteknolojisine önemli katkılar sunan doku kültürlerinde; bazı biyolojik ve biyokimyasal olayların aydınlatılmasını amaçlayan, *in vitro* kültüre dayalı temel araştırma niteliğindeki çalışmalar yanında, rejenerasyonun olmaması ya da düşük oranda gerçekleşmesi gibi kültür sırasında karşılaşılan sorunların çözümüne yönelik araştırmalar da yapılmaktadır. Ayrıca mikroüretimde olduğu gibi çoğaltma hızını, dolayısı ile üretimi artırarak maliyeti düşürmeyi; hücre ve saçaklı kök kültürlerinde sekonder metabolit üretimini sağlamayı ya da artırmayı hedefleyen; ışık yoğunluğu, sıcaklık, ortamdaki CO₂ oranı gibi dış koşulların *in vitro* kültürdeki bitkisel materyalin gelişmesine etkilerini ortaya koyan araştırmalar da düzenlenmektedir.

dirilmesinde, farklılıkların önemi için istatistiksel yazılım programlarının farklı versiyonları kullanılmakta, tek ya da iki yönlü varyans analizine tabi tutulmaktadır.

Biyoteknoloji alanında araştırma verilerinin istatistik analizleri için, bilgisayar yazılımlarından yararlanılmakta, ve bu programların kullanımının gittikçe yaygınlaştığı gözlenmektedir. Ayrıca, son zamanlarda bunlara bir alternatif olarak “yapay sinir ağları teknolojisi (YSA)” de kullanılmaya başlanmıştır. Bu teknoloji, karmaşık ilişkilerin anlaşılmasını sağlamak için geleneksel istatistiksel tekniklere kıyasla üstün tahmin gücü sunmaktadır, ve biyolojik süreçlerin güvenilir ve amaca yönelik değerlendirilmesinde etkilidir. İstatistiksel analizlerin bir alternatifi olmakla birlikte bazı özellikleriyle YSA teknolojisinin üstünlükleri vardır. YSA teknolojisi kullanıcı dostudur ve istatistik bakımından son derece uzmanlaşmış bir bilgi (lojistik regresyon, Poisson regresyonu ve ANOVA) gerektirmemektedir. İkinci olarak YSA'lar, sınırlı sayıda deneme ve düşük maliyetle modellemeye izin veren güçlü bir teknoloji oluştururlar. Ek olarak IN-Form yazılımı, aynı zamanda bir doku kültürü sürecini optimize edebilir ve en iyi koşulları çıkarabilir. Gelecekte YSA teknolojisinin bitki doku kültürü araştırmalarında yaygın olarak kullanılması olasıdır.

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BÖLÜM 20

Bitki Biyoçeşitliliğinin Korunması

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20.1. Giriş

Dünya zengin çeşitlilikte yaşam formları ile donatılmıştır ve bu canlı organizmaların milyonlarcası doğa kanunları tarafından iyi bir şekilde birbirine bağlanmıştır. Tek hücreli birincil üreticilerden yüksek bitki ve hayvanlara kadar çeşitli yaşam formlarının karşılıklı ilişkileri, bu yeşil gezegenin benzersiz bir özelliğini ortaya koymaktadır. Dünyadaki yaşamın çeşitliliği genellikle biyolojik çeşitlilik diğer bir deyişle biyoçeşitlilik olarak adlandırılır. Dünya üzerinde dağlar, çöller, ormanlar, göller, okyanuslar gibi çok farklı ekosistemler üzerinde canlılığını sürdüren bitki, hayvan, mantar ve mikroorganizma türlerinin sayısı, bu türlerdeki muazzam gen çeşitliliği biyoçeşitliliğin parçalarını teşkil eder. Etkin koruma ve sürdürülebilir kalkınma stratejileri, bu biyoçeşitliliği korumaya yönelik yaklaşımlar ileri sürer. Hemen hemen tüm kültür çeşitlerinin orijinleri bir şekilde biyolojik çeşitliliğe dayanmaktadır ve biyoçeşitlilik, ne kadar küçük olursa olsun her türün oynayacağı önemli bir role sahip olduğu ekosistem üretkenliğini artırmaktadır. Örneğin, daha fazla sayıda bitki türü, daha fazla ürün çeşidi anlamına gelirken daha fazla tür çeşitliliği, tüm yaşam formları için doğal sürdürülebilirlik sağlar. Diğer taraftan, sağlıklı ekosistemler, pek çok afete dayanabilecek güce sahiptir ve zarar görmeden korunabilmektedir. Bu nedendir ki insan olarak her ne kadar gezegende baskın türler olsak da doğal yaşamdaki biyoçeşitliliği her zaman korumak zorundayız (Cardinale ve ark., 2012; Kaya ve ark., 2018).

Biyoçeşitlilik kelimesi 1986 yılında Walter G. Rosen tarafından literatüre girmiş olup son zamanlarda oldukça popüler hâle gelmiştir. Biyoçeşitlilik, bütün yaşam formlarının karşılığı olarak tanımlandığında, artık sürdürülebilir geçim ve gıda güvenliğinin temeli olarak kabul edilmiştir. Bilim insanları, omurgasızlar ve mikroorganizmalar da dâhil olmak üzere 50 milyondan fazla bitki ve hayvan türünün Dünya’da mevcut olduğunu ve günümüze kadar yapılan sistematik çalışmalarla bunun neredeyse iki milyo-

yum folyolardan kesilen 5×15 mm boyutlarında şeritler üzerine steril mikropipet yardımıyla damlacıklar şeklinde damlatılır ve soğuğa alıştırma ve sukroz önkültürden gelen bitkisel materyalden izole edilen eksplantlar her bir damla içerisine bir eksplant olacak şekilde yerleştirilerek diğer vitrifikasyon prosedürlerindeki aşamalar uygulanır. İlk olarak patates sürgün uçlarının kriyoprezervasyonunda (kriyokoruyucu olarak DMSO uygulanmıştır) uygulanan yöntem (Schafer-Menhur ve ark., 1997), daha sonra, kriyokoruyucu çözeltili olarak PVS2 ozmoaktif çözeltili kullanılarak muz (*Musaceae*) ve *Colocasia esculenta* var. *esculenta* bitkilerinin kriyoprezervasyonunda başarılı bir şekilde uygulanmıştır (Panis ve ark., 2005; Sant ve ark., 2008). Geniş bir genotip aralığındaki bitkilere başarılı bir şekilde uygulanabilen yöntemin bir diğer farkı ise çözme aşaması oda sıcaklığında 1-1,2 M sukroz içeren sıvı besin ortamında doğrudan gerçekleştirilmesidir (Sakai ve Engelmann, 2007; Sakaive ark., 2008). Yöntem, günümüzde en çok kullanılan kriyoprezervasyon tekniklerinden birisidir.

20.3. Sonuç

Son yirmi yılda biyoteknolojide önemli gelişmeler yaşanmıştır ve şu anda tehdit altındaki bitki germplazmını korumak için yeni yöntemler mevcuttur. Yeni geliştirilen teknikler yeni seçenekler sunmakta ve tohum, polen, embriyo ve *in vitro* kültürler şeklinde korumayı kolaylaştırmaktadır. *In vitro* teknikler ve saklama yöntemleri, minimum alan kullanarak kapsamlı koleksiyonun oluşturulmasını sağlar ve *in vitro* bitki stoklarının oluşturulması, yabancı popülasyonlar üzerindeki toplanma baskısını azaltarak anında fayda sağlamaktadır. Bu koleksiyonlar, yabancı popülasyonun geri kazanılması, moleküler araştırmalar, ekolojik çalışmalar veya ekonomik kullanımlar için sürekli olarak değerli materyal tedarikine izin vermektedir.

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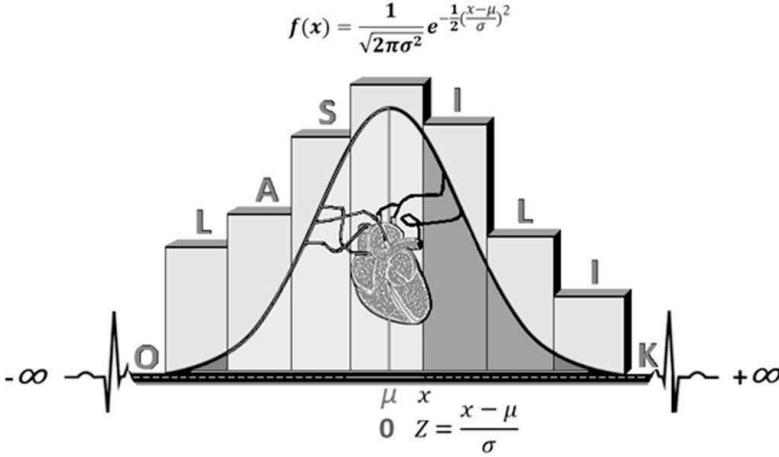
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BİYOİSTATİSTİK

“bilgiye Yolculuk: Veri Değerlendirme & Anlamlandırma Sanatı”

(Örnek Soru Çözümleri ve SPSS Uygulamaları)



Prof. Dr. Adnan Ünalın



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İÇİNDEKİLER

TEŞEKKÜR	iii
ÖN SÖZ	v

1. BÖLÜM

İSTATİSTİK/BİYOİSTATİSTİĞİN KISA TARİHÇESİ VE TEMEL KAVRAMLAR	1
1.1. İstatistik/Biyostatistiğin (Statistics/Biostatistics) Kısa Tarihiçesi	2
1.2. İstatistik Nedir?	5
1.3. Biyoistatistik Nedir?	8
1.4. İstatistik/Biyostatistikte Kullanılan Bazı Temel Kavramlar	9
1.4.1. Birim (Unit/Subject)	9
1.4.2. Özellik/Karakter (Feature/Character)	10
1.4.3. Anakütle/Populasyon/Evren (Population)	10
1.4.4. Parametre (Parameter)	10
1.4.5. Örneklem (Sample)	11
1.4.6. İstatistik (Statistics)	11
1.4.7. Örnekleme (Sampling)	11
1.4.8. Veri (Data) ve Bilgi (Information/Knowledge)	11
1.4.9. Değişken (Variable)	12
1.4.10. Varyasyon (Variation) ve Varyans (Variance)	13
1. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	14
1. BÖLÜM SORULARI CEVAP ANAHTARI	19

2. BÖLÜM

BİLİMSEL ARAŞTIRMALAR	21
2.1. Bilimsel Araştırmalara (Scientific Research) Giriş	22
2.1.1. Bilimsel Araştırmalarda Temel Kavramlar	23
2.1.2. Araştırma (Research) Nedir?	26
2.1.3. Bilimsel Yöntem (Scientific Method) Nedir?	26
2.1.4. Bilimsel Araştırma (Scientific Research) Nedir?	27
2.2. Bilimsel Araştırma Süreci	28
2.2.1. Araştırma Sorununu/Problemini Tanımlanma	29

2.2.1.1. Sorun/Problem Türleri	29
2.2.1.2. Literatür Taraması	30
2.2.2. Araştırmanın Kapsamının Belirlenmesi	34
2.2.3. Araştırmada Kullanılan Kavramların Açıklanması ve Tanımlanması	34
2.2.4. Araştırmanın Amacının Belirlenmesi	35
2.2.5. Araştırmanın Sınırlarının/Kısıtlarının Belirlenmesi	35
2.2.6. Araştırmanın Hipotezinin Oluşturulması	35
2.2.7. Verilerin Toplanması	36
2.2.8. Araştırma Yönteminin Seçilmesi	40
2.2.9. Araştırma Sonuçlarının Verilmesi	40
2.2.10. Araştırmanın Yayımlanması	41
2.3. Bilimsel Araştırmaların Sınıflandırması	41
2.3.1. Gözlemsel Araştırmalar (Observational Researches)	41
2.3.1.1. Gözlemsel Araştırma Türleri	42
2.3.2. Kesitsel Araştırmalar (Cross-Sectional)	47
2.3.3. Deneysel Araştırmalar (Experimental Researches)	48
2.3.3.1. Kontrollü Deneysel Araştırmalar (Clinical Trials without Itself Control)	49
2.3.3.2. Kontrolü Olmayan Araştırmalar (Researches without Control)	51
2.4. Bilimsel Araştırmalarda Hata Kaynakları	51
2.5. Bilimsel Araştırma Raporlarında Tablo ve Grafiklerin Kullanımı	57
2.5.1. Bilimsel Araştırmalarda Tablolar	57
2.5.2. Bilimsel Araştırmalarda Grafikler	59
2.6. Bilimsel Araştırmalarda Kaynak Gösterimi	61
2.7. Bilimsel Araştırmalarda Etik İlkeler	63
2.8. Bilimsel Araştırma Sürecinde Klinik Bir Sorunun Tanımlanması-PICO Yaklaşımı	68
2. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	69
2. BÖLÜM SORULARI CEVAP ANAHTARI	82

3. BÖLÜM

ÖLÇME, ÖLÇEKLER, TEST VE ANKET HAZIRLAMA TEKNİKLERİ	83
Giriş	84
3.1. Ölçme ve Ölçüm	84
3.2. Ölçme Aracı Nedir?	85
3.2.1. Ölçme Aracının Özellikleri	85
3.2.1.1. Geçerlilik	87

3.2.1.2. Güvenirlik	90
3.2.1.3. Kullanışlılık	92
3.3. Ölçekler	92
3.3.1. Sınıf Ölçek (Nominal Scale)	92
3.3.2. Sıralı Ölçek (Ordinal Scale)	93
3.3.3. Eşit Aralıklı Ölçek (Interval Scale)	93
3.3.4. Oran Ölçek (Ratio Scale)	94
3.4. Ölçme Aracı Olarak Test ve Anketler	95
3.4.1. Testler	95
3.4.1.1. Çoktan Seçmeli Testler	95
3.4.1.2. Test Geliştirme Aşamaları	95
3.4.1.3. Ölçek Geliştirme Aşamaları	96
3.4.1.4. Ölçeği Uyarılama	96
3.4.1.5. Ölçeğin Özellikleri	96
3.4.2. Anketler	98
3.4.2.1. Anket Geliştirme Süreci	99
3.4.2.2. Anketin Genel Yapısı ve Özellikleri	102
3.4.2.3. Anket Uygulama Şekli	103
3.4.2.4. Anketlerde Geri Dönüş Oranı	104
3.4.2.5. Anket Geliştirmede Dikkat Edilmesi Gereken Bazı Hususlar ...	104
3.4.2.6. Anket Yoluyla Toplanan Verilerin Özetlenmesi ve Analizi	105
3. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	106
3. BÖLÜM SORULARI CEVAP ANAHTARI	111

4. BÖLÜM

ÖRNEKLEME YÖNTEMLERİ, YANLILIK, RANDOMİZASYON VE KÖRLEME	113
4.1. Örneklem (Sampling) Nedir?	114
4.2. Örneklem Yöntemleri (Sampling Methods)	115
4.2.1. Olasılıklı Örneklem Yöntemleri (Probabilistic Sampling Methods)	115
4.2.1.1. Basit Tesadüfi Örneklem (Simple Random Sampling)	115
4.2.1.2. Tabakalı Örneklem (Stratified Sampling)	115
4.2.1.3. Sistemik Örneklem (Systematic Sampling)	116
4.2.1.4. Küme Örneklem (Cluster Sampling)	116
4.2.2. Olasılıklı Olmayan Örneklem Yöntemleri (Non-Probabilistic Sampling Methods)	117
4.3. Örneklem Yaparken Karşılaşılabilecek Hatalar	117

4.4. Örneklem Büyüklüğünün Hesaplanması	118
4.5. Araştırmalarda Yanlılık (Bias), Randomizasyon (Randomization) ve Körleme (Blinding)	120
4.5.1. Yanlılık (Bias)	120
4.5.2. Randomizasyon/Rastgeleleştirme	121
4.5.2.1. Randomizasyon Türleri	122
4.5.3. Körleme (Blinding)	125
4. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	127
4. BÖLÜM SORULARI CEVAP ANAHTARI	133

5. BÖLÜM

TANIMLAYICI İSTATİSTİKLER (MERKEZİ EĞİLİM ÖLÇÜLERİ VE DAĞILIM ÖLÇÜLERİ)	135
5.1. Merkezi Eğilim Ölçüleri (Central Tendency Measures)	136
5.1.1. Analitik Ortalamalar (Analytical Means)	137
5.1.1.1. Aritmetik Ortalama (Arithmetic Mean)	137
5.1.1.2. Ağırlıklı/Tartılı Ortalama (Weighted Mean)	139
5.1.1.3. Geometrik Ortalama (Geometric Mean)	141
5.1.1.4. Harmonik Ortalama (Harmonic Mean)	143
5.1.1.5. Kareli Ortalama (Squared Mean)	145
5.1.2. Analitik Olmayan Ortalamalar (Non-Analytical Means)	146
5.1.2.1. Mod/Tepe Değeri (Mode)	146
5.1.2.2. Medyan/Ortanca (Median)	147
5.1.2.3. Kartiller/Çeyrekler (Quartiles)	148
5.1.2.4. Desiller/Ondabirlikler (Deciles)	149
5.1.2.5. Pörsentiller/Yüzdebirlikler (Percentiles)	149
5.2. Dağılım/Dağılım Ölçüleri (Dispersion Measures)	150
5.2.1. Değişim Genişliği/Değişim Aralığı/Ranj (Range)	153
5.2.2. Ortalama Mutlak Sapma (Mean Absolute Deviation)	154
5.2.3. Varyans (Variance)	155
5.2.4. Standart Sapma (Standard Deviation)	160
5.2.5. Standart Hata/Ortalamanın Standart Hatası (Standard Error of Mean: SEM)	161
5.2.6. Değişim Katsayısı/Varyasyon Katsayısı (DK/VK) (Coefficient of Variation: CV)	162
5.3. Uç/Aykırı (Outlier) Değerlerin Belirlenmesi	164
5.4. Çarpıklık/Asimetri (Skewness)	167

5.4.1. Pearson Çarpıklık (Skewness) Katsayısı	168
5.4.2. Bowley'in Çarpıklık (Skewness) Katsayısı	168
5.5. Moment Çarpıklık (Skewness) ve Basıklık (Kurtosis) Katsayıları	169
5.6. Frekans Tabloları Oluşturma ve Bazı Tanımlayıcı İstatistiklerin Hesaplanması	173
5. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	181
5. BÖLÜM SORULARI CEVAP ANAHTARI	188

6. BÖLÜM

OLASILIK, TEMEL KAVRAMLAR VE ÖZELLİKLERİ	189
6.1. Olasılığa (Probability) Giriş	190
6.2. Olasılıkla İlgili Temel Kavram ve Tanımlar	192
6.3. Olasılığın Tarihsel Gelişimi	196
6.4. Toplam Olay Sayısını Bulmada Kullanılan Sayma Kuralları	200
6.5. Örnek Uzayındaki Toplam Olay Sayısının Bulunması	201
6.5.1. Basit Olaylarda Toplam Olay Sayısının Bulunması	201
6.5.2. Karmaşık Olaylarda Toplam Olay Sayısının Bulunması	201
6.5.2.1. Permütasyon	201
6.5.2.2. Kombinasyon	206
6.5.2.3. Ağaç Diyagramları İle Toplam Olay Sayısının Bulunması	209
6.6. Koşullu/Şartlı Olasılık (Conditional Probability)	210
6.7. Bayes Teoremi	212
6.8. Çebişev Teoremi (Chebyshev's Theorem)	214
6.9. Bağımsız ve Bağımlı Olaylar	215
6.9.1. Bağımsız Olaylar	215
6.9.2. Bağımlı Olaylar	216
6.10. Kesikli ve Sürekli Şans Değişkenleri İçin Olasılık Dağılımları (Beklenen Değer, Varyans ve Olasılıkların Hesaplamaları)	216
6.10.1. Kesikli Şans Değişkenlerinin Olasılık Fonksiyonları	217
6.10.2. Sürekli Şans Değişkenlerinin Olasılık Fonksiyonları	219
6. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	221
6. BÖLÜM SORULARI CEVAP ANAHTARI	224

7. BÖLÜM

BAZI TEORİK OLASILIK DAĞILIMLARI	225
7.1. Sürekli Olasılık Dağılımları (Continous Probability Distributions)	226
7.1.1. Normal Dağılım	226

7.1.1.1. Normal Dağılımın Özellikleri	226
7.2. Kesikli Olasılık Dağılımları (Discrete Probability Distributions)	235
7.2.1. Binom Dağılımı	235
7.2.1.1. Binom Dağılımının Özellikleri	236
7.2.2. Poisson Dağılımı	239
7.2.2.1. Poisson Dağılımın Özellikleri	239
7. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	242
7. BÖLÜM SORULARI CEVAP ANAHTARI	246

8. BÖLÜM

HİPOTEZ TESTLERİ VE NORMALLİK TESTLERİ	247
8.1. Hipotez Testlerine Giriş	248
8.1.1. Hipotez Testinin Aşamaları	249
8.2. Normallik Testleri	257
8.2.1. Shapiro-Wilk Testi	260
8.2.2. Kolmogorov-Smirnov Testi	262
8. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	265
8. BÖLÜM SORULARI CEVAP ANAHTARI	268

9. BÖLÜM

BAZI PARAMETRİK TESTLER VE PARAMETRE TAHMİNİ	269
9.1. Parametrik Testler ve Özellikleri	270
9.1.1. Z-testi	270
9.1.1.1. Tek Örneklem Ortalaması İçin Z-testi	270
9.1.1.2. Bağımsız İki Örneklem Ortalamasının Karşılaştırılması İçin Z-testi	272
9.1.1.3. Tek Örneklem Oranı İçin Z-testi	274
9.1.1.4. Bağımsız İki Örneklem Oranının Karşılaştırılması İçin Z-testi	275
9.1.2. Student t -testi.....	277
9.1.2.1. Tek Örneklem Ortalaması İçin t -testi	278
9.1.2.2. Bağımsız İki Örneklem Ortalamasının Karşılaştırılması İçin t -testi	279
9.1.2.3. İlişkili İki Örneklem Ortalamasının Karşılaştırılması İçin t -testi	282
9.1.3. Tek Yönlü Varyans Analizi (F -testi, One-way ANOVA)	284
9.1.3.1. Çoklu Karşılaştırma Testleri (Multiple Comparison Tests)	287

9.1.3.2. Varyansların Homojenliğinin Testi (Levene Test)	293
9.1.4. Tekrarlanan Ölçümler Varyans Analizi (Repeated Measures ANOVA)	295
9.2. Parametre Tahminleri	296
9.2.1. Nokta Tahmini ve Özellikleri	296
9.2.2. Güven Aralığı Tahmini	297
9. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	299
9. BÖLÜM SORULARI CEVAP ANAHTARI	304

10. BÖLÜM

PARAMETRİK OLMAYAN TESTLER	305
10.1. Parametrik Olmayan (Non-Parametric) Testlere Giriş	306
10.1.1. Tek Örneklem İşaret (Sign) Testi	307
10.1.2. Medyan (Mood's Median) Testi	311
10.1.3. Mann-Whitney U Testi	314
10.1.4. Wilcoxon İşaretleli Sıra (Wilcoxon Signed Rank)	Testi 318
10.1.5. Kruskal-Wallis H Testi	320
10.1.6. Friedman Testi	324
10. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	327
10. BÖLÜM SORULARI CEVAP ANAHTARI	330

11. BÖLÜM

KATEGORİK VERİLERİN ANALİZİ	331
11.1. Kategorik Verilerin Analizi	332
11.1.1. Ki-kare (Chi-square) Testi	332
11.1.1.1. Ki-kare Testinin Varsayımları	335
11.1.1.2. Örnek Soru Çözümleri	336
11.1.2. McNemar Testi	344
11.1.2.1. McNemar Testinin Varsayımları	344
11.1.2.2. Örnek Soru Çözümleri	344
11.1.3. Cochran Q Testi	346
11.1.3.1. Cochran Q Testinin Varsayımları	346
11.1.3.2. Örnek Soru Çözümü	347
11. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	348
11. BÖLÜM SORULARI CEVAP ANAHTARI	354

12. BÖLÜM

KORELASYON VE REGRESYON ANALİZİ	355
12.1. Korelasyon ve Regresyon Analizlerine Giriş	356
12.1.1. Korelasyon Analizi (Correlation Analysis)	358
12.1.1.1. Pearson Korelasyon Katsayısı (r)	364
12.1.1.2. Spearman Sıra Korelasyon (Rho) Katsayısı (r_s)	367
12.1.1.3. Kısmi Korelasyon Katsayısı (Partial Correlation Coefficient)	369
12.1.1.4. Diğer Bazı Korelasyon Katsayıları	370
12.2. Regresyon Analizi (Regression Analysis)	372
12.2.1. Basit Doğrusal Regresyon Analizi (Simple Linear Regression Analysis)	372
12.2.2. Çoklu Doğrusal Regresyon Analiz (Multiple Linear Regression Analysis)	376
12. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	378
12. BÖLÜM SORULARI CEVAP ANAHTARI	384

13. BÖLÜM

SAĞLIK ALANINA ÖZEL BAZI İSTATİSTİK YÖNTEMLER	385
13.1. Sağlık Alanına Özel Bazı İstatistik Yöntemler Giriş	386
13.1.1. Sağlıkım/Yaşam/Survi Analizi (Survival Analysis)	386
13.1.1.1. Kaplan-Meier Yöntemi	388
13.1.1.2. Yaşam Tabloları (Life Tables/Actuarial) Yöntemi	391
13.1.1.3. Sağlıkım Eğrilerinin Karşılaştırılması	396
13.1.2. Tanı Testi Ölçütleri ve ROC Analizi	404
13.1.2.1. Tanı Testleri ve Ölçütleri	404
13.1.2.2. ROC (Alıcı İşlem Karakteristikleri: Receiver Operator Characteristics) Analizi	407
13. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	413
13. BÖLÜM SORULARI CEVAP ANAHTARI	418

14. BÖLÜM

ARAŞTIRMALARIN RAPORLANDIRILMASI	419
14.1. Araştırmaların Raporlandırılması	420
14.1.1. Bilimsel Araştırma Süreci	420
14.1.2. Araştırma Raporu Çeşitleri	422
14.1.3. Araştırma Raporu Bölümleri	422

14. BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	428
14. BÖLÜM SORULARI CEVAP ANAHTARI	432

15. BÖLÜM

İSTATİSTİK ANALİZLER İÇİN VERİ DOSYASI OLUŞTURMA VE SPSS

UYGULAMALARI	433
15.1. MS-Excel'de Veri (Data) Dosyası Oluşturma	433
15.2. MS-Excel'de Oluşturulmuş Veri Dosyasının SPSS Programına Aktarılması ...	438
15.3. SPSS'te Veri (Data) Dosyası Oluşturma	441
15.3.1. SPSS'te Değişken Tanımlama (Variable View) Sekmesi ve Özellikleri	442
15.3.2. SPSS'te Veri Girişi ve Görüntüleme (Data View) Sekmesi	446
15.4. SPSS'te Örneklem Oluşturma	450
15.4.1. Basit Tesadüfi Örneklem Yöntemiyle Örneklem Oluşturma	450
15.4.2. Sistematik Örneklem Yöntemiyle Örneklem Oluşturma	458
15.5. SPSS'de Kategorik Değişkenin Kategorilerine Göre Sayısal/Nümerik Değişkenlerin Tanımlayıcı İstatistiklerin Bulunması	460
15.5.1. SPSS'te Oluşturulan Tablolardan Grafik Oluşturmak	464
15.6. SPSS'te Değişkenler İçin Frekans Tablosu Oluşturma	465
15.7. Anketlerde Çok Cevaplı Sorularının SPSS'e Girişi ve Frekanslarının Analizi ..	470
15.8. SPSS'te Sayısal Değişkenler İçin Genel Tanımlayıcı İstatistiklerin Hesaplanması	474
15.9. SPSS'te Kategorik Değişkenlere Göre Sayısal/Nümerik Değişkenlerin Tanımlayıcı İstatistikleri ile Uç/Aykırı (Outlier) Değerlerin Bulunması ve Normallik Testleri	476
15.10. SPSS'te Çaprazlık/Kontenjans Tablosu Oluşturma ve Ki-Kare Analizi	486
15.10.1. SPSS'te Kategorik Değişkenlerin Doğrudan Frekansları Üzerinden Ki-Kare Analizi	490
15.10.1.1. Bir Kategorik Değişkenin Kategorilerindeki Frekansların Homojenliğinin Ki-Kare Testi	490
15.10.1.2. İki Kategorik Değişkenin Doğrudan Frekansları Üzerinden Ki-Kare Bağımsızlık Analizi	494
15.11. SPSS'te Odds Oranı ve Rölatif Risk Hesaplama	496
15.12. SPSS'te Kategorik Değişkenlere Göre Sayısal Değişkenlerin Tanımlayıcı İstatistiklerinin Bulunması ve Ortalamaların Karşılaştırılması	499
15.13. SPSS'te Tek Örneklem <i>t</i> -Testi	502
15.14. SPSS'te Bağımsız İki Örneklem Ortalamasının <i>t</i> -Testi	504
15.15. SPSS'te İlişkili İki Örneklem <i>t</i> -Testi	506

15.16.	SPSS’te Tek Yönlü Varyans Analizi (One-way ANOVA) ve Çoklu Karşılaştırma Testleri (Post Hoc Multiple Comparison Tests)	509
15.16.1.	Tek Yönlü Varyans Analizi (One-way ANOVA)	509
15.16.2.	Genelleştirilmiş Doğrusal Model Altında Tek Değişkenli Varyans Analizi (General Linear Model-Univariate Analysis of Variance) ...	513
15.17.	SPSS’te Tekrarlanan Ölçümler (Repeated Measures ANOVA) Varyans Analizi	520
15.18.	SPSS’te Tek Örneklem İşaret (Sign) Testi	529
15.19.	SPSS’te Bağımsız İki Örneklem İçin Mann-Whitney <i>U</i> Testi	531
15.20.	SPSS’te Kruskal-Wallis <i>H</i> Testi	533
15.21.	SPSS’te ilişkili İki Örneklem Wilcoxon İşaretli Sıra Testi	536
15.22.	SPSS’te Korelasyon Analizi (Correlation Analysis)	538
15.22.1.	SPSS’te Kısmi Korelasyon Analizi (Partial Correlation Analysis)	540
15.23.	SPSS’te Basit Doğrusal Regresyon Analizi (Simple Linear Regression Analysis)	543
15.24.	SPSS’te Sağkalım/Yaşam Analizi (Survival Analysis)	548
15.24.1.	SPSS’te Sağkalım Analizi-Yaşam Tabloları (Life Tables)	548
15.24.2.	SPSS’te Sağkalım Analizi-Kaplan-Meier Yöntemi (Kaplan-Meier Method)	552
15.25.	SPSS’te Tanı Testleri İçin ROC Analizi	560
15.26.	SPSS’te İkili Logistik Regresyon Analizi (Binary Logistic Regression Analysis)	563
15.27.	SPSS’te Geçerlilik (Validity) ve Güvenirlik (Reliability) Analizi	570
15.27.1.	SPSS’te Geçerlilik Analizi (Factor Analysis)	572
15.27.2.	SPSS’te Güvenirlik Analizi (Reliability Analysis)	577
15.28.	SPSS’te Grafik Oluşturma	581
15.28.1.	Sütun/Çubuk (Bar) Tipi Grafik Oluşturma-Kategorik Değişkenin Kategorilerindeki Frekansları Göstermek İçin	581
15.28.2.	Sütun/Çubuk (Bar) Tipi Grafik Oluşturma-Kategorik Değişkenin Kategorilerine Göre Sayısal Değişkenin Ortalamalarını Göstermek İçin	584
15.28.3.	Çizgi (Line) Grafik Oluşturma	587
15.28.4.	Pasta (Pie) Grafik Oluşturma	589
15.28.5.	Kutu-Çizgi (Boxplot) Grafik Oluşturma	592
15.28.6.	Hata Çubukları (Error Bar) Grafiği Oluşturma	594
15.28.7.	Serpilme Diyagramı/Saçılım Grafiği (Scatter Dot) Oluşturma	597
15.28.8.	Histogram Oluşturma	600
15.	BÖLÜM: KAZANIMLARIN ÖLÇÜLMESİ-ÇOKTAN SEÇMELİ TEST SORULARI	602
15.	BÖLÜM SORULARI CEVAP ANAHTARI	612

EK 1: BAZI İSTATİSTİK TESTLER İÇİN ÖRNEKLEM BÜYÜKLÜĞÜ	613
EK 1.1: Nicel Tipte Veriler (N-Bilinmiyor ve N-Biliniyor) İçin Örneklem Büyüklüğü ..	614
EK 1.2: Nitel Tipte Veriler (N-Bilinmiyor) İçin Örneklem Büyüklüğü	615
EK 1.3: Nitel Tipte Veriler (N-Biliniyor) İçin Örneklem Büyüklüğü	618
EK 1.4: Tek Örneklem <i>t</i> -Testi İçin Örneklem Büyüklüğü	621
EK 1.5: Bağımsız Örneklem ve İlişkili Örneklem <i>t</i> -Testi İçin Örneklem Büyüklüğü ...	622
EK 1.6: Mann Whitney U Testi İçin Örneklem Büyüklüğü	623
EK 1.7: Wilcoxon İşaretli Sıra Testi İçin Örneklem Büyüklüğü	624
EK 1.8: Tek Yönlü ANOVA ve Kruskal-Wallis <i>H</i> Testi İçin Örneklem Büyüklüğü	625
EK 1.9: Ki-kare Testi İçin Örneklem Büyüklüğü	628
EK 1.10: Korelasyon Analizi İçin Örneklem Büyüklüğü	631
EK 2: İSTATİSTİK TABLOLAR	632
EK 2.1: Z-Tablosu (Standart Normal Dağılım) $P(Z \leq 0)$ veya $P(Z \geq 0)$	633
EK 2.2: <i>t</i> -Tablosu (Student <i>t</i> -Dağılımı)	634
EK 2.3: <i>F</i> -Tablosu (<i>F</i> -Dağılımı)	635
EK 2.4: DUNCAN Tablosu	637
EK 2.5: TUKEY Tablosu	638
EK 2.6: Ki-kare Tablosu	639
EK 2.7: Kolmogorov-Smirnov <i>D</i> Tablosu	640
EK 2.8: Shapiro-Wilk <i>W</i> Tablosu (α_{n-i+1})	641
EK 2.9: Wilcoxon İşaretli Sıra Testi Tablosu	644
EK 2.10: Friedman Testi Tablosu	645
EK 2.11: Kruskal Wallis <i>H</i> Tablosu	646
EK 2.12: Mann Whitney <i>U</i> Tablosu ($\alpha = 0,01$ Çift Yönlü)	647
EK 2.12: Mann Whitney <i>U</i> Tablosu ($\alpha = 0,05$ Çift Yönlü)	648
EK 2.12: Mann Whitney <i>U</i> Tablosu ($\alpha = 0,05$ Tek Yönlü)	649
EK 3: İSTATİSTİK ANALİZ YÖNTEMİ SEÇME REHBERİ	650
EK 4: GÜLÜMSETEN BAZI İSTATİSTİK YAKLAŞIMLAR	652
YARALANILAN KAYNAKLAR	655
DİZİN	659

YARALANILAN KAYNAKLAR

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BİYOKÜTLE ENERJİSİ DÖNÜŞÜM TEKNOLOJİLERİ

Prof. Dr. Birol Kayışođlu - Prof. Dr. Türkan Aktaş



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İÇİNDEKİLER

ÖN SÖZ	iii
1. BİYOKÜTLE.....	1
1.1. Biyokütlenin Fizikokimyasal Yapısı.....	4
1.2. Katı Yakıtların Genel Sınıflandırılmasında Biyokütlenin Yeri.....	7
1.2.1. Atomik oran	7
1.2.2. Lignoselülozik bileşenlerinin bağıl oranları	9
1.2.3. Üçlü (Ternary) diyagram.....	11
1.3. Biyokütlenin Fiziksel ve Kimyasal Özelliklerinin Yakıt Özelliklerine Etkisi	12
1.4. Biyokütlenin Yoğunluğu	13
1.4.1. Gerçek yoğunluk	13
1.4.2. Görünür yoğunluk	14
1.4.3. Yığın yoğunluğu.....	14
1.5. Biyokütlenin Karakterizasyonu	16
1.5.1. Kısa (proximate) analizler	16
1.5.2. Nihai (elementel, ultimate) analizler	20
1.5.3. Biyokütlenin ısı değeri	21
1.6. Biyokütle Bileşimini İfade Etmenin Esasları.....	23
1.7. Biyokütlenin Ekserjisi	24
1.8. Biyokütle Enerjisi Dönüştürme Yöntemleri	25
Kaynaklar	28
2. FİZİKSEL İŞLEMLER.....	31
2.1. Mekanik Öğütme ve Parçalama	31
2.2. Biyokütlenin Kurutulması	35
2.3. Biyokütlenin Yoğunlaştırılması (Pelet ve Briket).....	36
2.3.1. Peletleme sistemleri.....	37
2.3.2. Briketleme sistemleri.....	38
2.3.3. Vidalı ekstrüderler.....	40
2.3.4. Farklı biyokütlelerin yoğunlaştırılmasında özgül enerji tüketimleri	41
Kaynaklar	42
3. BİYOKÜTLENİN DOĞRUDAN YAKILMASI.....	45
3.1. Yanma Olayı.....	45
3.2. Stokiyometrik Hava Oranı	51

3.3. Doğrudan Yakmanın Çevresel Etkileri.....	53
3.4. Doğrudan Yakmada Kullanılan Biyokütle Ürünleri.....	54
3.5. Biyokütle Yakma Sistemleri.....	56
3.5.1. Sabit yataklı yakma sistemleri.....	56
3.5.2. Akışkan yataklı yakma sistemleri.....	68
3.5.3. Pülverizasyonlu (süspansiyonlu) yakma sistemleri.....	71
Kaynaklar.....	72
4. TORREFAKSİYON.....	75
4.1. Torrefaksiyon Mekanizması.....	76
4.2. Torrefaksiyon Ürünleri ve Özellikleri.....	79
4.3. Torrefaksiyon Derecesi.....	79
4.3. Torrefaksiyon Ürününün Enerji Kalitesi.....	80
4.4.1. Kütle verimi.....	80
4.4.2. Enerji yoğunluğu.....	82
4.4.3. Isıl değer geliştirme faktörü.....	82
4.4.4. Enerji verimliliği.....	83
4.5. Torrefaksiyon Yöntemleri.....	83
4.5.1. Kuru torrefaksiyon.....	84
4.5.1.1. Non-oksidatif torrefaksiyon.....	84
4.5.1.2. Oksidatif torrefaksiyon.....	85
4.5.2. Yaş torrefaksiyon.....	86
4.6. Torrefaksiyon İşlemi Görmüş Biyokütlenin Kullanım Alanları.....	87
Kaynaklar.....	89
5. PİROLİZ.....	93
5.1. Piroliz Ürünleri.....	94
5.1.1. Sıvılar.....	95
5.1.2. Katılar.....	96
5.1.3. Gazlar.....	97
5.2. Biyokütle Pirolizini Etkileyen Faktörler.....	98
5.2.1. Biyokütle bileşimi ve parçacık boyutu.....	98
5.2.2. Piroliz sıcaklığı.....	99
5.2.3. Piroliz ortam basıncı.....	100
5.2.4. Piroliz ortamı.....	101
5.2.5. Katalizör kullanımı.....	101
5.3. Piroliz Mekanizması.....	102
5.3.1. Selülozun pirolizi.....	103
5.3.1.1. Sıcaklığın selüloz pirolizine etkisi.....	103
5.3.1.2. Reaktörde kalma süresinin selüloz pirolizine etkisi.....	105
5.3.1.3. Ön işlem olarak asit uygulamasının selüloz pirolizine etkisi.....	106

5.3.1.4. Diğer reaksiyon faktörlerinin selüloz pirolizine etkisi.....	106
5.3.2. Hemiselülozun pirolizi	107
5.3.3. Ligninin pirolizi	108
5.4. Piroliz Yöntemleri	109
5.4.1. Yavaş piroliz yöntemi	109
5.4.2. Hızlı piroliz yöntemi	113
5.4.2.1. Kabarcıklı akışkan yataklı hızlı piroliz sistemi.....	115
5.4.2.2. Sirkülasyonlu akışkan yataklı hızlı piroliz sistemi.....	116
5.4.2.3. Döner konik reaktörlü hızlı piroliz sistemi	116
5.4.2.4. Ablatif diskli hızlı piroliz sistemi	118
5.4.2.5. Çift vidalı reaktör.....	118
5.5. Piroliz İşlemi İçin Biyokütle Seçim Kriterleri	119
Kaynaklar	123
6. HİDROTERMAL DÖNÜŞÜM TEKNOLOJİLERİ	127
6.1. Hidrotermal Dönüşüm Yönteminin Temelleri.....	128
6.2. Hidrotermal Dönüşüm Teknolojileri.....	132
6.2.1. Hidrotermal karbonizasyon (HTC).....	134
6.2.1.1. Sıcaklık	135
6.2.1.2. Reaksiyon süresi	136
6.2.1.3. Besleme suyunun pH değeri	137
6.2.1.4. Ham madde konsantrasyonu	137
6.2.1.5. Isıtma oranı	138
6.2.1.6. Hidrotermal karbonizasyon (HTC) işlem süreçleri.....	138
6.2.2. Hidrotermal sıvılaştırma (HTL)	139
6.2.3. Hidrotermal gazlaştırma (HTG)	142
Kaynaklar	144
7. BİYOKÜTLENİN GAZLAŞTIRILMASI	147
7.1. Gazlaştırma Ortamı.....	147
7.2. Gazlaştırma Aşamaları.....	148
7.2.1. Kuruma aşaması	148
7.2.2. Piroliz aşaması	150
7.2.3. Gazlaşma aşaması	150
7.2.3.1. Kısmi oksidasyon aşaması	151
7.2.3.2. İndirgeme aşaması	152
7.3. Gazlaştırma Reaktörleri	152
7.3.1. Sabit yataklı gazlaştırıcılar	153
7.3.2. Akışkan yataklı gazlaştırıcılar	157
7.3.3. Sürüklenmiş (zorlamalı) akışlı gazlaştırıcılar	161
7.3.4. Diğer gazlaştırma reaktörü tipleri.....	161

7.3.4.1. Hidrotermal gazlaştırıcı	161
7.3.4.2. Plazma gazlaştırıcı	162
7.4. Gazlaştırma Performansını Değerlendirmek İçin Kullanılan Kriterler	164
7.4.1. Sentez gazın özellikleri	164
7.4.2. Biyokütle tüketim oranı	165
7.4.3. Gaz üretim oranı	166
7.4.4. Özgül gaz üretimi	166
7.4.5. Karbon dönüşüm oranı	166
7.4.6. Gazlaştırma ortamı besleme oranı	167
7.4.7. Eş değerlik oranı (ER)	167
7.4.8. Gazlaştırma sisteminin verimi	168
7.4.9. Buhar biyokütle oranı	168
7.4.10. Yüzeysel hız ve reaktörde kalma süresi	169
7.4.11. Sıcaklık	169
7.5. Gazın Temizlenmesi ve Kullanımı	170
Kaynaklar	175
8. BİYOGAZ	179
8.1. Biyogaz Üretiminde Kullanılan Biyokütle Kaynakları	181
8.2. Anaerobik Sindirimin Aşamaları	184
8.2.1. Hidroliz aşaması	185
8.2.2. Asidojenik aşama	186
8.2.3. Asetojenik aşama	186
8.2.4. Metanojenik aşama	187
8.3. Biyogaz Üretiminde Önemli Tanımlamalar ve Kavramlar	188
8.3.1. Substrat (Ham madde)	188
8.3.2. İnokulum	188
8.3.3. Hidrolik bekleme süresi (HRT)	188
8.3.4. Yaş ağırlık (WW), toplam katı (TS) ya da kuru madde (DM) miktarı	189
8.3.5. Uçucu katı madde miktarı (VS)	190
8.3.6. Kimyasal oksijen gereksinimi (COD)	190
8.3.7. Organik yük (OL)	190
8.3.8. Organik yükleme oranı (OLR)	190
8.3.9. Biyokimyasal metan potansiyeli (BMP)	191
8.3.10. Teorik (maksimum) metan verimi	191
8.4. Biyogaz Üretimini Etkileyen Faktörler	191
8.4.1. Katı madde içeriği	192
8.4.2. C/N oranı	192
8.4.3. Sıcaklık	193
8.4.4. Sindirim ortamının pH değeri	194
8.4.5. Amonyak	194

8.4.6. Serbest yağ asitleri	195
8.4.7. Mikroorganizma konsantrasyonu	195
8.4.8. Materyalin özgül yüzey alanı	196
8.4.9. Kısmi hidrojen basıncı	196
8.4.10. Toksisite	197
8.4.11. Karıştırma/çalkalama	197
8.5. Biyogaz Tesisinin Temel Bileşenleri	197
8.5.1. Sindirim ünitesi	197
8.5.1.1. Besleme sistemleri	198
8.5.1.2. Sindirici reaktörler	201
8.5.1.4. Karıştırma/Çalkalama sistemleri	206
8.5.1.5. Gaz depolama üniteleri	209
8.5.1.6. Borular, pompalar ve vanalar	210
8.6. Biyogaz Kullanım Alternatifleri	211
8.6.1. Bölgesel kullanım	211
8.6.2. Elektrik üretim amaçlı kullanımı	212
8.6.2.1. İçten yanmalı motorlar	212
8.6.2.2. Gaz türbinleri	213
8.6.3. Boru hattına verilmesi	213
8.7. Sindirim Atıklarının Değerlendirilmesi	214
8.7.1. Sindirim atıklarının katı-sıvı ayrımı	215
8.7.1.1. Vidalı presler	216
8.7.1.2. Dekanter santrifüj	216
8.7.1.3. Bant filtreler	217
8.7.1.4. Kesikli santrifüj ayırma sistemi	218
8.7.2. Katı fraksiyonların işlenmesi	218
8.7.2.1. Kompostlama	219
8.7.2.2. Kurutma	219
8.7.3. Sıvı fraksiyonun işlenmesi	220
8.7.3.1. Amonyak giderme	220
8.7.3.2. Membran filtreleme	221
8.7.3.3. Buharlaştırma	222
8.7.4. Sindirim atıklarının kullanımı	222
Kaynaklar	224

9. BİYOETANOL..... 227

9.1. Biyoetanol Üretiminde Ham Madde Olarak Kullanılan Biyokütle Kaynakları ...	228
9.1.1. Birinci nesil biyokütle kaynakları	228
9.1.1.1. Şeker bazlı bitkiler ve biyoetanol üretimi	229
9.1.1.2. Nişasta bazlı bitkiler ve biyoetanol üretimi	230
9.1.2. İkinci nesil (Lignoselülozik) biyokütle kaynakları	233

9.1.2.1. Şeker platformu.....	235
9.1.2.2. Sentez gaz platformu.....	236
9.1.3. Üçüncü nesil biyokütle kaynakları	239
Kaynaklar	240
10. BİYODİZEL	243
10.1. Biyodizel Üretiminde Kullanılan Biyokütle Kaynakları	245
10.2. Transesterifikasyon İşlemi.....	246
Kaynaklar	250
11. ÖN İŞLEMLER.....	253
11.1. Lignoselülozun Yapısal Özellikleri ve Bileşenleri	256
11.2. Ön İşlem Yöntemleri	259
11.2.1. Fiziksel ön işlemler.....	259
11.2.1.1. Yüksek enerjili radyasyon ön işlemleri	259
11.2.1.2. Piroliz ön işlemi.....	262
11.2.2. Kimyasal ön işlemler	262
11.2.2.1 Seyreltik asit ve konsantre asit ön işlemi	262
11.2.2.2 Alkali ön işlemi	264
11.2.2.3 Ozonoliz ön işlemi	264
11.2.2.4. Organosolv	265
11.2.2.5. İyonik sıvılar	267
11.2.2.6. Derin ötektik çözücüler	268
11.2.3. Fizikokimyasal ön işlemler.....	269
11.2.3.1. Buhar patlaması.....	269
11.2.3.2. Sıvı sıcak su.....	272
11.2.3.3. Sülfite (SPORL).....	273
11.2.3.4. Amonyak bazlı uygulama.....	274
11.2.3.5. CO ₂ patlama	275
11.2.3.5. Oksidatif uygulama	276
11.2.3.5. Islak oksidasyon	277
11.2.4. Biyolojik ön işlemler	278
11.3. Ön İşlemlerin Karşılaştırılması.....	280
Kaynaklar	282
ÖZ GEÇMİŞLER.....	289

1.

BİYOKÜTLE

Biyokütle, yaşamakta olan ya da yakın zamanda yaşamış olan canlı organizmalardan elde edilen, henüz fosilleşmemiş organik kökenli tüm biyolojik malzemelere verilen genel bir addır. Botanik biyokütle, atmosferdeki karbondioksitin (CO_2) klorofil ve su varlığında güneş enerjisiyle karbonhidrata dönüştürülmesiyle oluşur. Diğer biyolojik türler (hayvanlar, insanlar vb.), botanik veya diğer biyolojik türleri tüketerek büyürler.

Bitkiler, fotosentez adı verilen bir işlemle güneş enerjisini emerler. Belirli dalga boylarına sahip güneş ışığının varlığında, yeşil bitkiler elektron ve proton elde etmek için suyu parçalayarak CO_2 'yi glikoza dönüştürmek için kullanır ve oksijeni (O_2) atmosfere salarlar. Bu işlem aşağıdaki kimyasal tepkimeyle ifade edilmektedir:



Yukarıdaki fotosentez reaksiyonunda oluşan $\{CH_mO_n\}$ organik bitki materyalidir ve glikoz ($C_6H_{12}O_6$) oluşumu için temel biçim olarak kabul edilmektedir [1].

Bitkilerde depolanan kimyasal enerji daha sonra bunları besin olarak kullanan insanlara ve hayvanlara aktarılmaktadır. Hayvan ve insan atıkları da biyokütlenin oluşumuna katkıda bulunmaktadır. Hayvanlar ve insanlar, aldıkları besin elementlerini O_2 kullanarak enerji ve biyokütleyle dönüştürürken CO_2 'i atmosfere salmaktadırlar. Böylece biyokütlenin oluşumu, yaşam döngüsü içerisinde sürekli kendini yenileyerek gerçekleşmektedir (Şekil 1.1).

Çizelge 1.11: Biyokütle dönüştürme teknolojilerinin uygunluğunu etkileyen ham madde özellikleri [30]

Özellik	Dönüşüm Teknolojileri			
	Fiziksel	Termokimyasal	Biyokimyasal	Kimyasal
Nem içeriği	x	x	x	x
Enerji içeriği	x	x		x
Yanmaz maddeler içeriği	x	x	x	
Kimyasal bileşimi		x	x	x
Karbon reaktivitesi		x		x
Toplu bileşen analizi	x	x	x	x
Yoğunluk	x			
Boyut dağılımı	x	x	x	x
Biyobozunurluk			x	
Organizma içeriği/türü			x	
Besin içeriği/türü			x	

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2.

FİZİKSEL İŞLEMLER

Fiziksel işlemler, biyokütlenin enerji dönüşümleri için kullanılabilir hâle getirilmesi amacıyla boyut küçültme, kurutma ve enerji yoğunluğunu arttırmak için yapılan peletleme-briketleme gibi işlemlerdir. Fiziksel işlemler sonucunda biyokütle doğrudan ısı enerjisi elde etmek için kullanılabilirdiği gibi, gazlaştırma, piroliz, torrefaksiyon gibi termokimyasal dönüştürme işlemlerinde de kullanılmaktadır.

2.1. Mekanik Öğütme ve Parçalama

Mekanik parçalama işlemi, biyokütlenin yüzey alanını arttırmak, polimerizasyon derecesi ve selüloz kristalliğini azaltmak için yapılmaktadır [1]. Kaba boyut küçültme, ıslak veya kuru kırma, ufalama, parçalama, öğütme ve sıkıştırma gibi işlemleri kapsamaktadır. Bu amaçla; çekiçli, bilyeli, titreşimli, valsli ve çalkalama taneli değirmenler kullanılmaktadır. Boyut küçültmenin bir diğer amacı da ısı ve kütle transferi sınırlamalarını azaltmaktır. Mekanik parçalama ve öğütmenin başarısı öğütme tipi ve süresi ile biyokütle cinsine bağlı olarak değişmektedir.

Biyokütlenin boyutlarının küçültülmesinin bir diğer amacı da transferinin kolaylaştırılmasıdır. Ayrıca bantlı, vidalı ve pnömatik konveyörlerde iletimi de boyut küçültme ile daha kolay olmaktadır.

Mekanik parçalama ve öğütme işlemi daha sonraki süreçlerin daha kolay ve daha etkili hâle getirilmesi için Bölüm 11’de ayrıntılı olarak açıklanmış olan diğer ön işlemlerden önce de yaygın olarak kullanılmaktadır [2]. Öğütme işlemi; biyoe-tanol, biyogaz ve biyohidrojen verimini artırmaktadır ve kimyasal ön işlemden önce veya sonra yapılabilmektedir. Kimyasal ön işlemden sonra öğütme işleminin yapılması; öğütme için gereken enerji gereksinimini düşürmesi, fermantasyon inhibitörlerinin oluşmasına sebep olmaması ve ön işlem görmüş biyokütle parçala-

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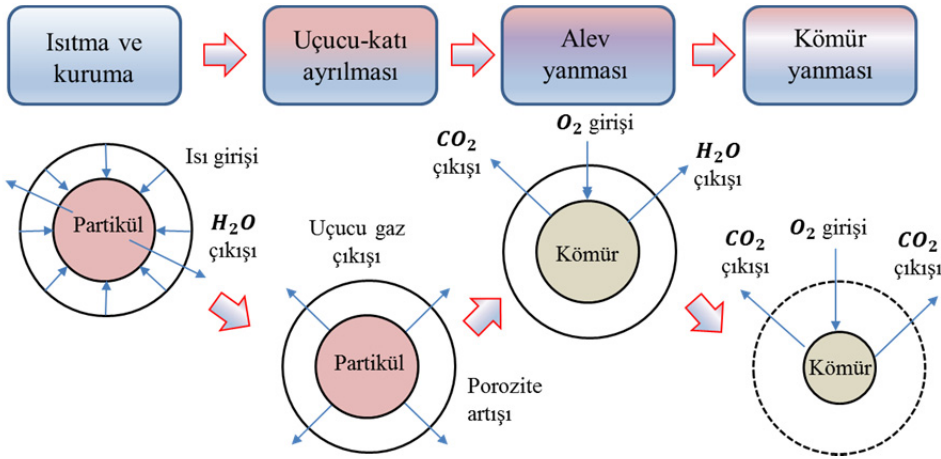
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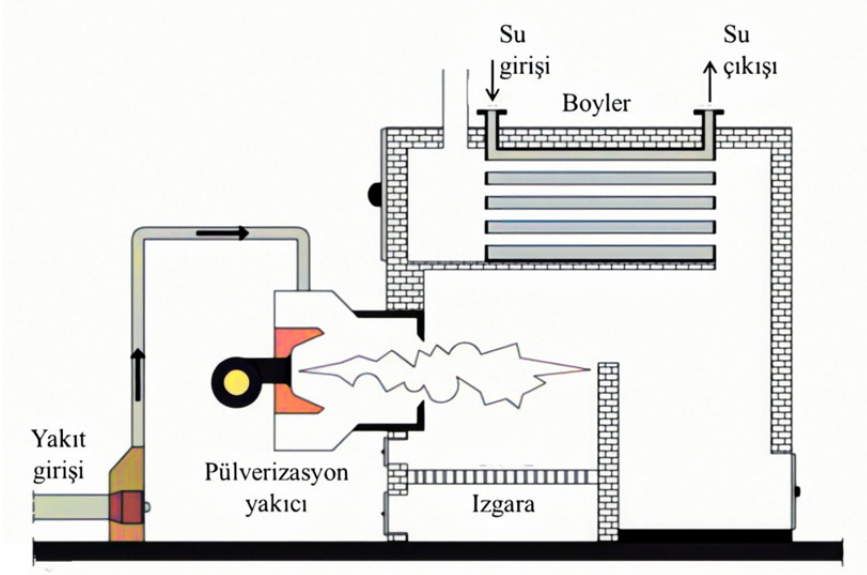
BİYOKÜTLENİN DOĞRUDAN YAKILMASI

3.1. Yanma Olayı

Biyokütlenin termokimyasal dönüştürme yöntemlerinden biri olan yanma, nispeten yüksek bir sıcaklıkta meydana gelen ekzotermik bir oksidasyon işlemi olarak tanımlanabilir. Biyokütle yakma işlemi bir dizi yüksek karmaşıklığa sahip fiziksel ve kimyasal işlemi içermektedir. Genel biyokütle yakma süreci temel olarak ısıtma-kurutma, uçucu-katı ayrılması (devolatilizasyon), uçucu maddelerin alev yanması ve kömürün yakılması olmak üzere dört temel aşamayı içermektedir [1]. Yanma işleminin doğası yakıtın ve yanma işleminin özelliklerine bağlıdır. Biyokütlenin doğrudan yakılmasındaki aşamalar Şekil 3.1’de verilmiştir.



Şekil 3.1: Biyokütlenin yanma aşamaları [2]



Şekil 3.23: Yardımcı pilot alevi olan bir pülverizasyonlu (süspansiyon) yakma sisteminin çalışma prensibi

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4.

TORREFAKSİYON

Bilindiği gibi biyokütle, doğrudan yakılıp ya da gazlaştırma vb. teknolojik işlemlerle farklı enerji türlerine dönüştürülerek ısı ve güç elde etmek için kullanılmaktadır. Ancak biyokütlenin yüksek nem içeriği, diğer yakıtlara göre düşük ısı değeri, kolay nem alması, hacminin fazla olması gibi olumsuz yanları da bulunmaktadır. Bu olumsuz yanları gidermek için birçok ön hazırlık işlemi bulunmaktadır. Karbonizasyondan farklı bir termokimyasal işlem olan torrefaksiyon, oksijen olmadan 230 ila 300 °C sıcaklık aralığında gerçekleştirilen hafif bir piroliz işlemidir. Biyokütlenin başka teknolojilerle enerjiye dönüştürülmesini kolaylaştırmak için uygulanan bir termokimyasal ön hazırlık işlemi olmakla beraber, tek başına da uygulanan bir yöntemdir ve kahve kavurma işlemine çok benzemektedir [1, 2]. Torrefaksiyon işlemi sonucunda biyokütleden H_2O ve CO_2 uzaklaştırılmaktadır. Böylece biyokütlenin enerji yoğunluğu artmakta, atomik O/C ve H/C oranı düşmekte ve higroskopik yapısı iyileşmektedir. Şekil 3.1’de torrefaksiyon işlemine tabi tutulan odun parçalarının yapısal değişimleri görülmektedir [2].



Şekil 4.1: Orijinal odun parçası (solda), 260 °C’de 8 dakika (ortada) ve 285 °C’de 16,5 dakika torrefaksiyon işlemi görmüş odun parçası (sağda)

Çizelge 4.2: Birlikte yakmada (co-firing) kullanılan torrefaksiyon peletinin ve diğer biyokütle yakıtların özellikleri [25]

Özellik	Odun peleti	Torrefaksiyon peleti	Mangal kömürü	Kömür
Nem içeriği (%y.b.)	7-10	1-5	1-5	10-15
Alt ısı değer (MJ/kg)	15-18	20-24	30-32	23-28
Uçucu madde (%k.b.)	70-75	55-65	10-12	15-30
Sabit karbon (%k.b.)	20-25	28-35	85-87	50-55
Yığın yoğunluğu (kg/l)	0,55-0,75	0,75-0,85	~ 0,20	0,8-0,85
Enerji yoğunluğu (GJ/m ³)	7,5-10,4	15,0-18,7	6-6,4	18,4-23,8
Toz	Sınırlı	Sınırlı	Yüksek	Sınırlı
Higroskopik özellikler	Hidrofilik	Hidrofobik	Hidrofobik	Hidrofobik
Biyolojik bozunurluk	Evet	Hayır	Hayır	Hayır
Öğütülebilirlik	Zayıf	İyi	İyi	İyi
Taşıma	Özel	İyi	İyi	İyi
Kalite değişkenliği	Sınırlı	Sınırlı	Sınırlı	Sınırlı

Torrefaksiyon işlemi görmüş biyokütlenin kullanıldığı uygulamalara; genel olarak pülverize kömür ile yakmanın yapıldığı (co-firing) enerji santralleri ve çimento fırınları, küçük ölçekli pelet brülörleri ve normalde pülverize kömür ile çalıştırılan sürüklemeli akışlı gazlaştırıcılar örnek olarak verilebilir. Güç üretimine yönelik olarak özellikle kömürle birlikte yakma uygulamalarına ilaveten torrefaksiyon ürünlerinin tek olarak kullanıldığı ısıtma amaçlı endüstriyel ve merkezî uygulamalar içinde bu ürünlerin pazar potansiyeli yüksektir.

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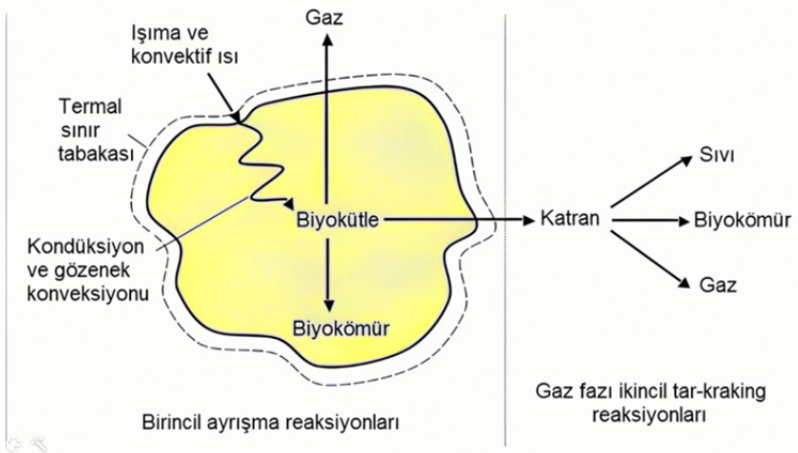
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5.

PIROLİZ

Piroliz işlemi, oksitleyicilerin hiç olmadığı ya da tam olarak gazlaşmayı engelleyecek miktarlarda oldukları ortamlarda, biyokütlenin belirli sıcaklık aralıklarında ve sürede tutularak termokimyasal olarak bir dizi faydalı ürüne ayrıştırılmasıdır [1]. Piroliz sırasında, biyokütlenin büyük karmaşık hidrokarbon molekülleri nispeten daha küçük ve daha basit gaz, sıvı ve kömür moleküllerine ayrılmaktadır. Elde edilen ürünlerin özellikleri, piroliz sıcaklığı ve ısıtma hızı gibi çeşitli faktörlere bağlı olarak değişmektedir. Piroliz için uygun olan lignoselülozik biyokütller orman artıkları, bitkisel artıklar, kâğıt, karton, belediye atıkları ve kanalizasyon çamurlarıdır [2]. Piroliz işleminde birincil ayrışma reaksiyonları ve katranın ayrıştığı gaz fazındaki ikincil reaksiyonlar söz konusudur. Pirolizin birincil ürünleri biyokömür ve yoğunlaşabilir gazdır. Yoğunlaşabilir gaz ikincil aşamada yoğunlaşmayan gazlara (H_2 , CO_2 , H_2O , CO , CH_4), sıvıya ve kömüre dönüşmektedir (Şekil 5.1). İkincil aşamadaki ayrışma kısmen gaz fazında homojen reaksiyonlar yoluyla ve kısmen de gaz-katı faz heterojen termal reaksiyonlar yoluyla oluşmaktadır.



Şekil 5.1: Biyokütle parçacığının pirolizi [1]

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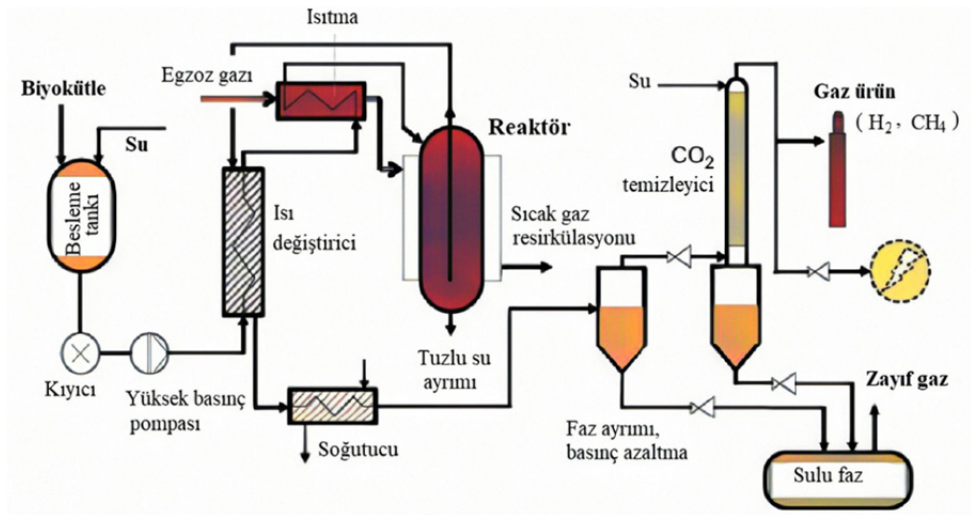
HİDROTERMAL DÖNÜŞÜM TEKNOLOJİLERİ

Hidrotermal işlem biyokütleden değerli enerji ürünleri elde etmek için kullanılan önemli bir termokimyasal dönüşüm yöntemidir. Yakma (kömürle birlikte yakma dâhil), gazlaştırma ve piroliz gibi gelişmiş termokimyasal teknolojilerde ham madde olarak genellikle %20 nem içeriğinden daha az nem içeriğine sahip kuru biyokütler kullanılmaktadır. Yüksek nem içerikli biyokütle yakıtlarını işleme ihtiyacı, hidrotermal işleme teknolojilerinin gelişmesine yol açmıştır. Teknik olarak, “hidrotermal” terimi, sıcak basınçlı sıvı veya sıcak basınçlı su olarak ifade edilmektedir [1]. Hidrotermal terimi 0,1 MPa basıncın üzerindeki bir basınçta ve 100 °C'nin üzerindeki bir sıcaklıkta sıvı suyu tanımlamakla beraber, hidrotermal dönüşüm yöntemi genel olarak, daha yüksek sıcaklıkta (200 °C-800 °C) ve basınçta (5-30 MPa) kritik altı veya süper kritik su ortamını kullanan bir teknoloji olarak tarif edilmektedir [2]. Biyokütlenin hidrotermal dönüşüm işlemi için karıştırmalı veya karıştırmaz olan kesikli reaktörler, boru şeklinde sürekli akışlı sabit yataklı reaktörler, sürekli karıştırılan tank reaktörler gibi yüksek basınç ve sıcaklığa dayanıklı malzemelerden imal edilmiş reaktörler kullanılmaktadır.

Hidrotermal dönüşüm yönteminin, diğer biyokütle işleme teknolojilerine göre avantajları aşağıdaki gibi özetlenebilir [1, 3-5]:

- Nem içeriği yüksek olan biyokütlerin yanı sıra ve farklı tip biyokütlerden oluşan karışık biyokütlenin de bu yöntemle dönüştürülmesi mümkündür. Nem içeriğinin yüksek olması, ham maddesi biyokütle olan sistemlerin yüksek enerji verimliliği için ana sınırlamalardan birisidir. Nem içeriği %50'den fazla olan yaş biyokütle (hayvan gübresi, yosun ve atık su gibi), çeşitli teknik ve teknik olmayan nedenlerden dolayı besleme materyali olarak genellikle istenmez. Yaş biyokütlenin kullanılmasıyla taşıma giderleri artacak ve biyokütlenin kurutulması ve tore-

pompalanmakta ve buradan da propan brülörün egzoz gazı ile ısıtılan ısıtıcıda yaklaşık reaksiyon sıcaklığına kadar ısıtılmaktadır. Reaktör, 110 mm iç çapa ve 35 L hacme sahip uzun, dikey bir silindirdir. Çöken tuzlar ve diğer maddeler tıkanmaları önlemek için reaktör altından boşaltılmaktadır. Reaktörden sonra, sıkıştırılmış olan ürün akışı önce ısı eşanjöründe ve ardından bir soğutucuda soğutulmakta ve iki aşamada gevşetilmektedir. CO₂ temizleyicide yaklaşık 10 MPa basınçlı su kullanılarak ürün gazındaki CO₂'nin büyük bir kısmı ayrılabilir. Böyle bir tesiste yaklaşık %95 hidrojen içeriğine sahip gaz ürün elde edilebilmektedir [2].



Şekil 6.5: Katalitik olmayan bir süreçle çalışan bir pilot tesisin şematik şekli [2]

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7.

BİYOKÜTLENİN GAZLAŞTIRILMASI

Gazlaştırma, biyokütleden sınırlı oksijen kaynağıyla ya da CO_2 ve su buharı gibi uygun oksidantlar ile yanabilen sentez gaz elde edildiği termokimyasal bir dönüşüm teknolojisidir. Biyokütlenin gazlaştırılması genellikle yüksek sıcaklıklarda (~ 800 °C) gerçekleşmektedir. Elde edilen sentez gaz %12-20 H_2 (hidrojen), %17-22 CO (karbon monoksit), %2-3 CH_4 (metan), %9-15 CO_2 (karbondioksit), az miktarlarda H_2O (su buharı), N_2 (nitrojen) gazlarının yanı sıra katran buharı gibi kirletici maddelerin karışımından oluşmaktadır. Sentez gazdaki bileşenlerin oranları biyokütlenin cinsi, gazlaştırma ortamı, gazlaştırıcının tasarımı ve çalışma koşullarına bağlı olarak değişmektedir. Gazlaştırma ürünü olan sentez gaz doğrudan yakılarak ısı enerjisi elde edilebildiği gibi, gaz motorlarında elektrik enerjisi elde etmek amacıyla da kullanılmaktadır [1].

Gazlaştırma ürünü olan sentez gaz, katı yakıttan daha geniş bir uygulama aralığında kullanılabilir. Taşınması ve dağıtımı daha kolaydır. Bu nedenle sentez gazın veya ondan üretilen sıvı yakıtın taşınması, katı yakıtın taşınmasına göre daha ucuz olup daha az enerji gerektirmektedir. Güç ünitelerinde kullanıldığında katı yakıtlara göre baca gazlarında daha az CO_2 , SO_2 ve NO_x emisyonları oluşmaktadır. Özellikle kırsal alanlarda elektrik enerjisi üretimi için kullanıldığında katı ve sıvı yakıtlı güç sistemlerine göre daha uygun ve ekonomiktir. Sentez gaz ayrıca gübre, metanol ve benzin üretimi için bir ham madde olarak kullanılabilme potansiyeline sahiptir [2].

7.1. Gazlaştırma Ortamı

Gazlaştırma ortamı biyokütlerdeki katı karbon ve daha ağır hidrokarbonlarla reaksiyona girerek bunları CO ve H_2 gibi düşük moleküler ağırlıklı gazlara dönüştüren maddeleri içermektedir. Gazlaştırma için kullanılan başlıca gazlaştırıcı mad-

siklon filtreler, bariyer filtreler, sıcak gaz filtreleri, torba filtreler, elektrostatik filtreler gibi filtrelerin yanı sıra yüksek sıcaklıklarda seramik mum filtreler kullanılarak fiziksel olarak ayrılabilirler. Filtreleme verimliliği ve filtrenin çalışması ve boyutlandırılması, partikül kütle konsantrasyonu ve boyut dağılımının yanı sıra bu partiküller maddelerin bileşimine de bağlıdır [27].

Gaz içerisindeki diğer bir kirletici madde olan alkali metal tuzlarının yoğunlaşması da ciddi korozyon sorunlarına neden olabilmektedir ve uzaklaştırılmaları gerekmektedir. Bu maddeler ince katı parçacıklar üzerinde yoğunlaşacakları için gaz sıcaklığının 600 °C'nin altında olduğu durumda bir siklon, ıslak elektrostatik çöktürücüler veya filtreler tarafından tutulabilmektedirler [27].

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8.

BİYOĞAZ

Biyogaz, biyokütlenin anaerobik sindirimi ile elde edilen biyokimyasal dönüştürme ürünüdür. Organik maddeler (gıda, bitki artıkları, hayvan gübresi, kanalizasyon çamuru, evsel katı atıkların biyolojik olarak parçalanabilir kısımları vb.) serbest oksijen yokluğunda bozunmaya (anaerobik sindirim) uğradığında, normalde %40-70 metandan oluşan bir gaz üretmektedir. Biyogazın geri kalanı ise çoğunlukla diğer gazların da izlerini içeren karbondioksittir [1]. Biyogazın ısı değeri içerdiği metan miktarına bağlı olarak 6,0-6,5 kWh/Nm³ arasında değişmektedir. Yoğunluğu ise 1,2 kg/Nm³ dolayındadır [2].

Biyogazın kimyasal bileşimi kullanılan biyokütlenin özelliklerine bağlı olarak Çizelge 8.1’de verilen sınırlar içerisinde değişmektedir.

Çizelge 8.1: Biyogazın kimyasal bileşimi [3]

Bileşen	Kimyasal Formül	%
Metan	CH_4	50-75
Karbondioksit	CO_2	25-45
Su buharı	H_2O	2-7
Nitrojen	N_2	< 2
Hidrojen	H_2	< 1
Hidrojen sülfid	H_2S	< 1
Amonyak	NH_3	< 1
Oksijen	O_2	< 2

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9.

BİYOETANOL

Kimyasal olarak etanol ve biyoetanol aynı içeriğe sahiptir. Ancak üretim yöntemlerini belirtmek için bu iki terim ayrı ayrı kullanılmaktadır. Etanol petrokimyasal yolla, biyoetanol ise termokimyasal dönüşüm teknolojileri uygulanarak organik kaynakların fermantasyonu ile üretilmektedir. Etanol, kimyasal formülü C_2H_5OH olan, yüksek derecede yanıcı, su ve benzinle istenilen oranda rahatlıkla karışabilen sıvı yakıttır. Biyoetanol, geleneksel benzin için potansiyel bir ikame olarak kabul edilmekte ve doğrudan veya belli oranlarda içten yanmalı motorlarda benzinle karıştırılarak kullanılabilir. Böylece sera gazı emisyonlarını ve benzin tüketiminin azaltılmasına katkıda bulunmaktadır. Doğrudan uygulama için (E100) benzinli motorun zamanlaması (ve kullanılıyorsa elektronik kontrol sistemi) ayarlanmakta ve daha büyük benzin deposu kullanılmaktadır. Bununla birlikte, biyoetanolün %100 kullanımı, daha yüksek buharlaşma ısısı nedeniyle düşük sıcaklıkta veya soğuk havalarda motoru çalıştırmada zorluk yaratmaktadır. Biyoetanolün benzinle karıştırılarak kullanımı, motorun modifiye edilmesini gerektirmeyebilmekte ve ateşlemeyi veya motor performansını artırmaya yardımcı olmaktadır. En yaygın kullanılan karışımlar E85 ve E10'dur. Biyoetanolün avantajları, artan motor verimliliği ve performansı ile sonuçlanan yüksek oktan derecesi, düşük kaynama noktası, artan yanıcılık, daha yüksek sıkıştırma oranı ve buharlaşma ısısı, karşılaştırılabilir enerji içeriği, azaltılmış yanma süresi ve fakir karışimli yanma oluşumu şeklinde sıralanabilmektedir. Dezavantajları ise sırasıyla ham madde, enzim, detoksifikasyon ve etanol geri kazanımının yüksek maliyetinden kaynaklanan yüksek üretim maliyetidir. Biyoetanol, düşük hacimsel enerji yoğunluğuna sahiptir, yani geleneksel benzine kıyasla hacimsel olarak daha fazla biyoetanol/km (%50'ye kadar) tüketilmektedir. Biyoetanolün bazı elastomerleri parçalama ve metallerin aşınmasına neden olma kapasitesi olduğundan, motorlarda biyoetanol kullanımı motor parçalarının sık sık değiştirilmesini de gerektirebilmektedir. Bu dezavantajlarına rağmen organik kaynaklardan elde edilecek biyoetanol, yenilenebilir bir enerji kaynağı olarak büyük önem taşımaktadır.

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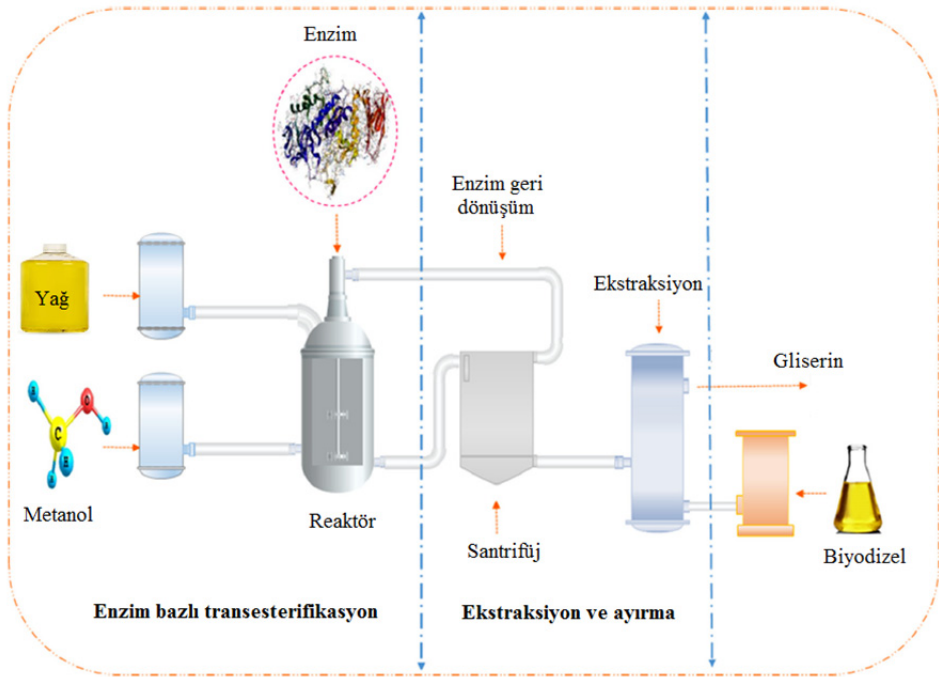
10.

BİYODİZEL

Biyodizel kısaca bitkisel veya hayvansal yağların monoalkil esterleri olarak tanımlanmaktadır ve ağırlıklı olarak soya fasulyesi, kolza tohumu ve palmye yağlarından üretilmektedir. Üst ısıl değeri (39-41 MJ/kg), benzinden (46 MJ/kg), motordan (43 MJ/kg) ve petrolden (42 MJ/kg) biraz daha düşük ancak kömürden (32- 41 MJ/kg) daha yüksektir (32-37 MJ/kg) [1]. Bitkisel veya hayvansal yağların monoalkil esterlere veya biyodizel dönüştürülmesi, kimyasal bir süreç olan transesterifikasyon işlemi ile gerçekleşmektedir. Transesterifikasyon işlemi yaklaşık 130 yıl önce Rudolf Diesel tarafından dizel motorlarda kullanılmak üzere biyodizel üretmek amacıyla uygulanan oldukça eski bir yöntemdir. Biyodizelin teknik özellikleri ASTM D 6751 standartları ile belirlenmiştir (Çizelge 10.1).

Çizelge 10.1: Biyodizelin teknik özellikleri [2]

Özellik	Açıklama
Ticari adı	Biyodizel
Kimyasal adı	Yağ asidi metil ester
Kimyasal formülü	$C_{14} - C_{24}$ metil esterler ya da $C_{15-25}H_{28-48}O_2$
Setan sayısı	> 47
Metanol içeriği	< %0,2 w.t.
Kinematik vizkozite (mm^2/s ; $T=313$ K)	3,5-5,2
Yoğunluk (kg/m^3 ; $T=288$ K)	860-894
Kaynama noktası (K)	> 475
Parlama noktası (K)	430-455
Distilasyon (K)	470-600
Buhar basıncı (kPa; $T=295$ K)	< 0,67
Suda çözülebilirlik	Hayır
Biyoçözünürlük	Petrolden daha fazla



Şekil 10.4: Enzim bazlı katalizör kullanılarak yapılan transesterifikasyon işlemi [13]

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11.

ÖN İŞLEMLER

Lignoselülozik biyoküteller, biyokütle rekalsitansı olarak da adlandırılan kimyasal ve biyolojik bozulmaya karşı dirençli bir yapıya sahiptirler. Selülozun kristal yapısı, odunlaşma derecesi ve hücre duvarı bileşenlerinin yapısal olarak heterojenliği ve karmaşıklığı gibi faktörler, lignoselülozik ham maddelerin kullanılabilir maddelere dönüştürülebilmesi için üstesinden gelinmesi gereken faktörlerdir. Bu bağlamda, lignoselülozik biyokütlelere ön işlem uygulanması, bunların işlenerek ısı, elektrik, yakıt, kimyasallar vb. gibi katma değeri yüksek ürünlerin üretiminin sağlandığı dönüşüm süreçlerinde (biyorafineri) önemli bir adımdır. Ön işlem süreci boyunca, lignoselülozun inatçı yapısının bozulması lignin kılıfının kırılmasına, hemiselülozun bozulmasına ve selülozun kristallik ve polimerizasyon derecesinde azalmaya neden olmaktadır. Bu amaçla çok sayıda ön işlem tekniği geliştirilmiştir. Bu teknikler Şekil 11.1’de gösterildiği gibi sınıflandırılabilir. Pek çok ön işlem arasında uygun olan ön işlemin tercihi, biyokütlenin bileşimini oluşturan selüloz, hemiselüloz ve lignin oranlarına bağlıdır [1-3]. Ön işlemler; fiziksel, kimyasal, fizikokimyasal ve biyolojik veya bunların kombinasyonu şeklinde uygulanabilmektedir ve bu yöntemler arasında güçlü etkileşimler bulunmaktadır (Şekil 11.1).

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Editörler:
Ferhat Karaman - Aylin Özdeő



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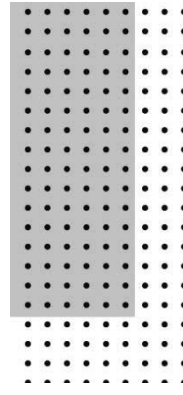
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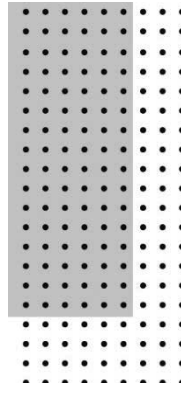


İçindekiler

Yazarlar Listesi	iii
Giriş	ix
KISIM I: DİJİTAL ÇAĞDA BİLİŞSEL GELİŞİM.....	1
BÖLÜM 1.....	3
Dijital Teknolojilerin Duyum ve Algı Gelişimi Üzerindeki Etkileri ve Bu Etkilerin Gelişimsel Bozuklukların Rehabilitasyonunda Kullanımı	3
<i>Bahtım Küçük, Ali Aytemür</i>	<i>3</i>
BÖLÜM 2.....	25
Dijital Çağda Gelişen Yürütücü İşlevler	25
<i>Mine İmren</i>	<i>25</i>
BÖLÜM 3.....	55
Dijital Dünyada Erken Çocukluk: Ekran Kullanımı ve Öz Düzenleme Becerileri Arasındaki İlişki	55
<i>Berna A. Uzundağ, Dilara Keşşafoglu, Merve Nur Altundal</i>	<i>55</i>
BÖLÜM 4.....	79
Dijital Teknoloji Dünyasında Gelişen Bellek.....	79
<i>Aylin Özdeş.....</i>	<i>79</i>
BÖLÜM 5.....	103
Dijital Dünyada Öğrenme	103
<i>Nilgün Türkileri</i>	<i>103</i>

KISIM II DİJİTAL ÇAĞDA DİL GELİŞİMİ.....	133
BÖLÜM 6.....	135
Dijital Yerlilerde Dil Gelişimi: Teknolojinin Rolü ve Etkileri.....	135
<i>Ferhat Karaman</i>	135
BÖLÜM 7.....	155
Dijital Teknolojilerin Çocuk İkinci Dil Edinimi Sürecindeki Rolü.....	155
<i>İlmiye Seçer</i>	155
BÖLÜM 8.....	179
Okuma Yazma ve Matematik Gelişiminde Dijital Teknolojiler.....	179
<i>Tuğba Bahçekapılı Özdemir</i>	179
KISIM III DİJİTAL ÇAĞDA SOSYAL DUYGUSAL GELİŞİM.....	203
BÖLÜM 9.....	205
Çocuklarda Dijital Teknoloji Kullanımının Sosyal Beceriler ve Duygu Düzenlemeye Etkisi	205
<i>Gizem Koç Arık</i>	205
BÖLÜM 10.....	231
Ebeveyn-Çocuk Etkileşiminde Dijital Teknolojinin Rolü.....	231
<i>Tuğba Koçak Özel</i>	231
BÖLÜM 11.....	259
Dijital Teknoloji ve Benlik Gelişimi	259
<i>Şükran Okur Ataş</i>	259
BÖLÜM 12.....	283
Dijital Çağda Çocuk ve Oyun	283
<i>Şıvganur Kirman Güngörer</i>	283

KISIM IV GELECEK VİZYONLARI.....	303
BÖLÜM 13.....	305
Çocuk ve Ergenlerde İnternet ve Sosyal Medya Kullanımı	305
<i>İlknur Çoban</i>	305
BÖLÜM 14.....	331
Değişen Dünyada Medya Okuryazarlığı: Eleştiren ve Üreten Çocuklar	331
<i>Tolga Kargın</i>	331
BÖLÜM 15.....	355
Erken Çocukluk Döneminde Artırılmış Gerçeklik Teknolojisi	355
<i>Merve Coşgun Demirdağ, Sevda Küçük, Adnan Taşgın</i>	355
Öz Geçmişler.....	389



BÖLÜM 1

Dijital Teknolojilerin Duyum ve Algı Gelişimi Üzerindeki Etkileri ve Bu Etkilerin Gelişimsel Bozuklukların Rehabilitasyonunda Kullanımı

Bahtım Kütük, Ali Aytemür

Dünya hiç olmadığı kadar hızlı bir şekilde değişmekte ve bu değişime çocuklar yetişkinlerden daha fazla maruz kalmaktadır. Fakat bu hızlı değişime çocuklar yetişkinlerden daha kolay uyum sağlamaktadır denilebilir. Burada dikkat edilmesi gereken noktalardan biri normal şartlarda nesil farkı ebeveyn ve çocuklar arasındayken artık bu nesil farkı süresi kardeşler arasına kadar düşmüştür. Nesil farkı, bir nesil ile diğer nesil arasındaki, özellikle çocuklar ve ebeveynleri arasındaki değerler ve tutumlardaki farklılığı ifade etmektedir. Bu farklılıklar, deneyimler, hayata bakış açısı, alışkanlıklar ve davranışlardaki farklılıklar nedeniyle meydana gelir.

Hayatımızın artık merkezinde olan ve farkında olarak ya da olmayarak maruz kaldığımız, hatta olmadığına yokluğunu hissettiğimiz, dahası bazı kişilerin bağımlısı olduğu bir fenomenle karşı karşıyayız; teknoloji. Teknoloji kişisel ve toplumsal hayatımızda yeni normlar oluşmasına neden olmuştur. Örneğin tabletler, telefonlar, bilgisayarlar ve televizyonlar yeni çocuk bakıcıları görevi görmeye başlamıştır. Ebeveynler çocuklarını oyalamak için bu tür teknolojik aletleri oldukça sık kullanılmakta ve çocuklar da bu tür aletlere oldukça ilgi duymaktadır. Bazı çocuklar ise ilgisini çeken bir şeyler izlerken âdeta hipnoz olmuş gibi gözükmektedir. Beş yaş altı çocukların ekran süresinin araştırıldığı bir meta analizde 2009-2018 yıllarındaki yayınlanan araştırmalara göre orta gelirli ülkelerde %21 ila %98, yüksek gelirli ülkelerde ise %10 ila %93,7 arasında ekran süresi yükünün değiştiği görülmüştür (Kaur vd., 2019). Teknolojiyle bu kadar iç içe olduğumuz bir dönemde bu tür aygıtlara maruz kalan çocukların duyum ve algılarına nasıl bir etkisi

zengin veri analizi sağlayabilecek bilgi elde edilmesini sağlayabilmektedir. Ayrıca bilgisayar tabanlı uygulamalar belirli bir seviyeye kadar ekonomik giderlerin azaltılmasını da sağlayabilecek niteliktedir. Bu nedenlerle bilgisayar tabanlı değerlendirme uygulamalarının otizmi olan çocukların değerlendirilmesinde olan kullanımı artış trendindedir (Mazon vd., 2019). Bu anlamda görsel algı becerilerinin değerlendirilmesi amacıyla ortaya konulan bilgisayar tabanlı değerlendirme uygulamaları önem kazanmaktadır.

Son olarak, bilgisayar oyunu uygulamaları hızlı tanılamada kullanılmakla özel popülasyonlarda rehabilitasyona yönelik uygulamaların çeşitliliğini ve etkililiğini artırmakla kalmayıp bu popülasyonlarda uygulanabilecek araştırma görevlerinin katılımcılar tarafından yapılabilirliğini de artırmaktadır. Örneğin oldukça yoğun sözel ve sosyal beceri gerektiren diğerlerinin konuşmalarını anlamaya yönelik araştırma görevleri gibi görevler düşük fonksiyonel otizmi bulunan çocukların bu becerilerinin incelenmesinde kısıtlı kalmaktadır (Ploog vd., 2009). Bu gibi durumlarda bilgisayar oyunu tabanlı görevler geleneksel yöntemlerle normalde araştırmalarda değerlendirilemeyecek olan düşük işlevselliği olan bireylerin araştırmalarda incelenmesini sağlamaktadır. Bilgisayar destekli video oyunları üzerine inşa edilmiş olan araştırma görevleri bu tarz düşük fonksiyonelliği bulunan grupların hem dikkatini çekerek onların araştırmalara katılımını artırmaktadır hem de araştırma görevlerini tamamlayabilmelerini sağlamaktadır (Brooks ve Ploog, 2013).

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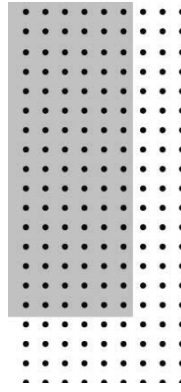
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BÖLÜM 2

Dijital Çağda Gelişen Yürütücü İşlevler

Mine İmren

Dört bir yanımızın teknolojik cihazlarla çevrili olduğu, dijital bir çağda yaşamaktayız. Dijitalleşme hem günlük işlemleri halletmek hem boş zamanları değerlendirmek hem de eğitim öğretim faaliyetleri için elzem hâle gelmiştir. Bu nedenle âdeta dijital bir çevre içerisinde yaşam sürmekteyiz. Bu dijital çevre aynı zamanda çocukların da doğal çevresel şartlarını betimlemektedir. Çocuklar gerek eğlence amaçlı gerekse de eğitim öğretim faaliyetleri (ödev yapma vs.) ile ilgili olarak dijital ekranlarla sıklıkla etkileşim hâlinde bulunmaktadır. Çocukların teknolojik cihazlarla bu kadar haşır neşir olması nedeniyle aileler, eğitimciler gelişim süreci içerisinde olan çocukların özellikle de bilişsel gelişimlerinin seyri hakkında endişe duymaktadır. Literatüre bakıldığında ise dijital teknolojilerin çocukların psikolojik (psikolojik iyi oluş, öfke davranışını ifade etme gibi), bilişsel (yürütücü işlevler, dikkat, bellek vs.) ve sosyal süreçlerine olası etkilerinin sıklıkla çalışıldığı görülmektedir.

Günümüzde eğitim, iş, boş zamanı değerlendirme ve eğlence gibi amaçlarla dijital ekranlarla sürekli etkileşim kurulmaktadır. Bu nedenle de ekranlara adaptasyon geliştirmek, çağa ayak uydurmak önem arz etmektedir (Lortie, 2022). Çocukların da dijital teknoloji ile donanmış bu çevrede sıklıkla teknolojiyle haşır neşir olduğu gözlenmektedir. Bu nedenle dijital teknolojilerin bilişsel düzeyde özellikle de gelişen beyinler açısından nasıl bir etkisi olduğu konusu hem aile ve bakım verenlerin hem de araştırmacıların oldukça ilgisini çekmektedir.

Çocukların Dijital Teknoloji ve Medya İle İlişkisi

Âdeta dijital bir fanus içerisinde büyüyen çocuklarımız teknolojik uyarımlarla doğal olarak iç içe zaman geçirmektedir. Çocuklar sadece çevrelerindeki dijital cihazlara maruz kalmamakta, dahası kendilerine ait dijital cihazlar edinebilmekte-

gerektiğini vurgulamaktadır. Okul çağında ise kısıtlı olmak şartıyla ekran saatinin uyku, yemek yeme, egzersiz yapma gibi gelişim için oldukça önemli olan temel gereksinimlerin aksatılmasına neden olmaması gerektiğinin altını önemle çizmektedir. Ayrıca taşınabilir olan teknolojik cihazları kullanmak için belirli zaman ve mekân belirlenmesi önerilmektedir (AAP Council On Communications and Media, 2016). Cihazların artık her yere götürülebilmesi, çocukların yemek, ders, uyku gibi temel gereksinim ve görevlerine odaklanmasını engelleyebilir. Araştırmacılar ayrıca bilişsel becerileri desteklemek adına farklı özellikler sağlayan eğitici içerikler üretilbileceği ve tercih edilebileceğine de işaret etmektedir (Kostyrka-Allchorne vd., 2019).

Sonuç olarak çocukları dijital cihazlardan tümüyle uzak tutmak, bulunduğumuz çağda çok da mümkün görünmemektedir. Yapılan çalışmalar, elastik yapıdaki gelişen beyinlerin teknolojinin aşırı kullanımıyla olumsuz yönde şekillenebilme olasılığını vurgulamaktadır. Ancak teknolojinin kontrollü ve özenle seçilmiş içeriklerle uzman önerileri de dikkate alınarak ve yaş sınırlarına dikkat edilerek kullanımını sağlamak, çocukları olası zararlı etkilerden korumayı sağlayabilmektedir (Chiu vd., 2022). Ayrıca teknoloji süresinin tek başına kısıtlanması yerine bu sürenin bilişsel açıdan besleyici faaliyetlerle geçirilmesini sağlamak önem arz etmektedir. Son olarak medya cihazlarının ebeveyn veya bakım verenlerle etkileşim içinde kullanılması ve yine aileler tarafından veya uygulamalar aracılığı ile sadece teknoloji süresinin değil içeriğinin de denetlenmesi uygun bulunmaktadır.

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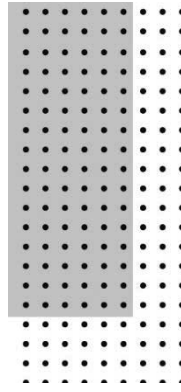
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BÖLÜM 3

Dijital Dünyada Erken Çocukluk: Ekran Kullanımı ve Öz Düzenleme Becerileri Arasındaki İlişki

Berna A. Uzundağ, Dilara Keşşafoglu, Merve Nur Altundal

Duygu ve davranışları kontrol edebilme, yani öz düzenleme (self-regulation) yetisi, kişilerin tüm hayatı boyunca ihtiyaç duyduğu önemli becerilerden biridir (Karoly, 1993). Öz düzenleme becerilerinin gelişimi için ilk adım bebeklik yıllarında atılır ve bu beceriler erken çocukluk döneminde önemli bir gelişim gösterir (Diamond ve Lee, 2011; McClelland vd., 2015; Montroy vd., 2016). Erken dönemdeki öz düzenleme becerileri ilerleyen yıllardaki okula hazır olma, okul başarısı ve sosyal-duygusal yeterlilik gibi çeşitli çıktılarla yakından ilişkilidir (Blair ve Raver, 2015; Diamond, 2013; Eisenberg vd., 2004a, 2010; Eisenberg vd., 2010; Liew vd., 2004). Öz düzenleme becerilerinin çocukların gelişimi için taşıdığı önemli rol sebebiyle bu becerilerin gelişiminin hangi sosyal ve çevresel unsurlarla ilişkili olduğunun incelenmesi araştırmacıların ilgisini çekmiştir. Son yıllarda yayımlanan çalışmalar, günümüzde çocukların günlük yaşamının bir parçası hâline gelmiş olan ekranların nasıl ve ne kadar süreyle kullanıldığının çocukların öz düzenleme becerileriyle ilişkili olabileceğini önermektedir. Bu bölümdeki amacımız, bebeklik ve erken çocukluk döneminde öz düzenleme becerileri ile ekran kullanımı arasındaki ilişkiyi çalışma bulguları ışığında incelemektir.

Öz düzenleme becerileri, bilişsel ve sosyal-duygusal gelişim alanlarında çalışan araştırmacılar tarafından genellikle farklı şekillerde tanımlanır ve ölçülür. Bilişsel gelişim alanında davranışların kontrolüne ve planlama, organizasyon gibi daha üst düzey olarak görülen davranışlara olanak sağlayan *yürütücü işlevler* (executive functions) ön plana çıkarken sosyal-duygusal gelişim alanında davranışları bastırmaya ve duyguları düzenlemeye yarayan *çabalı kontrol* (effortful

ve mobil cihazların günlük yaşamın bir parçası olduğu düşünüldüğünde bu teknolojilerin nasıl *daha olumlu şekilde* kullanılabilceği konusunda da incelemelere ihtiyaç vardır. Örneğin çocukların ekranları hep tek başına kullanmaları yerine, bazı durumlarda kardeşleri veya ekrandaki olayları konuşabilecekleri bir büyükle birlikte izlemeleri/kullanmaları daha olumlu çıktılar sağlayabilir (Ewin vd., 2021; Padilla-Walker vd., 2020). Zorluk seviyesini çocuğun beceri seviyesine göre ayarlayan uygulamaların/oyunların da çocukların yeni bilgiler edinmesine ve sahip oldukları becerileri geliştirmesine destek olabileceği önerilebilir. Henüz hangi tür ve özelliklerde uygulamaların ve oyunların küçük çocukların öz düzenleme becerileri ile ilişkili olabileceğine dair yeterince bilgi bulunmamaktadır.

Özetle, pek çok araştırma küçük çocukların ekran kullanımı ve öz düzenleme becerileri arasında bir ilişki raporlamıştır ancak çelişkili bulguların varlığı ekran kullanımının ölçüm yöntemleri hakkında soru işaretleri uyandırmakta ve göz önüne alınması gereken diğer değişkenlerin (ör. öz düzenleme becerilerini destekleyen anne-baba davranışları, etkileşimli cihaz kullanımında tüketilen içerik gibi) önemini vurgulamaktadır. Ekran kullanımı ve öz düzenleme becerileri arasındaki ilişkiyi daha iyi anlamak için çocukların ekran kullanımını daha ayrıntılı ve incelikli bir şekilde irdelemek gerekmektedir.

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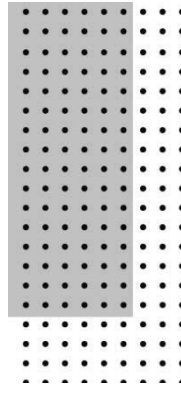
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BÖLÜM 4

Dijital Teknoloji Dünyasında Gelişen Bellek

Aylin Özdeş

Dijital teknoloji araçlarının modern toplumlarda günlük yaşantının bir parçası hâline gelmesi, bu araçların bilişsel süreçler üzerindeki etkileri ile ilgili tartışmaların ortaya çıkmasına sebep olmuştur. Uzun süredir yaygın olarak kullanılan televizyonun yanı sıra görece yeni olan akıllı telefon, tablet, kişisel bilgisayarlar, akıllı asistanlar (Ör. Siri, Alexa), sanal/artırılmış gerçeklik gözlükleri gibi cihazlar ve bu cihazlarda yer alan internet, video oyunları, sosyal medya, videolu konuşma gibi kullanımlar dijital teknolojinin en popüler örnekleri olarak sıralanabilir. Yetişkinlere yönelik çalışmalar dijital teknoloji kullanımının dikkat (Uncapher vd., 2016; Ward vd., 2017), kısa süreli/çalışan bellek (Ophir vd., 2009; Uncapher vd., 2016) ve uzun süreli bellek (Sparrow vd., 2011; Storm ve Stone, 2015) performansı üzerinde olumlu ve olumsuz olarak sınıflandırılabilir karmaşık etkilerinin olduğunu göstermektedir. Maruz kalınan uyaranların artması sebebiyle kısıtlı dikkat, kısa süreli ve çalışan bellek performansının düştüğü tekrarlanan bir biçimde bulunurken (Ophir vd., 2009; Uncapher ve Wagner, 2018) bilgilerin dijital ortamlara kaydının uzun süreli bellek performansını olumsuz etkilediğini gösteren çalışmaların sayısı hızla artmaktadır (Sparrow vd., 2011). Örneğin yakın zamanlı bir çalışmada yaşanan bir deneyimin fotoğrafının çekilerek sosyal medyada yayınlanmasının o deneyime ilişkin bellek performansını düşürdüğü gözlemlenmiştir (Tamir vd., 2018). Öte yandan hatırlama sorumluluğunun dijital cihazlara aktarılmasının diğer bilişsel süreçler için daha fazla kaynak kullanılmasına olanak sağladığı dolayısıyla bilişsel performansı artırabileceğine ilişkin görüşler de bulunmaktadır (Storm ve Stone, 2015). Yetişkinlere ilişkin bu bulgular, teknolojinin bellek süreçler üzerindeki karmaşık etkisini gösterirken (Bk. Özdeş ve Karaman, 2023), henüz bellek sistemi olgunlaşmamış olan çocuklar dijital teknolojinin etkilerine karşı daha hassas ve etkilenebilir görünmektedir.

üzerindeki etkilerinin anlaşılması kritik öneme sahiptir. Dijital teknoloji araçlarının bellek gelişimi için tümüyle zararlı olduğunu iddia etmek ve çocukların yaşamından tümüyle çıkarmak doğru olmayan bir yaklaşım olarak görünmektedir. Bütün çalışmalar tutarlı bir şekilde dijital teknolojinin uzun süreli ve pasif kullanımının tüm bellek türleri için zarar verici olduğunu göstermektedir. Ancak bu bulgular dijital teknolojinin bellek gelişimi için tümüyle zararlı olduğunu göstermekten uzaktır. Dijital teknoloji araçları bellek performanslarının ölçümü ve hatta geliştirilmesi için araştırmacılara ve eğitimcilere yeni fırsatlar sunmaktadır. Bu durumda dijital teknolojinin bellek üzerindeki olumsuz özelliklerinin azaltılması ve olumlu etkilerinin ön plana çıkarılması için kullanılabilir yeni yöntem ve uygulamalara ihtiyaç olduğu görülmektedir.

Kaynakça

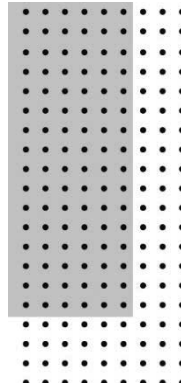
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BÖLÜM 5

Dijital Dünyada Öğrenme

Nilgün Türkileri

Öğrenme insan bilişinin temelini oluşturan biyolojik, psikolojik ve sosyal boyutlu bir mekanizmadır. İnsanda öğrenme, öğretmenin bir sonucu değil kişinin çocukluktan itibaren kendi dünyasını dinamik bir biçimde şekillendirmesinin bir sonucudur. Bu açıdan insan öğrenmesi ve çocuk ve gençlerin eğitimi birbiriyle etkileşime giren birçok bileşenden oluşan *karmaşık sistemler* (complex systems) bağlamında incelenmelidir (Davis ve Sumara, 2008). Örneğin dünyanın küresel iklimi, organizmalar, insan beyni, iletişim sistemleri, yaşayan bir hücre ve nihayetinde evren tek ya da birkaç nedenle açıklanamayan, tersine küçüklü büyüklü pek çok sebebin bir araya gelip etkileşerek oluşturduğu karmaşık sistemlerdir (Bk., Gleick, 2014). Dolayısıyla bu bölümde sınırlı sayıda kelimeyle öğrenmeyi kapsayan sistemlerden yalnızca bir kısmı (davranış, biliş, sosyal çevre gibi) birbirleriyle ilişkilendirilmeye çalışılacaktır. Bununla birlikte insan öğrenmesini diğer canlıların öğrenmesine göre daha karmaşık kılan nokta diğer canlıların çoğunlukla doğuştan getirdikleri içgüdüleri ile hareket ederken insanın yaşamını devam ettirmek için sayısız beceri kazanmak zorunda olmasıdır. Örneğin bir kuş doğuştan yuva yapma içgüdüğü ile doğarken insan barınmak için binalar inşa etmek, para kazanmak için eğitim alıp bir işe girmek gibi karmaşık sosyal davranışlar gösterir. İnsan, bu üst düzey öğrenme kapasitesi sayesinde önce aletler, sonra makineler icat etmiştir. Hatta günümüzde kendi icat ettiği makinelerin kendisini yok edeceğine dair film senaryoları bile geliştirmektedir.

Tarihsel olarak makineleşme ve sanayileşme ile birlikte 19. yy. boyunca daha önce belirli bir zümreye ait olan eğitimin biçimi de değişmiştir (Carl, 2009). Şehirleşme ve demokratikleşme hareketleri ile birlikte tüm çocukların devlet denetimi altındaki kurumlarda eğitim almaları sağlanmıştır. Günümüzde ise artık Endüstri 4.0 olarak adlandırılan dijitalleşmenin öğrenme biçimlerini ve eğitim yöntemlerini

sanın bireysel ihtiyaçları ve fizyolojisinden sosyokültürel çevresine kadar pek çok düzeyde incelenebilir. Tarihsel olarak 1800'ler ve 1900'ler boyunca ortaya çıkan öğrenme kuramları insanı mekanik bir çerçevede değerlendirmiş ve ortaya çıkan eğitim sistemleri çocukları pasif öğrenenler olarak ele almıştır. Davranışçı psikolojinin temelini oluşturan bu neden-sonuç (uyarıcı-tepki) anlayışı, insan zihni ve davranışının karmaşıklığı idrak edildiğinde sorunlu hâle gelmektedir. Spesifik olarak öğrenmenin bir şekilde deneyimden "kaynaklandığı" veya deneyim "nedeniyle" olduğu şeklindeki davranışçı görüşe karşı öğrenen bireyin aktif biçimde çevresini şekillendirdiğine vurgu yapan yapısalcı ve hümanistik yaklaşımlar öne çıkmıştır. Ayrıca burada yapay zekâ öğrenmesi (machine learning) ile insan öğrenmesi arasındaki farkın da vurgulanması yerinde olacaktır. Günümüzde bilişsel psikoloji ve sinirbilim ile bilgisayar teknolojileri alanları karşılıklı olarak birbirlerinden beslenmektedir. İnsan zihnini bilgisayar modellemeleri kullanarak anlamaya çalışmak da oldukça faydalıdır. Ancak insanların bilgisayarlardan farklı olarak kişisel, sosyal ve eğitime dayalı ilgi ve merakları vardır ve karar verme süreçleri açısından bazen sezgisel bazen rasyonel yargılama eğilimindedirler. Bununla birlikte insan öğrenmesini belirli bölümlere ayırarak incelememize rağmen öğrenmenin karmaşıklık düşüncesi bağlamında ele alınması gerektiği de vurgulanmalıdır. Öğrenen kişiler olarak çocuk ve ergenler, aktif ve dinamik biçimde dünyada karşılaştıkları yeni ve çeşitli koşullara uyum sağlayabilen karmaşık birlikler olarak ele alınmalıdır. Öğrenmenin bu dinamik yapısı ve insan zihninin karmaşıklığının yanı sıra dijital teknolojilerin hayatımıza olan etkisi de karmaşık sistemler olarak karşımıza çıkmaktadır. Bölümün başında “Dijital teknolojiler sayesinde aklımızda pek çok şeyi tutmamıza gerek yoksa çocuklara ne öğretmeliyiz?” sorusunu sormuştuk. Gördük ki insan tıpkı barınmak için binalar inşa etmesi gerektiği gibi kendi çevresini ve kendisini de dinamik biçimde inşa etmektedir. Bilgi çağında bu inşa sürecine aktif biçimde dâhil olabilmek için birey, yaşam boyu öğrenme, bilgiyi arama, bilgiyi üretme ve bilgi ile yaşama becerilerini geliştirmek zorundadır. Sonuçta, hümanist bakış açısından dijital çağın getirdiği faydaları kullanabilmek ve özellikle çocuk ve ergenler açısından riskleri en aza indirebilmek için kazanılması gereken en önemli becerilerin uzun süreli amaçlara ulaşmak için hazzı erteleme ve öz disiplin ile bireysel, özgün ve rasyonel kararlar verebilmek için özerklik ve eleştirel düşünme olduğu söylenebilir.

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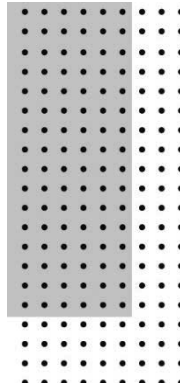
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BÖLÜM 6

Dijital Yerlilerde Dil Gelişimi: Teknolojinin Rolü ve Etkileri

Ferhat Karaman

Dil, hayatın ilk yıllarından itibaren edinilmesi gereken en karmaşık sistemlerden birisidir. Okuma, yazma veya matematik gibi diğer öğrenme problemlerinden farklı olarak dil ediniminin büyük bir bölümü hayatın ilk birkaç yılında gerçekleşmektedir. Bu durum bebeklerin beyinlerinin dillerin yapılarını öğrenmeye özellikle uygun olduğunu göstermektedir. Bebeklerin ana dillerindeki veya birden fazla dildeki sayısız karmaşıklığın etkileyici bir hızla farkına varması ve dilsel süreçleri verimli şekilde öğrenebilmesi tipik gelişimin en etkileyici yönlerindedir. Bu dilsel süreçler, ana dildeki fonemleri keşfetmekten (Eimas, Siqueland, Jusczyk, ve Vigorito, 1971; Kuhl vd., 2006; Polka ve Werker, 1994; Werker ve Tees, 1984), ses dizelerini akıcı bir konuşma içerisinden çıkarmaya (Jusczyk, Houston, ve Newsome, 1999; Saffran, Aslin, ve Newport, 1996; Shukla, White, ve Aslin, 2011; Thiessen, Hill, ve Saffran, 2005), hangi ses dizelerinin anlamlarla eşleştiğini ayırt etmeye (Bloom, 2000; Waxman ve Gelman, 2009), sözcükleri kategoriler hâlinde düzenlemeye ve bu kategorileri söz dizimsel yapılara göre sıralamaya kadar uzanmaktadır (Clark, 1973; Waxman ve Markov, 1995). Bebeklerin dilleri nasıl bu kadar hızlı bir şekilde öğrendiği sorusu uzun yıllardır birçok araştırmannın konusu olmuştur.

Birçok dil edinimi teorisi, dil girdisi ve çocuğun çevre ile etkileşiminin dil gelişimi açısından çok önemli olduğunu vurgulamaktadır (Hart ve Risley, 1995, 1999; Tomasello, 2003). Ancak akıllı telefon, tablet gibi teknolojik cihazlara erişimin gitgide artmasıyla günümüz çocukları, analog bir dünyada yetişen geçmiş yıllardaki çocuklardan farklı olarak dijital bir ekosistem içerisinde büyümeye başlamışlardır. Diğer nesillerden farklı olarak dijital teknolojilerle iç içe büyüyen

veynlerin ekran zamanı sınırlamaları, çocuklarıyla birlikte ekran zamanı geçirmeleri ve örnek davranışlarının çocukların ekran alışkanlıklarına etkisi daha iyi anlaşılabilir. Ayrıca çocukların sağlıklı ekran alışkanlıkları geliştirmelerine yardımcı olacak teknoloji kullanımı eğitimi aracılığıyla ebeveynler çocuklarına nasıl doğru ve etkili bir şekilde rehberlik edebilecekleri konusunda bilinçlendirilmelidir. Tüm bunlarla birlikte çocukların ekran zamanını azaltmalarına ve alternatif etkinliklere (ör. açık hava oyunları, kitap okuma, sanatsal etkinlikler) yönelmelerine yardımcı olacak olası stratejilerin daha iyi araştırılması gerekmektedir. Bu odak noktaları, gelecekteki araştırmaların, erken çocukluk döneminde ekran zamanının etkilerini daha derinlemesine anlamamıza ve çocukların sağlıklı bir şekilde büyümelerine yönelik daha etkili stratejiler geliştirmemize yardımcı olacaktır.

Ekran maruziyetinin bebeklerde dil gelişimi üzerindeki etkilerini inceleyen çalışmaların artması, en nihayetinde dil ile ilişkili gelişimsel bozukluklara dair anlayışımızın gelişmesine katkı sağlayacaktır. Bu araştırmalar, dil gelişimiyle ilgili risk faktörlerini ve koruyucu faktörleri belirlememize ve erken müdahale stratejileri geliştirmemize yardımcı olacaklardır. Ayrıca dil bozukluklarının erken teşhisi ve uygun müdahalelerin planlanması konusunda da önemli bilgiler sağlayabilirler. Bu nedenle dijital teknolojiler ile bebeklik ve erken çocuklukta dil gelişimi arasındaki ilişki üzerine odaklanan çalışmaların artması hem ebeveynlere hem de uzmanlara daha iyi bir anlayış ve rehberlik sunma potansiyeline sahiptir.

Kaynakça

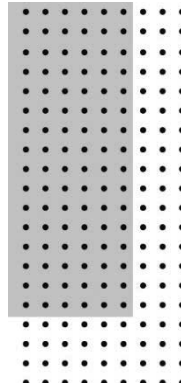
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BÖLÜM 7

Dijital Teknolojilerin Çocuk İkinci Dil Edinimi Sürecindeki Rolü

İlmiye Seçer

Ana dilden veya ilk öğrenilen dilden başka ikinci bir dilin öğrenilmesine ikinci dil edinimi denilir ve her iki dili günlük hayatta düzenli kullanan bireyler ikidilli olarak adlandırılır (Grosjean ve Miller, 1994). Bireyler iş, eğitim, seyahat ve göç gibi birçok sebepten dolayı ikinci bir dil öğrenmektedir ve tahminlere göre günümüzde dünya nüfusunun yaklaşık yüzde 50'si ikinci bir dil edinmiştir (Grosjean, 2021). Birden fazla dil edinmenin motivasyonları arasında kariyer ile birlikte “Bir lisan bir insan, iki lisan iki insan” sözünden de anlaşılacağı gibi ikidilli olmanın sosyal getirilerinin olmasıdır. Bunun yanı sıra ikidilliliğin bilişsel faydalarının olup olmadığı ise güncel tartışmalar arasında (İnceleme için bk. Antoniou, 2019) ve demans ve Alzheimer hastalığının semptomlarını geciktirebileceği yaygın bulgular arasındadır (ör. Bialystok vd., 2007). İkinci bir dil edinmenin birden fazla olası faydası olduğu açıktır.

İkinci dil edinme sürecini kolaylaştıran ve etkileyen birçok faktör vardır. Bunlardan bazıları ikinci dile maruz kalma yaşı; çocukluk veya yetişkinlik dönemleri, öğrenilen bağlam; ev, okul veya ikinci dil ortamı, ikinci dili kullanma sıklığı, bilişsel beceriler ve motivasyon ve kaygı gibi bireysel farklılıklardır. Bu faktörlerin dil edinme süreçlerine olan etkileri oldukça araştırılmıştır. Örneğin bazı çalışmalar çocukluk döneminde öğrenilen ikinci dilin daha akıcı olduğunu bulurken diğer çalışmalar öğrenilen yaştan ziyade ikinci dil girdisinin kalitesinin ve ikinci dilde üretme fırsatının olmasının önemli olduğunu vurgulamaktadır (İnceleme için bk. Oliver ve Azkarai, 2017). Bu faktörlerin yanı sıra günümüzde dijital teknolojinin hayatımıza entegre olması ile birlikte internet, sosyal medya ve oyunlar sayesinde ikinci bir dile maruz kalmak farklı bir boyut kazanmıştır. Bu değişim ikinci

konu çok yeni bir ilgi alanıdır ve Yaşamımızda sanal gerçeklik gibi daha farklı biçimlerde yer aldıkça çocuk ikinci dil ediniminde dijital teknolojilerin etkileri ve sınıf ortamlarına nasıl uyarlanabileceği ile ilgili daha fazla çalışma gerekmektedir. Ayrıca dijital teknolojilerin olumlu yönlerinin yanı sıra cümle kurulum hataları gibi oluşabilecek olumsuzlukların da araştırılması söz konusudur. Dijital teknolojiler hayatımızın bir gerçeğidir. Ebeveynlerin internet güvenliği konusunda bilinçlenmesi ve çocuklarının güvenliğini sağlaması, çocuklarının ekran başında geçirdikleri süre, oyun türünün ve içeriğinin uygunluğundan emin olmaları önemlidir.

Kaynakça

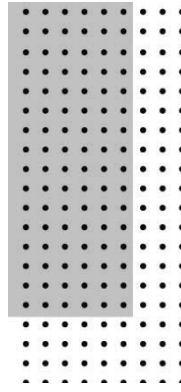
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BÖLÜM 8

Okuma Yazma ve Matematik Gelişiminde Dijital Teknolojiler

Tuğba Bahçekapılı Özdemir

Günümüzde çocuklar dünyaya geldikleri andan itibaren birçok farklı dijital teknolojiye maruz kalmakta ve yaşamlarının ilk yıllardan itibaren çeşitli teknolojileri kullanmayı öğrendikleri dijital bir ortamda büyümektedirler (Kabali vd., 2015; Rideout, 2013; Spatariu vd., 2012). Yapılan araştırmalar, çocukların medya kullanımının son yıllarda önemli ölçüde arttığını göstermektedir. Common Sense Medya'nın Amerika Birleşik Devletleri'nde yürütmüş olduğu çalışmanın raporuna göre 0-8 yaş arası çocuklar günde ortalama iki buçuk saat dijital medya ortamlarında vakit geçirmektedirler (Rideout ve Robb, 2020). Bu kapsamda televizyon ve video izlemek, medyada geçirilen sürelerinin yaklaşık dörtte üçünü (%73) oluşturmaktadır. Ayrıca YouTube gibi sitelerde çevrim içi video izlemenin, günde ortalama 39 dakika ile toplam TV ve video izlemede en büyük paya sahip olduğu belirtilmektedir. Türkiye'de de 412 aileyle yürütülen bir çalışma; 0-6 yaş arası çocukların günde yaklaşık 1-2 saatlerini televizyon izleyerek ve yaklaşık 1 saati tablet/akıllı telefonda video izleyerek geçirilen ortaya koymuştur (Merdin, 2017). Konca'nın (2022) 3-6 yaş arası çocuğa sahip 537 aileyle ev ortamındaki dijital medya kullanımını inceleyen çalışması da çocukların günde ortalama 118,6 dakika televizyon seyrettiklerini, 63.1 dakika akıllı telefon ve 40.7 dakika tablet bilgisayar kullandıklarını göstermektedir. Araştırmada, çocukların teknolojiden zengin bir ortamda yaşadıkları ve evlerinde en yaygın kullanılan dijital cihazların sırasıyla televizyon, akıllı telefon ve tablet bilgisayarlar olduğu ifade edilmektedir. Türkiye'de 1214 ebeveynle yürütülen diğer bir çalışmada, çocukların yaşlarıyla birlikte ekran sürelerinin arttığı, bu bağlamda 2 yaşından küçük çocukların günlük ekran süresi ortalama 1 saat iken 2-4 yaş arası yaklaşık 2.5 saate, 5-6 yaş arası 3 saate çıktığı ortaya koyulmuştur (Uzundag vd., 2022). Ekran başında çocukların sırasıyla You-

nolojilerin okul öncesi dönemde öğrenme ve gelişmeyi desteklemede nasıl tasarlanıp kullanılabileceğine yönelik araştırma destekli bulgular paydaşlara yol gösterici olacaktır.

Kaynakça

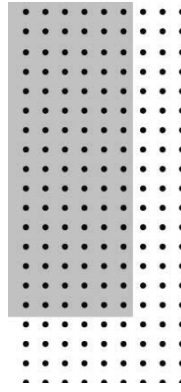
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BÖLÜM 9

Çocuklarda Dijital Teknoloji Kullanımının Sosyal Beceriler ve Duygu Düzenlemeye Etkisi

Gizem Koç Arık

Dijital teknoloji, veri üreten, depolayan veya işleyen elektronik araçlar, sistemler, cihazlar ve kaynaklara karşılık gelmektedir. Akıllı telefonlar, tablet, bilgisayar gibi multimedya cihazlar ile sosyal medya uygulamaları ve çevrim içi oyunlar en sık kullanılan dijital teknoloji örnekleridir (Chaudron vd., 2015). Günümüzün çocukları daha önce eşi benzeri görülmemiş bir şekilde dijital teknolojilere erişebilmektedir ve bu açıdan önceki jenerasyonlardan farklılaşmaktadır (Bohnert ve Gracia, 2021). Bu çocuklar için dijital teknoloji kullanımı günlük hayatın bir parçası hâline gelmiştir. 2007 yılında ilk iPhone'un tanıtılmasından sonra doğan çocuklara dokunmatik ekran erişimine sahip oldukları için dijital çocuk anlamına gelen *digitods* denilmektedir (Holloway vd., 2013). Bir önceki kuşakla karşılaştırıldığında, bu çocukların birçoğu taşınabilir akıllı ekranlara daha çok erişim imkânına sahiptir (Brito vd., 2018). Daha önceki kuşaklar dijital teknolojileri bilgisayarda ders anlatımı gibi pasif bir şekilde ve eğitici amaçlar için kullanırken günümüz çocukları için dijital teknoloji kullanımı, çevrim içi benlikler, sosyal ağlar ve günlük deneyimlerle iç içe olmaya kaymıştır (Fomby vd., 2019).

Çocukların dijital teknolojiyi en çok kullandığı form, ekran kullanımı olarak karşımıza çıkmaktadır. Önceki kuşaklar için ekran kullanımı olarak TV izleme öne çıkmışken günümüzde teknolojilerin gelişmesiyle birlikte TV yerini dijital ekran kullanımına bırakmıştır (Bohnert ve Gracia, 2021). Ekran kullanımında ekran süresi çocukların gelişimini etkileyen en önemli göstergelerden biridir. Alan yazında ekran süresinin farklı tanımları bulunmaktadır. Bazı çalışmalarda *ekran süresi*; eğlence, öğrenme, etkileşim veya oyun için ekranda içerik sağlayan herhangi bir

mesine teşvik ettiği de görülmektedir. Alan yazındaki ilgili çalışmalar, ekran kullanımının çocuğun zor duygularında düzenleme becerileri geliştirmesindenense ekrana bakarak becerilerini geliştirme fırsatlarını azalttığını, ayrıca genel olarak ebeveynleriyle etkileşim sıklığını azalttığı için duygu düzenleme gelişimini olumsuz etkilediği gösterilmiştir.

Sonuç

Kitabın bu bölümünde çocukluk döneminde dijital teknoloji kullanımının duygu düzenleme becerilerini de içerecek biçimde çocukların sosyal beceri ile ilişkisinden bahsedilmiştir. Bu ilişkiden bahsedilirken öncelikle dijital teknolojilerin çocuklar arasında kullanım sıklığı, formu, farklı yaşlar için önerilen süreler ve kullanım sebepleri ile kullanımı etkileyen temel faktörlerden tanımlayıcı olarak bahsedilmiştir. Sonrasında sosyal becerilerin tanımı yapılarak dijital teknoloji kullanımıyla ilişkisi gelişimsel olarak anlatılmıştır. Benzer şekilde dijital teknolojilerin kullanımı ile duygu düzenleme ilişkisine değinilmiştir. Çalışmalar çoğunlukla dijital teknoloji kullanımının çocuğun duygu düzenlemesini ve sosyal becerilerini olumsuz etkilediğini göstermektedir. Ancak ebeveyn ile birlikte yaşına uygun bir içerikle ve aktif bir şekilde ekran kullanımının risklerinin ilgili gelişimsel çıktılar açısından daha düşük olduğu da tutarlı bir şekilde görülmüştür. Bu şekilde dijital teknoloji kullanımının yüksek SED’de yaşayan çocuklar için daha sık deneyimlendiği düşünüldüğünde özellikle düşük SED’deki çocuklar için dijital teknoloji kullanımının sosyal beceriler açısından bir risk faktörü olduğunu söyleyebiliriz.

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BÖLÜM 10

Ebeveyn-Çocuk Etkileşiminde Dijital Teknolojinin Rolü

Tuğba Koçak Özel

Günümüzde pek çok insan televizyon, akıllı telefon, tablet ve bilgisayar gibi dijital teknolojileri kullanmaktadır. Ebeveynler ve çocuklar da çoğunlukla görünümlü görüşme, mesajlaşma, sosyal medya, oyun gibi amaçlarla çeşitli uygulamalar üzerinden dijital teknolojilerden faydalanmaktadır. Dijital teknolojilerin günlük yaşamın mutlak bir gerekliliği olması dijital teknoloji yönetimini önemli hâle getirmektedir (McDaniel ve Coyne, 2016b; Radesky vd., 2016). Dijital teknolojilerin kontrollü kullanıldığında sosyal destek sağlama (McDaniel, 2015; McDaniel, 2020; Radesky vd., 2016), aile ve arkadaşlarla iletişim kurma (Elsaesser vd., 2017), yaratıcılığı ve bilişsel becerileri geliştirme (Limone ve Toto, 2021), dijital hikâye okuma (Ong ve Aryadoust, 2023), etkili ebeveynliği destekleme (McDaniel, 2020) gibi bazı olumlu işlevleri olsa da hayatın her alanına yayılmasıyla kullanım sıklığı artmakta, bu da olası olumsuz etkileri konusunda bazı endişeleri beraberinde getirmektedir. Nitekim Çocuklarda Bilişim Teknolojileri Kullanım Araştırması'nda, 6-15 yaş grubu arasındaki çocukların internet kullanım oranının %82,7 olduğu, internet kullanan çocukların %90,1'inin hemen her gün internet kullandığı, yaklaşık ortalama 12 saat çevrim içi derse katılma, ödev yapma gibi okul ile ilgili gereksinimlerle ve yaklaşık ortalama 7 saat ise oyun oynama, video izleme gibi ders dışı nedenlerle internet kullandığı rapor edilmiştir (Türkiye İstatistik Kurumu, 2021). Yapılan bir araştırmada, küçük çocukların %80'inin dijital teknolojilere doygun bir ortamda büyümekte olduğunun, hatta pek çoğunun yatak odasında dahi televizyon, oyun konsolu gibi dijital teknoloji araçlarının bulunduğu altı çizilmektedir (Vandewater vd., 2007). Sözü edilen çalışmalar, çocukların dijital teknolojilere sıklıkla maruz kaldıklarına ve dijital teknolojilerin olumsuz etkilerine karşı savunmasız olduklarına işaret etmektedir. Diğer taraftan çocukların

tedbirlerin ve dijital teknolojilerin kullanımını azaltmayı hedefleyen politikalar geliştirmenin önemli olduğu sonucuna ulaşılabilir.

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BÖLÜM 11

Dijital Teknoloji ve Benlik Gelişimi

Şükran Okur Ataş

Dijital teknoloji, hızla dijitalleşen dünyaya çocukların uyum sağlayabilmesi, çeşitli bilgi ve becerileri öğrenebilmesi açısından önemlidir (Stoilova vd., 2021). Çocuklar internet kullanımına en çok telefon ile ulaşmaktadır. Farklı dijital ortamlar, farklı amaçlar için kullanılabilir. Örneğin sosyal medya daha çok iletişim kurma ve sosyalleşme amacı ile kullanılmakta, çevrim içi oyunlar ise daha çok eğlence amaçlı kullanılmaktadır. Ancak internet üzerinde çocuklar için birçok risk bulunmaktadır. Bu riskler arasında, uygunsuz içeriklere maruz kalma (ör. madde kullanımı, şiddet içerikli video ve fotoğraflar, kendine fiziksel olarak zarar verme), zorbalık, ayrımcılık, şiddet içerikleri, cinsel içerikli mesajlar alma/gönderme ve cinsel istismar sayılabilir. Dijital medya, çocukların gelişimlerini birçok alanda etkilemektedir. Bu gelişim alanlarından biri de benlik gelişimidir. Bu bölümde, çeşitli dijital medya araçlarının çocukların ve ergenlerin benlik gelişimi üzerindeki etkilerini inceleyen çalışmalara yer verilmiştir.

Benlik

Benlik kavramı, kişinin kendisine dair duygu ve düşüncelerinin bütünü şeklinde tanımlanabilir (Rosenberg, 1979). Benlik kavramı genel ve sabit bir kavram olmaktan ziyade, aktif ve çok boyutlu bir kavram olarak tanımlanmaktadır (Markus ve Wurf, 1987). Kişilerin benlik temsilleri farklı kaynaklara dayanabilir. Bazı temsiller kişinin kendi duygu, biliş, motivasyon ve fizyolojik tepkilerinden yaptığı çıkarımlarına dayanırken bazıları başkalarının tutum ve tavırlarından yapılan çıkarımlara dayanabilir. Dolayısıyla kişiler benliklerine dair bilgileri başkalarından öğrenebilirler. Bu durum başkaları ile olan etkileşimler veya kişinin kendini başkaları ile kıyaslaması yoluyla ortaya çıkabilir.

zaman içinde azaldığı görülmüştür (Touloupis ve Athanasiades, 2022). Dolayısıyla siber zorbalığı azaltmaya yönelik çalışmalarda benlik saygısına yer verilmesi oldukça önemlidir.

Sonuç

Çocukların medyanın verdiği mesajlara karşı oldukça hassas olması nedeniyle çocuklara yönelik medyanın onların ihtiyaçlarına ve becerilerine karşılık gelmesi oldukça önemlidir (Lieberman vd., 2009). Çocuklar için uygun olmayan içerikler (ör. şiddet), çocukların benlik algılarını olumsuz yönde etkilemektedir. Özellikle sosyal medya ve dijital oyunlar benlik gelişiminde daha fazla araştırılan konulardır. Sosyal medyada başkaları ile yapılan etkileşimler, çocukların/ergenlerin benlik algılarını etkilemektedir. Şiddet içeren dijital oyunlar ise çocukların saldırgan bir benlik geliştirmesine neden olabilmektedir. Dolayısıyla dijital medya araçlarının çocuklara uygun şekilde seçilmesi ve denetlenmesi benlik gelişimi açısından oldukça önem taşımaktadır. Ebeveynlerin çocuklarının kullandığı dijital medya araçlarının farkında olması ve bu ortamları denetlemesi çocukların benlik gelişimindeki risklerin ortaya çıkarılması için önemlidir. Ayrıca uygulanacak müdahale programlarında benlik saygısının artırılmasına da yer verilmesi, özellikle siber zorbalık ile mücadelede oldukça etkili olacaktır.

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BÖLÜM 12

Dijital Çağda Çocuk ve Oyun

Şıvganur Kirman Güngörer

Çocuk oyunları, insanlık tarihinin başından beri var olmuştur ve çağlar boyunca farklı kültürlerde farklı şekillerde görülmüştür. Geçmişten günümüze çocuk oyunları incelendiğinde, İlk Çağlarda müzik ve dansı içeren oyunların olduğu, beş taş, uçurtma ve ip oyunlarının en bilinenler arasında yer aldığı görülmektedir (Chalid, Kâmil ve Meliza, 2020). Ayrıca körebe, saklambaç, çember, suda taş kaydırmaca gibi oyunların da sıklıkla oynandığı düşünülmektedir (Chalid, Kâmil ve Meliza, 2020). Orta Çağ'da, çocukluğa atfedilen değer günümüzden farklı olduğu için çocukların yetişkinlere özgü oyunlar oynadığı gözlenmektedir. Bu dönemde kiraz çekirdeği ve fındık kullanılarak oynanan misketler, kumaşlardan yapılan kuklalar kullanılmış, dama, saklambaç, seksek ve taklit oyunları oynanmıştır (Özcan, 2017). Yeni Çağ'da, oyunun çocuk gelişimi ve öğrenmeyle ilişkisi fark edilmiştir ve derslerin daha ilgi çekici olması için oyunun kullanılması önerilmiştir (Özcan, 2017). Masaüstü oyunlarının ve sanal oyunların ortaya çıktığı yakın çağda ise oyunlar sadece nicel değil aynı zamanda niteliksel değişime uğramışlardır (Özcan, 2017). 20. yüzyıldan sonra teknolojinin hızlı gelişimi, çocukların oyun dünyasında köklü değişikliklere neden olmuştur. Bu değişim, çocukların oyun dünyasına yeni bir boyut kazandırmıştır ve oyunların türü, içeriği ve oynanış şekli üzerinde önemli bir etki yaratmıştır. Bu kitap bölümünde, teknolojinin gelişmesiyle birlikte çocuk oyunlarında yaşanan bu değişim ele alınacaktır. Ayrıca bu dönüşümün çocukların sosyal ve duygusal gelişimi üzerindeki etkileri de tartışılacaktır.

Geleneksel Oyun Tanım ve Sınıflandırması

Öncelikle oyun kavramına yakından bakarsak, bu kavramın anlamı konusunda genel bir fikir birliği bulunmadığı görülmektedir (Sherwood ve Reifel, 2010). Bjorklund (2007) tarafından oyun, çocukların yaptığı şey olarak tanımlanmaktadır.

dijital teknolojileri kendi uygulamalarına en faydalı şekilde nasıl yerleştirecekleri konusunda desteğe ihtiyacı olduğu açıktır. Dijital oyunları gereksiz görüp göz ardı etmek ya da potansiyel olarak zararlı olarak görüp yok saymak yerine akademisyenlerin ve eğitimcilerin görece yeni olan bu dünyanın olanaklarını ve neler sunabileceğini daha yakından incelemeleri gerekmektedir. Örneğin günümüzde teknoloji kullanılarak oluşturulan, kurgular ile gerçek ve hayalin birleştirilmesi olarak tanımlanan sanal gerçeklik teknolojileri çocuk oyun deneyimlerini daha da çeşitlendirmektedir. Ancak bu oyunların çocukların gelişimi üzerindeki etkileri ve gelişimlerini desteklemek için nasıl kullanılabilirliği konusunda çok sınırlı çalışma bulunmaktadır. Çocukların dijital oyunlarının kesin doğasına ilişkin bilgi ve anlayışı derinleştirmek için hem genel olarak hem de daha özel olarak bilgide belirlenen boşluklarla ilgili, devam eden araştırmalara ihtiyaç olduğu açıktır.

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BÖLÜM 13

Çocuk ve Ergenlerde İnternet ve Sosyal Medya Kullanımı

İlknur Çoban

Teknolojinin hızla geliştiği günümüz dünyasında farklı birçok amaçlarla kullanılan internetin önemi gün geçtikçe artmaktadır (Arslan vd., 2014). Eğlence, iletişim, ev işleri, kişisel bakım, sağlık, seyahat ve benzeri birçok alanda yaygın olarak kullanılan internet, günümüz koşullarında bir tercih olmaktan çıkıp bir zorunluluk hâline gelmiştir (Aral ve Keskin, 2018). Elektronik medya çeşitliliğinin artması ve internetin yetişkinler tarafından oldukça sık kullanılması internetin çocuklar tarafından da yaygın olarak kullanılmasına yol açmıştır. Çocuklar ve ergenler bilgiye erişmek, iletişim kurmak, oyun oynamak ve daha da yaygın olarak sosyal medya platformlarını kullanmak amacıyla interneti sıkça kullanmaktadırlar (Topçu, 2018). Sosyal medya platformları da internetin hayatımıza getirdiği ve oldukça sık kullanılan yeniliklerden birisidir (Sarıçam ve Adam Karduz, 2018). Bu nedenle çocuk ve ergenlerin internet ve sosyal medya kullanım davranışları ve bu platformların çocuk ve ergenler üzerindeki etkileri sıkça araştırılan bir konu hâline gelmiştir. Bu bölümde çocuk ve ergenlerin internet ve sosyal medya kullanım davranışları, günümüzde yaygın olarak görülen problemlerden takıntılı internet kullanımı ve siber zorbalık üzerinde durulmuştur. Buna ek olarak ebeveynlerin sosyal medya kullanımına değinilmiş, ebeveynlere ve uzmanlara sağlıklı internet kullanımına yönelik öneriler sunulmuştur.

İnternet ve Sosyal Medya Kullanımı, Yaygınlığı, Kullanım Amaçları ve Etkileri

Herhangi bir yöntem ile başkaları ile iletişim kurmaya yardımcı olan araçların ve uygulamaların tümü sosyal medya olarak adlandırılmaktadır (Amerikan Pedi-

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BÖLÜM 14

Değişen Dünyada Medya Okuryazarlığı: Eleştiren ve Üreten Çocuklar

Tolga Kargın

COVID-19 vakalarını tedavi eden Japon doktorlar tarafından MÜKEMMEL TAVSİYE:

Herkes ağzının ve boğazının nemli olmasını sağlamalı, asla KURU olmamalıdır. En az 15 dakikada birkaç yudum su için NEDEN? Virüs ağzınıza girse bile ... içme suyu veya diğer sıvılar onları yemek borunuzdan ve mideye yönlendirir. Karın içinde mide asidiniz tüm virüsü öldürecektir. Eğer düzenli olarak yeterince su içmezseniz virüs nefes borunuza ve oradan da AKCİĞERİNİZİN içine girebilir. Bu çok tehlikelidir. Lütfen bu mesajı aileniz, arkadaşlarınız ve bu konudan yararlanabilecek herkes ile paylaşın! İnsanların dünyanın her yerinde korona virüsünden kurtulmasına yardım edin³

Medya aracılığı ile karşılaştığımız iletileri ne kadar doğru yorumlayabiliyoruz? Her ne kadar iyi bir medya okuryazarı olmanın önemi yıllardır konuşulmuş ve tartışılmış olsa da kısa bir süre önce tecrübe ettiğimiz Koronavirüs pandemisi döneminde medyayı doğru okuyup anlamanın ve doğru kullanmanın önemi tüm toplum tarafından daha net olarak anlaşılmıştır. Bu süreçte insanlar bilgi edinmek ve bilgi paylaşmak amacıyla medyayı aktif olarak kullanmışlar ancak paylaşılan hatalı bilgiler ve sahte haberler birçok insanı böylesine önemli bir konuda yanlış yönlendirmiştir. Yalnızca Türkiye’de değil dünyanın birçok yerinde yukarıdakine benzer bilimsel gerçeklerden uzak sosyal medya iletileri paylaşılır olmuştur. Bazı haber kanallarında

³ Koronavirüs pandemisi sırasında viral olan bu medya iletişi 22.02.2023 tarihinde Euronews web sitesinden alınmıştır. Medya iletişinde yapılan yazım hataları kasıtlı olarak düzeltilmemiştir. İletişime ulaşmak için: <https://tr.euronews.com/2020/04/03/sosyal-medyada-koronavirus-paylasimlari-dogru-bilinen-10-yanlis-corona-virus-covid-19>

çocuklar, sorumsuzca hazırlanan ve çeşitli platformlarda servis edilen video içeriklerinin olumsuz etkilerini en aza indirmek için daha donanımlı hâle gelebilirler.

Öğrencilere medya okuryazarlığı eğitimi vermek ve sınıf içinde ve dışında örnek olmak öğretmenlerin sorumluluğunda olsa da bu eğitim tek başına yeterli olmayacaktır. Çocukların medya etkileşimi genellikle eve gittikten sonra başlar ve evde medyayı bilinçsizce kullanan aile üyeleriyle karşılaştıklarında okulda alınan medya okuryazarlığı eğitiminin pek bir anlamı kalmayacaktır (Coyne vd., 2017). Bu nedenle öğretmenlerin aileleri doğru medya kullanımı ve medya okuryazarlığı konusunda düzenli olarak bilgilendirmesi ve bu sürece dâhil etmesi önemlidir. Böylece ebeveynlerin çocuklarına medyayı sorumlu bir şekilde kullanma konusunda rehberlik etmeleri ve çocukların okulda öğrendikleri dersleri pekiştirmelerine destek olmaları sağlanabilir.

Ancak hem okulda medya okuryazarlığı eğitimini doğru verebilecek hem de ailelere bu konuda rehberlik edebilecek öğretmenlere sahip olmak için devlet eliyle atılması gereken adımlar vardır. Hem üniversitelerin eğitim fakültelerinde temel eğitim bölümü lisans ve lisansüstü programlarına medya okuryazarlığına yönelik dersler eklenerek öğretmen adayları bu konuda donanımlı olarak yetiştirilmeli hem de Millî Eğitim Bakanlığı ve Yükseköğretim Kurulu iş birliği ile medya okuryazarlığı alanında uzman akademisyenlerce hazırlanan eğitimlerle öğretmenler bu konuda bilinçlendirilmelidir. Öğretmen bu konuda donanımlı hâle getirildikten sonra öğretmenlerin medya okuryazarlığı dersinde kullanacakları materyal ve malzeme eksiklikleri de en kısa zamanda tedarik edilmelidir (Kargın ve Demir, 2023).

Özetle, medya okuryazarı çocuklar yetiştirmek konusunda en büyük sorumluluk ebeveynlere ve öğretmenlere düşmektedir. Bu bölümde, önce çocukların medya kullanım alışkanlıkları ele alınmış daha sonra medya okuryazarlığının ne olduğu ve hangi becerileri kapsadığı anlatılmıştır. Medya iletilerini anlamlandırma (Tablo 1) ve medya iletileri üretme (Tablo 2) aşamaları detaylı bir şekilde örnekler üzerinden açıklanmıştır. Sunulan içeriğin hem ebeveynlere hem de öğretmenlere medya okuryazarı çocuklar yetiştirmek konusunda rehberlik edeceği düşünülmektedir.

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BÖLÜM 15

Erken Çocukluk Döneminde Artırılmış Gerçeklik Teknolojisi

Merve Coşgun Demirdağ, Sevda Küçük, Adnan Taşgın

Teknolojik ve küresel gelişmeler eş zamanlı olarak tüm dünya ülkelerine yayılmaktadır. Bu gelişmelerden tüm toplumlar, çocuklardan yetişkinlere kadar tüm insanlık etkilenmektedir. Sürekli olarak yeni teknolojiler ve dijital cihazların ortaya çıkışı, toplumların yaşamlarını da değiştirip dönüştürmüştür. Dijital cihazlar hızla evde, okulda ve toplumda kültürel araçlar hâline gelmiştir (Wartella vd., 2013). Amerika Birleşik Devletleri'nde 2000 yılında hanelerin sadece %41,5'i internet erişimine sahipken bu rakam 2014 yılında %76,7'ye (Ryan ve Bagley, 2015), 2019 yılında ise %89,4'e yükselmiştir (Taştan, 2019). Dijital teknolojilerin günlük hayatımızda yaygınlaşmasıyla birlikte dijital teknoloji kullanımına başlama yaşı da düşmüştür (Chaudron ve Beutel, 2015; Ofcom, 2019; Rideout ve Robb, 2020).

Özellikle küçük çocuklar çok aktiftir ve bir şeyler yapmaktan hoşlanırlar. Hareket ederken ve çevrelerindeki dünyayla etkileşime girerken önemli duyu-motor ve bilişsel beceriler geliştirirler (Radesky vd., 2015). Bir mobil cihazın ve teknolojinin entegre kullanımı hem aktif hem de kültürel olarak anlamlı öğretimi destekleyebilmektedir. Bu ortamda çocuklar, yalnızca tablet telefon vb. ekranlarla etkileşime girmeye değil aynı zamanda kullanılacak bir robotla hareket etmeye, konuşmaya, dokunmaya ve iletişim kurmaya teşvik edilebilmektedir. Böylece etkileşim düzeyi artarak kalıcı öğrenmeler gerçekleştirilebilmektedir.

Günümüz çocukları biz yetişkinlerden tamamen farklı bir çocukluk ve dijitalize bir hayat sürdürmektedir. Bizim çocukluk anılarımızda ağaçlara tırmanmak, top oynamak, bisiklet sürmek varken onlar ekranlara tıklayıp sürüklemektedirler (Goodwin vd., 2018). Dijital çağda teknoloji eğitici amaçlarla ve doğru kullanıldı-

Bunun yanında AG oyunları eğlenerek öğrenmeyi sağladığı gibi, çocukların motivasyon, dikkat, problem çözme sorumluluk ve yaratıcılık becerilerini de iyi yönde etkileyip geliştirmektedir. Tüm bu faydalara rağmen teknolojiyle iç içe olan erken çocukluk dönem çocuklarının teknoloji kullanımında ebeveyn denetimi ve öğretmen rehberliği önemlidir. Teknolojiye duyulan ilgi ve isteğin yüksek olduğu çocukluk döneminde bu durum fırsata çevrilmeli, AG teknolojisiyle zenginleştirilmiş öğrenme ortamlarıyla çocuklar eğlenerek öğrenmeye teşvik edilmelidir.

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İÇİNDEKİLER

YAZARLAR HAKKINDA	iii
ÖN SÖZ	vii
SUNUŞ	xv

BÖLÜM 1

TEMEL BİLEŞENLER ANALİZİ	1
Burcu Öngen Bilir, Serkan Kardeş	1
1. GİRİŞ	1
2. TEMEL BİLEŞENLER ANALİZİ ALGORİTMASI.....	2
3. TEMEL BİLEŞENLER ANALİZİ UYGULAMASI	4
4. R UYGULAMASI	5
5. PYTHON UYGULAMASI	12
KAYNAKLAR	19

BÖLÜM 2

TEKİL DEĞER AYRISIMI	21
Ali Alsaç,Tuncay Özcan	21
1. GİRİŞ	21
1.1. Boyut İndirgeme	24
1.2. Gürültü Temizleme	25
1.3. Doğrusal Denklem Çözme ve Doğrusal Regresyon.....	26
1.4. Öznitelik Önışleme ve Beyazlatma	27
1.5. Aykırı Değer Tespiti	28
1.6. Öznitelik Mühendisliđi	29
2. TDA Algoritması	30
2.1. Avantajlar ve Dezavantajlar.....	33
3. VERİ KÜMESİNDE BOYUT AZALTMA: İRİS TÜRLERİNİN AYRIŞTIRILMASI ÖRNEĐİ	34
4. R UYGULAMASI.....	35
5. PYTHON UYGULAMASI	41
6. SONUÇ	50
KAYNAKLAR	52

BÖLÜM 3

BİRLİKTELİK KURALLARI - APRİORİ ALGORİTMASI	55
Gökçe Karahan Adalı.....	55
1. GİRİŞ.....	55
1.1. Birliktelik Kuralları.....	55
1.2. Birliktelik Kurallarında Kullanılan Temel Kavramlar.....	56
1.3. Apriori Algoritması.....	57
1.4. Apriori Algoritmasının Adımları	58
2. APRİORİ İLE BİRLİKTELİK KURAL ÇIKARIMI UYGULAMASI	60
2.1. Python ile Birliktelik Kural Çıkarımı Uygulaması	60
2.1.1. Python Kütüphanelerinin Yüklenmesi	60
2.1.2. Veriyi Okuma.....	60
2.1.3. Veriyi Anlama.....	61
2.1.4. Veri Önışleme	62
2.1.5. Modelleme	65
2.2. R ile Birliktelik Kural Çıkarımı Uygulaması.....	67
2.2.1. R Kütüphanelerinin Yüklenmesi.....	67
2.2.2. Veriyi Okuma.....	67
2.2.3. Veriyi Anlama.....	67
2.2.4. Veri Önışleme	67
2.2.5. Modelleme	69
2.2.6. Birliktelik Kurallarının Görselleştirilmesi	70
KAYNAKLAR	73

BÖLÜM 4

OneR ALGORİTMASI	75
Toprak Enes Tütüncü.....	75
1. GİRİŞ.....	75
2. OneR ALGORİTMASI.....	76
3. ONE RULE (ONER) ALGORİTMASI İLE CHURN MODELİ	79
4. R UYGULAMASI.....	79
5. PYTHON UYGULAMASI	89
6. SONUÇ.....	102
KAYNAKLAR	102

BÖLÜM 5

k-MEDOIDS ALGORİTMASI.....	105
Sevda Gürsakal	105
1. GİRİŞ.....	105
2. k-MEDOIDS ALGORİTMASI.....	106
2.1. k-Medoids Algoritmasının Aşamaları.....	107
2.2. k-Medoids Algoritmasının Avantajları ve Dezavantajları	108

3. 2021 YILI DÜNYA MUTLULUK RAPORUNA GÖRE ÜLKELERİN k-MEDOIDS ALGORİTMASI KULLANILARAK KÜMELENMESİ	109
4. R UYGULAMASI	110
5. PYTHON UYGULAMASI	117
6. SONUÇ	127
KAYNAKLAR	127

BÖLÜM 6

k-ORTALAMALAR ALGORİTMASI	129
Metin Bilgin, Murat Eser	129
1. GİRİŞ	129
2. k-ORTALAMALAR ALGORİTMASI	130
3. BÖLÜMDE ELE ALINAN PROBLEM	137
4. R UYGULAMASI	138
5. PYTHON UYGULAMASI	141
6. SONUÇ	144
KAYNAKLAR	144

BÖLÜM 7

BULANIK c-ORTALAMALAR ALGORİTMASI	147
Fatma Önay Koçoğlu, Hasan Yiğit	147
1. GİRİŞ	147
2. BULANIK (FUZZY) c-ORTALAMALAR ALGORİTMASI	150
2.1. Denetimsiz Öğrenme.....	150
2.2. Benzerliğin Ölçüsü.....	151
2.3. Bulanık Kümeleme ve Bulanık c-Ortalamalar Algoritması	152
3. ENVANTER SEGMENTASYONU.....	157
4. R UYGULAMASI	161
5. PYTHON UYGULAMASI	168
6. SONUÇ	170
KAYNAKLAR	173

BÖLÜM 8

DBSCAN ALGORİTMASI.....	177
Onur Barca, Nuran Bayram Arlı	177
1. GİRİŞ	177
2. DBSCAN ALGORİTMASI	178
3. ÜLKELERİN DBSCAN ALGORİTMASI İLE KÜMELENMESİ	181
4. R UYGULAMASI	182
4.1. R Kütüphanesinin Hazırlığı	182
4.2. Veriyi Anlama.....	182
4.3. Model	182

5. PYTHON UYGULAMASI	186
5.1. Python Kütüphanelerinin Hazırlığı	186
5.2. Veriyi Anlama	186
5.3. Model	188
6. SONUÇ	191
KAYNAKLAR	193

BÖLÜM 9

OPTICS ALGORİTMASI	195
Ayşe Çınar	195
1. GİRİŞ	195
2. OPTICS ALGORİTMASI	195
2.1. OPTICS Algoritmasının Bileşenleri	196
2.2. OPTICS Algoritmasının İşlem Aşamaları	199
2.2.1. OPTICS Algoritmasının Çalışma Prensibi İle İlgili Örnek Uygulama	201
3. OPTICS ALGORİTMASI UYGULAMALARI	210
4. R UYGULAMASI	211
4.1. R Kütüphanelerinin Yüklenmesi ve Aktif Hâle Getirilmesi	211
4.2. Veriyi Okuma	212
4.3. Veriyi Anlama	212
4.4. Veri Önişleme	213
4.4.1. Eksik Verinin Kontrol Edilmesi	213
4.4.2. Sayısal Dönüşüm	213
4.4.3. Verinin Standart Hâle Getirilmesi	214
4.5. Kümeleme Analizi	215
5. PYTHON UYGULAMASI	217
5.1. OPTICS Algoritması İçin Gerekli Kütüphanelerin Yüklenmesi	217
5.2. Veriyi Okuma	218
5.3. Veriyi Anlama	218
5.4. Veri Önişleme	219
5.5. Kümeleme Analizi	220
5.5.1. Modelde Ortaya Çıkan Kümelerin Listelenmesi	221
5.5.2. Çekirdek Uzaklıkların Listelenmesi	222
5.5.3. Erişilebilirlik Uzaklıklarının Listelenmesi	222
5.5.4. Erişilebilirlik Uzaklıklarının Görselleştirilmesi	222
5.5.5. Veri Setindeki Anormal Değerlerin Görselleştirilmesi	223
6. SONUÇ	225
KAYNAKLAR	225

BÖLÜM 10

BIRCH ALGORİTMASI	229
Elif Kartal	229
1. GİRİŞ	229
2. BIRCH ALGORİTMASI.....	230
2.1. CF Toplama Teoremi.....	231
2.2. CF Ağacı	232
2.3. BIRCH Algoritmasının Aşamaları.....	233
2.4. CF Ağacının Oluşturulması	234
2.5. BIRCH Algoritmasının Avantaj ve Dezavantajları.....	240
3. BIRCH ALGORİTMASI İLE FACEBOOK ETKİLEŞİM METRİKLERİNİN KÜMELENMESİ	240
4. PYTHON UYGULAMASI	241
5. R UYGULAMASI.....	247
6. SONUÇ	253
KAYNAKLAR	254

BÖLÜM 11

CURE ALGORİTMASI	257
Mine Aydemir Dev, Muhammed Burak Görentaş.....	257
1. GİRİŞ	257
2. CURE ALGORİTMASI	258
3. MÜŞTERİ HARCAMALARININ CURE ALGORİTMASI İLE KÜMELENMESİ	265
4. PYTHON UYGULAMASI	266
5. SONUÇ	273
KAYNAKLAR	273

BÖLÜM 12

KENDİNİ ÖRGÜTLEYEN HARİTALAR ALGORİTMASI	275
Zeki Özen.....	275
1. GİRİŞ	275
2. KENDİNİ ÖRGÜTLEYEN HARİTALAR	275
2.1. SOM Algoritmasının Aşamaları	277
3. 2023 YILI DÜNYA MUTLULUK RAPORUNA GÖRE ÜLKELERİN SOM ALGORİTMASI KULLANILARAK KÜMELENMESİ	279
4. R UYGULAMASI.....	280
5. PYTHON UYGULAMASI	286
6. SONUÇ	293
KAYNAKLAR	294

BÖLÜM 13

GAUSS KARMA MODELLERİ.....	297
Murat Uçar, Emine Uçar	297
1. GİRİŞ	297
2. GAUSS KARMA MODELİ	297
2.1. Beklenti Maksimizasyonu Algoritması.....	299
2.2. Gauss Karma Modelin Güçlü ve Zayıf Yönleri	300
3. GAUSS KARMA MODELİ UYGULAMALARI.....	301
4. R UYGULAMASI.....	302
5. PYTHON UYGULAMASI	311
6. SONUÇ	319
KAYNAKLAR	319

BÖLÜM 14

SAKLI MARKOV MODELLERİ.....	321
Melih Engin, Yasin Erduran	321
1. GİRİŞ	321
2. SMM	322
2.1. Markov Zinciri	323
2.2. SMM ve Markov Zincirleri Kıyaslaması	325
2.3. SMM'lerin Örnek Kullanım Alanları.....	326
2.4. SMM'nin Denetimli Makine Öğrenmesi Yöntemi ile Kıyaslanması.....	326
2.5. SMM'lerde Durumlar	327
2.6. SMM'lerde Olasılık Dağılımları	328
2.7. Durumların Gerçekleşme Olasılıkları	329
3. KİŞİNİN DUYGUSAL DURUMUNUN TAHMİNLENMESİ	330
4. R UYGULAMASI.....	331
4.1. R Kütüphanelerinin Kurulması ve Uygulama Verisinin Hazırlığı.....	331
4.2. R ile Olasılık Tablolarının Hesaplanması	332
4.3. R ile SMM Modelinin Oluşturulması	334
4.4. R ile Duygusal Durumun Tahminlenmesi.....	335
4.5. R ile Oluşturulan Modelin Performansının Yorumlanması	335
5. PYTHON UYGULAMASI	336
5.1. Python Kütüphanelerinin Kurulması ve Uygulama Verisinin Hazırlığı	336
5.2. Python ile Olasılık Dağılım Tablolarının Hesaplanması	337
5.3. Python ile SMM Modelinin Oluşturulması.....	343
5.4. Python ile Duygusal Durumunun Tahminlenmesi	346
5.5. Python ile Oluşturulan Modelin Performansının Yorumlanması.....	346
6. SONUÇ	347
KAYNAKLAR	347

BÖLÜM 15

GENETİK ALGORİTMALAR.....	349
Burcu Avcı Öztürk.....	349
1. GİRİŞ.....	349
2. GENETİK ALGORİTMALAR.....	349
2.1. GA ile İlgili Temel Kavramlar.....	350
2.2. Genetik Algoritmaların Aşamaları.....	352
2.3. Genetik İşlemciler.....	353
2.3.1. Çözümün kodlanması (şifrelenmesi) ve başlangıç popülasyonu.....	354
2.3.2. Seçim.....	356
2.3.3. Çaprazlama.....	357
2.3.4. Mutasyon.....	359
2.3.5. Elitizm.....	361
2.3.6. Uygunluk Değeri.....	362
2.3.7. Sonlandırma Kriterleri.....	363
2.4. Genetik Algoritmaların Parametreleri.....	364
2.5. Genetik Algoritmaların Avantaj ve Dezavantajları.....	365
3. GENETİK ALGORİTMALAR ile SIRT ÇANTASI OPTİMİZASYONU.....	366
4. R UYGULAMASI.....	367
5. PYTHON UYGULAMASI.....	372
6. SONUÇ.....	379
KAYNAKLAR.....	380

BÖLÜM 1

TEMEL BİLEŞENLER ANALİZİ

*Burcu Öngen Bilir
Serkan Kardeş*

1. GİRİŞ

Temel Bileşenler Analizi – TBA (*Principle Component Analysis - PCA*), denetimsiz bir öğrenme algoritması olup, makine öğrenmesinde verinin boyutunu azaltmak için kullanılan bir yöntemdir. TBA, veri öznitelikleri açısından büyük değişken kümesinden düşük boyutlu bir öznitelik kümesi olan bir boyut azaltma tekniğidir. Buradaki amaç, verideki en önemli bilgileri korurken girdi özniteliklerinin sayısını azaltmaktır. TBA, her bir özneliğin varyansını dikkate alarak çalışır. Bileşenlerin açıkladıkları varyans oranlarının yüksekliği, sınıflar arasındaki iyi ayrımı gösterir. Bu durum çok boyutluluğu azaltmaktadır (Vasan & Surendiran, 2016).

Boyut azaltma terimi, araştırmada kullanılan özniteliklerin veya değişkenlerin miktarını tanımlar. Çok sayıda değişken içeren yüksek boyutlu veri setleriyle uğraşırken değişkenler arasındaki ilişkileri görselleştirmek ve yorumlamak zor olmaktadır. Veri setindeki değişken sayısı azaltılırken, en önemli veriyi korumak için TBA gibi boyut azaltma yöntemleri kullanılır. Veri setinin azaltılmış boyutluluğu, çalışmada kaç temel bileşenin kullanıldığına bağlıdır. TBA, veri setinin boyutsallığını azaltarak veri analizini kolaylaştırmaya, görselleştirmeyi geliştirmeye ve trendleri ve faktörler arasındaki ilişkileri tespit etmeyi kolaylaştırmaya yardımcı olmaktadır (Lauro & Palumbo, 2000). TBA, diğer makine öğrenmesi algoritmalarını uygulamadan önce verinin boyutsallığını azaltmak için bir ön işleme adımı olarak kullanılabilir. TBA, özniteliklerin sayısını azaltarak aşırı öğrenmenin (*overfitting*) önlenmesine, algoritmaların hesaplama karmaşıklığının azaltılmasına ve öznitelik sayısına duyarlı algoritmaların performansının iyileştirilmesine yardımcı olabilir. Literatürdeki en belirgin öznitelik azaltma yöntemi olan TBA'nın denetimsiz bir yöntem olmasının sebebi, büyük veri setinden ilgili bilgileri çıkaran parametrik olmayan bir algoritma olmasıdır (Martinez & Kak 2001). Esas amacı, örneklemelerin en büyük varyans boyutlarının bazılarını bir veri alt uzayına yansıtmaktır. İzdüşüm, en büyük özdeğerlerle eşleşen

Değişkenler uygulamanın başında belirtildiği sıra ile otomatik bir şekilde tanımlanmıştır. Örneğin, *D1* cinsiyet, *D2* etnik köken, *D3* ebeveyn eğitim düzeyi, *D4* öğle yemeği, *D5* sınava hazırlık kursu, *D6* matematik puanı, *D7* okuma puanı, *D8* yazma puanı değişkenlerini temsil etmektedir. Tablo incelendiğinde ilk bileşene en çok etki eden değişkenlerin matematik, okuma ve yazma puanları olduğu, ikinci bileşene en çok etki eden değişkenin cinsiyet olduğu, üçüncü bileşene en çok etki eden değişkenlerin ebeveyn eğitim düzeyi ve sınava hazırlık kursu olduğu, dördüncü bileşene en çok etki eden değişkenlerin ebeveyn eğitim düzeyi, öğle yemeği ve sınava hazırlık kursu olduğu, beşinci bileşene en çok etki eden değişkenlerin etnik köken ve ebeveyn eğitim düzeyi olduğu görülmektedir.

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BÖLÜM 2

TEKİL DEĞER AYRIŞIMI

*Ali Alsaç
Tuncay Özcan*

“TDA yöntemi kesinlikle lineer cebirin en yüksek noktasıdır.”- (Strang & Borre, 1997)

1. GİRİŞ

Yapay zekâ destekli sistemlerin etkinliğinin artmasıyla veri günümüzde en önemli kaynaklardan biri hâline gelmiştir. Soyut bir kavramdır ama sonuçlarıyla somutlaşan bir operasyonun, işlemin ana besleyicisidir. Dijital dönüşüm için yapılan çalışmaların hızlanmasıyla üretilen veri miktarının da arttığı görülmektedir. Toplum yaşantısının her alanında, insanın kayıt tuttuğu her noktada, bilgisayar destekli bütün sistemlerde yazılı, görsel, sesli ve diğer veri türlerinde çıktılar üretilmektedir. Özellikle nesne tanıma ve ses sinyali işleme için yüksek boyutlu veriyle çalışmak gerekmektedir.

Makine öğrenmesi destekli dijital sistemlerin ana besleyicisi veridir. Temel olarak makine öğrenmesi, veriyi deneyim olarak kullanan çeşitli teknikler yardımıyla sistemler geliştirmeyi amaçlamaktadır (Kartal vd., 2022).

Verinin işlenerek hedef sistemler içinde kullanılması artık zamanla yarışılan bir uğraş olmuştur. Verinin boyutu ile işleme süresi arasında doğrusal bir bağlantı vardır. Bu noktada verinin boyutu ile ilgili fikirler belirmektedir. Verinin boyutuna etki eden yöntemlerin geliştirilmesi ile zaman ve bellek konusunda ilerlemeler sağlanmıştır. Veri boyutunun azaltılması, yüksek boyutlu ham verinin daha düşük boyutlara indirgenmesi işleme, depolama ve taşıma maliyetlerini düşürmektedir (Çalışan & Talu, 2020).

Boyut indirgeme yöntemlerinden biri literatürde yaygın kullanılan ismiyle Tekil Değer Ayrışımı – TDA (*Singular Value Decomposition - SVD*) ve bu yönteme ait olan algoritmalarıdır. TDA yöntemi sayesinde verinin boyutu azaltılarak yöntemin kullanıldığı modellerde sonuçlara daha çabuk ulaşıldığı görülmektedir (Bakir, 2018).

Boyut indirgeme yöntemlerinin amacı boyut azaltılırken yaşanan kaybın en az olmasıdır. Veri içinde önemli olmayan parçaların ayıklanması ile boyut düşürülmektedir. Boyut indirgeme

Veri setlerinde boyutların artması veri analizlerinin, görüntü ve ses işleme gibi zorlu işlemlerin sürelerini arttırmaktadır. Boyut arttıkça işlemler samanlıkta iğne aramaya dönüşmektedir. TDA yöntemi işte tam bu noktada bilginin ayıklanması ve çözümün kolaylaştırılması için önemli bir katkı sağlayıcı yöntem olarak öne çıkmaktadır. Ayrıca veri setlerinde bazı öznelilikler arasında kurulan yüksek etkileşim, korelasyon nedeniyle aşırı öğrenme (*overfitting*) problemi görülmektedir. Boyut azaltma ihtiyacına neden olan durumlardan biri de bu durumdur.

TDA yönteminin makine öğrenmesi alanında kullanıldığı örneklerden biri de öneri ve tahmin sistemleridir. Tahmin sistemlerinin başarılarının artırılmasında TDA tabanlı algoritmaların kullanılması yaygınlaşmaktadır. Bir sınıflandırma ya da regresyon modelinin performansı Ortalama Karekök Sapması (RMSE) veya Doğruluk değeri ile ölçülerek, TDA öncesi ve sonrası olarak incelenebilir.

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BÖLÜM 3

BİRLİKTELİK KURALLARI - APRIORI ALGORİTMASI

Gökçe Karahan Adalı

1. GİRİŞ

Denetimsiz makine öğrenmesi yöntemlerinden birliktelik kuralları, genel olarak, karar desteği için anlamı olan büyük miktarda veride sıklıkla birlikte tekrar eden öğeleri/olayları bulmaya yönelik bir teknik olarak tanımlanabilmektedir. İyi bilinen ve yaygın olarak kullanılan birliktelik kuralı yöntemlerinden biri Apriori algoritmasıdır. Bu algoritmada veri tabanlarında depolanan işlem verilerinden sık sık meydana gelen bir dizi öğe kümesini bulmak için öne çıkan bir algoritmadır (Santaso, 2021).

Bu bölümde birliktelik kurallarının temel yapısından bahsedilerek, Apriori algoritması ele alınmıştır. Bölümün akışında perakende satış verileri üzerinde Apriori algoritması uygulanarak birliktelik analiz modeli içeren bir uygulamaya yer verilmiştir. Uygulama aynı veri seti üzerinde Python ve R programlama dili kullanılarak gerçekleştirilmiştir. Bölüm içerisinde yer alana uygulamada **Veri Madenciliği için Çapraz Endüstri Standart Süreç Modeli** (*CRoss-Industry Standard Process for Data Mining - CRISP-DM*) adımları takip edilmiştir (Balaban ve Kartal, 2018; Shearer, 2000).

1.1. Birliktelik Kuralları

Birliktelik kuralları, eldeki verilerin analiz edilerek bu veriler içerisindeki hangi süreçlerin sıklıkla birlikte gerçekleştiğinin tespiti ile geleceğe yönelik iyileştirme çalışmaları yapılmasını destekleyen bir yaklaşımdır. Öğe kümeleri arasındaki ilişkilendirme kurallarını veya ilişkileri arama süreci, ilişkiyel bir veri tabanından elde edilmektedir (Yudanar vd., 2020). Birliktelik kuralları Agrawal ve Srikant tarafından 1993 yılında geliştirilmiştir.

Birliktelik kurallarının birçok farklı alanda uygulamasını görmek mümkündür. Finans, mühendislik, eğitim ve sağlık sektörlerinde uygulama sahası bulunmaktadır. Bu çalışmada da bahsi geçen perakende sektöründe ise birliktelik kuralı yöntemi daha çok alışveriş sepeti (market sepet) analizi olarak bilinmektedir. Bu analiz, bir alışveriş deneyimi sırasında müşteri

bağlılığını artırabilecek ve müşteri deneyimini iyileştirebilecek ve müşteri davranışlarını belirleyebilecektir.

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BÖLÜM 4

OneR ALGORİTMASI

Toprak Enes Tütüncü

1. GİRİŞ

OneR algoritması, tek bir öznitelik değişkeninden bir dizi karar kuralı geliştiren basit bir sınıflandırma öğrenme algoritmasıdır. Algoritmanın adı, öznitelik değişken sayısı için “One” ve karar kuralları için “R (Rule)” kullanılarak oluşturulmuştur. Algoritma, belirli bir veri kümesinin bir özelliğine bakar ve sonucu tahmin etmek için bu özelliğe dayalı bir karar kuralı üreterek çalışır. OneR, denetimli makine öğrenmesi için kullanılan klasik bir algoritmadır ve bir karar kuralı anlamına gelmektedir (Raschka, 2023). Kural tabanlı sınıflandırıcılar, çeşitli IF-THEN kurallarını kullanarak sınıf kararını buna bağlı olarak veren bir sınıflandırıcı türüdür. Bu kurallar kolayca yorumlanabilir ve bu nedenle bu sınıflandırıcılar genellikle tanımlayıcı modeller oluşturmak için kullanılır (Virmani, 2023).

Karar kuralı bir koşul veya öncül ve bir tahminden oluşan basit bir IF-THEN ifadesidir. Örneğin; EĞER bugün yağmur yağıyorsa (koşul) ve EĞER aylardan Nisan (koşul) İSE yarın yağmur yağacak (tahmin) gibi. Tahmin yapmak için yalnız bir karar kuralı veya birkaç kuralın birleşimi kullanılabilir. Karar kuralları genel bir yapı izler, eğer koşullar sağlanıyorsa kesin bir tahminde bulunulabilir. Karar kuralları en iyi yorumlanabilir tahmin modellerinden biridir. Programlama dillerinde IF-THEN kurallarının yazılması oldukça doğaldır. Makine öğrenmesinin getirdiği yenilik ise, karar kurallarının bir algoritma aracılığıyla öğrenilmesidir. Örneğin, bir evin değerini (düşük, orta veya yüksek) tahmin etmeye yönelik bir karar kuralını öğrenmek için bir algoritma kullandığımızı varsayalım. Bu model tarafından öğrenilecek bir karar kuralı şöyle olabilir: Bir ev 100 m^2 'den büyükse ve evin bahçesi varsa, değeri yüksektir.

- Boyut > 100 IF kısmındaki birinci koşuldur.
- Bahçe = 1 IF kısmındaki ikinci koşuldur.
- İki koşul, yeni bir koşul oluşturmak için VE ile bağlanır. Kuralın uygulanabilmesi için her ikisinin de doğru olması gerekir.
- Tahmin edilen çıktı (THEN kısmı) değer = yüksek olmaktadır.

ortalamalarıyla elde edilen ve modelin genel performansı hakkında bilgi veren F1-skoruna göre terk olmayan aktif müşterilerin ve terk olan müşterilerin sınıflandırma başarısı sırasıyla %90 ve %25'tir.

Eğitim veri setiyle oluşturulan OneR model kurallarının tutarlılığının ölçülmesi için eğitim ve test veri setlerinin sınıflandırma performanslarında bir uyum olması beklenmektedir. Bu doğrultuda, eğitim veri seti ile elde edilen modelin doğru sınıflandırma skoru %81.95 iken test veri setinin doğru sınıflandırma skoru %82.05 olarak gözlemlenmiştir. Her iki veri setinin doğru sınıflandırma skorları arasında yüksek uyumun olduğu söylenebilir.

6. SONUÇ

Bu çalışmada Kaggle platformundaki bir bankanın müşteri ayrıntılarını içeren Churn veri seti kullanılarak Churn (müşteri kaybı) modeli One Rule (OneR) algoritmasıyla hem R hem de Python programlama dilleriyle oluşturulmuştur.

Eğitim veri setini üzerinden geliştirilen modelin özet bilgisi incelendiğinde, Ürün Numarası değişkeninin en iyi ayrımı sağladığı ve buna göre müşteri terk durumunun tahmin edildiği görülmüştür. Elde edilen kurallar ile modelin başarısı test veri setinin sonuçlarındaki performansı ile değerlendirilmiştir.

R ve Python ile elde edilen Churn modeli, müşteri Churn oranının analiz edilmesi ve işletmenin müşteri tabanını koruma veya müşteri kaybını en aza indirme stratejilerinin geliştirilmesinde kullanılabilir; ancak, modelin sadece bir tahmin aracı olduğu unutulmamalıdır. İşletme kararları alınırken, modelin tahminlerinin diğer faktörlerle birlikte değerlendirilmesi oldukça önemlidir.

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BÖLÜM 5

k-MEDOIDS ALGORİTMASI

Sevda Gürsakar

1. GİRİŞ

Bölümlemeli (*partitioning*) kümeleme algoritmaları, tüm veri setini doğrudan bir dizi ayrık kümeye böler. Bu algoritmalar, tekrarlı bir prosedür yoluyla belirli bir amaç fonksiyonunu optimize eden sayıda küme belirlemeye çalışır. Veri setini k ayrı kümeye ayırmanın amacı, elemanları kendi aralarında yüksek derecede benzerlik gösteren ancak diğer küme elemanlarıyla benzerlik göstermeyen kümeleri bulmaktır (Kaufman & Rousseeuw, 1987; Kumar & Krishan Wasan, 2008).

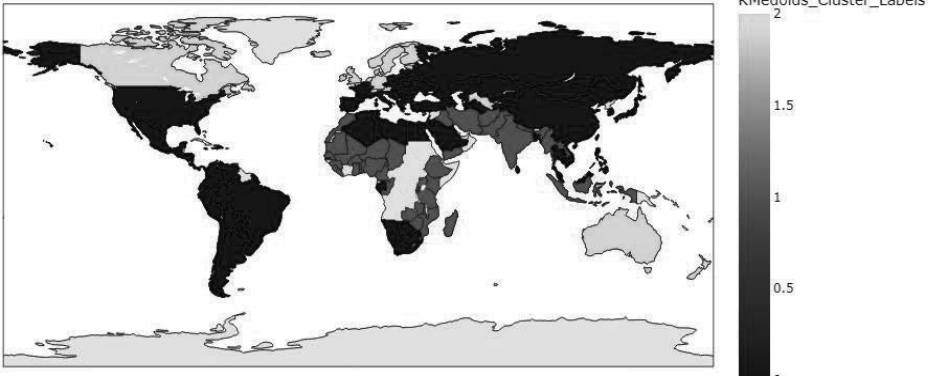
Bölümlemeli kümeleme algoritmaları arasında yer alan k-Medoids algoritması 1987 yılında Kaufman ve Rousseeuw tarafından geliştirilmiştir. Bu algoritma literatürde “medoid”ler etrafında bölümleme (*Partitioning Around Medoids-PAM*) algoritması olarak da bilinmektedir. Bu algoritmanın temeli, verinin çeşitli yapısal özelliklerini temsil eden k tane temsilci nesneyi bulmaktır. Burada temsilci nesne *medoid* olarak adlandırılmaktadır. Medoid, bir kümedeki tüm elemanlara olan uzaklıklarının ortalaması en küçük olan elemandır ve dolayısıyla da kümenin merkezine en yakın noktadır. Bir başka ifade ile medoid, diğer nesnelere olan ortalama uzaklığı en küçük yapan kümenin en merkezi nesnesidir. Bu nedenle bu algoritma her bir nesne ve onun referans noktası arasındaki benzerliklerin toplamını en küçük yapma mantığı esas alınarak uygulanır (Işık & Çamurcu, 2007).

k-Medoids algoritmasında küme merkezleri, kümedeki nesnelerin ortalama değerleri ile değil, küme merkezine en yakın nesne (*medoids*) bulunarak belirlenmektedir. Böylece gürültülü ve aykırı değerlere karşı k-Ortalamalar algoritmasına oranla daha az hassastır. k-Medoids algoritmasında küme sayısı kullanıcı tarafından belirlenmekte ve küçük veri setleri üzerinde iyi sonuçlar verdiği belirtilmektedir. Algoritmanın bu eksikliğini tamamlamak için 1990 yılında Kaufman ve Rousseeuw tarafından CLARA algoritması geliştirilmiştir (Akın, 2008; Kaufman & Rousseeuw, 2009). Bu bölümde yalnızca k-Medoids algoritması ele alınacaktır.

```
#Dünya Haritası verisini uygulama verisi ile birleştirme
km_worldmap = world.merge(küme_veri[['KMedoids_Cluster_Labels',
                                     'Country_name']],
                           left_on='name',
                           right_on='Country_name',
                           how='left')
```

Elde edilen veri setine **plotly** kütüphanesinin **choropleth()** fonksiyonu yardımı ile aşağıdaki interaktif grafiksel gösterim elde edilmiştir.

```
fig = px.choropleth(km_worldmap,
                    locations="iso_a3",
                    color="KMedoids_Cluster_Labels",
                    hover_name="name",)
fig.show()
```



6. SONUÇ

Kitabın bu bölümünde, bölümlenmeli kümeleme algoritmalarından k-Medoids algoritması R ve Python uygulamaları ile anlatılmıştır. Uygulamada Kaggle platformundaki *world_happiness_report_2021* veri seti kullanılarak 149 dünya ülkesi altı değişkene göre k-Medoids algoritması kullanılarak kümelendi. Uygulama sonucunda 149 ülke üç kümede toplanmıştır.

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BÖLÜM 6

k-ORTALAMALAR ALGORİTMASI

Metin Bilgin
Murat Eser

1. GİRİŞ

Bu bölümde kümeleme problemlerinin çözümünde kullanılan denetimsiz makine öğrenme yöntemlerinden biri olan k-Ortalamlar algoritması üzerinde durulacaktır. Denetimsiz öğrenme (*Unsupervised Learning*) yöntemleri elimizdeki etiketsiz verinin yani sınıfı belli olmayan ya da bilinmeyen örneklerin birbirlerine olan yakınlıklarına ya da benzerlikleri göre kümelenmesi esasına dayanmaktadır. Denetimli öğrenmeden farklı olarak bir uzman/danışman süreçte etkin olarak rol almamaktadır fakat istenirse elde edilen sonuçlar bir uzman/danışman tarafından kontrol edilebilir ve böylelikle sonuçların güvenilirliğinin artırılması sağlanabilir.

Kümeleme kavramını açıklamak gerekirse; “veri içerisinde birbirine benzer özelliklere sahip örneklerin gruplandırılarak oluşturduğu şekle verilen isimdir” olarak ifade edilebilir. Kümelemedeki amaç, küme içinde maksimum benzerliği/yakınlığı ve kümeler arasında minimum benzemezliği/uzaklığı yakalayabilmektir. Kümeleme algoritmalarında verilerin hangi kümeye atanacağı benzerlik/yakınlık ölçütlerine göre gerçekleştirilmektedir. Kümelemedeki en büyük sorun kümeler arasındaki benzerliklerin/yakınlığın nasıl belirleneceği ve hesaplanacağı problemidir. Literatürde benzerlik/yakınlık hesabı için birçok metrik geliştirilmiştir. Bölümün ilerleyen kısımlarında sıklıkla kullanılan bu metriklerle ilgili kısa bilgiler sunulacaktır. Şekil 1’de örnek kümeleme gösterimi verilmiştir.

Kümeleme algoritmaları için literatüre bakıldığında beş farklı kümeleme tekniği olduğu görülmektedir. Bunlar; hiyerarşik yöntemler, bölümlenme yöntemleri, yoğunluğa dayalı yöntemler, grid bazlı yöntemler ve model bazlı yöntemler şeklindedir. Bu bölümde bölümlenmeli bir yöntem olan k-Ortalamlar algoritması ile ilgili bilgiler sunulmuştur.

6. SONUÇ

Bu bölümde danışmansız öğrenme yöntemlerinden olan k-Ortalamlar kümeleme algoritması hem teorik hem de uygulamalı örneklerle anlatılmaya çalışılmıştır. k-Ortalamlar algoritması birbirlerinden iyi ayrılabilen yoğun kümeleri etkin bir biçimde belirleyebilme yeteneğine sahiptir. Algoritma karmaşıklığı olarak NP-Zor yani polinomsal zamanda bir çözümün olduğunun ispat edilmesi zor problem sınıfına girmektedir. Bu açıdan elde edilen küme şekilleri genellikle konveks şeklidir.

k-Ortalamlar algoritması günümüzde birçok alanda (müşteri ve pazar gruplaması vb.) uygulaması olan bir algoritmadır. k-Ortalamlar algoritmasının olumsuz yanlarından birisi olarak genellikle yerel minimuma takılması sayılabilir. Algoritmanın doğru bir gruplandırma yapabilmesi için başlangıç parametresi olan k değerinin doğru seçilmesi son derece kritik bir adımdır. k-Ortalamlar algoritması sayılan artı ve eksilerine ilave olarak gürtülülü verilere ve aykırı değerlere duyarlı bir algoritmadır. Tüm bu özelliklerinin toplamında günümüzde kümeleme algoritmaları içerisinde en popüler olanı ve hızlı kodlanabilmesi sayesinde en çok tercih edilen algoritmadır.

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BÖLÜM 7

BULANIK c-ORTALAMALAR ALGORİTMASI

*Fatma Önay Koçoğlu
Hasan Yiğit*

1. GİRİŞ

Binlerce yıllık süreçte insanoğlu yaşamı ile ilgili önemli gördüğü olayları ve izlenimlerini kayıt altına almak üzere mağara duvarlarını, kil tabletleri, papirüsü ve daha nice aracı kullanmıştır. Günümüzde geldiğimiz koşullarda bilgi ve iletişim teknolojilerinin sağladığı olanaklarla kayıtlar artık dijital ortam olan bilgisayarlarda tutulmaktadır. Bununla birlikte, dijitalleşme kavramı ön plana çıkmış, birçok kurum ve kuruluş bu doğrultuda tüm iş süreçlerini dijital ortama taşıma bir başka deyişle dijitalleşme sürecine girmiştir. Diğer taraftan, veri depolama ve işlem gücü yüksek bilgisayarlar ve bulut bilişim gibi olanaklar sayesinde ise hem daha büyük miktar ve boyuttaki veriyi saklamak hem de bu veriyi daha hızlı işlemek mümkün hâle gelmiştir. Yine bu dijitalleşme sürecinde veri toplama işlemleri sonucunda sıklıkla kullandığımız kavramlardan birisi de büyük veri olmuştur. Doğal olarak veriyi kayıt altına alarak büyük veri elde etme serüveninin bir amacı olduğu da açıktır. Hem kayıt altına alınan bu veriyi çeşitli matematiksel ve istatistiksel yöntemler ve de raporlama araçlarını kullanarak değerli bilgiler elde edebilmek, hem de edinilen bu bilgileri ileri nesillere taşımak dijital dönüşümün en temel amacı olarak ifade edilebilir. Tam bu noktada bilginin neden bu kadar önemli olduğu sorusu karşımıza çıkmaktadır. Bu sorunun cevabı için öncelikle karar verme süreci ve problemini ele almak gerekir.

Özellikle zorlu rekabet ortamında varlığını devam sürdürebilmek, rakipler karşısında üstünlük sağlamak, kaynakları verimli bir şekilde kullanmak ve müşteri/kullanıcı/çalışan memnuniyetini maksimum düzeyde tutmak gibi durumlar göz önünde bulundurulduğunda karar vericilerin tüm üretim ve iş süreçlerini en az hata en çok fayda ile etkin bir şekilde yönetmesi kritik önem taşımaktadır. Özellikle üretim veya hizmet sektöründe yer alan kurum ve kuruluşlarda yatırım projesi belirleme, satın alma, tedarikçi seçme, personel istihdamı, tesis yeri seçimi gibi idari ve mali açıdan önemli görülen birçok farklı problem söz konusudur. Bu gibi problemler için çözüm sağlamak, belirlenen hedeflere etkin bir yol ile

Tablolar dikkate alındığında ve kendi içlerinde karşılaştırıldığında, Küme 1 için *Unitprice* sütununda ortalama bir varyans; yüksek değer mevcuttur. *Pal.height* ve *Pal.grossweight* sütunlarında yüksek değerler görülmektedir. Diğer özneliklerde ortalama değerler bulunmaktadır. Bu durum, Küme 1'in genel olarak büyük boyutlu, ağır ve pahalı ürünlerden oluştuğunu göstermektedir. Ayrıca, ortalama olarak satılan ürün grubunu oluşturduğu söylenebilir. Küme 2 için ise, *Unitprice* niteliğinde düşük değer ve yüksek varyans gözlenirken, *Expire.date* en düşük değer; *Pal.height* ve *Pal.grossweight* düşük değerler ve *Units.per.pallet* niteliklerinde en yüksek değerler bulunmaktadır. Diğer sütunlarında ise değerler ortalama seviyededir. Bu küme genel olarak küçük boyutlarda ve düşük ağırlıktaki ürünleri içermektedir. Ayrıca, bu kümeyi oluşturan ürünlerin dayanıklılık süreleri düşük olarak yorumlanabilir. Küme 3 incelendiğinde, *Unitprice* niteliğinde ortalama değerler ve ortalama varyans değeri mevcuttur. *Expire.date*, *Outbound.number* ve *Total.outbound* sütunlarında yüksek seviyede değerler bulunurken, diğer sütunlarda ise ortalama değerler gözlenmektedir. Bu küme genellikle ortalama fiyatlı ve ortalama boyutlu ürünlerden, aynı zamanda da raf ömrü uzun olan ürünlerden oluşmaktadır. *Outbound.number* ve *Total.outbound* sütunlarında yüksek varyansın etkisiyle genellikle çok satan ürün grubu olduğu söylenebilir. Son olarak, Küme 4 incelendiğinde, *Unitprice* sütununda en düşük değer ve ortalama varyans görülmektedir. *Expire.date* sütununda yüksek değer bulunurken, en düşük *Pal.height* değerine sahiptir ve en düşük *Pal.height* varyansına sahiptir. Diğer niteliklerde ortalama değerler mevcuttur. Bu küme, en düşük fiyatlı, en düşük boyutlu raf ömrü uzun ürünleri içermektedir.

Özetle, yapılan segmentasyon analizine göre, farklı kümelerin farklı ürün gruplarını temsil ettiği görülmektedir. Ayrıca bu sonuçlara göre, BCO envanter yönetimi açısından farklı ürün grupları için farklı envanter stratejileri ve stok seviyeleri belirlemede kullanılabilir. Bu da işletmelere envanter maliyetlerini minimize etme, sipariş zamanlarını optimize etme ve iş sürekliliğini sağlama konusunda yardımcı olur. Böylece işletmeler, denetimsiz makine öğrenmesi modelleriyle envanterlerini daha etkin bir şekilde yönetebilir ve rekabet avantajı elde edebilirler.

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BÖLÜM 8

DBSCAN ALGORİTMASI

*Onur Barca
Nuran Bayram Arlı*

1. GİRİŞ

Kümeleme analizi, yıllar boyunca birçok yaklaşımın ve algoritmanın önerildiği, temel ve yaygın olarak kullanılan bir bilgi keşfi yöntemi olarak bilinir (Blei & Lafferty, 2009). Kümeleme analizinde *yoğunluk (density)* ve *ızgara tabanlı (grid-based)* yöntemler, veri alanını yüksek ayrıntı düzeylerinde keşfetmeye çalışan, birbiriyle yakından ilişkili iki sınıftır. Bu yöntemlerin avantajı, rastgele şekillere sahip kümeleri belirlemek için kullanılabilmesidir. Gerçek hayattaki veri tabanlarının giderek artan boyutları, büyük veri tabanlarının kümelenebilmesi, gürültüyü (*noise*) tespit etme ve ortadan kaldırma becerisini gerektirir. Yoğunluğa dayalı kümeleme paradigması, tüm bu gereksinimleri karşılamak için önerilmiştir (Ester vd., 1996; Kriegel vd., 2011; Aggarwal & Reddy, 2016).

Yoğunluk tabanlı kümelemede veri noktaları yoğunluğa dayalı olarak kümelenebilir. Burada kümeler, yüksek yoğunluklu bölgelerin düşük yoğunluklu bölgelerden ayrılması ile belirlenir. Yoğunluğa dayalı bir kümeleme algoritmasının aşağıdaki temel tasarım sorularını cevaplaması gerekir (Aggarwal & Reddy, 2016; Tan vd., 2016).

- ✓ Yoğunluk nasıl tahmin edilir?
- ✓ Bağlantı nasıl tanımlanır?
- ✓ Algoritmanın verimli bir şekilde uygulanmasını hangi veri yapıları destekler?

Yoğunluk tabanlı kümeleme yöntemleri, girdi parametreleri olarak küme sayısı ve ilgili veri kümesinde var olabilecek yoğunluk veya kümeler içindeki varyansla ilgili varsayımlarda bulunmaz. Dolayısıyla yoğunluk tabanlı kümeleme, küme sayısı veya bunların dağılımı hakkında herhangi bir varsayımda bulunmadığı için parametrik olmayan bir yöntem olarak düşünülebilir (Aggarwal & Reddy, 2016; Kriegel vd., 2011).

DBSCAN kümeleme sonuçlarına göre ülkeler, az gelişmiş, gelişmekte olan ve gelişmiş olmak üzere üç kümeye ayrılmıştır. Ayrıca kümeleme sonuçlarının, Uluslararası Para Fonu⁹ (IMF) ve Birleşmiş Milletler¹⁰ (UN)'nin yapmış olduğu ülke sınıflandırması ile de uyumlu olduğu görülmektedir. Analiz sonuçlarına göre üçüncü kümeyi (az gelişmiş ülkeleri) ağırlıklı olarak Afrika ülkelerinin oluştururken, bu ülkelerin sağlık, finans ve ticaret bakımından diğer kümelerde yer alan ülkelere göre daha kötü bir durumda oldukları söylenebilir. Birinci küme (gelişmekte olan ülkeler) en çok ülkenin yer aldığı küme olarak görülmektedir. Analiz sonuçlarına göre, bu kümede yer alan ülkelerin sağlık, finans ve ticaret bakımından üçüncü kümedeki ülkelere göre daha iyi bir durumda olduklarını söyleyebiliriz. İkinci küme (gelişmiş ülkeler) ise hem sağlık hem finans hem de ticaret bakımından iyi durumda olan ülkelere oluşturmaktadır. Gürültü değerleri ise kümeleme dışında kalan ülkeleri göstermektedir.

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⁹ <https://www.imf.org/external/pubs/ft/weo/2022/01/weodata/groups.htm>

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BÖLÜM 9

OPTICS ALGORİTMASI

Ayşe Çınar

1. GİRİŞ

Denetimsiz öğrenme yöntemleri adı altında başvuru alan birçok kümeleme yöntemi nesnelere arasındaki uzaklığın hesaplanmasına dayanmaktadır. Ancak bölümsel kümeleme yöntemi olarak isimlendirilen bu yöntemler sadece küresel şekilli kümeleri belirlerken, rastgele şekilli kümelerin varlığının ortaya konmasında yetersiz kalmaktadırlar (Han vd., 2012). Bu sorunu gidermek amacıyla yoğunluğa dayalı kümeleme yöntemleri geliştirilmiştir. Yoğunluğa dayalı kümeleme yöntemleri, nesnelere arası uzaklığa dayalı küme seçimi yerine, verinin yoğunluğunu göz önüne alan bir kümeleme işlemi gerçekleştirmektedirler. Dolayısıyla, bu yöntemler ile ortaya çıkan her bir küme veri seti içinde yüksek yoğunluklu alanlar olarak ele alınmaktadır (Ester vd., 1996). Küme yoğunluklarının seyrek olduğu alanlarda ise ya gürültülü veri ya da küme sınırını oluşturan veri olduğu düşünülmektedir (Jiang vd., 2003). Söz konusu yöntemler için geliştirilen yoğunluğa dayalı kümeleme algoritmaları büyük veri tabanları ve gürültülü verisi çok olan yapılarda etkin bir şekilde kullanılabilirler (Ester vd., 1996).

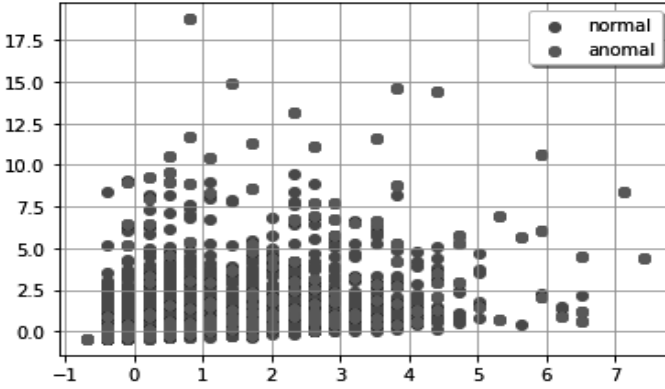
Yoğunluğa dayalı kümeleme algoritmaları içinde en yaygın olanları DBSCAN, DENCLUE ve OPTICS algoritmalarıdır.

Bu bölüm kapsamında, OPTICS (*Ordering Points To Identify The Clustering Structure*) algoritması hakkında temel bilgiler verilerek, algoritmanın çalışma prensibi ve işlem aşamaları açıklanmış olup, R ve Python Dillerinde uygulamalar gerçekleştirilmiştir.

2. OPTICS ALGORİTMASI

DBSCAN Algoritmasını geliştiren araştırma grubu üyeleri Mihael Ankerst, Markus M. Breunig, Hans-Peter Kriegel ve Jörg Sander tarafından geliştirilen OPTICS Algoritması, kümeleme yapısını tanımlamak için noktaları sıralama yöntemi olarak adlandırılmaktadır

`plt.scatter()` fonksiyonuyla normal ve anormal veriyi gösteren saçılım grafiği elde edilmiştir.



6. SONUÇ

OPTICS algoritması tek başına bir kümeleme aracı değildir. Bu algoritma küme üyelikleri atamaz. Bunun yerine, veri tabanının yoğunluğa dayalı kümeleme yapısını temsil eden genişletilmiş bir sıralamasını oluşturur. Bu küme sıralaması, çok çeşitli parametre ayarlarına karşılık gelen yoğunluğa dayalı kümelemelere eşdeğer bilgiler içerir.

Söz konusu algoritma, sadece “geleneksel” kümeleme bilgilerini (örn. temsili noktalar, rastgele şekilli kümeler) değil, aynı zamanda içsel kümeleme yapısını da verimli bir şekilde ortaya çıkarmaktadır. Ayrıca, orta büyüklükteki veri kümeleri için küme sıralamasının grafiksel olarak gösterilebilmesinin yanı sıra, çok büyük veri kümeleri için de uygun bir görselleştirme tekniği sunmaktadır.

Bu bölümde OPTICS algoritması teorik olarak ele alınmış, algoritmanın çalışma aşamalarını açıklayan örnek bir çözüm sunulmuş ve ardından R ve Python dillerinde uygulama gerçekleştirilmiştir.

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BÖLÜM 10

BIRCH ALGORİTMASI

Elif Kartal

1. GİRİŞ

Kümeleme en temel hâli ile n -boyutlu uzayda veri noktalarını -ya da gözlemleri-gruplamaktır. Kümeleme problemlerine, denetimsiz makine öğrenmesi algoritmaları ile çözüm aranmaktadır. Veri setinde herhangi bir hedef nitelik (*target attribute*) olmadan noktaların birbirine olan uzaklıklarından (benzemezliliklerinden) hareketle kümeleme işlemi gerçekleştirilir. Nihayetinde, aynı kümedeki veri noktalarının birbirine olabildiğince yakın, farklı kümeler arası uzaklıkların da olabildiğince fazla olması hedeflenir. Kümeleme işlemleri sırasında veri seti denetimli öğrenmede olduğu gibi eğitim ve test veri seti olarak ayrılmaz. Tüm veri seti algoritmaya sunulur ve sonuç alınır. Kümeleme ileriye yönelik bir tahmin ya da bir öngöründe bulunmak için değil daha çok veride yer alan gizli örüntü ve kalıpların keşfedilmesi, verinin mevcut durumunun açıklanması için kullanılmaktadır. Literatürde ve sektörde müşteri segmentasyonu, görüntü segmentasyonu gibi pek çok alanda kullanılmaktadır.

Kümeleme algoritmalarından biri olan BIRCH (*Balanced Iterative Reducing and Clustering Using Hierarchies*) algoritması, büyük veri setlerini küçük kümelere böler ve mümkün olan en fazla miktarda bilgiyi tutmaya çalışır (All, 2022). Daha sonra tüm veri setinin kümelenmesi yerine bu özet bilgi kümelenir (Benzer, 2022). Bu da BIRCH algoritmasının özellikle büyük veri setleri üzerinde çalışılırken tercih edilmesinin nedenlerindedir. BIRCH, bellek veya hesaplama kısıtları (daha yavaş CPU) sebebiyle k -Ortalamalar (*k-Means*) algoritması ile analiz edilemeyen büyük veri setlerini kümelemek için bellek açısından verimli bir alternatif algoritmadır (All, 2022; Benzer, 2022). BIRCH tipik olarak veri setinde tek bir tarama ile iyi bir kümeleme gerçekleştirebilir ve isteğe bağlı olarak birkaç ek taramayla kümeleme kalitesini daha da iyileştirebilir (Han & Kamber, 2006; Zhang vd., 1996).

Bileşenler Analizi tercih edilmiş ve kümeler iki temel bileşen yardımı ile görselleştirilmiştir. Kümeleme performansı ise Silhouette, Calinski-Harabasz ve Davies-Bouldin indeks değerlerinin hesaplanması ile elde edilmiştir. $k = 3$ için hesaplanan indeks değerlerinin birbirine benzerlik gösterdiği Tablo 3'ten görülebilir. $k = 2,3, \dots, 20$ için gerçekleştirilen analiz sonuçları da grafiklerle sunulmuştur. Hem uzman görüşü hem de hesaplanan indeks değerleri çerçevesinde kümeleme kalitesi değerlendirilerek nihai küme sayısına karar verilebilir. Ayrıca Python ve R uygulamalarında kullanılan BIRCH fonksiyonları birbirinden farklıdır, dolayısıyla her iki analiz sonucunun da birebir örtüşmesi beklenmemelidir.

Tablo 3: $k=3$ için Python ve R Kümeleme Performans Değerlerini Karşılaştırılması

İndeks Adı	Python	R
Silhouette	0.878	0.890
Calinski-Harabasz	880.699	867.817
Davies-Bouldin	0.803	0.778

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Not: Bu bölümde yer alan Şekil 1-8 <https://draw.io/> kullanılarak çizilmiştir.

BÖLÜM 11

CURE ALGORİTMASI

Mine Aydemir Dev
Muhammed Burak Görentaş

1. GİRİŞ

Kümeleme algoritmaları, denetimsiz öğrenmenin bir türüdür. Kümeleme, bir dizi veriyi, küme içi benzerliği en üst düzeye çıkaracak ve kümeler arası benzerliği en aza indirecek şekilde gruplandıran bir keşif işlemidir (Karypis vd., 1999). Kümeleme algoritmaları bölümlenmeli (*partitional*) ve hiyerarşik (*hierarchical*) olarak sınıflandırılabilir. Bölümlenmeli kümeleme algoritmaları, belirli bir kriter fonksiyonunu optimize eden k bölümü belirlemeye çalışır. Bu tip kümeleme, k kümeyi olabildiğince yoğun ve ayrı yapmaya çalışır ve kümeler birbirinden oldukça iyi ayrılmış yoğun bulutlar olduğunda iyi çalışmaktadır. Hiyerarşik kümelemede ise her bölümlenmenin (*partition*) bir sonraki bölüme yerleştirildiği, bir bölüm dizisi söz konusudur. Burada her girdi veri noktası ayrı bir kümeye yerleştirilen ayrık kümelerle başlamaktadır. Daha sonra küme çiftleri küme sayısı k olana kadar art arda birleştirilmektedir. Burada gerçekleştirilen birleştirmede birleştirilen küme çifti, aralarındaki mesafenin minimum olduğu kümelerdir. Kümeler arası mesafeler için kullanılan ölçüler, C_i incelenen kümeyi ve m_i incelenen kümenin ortalamasını göstermek üzere aşağıdaki gibidir.

$$d_{\text{ort}}(C_i, C_j) = \|m_i - m_j\| \quad 1$$

$$d_{\text{min}}(C_i, C_j) = \text{minimum}(\|P_i - P_j\|) \quad 2$$

Mesafe ölçüsü olarak **merkeze dayalı yaklaşım** (*centroid-based approach*) olan d_{ort} kullanıldığında her adımda ortalamaları en yakın olan küme çiftleri birleştirilmektedir. Bu yaklaşımda, bir kümenin temsilcisi olarak yalnızca küme merkezi yani tek bir nokta kabul edilmektedir. Mesafe ölçüsü **tüm noktalar yaklaşımı** (*all points approach*) olan d_{min} seçildiğinde ise birleştirilen kümeler en yakın nokta çiftini içeren kümeler olmaktadır. Bu yaklaşım bir küme içindeki tüm noktaları kümenin temsilcisi olarak kabul etmektedir. Bu mesafe ölçüleri ile elde edilen sonuçlar benzer olsa da kümelerin çok yakın olması ya da tek

örtüştüğü söylenebilir. Bu durumda gelişmemiş ülkelerin en mutsuz grupta ve bir kümede gösterildiği, gelişmekte olan ülkelerin orta mutlu seviyede farklı bir kümede gösterildiği, gelişmiş ülkelerin ise üçüncü bir kümede gösterildiği görülmektedir.

SOM algoritması hızlı çalışması ve veri görselleştirmedeki üstün meziyeti ile veri madenciliği alanında birçok kümeleme uygulamasında kullanılmaktadır. SOM algoritması ayrıca sınıflandırma problemlerinde de kullanılmaktadır.

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BÖLÜM 13

GAUSS KARMA MODELLERİ

Murat Uçar
Emine Uçar

1. GİRİŞ

Denetimsiz makine öğrenmesi teknikleri arasında yer alan Gauss Karma Modeli (*Gauss Mixture Model - GMM*) çoğunlukla verileri kümelemek için kullanılmaktadır. Gauss karma modeli bir veri kümesindeki verilerin, bir veya daha fazla normal dağılımın birleşimi şeklinde modellenmesine olanak sağlayan bir yöntemdir (Bishop & Nasrabadi, 2006; Reynolds, 2009). Bu model, özellikle görüntü bölütleme, konuşma tanıma ve biyoinformatik dâhil olmak üzere çok çeşitli uygulamalarda kullanılır (Balafar, 2014; McNicholas & Murphy, 2010; Povey vd., 2011).

Bu bölüm kapsamında Gauss dağılımı hakkında kısa bir bilgi verildikten sonra Gauss karma modeli detaylı olarak açıklanmış, ardından R ve Python dilleri kullanılarak örnek uygulamalar geliştirilmiş ve elde edilen sonuçlar tartışılmıştır.

2. GAUSS KARMA MODELİ

Gauss dağılımı ilk olarak 1733 yılında Abraham de Moivre tarafından ortaya atılmış daha sonra Carl Friedrich Gauss tarafından geliştirilmiştir (Pontes, 2018). Gauss karma modeli ise daha yeni bir gelişmedir ve GMM formülasyonu, 1977 yılında Arthur Dempster, Nan Laird ve Donald Rubin tarafından önerilmiştir (Dempster vd., 1977). GMM, Gauss bileşen yoğunluklarının ağırlıklı toplamı olarak temsil edilen bir parametrik olasılık yoğunluk işlevidir (Reynolds, 2009).

Gauss dağılımı günümüzde veri kümelerini modellemede yaygın olarak kullanılmakta ve birçok veri kümesini modellemede yüksek başarılar elde etmektedir. Ancak veri kümelerini tek bir dağılımla modellemek her zaman iyi sonuçlar vermemektedir. Bu sorunun üstesinden gelmek için karma modeller önerilmiştir. Karma model, bir veri kümesinin modellenmesi için birden çok dağılımı belirli ağırlıklarla birlikte kullanarak olasılık yoğunluk fonksiyonunu meydana getirir. Şekil 1'de örnek bir veri setine ait dağılım verilmiştir. Burada x değişken

6. SONUÇ

Bu bölümde gerçekleştirilen uygulamada 167 ülke, 9 farklı nitelik kullanılarak iki farklı programlama dili ile kümelendi. Python programlama dili ile gerçekleştirilen uygulamada en uygun küme sayısı 2256,5812 BIC değeri ile 7 olarak belirlenmiştir. R dili ile gerçekleştirilen uygulamada ise 2389,8487 BIC değeri ile en uygun küme sayısı 3 olarak tespit edilmiştir. İki farklı programlama dili ile alınan sonuçlar karşılaştırıldığında Python programlama dilinin daha düşük bir BIC değerine erişerek daha ideal bir kümeleme gerçekleştirdiği anlaşılmaktadır.

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BÖLÜM 14

SAKLI MARKOV MODELLERİ

*Melih Engin
Yasin Erduran*

1. GİRİŞ

Saklı Markov Modeli-SMM (*Hidden Markov Models-HMM*), ardışık verilerin modellemesi için kullanılan istatistiksel bir yöntemdir ve özellikle dil işleme, konuşma tanıma, biyoinformatik gibi alanlarda geniş bir uygulama yelpazesi sunmaktadır. SMM, Markov zinciri temelinde çalışır ve verinin gizli durumlarla ilişkilendirildiği bir yapıyı tanımlar. Gözlem verileri, bu gizli durumların altında yatan durumların dizisini oluşturur. SMM, durumların birbirine geçişi ve durumlarla gözlem verileri arasındaki ilişkileri birlikte modelleyerek, veri dizilerini etkili bir şekilde analiz etme yeteneği sağlar. Bu model, özellikle belirsizliğin ve gürültünün yüksek olduğu durumlarda başarılı sonuçlar verir. SMM'in çeşitli varyasyonları, modelin farklı uygulama alanlarına ve veri tiplerine uyum sağlamasını mümkün kılar.

Bu bölümde denetimsiz makine öğrenmesi algoritmalarından SMM ile kişinin duygusal durumunun tahminlenmesine yönelik bir uygulama gerçekleştirilmiştir. Kullanılan veri seti bir kişinin 96 gün içerisinde hareket durumu, yaktığı kalori miktarı, uyku süresi ve kişinin ağırlığı bilgilerini içermektedir. Bu niteliklere ek olarak veri setinde kategorik değişken olarak kişinin gün içindeki duygusal durumu ve aktif veya durgun hissetme verisi de bulunmaktadır. Veri setindeki bu iki kategorik değişkenden duygusal durum hedef değişkeni “mutlu”, “normal” ve “üzgün” şeklinde üç sınıftan birisine ait olacak şekilde etiketlenmiştir. Durgun ya da hareketli olarak etiketlenen hareketlilik durumu kategorik değişkenine ait veri bu çalışmada kullanılmamıştır.

Bölümde konu anlatımında öncelikle Markov Zincirlerinden ve SMM ile ilgili temel teorik bilgilere yer verilmiştir. Sonrasında duygusal durumu tahmini örnek olay uygulamasının R ve Python kodları yer almıştır. Python uygulaması (Python Software Foundation, 2022) PyCharm (2022) bütünlük geliştirme ortamının (*Integrated Development Environment* –

```
def hesaplaDogrulukOrani(gercek_degerler, tahmin_degerler):
    dogru_tahmin_sayisi = 0
    for i in range(len(tahmin_degerler)):
        if(gercek_degerler[i]==tahmin_degerler[i]):
            dogru_tahmin_sayisi +=1

    return dogru_tahmin_sayisi/len(tahmin_degerler)
hesaplaDogrulukOrani(gercek_degerler, viterbi)
```

0.8571428571428571

6. SONUÇ

Bir zaman serisi üzerinde kişinin duygusal durumunun tahminlenmesi SMM ile hem R hem de Python dili ile gerçekleştirilmiştir. R dilinde Viterbi algoritması çözümü **HMM** kütüphanesi aracılığı ile çözülmüş Python dilinde ise Viterbi algoritmasının çözümü için **pandas** haricinde ek bir hazır kütüphane kullanılmamıştır. İki programlama dilinde farklılıklar olsa da kurulan model sonucunda elde edilen başarımlar aynı kalmıştır. Model kendisine verilen yedi günlük tahmin örneğinde 0.857'lik (%86) bir başarımlar elde etmiştir.

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BÖLÜM 15

GENETİK ALGORİTMALAR

Burcu Avcı Öztürk

1. GİRİŞ

Genetik algoritmalar (GA), yapay zekânın gün geçtikçe genişleyen bir kolu olan evrimsel hesaplamaların bir parçasını oluşturmaktadır. GA, Darwin'in evrim teorisinden ilham alınarak geliştirilen sezgisel arama tabanlı bir algoritmadır ve makine öğrenmesinde optimizasyon problemlerinin çözümü için kullanılmaktadır. Çözüm için rassal arama tekniklerini kullanan ve parametre kodlama esasına dayanan GA, Darwin'in evrim teorisinin doğada olduğu gibi en iyi veya en güçlü olanın hayatta kalması/güçlününun zayıfı yenmesi kuralından esinlenerek oluşturulan, bir veri öbeğinden özel bir veriyi bulmak için kullanılan sezgisel bir yöntemdir. Geleneksel yöntemlerle çözümü zor veya imkânsız olan problemlerin çözümünde yoğun olarak kullanılmaktadır. Herhangi bir problemin GA ile çözümü, problemin sanal olarak evrimden geçirilmesiyle yapılmaktadır. GA, çözümü uzun süre alan karmaşık problemlerin çözümüne yardımcı olan önemli algoritmalarından biridir. GA, evrimsel algoritmalar içerisinde yer almakta ve problem çözümünde genetik ve doğal seçim altyapısını kullanmaktadır (Kazu & Özdemir, 2009; Bekdaş & Niğdeli, 2021; Muthee, 2021; Sayım, 2022; Java, 2023).

GA, montaj hattı dengeleme, çizelgeleme, tesis yerleştirme, atama, hücreyel üretim, sistem güvenilirliği, taşıma, gezgin satıcı ve araç rotalama problemlerinin çözümünde, finans, pazarlama, üretim sistemleri, yapay sinir ağları, veri madenciliği ve kümeleme, robotik ve sağlık bilimleri gibi pek çok alanda uygulanabilmektedir (Gökay Emel ve Taşkın, 2002; Chaudhary, 2023).

Bu bölümde GA'nın temel kavramları, işlemcileri ve parametreleri ayrıntılı şekilde açıkladıktan sonra, GA'nın optimizasyon problemlerinde nasıl uygulandığı bir sırt çantası problemi çözülerek aktarılacaktır.

2. GENETİK ALGORİTMALAR

GA, ile ilgili ilk çalışmayı Holland (1975), kromozom olarak adlandırdığı ikili kodlanmış gen (bit) dizelerinden oluşan bir popülasyon üzerinde uyum fonksiyonu ile seçme, çaprazlama ve mutasyon işlemcilerini kullanarak evrimsel ilkeleri taklit eden bir algoritma önererek

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FABRİKADA YARDIMCI TESİS VE BİRİMLER

Prof. Dr. Ferhan Sami Atalay



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İÇİNDEKİLER

ÖN SÖZ xi

BÖLÜM 1

GİRİŞ1

BÖLÜM 2

BUHAR ÜRETİMİ5

2.1. Buharla Isıtma6

2.2. Buhar Üretim Sistemi8

2.3. Buhar Kazanların Donanımı13

2.3.1. Su Besleme ve Arıtma Birimi15

2.3.2. Buhar Sisteminde Isı Ekonomisi21

2.4. Buhar Dağıtım Hatları27

2.4.1. Buhar Hat Borularında Çap Hesabı30

2.5. Flaş Buhar Üretimi35

2.6. Buhar Kazanında Enerji Kayıpları38

2.7. Buhar Sisteminde Kontrol49

2.7.1. Kazan Kontrolları50

2.8. Kazan Tasarımı53

2.8.1. Su Borulu Kazan Tasarımı54

2.8.2. Alev-Duman Borulu Kazan Tasarımı61

KAYNAKLAR65

BÖLÜM 3

SÜREÇ BESİ SUYU HAZIRLAMA (DEMİNERALİZASYON)67

3.1. Çöktürme69

3.2. Yumaklaştırma (koagülasyon, pıhtılaştırma)73

3.2.1. Hızlı Karıştırma Sistemleri81

3.2.2. Yavaş Karıştırma Sistemi82

3.3. Filtrasyon83

3.3.1. Diatoma Filtre84

3.3.2. Yavaş Kum Filtreleri86

3.3.3. Hızlı Granüler Filtre87

3.3.4. Filtrasyon Sistemin Tasarım İlkeleri88

3.4. İyon Değişimi Süreci95

3.4.1. İyon Değişimi Sürecin Tasarımı99

3.5. Membran Süreci ile Su Hazırlama.....	113
KAYNAKLAR.....	132

BÖLÜM 4

SU SOĞUTMA KULESİ	135
4.1. Soğutma Kulelerinin Sınıflandırılması	136
4.2. Soğutma Kuleleri Elemanları	142
4.3. Soğutma Kulelerin Seçimi ve Montaj Kuralları	144
4.4. Soğutma Kulesi İşletimi ve Sorunları.....	147
4.5. Soğutma Kulesi Tasarım İlkeleri.....	150
4.6. Soğutma Kulelerinde Basınç Düşmesi	154
4.7. Soğutma Suyun Koşullandırılması ve Blöf.....	159
4.7.1. Soğutma Suyun Koşullandırılmasında Kullanılan Kimyasallar.....	160
4.7.2. Soğutma Kullerinde Blöf.....	164
KAYNAKLAR.....	176

BÖLÜM 5

SOĞUK SU ÜRETİM SİSTEMİ (CHİLLER)	179
5.1. Kompresör	181
5.1.1. Soğutucu Akışkanlar	186
5.2. Yoğuşturucu (Kondenser)	191
5.2.1. Hava Soğutmalı Kondenserler	192
5.3. Buharlaştırıcı (Evaporatör).....	197
5.4. Genleşme Vanası.....	200
5.5. Chillerin Montaj ve İşletmesinde Dikkat Edilecek Kurallar.....	202
5.6. Soğutma Sistemlerinde Güvenlik Kuralları.....	208
KAYNAKLAR.....	215

BÖLÜM 6

KIZGIN YAĞ SİSTEMİ.....	217
6.1. Kızgın Yağ Sistemin Elemanları	220
6.1.1. Yağ Isıtma Kazanı.....	220
6.1.2. Brülör	222
6.1.3. Yağ Sirkülasyon Pompası	225
6.1.4. Yağ Genleşme Tankı.....	230
6.1.5. Baca	230
6.1.6. Degazör (Havalık) ve Filtre	231
6.2. Isı Aktarım Yağı.....	232
6.3. Kızgın Yağ Sistemin Montajı.....	234

6.4. Kızgın Yağ Sistemlerin İşletimi	237
6.4.1. Sistemin Isı Aktarm Yağı ile Doldurulması ve Yıkanması	237
6.4.2. Sistemin Çalıştırılması	238
6.4.3. Sistemin Kapatılması	240
6.4.4. Sistemin Boşaltılması.....	240
6.5. Kızgın Yağ Sistemlerinde Sorunlar	240
6.5.1. Sistem Kaçakları	241
6.5.2. Kendinden Alevlenme.....	241
6.5.3. Isı Aktarım Yağının Kirlenmesi.....	241
6.5.4. Isı Aktarım Yağının Oksidasyonu.....	242
6.5.5. Yağ Kaynaması	243
6.5.6. Yağın Isıl Parçalanması	243
6.5.7. Sistemin Ani Kapanması.....	244
6.5.8. Sirkülasyon Pompası Arıza ve Sorunları	244
6.6. Kızgın Yağ Kazan Seçim ve Tasarım İlkeleri	246
KAYNAKLAR.....	259

BÖLÜM 7

VAKUM SİSTEMİ.....	261
7.1. Vakum Pompaları.....	267
7.2. Ejektör	275
7.2.1. Jet Ejektörlerin Tasarım İlkeleri.....	278
7.2.2. Jet Ejektörün Modellenmesi.....	282
7.3. Vakum Ekipmanların Mekanik Tasarımı	287
KAYNAKLAR.....	290

BÖLÜM 8

ELEKTRİK SİSTEMİ, SÜREÇ KONTROL VE OTOMASYONU	291
8.1. Elektrik Sistemi	291
8.1.1. Elektrik Kazaları ve Alınması Gereken Önlemler	295
8.2. Süreç Kontrolü ve Otomasyon	299
8.2.1. Endüstriyel Otomasyon.....	299
8.2.2. Kimyasal Süreçlerde Kontrol.....	306
8.2.2.1. Süreçlerde Kontrol Sistemleri	311
KAYNAKLAR.....	330

BÖLÜM 9

ÇEVRE KORUMA SÜREÇLERİ.....	331
9.1. Atıklar ve Yönetimi.....	337

9.2. Hava Kirliliği Kontrol Süreçleri	347
9.2.1. Taneciklerin Tutulması	347
9.2.2. Baca Gazında Tehlikeli Gaz Bileşenlerin Arıtım Süreçleri	361
9.2.3. Kimyasal Yöntemlerle Atık Gaz Arıtım Süreçleri	387
9.3. Su Kirliliği Kontrol Süreçleri	403
9.3.1. Adsorpsiyonla Atıksu Arıtımı	405
9.3.2. Membranlarla Atıksu Arıtımı	415
9.3.3. Kimyasal Yöntemlerle Atıksu Arıtımı	422
KAYNAKLAR.....	430

BÖLÜM 10

BAKIM - ONARIM VE KOROZYONLA MÜCADELE.....	433
10.1. Bakım Türleri	433
10.1.1. En Uygun Bakım Yönteminin Belirlenmesi	436
10.2. Bakım Faaliyetlerinde Ekipman ve İş Sıralaması.....	439
10.3. Bakımın Belgelendirilmesi.....	441
10.3.1. Belgelendirilmede Kullanılan Formlar.....	442
10.3.2. Kestirimci Bakım Uygulaması.....	443
10.4. Yardımcı Üniteler ve Ekipmanlarda Bakım - Onarım.....	447
10.4.1. Buhar Kazanların Bakımı.....	447
10.4.2. Su Soğutma Kulelerinin Bakımı	453
10.4.3. Chiller Bakımı.....	455
10.4.4. Kızgın Yağ Sisteminde Bakım.....	456
10.4.5. Kompresörlerde Bakım - Onarım.....	457
10.4.6. Su Sirkülasyon Pompalarında Bakım - Onarım	461
10.4.7. Depo Tanklarının Bakımı.....	464
10.5. Korozyonla Mücadele	467
10.5.1. Korozyondan Korunma Yöntemleri.....	473
10.5.2. Katodik Koruma.....	477
10.5.3. Anodik Koruma	496
10.5.4. Katodik Koruma Tesislerinde İşletme ve Bakım	497
KAYNAKLAR.....	500

BÖLÜM 11

İŞ GÜVENLİĞİ, SAĞLIĞI VE YANGINLA MÜCADELE.....	503
11.1. Tesislerde Tehlike Oluşturan Etkenler	508
11.2. Tehlike Risk Analizi.....	510
11.3. Boşaltım Sistemi.....	518
11.3.1. Alev Bacası	523

11.4. İş Güvenliğinde Kişisel Koruyucu Donanımlar	535
11.5. Kaynak Yapımında İş Sağlığı ve Güvenlik	541
11.5.1. Kaynak İşlerinin İş Sağlığına Etkileri	542
11.5.2. Kaynak Uygulamalarında Güvenlik.....	545
11.5.2.1. Kaynak Atölyelerinde Alınması Gereken Önlemler.....	545
11.5.2.2. Gaz Kaynak Uygulamalarında Alınması Gereken Önlemler.....	545
11.5.2.3. Elektrik Ark Kaynağında Alınması Gereken Önlemler.....	547
11.5.2.4. Kaynak Uygulamalarında Yangına Karşı Alınması Gereken Önlemler.....	548
11.5.2.5. Kaynak Uygulamalarında Gürültüye Karşı Alınması Gereken Önlemler.....	548
11.5.2.6. Kaynak Uygulamalarında Kullanılması Gerekli Olan Kişisel Koruyucular.....	549
11.6. Yangınla Mücadele.....	550
11.6.1. Yangın Sebepleri ve Türleri	552
11.6.2. Yangın Yerinde Tehlikeler ve Güvenlik	556
11.6.3. Yangınla Mücadele	560
11.6.4. Yangın Güvenlik Önlemleri.....	565
11.6.5. Uçucu Sıvı Depo Tank Sızıntıların Yangın Tehlikesi.....	567
KAYNAKLAR.....	573
EK A: Kızgın Su Buharının Termodinamik Özellikleri	575
EK B: 1 atm Toplam Basınç İçin Psikrometrik Diyagram.....	578
EK C: Soğutucu Akışkanların Özellikleri, Çevresel Etkileri ve Karışımların Özellikleri	579
EK D: Tesislerde Atmosfere Verilen Emiyonların Kütle Sınır Debileri.....	582
EK E: Suların Sınıflarına Göre Kalite Kriterleri.....	583
EK F: Kimyasalların Sınıflandırılması ve Tehlike Sınır Değerleri.....	584
EK G: İş Sağlığı ve Güvenliğinde Mesleki Eğitim Alınması Gereken Endüstriler.....	590
EK H: Acil Müdahale Programı.....	592
EK I: Kişisel Koruyucu Donatım Listesi	593

BÖLÜM 2

BUHAR ÜRETİMİ

Su katı, sıvı ve gaz fazında bulunan hayati bir madde olup gaz hâli **buhar** olarak adlandırılır. Su, ısıtıldığı ve belli bir sıcaklığa eriştiği zaman sıvı fazda olamayacağı bir duruma gelir. Buna **doyma noktası** denir ve suyun bir kısmı buharlaşarak kaynamaya başlar. Buharlaşma için önemli miktarda enerjiye ihtiyaç vardır ve doyumluk sıcaklığında enerji verildiği esnada su ve buhar aynı sıcaklıktadır. Eğer buharın, buharlaştırılması için verilen enerji geri alınırsa, buhar yoğunlaşır ve aynı sıcaklıkta suya dönüşür.

Buhar çeşitli amaçlarla çok yaygın olarak kullanılan bir akışkandır. Buhar, bazı kimyasal reaksiyonlarda **reaktif**; süreçlerin **ısıtılmasında** ve **termik santrallerde elektrik üretiminde** kullanılmaktadır. Sadece ısıtma amacıyla buhar kullanımı terk edilmiş ve buhar yerine kızgın yağ kullanımı tercih edilmiştir. Ancak bir çok kimyasal maddenin üretildiği komplekslerde ve organize sanayi tesislerinde yüksek basınçta üretilen buhar önce elektrik üretiminde kullanılmakta türbinden çıkan düşük basınçtaki buhar ve elde edilen sıcak su diğer fabrikalarda ısıtma amacı ile kullanılmaktadır.

Endüstride buhar kullanımında tercih nedenleri şöyle sıralanabilir.

1. *Yüksek akışkan sıcaklıklarına çıkmak mümkündür.*
2. *Isı geçiş yüzeylerinde sıcaklık sabittir. Buhardan ısı çekişi genellikle doymuş buharın yoğunlaşmasıyla gerçekleşir. Bu işlem sabit sıcaklıkta gerçekleştiğinden bütün ısıtma yüzeyi boyunca buhar tarafının sıcaklığı sabittir.*
3. *Sıcaklık kontrolünü hassas biçimde gerçekleştirmek mümkündür. Söz konusu sabit yoğunlaşma sıcaklığı buharın basıncına bağlıdır. Basınç kontrolü yoluyla proses sıcaklığını hassas olarak kontrol etmek mümkün olabilmektedir.*

Toplam ısı transfer alanı,

$$A_{total} = A_2 + A_3$$

$$A_{total} = 36.92 + 37.86$$

$$A_{total} = 74.78 \text{ m}^2$$

Kazan yapımında kullanılacak 3 metre uzunluğunda boruların sayısı,

$$A_{one\ tube} = \pi d_o L = (\pi) (0.05)(3)$$

$$= 0.47 \text{ m}^2$$

$$N_{tube} = A_{total} / A_{one\ tube}$$

$$= 74.78 / 0.47$$

$$= 158.68 = 159$$

Sonuç : Fabrika için gerekli olan alev borulu kazanın imalatında 5 cm çapında ve 3 metre uzunluğunda 159 adet çelik boru kullanılmalıdır.

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BÖLÜM 3

SÜREÇ BESİ SUYU HAZIRLAMA (DEMİNERALİZASYON)

Süreç suyu, içme suyu kullanımı dışındaki değişik maddelerin üretimlerinde doğrudan, enerji santralleri ve endüstriyel faaliyetlerdeki soğutma, ısıtma amaçlı süreçlerde bağlantılı olarak kullanılan suyun ortak adıdır.

Endüstriyel su kullanımı, bir maddenin üretimi, yıkanması, seyreltilmesi soğutulması ya da taşınması olabilmektedir. Endüstride süreç suyu en çok kazan besleme suyu olarak kullanılmaktadır. Süreç suyun kalitesi kullanılacağı sürece göre değişiklik göstermekte ve kullanıldığı süreçte sorun yaratmaması istenmektedir. Örneğin buhar üretiminde kazan besli suyunda var olan alkalite (HCO_3^- , CO_3^{2-}) buhar içerisinde karbonik asit oluşmasına sebep olarak CO_2 üretir ve korozyona sebep olurken, kalsiyum ve magnezyum tuzları, yani suyun sertliği, kireçtaşının oluşumuna dolayısıyla buhar üretimin azalmasına hatta kazan patlamalarına neden olmaktadır.

Kazan suyu arıtımı, sorunsuz ve ekonomik kazan çalışma koşulları yanında buhar kalitesi içinde önemlidir. Kireç oluşumu, korozyon, sık sık boşaltma ve yüksek kimyasal madde tüketimi ile oluşan dezavantajlar sonucu mali kayıplar oluşmaktadır. Doğru kazan suyu arıtımı, kazan ömrünü uzatır ve korozyonu azaltır ve kimyasalların tüketimini azaltarak ekonomik bir çalışma sağlar.

Ürünlerde doğrudan su kullanmak, ürünlerin kalitesini, korunabilirliğini ve görünümünü sağlamak amacı ile genellikle arıtım işlemlerini gerektirir. Hatta en iyi içilebilir su doğrudan ürünlerde kullanılacağı zaman sorunlara neden olabilir. Kozmetik, ilaç, kimyasal üretimi, bira fabrikaları ve mandıralar ek veya alternatif su arıtma yöntemleri gerektiren işletmelerin iyi örnekleridir.

$$\frac{15.75}{3} = \frac{\exp\left(\frac{J}{8.48 \times 10^{-6}}\right)}{0.9873 + (1 - 0.9873) \exp\left(\frac{J}{8.48 \times 10^{-6}}\right)}$$

$$5.1833 = 0.933 \exp\left(\frac{J}{8.48 \times 10^{-6}}\right)$$

$$\exp\left(\frac{J}{8.48 \times 10^{-6}}\right) = 5.553$$

$$J = (8.48 \times 10^{-6}) \ln(5.553)$$

$$= 1.4536 \times 10^{-5} \text{ m}^3/\text{m}^2\text{s}$$

$$= 0.05233 \text{ m}^3/\text{m}^2\text{saat}$$

Aritma için gereken toplam membran yüzey alanı,

$$A_{Top} = V_F / J$$

$$= 1200 / 0.05233$$

$$= 22931 \text{ m}^2$$

Membran elemanın (bir borunun) aktarım alanı,

$$A_{Boru} = \pi d L$$

$$= 0.090478 \text{ m}^2$$

Bir modüldeki membranların toplam alanı,

$$A_{Mod} = (130)(0.090478)$$

$$= 11.762 \text{ m}^2$$

Aritma için gerekli olan modül sayısı,

$$N_{Mod} = 22931 / 11.762$$

$$= 1950 \text{ adet}$$

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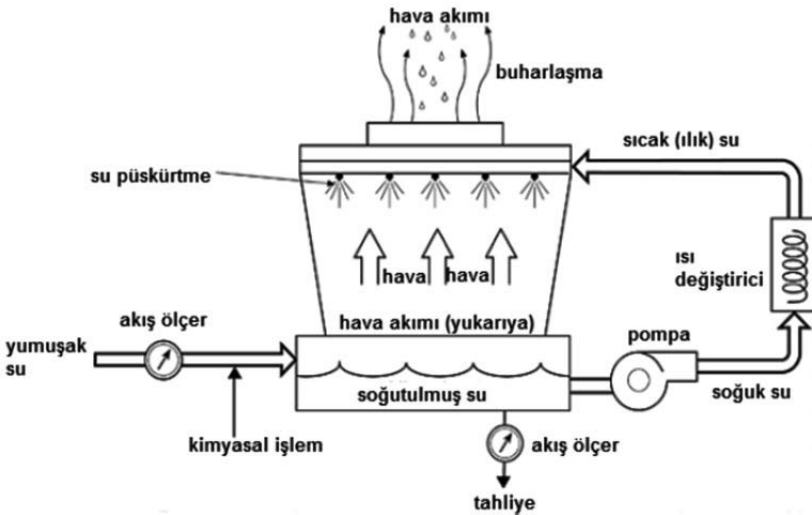
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BÖLÜM 4

SU SOĞUTMA KULESİ

Bir tesiste değişik süreçlerde (ısı değiştirici, yoğuşturucu vb.) soğutma amacı ile kullanılan ve süreçten ısınarak çıkan su, tekrar kullanılması için soğutulması gerekir. Bu amaç için ekonomik soğutma sistem olan **soğutma kuleleri** kullanılmaktadır. Soğutma kuleleri, sıcak olarak kuleye giren suyun ısı enerjisini kuleden geçen havaya aktararak atmosfere veren ve böylece suyun sıcaklığı düşürülen sistemdir. Bir kısım suyun buharlaşması, su soğutma kulesinin ana mekanizmasını oluşturur. Bu olay sırasında sıcak su, suyun buharlaşması için gereken buharlaşma ısısını kaybedeceğinden sıcaklığı düşer. Ortamdaki bulunan havanın nemi buharlaşmayı etkileyen itici güç olup, havanın bağıl nemi %100 oluncaya kadar buharlaşma devam eder. Buharlaşmanın yanında su ve havanın sıcaklık farkından dolayı gerçekleşen konvektif ısı transferi ile de soğutma olmaktadır.

Aşağıda su soğutma kulesinin şematik görünümü verilmiştir.



➤ *Dolgu Yüksekliği Z hesabı:*

$$Z = \frac{V'}{k_y a S} \int_{H_{v1}}^{H_{v2}} \frac{dH_v}{(H_i - H_v)}$$

H_v	17	34.6	52.3	69.9	87.6
H_i	31.72	45.62	61.72	79.43	98.62
$1/(H_i - H_v)$	0.0678	0.0911	0.106	0.1053	0.0906

$$\int_{H_{v1}}^{H_{v2}} \frac{dH_v}{(H_i - H_v)} = \frac{0.0678 + 0.0911}{2} * (34.6 - 17) + \dots + \frac{0.1053 + 0.0906}{2} * (87.6 - 69.9) = 6.737$$

$$Z = \frac{5.663}{6.59 * 2.573} * 6.737$$

$$= 2.25 \text{ m}$$

Kolon silindir seçilirse ve a değeri 0.0833 olarak alınırsa kule çapı,

$$D_c = \left(\frac{4V'}{\pi u_G (1 - a)} \right)^{0.5} = \left(\frac{4(5.663)}{\pi(1.826)(1.205)(1 - 0.0833)} \right)^{0.5}$$

$$= 1.89 \text{ m}$$

Kolon kesiti dörtgen seçilirse,

$$D = \left(\frac{V'}{u_G} \right)^{0.5} = \left(\frac{5.663}{(1.826)(1.205)} \right)^{0.5}$$

$$= 1.6 \text{ m}$$

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BÖLÜM 5

SOĞUK SU ÜRETİM SİSTEMİ (CHILLER)

Endüstride soğuk su ihtiyacı özellikle, plastik üretim tesislerinde 10–12 °C su çıkışı olması gereken enjeksiyon kalıplarının ve işlem yapılmış malın soğutulmasında, kozmetik ve sabun üretim tesislerinde ve kimya endüstrisinde normal kaynama noktası 20°-35°C olan ve soğutma suyu kullanarak yoğunlaştırılması zor olan buharları yoğunlaştırmak amacı ile kullanılır.

Ayrıca, her türlü soğutma ve iklimlendirme sağlayan endüstriyel tip uygulamalarda, soğuk su hazırlama (chiller) sistemlerine ihtiyaç duyulur.

Plastik sanayinde kalıp şartlandırılması, özellikle ürün kalitesi açısından önemlidir. Malzemenin özelliklerine göre kalıpların belirli sıcaklık değerleri arasında tutulması gerekir. Bu ihtiyacı karşılamak amacıyla işletmelerde kullanılan su soğutma kuleleri sağlamada yetersiz kalmaktadır.

Plastik sektörü, soğutma ihtiyacı en fazla olan alanlardan biridir. Gerek kalıpların ve gerekse makine yağının soğutulması, işletme ve bakım maliyetlerinin yükselmesine sebep olmaktadır. Bu nedenle, kullanılacak yöntemin dikkatli seçilmesi gerekmektedir. Kalıpların yeteri kadar soğutulmaması, ürün kalitesini doğrudan etkilemektedir. Ayrıca, kalıptan elde edilecek birim ürün başına geçen sürenin artmasına neden olmakta ve üretim kapasitesini düşürmektedir. Bu nedenle makinelerdeki aşınmanın azaltılması ve verimli bir çalışma için yağın da iyi soğutulması önemli olmaktadır.

Chiller, buhar sıkıştırırmalı soğutma sistemi olup kompresör, kondenser genişleme vanası ve evaporatör (buharlaştırıcı) ana elemanlardan oluşmaktadır. Evaporatör, tesisten ısınarak dönen soğutma suyun (ya da glikol vb. diğer akışkanlar) tekrar soğutulduğu ekipmandır.

Evaporatör (buharlaştırıcı), genellikle boru-kovan tipidir ve kovan tarafından basıncı genişleme vanası tarafından düşürülmüş sıvı soğutucu akışkan (R22, R407C,

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BÖLÜM 6

KIZGIN YAĞ SİSTEMİ

Bazı teknolojilerde yüksek sıcaklıklara dolayısıyla bunun temininde ısı transfer akışkanlarında yüksek sıcaklıklara ihtiyaç bulunmaktadır. Yüksek sıcaklık yüksek basınçlı kaynar su, doymuş buhar, kızgın buharla veya düşük basınçta çalışan kızgın yağ sistemi ile elde edilebilmektedir.

Doymuş buhar ve kaynar su için 250-300 °C'lık derece sıcaklık, 42 ila 90 barlık çok yüksek bir basınç gerektirmektedir. Çok kere ihtiyaç duyulan 170-180 °C derecelik sıcaklıklar için dahi 10-12 barlık basınca ihtiyaç olmaktadır.

Kızgın yağda ise 300 °C derece sıcaklığa kadar sadece tesisatın akışa gösterdiği direnci kadar bir basınca gereksinim olmakta ve bu direnç çoğu kez 3 barın altında olmaktadır.

Buhar tesisatlarında, özellikle kondens tanklarında ve zamanla bozulan kondens tutucularında büyük enerji kayıpları olmaktadır. Kızgın yağ sistemleri, eşdeğer buhar sistemlerine göre, enerjide ortalama %25-35 tasarruf sağlar.

Bunun yanı sıra kireçlenme ve korozyon dolayısı ile buhar kazanlarında borularda ve armatürlerde, telafisi büyük maliyetlere ulaşan yıpranma ve aşınmalar meydana gelmektedir. Buna karşılık uygun çalıştırılan kızgın yağ sisteminde koruyucu ortam dolayısı ile sistemde bir aşınma ve yıpranma olmamaktadır.

Buhar sistemleri ile kıyaslandığında kullanım alanına göre birçok avantajı vardır. Sıvının donma riski yoktur, genleşme tankı ile atmosfere açık çalışmakta, pahalı su yumuşatma sistemlerine ihtiyaç duymamakta, yoğunlaşma kayıpları da yoktur. Otomatik çalışır, hızlı ilk çalışma sağlar, taze su besleme sorunu yoktur.

Bununla birlikte yanlış kullanılması veya emniyet sistemlerinin çalışmaması hâlinde yangın riski mevcuttur ancak emniyet kurallarına uyulması ve doğru sistem tasarımı ile bu risk ortadan kaldırılmaktadır. Uygun brülör seçimi yapılmak

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BÖLÜM 7

VAKUM SİSTEMİ

Vakum, atmosfer basıncının altındaki basınca verilen addır. Vakum sistemi oluşturmak için sistemdeki gaz moleküllerin boşaltılması gerekir. Sistemden ne kadar çok molekülün dışarıya transferi yapılırsa, sistemde o kadar düşük vakum elde edilir. Pompalama ile elde edilen vakum, kullanılan pompalama gücüne bağlı olarak farklı değerler alır. Ulaşılan vakum seviyesi düzeneğin mutlak basıncını ölçerek elde edilir. Oluşturulan yapay vakum seviyesini alçak, orta, yüksek, çok yüksek ve ileri yüksek olarak sınıflara ayırılarak ifade edilir.

<i>Vakum aralıkları</i>	<i>Pascal (Pa)</i>	<i>mbar</i>
Alçak vakum (LV)	$10^5 - 3.3 \times 10^3$	1013 - 1
Orta vakum (MV)	$3.3 \times 10^3 - 10^{-1}$	$1 - 10^{-3}$
Yüksek vakum (HV)	$10^{-1} - 10^{-4}$	$10^{-3} - 10^{-6}$
Çok yüksek vakum (VHV)	$10^{-4} - 10^{-7}$	$10^{-6} - 10^{-9}$
İleri yüksek vakum (UHV)	$10^{-7} - 10^{-10}$	$10^{-9} - 10^{-12}$
Aşırı yüksek vakum (XHV)	$<10^{-10}$	$<10^{-12}$

Vakumun bir çok uygulama alanı vardır. Örneğin safsızlığın önemli olduğu bazı yarı iletken malzemelerin üretimi sırasında ortamda istenmeyen atomların bulunması malzemenin safsızlığını dolayısıyla da elektronik özelliklerini olumsuz yönde etkilemektedir. Bu sebepten bu türden malzemelerin üretimlerinin yapıldığı ortam-

Dış basınç etkisindeki kapların detaylı tasarımlarında kabul görmüş yöntemler için, ASME BPV Yönerge Böl. VIII D.1 Kısım UG-28 e başvurmak gerekir. EN 13447 yönetmeliği, BS PD 5500 gibi aynı yöntemi kullanır.

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BÖLÜM 8

ELEKTRİK SİSTEMİ, SÜREÇ KONTROL VE OTOMASYONU

Ulaşım, tıp, tarım, iletişim, sanayi ve daha birçok alanda kullandığımız elektrik, aynı zamanda çağdaşlaşmanın da önemli bir göstergesi olup hayatımızın vazgeçilmez bir parçasıdır. Elektrik makinelerinin verimlerin yüksek olması, kumandalarının kolaylığı ve yapılarının basit olması, diğer enerji makineleri yanında ön sırayı almalarına neden olmuştur.

Fabrikalarda kullanılacak olan cihazların, makinelerin elektrik ihtiyaçları yeterli bir şekilde sağlanmalı, evsel elektrik tesisatından daha farklı yapılara sahip olan fabrika elektrik tesisatı profesyonel kişiler tarafından kurulmalıdır. Bunun yanında fabrikalarda elektrik sürekli olarak kullandığı için sorun çıkarma olasılıkları da fazladır. Bu nedenle fabrika elektrik tamirati ve olabilecek kazaların önlenmesi büyük önem taşımaktadır.

Diğer taraftan fabrikada üretilen ürünlerin istenen kalite ve miktarda üretilebilmesi, tesisin güvenli çalışabilmesi için üretim esnasında süreçlerin kontrolleri ve otomasyonları da oldukça önemli olmaktadır.

8.1. Elektrik Sistemi

Elektrik enerjisi aktarımını gerçekleştiren ve çalışma koşulları belirli standartlara bağlı olan sistemlere *elektrik sistemleri* adı verilebilir. Bu sistemler mühendislik

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BÖLÜM 9

ÇEVRE KORUMA SÜREÇLERİ

Çevre, canlı ve cansız tüm varlıkların iç içe bulunduğu kompleks bir yapıdır. Bu yapının bir kısmında meydana gelen çevresel değişiklik (sıcaklık, pH, oksijen miktarı vb.) orada var olan canlı varlıkların birbirleriyle ilişkisi olan ekosistemi de etkiler. Çevre birden fazla etmenin bir araya gelmesiyle oluşsa da tüm bu kirliliklerin başlıca sorumlusu insan faaliyetleridir. Büyüyen ve gelişen insan nüfusu, ihtiyaçlarını gidermek için zaman içinde yağmur ormanları, sulak ve otlak alanları ve diğer biyolojik açıdan zengin yerleri talan edip oradaki diğer türlerin habitatlarına müdahale etmiştir. Bunun sonucunda, insanlar yaptığı faaliyetler sonunda besin zincirine müdahale ederken aslında kendine de zarar vermiş ve gelecek insan neslinin de yaşamını tehlike altına almıştır.

Yaşamın sağlıklı sürdürülmesi ancak sağlıklı bir çevre ile mümkündür. Sağlıklı bir çevre içinde doğal dengenin yani ekosistemin korunması gerekmektedir. Canlılar hayatlarını sürdürebilmeleri için yaşadıkları ortamdaki birçok maddeyi almak ve vermek zorundadır. Maddelerin çevrimsel olarak kullanılması, yaşama döngüsünde en önemli etkidir. Bu nedenle **çevre koruma süreçleri** ile ekosistemde oldukça önemli olan *su karbon; azot döngülerin* korunmaları gerekmektedir.

İnsan faaliyetleri sonucunda alıcı ortamlara arıtılmadan atılan atık maddelerin olumsuz etkileri sonucunda ekolojik dengenin bozulması ve istenilmeyen sonuçların ortaya çıkması **çevre kirlenmesi** olarak adlandırılır.

Çevre kirliliği, doğal yaşam üzerinde önemli bir olumsuz etkiye sahip olmakla birlikte aynı zamanda insan sağlığı üzerinde de ölçülebilir bir etkiye sahiptir. Modern dünyada kirlilik türlerine bakıldığında aşağıda verilen gruplandırma karşımıza çıkmaktadır.

olmuş; son zamanlarda grafen yapıda grafitinde olumlu sonuçlar verdiği belirlenmiştir.

Sonuç olarak ileri oksidasyon süreçleri daha pahalı sistemler olmasına rağmen diğer atıksu arıtım süreçlerine göre aşağıda belirtilen üstünlüklere sahiptir.

1. *İleri oksidasyon süreçleri yüksek oksidasyon potansiyeline sahip hidroksil radikallerini üretmekte ve bu radikallerle ortamdaki organik bileşenler ile reaksiyonu sonucunda pek çok organik bileşenin, son ve kararlı ürünler olan su ve karbondioksit kadar oksidasyonu mümkün olabilmektedir. Bu nedenle arıtma verimi diğer süreçlere göre daha yüksek olmaktadır.*
2. *Klasik arıtma süreçlerinde karşılaşılan çamur oluşumu ve çamur bertarafının meydana getirdiği sorunlar ve ek maliyetler bu tip süreçlerde (Fenton süreci hariç) neredeyse yok denecek kadar azdır.*
3. *Hidroksil radikalleri ile organik bileşenler arasındaki reaksiyonun gerçekleşme süresi özellikle biyolojik arıtma süreçlerine göre daha düşüktür.*
4. *İleri oksidasyon süreçlerin diğer arıtma süreçlerine göre daha az yerleşim alanına kurulması, işletme içerisindeki alanların daha etkin kullanımına olanak sağlamaktadır.*
5. *Bu süreçlerde sağlanan yüksek orandaki arıtma verimiyle atıksudaki kirleticiler büyük bir oranda giderilmeleri, işletmeye iyi kalitede suyu geri kazandırabilmekte ve su kullanım maliyeti düşürmektedir.*

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BAKIM – ONARIM VE KOROZYONLA MÜCADELE

Üretim tesisinde yer alan elektrik, enstrüman ve tüm donanımların üretimde sürekliliği sağlayacak bir şekilde kontrolü, tamiri, onarımı temizliği vb. eksiklik, aksaklık ve ihtiyaçlarının giderilmesine yönelik olarak yürütülen faaliyetler **bakım** faaliyetleri olarak tanımlanır. Bakım organizasyonunda bakım ve onarım birimi, direkt olarak işletme baş mühendisliğine bağlıdır. Bakım ve Atölye bünyesinde üç ana grupta toplanmaktadır.

- a) *Makine bakım atölyesi*
- b) *Elektrik ve instrümantasyon atölyesi*
- c) *Bakım ve yenileme atölyesi*

10.1. Bakım Türleri

1. *Plansız bakım*
2. *Planlı bakım*
3. *Periyodik bakım*
4. *Kestirimci bakım*

olarak sınıflandırılmaktadır. Plansız bakım, arıza oluştuğunda yapılan müdahaleleri kapsamaktadır. Aslında bu bakım yöntemini bakım kapsamı içinde almak biraz yanlış olmaktadır. Çünkü bu yöntemde ekipman tamamen bozulup üretim dışı kalana dek, verimsizlik başlamasına üretimin belli bir düzeye düşmesine kadar bir bakım yapılmamaktadır. Plansız bakımın dezavantajları,

- 1- *Arızanın ne zaman ortaya çıkacağı belli olmadığından hangi parçanın değiştirileceği, ne kadar iş gücü gerekeceği, hangi alet ve takımların kullanılacağı gibi planlama için gereken ön bilgilere sahip olmak güçtür.*

Dış akım kaynaklı katodik koruma sistemlerinin periyodik kontrollerinde yapılan ölçümler aşağıda sıralanmıştır.

- 1- *Dış akım kaynaklı sistemde polarite tayinin düzgün yapılması gerekir. Polarite bağlantısı ters yapılırsa korunması gereken metal yapı anot, yardımcı anotlar ise katot durumuna geleceğinden metal yapı hızla korozyona uğrayacaktır. Polarite kontrolü yapılırken avometrenin (+) ucu referans elektroda, (-) ucu ölçü kutusundaki pirinç vidaya temas ettirilir. Bu durumda avometrenin ekranından negatif bir değer okunmuyorsa redresör çıkış bağlantıları doğru yapılmıştır. Ekranda negatif bir değer okunuyorsa redresör çıkış bağlantı uçları değiştirilmelidir.*
- 2- *Dış akım kaynaklı katodik koruma sisteminde en sık görülen arızalar T/R ünitesinde meydana gelir. Bu arızaların başında köprü diyot arızaları ilk sırada yer alır. Söz konusu diyotların arızalı olup olmadığını avometrenin Ohm soketini kullanarak tespit etmek mümkündür.*
- 3- *T/R ünitesinden normalden daha fazla akım çekilmesine rağmen potansiyel değeri normal ise bu duruma izole flaşlardan birinin görevini yapmadığı, çevredeki diğer metal yapıların kaçak akım etkilerini olduğu, metal yapıya ilave yapılmış olması ve metal yapının kaplamasının zarar görmüş olması gibi sorunlar neden olabilir.*
- 4- *T/R ünitesinin potansiyeli normal iken akımın normalden daha az olması durumu anot yatağındaki bazı anotların devre dışı kalması ya da anot yatağının kuruması gibi sorunlardan kaynaklanabilir.*

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İŞ GÜVENLİĞİ, SAĞLIĞI VE YANGINLA MÜCADELE

İş kazalarını önlemek amacı ile güvenli çalışma ortamını oluşturmak için alınması gereken tedbirler dizisine *İş Güvenliği* denir. İşçi sağlığı bilimi; tüm mesleklerde çalışanların sağlıklarını sosyal, psikolojik ve fiziksel olarak en üst seviyede tutmak, çalışma şartlarını ve üretim araçlarını sağlığa uygun hâle getirmek, çalışanları çalışma ortamlarının tüm zararlı etkilerinden koruyarak işin ve işçinin birbirine uyumunu sağlamak üzere kurulmuş mühendislik ve tıp disiplinlerini temel alan entegre bilim dalıdır.

Hızlı sanayileşme ve teknolojik gelişmeler ile doğru orantılı olarak özellikle iş yerlerinde çalışan kişilerin güvenliği ile ilgili bazı sorunlar da açığa çıkmıştır. Bu sebeple birtakım önlemleri önceden alarak iş yerlerini güvenli hâle getirmek gerekmekte olduğundan iş güvenliği oldukça önem kazanmıştır.

İşçi sağlığı ve güvenliğin temel ilkeleri, iş yerlerinde işin yürütülmesi ile ilgili olarak oluşan tehlikelerden, sağlığa zarar verebilecek şartlardan korunmak ve daha insanî bir iş ortamı meydana getirmek için yapılan metotlu çalışmaları; genel anlamda, hem çalışanları korumayı hem de bütün işletmenin ve üretimin güvenliğini, yani etraftakilerin ve çevrenin korunmasını esas alan tedbirleri; iş yerinde çalışan işçilerin sağlığını ve iş güvenliğini sağlamayı, bir başka ifadeyle, iş yerinde doğabilecek, iş kazası ve meslek hastalıkları gibi her türlü riske karşı gerekli tedbirleri almayı, bu husustaki şartları yerine getirmeyi, bu hedefleri yerine getirmeye yardımcı olabilecek araç-gereçlerin eksiksiz bulundurulmasını öngören, genelde bunların uygulanmasından işverenin sorumlu tutulduğu ve/fakat işçilerin de, öngörülen tedbirlerle ilgi olarak usul ve şartlara uymalarını içermektedir.

$$0.1143 = 1 / [1 + 4/(24.87)^2 [x - 37.85]^2]$$

$$1197 = [x - 37.85]^2$$

$$X = 72.44 \text{ m}$$

Sonuç olarak tesiste depolara en yakın bina en az **75 metre** olmalıdır.

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İçindekiler

<i>Ön Söz</i>	iii
<i>Şekiller</i>	ix
<i>Tablolar</i>	xiii
1. Tarihî Gelişim	1
1.1 Yeryüzünün şekli ve büyüklüğü	1
1.1.1 Eratostenes'in haritası ve yerkürenin çevre uzunluğu .	2
1.1.2 Batlamyus'un coğrafyaya katkıları	4
1.1.3 Orta Çağ Avrupası'nda coğrafya	5
1.1.4 El-Birûnî'nin coğrafyaya katkıları	6
1.2 Denizlerin ve yeni karaların keşfi	9
1.2.1 Portekizlilerin keşifleri	9
1.2.2 Kolomb'un seferi	13
1.2.3 Macellan'ın seferi	15
1.2.4 Pîrî Reis	16
1.3 Bilimsel seferler	18
2. Genel Kavramlar	21
2.1 Deniz bilimlerinin sınıflandırılması	21
2.2 Yerküre üzerinde konum ve mesafe belirleme	23
2.2.1 Konum belirleme	23
2.2.2 Kısa mesafelerin hesaplanması	25
2.2.3 Uzun mesafelerin hesaplanması	28
3. Okyanus ve Denizlerin Fiziksel Özellikleri	33
3.1 Okyanus ve denizlerin boyutları	33
3.2 Tipik bir okyanus kesiti	35
3.2.1 Kıyı bölgesi	35

3.2.2	Kıta sahanlığı	36
3.2.3	Dik eğim ve dip yükseltisi	36
3.2.4	Taban bölgesi	37
3.3	Dip materyalleri	38
3.4	Okyanuslarda sıcaklık ve tuzluluk dağılımları	39
3.4.1	Sıcaklık ve tuzluluk	39
3.4.2	Sıcaklık ve tuzluluğun enlemlere göre değişimi	40
3.4.3	Sıcaklığın derinlikle değişimi	41
3.4.4	Tuzluluğun derinlikle değişimi	42
3.5	Denizlerde ses yayılması	44
3.6	Denizlerde ışık yayılması	47
4.	Deniz Suyunun Yoğunluğu	51
4.1	Yoğunluk ve yoğunluk birimleri	51
4.1.1	Sıcaklık ve Tuzluluğun yoğunluk üzerine etkisi	52
4.1.2	Basıncın yoğunluk üzerine etkisi	53
4.2	Yoğunluk hesabı	54
4.2.1	Tablolarla yoğunluk hesabı	54
4.3	Yoğunluğunun dikey değişimi ve bir su sütunun kararlılığı	58
5.	Denizlerde Su, Tuz ve Isı Bütçesi	63
5.1	Hacmin korunumu	63
5.2	Tuzun korunumu	64
5.3	Hacmin ve tuzun korunumuna ait uygulamalar	65
5.3.1	Akdeniz	66
5.3.2	Karadeniz	67
5.3.3	Denize açık bir su havzası	68
5.4	Isı bütçesi	70
5.4.1	Denizlerde ısı bütçesini oluşturan katkılar	70
5.4.2	Işınım ile ısı yayılımının temelleri	72
5.4.3	Kısa ve uzun dalga ışınımı	74
5.5	Isı bütçesine ait uygulamalar	76
5.5.1	İki göletin ısı bütçesi	77
5.5.2	Derin bir deniz çukurundaki ısı bütçesi	79
6.	Temel Denklemler	81
6.1	Süreklilik denklemi	82
6.1.1	Sonlu farklar yaklaşımı ve hız gradyenti kavramı	85
6.1.2	Süreklilik denkleminin sayısal bir uygulaması	87
6.2	Hareket denklemi	93
6.2.1	İvme vektörü	93

6.2.2	Kuvvet vektörü	94
6.2.3	Momentum denklemi	99
6.2.4	Hidrostatik denklem	100
7.	Yerdönel Akıntılar	107
7.1	Yerdönel hareketin denklemi	109
7.2	Yerdönel akıntılarının yoğunluk ölçümleri yardımıyla hesabı	113
7.3	Yerdönel akıntı hız profili hesabı uygulaması	115
8.	Deniz Dalgaları	119
8.1	İdeal bir dalga formunun genel özellikleri	120
8.2	Küçük genlikli dalga kuramı	121
8.2.1	Su zerrelerinin hareketleri	124
8.2.2	Yayılm (dispersiyon) bağıntısı ve özel hâlleri	124
8.3	Dalga dinamik basıncı	131
8.4	Dalga grupları, grup hızı ve özel hâlleri	133
8.5	Dalga ortalama enerjisi ve enerji akısının korunumu ilkesi	138
8.6	Doğrusal olmayan dalga kuramları	148
8.7	Dalga kırılmaları	151
9.	Çeken Akıntılar	153
9.1	Çeken akıntılarının oluşumu	154
9.2	Çeken akıntılarda kum özelliklerinin önemi	156
9.3	Çeken akıntılarının gözlemlenmesi	157
9.4	Çeken akıntıdan kurtulma yolları	158
Ek A	Yoğunluk Hesabı İçin UNESCO Bağıntısı	161
Ek B	Yoğunluk Hesabı İçin Tablolar	163
Ek C	Ses Hızı Hesabı İçin UNESCO Bağıntısı ve Tablolar	183
	<i>Kaynaklar</i>	187
	<i>Konu Dizini</i>	191

Kaynaklar

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**G*Power Programıyla
Örnek Büyüklüğü Hesaplama ve Güç Analizi
(Power Analysis)**

Prof. Dr. Özkan Görgülü
Dr. Öğr. Üyesi Rıdvan Ergin



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Prof. Dr. Özkan Görgülü Dr. Öğr. Üyesi Rıdvan Ergin

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İçindekiler

Ön Söz	v
Giriş	1

BİRİNCİ BÖLÜM

1. Temel Kavramlar	5
1.1. Birim.....	5
1.2. Değişken (Karakter, Vasıf).....	6
1.2.1. Değişken Tipleri	6
1.2.1.1. Nitel (Kalitatif) Değişken.....	6
1.2.1.2. Nicel (Kantitatif) Değişken	7
1.3. Popülasyon (Evren, Kitle, Ana Kütle).....	7
1.4. Örnek	8
1.5. Örneklem	8
1.6. Örneklem Yöntemleri	10
1.6.1. Olasılıklı Örneklem Yöntemleri	11
1.6.1.1. Basit Tesadüfi Örneklem.....	11
1.6.1.2. Sistematik Örneklem	11
1.6.1.3. Tabakalı Basit Rastgele Örneklem	12
1.6.1.4. Küme Örneklemesi	13
1.6.2. Olasılıksız Örneklem Yöntemleri	14
1.6.2.1. Gönüllülerin Seçilmesi.....	14
1.6.2.2. Kolayda Örneklem	14
1.6.2.3. Kartopu Örneklemesi	15

İKİNCİ BÖLÜM

2.1. Hata Tipleri.....	17
2.2. Testin Gücü	20
2.3. Etki Büyüklüğü.....	21
2.4. Gruplara Dağıtım Oranı (Allocation Ratio, N_2/N_1)	25

ÜÇÜNCÜ BÖLÜM

3.1. Bilimsel Çalışmalarda Örnek Büyüklüğünün Hesaplanması (Sample Size)	27
3.1.1. G*Power Programı	27
3.2. A Priori Power Analizi ile Örnek Büyüklüğü Hesaplaması	40
3.2.1. Referans Çalışmanın İstatistik Değerleri Kullanarak Örnek Büyüklüğü Hesaplanması	40
3.2.2. Pilot Çalışma İstatistik Değerleri ile Örnek Büyüklüğü Hesaplanması	40
3.2.3. Standart Değerleri Kullanarak Örnek Büyüklüğü Hesaplanması	41

DÖRDÜNCÜ BÖLÜM

4. Korelasyon ve Regresyon Analizleri İçin Örnek Büyüklüğü Hesaplaması	43
4.1. Korelasyon Analizleri İçin Örnek Büyüklüğü Hesaplaması.....	43
4.1.1. Correlation: Bivariate Normal Model.....	43
4.1.2. Nokta-Çift Serili Korelasyon Katsayısı (Point Biserial Correlation).....	49
4.1.3. Tetrakorik Korelasyon Analizi (Correlation: Tetrahoric Model).....	52
4.2. Regresyon Analizleri İçin Örnek Büyüklüğü Hesaplaması.....	57
4.2.1. Linear Bivariate Regression: One Group, Size of Slope	58
4.2.1.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	58
4.2.1.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power)	66
4.2.2. Linear Multiple Regression: Fixed Model, R^2 Deviation From Zero	68
4.2.2.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	68
4.2.2.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power)	79
4.2.3. Logistic Regression	81
4.2.3.1. Logistic Regression (Bağımsız Değişken İki Önermeli Nitel Değişken).....	81
4.2.3.2. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	83
4.2.3.3. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power)	93
4.2.4. Logistic Regression (Bağımsız Değişken Sürekli Nicel Değişken).....	95
4.2.4.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	97
4.2.4.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power)	99

BEŞİNCİ BÖLÜM

5. Ortalama Karşılaştırmaları İçin Örnek Büyüklüğü Hesaplaması.....	103
5.1. One group: Difference from Constant (one sample case).....	104
5.1.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	104
5.1.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power)	110
5.2. Two Dependent Groups (matched pairs).....	112
5.2.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	112
5.3. Two Independent Groups	119
5.3.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	120
5.3.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power) ...	134
5.4. Many Groups: ANOVA: One-way (one independent variable).....	140
5.4.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	140
5.4.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power) ...	153

ALTINCI BÖLÜM

6.1. Repeated Measures	157
6.1.1. Repeated Measures: Between Factors, ANOVA-approach	158
6.1.1.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size).....	158
6.1.2. Repeated Measures: Within Factors, ANOVA-approach.....	165
6.1.2.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size).....	166
6.1.3. Repeated Measures: Within-Between Interactions, ANOVA-approach.....	175
6.1.3.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size).....	175

YEDİNCİ BÖLÜM

7. Ki-Kare Testi.....	183
7.1. Ki-Kare Uygunluk Testi (Goodness-of-fit tests: Contingency tables)	184
7.1.1. Örnek Büyüklüğü Hesaplaması (A Priori: Compute required sample size)	184
7.1.2. Testin Gücünün Hesaplanması (Post Hoc: Compute achieved power) ..	190

Kaynaklar	193
Son Söz	197

Kaynaklar

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İÇİNDEKİLER

ÖN SÖZ	iii
KISALTMALAR DİZİNİ	xiii
1. RADYO DALGALARI İLE YAYINIM	1
1.1. Radyo Dalgaları Temel Kavramlar	1
1.1.1. Frekans Bandları	3
1.1.2. Radyo Dalgalarının Genel Özellikleri	4
1.1.2.1. Kırılma	5
1.1.2.2. Yansıma	5
1.1.2.3. Kırınım	6
1.1.2.4. Emilim ve Zayıflama	6
1.1.2.5. Doppler Etkisi	7
1.1.3. Radyo Dalgaları Yayınım Tipleri	8
1.1.3.1. Yüzey Dalgaları	8
1.1.3.2. Gök Dalgaları	9
1.1.3.3. Uzay Dalgaları	12
1.1.3.4. Ducting	14
1.1.4. Yayınımında Ortaya Çıkan Problemler	14
1.1.4.1. Statik Parazit	14
1.1.4.2. Gece Etkisi (Fading)	14
1.1.4.3. Sessiz Bölge	15
1.1.4.4. Sessizlik Konisi	16
1.1.4.5. Sinyalin İrtifaya Bağlı Alınması	17
1.1.4.6. Düzensiz Kırılmalar	17
1.1.4.7. Atmosferik Etki	19
1.2. Radyo Vericisi	19
1.2.1. Osilatör	20
1.2.1.1. LC Osilatör	20
1.2.1.2. Kristal Osilatör	21
1.2.1.3. Mikrodalga Osilatör	21
1.2.2. Modülatör	22
1.2.3. Besleme Hattı	22
1.2.3.1. Açık Telli Dengeli Besleme Hattı	22

1.2.3.2. Koaksiyel Kablo	23
1.2.3.3. Dalga Kılavuzu	24
1.2.4. Antenler	24
1.2.4.1. Anten Polarizasyonu	25
1.2.4.2. Yayın Genişliği ve Direktiflik.....	26
1.2.4.3. Anten Kazancı.....	27
1.2.4.4. Yarım Dalga (Dipol) Anteni	27
1.2.4.5. Çeyrek Dalga (Marconi) Anteni.....	28
1.2.4.6. Çerçeve (Loop) Anteni	29
1.2.4.7. Parabolik Anten.....	29
1.2.4.8. Yagi Anteni.....	30
1.2.4.9. Heliks Anteni	30
1.3. Modülasyon	31
1.3.1. Genlik Modülasyonu (AM).....	32
1.3.2. Frekans Modülasyonu (FM)	34
1.3.3. Faz Modülasyonu	35
1.3.4. Darbe Modülasyonu	36
1.3.5. Verici Yayın Tanıtım Kodu	38
Kaynaklar.....	40
2. YERE DAYALI SEYRÜSEFER SİSTEMLERİ	41
2.1. Yön Bulucu (Gonyometre).....	41
2.1.1. VHF Yön Bulucu (VDF).....	43
2.1.1.1. Çalışma Prensibi.....	43
2.1.1.2. Hata Kaynakları ve Hassasiyet.....	44
2.1.2. Otomatik Yön Bulucu (ADF).....	45
2.1.2.1. Çalışma Prensibi.....	46
2.1.2.2. ADF Yer İstasyonları.....	50
2.1.2.3. ADF Göstergeleri	51
2.1.2.4. Hata Kaynakları	53
2.1.2.5. Menzile Etki Eden Faktörler	54
2.2. VOR (VHF Omnidirectional Range)	55
2.2.1. Çalışma Prensibi	55
2.2.2. VOR Tipleri.....	58
2.2.3. VOR Göstergeleri	60
2.2.4. Hata Kaynakları.....	63
2.2.5. Menzil ve Kapsama Alanına Etki Eden Faktörler.....	64
2.3. Mesafe Ölçüm Ekipmanı (DME).....	65
2.3.1. Çalışma Prensibi	66
2.3.2. Menzile Etki Eden Faktörler	68
2.3.3. Hassasiyet.....	68

2.4. Aletli İniş Sistemi (ILS).....	69
2.4.1. ILS Yer Ekipmanları	70
2.4.1.1. Localizer (LLZ)	70
2.4.1.2. Glide Path/Slope (GP/GS)	71
2.4.1.3. Marker	72
2.4.2. Çalışma Prensibi	73
2.4.2.1. Localizer	73
2.4.2.2. Glide Path/Slope	75
2.4.2.3. Marker	76
2.4.3. ILS Göstergeleri	77
2.4.4. ILS Yaklaşma Kategorileri	78
2.4.5. Hata Kaynakları ve Menzili Etkileyen Faktörler	81
2.5. Mikrodalga İniş Sistemi (MLS).....	84
2.5.1. MLS Yer Ekipmanları	85
2.5.1.1. Yatay Tarama (Azimuth) Antenleri	85
2.5.1.2. Dikey Tarama (Elevation) Antenleri	86
2.5.1.3. Hassas DME (P-DME)	87
2.5.2. Çalışma Prensibi	87
2.5.3. Hata Kaynakları	90
2.6. Radar	90
2.6.1. Çalışma Prensiplerine Göre Sınıflandırma	90
2.6.1.1. Darbe Radarı	91
2.6.1.2. Birincil Radar Denklemi	92
2.6.1.3. Sürekli Dalga Radarı	93
2.6.2. Tasarım Parametreleri	93
2.6.2.1. Darbe Tekrarlama Frekansı	93
2.6.2.2. Darbe Genişliği	94
2.6.2.3. Frekans Seçimi	95
2.6.2.4. Verici Gücü	95
2.6.2.5. Anten Dönüş Hızı	96
2.6.3. Yer Radar Sistemleri	97
2.6.3.1. Birincil İzleme Radarı (PSR)	97
2.6.3.2. İkincil İzleme Radarı (SSR)	99
Kaynaklar	108
3. UÇAK ÜZERİNDEKİ SEYRÜSEFER SİSTEMLERİ.....	109
3.1. Doppler Radarı	109
3.1.1. Çalışma Prensibi	109
3.1.2. Doppler Radarı Göstergesi	111
3.1.3. Hata Kaynakları	112
3.2. Hava Radarı	113

3.2.1. Hava Radarı Bileşenleri	113
3.2.1.1 Alıcı/Verici Ünitesi	114
3.2.1.2. Anten	114
3.2.1.3. Kontrol Birimi	116
3.2.1.4. Gösterge	117
3.2.2. Çalışma Prensibi	118
3.2.3. Menzile Etki Eden Faktörler	118
3.3. Radar Altimetre	119
3.3.1. Çalışma Prensibi	119
3.3.2. Radar Altimetre Göstergesi	121
3.4. Yere Yakınlık Uyarı Sistemi (GPWS)	122
3.4.1. Gelişmiş Yere Yakınlık Uyarı Sistemi (EGPWS)	123
3.4.2. Çalışma Modları	123
3.5. Trafik Uyarı ve Çarpışma Önleme Sistemi (TCAS)	128
3.5.1. TCAS Tipleri	131
3.5.2. Çalışma Prensibi	131
3.6. Atalet Ölçüm Sistemi (INS/IRS)	133
3.6.1. İvmeölçer	133
3.6.2. Dengeli Platform	134
3.6.3. Kontrol ve Gösterge Paneli	136
3.6.4. IRS	137
3.7. Saha Seyrüseferi (RNAV)	139
3.7.1. İki Boyutlu B-RNAV Yol Hesabı	140
3.8. Uçuş Yönetim Sistemi (FMS)	142
3.8.1. Uçuş Yönetim Bilgisayarı (FMC)	144
3.8.2. Kontrol ve Gösterge Ünitesi (CDU)	146
Kaynaklar	147
4. UYDUYA DAYALI SEYRÜSEFER SİSTEMLERİ	149
4.1. Giriş	149
4.2. Uydularla Konum Belirleme	151
4.3. GPS	152
4.3.1. Gelişim Tarihçesi	152
4.3.2. Zaman ve Koordinat Sistemi	153
4.3.3. Hizmet Tipleri	154
4.3.4. Yayın Frekansları	155
4.3.5. Uzay Bölümü	156
4.3.6. Yer Kontrol Bölümü	158
4.3.7. Uydu Sinyal Bileşenleri	159
4.3.7.1. İkili Faz Kaydırmalı Anahtarlama (BPSK)	160
4.3.7.2. Menzil Ölçüm Kodları	161

4.3.7.3. Seyrüsefer Mesajı	163
4.3.7.4. GPS L1 Yayını	167
4.3.7.5. GPS L2 Yayını	169
4.3.7.6. GPS L5 Yayını	170
4.4. GLONASS	172
4.4.1. Gelişim Tarihçesi	172
4.4.2. Zaman ve Koordinat Sistemi	172
4.4.3. Hizmet Tipleri	173
4.4.4. Yayın Frekansları	174
4.4.5. Uzay Bölümü	175
4.4.6. Yer Kontrol Bölümü	177
4.4.7. Uydu Sinyal Bileşenleri	177
4.4.7.1. Modülasyon	178
4.4.7.2. Menzil Ölçüm Kodları	178
4.4.7.3. Seyrüsefer Mesajı	178
4.4.7.4. GLONASS L1 Yayını	181
4.4.7.5. GLONASS L2 Yayını	182
4.4.7.6. GLONASS L3 Yayını	182
4.5. Galileo	183
4.5.1. Gelişim Tarihçesi	183
4.5.2. Zaman ve Koordinat Sistemi	184
4.5.3. Hizmet Tipleri	185
4.5.4. Yayın Frekansları	185
4.5.5. Uzay Bölümü	186
4.5.6. Yer Kontrol Bölümü	187
4.5.7. Uydu Sinyal Bileşenleri	188
4.5.7.1. İkili Kaydırılmış Taşıyıcı (BOC)	188
4.5.7.2. Menzil Ölçüm Kodları	189
4.5.7.3. Seyrüsefer Mesajı	190
4.5.7.4. Galileo E1 Yayını	194
4.5.7.5. Galileo E5 Yayını	194
4.5.7.6. Galileo E6 Yayını	195
4.6. BeiDou	195
4.6.1. Gelişim Tarihçesi	195
4.6.2. Zaman ve Koordinat Sistemi	196
4.6.3. Hizmet Tipleri	197
4.6.4. Yayın Frekansları	197
4.6.5. Uzay Bölümü	199
4.6.6. Yer Kontrol Bölümü	200
4.6.7. Uydu Sinyal Bileşenleri	200

4.6.7.1. Dörtlü Faz Kaydırmalı Anahtarlama (QPSK)	201
4.6.7.2. Menzil Ölçüm Kodları	204
4.6.7.3. Seyrüsefer Mesajı	204
4.6.7.4. BeiDou-3 B1 Yayını	210
4.6.7.5. BeiDou-3 B2 Yayını	211
4.6.7.6. BeiDou-3 B3 Yayını	212
4.7. GNSS Hata Kaynakları	213
4.7.1. Uydu Saat Hatası	213
4.7.2. Uydu Grup Gecikme Hatası	214
4.7.3. Uydu Yörünge Hatası	214
4.7.4. İyonosfer Hatası	215
4.7.5. Troposfer Hatası	215
4.7.6. Çoklu Yol Hatası	216
4.7.7. Alıcı Gürültüsü	216
4.7.8. Uydu Geometri Hatası	217
4.7.9. Kasıtlı Hata Kaynakları	218
4.7.9.1. Seçimli Kullanılabilirlik (Selective Availability)	218
4.7.9.2. Sinyal Bozma (Jamming)	218
4.7.9.3. Yanıltıcı Yayın (Spoofing)	218
4.7.10. Toplam Hata Ölçütleri	219
4.8. Bölgesel Uyduya Dayalı Konum Belirleme Sistemleri	220
4.8.1. QZSS	221
4.8.2. IRNSS	223
4.9. Performans Artırım Yöntemleri	225
4.9.1. Uyduya Dayalı Performans Artırımı (SBAS)	226
4.9.2. Yere Dayalı Performans Artırımı (GBAS)	230
4.9.3. Uçağa Dayalı Performans Artırımı (ABAS)	234
4.9.3.1. RAIM	234
4.9.3.2. AAIM	236
Kaynaklar	238
5. CNS-ATM SİSTEMLERİ	243
5.1. Tarihçe	243
5.2. Haberleşme	246
5.2.1. Sesli Haberleşme	248
5.2.2. Yer Birimleri Arasındaki Haberleşme	250
5.2.2.1. Havacılık Sabit Haberleşme Ağı (AFTN)	251
5.2.2.2. ICAO Ortak Veri Değişim Ağı (CIDIN)	252
5.2.2.3. Havacılık Mesaj İşleme Sistemi (AMHS)	252
5.2.3. Hava ve Yer Arasındaki Haberleşme	253

5.2.3.1. Uçak Haberleşme, Adresleme ve Raporlama Sistemi (ACARS)	259
5.2.3.2. Havacılık Haberleşme Ağı (ATN).....	259
5.2.4. Geleceğe Dönük Haberleşme Uygulamaları.....	261
5.2.4.1. Bağlantı Kurma	264
5.2.4.2. Kontrolör-Pilot Veri Hattı Haberleşmesi (CPDLC)	265
5.2.4.3. Veri Hattı Uçuş Bilgi Hizmeti (DFIS)	265
5.3. Seyrüsefer	266
5.4. Gözetim	272
5.4.1. Çoklu Statik PSR (MSPSR)	273
5.4.2. Multilaterasyon	274
5.4.3. Otomatik Bağımlı Gözetim Yayını (ADS-B)	276
5.4.3.1. ADS-B Out ve ADS-B In	277
5.4.3.2. ADS-R.....	278
5.4.3.3. TIS-B ve FIS-B	278
5.4.3.4. Uzay Temelli ADS-B	279
5.4.3.5. ADS-B Mesaj Yapısı	280
5.4.4. Otomatik Bağımlı Gözetim Kontratı (ADS-C).....	280
5.5. Hava Trafik Yönetimi	284
5.5.1. Hava Trafik Hizmetleri	285
5.5.2. Hava Trafik Akış Yönetimi.....	287
5.5.3. Hava Sahası Yönetimi.....	287
Kaynaklar.....	288

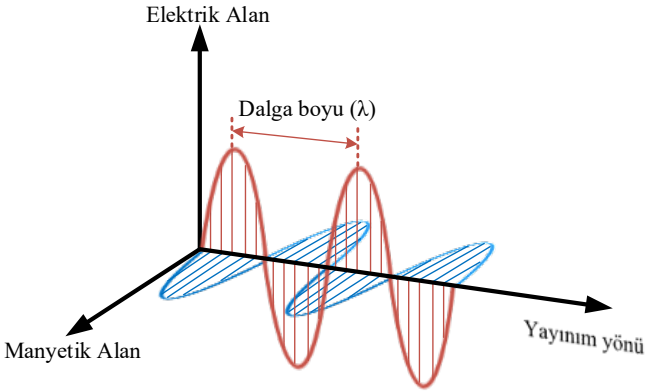
DİZİN	291
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1

RADYO DALGALARI İLE YAYINIM

1.1. Radyo Dalgaları Temel Kavramlar

Elektromanyetik dalgalar, yüklü bir parçacığın ivmeli hareketi sonucu oluşan bir enerji türüdür. Biri elektrik alan, diğeri manyetik alan olmak üzere aynı fazda birbirine dik iki bileşenden oluşmaktadır ve her ikisi de sinüs fonksiyonu formundadır. Elektromanyetik dalga ise bu iki alanın oluşturduğu düzleme dik doğrultuda ilerler (Şekil 1.1). Elektromanyetik dalgaların yayılmaları için ortam gerekmezken, boşlukta ışık hızı ($c = 3 \times 10^8$ m/s) ile yayılırlar.



Şekil 1.1. Elektromanyetik dalga

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2

YERE DAYALI SEYRÜSEFER SİSTEMLERİ

2.1. Yön Bulucu (Gonyometre)

Hava taşımacılığında, uçağı yayın yapan istasyona veya havaalanına doğru yönlendirme amacına hizmet eden *VDF* (VHF Direction Finder) ve *ADF* (Automatic Direction Finder) olmak üzere iki tip yön bulucu seyrüsefer sistemi kullanılmaktadır. *Gonyometre* olarak da isimlendirilen bu iki sistem pilota, Şekil 2.1’de görüldüğü gibi uçaktan istasyona olan QDM (manyetik kerteriz) ve istasyondan uçağı olan QDR (gerçek kerteriz) açılarını verir. Bilindiğı üzere radyo dalgaları dünyanın manyetizmasından etkilendikleri için bu açılar gerçek kuzeye göre değil, manyetik kuzeye göre belirlenir. Gerçek kuzeye göre uçaktan istasyona olan açı QUJ ve yine gerçek kuzeye göre istasyondan uçağı olan açı ise QTE olarak isimlendirilir. Pilotun istasyona veya havaalanına yönelmesi için ihtiyaç duyduğu açı, QDM değeridir.

IAS/Mach No gibi bilgilerin de ilave olarak iletilmesi öngörülmektedir. Bu sayede olası çarpışma tehlikelerinin önceden tahmin edilerek çözülmesi ve emniyetin yüksek oranda artırılması planlanmaktadır.

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3

UÇAK ÜZERİNDEKİ SEYRÜSEFER SİSTEMLERİ

3.1. Doppler Radarı

Uçak üzerinde bulunan ve uzun menzilli uçuşlarda pilotlara yer hızı ile sürüklenme açısı bilgilerini sağlayan bir seyrüsefer yardımcısıdır. Doppler radarının yerini daha modern sistemler almasına rağmen, eski nakliye uçaklarında ve helikopterlerde hâlen kullanılmaktadır.

3.1.1. Çalışma Prensibi

Doppler radarının hassasiyeti ve doğruluğu yayın frekansı ile artar. Frekansın artması sinyalin yansıma, saçılma ve emilim etkilerini daha fazla artırır. Bu nedenle operasyonel kullanım yüksekliği, güç çıkışı ve uçağın hızı gibi faktörler dikkate alınarak çalışma frekansı SHF bandında 8800 MHz ve 13300 MHz olarak tanımlanmıştır. Bu sistemin çalışma prensibi, adından da anlaşılacağı üzere Doppler etkisine dayalıdır. Daha önce detaylı bir şekilde açıklandığı üzere bir verici ve alıcı arasında göreceli bir hareket olduğunda, bunların hareketiyle orantılı bir frekans kayması meydana gelir. Frekanstaki bu değişiklik Doppler kayması ya da Doppler frekansı olarak adlandırılır. Bu etki Doppler radarına uyarlandığında uçağın hareketinin bir sonucu olarak yerden yansıyan sinyaldeki frekans kaymasının sürekli ölçülmesiyle uçağın yol boyunca yere göre hızı ve sürüklenme açısı belirlenir.

İşlem ve durum bildirim tuş grubu FMS'in etkin hâle getirilmesi, uçuş planının görüntülenmesi ve modifikasyonu, uçuş planının hazırlanması veya güncellenmesi için kalkış, düz uçuş ve iniş aşamalarına ait bilgilerin seçilmesi amacı ile kullanılır. Örneğin 'DEP ARR' tuşu ile pilot, kalkış ve iniş yapacağı meydanlara ait ilgili prosedürleri ve uygun pisti seçebilir. Satır seçim tuşları ise seçilen satıra alfa nümerik tuş grubu kullanılarak veri girişi yapılmasını sağlar. Ekranın her iki tarafında altışar tane olmak üzere 12 adet satır seçim tuşu bulunmaktadır. FMC kabin ekibinden veri talep ettiğinde ilgili satırda soru işareti belirir. Örneğin FMC'nin kalkış yapılacak meydandaki yolcu yükleme için tanımlanmış kapı numarasını talep ettiğini varsayalım. Bu durumda pilot hızlı işlem belleği satırına istenen bilgiyi alfa nümerik tuş grubunu kullanarak girer. Yedinci satırda görünen bu bilgiyi ilgili satır seçim tuşuna dokunarak aktif hâle getirir ve satırda görüntülenmesini sağlar.

Bunlara ek olarak tuş takımının iki yanında 4 adet uyarı ışığı da bulunmaktadır. Şekil 3.34'de görüldüğü gibi sağ üstteki beyaz ışık (MSG) bir uyarı veya öneri mesajı olduğunu, altındaki beyaz ışık (OFFSET) uçağın uçuş planında tanımlı yola paralel uçtuğunu göstermektedir. Tuş takımının sol üst kısmındaki beyaz ışık (DISPLAY) ekranda görünen bilgilerin aktif uçuş planı veya seçilen operasyonel uçuş modu ile ilgili olmadığını, son olarak sol alttaki amber renkli ışık ise FMC'de bir arıza tespit edildiğini göstermektedir.

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4

UYDUYA DAYALI SEYRÜSEFER SİSTEMLERİ

4.1. Giriş

Günümüzde kara, hava ve deniz taşımacılığında çok yaygın bir şekilde kullanılan ve uygulama alanları her geçen gün artan uydu seyrüsefer sistemlerinin tarihsel gelişim süreci 1950’li yıllara kadar uzanmaktadır. Sovyetler Birliği’nin 1957’de *Sputnik I*’i yaklaşık bir ay sonrasında da *Sputnik II* ve *Sputnik III* uydularını uzaya başarılı bir şekilde göndermesinin ardından, dünyanın uzaydan incelenme fikrinin oluşması ile başlayan çalışmalar, bugün tüm dünya ülkeleri tarafından kullanılan evrensel bir teknolojiye dönüşmüştür. Sovyetler Birliği’nin ardından Amerika da 1958 yılında ilk yapay uydusu olan *Explorer I* ile *Vanguard-1*’i başarılı bir şekilde yörüngeye oturtarak uzay çalışmalarına hız kazandırmıştır. Sputnik I’in radyo sinyallerini inceleyen bilim adamları, Doppler etkisi nedeniyle iletilen sinyalin frekansındaki değişiklikleri gözlemlemişlerdir. Uydu konumunun radyo sinyalinin frekansındaki kayma yolu ile yerden belirlenebilmesi durumunda, bir alıcının yerdeki konumunun da uyduya uzaklığına göre belirlenebileceğini tespit etmişlerdir. Bu fikir çerçevesinde 1959 yılında dünyanın ilk uydu seyrüsefer sistemi olarak tarihe geçen *Transit*, Amerika Birleşik Devletleri Donanması tarafından kullanılmaya başlamıştır. Başlangıçta güdümlü füzelerin hassasiyetini artırmak ve gemilerin konumlarını belirlemek amacıyla kullanılan bu sistem, 1964 yılından 1996 yılına kadar iki boyutlu konum belirleme amacıyla kesintisiz bir şekilde hizmet

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5

CNS-ATM SİSTEMLERİ

5.1. Tarihçe

Haberleşme, Seyrüsefer, Gözetim ve Hava Trafik Yönetimi (*CNS-ATM*: Communication, Navigation, Surveillance and Air Traffic Management), 1980'li yıllarda hava taşımacılığına olan talebin artmasıyla birlikte mevcut hava seyrüsefer hizmet ve altyapısının yeterliliğinin değerlendirilmesi neticesinde ortaya çıkmış bir kavramdır. İlk olarak Geleceğin Hava Seyrüsefer Sistemleri (*FANS*: Future Air Navigation Systems) olarak adlandırılan bu kavram ile teknolojik gelişmelere paralel olarak hava trafiğinin daha emniyetli ve etkin bir şekilde yönetilmesi, hava sahası kapasitesinin ve operasyonel verimliliğinin artırılması hedeflenmiştir. Veri hattı uygulamaları, uydu seyrüsefer sistemleri gibi modern teknolojilerin kullanımı sayesinde gerek uçak, gerekse yerdeki sistem kabiliyetlerinin artırılması ve bu kapsamda bir takım yenilikçi prosedürlerin uygulanması öngörülmüştür.

CNS-ATM kavramının gelişimi iki aşamada gerçekleşmiştir. İlk olarak 1983 yılında Uluslararası Sivil Havacılık Teşkilatı (*ICAO*: International Civil Aviation Organization), uzun vadeli hava trafik tahminlerine dayalı olarak mevcut hava seyrüsefer alt yapısının değerlendirilmesi amacıyla özel bir FANS komitesi kurmuştur. ICAO'ya üye ülkelerden ve uluslararası organizasyonlardan oluşan bu Komitenin 1988 yılında yayınladığı raporda; dünya genelinde hızlı bir büyümenin yaşandığı hava taşımacılığında mevcut haberleşme, seyrüsefer ve gözetim sistemlerinin belirli kapsama alanı ve kapasite dâhilinde çalışması, sesli haberleşmeden

ve taktiksel olarak planlanması amacıyla oluşturulan hava trafik yönetim fonksiyonlarından biridir. Hava sahası yönetiminin temel amacı, hava sahalarının daha esnek ve dinamik olarak yönetilebilmesi, uçuş operasyonlarını kısıtlayan faktörleri en aza indirgeyecek şekilde hava sahası hacminin boyut, şekil ve zaman olarak düzenlenmesi ile hava sahalarının yapısal ve trafik akış karakteristiklerine bağlı olarak karmaşıklığının azaltılması için gereken düzenlemeleri sağlamaktır. Stratejik ve taktiksel olmak üzere iki tip hava sahası yönetimi söz konusudur. Stratejik hava sahası yönetimi, hava sahalarının uzun vadede daha esnek kullanımına yönelik planlamaları, taktiksel hava sahası yönetimi ise hava sahalarının dinamik kullanımını ve sivil-asker koordinasyonu gibi konu başlıklarını kapsar.

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Prof. Dr. Öner Yusuf Toraman



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İÇİNDEKİLER

SUNUŞ	iii
TEŞEKKÜR.....	v
ŞEKİLLER LİSTESİ	xv
TABLolar LİSTESİ.....	xix
BÖLÜM I.....	1
KALSİT	1
Kalsit ve Ürünleri.....	3
1. Kalsit	3
1.1. Kalsiyum Karbonat Formları.....	6
1.2. Kristal Formları	9
2. Kalsit Oluşumu.....	11
2.1. Organik Oluşum	11
2.2. İnorganik Oluşum.....	12
3. Kalsitin Özellikleri	13
4. Kalsit Ürünleri.....	14
4.1. Mozaik	14
4.2. Mikronize (Öğütülmüş) Kalsit (GCC).....	15
4.3. Slurry (Sulu) Kalsit	20
4.4. Kaplı (Modifiye) Kalsit (MCC).....	21
4.5. Fonksiyonel (İşlevselleştirilmiş) Kalsiyumkarbonat (FCC)	23
4.6. Presipite (Çöktürülmüş) Kalsit	24
4.6.1. PCC-GCC Farkı	30
4.6.2. Türkiye’de PCC Üretimi	32
4.6.3. PCC Kullanımı	32
Kaynaklar.....	36
Dünyada ve Türkiye’de Kalsit	39
1. Dünyada Kalsit.....	39
1.1. Kalsit Üreticisi Firmalar	41
2. Türkiye’de Kalsit	45
2.1. Niğde Kalsit Potansiyeli	47
2.2. Niğde’deki Kalsit Üreticisi Firmalar	48
Kaynaklar.....	49

BÖLÜM II	51
KALSİT MADENCİLİĞİ	51
Kalsit Madenciliği ve Arazi İyileştirme.....	53
1. Açık Ocak Madenciliği	53
1.1. Delik Düzeni	55
1.2. Ateşleme Sırası.....	55
2. Maden Hukuku ve Ruhsatlandırma	58
3. Arazi İyileştirmesi	61
3.1. İyileştirme Modülleri.....	62
3.1.2. Yeniden Düzenleme	63
3.1.3. İyileştirme	64
3.1.4. İzleme ve Denetim	64
Kaynaklar	65
Taş Seçme (Ayıklama)	67
1. Elle Ayıklama.....	67
2. Otomatik Ayıklama	68
2.1. Şarjlı Kaplin Cihazları.....	71
2.2. Yakın Kızılötesi Kamera	71
3. Kalsit Madenciliğinde Optik Ayırma	73
Kaynaklar	76
Kayaç/Agregalara Uygulanan Testler	77
1. Fiziksel Testler	77
1.1. Özgül Ağırlık	78
1.2. Ağırlıkça Su Emme	79
1.3. Birim Hacim Ağırlık	80
1.4. Porozite	81
1.5. Sertlik Testleri	82
1.5.1. <i>Mohs</i> Sertliği	83
1.5.2. <i>Schmidt</i> Sertliği	84
1.5.3. <i>Shore</i> Sertliği.....	88
1.5.4. <i>Brinell</i> Sertliği	90
1.5.5. <i>Vickers</i> Sertliği	92
1.5.6. <i>Cerchar</i> Sertliği.....	93
1.5.7. <i>Knoop</i> Sertliği	94
1.5.8. <i>Batma</i> Sertliği.....	95
1.5.9. <i>Leeb</i> Sertliği	96
2. Fiziko-Mekanik Testler	97
2.1. Tek Eksenli Basınç Dayanımı	97

2.2. <i>Brazilian</i> Dolaylı Çekme Deneyi	99
2.3. Nokta Yük Deneyi.....	100
2.4. <i>Los Angeles</i> Aşınma İndeksi Deneyi	103
2.5. Darbe Dayanım Deneyi	106
2.6. S ₂₀ Kırılma Testi.....	107
2.7. Agregada Darbe Dayanımı.....	108
2.8. Agregada Kırılma (Ezilme) Dayanımı	111
2.9. Kırılabilirlik Testi.....	113
3. Numune/Örnek Azaltma (Örnekleme)	114
3.1. El ile Örnek Azaltma	115
3.1.1. Dikdörtgen yöntemi.....	115
3.1.2. Kareleme-küreklenme yöntemi	115
3.1.3. Konileme-dörtleme yöntemi.....	116
3.2. Otomatik Örnek Azaltma	117
3.2.1. Numune Bölücü (<i>Bölgeç</i>).....	118
3.2.2. Rotari (Dönen) Numune Bölücü	119
Kaynaklar.....	120
BÖLÜM III.....	125
KIRMA ve ELEME	125
Kırma Teknolojileri ve Kırıcı Seçimi	127
1. Kırma	127
2. Kırıcı Ekipmanlar.....	130
2.1. Primer (Birincil) Kırıcılar.....	131
2.2. Sekonder (İkincil) Kırıcılar	134
3. Kırılacak Malzeme Özellikleri	137
4. Kırıcıların Seçiminde Bazı Kriterler	138
5. Yardımcı Ekipmanlar	139
5.1. Bunkerler.....	139
5.1.1. Ana Besleme Bunkerleri.....	140
5.1.2. Ara Bunker	141
5.1.3. Silolar	141
5.2. Besleyiciler.....	142
5.2.1. Titreşimli Besleyici	142
5.2.2. Apron (Paletli) Besleyici	143
5.2.3. Vibro Besleyici.....	144
5.2.4. Bantlı Besleyici	144
Kaynaklar.....	145

Eleme Teknolojileri.....	147
1. Eleme	147
2. Endüstriyel Elekler.....	148
2.1. Hareketli Izgara.....	148
2.2. Tromel Elek.....	149
2.3. Vibro Elek	149
2.4. Sarsıntılı/Titreşimli (Sarsak) Elek	149
3. Elek Temizleme Topları.....	150
Kaynaklar.....	151
BÖLÜM IV.....	153
MİKRONİZE ÖĞÜTME	153
Öğütme ve Değirmenler.....	155
1. Öğütme.....	155
2. Değirmenler.....	156
Kaynaklar.....	158
Bilyalı Değirmenler	159
1. Bilyalı Değirmenler.....	159
2. Değirmen Elemanları	162
2.1. Gövde	162
2.2. Astarlar.....	163
3. İşletme Parametreleri.....	165
Kaynaklar.....	166
Karıştırmalı Bilyalı Değirmenler	167
1. Karıştırmalı Değirmenler	167
2. İşletme Parametreleri.....	170
3. Karıştırmalı Değirmen Çeşitleri	171
Kaynaklar.....	172
Öğütme Devreleri ve Tesis Örnekleri.....	173
1. Öğütme Devreleri.....	173
2. Pilot Tesis Örneği.....	176
3. Kalsit Üretim Tesisi	177
3.1.2. Vidalı Besleyici.....	179
3.1.3. Elevatör	180
3.1.4. Jet Pulse Torbalı Filtre	180
3.1.5. Radyal Vantilatör	181
3.1.6. Blower.....	182

Kaynaklar.....	183
BÖLÜM V.....	185
SEPERASYON.....	185
Seperatörler (Havalı Ayırıcılar).....	187
1. Sınıflandırma.....	187
3. Sınıflandırıcı Türleri.....	189
4. Statik Ayırıcılar.....	190
5. Dinamik Ayırıcılar.....	192
Kaynaklar.....	193
BÖLÜM VI.....	195
KAPLAMA.....	195
Yüzey Modifikasyonu.....	197
1. Yüzey Modifikasyonu.....	197
2. Aktivasyon Prosesi ve Ekipmanları.....	202
2.1. Titreşimli Değirmende Kaplama.....	205
2.2. Jet Değirmende Kaplama.....	206
2.3. Yörüngesel Değirmende Kaplama.....	207
2.4. Karıştırırmalı Bilyalı Değirmende Kaplama.....	209
Kaynaklar.....	210
Endüstriyel Kaplama Sistemleri.....	213
1. Kaplama Sistemleri.....	213
1.1. Pinli Değirmen.....	213
1.1.1. <i>ECUTEK</i> SMW Pinli Değirmen.....	220
1.1.2. <i>Netsche Sierra</i> Pinli Değirmen.....	221
1.2. <i>Raymond</i> Değirmen.....	222
1.3. Turbo Değirmen.....	225
Kaynaklar.....	227
Kaplı Kalsitin Plastikte Kullanımı.....	229
1. Plastik.....	229
2. Plastik Türleri.....	230
2.1. Termoplastik.....	230
2.2. Termoset.....	231
2.3. Elastomer.....	231
3. Plastik Üretimi.....	231
4. Kalsitin Plastikte Kullanımı.....	234

4.1. Masterbach Üretimi.....	235
4.2. Kompaund Üretimi.....	236
4.3. Kompaund ve Masterbach Farkı	237
Kaynaklar.....	238

BÖLÜM VII.	239
PAKETLEME ve İSG.....	239

Paketleme İşlemleri ve İş Güvenliği.....	241
1. Maden Paketleme İşçisi (Kalsit).....	241
2. Mikronize Kalsit Paketleme	242
2.1. Paketleme Çeşitleri.....	242
2.1.1. Kraft Torba.....	242
2.1.2. PP (Polipropilen) Torba	242
2.1.3. Big-Bag	243
2.1.4. Sling (Şilink) Bag.....	243
2.1.5. Palet.....	244
2.2. Paketleme Ekipmanları.....	245
2.2.1. Palet Streç Sarma Makinesi.....	245
2.2.2. Otomatik Palet Streçleme Makinesi	246
3. Dolum Makineleri	246
3.1. Torba Dolum Makinesi (TDM).....	246
3.1.1. Ventilli-Pnömatik Beslemeli TDM	247
3.1.2. Ventilli-Vida Beslemeli TDM.....	248
3.1.3. Big-Bag Dolum Makinesi	249
4. Risk Değerlendirmesi.....	250
5. İSG Önlemleri	250
5.1. Maruziyet Belirtileri ve Semptomları.....	252
5.2. Acil Müdahale Prosedürleri.....	253
5.3. Çalışma Alanı Kontrolü.....	253
5.4. Depolama	253
5.5. Kişisel Koruyucu Donanımlar	254
Kaynaklar.....	256

BÖLÜM VIII.	257
MİKRONİZE KALSİTİN ÖZELLİKLERİ, KULLANIM ALANLARI VE ÜRÜN STANDARTLARI.....	257

Mikronize Kalsitin Özellikleri ve Kullanım Alanları.....	259
1. Mikronize Kalsitin Özellikleri.....	259
2. Mikronize Kalsitin Kullanım Alanları.....	260

2.1. Boya	260
2.2. Kâğıt.....	262
2.2.1. Kâğıt Sektöründe PCC Kullanımı	263
2.2.2. Morfolojik Özellikler	267
2.2.3. Kâğıt Performansına Etkisi	268
2.2.4. PCC/GCC Karışımları.....	268
2.2.5. Ürün Maliyetleri.....	269
2.2.6. Dünyadaki Uygulamalar.....	269
2.3. Plastik.....	270
2.4. Elastomer (Kauçuk).....	276
2.4.1. İncelik.....	276
2.4.2. Renk	278
2.4.3. Kimyasal İçerik	278
2.4.4. Kristal Yapı	278
2.5. Seramik ve Cam	280
2.6. Yapı Kimyasalları	281
2.7. Beton ve Yapı Elemanları	282
2.8. Tarım.....	282
2.9. Hayvan Yemi	283
2.10. Ev Bakımı (Deterjanlar).....	283
2.11. Kişisel ve Ağız Bakımı.....	284
2.12. Gıda ve İlaç	284
2.13. Çevre Koruma	286
2.14. Diğer.....	287
Kaynaklar	288
Kalsit ve Nanoteknoloji.....	291
1. Nanoteknoloji.....	291
2. Nanoteknolojiye Uzman Süreç	291
3. Nanoteknoloji ve Endüstriyel Mineraller	292
4. Nanomineraller.....	294
5. Nanopartiküller	296
5.1. Nanopartikül Katkılı Malzemeler.....	298
6. Nanokalsitin Bazı Uygulama Alanları.....	299
6.1. Kâğıt.....	299
6.2. Tutkal ve Macun.....	299
6.3. Polimer	299
6.4. Boya	300
6.5. Sağlık	300
7. Nanokalsit Üretimi	300
7.1. Yaş Nano-Öğütme.....	301

7.1.2. Öğütme Limiti	304
7.1.3. Pülp Stabilitesi	305
Kaynaklar	306
Kalsit Test, Analiz ve Ürün Standartları	307
1. Test ve Analizler	307
1.1. Tane Boyut Analizleri	309
1.1.1. Elek Analizi	309
1.1.2. Dinamik Görüntü Analizi	310
1.1.3. Lazer Işığı Saçılması	311
1.2. Toplam Yüzey Alanı	317
1.3. Aşındırıcılık	319
1.4. Beyazlık	320
1.5. Yığın ve Tap Yoğunluğu	323
1.6. Dop ve Keten Yağ Emme	326
2. Kaplama Oranının Tespiti	327
2.1. Aktive Oranı	327
2.2. Kaplama Oranı	329
2.3. Adsorpsiyon Miktarı	331
3. Ürün Standartları	332
Kaynaklar	337
ÖZ GEÇMİŞ	341

BÖLÜM I.

KALSİT

[Calcite]

Kalsit ve Ürünleri

[Calcite and Its Products]

1. Kalsit

[Calcite]

Dünyanın en faydalı (kullanışlı/çok yönlü) **minerali** olarak bilinen kalsit (CaCO_3) (kalsiyum karbonat), çeşitli şekillerde ve kristal yapıda bulunan, camsı parlaklığa sahip, renksiz, sertliği orta, yoğunluğu düşük ve kolay öğütülen bir *endüstriyel mineraldir* (Şekil 1.1).

Endüstriyel mineral, fazla bir ön işlemden geçmeden, maden ocağından çıkartıldığı şekliyle sanayide veya günlük hayatta kullanılabilen doğal kaynaktır.



Şekil 1.1: Kalsit minerali [1].

Saf kalsit kristali; %56 kalsiyum oksit (CaO), %44 karbondioksit (CO_2) içerir. Saf olmayan kristallerde ise kalsiyumun bir kısmı Fe, Mg ve diğer elementlerle yer değiştirmiş olabilir.

Kalsit iri tek kristal form hâlinde bulunabilir. İlk defa Doğu İzlanda'da rastlanmasından dolayı buna **İzlanda sparı** denilir ve yüksek optik kaliteye sahip, kalsitin en saf ve transparan (şeffaf) hâlidir. Işık polarizasyon özelliğinden dolayı da eskiden Vikingler tarafından bulutlu günlerde yön bulmada (navigasyon) kullanılmıştır [2].

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Dünyada ve Türkiye’de Kalsit

[Calcite in the World and Türkiye]

1. Dünyada Kalsit

[Calcite in the World]

Kalsitin dünya rezervleri hakkında düzenli ve yeterli bilgi bulunmamaktadır. Özellikle, metamorfik kireçtaşlarında açılmış olan **mermer ocaklarının artıkları** ile ayrıca **blok alınamayan mermer sahalarında** üretim yapıldığı bilinmektedir (Tablo 1.20). Dolayısıyla dünyada bir rezerv problemi olduğu söylenemez. Ancak yine de çok beyaz, saf ve öğütülebilirliği yüksek olan, limanlara ve tüketim merkezlerine yakın olan kalsiyum karbonatlar her zaman aranmaktadır.

Rezerv, bir maden yatağında ya da havzasında henüz işletilmemiş maden miktarının kısa vadede ekonomik olan ve belirlenlik gösteren kısmıdır.

Dünya kalsit piyasa büyüklüğü;

2012 yılında 15.6 milyar \$ karşılığı 86.5 milyon ton olarak rapor edilmiştir. Bu rakamların 2025 yılı tahmini ise 35 milyar \$ seviyelerinde öngörülmektedir.

Tablo 1.20: Dünyadaki kalsiyum karbonat oluşumları [1].

Bölge	Kalsit oluşumu
ABD-Georgia ve Great Lake Bölgesi	Mermer ve kireçtaşları öğütülmekte ve daha çok PCC üretimi yapılmaktadır.
İngiltere	Mermer yatakları bulunmamaktadır. Güney kesiminde tebeşir yatakları ve Norveç’ten temin edilen mermerler öğütülerek değerlendirilmektedir.
Almanya	Beyaz renki kireçtaşları öğütülmektedir.
Fransa	Tebeşir ve beyaz kireçtaşları öğütülmektedir.
İtalya	Carrara bölgesindeki mermer ocaklarının atıkları değerlendirilmektedir.
İspanya	Beyaz mermerler öğütülmektedir.
Yunanistan	Az miktarda beyaz mermer kırıkları ve kriptokristalen yapıda oluşan kalsiyum karbonat yatakları değerlendirilmektedir.
Mısır	Beyaz renkli kireçtaşları öğütülmektedir.
Tayvan, Endonezya	Mermer ve amorf kalsiyum karbonat yatakları değerlendirilmektedir.

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BÖLÜM II.

KALSİT MADENCİLİĞİ

(Calcite Mining)

Kalsit Madenciliđi ve Arazi İyileřtirme

[Calcite Mining and Land Rehabilitation]

1. Açık Ocak Madenciliđi

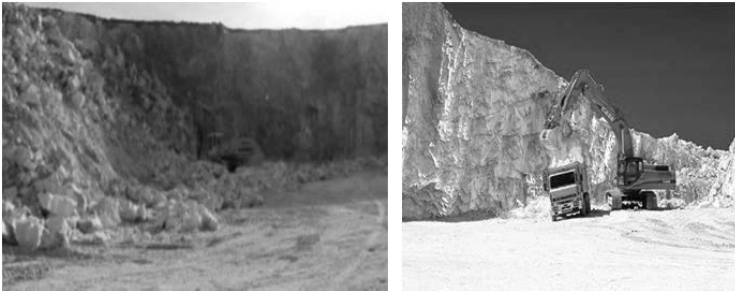
[Open Pit Mining] [Surface Mining]

Genel olarak, *açık işletme* şevli basamak üretim yöntemi ile çalıştırılan ocaklardaki kazı işlemleri iki şekilde yapılmaktadır:

- *Sert* formasyonlarda **delme-patlatma** (drilling-blasting) yöntemiyle gevşetilerek
- *Orta sert ve yumuşak* formasyonlarda ise kepçeli ekskavatörler ile doğrudan **kazı** (excavation) yapılarak

Açık işletme, madenin üzerindeki örtü tabakasını almak ve bu sayede madeni açığa çıkarmak için uygulanan maden ocağı üretim metodudur.

Gevşetilen malzeme daha sonra kamyonlara yüklenmekte olup (Şekil 2.1) kırma-eleme ünitelerine ve daha sonrasında ise öğütme ve zenginleştirme ünitelerinin bulunduğu cevher hazırlama tesislerine nakledilmektedir.



Şekil 2.1: Niğde'deki kalsit açık işletmelerinden görünüm [1].

- ♦ Rekreasyon
(Eğlence ve dinlenme yerleri, parklar, halka açık alanlar vs.)
- ♦ Su kullanımı
(Balıkçılık, gölet vs.)
- ♦ Bayındırlık ve inşaat
(Hafif endüstriyel yapılar, konut, hizmet binaları, yol vs.)
- ♦ Yaban hayatı gibi toplumsal amaçlar
(Biyotop, doğal koruma alanları vb.)

Biyotop (biyo-topluluk) (habitat), bitki ve hayvanların belirli bir bileşimi için bir yaşam alanı sağlayan tek tip çevresel koşulların bir alanıdır [18].

Madencilik sonrası arazi rehabilitasyonu olarak ülkemizde, genellikle ilgili sahalarda sadece teraslama, çapalama ve ağaçlandırma faaliyetleri yapılmaktadır. Fakat son yıllarda gerek yasal mevzuatlar gerekse artan çevre bilinci dolayısıyla, ülkemizde de modern, toplumsal beklentileri karşılayan çok başarılı **maden kapatma ve doğaya yeniden kazandırma** faaliyetleri sürdürülmektedir (Şekil 2.5).



Şekil 2.5: Açık işletme sonrası örnek arazi rehabilitasyon çalışması: a) önce, b) sonra [19].

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Taş Seçme (Ayıklama)

[Sorting]

1. Elle Ayıklama

[Manuel Sorting]

Ayıklama (taş seçme) veya **Triyaj** madenciliğin ilk uygulamalarındandır. Ayıklama ister insan gücü (el) ile olsun ister otomatik cihazlarla (el değmeden) olsun minerallerin bazı fiziksel özelliklerinden (*şekil ve renk* gibi) yararlanmak gerekmektedir.

Ayıklama nispeten *iri* (**3-30 cm**) mineral parçaları üzerinde uygulanır. Özellikle elle ayıklamanın ekonomik olması bakımından büyük parçalar hâlinde değerli ve değersiz cevher parçalarının birbirinden ayrılabilmesi gerekir [1].

Minerallerin aşağıdaki bazı farklılıklarından yararlanarak, elle seçilerek birbirinden ayrılmasına, “*Elle Zenginleştirme*” de denilmektedir:

- Renk
- Parlaklık
- Floresans (*ışık verme, ışıma*)
- Radyoaktivite
- Özgül ağırlık
- Genel görünüm



Ülkemizde cevherlere uygulanan elle ayıklamaya ayrıca “*tavuklama*”, kömüre uygulanan ise “*kriblaj*” adı verilmektedir.

Madenciliğin ilk uygulamasından beri kullanılan ve en eski cevher hazırlama yöntemi olarak bilinen **elle ayıklama** (elle triyaj) çağdaş teknolojilerde de yer almaktadır. İşçiliğin ucuz olduğu yerlerde, küçük maden işletmelerinde nihai zenginleştirme işlemi olarak zenginleştirme tesisleri öncesinde de iri boyutta konsantre üretimi veya artık atmak amacıyla uygulanmaktadır.

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Kayaç/Agregalara Uygulanan Testler

[Applied Tests on Rock / Aggregates]

Agrega, mineral kökenli, belirli boyutlardaki doğal taş ya da ufalanmış kaya(ç) parçalarıdır. Beton üretiminde kullanılan kum, çakıl, kırmataş gibi malzemelerin genel adıdır. Betonun %60-75'ini oluşturur.

Yer kabuğundaki kayaçlardan çok eski yıllardan beri yararlanılmaktadır. Son yıllarda kayaçların **agrega (kırmataş) ve yapı taşı** olarak işletilmesi amacıyla dünyada ayrı bir endüstri gelişmiştir. Dünyanın en zengin doğal taş oluşumlarının bulunduğu Alp-Himalaya kuşağında yer alan Türkiye, çok çeşitli ve büyük miktarda doğal yapıtaşı ve agrega rezervlerine sahiptir. Dünya doğal taş rezervlerinin yaklaşık %40'ına sahip olan Türkiye'nin rezervi yaklaşık 13.9 milyar tondur [1]. Türkiye'nin doğal taş üretimi son yıllarda gelişen sanayisi ve üretimde kullandığı teknoloji ile büyük bir artış göstermiştir. Agreganın türü, mineralojik bileşimi, dokusu gibi önemli jeolojik faktörler; betonun dayanımında, aşınmasında, kimyasal etkilere karşı davranışında ve hacimsel deformasyonunda etkin rol oynamaktadır [2]. Depreme dirençli yerleşimlerin, binaların yapımında betonun dolayısıyla içerisinde yer alan agregaların önemi gittikçe artmaktadır.

Agregayı oluşturan kayacın mineralojik bileşimi, tanelerin dokusal ve yapısal özellikleri, tamamen agreganın fiziksel ve mekanik özelliklerini yansıtır [3].

Bu bölümde kalsiyum karbonat kökenli kayaçlara uygulanan fiziksel ve fiziko-mekanik testler ayrıntılı olarak ele alınmakta ve numune azaltma yöntemlerine değinilmektedir.

1. Fiziksel Testler

[Physical Tests]

Kalsiyum karbonatlı kayaçlara uygulanan belli başlı fiziksel testler şunlardır:

- Özgül ağırlık
- Ağırlıkça su emme
- Birim hacim ağırlık
- Porozite (*gözeneklilik*)
- Sertlik



Şekil 2.32: Rotari (döner) numune bölücü (lab tipi) [72].

Bu cihazda, numune besleme ünitesinin hunisine boşaltılan numune, elektrik motoru tarafından üretilen **titreşim** sayesinde bir kanal boyunca sabit hızda ilerleyerek numune bölme ünitesindeki sabit hızla dönen kavanozların (bazı cihazlarda kapların) içerisine dökülmektedir. Bu yöntemde de bölünen her bir parçanın ağırlığı, numunenin bölünmeden önceki toplam ağırlığının parça sayısına bölünmesiyle elde edilen değerden $\pm 10\%$ 'dan fazla sapma göstermemesi, aksi durumda bölünen parçaların birleştirilmesi ve tekrar bölme işlemine tabi tutulması gerekmektedir [73].

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BÖLÜM III.

KIRMA ve ELEME

[Crushing and Screening]

Kırma Teknolojileri ve Kırıcı Seçimi

[Crushing Technology and Crusher Selection]

1. Kırma

[Crushing]

Kırma, büyük katı maddelerin (kayaç, cevher ve mineral gibi) az veya çok sayıda küçük parçalara ayrılması işlemidir.

Boyut küçültme olarak da isimlendirilen bu işlemin mümkün olabilmesi için dıştan uygulanacak bir kuvvetle (*darbe, makaslama, baskı veya kesme gibi*) katı maddeleri bir arada tutan iç kuvvetlerin yenilmesi gerekmektedir.

Yeraltı (underground) ve yerüstü (açık işletme) (open-pit) madencilik faaliyetleri ile açığa çıkarılan/kazanılan kayaç, cevher ve minerallerin kullanım alanına bağlı olarak boyut küçültme işlemine tabi tutulması gerekmektedir. Bu ise genellikle büyük ekipmanları içeren, enerji ve bakım masrafları yüksek bir işlem olmaktadır.

Kırma işlemi sadece hammadde hazırlanması bakımından değil, aynı zamanda *kimya, gıda, seramik, döküm, boya* gibi çeşitli endüstriyel uygulamaların da etkin bir proses aşamasıdır. Bu proses;

- Düşük mekanik verim ve
- Yüksek enerji harcamasına

karşın aynı zamanda **ilk (ön) işlem** adımı/basamağı olarak vazgeçilmezdir [1,2].

Madencilikte cevher hazırlama/zenginleştirme işleminin ilk adımı olan kırma genel olarak dört amaç için yapılır [3]:

- Mineralleri serbest hâle getirmek
(Cevher içindeki kıymetli minerallerin kıymetsizlerden ayrılması) (Ör. *Kompleks bakır cevheri*)
- Yüzey alanını büyütme
(Cevherin tane boyutu küçüldükçe yüzey alanı artmakta bu da kimyasal işlemlerin etkinliğini arttırmaktadır) (Ör. *Altın cevheri*)
- İstenilen tane boyutunda ürün elde etmek
(Ör. *Kalsit minerali*)

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Eleme Teknolojileri

[Screening Technologies]

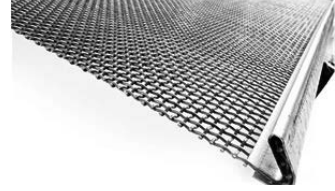
1. Eleme

[Screening]

Eleme; malzemelerin boyutları belirlenmiş bir açıklıktan geçenler ve geç(e)meyenler olarak sınıflandırılmasıdır.

Cevher hazırlamada eleme ana amacı şunlardır [1];

- İri malzemeyi ayırarak kırmak,
- İnce malzemeyi ayırarak gereksiz yere uflanmayı ve enerji sarfiyatını önlemek,
- Cevheri tüketim yerinin teknolojik ihtiyacı olan boyut gruplarına ayırarak (sınıflandırarak) tüketimi kolaylaştırmak veya mümkün kılmak ve
- Ayırma işlemlerinde bir kademe oluşturarak ayırmayı mümkün kılmak.



Eleme işleminin başarılı olabilmesi için;

- Tanelerin birbirlerinden **serbest hâlde olmaları**,
- Sarsıntı, sallantı veya dönme gibi hareketler sonucu birleşerek **topaklanmamaları**,
- Her bir tanenin deliklerle temas etmesi ve burada kontrole tabi tutularak elek altına geçmesi veya **elek üzerinde kalması**,
- Elek altına geçenlerin bir ürün, elek üstünde kalanların **ayrı bir ürün olarak alınabilmesi** gerekir [1].

Tablo 3.5: Bazı elek temizleme toplarına ait performans özellikleri [9].

İndeks	Malzeme		
	NB (kauçuk)	Silikon	Poliüretan (PU)
Sertlik (Shore A)	55 - 85	55 - 85	70 - 85
Çalışma sıcaklığı (°C)	- 25 + 100	0 + 220	- 40 + 120
Yağ direnci	Orta	Orta	İyi
Elastisite	İyi	Orta	Orta
Aşınma direnci	Orta	İyi	İyi

Tablo 3.6’da ülkemizde elek temizleme topu imal eden bazı firmalar gösterilmektedir.

Tablo 3.6: Ülkemizde elek temizleme topu imal eden bazı firmalar [10].

Üretici firma	Ürünler ve özellikleri	Yer
Ada Elek ve Metal San. A.Ş. Karadirek Makina Ltd. Şti.	Elek tıkanmasına karşı kauçuk elek topları, doğal kauçuk, NBR, SPR, EPDM, silikon, poliüretan, aşınmaya karşı yüksek dayanım, 80-180°C arası ısıya dayanımlı, 10-60 mm çaplı	Aydın
Plassan Değirmen Plastik ve Fırça San.	Çeşitli boylarda elek topu	İstanbul
Aspar Kauçuk Plastik Makina	Temizleme topu	Ankara

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BÖLÜM IV.

MİKRONİZE ÖĞÜTME

[Mikronized Grinding]

Öğütme ve Değirmenler

[Grinding and Mills]

1. Öğütme

[Milling] [Grinding]

Ufalama (kıırma ve öğütme) (*comminution*) bir malzemenin tane boyutunu düşürmek, istenilen tane boyut dağılımını (*PSD*) sağlamak, istenen tane şeklinde malzeme üretmek, aglomeraları dağıtmak, çözünme kinetiğini artırmak için kullanılan en yaygın yöntemdir.



Katı maddelerin ufalanma karakteristiklerini belirleyen unsurlar ise şunlardır [1]:

- **İçyapılarındaki kuvvetlerin varlığı**
- Kristal yapılarındaki atomların dizilişleri, bunları birlikte tutan **bağlar ve kafes yapısı**
- Mekanik özellikleri (**yapısal kusurlar, çatlak ve yarıklar**)

Bazı cevherlerin ufalama yönünden fiziksel özellikleri Tablo 4.1'de verilmiştir.

Tablo 4.1: Çeşitli endüstriyel hammaddelerin ufalanma yönünden bazı fiziksel özellikleri [1].

Cevher	Özelliđi	Ort. ađırlık (lb/ft ³) *
Barit	Aşırı aşındırıcı, akıcılığı iyi	140-180
Dolomit	Hafif aşındırıcı, biraz gevrek, akıcılığı iyi	90-100
Alçıtaşı (jips kayası)	Hafif aşındırıcı, biraz gevrek, akıcılığı iyi	90-100
Kireçtaşı	Hafif aşındırıcı, biraz gevrek, akıcılığı iyi	90-110
Talk	Az aşındırıcı, biraz gevrek	40-50

* 1 lb/ft³ = 16.02 kg/m³tür.

Tablo 4.3: Farklı bilyalı değirmenlerin karakteristik özellikleri [6].

Değirmen	Bilye hareketi	Soğutma potansiyeli	Ölçek büyütme	Maksimum ivmelenme	Çarpışma frekansı	Stres Enerjisi (SE)
Aktarılan ortam (tambur) bilyalı değirmen	Dönen tambur	Çok zayıf	Çok iyi	$1 \times G$	Düşük	Yüksek
Yörüngesel bilyalı değirmen	Santrifüj alanda dönen tambur	Genellikle çok zayıf	Çok zayıf	$< 150 \times G$	Orta	Çok yüksek
Titreşimli bilyalı değirmen	Titreşen değirmen haznesi	Orta	Orta	$< 30 \times G$	Yüksek	Yüksek
Karıştırmalı bilyalı değirmen	Sabit haznede dönen karıştırıcı	Çok iyi	Çok iyi	$< \text{Bir kaç } 100 \times G$	Çok yüksek	Çok yüksek

Konuyla ilgili daha ayrıntılı bilgi “*Mikronize Öğütme*” kitabında [7] yer almaktadır.

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Bilyalı Değirmenler

[Ball Mills]

1. Bilyalı Değirmenler

[Ball Mills]

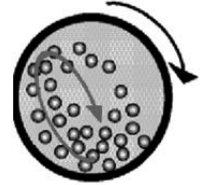
Cevher hazırlama, ilaç, boya ve çimento gibi geniş bir alanda *boyut küçültme* işlemlerinde kullanılan, **tambur değirmen**, **yatay değirmen**, **aktarılan ortam değirmen** (tumbling ball mill) ve **konvansiyonel (geleneksel, klasik) değirmen** olarak da isimlendirilen **bilyalı değirmenler** aşağıdaki temel özelliklere sahip öğütücü ekipmanlardır:

- *Yatay* pozisyonda yerleştirilir,
- (İç kısmı aşınmayı önleyici plakalarla kaplanmış) **silindirik gövdeden** oluşur,
- Çeşitli düzeneklerle kendi eksenini etrafında dairesel olarak hareket ederken *öğütücü ortam* olarak kullanılan **çelik bilyalar** ile besleme malzemesini çok ince tane boyutlarına indirir.

Bilyalı değirmenler neredeyse yaklaşık 100 yıldan beri uygulanmaktadır. Ancak hâlâ enerji verimi %1-2 civarındadır. Gelişen sensör teknolojileri ile çalışma şartlarının optimize edilmesi ve uygun izleme ile bu değirmenlerin enerji verimliliği %10'lara çıkarılabilme imkânı bulunmaktadır [1].

Bilyalı değirmenlerin genel özellikleri şu şekildedir [2]:

- İkinci kademe ve ince öğütme devrelerinde kullanılır,
- Değirmene beslenen malzeme boyutu **9.5-2.5 mm** arasında ve ürün boyutu ise **600-45 mikron** arasında değişmektedir,
- Bilya şarjı doluluğu değirmen hacminin %35-45'ine denk gelmektedir,
- Bilya doluluk oranı %40'tan çok olduğu durumda, değirmenin besleme girişi geriye taşmayı ve çıkış ağzı ise bilyaların dışarı çıkmasını önleyecek şekilde seçilmelidir.



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Karıştırılmalı Bilyalı Değirmenler

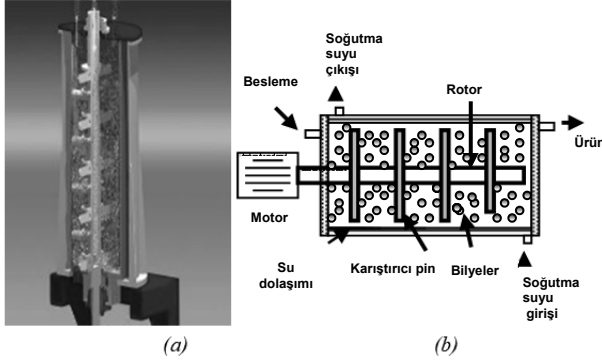
[Stirred Media Mills]

1. Karıştırılmalı Değirmenler

[Agitated Mills]

Karıştırılmalı değirmen, karıştırılmalı ortam değirmen olarak da isimlendirilirler.

Karıştırılmalı bilyalı değirmenler; öğütücü ortam şarjının bir shaft (mil) etrafına monte edilmiş **çubuk (pin), disk veya spiral** vasıtasıyla silindirik bir hazne içerisinde shaftta verilen dönme hareketi ile çalışmakta (Şekil 4.4) ve malzemenin öğütücü ortam ve cevher taneleri arasındaki **sürtünme, aşınma ve darbe** ile ufalanması prensibine dayanmaktadır [1]. Ancak, bilyelerin *serbest düşme* ihtimalleri pek olmadığından darbe etkisi pek oluşmamaktadır.



Şekil 4.4: a) Disk tipi ve b) Pin tipi karıştırılmalı değirmen [4].

Temel tasarımı 1920'lere kadar uzanan (*Klein ve Szegvar-1928*) bu değirmenler, ilk kez 1960'larda kaolinin öğütülmesinde kullanılmıştır [2].

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Öğütme Devreleri ve Tesis Örnekleri

[Grinding Circuits and Plant Examples]

1. Öğütme Devreleri

[Grinding Circuits]

Öğütme devreleri iki şekilde olabilir;

- Açık devre
- Kapalı devre

Açık devre malzemenin değirmenden tek seferde geçerek istenen ürünün alındığı devredir ki uygulamada nadiren uygulanır. Zira bu devrede ürünün *PSD*'ni kontrol etmek mümkün değildir.

Kapalı devre ise ürün olarak alınan kısım içerisindeki kaba (iri) malzeme yeniden değirmene (devreden yük) beslenir. Bu sayede *PSD* kontrolü sağlanmış olur. Devreden yük (circulating load) taze besleme malına göre 1-3.5 kat olabilir [1].

Öğütme devresi tasarlanırken aşağıdaki bazı faktörler dikkate alınmalıdır [2]:

- Değirmen boyutu
- Değirmenin gücü, özgül öğütme enerjisi
- Öğütme şartlarının etkisi
- Devreden yük ve seperatör etkinliği

Değirmenin performansını etkileyecek malzeme özelliklerinin de bilinmesi gerekmektedir. Bunlar;

- Özgül ağırlığı
- Yığın yoğunluğu
- Kırılma indeksi
- Besleme boyutu
- Beslemedeki ince malzeme oranı
- İş indeksi (*BWI*)
- Kırılganlık
- Akışkanlık, yapışkanlık vb. [3].

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BÖLÜM V.

SEPERASYON

[Seperation]

Seperatörler (Havalı Ayırıcılar)

[Seperators] [Air Classifiers]

1. Sınıflandırma

[Classification]

Sınıflandırma genellikle cevheri *boyutuna göre* gruplandırmak amacı ile uygulanan bir prosestir.

Havalı sınıflandırma (ayırma) ise hava akışı ile taneleri **boyut, şekil ve özgül ağırlık** farkına göre ayırma işlemidir ve kuru olarak gerçekleştirilmektedir. Ayırma işlemi d50 *ayırma* boyutu ile karakterize edilmektedir. d50'nin üzerindeki taneler **iri fraksiyonu**, altındakiler ise **ince fraksiyonu** ifade eder. Ayırmanın performansı elde edilen üründeki her bir fraksiyonun kütle içerikleriyle belirlenir [1].

Havalı sınıflandırma <2 mm'den mikron boyutuna kadar uygulanır.

Beslenen malzeme + Hava \longrightarrow *SEPERATÖR* \longrightarrow *İri malzeme + [İnce malzeme + Hava]*

Havalı ayırıcılar dört farklı amaç için uygulanabilir [1]:

- İri boyutlu malzemeler ile istenilen boyuta öğütülmüş malzemeyi ayırmak,
- Homojen olmayan bir karışımdaki malzemeleri boyutlarına göre sınıflandırmak,
- Belirli boyuta öğütülmüş malzeme içindeki tozu almak ve
- Birbirine yakın boyuttaki malzemeyi ayırmak.

Ayırma işlemi şu aşamaları kapsar:

- Malzeme ve hava karıştırılarak sınıflandırıcıya (seperatör) beslenir.
- Hava-malzeme karışımı seperatörde (yerçekimi, merkezkaç ve sürüklenme kuvveti sayesinde) ayrışır.
- Küçük taneler hava ile sürüklenir (daha sonra ikisi de ayrılır), iri taneler ise ortamdaki uzaklaştırılır [1].

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BÖLÜM VI.

KAPLAMA

[Coating]

Yüzey Modifikasyonu

[Surface Modification]

1. Yüzey Modifikasyonu

[Surface Modification]

Ülkemizin önemli endüstriyel minerallerinden olan kalsit (CaCO_3), ucuz dolgu maddesi olarak ve ürünlere çeşitli özellikler kazandırılması amacı ile sanayinin bir birçok alanında yaygın bir şekilde kullanılmaktadır.

Özellikle *kâğıt, plastik, kauçuk ve boya* sanayinde kullanılan bu endüstriyel mineralin bazı fiziksel ve fizikokimyasal özelliklere sahip olması istenmekte ve aşağıdaki üç özellik öne çıkmaktadır:

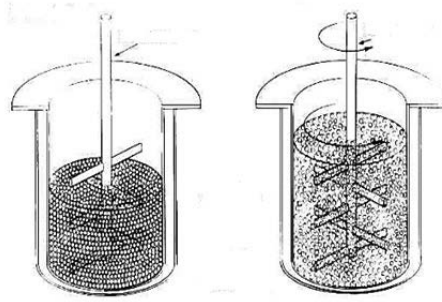
- Mikronize boyutlara öğütme (*incelik*)
- Hidrofob (*su sevmez*) yapı
- Yüksek beyazlık derecesi

Kalsitin dolgu maddesi olarak kullanılabilmesi için öncelikle mikronize boyutlara öğütülmesi gerekmektedir. Bu süreçle birlikte, d50 oldukça geniş bir aralığı (**1-100 mikron**) kapsamaktadır.

Dolgu (filler) terimi esasında polimer kullanımını azaltmaya müsaade eden ve maliyet azaltıcı malzemelere vurgu yapan bir terimdir. **Fonksiyonel mineral dolgular** (FMD) ise aşağıdaki gibi belirli spesifik özelliklere göre sınıflandırılabilir [1]:

- Alev geciktiriciler
- Mekanik özellikleri modifiye eden dolgular
- Elektrik ve manyetik özelliği modifiye eden dolgular
- Yüzey özelliklerini modifiye eden dolgular

FMD'ler ayrıca, inşaat ve otomotiv sanayinde ısı ve ses yalıtımı için kullanılan kompozit malzemelerde de kullanılır.



Şekil 6.12: Karıştırılmalı bilyalı değirmen [26].

Mekanokimyasal yüzey modifikasyonu ile kalsiyum karbonatın karıştırılmalı bilyalı değirmende kuru ve yaş koşullarda çeşitli modifikasyon çalışmaları yapılmıştır. Söz konusu çalışmalarda dodesil sülfat (DSS) [7], sodyum stearat (SDS) [27-30] ve sodyum oleat [27,31] kullanılmıştır. Wu ve Lu [31] tarafından karıştırılmalı değirmende kalsiyum karbonatın polimer grafting (aşılama) tekniği ile yüzey modifikasyonu kuru olarak gerçekleştirilmiştir. Kimyasal reaktif olarak benzen (C_6H_6), stiren ($C_6H_5C_2H_3$) ve benzil peroksit ($C_{14}H_{10}O_4$) kullanılmıştır. Modifikasyon deneyleri ön öğütme sonrasında gerçekleştirilerek bazı çalışma parametreleri aktive oranı ve dispersiyon oranı kullanılarak optimize edilmiştir.

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Endüstriyel Kaplama Sistemleri

[Industrial Coating Systems]

1. Kaplama Sistemleri

[Coating Processes]

Günümüzde mikronize (ince/çok ince) kalsitin kaplanmasında dört farklı değirmen ve sistem kullanılmaktadır:

- **Pinli** değirmen
- **Raymond** (*çekikli veya rotor tipi*) değirmen
- **Turbo** değirmen
- **Karıştırmalı** sistem

Aşağıda bu değirmenler ve kaplama proseslerinden uygulama örnekleri sunulmaktadır.

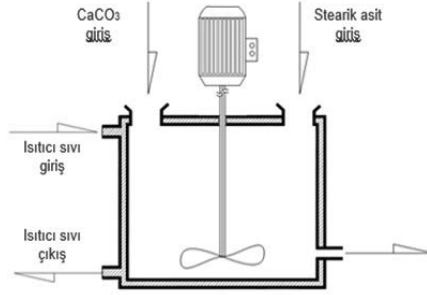
1.1. Pinli Değirmen

[Pin Mill]

Çivili değirmen olarak da isimlendirilen **pinli değirmen** madencilik endüstrisinde daha çok ince kırma ve/veya kaba öğütme amacıyla kullanılan makinelerdir [1]. Bu değirmene ait görünüm Şekil 6.13'te verilmiştir. Söz konusu değirmenlerde tasarım değişikliğine gidilerek kaplama amaçlı (modifiye) pinli değirmenler üretilmiştir.



Şekil 6.13: Ufalamada kullanılan pinli değirmen [2].



Şekil 6.28: Isıtmalı + karıştırmalı kaplama sistemi [5].

Tank cidarında ısıtma ve tank içi sıcaklığın korunmasını sağlayan yağ ceketi (oil jacket) bulunmaktadır. Mikronize kalsit ve stearik asit (granül) tank içerisine birlikte besleme yapılmakta, karışım belirli sürelerde ve hızlarda karıştırılarak kaplama işlemine tabi tutulmaktadır.

Karıştırma tankları alternatif hızlarda döndürülebilirken karıştırma düzenekleri farklı yapıda (*pervane, kanat, vb.*) imal edilebilmektedir. Bu sistemler genellikle kesikli (batch) olarak çalıştırılmaktadır.

Bu sistemin en önemli dezavantajı;

- Kesikli çalışması ve
- Kapasitesinin düşüklüğü

gösterilirken

- Kompakt-basit yapıda olması,
- İlk yatırım-işletme maliyetinin düşüklüğü ve
- Yerli üretiminin yapılabilmesi

avantajları olarak kabul edilmektedir [23].

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Kaplı Kalsitin Plastikte Kullanımı

[Coated Calcite Usage in Plastic]

1. Plastik

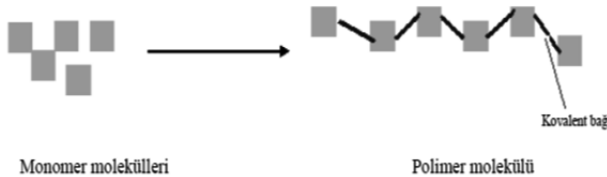
[Plastic]

Maddenin en küçük yapı taşı olan atomların bir zincirin halkaları gibi birbirine bağlanarak oluşturduğu büyük molekül yapılı *sentetik* maddelere plastik adı verilir.

Plastiğin en küçük yapı taşını oluşturan bu tür büyük moleküllere de “makro molekül” denilmektedir. Her atom birleşme değeri ile yanındaki atoma bağlanır. Bu yapı, bir zincire benzetilebilir.

Plastik terimi genelde sanayide kullanılan bir terimdir, bilimsel olarak **polimer** ile aynı anlama gelir. Birçok plastik, esas yapıyı oluşturan *reçine* ile belirtilir. Bunlar saf polimerlerdir. Reçineler doğrudan son ürün üretiminde kullanılabilirdiği gibi, son üründe istenen bazı özelliklere bağlı olarak bünyesine birçok katkı maddeleri katılarak da işlenebilir [1].

Polimer en basit tanımıyla çok sayıda aynı ya da farklı grupların kimyasal bağlarla az veya çok düzenli bir biçimde bağlanarak oluşturduğu uzun zincirli yani **yüksek molekül ağırlıklı bileşikler**dir. Polimer çok sayıda monomerin bir araya gelerek bağlanması ile oluşan büyük moleküllerdir. Monomer birimleri **polimerleşme** (polimerization) reaksiyonları ile birbirine bağlanarak polimer molekülüne dönüşürler. Bir polimer molekülünde onlarca, yüzlerce hatta binlerce monomer birimi bulunabilir (Şekil 6.29).



Şekil 6.29: Monomer molekülleri polimerizasyon reaksiyonu ile birbirine bağlanması [2].

Plastik = Polimer + Katkı maddeleri

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BÖLÜM VII.

PAKETLEME ve İSG

[Packaging and OHS]

Paketleme İşlemleri ve İş Güvenliği

[Packaging Processes and Work Safety]

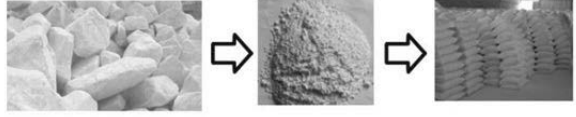
1. Maden Paketleme İşçisi (Kalsit)

[Mine Packaging Worker (Calcite)]

Paketleme; endüstriyel ürünleri satış/pazarlamaya uygun boyutlarda *kâğıt, karton, plastik, cam veya metalden* yapılmış kapların içine yerleştirerek pazara sürülebilir hâle getirme işlemidir [1].

Bu bölümde aşağıdaki paketleme çeşitlerinden bahsedilecektir:

- Kâğıt (Kraft) torba
- PP (Polipropilen) torba
- Big-Bag
- Sling-Bag
- Palet



Maden paketleme işçisi şunları kapsamaktadır [2]:

- Meslek Ana Grubu: Sanatkârlar ve ilgili işlerde çalışanlar
- Meslek Alt Ana Grubu: Maden çıkarımı ve inşaatla ilgili işlerde çalışan sanatkârlar
- Meslek Grubu: Madenciler, Ateşleyiciler, Taş Kesiciler ve Oymacılar
- Meslek Birim Grubu: Madenciler ve taşocağı çalışanları
- Gereken Minimum Eğitim Düzeyi: Okuryazar
- Meslek Tanımı: Kalsit madenini paketleme makinesinde paketleyen ve istifleyen kişidir

Görev ve İşlem Basamakları:

Maden Paketleme İşçisi (Kalsit), işletmenin genel çalışma prensipleri doğrultusunda, araç, gereç ve ekipmanları etkin bir şekilde kullanarak **işçi sağlığı, iş güvenliği ve çevre koruma** düzenlemelerine ve mesleğin verimlilik ve kalite gereklerine uygun olarak aşağıdaki görevlerden sorumludur [2]:

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BÖLÜM VIII.

MİKRONİZE KALSİTİN ÖZELLİKLERİ, KULLANIM ALANLARI VE ÜRÜN STANDARTLARI

[Properties of Micronized Calcite,
Usage Areas and Product Standards]

Mikronize Kalsitin Özellikleri ve Kullanım Alanları

[Properties of Micronized Calcite
and Usage Areas]

1. Mikronize Kalsitin Özellikleri

[Properties of Micronized Calcite]

Ocaklarda açık işletme metodu ile üretilen ve tesiste;

Kırma \implies Eleme \implies Öğütme \implies Boyuta göre sınıflandırma

sonrası mikron boyutlarında (*1, 3, 5, 10, 50 ve 100 mikron gibi*) “**toz ürün**” olarak elde edilen mikronize kalsitin başlıca kullanım alanları şu şekildedir:

- Boya
- Plastik
- Kâğıt
- İnşaat/seramik
- Diğer (*Tarım, gıda, kozmetik, ilaç vb.*)

Pigment pazarına bakıldığında kalsiyum karbonat ile birlikte kaolin, talk ve titanyum dioksit gibi mineraller de talep görmektedir. Öncelikle ucuz oluşu, yüksek oranda CaCO_3 içermesi ve yüksek beyazlığa sahip oluşu sebebiyle CaCO_3 kökenli kayalar çok daha yaygın bir şekilde kullanılmaktadır [1].

Mikronize kalsitin özellikleri genel olarak aşağıda sıralandığı şekliyle karakterize edilebilmektedir [2]:

- Ağır metalleri içermemesi ve yüksek kimyasal saflığa sahip olması sayesinde polimer yaşlanmasına sebep olacak herhangi bir katalitik etkiyi ortadan kaldırır.
- Yüksek beyazlık derecesi ile pahalı beyaz pigmentlerden (örneğin TiO_2) tasarruf sağlar.

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Kalsit ve Nanoteknoloji

[Calcite and Nanotechnology]

1. Nanoteknoloji

[Nanotechnology]

Nano terimi cüce anlamındaki “**nanos**”tan gelir, teknik alanda bir şeyin bir milyarda biri anlamındadır. Temel olarak nanometre, diğer ölçüm skalaları gibi bir ölçüm skalasıdır. Bir nanometre, bir metreden bir milyar kere küçüktür. Bir nanometre aşağı yukarı orta boyutta bir molekülün, örneğin 60 karbon atomu içeren bir molekülün boyutundadır.

Yaklaşık olarak **50 nm**'nin altındaki boyutlarda bir madde söz konusu olduğunda *kuantum fiziği* kanunları geleneksel fizik kurallarının yerini alır. Bunlar bir maddenin iletkenliğinde, elastisitesinde, reaktifliğinde, sertliğinde, renginde ve sıcaklıkla, basınca olan dayanıklılığında değişimlere neden olurlar.

Nanoteknoloji yaşantımızı kolaylaştırıp güzelleştirirken madencilik sektörüne de birçok fırsat sunmaktadır. Nanoteknoloji ile hammadde ton fiyatı 10-15 \$ olan ham parça kalsiti nano boyutlara indirerek 400 \$'dan daha pahalı ürünlere dönüştürmek mümkündür [1].

2. Nanoteknolojiye Uzanan Süreç

[The Process Extending to Nanotechnology]

Nanoteknolojiye uzanan sürecin 20. yüzyılın başlarında maddeyi oluşturan parçacıklardan örneğin elektronların, hem parçacık hem de dalga gibi davrandığının, yine bu ölçeklerde belirsizlik kuramının geçerli olduğunun saptanmasına kadar gittiği söylenebilir. Bu temel öğelerden doğan kuantum mekaniği sayesinde atom ve moleküller doğru olarak algılanıp anlaşılabilir, temel bilimler ve ilgili teknolojiler hızla gelişmiştir. Özellikle *silisyum* teknolojisi önem kazanmış ve mikroelektronik sanayi hızla gelişmiştir.

NANO

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Kalsit Test, Analiz ve Ürün Standartları

[Calcite Test, Analyzes and Product Standards]

1. Test ve Analizler

[Test and Analyzes]

Kaplama öncesi (mikronize) veya sonrasında elde edilen nihai ürün üzerinde çeşitli test ve analizler gerçekleştirilmektedir.

Farklı sektörler açısından mikronize kalsite uygulanan mineralojik-fiziksel-kimyasal-termal testler Tablo 8.17’de toplu bir şekilde verilmiştir.

Tablo 8.17: Farklı sektörler açısından mikronize kalsite uygulanan testler [1].

Analiz	Amaç
Kimyasal analiz (XRF)	Kalsit örneğinin içerik analiz değerlerinin (CaO, SiO ₂ , MgO, Fe ₂ O ₃ , Al ₂ O ₃ , Na ₂ O, K ₂ O, SO ₃) belirlenmesi
Kayaç yapısı (XRD)	Kayaç yapısında kalsit, tebeşir, kalker veya aragonit olup olmadığı ve diğer mineralleri içerip içermediğinin tespit edilmesi
Mineraloji (Polarize mikroskop)	Minerallerin kristal yapısı, rekristalisasyonu ve büyüklüğü, kristallerin dilinimli olup olmaması, mineral dağılımının homojen veya heterojen olması ve eser oranda bulunan diğer minerallerin belirlenmesi
Termal Gravimetrik Analiz (TGA) ve Diferansiyel Termal Analiz (DTA)	Malzeme bünyesinde meydana gelen ağırlık değişimleri (su kaybı, organik madde uzaklaşması gibi) belirlemede TGA, ekzotermik ya da endotermik reaksiyonlar sonucu meydana gelen sıcaklık değişimleri DTA cihazı ile tespit edilmesi
Morfoloji (SEM)	Çok ince öğütme sonrası kalsitin ufalanma şekilleri (kübik, çubuksu, pulsu vb.) farklılığının ortaya konması ve öğütme sonrasında yüzey pürüzlülüğü oluşumu ve mekano-kimyasal etki ile kristal yapısında dönüşümün olup olmadığının belirlenmesi
Öğütülebilirlik	Öğütme maliyetleri açısından Bond İş İndeksi (W_i) ve Bond öğütülebilirlik (G_{bg}) ile Hardgrove öğütülebilirlik (HGI) değerlerinin belirlenmesi

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Gül Sakarya



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İÇİNDEKİLER

ÖN SÖZ.....	vii
GİRİŞ	ix

1. BÖLÜM

KEMAN, İNSAN VE BEDEN FARKINDALIĞI.....	1
Doğallık ve Müdahalesizlik İlkesi	4
Doğal Durumda Kollar, Eller ve Parmaklar	7
Sol Eli Güçlendirmek İçin Bazı Egzersiz Önerileri	12
Duruş ve Oturuş (Postür)	16
Doğal Durumda Boyun ve Baş	20

2. BÖLÜM

YOGA NEDİR?	23
Yoganın Kökenleri.....	23
Yoganın Amacı ve Faydaları	24
Yoga Türleri.....	25
Hatha Yoga	26
Menuhin'in Yoga Uygulamaları	26

3. BÖLÜM

ASANALAR.....	31
Keman Çalmaya Hazırlık İçin Temel Oturuş ve Esneme	32
Sukhasana	32
Siddhasana	33
Padmasana	34
Baddha Konasana.....	35
Sukhasana (Boyun Esnetme)	36
Parshva Sukhasana.....	37
Parivritta Sukhasana.....	38
Marjaryasana/Bitilasana (Kedi/İnek)	39
Dört Ayak Üzerinde Denge ve Esneme	41
Eka Hasta Eka Pada Bitilasana	41
Vyaghrasana (Kaplan Duruşu).....	42
Ashva Sanchalanasana (Binici Pozu).....	43
Anjaneyasana (Hilal Pozu).....	44

Bhujangasana (Kobra Pozu).....	45
Ardha Shalabhasana.....	46
Adho Mukha Svanasana (Aşağı Bakan Köpek).....	47
Ayakta Denge ve Postür.....	48
Tadasana (Dağ Duruşu).....	48
Urdhva Hastasana.....	49
Indudalasana (Hilal Pozu).....	50
Eka Hasta Parshvasana.....	51
Baddha Hasta Tadasana.....	52
Tadasana Paschima Namaskarasana.....	53
Gomukhasana.....	53
Vrikshasana Namaskar (Ağaç Duruşu).....	55
Garudasana (Kartal Pozu).....	56
Natarajasana.....	57
Utkatasana (Sandalye Pozu).....	58
Parivritta Utkatasana.....	59
Utthita Hasta Ardha Uttanasana.....	60
Uttanasana.....	61
Baddha Hasta Uttanasana.....	62
Kalyasana.....	63
Malasana (Çömelme).....	64
Omurga Farkındalığı.....	65
Dandasana.....	65
Janu Sirsasana.....	66
Paschimottanasana.....	67
Navasana/Ardha Navasana.....	68
Setu Bandha Sarvangasana (Köprü Pozu).....	69
Dinlenme.....	70
Ananda Balasana (Mutlu Bebek Pozu).....	70
Balasana.....	71
Shavasana (Ceset Duruşu).....	72

4. BÖLÜM

NEFES.....	75
Nefes Teknikleri.....	77
Diyafraam Nefesi.....	77
Dönüşümlü Burun Nefesi (Nadi Sodhana).....	79
Okyanus Nefesi (Ujjayi Pranayama).....	80
4-7-8 Nefes Tekniği.....	81
Dengeli Nefes (Sama Vritti).....	81

5. BÖLÜM

MEDİTASYON	83
Duvar Meditasyonu.....	86
Beden Tarama Meditasyonu	87
Dinamik Meditasyon.....	88

6. BÖLÜM

MUDRALAR	91
Anjali Mudra.....	94
Lotus Mudra.....	99
Chin Mudra	100
Akasha Mudra.....	100
Pritvihi Mudra.....	101
Varuna Mudra	102

7. BÖLÜM

İLGİLİ ARAŞTIRMALAR.....	103
SON SÖZ.....	109
ÖZ GEÇMİŞ.....	111
KAYNAKLAR.....	113
DİZİN	121

KAYNAKLAR

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Prof. Necati Tahralı - Doç. Dr. Can Çivi



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İÇİNDEKİLER

ÖN SÖZv

BÖLÜM 8

GÜÇ VE HAREKET İLETİM ELEMANLARI	1
8.1. Dişli Çark Mekanizmaları	3
8.1.1. Dişli Çark Mekanizmalarında Çevrim Oranı ve Verim	4
8.1.2. Eksenleri Aynı Düzlemde Ve Birbirine Paralel Olan Dişli Çarklar	11
8.1.2.1. Silindirik Düz Dişli Çarklar	13
8.1.2.2. Silindirik Helisel Dişliler	109
8.1.2.3. Kremayer Dişliler	138
8.1.3. Eksenleri Aynı Düzlemde Ve Kesişen Dişli Çarklar (Konik Dişli Çarklar)	143
8.1.3.1. Konik Dişli Çarkların Boyutları	143
8.1.3.2. Konik Dişli Çarklarda Çevrim Oranı	148
8.1.3.3. Konik Dişli Çarklarda Eş Çalışma Durumunda Moment Değerleri ve Diş Kuvveti ile Yatak Kuvvetlerinin Hesabı	149
8.1.3.4. Konik Dişli Çarklarda Dişli Mukavemet Hesabı	150
8.1.4. Eksenleri Aynı Düzlemde Olmayan Dişli Çarklar (Spiral Dişli Çarklar)	166
8.1.4.1. Sonsuz Vida Mekanizmasının Boyutları	169
8.1.4.2. Sonsuz Vida Mekanizmasının Verim Hesabı	172
8.1.4.3. Sonsuz Vida Mekanizmasında Diş Kuvvetleri	174
8.1.4.4. Sonsuz Vida Mekanizmasında Mukavemet Hesabı	175
8.1.5. Dişli Çarkların Ömür hesapları	189
8.1.6. Dişli Çarkların İmalat Yöntemleri	192
8.2. Dişli Çark Sistemleri	193
8.2.1. Redüktörler	193
8.2.2. Vites Kutuları	194
8.2.3. Planet Mekanizmaları	200
8.2.4. Diferansiyel Mekanizmaları	202
8.2.5. Dişli Çark Sistemlerinde Sıcaklık Kontrolü	203
8.3. Kayış-Kasnak Mekanizmaları	205
8.3.1. Kayış-Kasnak Mekanizmalarının Gerdirme Sistemleri	209
8.3.2. Kayış-Kasnak Mekanizmalarının Kinematik-Dinamik Hesapları	211
8.3.3. Kayış-Kasnak Mekanizmalarının Boyutlandırılması	215
8.3.4. Kayış Kesiti Hesabı	221
8.3.5. Kayışlarda Ömür Hesabı	222

8.3.6. Kayış-Kasnak Mekanizmasında Mile Gelen Kuvvetler.....	223
8.3.7. Değişken çevrim Oranlı Kayış-Kasnak Mekanizmaları.....	223
8.3.8. Kasnaklar ve Kasnak Malzemeleri	225
8.3.9. Kayış Malzemeleri	226
8.4. Zincir Mekanizmaları.....	236
8.4.1. Zincir Mekanizmalarının Sınıflandırılması.....	237
8.4.1.1. Rulolu Manşonlu Zincirler	238
8.4.1.2. Burçlu Zincirler	239
8.4.1.3. Dişli Zincirler	239
8.4.1.4. Menteşeli Zincirler	240
8.4.2. Zincir Mekanizmalarının Kinematik-Dinamik Hesapları	241
8.4.2.1. Zincir Mekanizmalarında Çokgen Etkisi.....	241
8.4.2.2. Zincir Mekanizmalarında Kuvvetler	242
8.4.3. Zincir Mekanizmalarının Boyutlandırılması.....	244
8.4.4. Zincir Mekanizmalarında Mukavemet Kontrolü.....	247
8.4.4.1. Aşınma Hesabı (Yüzey Basınç Kontrolü)	248
8.4.4.2. Statik Kopma Emniyet Katsayısı.....	248
8.4.4.3. Dinamik Kopma Emniyet Katsayısı	248
8.4.5. Zincir Mekanizmalarında Mile Gelen Kuvvetler	248
8.4.6. Zincir Mekanizmalarında Konstrüksiyon Özellikleri	248
8.5. Sürtünmeli Çarklar ve Mekanizmaları	270
8.5.1. Sürtünmeli Çark Malzemeleri	275
8.5.2. Sürtünmeli Çark Malzemelerinin Mukavemet Hesapları ve Boyutlandırılması.....	276
8.5.2.1. Silindirik Sürtünmeli Çark Mekanizmaları	276
8.5.2.2. Konik Sürtünmeli Çark Mekanizmaları.....	278
8.5.3. Sürtünmeli Çark Mekanizmalarının Verim ve Sıcaklık Kontrolü.....	280
8.5.4. Sürtünmeli Çark Mekanizmalarında Yataklara Gelen Kuvvetler	280
8.5.5. Değişken Devirli Mekanik Sürtünmeli Çark Mekanizmaları (Varyatörler)	281
8.5.6. V Kanallı Mekanik Sürtünmeli Çark Mekanizmaları	284

BÖLÜM 9

İRTİBAT ELEMANLARI.....	313
9.1. Çözilemeyen Kavramalar (Kaplinler)	315
9.1.1. Ririt Kaplinler	315
9.1.1.1. Flanşlı Kaplinler	316
9.1.1.2. Zarflı Kaplinler.....	321
9.1.2. Esnek Kaplinler.....	324

9.1.2.1. Elastik Kaplinler	324
9.1.2.2. Oldham Kaplini	331
9.1.2.3. Kardan Kaplini	335
9.1.2.4. Hidrolik Kaplin.....	348
9.1.2.5. Dişli Kaplin	353
9.2. Çözülebilir Kavramalar (Kavramalar)	354
9.2.1. Mekanik Kavramalar	354
9.2.2. Sürtünmeli Kavramalar	356
9.1.2.1. Düz Sürtünme Yüzeyle Kavramalar	357
9.1.2.2. Kavramalar	372
9.1.2.2. Elektromanyetik Kavramalar.....	380
9.1.2.2. Otomatik Kavramalar	381
9.3. Frenler	386
9.3.1. Pabuçlu Frenler	391
9.3.1.1. Dıştan Pabuçlu Fren	391
9.3.1.2. İçten Pabuçlu Fren.....	396
9.3.1.3. Bantlı Frenler.....	419
BÖLÜM 10	
ÖRNEK PROJELER.....	425
Örnek (Proje-1)	425
Örnek (Proje-2)	457
Örnek (Proje-3)	468
Örnek (Proje-4)	482
Örnek (Proje-5)	496
Örnek (Proje-6)	509
Örnek (Proje-7)	534
Kaynakça.....	570

KAYNAKÇA

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İçindekiler

Yazar Hakkında v

Ön Söz vii

1.

Makine Mühendisliği Tasarımı 1

- 1.1. Kavramlar 1
- 1.2. Konstrüktör ve konstrüksiyon departmanı 9

2.

Yaratıcı Fikirler Geliştirme Yöntemleri 15

- 2.1. Yaratıcı düşünce geliştirmede insanlık mirasının etkisi, literatür araştırması yapma 15
- 2.2. Yaratıcı fikirler geliştirmede insanın düşünce gücünün katkısı 19
- 2.3. Benzetim yöntemleri 21
 - 2.3.1. Doğal sistemlerin analizi yöntemi 21
 - 2.3.2. Mevcut teknik sistemlerin analizi yöntemi 23
 - 2.3.3. Benzerlik (Analoji) yöntemi 24
- 2.4. Sezgisel yöntemler 24
 - 2.4.1. Beyin fırtınası 24
 - 2.4.2. 635 Yöntemi 27
 - 2.4.3. Sineklik Yöntemi 28
 - 2.4.4. Delfi yöntemi 31
 - 2.4.5. Galeri Yöntemi 31
 - 2.4.6. Yöntemlerin birleştirilmesi 33
- 2.5. Mantıksal yöntemler 33
 - 2.5.1. Fiziksel ilişkilerin sistematik incelemesi 33
 - 2.5.2. Tasarım katalogları kullanma 34

2.5.3. TRIZ yöntemi.....	36
--------------------------	----

3.

Yeni Ürün Geliştirme..... 85

3.1. Bir ürünün yenilik derecesi.....	88
3.2. Ürün yaşam döngüsü	90

4.

Mühendislik Faaliyetlerinde ve Tasarımda Kullanılan Yöntemler 93

4.1. Mühendislik yöntemleri.....	93
4.1.1. Geleneksel yöntem	94
4.1.2. Çevik mühendislik yöntemi.....	97
4.1.3. Tasarım odaklı düşünme yöntemi	101
4.1.4. Tersine mühendislik yöntemi	102
4.1.5. Eş zamanlı mühendislik yöntemi.....	106
4.2. Tasarım yöntemleri.....	108
4.2.1. Geleneksel tasarım	109
4.2.2. Algoritmik tasarım	110
4.2.3. Aksiyomatik Tasarım	114

5.

Sistematik Tasarım..... 121

6.

Kavramsal Tasarım 123

6.1. Tasarım görevinin netleştirilmesi ve tasarım şartnamesi oluşturma	124
6.2. Kavramsal tasarım alternatiflerini geliştirme.....	130
6.2.1. Fonksiyon yapısı oluşturma.....	130
6.2.2. Seçim tabloları hazırlama ve konsept tasarım için çözüm alternatiflerini belirleme	136
6.3. Kavramsal tasarımı belirleme	144

7.

Şekillendirme Tasarımı 151

7.1. Ürünün tasarım şeklini geliştirme.....	153
7.1.1. Ürün yapısının fonksiyona göre şekillendirilmesi.....	157
7.1.2. Estetik ürün yapısı oluşturma.....	161
7.2. Şekillendirme tasarımının temel kuralları.....	165
7.2.1. Açıklık kuralı.....	166
7.2.2. Basitlik kuralı.....	172
7.2.3. Emniyet kuralı.....	177
7.3. Şekillendirme tasarımının ilkeleri.....	186
7.3.1. Kuvvet aktarma ilkesi.....	187
7.3.2. Görevlerin ayrılığı ilkesi.....	197
7.3.3. Kendine yardım ilkesi.....	199
7.3.4. Kararlılık İlkesi.....	202

8.

Konstrüksiyonda Malzeme Seçimi 205

8.1. Teknik malzemelerin genel tanıtımı.....	205
8.2. Teknik malzemelerin özellikleri.....	219
8.3. Bilgisayar ortamında malzeme seçimi prosesi.....	237
8.3.1. Malzeme seçimi indekslerinin bulunması.....	238

9.

Teknik Resimler ve Tolerans Analizleri..... 257

9.1. Teknik resimler.....	257
9.2. Ölçü toleransları.....	262
9.2.1. Tolerans tasarımı.....	262
9.2.2. Tolerans kaliteleri ve tolerans cetvelleri.....	263
9.2.3. Alıştırılmalar.....	267
9.2.4. Temel tolerans analizi teknikleri.....	271
9.2.5. Boyut toleranslarının tasarımın farklı yönleri ile ilişkisi.....	278
9.2.6. Tolerans sentezi.....	284
9.2.7. Toleransların gerçekleşmesi ve kontrolü.....	284
9.3. Geometrik toleranslar.....	285
9.3.1. Şekil ve konum toleransları için tanımlar.....	286

9.3.2.	Form toleransları	291
9.3.3.	Profil toleransları.....	296
9.3.4.	Yön toleransları.....	297
9.3.5.	Konum toleransları.....	300
9.3.6.	Salgı (yalpa) toleransları	303
9.3.7.	Geometrik tolerans örnekleri.....	305
9.3.8.	Geometrik toleranslar için tolerans yığılması analizi	307
9.4.	Yüzey kalite toleransları	312
9.4.1.	Yüzey kalitesinin temel parametreleri ve kullanım alanları	312
9.4.2.	Yüzey kalitesi sembolleri	320
9.4.3.	Yüzey kalite toleranslarını ölçme araçları	325

10.

İmalata Uygun Tasarım	329
10.1. İmal usullerinin seçimi	330
10.2. Döküm yöntemine uygun tasarım.....	341
10.3. Döküm sonrası ısıl işlemler	346
10.4. Döküm sonrası test ve kontroller.....	347
10.5. Döküme uygun tasarım, uygulamalar	348
10.6. Kaynak yöntemine uygun tasarım	358
10.6.1. Çelik malzemelerin kaynak kabiliyetleri.....	362
10.6.2. Kaynağa uygun tasarım.....	363
10.6.3. Teknik çizimlerde kaynak dikişlerinin standarda uygun olarak gösterilmesi	370
Kaynaklar	373

Kaynaklar

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MİKROELEKTRONİK DEVRELER VE UYGULAMALARI

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Doç. Dr. Yunus Babacan, Doç. Dr. Abdullah Yeşil, Prof. Dr. Fırat Kaçar

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İçindekiler

Ön Söz.....	iii
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Bölüm 1

Temel Kavramlar	1
Giriş.....	2
1.1. Akım ve Gerilim.....	3
1.2. Güç ve Enerji.....	4
1.3. Gerilim ve Akım Kaynakları	4
1.4. Temel Pasif Devre Elemanları.....	5
1.4.1. Direnç.....	5
1.4.2. Kapasitör	6
1.4.3. İndüktör.....	6
1.4.4. Memristör.....	6
1.5. Kirchhoff Yasaları	7
1.5.1. Akım Yasası.....	7
1.5.2. Gerilim Yasası	8
1.6. Gerilim ve Akım Bölücü Devreler	8
1.6.1. Gerilim Bölücü Devre	8
1.6.2. Akım Bölücü Devre	9
1.7. Üçgen-Yıldız Yapısı	10
1.8. Devre Çözüm Teknikleri	12
1.8.1. Düğüm Gerilimleri Yöntemi	12
1.8.2. Çevre Akımları Yöntemi.....	14
1.8.3. Kaynak Dönüşümü Yöntemi.....	16
1.9. Thevenin ve Norton Eş Değer Devreleri	19
1.10. Maksimum Güç Aktarımı.....	26

Bölüm 2

Yarı İletkenler	29
Giriş	30
2.1. Enerji Bantları	30
2.2. Saf Yarı İletkenler	32
2.3. Katkılı Yarı İletkenler.....	33
2.3.1. n Tipi Yarı İletken.....	33
2.3.2. p Tipi Yarı İletken.....	34
2.4. p-n Eklemi, Diyotlar	36
2.4.1. p-n Ekleminin Enerji Seviyesi	36
2.4.2. Gerilim Uygulanmadığı Durum	38
2.4.3. Gerilim Uygulandığı Durum	40
2.4.4. Gerilim-Akım Grafiği	41
2.5. Metal/Yarı İletken Yapılar, Schottky Diyotlar	44
2.6. Zener Diyot.....	46
2.7. Foto Diyot	47
2.8. Işık Yayan Diyot-Light Emitting Diode (LED).....	48
2.9. Güneş Hücreleri.....	49
2.10. Akım Çeşitleri	49

Bölüm 3

Diyot Devreleri.....	51
Giriş	52
3.1. Doğrultucu Devreler	52
3.1.1. Yarım Dalga Doğrultucu Devreler.....	52
3.1.2. Tam Dalga Doğrultucu Devreler.....	54
3.2. Kırpıcı Devreler.....	58
3.3. Kenetleme Devreleri.....	68
3.4. Zener Diyotlu Devreler.....	74

Bölüm 4

Bipolar Jonksiyonlu Tranzistör	87
4.1. BJT Yapısı.....	88
4.2. BJT Karakteristikleri	90
4.3. Early Olayı	91
4.4. BJT DC Analizi	92
4.4.1. Sabit Kutuplamalı Devre.....	92
4.4.2. Sabit Kutuplamalı Emetör Dirençli Devre	96
4.4.3. Baz Bölücü Devre	98

4.4.4. Geri Beslemeli Devre.....	103
4.5. BJT Küçük Sinyal Analizi.....	110
4.6. Kuvvetlendirici Devrelerin Küçük Sinyal Analizi.....	111
4.6.1. Sabit Kutuplamalı Devre.....	114
4.6.2. Sabit Kutuplamalı Emetör Dirençli Devre.....	118
4.6.3. Baz Bölücü Devre.....	122
4.6.4. Geri Beslemeli Devre.....	126
4.6.5. Emetör İzleyici Devre.....	130

Bölüm 5

MOSFET.....	155
5.1. MOS Tranzistör Yapısı.....	156
5.2. MOS Karakteristikleri.....	159
5.3. İkincil Etkiler.....	162
5.3.1. Gövde Etkisi.....	162
5.3.2. Kanal Boyu Modülasyonu (Kanal Kısılması).....	163
5.3.3. Kısa Kanal Etkisi.....	164
5.3.4. Sıcak Taşıyıcı (Hot Carrier) Etkisi.....	164
5.3.5. Sıcaklık Etkisi.....	165
5.4. CMOS Yapısı.....	165
5.5. MOS DC Analizi.....	166
5.5.1. Ortak Source'lu Devreler.....	167
5.5.2. Ortak Gate'li Devreler.....	172
5.5.3. Ortak Drain'li Devreler.....	173
5.6. MOS Küçük Sinyal Analizi.....	174
5.7. Kuvvetlendirici Devrelerin Küçük Sinyal Analizi.....	175
5.7.1. Ortak Source'lu Devreler.....	175
5.7.2. Ortak Gate'li Devreler.....	180
5.7.3. Ortak Drain'li Devreler.....	184
5.8. Yeni Nesil Tranzistörler.....	206
5.8.1. Floating Gate MOS (FGMOS).....	206
5.8.2. Dynamic Threshold MOS (DTMOS).....	208
5.8.3. FinFET.....	209
5.8.4. High Electron Mobility Transistor (HEMT).....	210
5.8.5. Organic FET (OFET).....	211
5.8.6. Carbon Nanotube FET (CNFET).....	212
5.8.7. SpinFET.....	213

Bölüm 6

Fark Kuvvetlendiricileri	215
Giriş	216
6.1. BJT Fark Kuvvetlendirici Yapısı	216
6.2. MOS Fark Kuvvetlendirici Yapısı	221
6.3. Ortak İşareti Bastırma Oranı-Common Mode Rejection Ratio (CMRR)	227
6.3.1. R_C Direncinin Eşitsizliği	227
6.3.2. Akım Kaynağının İdeal Olmaması	229

Bölüm 7

İşlemsel Kuvvetlendiriciler	239
Giriş	240
7.1. Tampon (Buffer) Devresi	243
7.2. Eviren (Inverting) Yükselteç Devresi	243
7.3. Evirmeyen (Non-Inverting) Yükselteç Devresi	245
7.4. Toplama Devresi	245
7.5. Çıkarma Devresi	247
7.6. İntegral Alıcı Devre	248
7.7. Türev Alıcı Devre	249
7.8. Logaritma Alıcı Devre	250
7.9. Üs Alıcı Devre	251
7.10. Schmitt Tetikleyici Devreleri	251
7.10.1. Eviren Schmitt Tetikleyici Devre	251
7.10.2. Evirmeyen Schmitt Tetikleyici Devre	254

Bölüm 8

OTA	271
Giriş	272
8.1. OTA Yapıları	273
8.1.1. Basit OTA	273
8.1.2. Simetrik OTA	274
8.2. Tampon (Buffer) Devresi	275
8.3. Eviren (Inverting) Yükselteç Devresi	276
8.4. Evirmeyen (Non-Inverting) Yükselteç Devresi	277
8.5. Toplama Devresi	278
8.6. Çıkarma Devresi	278
8.7. İntegral Alıcı Devre	279
8.8. Türev Alıcı Devre	279
8.9. Alçak Geçiren Filtre	281

8.10. Yüksek Geçiren Filtre.....	282
8.11. Bant Geçiren Filtre	283
8.12. Bant Durduran Filtre.....	284
8.13. Direnç Yapıları	285
8.13.1. Topraklı Pozitif Direnç	285
8.13.2. Topraklı Negatif Direnç	286
8.13.3. Yüzen Uçlu (Floating) Pozitif Direnç	287
8.13.4. Yüzen Uçlu (Floating) Negatif Direnç.....	287
8.14. İndüktans Yapıları	288
8.14.1. Topraklı Pozitif İndüktans	288
8.14.2. Yüzen Uçlu (Floating) Pozitif İndüktans	289
8.14.3. Yüzen Uçlu (Floating) Negatif İndüktans	290
8.15. Jirator.....	292

Bölüm 9

Akım ve Gerilim Kaynakları.....	293
Giriş.....	294
9.1. Akım Aynaları.....	294
9.1.1. Basit Akım Aynası.....	294
9.1.2. Wilson Akım Aynası.....	296
9.1.3. İyileştirilmiş Wilson Akım Aynası	297
9.1.4. Kaskot Akım Aynası.....	298
9.2. Referans Akım Üreteçleri.....	298
9.2.1. Basit Akım Referansı	299
9.2.2. Kendinden Kutuplamalı Akım Referansı.....	299
9.2.3. V_{BE} Akım Referansı	302
9.3. Referans Gerilim Üreteçleri.....	303
9.3.1. Gerilim Bölücü Referansı	303
9.3.2. Diyot Bağlı MOS Tranzistör Referansı.....	305
9.3.3. Zener Diyot Referansı.....	307
9.3.4. Band Aralığı Referansı.....	307
9.3.5. Kendinden Kutuplamalı Gerilim Referansı.....	311
9.3.6. V_{GS} Gerilim Referansı.....	311

Bölüm 10

Frekans Cevabı.....	313
Giriş.....	314
10.1. Desibel Kavramı.....	315
10.2. Kutup ve Sıfır Kavramı	316

10.3. Basit RC Devresi	331
10.4. Düşük Frekans Cevabı.....	332
10.4.1. BJT Tabanlı Yükselteç Devresi	332
10.4.2. MOS Tabanlı Yükselteç Devresi	341
10.5. Yüksek Frekans Cevabı.....	344
10.5.1. BJT'nin Yüksek Frekans Eş değeri.....	344
10.5.2. MOS Tranzistörün Yüksek Frekans Eş değeri.....	345
10.5.3. Miller Teoremi	345

Bölüm 11

Geri Besleme	357
Giriş.....	358
11.1. Geri Besleme Kavramı	358
11.1.1. Giriş Sinyaline Daha Az Bağlılık.....	359
11.1.2. Yüksek Giriş Empedansı.....	360
11.1.3. Düşük Çıkış Empedansı	360
11.1.4. Daha İyi Frekans Cevabı.....	361
11.1.5. Daha Fazla Lineerlik.....	362
11.1.6. Daha Az Gürültü	363
11.2. Temel Geri Besleme Yapıları	363
11.2.1. Gerilim Yükseltici (Seri Gerilim).....	363
11.2.2. Akım Yükseltici (Paralel Akım).....	369
11.2.3. Geçiş Direnci (Transrezistance) Yükseltici (Paralel Gerilim).....	375
11.2.4. Geçiş İletkenliği (Transconductance) Yükseltici (Seri Akım).....	380

Bölüm 12

Osilatörler	403
Giriş.....	404
12.1. Rezonans Devreleri	405
12.1.1. Seri LC Rezonans Devresi	405
12.1.2. Paralel LC Rezonans Devresi.....	406
12.1.3. Seri RLC Rezonans Devresi.....	407
12.1.4. Paralel RLC Rezonans Devresi	408
12.2. Osilatör çeşitleri.....	409
12.2.1. Sinüzoidal Osilatörler	409
12.2.1.1. RC Geri Beslemeli Osilatörler	409
12.2.1.2. LC Geri Beslemeli Osilatörler.....	415
12.2.3. Kristal Osilatörler.....	421

Bölüm 13

Filtreler.....	423
Giriş.....	424
13.1. Rezonans	424
13.2. Kesim Frekansı.....	425
13.3. Bant Genişliği.....	426
13.4. Kalite Faktörü.....	426
13.5. Pasif Filtreler	426
13.5.1. Alçak Geçiren Filtre.....	427
13.5.2. Yüksek Geçiren Filtre	429
13.5.3. Bant Geçiren Filtre.....	430
13.5.4. Bant Durduran (Söndüren) Filtre	432
13.5.5. Tüm Geçiren Filtre.....	435
13.6. Aktif Filtreler.....	436
13.6.1. Alçak Geçiren Filtre.....	437
13.6.2. Yüksek Geçiren Filtre	439
13.6.3. Bant Geçiren Filtre.....	440
13.6.4. Bant Durduran Filtre	441
13.6.5. Diğer Filtreler.....	443

Bölüm 14

Güç Kuvvetlendiricileri ve Çıkış Katları.....	483
Giriş.....	484
14.1. Yükseltme Türleri.....	484
14.1.1. A Sınıfı Yükseltme.....	485
14.1.2. B Sınıfı Yükseltme.....	486
14.1.3. AB Sınıfı Yükseltme	487
14.1.4. C Sınıfı Yükseltme.....	487
14.2. Güç Hesaplama.....	488
14.3. Yükselteç Türleri	490
14.3.1. A Sınıfı Güç Yükseltici	490
14.3.2. B Sınıfı Güç Yükseltici	497
14.3.3. AB Sınıfı Güç Yükseltici	501
14.3.4. C Sınıfı Güç Yükseltici	503
Kaynaklar	504

Kaynaklar

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İÇİNDEKİLER

YAZARLAR LİSTESİ.....	iii
ÖN SÖZ	v
TEŞEKKÜR.....	vii
1. BÖLÜM	1
GİRİŞ	1
Selim Dünder.....	1
2. BÖLÜM	5
MİKROMOBİLİTENİN TARİHİ	5
Selim Dünder.....	5
3. BÖLÜM	25
MİKROMOBİLİTE ARAÇLARI	25
Selim Dünder, Tanzer Kantık.....	25
4. BÖLÜM	51
MİKROMOBİLİTEYE (MİKROHAREKETLİLİK) UYGUN ŞEHİRLER	51
Gizem Erdoğan Aydın, Elçin Mert.....	51
5. BÖLÜM	69
MİKROMOBİLİTENİN SOSYOKÜLTÜREL ETKİLERİ	69
Gürkan Günay, Pelin Alcan Gezginci.....	69
6. BÖLÜM	81
MİKROMOBİLİTE VE TRAFİK	81
Selim Dünder, Ecem Şentürk Berktaş.....	81
7. BÖLÜM	105
MİKROMOBİLİTENİN ÇEVRESEL ETKİLERİ	105
Agne Karlikanovaite Balıkcı.....	105

8. BÖLÜM	127
MİKROMOBİLİTENİN SAĞLIĞA ETKİLERİ	127
Ahmet Cüneyt Akgöl, Begüm Okudan.....	127
9. BÖLÜM	163
MİKROMOBİLİTENİN ERGONOMİSİ	163
Pelin Alcan Gezginci	163
10. BÖLÜM	179
PAYLAŞIMLI MİKROMOBİLİTE SİSTEMLERİ	179
Yavuz Salih Şahin, Tanzer Kantık, Elçin Mert	179
11. BÖLÜM	183
MİKROMOBİLİTE İŞLETMECİLİĞİ	183
Yavuz Salih Şahin, Tanzer Kantık, Ersoy Soyer, Elçin Mert	183
12. BÖLÜM	187
MİKROMOBİLİTEDE VERİNİN KULLANIMI	187
Ersoy Soyer	187
13. BÖLÜM	189
MİKROMOBİLİTE VE YÜK TAŞIMACILIĞI	189
Gürkan Günay	189
14. BÖLÜM	197
MİKROMOBİLİTE SİSTEMLERİNİN YASAL DURUMU	197
Saadet Deveci	197
15. BÖLÜM	239
AFET VE MİKROMOBİLİTE	239
Hilmi Evren Erdin, Ziya Çakıcı, Pelin Alcan Gezginci, İrem Merve Ulu	239
16. BÖLÜM	275
GELECEKTE MİKROMOBİLİTE.....	275
Gürkan Günay, Ersoy Soyer	275

2. BÖLÜM

MİKROMOBİLİTENİN TARİHİ

Selim Dündar

25 km/sa'ın altındaki hızlarla gidebilen, küçük boyutlu ve bireysel araçların kullanıldığı ulaşım sistemleri olarak tanımlanan mikromobilitenin tarihi açıdan değerlendirilmesi aslında oldukça karmaşık bir konudur. Bunun temel nedeni mikro yani küçük boyutlu olarak tanımlanabilecek hareketliliğin gerçekte ne zaman başladığını ya da mikro olmayan hareketlilikten hangi noktada ayrıldığını net olarak belirleyebilmenin zorluğudur. Bu nedenle ulaşım sisteminin tarihsel gelişimi ile birlikte incelenmesi daha faydalı olacaktır.

2.1. Ulaşım Sisteminin Kısa Tarihsel Gelişimi

Bilinen insanlık tarihi göz önüne alındığında, insanlar paleolitik çağda dünyanın farklı noktalarında topluluklar hâlinde organize olmaya başlamışlar ve özellikle içme suyu kaynaklarına yakın olan bölgelerde barınmaya başlamıştır. Barınma ihtiyaçları için ağaç kovukları, mağaralar gibi dış etkilerden korunaklı yerleri tercih eden topluluklar, su ya da yiyecek ihtiyaçları için hareket etmek zorunda kalmıştır. İlk başta bu hareketlerini yürüyerek gerçekleştirirken, binek hayvanlarının evcilleştirilmesiyle bu hayvanların daha yüksek güç ve hız gibi üstünlüklerinden faydalanmaya başlamışlardır. Yine bu dönemde farklı özellikteki taşları birbirine vurarak ya da sürterek sivrileştirilen insanlar, avlanmak için kullanılan silahların ilkel biçimlerini ortaya koymuştur. Neolitik çağa gelindiğinde obsidiyen ve çakmaktaşı gibi maddelerin kullanımıyla avcılık olanakları artarak, besin kaynakları çeşitlenmeye başlamıştır. Tunç çağına ulaşıldığında ise daha sağlam ve dayanıklı silahlar oluşturulmaya başlanmış ve daha büyük boyuttaki hayvanların avlanması kolaylaşmıştır. Büyük boyuttaki hayvanların avlanması, av etlerinin barınma merkezlerine taşınması sorununu da ortaya çıkarmıştır. Önceleri avlarını tamamen iterek ya da çekerek barındıkları yerlere taşıyan insanlar, ulaşım alanındaki belki

Her ne kadar düşük düzeyde de olsa ülkemizde bireysel e-skuter kullanımı bulunmakta idiye de, Türkiye'nin e-skuterlerle gerçek anlamda tanışması 2018 yılında ilk paylaşımlı e-skuter firmasının piyasaya girmesiyle oldu. 2020'nin mart ayında Çin'in Wuhan eyaletinde başlayıp, tüm dünyaya yayılan COVID-19 salgınının etkileriyle insanların toplu taşımadan uzaklaşması, bireysel ulaşım türlerine olan talebin artmasına neden oldu. Bu sayede e-skuterlerin kullanımına olan talep de gün geçtikçe artmaya başladı. Bunun üzerine e-skuterlerin trafikte işletilmesine ilişkin yasal düzenlemelere ihtiyaç duyulmaya başladı. Gerek ülkemizde, gerekse de diğer ülkelerde e-skuterlere ilişkin yasal düzenlemeler kitabımızın 14. Bölümünde detaylı bir biçimde incelenmektedir.

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3. BÖLÜM

MİKROMOBİLİTE ARAÇLARI

Selim Dündar, Tanzer Kantık

Mikromobilite temel olarak 25 km/sa'ın altındaki hızlarda işletilen, boyutu küçük olan ve genellikle elde taşınabilen, kısa mesafelerde bireysel ulaşım amaçlı kullanılan sistemlere verilen isimdir. Mikromobilite kavramı çoğunlukla bisiklet, e-bisiklet, e-skuter gibi popüler olmuş ulaşım sistemlerini çağrıştırmaktadır. Buna karşın, gerek ülkemizde gerekse yurt dışında kullanılan bu tanıma uygun farklı araç tipleri de bulunmaktadır. Bununla birlikte az önce belirttiğimiz tanıma tam olarak uymasa da yine de mikromobilite sistemi olarak değerlendirilen farklı araç tipleri de mevcuttur. Bu bölüm kapsamında kısaca bu araçlara değinilecektir.

3.1. Mikromobilite Araç Türleri

3.1.1. Bisiklet

Bisiklet aslında tarihi olarak ilk ortaya çıkan mikromobilite aracıdır. Ancak mikromobilite kavramının ortaya çıkması bisikletin ortaya çıkmasından çok daha geçtir. Dağ bisikleti, BMX, yarış bisikleti gibi farklı türleri bulunan bisikletin tarihine kitabımızın 2. bölümünde detaylı bir biçimde değinildiğinden bu bölümde detaylara girilmeyecektir. Kendine özgü bir yol üzerinde hareket etmekte olan bir bisiklet Şekil 3.1'de görülmektedir.

derece popüler hâle gelmişler ve pek çok büyük şehirde paylaşımlı olarak kullanıma sunulmuşlardır.

2. **Elektrikli Bisikletler:** Elektrikli bisikletler, geleneksel bisikletlere benzer ancak elektrik motoru tarafından desteklenirler. Pedal çevrildiği esnada elektrik motorunun devreye girmesi prensibi ile çalışır. Elektrik desteği 25 km/sa'e geldiğinde otomatik kesilir. Şehir içi ulaşım için hem eğlenceli hem de pratik bir seçenektir.
3. **Elektrikli Mopedler:** Elektrikli mopedler, biraz daha büyük elektrikli araçlardır ve skuterlerle bisikletlerin bir kombinasyonudur. Bir koltuğa ve daha büyük pile sahiptirler, bu sayede daha rahat ve daha uzun mesafeli bir sürüş imkanı sunarlar.
4. **Elektrikli Kaykaylar ve Hoverboard'lar:** Elektrikli kaykaylar ve hoverboard'lar, genellikle gençler arasında popüler olan eğlenceli ulaşım araçlarıdır. Ayaklarınızın altına aldığımız sensörlere göre hareket ederler.
5. **Elektrikli Tek Tekerlekli Araçlar:** Bu, özellikle denge konusunda yetenekli olan kullanıcılar için uygundur. Elektrikli tek tekerlekli araçlar, hareket etmek için vücut ağırlığınızı kullanır ve çevik bir şekilde manevra yapabilirler.

Bu tür paylaşımlı mikromobilite araçlarını kullanmak için genellikle bir mobil uygulamayı indirip kaydolmanız gerekecektir. Uygulama, size en yakın araçları ve kiralama sürecini gösterir. Kiralama işlemi tamamlandığında, aracı belirli bir bölge içinde kullanabilirsiniz. Kiralama süresi sona erdiğinde, aracı uygun bir park alanına bırakarak işlemi tamamlayabilirsiniz. Bu sistem, hızlı ve çevre dostu ulaşım seçenekleri sunarak şehir içi trafiği azaltmaya ve çevreyi korumaya yardımcı olur. Ancak, kullanıcıların güvenliği ve trafik kurallarına uymaları da önemli bir konudur.

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4. BÖLÜM

MİKROMOBİLİTEYE (MİKROHAREKETLİLİK) UYGUN ŞEHİRLER

Gizem Erdoğan Aydın, Elçin Mert

İnsanın yolculuk ihtiyacını gidermek amacıyla mekânlar arası yer değişimi ulaşım olarak tanımlanır. Ulaşım, insanların veya nesnelerin bir yerden başka bir yere hareket etmesini sağlamak için iş, eğitim, ticaret, turizm gibi çeşitli amaçlarla gerçekleştirilen harekettir. Ulaşım zaman, hız, maliyet, güvenlik, hareketlilik gibi çeşitli bileşenlerden oluşmaktadır. Mal ve hizmetlerin taşınması, lojistik faaliyetleri, kamu hizmetleri gibi alanlarda da ulaşım büyük öneme sahiptir ve insan hayatının en temel unsurlarındandır. Toplumların ekonomik, sosyal ve kültürel gelişiminde büyük bir rol oynayan ulaşımın sürdürülebilir ve etkili olması önemlidir. Bütün yolculuk türleri insanın hareket etmesi ile başlar ve son bulmaktadır. İnsanların günlük yaşamlarında iş, eğitim, alışveriş, sağlık hizmetleri gibi faaliyetler için gerçekleştirdiği seyahatleri kapsayan kavram ise kentsel hareketliliktir. İnsanların konut, işyeri, okul, sağlık merkezleri, alışveriş bölgeleri ve diğer önemli noktalara kolayca ulaşabilmesini sağlayan ulaşılabilirlik, insanların kent içinde seyahat etmelerini kolaylaştıran iyi bir toplu taşıma ağı, insanların bisiklet veya yürüyerek seyahat etmelerini teşvik eden bisiklet yolları, yaya yolları, kaldırımlar ve güvenli geçitler gibi altyapı önlemleri, sürdürülebilirlik ve teknolojik inovasyonları içermektedir.

İnsan, ulaşım ihtiyacı en temel organik hareketini yaya ulaşımı ile sağlamaktadır. Kentsel hareketlilik, üç farklı büyüklükteki ölçekte değerlendirilerek, ulaşım talebinde bulunan yolcunun fiziksel hareketi, taşıt hareketliliği ve çevresel, sosyal parametreler ile birlikteliği sentezlenmesi sonucunda ortaya çıkmaktadır (Rupperecht Consult, 2019). Kentsel hareketliliğin üç ölçüğü [1] makromobilite, [2] mezomobilite ve [3] mikromobilite olarak sınıflanmaktadır:

mobilité araçlarını etkin ve sürdürülebilir kullanıma uygun hâle getirmek kentler için birer fırsat olabilir.

Görüntü kirliliği, güvensiz yolculuk vb negatif etkileri indirebilmek için toplum yaklaşımını yönlendirmeli ve aidiyet duygusu yaratılmalıdır. Mahallelerle bütünleşmiş bir mikrohareketlilik sistemi kullanıcılar tarafından sahiplenilmesini sağlayacaktır. Kullanıcıya rağmen hiçbir planlama kararı sürdürülebilir olamaz.

Her kentin kendi kimliği bulunmaktadır. Sürüş alışkanlıkları, araç kullanım türleri, araç kullanım şekilleri, yaya hareketliliği toplumun kimliğine göre şekillenmektedir. Aitlik hissedilmeye yerde barınmak çok güçtür. Dolayısıyla aidiyet duygusu, zorunlu olarak yaşanan mekanlarda bile istemli/istemli kazanılan ilk duygudur. Kullanılan araçlar da bu kimliğe ve duyguya ait bir parça hâline gelmeye başlarlar. Özellikle mikromobilité araçları araçların otonomla birleşmesi ve inovatif bir hâl alması ile hayatı kolaylaştırıp benimsemeyi de beraberinde getirecektir.

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5. BÖLÜM

MİKROMOBİLİTENİN SOSYOKÜLTÜREL ETKİLERİ

Gürkan Günay, Pelin Alcan Gezginci

Mikromobilité kullanımı, özellikle e-skuterler, son yıllarda dünyada ve ülkemizde artış eğilimindedir. Ülkemizdeki artış eğilimi oldukça göze çarpıcıdır; öyle ki, bu araçların sayısı zaman zaman kara yolu trafiği ve kaldırımlardaki yaya trafiğini tehlikeye sokabilecek düzeye ulaşmaktadır. Sözü edilen mikromobilité kullanım artışı ve buna bağılı oluşan tehlikeler, mikromobilité sistemlerinin toplum tarafından kabul edilme seviyesini tartışma açısından önemli bakış açılarından birini oluşturur.

Mikromobilité araçlarının karıştığı kazalar dikkate alındığında yaralanmalı ve hatta ölümlü kazaların olduğu bilinmektedir. Yaya kaldırımındaki kazalarda daha çok yaralanmalı kazalar meydana gelmekteyken, kara yolunda e-skuterlerle motorlu araçların karıştığı kazalarda ne yazık ki hayatını kaybeden insanlar olabiliyor. Bu araçların bu şekilde gündeme gelmesi, özellikle basın-yayın yoluyla insanlara kaza bilgilerinin gitmesi, insanlarda bu araçlara karşı ister istemez olumsuz bir yargı oluşturmaktadır. Bu yargının kırılması ise ancak bu araçların güvenli olduğunun algılanmasıyla gerçekleşecektir. Bu bağlamda, mikromobilité araçlarının yalnızca bisiklet yolunda kullanımı ve maksimum hızının düşürülmesi uygun çözümler olabilir. Mikromobilité araçlarının bisiklet yolundan çıkmamaları ve düşük hızda seyretmeleri sayesinde kazaların sayısı azalacak ve insanlar arasındaki olumsuz algı kırılacaktır. Bu olumsuz algının kırılması sayesinde daha fazla insan mikromobilitéyi tercih etmeye başlayabilir, dolayısıyla da mikromobilité bu açıdan bakıldığında toplum tarafından kabul edilmiş olabilir.

Nitekim 2023 yılının Nisan ayında İstanbul Büyükşehir Belediyesi (İBB), e-skuter kullanımı ile alakalı yeni kararlar almıştır. Bu kararlar doğrultusunda mevcut 15

yönelik ürünler tasarlamak bu anlayışlardan sadece birisidir. Ayrıca bu ürünlerin tasarlanması için yaratıcılıklarını kullanmaları adına kadınları işe almak, erkek egemen mobilite endüstrisini de geliştirecektir (Sallah and Caesar, 2020).

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6. BÖLÜM

MİKROMOBİLİTE VE TRAFİK

Selim Dündar, Ecem Şentürk Berkaş

Trafik sıkışıklıkları ve kara yolu trafik kazaları günümüzde tüm gelişmiş ülkelerin yaşadığı toplumsal sorunların başında gelmektedir. Trafik sıkışıklıkları temel olarak yolların hizmet verebileceği taşıt sayısından, diğer bir deyişle yolların *kapasitesinden* daha fazla sayıda taşıtın yolu kullanma talebi göstermesi olarak tanımlanabilir. Trafik kazası ise 2798 sayılı Karayolları Trafik Kanunu'nda, "Kara yolu üzerinde hareket hâlinde olan bir veya birden fazla aracın karıştığı ölüm, yaralanma ve zararlar sonuçlanmış olan olaydır." şeklinde tanımlanmıştır (Karayolları Trafik Kanunu, 1983). Trafik sıkışıklıkları, yaşandığı bölgede kirletici egzoz gazı salımları, yakıt tüketimindeki artış, zaman kaybı gibi hem çevreye hem de yerel ve ulusal ekonomiye olumsuz etkiler yaratmaktadır. Trafik kazaları da benzer şekilde maddi hasarın yanı sıra yaralanma ve can kayıplarıyla sonuçlanabilmektedir. Bu nedenlerle günümüzde gerek trafik sıkışıklıklarını, gerekse de trafik kazalarını azaltmak için çok sayıda çalışma yapılmaktadır. Örneğin Birleşmiş Milletler 2015 yılında 193 ülke tarafından 2030 sonuna kadar ulaşılmak üzere kabul edilen 17 adet "Sürdürülebilir Kalkınma Amacı" tanımlamıştır (Birleşmiş Milletler, 2015). Tanımlanan bu amaçlar Şekil 6.1'de görülmektedir.

6.3. Mikromobilite Araçlarının Trafik Akımına Etkileri

Mikromobilite taşıtlarının kara yolu trafik akımına etkileri konusunda gerçekleştirilen bilimsel çalışmalar henüz yeterli düzeye ulaşmamıştır. Ancak, bu taşıtların kara yolunun bir şeridini taşıtlarla paylaştığı durum göz önüne alındığında, gerek en yüksek hızları, gerekse de bu taşıtlar için belirlenmiş olan yasal hız sınırları diğer motorlu taşıtlara göre çok daha düşük kalmaktadır. Bu durum trafik akımının homojenliğinin bozulmasına yol açmakta, mikromobilite araçlarıyla aynı şeridi kullanan taşıtların daha fazla fren yapma ihtiyacı duymasına ya da şerit değiştirme manevraları gerçekleştirmesine neden olmaktadır. Dündar, vd. (2022) tarafından gerçekleştirilen çalışmada, e-skuterların Bağdat Caddesi'nin sağ şeridini kullandıkları durum incelenmiş ve e-skuter talep düzeyi arttıkça yolun özellikle sağ şeridindeki serbest akım hızının, tıkanıklık yoğunluğunun ve maksimum hacim değerinin azaldığı görülmüştür. Bu durum da e-skuterların kendine özgü bir yolda ya da yaya kaldırımında yolculuk etmedikleri sürece, trafik akımını olumsuz etkilediğini göstermektedir. Bu durum şüphesiz diğer mikromobilite taşıtları için de geçerlidir. Ancak bu konuda farklı yol kesimleri için farklı trafik talep düzeylerinde araştırmalar gerçekleştirilerek, bu durumun daha somut bir biçimde ortaya konulması gerekmektedir. Bu konuya ilişkin bilimsel araştırmalar başlamış olup, hâlen sürdürülmektedir.

Henüz yeterli bir biçimde yasal altyapısı düzenlenememiş olan mikromobilite araçlarının hem kara yolu trafik güvenliğini hem de trafik akım özelliklerini olumsuz olarak etkilediği görülmektedir. Bu nedenle mümkün olan kesimlerde motorlu taşıt trafiği ve yaya trafiğinden fiziki engellerle ayrılmalı, bunun mümkün olmadığı kesimlerde ise güvenli bir biçimde işletilmelerine ilişkin yasal düzenlemeler geliştirilmelidir. Ancak yasal düzenlemeler ne yazık ki tek başlarına yeterli olmadığından, verimli çalışan bir denetleme mekanizmasının kurulması ve işletilmesi de oldukça önemlidir. Böylece kamuoyunun bazı kesimlerince mikromobilite taşıtlarına karşı olan olumsuz ön yargı da yıkılabilecektir.

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7. BÖLÜM

MİKROMOBİLİTENİN ÇEVRESEL ETKİLERİ

Agne Karlikanovaite Balıkçı

7.1. Giriş

Çevre dostu davranışın temel ön koşullarından biri biyosferik değerler olarak da bilinen çevresel değerlerdir (Steg, vd., 2012). Güçlü biyosferik değerlere sahip olan insanlar, doğanın insanlara fayda sağladığı için değil, kendi başına önemli olduğuna inanırlar. Bu tür insanlara göre, doğal kaynaklar korunmalı ve muhafaza edilmelidir. Araştırmalar, insanların çevresel değerleri ne kadar güçlüyse, atıklarını ayırma, çevre dostu ulaşım türlerini seçme, daha az araç kullanma, daha az tek kullanımlık plastik şişelerde su kullanma, çevre politikalarını destekleme, daha az et yeme vb. olasılıklarının da o kadar yüksek olduğunu göstermektedir (Balundé, vd. 2019; Balundé, vd., 2020a; Balundé, vd., 2020b; Hiratsuka, vd., 2018). Dünya toplumlarında yaygın çevre dostu davranış ve kaynakların korunması, ekolojik krize uyum sağlanmasına ve ekolojik krizin aşılmasına önemli katkı sağlayacaktır. Ancak bu basit bir iş değildir çünkü insan davranışı, kişisel özellikler ve çeşitli çevresel faktörler tarafından etkilenir ve belirlenir.

Dünya Çevre ve Kalkınma Komisyonu (WCED, 1987), sürdürülebilir kalkınmayı, gelecek nesillerin ihtiyaçlarını karşılama fırsatlarını azaltmadan, toplumun mevcut ihtiyaçlarını karşılayan bir gelişme olarak tanımlamaktadır.

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8. BÖLÜM

MİKROMOBİLİTENİN SAĞLIĞA ETKİLERİ

Ahmet Cüneyt Akgöl, Begüm Okudan

Dünya nüfusundaki artışa paralel olarak, ekonomik ve teknolojik gelişmelerin etkisiyle büyük şehirlerde yaşayan insan popülasyonu giderek artmaktadır (United Nations, 2023). Çok sayıda insan bir gün içinde bireysel, sosyal veya ticari gereksinimleri için yoğun şekilde yer değiştirmek zorunda kalmaktadır. Bu durum ulaşımda ekonomik hızlı ve kullanışlı çözümlere gereksinim doğurmıştır.

Mikromobilite araçları, özellikle şehir içi transferler için ekonomik ve kullanışlı alternatifler oluşturmaları nedeniyle tüm dünyada giderek popüler hâle gelmiştir (Bozzi ve Aguilera, 2021). Özellikle büyük kentlerde ve sınırlı lokasyonlarda kullanılırken, gereksinimlerin oluşturduğu ivmelenmeyle her lokasyondaki araç sayısı ve çeşidi artmakta, yeni lokasyonlar açılmaya devam etmektedir (New Urban Mobility Alliance). Bu nedenle, giderek daha fazla insanın mikromobilite araçlarını kullanacağı tahmin edilmektedir.

Giderek büyüyen mikromobilite kullanıcı kitlesi doğal olarak, insan sağlığıyla ilgili meslek profesyonellerinin ilgi alanındadır. Bu kitlenin gereksinimlerini saptayabilmek ve bunlara çözüm bulabilmek için bilimsel çalışmalar yapılmaktadır. Bu çalışmalardan bir grubu mikromobilite araçlarını kullanan kişilerin insan bedeninin sınırlarından kaynaklanan bireysel risklerini konu almaktadır. Bir diğer grup çalışma da toplum sağlığı risklerini ele almaktadır. Toplum sağlığının dolaylı olarak zarar görmesine neden olabilecek sosyal ve ekolojik etkenleri saptayarak önleyebilmek için farklı disiplinlerde çalışmalar yapılmaktadır (Bretones, vd., 2023).

Bu bölümde, güncel bilimsel araştırmalar doğrultusunda, mikromobilite araçlarını kullanan kişilerin olası sağlık riskleri ve bu risklerin oluşturabileceği bireysel ve toplumsal etkiler ele alınmıştır.

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9. BÖLÜM

MİKROMOBİLİTENİN ERGONOMİSİ

Pelin Alcan Gezginci

9.1. Giriş

Mobilite sistemleri ilerlemeye devam etmektedir. Yıllardır otomotiv çevrelerinde her daim söylenen "daha büyük, daha güçlü ve daha hızlı olan, çok daha iyidir" düşüncesi artık değişmektedir. Bu tanım belki de birkaç sene içerisinde "daha küçük araçlar ve daha fazla mikromobilite çok daha iyidir" tanımına dönüşebilecektir.

Avrupa'da ve özellikle Türkiye'nin büyük şehirlerinde yolların e-bisikletler, e-skuterler ve daha pek çok farklı mikromobilite aracı tarafından fethedildiği söylenebilir. Geleceğe dair Kentsel Ulaşım perspektiflerine bakılırsa, şehirlerin en büyük ihtiyaçlarından birisinin daha az araba trafiği olduğu görülmektedir. O zaman motorlu araç trafiğinde kısıtlayıcı önlemlerin uygulandığı bir ulaşım politikasına ihtiyaç olduğu rahatlıkla söylenebilir. Bazı bilim çevreleri ise, araç trafiğini mümkün olduğunca şehirle uyumlu hâle dönüştürmenin önemini hatırlatmaktadır. Elbette sadece mikromobilitenin yeterli olduğu söylenemez. Yeni araç kategorileri, farklı hareketlilik merkezleri ve yasal kuralların her ülke ve şehirde mutlaka uygulanıp, o ülke ve şehre göre uyarlanması diğer önemli hususları oluşturmaktadır.

En genel tanımıyla *Ergonomi*, insanlar, araçlar ve bir sistemin diğer alt yapıları arasındaki ilişkilerin anlaşılmasıyla ilgili bilimsel bir disiplindir. Çalışmanın sistemli bir şekilde düzenlenmesi ve hem makinelerin hem de donanımın çalışan kişinin yatkınlıklarına/özelliklerine göre hesaplanması ve uyarlanması amacıyla yapılan tüm inceleme ve araştırmaları kapsamaktadır. İş çevresi ve içerdiği tüm etkenler, insanın psiko-fizyolojik ve sosyo-kültürel bütün limitleriyle uyumlaştırılmalıdır. Ancak bu şekilde üretimsel verimliliğe ulaşmak mümkün olacaktır. İşte, çalışmanın düzenli bir şekilde ilerlemesini amaçlayan ergonomi aynı zamanda

Mikromobilite alternatifleri kesinlikle ve artarak ufukta yerini hazırlamaktadır. Yeni mobilite çözümlerini ergonomi ve insana uygun tasarım olmadan düşünmek neredeyse imkansızdır. Mikromobilite araçları çok çeşitli yapıda, tasarımda ve farklı özelliklerdedir. Ergonominin en temel konusu olan donanım ergonomisinde mühendislikte var olan bazı tasarım hataları araştırılırken, ayrıca ürünlerin, iş istasyonlarının, ofis donanımının ve taşımacılığın bütün farklı kollarında teknolojinin kullanımı da mümkün kılınmaktadır. Ergonomide tasarımın önemi yukarıda da anlatıldığı gibi, oldukça önemlidir.

Bu bölüm sonucunda anlaşılmaktadır ki, mikromobilite araçlarının güvenli kullanımını için fren sistemleri ve daha pek çok noktaya dikkat edilmeli ve ergonomik tasarımlarına önem verilmelidir. Yasama organları ve mobilite araçlarının sağlayıcıları mikromobilite kullanımının güvenliğini artırmak için bu bulguları dikkate almak zorundadır.

Yapılan çalışmalardan, mikromobilite kullanıcılarında önemli bir bilgi eksikliğinin olduğu da görülmektedir. Yürürlükteki yasalar ve düzenlemeler hakkında mobilite sağlayıcılarına büyük görevler düşmektedir. Kullanıcılara daha iyi bilgi verilebilmesi için bazı halk eğitim kampanyaları, TV ve internet ortamında yapılabilecek online tanıtımlar önemli olabilir. Kullanıcıların mobilitenin yolda güvenli bir şekilde kullanımına ilişkin bilgilerini arttırmaları çok önemlidir.

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13. BÖLÜM

MİKROMOBİLİTE VE YÜK TAŞIMACILIĞI

Gürkan Günay

Mikromobilité çoğu zaman insanların ulaşımı ile ilişkilendirilmiştir ve bu ilişkilendirmenin çok yanlış olduğu söylenemez. E-skuter ve e-bisiklet gibi araçlar büyük çoğunlukta insanlar tarafından kendi ulaşımaları için kullanılıyor. Ancak, mikromobilitenin sadece bireylerin ulaşımı ile alakalı olduğunu düşünmek de doğru değildir. Nitekim, sınırlı da olsa, mikromobilitenin yük taşımacılığında da rol alması konusunda bazı girişimler mevcuttur. Ama öncelikle, yük taşımacılığının kendine özgü özelliklerini anlamak gereklidir.

Yük taşımacılığı birçok açıdan insanların ulaşımından farklıdır (Günay vd., 2016) ve çoğunlukla ekonomik şartlardan etkilenir (Holguín-Veras, 2002; Holguín-Veras vd., 2011). Örneğin, kişiler ulaşım türü seçerken konfor, fiyat veya seyahat süresi gibi etmenleri değerlendirirken yük taşımacılığında ise gönderi yapan işletmeler lojistik maliyetlerin minimizasyonunu düşünmektedir (Holguín-Veras vd., 2021). Lojistik maliyeti dört alt maliyet kategorisi oluşturmaktadır. Bunlar sipariş maliyeti, taşıma maliyeti, envantere taşıması sırasındaki yatırım maliyeti ile depolama maliyetleridir. İşletmeler teslimat yapacakları gönderilerin büyüklüklerini ve ulaşım tür seçimlerini maliyet minimizasyonunu düşünerek yaparlar (Abate ve De Jong, 2014). Bu seçimler sadece deniz yolu, kara yolu, demir yolu gibi kategorilerde olmaz, aynı zamanda kara yolu yük araçları türleri kategorisinde (kamyonet, kamyon ve treyler) de yapılmaktadır (Günay, 2023).

Ayrıca, kentsel alanlarda yapılan yük taşımacılığı dinamikleri ile daha geniş coğrafik ölçekte yapılan taşımacılığın dinamikleri farklılık göstermektedir (Cambridge Systematics, 2007). En belirgin farklardan birisi de kentsel alanlarda yükler daha küçük hacimlerde taşınırken, daha uzun menzilli yük seyahatlerinde yükler daha büyük hacimlerde taşınır. Dolayısıyla, kentsel alanlarda yükler daha çok kamyonet

yapılması gerektiği ortadadır. Yine de her ne kadar şu an için payı az olsa da, yük taşımacılığında gelecekte dron araçları vasıtasıyla mikromobilite hatırı sayılır bir yer tutacaktır.

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14. BÖLÜM

MİKROMOBİLTE SİSTEMLERİNİN YASAL DURUMU

Saadet Deveci

14.1. Mikromobilitte Sistemlerinde Yasaları Gerekli Kılan Gelişim

Artan nüfus ve araç sahipliliğiyle doğru orantılı olarak büyüyen trafik sorunu özellikle büyükşehirlerde büyük önem arz etmektedir. Artan trafik; hava kirliliği, gürültü kirliliği, tıkanıklık ve trafik kazalarını beraberinde getirmekte, insan hayatını birçok yönden tehlikeye atmakta, yaşam standartlarını düşürmektedir. Yürüme ve bisiklet gibi seçenekler ve hatta toplu taşıma araçları bu sorunları azaltmaya yönelik sunulan çözüm önerileri arasında olmakta, çevreyi daha az kirleten, daha az enerji gerektiren, trafik sıkışıklığını azaltacak hareketlilik alternatifleri üzerine çalışmalar uzun yıllardır sürdürülmektedir.

Ulaşımındaki ihtiyaçlar, trafik yoğunluğu ve karbon salımı oranları şehirlerde mobilite alanında yeni arayışların ve hizmetlerin oluşmasının zeminini oluşturmuştur (Gössling, 2020). Küresel iklim değişikliğine neden olan çevresel sorunların gündeme gelmesi ve ülkelerin sera gazı salımlarını stabilize etmeleri konusunda bağlayıcı olmayan yükümlülüklerin tanımlandığı Kyoto Protokolü (1997) sonrasında çevre dostu ulaşım seçenekleri arayışları gündeme gelmiştir (Ertoy Sarıışık ve Yalçiner Ercoşkun, 2021). Özel araç sahipliliğindeki pozitif ivme ve kent içi yollarda görülen trafik sıkışıklığı, fosil yakıt tüketmeyen ve trafik sıkışıklığı durumunda bile ulaşım imkânı sağlayan mikroulaşım araçlarına olan ilgiyi kısa sürede arttırmıştır. Mikromobilitte olarak sınıflandırılan paylaşımlı bisiklet, e-skuter, moped, mobilet, tekerlekli kızak, elektrikli kayak son yıllarda kent içi ulaşım türleri olarak ciddi oranda tercih edilen sistemler hâline gelmiştir.

ler geliştirilmeye çalışılmıştır. E-skuterlerin özellikle trafiğe, trafik güvenliğine, çevreye ve sağlığa olan etkileri konusunda araştırmacılar çalışmaya devam etmektedir. Gerekli yasal düzenlemelerin tüm bu etkileri bir arada değerlendireceği şekilde gerçekleştirilmesi e-skuterler için en uygun işletme koşullarının tanımlanması açısından büyük önem taşımaktadır. Bu hususta her ülkenin kendi yerel koşullarını da göz önüne alarak, konuyla ilgili halk, e-skuter firmaları, paylaşımlı e-skuter işletmecileri, diğer taşıt sürücüleri gibi farklı paydaşların da katılımını sağlayarak, kendilerine has yönetmelikler geliştirmesi, evrensel bir yönetmeliğin oluşturulup, tüm ülkelerce aynı yönetmeliğin kullanımından çok daha yararlı olacaktır.

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15. BÖLÜM

AFET VE MİKROMOBİLİTE

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15.1. Afetler ve Afet Türleri

Kelime anlamı olarak, “doğa olaylarının sebep olduğu yıkım” ve “önlenmesi elde olmayan büyük felaket, bela, musibet” anlamına gelen afet; doğa, insan veya teknoloji kaynaklı bir tehlikenin can, mal, ekonomi, çevre, kültürel varlıklar üzerinde yarattığı kötü etkileri önlemek için yerel imkânların yetersiz kaldığı durumlardır (AFAD, 2014; Dikmenli ve Gafa, 2017). Afetler, normal hayatı ve insan faaliyetlerini durdurup kesintiye uğratarak, etkiledikleri kesim için fiziksel, ekonomik ve sosyal kayıplar oluşturmaktadır. Bu nedenle, bir olayın afet olarak değerlendirilebilmesi için maddi ve/veya manevi kayıplar meydana getirmesi, eldeki mevcut imkân ve kaynaklar ile üstesinden gelinememesi, günlük olağan yaşamı bozarak yerleşim birimini derinden etkilemesi gerekmektedir (Çoşkun, 2021). Bir afetin büyüklüğü, meydana getirdiği can kayıpları ve yaralanmaların yanı sıra yol açtığı sosyal ve ekonomik kayıplar ile de doğrudan ilişkilidir.

Doğa, teknoloji ve insan kaynaklı tehlikeler yüksek risk faktörü ile birleştiğinde, afetin meydana gelmesi kaçınılmaz olmaktadır. Doğal ve/veya yapay tehdit ve tehlikelerin afete dönüşmesinde insan faaliyetlerinin etkisi de oldukça fazladır. Olayın fiziksel büyüklüğü ile birlikte tasarım hataları, bilinç eksikliği, yerleşim ve sanayi bölgesi seçiminde yapılan yanlışlar (yanlış yapılaşma), yeterli tedbir ve önlemlerin alınmaması, çevre tahribi ve yanlış kullanım, ihmaller, planlama hataları vb. afetlerin olumsuz sonuçlarını arttıran önemli etkenler olarak karşımıza çıkmaktadır (Erkal ve Değerliyurt, 2009). Afetler ile ilgili değerlendirmeler, genel olarak, sıklık ve tehdit, başlangıç ve yayılma hızı, etki süresi ve alanı, tahrip gücü, tahmin edilebilme, kontrol edilebilirlik gibi farklı faktörler göz önünde bulundurulabilir (Üneri, 2010).

Örneğin, 6 Şubat 2023'te Kahramanmaraş'taki depremler sonrasında meydana gelen yolların kapanmasıyla birlikte bisikletli müdahale ekipleri afet bölgesine ulaşmışlardır. Bu durum, insan gücüyle ya da elektrikle çalışan mikromobilité araçlarının afet durumundaki önemini vurgulamaktadır. Ayrıca, mikromobilité taşıtları, iklim değişikliği ve pandemi gibi afetleri önleme ve etkilerini azaltmaya da katkı sağlayabilirler. COVID-19 pandemisi nedeniyle insanların seyahat tercihleri değişmiş ve mikromobilité araçlarının kullanımı artmıştır. Kısa yolculuklarda sosyal mesafenin korunduğu mobilité çözümleri daha çok tercih edilmiştir. Bunun yanından çevresel kaygılarla mikromobilité taşıtlarının kullanıldığı bilinmektedir. Bunlara örnek olarak 1995 Kobe depremi ve 2012 yılında yaşanan Sandy kasırgasında erişimin kısıtlandığı alanlarda mikromobilité taşıtları tahliye, acil yardım, yardım malzemesi taşıma amacıyla kullanımı alternatif bir ulaşım biçimi sunulmuş ve kısıtlanmış erişilebilirliği iyileştirmişlerdir.

Ülkemizde afetlerden sorumlu resmi birim olan AFAD tarafından 2022 yılında sunulan Türkiye Afet Müdahale Planı'nda afet durumunda ulaşım sisteminin uğrayabileceği zararlar ve talebin nasıl etkilenebileceği ele alınmıştır (AFAD, 2019). Ancak çalışmada mikromobilité taşıtlarının kullanımına yönelik bir planlama yer almamaktadır. Hâlbuki mikromobilité araçlarının afetler ile oluşan kriz durumunda erişim ve afet lojistiği açısından sağladığı fırsat ve olanaklar bulunmaktadır. Sonuç olarak, afet yönetimi konusunda karar vericiler, mikromobilité taşıtlarını risk azaltma, hazırlık, müdahale ve iyileştirme aşamalarında etkili bir şekilde kullanmalarının, afetlerin neden olduğu zorlukların üstesinden gelinmesi ve etkilerinin azaltılmasında önemli bir potansiyele sahip olduğunu ve kritik rol üstlenebileceğini dikkate almak durumundadırlar.

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16. BÖLÜM

GELECEKTE MİKROMOBİLİTE

Gürkan Günay, Ersoy Soyer

Bir büyük metropolde yaşıyorsanız muhtemelen en büyük derdimiz aynı. Ulaşım. Zamanımızın büyük kısmını bir yerden diğer bir yere gitmek isterken tüketiyoruz. İhtiyaçlarımız değişiyor beklentilerimiz birbirinden farklı. Bu sebeple farklı ulaşım seçeneklerine daha çok ihtiyaç duyuyoruz. Ulaşım araçlarımız da çeşitlenmeye devam ediyorlar. Bir yandan da iklim krizleri sebebiyle toplum farkındalığını yükseltmek adına tüm ülkeler canla başla yeni ve temiz ulaşım sistemlerine geçiş için çabalamaya devam ediyorlar. Paris İklim Anlaşması gibi ülkelerin geleceğe dair oluşturdukları hedefler birçok ülkenin ulaşım planlarını değiştirmesine olanak sağladı. Ülkelerin yüksek enerji talebi, yenilenebilir enerjiye geçiş isteği ve karbon emisyonlarını azaltmaya çabalamaları sebebiyle, temiz enerjiye olan talep her geçen gün yükselmeye devam ediyor. Tabiki bu değişim ulaşım araçlarının ve şekillerinin de değişimini beraberinde getiriyor. Mikromobilite araçları tüm bu süreçler sebebiyle karar vericilerin özellikle destekledikleri ulaşım yöntemlerinden biri hâline geldi.

Mikromobilite her ne kadar toplumda yeni ortaya çıkmış bir ulaşım türü gibi gözüksün de, yaklaşık 140 yıldır hayatımızda olan bir konsept. Bölüm 2’de (Mikromobilite Tarihi) değinildiği üzere mikromobilite ilk kez 1800’lü yılların sonunda hayatımıza girdi. 1916’da günümüzdeki e-skuter’in atası olarak nitelendirilebileceğimiz ilk araç da Londra’da ortaya çıktı (Şekil 16.1) (Wild, 2015). Daha sonra ilerleyen yıllar içerisinde bu araç evrildi ve günümüzde kullandığımız e-skuter araçlarına dönüştü. Şekil 16.1’de yer alan bu ilk araçla kıyasladığımızda, günümüzde kullanılan e-skuterlerin en azından şekil olarak çok farklı bir şekilde evrildiğini söyleyebiliriz.

munda. Bu deęişim Őu anda mevcut kullandıđımız havalimanlarını veya ulaşıım noktalarını biraz daha merkeze ve Őehrin orta noktalarına çekecek. Bu merkezi hub'lar sayesinde paylaşımlı mobilite araçlarımızla bu hub'lardan hareketle evlerimize ulaşacağız. Toplu taşımanın yeni boyutunun bu olacağını söyleyebiliriz. Bu noktalardan da kesintisiz ulaşıım çeşitliliđiyle daha hızlı erişim alternatiflerine sahip olacağız.

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MİKRONİZE ÖĞÜTME

(İnce, Çok İnce Öğütme - Sınıflandırma)

Prof. Dr. Öner Yusuf Toraman



MİKRONİZE ÖĞÜTME (İnce, Çok İnce Öğütme - Sınıflandırma)

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İÇİNDEKİLER

SUNUŞ.....	v
SİMGE VE KISALTMALAR	xi

BÖLÜM I

MİKRONİZE ÖĞÜTME.....	1
Öğütme ve Değirmenler	3
1. Öğütme.....	3
1.1. Ürün Tane Boyutu	4
1.2. Enerji Tüketimi.....	5
2. Kullanılan Değirmenler.....	11
Kaynaklar.....	13
Bilyalı Değirmenler.....	15
1. Bilyalı Değirmenler.....	15
1.1. Değirmen Tipi	18
1.2. Değirmen Hareketi	19
1.3. Malzeme Besleme	20
1.4. Malzeme Boşalması.....	20
1.5. Değirmen Hava Hızı.....	23
1.6. Öğütme Rejimi	23
1.7. Öğütme Devresi.....	26
1.7.1. Devreden Yük.....	27
1.8. Değirmen Kapasitesi	28
1.9. Değirmen Verimi ve Bakım	29
2. Değirmen Elemanları	31
2.1. Gövde	31
2.2. Astarlar	32
2.2.1. Astar Plakaları	34
2.2.2. Ara Bölme Plakaları	34
2.2.3. Giriş Plakaları.....	35
2.2.4. Çıkış Plakaları	35
2.3. Astar Tasarımı	35
2.3.1. Kaldırıcılar	37
3. İşletme Parametreleri.....	39

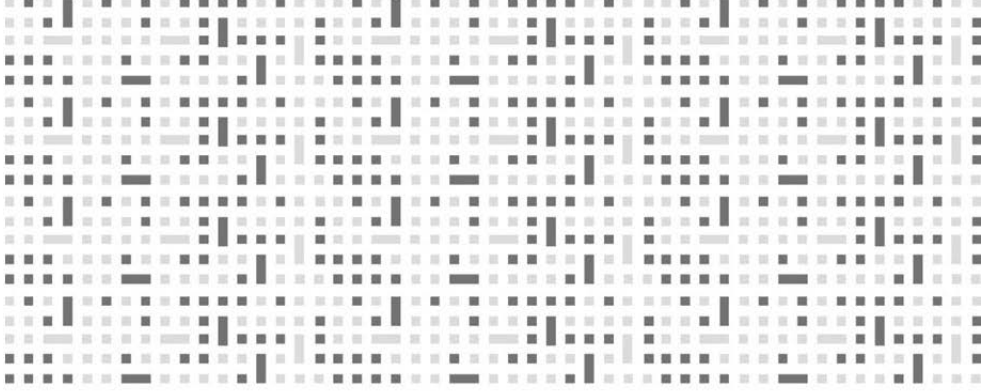
3.1. Bilya Boyutu.....	40
3.1.1. Bilya Hesaplamaları	41
3.2. Bilya Boyut Dağılımı	44
3.3. Bilya Şarj Oranı.....	44
3.4. Bilya Yoğunluğu	47
3.5. Bilya Yörüngesi.....	47
3.6. Bilya Türü.....	48
3.7. Bilya Malzemesi.....	49
3.8. Cevher Şarj Oranı	50
3.9. Değirmen Kritik Hızı.....	51
4. Astar ve Bilya Aşınması.....	53
4.1. Astar Aşınması	53
4.2. Bilya Aşınması	53
5. Öğütme Verimliliği	55
Kaynaklar	57
Karıştırmalı Bilyalı Değirmenler.....	60
1. Karıştırmalı Değirmenler	60
1.1. Karıştırma Tipi	62
1.2. Atritörler.....	65
1.2.1. Atritörde Kuru Öğütme	65
1.2.2. Atritörde Yaş Öğütme	68
1.3. Öğütme Hareketi	69
2. İşletme Parametreleri.....	75
2.1. Bilye Boyutu.....	75
2.2. Bilye Şarj Oranı.....	77
2.3. Bilye Türü ve Malzemesi	77
2.4. Karıştırma Hızı	81
2.5. Pülp Yoğunluğu.....	82
3. Karıştırmalı Değirmen Çeşitleri	82
3.1. ALPINE ATR Değirmen	83
3.2. Sala Karıştırmalı Değirmen	84
3.3. ANI-Metprotech Değirmen	86
3.4. MaxxMill Değirmen.....	86
3.4.1. Eirich MaxxMill.....	87
3.5. Kule Değirmen	89
3.6. Detritör Karıştırmalı Değirmen	92
3.7. IsaMill Değirmen.....	94
3.8. Netzsche SpheRho Karıştırmalı Değirmen.....	95
4. Bilye Aşınması	97

5. Öğütme Yardımcısı (Kolaylaştırıcı)	98
6. Ölçek Büyütme.....	100
Kaynaklar	101
Diğer Değirmenler	105
1. Yüksek Basınçlı Merdaneli Değirmenler	105
2. Valsli Değirmenler	110
2.1. Dikey Valsli Değirmenler.....	111
2.1.1. Sarkaç Toplu Değirmenler	120
2.1.2. PoitteMill.....	121
2.1.3. Valsli Değirmen	122
2.1.4. <i>Netzsch Ecutec</i> Dikey Valsli Değirmen.....	123
2.2. Yatay Valsli Değirmenler	125
2.2.1. HoroMill.....	125
2.2.2. <i>Verdes</i> Merdaneli Değirmen.....	127
2.2.3. <i>Vipeak Hyper</i> Basınçlı Değirmen	130
2.2.4. <i>Neuman Esser GmbH-NEA PM</i> Değirmen.....	130
2.2.5. Yerli Sarkaç Toplu Değirmenler	131
3. Jet Değirmenler	133
4. Titreşimli Değirmenler.....	136
4.1. Titreşimli Değirmen Tipleri.....	137
4.1.1. <i>PallaMill</i>	139
4.1.2. <i>Siebtechnik</i> Eksantrik Titreşimli Değirmen.....	144
4.1.3. <i>General Kinematics</i>	145
4.1.4. <i>AUBERA</i>	146
Kaynaklar	147

BÖLÜM II

SINIFLANDIRMA.....	151
Seperatörler (Havalı Ayırıcılar)	153
1. Sınıflandırma.....	153
2. Sınıflandırma Prensipleri.....	155
2.1. Sınıflandırma Bölgeleri	155
2.1.1. Yerçekimi-Ters Akış	156
2.1.2. Yerçekimi-Çapraz Akış.....	156
2.1.3. Santrifüj-Ters Akış.....	157
2.1.4. Santrifüj-Çapraz Akış.....	158
3. Sınıflandırıcı Türleri.....	158
3.1. <i>Hosokowa Alpine</i>	159
3.2. <i>DeltaSizer</i>	161

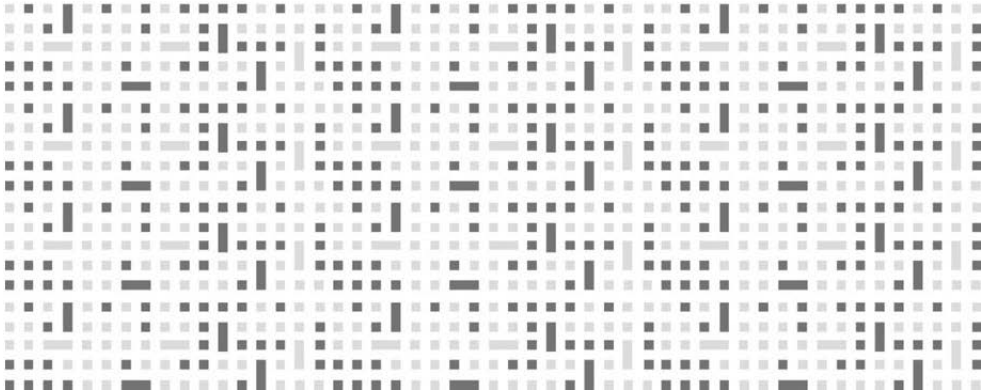
3.3. Comex	163
3.4. KHD Sınıflandırıcı	166
4. Statik Ayırıcılar	167
5. Dinamik Ayırıcılar	169
5.1. Ayırıcı İşletme Parametreleri.....	171
5.1.1. Tane Boyutu Kontrolü.....	171
5.2. Tasarım Parametreleri.....	173
5.2.1. Rotor Çapı	174
5.2.2. Ayırıcı Hattı Tasarımı.....	175
6. Ayırma Performansı	178
Kaynaklar	182



BÖLÜM I.

MİKRONİZE ÖĞÜTME

(Micronized Grinding)



Öğütme ve Değirmenler

[Grinding and Mills]

1. Öğütme

[Milling] [Grinding]

Ufalama (kıırma ve öğütme) (comminution) bir malzemenin tane boyutunu düşürmek, istenilen tane boyut dağılımını (*PSD*) sağlamak, istenen tane şeklinde malzeme üretmek, aglomeraları/topak(lanma)ları dağıtmak, çözünme kinetiğini artırmak vb. için kullanılan en yaygın yöntemdir. Katı maddelerin ufalanma/boyut küçülme karakteristiklerini belirleyen unsurlar şunlardır [1]:



- İç yapılarındaki kuvvetlerin varlığı,
- Kristal yapılarındaki atomların dizilişleri, bunları birlikte tutan bağlar ve kafes yapısı,
- Mekanik özellikleri (yapısal kusurlar, çatlak ve yarıklar).

Bazı cevherlerin ufalama yönünden fiziksel özellikleri Tablo 1.1'de verilmiştir.

Tablo 1.1: Çeşitli endüstriyel hammaddelerin ufalanma yönünden bazı fiziksel özellikleri [1].

Cevher	Özelliđi	Ort. ađırlık (lb/ft ³)*
Barit	Aşırı aşındırıcı, akıcılığı iyi	140-180
Dolomit	Hafif aşındırıcı, biraz gevrek, akıcılığı iyi	90-100
Alçıtaşı (jips kayası)	Hafif aşındırıcı, biraz gevrek, akıcılığı iyi	90-100
Kireçtaşı	Hafif aşındırıcı, biraz gevrek, akıcılığı iyi	90-110
Talk	Az aşındırıcı, biraz gevrek	40-50

*1 lb/ft³=16.02 kg/m³'tür.

Tablo 1.8: Farklı bilyalı değirmenlerin karakteristik özellikleri [25].

Değirmen	Bilye hareketi	Soğutma potansiyeli	Ölçek büyütme	Maksimum ivmelenme	Çarpışma frekansı	Stres enerjisi (SE)
Aktarılan ortam (tambur) bilyalı değirmen	Dönen tambur	Çok zayıf	Çok iyi	1 x g	Düşük	Yüksek
Yörüngesel bilyalı değirmen	Santrifüj alanda dönen tambur	Genellikle çok zayıf	Çok zayıf	<150 x g	Orta	Çok yüksek
Titreşimli bilyalı değirmen	Titreşen değirmen haznesi	Orta	Orta	<30 x g	Yüksek	Yüksek
Karıştırmalı bilyalı değirmen	Sabit haznede dönen karıştırıcı	Çok iyi	Çok iyi	<Bir kaç 100 x g	Çok yüksek	Çok yüksek

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Bilyalı Değirmenler

[Ball Mills]

1. Bilyalı Değirmenler

[Ball Mills]

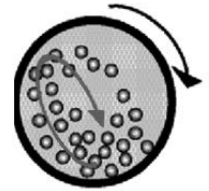
Cevher hazırlama, ilaç, boya ve çimento gibi geniş bir alanda *boyut küçültme* işlemlerinde kullanılan, **tambur değirmen**, **yatay değirmen**, **aktarılan ortam değirmen** (tumbling ball mill) ve **konvansiyonel (geleneksel, klasik) değirmen** olarak da isimlendirilen **bilyalı değirmenler** aşağıdaki temel özelliklere sahip öğütücü ekipmanlardır:

- *Yatay* pozisyonda yerleştirilir,
- (İç kısmı aşınmayı önleyici plakalarla kaplanmış) **silindirik gövdeden** oluşur ve
- Çeşitli düzeneklerle kendi ekseni etrafında dairesel olarak hareket ederken öğütücü ortam olarak kullanılan **çelik bilyalar** ile besleme malzemesini çok ince tane boyutlarına indirir.

Bilyalı değirmenler neredeyse yaklaşık 100 yıldan beri uygulanmaktadır. Ancak yine de enerji verimi %1-2 civarındadır. Gelişen sensör teknolojileri ile çalışma şartlarının optimize edilmesi ve uygun izleme ile bu değirmenlerin enerji verimliliği %10'lara çıkarılabilme imkânı bulunmaktadır [1].

Bilyalı değirmenlerin genel özellikleri şu şekildedir [2]:

- İkinci kademe ve ince öğütme devrelerinde kullanılmakta,
- Değirmene beslenen malzeme boyutu **9.5-2.5 mm** arasında ve ürün boyutu ise **600-45 mikron** arasında değişmekte,
- Bilya şarjı doluluğu değirmen hacminin %35-45'ine denk gelmekte ve



Öte yandan, bilyalı değirmenin çalışma ortamının stabilitesini temin etmek, değirmen çalışma kapasitesini sağlamak için gerekli koşuldur. Bu amaçla şu iki hususa dikkat edilmelidir [53]:

- Değirmene beslenen malzeme uniform olmalıdır. Besleme hızı çok yüksek olduğunda tane boyutu irileşecek ve şişkinliğe (bulging) neden olacaktır. Bu durumda besleme durdurulmalı ve uygun ayarlamalar yapılmalıdır. Besleme için *titreşimli besleyici* tavsiye edilmektedir.
- Bilyalı değirmen iyi bir güç kaynağına sahip olmalı, ani elektrik kesintisi veya arızalardan kaçınmak için rulman motorun normal şekilde çalıştırıldığından emin olunmalıdır.

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Karıştırırmalı Bilyalı Değirmenler

[Stirred Media Mills]

1. Karıştırırmalı Değirmenler

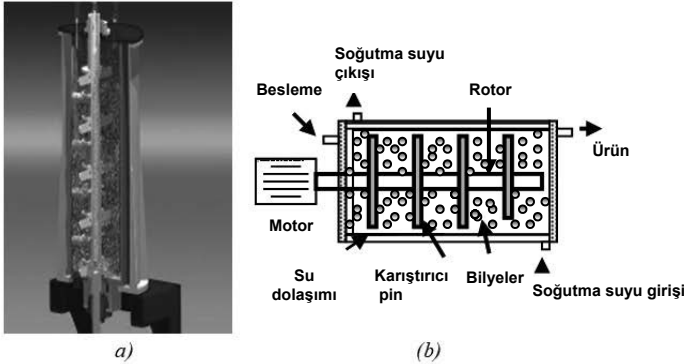
[Agitated Mills]

Karıştırırmalı değirmen, karıştırırmalı ortam değirmen olarak da isimlendirilirler.

Karıştırırmalı bilyalı değirmenler; öğütücü ortam şarjının bir shaft (mil) etrafına monte edilmiş **çubuk (pin), disk veya spiral** vasıtasıyla silindirik bir hazne içerisinde shaftta verilen dönme hareketi ile çalışmakta (Şekil 1.21) ve malzemenin öğütücü ortam ve cevher taneleri arasındaki **sürtünme, aşınma ve darbe** ile ufalanması prensibine dayanmaktadır [1]. Ancak, bilyelerin serbest düşme ihtimalleri pek olmadığından darbe etkisi pek oluşmamaktadır.

Temel tasarımını 1920'lere kadar uzanan (*Klein ve Szegvar, 1928*) bu değirmenler, ilk kez 1960'larda kaolinin öğütülmesinde kullanılmıştır [2].

Karıştırırmalı bilyalı değirmenlerde klasik değirmenlere göre daha düşük stres enerjileri elde edilmesine karşın, çok daha yüksek sayıda bilye-bilye temasından dolayı stres olayının sıklığı çok daha fazladır [3]. Bu yüzden de daha yüksek enerji yoğunluklarına sahiptir ve sürekli öğütmede öğütücü ortamın nihai türünden ayrılması sorunsuz bir şekilde gerçekleştirilmektedir.



Şekil 1.21: a) Disk tipi ve b) Pin tipi karıştırırmalı değirmen [4].

Ölçek büyütmede iki yol izlenebilir [26]:

- Sabit kütle spesifik enerji metodu
- Değirmen boyutları arasında *sabit faktör* metodu (Tablo 1.50)

Uygulamada dikkat edilecek diğer hususlar ise şunlardır [30]:

- Lab değirmeni ile üretim değirmeni aynı tasarıma sahip olmalı
- Aynı bilya boyutu ve bilya malzemesi (aynı yoğunlukta)
- Aynı bilya şarj derecesi
- Benzer bilya sıkıştırması

Tablo 1.50: Ölçek büyütme sabit faktörü [26].

Değirmen tipi	Kapasite faktörü (f)	Örnek kapasite (kg/saat)
Lab ölçekli	-	27
Küçük üretim boyutlu değirmene	8.5	229
Orta üretim boyutlu değirmene	1.75	400
Büyük üretim boyutlu değirmene	1.65	660

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Diğer Değirmenler

[Other Mills]

1. Yüksek Basıncılı Merdaneli Değirmenler

[High Pressure Roller Mills] [High Pressure Grinding Rollers] [HPRM] [HPGR]

Merdaneli pres, yüksek sıkıştırılmalı veya yüksek basınçlı merdaneli değirmen isimleri ile de anılır.

Alman bilim adamı ve mucit *Prof. Dr.-İng. Klaus Schönert* (1927-2011) tarafından tasarlanan ve 1982’de patenti alınan [1] **yüksek basınçlı merdaneli değirmen** (HPGR) (Roller Mill, Roller Pres), 1980’lerin ortasından itibaren özellikle çimento sanayiinde *farin* ve *klinker* öğütülmesi (ön-öğütücü olarak) başta olmak üzere *kömür*, *kireçtaşı*, *kurşun-çinko*, *demir*, *elmas* ve *krom* gibi cevherlerin boyut küçültme devrelerinde kaba ve ince öğütmede kullanılmaya başlanmıştır (Tablo 1.51). Günümüzde özellikle çubuklu ve yarı otojen değirmenlerin yerini aldığı söylenebilir.

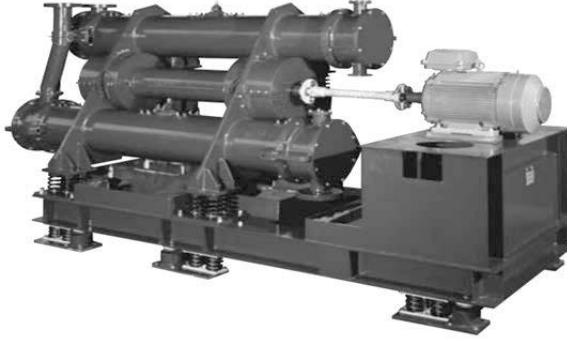
Farin, çimentonun yarı mamulüdür (pişme öncesi).
Klinker, çimento fırınından çıkan pişmiş iri taneli üründür.
Çimentonun bir önceki aşamasıdır.

Tablo 1.51: HPGR’lerin başlıca endüstriyel kullanım alanları [2].

Uygulama	Oran (%)
Klinker	62.8
Kireçtaşı	18.0
Cüruf	7.7
Cevher	6.8
Diğer	4.2

Bu değirmenlerde birbirine doğru dönen iki adet geniş çaplı (0.75-2.5 m) **merdane** (roller) bulunur. Bu merdanelerden biri sabit bir yatağa oturtulmuş-

AUBERA titreşimli değirmen (Şekil 1.70) uygulama kapsamı Tablo 1.70’de verilmektedir.



Şekil 1.70: AUBERA titreşimli değirmen [51].

Tablo 1.70: AUBERA titreşimli değirmen uygulama kapsamı [51].

Parametre	Birim	Değer
Kapasite	m ³ /saat	12’ye kadar
Besleme boyutu	mm	~ 16
Nihai ürün boyutu	mikron	<25’e kadar
Boyut küçültme oranı	-	1:30
Güç	kW	132

İki tüplü (öğütme silindirli) yanı sıra üç tüplü değirmenler de özellikle daha yüksek kapasiteler için imal edilebilmektedir.

Kaynaklar

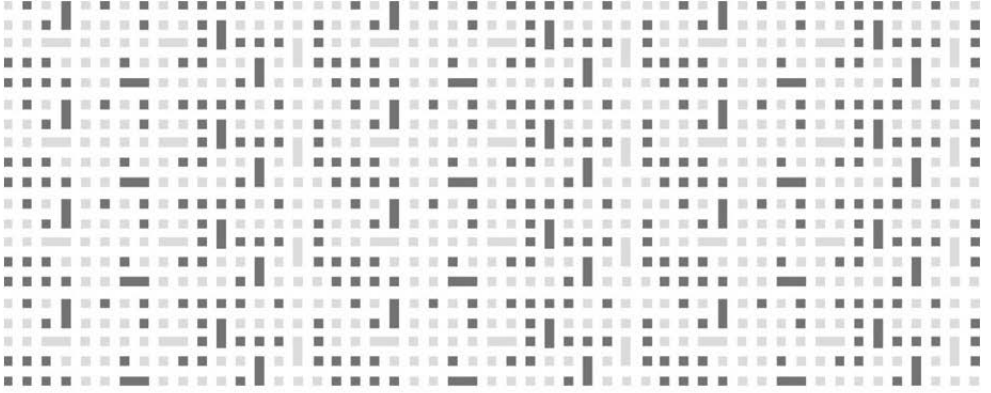
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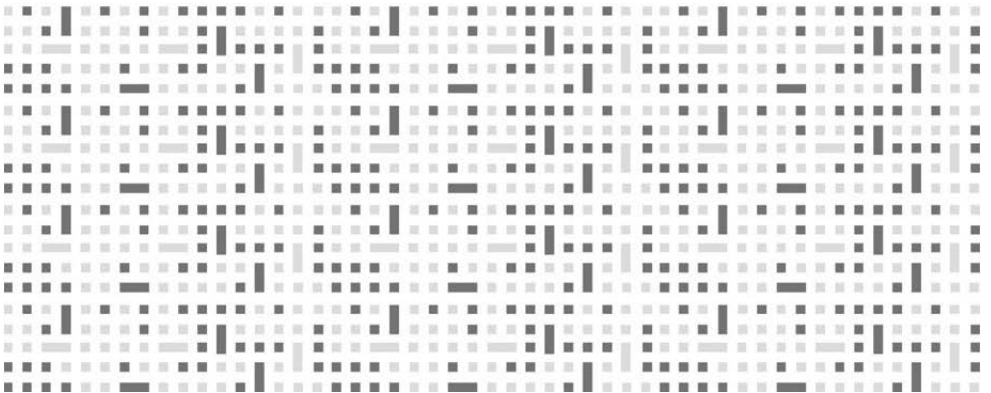
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BÖLÜM II

SINIFLANDIRMA

(Classification)



Seperatörler (Havalı Ayırıcılar)

[Seperators] [Air Classifiers]

1. Sınıflandırma

[Classification]

Sınıflandırma genellikle cevheri *boyutuna göre* gruplandırmak amacı ile uygulanan bir prosestir.

Havalı sınıflandırma (ayırma) ise hava akışı ile taneleri **boyut, şekil ve özgül ağırlık** farkına göre ayırma işlemidir ve kuru olarak gerçekleştirilmektedir. Ayırma işlemi d50 *ayırma* boyutu ile karakterize edilmektedir. d50'nin üzerindeki taneler iri fraksiyonu, altındakiler ise ince fraksiyonu ifade eder. Ayırmanın performansı elde edilen üründeki her bir fraksiyonun kütle içerikleriyle belirlenir [1].

Havalı sınıflandırma <2 mm'den mikron boyutuna kadar uygulanır.

Beslenen malzeme + Hava \longrightarrow *SEPERATÖR* \longrightarrow *İri malzeme + [İnce malzeme + Hava]*

Havalı ayırıcılar dört farklı amaç için uygulanabilir [1]:

- İri boyutlu malzemeler ile istenilen boyuta öğütülmüş malzemeyi ayırmak,
- Homojen olmayan bir karışımdaki malzemeleri boyutlarına göre sınıflandırmak,
- Belirli boyuta öğütülmüş malzeme içindeki tozu almak ve
- Birbirine yakın boyuttaki malzemeyi ayırmak.

Ayırma işlemi şu aşamaları kapsar:

- Malzeme ve hava karıştırılarak sınıflandırıcıya (seperatör) beslenir.
- Hava-malzeme karışımı seperatörde (yerçekimi, merkezkaç ve sürüklenme kuvveti sayesinde) ayrışır.
- Küçük taneler hava ile sürüklenir (daha sonra ikisi de ayrılır), iri taneler ise ortamdaki uzaklaştırılır [1].

Gerçek performans eğrisinin hesaplanmasında aşağıdaki yol izlenmelidir [29]:

- Seperatör beslemesinden, iri ve ince aşısından **numune alınması** ve PSD'lerinin hesaplanması,
- Deneysel verilerdeki hataları gidermek ve her akıştaki malzeme miktarını belirlemek amacıyla **madde denkliği** çalışmalarının yürütülmesi,
- Beslemedeki her fraksiyonun iri ya da ince akıştaki bulunma oranlarının belirlenmesi.

Gerçek sınıflandırıcı etkinliği, beslemenin alt ve üst akımdaki sınıflandırılmamış bölümünün de hesaba katılması ile belirlenmektedir.

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Mikroplastiklerden Nanoplastiklere **PLASTİK KİRLETİCİLER**

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İÇİNDEKİLER

ÖN SÖZ	iii
ÖN SÖZ	v
YAZARLAR LİSTESİ.....	vii
TEŞEKKÜR.....	xxiii

1. BÖLÜM

ANTROPOSEN ÇAĞIN KİRLETİCİLERİ.....	1
Kadir Gedik*, Nilay Doğan, Parisa Akbari Dana, Zhala Gachayzade	
1.1. GİRİŞ.....	1
1.2. GÜNLÜK YAŞAMDA PLASTİKLER	3
1.3. PLASTİK KİRLETİCİLER.....	5
1.4. BİLİMETRİK VERİLER	10
1.5. SONUÇLAR ve ÖNERİLER	15
KAYNAKLAR.....	16

2. BÖLÜM

GEÇMİŞTEN GÜNÜMÜZE POLİMERLERİN TARİHÇESİ.....	21
Rumeysa Yıldırım, Gizem Urtekin, Güralp Özkoç, Mehmet Kodal*	
2.1. GİRİŞ.....	21
2.2. POLİMER NEDİR?.....	21
2.2.1. Polimerlerin Sınıflandırılması.....	22
2.3. POLİMER TARİHÇESİ.....	25
2.4. SONUÇLAR ve ÖNERİLER	34
KAYNAKLAR.....	34

3. BÖLÜM

DÖNGÜSEL EKONOMİ BAĞLAMINDA PLASTİK ATIKLARIN YÖNETİMİ..	37
Müfide Banar*, Aysun Özkan, Zerrin Günkaya, Alp Özdemir	
3.1. GİRİŞ.....	37
3.2. DÖNGÜSEL EKONOMİ EYLEM PLANI VE PLASTİKLER.....	39
3.3. PLASTİK ATIKLARIN GERİ DÖNÜŞÜM VE GERİ KAZANIM YÖNTEMLERİ	42
3.3.1. Birincil Geri Dönüşüm.....	44
3.3.2. İkincil Geri Dönüşüm	44
3.3.3. Üçüncül Geri Dönüşüm	44

3.3.3.1. Piroliz.....	45
3.3.3.2. Gazlaştırma	47
3.3.3.3. Hidrokraking.....	48
3.3.3.4. Kemoliz	49
3.3.4. Dördüncül Geri Dönüşüm.....	51
3.4. PLASTİK ATIKLARDAN DEĞERLİ ÜRÜN ELDESİ.....	52
3.4.1. Değerli Kimyasal Eldesi ve Enerji Üretiminde Yakıt Olarak Kullanım	52
3.4.2. Yapı Sektöründe Kullanım	55
3.4.3. Karbonlu Malzeme Üretimi	57
3.5. SONUÇLAR ve ÖNERİLER	59
KAYNAKLAR.....	60

4. BÖLÜM

PLASTİKLERİN YAŞAM DÖNGÜSÜ DEĞERLENDİRMESİ.....	65
Müfide Banar*, Aysun Özkan, Zerrin Günkaya, Alp Özdemir	
4.1. GİRİŞ.....	65
4.2. YAŞAM DÖNGÜSÜ DEĞERLENDİRMESİ	65
4.2.1. Hedef ve Kapsam Tanımı	67
4.2.2. Yaşam Döngüsü Envanter Analizi.....	69
4.2.3. Yaşam Döngüsü Etki Analizi.....	71
4.2.4. Yorum.....	75
4.3. PLASTİK ÜRÜNLERİN YAŞAM DÖNGÜSÜ DEĞERLENDİRMESİ.....	76
4.4. MİKRO – NANO PLASTİKLERİN YAŞAM DÖNGÜLERİNDEKİ ÇEVRESEL ETKİLER.....	79
4.4.1. Plastiklerden Mikroplastik Oluşma Potansiyeli Karakterizasyon Faktörünün Belirlenmesi	80
4.4.2. Mikroplastiklerin Ekotoksosite Etkisinin Belirlenmesi	81
4.4.3. Mikroplastiklerin Taşıdığı Plastik Katkı Maddelerinin Ekisinin Belirlenmesi.....	86
4.5. SONUÇLAR ve ÖNERİLER	87
KAYNAKLAR.....	88

5. BÖLÜM

MİKROPLASTİKLER VE NANOPLASTİKLER.....	91
Ülkü Nihan Tavşanoğlu*, Tamer Çırak, Gökben Başaran Kankılıç	
5.1. GİRİŞ.....	91
5.2. MİKROPLASTİK VE NANOPLASTİKLERİN ÖZELLİKLERİ	94
5.3. SONUÇLAR ve ÖNERİLER	99
KAYNAKLAR.....	100

6. BÖLÜM

PLASTİK PARTİKÜL ÖRNEKLEME TEKNİKLERİ.....	103
Akif Arı*, Pelin Ertürk Arı	
6.1. GİRİŞ.....	103
6.2. TOPRAK VE SEDİMAN ÖRNEKLERİNDE MİKROPLASTİK BİLEŞİMİNİN BELİRLENMESİ.....	105
6.2.1. Toprak Yüzeyinden Numune Alma	106
6.3. SU (DENİZ, OKYANUS, GÖL VE AKARSU) ÖRNEKLERİNDE MİKROPLASTİK BİLEŞİMİNİN BELİRLENMESİ	111
6.3.1. Numune Alma Esnasında Olası Kontaminasyonların Önlenmesi.....	117
6.4. ATMOSFERİK (PARTİKÜL MADDE, KURU VE YAŞ ÇÖKELME) ÖRNEKLERDE MİKROPLASTİK BİLEŞİMİNİN BELİRLENMESİ.....	118
6.4.1. Çökeltme Yöntemiyle Atmosferik Mikroplastik Örneklerinin Toplanması	120
6.4.2. Aktif Örnekleme Yöntemiyle Atmosferik Mikroplastik Örneklerinin Toplanması	126
6.5. SONUÇLAR ve ÖNERİLER	137
KAYNAKLAR.....	138

7. BÖLÜM

MİKROPLASTİK NUMUNE HAZIRLAMA VE ANALİZ TEKNİKLERİ	149
Mansoor Ahmad Bhat, Fatma Nur Eraslan, Gülay Ertaş, Eftade O. Gaga*	
7.1. GİRİŞ.....	149
7.2. MİKROPLASTİK ANALİZİNDE ÖN İŞLEMLER	150
7.3. MİKROPLASTİK ANALİZİNDE KULLANILAN ANALİTİK TEKNİKLER	152
7.3.1. Fiziksel Karakterizasyon (Mikroskopik Analiz).....	152
7.3.2. MP'lerin Kimyasal Karakterizasyonu ve Kantitatif Analizi	155
7.3.2.1. Fourier-Dönüşümlü Kızılötesi Spektroskopisi (FTIR)	155
7.3.2.2. Raman Spektroskopisi	156
7.3.2.3. Termal Analiz Teknikleri.....	157
7.3.2.4. Kütle Spektrometresi	158
7.4. SONUÇLAR ve ÖNERİLER	159
KAYNAKLAR.....	160

8. BÖLÜM

MİKROPLASTİK MEVZUATI VE YASAL DÜZENLEMELER	167
Merve Özkaleli Akçetin, Perihan Binnur Kurt Karakuş*	
8.1. GİRİŞ.....	167
8.2. ULUSAL YASAL DÜZENLEMELER	169

8.3. ULUSLARARASI YASAL DÜZENLEMELER.....	170
8.4. FARKLI ÜLKELERDE MİKROPLASTİKLERE (MİKROBONCUKLARA) YÖNELİK HAZIRLANAN YASAL DÜZENLEMELER	174
8.5. MİKROPLASTİKLERLE İLGİLİ STANDARTLAR	176
8.6. SONUÇLAR ve ÖNERİLER	179
KAYNAKLAR.....	181

9. BÖLÜM

SU KAYNAKLARINDA (YER ÜSTÜ VE YER ALTI) MİKROPLASTİKLER ... 185

Emine Can Güven, Kadir Gedik*

9.1. GİRİŞ.....	185
9.2. İÇME SULARINDA MİKROPLASTİKLER	186
9.3. YÜZEYSEL SU KAYNAKLARINDA MİKROPLASTİKLER	188
9.3.1. Tatlı Su Kaynaklarında Mikroplastikler.....	188
9.3.1.1. Akarsularda Mikroplastikler.....	188
9.3.1.2. Göllerde Mikroplastikler.....	190
9.3.1.3. Yer altı Sularında Mikroplastikler	192
9.3.2. Tuzlu Su Kaynaklarında Mikroplastikler.....	194
9.3.2.1. Denizler ve Okyanuslarda Mikroplastikler	194
9.3.2.2. Kıyı Lagünlerinde Mikroplastikler	198
9.4. SONUÇLAR ve ÖNERİLER	198
KAYNAKLAR.....	200

10. BÖLÜM

ARITMA ÇAMURLARINDA MİKROPLASTİKLERİN VARLIĞI VE AKİBETİ..... 209

M. Dilara Hatinoğlu, İrem Şimşek, F. Dilek Sanin*

10.1. GİRİŞ.....	209
10.2. ARITMA ÇAMURUNDA MP'LERİN TESPİTİ İÇİN TEKNİKLER.....	211
10.2.1. Örneklem, Ön Arıtma ve Ekstraksiyon.....	212
10.2.2. Tanımlama ve Miktar Belirleme	214
10.3. ARITMA ÇAMURUNDA MP'LERİN VARLIĞI.....	216
10.4. ARITMA ÇAMURU İŞLEME YÖNTEMLERİNİN MP'LER ÜZERİNDEKİ ETKİLERİ	220
10.4.1. Arıtma Çamurlarının Stabilizasyonu	220
10.4.2. Yoğunlaştırma, Susuzlaştırma ve Kurutma.....	221
10.5. MP'LERİN ÇAMUR İŞLEME SÜREÇLERİNE ETKİLERİ	222
10.6. SONUÇLAR ve ÖNERİLER	225
KAYNAKLAR.....	226

11. BÖLÜM

MİKROPLASTİKLERİN TOPRAK EKOSİSTEMİNDEKİ ÖYKÜSÜ	233
Ece Tuğba Mızık, Zehra Yiğit Avdan*	
11.1. GİRİŞ.....	233
11.2. TOPRAKTAKİ MİKROPLASTİKLERİN OLUŞUMU VE AKİBETİ.....	235
11.3. MİKROPLASTİKLERİN TOPRAK EKOSİSTEMİNDEKİ GÖÇÜ	240
11.4. MP'LERİN TOPRAĞIN FİZİKSEL VE KİMYASAL YAPISINDAKİ ETKİLERİ	242
11.4.1. MP'lerin Toprağın Fiziksel Yapısına Etkileri.....	243
11.4.1.1. Toprak Tekstürü	243
11.4.1.2. Toprak Hidrolik İletkenliği	244
11.4.1.3. Toprak Yapısı ve Agregası.....	244
11.4.1.4. Toprak Gözenekliliği.....	246
11.4.1.5. Toprak Yığın Yoğunluğu	247
11.4.1.6. Toprak Su Tutma Potansiyeli	247
11.4.2. MP'lerin Toprak Kimyasal Yapısına Etkileri	248
11.4.2.1. Toprak pH'ı.....	248
11.4.2.2. Toprak Organik Maddesi.....	250
11.4.2.3. Toprak Besin Maddesi	251
11.5. MP'LERİN TOPRAK ORGANİZMALARINI ÜZERİNDEKİ ETKİLERİ	252
11.5.1. MP'lerin Toprak Mikroorganizmaları Üzerindeki Etkileri.....	253
11.5.2. MP'lerin Toprak Hayvanları Üzerindeki Etkileri	255
11.5.3. MP'lerin Bitkiler Üzerindeki Etkileri	256
11.6. SONUÇLAR ve ÖNERİLER	258
KAYNAKLAR.....	259

12. BÖLÜM

HAVADAKİ MİKROPLASTİKLER.....	265
Fatma Nur Eraslan, Mansoor Ahmad Bhat, Eftade O. Gaga*	
12.1. GİRİŞ.....	265
12.2. HAVADAKİ MİKROPLASTİKLER.....	266
12.3. HAVADAKİ MİKROPLASTİKLERİN FİZİKSEL VE KİMYASAL ÖZELLİKLERİ	268
12.4. HAVADAKİ MİKROPLASTİKLERİN KAYNAĞI.....	269
12.5. HAVADAKİ MİKROPLASTİKLERİN İNSAN SAĞLIĞI ÜZERİNDEKİ POTANSİYEL ETKİLERİ.....	271
12.6. SONUÇLAR ve ÖNERİLER	273
KAYNAKLAR.....	273

13. BÖLÜM

MİKROPLASTİKLERİN ORGANİK VE İNORGANİK KİMYASALLARLA VEKTÖREL ETKİLEŞİMİ	281
Filiz Karakaş*, İlker Balcılar	
13.1. GİRİŞ.....	281
13.2. ORGANİKLERLE VEKTÖREL ETKİLEŞİMİ	282
13.3. İNORGANİKLERLE VEKTÖREL ETKİLEŞİM	285
13.4. SORPSİYON VE DESORPSİYON MEKANİZMALARI	286
13.5. VEKTÖREL ETKİLEŞİM MEKANİZMASINI BELİRLEYEN FAKTÖRLER.....	290
13.5.1. MP'lerin fizikokimyasal özellikleri	290
13.5.1.1. Mikroplastik Boyutu ve Özgül Yüzey Alanı.....	291
13.5.1.2. Yaşlanma.....	292
13.5.1.2. Kristal Yapı.....	292
13.5.1.3. Fonksiyonel Gruplar ve Polarite.....	293
13.5.2. Organik/İnorganik Kirleticilerin Fizikokimyasal Özellikleri.....	294
13.5.3. Çevresel Koşullar.....	295
13.5.4. Deneysel Yaklaşım	297
13.6. AYRIŞMA KATSAYISININ İN-SİLİCO MODELLERLE BELİRLENMESİ.....	298
13.7. SONUÇLAR ve ÖNERİLER	302
KAYNAKLAR.....	303

14. BÖLÜM

MİKROPLASTİKLERLE KİRLENMİŞ SAHALAR: İHTİYAÇLAR VE ZORLUKLAR	311
Hale Demirtepe*	
14.1. GİRİŞ.....	311
14.2. KİRLENMİŞ SAHA YÖNETİMİNDE MEVZUATLAR VE ÇERÇEVELER	313
14.3. ÇEVRESEL ORTAMLARDA MİKROPLASTİKLER.....	316
14.3.1. Toprak ve Sedimanlarda Bulunan Mikroplastikler	317
14.3.2. Yer Altı Suyunda Bulunan Mikroplastikler.....	318
14.3.3. Mikroplastik Kirliliğine En Çok Katkı Yapan Kaynaklar	319
14.4. RİSK DEĞERLENDİRMESİ.....	320
14.5. İYİLEŞTİRME YÖNTEMLERİ	323
14.6. SONUÇLAR ve ÖNERİLER	325
KAYNAKLAR.....	326

15. BÖLÜM

GIDA ÜRÜNLERİNDE MİKROPLASTİKLER.....	333
Kadir Gedik*	
15.1. GİRİŞ.....	333
15.2. GIDA GÜVENLİĞİ AÇISINDAN MİKROPLASTİKLER	334
15.3. GIDA MADDELERİNDE MİKROPLASTİKLER.....	335
15.3.1. Katı Gıda Maddeleri	335
15.3.1.1. Tuz	335
15.3.1.2. Çay	338
15.3.1.3. Şeker.....	340
15.3.1.4. Meyve ve Sebzeler	341
15.3.1.5. Pirinç	342
15.3.1.6. Kırmızı Et, Tavuk ve Balık Eti, vb. Ürünler	343
15.3.1.7. Baharatlar	345
15.3.2. Sıvı Gıda Maddeleri.....	345
15.3.2.1. Şişelenmiş Su	345
15.3.2.2. Mineral Sular (Maden suyu)	348
15.3.2.3. Bal	349
15.3.2.4. Süt ve Ürünleri	351
15.3.2.5. Bira.....	353
15.3.2.6. Şarap.....	354
15.3.2.7. Diğer İçecekler	354
15.3.3. Gıdaların Hazırlanması ve Tüketilmesi Sürecinde Mikroplastik Kontaminasyonu.....	356
15.4. MİKROPLASTİK MARUZİYETİNE BAĞLI SAĞLIK ETKİLERİ	357
15.5. SONUÇLAR ve ÖNERİLER	360
KAYNAKLAR.....	363

16. BÖLÜM

BESİN ZİNCİRİNDE MİKROPLASTİKLER.....	373
Yahya Terzi*, Rafet Çağrı Öztürk	
16.1. GİRİŞ.....	373
16.2. BESİN ZİNCİRİ İLE KİRLETİCİLERİN TRANSFERİ	374
16.3. PLASTİKLERİN CANLILAR İLE ETKİLEŞİMİ.....	377
16.3.1. Mikroplastiklerin Sucul Canlılar Üzerindeki Etkileri	378
16.3.1.1. Fitoplanktonlar	380
16.3.1.2. Zooplanktonlar	381
16.3.1.3. Çift Kabuklular.....	382
16.3.1.4. Balıklar.....	383

16.3.2. Kuşlar.....	386
16.3.3. Memeliler.....	388
16.4. MİKROPLASTİKLERİN İNSAN SAĞLIĞINA ETKİLERİ	389
16.5. SONUÇLAR ve ÖNERİLER	391
KAYNAKLAR.....	391

17. BÖLÜM

PLASTİK PARTİKÜLLERİN SAĞLIK ETKİLERİ.....	407
Gonca Çakmak*, İrem İyigündoğdu	
17.1. GİRİŞ.....	407
17.2. PLASTİKLERİN FİZİKOKİMYASAL ÖZELLİKLERİ.....	408
17.2.1. Polimer Tipi.....	409
17.2.2. Partikül Boyutu.....	409
17.2.3. Partikül Dozu.....	410
17.2.4. Partikül Şekli	410
17.2.5. Partikül Yüğü, Yüzey Kimyası ve Katkı Maddeleri	411
17.2.6. Plastik Partiküllere Adsorbe Olmuş Kirleticiler	411
17.3. İNSANLARDA PLASTİKLERE MARUZİYET YOLLARI	412
17.3.1. Ağız Yoluyla Maruziyet	413
17.3.2. Solunum Yoluyla Maruziyet.....	413
17.3.3. Deri Yoluyla Maruziyet.....	414
17.3.4. Plasental Transfer ve Emzirme Yoluyla Maruziyet.....	415
17.4. PLASTİK PARTİKÜLLERİN CANLILARDA BİYOBİRİKİMİ	415
17.5. PLASTİKLERE YÖNELİK TOKSİSİTE ÇALIŞMA TÜRLERİ.....	415
17.5.1. Solunum Sisteminde Plastiklerin Toksik Etkileri	417
17.5.2. Gastrointestinal Sistemde Plastiklerin Toksik Etkileri	418
17.5.3. Karaciğerde Plastiklerin Toksik Etkileri.....	419
17.5.4. Hematolojik Sistemde Plastiklerin Toksik Etkileri.....	420
17.5.5. Böbreklerde Plastiklerin Toksik Etkileri	420
17.5.6. Sinir Sisteminde Plastiklerin Toksik Etkileri.....	421
17.5.7. Üreme Sisteminde Plastiklerin Toksik Etkileri.....	421
17.5.8. Kardiyovasküler Sistemde Plastiklerin Toksik Etkileri	422
17.6. PLASTİKLER İLE İLGİLİ EPİDEMİYOLOJİK BULGULAR	422
17.7. SONUÇLAR ve ÖNERİLER	425
KAYNAKLAR.....	426

18. BÖLÜM

UZAKTAN ALGILAMA YÖNTEMLERİ KULLANILARAK SU ORTAMINDAKİ PLASTİKLERİN İZLENMESİ.....	433
Mustafa Said Tanrıverdi, Uğur Avdan*	
18.1. GİRİŞ.....	433
18.2. UZAKTAN ALGILAMA VERİLERİ.....	435
18.3. DENİZLERDE YÜZEN PLASTİK ATIKLARIN UZAKTAN ALGILANMASI	437
18.3.1. Hava Platformları (İHA).....	439
18.3.1.1. Kıyılardaki Plastik Atıkları Haritalamak için Kullanılan Hava Platformları.....	439
18.3.1.2. Denizlerdeki Plastik Atıkları Haritalamak için Kullanılan Hava Platformları.....	440
18.3.1.3. Kıyılarda ve Denizlerde Yüzen Plastik Atıkları Haritalamak için Kullanılan İHA'lar.....	440
18.3.2. Kıyalarda ve Denizlerde Biriken Plastik Atıkların Tespiti İçin Kullanılan UZAY Platformları.....	441
18.3.3. Denizlerdeki Plastik Atıkların İzlenmesinde LiDAR, Radar ve Sonar Teknolojilerinin Kullanılması.....	442
18.4. UZAKTAN ALGILAMA VERİLERİ KULLANILARAK DENİZ PLASTİK ATIKLARINI HARİTALANDIRMA YÖNTEMLERİ.....	442
18.4.1. Spektral Kütüphane	443
18.4.2. Spektral İndeksler	444
18.5. DENİZLERDEKİ PLASTİK ATIKLARIN UZAKTAN ALGILAMA KULLANILARAK HARİTALANMASINDAKİ ZORLUKLAR.....	444
18.6. OKYANUS PLASTİK DEDEKTÖRÜ PROTOTİP KOMUT DOSYASI VE ÖRNEK ALANLAR ÜZERİNE UYGULANMASI.....	446
18.6.1. Adana Bölgesinde Okyanus Plastik Dedektörü Prototipi Uygulanması	449
18.6.2. Komut Dosyasının (script) Eskişehir İline Uygulanması.....	452
18.5. SONUÇLAR ve ÖNERİLER	453
KAYNAKLAR.....	455

19. BÖLÜM

TOPLUMSAL FARKINDALIK İÇİN PLASTİK AYAKİZİ	461
Ayça Erdem Ünşar*, Çiğdem Moral	
19.1. GİRİŞ.....	461
19.2. ÇEVRESEL AYAK İZİ NEDİR?.....	462
19.2.1. Ekolojik Ayak İzi.....	462
19.2.2. Karbon Ayak İzi	463
19.2.3. Su Ayak İzi.....	463

19.2.4. Plastik Ayak İzi	464
19.2.5. Mikroplastik Ayak İzi.....	464
19.2.5.1. Mikroplastik Ayak İzinin Önemi.....	465
19.2.6. Literatürdeki Plastik ve Mikroplastik Ayak İzi Çalışmaları	465
19.3. PLASTİK AYAK İZİ METODOLOJİLERİ	468
19.3.1. Yaşam Döngüsü Analizi	469
19.3.2. Çevresel Olarak Genişletilmiş Girdi-Çıktı Analizi.....	470
19.3.2.1. Büyük Ölçekli Yaklaşım	470
19.3.2.2. Coğrafi Yaklaşım	471
19.3.2.3. Entegre Yaklaşım	471
19.3.2.4. Modellemeye Uygun Yaklaşım.....	471
19.3.3. Mevcut Plastik Ayak İzi Metodolojileri	471
19.4. SONUÇLAR ve ÖNERİLER	477
19.4.1. Plastik Ayak İzini Azaltmak için Ne Yapabiliriz?.....	477
19.4.2. Evde Mikroplastik Ayak İzini Azaltmak için Yapılabilecekler	478
KAYNAKLAR.....	480

20. BÖLÜM

MİKROPLASTİK AR-GE ÇALIŞMALARININ DİJİTALLEŞTİRİLMESİ VE YAYILIMI BAĞLAMINDA VİDEOLAR	483
Nuray Gedik*, Barış Yiğit	
20.1. GİRİŞ.....	483
20.2. DİJİTALLEŞME SÜRECİNDE VİDEOLAR.....	486
20.3. VİDEO ÇALIŞMALARININ KAYIT ALTINA ALINMASI VE KURGULANMASI.....	489
20.3.1. Yapım Öncesi (Pre Production- Prodüksiyon öncesi)	490
20.3.2. Yapım Süreci (Production-Prodüksiyon).....	495
20.3.3. Yapım Sonrası (Post Production-Prodüksiyon sonrası).....	495
20.3.4. Sona Doğru: Bazı Faydalı Bilgiler.....	495
20.4. SONUÇLAR ve ÖNERİLER	498
KAYNAKLAR	499

1. BÖLÜM

ANTROPOSEN ÇAĞIN KİRLETİCİLERİ

Kadir Gedik*, Nilay Doğan, Parisa Akbari Dana, Zhala Gachayzade

1.1. GİRİŞ

İnsanoğlu, toplumsal ihtiyaçları karşılamaya yönelik attığı endüstriyel adımlar neticesinde doğal çevreyi ve biyojeokimyasal döngüleri etkileyen güç haline gelmiştir. Son birkaç yüzyıl içerisinde dünyamızın değişim ve dönüşümüne neden olan bu durum, mevcut jeolojik dönemin “Antroposen” terimiyle tanımlanmasını sağlamıştır (Logemann vd., 2022). Etimolojik köken olarak Yunanca "insan" (Antropo-) ve "yeni" (-cene) kelimelerinin birleşiminden oluşan antroposen terimi, insan etkilerinin ve faaliyetlerinin hâkim olduğu bir gezegene doğru geçişi yansıtmaktadır. Kavramın ortaya çıkışı incelendiğinde; 1873 gibi erken bir tarihte İtalyan rahip, jeolog ve paleontolog Antonio Stoppani tarafından "Antropozoik dönem" teriminin kullanıldığı (Allenby, 2014; Crutzen ve Stoermer, 2014), 2000 yılında ise “Antroposen” başlıklı bir makale ile popüler hale geldiği görülmektedir (Crutzen ve Stoermer, 2014). Antroposen kavramı, sınırının nerede olması gerektiği sorusunu da beraberinde getirmiştir. “İnsan çağı” olarak da kullanılan terim, insan faaliyetleri sonucunda dünyadaki doğal süreçlerin bozulmasını yansıtmak için önerilmiş ve başlangıç olarak James Watt'ın buhar makinesi icadından sonra 19. yüzyılın başlarındaki Sanayi Devrimi ile ilişkilendirilmiştir (Zalasiewicz vd., 2016).

Jeolojik dönem olarak Uluslararası Stratigrafi Komisyonu'nun bir bileşeni olan Kuaterner Stratigrafi Alt Komisyonu'nun Antroposen Çalışma Grubu tarafından Uluslararası Kronostratigrafik Çizelge içinde potansiyel yeni bir birim olarak incelenmektedir (Waters vd., 2014). Antroposen zamansal bir kavram olarak, doğası gereği tarihlenememektedir. Jeologlar tarafından çeşitli başlıklarda tartışılan kavram için “Büyük Hızlanma” ifadesi daha fazla tercih edilmeye başlanmıştır (Steffen vd., 2015). İçerisinde bulunduğumuz çağ, ‘antroposen çağı’ veya ‘insan çağı’ olarak isimlendirilmekte veya insan etkisiyle şekillenen önemli ölçüde zor-

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2. BÖLÜM

GEÇMİŞTEN GÜNÜMÜZE POLİMERLERİN TARİHÇESİ

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2.1. GİRİŞ

Yaşamın modernleşmesi ile birlikte her geçen gün plastik tüketim hızı artmaktadır. Bu durum ise ciddi bir çevre kirliliğini beraberinde getirmektedir. Dünyadaki katı atıkların yaklaşık %40'ı plastik temelli atıklardan oluşmaktadır. Endüstriyel olarak kullanılan polimerlerin birçoğu sentetik olduğundan bu polimerlerin mikroorganizmalar tarafından parçalanarak doğaya geri kazandırılması çok uzun yıllar sürmektedir. Bu süreçte, küçük parçacıklara ayrılarak mikroplastik olarak adlandırılan polimerler havada askıda ve toprakta bozunmadan kalarak, ayrıca su kaynaklarına karışarak canlı yaşamını her geçen gün daha da ileri boyutta tehdit etmektedir. Bu bölümde, yaşamımızın değişmez bir parçası olan polimerleri daha yakından tanımak için polimerler hakkındaki temel bilgiler ve polimerlerin geçmişten günümüze gelişimine dair süreç yer almaktadır.

2.2. POLİMER NEDİR?

“Polimer” kelimesi, Antik Yunanca’da poli (çok anlamına gelen) ve meros (birim anlamına gelen) kelimelerin birleşimidir. Polimer yerine büyük molekül anlamına gelen makromolekül terimi de kullanılabilir. Polimerlerin en küçük yapıtaşına “monomer” adı verilmektedir. Bir polimer zincirindeki her molekül tek bir birim olarak kabul edilir ve bunların her birine "mer" adı verilir. Uzun zincirler oluşturmak için birbirine bağlanma yeteneğine sahip olan bu merlerin bir araya gelmesi ile polimerler oluşur (Crawford & Quinn, 2017). Polimerik bir malzemeye ilgili yapılabilecek en güzel benzetme bir tabak spagettidir. Polimer zincirleri aynı spagettide olduğu gibi birbirine dolaşık bir halde bulunurlar. Malzemenin özellikleri, zinciri oluşturan atomlar ve yan zincirler tarafından belirlenir (Gerdeen & Rorrer, 2012). Polimerlerin endüstriyel olarak kullanılabilmesi için yeterli fiziksel ve mekanik özellik sergilemeleri gerekmektedir. Bu ise doğrudan molekül

2.4. SONUÇLAR ve ÖNERİLER

Ambalaj, otomotiv, yapı-inşaat, tekstil, elektrik-elektronik ve ev eşyaları gibi birçok alanda oldukça yaygın bir şekilde kullanılan plastikler veya genel adıyla polimerler her geçen gün daha fazla uygulama alanı bulmakta ve üretim kapasiteleri artmaktadır. Örneğin, eşya plastikleri olarak adlandırdığımız, bir poliolefin olan ve plastik tabak, çatal, kaşık ve ambalaj sektörü gibi geniş bir kullanım alanına sahip olan polietilenin küresel pazardaki üretim hacminin 2021 yılında 109 milyon ton olduğu bilinmektedir. Bu pazarın yakın gelecekte yaklaşık olarak %25 oranında büyümesi beklenmektedir. Ayrıca, toplam plastik pazarının 2029 yılında yaklaşık 645 milyar USD olacağı öngörülmektedir. Tüm bu durumlar göz önüne alındığında plastiklerden kaynaklanan atık probleminin daha da ileri seviyelere taşınabileceği kaçınılmazdır. Günümüzde hem akademi hem de endüstri tarafından bu durumu bertaraf etmek için çözüm yolları aranmaktadır. Hâlihazırda mevcut plastiklerin yaklaşık %25'i geri dönüştürülmektedir. Son yıllarda çevre kirliliğinin artmasıyla plastiklerin geri dönüşümü oldukça önemli bir konu haline gelmiş ve gelişmiş devletler tarafından yüksek fonlu projelerle bu tür ürünlerin geri dönüştürülebilirlik çalışmaları artarak desteklenmeye başlamıştır. Ayrıca, plastik atık sorununa çözüm olabilecek bir diğer konu ise biyobozunur polimerlerin üretiminin ve kullanımının yaygınlaşmasıdır. Biyopoliesterler olarak adlandırılan poli(laktik asit) (PLA), polihidroksialkanoatlar (PHA) ve poli(bütilen süksinat) (PBS) gibi polimerlerin kullanımının yaygın hale gelmesi oldukça önem arz etmektedir. Bu polimerler kontrollü çevre koşullarında, aerobik mikroorganizmalar tarafından parçalanarak CO₂, H₂O ve biyokütleye dönüşebilmektedir. Daha yaşanılır bir çevre oluşturmak bakımından oldukça önemli malzemelerdir. Sentetik polimerlerin geri dönüştürülebilirlik çalışmalarının yaygınlaşması, biyobozunur polimerlerin endüstriyel olarak daha yaygın ticari ürünlere dönüşmesi ve insanlara çevre bilincinin ileri boyutta kazandırılması yoluyla plastiklerden kaynaklanan çevre kirliliğinin önemli derecede önüne geçilebileceği düşünülmektedir.

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3. BÖLÜM

DÖNGÜSEL EKONOMİ BAĞLAMINDA PLASTİK ATIKLARIN YÖNETİMİ

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3.1. GİRİŞ

Plastik atıkların yeryüzündeki dağılımı doğrudan veya dolaylı olarak insan nüfusu ile bağlantılıdır. Tüm Dünya’da 1970’li yıllarla birlikte plastik üretimi ve buna bağlı olarak, plastik ambalaj atığı miktarı artmıştır. Plastik ambalajlara örnek olarak; su ve meşrubat kutuları, sıvı yağ şişeleri, deterjan kutuları, şampuan kutuları, yoğurt ve peynir kapları vb. verilebilir.

Dünya’daki plastik üretimi artışına paralel olarak Türkiye’de de her geçen yıl bu miktar artmakta, ülkemizdeki plastik endüstrisi yıllık 10 milyon ton üretim ve 250.000 kişiye sağlanan istihdamla Dünya’da 6. sırada bulunmaktadır. Türkiye’nin ithal ettiği hurda plastiğin tonu 400 USD iken, orijinal ham maddenin fiyatı 2000 USD’dir. Bu bağlamda ithal edilen hurda plastiğin geri dönüştürüldükten sonra 1000 USD’ye satılması ülkemizdeki geri kazanım tesislerinin ithalata ağırlık vermelerine sebep olmaktadır (http-1, 2023). Nitekim, 2013 yılında yapılan plastik atık ithalatı 11 bin ton iken 2020 yılında 775 bin tona ulaşmıştır. 2019 yılında 1200 adet olan lisanslı plastik geri kazanım tesisi, 2020 yılında 1300’lere çıkmış, Mart 2021 itibariyle lisanslı tesis sayısı 1593’e ulaşmıştır.

Dünya’da toplanan atık plastikler 2019 yılına kadar Çin tarafından alınıyor-ken, Çin’in 2019 yılı itibariyle atık plastik ithalatına yasak getirmesi, atık plastik ticaretinde tüm dengelerin bozulmasına neden olmuş ve lojistik olarak Avrupa ülkelerine en yakın olan ülkemiz, atık plastik ithalatında Malezya’dan sonra ikinci sıraya yükselmiştir. Özellikle atıklarından kurtulmak isteyen Avrupa ülkeleri, ülkemizdeki geri kazanım potansiyelinden faydalanmaya başlamış, bazı atıklarını bedelsiz veya üstüne para vererek ülkemizde bulunan geri kazanım tesislerine göndermeye başlamıştır. İthalatın artmasıyla yurtiçi toplama faaliyetlerinin olumsuz yönde etkilenmemesi amacıyla ülke ekonomisine katma değer sağlayacak ve

toplanması ve ayrılması için, yapay zeka ve makine öğrenmesi gibi uygulamaların kullanılması, tüm belediyelerde çoklu sensörler (ultrasonik ve kızılötesi) ile birleştirilmiş akıllı atık kutularının tercih edilmesi önemlidir. Akıllı atık kutularının kullanılması, insan gücünü, atık kutusu sayısını azaltır, emisyonları ve ulaşım araçlarının yakıt kullanımını azaltarak pozitif çevresel dışsallıkları artırır. Bunun yanı sıra, özellikle gelişmekte olan ülkelerde, plastik atıkların toplanmasındaki en önemli sorun, kayıt dışı atık toplama sektörüdür. Atığın resmi bir şekilde toplanması ve geri dönüştürülmesi için kayıt dışı sektörün kontrol altına alınması gerekir ve böylelikle nihai olarak ürünlerin piyasadaki geri dönüşüm oranı hızlanacak ve plastik atıkların verimli bir şekilde kullanılması sağlanacaktır. Ayırma tesislerinde kullanılacak yakın kızılötesi (near infrared, NIR) gibi ileri teknoloji sistemler plastik ambalaj atıklarını, manuel ayırma işleminden daha doğru ve daha hızlı algılar ve sınıflandırır. Ayrıca, özellikle ambalaj üreticilerine/piyasaya sürenlere, plastik atıkların geri dönüşümünü sağlamak ve eşdeğer miktarda geri kazanılmış ve geri dönüştürülmüş plastik kullanmak zorunluluğu gibi belirli hedefler koymak da yerinde olacaktır. Plastik atıkların geri dönüşümünde de temiz olarak toplanacak atıklarla katma değeri yüksek ürünlerin üretileceği proseslerin tercih edilmesi ve bu ürünler için bir pazar oluşturulması önem arz etmektedir. Plastiklerin oluşumundan bertarafına kadar sürdürülebilir atık yönetim ilkelerine göre yönetimiyle hem oluşturdukları çevresel etkilerin minimize edilmesi hem de yeni bir ürün üretimiyle kaynakların korunması mümkün olacaktır.

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4. BÖLÜM

PLASTİKLERİN YAŞAM DÖNGÜSÜ DEĞERLENDİRMESİ

Müfide Banar*, Aysun Özkan, Zerrin Günkaya, Alp Özdemir

4.1. GİRİŞ

Plastikler ambalajlamadan tekstile, inşaattan otomobil sektörüne çok geniş bir ürün yelpazesinde kullanılmaktadır. Plastiklere olan bu büyük talep, üretimde kullanılan ham madde kullanımını, enerji tüketimini ve atık plastiklerin neden olduğu çevresel etkilerin bütüncül bir şekilde düşünülmesini, söz konusu çevresel etkileri belirlemek ve sistematik olarak azaltmaya yönelik çalışmalar için tüm tedarik zincirini kapsayacak bir yaşam döngüsü düşüncesinin benimsenmesini gerektirmektedir. Diğer yandan küresel çapta plastik üretimindeki artış, plastik atık oluşumunda da büyük artışa neden olmaktadır. Bu atıklar, sürdürülebilir ve dögüsel bir yaklaşımla yönetilmediklerinde çevrede sürekli birikmekte, biyolojik olarak bozunamadıkları için gözle görülemeyen parçalara (örn. nanoplastik) dönüşseler bile çevre ve insan sağlığını etkilemeye devam etmektedirler. Bu noktada, plastik ürünlerin üretim sürecinde ve atık haline geldikten sonraki aşamalarda neden oldukları çevresel etkilerinin belirlenmesinde Yaşam Dögüsü Değerlendirmesi (Life Cycle Assessment, LCA) yaklaşımı, ürünlerin ve süreçlerin sürdürülebilirliğinin ölçülmesinde kullanılan çevresel boyutların ele alındığı önemli bir araçtır. LCA, şirketlerin ürünleri için stratejik kararlar almak amacıyla kullanılabilmele birlikte atıkların çevresel akıbetlerinin belirlenmesinde de sıkça uygulanan bir yöntemdir.

4.2. YAŞAM DÖNGÜSÜ DEĞERLENDİRMESİ

LCA, bir eylemin tüm çevresel boyutlarını; ham maddenin doğadan eldesinden, tüm atıklar tekrar doğaya dönene kadar değerlendiren bir sistemdir. Bu değerlendirme, ürünün işlenmesinde olduğu kadar enerji dahil olmak üzere ham maddenin üretilmesi, kullanılması, atıkların yeniden kullanım, geri dönüşüm, geri kazanım, arıtım ve bertarafı sırasında havaya, suya ve toprağa olan tüm etkileri içerir. LCA'lar hem doğrudan (üretim aşamasında oluşan emisyonlar ve kullanılan enerji

lımlarında bulunan veri tabanlarındaki arka plan veri ile ilişkilendirilmesi gerekir. Bu şekilde hazırlanan veri setleri yazılımda bulunan etki değerlendirme yöntemleri ile çevresel etkilere dönüştürülür. Diğer yandan, etki değerlendirme yöntemlerinde plastik atıklardan kaynaklanacak olan mikroplastik emisyonları ve mikroplastiklerin çevresel etkileri ile ilgili karakterizasyon faktörleri bulunmamaktadır. Bu verilerin olmaması, LCA aracılığıyla mikroplastik emisyonlarının çevresel etkilerinin değerlendirilmesinde sınırlayıcı bir faktördür. Bu yönde sınırlı sayıda literatür çalışması bulunmakta olup bu çalışmalarda araştırmacılar, kendi hesapladıkları karakterizasyon faktörü değerleri ile ele aldıkları ürün için mikroplastiklerin çevresel etkisini hesaplamaktadır. Bu nedenle, LCA veri tabanlarına ve etki değerlendirme yöntemlerine mikro ve nano plastik gibi yeni emisyonların dahil edilmesi, yayılan mikro ve nano plastik miktarı ile insan veya ekotoksikolojik etki kategorileri arasındaki ilişkiyi temsil eden gerekli karakterizasyon faktörlerinin oluşturulması gerekmektedir. Böylece, plastik ürünlerle ilgili yapılan tüm LCA çalışmalarında, mikroplastik gibi önemli bir etki gözden kaçırılmamış olacak ve LCA'nın bütünselliği sağlanmış olacaktır.

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5. BÖLÜM

MİKROPLASTİKLER VE NANOPLASTİKLER

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5.1. GİRİŞ

Son yüzyılda insan faaliyetlerinin artmasıyla birlikte küresel ölçekte plastik kullanımı da benzer şekilde bir artış eğilimi sergilemektedir ve günümüzde artık plastikler yaşadığımız çağın bir göstergesi olarak nitelendirilmektedir (Waters vd., 2016). Bu bölümde plastiklerin temel kullanım alanları, dönüşüm ve bertaraf süreçleri ile çevresel etkileri mikroplastikler ve nanoplastikler özelinde fayda-zarar değerlendirmesi de yapılarak açıklanmıştır.

İnsanlık tarihinin başlangıcından itibaren beslenme, barınma, ulaşım ve savunma temel ihtiyaçların özünü oluşturmuş ve buna bağlı olarak araç ve gereç gereksinimi gelişmiştir. Zamanla nüfus artışı, refah seviyesinin yükselmesi, popülasyonlar arası etkileşimlerin artması gibi nedenlerle birlikte buluşlar ve teknolojik gelişmeler de dikkate alındığında daha dayanıklı, daha çok miktarda ve kısa sürede üretilebilen materyallere ve üretim yöntemlerine talep oluşmuştur. Tüm bu süreç ve ihtiyaçlar doğrultusunda polimer kimyası alanındaki bilgi birikimi ve teknolojik gelişmeler sayesinde plastik olarak tanımlanan polimerik materyaller ortaya çıkmıştır. İhtiyaçlar doğrultusunda düzenlenebilir geniş elastik karakter, yüksek mukavemet ve işlenebilirlik gibi özellikler düşük üretim maliyeti ile birleştiğinde plastikler günümüzde birçok alanda en yaygın kullanılan malzemelerden birisi haline almıştır. Plastiklerin en yaygın olarak kullanıldıkları uygulamaların başında %44'lük bir payla ambalajlama bulunmakta ve devamında sırasıyla yapı-konstrüksiyon, otomotiv, elektrik-elektronik, ev gereçleri, eğlence-spor ekipmanları ve tarımsal uygulamalar gelmektedir (Plastics Europe, 2022). Alternatif malzemelerle karşılaştırıldıklarında birçok alanda düşük maliyetli ve hızlı üretimleri nedeniyle plastikler son tüketici açısından da daha kolay temin edilebilmekte ve tercih edilmektedir. Tek kullanımlık plastiklerin yaygınlaşması gibi toplumda oluşan alışkanlıklar, plastik atıkların depolanma, bertaraf edilme ve geri dönüşüm gibi

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6. BÖLÜM

PLASTİK PARTİKÜL ÖRNEKLEME TEKNİKLERİ

Akif Arı, Pelin Ertürk Arı

6.1. GİRİŞ

Dünya genelinde insan nüfusunun ve buna bağlı olarak sayısız ihtiyacın artmasıyla ilişkili olarak plastik üretim, kullanım ve tüketimi artmaya devam edecektir (Choong vd., 2021). Buna paralel olarak pek çok araştırmacının hemfikir olduğu küresel istatistiklere göre, 1950 ile 2018 yılları arasındaki toplam plastik üretim miktarları 1,5 tondan 359 tona ulaşmıştır. Küresel arz eğiliminin benzer şekilde devam edeceği varsayıldığı takdirde ise 2050 yılında toplam birikimli plastik üretiminin 34 milyar ton seviyesine ulaşacağı hesaplanmıştır (Zhang vd., 2021). Bu yüksek üretim istatistiklerine karşın, nispeten zayıf enerji içeriği ve düşük geri dönüşüm verimleri sebebiyle üretilen toplam plastik kütesinin sadece küçük bir kısmı enerji üretimi ve/veya çeşitli süreçlerle geri kazanılırken, çok büyük bir kısmı ise atık olarak çevresel sistemlere karışmaktadır (Sutherland vd., 2010).

Çevresel alıcı ortamlarda büyük boyutlu olarak atılan bu plastik atıklar, ultraviyole foto-bozunum, mekanik aşınma/ayırışma, biyolojik bozunma ve hidroliz gibi uzun süreli bozunma ve parçalanma basamakları şeklinde tanımlanabilen süreçler neticesinde mikro ve nano boyutlara parçalanmaktadırlar. Her ne kadar bu parçalanma ürünlerinin boyutsal dağılımına göre farklı sınıflandırmalar bulunsun da boyut aralığı 5 mm ve altında olan fraksiyon ilk kez 2004 yılında “mikroplastik” olarak isimlendirilerek çevresel izleme çalışmalarına yeni bir kavram olarak dahil edilmiş (Thompson vd., 2004), ve bu tarihten sonra konuyla ilişkili bilimsel çalışmaların sayısı logaritmik olarak artmıştır (Du ve Wang, 2021). Öyle ki, konuyla ilgili güncel literatürde, hatta oldukça prestijli yayın organlarında, çeşitli çevresel kompartmanlardaki mikroplastiklerin dağılımı, kaynakları ve sağlık etkilerine odaklı çalışmaların yanında, ayrıca bilimsel veri tabanlarında yayınlanan “mikroplastik (MP)” başlıklı çalışmaların zamansal (yıllara göre artışı) ve mekânsal (hangi ülke/kıtada gerçekleştirildiği) değerlendirmelerini özetleyen makalelere de rast-

atmosfer, su ve toprak ortamlarında mikroplastik kirleticilerin miktar ve türlerinin yüksek doğrulukta belirlenmesi ve mümkün olan en yüksek temsiliyet, ve aynı zamanda en düşük girişim/kirlenme potansiyeli bulunan numune alma yöntemleri özetlenmiştir. Aynı zamanda söz konusu her bir çevresel ortam veya matris için mevcut alternatif mikroplastik numune alma yöntemleri de tartışılarak, bilinen avantaj ve dezavantajları listelenmiştir. Bu sayede okuyucu için özellikle numune alma yaklaşımının belirlenmesi konusunda daha hızlı ve sağlıklı, aynı zamanda ekonomik ve efektif yöntem tercihlerinin hızlı şekilde seçilmesine yardımcı olmak amaçlanmıştır.

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7. BÖLÜM

MİKROPLASTİK NUMUNE HAZIRLAMA VE ANALİZ TEKNİKLERİ

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7.1. GİRİŞ

Plastikler tarım, sanayi, tıp, askeriye, günlük ihtiyaçlar ve havacılık gibi çok sayıda farklı alanlarda yaygın olarak kullanılmaktadır. Bunun bir sonucu olarak plastik ürünler herhangi bir işlem görmeden ekolojik çevrede atık olarak ortaya çıkmaktadır ve bu atıkların önemli bir kısmını mikroplastikler (MP'ler) oluşturmaktadır. Makro plastikleri (>5 mm) sucul ortamlar başta olmak üzere diğer çevresel matrislerde tespit ve karakterize etmek amacıyla kullanılan metotlar, boyutları daha küçük olan birincil ve ikincil mikroplastikler için kullanılanlara kıyasla daha basittir (Bhat vd., 2023). Çıplak gözle görülebilen bu plastik parçacıklar mikroskopa gerek duyulmadan buldukları matristen kolaylıkla ayırt edilerek spektroskopik yöntemler ile karakterize edilebilirler. Öte yandan karasal, sucul ve hava ortamlarında belirlenen MP'ler çoğunlukla ikincil mikroplastikler olup boyutları çok daha küçüktür (Wong, vd., 2020). Bu durum MP'lerin buldukları matristen ayrılmasını, tespitini ve karakterize edilmesini zorlaştırmaktadır. Makro plastikler için kontaminasyon önemli bir analitik problem olmazken, mikroplastikler için kontaminasyonu engelleyecek ve izleyecek detaylı analitik prosedürlere ihtiyaç vardır (Akanyange vd., 2021). Bu bölümde, mikroplastiklerin çevresel matrislerde belirlenmesi için kullanılan ön işlemler ve yaygın olarak kullanılan analitik tekniklere yer verilecektir. Bu sürecin önemli bir parçası olan örnekleme ise çevresel örneklerin çeşitliliği dikkate alındığında ayrıca dikkat edilmesi gerektiğinden ayrı bir bölümde tartışılmıştır. MP'ler, çapı 5 mm'den küçük olan plastik parçacıklardır (Thompson vd., 2004). Son yıllarda, atık MP miktarı giderek artmakta ve bu artış çevre ve canlılar için tehdit haline gelmektedir (Bhat vd., 2022a, 2022b; Eraslan vd., 2021, 2023; Guo vd., 2020). Ek olarak, çevreye yayılan MP'ler süreç içerisinde biyotoksisiteye sahip ve plastiklerin üretimi esnasında farklı amaçlarla eklenen katkı maddelerinin salınmasına sebep olabilmektedir. Ayrıca, MP'lerin geniş yü-

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8. BÖLÜM

MİKROPLASTİK MEVZUATI VE YASAL DÜZENLEMELER

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8.1. GİRİŞ

Tek kullanımlık ürünlerin yapımında sıklıkla kullanılan plastikler, yapısında barındırdıkları çeşitli kirleticiler sebebiyle son zamanlarda üzerine pekçok araştırmanın yoğunlaştığı en büyük kirletici grubunu oluşturmaktadır. Doğal süreçlerle bozunmaları uzun yıllar süren plastikler; değişen çevresel koşullarla birlikte nitelik değiştirmektedir. Makro boyutlardan mikro ve hatta nano boyutlara parçalanması ve mikro/nano boyuttaki plastiklerin makro boyuttakilere kıyasla daha tehlikeli ve zararlı olduğu ve bu sebeple de kontrol altına alınması gerektiği birçok ülkede tartışılmakta, bu durum ülkemiz için de önem arz eden konular arasında bulunmaktadır.

Çevresel ortamların sağlığı hiç kuşkusuz bütün canlılar için önemlidir. Tabiatın bütün canlılara yaşam ortamı sağladığı farklı çevresel ortamlarda bulunan olumlu ve olumsuz bütün etkenler en küçük organizmadan en gelişmiş organizmaya kadar birçok canlıyı etkilemektedir. Bu sebeple aslında sağlıklı bir çevresel ortam, gelecek nesillere de sağlıklı bir şekilde bırakılması esas olan bir miras niteliğindedir.

Organik/inorganik kirleticilerin, çevresel ortamlara salıverilmesini/mevcudiyetini kısıtlayan, kalitesi azalmış çevresel ortamlardaki kirleticilerin belirlenmesi ve iyileştirme çalışmalarını kapsayan çeşitli yönetmelikler ve yasal düzenlemeler bulunmaktadır. Çevresel ortamlarda bulunan kirleticilerin niteliklerinin değişmesi ile birlikte bu düzenlemeler güncellenmekte ve kapsamı içerisine alınan kirleticiler ve bu kirleticilere yönelik kontrol mekanizmaları arttırılmaktadır.

Plastik ve plastik türevi atıklar, 21. yüzyılın en çok maruz kaldığı kirletici grubu içerisinde bulunmaktadır. Günlük kullanım ürünleri baz alındığında plastik-

lerle bertarafını sağlayacak yasal yaptırımların oluşturulması gerekmektedir. Uygulanabilirlikten uzak yönetmeliklerle mevcut atık sistemi içerisindeki MP'lerin kontrol altına alınabilmesi zorlayıcıdır. Ek olarak MP'lerin bünyelerinde başka kirletici gruplarını da bulundurduğu veya kirleticileri adsorbe/absorbe ederek konsantre hale getirdiği de bilinmektedir. Bu sebeple MP'ler hayli karmaşık ve içinden çıkılması zor bir kara kutu niteliğindedir. Buradan hareketle, MP'ler için hazırlanacak yasal düzenlemelerin yapısındaki kirletici gruplarını barındırması açısından diğer yasal düzenlemeleri de kapsayarak daha kontrol edici bir hale getirilmesi gerekmektedir.

- **Sınır Aşan Uygulamalar:** AB çevresel uygulamalara yatırım yapan öncü bir organizasyondur. Çapı geniş ülkelere yayılan AB uygulamaları, kendi sınırları içerisinde kalmayıp üye veya aday ülkeler bazında da uygulama yapılmasını dayatmaktadır. Bu sayede aslında bölgesel/küresel bazda bir hareketlilik sağlanmakta ve aslında bir kelebek etkisi niteliğinde küresel ölçekli sonuçlar ortaya çıkmaktadır. MP kirliliğinin önlenmesi için de AB başta olmak üzere ortak hareketle yapılan düzenlemelerin, ortak geliştirilen projelerin etkileri de yine geniş ölçüde olacaktır.
- **Standartlaştırma:** MP'lerin kontrol altına alınmasının etkili bir şekilde sürdürülebilmesi için tüm çevresel ortamlara ve gerekirse faaliyet kapsamına yönelik standartların geliştirilmesi faydalı olacaktır. Örneğin MP'lerin tanımlanması için tek bir standardın oluşturulması kavramlarla ilgili çeşitliliğin ortadan kaldırılması ve tanımlama ile ilgili belirsizliğin sonlanmasını sağlayacaktır. Standartlaştırma hem çevre sağlığı hem de toplum sağlığı açısından önem arz etmektedir. Bu sebeple küresel ya da bölgesel nitelikli olacak şekilde standartların oluşturulması gerekmektedir.

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9. BÖLÜM

SU KAYNAKLARINDA (YER ÜSTÜ VE YER ALTI) MİKROPLASTİKLER

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9.1. GİRİŞ

Nüfus artışı, iklim değişikliği ve endüstriyel faaliyetler ile paralel olarak artan su kıtlığı sonucunda su kirliliği, küresel ölçekte acilen izlenmesi ve önlem alınması gereken ciddi bir sorun haline gelmiştir. Temiz suya erişimin sorunlu olduğu bölgeler başta olmak üzere su ile ilişkili hastalıklar Dünya’da en önemli sağlık problemlerinden birisi olmaya devam etmektedir. Bu nedenle, su kaynaklarının korunmasına yönelik en iyi arıtma teknolojilerinin geliştirilmesi için sulardaki kirleticilerin detaylı şekilde belirlenmesi gereklidir. Su ortamında özellikle son yıllarda tespit edilen mikroplastikler (MP), kirlilik izleme ve önleme çalışmalarında dikkat çeken kirleticiler haline gelmiştir. Su ortamındaki MP kirliliği sadece sucul ekosistem için değil aynı zamanda insanların yaşamsal faaliyetleri ve sağlığı için de bir risk teşkil etmekte olup insanlar plastik kirliliğinin sadece kaynağı değil, aynı zamanda bu kirliliğe maruz kalan tarafıdır.

Plastiklerin su ortamında, özellikle de akarsu ve denizlerde oluşturduğu kirlilik ve buna bağlı olarak kamuoyunun dikkati, 1950'lere dayanan seri plastik üretiminin başlangıcından bu yana önemli ölçüde artmıştır (Uzun vd., 2022). Su ortamında MP'lere yönelik yapılan çalışmaların birçoğu MP mevcudiyeti, boyutu, şekli, türü ve dağılımına yöneliktir. MP'lerin akıbeti, kaynakları, biyolojik birikimi, diğer maddeler için vektör kirletici olması ve su ortamlarında dağılımının modellenmesi üzerine sınırlı sayıda çalışma olmakla birlikte son yıllarda bu çalışmalar artış göstermiştir (Uzun vd., 2022). MP'lerin sulara yayılımı ve miktarı zamanla arttığından çeşitli su ortamlarına yönelik araştırmalar artarak devam etmektedir. Bu çalışma kapsamında su kaynaklarındaki MP'ler içme suyu, tatlı su kaynakları (akarsular, göller ve yer altı suyu) ve tuzlu su kaynakları (denizler ve okyanuslar, kıyı lagünleri) başlıklarında detaylı olarak değerlendirilmiştir.

tespit çalışmalarında sedimanlar da değerlendirmeye alınarak daha bütüncül bir yaklaşım ortaya konabilir.

Denizler ve okyanuslar MP mevcudiyeti, dağılımı ve taşınımının en fazla araştırıldığı su ortamlarıdır. Deniz ve okyanus suyunda MP'lerin mevcudiyeti su yüzeyinde veya çeşitli su derinliklerinde, sedimanda ve deniz canlılarında yapılan araştırmalara konu olmuştur. Ancak örnekleme ve analiz yöntemlerindeki bazı farklılıkların sonuçların değerlendirilmesinde sorun teşkil etmesi, deniz ve okyanuslar için de standart yöntemlere olan ihtiyacı göstermektedir. Denizlerdeki MP kirliliğinin büyük bir kısmı sahillerdeki plastik atıklardan kaynaklandığı için sahillerde plastik kirliliğinin önlenmesi ve mevcut atıkların parçalanma sürecine maruz kalmadan yok edilmesi denizlerde ve okyanuslardaki MP kirliliğinin önlenmesinde önemli bir faktördür. Ayrıca denizcilik faaliyetleri, atık su deşarjları, turizm, balıkçılık vb. gibi faaliyetlerden denizlere ve okyanuslara MP girdisinin önlenmesi uzun vadede deniz ve okyanuslardaki kirliliğin azaltılması ve yok edilmesi bakımından önemlidir.

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10. BÖLÜM

ARITMA ÇAMURLARINDA MİKROPLASTİKLERİN VARLIĞI VE AKİBETİ

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10.1. GİRİŐ

Atık su arıtma tesisleri (AAT'ler) Őekil 1'de gösterildiđi gibi evsel ve endüstriyel atık sular, yağmur suyu ve çöp sahası sızıntı suyu deŐarjlarıyla yüksek miktarda MP içeriđine sahip atık sulara maruz kalırlar (Ou ve Zeng, 2018). AAT'ler %99,9'a varan MP giderim verimine sahip olmalarına rađmen giriş atık suyundaki yüksek MP miktarları nedeniyle çıkıŐ suyuyla birlikte günlük ortalama 10^5 - 10^8 MP'yi dođaya deŐarj etmektedirler (Sun vd., 2019; Ziajahromi vd., 2016). Ayrıca, atık sudan uzaklaŐtırılan MP'ler arıtma süreçleri sırasında giderilmek yerine çamura aktarılmaktadır (Okoffo vd., 2019). Arıtma çamuru, sürekli olarak ve yüksek miktarlarda üretildiđinden ve içinde bulunan faydalı bileŐenlerinden dolayı pek çok ülkede atık yerine kaynak olarak deđerlendirilmeye başlanmıŐtır. Çamurun daha uygun maliyetli bir Őekilde yönetilebilmesi için yoğunlaŐtırma, susuzlaŐtırma ve kurutma yoluyla yüksek miktarda suyunun giderilmesi gerekmektedir. Yüksek organik ve besin içeriđi nedeniyle, toprak Őartlandırıcı veya gübre olarak arazi uygulaması, çamur için başlıca geri dönüŐüm yolu olmuŐtur. Kuzey Amerika ve Avrupa'da üretilen arıtma çamuru, arazide geri dönüŐtürülerek %50'ye kadar faydalı bir Őekilde kullanılmaktadır (Nizzetto vd., 2016). Öte yandan, uygun Őekilde arıtılmamıŐ arıtma çamurunun araziye uygulanması, patojenlerin varlıđı ve daha da önemlisi toksik organikler ve MP'ler de dahil olmak üzere bazı eser kirleticilerin ekosistemde birikmesi nedeniyle artan bir endiŐe yaratmaktadır (Chen vd., 2020). Atık sudaki MP'lerin %90'ından fazlasının çamurda birikmesi nedeniyle, AAT'lerin çevresel MP kirliliđi için fazladan bir kaynak oluŐturduđu açıktır (Zhang vd., 2020). Yıllık ortalama 10^6 - 10^{14} MP'nin yakma, düzenli depolama ve çamurun araziye uygulanması yoluyla çevreye salındıđı gösterilmiŐtir.

artırabileceği göz önünde bulundurulduğunda çamurdaki diğer birçok kirletici gibi MP'lerin de çamur kütlesi bazında raporlanması önerilmektedir.

MP analizinde standardizasyonun yanı sıra, çamur arıtma süreçleri sırasında MP'lerin akıbeti ve etkilerine ilişkin daha çok araştırma yapılmasına gerek olduğu görülmektedir. Çamur arıtımındaki fiziksel, kimyasal ve biyolojik stres faktörlerinin MP'ler üzerinde bir miktar bozunmaya sebep olduğu ve eş zamanlı olarak MP'lerin de bu işlemlerin verimliliği üzerinde etkisi olduğu sınırlı sayıda çalışmada gösterilmiştir. Özellikle çamur dezentegrasyon işlemlerinin (örn. termal hidroliz, alkali, ultrasonikasyon, ozonlama ve enzimatik) MP'lerin pek çok fiziko-kimyasal özelliklerini değiştirebileceği öngörülmektedir. Dolayısıyla, anaerobik çürütme öncesinde uygulanan dezentegrasyon işlemleri MP'lerin çürütme sırasında bir dereceye kadar biyobozunmasına yardımcı olabilmekte ve toksisite mekanizmaları da dahil olmak üzere mikroorganizmaların süreç sırasındaki hareket tarzlarını değiştirebilmektedir. Ayrıca, MP'lerin çamurdaki diğer mikrokirleticilerle birlikte çamur arıtma süreçleri üzerindeki birleşik etkisinin araştırılması, MP'lere adsorplanma yoluyla doğaya taşınan toksik kirleticilerden kaynaklı uzun vadeli çevresel risklerin öngörülmesi açısından önem arz etmektedir. Sonuç olarak, MP'lerin akıbetini ve etkilerini sistematik olarak araştıran daha fazla çalışma yapılması, anlayışımızı büyük ölçüde geliştirecek ve çamur bazlı MP kirliliğine yönelik çözümlere odaklanmamızı sağlayacaktır.

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11. BÖLÜM

MİKROPLASTİKLERİN TOPRAK EKOSİSTEMİNDEKİ ÖYKÜSÜ

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11.1. GİRİŞ

Teknolojik gelişmeler ve sanayileşmeyle birlikte insan yaşamını kolaylaştırmak amacıyla her yıl tonlarca plastik üretimi gerçekleştirilmektedir. Plastikler yüksek kimyasal kararlılık, yüksek plastisite, hafiflik, iyi süneklik ve elektrik yalıtımı özelliklerine sahip düşük maliyetli malzemelerdir. Bu özellikleri nedeniyle plastikler ambalaj, inşaat, tekstil, ilaç, tarımsal üretim ve elektronik imalatı gibi sektörlerde yaygın olarak kullanılmaktadır (Thompson vd., 2009). Avrupa Plastik Üreticileri Birliği (Plastics Europe) tarafından yayımlanan plastik üretimi istatistiklerine göre 2016 yılında 335 milyon ton olan plastik üretimi, hayatımızı değiştiren COVID-19 pandemisinin de etkisiyle birlikte 2020 yılında 367 milyon tona kadar yükselmiştir (Plastics Europe, 2022). Ancak, yüksek düzeyde üretilen ve kullanılan sentetik bazlı polimerler grubunda yer alan plastiklerin kullanım/atık yönetimi modelleri ve düşük geri kazanım oranları atık plastiklerin büyük oranda birikimine neden olmaktadır. Biriken plastik atıklar mikroorganizmalar, hava koşulları, morötesi (UV) ışık ve hidroliz gibi mekanizmalar tarafından bozunmaktadır. Bozunan plastik atıklar parçacık boyutlarına göre makroplastik, mikroplastik (MP) ve nanoplastik (NP) olarak adlandırılmaktadır. Günümüzde MP'ler yüksek miktarda bulunmaları, küçük parçacık boyutları ve uzun mesafelere taşınabilme özellikleri nedeniyle hem su, toprak ve hava ortamı hem de canlı sağlığı için zararlı etkiler oluşturabilecek kirleticiler arasında yer almaktadır (Li vd., 2020; Guo vd., 2020).

Önemli bir çevresel bileşen olan toprak, gezegenimizdeki temel ekolojik işlevlerin yerine getirilmesini üstlenen ve diğer çevresel ortamlarla etkileşime giren doğal bir kaynaktır (Helmerger vd., 2020). Ancak toprak ekosistemi teknolojik gelişmeler, nüfus artışı ve endüstriyel faaliyetler nedeniyle pek çok kirleticiye maruz kalmaktadır. Bu kirleticilerden bir tanesi de parçacık boyutu ve uzun mesafelere taşınma özelliğine sahip olan MP'lerdir. MP'ler toprak ekosistemine atmosferik çökme, tarımsal faaliyetlerde sulama suyu olarak atık su kullanımı, arıtma çamuru bertarafı sonucu oluşan biyolojik katıların gübre niteliğinde kullanımı ve

risklerin azaltılması konusunda fikir alışverişinde bulunmaları, küresel bir tehdit haline gelen toprak MP'lerinin yönetimi açısından oldukça önemlidir.

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12. BÖLÜM

HAVADAKİ MİKROPLASTİKLER

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12.1. GİRİŞ

Hava kirliliği, insan sağlığına yönelik en büyük tehditlerden biridir ve her yıl Dünya çapında 7 milyon erken ölüme neden olmaktadır (Ashmore & Dimitroulopoulou, 2009). Son yıllarda yapılan çalışmalar, atmosferdeki küçük plastik partiküllerin yeni antropojenik kirleticiler olarak karşımıza çıktığını göstermektedir (Chen et al., 2020; Dris vd., 2017a; Enyoh vd., 2019; Prata, 2018). Bu plastik partiküller boyutlarına göre makroplastik, mikroplastik (MP) ve nanoplastik olarak sınıflandırılmaktadır. Evrensel olarak belirlenmiş bir tanımı olmamasına rağmen, makroplastikler 5 mm'nin üzerinde boyuta sahip plastik parçalar olarak ifade edilirken, MP'ler genel tanımlanmış bir alt boyut sınırı olmaksızın 5 mm'ye kadar olan plastik partikülleri ve nanoplastikler ise mikron altı aralığında, yani $<1 \mu\text{m}$ olan plastik partikülleri temsil etmektedir. MP'ler kaynaklarına göre (Cole vd., 2011) birincil (mikroskobik boyutlarda üretilen plastikler) ve ikincil MP'ler (çevresel ortamlardaki nispeten daha büyük plastiklerin bozunma ve parçalanma süreçlerinden kaynaklanan plastik parçacıklar) olarak tanımlanmaktadır. MP'lerin her türlü çevresel ortamda bulunması, bu kirleticileri çevre ve insan sağlığı açısından endişe verici hale getirmektedir.

Yapılan çalışmalar MP'lerin okyanuslarda (Fries vd., 2013; Hidalgo-Ruz vd., 2012; Liu vd., 2020), nehirlerde (Duan vd., 2020; Kettner vd., 2017), göllerde (Anderson vd., 2017; Fischer vd., 2016; Su vd., 2016), dağlarda (Ambrosini vd., 2019; Dong vd., 2021; Zhang vd., 2019), toprakta (Corradini vd., 2019; Vermeiren vd., 2020) ve biyotada (Cole vd., 2013; Rezanian vd., 2018; Torre vd., 2016) bulunduğu dair birçok kanıt sunmaktadır. Ayrıca, atmosferik MP'lerin diğer çevresel ortamlar için önemli kaynak olduğu ve uzak bölgelere, okyanuslara (Allen vd., 2019; Brahney vd., 2020; Dong vd., 2021; Evangelidou vd., 2020; Liu vd., 2020; Liu vd., 2020) ve Arktik bölgelere (Ambrosini vd., 2019; Bergmann vd., 2019;

barındırmaları gibi fiziksel ve kimyasal özellikleri ile ilgilidir (Wright ve Kelly, 2017). Bu nedenle, özellikle solunum yoluyla istemsizce iç ve dış ortamlarda maruz kaldığımız MP'lerin nicel ve nitel olarak karakterizasyonu, kaynaklarının belirlenmesi ve azaltımı için önlemlerin alınması son derece önemlidir.

12.6. SONUÇLAR ve ÖNERİLER

Havadaki mikroplastiklerin doğru bir şekilde belirlenmesi, karakterize edilmesi, solunumun önemli bir maruziyet yolu olması ve MP'lerin sağlık etkilerinin anlaşılması açısından son derece önemlidir. Bununla birlikte atmosferik çökeltme, MP'lerin alıcı ortamlara ulaşması için de önemli bir mekanizmadır ve bu bakış açısıyla alıcı ortamlardaki MP'lere katkısının belirlenmesi gereklidir. Henüz standart örnekleme ve analiz protokollerinin oluşmadığı havadaki MP'ler için iç ortamların da ayrıca değerlendirilmesi, iç ortam MP kaynaklarının belirlenmesi ve derişimlerinin azaltılması için önlemlerin alınması faydalı olacaktır. İnsanların iş ortamları başta olmak üzere vakitlerinin çoğunu iç ortamlarda geçirdiği düşünülürse sağlık riski açısından da bu husus önem kazanmaktadır. Literatür incelendiğinde havadaki MP'ler ile ilgili çalışmalarda diğer hava kirleticilerin örnekleme için kullanılan yöntemlerin kullanıldığı görülmektedir ve MP'lerin seçici olarak örnekleme imkân veren örnekleycilere yönelik araştırmaların yapılmasına ihtiyaç vardır.

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13. BÖLÜM

MİKROPLASTİKLERİN ORGANİK VE İNORGANİK KİMYASALLARLA VEKTÖREL ETKİLEŞİMİ

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13.1. GİRİŞ

Mikroplastikler (MP), inorganik ya da organik kirleticilerin doğada taşınmasında ya da canlıların dokularında birikmesinde vektörel bir rol oynamaktadırlar ve ağır metaller, pestisitler ve her geçen gün ortaya çıkan yeni kimyasallarla etkileşime geçebilmektedir. Bu etkileşim sonucu, MP'ler doğadaki diğer kimyasalların biyolojik birikimini (biyobirikim) artırmakta ve kirlilik potansiyelini etkilemektedir. Diğer kimyasallarla sinerjisi daha tehlikeli bir karışım yaratacağından canlıların sağlığı açısından risk teşkil etmektedir.

MP'ler potansiyel olarak toksik olan kimyasalların organizmalara ve diğer canlılara iletilmesi ya da taşıyıcı rol oynayarak bir vektör olarak davranmasıdır. MP'ler bu kimyasalları besin ağına taşınması için önemli bir taşıma yolu veya vektör olabilir. MP'lerin yüzeyinde adsorbe olan kimyasallar ve plastiklerden salınan plastikleştiriciler veya katkı maddeleri, organizmaya partiküllerle birlikte girer ve desorpsiyon süreçleri aracılığıyla lezyonlar gibi etkilere neden olabilir ve nihayetinde insanlara kadar etki edebilir.

İnsanoğlunun ihtiyacı ve yararı gözetilerek sentezlenen ya da üretilen organik ve inorganik kimyasallar doğaya salındıktan sonra insan sağlığına ve doğaya zarar veren kirleticiler haline gelmektedir. MP'lerin polimerik yapısındaki organiklerin salımı ya da farklı çevresel ortamdaki kirleticilerin MP'lerle etkileşimi sonucu canlılar için daha zararlı bir yapıda kokteyl oluşmaktadır. Dolayısıyla, bu kokteylin oluşumunda etkili olan desorpsiyon, absorpsiyon ve adsorpsiyon mekanizmalarının özellikleri ve aralarındaki farklılıklardan bahsedilmiştir. Ayrıca, bu mekanizmaları etkin kılan etkileşim ve bağların (hidrofobik etkileşim, ayrışma etkisi, hidrojen bağları) mekanizmalar üzerindeki etkilerine de değinilmiştir. Bunlara ek olarak, organik/inorganik-MP etkileşimini belirleyen faktörler içerisinde MP'lerin

olan vektörel etkileşimin irdelendiği bölümde ulaşılan önemli sonuç ve öneriler aşağıda sıralanmıştır:

- Literatürde, ağır metallerin MP'lerle etkileşimini ve mekanizmalarını anlatan laboratuvar haricinde çok fazla çalışmaya yer verilmemiştir. Daha fazla saha çalışması ve denge katsayılarının araştırılması bu kirleticilerin çevresel risklerinin belirlenmesi açısından önemlidir.
- MP'lerin çevresel risklerinin (örneğin, çevresel davranış ve ekotoksisite) kapsamlı ve doğru bir şekilde değerlendirilmesi, etkili çevre politikaları geliştirilmesi açısından önemlidir.
- Denge katsayılarının deneysel olarak belirlenmesi zaman alıcı, maliyetli ve hataya açık olabileceğinden in-silico modellerle tahmin edilmesi daha pratiktir. Böylesi, farklı ortamlardaki kirleticilerin MP üzerindeki adsorpsiyon kapasitesi hızlı bir şekilde tahmin edilebilir ve MP'lerin ekolojik risk çalışmaları için gerekli bilgiler sağlanabilir.
- In-silico yaklaşımı her geçen gün ortaya çıkan yeni kimyasallarla MP'lerin etkileşimini belirlemeye yardımcı olabilir ve elde edilen veriler, kirlenmiş sahaların remediasyonuna yönelik modellerin geliştirilmesine katkı sağlayabilir.

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14. BÖLÜM

MİKROPLASTİKLERLE KİRLENMİŞ SAHALAR: İHTİYAÇLAR VE ZORLUKLAR

Hale Demirtepe*

14.1. GİRİŞ

İnsan hayatını kolaylaştırmak adına üretilen ürünler, evsel, tarımsal ve endüstriyel kullanım sırasında ve sonrasında ömrünü tamamlayınca atık haline gelir ve/veya atık sulara karışır. Bu atıklar eğer uygun ve planlı bir şekilde yönetilmezse, çeşitli yollarla doğaya karışarak çevre kirliliğine sebep olurlar. Su ve toprak kirliliği, insan sağlığına ve ekosisteme karşı risk teşkil ettiğinden, küresel çapta hayati öneme sahiptir. Birleşmiş Milletler tarafından belirlenen Sürdürülebilir Kalkınma Amaçlarının neredeyse hepsi, su ve toprak kirliliği ile bağlantılıdır (Birleşmiş Milletler, 2021). Çevre ve insan sağlığına yönelik belirlenen amaçların yanı sıra; toplumların gelişmesi, ülkeler arasındaki eşitsizliklerin azalması, adil bir şekilde tüm toplumların sürdürülebilir kalkınmaya dahil edilmesi amaçları da temiz su kaynaklarının ve temiz tarımsal toprak alanlarının sağlanmasına bağlıdır. Bu sebeple, Sürdürülebilir Kalkınma Amaçlarına ulaşmada en önemli konulardan biri kirlenmiş su kaynaklarının ve toprak alanlarının belirlenmesi ve bu kirliliğin giderilmesi için gerekli faaliyetlerin gerçekleştirilmesidir. Bunun için de ilk adım, birincil öneme sahip kirleticilerin yönetimsel çerçevede ele alınmasıdır.

Son yıllarda öncelik kazanan kirleticilerden biri mikroplastiklerdir. Fosil bazlı, biyo-bazlı ve geri dönüştürülmüş plastik üretimi 2021 yılında Dünya çapında 391 milyon tona ulaşmıştır (PlasticsEurope, 2022). Ancak bu sayıya tekstil için kullanılan, sızdırmazlık ürünlerinde, yapııştırıcılarda, boyalarda bulunan, kozmetik ve ilaç üretiminde kullanılan plastikler dahil edilmemiştir (PlasticsEurope, 2022). Kullanımları sırasında ve sonrasında bu plastikler atık haline gelmektedir. Ekonomik Kalkınma ve İşbirliği Örgütü (OECD) tarafından yayımlanan rapora göre kişi başına üretilen yıllık plastik atık miktarı 69 kg (Japonya ve Kore ortalaması) ile 221 kg (ABD) arasında değişmektedir (OECD, 2022). 2019 yılı için küresel çapta üretilen plastik atık miktarı tahminen 353 milyon tondur. Aynı raporda, ortaya

Çevresel ortamlarda mikroplastiklerin örneklenmesi, örneklerin saklanması, işlenmesi ve analizleri için standart ve ulaşılabilir yöntemler geliştirilmeli ve araştırmacıların bu yöntemleri kullanmaları teşvik edilmelidir. Ayrıca, mikroplastik derişimlerinin raporlanmasında da standart bir birim kullanılması, çalışmaların karşılaştırılabilir olması ve risk değerlendirmelerinde belirsizliğin azaltılması açılarından önemlidir.

Toksikolojik çalışmalarda son yıllarda çevresel ortamlardaki derişimlere yakın değerler kullanılmaya başlanmış olsa da (Allen vd., 2022), bundan sonra yapılacak çalışmalarda bu konuya özellikle dikkat edilmeli, ne tip polimerlerin hangi çevresel ortamlarda hangi derişimlerde bulunduğu taklit edilerek ve canlıların maruziyet yolları tüm olasılıklar göz önüne alınarak çalışma planı oluşturulmalıdır. Ayrıca, mikroplastikleri oluşturan sınıfın şekil, boyut ve polimer tipi açılarından büyük bir varyasyon oluşturduğu ve bunların çevresel ortamlarda bir arada bulunduğu düşünüldüğünde, farklı mikroplastiklere maruz kalınması durumunda olası sinerjik/antagonistik etkilerin değerlendirilmesi büyük önem taşımaktadır. Mikroplastiklerin diğer kirleticilerle de etkileşim halinde olması durumu ise risk değerlendirmesinde, kümülatif risk hesaplamalarının yapılması gerekliliğini getirebilir. Bununla birlikte, tehlike katsayılarının hesaplanabilmesi için mikroplastikler için referans doz değerlerine ihtiyaç vardır. Bu değerlerin belirlenmesinde kullanılacak yöntemler de standart bir hale getirilmeli, tutarlı risk değerlendirmelerin yapılmasına olanak sağlanmalıdır. Ayrıca, mikroplastiklere maruz kalma yollarından biri olan deriyle temas yoluna yönelik araştırmalar geliştirilmelidir.

Son olarak, kirlenmiş sahaların tanımlanmasının ardından uygulanacak iyileştirme yöntemleri saha koşullarına uygun olarak seçilmelidir. Ancak, bu aşamada seçilen yöntem aynı zamanda sürdürülebilir olmalıdır. Bir kirleticinin giderimi için uygulanan yöntemlerin başka çevre sorunlarına sebep olmaması adına, uygulanacak iyileştirme yöntemlerinin çevresel, sosyal ve ekonomik açılardan en az hasara sebep olacak ve en çok yararı sağlayacak yöntemler arasından seçilmesi önemlidir. Böylece, mikroplastiklerle kirlenmiş sahaların sürdürülebilir yönetimi ile Sürdürülebilir Kalkınma Amaçlarına ulaşmada bölgesel ve küresel çapta en yüksek katkı sağlanmış olacaktır.

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15. BÖLÜM

GIDA ÜRÜNLERİNDE MİKROPLASTİKLER

Kadir Gedik*

15.1. GİRİŞ

Yirminci yüzyılın başından itibaren küresel çapta her alanda çok hızlı gelişmeler ve ilerlemeler yaşanmaktadır. Çeşitli etkenlerin ivmelendirdiği bu itici güç, yeni teknoloji ve üretim tekniklerinin bulunması ile beraber geleneksel gıda üretimlerinin endüstriyel olarak gerçekleştirilmesini sağlamıştır. Yeni gıda ürünlerinin geliştirilmesi, deniz hava ve kara yolu taşımasındaki fiziksel şartlar ve araçların gelişmesi ile beraberinde iletişim ve internet teknolojisindeki gelişmeler ile dünyadaki farklı üreticiler ve tüketiciler arasındaki mesafenin kısılması sonucu uluslararası ticarete pek çok yeni aktör katılmış ve böylece dünyanın herhangi bir ülkesinde istenilen bir ürüne ulaşım kolay hale gelmiştir. Özellikle B2B (Şirketten Şirkete) tarzı ticaretin yaygınlaşmasıyla beraber pek çok üretici dünya gıda ticaretinde yerini almak için çaba sarf etmektedir.

Yaşanan gelişmeler insanoğluna çeşitli kolaylıklar ve avantajlar sağlamasına rağmen bazı dezavantajları da beraberinde getirmektedir. İnsan nüfusunun ve endüstriyel ürünlerin tüketimindeki bu artış ve de diğer etkenler “kirlilik” olarak adlandırılan bir sorunu ortaya çıkarmaktadır. İlk başta sadece çevre kirliliği aklı gelmesine rağmen, çevre kirliliğinin çarpan etkileri, türevleri göz ardı edilmemelidir. Gıda maddelerinin yapısal özelliklerine bağlı olarak gıda ham maddeleri üretimi, gıda işleme teknolojileri ve uygulamaları, taşımacılık, depolama, perakendecilik, gıdaları hazırlama ve tüketme gibi pek çok aşamada gıdalar çeşitli kirletici unsurlarla kirlenmekte, Dünya genelinde milyonlarca insan kontamine gıda ve su tüketimi nedeniyle hastalanabilmektedir. Sonuç olarak ise gıda güvenliği terimi öne çıkmaktadır. Gıda güvenliği; Codeks Alimentarius Uzmanlar Komisyonu tarafından “sağlıklı ve kusursuz gıda üretimini sağlamak amacıyla gıdaların; üretim, işleme, muhafaza ve dağıtımları sırasında gerekli kurallara uyulması ve önlemlerin alınması” şeklinde tanımlanmıştır. 5179 sayılı Gıda Kanununa göre de gıda güvenliği; “Gıdalarda olabilecek fiziksel, kimyasal, biyolojik ve her türlü zararların ber-

insan sağlığı üzerine direkt etkileri hakkında çok az şey bilindiği, tedarik zinciri boyunca mikroplastik gözlemlene teknikleri üzerine yeni araştırmalara odaklanması gerektiği, MP'lerin varlığı ile gıda güvenliğinin nasıl etkilendiği konusunda da bilgi eksikliğinin olduğu ve son olarak plastik atık yönetimi bağlamında mikroplastik mevzuatının geliştirilmesi gerekmektedir (De-la-Torre 2020, Usman vd. 2020, Kadac-Czapska vd. 2022, Sánchez vd. 2022).

TEŞEKKÜR

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16. BÖLÜM

BESİN ZİNCİRİNDE MİKROPLASTİKLER

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16.1.GİRİŞ

Endüstriyel olarak üretimi 1950 yılında başlayan plastik, sağlam, üretimi kolay, ucuz ve uzun ömürlü bir materyal olması nedeniyle modern dünyada yaygın bir kullanım alanı bulmuştur (Sivan, 2011). 2020 yılı itibarı ile küresel ölçekteki plastik üretimi 367 milyon tona ulaşmıştır (PlasticsEurope, 2020). Bu geniş kullanım ve yüksek üretim hacmi sonucunda oluşan plastik atıklar, bertaraf ve depolamadaki eksiklikler nedeniyle zamanla doğal ortamı kirletmeye başlamıştır.

Plastik partiküllerin doğadaki varlığı ilk olarak 1972 yılında Sargasso Denizi'nde ortaya konmuştur (Carpenter ve Smith, 1972). Bu tarihten itibaren araştırmacılar farklı denizlerde plastik partiküllerin varlığını rapor etmiştir (Colton vd., 1974; Eryaşar vd., 2021; Erüz vd., 2022; Gedik vd., 2022; Morris ve Hamilton, 1974; Terzi vd., 2022; Wong vd., 1974). Mikroplastiklerin doğadaki varlığı 1970'lerden bu yana bilinmesine rağmen Moore vd. (2001) tarafından Kuzey Pasifik döngüsündeki mikroplastik kütlelerinin planktonların altı katından fazla olduğunun belirlenmesi üzerine konu ile ilgili çalışmaların sayısı hızla artmıştır. Bu kirletici ile ilgili yapılan ilk çalışmalarda mikroplastiklerin birim hacimdeki miktarının, şekillerinin, boyutlarının ve renklerinin belirlenmesine odaklanılmıştır. Bu süreçte mikroplastiklerin farklı ekosistemlerdeki varlığı, dağılımı ve kaynakları kapsamlı bir şekilde araştırılmış olmasına rağmen (Ivleva vd., 2017; Ya vd., 2021) bunlarla etkileşime giren canlılar üzerindeki etkileri hâlâ tam olarak anlayılamamıştır. Canlıların bu kirletici ile girdikleri en önemli etkileşim şekli ise bu partiküllerin doğrudan veya dolaylı şekilde besin maddesi olarak tüketilmesidir (Wesch vd., 2016). Özellikle sucul canlılar üzerinde yapılan araştırmalarda bu canlıların sindirim sistemlerinde mikroplastiklerin varlığı belirlenmiştir (Eryaşar vd., 2022; Gedik and Eryaşar, 2020) ve bunların besin zinciri ile taşınabildikleri ortaya konmuştur (Cartery vd., 2018; Zhang vd., 2019). Canlılar tarafından tüketilen mikroplastikleri

yonlara, hücre toksisitesine ve genotoksisiteye yol açabilmektedir (Lehner vd., 2019). Solunum yolu ile uzun süre mikroplastığe maruz kalınımı astım ve pnömokonyoz gibi solunum hastalıklarına neden olabilmektedir (Walker et. al. 2022).

16.5. SONUÇ ve ÖNERİLER

Yapılan çalışmalar karasal ve sucul ekosistemlerdeki birçok canlı grubunun doğrudan veya dolaylı olarak mikroplastiklere maruz kaldıklarını ortaya koymuştur. Bunun sonucunda da beslenme, büyüme, üreme gibi yaşamsal faaliyetlerin olumsuz etkilendiği, bu kirleticinin besin zincirinde üst basamaklara taşınabildikleri belirlenmiştir. Ayrıca mikroplastikler barındırdıkları diğer kimyasal katkı maddeleri vasıtasıyla toksik etkiye neden olabilmekte, ortamdaki diğer kimyasal kirleticilerle etkileşime girerek bunların toksik etkilerini arttırabilmekte veya azaltabilmektedir.

Mikroplastiklerin ve katkı kimyasallarının canlılar üzerindeki etkilerinin araştırılması adına birçok model canlı üzerinde farklı deneysel çalışmalar yürütülmüştür. Ancak bu deneysel çalışmaların büyük bir çoğunluğu canlıların doğal ortamda maruz kaldıkları mikroplastik miktarının üzerindeki konsantrasyonlarda gerçekleştirilmiştir.

Mikroplastiklerin etkilerinin habitat, canlı türü, canlının beslenme stratejisi, mikroplastiklerin polimer türü, şekli, büyüklüğü ve hatta rengi gibi birçok faktöre bağlı olduğu göz önüne alındığında yapılacak deneysel çalışmaların bu farklı matrislerin kombinasyonları ile farklı sonuçlar göstermeleri kuvvetle muhtemeldir. Bu nedenle deneysel çalışmalar öncesinde çalışma yapılacak canlının doğal ortamda hangi tür mikroplastiklere ne mertebede maruz kaldıklarının bilinmesi araştırmacılara daha gerçekçi deney ortamları hazırlamakta konusunda yardımcı olacaktır. Mikroplastikler her ne kadar küresel bir sorun olsa da bunların besin zincirindeki yerel boyutta kaynaklarının ve çeşitliliklerinin anlaşılması gerekmektedir.

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17. BÖLÜM

PLASTİK PARTİKÜLLERİN SAĞLIK ETKİLERİ

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17.1. GİRİŞ

Kimyasalların üretim çeşitliliđi, üretim miktarı, kullanımları ve dolayısıyla çevresel yükleri gün geçtikçe artmaktadır. Üretilen kimyasallar ise kozmetikten ilaca, gıdadan tekstile kadar yaşamımızı kolaylaştıran pek çok alanda kullanılmaktadır. Aralarında plastik yapıda olanların üretimi yıllık 300 milyon tonu aşmaktadır (H. Sun, Chen, Yang, Xia, & Wu, 2021). Yaşamımızın vazgeçilmezi haline gelmiş olan plastikten yapılan ürünlerin üretim miktarındaki artış ve kullanım yoğunluğunun yanı sıra, plastikler son yıllarda sağlık riskleri ile gündemdedir.

Plastik partiküllerin her türlü ekosistemde ve canlıların özellikle de insanların biyolojik örneklerinde bulunduğu ve biriktiđinin saptanmış olması (Chen, Feng, & Wang, 2020; Hirt & Body-Malapel, 2020; Jing et al., 2022) günümüzün en önemli çevresel kaynaklı maruziyetleri arasında anılmasına neden olmaktadır. Son yıllarda bilimsel literatürdeki araştırmalar mikro plastikler (MP) ve nano plastikler (NP)'in çevrede bulunuşları, maruziyet yolları, maruziyetin çeşitli sistemlerde yol açtığı toksik etkiler ve sağlık etkileri üzerine yoğunlaşmaktadır.

Bu çerçevede plastikler ve plastik partiküller ile ilgili düzenlemelerin yapılabilmesi için üretim, çevrede bulunuş, maruziyet ve maruziyet ile ilişkili toksik etkilere yönelik bulguların artması gerekmektedir. İkibinli yıllarda hız kazanan araştırmalar ve ikibinyirmilerin başında elde edilen bulgular detaylı derlemelerde biraraya getirilmiştir. Derlemelerin odaklandığı konular plastik partiküllerin toksisitesi, in vitro çalışmaları, sucul canlılarda ve memelilerde etkiler, toksisiteyi etkileyen faktörler, çeşitli dokular ve organ sistemleri üzerine etkiler ve genel olarak insan sağlığı üzerine etkilerine yönelik (Banerjee & Shelver, 2021; Chen et al., 2020; Hirt & Body-Malapel, 2020; Kannan & Vimalkumar, 2021; Kögel, Björøy, Toto, Bienfait, & Sanden, 2020; Kumar et al., 2022) olup ilgili 17. bölümün oluşturulmasında bunlardan yararlanılmıştır

ruziyet yollarına yönelik hedef hücreler ve dokular seçilmektedir. Partikül ve lif özellikli bütün etkenlerde olduğu gibi plastiklerde de toksisiteyi etkileyen şekil, boyut, yapıldığı ve üzerinde taşıyabileceği maddeler, sağlık etkilerinde ve canlıdaki dağılımında rol oynamaktadır. Öyle ki kan dolaşımına girebilecek kadar küçük plastik partiküllerin toksisitelerini ve istenmeyen sağlık etkilerini solunum, bağırsak, karaciğer, kan, sinir, kalp, böbrek ve üreme sisteminde gösterebildiğine ait bulgular son yıllardaki çalışmalardan elde edilmektedir.

Toplumun her kesiminden toplanan kan, karaciğer, kolon, akciğer biyolojik örneklerinde plastik partiküllerin varlığı gösterilmiştir. Ayrıca plasenta ve anne sütünde de saptanmaları, bu dokuların da maruziyet kaynağı olarak değerlendirilmesine ve konunun ne kadar önemli olduğuna bir kanıttır. Sağlık etkileri en fazla araştırılan plastik polimeri PS'dir. Plastikleri temsil eden molekül olarak sıklıkla kullanılmaktadır. Ancak, diğer polimerler ve oluşturabilecekleri toksisite, çevrede plastik partiküllerin üzerine tutunabilecek hava kirliliği etkenleri, endüstriyel kirleticiler de toksisiteyi şekillendirmede önemlidir. Dolayısıyla, bu konulardaki çalışmalar bilimsel verilerin artmasına ve sağlık etkilerinin sınıflandırılmasına katkı verecektir ya da vermektir.

Her ne kadar insanların biyolojik örneklerinde maruziyet biyogöstergeleri ile plastikler ve ilgili etkenler saptansa da moleküler epidemiyoloji çalışmaları ile etki biyogöstergelerini de içeren kontrollü çalışmaların tasarlanması olası sağlık etkilerini, hastalıklarla plastik maruziyeti arasında bir ilişki bulunup bulunmadığını açıklayabilecektir.

Plastiklere yönelik araştırmaların disiplinlerarası tasarlanması önemlidir. Böylece tüketici ürünlerinden hava, su ve toprağa karışan plastiklerin çevredeki durumları, canlılara ulaşması sonucu olası toksisiteleri ve sağlık etkileri gibi bulgular toksikolojik risk değerlendirmesinde kullanılabilir. Bu da risk yönetiminin ve yasal düzenleyici otoritelerce maruziyet sınır değerlerinin belirlenmesi basamaklarının her birinin profesyonelce tamamlanmasını sağlayacaktır.

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18. BÖLÜM

UZAKTAN ALGILAMA YÖNTEMLERİ KULLANILARAK SU ORTAMINDAKİ PLASTİKLERİN İZLENMESİ

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18.1. GİRİŞ

Plastik kirliliği insanoğlunun meydana getirdiği, son yüzyılın en büyük çevre sorunlarından biri olacaktır. Plastik kirliliği Dünya genelinde katlanarak artmakta ve tüm denizlere ve okyanuslara hızla yayılmaktadır. Sınır tanımayan ve bir türlü önüne geçilemeyen plastik kirliliği küresel boyutta ciddi bir tehdit haline gelmiştir. Özellikle son 20 yılda Dünya genelinde endüstriyel ve sanayi alanlarında plastiğin yoğun üretimi ve kullanımı çevresel boyutta ciddi sorunları beraberinde getirmektedir. Bu devasa kirlilik, gelecek nesillere bırakacağımız kötü bir mirastır. İnsanoğlunun kullandığı plastiklerin büyük çoğunluğu atık olarak değerlendirilmiş ve bunların birçoğu gerek hava gerekse başka yollar ile su kaynaklarına karışmıştır. Şu an sadece su kaynaklarında değil, karalarda, dağların tepelerinde, yediğimiz gıdalardan içtiğimiz sulara ve hatta kanımızda bile çok küçük boyutlarda plastik partiküller ile karşılaşmak mümkündür. Su kütlelerinde bulunan plastikler hacimsel olarak fazla olmasına rağmen, plastiklerin boyutunun küçük olması plastik kütlelerin tespitini zorlaştırmaktadır. Bunun en önemli nedeni büyük parçalardan aşınmış küçük plastik parçalarından oluşmasıdır.

Dünya genelinde ve kamuoyunda ise mikroplastiklerin çevresel etkileri hakkındaki endişeler gün geçtikçe artmaktadır. Mikroplastikler, küçük plastik parçaları olup doğal ortamlarda ve su kaynaklarında yaygın olarak bulunmaktadır. Atığa dönüşen plastiklerin büyük çoğunluğu gerek hava gerekse başka yollar ile su kaynaklarına karışmaktadır. Şu an sadece su kaynaklarında değil, karalarda, dağların tepelerinde, yediğimiz gıdalardan içtiğimiz sulara ve hatta kanımızda bile çok küçük boyutlarda plastik partiküller ile karşılaşmak mümkündür. Dünya'nın en büyük çöplükleri okyanus ve denizler üzerinde karadan binlerce kilometre uzakta, gözden uzakta bulunmaktadır. Söz konusu çöp alanları, kamuoyu tarafından yedinci kıta veya sekizinci kıta olarak isimlendirilmektedir. Bu şekilde isimlendirme-

tır. Yine Eskişehir ili merkezinde bulunan Porsuk Çayı ve Sazova Parkına ait aynı tarihli Sentinel görüntülerine ilgili komut dosyası uygulandığında insan ve şehir faktörünün etkisi sonuç haritalarına yansımıştır. Her iki alandan elde edilen görüntüler incelendiğinde şehirden ve yapay kirlilikten uzak olan Borabey Göletinin nispeten şehir merkezinde bulunan sulak alanlardan daha temiz olduğu görülmektedir. Bu sonuçlar, uydu görüntüleri ve araştırmacıların geliştirmiş olduğu komut dosyasının çalıştırılması ile elde edilmiştir. Plastik kirliliğinin daha detaylı tespit edilebilmesi için görüntülere esas alanlardan alınan su numunelerinin laboratuvar ortamında analiz edilmesi gerekmektedir. Uzaktan algılama yöntemleri ile elde edilen veriler kesin bir değer vermeyip öncül veya öngörü niteliğindedir.

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19. BÖLÜM

TOPLUMSAL FARKINDALIK İÇİN PLASTİK AYAK İZİ

Ayça Erdem Ünşar*, Çiğdem Moral

19.1. GİRİŞ

Her yıl Dünya çapında artarak çoğalan miktarlarda plastik üretilmekte, farklı alanlarda kullanılmakta ve atık olarak çeşitli şekillerde bertaraf edilmektedir. 2019 yılında Dünya genelindeki plastik üretiminin 368 milyon tona ulaştığı (PlasticEurope, 2020) ve buna tekstil sektörü plastik atıklarının da eklenmesiyle bu miktarın yaklaşık 420 milyon tona çıktığı (Lebreton ve Andrady, 2019; The Fiber Year, 2017) rapor edilmiştir. 2019'da 7,7 milyar olan insan nüfusunun 2040'ta 9,2 milyara çıkmasıyla (UN, 2019), plastik üretiminin 2050'ye kadar 589,3 milyon ton olacağı tahmin edilmektedir (Tisea, 2021). 2010'da karasal kaynaklardan okyanusa 4,8–12,7 milyon ton plastik atığın karıştığı tahmin edilmiştir (Jambeck ve ark. 2015). Su ortamlarındaki plastik kirliliğinin, mevcut üretim, tüketim ve atık yönetimi uygulamalarının devam etmesi durumunda 2016'da yıllık 19–23 milyon tondan 2030'a kadar neredeyse üç katına çıkacağı öngörülmüştür (Borrelle vd., 2020). Söz konusu artışın, insan ve çevre sağlığı üzerinde olumsuz etkilere yol açtığı çeşitli çalışmalarla bildirilmiştir. Gündoğdu (2018) sofrta tuzunda, Li vd. (2020) deniz yosunlarında, Li vd. (2019) ve Gündoğdu vd. (2020) midyelerde ve Çevik vd. (2022) diğer birçok deniz ürünüde plastik ve mikroplastiklere rastlandığını raporlamıştır. Plastik kirliliğinin olumsuz etkilerinin yakın gelecekte de artması beklenmektedir. Çalışmalar, plastik kirliliğinin plastik ayak izi ile doğrudan ilişkisi olduğunu göstermektedir. Temel anlamda plastik ayak izi, Dünya'da oluşan plastik atığına ne kadar plastik katkı yaptığınızı göstermektedir. Dolayısıyla kişisel, ürün, şirket/kuruluş, ülke, bölge ve/veya küresel boyutta meydana gelen plastik kirliliğinin olumsuz etkilerini ölçmek için kullanılan plastik ayak izi önemli bir göstergedir. Plastik ayak izinin belirlenmesi için farklı metodolojiler geliştirilmiş olup, Yaşam Döngüsü Analizi (Life Cycle Assessment, LCA), Malzeme Akış Analizi (Material flow analysis, MFA), Çok Bölgeli Girdi-Çıktı (Multi-Regional Input-

yısıyla doğada bu plastikler küçük parçalara ayrışır ve mikroplastik ayak izini arttırır.

Tüm bunlar dikkate alındığında plastiğin insanoğlunun günlük hayatındaki yaygın kullanımı kolayca gözlenebilir. Diğer yandan kişilerin bireysel olarak çevreye yüklediği plastiklerle ilgili üretim, kullanım ve atma alışkanlıklarını değiştirmesinin önemli olduğunun farkına varması geleceğe bırakılan mikroplastik ayak izini olumlu yönde etkileyecektir (URL 15).

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20. BÖLÜM

MİKROPLASTİK AR-GE ÇALIŞMALARININ DİJİTALLEŞTİRİLMESİ VE YAYILIMI BAĞLAMINDA VİDEOLAR

Nuray Gedik*, Barış Yiğit

20.1. GİRİŞ

Dijitalleşme tüm bilimsel alanlarda değişim ve dönüşüme neden olmaktadır. Bilimsel araştırma süreçlerinde yaşanan değişim ve dönüşümlerin çalışma konularının belirlenmesinden, deneysel süreçlere, bilgi paylaşımından toplumsal katılıma kadar geniş bir alanı kapsadığı görülmektedir (OECD, 2020). Dijitalleşme süreci, endüstri ve sanayi için sürdürülebilir gelecek adına etkili ve verimli bir devrim olarak da tanımlanmaktadır (World Economic Forum, 2022). Birleşmiş Milletler tematik eylemleri arasında gösterilen “dijital öğrenme ve dönüşüm” başlığı altında dijital öğrenme kavramının eğitim amaçlı kullanılan yazılım, donanım ve dijital kaynakların hepsini kapsadığı görülmektedir.

Peki dijitalleşme, yükseköğretimde araştırma ve geliştirme (ar-ge) süreçlerine nasıl etki etmektedir? Bu sorunun yanıtı, kullanılan dijital teknolojiler ve ar-ge çalışmalarının bağlamına göre değişmektedir. Örneğin video, uzaktan erişimli laboratuvar, bulut bilişim gibi teknolojilerden; artırılmış, sanal ya da karma gerçeklik, dijital ikiz gibi teknolojilere kadar pek çok teknolojiye söz edilebilir. Aynı şekilde ar-ge süreçleri açısından da veri toplamadan, deneysel süreçlere, veri analizinden yorumlamaya, raporlamaya ve iş birlikli çalışmadan yayınlamaya kadar tüm süreçlerde dijitalleşmenin farklı kullanımlarını ve uygulamalarını görmek mümkündür (Tablo 1). Kimi gelişmeler ve dijital teknolojiler yıkıcı olarak adlandırılmakta ve tüm süreçlere ve bileşenlere yönelik etkisinin de yıkıcı olacağı değerlendirilmektedir. Bu teknolojilerin başında uzun yıllardır hayatımızda olan yapay zeka uygulamalarının son dönemdeki gelişmeleriyle ortaya çıkan Web 4.0 ve Web 5.0 gibi uygulamalar ve sanal asistanlar gibi gelişmeler gösterilebilir. Yıkıcı teknolojiler, mevcut pratikleri ve kullanılan teknolojileri ortadan kaldıran teknolojiler olarak tanımlanmaktadır (Flavin, 2012). Dijital dönüşüm başlığı altında da incelenen bu teknolojilerin etkilerinin yapay zeka uygulamaları ile köklü

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MUTFAK TASARIMI

Konut Mutfakları ve
Endüstriyel Mutfaklar

Tülay Zorlu



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İÇİNDEKİLER

Teşekkür	iii
Ön Söz	iv

1. BÖLÜM

KONUT MUTFAKLARI.....	1
Konutlarda Mutfak Tasarımının Önemi	1

2. BÖLÜM

KONUT MUTFAKLARINDA YER ALAN EYLEMLER VE EYLEM ALANLARI....	3
Temel Olarak Mutfakta Yer Alan Eylemler.....	3
Eylem Sırası	4
Mutfakta Çalışma Üçgeni	5
Eylem Grupları İle ilgili Çalışma Bölgeleri.....	8
Hazırlama Bölgesi.....	8
Pişirme Bölgesi	9
Servise Hazırlık ve Servis Bölgesi.....	11
Yemek Yeme Bölümü	12
Bar Tipi Yemek Alanı Düzenlemeleri için Temel Ölçüler.....	16
Bulaşık Yıkama-Temizleme Bölgesi	18
Depolama Bölgeleri	19

3. BÖLÜM

KONUT MUTFAKLARINDA YER ALAN EKİPMAN VE DONATILAR.....	21
Mutfaklarda Yer Alan Ekipmanlar.....	22
Mutfak Tezgâhları	22
Mutfak Tezgâhlarında Kullanılan Malzemeler ve Özellikleri	23
Masif Tezgâh	23
Laminat Tezgâh.....	23
Doğal Taş Tezgâh.....	23
Mermer Tezgâh	24
Granit Tezgâh.....	24
Sert Yüzeyle Mutfak Tezgâhları	24
İşlenmiş Taş (Kuvars) Tezgâh.....	24
Corian-Akrilik Tezgâh	25
Dekton Tezgâh.....	25
Paslanmaz Çelik Tezgâh	25
Beton Tezgâh	26
Cam Tezgâh	26
Seramik Tezgâh	26
Mutfak Dolapları	29
Tezgâh Altı (Döşeme) Dolapları	29
Yüksek Dolaplar	32
Tezgâh Üstü (Duvar) Dolapları	35
Mutfak Dolaplarında Kapak Malzemeleri ve Özellikleri	38
Profil Kapak	38
Alüminyum Profil Kapak	39
Suntalam/Mdf lam Kapak	40
Laminant Kapak	42
PVC (Membran) Kapak	43
Thermofoil Kapak	43
Akrilik Kapak	44
High Gloss Kapak	45

Lake Boya Kapak	46
Masif Ahşap Kapak.....	48
Ahşap Kaplama Kapak	49
Evye Biriminin Özellik ve Boyutları.....	50
Bulaşık Makineleri	54
Pişiriciler.....	55
Aspiratör ve Davlumbazlar.....	57
Soğutucular	60

4. BÖLÜM

MUTFAK TASARIMINDA KULLANICI FAKTÖRÜ	63
Kullanıcı Gereksinimleri ve Mutfak Tasarımı.....	63
Mutfak Tasarımında Dikkate Alınması Gerekli Boyutlar.....	66
Ayakta ve Oturur Pozisyonda Çalışma Yükseklikleri	67
Yatayda Erişim, Çalışma Alanı ve Boyutları.....	68
Depolama Ünitelerine Erişim ile İlgili Boyutlar.....	68
Çalışma Bölgelerinde Ekipmanların Önünde Rahat Çalışma ve Sirkülasyona İlişkin Boyutlar	71
Yaşlı ve Engelliler için Mutfak Tasarımı	72
Çalışma Bölgelerinin Düzenlenmesine İlişkin Prensipler	74
Depolama Alanlarının Tasarımına İlişkin Prensipler	78
Sirkülasyon Çözümüne İlişkin Prensipler	84
Görsel Konfor/Aydınlatma.....	85

5. BÖLÜM

MUTFAKLARDA AYDINLATMA	91
Genel Aydınlatma.....	92
Bölgesel Aydınlatma	95
Tezgâh Üstünün Aydınlatılması	95

Depolama İçinin ve Rafların Aydınlatılması.....	96
Yemek Masası veya Yemek Bölümünün Aydınlatılması.....	97

6. BÖLÜM

MUTFAK TİPLERİ VE TASARIM İLKELERİ.....	101
Tezgâhın Düzenleniş Biçimine Göre Mutfak Tipleri	101
I (Tek Duvar Tipi) Tipi Mutfak	101
Koridor Tipi Mutfak.....	102
L Tipi Mutfak.....	102
U Tipi Mutfak.....	103
G (Yarım Ada Tipi) Tipi Mutfak.....	105
Ada Tipi Mutfak	106
Eylemlerine Göre Mutfak Tipleri.....	108
Çalışma-İş Mutfağı	108
Yemek Mutfağı.....	109
Açık Mutfak	110

7. BÖLÜM

MUTFAK STİLLERİ.....	113
Victorian Stil	113
İtalyan Stil	115
Tuscan Stili.....	117
Georgian Stil.....	119
Country Stil	121
Arts and Crafts Stil	124
Rustik Stil.....	126
Art Deco Stil	129
Modern Stil	132

8. BÖLÜM

ENDÜSTRİYEL MUTFAKLAR.....	135
Restoran Mutfakları	135
Restoran Mutfaklarında Tasarım Prensipleri	136
Restoran Mutfaklarında Eylem/İş Akışı	137
Çalışma Bölgeleri	141
Malzemenin Kabulü.....	141
Depolama Bölgeleri	141
Yiyecek ve İçeceklerin Depolanması.....	142
Kuru Depolar.....	142
Sebze-Meyve Depoları	143
Soğuk Depolar	143
İçecek Depoları	143
Yiyecek Hazırlık Bölgeleri	144
Pişirme Bölgesi	146
Bulaşık Yıkama Bölgesi	146
Servise Hazırlık ve Servis Bölgesi.....	147
Restoran Mutfaklarında Ekipman.....	148
Restoran Mutfaklarında Ergonomi	150
KAYNAKÇA	159
ÖZ GEÇMİŞ	168

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İçindekiler

Ön Söz	v
1 Temel Kavramlar	1
1.1 Bilgi ve Bilgi Kaynakları	1
1.2 Araştırma Türleri	1
1.2.1 Nitel Araştırma	1
1.2.2 Nicel Araştırma	1
1.3 Araştırma Süreci Aşamaları	2
1.3.1 Problem	2
1.3.2 Araştırma Sorusu	3
1.3.3 Yöntem	3
1.3.4 Deney	3
1.3.5 Literatür Taraması	3
1.3.6 Amaç	4
1.3.7 Performans ve Kontrol	4
1.3.8 Rapor	4
1.4. Akademik Ünvanlar	4
1.4.1 Öğretim Elemanı	4
1.4.2 Öğretim Üyesi	5
1.5 Eğitim Süreci	6
1.5.1 Ön Lisans	6
1.5.2 Lisans	6
1.5.3 Lisansüstü – Yüksek Lisans	6
1.5.4 Lisansüstü – Doktora	7
1.6 Bilimsel Dergi	7
1.7 Bilimsel Yayın Türleri	7
1.7.1. Makale	7
1.7.2 Bildiri	8
1.7.3 Poster	8
1.7.4 Editöre Mektup	8
1.7.5 Tezler (Yüksek Lisans ve Doktora)	8
1.7.6 Lisans Bitirme Ödevi	8
1.8 Akademik Diller	8
1.9 Bilimsel Yayın Sürecinde İnsan	8
1.9.1 Yazar	8
1.9.2 Hakem	8

1.9.3 Editör.....	9
1.9.4 Dergi Ofisi Memuru.....	9
1.9.5 Danışman	9
1.9.6 Öğrenci	9
1.10 Referans.....	9
1.11 Üniversite Birimleri.....	9
1.11.1 Fakülte	9
1.11.2 Enstitü.....	9
Kaynaklar	10
2 Araştırma Konusu ve Bilgi Kaynakları	11
2.1 Bilimsel Çalışmanın Temel Şartları	11
2.2 Bilimsel Çalışmaya Başlangıcın Ön Koşulları	12
2.3 Bilimsel Çalışmaya Başlangıcın Ön Basamakları	12
2.3.1 Çalışmanın Amacı	13
2.3.2 Çalışmanın Önemi	13
2.3.3 Çalışmanın Sınırının Belirlenmesi	13
2.3.4 Çalışmada Kullanılacak Yöntem	13
2.3.5 Çalışma Planı ve Takvimi.....	14
2.4 Bilimsel Çalışmanın ve Yazılan Dokümanın Temel Bileşenleri.....	15
2.4.1 Beyan	15
2.4.2 Ön Söz	16
2.4.3 Özet.....	16
2.4.4 Giriş	17
2.4.5 Çalışmanın Bölümleri.....	17
2.4.6 Sonuçlar	17
2.4.7 Kaynak Gösterimi ve Kaynaklar Bölümü	18
2.5 Bilimsel Çalışmada Teknolojiden Yararlanılması.....	20
Kaynaklar	21
3 Literatür Tarama Süreci.....	23
3.1 Temel Bilgiler.....	23
3.1.1 Literatür Nedir	23
3.1.2 Literatür Taraması Nedir	23
3.1.3 Bilimsel Veri Tabanları Hangileridir	23
3.1.4 Veri Tabanı Tipleri.....	23
3.2 Bilimsel Yayın Nerede Araştırılır.....	24
3.2.1 Makale, Bildiri ve Poster Arama Nasıl Yapılır.....	25
3.2.2 Tez Arama Nasıl Yapılır	26
3.3 Bilimsel Yayın Nasıl Okunur	26
3.3.1 Başlık.....	27

3.3.2. Özet.....	27
3.3.3 Giriş.....	27
3.3.4 Materyal ve Yöntem.....	27
3.3.5 Sonuçlar.....	27
3.3.6 Tartışma ve Öneriler.....	28
3.4 Bilimsel Yayına Neden Referans Verilir.....	28
3.5 Bilimsel Yayına Nasıl Referans Verilir.....	28
3.5.1 Referans Vermek İçin Teknolojinin Kullanımı.....	29
3.5.2 Mendeley.....	30
3.6 Dergilerde Makale Arama Nasıl Yapılır.....	32
3.7 Dergilerin Sınıflandırılması.....	33
3.8 Üniversite Kütüphanesinden Faydalanma.....	34
3.8.1 Katalog Tarama.....	34
3.8.2 Dijital Kaynaklara Erişim.....	34
3.8.3 Tezler.....	34
3.9 Fikir Üretme Sürecine Ne Zaman Girilir.....	34
Kaynaklar.....	35
4 Bilimsel Yayın İçeriği ve Hazırlık Süreci.....	37
4.1 Bilimsel Çalışma Yapma ve Yazma Motivasyonu.....	37
4.2. Planlama ve Taslak Oluşturma.....	38
4.3. Çalışma Başlığının Oluşturulması.....	39
4.4 Çalışma Organizasyonu.....	40
4.4.1 Çalışma Alt Başlıklarının Oluşturulması.....	40
4.4.2 Ekler.....	41
4.5 Çalışma Metninin Yazımı.....	41
4.5.1 Sayfalar ve İçeriğe Yönelik Ölçülendirme.....	42
4.5.2 Sayfaların Numaralandırılması.....	43
4.5.3 Metin İçinde Uyulması Gerekli Yazım ve İmla Kuralları.....	43
4.5.4 Metin Yazımında Kişi ve Zaman.....	45
4.5.5 Metin İçinde Sayı ve Birimlerin Yazımı.....	45
4.6 Veri ve Sonuçların Görsel Sunumuna Yönelik Bileşenler.....	46
4.6.1 Şekiller.....	46
4.6.2 Tablolar.....	46
4.6.3 Grafikler.....	47
4.6.4 Denklemler.....	49
4.6.5 Simgeler ve Semboller.....	49
4.6.6 Kısaltmalar.....	50
Kaynaklar.....	50

5 Microsoft Word Programının Doğru ve Etkin Kullanımı	51
5.1 Microsoft Word	51
5.2 Microsoft Word Temel Kullanım Bileşenleri	52
5.2.1 Stillerin Kullanımı	52
5.2.2 Başlık Hiyerarşisinin Oluşturulması	56
5.2.3 Şekiller ve Tablolar ile İlgili Altyazı ve Başvuru Özellikleri	59
5.2.4 İçindekiler Tablosunun, Şekiller ve Tablolar Listesinin Oluşturulması	63
5.3 Dikkat Edilmesi Gereken Diğer Noktalar	66
Kaynaklar	67
6 LaTeX	69
6.1 Temel Bilgiler	69
6.1.1 LaTeX Nedir	69
6.1.2 Nerelerde Kullanılır	69
6.2 Latex Kurulum	70
6.2.1 MiKTeX	70
6.2.2 Metin Editörü TeXstudio	80
6.3 TeXstudio Kullanımı	80
6.3.1 Kurulum	80
6.3.2 Ana Pencere Tanıtımı	82
6.3.3 Menülerin Tanıtımı	83
6.3.4 Kod Yazım Standardı	91
6.3.5 Tablo Oluşturma	92
6.3.6 Matematiksel Denklemler	93
6.3.7 Şekil Yerleştirme	93
6.3.8 Mendeley ile Entegre Referans Kullanımı	94
6.3.9 Yeni Bilgi Edinme	96
7 Makale Hazırlama Süreci	97
7.1 Giriş	97
7.2 Problemin Belirlenmesi	97
7.3 Önerilen Çözüm Yöntemi	97
7.3.1 Kimler ne yapmış	98
7.3.2 Sahip Olunan Altyapı Olanakları ve Özgün Olarak Yapılabilecekler	98
7.3.3 Gerekli Altyapı ve Yöntemlerin Etkin Kullanımı	98
7.4 Makale Taslağı	98
7.4.1 Öneriye Göre Çözüm Planı	98
7.4.2 Akış Diyagramı	98
7.4.3 İçindekiler	100
7.4.4 Tablo ve Şekiller Listesi	101
7.4.5 Performans Değerlendirme Kriterleri	101

7.5 Uygulama.....	101
7.6 Makale Yazımı	101
7.6.1 Materyal ve Yöntem	102
7.6.2 Sonuçlar	102
7.6.3 Giriş.....	102
7.6.4 Tartışma ve Öneriler	103
7.6.5 Gelecek Çalışmalar.....	103
7.6.6 Özet	104
7.7 Anahtar Kelimeler	104
7.8 Bilgilendirme ve Teşekkür	105
7.9 Başlık.....	105
7.10 Yazar Bilgileri	105
7.11 Referanslar	105
7.12 Tez Nasıl Yazılır	106
7.12.1 İçindekiler	106
7.12.2 Kısaltmalar, Tablo ve Şekiller Listesi.....	106
7.12.3 Tez Yazım Araçları.....	106
Kaynaklar	107
8 Başarılı ve Etkili Bir Sunum Hazırlama Süreci.....	109
8.1 Sunum Türleri, Sunum Yapmanın Gerekliği ve Önemi	109
8.2 Sunum Öncesi Yapılması Gerekenler.....	110
8.2.1 Çok Sayfalı Dijital Sunumlar Öncesi Yapılması Gerekenler	111
8.2.2 Baskı Ortamındaki Görsel Sunumlar Öncesi Yapılması Gerekenler	112
8.3 Çalışmaların Doğru ve Etkili Sunumu	113
Kaynaklar	115
9 Araştırma ve Yayın Etiği.....	117
9.1 Giriş.....	117
9.2 Hukuki Yaptırımlar ile ilgili Kanun ve Yönetmelikler	117
9.3 Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler	118
9.4 Bilim Araştırma ve Yayın Etiğine Aykırı Eylemler için Yaptırımlar	118
9.4.1 İntihal	118
9.4.2 Sahtecilik	119
9.4.3 Çarpıtma	119
9.4.4 Tekrar Yayım	119
9.4.5 Dilimleme	119
9.4.6 Haksız Yazarlık.....	119
9.4.7 Diğer Etik İhlaller	120
Kaynaklar	121

1

Temel Kavramlar

1.1 Bilgi ve Bilgi Kaynakları

Bilgi ve bilgi kaynakları en değerli kavramlardan olmalarına karşın hak ettiği değeri görmeyen olgulardandır. Bilgi; araştırma, gözlem, deney, öğrenme gibi farklı şekillerle elde edilen bir gerçektir. Edinilen bilgi farklı işlerde kullanılarak pratiğe dökülür.

Edinilen bilgi kadar bilginin kaynağı da önemlidir. Bilgi edinme süreçleri ile bilgi kaynağının güvenilirliği muhakkak sorgulanmalıdır. Akademik bilgiler bilimsel yayınlar şeklinde literatüre eklenir. Ekleme sırasında bilginin doğruluğu bilimsel yayınların yayımlandığı dergiler tarafından kontrol edilir.

Günümüzde bilgi farklı yollarla elde edilebilir. Bunları aşağıdaki gibi listeleyebiliriz.

1. Hissetmeye dayalı bilgi
2. Bir başkasından elde edilen bilgi
3. Uzman kişiden elde edilen bilgi (Güvenilir Kaynak)
4. Mantık yürütme şeklinde elde edilen bilgi (Kısmi Güvenilir Kaynak)
5. Bilimsel Bilgi (Güvenilir Kaynak)

1.2 Araştırma Türleri

Araştırma türleri genel olarak Nitel ve Nicel Araştırma olmak üzere ikiye ayrılır.

1.2.1 Nitel Araştırma

En temel anlamıyla nitel araştırmalar sözcüklerle ifade edilen araştırmaları kapsamaktadır. Mühendislik tabanlı yapılan araştırmalarda bu tür araştırmalar pek tercih edilmez.

1.2.2 Nicel Araştırma

Nicel araştırmalar sayısal verilere dayanarak elde edilen araştırmaları kapsamaktadır. Bu tür araştırma kapsamında elde edilen sonuçlara dayanarak pek çok genelleştirilmiş yasalar elde edilebilir.

Kaynaklar

- Bartosz, R. (2015). How to write a perfect scientific manuscript. *European Journal of Cardio-Thoracic Surgery: Official Journal of the European Association for Cardio-Thoracic Surgery*, 48(2), 179. <https://doi.org/10.1093/EJCTS/EZV217>
- Dirk M., E., (2019). Writing a better research paper: Advice for young authors. *Journal of the American Academy of Dermatology*, 80(2), 379. <https://doi.org/10.1016/J.JAAD.2017.11.010>
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2

Araştırma Konusu ve Bilgi Kaynakları

2.1 Bilimsel Çalışmanın Temel Şartları

İnsanlar, yaratılışlarındaki kodlar ve yaşamı içerisinde değiştirebileceği özellikleri ile çeşitli farklılıklara sahiptirler. Farklı din, dil, dünya görüşü, siyasi yönelim vb. özellikler insanları farklılaştırır da insan hakları, temel hukuki düzen ve prensipler çerçevesinde herkes eşittir. Benzer biçimde bir bilimsel çalışmanın ortaya konması sürecinde de temel prensip, insanların sahip olduğu bu farklılıkların araştırmayı "bilimsellik"ten koparmaması, temel özelliklerini değiştirmemesidir. Bu bağlamda bir bilimsel çalışma için diğer tüm kriterlerin öncesinde dikkate alınabilecek temel şartlar söz konusudur (Silverman, 2021; Tang, 2020; Thiel, 2014).

Bilimsel bir çalışmanın başlıca ön şartları aşağıdaki gibi listelenebilir:

- Dürüstlük
- Nesnellik
- Güvenilirlik
- Özgünlük
- Geçerlilik
- Güncellik

Bu maddeler bilimsel çalışmanın niteliğini arttırmak açısından da ön şartlar olmakla birlikte; ilk olarak, çalışmanın etik yönü ve bunun olası ihlali durumunda ortaya çıkabilecek hukuki durum açısından belirleyicidirler (TÜBA, 2002; Pruzan, 2016). Bu maddeler ve bunlara karşılık yerine gelmesi gerekenler açısından gerekli tutum ve özen ortaya konmalıdır. Bu noktada gerekli dikkat ve özenin ortaya konmasında bilinçli ya da bilinçsiz olarak oluşacak eksiklikler çalışmanın bilimselliği üzerine gölge düşmesine neden olur. Ortaya çıkan durumun niteliğine bağlı olarak, çalışmanın bilimsel etiğe uygunluğu ortadan kalkar, hukuki sonuçlar ortaya çıkması söz konusu olur. İhlalin düzeyine bağlı olarak bu sonuç cezai ve idari yaptırıma dahi dönüşebilir.

Bunlar dışında grafik tablet klasik yazım ortamı ile sayısal depolama arasındaki bağlantıyı kuran bir araçtır. Grafik tablet, el yazısı ile not tutma; bu şekilde alınan notlar ve elle yapılan çizimlerin sayısal ortamda etkin biçimde depolanması ve gerektiğinde basit biçimde düzenlenmesini olanaklı kılar. Bir başka donanım örneği olarak sunum kumandası düşünülebilir. Kablosuz bir sunum kumandası ile bilgisayar başında sabit durarak sunumu kontrol etmek yerine; araştırmacı hareketli biçimde, sunum perdesi üzerinde dinleyicilere ilgili bölümü göstererek anlatımını yapar ve konusunda daha yetkin ve profesyonel görünür, önündeki kitleye daha etkili ulaşabilir.

Araştırmacılar özellikle tez yazımı gibi yoğun dönemlerinde birden fazla bilgisayarda (örnek olarak gündüz saatlerinde iş yerinde akşam evde) çalışabilirler. Bu durumda çalışılan dosyaların sistematik kaydedilmesi ve olası veri kayıplarının önlenmesi açısından bulut teknolojilerinden yararlanılabilir.

Bütün bu teknolojik araçlar ve bunların bilimsel araştırma sürecine katkıları yanında, klasik araç ve yöntemlerin önemi ortadan kalkmış değildir. Kalemin, kâğıdın ve basılı bir kitabın yerini buradaki hiç bir teknoloji dolduramaz.

Kaynaklar

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3

Literatür Tarama Süreci

3.1 Temel Bilgiler

Literatür arama sürecine daha iyi hâkim olabilmek adına bazı terimleri bilmekte fayda vardır.

3.1.1 Literatür Nedir

Literatür, çözmeye çalıştığımız problem için geliştirilen yöntemler veya problem ile ilgili her türlü bilginin yer aldığı havuz olarak tanımlanabilir. Literatür denildiğinde bilimsel yayınlar ile problem çözümüne yapılmış katkılar olarak düşünebiliriz.

3.1.2 Literatür Taraması Nedir

Literatür taraması farklı şekillerde yapılabilir. Bunlardan en önemlisi bilimsel yayınların yayınlandığı ve toplandığı veri tabanlarında araştırma yapmaktır (Liberati ve ark, 2009).

3.1.3 Bilimsel Veri Tabanları Hangileridir

Bilimsel yayınlar dergi, kitap ve tez gibi pek çok farklı formatta yayımlanır. Bilimsel yayınların bir arada okuyuculara sunulduğu sistemlere bilimsel veri tabanı denir. Google Scholar (<https://scholar.google.com.tr>) bu veri tabanlarında arama yapmak için sıklıkla kullanılır.

Türkçe makalelerin bir arada toplanması ve yönetilmesi için TÜBİTAK tarafından geliştirilen DergiPark platformu bulunmaktadır. Buradaki makalelerde arama yapabilmek için <https://dergipark.org.tr> adresine ulaşabilirsiniz. Burası dergilerin bulunduğu veri tabanı olarak düşünülebilir.

3.1.4 Veri Tabanı Tipleri

Bilimsel dergiler yayınladıkları makaleler kullanıcılara ücretli veya ücretsiz bir şekilde sunabilir. Buna ek olarak üniversiteler, kurum kuruluşlar bu veri tabanla-

araştırılması, (3) Problemin çözümü için yeni olarak ne yapılacağıın belirlenmesi. 3. madde lisansüstü tez konusu belirleme açısından en önemli parametredir. Bunu belirleyebilmek için mühendislikte problem çözümlerinde kullanılan yöntemlere çok iyi hâkim olunması gereklidir. Bu sayede farklı bir yöntem ve süreç ortaya konması mümkün olur. Bu yüzden eğitim hayatı sürecince farklı yöntemler öğrenilmesi ve bunların uygulanmasına yönelik bilgi kazanılması son derece önemlidir.

Buna ek olarak farklı alanlarda kullanılan yöntemlerin yeni bir alanda uygulanması ile gerçekleştirilen çalışmalar da bilimsel yayın niteliğindedir. Bilimsel araştırmalarınız aşağıdaki tanımlardan birine girmesi gerekir. Çalışmaların niteliğini sorgularken aşağıdaki başlıklara göre değerlendirebilirsiniz. Çalışmaların niteliği aşağıda verilen sırayla artmaktadır.

- Var olan bir problem için var olan çözüm yöntemi kullanma
- Özgün bir problem için var olan çözüm yöntemi kullanma
- Var olan bir problem için özgün bir çözüm yöntemi geliştirme
- Özgün bir problem özgün bir çözüm yöntemi geliştirme

Kaynaklar

- Bartosz, R. (2015). How to write a perfect scientific manuscript. *European Journal of Cardio-Thoracic Surgery: Official Journal of the European Association for Cardio-Thoracic Surgery*, 48(2), 179. url{<https://doi.org/10.1093/EJCTS/EZV217>} % (Bartosz, 2015)
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- Gastel, B., & Day, R. A. (2019). Bilimsel Bir Makale Nasıl Yazılır ve Yayınlanır? In Gazi Kitabevi. url{<https://www.amazon.com.tr/Bilimsel-Makale-Nasıl-Yazılır-Yayımlanır/dp/6053448893>}%(Gastel, 2019)
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4

Bilimsel Yayın İçeriği ve Hazırlık Süreci

4.1 Bilimsel Çalışma Yapma ve Yazma Motivasyonu

Nitelikli bir bilimsel çalışma yapma ve yazmaya yönelik olarak; ön şartlar, planlama aşamaları ve sistematik biçimde sağlanması gereken temel işlem basamakları söz konusudur (Silverman, 2021; Schimel, 2011; Thiel, 2014; Tang, 2020). Bu süreçlerin ilk aşaması ve sonrası açısından en temel unsurlardan biri ise motivasyondur. Söz konusu çalışmayı temel bir sürecin doğal bir parçası olarak yapmak, örneğin yüksek lisans, doktora tezi, bir motivasyon kaynağı olarak düşünülebilse de burada kastedilen, araştırmacının kendinden kaynaklanan bir irade ve istektir. Ancak bu tür bir doğal gerekliliğin var olması, araştırmacının kendi istek ve iradesinin ortaya çıkmayacağı anlamına gelmez. Aksine, gereklilikten uygun şekilde yararlandığında, olumlu stres olarak değerlendirilebilecek bir etki ortaya çıkarak çalışma konusunda kendinden gelen merak ve isteğe sahip araştırmacının başarısında pozitif katkı oluşturur. Bunun yanında, bu çalışmanın zorunlu olarak bir görev gibi değerlendirilmesi ve yalnızca bu yaklaşımla hareket edilmesi böylesi bir motivasyonun ortaya çıkmasına engel olarak çalışmanın niteliği üzerinde de olumsuz etki oluşturabilir. Özet olarak, bir araştırmacı için bir bilimsel çalışma sonunda somut bir maddi fayda elde edilecek olması, örnek olarak bir lisansüstü öğrencisinin tamamlaması gereken tezi, öğretim üyeliğine atanma için gerekli indeksli makale, bir doçent adayının başvurusu için gerekli başlıca eseri vb. çalışma için doğal bir motivasyona engel değil, aksine iyi kullanıldığında olumlu bir etki kaynağıdır.

Yukarıda sayılan örneklerdeki gibi elde edilmesi beklenen zorunlu ve hızlı bir somut karşılık olmasa da bir araştırmacı bir bilimsel yayın hazırlama ve yazma konusunda gerekli motivasyona sahip olabilir. Öğrencilere ve diğer bilim insanlarına yardımcı olmak, çalışılan kurumun ve/veya vatandaşı olunan ülkenin itibarını arttırmak, bilimsel dünyada alanında tanınırlık kazanmak vb. bu duruma yönelik örnekler olabilir. Bu hedeflere ulaşma durumunda da belli bir faydadan söz edilse de, bunlar kazanımları daha zor ve yavaş biçimde ortaya çıkan ve araştırmacının kendisi kadar diğer insanlara da yararlı olmayı amaçladığı daha ulvi motivasyonlar olarak dikkate alınabilir.

Yukarıda belirtilen türden, denklem editörü ile oluşturulabilecek özel işaretlere ihtiyaç olmaması, yalnızca özel karakterlerin kullanımının gerekmesi durumunda simge ve sembol listelerinden yararlanılabilir. Bunların ASCII adı verilen kod karşılıkları olup, klavye tuşlarında yer almasalar da buradaki harf, rakam, işaretler gibidirler. Arama motorlarında ilgili sembol aratılarak kısa yol karşılığı elde edilerek, yalnızca klavye kombinasyonu ile de bu karaktere ulaşılabilir. Örnek olarak sağda rakam tuş paneli olan klavyelerde ALT + 0215 tuş kombinasyonu ile × simgesi, ALT + 0176 tuş kombinasyonu ile ° (derece) sembolü elde edilebilir. Bu karakterler için farklı tuş kombinasyonları da olabilmektedir. Benzer biçimde diğer semboller için de bunları oluşturan tuş kombinasyonları mevcuttur.

4.6.6 Kısaltmalar

Kısaltmalar genel olarak birden fazla sözcük ya da harf parçalarından oluşan ve birden fazla kez tekrarlanan uzun ifadelerin uygun biçimde kısa formda yazılmasıdır. İlk kullanımlarında kısaltmaların hem açık hem de kısaltma karşılıkları birlikte verilmelidir. Kısaltmalar çoğunlukla açık hâldeki her sözcüğün baş harfi kullanılarak yalnızca büyük harfler içeren bir karakter dizisi şeklinde oluşturulsa da farklı kısaltma formatları da söz konusudur.

Tezlerde başlangıçta Simgeler ve Kısaltmalar Listesi ya da çok benzer isimde bir bölüm olup, burada tüm kısaltmalar ve açıklamaları verilmelidir. Makale ve bildiri gibi görece daha az sayfalı dokümanlarda az oranda farklı örnek olsa da, çoğunlukla böyle bir kısaltma listesi kullanımı söz konusu değildir. Verilen esas çerçevede ilk kullanımda tanımlanmaları yeterlidir. Bu noktadan sonra sadece kısaltma hâlinde kullanılabilirler.

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5

Microsoft Word Programının Doğru ve Etkin Kullanımı

5.1 Microsoft Word

Bilimsel çalışmanın etkin ve doğru bir araçla yazımı, sürecin verimli biçimde yönetilmesini sağlayacak en kritik noktalardan biridir. Planlanan bir takvim içerisinde tamamlanması gerekli bir çalışmanın yazımı için harcanan toplam süre çok önemli olup; etkin zaman kullanımı ve eksiksiz bir basılı nüsha ortaya çıkarmak ilgili yazım araçlarının doğru kullanım bilgisini gerektirmektedir (Vanhus, 2016; Gastel, 2016).

Microsoft® Word, Microsoft yazılım firması tarafından başta Microsoft® Windows olmak üzere uzun yıllardır hem bilgisayarlar hem de günümüzde tablet, telefon gibi taşınabilir aygıt işletim sistemlerinde çalışmak üzere tasarlanan gelişmiş bir sözcük işlemci programıdır (Cram ve ark, 2019). Microsoft® Word programının bu alandaki en yaygın kullanılan program olmasının en temel sebebi, gelişmiş metin düzenleme seçenekleri, kapsamlı ve görselliğe uygun biçimde tablo, şekil ve grafik oluşturma özellikleridir. Ancak Microsoft® Word programının bu denli geniş ölçekte kullanımının sebebi sadece bu tür metin ve bağlantılı görsel içeriğin oluşturulmasına olanak vermesi değil, aynı zamanda bu içeriğin oluşturulmasını kolayca sağlamasıdır. Zira, LaTeX gibi, kullanma ve öğrenme süreci daha zorlu olan bir ortam, temel kullanıcılar için ilk aşamada uygun bir başlangıç seçeneği değildir. Fakat giriş seviyesi açısından ilk tercih olarak gözükmese de profesyonel işlerde LaTeX kullanımı daha uygundur. Bununla birlikte gerekli yazım ve hazırlama işlemleri için doğru program özelliklerinin bilinmesi durumunda Microsoft® Word programı ile de çok sayfalı dokümanların gerektiği gibi hazırlanması mümkündür.

Özellikle programla ilgili kapsamlı bir bilgiye sahip olunmasa da temel düzeyde yazım ve düzenleme işlerinin sezgisel olarak yapılabilmesi Microsoft® Word programının en büyük avantajıdır. Ancak basit bir Microsoft® Word bilgisi ve istenen format özelliklerinin bir şekilde amatörce ayarlanması, kısa dokümanların oluşturulmasında temel kullanıcılar için önemli sorunlar oluşturmasa da, başta

- Dokümanın uzunluğu ve içindeki vektörel olmayan görsel öğelerin sayısına bağlı olarak Microsoft® Word dokümanı farklı dosya boyutlarına sahip olabilir. Bu anlamda standart bir dosya boyutunun bahsedilmesi kolay olmasa da tez dokümanları için birkaç on MB düzeylerinden itibaren dosya boyutunun çok da uygun olmadığı rahatlıkla söylenebilir. Muhtemelen ilgili dokümanda görsel öğeler gereğinden fazla boyutta tutulmaktadır.

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6

LaTeX

6.1 Temel Bilgiler

6.1.1 LaTeX Nedir

Büyük dokümanların bir araya getirilmesi ve içeriğin düzenlenmesi muazzam iş yüküne sahiptir. LaTeX büyük dokümanların düzenlenmesi ve dizaynı için bilim dünyasında ön plana çıkmış ve neredeyse standartlaşmış bir profesyonel dizgi programıdır.

Dizgi sırasında oluşan hataların giderilmesi farklı bir sorundur. LaTeX'in en önemli avantajı metin içerisindeki tüm içeriğin yazılımsal olarak hazırlanmasıdır. Bu sayede kayma, tabloların şekillerin değişmesi, sayfalarda boşlukların kalması, tablo ve şekillerin metin içerisinde gezinmesi gibi problemler çözülmüş olur. Tüm bu işlemlerin hatasız ve sistematik yapılması sayesinde dijital ya da fiziksel baskı ortamlarında profesyonel gözükten dokümanlar elde edilmiş olur.

Bu bölümün amacı temel düzeyde kullanabilecek LaTeX altyapısını vermek ve araştırmacıların çalışmalarını LaTeX kullanarak etkin ve hızlı biçimde oluşturmalarını sağlamaktır. Bu yüzden ihtiyaç duyulmayacak bilgiler çalışma içerisinde verilmeyecektir. İhtiyaç duyulabilecek diğer ileri seviye bilgilere nasıl ulaşılacağı sonraki bölümlerde değinilecektir.

6.1.2 Nerelerde Kullanılır

LaTeX bilim dünyasında sıklıkla kullanılan bir platformdur. Kitap basımı konusunda yayın evleri, çeşitli akademik dergiler, üniversite enstitüleri gibi pek çok yer özellikle çok sayfalı dokümanlarda LaTeX kullanımını Microsoft® Word'e tercih etmektedir. Ancak metin büyüklüğü az olan ve şablon ihtiyacı duyulmayan metinlerin düzenlenmesi için LaTeX'in çok etkin olduğu söylenemez. Çok daha fazla sayıda araştırmacının Microsoft® Word bilmesi ve tercih etmesi, dergi ve yayınevi ortamlarında baskı süreçlerinin profesyonel ekipler tarafından yürütülmesi gibi nedenlerle çalışmanın Microsoft® Word ortamında yazılmış ham hâlinin araştırmacıdan istenmesi de yaygın bir yöntemdir.

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\cite{Rasool2019}
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6.3.9 Yeni Bilgi Edinme

Yeni bir konu araştırılmak istenildiğinde arama motorlarında İngilizce olarak "***** in Latex" yazdığınızda birçok kaynak çıkacaktır. Örnek kodlamaları çalışmanıza eklemeyen önce muhakkak boş bir LaTeX dosyası içerisinde stabil çalışır olduğunu görmeye çalışın. Bu sayede hataların takibi kolaylaşacaktır.

Kaynaklar

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7

Makale Hazırlama Süreci

7.1 Giriş

Bu bölümde makale hazırlama süreci tüm yönleriyle anlatılacaktır. Makale hazırlama süreci doğası gereği 5 temel adım içerir.

1. Problemin Belirlenmesi - **Literatür Taraması**
2. Önerilen Çözüm Yöntemi - **Literatür Taraması**
3. Makale Taslağının Oluşturulması - **Plan**
4. Uygulama - **Gerçekleştirme**
5. Makale Yazımı - **Yazım**

7.2 Problemin Belirlenmesi

Problemin belirlenmesi sürecinde literatür taraması detaylı bir şekilde yapılmalıdır. Literatür taraması ile problem belirlenebilir (Bartosz, 2015). Problem belirlendikten sonra literatür taraması derinleştirilir. Bu adımda problemin çözümü için geliştirilmiş yöntemler incelenir ve sistematik bir şekilde tarama yapılır. Literatür taraması sırasında toplanan makalelerin kolay incelenebilmesi için FileLocator Pro ve dtSearch gibi indeksleme programları kullanılabilir (Team, 2021a; Team, 2021b).

Örnek konu olarak "Vücut Yağ Yüzdesinin Belirlenmesi" problemi belirlenmiştir.

7.3 Önerilen Çözüm Yöntemi

Problem belirlendikten sonra, problemin çözümü için ele alınabilecek yöntemler sistematik bir şekilde hazırlanan derleme makalelerinden incelenebilir (Liberati ve ark, 2009). Derleme makalesi araştırma makalesi hazırlanmasından daha kapsamlı ve zor bir süreçtir. Konuyla ilgili ancak uzun dönemdir çalışan araştırmacılar tarafından ilgili tüm literatürü analiz edilmesi ile hazırlanan çalışmalar derleme makalesi olarak yayınlanabilir (Ryan-Wenger, 2017). Bu tür derleme makaleleri ilgiyi konuya dair derinlemesine araştırma yapma sürecindeki araştırmacılar için son derece yararlıdır.

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8

Başarılı ve Etkili Bir Sunum Hazırlama Süreci

8.1 Sunum Türleri, Sunum Yapmanın Gerekliliği ve Önemi

Sunum hazırlama ve bu hazırlanan çalışmayı sunma, başta öğrencilik ve profesyonel iş hayatı olmak üzere çok çeşitli şekillerde modern yaşam içerisinde önemli bir konu olarak ortaya çıkar. Sunumlar fikirleri, hedefleri, yapılan çalışmaların detaylarını ve sonuçlarını diğer insanlara anlatmanın en etkili yollarından biridir (Carnegie, 1990; Crosby, 2019). Çok çeşitli amaçlarla sunum hazırlama ve bu çalışmayı sunma gereksinimi dikkate alınabilecek olmakla birlikte, bu dokümanda hem öğrencilik hem de iş yaşamı yönünden dikkate alınabilecek akademik amaç ve kapsamda sunum hazırlama süreçleri incelenecektir.

Günümüz imkânlarının da katkısıyla, içerik bakımından başarılı ve sunum tekniği yönünden de etkili sunumlar hazırlamak kolaylaşmıştır. Ancak potansiyel olarak var olan bu avantajı kullanarak iyi ve etkili bir sunum ortaya koymak için sunumu yapan araştırmacıya büyük iş düşmektedir. Sunum yapmanın kolaylaşması, çok çeşitli amaçlarla sunumlar yapılması, artık sunumların bir kısmının fiziksel olarak biraraya gelmeden online olarak yapılması gibi nedenlerle dinleyiciler açısından daha az önemsenen ve küçük bölümü akıllarda kalan sunumlar ortaya çıkabilmektedir.

Sıradanlıktan uzak, iyi bir sunum için ilk şart hazırlanan çalışmanın bilimsel niteliği ve araştırmacının konuya hakimiyeti olmakla birlikte, sunum safhası açısından bu gerek şart olmakla birlikte yeterli değildir. Çalışma için sunum süresi, sunum ortamı, dili, dinleyici kitlesi vb. çeşitli noktalar dikkate alarak en uygun sunum kapsamı belirlenmelidir (Carnegie, 1990; Crosby, 2019; Lucas, 2014).

Bu çalışmada sunum kelimesiyle kastedilen, var olan bir akademik kapsamı, Microsoft® PowerPoint, Prezi gibi bir sunum yapma programı ile uygun gösterim formatında aktarmaktır. Sunumun katılımcılarla fiziksel olarak bir arada olduğunda projeksiyon cihazı ile ya da online olarak herkesin kendi cihazını/ekranını kullanması yoluyla aktarılması gibi iki temel aktarım ortamı söz konusudur. Bu-

Çalışma ve sunum için harcanan süreye göre çok çok küçük bir zaman daha harcayarak çalışmanın farklı dijital ortamlarda yedeğini anında erişebilecek biçimde saklayın.

Gerekli bilimsel donanımına sahipseniz ve hazırlığınızı yapmışsanız kendinize güvenin ancak mütevazı olun.

Kaynaklar

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9

Araştırma ve Yayın Etiği

9.1 Giriş

Bilimsel çalışmalar bilgi üretimini, bilginin geliştirilmesini ve yayılmasını amaçlar. Bu sayede insanlığa katkı sunulmuş olur. Çalışmalar sonucunda üretilen bilimsel yayınların belirli kurallar çerçevesinde sunulması gerekir. Bilimsel yayınlardaki bilgilerin eksiksiz, çarpıtılmadan, tekrar üretilebilecek ve geliştirilebilecek çerçevede sunulması gerekir. Bu süreçlerle birlikte Bilim Etiği kavramı ortaya çıkmıştır. Çalışmaların etik kurallara uygun bir şekilde yürütülmesi gerekmektedir. Etik kurallar dışında gerçekleştirilen davranışlara etik dışı davranışlar adı verilir (Yördem, 2021). Bilimsel çalışmaların etik kurallara uygun bir şekilde devam ettirilmesi gerekir. Aksi hâlde bazı yaptırımlarla karşı karşıya kalınabilir (Ünal & Başpınar, 2012). Bu çalışmada etik ihlallerinde ortaya çıkabilecek yaptırımlar değerlendirilmiştir.

9.2 Hukuki Yaptırımlar ile ilgili Kanun ve Yönetmelikler

Bilimsel araştırma ve yayın etiği ihlallerine karşı bazı yönetmelikler ve kanunlar kullanılmaktadır. Yükseköğretim Kurulunun (YÖK) hazırladığı Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesinde (YÖK BAYEY) bilimsel araştırma sırasında gereken etik kurallar için bir çerçeve belirlenmiştir. Ancak burada yaptırım ve cezai hükümler yer almamaktadır. Araştırma etiğine aykırı suçlar 1951 tarihli Fikri ve Sanat Eserleri Kanunu (FSEK) kapsamında değerlendirilir (Kültür Bakanlığı, 1951). Ancak bu kanun tam anlamıyla bilimsel suçları değil engellemek için çıkarılmamış fikri hakların korunumunu kapsamaktadır. Buna ek olarak bilimsel araştırmalar etik ihlallerinin değerlendirilmesinde 2547 sayılı Yükseköğretim Kanunu (YÖK Kanunu, 1981), Üniversitelerarası Kurul Bilimsel Araştırma ve Yayın Etiği Yönergesi (ÜAK, 2021) ve Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) Araştırma ve Yayın Etiği Kurulu Yönetmeliği (TÜBİTAK, 2018) kullanılmaktadır. Yapılan etik ihlaller karşısında bu kanun ve yönetmeliklerdeki yaptırımlarla karşı karşıya kalınabilir. Etik ihlallerde esas yetki YÖK'te olmakla birlikte TÜBİTAK projeleri kapsamında gerçekleşen etik ihlaller sebebiyle TÜBİTAK'ta duruma müdahil olup kişilere yaptırım uygulayabilmekte-

YÖK BAYEY Madde 4-(2)-h'de hayvanlara zarar vermek ve ekolojik yapıyı tahrif etmek şeklinde diğer etik ihlaller çeşidi belirtilmiştir. Bu etik ihlal gerçekleşmesi durumunda YÖK Kanununa göre aylıktan veya ücretten kesme cezası verilir (Madde 53-3-c) (YÖK Kanunu, 1981).

YÖK BAYEY Madde 4-(2)-ı araştırmaların yapılabilmesi için gerekli izinlerin almamak şeklinde diğer etik ihlaller çeşidi belirtilmiştir. Bu etik ihlal gerçekleşmesi durumunda YÖK Kanununa göre kınama cezası verilir (Madde 53-2-ı) (YÖK Kanunu, 1981).

YÖK BAYEY Madde 4-(2)-i'de Türkiye'nin dâhil olduğu anlaşmalardaki hükümlere ayrı iş yapmak şeklinde diğer etik ihlaller çeşidi belirtilmiştir. Bu etik ihlal gerçekleşmesi durumunda YÖK Kanununa göre kınama cezası verilir (Madde 53-2-i) (YÖK Kanunu, 1981).

YÖK BAYEY Madde 4-(2)-j'de çalışmalar ile ilgili kamu görevlilerini çalışmanın olumsuz yönleri hakkında bilgilendirmemek şeklinde diğer etik ihlaller çeşidi belirtilmiştir. Bu etik ihlal olması durumunda YÖK Kanununa göre kınama cezası verilir (Madde 53-2-j) (YÖK Kanunu, 1981).

YÖK BAYEY Madde 4-(2)-k'de çalışmada toplanan verilerin gizliliğine riayet etmek şeklinde diğer etik ihlaller çeşidi belirtilmiştir. Bu etik ihlal olması durumunda YÖK Kanununa göre aylıktan veya ücretten kesme cezası verilir (Madde 53-3-d) (YÖK Kanunu, 1981).

YÖK BAYEY Madde 4-(2)-l'de akademik atama süreçlerinde yanlış bilgi vermek şeklinde diğer etik ihlaller çeşidi belirtilmiştir. Bu etik ihlal olması durumunda YÖK Kanununa göre aylıktan veya ücretten kesme cezası verilir (Madde 53-3-k) (YÖK Kanunu, 1981).

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PLANKTON BİLGİSİ VE KÜLTÜRÜ

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Plankton Bilgisi ve Kültürü

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İÇİNDEKİLER

ÖN SÖZ.....	iii
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BÖLÜM 1

GİRİŞ.....	1
1.1. Planktonun Besin Zincirindeki Yeri ve Önemi.....	2
1.2. Planktonik Organizmaların Gruplandırılması.....	8
1.2.1. Biyolojik Özelliklerine Göre Plankton.....	8
1.2.2. Büyüklüklerine Göre Plankton.....	8
1.2.3. Şekillerine Göre Plankton.....	10
1.2.4. Kökenine Göre Plankton.....	11
1.2.5. Yaşadıkları Ortama Göre Plankton.....	11
1.2.6. Topoğrafik Dağılımlarına Göre Plankton.....	12
1.2.7. Dağılım Seviyelerine Göre Plankton.....	12
1.2.8. Işık Durumuna Göre Plankton.....	14
1.2.9. Birey Sayılarına Göre Plankton.....	14

BÖLÜM 2

PLANKTON POPÜLASYONUNUN DİNAMİĞİ.....	17
2.1. Ötrofikasyon.....	17
2.2. Red-Tide.....	20
2.3. Biyoluminesans.....	24
2.4. Toksin Üreten Türler ve Neden Oldukları Zararlar.....	25
2.4.1. Aşırı Üremeye Neden Olan Cinsler.....	25
2.4.2. Zehirler ve Etkileri.....	28
2.5. Tutunucu (Fouling) ve Delici (Boring) Organizmalar.....	29
2.5.1. Fouling Organizmalar.....	29
2.5.2. Boring Organizmalar.....	32
2.6. Su Yüzeyinin Yüzer-Gezer Organizmaları.....	34
2.7. Biyomonitör Türler.....	36

BÖLÜM 3

FİTOPLANKTON.....	41
3.1. Fitoplanktonun Genel Özellikleri.....	41
3.2. Fitoplanktonun Tanımlanması.....	42
3.3. Fitoplanktonun Sınıflandırılması.....	43

BÖLÜM 4

ZOOPLANKTON	57
4.1. Zooplanktonik Organizmaların Genel Özellikleri.....	57
4.1.1. Altalem: Protista (Protozoa = Bir Hücreliler)	57
4.1.2. Altalem: Metazoa (Çok Hücreliler)	66

BÖLÜM 5

İHTİYOPLANKTON	115
5.1. Balık Yumurtalarının Genel Özellikleri.....	115
5.2. Balık Larvalarının Genel Özellikleri	119

BÖLÜM 6

PLANKTON KÜLTÜRÜ	139
6.1. Kültür Tipleri	139
6.1.1. Koruma-Bakım Kültürleri (Maintenance Kültürler)	140
6.1.2. Zenginleştirici Kültürler (Enrichment Kültürler).....	140
6.1.3. Tek Organizma Kültürleri	141
6.1.4. Akselik Kültürler.....	141
6.1.5. Klonal Kültürler	142
6.1.6. Sınırlı Hacimli Kültürler	142
6.1.7. Kitle Kültürleri (Mass Kültürler)	142
6.1.8. Sürekli Kültürler	143
6.2. Fitoplankton Kültürü	143
6.2.1. Akuakültürde Mikroalgler	144
6.2.2. Fitoplankton Kültürünün Hazırlanmasında Kullanılan Başlıca Araç-Gereçler	148
6.2.3. Fitoplankton Kültüründe Kullanılan Bazı Besin Maddeleri (Kimyasal Maddeler-Zenginleştiriciler).....	148
6.2.4. Fitoplankton Kültüründe Kullanılan Deniz Suyunun ve Kültür Ortamının Özellikleri.....	150
6.2.5. Fitoplankton Kültürünün Hazırlanması.....	150
6.2.6. Kültürü Yapılan Bazı Fitoplankton Türleri	151
6.3. Zooplankton Kültürü	155
6.3.1. Zooplankton Kültür Teknikleri	156
6.3.1.1. Kalanoid Kopepod	156
6.3.1.2. Harpaktikoid Kopepod.....	158
6.3.2. Rotifer Yetiştiriciliği	160
6.3.2.1. Rotifer Yetiştiriciliğinde Kullanılan Bazı Araç-Gereçler.....	162
6.3.2.2. Rotifer Kültüründe Kullanılan Deniz Suyunun ve Kültür Ortamının Özellikleri	163
6.3.2.3. Rotifer Kültürünün Hazırlanması.....	163
6.3.3. <i>Artemia</i> Kültürü	165
6.3.3.1. <i>Artemia</i> Kültüründe Kullanılan Temel Araç, Gereç ve Kimyasallar	168

6.3.3.2. <i>Artemia</i> Kistlerinin Kuluçkalanması	168
6.3.3.3. <i>Artemia</i> Türünde Dekapsülasyon İşlemi	169
6.3.4. <i>Daphnia</i> Kültürü	171
6.3.4.1. <i>Daphnia</i> Kültür Yöntemleri	173
BÖLÜM 7	
PLANKTON ARAŞTIRMA VE DEĞERLENDİRME YÖNTEMLERİ	175
7.1. Plankton Örneklemeye Araçları	175
7.1.1. Örneklemeye Şişeleri	175
7.1.2. Plankton Kepçeleri	177
7.1.3. Yüksek Hızla Kullanılan Araçlar	180
7.1.4. Motopomplar	181
7.2. Plankton Çekim Yöntemleri	181
7.3. Plankton Örneklerinin Tespiti ve Korunması	183
7.3.1. Formalin Solüsyonu	183
7.3.2. Lugol (İyot) Solüsyonu	184
7.4. Plankton Miktarının Tayini	184
7.5. Plankton Sayımında Kullanılan Araçlar	185
7.5.1. Pipetler	185
7.5.2. Utermohl Sedimentasyon	185
7.5.3. Petroff Hausser Lamı	185
7.5.4. Neubauer Hemositometresi	186
7.5.5. Palmer-Moloney Sayım Kamarası	186
7.5.6. Sedwick-Rafter Sayım Kamarası	186
7.5.7. Dollfus-Cuve Sayım Kamarası	186
7.5.8. Sayım Tepsisi	186
7.5.9. Milimetrik Kâğıt	186
7.6. Planktonik Organizmaların Biyokütle ve Bolluk Hesapları	188
7.6.1. Biyokütle	188
7.6.2. Bolluk	188
7.7. Mikroskop	190
BÖLÜM 8	
EKLER	197
EK 1: Ölçü Değişim Tabloları	197
EK 2: Latince Kelimelerin Okunuşları	200
EK 3: Terimler Sözlüğü	201
BÖLÜM 9	
KAYNAKLAR	235

BÖLÜM 9

KAYNAKLAR

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Doç. Dr. Hasan Bulut



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İÇİNDEKİLER

ÖN SÖZ	iii
ŞEKİL LİSTESİ	xi
Bu Kitaba Nasıl Çalışılmalı?	xix
KISIM 1: R İLE PROGRAMLAMA	1
1. R DÜNYASINA GİRİŞ	3
1.1. R Programı Nasıl Elde Edilir?	4
1.2. R Project vs RStudio	6
1.3. RStudio'nun Elde Edilmesi	9
1.4. RStudio Arayüzü	9
1.5. RStudio Arayüzünün Kişiselleştirilmesi	17
2. R PROGRAMLAMA DİLİNİN TEMELLERİ	21
2.1. Değişken Tanımlama	21
2.2. Aritmetik İşlemler ve Yorum Satırı	23
2.3. Değişken Çeşitleri	26
2.4. Veri Çeşitleri	28
2.4.1. Vektör Veri Tipi (vector)	28
2.4.2. Matris Veri Tipi (matrix)	31
2.4.3. Array Veri Tipi (array)	39
2.4.4. Veri Çerçevesi (data.frame)	40
2.4.5. Faktör Veri Tipi (factor)	43
2.4.6. Liste Veri tipi (list)	44
2.5. Paket Kavramı	47
2.6. R Dilinde Kullanılan Bazı Önemli Matematiksel Fonksiyonlar	47
2.7. R Dilinde Kullanılan Bazı Önemli İstatistiksel Fonksiyonlar	53
2.8. R Dilinde Kullanılan Diğer Önemli Fonksiyonlar	53
2.9. R Dilinde Bazı İstatistiksel Dağılımlardan Rastgele Veri Üretme	64
3. R PROGRAMLAMA DİLİNDE KARAR YAPILARI	67
3.1. If Yapısı	69
3.2. If-Else Yapısı	71
3.3. If- Else if Yapısı	72
3.4. ifelse Fonksiyonu	74

3.5. Switch Fonksiyonu	74
3.6. Karar Yapıları İçin Çözümlü Örnekler	75
4. R PROGRAMLAMA DİLİNDE DÖNGÜLER	79
4.1. for Döngüsü	79
4.2. while Döngüsü	87
4.3. repeat Döngüsü	89
4.4. Döngü Yapıları İçin Çözümlü Örnekler	91
5. R PROGRAMLAMA DİLİNDE KULLANICI TANIMLI FONKSİYONLAR	95
6. apply AİLESİ	103
6.1. apply () Fonksiyonu	103
6.2. lapply () Fonksiyonu	107
6.3. sapply () Fonksiyonu	109
6.4. tapply () Fonksiyonu	111
6.5. apply Ailesine Yakın Hazır Fonksiyonlar	113
7. dplyr PAKETİ İLE VERİ İŞLEME	115
7.1. select() Fonksiyonu	115
7.2. filter() Fonksiyonu	119
7.3. arrange() Fonksiyonu	119
7.4. rename() Fonksiyonu	120
7.5. mutate() Fonksiyonu	121
KISIM 2: R İLE İSTATİSTİKSEL ANALİZ	123
8. TEMEL İSTATİSTİKSEL KAVRAMLAR	125
8.1. İstatistik	125
8.2. Kitle ve Örneklem	125
8.3. Parametre ve Tahmin Edici	126
8.4. Değişken	127
8.4.1. Nitel ve Nicel Değişkenler	127
8.4.2. Bağımlı ve Bağımsız Değişkenler	127
8.5. Değişkenlerin Ölçme Düzeyleri	128
9. BETİMSSEL İSTATİSTİKLER	129
9.1. Merkezi Eğilim Ölçüleri	129
9.1.1. Ortalama	129
9.1.2. Ortanca (Medyan)	133
9.1.3. Mod (Tepe Değer)	135

9.1.4. Geometrik Ortalama	136
9.1.5. Harmonik Ortalama	138
9.1.6. Çeyrekler (Quartiles)	140
9.1.7. summary() fonksiyonu	140
9.2. Dağılım (Saçılım, Yayılım) Ölçüleri	141
9.2.1. Açıklık (Range)	141
9.2.2. Ortalama Mutlak Sapma	143
9.2.3. Varyans	145
9.2.4. Standart sapma	148
9.2.5. Değişim Katsayısı	149
9.2.6. Çarpıklık Katsayısı	152
9.2.7. Basıklık Katsayısı	156
9.2.8. Medyan Etrafında Mutlak Sapmaların Medyanı: MAD	159
9.3. Frekans Tabloları	161
9.4. Çapraz Tablolar	165
10. GRAFİKLER İLE VERİ ÖZETLEME	169
10.1. Çubuk (Sütun) Grafikleri	169
10.2. Pasta Grafikleri	176
10.3. Histogram	178
10.4. Boxplot Grafiği	181
10.5. Saçılım Grafiği	184
10.6. Temel Grafik Fonksiyonu ve Argümanları	189
10.6.1. x ve y argümanları	190
10.6.2. type argümanı	191
10.6.3. main, xlab ve ylab argümanları	192
10.6.4. pch argümanı	193
10.6.5. bg argümanı	193
10.6.6. col argümanı	193
10.6.7. las argümanı	194
10.6.8. bty argümanı	195
10.6.9. cex ve lwd argümanı	196
10.6.10. lty argümanı	196
10.6.11. xlim ve ylim argümanları	198
10.7. Diğer Grafik Fonksiyonları	198
10.7.1. grid() fonksiyonu	198
10.7.2. points() fonksiyonu	199
10.7.3. legend() fonksiyonu	201

10.7.4. <code>lines()</code> fonksiyonu	202
10.7.5. <code>abline()</code> fonksiyonu	202
10.7.6. <code>text()</code> fonksiyonu	203
10.7.7. <code>par()</code> fonksiyonu	204
10.8. Bir grafiği Otomatik Kaydetme	205
11. HİPOTEZ TESTİ VE İLGİLİ KAVRAMLAR.....	207
12. KATEGORİK DEĞİŞKENLER ARASINDAKİ İLİŞKİLERİN İNCELENMESİ	223
12.1. Ki-kare χ^2 Bağımsızlık Testleri	223
12.1.1. $R \times C$ Tipindeki Çapraz Tablolar	223
12.2.2. 2×2 Tipindeki Çapraz Tablolar	234
12.2. Sınıflama Ölçme Düzeyindeki Değişkenler İçin İlişki Katsayıları	242
12.2.1. Φ (Phi) Katsayısı	242
12.2.2. Kontenjans Katsayısı	244
12.2.3. Cramer'in v Katsayısı	246
12.2.4. Theil'in Belirsizlik (U) Katsayısı	247
12.3. Sıralama Ölçme Düzeyindeki Değişkenler İçin İlişki Katsayıları	250
12.3.1. Gamma γ Katsayısı	250
12.3.2. Tau-b τ_b Katsayısı	252
12.3.3. Tau-c τ_c Katsayısı	255
12.4. Kategorik ve Sayısal Değişkenler İçin η Katsayısı	256
13. NİCEL DEĞİŞKENLER ARASINDAKİ İLİŞKİLERİN İNCELENMESİ	259
13.1. Kovaryans	259
13.2. Pearson Korelasyon Katsayısı	262
13.3. Kısmi (Partial) Korelasyon Katsayısı	267
13.4. Spearman Sıra Korelasyon Katsayısı	269
13.5. Korelasyon Katsayısının Anlamlılık Testi	271
13.6. R ile Korelasyon Analizinin Görselleştirilmesi	279
14. NORMALLİK TESTLERİ	285
14.1. Kolmogorov-Smirnov Uyum İyiği Testi	285
14.2. Cramer-von Mises Uyum İyiği Testi	287
14.3. Shapiro-Wilk Normallik Testi	289
14.4. Lilliefors Normallik Testi	289
14.5. Grafiklere Dayalı Normallik İncelemesi	290
15. TEK KİTLE İÇİN HİPOTEZ TESTLERİ	297
15.1. Tek Kitle Ortalama Parametresi İçin Testler	297
15.1.1. Tek Örnek Z Testi	297

15.1.2. Tek Örnek t Testi	304
15.1.3. Tek Örnek Wilcoxon İşaretli Sıra Sayıları Testi	311
15.1.4. Tek Örnek Test Sonuçlarının Görselleştirilmesi	312
15.1.5. Tek Örnek Konum Parametresi İçin R Fonksiyonu Oluşturma	315
15.2. Tek Kitle Oran Parametresi İçin Testler	318
15.3. Tek Kitle Varyans Parametresi İçin Testler	322
16. İKİ KİTLE İÇİN HİPOTEZ TESTLERİ	327
16.1. İki Bağımsız Kitle Ortalama Parametreleri İçin Testler	327
16.1.1. İki Bağımsız Örnek Z Testi	328
16.1.2. İki Bağımsız Örnek t Testi	331
16.1.2.1. Bilinmeyen kitle varyansları eşitse $\sigma_1^2 = \sigma_2^2$:	331
16.1.2.2. Bilinmeyen kitle varyansları eşit değilse $\sigma_1^2 \neq \sigma_2^2$	339
16.1.3. Mann-Whitney U Testi	348
16.1.4. İki Bağımsız Örnek Test Sonuçlarının Görselleştirilmesi	349
16.2. İki Bağımlı Kitle Ortalama Parametreleri İçin Testler	352
16.2.1. Paired t Testi	354
16.2.2. Wilcoxon İşaretli Sıra Sayıları Testi	363
16.3. İki Kitle Ortalaması Testi İçin R Fonksiyonu	364
16.4. İki Kitle Oran Parametreleri İçin Testler	369
16.5. İki Kitle Varyans Parametreleri İçin Testler	372
17. ANOVA ve KRUSKAL-WALLIS TESTLERİ	379
17.1. Varyansların Homojenliği İçin Hipotez Testleri	379
17.2. Tek Yönlü Varyans Analizi	381
17.3. Çoklu Karşılaştırmalar	386
17.4. Kruskal-Wallis H Testi	389
17.5. Sonuçların Görselleştirilmesi	391
18. REGRESYON ANALİZİ	395
18.1. Basit Doğrusal Regresyon Analizi	395
18.2. Çoklu Regresyon Analizi	407
18.3. Kategorik-Nitel Açıklayıcı Değişken Durumu: Kukla (Dummy) Değişken	413
19. GÜÇ (POWER) ANALİZİ VE ÖRNEK HACMİ BELİRLEME	417
19.1. t-Testleri İçin Power Analiz	418
19.2. ANOVA İçin Power Analiz	422
19.3. Korelasyon İçin Power Analiz	424
19.4. Regresyon İçin Power Analiz	425
19.5. Ki-Kare Testleri İçin Power Analiz	427

20. BAZI ÖRNEKLEME DAĞILIMLARINA İLİŞKİN TABLOLAR	431
20.1. Standart Normal Dağılım Tablosu	431
20.2. Student <i>t</i> Dağılım Tablosu	434
20.3. χ^2 Dağılımı Tablosu	436
20.4. F Dağılımı Tablosu	438
KISIM 3: R DİLİNDE İLERİ DÜZEY ARAÇLAR	443
21. R İLE OTOMATİK TABLOLAR VE RAPORLAMA	445
21.1. <i>table1</i> Paketi	445
21.2. <i>stargazer</i> Paketi	449
21.3. <i>furniture</i> Paketi	452
21.4. <i>report</i> Paketi	453
22. İLERİ DÜZEY GRAFİKLER: ggp1ot2 PAKETİ	457
22.1. Çubuk (Sütun, Bar) Grafiği	458
22.2. Pasta (Pie) Grafiği	461
22.3. Histogram Grafikleri	463
22.4. Yoğunluk Grafikleri	465
22.5. Kutu (Boxplot) Grafikleri	467
22.6. Keman (Violin) Grafikleri	469
22.7. Saçılım Grafikleri	469
22.8. Farklı Tür Grafiklerin Birlikte Kullanımı	472
22.9. Grafikleri Kaydetme	474
23. RMARKDOWN İLE RAPOR HAZIRLAMA	477
24. shiny PAKETİ	493
25. R PAKETİ OLUŞTURMA	509
25.1. Fonksiyon Oluşturma	509
25.2. Veri Dosyası Oluşturma	512
25.3. DESCRIPTION Dosyası Oluşturma	513
25.4. Paket Dosyalarının Hazırlanması	515
25.5. Paketin CRAN'a Yüklenmesi	517
25.6. SAP Paketinin PDF Dosyası	521
KAYNAKLAR	525

KAYNAKLAR

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Prof. Dr. Özlem Gürünlü Alma



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İçindekiler

Ön Söz.....	iii
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BİRİNCİ BÖLÜM

KÜMELER KURAMI.....	1
1.1. Küme Teorisinin Temel Kavramları.....	1
1.2. Kümeler Üzerinde İşlemler.....	3
1.3. Çözümlü Alıştırmalar	13
1.4. Kümeler İşlemleri Üzerinde R Program Uygulamaları	25
1.4.1. R Programında Kullanılan Küme İşlem Operatörleri.....	25
1.4.2. R programında Venn Şemalarının Oluşturulması.....	30

İKİNCİ BÖLÜM

KOMBİNATÖR ANALİZ.....	37
2.1. Faktöriyel Fonksiyon.....	37
2.2. Temel Sayma Yöntemleri.....	38
2.2.1. Toplama ve Çarpma İlkeleri.....	39
2.3. Permütasyon	40
2.3.1. Dairesel Permütasyon.....	41
2.3.2. Tümü Birbirinden Farklı Olmayan Nesnelerin Permütasyonu	43
2.3.3. İki Farklı Cinsteki Öğelerin Permütasyonu	44
2.4. Kombinasyon.....	44
2.5. Sıralı ve Sırasız Parçalanmalar	50
2.6. Binom Teoremi.....	52
2.7. Multinomial Teorem.....	55
2.8. Çözümlü Alıştırmalar	57
2.9. Permütasyon ve Kombinasyon Konusunda R Program Uygulamaları	69

ÜÇÜNCÜ BÖLÜM

OLASILIK.....	75
3.1. Giriş.....	75
3.2. Olasılık Kavramları	76

3.2.1. Olasılığın Tanımı.....	78
3.2.2. Olasılık Ölçüsünün Bazı Özellikleri.....	86
3.2.3. Koşullu Olasılık.....	88
3.2.4. Koşullu Olasılık İçin Çarpımsal Teorem.....	102
3.2.5. Örnek Uzayın Parçalanışı.....	103
3.2.6. Toplam Olasılık Teoremi.....	104
3.2.7. Bayes Teoremi.....	105
3.2.8. Bağımsız Olaylar ve İlişkili Sonuçlar.....	107
3.3. Çözümlü Alıştırmalar.....	115
3.4. R Program Uygulamaları.....	130

DÖRDÜNCÜ BÖLÜM

RASTGELE DEĞİŞKENLER VE DAĞILIMLARI	145
4.1. Rastgele Değişkenler.....	145
4.2. Kesikli Rastgele Değişken ve Olasılık Dağılımı.....	148
4.3. Sürekli Rastgele Değişken ve Olasılık Fonksiyonu.....	162
4.4. İki Boyutlu Rastgele Değişkenler.....	177
4.4.1. (X,Y) Kesikli Rastgele Değişkeninin Ortak Olasılık Fonksiyonu.....	178
4.4.2. (X,Y) İki Boyutlu Sürekli Rastgele Değişkeninin Ortak Olasılık Yoğunluk Fonksiyonu.....	191
4.5. Çok Boyutlu Rastgele Değişkenler.....	202
4.6. Rastgele Değişkenlerin Bağımsızlığı.....	209
4.7. Koşullu Olasılık Fonksiyonları.....	213
4.8. Çeyrekler (Kantiller).....	226
4.9. ÇÖZÜMLÜ ALIŞTIRMALAR.....	229
4.10. R Program Uygulamaları.....	289

BEŞİNCİ BÖLÜM

BEKLENEN DEĞER, VARYANS ve MOMENTLER	305
5.1. Beklenen Değer ve Özellikleri.....	305
5.2. İki Boyutlu Rastgele Değişkeninin Beklenen Değeri.....	323
5.3. Koşullu Beklenen Değer.....	333
5.4. Bir Rastgele Değişkenin Varyansı.....	339
5.5. Koşullu Varyans.....	349
5.6. Kovaryans.....	356
5.7. Korelasyon.....	372
5.8. Rastgele Vektörlerde Beklenen Değer ve Kovaryans.....	380
5.9. Momentler.....	386
5.10. Moment Üreten Fonksiyonlar.....	392

5.10.1. Moment Çıkaran Fonksiyon	393
5.10.2. Karakteristik Fonksiyon.....	399
5.10.3. Faktöriyel Moment Çıkaran Fonksiyon	404
5.11. Eşitsizlikler	407
5.12. Çözümlü Alıştırmalar	415
5.13. R Program Uygulamaları	458

ALTINCI BÖLÜM

BAZI ÖZEL KESİKLİ DAĞILIMLAR	479
6.1. Bernoulli Dağılımı	479
6.1.1. Bernoulli Dağılımının Ortalama ve Varyansı	482
6.2. Binom Dağılımı	485
6.2.1. Binom Dağılımının Ortalama ve Varyansı	491
6.3. Çok Terimli Dağılım (Multinomial Distribution).....	495
6.3.1. Çok Terimli Dağılımın Ortalama ve Varyansı.....	498
6.4. Geometrik Dağılım	502
6.4.1. Geometrik Dağılımın Beklenen Değer ve Varyansı	507
6.5. Negatif Binom Dağılımı (Pascal Dağılımı)	512
6.5.1. Negatif Binom Dağılımının Ortalama ve Varyansı	516
6.6. Hipergeometrik Dağılım	522
6.6.1 Hipergeometrik Dağılımın Ortalama Ve Varyansı	529
6.7. Genelleştirilmiş Hipergeometrik Dağılım.....	534
6.7.1. Genelleştirilmiş Hipergeometrik Dağılımın Ortalama ve Varyansı	536
6.8. Poisson Dağılımı.....	537
6.8.1. Poisson Dağılımının Ortalama ve Varyansı.....	542
6.9. Kesikli Düzgün (Uniform) Dağılım.....	547
6.9.1. Kesikli Düzgün Dağılımın Ortalama Ve Varyansı	550
6.10. Çözümlü Alıştırmalar	554
6.11. R Program Uygulamaları	579
6.11.1. Bernoulli Dağılım	579
6.11.2. Binom Dağılım	583
6.11.3. Çok Terimli Dağılım.....	592
6.11.4. Geometrik Dağılım	592
6.11.5. Negatif Binom Dağılım	597
6.11.6. Hipergeometrik Dağılım	602
6.11.7. Poisson Dağılımı.....	607
6.12 Kesikli Dağılımlar Arasındaki Yakınsamalar	616
6.12.1. Bernoulli Dağılımının Binom Dağılımına Yakınsaması.....	616
6.12.2. Binom Dağılımı İle Negatif Binom Dağılımı Arasındaki İlişki.....	617

6.12.3. Hipergeometrik Dağılımın Binom Dağılıma Yakınması	617
6.12.4. Negatif Binom Dağılımının Geometrik Dağılıma Yakınsaması	618
6.12.5. Binom Dağılımının Poisson Dağılımına Yakınsaması	619

YEDİNCİ BÖLÜM

BAZI ÖZEL SÜREKLİ DAĞILIMLAR	621
7.1. Sürekli Düzgün Dağılım (Uniform Distribution).....	621
7.1.1. Sürekli Düzgün Dağılımın Beklenen Değer, Varyans ve Moment Çıkaran Fonksiyonu	625
7.2. Normal Dağılım	627
7.2.1. Normal Dağılımın Beklenen Değer, Varyans ve Moment Çıkaran Fonksiyonu	634
7.2.2. Normal Dağılımın Asimetri ve Basıklık Ölçüleri	638
7.3. Standart Normal Dağılım.....	639
7.4. İki Değişkenli Normal Dağılım	657
7.5. Lognormal Dağılım	675
7.6. Üstel Dağılım.....	686
7.7. Gamma Dağılımı	694
7.8. Beta Dağılımı.....	704
7.9. Cauchy Dağılımı.....	712
7.10. Çözümlü Alıştırmalar	720
7.11. R Program Uygulamaları.....	740
7.11.1. Sürekli Düzgün Dağılım	740
7.11.2. Normal Dağılım	744
7.11.3. İki Boyutlu Normal Dağılım.....	751
7.11.4. Log-Normal Dağılım	756
7.11.5. Üstel Dağılım.....	759
7.11.6. Gamma Dağılımı.....	763
7.11.7. Beta Dağılım	770
7.11.8. Cauchy Dağılımı.....	776
 EK 1: Standart Normal Dağılım (z) Tablosu.....	 782
 KAYNAKLAR.....	 783
 ÖZ GEÇMİŞ	 785

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İÇİNDEKİLER

ÖN SÖZ	v
--------------	---

BÖLÜM 1

BİLGİSAYARIN YAPISI VE TEMELLERİ.....	1
1.1. Giriş	1
1.2. Bilgisayarın Tanımı.....	2
1.3. Bilgisayarın Veri İşleme ve Depolama Yöntemi.....	2
1.4. Bilgisayarın Bileşenleri.....	5
1.4.1. Donanım	5
1.4.2. Yazılım	6
1.5. Programlama Dilleri.....	8
1.5.1. Problem Çözme ve Programlama.....	10
1.5.2. Programlama Dillerindeki Veri Tipleri.....	11
1.6. Wolfram Mathematica.....	12

BÖLÜM 2

MATHEMATICA İLE MATEMATİK ÇOK KOLAY!	25
2.1. Giriş	25
2.2. İşlemciler.....	25
2.3. Bazı Matematiksel Fonksiyonlar (Arşiv Fonksiyonları).....	29
2.4. Bazı Alfasayısal (String) Fonksiyonlar	36
2.5. Vektörler/Matrisler/Diziler	39
2.6. Denklem/Denklem Takımları Çözümleri, Kuvvet Açılımları.....	47
2.7. Trigonometrik İfadeler	55
2.8. Limit, Türev, İntegral ve Diferansiyel Denklemler	58
2.9. Fiziksel Birimler ve Boyut Analizi	70
2.10. İki ve Üç Boyutlu Grafik Çizimleri.....	75
2.11. Vektörel İşlemciler.....	119
2.12. Etkileşimli Nesnelere	130

BÖLÜM 3

ALGORİTMA, AKIŞ ŞEMALARI VE MATHEMATICA İLE PROGRAMLAMA	145
3.1. Giriş	145
3.1.1. Matematiksel İşlemler	147
3.1.2. Karşılaştırma İşlemleri	150
3.1.3. Mantıksal İşlemler	150
3.2. Algoritma ve Akış Şeması	151
3.3. Mathematica ile Programlama	180
3.3.1. Açıklama (Remark)	181
3.3.2. Girdi Komutu	182
3.3.3. Çıktı Komutu	195
3.3.4. Mantıksal İşlem (Karşılaştırma) Komutu	204
3.3.5. Alt Program	211
3.3.6. Dallanma (Programın Akış Sırasını Değiştirme) Komutu	225
3.3.7. Sayaç ve Ardışık Toplama	230
3.3.8. Döngüler	236

BÖLÜM 4

İNDİSLİ DEĞİŞKENLER	271
4.1. Giriş	271
4.2. İndisli Değişkenler	271

BÖLÜM 5

ÖZEL FONKSİYONLAR	311
5.1. Giriş	311
5.2. Bessel Fonksiyonu	311
5.2.1. Birinci Tür Bessel Fonksiyonu	311
5.2.2. İkinci Tür Bessel Fonksiyonu (Neumann Fonksiyonu)	313
5.2.3. Üçüncü Tür Bessel Fonksiyonu (Hankel Fonksiyonu)	314
5.2.4. Modifiye Bessel Fonksiyonu	316
5.2.5. Küresel Bessel Fonksiyonu	317
5.3. Legendre Fonksiyonu	318
5.4. Hermite Fonksiyonu	321
5.5. Laguerre Fonksiyonu	323
5.6. Chebyshev Fonksiyonu	326
5.7. Hipergeometrik Fonksiyon	328

BÖLÜM 6

UYGULAMALAR	335
6.1. Giriş	335
6.2. Mükemmel Sayı Bulma.....	335
6.3. Lucas Sayıları	336
6.4. Binom Katsayılarının Hesaplanması	342
6.4.1. Binom Katsayılarının Grafiği.....	344
6.5. Pascal Üçgeni	345
6.6. Laguerre Polinomlarının Çarpımı	347
6.7. Alan Hesabı	349
6.8. Matris Hesap Makinesi.....	351
EK A: Yaygın Olarak Kullanılan Komutlar Listesi	371
KAYNAKLAR.....	379
DİZİN	381

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Dr. Öğr. Üyesi Mustafa Timur - Dr. Öğr. Üyesi Halil Kılıç



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İÇİNDEKİLER

ÖN SÖZ.....	iii
TEŞEKKÜR.....	v

BÖLÜM 1..... 1

SolidCAM YENİ ÖZELLİKLER3

1.1. Web Tabanlı Şablon Yapılandırıcısı.....	3
1.2. İlişkisel Koordinat Sistemi	3
1.3. Paylaşılan Konum Özelliğinin Kullanılması	6
1.4. Makine Ön İzlemede Takım Seçme	7
1.5. Tutucu Özelliklerini Tanımlama.....	10
1.6. Makine Kontrol Destekleri ve Eşitlikleri.....	11
1.7. Vida Açma Özellikleri.....	11
1.8. Hızlı Hesaplama Modülleri	12
1.9. Kenar Çapak Alma ve İstenmeyen Zincirleri Tanımama	12
1.10. Düzlem Yüzeylere Doğrudan Pah Özelliği Uygulama.....	13
1.11. Yüzeý Seçimi ile Pocket (Cep) Çizgileri Oluşturma	13
1.12. Sandvik Tornalama.....	14
1.13. Otomatik İşlemler.....	14
1.14. SolidCloud.....	15
1.15. SolidCAM Maker Version.....	15

BÖLÜM 2..... 17

SolidCAM PROGRAM ARAYÜZÜ19

2.1. SolidCAM Referans Noktası Belirleme	19
2.2. Stock (Kütük) Sınırlarını Belirleme.....	29
2.3. Target (Hedef) Belirleme.....	33

BÖLÜM 3..... 35

2.5D EKSEN FREZELEME (MILLING) OPERASYONLARI.....37

3.1. Yüzeý Frezeleme Operasyonu (Face).....	37
3.2. Çevresel Frezeleme Operasyonu (Profile).....	60
3.3. Cep/Havuz Frezeleme Operasyonu (Pocket).....	85
3.4. Punta Açma Operasyonu (Drilling).....	93
3.5. Delik Delme Operasyonu (Drilling).....	101
3.6. ToolBox Döngü Operasyonları (ToolBox Cycles).....	114

3.7. İş Parçası Üzerinde 2.5D Eksen (XYZ) Frezeleme Uygulaması	117
3.7.1. Face	124
3.7.2. Profile	129
3.7.3. Pocket	134
3.7.4. T-Slot	138
3.7.5. Drilling.....	142
3.7.6. Face-2	148
3.7.7. Pocket-2	151
BÖLÜM 4.....	157
2D EKSEN (XZ) TORNALAMA (TURNING) OPERASYONLARI.....	159
4.1. Alın Tornalama Operasyonu (Face)	159
4.2. Kademeli Tornalama Operasyonu (Turning).....	185
4.3. Delik Delme Operasyonu (Drilling)	203
4.4. İç Tornalama Operasyonu (Turning)	208
4.5. İç Vida Açma Operasyonu (Threading).....	225
4.6. Dış Vida Açma Operasyonu (Threading)	236
4.7. Kanal Açma Operasyonu (Grooving).....	246
4.8. Kesme Operasyonu (Cutting)	257
4.9. Tornada Ayna Ayak Mesafesi Ayarlama (Setup).....	264
4.9.1. Kesici Takımın Yönünü Değiştirme	271
4.10. Zarf Oluşturma	274
4.11. Takım Kütüphanesi Oluşturma.....	278
4.12. İş Parçası Üzerinde 2D Eksen (XZ) Tornalama Uygulaması	282
4.12.1. Face.....	292
4.12.2. Turning	298
4.12.3. Drilling.....	300
4.12.4. Turning (Delik Genişletme).....	303
4.12.5. Grooving	305
4.12.6. Threading.....	308
4.12.7. CutOff.....	311
BÖLÜM 5.....	317
SolidCAM ÖRNEK UYGULAMA ÇALIŞMALARI.....	319
5.1. 2D İki Boyutlu Çizim Çalışmaları.....	319
5.2. Frezeleme (Milling) Uygulama Çalışmaları	331
5.3. Tornalama (Turning) Uygulama Çalışmaları	343
KAYNAKLAR.....	349

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SUSTAINABLE FUELS FROM BIOMASS

Prof. Dr. Ferhan Sami Atalay



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CONTENTS

CONTENTS	iii
FOREWORD	ix
1. INTRODUCTION	1
1.1. Biomass Sources for Biofuel Production	5
1.2. Biofuel Classification	6
1.3. Biomass-to-Biofuel Conversion Technologies.....	8
REFERENCES	14
2. THERMOCHEMICAL CONVERSION OF SOLID BIOMASS	17
2.1. Direct Combustion	18
2.1.1. Combustion of Biomass.....	19
2.1.2. Biomass Heating Value	22
2.1.3. Combustion Systems.....	26
2.1.4. Biomass Electric Generation System	31
2.2. Pretreatment of Biomass for Energy Applications.....	44
2.2.1. Drying	45
2.2.2. Pelletization and Briquetting	52
2.2.3. Torrefaction.....	58
2.3. Biomass Gasification	63
2.3.1. Stages of Gasification Process	65
2.3.2. Factors Affecting on the Gasification Process.....	68
2.3.3. Biomass Gasification Processes	72
2.3.4. Mathematical Modeling of the Fluidized Bed Gasifier	79
2.4. Pyrolysis of Biomass	91
2.4.1. The Fundamentals of Biomass Pyrolysis	92
2.4.2. Process Description.....	100
2.4.2.1. Cutting, Grinding, and Drying	102
2.4.2.2. Cleanup	103

2.4.2.3. Oil Collection	103
2.4.2.4. Storage	104
2.4.2.5. Combustion.....	104
2.4.2.6. Pyrolysis Reactor.....	104
2.4.2.7. Biooil Methods of Improvement.....	118
REFERENCES	130

3. BIODIESEL PRODUCTION 135

3.1. Feedstocks	138
3.2. Biodiesel Production Processes.....	145
3.2.1. Transesterification	145
3.2.1.1. Catalyst.....	146
3.2.1.2. Methanol to Oil Molar Ratio.....	151
3.2.1.3. Reaction Temperature.....	151
3.2.1.4. Mixing System	152
3.2.1.5. Residence Time.....	155
3.2.1.6. Composition of Oil	156
3.2.2. Biodiesel Production Reactors	157
3.2.3. The Continuously Stirred Tank Reactor's Design Principles.....	161
3.3. Novel Biodiesel Production Processes.....	174
3.3.1. Transesterification Under Supercritical Conditions	175
3.3.2. Ultrasound Assisted Transesterification	176
3.3.3. Reactive Distillation	178
3.3.4. Microwave Technique.....	183
3.3. Biodiesel Purification	184
3.3.1. Separation of Glycerol Rich Phase	185
3.3.2. Wet Washing	188
3.3.3. Dry Cleaning.....	189
3.3.4. Separation by Membrane	192
3.3.5. Crude Glycerol Purification.....	198
3.3.6. Methanol Recovery From Biodiesel	200
3.4. Usage areas of Byproduct Glycerol.....	203
3.4.1. Usage Potential of Glycerol in Chemical Industry	204
3.4.2. Glycerol's Potential Use in Fermentation Technology.....	215
REFERENCES	222

4. BIOGAS PRODUCTION FROM AGRICULTURAL WASTES	227
4.1. Anaerobic Digestion Process Phases	231
4.1.1. Hydrolysis	232
4.1.2. Acidogenesis	233
4.1.4. Methanogenesis.....	233
4.2. Factors That Influence Anaerobic Digestion	234
4.2.1. pH	234
4.2.2. Hydraulic Retention Time (HRT)	235
4.2.3. Temperature	236
4.2.4. Nutrients and Carbon to Nitrogen Ratio	236
4.2.5. Toxins	237
4.3. Agricultural Residues' Potential for Biogas Production	238
4.3.1. Anaerobic Manure Digestion	239
4.3.2. Anaerobic Digestion of Lignocellulosic Biomasses	240
4.4. Biogas Purification Technologies	246
4.4.1. Removal of Carbon Dioxide.....	246
4.4.2. Hydrogen Sulphide Removal.....	254
4.5. Biogas and Digestate Utilisation.....	263
4.5.1. Heating	263
4.5.2. Electricity Generation or Combined Heat and Power (CHP).....	264
4.5.3. Vehicle Fuel.....	266
4.5.4. Fuel Cells.....	267
4.5.5. Digestates as Vegetable Crop Fertilizers	270
4.6. Modeling of the Anaerobic Fermentation Process	271
4.6.1. Microorganism Growth Kinetics.....	271
4.6.1. Volumetric Methane Production Rate.....	276
4.7. Process Design for Biogas	280
4.7.1. Energy Requirements for Biogas System	280
4.8. Process Control, Maintenance and Safety of the Biogas System.....	285
4.8.1. Process Control and Monitoring	286
4.8.2. Maintenance of the Equipments.....	287
4.8.3. Safety of the Biogas Plant	292
4.9. An Example of a Biogas Fermenter Design	296
REFERENCES	307
5. ETHANOL PRODUCTION FROM BIOMASS	311
5.1. Bioethanol Production Raw Materials	312
5.1.1. Raw Materials Containing Sugar.....	313
5.1.2. Raw Materials Containing Starch	314

5.1.3. Lignocellulose-Containing Raw Materials	315
5.1.4. Bioethanol Using Glycerol	316
5.2. Bioethanol Production From Lignocellulosic Biomass	317
5.2.1. Lignocellulosic Biomass Pretreatment	319
5.2.2. Fermentation of Sugars Produced by Hydrolysis	327
5.3. Design Principles of Bioreactors	334
5.3.1. Enzymatic Reactions and Enzyme Kinetics	335
5.3.2. Microorganism Growth Kinetics.....	343
5.4. Bioethanol Separation and Purification	356
5.5. Ethanol Applications	366
5.5.1. Engine Fuel	366
5.5.2. Chemicals Produced from Ethanol.....	367
5.6. Example of Bioethanol Production from Corn Waste.....	372
5.6.1. Design of a Dilute Acid Hydrolysis Reactor.....	374
5.6.2. Reactor for Enzymatic Hydrolysis	390
5.6.3. Ethanol Production Fermenter Design	401
REFERENCES	413
6. HYDROGEN PRODUCTION FROM BIOMASS.....	415
6.1. Thermochemical Processes for Hydrogen Production.....	420
6.1.1. Hydrogen From Gasification of Biomass.....	420
6.1.2. Pyrolysis of Biomass to Produce Hydrogen	425
6.1.3. Steam Reforming Gas Cleaning and Hydrogen Purification	427
6.2. Biological Hydrogen Production Processes	442
6.2.1. Dark Fermentation.....	443
6.2.2. Hydrogen Production via Biophotolysis.....	449
6.2.3. Photofermentation Hydrogen Production	451
6.2.4. Advantages and Disadvantages of Photobiological Methods	452
6.3. Hydrogen Production Using Glycerol	453
6.3.1. Thermochemical Processes	454
6.3.1.1. Steam Reforming.....	455
6.3.1.2. Steam Reformer Design	461
6.3.2. Biological Process	470
6.4. Storage And Uses of Hydrogen.....	474
6.4.1. Storage of Hydrogen	474
6.4.2. Hydrogen's Applications	484
REFERENCES	492

7. PRODUCTION OF METHANOL	497
7.1. Production of Methanol From Glycerol.....	504
7.1.1. Reactor Design.....	505
7.1.2. Separation System	509
7.2. Methanol Production From Carbon Dioxide	527
7.2.1. Methanol Synthesis	529
7.2.2. Mass and Energy Balances.....	530
7.2.2. Design of Fixed Bed Plug Flow Tubular Reactor	558
7.3. Safety and Occupational Health.....	576
7.3.1. Factors Produced Hazard In Chemical Industry.....	577
7.3.2. Safety Analysis Methods	579
7.3.3. Explosion and Fire Control of Methanol	581
7.3.4. Effect of Methanol on Health	581
7.3.5. Environmental Protection	584

1.

INTRODUCTION

The depletion of petroleum-derived fuel and environmental concerns have prompted researchers to investigate biofuel as an alternative fuel source. Biofuels are potentially viable and long-term substitutes for fossil fuels. Over the last few decades, there has been a significant increase in biofuel research and development. However, from the standpoint of production capacity and engine compatibility, a complete substitution of petroleum-derived fuels by biofuel is impossible.

Energy security and climate change are the two major driving forces behind global biofuel development, both of which have the potential to boost the agro-industry. However, there are other issues with biofuel use, such as automotive engine compatibility in long-term operation and food security issues caused by biofuel production from food-grade oil-seeds.

Biofuels are renewable fuels that are primarily produced from domestic biomass feedstock or as a byproduct of agricultural or food processing. The most well-known biofuel sources for the transportation sector are bioethanol and biodiesel. Biofuel does not contain petroleum, but it can be blended with petroleum fuel in any proportion to create a biofuel blend. It can be used in standard heating equipment or diesel engines without requiring any major modifications.

Major benefits of biofuels as a form of renewable fuel include (Awogbemi, 2021):

- 1- *Biofuels are renewable energy source*
- 2- *Less green house gases emissions are generated from the utilization of biofuels compared to fossil fuels*

and a naphtha-like liquid which can be *steam cracked* to yield ethene, propene and buta-1,3-diene. As a result, biomass has the potential to provide a cost-effective and sustainable source of energy while also reducing greenhouse gas emissions.

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2.

THERMOCHEMICAL CONVERSION OF SOLID BIOMASS

Wood and other forms of solid biomass are some of the main renewable energy resources available and provide the only source of renewable liquid gaseous and solid fuels.

Biomass is used to heat facilities, generate electricity, and power combined heat and power plants. Several methods exist for converting biomass into electricity. Direct combustion of biomass material, such as agricultural waste or woody materials, is the most common. Other methods include gasification, pyrolysis, and anaerobic digestion. Gasification generates usable energy by heating the biomass with less oxygen than is required for complete combustion. Pyrolysis generates bio-oil by rapidly heating biomass in the absence of oxygen.

Woody biomass such as wood chips, pellets, and sawdust are combusted or gasified to generate electricity. Corn stover and wheat straw residues are baled for combustion or converted into a gas using an anaerobic digester. All wood is made up of primarily Cellulose ($C_6 H_{10} O_5$), Hemicellulose (xylose, mannose, galactose, rhamnose, and arabinose) and Lignin ($C_9 H_{10} O_2$, $C_{10} H_{12} O_3$).

All typical wood contains around 50% carbon, 6% hydrogen, 44% oxygen and the remaining ash is inorganic. Compared to hardwoods, softwoods often have lower oxygen concentration and higher carbon content. When entirely burned, around 12% of the wood mass is transformed to carbon dioxide, and approximately 12% to water. For hardwoods, this method produces roughly 8600 Btu per pound (20 MJ/kg) of thermal energy and 9000 Btu per pound (21 MJ/kg) for softwoods.

The supercritical fluids can be used as reaction condition in the production of bio-oil mainly in the process of hydrothermal liquefaction of biomass as well as it can be used for the upgradation of biooil. The SCFs upgrading of bio-oil is also performed in the presence of catalyst and solvent such as ethanol, methanol, CO₂, and water.

When SCFs are performed with acid catalysts and alcohol, the process is known as supercritical bio-oil esterification. The SCFs upgrading method is used to increase the heating value and lower the viscosity of the bio-oil. Using the supercritical water upgrading method, Duan and Savage reported that the heating value of algal bio-oil was increased to 43 MJ/kg and the total acid number was reduced from 256 to 25.

However, Zhang investigated the esterification of biooil compounds in supercritical ethanol. It was reported that at supercritical condition, all carboxylic acid from the crude biooil transformed completely into esters.

Shafaghat recently discovered that combining HDO and a supercritical fluid system increases the heating value of bio-oil and improves the deoxygenation degree. The heating value of upgraded bio-oil increased from 12.61 MJ/kg to 24.17 MJ/kg, and the degree of bio-oil deoxygenation was greatest when methanol was used as SCFs.

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3.

BIODIESEL PRODUCTION

Biodiesel, also known as B100, is a mixture of fatty acid alkyl esters (FAMES) produced by transesterification of vegetable and animal fats with alcohols such as methanol, ethanol, or propanol using catalysts. Numerous vegetable oils such as peanut, corn, safflower, soybean, palm, etc. have been utilized to produce biodiesel. Also, biodiesel is formed from non-edible oils like mahua neem, karanja, and jatropha.

Biodiesel fuel has several advantages over petro-diesel fuel. These advantages are as follows.

1. *It is sustainable, available, and renewable*
2. *It can provide modest and nearly fuel for rural economies*
3. *There is little toxic waste generated during production*
4. *Biodiesel production is simpler than diesel production*
5. *The combustion efficiency of biodiesel is very high*
6. *The cetane number of biodiesel is higher (around 50) than that of diesel energy. The cetane number is a commonly used index for determining diesel energy superiority*
7. *Biodiesel is almost sulfurless and non-aromatic. Furthermore, biodiesel has much better lubricity than low-sulfur diesel fuel. A small amount of biodiesel additive (about 1%) is sufficient to significantly improve the lubricity of conventional diesel fuel*
8. *According to life cycle analysis, biodiesel emits less CO₂ than conventional fossil fuels. The use of biomass energy has the potential to significantly reduce greenhouse gas emissions, and thus biodiesel contributes significantly less to global warming than fossil fuels*

reactions are termed oxidative fermentation, and the only known GA producers investigated so far belong to the acetic acid bacteria family.

Habe et al. demonstrated that more than 100 g/L of GA can be produced by both *G. frateurii* and *A. tropicalis*, and the product can be easily concentrated. GA was previously known as a minor by-product of DHA production by *G. oxydans*, these results may provide a new application for surplus glycerol. It will be necessary to demonstrate the functionality of GA or its derivatives and increase its industrial output to add more value to GA

Succinic Acid:

Succinic acid is a dicarboxylic acid produced as an intermediate of the tricarboxylic acid cycle and also as one of the fermentation products of anaerobic metabolism. It is used for the manufacture of synthetic resins and biodegradable polymers.

Lee et al. reported the production of succinic acid by fermentation of glycerol using *Anaerobiospirillum succiniciproducens*. Cells were grown in sealed anaerobic bottles containing 100 mL minimal salts medium containing 5 g/L glucose, 2.5 g/L yeast extract and 5 g/L polypeptone with CO₂ as the gas phase.

They cultured cells in a medium containing 6.5 g/L glycerol to give a high yield of succinic acid thus avoiding the formation of acetic acid as by-product. The gram ratio of succinic acid to acetic acid obtained was 25.8:1 (Padhi, 2013). The consumption of glycerol was strongly dependent on the amount of yeast extract added to culture medium. When glucose and glycerol were co-fermented with the increasing ratio of glucose to glycerol, the succinic acid yield decreased, suggesting that glucose enhanced acetic acid formation irrespective of the presence of glycerol.

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4.

BIOGAS PRODUCTION FROM AGRICULTURAL WASTES

The negative environmental effects of residues produced by the food and agricultural industries can be reduced by using biomass wastes as raw materials for manufacturing. Biofuel production is an alternative use for agricultural waste. Anaerobic digestion biogas is often recognized as the most cost effective and environmentally friendly biofuel. It is also critical that the feed for the biogas plants be made up of local rubbish. Anaerobic digestion can thus be employed to treat a potentially harmful organic complex waste while also creating valuable energy and fertilizer.

The basic concepts of anaerobic digestion and their application in the synthesis of methane from biomass, such as lignocellulosic biomass, food leftovers, and micro(macro) algae, will be presented in this chapter.

The anaerobic digestion is a biochemical conversion method in an oxygen free environment, which employs bacteria to digest the lignocellulosic biomasses, sewage sludge, animal excreta, food wastes, municipal solid waste, industrial wastes like pulp residues and even spent microalgae residues post oil extraction.

The biogas consists of several gases, the main ones being methane (CH_4), in the range of 60–70%, and carbon dioxide (CO_2), in about 30% in the mixture. Also, it includes a lesser extent hydrogen (0–1%), nitrogen (0–7%), oxygen (0–2%), hydrogen sulfide (0–3%) and ammonia (0–1%) gases. Classified as impurities, CO_2 , hydrogen sulfide and ammonia gases negatively interfere with the biogas quality when in high concentrations. Carbon dioxide, for example, lowers the calorific value of biogas, while H_2S causes corrosive to metallic materials of equipment used and unpleasant smell.

Mass flow rate of Mobiltherm:

$$M_{Y_{ag}} = (11.5 \text{ kJ/s}) / (2.09)(5) \\ = 1.1 \text{ kg/s}$$

Volumetric flow rate of Mobiltherm:

$$V_{Y_{ag}} = 1.1 / 850 \\ = 1.3 \times 10^{-3} \text{ m}^3/\text{s}$$

Note: As can be seen, the majority of the energy necessary to keep the reactor running is spent on heating the feed slurry. This issue is caused by the chilly temperature of the water used to make the slurry.

The liquid in the hot liquid-solid stream exiting the reactor can be used to solve this problem. As a result, a solid-liquid separation method, such as plate-frame pressure filtering or centrifugal dehydration, should be applied.

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5.

ETHANOL PRODUCTION FROM BIOMASS

When compared to fossil fuels, ethanol is a more environmentally friendly fuel. It is a volatile, flammable, colorless liquid under air circumstances. The following table lists the key physical features of ethanol.

Property	Value
<i>Normal boiling point</i>	78.32 °C
<i>Critical temperature</i>	243.1 °C
<i>Density</i>	0.7893 g/mL
<i>Heat of combustion at 25°C</i>	29676.69 J/g
<i>Autoignition temperature</i>	793.0 °C
<i>Flammable limits in air</i>	
<i>Lower</i>	vol% 4.3
<i>Upper</i>	vol% 19.0

Ethanol is an important organic chemical found in consumer and industrial products. Ethanol is utilized in the pharmaceutical, plastics, polishers plasticisers, cosmetics, and chemical industries. Ethanol is important in fuel applications because it burns cleanly and reduces greenhouse gas emissions particularly carbon dioxide.

In a fixed bed reactor, phosphoric acid adsorbed on the surface of a solid (silica) is used as a catalyst in the direct catalytic hydration of ethene in the presence of steam. The exothermic process is reversible.

Since the reaction time is 25 hours, the released heat energy in kW becomes

$$Q = - 32.1 * 10^6 / (25)(3600)$$

$$= - 356.66 \text{ kW}$$

Because a jacket can remove 390 kW of energy in the enzymatic hydrolysis reactor, it can also be utilized in the fermenter. Coolant flow rate required

$$M_{\text{water}} = (357) / (4.18 * 3)$$

$$= 28.5 \text{ kg / s}$$

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6.

HYDROGEN PRODUCTION FROM BIOMASS

Hydrogen is a critical chemical in the petrochemical and chemical industries. Hydrogen is used in the petroleum industry to remove sulfur as well as to upgrade heavy crude oil. Also, it is used in the chemical industry to produce chemicals such as ammonia, methanol, and hydrochloric acid, among others.

Hydrogen is the cleanest energy carrier and can be used in a wide range of energy applications, including electricity generation and transportation. Hydrogen fuel energy is expected to be the most widely used energy carrier in the future; many benefits have been investigated, including its use in transportation, long-term storage, and low environmental impact.

Because it can be used in fuel cells, hydrogen is expected to be an important energy carrier in the future. Fuel cells use less energy than internal combustion engines, have no moving parts, and emit no pollutant gases. The hydrogen economy remains the most important hydrogen production issue in order to reap the benefits of hydrogen fuel. As a result, renewable energy sources should be used to generate hydrogen at a low cost.

In general, there are three types of hydrogen production processes. Methods such as electrochemistry, biology, and thermochemistry are used. All of these methods can be implemented on a sustainable basis. In the case of electrochemical methods, electricity must then be generated using renewable energy sources.

At the moment, the primary source of hydrogen production is based on fossil fuels. The hydrogen production efficiency ranges from (65% to 75%) when using the steam reforming process of methane. Steam reforming is a highly endothermic reaction in which a hydrocarbon or alcohol reacts with water at

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7.

PRODUCTION OF METHANOL

Methanol, often known as methyl alcohol is one of the most crucial chemical raw materials. In the chemical industry, methanol is employed as a solvent or starting material for synthesis in around 65% of cases. The remaining portion is used for energy and fuel. The formaldehyde industry uses the most of it followed by the acetic acid industry.

Methanol is a liquid with relatively high polarity and medium vapor pressure at room temperature. It is colorless and can be used as a standard organic solvent, dissolving substances with high and medium polarity. It is miscible with water, alcohols, and various organic solvents, as well as, to a lesser extent, oils and fats. It is a well-known chemical, and detailed information about its chemical properties can be found in the literature. Table displays a selection of the key physical data (Ullmann's Encyclopedia)

methanol, ethanol, higher alcohols, other oxygen containing organic compounds, and varying amounts of paraffins are present.

Organic substances that are water soluble degrade quickly biologically. The insoluble substances can be safely incinerated in a standard waste incineration unit. This residual water is sometimes subjected to additional distillative purification. The resulting mixture of alcohols, esters, ketones, and aliphatics can be added to carburetor fuel in small amounts.

The spent catalysts contain auxiliary agents and supports, as well as active components such as copper, nickel, cobalt and molybdenum. These metals are typically recovered or used in other ways.

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Raşit Arsoy - Gabil Abdulla



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İçindekiler

Ön Söz.....	iii
1. Genel Bilgiler	1
1.1. Teknik Resimde Standardizasyon.....	1
1.2. Resim Kâğıdı Formatları [11].....	1
1.3. Antetler [11].....	3
1.4. Ölçek.....	4
1.5. Çizgiler	6
1.6. Yazılar.....	8
1.7. Tercih Edilen Ölçüler Sistemi.....	9
1.8. Çizim Enstrümanları	11
1.9. Ödevler	13
2. Çizimlerin Ölçülendirilmesi	15
2.1. Ölçüleri Uygulamak İçin Genel Kurallar.....	15
2.2. Doğrusal Ölçülerin Uygulanması.....	18
2.3. Açısal Ölçülerin Uygulanması.....	19
2.5. Konikliklerin Ölçülendirilmesi	25
2.6. Eğimlerin Ölçülendirilmesi.....	27
2.7. Ölçülendirme Çeşitleri.....	30
2.8. Ödevler	31
3. Tolerans ve Geçmeler, Yüzey Kalitesi, Şekil ve Konum Toleransları	39
3.1. Tolerans ve Geçmeler	39
3.1.1. Ölçü tolerans ve geçmelerinin ölçülendirilmesi.....	41
3.1.2. Ölçü toleranslarının teknik resimlerde gösterilmesi.....	47
3.1.2.1. Doğrusal ölçü toleranslarının teknik resimlerde gösterilmesi	47
3.1.2.2. Açısal ölçü toleranslarının teknik resimlerde gösterilmesi.....	48
3.1.2.3. Montaj resimlerinde toleransların gösterilmesi	49
3.1.2.4. Toleransları teknik resimde gösterilmeyen ölçülerin standart sapmalarının gösterilmesi	49
3.1.3. Geçme sisteminin, boyut kalitesinin ve geçmelerin seçimi	51

3.1.3.1. Geçme sisteminin seçimi	51
3.1.3.2. Boyut kalitelerinin seçimi	51
3.1.3.3. Geçmelerin seçimi	51
3.2. Yüzey Kalitesi	52
3.3. Şekil ve Konum Toleransları	64
3.3.1. Şekil toleransları	65
3.3.2. Konum toleransları	66
3.3.3. Yalpalama (Toplam tolerans)	68
4. Geometrik Çizimler	71
4.1. Geometrik Şekiller	71
4.1.1. Nokta	71
4.1.2. Düz ve eğrisel çizgiler	72
4.1.3. Düzlemde iki düz çizginin karşılıklı konumu	72
4.1.4. Çizgi parçası. Işın	73
4.1.5. Çember, daire.	73
4.1.6. Açı	75
4.1.7. Elips	76
4.1.8. Kırık çizgi	76
4.1.9. Çokgenler	77
4.1.10. Üçgenler	77
4.1.11. Dörtgenler	78
4.1.12. Geometrik cisimler	79
4.2. Geometrik Çizimler	81
4.2.1. Paralel ve dik çizgilerin çizimi	82
4.2.2. Doğru parçalarının eşit parçalara bölünmesi	83
4.2.3. Bir çemberi eşit parçalara bölmek	85
4.2.4. Teğetlerin çizilmesi	86
4.2.5. Doğru ve yayların yaylarla birleştirilmesi	90
4.2.5.1. Bir köşenin kenarlarının yayla birleştirilmesi	91
4.2.5.2. Daire ile doğrunun yayla birleştirilmesi	93
4.2.5.3. Dairelerin yaylarla birleştirilmesi	96
4.2.6. Örnek çözümü	98
4.3. Yay Eğrilerinin Çizimi	101
4.3.1. Oval çizimi	101
4.3.2. Spirallerin çizimi	104
4.4. Pistole Eğrilerinin Çizimi	107
4.4.1. Elips çizimi	108
4.4.2. Parabol	112

4.4.3.	Arşimet spirali	113
4.4.4.	Evolvent eğrisi.....	114
4.4.5.	Sikloit eğrisi	115
4.4.6.	Episikloit eğrisi.....	117
4.4.7.	Hiposikloit eğrisi.....	118
4.4.8.	Helis eğrisi.....	119
4.5.	Ödevler	121
5.	Ortogonal (Dik Grafik) İzdüşüm	123
5.1.	Giriş.....	123
5.2.	Nokta, Doğru ve Yüzeylerin İzdüşümleri ve İzdüşümlerinin Dönüştürülmesi Yöntemleri.....	126
5.2.1.	Noktanın izdüşümleri.....	129
5.2.2.	Doğruların izdüşümleri	132
5.2.3.	Düzlemlerin izdüşümleri.....	134
5.2.4.	Düzlem üzerindeki nokta ve doğrular	137
5.2.5.	Doğrunun düzlemle kesişmesi	141
5.2.6.	Doğruların gerçek boyutları	142
5.2.7.	Düzlemlerin gerçek boyutları.....	143
5.3.	Ödevler	147
6.	Perspektif	155
6.1.	Paralel Perspektif	155
6.1.1.	İzometrik perspektif.....	158
6.1.2.	Dimetrik perspektif	159
6.1.3.	Eğik (kabinet) perspektif.....	161
6.1.4.	Trimetrik perspektif	162
6.2.	Merkezî (konik) Perspektif	168
6.3.	Ödevler	177
7.	Geometrik Cisim ve Parçaların İzdüşümleri	187
7.1.	Basit Geometrik Cisimlerin İzdüşümleri	188
7.2.	Basit Geometrik Figür Üzerinde Yerleşmiş Noktaların İzdüşümleri	191
7.3.	Basit Cisimlerden Oluşturulmuş Grubun İzdüşümlerinin Çizilmesi.....	195
7.4.	Parçanın Perspektif Şekline Göre İzdüşümlerinin Çizilmesi	197
7.5.	Parça İzdüşümleri ve Perspektif Görünümlerinin Çizilmesi	199
7.6.	Ödevler	202

8. Cisimlerin Düzlemlerle Kesilmesi ve Yüzey Açılımlarının Çizimi.....	209
8.1. Düzlemle Kesilmiş Parçaların İzdüşümlerinin ve Perspektif Görünümlerinin Çizimi.....	209
8.2. Parça Yüzeylerinin Açılımının Çizimi.....	214
8.3. Ödevler	223
9. Figür Yüzeylerinin Karşılıklı Kesişmeleri	229
9.1. Giriş	229
9.2. Figür Yüzeylerinin Karşılıklı Kesişmeleri.....	230
9.3. Ödevler	238
10. Görünümler ve Kesitler. Ortogonal Kesitler	241
10.1. Görünümler.....	241
10.2. Kesit Alanlarının Taranması.....	245
10.3. Kesit Düzlemi ve Kesitler.....	247
10.4. Ödevler	257
11. Görünümler ve Kesitler. Özel Kesitler.	265
11.1. Özel Kesitler	265
11.2. Ödevler	267
12. Teknik Şemaların Çizimi.....	273
12.1. Giriş	273
12.2. Kinematik Şemalar	273
12.3. Hidrolik ve Pnömatik Şemaların Çizimi	283
12.4. Elektrik Devre Şemaları.....	292
13. Parçaların İmalat Teknik Resmi.....	295
13.1. Parça İmalat Teknik Resminin Çizim Kuralları.....	295
13.2. Standart Makine Parçalarının Teknik Resimleri	298
13.3. Kasnakların Teknik Resminin Çizilmesi	314
13.4. Standart Boruların Teknik Resminin Çizilmesi	316
13.5. Standart Yayların Teknik Resminin Çizilmesi	317
14. Birleştirme Elemanları.....	323
14.1. Giriş	323
14.2. Sökülebilen Birleştirmeler	324
14.2.1. Vidalı birleştirmeler	324
14.2.2. Kama birleştirmeleri	329

14.2.3. Kamalı mil birleştirmeleri.....	331
14.3. Sökülemeyen Birleştirmeler.....	335
14.3.1. Perçin birleştirmeleri.....	335
14.3.2. Kaynak birleştirmeleri.....	338
14.3.3. Lehimleme birleştirmeleri.....	344
14.3.4. Parçaların yapıştırma ile birleştirilmesi.....	346
14.3.5. Presleme ile üretilen montaj birimlerinin teknik resimde gösterilmesi	347
15. Genel Görünüm ve Montaj Resmi Uygulamaları.....	349
15.1. Ürünün Genel Görünüm Teknik Resmi	349
15.2. Montaj Teknik Resimleri	350
15.3. Şartname	351
15.4. Montaj Resimlerinin Okunması ve Parçaların Tanımı.....	354
15.5. Montaj Resmi Uygulamaları.....	355
15.6. Ödevler	369
Kaynaklar	375

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İÇİNDEKİLER

ÖN SÖZ	v
YAZARLAR HAKKINDA.....	xiii

1. BÖLÜM

MAKİNE ÖĞRENMESİ NEDİR?	1
Serkan Savaş, Selim Buyrukoğlu	1
1. MAKİNE ÖĞRENMESİ.....	2
1.1. Denetimli Öğrenme	4
1.2. Tekil Öğrenme Algoritmaları	5
1.3. Topluluk Öğrenme Algoritmaları.....	7
1.3.1. Torbalama (Bagging).....	8
1.3.2. Artırma (Boosting).....	9
1.4. Denetimsiz Öğrenme.....	11
1.5. Temel Python Kütüphaneleri ve Komutları.....	13
2. SONUÇ	17
KAYNAKÇA.....	18

2. BÖLÜM

DOĞRUSAL REGRESYON MODELİ

Yıldıran Yılmaz	21
1. GİRİŞ	23
2. MATERYAL VE METODOLOJİ	24
2.1. Doğrusal Regresyon Yöntemi	25
2.2. Python Programlama Dilinde Pratik Doğrusal Regresyon Uygulaması: Şifreli TCP Paketlerinin Ağ Protokolünde Aktarım Süresi Tahmini.....	28
2.2.1. Doğrusal Regresyon Makine Öğrenmesi Tekniğinin Python Uygulaması	28
3. UYGULAMA SONUÇLARI.....	31
3.1. Sonuçları Görselleştirme	31
4. TARTIŞMA	33
5. SONUÇ	33
KAYNAKÇA.....	34

3. BÖLÜM

LOJİSTİK REGRESYON MODELİ	37
Muhammed Mutlu Yapıcı	37
1. GİRİŞ	39
2. LİNEER MODEL	41
2.1. Hata Fonksiyonu	44
3. LOJİSTİK MODEL.....	46
3.1. Hata Fonksiyonu	55
4. LOJİSTİK REGRESYON MODEL TASARIMI.....	59

4. BÖLÜM

NAIVE BAYES SINIFLANDIRICISI.....	69
Serkan Savaş.....	69
1. BAYES TEOREMİ VE NAIVE BAYES SINIFLANDIRICISI.....	70
1.1. Sıfır Frekans Problemi	75
2. NAIVE BAYES TÜRLERİ.....	75
2.1. Gauss Naive Bayes (Gaussian Naive Bayes)	75
2.2. Çok Terimli Naive Bayes (Multinomial Naive Bayes)	75
2.3. Bernoulli Naive Bayes	76
2.4. Tamamlayıcı Naive Bayes (Complement Naive Bayes)	76
2.5. Kategorik Naive Bayes (Categorical Naive Bayes).....	77
2.6. Bayes Ağları (Bayesian Networks)	77
3. AVANTAJLARI VE DEZAVANTAJLARI.....	78
3.1. Avantajları.....	79
3.2. Dezavantajları	79
4. KULLANILDIĞI ALANLAR VE UYGULAMALARI.....	79
5. ÖRNEK UYGULAMA.....	81
6. SONUÇ	87
KAYNAKÇA.....	88

5. BÖLÜM

DESTEK VEKTÖR MAKİNESİ.....	93
Rukiye Karakiş	93
1. DOĞRUSAL DESTEK VEKTÖR MAKİNESİ	95
1.1. Yumuşak Marj.....	97
1.2. Doğrusal Olmayan Kerneller.....	97
2. DESTEK VEKTÖR MAKİNESİ SINIFLANDIRICISI	98
2.1. Kuadratik Programlama Yaklaşımları	99
2.1. Modern Yaklaşımlar.....	101

3. ÇOK SINIFLI DESTEK VEKTÖR MAKİNESİ.....	101
4. AVANTAJLARI VE DEZAVANTAJLARI.....	102
4.1. Avantajları.....	102
4.2. Dezavantajları	102
5. KULLANIM ALANLARI VE UYGULAMALARI.....	103
6. ÖRNEK UYGULAMA.....	104
7. SONUÇ	114
KAYNAKÇA.....	115

6. BÖLÜM

KARAR AĞAÇLARI	119
İhsan Tuğal	119
1. GİRİŞ	120
2. KARAR AĞACI OLUŞTURMA	122
2.1. Entropi.....	123
2.2. Bilgi Kazancı.....	124
2.3. Gini İndeks.....	125
2.4. Sınıflama Hatası	126
3. POPÜLER KARAR AĞACI OLUŞTURMA ALGORİTMALARI	126
3.1. ID3	126
3.2. C4.5.....	127
3.3. CART	127
3.4. CHAID	127
3.5. QUEST.....	127
3.6. SLIQ.....	128
3.7. SPRINT	128
4. KARAR AĞAÇLARININ OLUMLU VE OLUMSUZ YÖNLERİ	128
4.1. Avantajlar	128
4.2. Dezavantajlar.....	129
5. ÖRNEK UYGULAMA.....	129
6. PYTHON UYGULAMASI.....	141
7. SONUÇ	146
KAYNAKÇA.....	147

7. BÖLÜM

RASTGELE ORMAN.....	149
Ayşe Doğru.....	149
1. GİRİŞ	151
1.1. Hiper-Parametre Ayarları	151
1.2. Çalışma Modeli	152
1.3. Rastgele Orman Makine Öğrenmesi Modelinin Olumlu Yönleri.....	153
1.4. Rastgele Orman Makine Öğrenmesi Modelinin Olumsuz Yönleri	154
1.5. Uygulama Alanları	154
2. ÖRNEK UYGULAMA SINIFLANDIRMA	154
3. ÖRNEK UYGULAMA REGRESYON	157
4. ÖRNEK UYGULAMA REGRESYON	159
5. SONUÇ	163
KAYNAKÇA.....	163

8. BÖLÜM

ADABOOST ALGORİTMASI	165
Osman Güler.....	165
1. GİRİŞ	167
2. KULLANILDIĞI ALANLAR VE UYGULAMALARI.....	175
3. AVANTAJLARI VE DEZAVANTAJLARI.....	176
3.1. Avantajları.....	176
3.2. Dezavantajları	177
4. ÖRNEK UYGULAMA.....	177
5. SONUÇ	178
KAYNAKÇA.....	179

9. BÖLÜM

AŞIRI GRADYAN ARTIRMA	183
Selim Buyrukoğlu.....	183
1. GİRİŞ	184
2. AŞIRI GRADYAN ARTIRMA- EXTREME GRADIENT BOOSTING (XGBoost).....	186
2.1. Gradyan Artırma (Gradient Boosting).....	186
2.2. Aşırı Gradyan Artırma-Extreme Gradient Boosting (XGBoost).....	187
2.3. XGBoost Algoritmasının Avantaj ve Dezavantajları	188
2.3.1. Avantajları.....	188
2.3.2. Dezavantajları	188
2.4. Modellerin Performans Değerlendirmesi	189

3. ÖRNEK UYGULAMA.....	189
3.1. Regresyon Problemi için XGBoost	189
3.2. Sınıflandırma Problemi için XGBoost	192
4. SONUÇ	194
KAYNAKÇA.....	195

10. BÖLÜM

K-ORTALAMA KÜMELEME.....	199
Mohammed Rashad Baker.....	199
1. GİRİŞ	201
2. ÖRNEK UYGULAMA.....	205
3. SONUÇ	220
KAYNAKÇA.....	220

11. BÖLÜM

K-EN YAKIN KOMŞU ALGORİTMASI	223
Resul Bütüner, M. Hanefi Calp	223
1. K-EN YAKIN KOMŞU ALGORİTMASI.....	225
1.1. KNN Algoritmasında Kullanılan Uzaklık Hesaplama Yöntemleri	227
1.1.1. Öklid Uzaklığı.....	227
1.1.2. Şehir Mesafe Uzaklığı (Manhattan Uzaklığı)	228
1.1.3. Minkowski Uzaklığı.....	228
1.1.4. Chebyshev Uzaklığı.....	229
1.2. Komşu Sayısı (k).....	229
1.3. Ağırlıklandırma	230
2. KULLANILDIĞI ALANLAR VE UYGULAMALARI.....	230
3. ÖRNEK UYGULAMA.....	232
4. SONUÇLAR	247
KAYNAKÇA.....	248

12. BÖLÜM

TEMEL BİLEŞENLER ANALİZİ.....	251
Gonca Buyrukoğlu.....	251
1. GİRİŞ	253
1.1. Uygulama Veri Seti (PPMI data)	255
2. ÖRNEK UYGULAMA.....	256
3. SONUÇ	261
KAYNAKÇA.....	262

13. BÖLÜM**DOĞRUSAL OLMAYAN SİSTEMLERDE VERİ TAHMİN YÖNTEMLERİ
ve ÖRNEK UYGULAMA..... 263**

Nihat Daldal.....	263
1. GİRİŞ	265
2. MATLAB ORTAMINA TABLO VERİLERİNİN ALINMASI.....	268
3. LİNEER OLMAYAN SENSÖRLERDE TAHMİN YÖNTEMLERİ.....	269
3.1. Curve Fitting (Eğri Uydurma) Yöntemi ile Tahmin.....	269
3.1.1. Polinom Komutu Kullanarak Denklem Oluşturmak	270
3.1.2. Curve Fitting Toolbox ile Denklem Elde Etmek.....	271
3.2. Yapay Sinir Ağları ile Tahmin	274
3.3. MATLAB YSA Kodunun Mikroişlemci Yazılımına Çevrilmesi.....	280
4. SONUÇ	282
KAYNAKÇA.....	282
ÖZ GEÇMİŞLER.....	283
SON NOT.....	287

MAKİNE ÖĞRENMESİ NEDİR?

Serkan Savaş, Selim Buyrukoğlu

ÖZET

Bu bölümde, makine öğrenmesi ile alakalı genel bilgilere yer verilmiştir. İlk olarak, denetimli öğrenmenin ne olduğu ve hangi amaçla kullanıldığı açıklanmıştır. Sonrasında, denetimli öğrenme algoritmaları tekil ve topluluk öğrenme algoritmaları olarak iki farklı bölümde anlatılmıştır. Topluluk öğrenme algoritmaları olarak torbalama ve artırma algoritmalarının çalışma prensibinden bahsedilmiştir. Denetimli öğrenmeden sonra denetimsiz öğrenmenin çalışma prensibi anlatılmış ve bu sınıfa ait algoritmalar listelenmiştir. Son olarak, temel Python kütüphaneleri ve komutlarından bahsedilmiştir.

Anahtar Kelimeler: Makine Öğrenmesi, Torbalama, Artırma, Python kütüphaneleri

WHAT IS MACHINE LEARNING?

ABSTRACT

In this section, general information about machine learning is given. Initially, the meaning of supervised learning and the purpose of using it is explained. Afterward, supervised learning algorithms are explained in two different sections as single-based and ensemble-based learning algorithms. The working principle of bagging and boosting algorithms as ensemble learning algorithms is mentioned. After the supervised learning, the working principle of unsupervised learning is explained and the algorithms belonging to this class are listed. Finally, basic Python libraries and commands are mentioned.

Keywords: Machine Learning, Bagging, Boosting, Python Libraries

Günümüzde farklı problemler için farklı algoritmalar kullanılmaktadır. Algoritmalar tekil olarak kullanılabilirken, çoklu öğrenme algoritmalarını kullanım da gün geçtikçe yaygınlaşmaktadır.

Son yıllarda makine öğrenmesi algoritmalarının elde etmiş oldukları yüksek doğruluklu başarımlar sayesinde tüm disiplinlerin bu algoritmalara ve tekniklere olan ilgileri katlanarak artmıştır. Hemen hemen tüm alanlarda çok disiplinli çalışmalar gerçekleştirilirken, makine öğrenmesi algoritmalarının kullanımı çok geniş bir yelpazeye yayılmış durumdadır. Bu bölümde makine öğrenmesi ile ilgili temel bilgiler verilmiş olup kitabın ilerleyen bölümlerinde algoritmalar örneklerle birlikte açıklanmıştır.

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2. BÖLÜM

DOĞRUSAL REGRESYON MODELİ

Yıldıran Yılmaz

ÖZET

Bu bölüm, farklı boyutlara sahip şifrelenmiş verilerin TCP protokolü üzerinde gönderilirken iletim süresini tahmin eden doğrusal regresyon modelini kullanmaktadır. Bu doğrultuda konunun daha iyi anlaşılabilmesi için doğrusal regresyonun temelleri açıklanmakta ve Python programlama dilindeki uygulaması yapılmaktadır. Regresyon analizi, makine öğrenimindeki en önemli ve en yaygın alanlardan biridir. Doğrusal regresyon, belirli bir bağımsız değişken seti ile bağımlı bir değişken arasındaki ilişkileri modellemek için kullanılan istatistiksel bir makine öğrenmesi yöntemidir. Kullanılan veri seti, Cooja ağ simülatöründe oluşturulan, farklı boyutlarda şifrelenmiş verilerin TCP protokolünde aktarım sırasındaki iletim süreleri içermektedir. Sonuç olarak şifreleme yoluyla güvence altına alınan farklı veri boyutları için iletim süreleri değişkenindeki değişimin doğrusal regresyon modeli ile %98'inin girdi değişkenleri tarafından açıklanabildiği ortaya çıkmıştır. Deneysel sonuçlar R-squared değerinin 0.98 olduğunu göstermektedir ve buna göre doğrusal regresyon modelinin gözlemlenen verileri ne kadar iyi açıkladığı anlaşılmaktadır.

Anahtar Kelimeler: Makine öğrenmesi, Doğrusal Regresyon modeli, İletim süresi tahmini, TCP/IP packet, IPsec network.

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4. BÖLÜM

NAIVE BAYES SINIFLANDIRICISI

Serkan Savaş

ÖZET

Naïve Bayes (NB) sınıflandırıcısı, matematikçi Thomas Bayes'in olasılık kuramı için önemli bir teorem olan Bayes Teoremi'nden adını almaktadır. Sınıflandırıcı, bir öznitelik değerinin belirli bir sınıf üzerindeki etkisinin diğer özniteliklerin değerlerinden bağımsız olduğunu varsayar. Bu varsayım, hesaplamaları basitleştirmek için kullanılır ve sınıf koşullu bağımsızlık adını alır. Gauss, çok terimli, Bernoulli, tamamlayıcı, kategorik gibi türleri olan NB sınıflandırıcısı, doğal dil işleme, sağlık sistemleri, ticaret, endüstri, siber güvenlik, vb. gibi pek çok alanda başarılı bir şekilde kullanılmaktadır. Bu nedenle kitabın bu bölümünde NB sınıflandırıcısı tüm yönleriyle ele alınmış ve Iris veri kümesi üzerinde bir uygulama gerçekleştirilerek sonuçları açıklanmıştır. Çalışmada gerçekleştirilen uygulama adımları izlenerek farklı veri kümeleri üzerinde işlemler yapılabilir. Başarılı sonuçları nedeniyle tekil olarak uygulamalarda kullanılabilir ve/veya farklı makine öğrenmesi algoritmalarıyla karşılaştırmalı çalışmalar da gerçekleştirilebilir.

Anahtar Kelimeler: Naive Bayes, Makine Öğrenmesi, Gauss Naive Bayes, Bayes Teoremi

NAIVE BAYES CLASSIFIER

ABSTRACT

The Naïve Bayes (NB) classifier is named after the Bayes Theorem, an important theorem for mathematician Thomas Bayes' theory of probability. The classifier assumes that the effect of an attribute value on a given class is independent of the values of other attributes. This assumption is used to simplify calculations and is called class conditional independence. The NB classifier, which has types such as Gauss, polynomial, Bernoulli, complementary, and categorical, has been used

nin önemine değinmiştir. NB sınıflandırıcısı adını Thomas Bayes'ten almış ve sınıf koşullu bağımsızlık varsayımı nedeniyle de naif (saf) olarak adlandırılmıştır. Olasılık tabanlı çalışan bu sınıflandırıcının farklı problemler için uyarlanmış türleri vardır. Örneğin ikili sınıflandırma işlemleri için Bernoulli NB kullanılabilirken, çok sınıflı çalışmalarda Gauss NB kullanılabilir.

Nicel ve ayrık verileri yönetme, izole gürültülere dayanıklılık, hız, verimlilik, performans, kolay uygulanabilirlik, ikili veya çok sınıflı verilere uyarlanabilirlik gibi pek çok avantajı bulunan NB sınıflandırıcısının, sıfır frekans problemi ve bağımsızlık varsayımı gibi sınırlılıkları da bulunmaktadır. Ancak avantajları, dezavantajlarına nazaran daha fazla olan NB sınıflandırıcısı farklı pek çok probleme uyarlanabilir ve başarılı sonuçlar elde edilebilir.

Bu bölümde NB sınıflandırıcı için global bir veri kümesi (Iris) üzerinde uygulama gerçekleştirilmiş ve adım adım sonuçları açıklanmıştır. Farklı global veri kümeleri veya özel veri kümeleri de kullanılarak benzer çalışmalar gerçekleştirilebilir.

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DESTEK VEKTÖR MAKİNESİ

Rukiye Karakış

ÖZET

Destek Vektör Makinesi (DVM), sınıflandırma ve regresyon problemlerinde kullanılan verileri denetimli analiz eden bir Makine Öğrenimi (Machine Learning: ML) modelidir. İki sınıflı etiketli bir verisetindeki örnekleri kategorize etmek için geliştirilen herhangi bir doğrusal sınıflandırıcı, en çok karar sınırına yakın örnekleri ayırt etmekte zorlanmaktadır. Vapnik ve arkadaşları tarafından geliştirilen DVM, bu problemi çözerken tüm örnekler için sınıflar arasındaki mesafeyi maksimize edecek optimum bir karar sınırı bulmaya çalışmaktadır. Bu sebeple, eğitim kümesindeki her bir örnek, kategoriler arasındaki boşlukları maksimize etmek için uzaydaki noktalara eşlenmektedir. Yeni bir örnek geldiğinde ise önce bu öznelik uzayına eşlenmektedir ve ardından karar sınırına göre hangi kategoriye ait olduğu tahmin edilmektedir. Kitabın bu bölümünde, tıpta, biyolojide, doğal dil işlemede, tek boyutlu ya da çok boyutlu ses, görüntü, video gibi sinyallerin ve zaman serilerinin analizinde başarılı sonuçlar elde eden DVM'in teorik detayları aktarılmıştır. Ayrıca, son yıllarda pek çok problemin çözümünde başarılı sonuçlar elde eden bir ML yaklaşımı olan evrişimsel sinir ağı (ESA) modeli ile DVM tekniğinin hibrit olarak birleştirildiği bir uygulama okuyuculara aktarılmıştır.

Anahtar Kelimeler: Destek Vektör Makinesi, Makine Öğrenmesi, Öznelik Çıkarımı, Hibrit Sınıflandırma

doğru öznitelik analizleri ve boyut indirme operasyonları sonrasında DVM performans sonuçları iyileşebilir. Hiperparametre ya da kernel seçimi adımları optimizasyon teknikleri ile belirlenebilir.

Son yıllardaki araştırmalarda, veri kümesinin öznitelik seçim işlemleri derin öğrenme modelleri ile gerçekleştirilmektedir ve ardından bu modellerden elde edilen özniteliklerle DVM modeli eğitilmektedir. Sonuç olarak, hibrit yaklaşımların kullanımı sınıflandırma performansını artırıcı etkiye sahiptir.

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KARAR AĞAÇLARI

İhsan Tuğal

ÖZET

Ağaca benzer modeliyle sınıflandırma ve regresyon problemlerinin çözümüne destek sağlayan yapılar karar ağaçlarıdır. Tahmin veya sınıflandırma için verideki hangi niteliklerin daha önemli olduğuna dair net bir gösterge sağlar. Karar süreçlerinde karmaşık verileri daha anlaşılabilir parçalara ayırdığı, makine öğrenmesi problemlerine çözüm ürettiği için çok kullanışlıdır. Bu yüzden makine öğrenmesinde kullanımı oldukça fazladır. Bu bölümde karar ağaçları anlaşılır bir şekilde anlatılmaya çalışıldı. Karar ağaçlarının önemi, nasıl oluşturulduğu, kullanılan farklı algoritmaları, avantaj ve dezavantajlarından bahsedildi. Örnek veri ile karar ağacı oluşturmak için hesaplamaların nasıl yapıldığı gösterildi. Python dilinde uygulama geliştirilerek verisetinden karar ağacı oluşturularak, sınıflandırma yapıldı.

Anahtar Kelimeler: Karar Ağaçları, Sınıflandırma, Makine Öğrenmesi, Denetimli Öğrenme, Bilgi Kazancı

DECISION TREES

ABSTRACT

Decision trees are the structures that support the solution of classification and regression problems with a tree-like model. It provides a clear indication of which attributes in the data are more important for prediction or classification. It is very useful in decision processes as it divides complex data into more understandable parts and provides solutions to machine learning problems. Therefore, it is widely used in machine learning. In this section, decision trees have been tried to be explained in an understandable way. The importance of decision trees, how they are created, the different algorithms they use, their advantages and disadvantages are mentioned. It was shown how the calculations were made to create a decision tree with sample data. An application was developed in Python and a decision tree was created from the dataset, and classification was made.

Keywords: Decision Trees, Classification, Machine Learning, Supervised Learning, Information Gain

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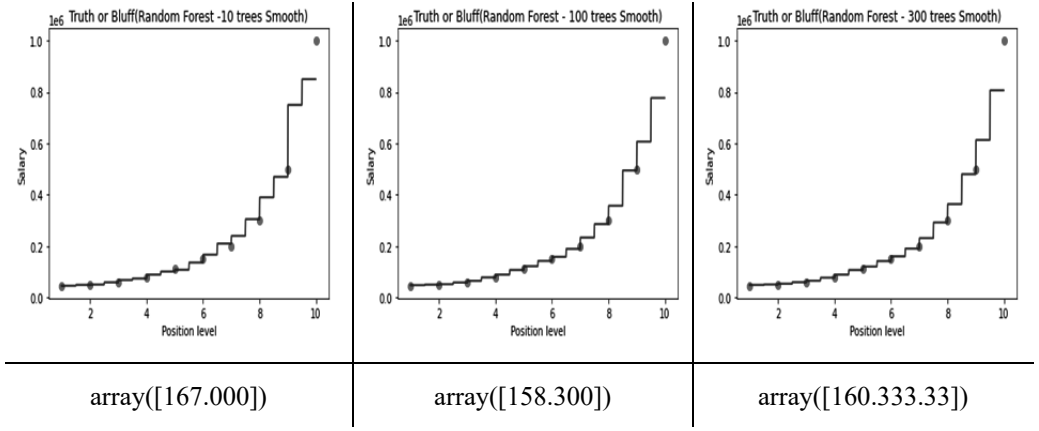
RASTGELE ORMAN

Ayşe Doğru

ÖZET

Gelişen teknoloji ile beraber hızla ilerleme kaydeden makine öğrenmesi algoritmaları gündelik hayatımızda da yerini almaya başlamıştır. Başta medikal, eğitim, finans-bankacılık, e-ticaret, spor, arazi tanımlama ve adli vakalar gibi pekçok farklı disiplin alanlarında sorunların çözülmesini hızlandırıp hem maliyetten hem de zamandan tasarruf etmemize olanak tanımaktadır. Rastgele Orman algoritması birden fazla karar ağacının biraraya gelerek tahminde bulunduğu bir algoritmadır. Bireysel bir model olmayıp toplu tahmin sonuçlarını birleştirip karar veren bir yöntemdir. Büyük ve karmaşık veri setlerinde elde ettiği başarıları, anlaşılır ve esnek olması sayesinde yaygın olarak kullanılan bir model hâline getirmiştir. Ayrıca sürekli ve kategorik tipli veri setlerinde, dengesiz veri setlerinde de oldukça duyarlıdır. Tahmine dayalı problem çözümünde veri bilimciler arasında oldukça popüler bir algoritmadır. Bu çalışmada Rastgele Orman algoritmasının tarihçesi, hiper-parametre ayarları, çalışma modeli, kullanım alanları ve örnek uygulamalar ile genel bilgiler verilmektedir.

Anahtar Kelimeler: Rastgele Orman, Karar Ağaçları, Makine Öğrenmesi, Topluluk Öğrenmesi, Regresyon, Sınıflandırma



Şekil 3: Regresyon Problemi Sonuç Tahmini Grafiksel Gösterimi-2

5. SONUÇ

Geleneksel yöntemlerle saptanması zor olan veri ilişkilerinin tespit edilip, yorumlanması ve anlamlı sonuçlar çıkarılması makine öğrenmesi algoritmalarının daha çok tercih edilmesini sağlamıştır. RO makine öğrenmesi algoritması, sınıflandırma ve regresyon problemlerinden elde edilen doğruluk tahmin performansları incelendiğinde en başarılı yöntemler arasında bulunmaktadır. Çeşitli disiplin alanlarına hitap etmesi sebebiyle birçok veri bilimcinin ilgisini çekebilmiştir. Aşırı uydurma sorunun en aza indirgenmesi, varyansın azalması ve artan doğruluk tahmini değeri algoritmayı popüler hâle getirmiştir. Modelin tahmin performansını arttırmak için hiper-parametre ayarlarının yapılması önemli rol oynamaktadır.

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ADABOOST ALGORİTMASI

Osman Güler

ÖZET

Bir topluluk öğrenme modeli olan AdaBoost algoritması, Yoav Freund ve Robert Schapire, tarafından sınıflandırma problemlerinde daha düşük hata oranı elde etmek ve sınıflandırma modelinin başarımının artırılması amacıyla önerilmiştir. Zayıf öğrenciler üzerine odaklanan AdaBoost algoritması, doğru sınıflandırılmayan zayıf öğrencilerin ağırlıklarını artırarak daha güçlü bir tahmin modeli elde etmektedir. AdaBoost algoritması sağlık alanı başta olmak üzere finans, karar destek sistemleri, tahmin sistemleri, siber güvenlik, optik karakter tarama vb. birçok alanda sınıflandırma problemlerinin çözümünde yaygın olarak kullanılmaktadır. Kitabın bu bölümünde AdaBoost algoritması, çalışma prensibi, avantajları ve dezavantajları ile kullanım alanları ele alınmış olup, örnek bir veri seti üzerinden bir sınıflandırma uygulaması ve algoritmanın modellenmesi açıklanmıştır. Başarılı sonuçlar elde eden AdaBoost algoritması, farklı modeller ile birleştirilebilir. Ayrıca farklı veri setleri üzerinde de uygulamalar yapılabilir.

Anahtar Kelimeler: AdaBoost, Boosting, Topluluk Öğrenmesi, Yapay Zekâ, Makine Öğrenmesi

AdaBoost algoritması, özellikle ikili sınıflandırma problemlerinde etkili sonuçlar elde etmektedir. AdaBoost algoritması yapısı gereğiyle aşırı öğrenmeye karşı duyarlıdır, veri ve sonuç ezberleme oranı düşüktür. Esnek bir yapıya sahip olduğu için diğer modeller ile uyum sağlayabilir. Aynı zamanda kullanım kolaylığı ve parametre değişimi açısından diğer modellere göre avantajlıdır. Bu avantajları sayesinde yaygın olarak kullanılmaktadır. Avantajlarının yanında AdaBoost algoritmasının hassas olduğu noktalar da vardır. Başarılı sonuçlar elde etmek için, büyük ve kaliteli bir verisetine ihtiyaç duymaktadır. Verisetinde aykırı değerlerden ve gürültülü verilerden kaçınılmalıdır.

Bu bölümde AdaBoost algoritması ile scikit-learn kütüphanesinde bulunan Iris veri seti kullanılarak pythonda model oluşturulması ve eğitimi üzerine bir uygulama gerçekleştirilmiştir. Yapılan denemeler sonucunda %91.11 ile %97.77 arasında test doğruluk sonuçları elde edilmiştir. Farklı verisetleri kullanılarak, AdaBoost algoritması farklı modeller ile kullanılarak farklı alanlarda yeni çalışmalar gerçekleştirilebilir.

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AŞIRI GRADYAN ARTIRMA

Selim Buyrukoğlu

ÖZET

Extreme Gradient Boosting (XGBoost) algoritması Tianqi Chen ve Carlos Guestrin tarafından geliştirilmiştir (Chen & Guestrin, 2016). XGBoost algoritması hem sınıflandırma hemde regresyon problemleri için aktif olarak kullanılmaktadır. XGBoost algoritması en etkili topluluk öğrenme algoritması olarak kabul edilmektedir. XGBoost algoritması sağlık, çevre, tarım, eğitim, finans, spor vb. gibi birçok alanda aktif olarak kullanılmaktadır. Bu bölümde iki farklı XGBoost algoritması regresyon ve sınıflandırma problemlerinin çözümü için ayrı ayrı oluşturulmuştur. Regresyon problem çözümü için bir hava yoluna ait veri seti kullanılmıştır. Sonrasında, tek yönlü uçak bilet fiyatları tahmin edilmiştir. Sınıflandırma problemi için bir diyabet veri seti üzerinde uygulama gerçekleştirilip XGBoost algoritmasının sonucu açıklanmıştır. Sonuç olarak, XGBoost algoritmasının hem regresyon hemde sınıflandırma problemleri için aktif olarak kullanıldığı bu bölümde uygulamalı olarak anlatılmıştır. Farklı veri setleri kullanılarak XGBoost algoritmasını etkisi çeşitli alanlar içinde test edilebilir.

Anahtar Kelimeler: XGBoost, Gradient Boosting, Topluluk Öğrenmesi, Makine Öğrenmesi

zenli hâli olduğundan dolayı ilk olarak Gradient Boosting algoritması açıklanmıştır. Sonrasında, XGBoost algoritması kullanılarak iki farklı uygulama gerçekleştirilip her bir adım ayrı ayrı açıklanmıştır. Birinci uygulama regresyon problemi için gerçekleştirilirken ikinci uygulama sınıflandırma problemi için gerçekleştirilmiştir.

Regresyon problemi için bir hava yoluna ait veri kullanılmıştır ve tek yönlü uçak bilet fiyatları tahmin edilmiştir. Sınıflandırma problemi için ise diyabet hastalığı veri seti kullanılıp bir hastanın diyabet olup olmadığı tahmin edilmiştir. Farklı birçok veri seti kullanılarak XGBoost algoritmasının performansı regresyon ve sınıflandırma problemleri için elde edilebilir.

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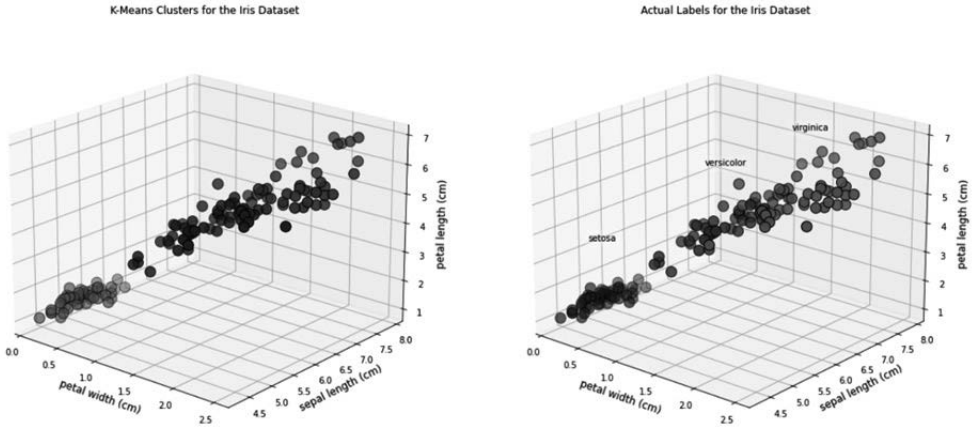
K-ORTALAMA KÜMELEME

Mohammed Rashad Baker

ÖZET

K-ortalama kümeleme tekniđi, bilim dünyasında en etkili ve yaygın olarak kullanılan veri madenciliđi algoritmalarından biri olarak kabul edilmektedir. Bununla birlikte, yutturmacaya rađmen, algoritmanın, beklenmedik yakınsama ile sonuçlanan merkezlerin rastgele başlatılmasıyla ilgili sorunlar gibi sınırlamaları vardır. Ek olarak, böyle bir kümeleme prosedürü, farklı kümelenmelerden sorumlu kümelerin sayısının bir aykırı deđer etkilerinden önceden belirlenmesini gerektirir. K-araç yönteminin bir dizi veri türünü işleyebilmesi, temel bir kusurdur. Bu bölüm, bu eksiklikleri gidermek için k-ortalama algoritması üzerinde yapılan arařtırmaların sistematik ve özlü bir özetini sunar. K-ortalama algoritmalarının gerekçeleri ve son gelişmeleri incelenmekte ve birçok veri setinin ampirik incelemesine dayalı olarak etkinlikleri arařtırılmaktadır. Bu bölüm, ayrıntılı analiz ve çeřitli k-ortalama kümeleme algoritmalarının tam bir karşılařtırmasını kullanan diđer erişilebilir anket çalışmalarıyla karşılařtırılır. Ayrıca, k-araç yönteminin ve çeřitli arařtırma uygulamalarının açık ve kapsamlı bir şekilde anlaşılmasının kısa bir özetini sağlar.

Anahtar Kelimeler: Kümeleme, K-Ortalama Kümeleme, Kategorik Nitelikler, Denetimsiz Öğrenme



Şekil 11: 3D grafik çıktısı

3. SONUÇ

Çok çeşitli uygulama etki alanlarında, veri analizi görevleri ağırlıklı olarak kümelemeye dayanır. Bu bölümde, popüler k-ortalama algoritması ile modeli başlatma ve verileri işleyememe sorunlarına odaklanıldı. Ayrıca k-ortalama kümeleme algoritmasının farklı varyantlarının performansları da gösterilmiştir. K-ortalama kümeleme algoritmasının belirgin güçlü yönlerinden biri, özelliğin sadece kümenin kendisi değil, küme üzerinden de ortalama bir değer vermesidir. Bu durum, segmentasyonla ilgili görüntü işleme görevlerinde, kümeleme sorunu olarak segmentasyonla uğraşırken çok yararlı olabilir. Son olarak bu bölüm aynı zamanda veri madenciliği araştırma topluluğunun Büyük Veri etrafındaki araştırma konularını ele alabilecek yeni tür kümeleme algoritmaları tasarlamasına ve geliştirmesine yardımcı olacaktır (Ahmed, 2019; Wang ve Garibaldi, 2005).

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K-EN YAKIN KOMŞU ALGORİTMASI

Resul Bütüner, M. Hanefi Calp

ÖZET

K-En Yakın Komşu (K-Nearest Neighbor - KNN) algoritması, T. M. Cover ve P. E. Hart tarafından 1967 yılında önerilmiş olup örüntü tabanlı öğrenme veya tembel öğrenme türüdür. Bu algoritmada sınıfları belirlenmiş bir veri kümesindeki verilerden yararlanılmaktadır. Ayrıca tüm makine öğrenmesi yöntemleri içinde en basit yapıya sahip algoritmalardan biridir. KNN algoritmasının işlevi sadece yerel olarak yaklaştırılır ve tüm hesaplama, sınıflandırmaya kadar ertelenir. Ayrıca KNN, eğitim, doğal dil işleme, sağlık sistemleri, askeri, ticaret, endüstri, siber güvenlik, vb. gibi pek çok alanda başarılı bir şekilde kullanılmaktadır. Bu bağlamda, kitabın bu bölümünde KNN algoritması birçok yönüyle ele alınmış, COVID-19'a ait gerçek bir veri kümesi kullanılarak bir uygulama gerçekleştirilmiş ve elde edilen sonuçlar açıklanmıştır. Uygulamada bir bireyin COVID-19 virüsü taşıyıp taşımadığı tahmin edilmiştir. KNN algoritmasından elde edilen başarılı sonuçlar irdelendiğinde, söz konusu algoritma tek başına ve/veya farklı makine öğrenmesi algoritmalarıyla birlikte hibrit bir şekilde karşılaştırmalı olarak kullanılabilir. Elde edilen başarılı sonuçlar ile KNN algoritması ve farklı veri kümeleri kullanılarak, yeni çalışmalar yapılmasına örnek teşkil etmesi beklenmektedir.

Anahtar Kelimeler: K-En Yakın Komşu, Makine Öğrenmesi, COVID-19, Hastalık Tespiti

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TEMEL BİLEŞENLER ANALİZİ

Gonca Buyrukođlu

ÖZET

Bu bölüm Parkinson hastalığında büyük boyutlu veri analizi için temel bileşenler analizi (principal component analysis, PCA) kullanımını tartışmaktadır. PCA boyut indirgeme metotları ailesindedir ve özellikle veri çok değişkenli, büyük (her bir değişken için birden fazla gözlem varsa) ve değişkenler birbirleriyle büyük oranla ilişkiliyse oldukça faydalı bir yöntemdir. Amaç, orijinal veri setini temsil edebilecek nitelikte daha küçük boyutlu veri altkümesinde minimum bilgi kaybı ile bir indirgenmiş değişkenler kümesi belirleyebilmektir. PCA ve diğer boyut indirgeme metotları veriyi özetlemeyi ve kişisel farklılıklar hakkında bilgi çekmeyi sağlar. Bu da boyut indirgeme metodlarını bireysel tedavi ve büyük veri çağında oldukça kullanışlı metotlar yapar. Bu bölümde PCA genel yapısından bahsedilerek, bir uygulama veri setinin nasıl analiz edildiği gösterilmiştir.

Anahtar Kelimeler: Parkinson hastalığı, PPMI verisi, gözetimsiz öğrenme, büyük veri, temel bileşenler analizi

yı artan veri setlerinde ölçeklendirilebilmektedir. Ana bileşenler analizi ölçeklendirilebilme ve büyük boyutlu ve karmaşık verileri temsil edebilme yeteneği açısından büyük veri çağında hâlâ popüler bir yöntem olarak yerini korumaya devam etmesi beklenmektedir.

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DOĞRUSAL OLMAYAN SİSTEMLERDE VERİ TAHMİN YÖNTEMLERİ ve ÖRNEK UYGULAMA

Nihat Daldal

ÖZET

Elektronik kontrol sistemlerinde, sistemi işleten ana işlemci sensörlerden okuduğu verileri değerlendirerek istenilen kontrolü gerçekleştirir. Bu sistemlerde sensörler ölçtüğü büyüklüğe göre doğrusal değişimli bir sinyal üretiyorsa basit bir doğrusal denklem ile sensör sinyalinden ölçtüğü büyüklüğün değeri kolayca öğrenilir ve bu değer durumuna göre istenilen kontrol gerçekleştirilebilir. Ancak sensör doğrusal değilse bu durumda sensörün ölçtüğü fiziksel büyüklüğe göre ürettiği sinyal basit bir matematiksel doğrusal denklem ile modellenemez. Şayet doğrusal denklem ile modellenirse sinyale göre ölçülen büyüklüğün değerinin tahmininde hatalar meydana gelir ve elektronik kontrol sisteminin çalışmasında olumsuz etki oluşturur. Kontrol sisteminin yanlış çalışmasına sebebiyet verebilir. Bu bölümde doğrusal olmayan sensörlerde ölçtüğü büyüklüğün hatasız tahmin edilmesi için polinom yöntemi, eğri uydurma ve yapay sinir ağı ile tahmin modelleri örnek bir uygulama üzerinden anlatılmıştır. Bu yöntemler ile tahmin değerinin minimum hata ile yapılması verilerin sayısına bağlıdır ve veri sayısı arttıkça doğruluk artar. Yapılan bu çalışma gömülü yazılım ile uğraşan mühendisler için örnek bir başvuru kaynağı niteliğindedir.

Anahtar Kelimeler: Sensör Okuma, Veri Tahmini, Polinom Denklemi, YSA, Yapay Zekâ

4. SONUÇ

Bu yazıda, elektronik mühendisliği ve gömülü yazılımda elektronik kontrol devrelerinde doğrusal olmayan sensörlerden veri okunup sensörün ölçtüğü büyüklüğün yüksek doğrulukta tahmin edilebilmesi için kullanılan yöntemlerden bahsedilmiş ve örnek bir PTC sensöründen alınan ölçümlere göre sıcaklık değeri tahmin edilmiştir. YSA ile tahmin modeli veya polinom denklemi ve eğri uydurma ile elde edilen denklem yapılarının tahmin doğruluğu uygulamalarda veri çeşidine göre farklılık göstermekle birlikte, tasarımcı elektronik sistemde kullandığı işlemci özelliğine bağlı olarak en uygun yöntemi kullanarak sensör okumayı yüksek doğrulukta gerçekleştirebilir.

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İçindekiler

Yazar Listesi	iii
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BİRİNCİ BÖLÜM

ANADOLU MUTFAK KÜLTÜRÜ	1
<i>Adem Ademoğlu</i>	1
GİRİŞ	1
1. ANADOLU MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŞİMİ	3
2. ANADOLU MUTFAĞINA ÖZGÜ YİYECEK VE İÇECEKLER	6
3. ANADOLU MUTFAĞINDA ÖĞÜNLER	13
4. ANADOLU MUTFAĞINA AİT GELENEKLER/RİTÜELLER	14
SONUÇ	15
Kaynakça	17

İKİNCİ BÖLÜM

AZERBAYCAN MUTFAK KÜLTÜRÜ	23
<i>Duygu Kırmızıkuşak</i>	23
GİRİŞ	23
1. AZERBAYCAN MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŞİMİ	25
2. AZERBAYCAN MUTFAĞINA ÖZGÜ YİYECEK VE İÇECEKLER	27
3. AZERBAYCAN MUTFAĞINDA ÖĞÜNLER	29
4. AZERBAYCAN MUTFAĞINA AİT GELENEKLER/RİTÜELLER	29
SONUÇ	36
Kaynakça	37

ÜÇÜNCÜ BÖLÜM

DOĞU TÜRKİSTAN MUTFAK KÜLTÜRÜ	39
<i>Hasan Önal Şeyhanlıođlu</i>	39
GİRİŞ	39
1. DOĐU TÜRKİSTAN MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŐİMİ	41
2. DOĐU TÜRKİSTAN MUTFAĐINA ÖZGÜ YİYECEK VE İÇECEKLER....	42
3. DOĐU TÜRKİSTAN MUTFAĐINA AİT GELENEKLER/RİTÜELLER.....	46
SONUÇ	48
Kaynakça.....	49

DÖRDÜNCÜ BÖLÜM

GAGAUZ MUTFAK KÜLTÜRÜ	53
<i>Merve Sema Yiđit Tekinçay</i>	53
GİRİŞ	53
1. GAGAUZ MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŐİMİ	55
2. GAGAUZ MUTFAĐINA ÖZGÜ YİYECEK VE İÇECEKLER.....	56
3. GAGAUZ MUTFAĐINDA ÖĐÜNLER	60
4. GAGAUZ MUTFAĐINA AİT GELENEKLER/RİTÜELLER	60
SONUÇ	64
Kaynakça.....	64

BEŐİNCİ BÖLÜM

KAZAKİSTAN MUTFAK KÜLTÜRÜ	67
<i>Cihan Canbolat</i>	67
GİRİŞ	67
1. KAZAKİSTAN MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŐİMİ	69
2. KAZAKİSTAN MUTFAĐINA ÖZGÜ YİYECEK VE İÇECEKLER.....	70
3. KAZAKİSTAN MUTFAĐINDA ÖĐÜNLER.....	71
4. KAZAKİSTAN MUTFAĐINA AİT GELENEKLER VE RİTÜELLER	71
SONUÇ	74
Kaynakça.....	75

ALTINCI BÖLÜM

KUZEY KIBRIS MUTFAK KÜLTÜRÜ	77
<i>İbrahim Çekiç</i>	77
GİRİŞ	77
1. KIBRIS ADASI.....	78
2. KIBRIS MUTFAĐININ GENEL ÖZELLİKLERİ	79
3. KIBRIS TÜRK MUTFAĐI.....	81

3.1. Mutfak Araç Gereçleri ve Pişirme Teknikleri	82
3.2. Mutfak Etrafında Şekillenen Sosyal Pratikler	82
3.3. Kıbrıs Türk Mutfağında Yer alan Yiyecek İçecekler	84
3.4. Kıbrıs Türk Mutfağının İmgesel Lezzetleri	85
SONUÇ	87
Kaynakça	89

YEDİNCİ BÖLÜM

KIRGIZİSTAN MUTFAK KÜLTÜRÜ	91
<i>Kenan Pala, Mustafa Yılmaz, Ümit Sormaz</i>	91
GİRİŞ	91
1. KIRGIZİSTAN MUTFAĞININ TARİHÇESİ	93
2. KIRGIZ YEMEK KÜLTÜRÜ VE ADABI	94
3. KIRGIZ MUTFAĞI RİTÜELLERİ	96
4. KIRGIZ MUTFAĞINDA ÖĞÜNLER	98
5. KIRGIZ MUTFAĞINA ÖZGÜ YÖRESEL GASTRONOMİK ÜRÜNLER	99
6. KIRGIZ MUTFAĞINA ÖZGÜ YEMEKLER	101
SONUÇ	105
Kaynakça	106

SEKİZİNCİ BÖLÜM

KIRIM MUTFAK KÜLTÜRÜ	109
<i>Aysun Yilmabaşar, Elif Zeynep Özer</i>	109
GİRİŞ	109
1. KIRIM MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŞİMİ	111
2. KIRIM MUTFAĞINA ÖZGÜ YİYECEK VE İÇECEKLER	113
3. KIRIM MUTFAĞINDA ÖĞÜNLER	119
4. KIRIM MUTFAĞINA AİT GELENEKLER VE RİTÜELLER	120
SONUÇ	122
Kaynakça	123

DOKUNCU BÖLÜM

ÖZBEKİSTAN MUTFAK KÜLTÜRÜ	127
<i>Yener Oğan</i>	127
GİRİŞ	127
1. ÖZBEKİSTAN MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŞİMİ	129
2. ÖZBEKİSTAN MUTFAĞINA ÖZGÜ YİYECEK VE İÇECEKLER	130
3. ÖZBEKİSTAN MUTFAĞINDA ÖĞÜNLER	134
4. ÖZBEKİSTAN MUTFAĞINA AİT GELENEKLER/RİTÜELLER	135

SONUÇ	137
Kaynakça	138

ONUNCU BÖLÜM

TATARİSTAN MUTFAK KÜLTÜRÜ	141
<i>Özden Özdemir</i>	<i>141</i>
GİRİŞ	141
1. TATAR MUTFAĞININ TARİHSEL GELİŞİMİ.....	143
2. TATAR MUTFAĞINA ÖZGÜ YİYECEK VE İÇECEKLER	145
3. ARAÇ GEREÇLER	149
4. TATAR MUTFAĞINA AİT GELENEKLER	150
4.1. Tepreç (Tepreş)	150
4.2. Doğum Törenleri	151
4.3. Düğün Törenleri	151
4.4. Cenaze Törenleri	153
4.5. Askere Uğurlama.....	154
4.6. Dinî Bayramlar	154
4.7. Diğer Önemli Günler	156
SONUÇ	156
Kaynakça.....	157

ON BİRİNCİ BÖLÜM

TÜRKMENİSTAN MUTFAK KÜLTÜRÜ	161
<i>Gökhan Yılmaz, Mustafa Ülker</i>	<i>161</i>
GİRİŞ	161
1. TÜRKMENİSTAN MUTFAK KÜLTÜRÜNÜN TARİHSEL GELİŞİMİ.....	163
2. TÜRKMENİSTAN MUTFAĞINA ÖZGÜ YİYECEK VE İÇECEKLER	166
3. TÜRKMENİSTAN MUTFAĞINDA ÖĞÜNLER.....	171
4. TÜRKMENİSTAN MUTFAĞINA AİT GELENEKLER VE RİTÜELLER ..	172
SONUÇ	174
Kaynakça.....	175



BİRİNCİ BÖLÜM

ANADOLU MUTFAK KÜLTÜRÜ

Adem Ademođlu

GİRİŞ

İnsanlar, yaşamının devamını sağlayabilmesi için beslenmek/yemek yemek durumdadır. Bu fiziksel ihtiyacın karşılanmasında toplumların kültürel birikimleri, içinde buldukları coğrafya, iklim, tarımsal ürünler, ekonomik yapı gibi unsurlar etkili olmaktadır. Türkler uzun yıllar birbirinden farklı milletlerle komşuluk yaparak iç içe yaşamış ve Orta Asya'da sahip oldukları zengin gelenekleri Anadolu'ya getirerek bu coğrafyada yer alan zenginliklerle harmanlamıştır. Daha açık bir ifade ile Türkler yerleştikleri coğrafyada yer alan kültürlerden hem etkilenmiş hem de sahip oldukları zenginliği bu topraklara taşımıştır. Söz konusu bu kültürel değerlerin en başında yer alan yeme içme kültürü ise yaşamsal önem arz etmektedir (Güler, 2010). Orta Asya'nın sert ve kurak ikliminde o yöreye uygun beslenme alışkanlığı edinirken Anadolu topraklarına yapılan göçlerle birlikte birbirinden farklı ve zengin bölgelere sahip bu coğrafyada da en uygun beslenmeyi benimsemiştir. Anadolu yemek kültürünün gelişiminde oldukça önemli rol oynayan bu toplum, olağanüstü güzelliklerin yer aldığı bu kadim coğrafyada sahip olduğu bu eşsiz değerleri çok daha üst seviyelere taşımıştır. Dahası İpek Yolu ve Baharat Yolu'nun bu coğrafyadan geçiyor olması (Harita 1) farklı yiyeceklerin ülkeye getirilmesi ve baharatlarla lezzetlendirilmesi sayesinde mutfakın zenginleşmesini sağlamıştır.

Anadolu, tarımsal faaliyetlerin başlangıç noktası olması ve yerleşik yaşamın bu kadim coğrafyada yer almasının yanı sıra birbirinden farklı kültürlere ev sahipliği yapması âdeta hazine niteliğinde bir değerdir. Türk toplumunu belirtilen bu özelliklerin yanında sahip olduğu eşsiz değerler arasında ilk kent planı ve ilk tarım

eğitim merkezlerinde Türk kültürüne özgü değerlerin aktarıldığı kurslarla desteklenmesi toplumun farkındalığını artıracaktır.

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AZERBAYCAN MUTFAK KÜLTÜRÜ

Duygu Kırmızıkuşak

GİRİŞ

Türk kavminin ilk kez 4000 sene önce savaşçı ve göçebe bir kültüre sahip şekilde yeryüzünde bulunduğu yazıtlarda yazmaktadır. MÖ 1700 yılları sonrasında kitleler hâlinde Altay Dağları ile Tanrı Dağları arasındaki bölgeye yayıldıkları bilinmektedir. Türkler Orta Asya'daki bozkır arazilerinin elverişsizliği nedeni ile boylar hâlinde göçmüştür. Bu sebeple Orta Asya Türk mutfak kültürünün genel olarak kurutulmuş gıdalara (tarhana, pastırma, kurut) dayandığı bilinmektedir (Bedirhan, 2019: 190-196).

Türkler at, keçi, geyik, deve, koyun gibi hayvanların etinden, sütünden ve derisinden yararlanmışlardır. At, Orta Asya Türklerinde çok önemli bir semboldür. Öyle ki araç veya binek rolü ile birlikte etinden ve sütünden de yararlandığı görülmüştür. Türk devletlerinde süt ürünlerinin özellikle kırmızın öneminin büyük olduğu anlaşılmaktadır. Eski Türk toplumlarında bayramlar düzenlenmiş, Türk edebiyatına konu olmuştur. Türklerin İslamiyet'i kabulü, kırmızın helalliği konusunda belirsizliğe sebep olmuştur. Bu anlamda İslamiyet'i kabul eden Türkler için kırmızın eski önemini yitirdiği söylenebilmektedir. Kırmız yerine diğer bir süt ürünü olan ayranın belirgin olarak ön plana çıktığı görülmektedir (Yalınel, 2021).

İslamiyet öncesi Türk devletleri Çin'e canlı hayvan, yün, yağ, bal, elbise ve zırh ihraç etmekteydi. Türk devletlerinin kendi aralarında da ticaret yürüttüğü bilinmektedir. Dönemin en seçkin ve değerli eti, Oğuzlardan ithal edilen koyun eti idi (Bedirhan, 2019: 190-196). Orta Asya'dan günümüze kadar geçen zaman diliminde Türk mutfağı çeşitli ülkelerin ve kültürlerin içinde olgunlaşarak bugünkü hâline gelmiştir (Demirgöl, 2018):

yaşandığı söylenebilmektedir. Orta Asya'dan günümüze kadar gelen süreçte Türk mutfağının farklı coğrafyalarda çok az değişikliklerle yaşadığı görülmüştür. Bu alanda yapılacak karşılaştırmalı çalışmaların alan yazına katkı sağlayacağı ileri sürülmektedir.

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DOĞU TÜRKİSTAN MUTFAK KÜLTÜRÜ

Hasan Önal Şeyhanlıođlu

GİRİŞ

Türkler, göçebe bir yaşam tarzını benimsemeleri ile mutfak kültürünün gelişimini sağlamışlardır. Orta Asya’da bulunan Türklerin bu yaşam tarzlarından dolayı tarımsal faaliyetlerle ilişkileri sınırlı olmuştur ve Orta Asya Türkleri hayvancılıkla daha kapsamlı faaliyetlerde bulunmuşlardır. Bu nedenle yapımı, stoklanması ve tüketimi kolay olan yemekler tercih edilmiştir (Çakar ve Erol, 2022). Türklerin yaşadıkları bölge ve coğrafya ile beslenmelerinin yakından ilişkili olduğu bilinmektedir. Bu nedenle hüküm sürülen bölgede hayvancılığın etkin olmasıyla etçil bir tüketim hâkim olmuştur (Demirgöl, 2018).

Türk tarihinde gelmiş geçmiş birçok devlet yer almıştır. Her biri de mutfak kültürüne önemli katkılar sunmuşlardır. Bu katkı sunanlardan biri de Uygur Türkleridir. Günümüzde Çin Halk Cumhuriyeti sınırları içinde yer alan ve İpek Yolu’nun geçiş noktasında olan toplam yüz ölçümü yaklaşık 1 milyon 660 bin km² olan Sincan Uygur Özerk Bölgesi, Çin’in yüz ölçümü bakımından en büyük olan eyalet seviyesindeki idari bölgesidir (Mollayakub, 2019). Sincan Uygur Özerk Bölgesi’nin sekiz ilke ile sınırı yer almaktadır.

Doğu Türkistan yemekleri kalori olarak yüksek ve doyurucu olarak tüketilmektedir. Bölge ikliminin yapısından kaynaklı olarak hayvancılık da bölgede gelişmiştir. Böylece et tüketiminin yüksek olduğu da bilinmektedir. Orta Asya kültüründen kaynaklı olarak tüketim hızlı olmaktadır. Sofrada tüketim yapıldıktan sonra sofraya toplanmaktadır. Kendine has tüketimi olan bu bölgede sokak lezzetleri de ön plandadır. Özellikle kavap (kebab) bu noktada tüketilen ve halkta tevecüh gören bir üründür. Bundan dolayı başta Urumçi ve Kaşgar illeri başta olmak üzere tüm şehirlerde sokak lezzetleri görülmektedir. Akşam saatlerine doğru daha da aktif satış yapılmaktadır. Buradan hareketle araştırmada Doğu Türkistan'ın mutfak kültürü, mutfağına dair yiyecek ve içecekleri, mutfağına dair gelenekler/ritüeller başlıkları altında geçmişten bugüne dek öne çıkan ürünlerin ve yerel yemek kültürünün ele alınması amaçlanmıştır. Doğu Türkistan mutfak kültürünü yansıtan az kaynağın olması nedeniyle bu araştırmanın alan yazına katkı sağlaması diğer amaçlar arasında var olmaktadır.

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DÖRDÜNCÜ BÖLÜM

GAGAUZ MUTFAK KÜLTÜRÜ

Merve Sema Yiğit Tekinçay

GİRİŞ

Gagauz isminin gök-oğuz kelimelerinin birleşiminden meydana geldiği (Bozkurt, 1992; Köseoğlu, 1999) ve Romanya, Ukrayna, Moldova, Yunanistan, Kuzeydoğu Bulgaristan'da yaşayan Hristiyan Ortodoks Türklerine verilen isim olduğu ileri sürülmektedir (Atmaca ve Gözdaş, 2018). Günümüzde Moldova'da *Gagauz Yeri* adı verilen özerk yönetime sahip olmakla birlikte (Hünerli ve Arnaut, 2017) Gagauzların Orta Asya Türk Cumhuriyetleri, Türkiye ve Azerbaycan'da da azınlık olarak yaşadıkları bilinmektedir (Tan, 2001). Gagauz Türklerinin nüfusunun dünya çapında yaklaşık olarak üç yüz bin olduğu tahmin edilmektedir (Demir, 2011). Gagauz Yeri, haritada da görüldüğü üzere Moldova'nın güneyinde bulunan Gagauzların yaşadığı yere denilmektedir. Batısında Romanya, doğusunda ise Ukrayna yer almaktadır. 1837,9 kilometrekare yüz ölçümü olan Gagauz Yeri topraklarında toplam 171.500 olan nüfusun %82,6'sını Gagauzlar oluşturmaktadır (Gagauzya Coğrafyası, 2023).

Gagauz lehçesinin Türkiye Türkçesi ve Rumeli ağızlarına yakın olduğu bilinmektedir. Ayrıca Anadolu ağızlarında kullanılan birçok kelimeye sahip olmakla beraber Bulgarca, Rusça ve Romenceden de birçok kelime almıştır. Bu sözler üzerine yapılacak araştırmalar etnik kökeni aydınlatmak açısından önem taşımaktadır (Karpat, 1996). Gagauzların yaşadıkları sancaklarda kullandıkları kişi isimleri arasında en çok Uz (Oğuz) isimleri görüldüğünden %70'inin Tuna üzerinden Balkanlara geçerek yerleşen Uzlardan (Oğuz) oldukları, %10'unu Kuman (Kıpçak) ve Anadolu'dan gelen Selçuklu Türklerinin ise %20'sini teşkil etmektedir. Buradan hareketle Gagauzlar; Uz, Kuman, Selçuklu ve Peçeneklerden oluşan Oğuz ağırlıklı

SONUÇ

Gagauzların yemek kültürü göçebe olarak yaşadıkları yerlerdeki Türk, Bulgar, Slav, Romen ve Yunan kültürleriyle etkileşimleri sonucunda meydana gelmiştir. Tören ve özel günlerin; toplumun birlik ve beraberliğinin korunması bakımından büyük bir öneminin olduğu açıkça görülmektedir (Ademoğlu ve Durlu-Özkaya, 2022). Eski zamanlarda göçebe yaşam ve buzdolabı olmasının bir sonucu olarak etleri kurutarak, kavurma, pastırma ya da sucuk yaparak muhafaza etmişlerdir. Gagauz yemeklerinin Türk mutfağıyla olan benzerlikleri göz önünde bulundurulduğunda iki milletin de aynı kökene ait oldukları görüşü baskın gelmektedir (Pancu ve Selçuk, 2023).

Gagauz Türkleri ile ilgili alan yazın incelendiğinde Gagauz mutfak kültürü özelinde yapılan araştırmaların sınırlı olduğu görülmektedir (Güleç ve Özkaya, 2022; Pancu ve Selçuk, 2023). Gagauzların tarihsel olarak süreçlerine bakıldığında yaşadıkları coğrafyadan etkilendikleri, bazı âdet ve geleneklerinin unutulduğu veya günümüzde uygulanmadığı açıkça görülmektedir. İnanç bakımından Hristiyanlığı benimsemiş olduklarından dolayı diğer Türk topluluklarından ayrılmaktadır. Gagauzların geleneksel ve kültürel değerlerinin korunarak gelecek kuşaklara aktarılabilmesi için daha fazla çalışmaya ihtiyaç vardır.

Gagauz mutfağı farklı kültürlerden ve mutfaklardan etkilenerek kendine özgü bir tarz geliştirmiştir. Et ve sebze yemekleri, hamur işleri ve tatlılarıyla zenginleştirilmiştir.

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BEŞİNCİ BÖLÜM

KAZAKİSTAN MUTFAK KÜLTÜRÜ

Cihan Canbolat

GİRİŞ

Kazakistan, Orta Asya'da bulunan yüz ölçümü olarak en geniş ülkedir. Rusya ile Çin arasında büyük bir toprak alanına sahip olduğu için önemli bir konumda bulunmaktadır (Harita 1). Orta Asya ve Avrupa'da bulunan bu bağımsız devlet Aral Gölü ve Hazar Denizi'ne sınırdadır. Ülke topraklarının yüzde olarak yarısına yakını çöl diğer yarısı bozkır dağ ve ormanlardır. Akarsular bakımından zengin bir ülkedir. Ülkede 48000 civarında göl bulunmaktadır. İklim, bölgelere göre çeşitlilik göstermektedir. Denizlerden uzakta bulunan Kazakistan'da kara iklimi belirgin bir şekilde görülmektedir. Kazak kelimesinin kökeni, eski Türk boylarının isimlerinin birleşmesi ile türemiştir. Diğer bir görüşe göre cesaretli insanlara verilen isimdir (Kobeshova, 2013).

- Pilav, genelde et yemeklerinin yanında takviye amacı ile verilmektedir
- Yemeklerin yanında kullanılan otlar, genellikle maydanoz ve dereotudur.
- Tatlı olarak hamur işi, sütlü tatlı ve helva Kazakistan mutfak kültürünün öncü tatlılarıdır.
- Geç girmiş olsa da deniz ürünleri de Kazak mutfağında önemli yer tutmaktadır.

Millî unsurlar barındıran Kazak mutfağı, yüzyıllardır alışkanlıkları ritüelleri ve zengin yemek çeşidi ile ülkenin kültürel değeri olarak Kazakistan için büyük bir tanıtım aracıdır.

Teknolojinin gelişmesi ve son yıllarda dünya genelinde ortaya çıkan gelişmeler Kazak mutfağını da etkilemiştir. Fast-food ve atıştırmalıklar gibi çeşitlerinde ülke mutfağına eklenmesi ile kazak mutfağına yeni türler girmeye başlamıştır. Her şeye rağmen diğer devletlerle karşılaştırıldığında geleneksel kimliğini koruyan sofranın sunum ve reçetelerine bağlı olan Kazak mutfak kültürü orijinalliğini korumaktadır (Yergaliyeva, 2011).

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KUZEY KIBRIS MUTFAK KÜLTÜRÜ

İbrahim Çekiç

GİRİŞ

Kültür, toplumların geçmişten günümüze şekillendirdiği somut ve somut olmayan unsurların tümünü karşılayan genel bir kavramdır. Kavramın somut kısmı insanların bilgi, birikim, tecrübe ve yetenekleri sayesinde ortaya koyduğu fiziki varlığı kapsar. Kültürün somut olmayan kısmı ise söz konusu fiziki varlığın etrafında zamanla şekillenen her türlü sosyal algıyı ve toplumların duygu, düşünce, istek, hayal ve inanışları ile anlam bulan pratikleri bünyesinde barındırır. Mutfak bağlamında düşünüldüğünde yeme içme unsurlarını kültürün somut bileşenleri; bu bileşenler etrafında vücut bulan ve nesilden nesile aktarılan sözlü gelenekleri, gösteri sanatlarını, ritüelleri, şölenleri ve toplumsal uygulamaları kültürün soyut bileşenleri arasında değerlendirmek mümkündür. Söz konusu bileşenlerin birleştirici ve ayırt edici olmak üzere iki özelliği bulunmaktadır. Birleştiricilik özelliği aynı tadı paylaşmakla, yani benzer ya da aynı hislerle büyüüp ortak noktada ve sofrada buluşmakla ilgilidir. Ayırt edicilik özelliği ise geleneksel mutfak uygulamalarının ait oldukları toplumlara öne çıkarması ve görünür kılmasıdır. Baklava, künefe ve lokum denildiğinde Türkiye'nin akla gelmesi bu duruma örnek verilebilir. Aynı şekilde kuymağın Karadeniz'i, nohut dürümünün Gaziantep'i çağrıştırması ve hemşehricilik duygusuna atıfta bulunması söz konusu durumun farklı bir yansımasıdır.

Geleneksel mutfak uygulamaları ve bu uygulamalarla ilişkilendirilebilecek somut olmayan kültürel miras unsurları, günümüzde destinasyon pazarlamasının önemli argümanlarından biri olarak görülmektedir (Akgöz, 2021). Refah düzeyindeki artış ile ulaşım ve iletişim kanallarındaki gelişmeler sayesinde etki alanını genişleten bu argüman aynı zamanda turistik ürün çeşitliliği arayışında olan destinasyonlara fırsatlar sunmaktadır.

Kaynakça

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KIRGIZİSTAN MUTFAK KÜLTÜRÜ

Kenan Pala, Mustafa Yılmaz, Ümit Sormaz

GİRİŞ

Mutfak kültürü, bir toplumun temelini oluşturan en önemli unsurdur. Bu kültürün içerisinde; kullanılan malzemeler, yenilen yemekler, yeme adabı, yemeklerin sunumu gibi birçok faktör bulunmaktadır. Bu faktörler; o toplumun dinini, coğrafyasını, ekonomisini, gelenek ve göreneklerini, göçebe bir yaşam sürüp sürmediğini yansıtmakta ve kendisi için bir kimlik hâline gelmektedir. Bir milletin mutfağı, onun tarihî kimliğini yansıtmakta ve kendisinden haber vermektedir. Türk milletinin yemek kültürleri arasında farklılıklar olmakla birlikte birbirine benzer birçok yönü vardır. Örneğin; tüm Orta Asya Türklerinin mutfağında etli pilav yer almaktadır. Kırgızistan'da “aş”, Kazakistan'da “palav”, Özbekistan'da “polov” isimleri ile anılmaktadır. Manti, tüm Türk ülkelerinde boyut farklılıkları olsa da aynı şekilde yapılmaktadır (Çelik, 2017).

Yeryüzündeki Türkler, geniş bir coğrafyaya yayılmışlardır. Gittikleri yere kendi kültürlerini götürmüşler ve aynı zamanda oranın kültürlerini de almışlardır. Orta Asya Türkleri göçebe bir yaşam sürmüş ve dolayısıyla tarım ve hayvancılıkla uğraşmışlardır. Bu uğraş, yemek kültürlerine de yansımıştır (Çelik, 2017).

Kırgız mutfağı, oldukça geniş ve köklü bir geçmişe sahiptir. Mutfak kültürü, geçmiş ile bağlarını koparmamış ve bozulmamıştır. Eski âdetlerini, gelenek ve göreneklerini günümüzde de aynı şekilde yaşatmaktadır.

Kırgızistan'da şehir ve kasabalarda mutfak birbirinden farklılaşmaktadır. Kasaba ve köylerde halk çorba ve sulu yemeklerle beslenmektedir. Çorba ve sulu yemekler, az malzeme ile birçok kişiyi doyurma özelliğine sahiptir. En bilinen örnekleri ise carma ve maksımdır. Carma, arpa ve buğdayın ahşap havanda dövülmesinden

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KIRIM MUTFAK KÜLTÜRÜ

Aysun Yılmazbaşar, Elif Zeynep Özer

GİRİŞ

İlk çağlardan bu yana insanların varoluşlarını sürdürebilmeleri için beslenme zorunlulukları ortaya birtakım yeme içme pratikleri çıkarmıştır. İlk başta fizyolojik bir olgu olan bu ihtiyaç, ihtiyacı karşılama yöntemleri açısından kültürel bir unsura dönüşmüştür. Bu dönüşüm başta toplumun içinde bulunduğu coğrafya, tarımsal ve hayvansal üretim sistemleri, ekonomi, ticaret, göç, diasporalar ve savaşlar gibi unsurların etkisinde gelişmektedir.

Ateşin kontrolü, alet kullanımı, yerleşik hayat beraberinde tarım ve hayvancılığın başlaması gibi gelişmeler kültürel değerleri oluşturan çabalardır. Gelişmeler kültürel yapı ile beraber insan yaşamını da şekillendirmiştir. Kültür ve beslenme kavramlarının bir araya gelmesi ile ortaya yemek kavramı çıkmıştır. Bu bağlamda yemeğin kültürel boyutu ifadesinde; etnik topluluk ve ülkelerin paylaştıkları ortak yeme alışkanlıklarını belirtmek üzere yemek ve mutfak kültürü ifadeleri kullanılmaktadır (Aksoy ve Üner, 2022).

Dünya üzerinde sosyoekonomik, sosyokültürel ve inanışlar yönünden farklı birçok toplum bulunmaktadır. Toplumların sahip oldukları bu farklılıklarla birbirlerinden ayrışan ve benzeşen yönleri, yemek ve mutfak kültürlerini ortaya çıkarmaktadır (Düzgün ve Durlu-Özkaya, 2015).

Kırım, tarihin genel akışı içerisinde birbirini izleyen Türk boylarının göç ettiği ülkelerden biri olmuştur (Kavak, 2008). İlk Türk kavimlerinin yerleşmelerinin MÖ 7. yy. öncesine dayandığı tarihî yazılı kaynaklardan bilinmektedir (Zaatov, 2018).

en iyi yollarından birinin de toplumun yemeklerinden geçmek olduğu ifade edilebilir.

Dinî ve kültürel açıdan farklı birçok etnik gurubun bira ada yaşadığı bir yarımada olan Kırım'da, gayrimüslim toplulukların çok önceleri tarımı başlattığı söylenebilmektedir. İç bölgelerde göçebe bozkır kültüründen gelen kıymız ve et gibi geleneksel beslenme gıdalarında sürekliliğin devam ettirildiği söylenebilmektedir. Kırım yarımadası güneyine inildikçe burada yaşayan farklı etnik toplulukların etkileşimi ile deniz iklimi etkisinde daha çok balık, meyve ve sebze gibi besin maddelerinin ön planda olduğu Akdeniz tipi beslenmeye yaklaşmaktadır.

Genel anlamda Kırım yemek kültürü Kafkas ve Ota Asya toplumlarının yemek kültürleri ile benzer bir çizgidedir. Yarımadada yaşayan Türk ve Rusların mutfak ve yemek kültürü kapsamında oldukça etkileşime girdiklerini ve isimleri değişik olabilese de benzer yemekleri tükettiklerini söylemek mümkündür. Kırım mutfağında kültürel etkileşime en güzel örnek 17. yy. gayrimüslim terekelerinde bulunan Kırım Türklerine özgü börek çeşidi olan Köbete'dir.

Kırım topluluklarında özel gün ve gecelerde gerçekleştirilen ritüellerde başat rolü Kırım mutfak kültürüne ait yiyecek ve içeceklerin oluşturulduğu görülmektedir. İlk yaşamdan ölüme kadar olan süreçte gerçekleştirilen ritüellerde çi börek, köbete, kıygaşa ve kalakay; Kırım özel gün gastronomisi uygulamalarına örnek verilebilir.

Bunların yanı sıra zaman içerisinde Türkiye'ye ulaşan Kırım Türklerinin de mutfaklarının Türk mutfak kültürü ile özdeşleşirken yemek kültürlerini de koruma çabaları yadsınamaz bir gerçek olarak ifade edilebilir.

Kırım sınırları içerisindeki çok kültürlülük Kırım mutfağını ortak ve zengin bir mutfak kültürü yapmaktadır.

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DOKUZUNCU BÖLÜM

ÖZBEKİSTAN MUTFAK KÜLTÜRÜ

Yener Ođan

GİRİŞ

Türkler, ilk olarak Orta Asya'nın bozkır bölgelerinde yerleşik hayatı benimsemiştir. Burada geçimlerini tarımsal ve hayvancılık faaliyetlerine dayalı olarak sağlamışlardır. Hayvansal ürünlerden sığır, keçi, koyun ile tarımsal ürünlerden buğdaydan elde edilen un, yarma ve bulgur ilk olarak yararlandıkları besinlerdir (Ciđerim, 2001). Toygar (2001), Türk yemek kültüründe hayvansal ürünlerin önemli bir yer tuttuğunu belirtmiştir. Türkler, göçebe yaşam tarzı geleneğini sürdürerek yemek kültürlerini Anadolu'ya taşımışlardır. Türklerin İslamiyet'i kabul etmesi de yemek kültürünü etkileyen bir diğer husus olarak öne çıkmaktadır (Kızıldemir, Öztürk ve Sarusık, 2014). Çünkü İslamiyet'in yasakladığı ürünler Türklerin İslamiyet'i kabul etmesiyle Türk yemek kültüründe yer almamaya başlamıştır.

Şanlıer, Cömert ve Özkaya (2012) çalışmalarında Türk yemek kültürünü; Orta Asya'nın et ve mayalanmış süt ürünleri, Mezopotamya'nın tahıl ürünleri, Akdeniz'in sebze-meyve ve su ürünleri, Güney Asya'nın baharat ürünleri birleşmesi olarak ifade etmiştir. Dolayısıyla Türk mutfağının zengin ve çeşitli ürünlerin yer almasında farklı kültürlerle etkileşimde bulunmasının da önemli katkılar sağladığı söylenebilir (Dilsiz, 2010).

rumlanabilir. Türk kültüründe olduğu gibi sofrada adabının Özbek mutfağında da önemli bir yer bulunmaktadır. Örneğin, sofrada evin en yaşlı erkeği, sofranın başında oturmaktadır. Özbek mutfağı yemek çeşitliliği, pişirme yöntemleri, sofrada düzeni ve adabı, servis şekilleri, saklama teknikleri olmak üzere kendine özgü bir mutfak kültürü bulunmaktadır. Buradan hareketle çalışmada Özbekistan'ın mutfak kültürü ile ilgili mutfak kültürünün tarihsel gelişimi, mutfağına özgü yiyecek ve içecekleri, mutfağındaki öğünler ve mutfağına ait gelenekler/ritüeller başlıkları altında geçmişten günümüze kadar olan süreçte Özbekistan Cumhuriyeti'nin yemek kültürü değerlendirilmesi amaçlanmıştır. Özbek mutfak kültürünü yansıtan sınırlı sayıda kaynağın olması sebebiyle bu çalışmanın alan yazına katkı sağlaması diğer amaçları arasında yer almaktadır.

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ONUNCU BÖLÜM

TATARİSTAN MUTFAK KÜLTÜRÜ

Özden Özdemir

GİRİŞ

Tarih süresince Tatar ismi her ne kadar farklı toplulukları tanımlamak için kullanılmışsa da günümüzde Rusya Federasyonunun sınırları içerisinde yaşayan Kazak Tatarları ile 2014 yılından beri Rusya tarafından ilhak edilen Kırım Tatarları olmak üzere bu iki topluluk yaygın olarak akla gelmektedir (Şahin, 2017). Tataristan Cumhuriyeti ise 67.836 km²lik yüz ölçümü ile Rusya'nın merkezinde, Volga ve Kama nehirleri arasında yer almaktadır (Harita 1). Tataristan, kuzeyde orman ve güneyde bozkır olmak üzere iki coğrafi bölgenin kesişim noktasında yer almaktadır. Tatar mutfak kültürü hem ulusal hem de kültürel açıdan oldukça zengin ve köklü bir geçmişe sahiptir. Bütün köklü kültürlerde olduğu gibi Tatar mutfağının da gelişmesinde eski geleneksel unsurlarla birlikte Tataristan'ın coğrafyası ve doğası da etkili olmuştur.

Göçlerle birlikte farklı kültürlerle etkileşime girmiş olan Tatar mutfağı, çevresinde yer alan Rus, Mari ve Udmurt gibi milletlerin yanında Orta Asya milletleriyle, özellikle de Özbekler ve Taciklerle etkileşim içerisinde bulunmuştur. Bu da Tatar mutfağının zenginleşmesine katkı sağlamıştır (Sysoeva, Sysoeva, ve Kharina, 2021:40). Bunun yanında Tatarların gittikleri bölgelere kendi mutfak kültürleri taşımaları Tatarların köklü bir mutfak kültürüne sahip olduğunu göstermesi açısından önem arz etmektedir. Geçmişte Ruslar tarafından göçe zorlanan ve Türkiye'ye göç eden Kırım Tatarlarının, köy ve kasabalarda beraberinde getirdikleri mutfak araç gereçlerini kullandıkları bilinmektedir.

arasındadır. Türk kültürünün önemli içeceklerinden olan geleneksel Türk kahvesi ve çay (Ademoğlu, 2022), Tatar mutfağının vazgeçilmez içecekleridir. Tatarlar, çayı genellikle süt ve kaymakla ikram etmektedirler. Tatar mutfağında tahıl ürünleri, sebzeler, meyveler ve arıcılık da önemli bir yere sahiptir. Ekmek üretimi ve tüketimi önemli bir geleneğe sahiptir ve hamur işi gıdalar da yaygın olarak tüketilmektedir. Sebzeler ve meyveler, çeşitli yemeklerde ve tatlılarda kullanılmaktadır. Arıcılık da Tatarlar arasında yaygın bir faaliyettir ve bal üretimi önemli bir geleneğe sahiptir. Tatar mutfağı, zengin bir tarih ve kültürel birikime sahip olan bir mutfaktır. Et ürünlerinin ön plana çıktığı, çeşitli koruma yöntemlerinin kullanıldığı ve süt ürünleri, tahıllar, sebzeler, meyveler ve balın da önemli bir yer tuttuğu bir mutfaktır.

Tatar mutfağı, Orta Asya'dan bu yana farklı kültürlerin etkileşimiyle şekillenmiş ve bugün bile Tatarların kimliklerinin önemli bir parçası konumundadır. Bu mutfak, yüzyıllar boyunca Tatarların yaşam tarzıyla, coğrafi konumuyla ve etkileşim hâlinde olduğu diğer kültürlerle bir araya gelerek zenginleşmiştir. Tatar mutfağı, çeşitliliğiyle ve özgün tatlarıyla tanınır. Tarihi ve kültürel birikimi yansıtan yemekler, geleneksel yöntemlerle hazırlanır ve günümüzde bile Tatar ailelerinin sofralarında yerini korur. Tatar mutfağının önemi, sadece lezzetleriyle sınırlı değildir. Bu mutfak, Tatarların kültürel kimliklerini korumalarına, nesilden nesile aktarmalarına ve birlikte yemek yemekle bağlarını güçlendirmelerine olanak tanır. Geleneksel yemekler, Tatar halkının ortak değerlerini yansıtır ve toplumun birlik ve dayanışma ruhunu besler.

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ON BİRİNCİ BÖLÜM

TÜRKMENİSTAN MUTFAK KÜLTÜRÜ

Gökhan Yılmaz, Mustafa Ülker

GİRİŞ

Türkmenistan yemek kültürünün şekillenmesinde tarih, coğrafya, etnik çeşitlilik, iklim, gelenek ve görenek, inanç gibi faktörlerin önemli bir rol oynadığı bilinmektedir. Başka bir anlatımla Türkmen yiyecek, içecek ve yemeklerini bünyesinde barındıran gastronomik kimliğin özünde bölgenin tarihsel süreci ve coğrafi özellikleri yer almaktadır. Bu bağlamda Türkmenistan'ın yemek ve mutfak kültürünü anlatmadan önce bölgenin tarihi ve coğrafyasına kısaca değinmenin yararlı olabileceği düşünülmektedir. Türkmenistan'ın tarihî geçmişi, dokuzuncu yüzyılda bölgede yaşayan Kayı-Bayat, Yazır ve Salır-Kanık boylarından meydana gelen Oğuzlara kadar dayanmaktadır (Saray, 1993). On dokuzuncu yüzyıla kadar dağınık ve kabile şeklinde yaşayan Türkmen halkının 1884 yılında Rus hâkimiyetine girdiği göze çarpmaktadır (Kara, 2002; Charyyeva ve Öztürk, 2018). Yaklaşık kırk yıllık bir sürecin ardından Rusya'da gerçekleşen Bolşevik (Ekim, Rus) Devrimi'nin etkisiyle birlikte 27 Ekim 1924'te Türkmenistan Sovyet Sosyalist Cumhuriyeti'nin kurulduğu tarihe not düşülmektedir (Kara, 2000). Sovyet etkisinde geçen yetmiş yılın sonunda tarih 27 Ekim 1991'i gösterdiğinde ise Türkmenistan'ın bağımsızlığını kazandığı dikkat çekmektedir (Kara, 2002; Gayypov, 2022). Hâl böyle olunca Türkmen yemekleri ve mutfak kültürü de hem Orta Asya Türk kültürünün hem de Rus kültürünün izlerini taşımaktadır.

Türkmenistan Özbekistan, Kazakistan, Kırgızistan ve Tacikistan gibi Türk Dünyası ülkelerinin bulunduğu Orta Asya'nın merkezinde stratejik bir konuma sahiptir (Kara, 2006). Ülkenin kuzeyinde Kazakistan, kuzeydoğusu ve doğusunda Özbekistan, güneydoğusunda Afganistan, güneyinde İran ve batısında ise Hazar Denizi

Gelenekler ve ritüeller toplumu oluşturan bireylerin ortak paylaştığı değerler olarak nitelendirilmektedir. Her ne kadar yiyecek ve içecek çeşitliliği sınırlı olsa da Türkmenistan mutfak kültürüne özgü gelenek ve ritüellerin de var olduğu bilinmektedir. Türkmenistan mutfağında ekme ve sofraya ayrı bir öneme sahiptir. Yemeklerin genellikle yere oturarak ve bağdaş kurarak yenmesi ile ekmeğin yere konmaması, misafirin ekmeği koparmaması ve misafirlığe giderken muhakkak yiyecek-içecek götürülmesi gibi gelenekler bu duruma örnek olarak gösterilebilir. Bir diğer önemli gelenek ise Türkmen kültüründe beyaz ürünlerin ticaretinin günah olmasından dolayı daha çok kırsal bölgelerde sütün satılmamasıdır. Sütün satılmasının günah sayıldığı bu bölgelerde takas yoluyla bir alışveriş söz konusu olmaktadır. Birçok Türk toplumunda olduğu gibi Türkmenistan kültüründe de biri doğduğunda veya biri öldüğünde kişinin yakınları tarafından kurban kestirilmesi, yemek dağıtılması ve hediye edilmesi söz konusudur. Tüm bunların ışığında ana akım yazında kısıtlı bilgiye sahip olan Türkmenistan mutfağı ile ilgili bütüncül bir bakış açısının geliştirilebilmesi amacıyla bu bölüm hazırlanmıştır. Böylece Türkmen mutfak kültürüne dair kapsamlı bir değerlendirme yapabileme imkânı ortaya çıkmıştır. Bu bağlamda hem ilgili yazına katkı sağlayabileceği hem de ilgi duyan araştırmacılara yol gösterebileceği öngörülmektedir.

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İÇİNDEKİLER

YAZARLAR HAKKINDA..... iii

BÖLÜM 1

SINIFLANDIRMA PROBLEMLERİNE GİRİŞ1

Ömer Faruk Rençber, Abdurrahman Coşkuner1

1. GİRİŞ.....1

2. SINIFLANDIRMA PROBLEMLERİ1

2.1. Klasik İstatistik Yaklaşımları..... 2

2.2. Makine Öğrenme Yaklaşımları..... 2

2.3. Derin Öğrenme Yaklaşımları 5

3. SINIFLANDIRMA PROBLEMLERİNDE DEĞERLENDİRME ÖLÇÜTLERİ 6

4. SONUÇ VE ÖNERİLER.....9

KAYNAKÇA..... 11

BÖLÜM 2

LOJİSTİK REGRESYON ANALİZİ.....13

Sinan Mete.....13

1. GİRİŞ.....13

2. LOJİSTİK REGRESYON MODELİ15

3. LİTERATÜR TARAMASI.....18

4. UYGULAMA.....20

5. SONUÇ.....25

KAYNAKÇA..... 26

EK 1: Çalışmada Kullanılan Finansal Oranlar28

EK 2: İsimsel (Multinomial) Lojistik Regresyon Analizi R Kodları.....29

BÖLÜM 3

RASSAL ORMAN VE RASSAL EĞRELTİ OTU MODELİ31

İlkay Altındağ.....31

1. GİRİŞ.....31

2. RASSAL ORMAN REGRESYON33

3. RASSAL EĞRELTİ OTU35

4. UYGULAMA40

4.1. Rassal Orman Uygulaması..... 41

4.2. Rassal Eğrelti Otu Uygulaması..... 52

5. SONUÇ.....	56
KAYNAKLAR	57
EK 1: Rassal Orman ve Rassal Eğrelti Otu Algoritmaları için Kullanılan R Kodları	60

BÖLÜM 4

DESTEK VEKTÖR MAKİNELERİ: R İLE SINIFLANDIRMA	63
<i>Özlem Kuru Sönmez</i>	63
1. GİRİŞ.....	63
2. DESTEK VEKTÖR MAKİNELERİ	63
2.1. Doğrusal Destek Vektör Makineleri	65
2.2. Doğrusal Olmayan Destek Vektör Makineleri.....	66
3. LİTERATÜR İNCELEMESİ.....	67
4. UYGULAMA	69
4.1. Doğrusal Destek Vektör Makineleri ile Sınıflandırma.....	69
4.2. Doğrusal Olmayan Destek Vektör Makineleri Fonksiyonları ile Sınıflandırma	73
4.2.1. Radyal Çekirdek ile Sınıflandırma.....	75
4.2.2. Sigmoid Çekirdek ile Sınıflandırma.....	76
4.2.3. Polinom Çekirdek ile Sınıflandırma.....	78
4.3. Destek Vektör Makineleri için Parametre Seçimi (Model İyileştirme).....	79
5. SONUÇ.....	84
KAYNAKÇA.....	85
Ek 1: Doğrusal Destek Vektör Makineleri ile Sınıflandırma Uygulaması Kodları	87
Ek 2: Radyal Çekirdek ile Sınıflandırma Uygulaması Kodları	88
Ek 3: Sigmoid Çekirdek ile Sınıflandırma Uygulaması Kodları	89
Ek 4: Polinom Çekirdek ile Sınıflandırma Uygulaması Kodları	90
Ek 5: Radyal Çekirdek ile Sınıflandırmada Parametre Seçimi Uygulaması Kodları.....	91

BÖLÜM 5

XGBOOST: R İLE SINIFLANDIRMA	93
<i>Emre Yakut, Özlem Kuru Sönmez</i>	93
1. GİRİŞ.....	93
2. XGBOOST YÖNTEMİ	93
3. LİTERATÜR İNCELEMESİ.....	96
4. UYGULAMA	98
5. SONUÇ.....	109
KAYNAKÇA.....	110
Ek 1: Xgboost ile Sınıflandırma Uygulaması Kodları.....	112

BÖLÜM 6

LIGHTGBM ALGORİTMASI.....	115
<i>Ahmet Çankal.....</i>	<i>115</i>
1. GİRİŞ.....	115
2. LIGHTGBM ALGORİTMASI.....	115
3. LİTERATÜR İNCELEMESİ.....	116
4. LIGHTGBM UYGULAMA.....	118
5. SONUÇ.....	129
KAYNAKÇA.....	130

BÖLÜM 7

YAPAY SİNİR AĞLARI.....	131
<i>Özlem Akay.....</i>	<i>131</i>
1. GİRİŞ.....	131
2. LİTERATÜR TARAMASI.....	132
4. UYGULAMA.....	139
5. SONUÇLAR.....	148
KAYNAKÇA.....	149
EK 1: Uygulanan R Kodları.....	152

BÖLÜM 8

ÖZYİNELEMELİ SİNİR AĞLARI.....	155
<i>Erhan Turan.....</i>	<i>155</i>
1. GİRİŞ.....	155
2. LİTERATÜR İNCELEMESİ.....	155
3. YÖNTEMLER.....	156
4. UYGULAMALAR.....	165
5. SONUÇ.....	177
KAYNAKÇA.....	178
EK-1A: MNIST için RNN Ağ Sınıflandırıcı Kodu.....	180
EK-1B: MNIST için LSTM Ağ Sınıflandırıcı Kodu.....	181
EK-1C: MNIST için GRU Ağ Sınıflandırıcı Kodu.....	182
EK-2A: IMDB için RNN Ağ Sınıflandırıcı Kodu.....	183
EK-2B: IMDB için LSTM Ağ Sınıflandırıcı Kodu.....	184
EK-2C: IMDB için GRU Ağ Sınıflandırıcı Kodu.....	185

BÖLÜM 9

BERT MODELİ İLE DUYGU ANALİZİ UYGULAMA ÖRNEĞİ.....	187
<i>İbrahim Öztürk, Mehmet Gökhan Bakal.....</i>	<i>187</i>
1. GİRİŞ.....	187
2. LİTERATÜR İNCELEMESİ.....	187

3. UYGULAMA	195
3.1. Çalışma Ortamı	195
3.2. Veri Kümesi ve Materyal	196
3.3. Python Tarafındaki Hazırlıklar	199
3.4. R Tarafındaki Hazırlıklar	200
3.4.1. reticulate Paketi	201
3.5. Veri Kümesi Hazırlama ve Ön İşlemleri	204
3.6. Veri Kümesi Bölümleme	206
3.7. Modelin Yüklenmesi ve Model Yapısı	207
3.8. Model Parametreleri	209
3.9. Eğitim ve Test Sonuçları	210
4. SONUÇ	211
KAYNAKÇA	211
EKLER	213
1.1. Kısa ve Faydalı Komutlar	213
1.2. Kullanışlı RStudio Kısa Yolları	215
1.3. Kod Parçaları	216
1.4. Diğer	217

BÖLÜM 10

HİBRİT MODELLEME İLE SINIFLANDIRMA YAKLAŞIMI.....	219
<i>Mehmet Gökhan Bakal, İbrahim Öztürk</i>	<i>219</i>
1. GİRİŞ	219
2. LİTERATÜR İNCELEMESİ	220
3. IRIS VERİ SETİ	220
4. MAKİNE ÖĞRENMESİ & SINIFLANDIRMA	221
5. SINIFLANDIRMA ALGORİTMALARI	222
6. GRADYAN ARTIRMA MAKİNELERİ (GAM)	224
7. KARAR AĞACI ALGORİTMASI	224
8. YAPAY SİNİR AĞI MODELİ	225
9. TOPLULUK SINIFLANDIRMA	227
10. UYGULAMA	227
11. SONUÇLAR	232
KAYNAKLAR	233
EK 1: Hibrit Modelleme ile Sınıflandırma Yaklaşımı için kullanılan R kodları	235

BÖLÜM 1

SINIFLANDIRMA PROBLEMLERİNE GİRİŞ

Ömer Faruk Rençber, Abdurrahman Coşkuner

1. GİRİŞ

Veri madenciliğinde kullanılan yöntemler; regresyon, sınıflandırma, kümeleme ve birliktelik kural çıkarımları olmak üzere dört kısımda incelenmektedir. Regresyon ve sınıflandırma algoritmaları danışmanlı öğrenme, kümeleme ve kural çıkarımları ise danışmansız öğrenme tabanlı olarak çalışmaktadır. Sınıflandırma problemlerinin temelinde farklı sınıflarda yer alan gözlemlerin ayırımlarında etkili olan faktörlerin ve ne düzeyde başarılı sınıflandırıldıklarının incelenmesi amaçlanmaktadır. Bu açıdan sınıflandırma algoritmasının kümeleme yöntemlerinden farkı danışmanlı öğrenme olmasıdır.

Veri madenciliği teknikleri kullanılan veri türüne göre metin madenciliği, görüntü işleme veya veri madenciliği olarak incelenmektedir. Metin madenciliğinde veriler metin dosyası, görüntü işlemede resim ve veri madenciliği problemlerinde ise sayısal veri olarak değerlendirilmektedir. Veri madenciliği tabiri, bu hesaplamaların genel adı olmakla birlikte sayısal veri analizleri için de kullanılmaktadır. Algoritmaların uygulamaları R, Phyton, RapidMiner veya KNIME ile yapılabilmektedir. Bu bölümde sınıflandırma algoritmalarının temel mantığı ve çeşitleri üzerine durulacak ve uygulama hususunda genel bilgilere yer verilecektir.

2. SINIFLANDIRMA PROBLEMLERİ

Literatürde sınıflandırma problemleri açısından birçok yöntem çeşitliği bulunduğu görülmektedir. Bu açıdan tarihsel gelişimine göre sınıflandırma problemlerinde klasik istatistik, makine öğrenme ve derin öğrenme yaklaşımlarına göre

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BÖLÜM 2

LOJİSTİK REGRESYON ANALİZİ¹

Sinan Mete

1. GİRİŞ

Lojistik regresyon analizi, kategorik bağımlı değişkenin bağımsız değişkenler ile tahmin edilmesinde kullanılmaktadır. Klasik regresyon ve lojistik regresyon analizleri arasındaki fark; klasik regresyon analizinde bağımlı değişken sürekli iken lojistik regresyon analizinde sonuç değişkeninin ikili veya çoklu düzeyde kategorik yapıda olmasıdır.

Bu iki yöntem arasında üç önemli fark vardır (Elhan, 1997:4);

- Doğrusal regresyon analizinde tahmin edilecek olan bağımlı değişken sürekli iken lojistik regresyon analizinde bağımlı değişken kesikli bir değer almaktadır.
- Doğrusal regresyon analizinde bağımlı değişkenin değeri, lojistik regresyon analizinde ise bağımlı değişkenin alabileceği değerlerden birinin gerçekleşme olasılığı tahmin edilir.
- Doğrusal regresyon analizinde bağımsız değişkenin çoklu normal dağılım göstermesi şartı aranırken lojistik regresyon analizinde böyle bir şart yoktur.

Lojistik regresyonun amacı bağımlı ve bağımsız değişkenler arasındaki ilişkileri araştırıp kategorik bağımlı değişkenin alabileceği değerlerden birinin gerçekleşme olasılığını tahmin etmek ve böylece iki veya daha fazla gruba ilişkin üyelik tahmini yapmaktır. Bu anlamda analizin diğer amacının “sınıflandırma” olduğu söylenebilir.

¹ Bu bölüm, Prof. Dr. Aydın Ünsal danışmanlığında 2009 yılında tamamlanan “Kategorik Veri Analizi Yöntemleri ve Uygulamalar” başlıklı doktora tezinden üretilmiştir.

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BÖLÜM 3

RASSAL ORMAN VE RASSAL EĞRELTİ OTU MODELİ

İlkay Altındağ

1. GİRİŞ

Günlük hayattaki sınıflandırma ve tahmin problemlerini çözmek için çeşitli makine öğrenme algoritmaları yaygın olarak kullanılmaktadır. Makine öğrenimi yöntemleri, sınıflandırılmış örneklerden öğrenilen yolu kullanarak yeni örneğin sınıfını bulmaya çalışır. Literatürde, sınıflandırma algoritması, eğitim örneği ve buna karşılık gelen çıktı ile birlikte verildiğinden, sınıflandırma için denetimli öğrenme terimi de kullanılmaktadır (Chaudhary, Kolhe ve Kamal, 2016; Abdoh, Rizka ve Maghraby, 2018; Dogru ve Subasi, 2018).

Karar ağaçları (KA), birçok makine öğrenimi uygulamaları için kullanılabilen güncel ve güçlü bir yöntemdir. KA, bağımlı değişkenin türüne göre adlandırılan parametrik olmayan bir yöntemdir. Bağımlı değişken kategorik ise sınıflandırma ağacı olarak bağımlı değişken sürekli ise regresyon ağacı olarak adlandırılır. Karar ağaçlarının amacı, bağımsız değişkenler açısından tahmin edici bir model geliştirmektir. Ağaç, verilerin ardışık olarak bağımsız değişkenlerden birine bölünmesiyle oluşturulur. KA algoritmaları, genel olarak okunabilir sınıflandırma kuralları sağladıkları için etkili bir yöntem olarak kabul görmektedir (Ben-Haim ve Tom-Tov, 2010; Esmaily vd. 2018, Altındağ; 2021). Sınıflandırma ve Regresyon Ağacı (CART: Classification and Regression Trees) yöntemi ise makine öğreniminde kullanılan tahmine yönelik bir karar ağacı algoritmasıdır. 1984'te Breiman, Friedman, Olshen ve Stone tarafından önerilen CART yönteminin amacı, bir sınıflandırıcı için parça parça sabit tahmin edici veya bir eğitim gözlem örneğinden bir regresyon fonksiyonu veren verimli bir algoritma oluşturmaktır. Bu algoritma, geniş bir ağaç koleksiyonundan bazı "iyi" ağaç yapısı tahmin edicilerinin

Veri seti eğitim ve test olmak üzere iki parçaya bölünmüş, ele alınan yöntemler ile eğitim veri seti üzerinde modeller oluşturulmuştur. Oluşturulan modeller ile test verisi ve eğitim verileri için tahminler yapılmıştır. Tahminlerin performansını değerlendirmek için test verisi hata yüzdeleri ve değerlendirme metrikleri ele alınmıştır.

Modellerden elde edilen değerlendirme metrikleri dikkate alındığında birbirlerine çok yakın sonuçlar elde edildiği, aralarında bariz bir farklılığın olmadığı belirlenmiştir. Hata oranları dikkate alındığında ise ele alınan Rassal Orman modelinin rassal eğrelti otu modeline göre daha düşük bir hata oranına sahip olduğu tespit edilmiştir.

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Bölüm 4

DESTEK VEKTÖR MAKİNELERİ: R İLE SINIFLANDIRMA

Özlem Kuru Sönmez

1. GİRİŞ

Destek Vektör Makineleri (DVM), 1960'lı yıllarda geliştirilmeye başlanmış bir veri madenciliği ve makine öğrenmesi yöntemidir. Regresyon ve sınıflandırma problemlerinde çok sayıda farklı çalışma alanında uzun yıllardır kullanılmış ve günümüzde de kullanılmaya devam etmektedir. Bu alanlardan bazıları görüntü tanıma, metin sınıflandırma, ses tanıma, duygu analizi uygulamaları ile tarım, tıp, finans, enerji ve güvenlik olarak sayılabilir. Literatür incelendiğinde DVM yöntemi kullanılarak yapılmış çok sayıda çalışmaya ulaşmak mümkündür. Yöntemin bu kadar tercih edilen bir yöntem olmasının sebebi, yüksek doğruluk sağlaması ve uzun yıllardır kullanılmasından dolayı ortaya çıkan uygulama örneklerinin bol oluşu olarak düşünülmektedir.

Bu çalışmanın ikinci bölümünde DVM'nin doğrusal ve doğrusal olmayan çeşitleri ile ilgili teorik açıklamalar sunulmuştur. Üçüncü bölümde, DVM'nin sınıflandırma amacıyla kullanıldığı çalışmalardan örnekler özetlenmiştir. Çalışmanın dördüncü bölümünde ise doğrusal ve doğrusal olmayan DVM uygulama örnekleri sunulmuştur.

2. DESTEK VEKTÖR MAKİNELERİ

DVM'nin gelişimi üç ana adımdan oluşmuştur. Bunlardan ilki, eğitim örneklerinin dâhil olduğu iki sınıfın bir hiper düzlem ile ayrılabilmesine imkân sağlayan optimal hiper düzlem (Vapnik ve Lerner, 1963) ve 1960'lardan 1990'lara kadar geliştirilmeye devam eden Vapnik-Chervonenkis teorisidir. Bir sonraki adım ise Boser vd. (1992) tarafından çekirdek fonksiyonun maksimum marj modellerine

cek faktörlerdir. Bu bölümde veri setlerinden en yüksek doğruluk ile sınıflandırma yapmaktan ziyade RStudio ortamında bir DVM modelinin oluşturulması, iyileştirilmesi ve performans ölçütlerine ulaşılması aşamalarında kullanılan kodları anlatmak amaç edinilmiştir.

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BÖLÜM 5

XGBOOST: R İLE SINIFLANDIRMA

Emre Yakut, Özlem Kuru Sönmez

1. GİRİŞ

Makine öğrenme tekniklerinden birisi olan XGBoost algoritması, sınıflandırma ve regresyon problemlerinin analizinde uygulanan denetimli makine öğrenmesi teknikleri arasında yer almaktadır. Bu yöntemin en önemli özelliği, verilerin sınıflandırma ve regresyon analizlerinde oldukça hızlı ve yüksek tahmin gücüne dayalı olmasıdır. Böylece XGBoost algoritması; bu avantajları nedeniyle enerji verileri, sağlık sektörü ve finans alanında araştırmacıların ilgisini çeken makine öğrenme tekniklerinden birisi olmuştur.

Bu çalışmada R uygulamasının UCI Machine Learning Repository veritabanında da yer alan “Ionosphere” isimli veri seti kullanılarak sınıflandırma analizi gerçekleştirilecektir. Çalışma beş bölüm başlığı altında toplanırken ikinci bölümde XGBoost algoritması tanıtılmış, 3. bölümde literatür taramasına yer verilmiş, 4. bölümde çalışmanın uygulaması için gerekli paketlerin kurulması ve çağrılmasından bahsedilerek analiz işlemleri yapılmış ve sonuç bölümünde ise yöntemin yüksek doğrulukla sınıflandırma başarısı açıklanarak bu yöntemin sınıflandırma tekniğinde de kullanılabileceğinin önemine vurgu yapılmıştır.

2. XGBOOST YÖNTEMİ

XGboost algoritması, Friedman (2001) tarafından geliştirilmiş, Gradyan Boosting (Gradyan Yükseltme) tabanlı, sınıflandırma ve regresyon problemlerinde uygulanan bir makine öğrenmesi tekniğidir. XGboost algoritması, gradyan boosting algoritmasının optimize edilmesiyle, aşırı öğrenme durumunun önüne geçilerek algoritmanın hızlı olmasına ve yüksek tahmin gücüne ulaşmasıyla diğer makine öğrenmesi algoritmalarına göre oldukça avantajlıdır. Bu kapsamda Chen ve

Daha önce de bahsedildiği gibi XGBoost yönteminde parametrelerin doğru ayarlanması başarıyı önemli derecede etkileyebileceğinden hiper parametre optimizasyonu gerçekleştirilerek modeli geliştirmek ve sınıflandırma başarısını yükseltmek amaçlanmıştır. Bu sebeple öncelikle bir trainControl nesnesi oluşturulmuştur. Ardından parametrelerin farklı değerlerini içeren bir grid nesnesi oluşturulup bu nesnelere kullanılarak iyileştirilmiş model eğitimi gerçekleştirilmiştir. İyileştirilmiş modelin performans metrikleri elde edildikten sonra doğru sınıflandırma oranı %95,71 olarak belirlenmiştir. Dolayısıyla iyileştirilmiş model, ilk modelden daha başarılı hâle getirilebilmiştir. Ardından ilk modelde olduğu gibi iyileştirilmiş modelde de değişkenlerin önem dereceleri belirlenip basit bir grafikte sunulmuştur.

Gerçekleştirilen uygulamada öncelikli amaç yüksek doğruluk oranına ulaşmaktan ziyade RStudio ortamında XGBoost yöntemi kullanarak sınıflandırma modelini oluşturma, performans ölçütlerine ulaşma ve model iyileştirme aşamalarını anlatmaktır.

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Bölüm 6

LIGHTGBM ALGORİTMASI

Ahmet Çankal

1. GİRİŞ

Gradyan artırma karar ağaçları (Gradient Boosting Decision Tree, GBDT) , çok sınıflı sınıflandırma, tahminleme gibi makine öğrenmesi işlemlerini yüksek başarıyla gerçekleştiren geniş bir kullanım alanına sahip makine öğrenmesi algoritmasıdır. Buna karşın, öznelik sayısı ve veri boyutu arttığında verimlilik ve ölçeklenebilirlik konusunda yetersiz kalmaktadır. Buradaki en önemli sorun ise her bir öznelik için tüm veri örneklem noktalarının taranmasından dolayı işlemlerin çok zaman almasıdır. Modelin eğitim ve hesaplama zamanını azaltmak için Ke ve arkadaşları (Ke vd., 2017) LightGBM algoritmasını önermişlerdir.

2. LIGHTGBM ALGORİTMASI

LightGBM, Microsoft DMTK (Distributed Machine Learning Toolkit) projesi kapsamında 2017 yılında geliştirilmiş bir boosting algoritmasıdır (Url-1, 2022). Light Gradient Boosting Machine (LightGBM), karar ağacı algoritmasına dayanan bir Gradyan Artırıcı Karar Ağacı (GBDT) çerçevesidir (Tang vd., 2020). LightGBM karar ağaçları tabanlı Ke ve arkadaşları tarafından geliştirilmiş topluluk öğrenme yöntemidir (Saner vd., 2019).

LightGBM, geliştirilmiş daha hızlı eğitim verimliliği, düşük bellek kullanımı, daha yüksek doğruluk, paralel çalışma özelliği, GPU desteği ve büyük ölçekli veri işleme avantajlarına sahiptir. LightGBM’de, çoğu gradyan artırma karar ağacı algoritması tarafından kullanılan seviye odaklı (level-wise) karar ağacı büyüme stratejisi yerine derinlik kısıtlamaları olan yaprak odaklı (leaf-wise) strateji tercih edilmiştir. Yaprak odaklı stratejide hataları azaltarak aynı sayıda bölme süresi ile daha yüksek doğruluk elde edilebilir. Ancak yaprak odaklı stratejinin dezavantajı,

Uygulama sonucunda ele alınan LightGBM modeli yüksek doğrulukla DNA veri setinde sınıflandırma yapmıştır.

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BÖLÜM 7

YAPAY SİNİR AĞLARI

Özlem Akay

1. GİRİŞ

Yapay Sinir Ağları (YSA), beyinde ve merkezi sinir sisteminde bulunan biyolojik nöronların davranışlarından esinlenen bir makine öğrenme algoritmasıdır (Shenfield ve ark., 2018). Yirminci yy.ın ilk yarısında YSA ile ilgili çalışmalar başlamıştır ve büyük bir hızla devam etmektedir. 1943 yılında, sinir hekimi olan Warren McCulloch ile matematikçi olan Walter Pitts basit algoritmaları çalıştıran insan beyninin işleyişine yaklaşmayı amaçlayan bir devre sistemi kurmuşlardır (Gönül ve ark., 2015). 1957 yılında Cornell Üniversitesinden araştırmacı Frank Rosenblatt, gelişmiş örüntü tanıma gerçekleştirmek için tasarlanmış bir algoritma olan algılayıcıyı geliştirmiş ve makineleri görüntülerdeki nesnelere tanıma becerisine doğru ilerletmiştir. 1969'da MIT araştırmacıları Marvin Minsky ve Seymour Papert, sinir ağlarının amaçlandığı gibi çalışması için günün bilgisayarlarının gereken verileri işlemede bilgi işlem güçlerinin çok sınırlı olduğu gerçeğini de dâhil ederek sinir ağları ile ilgili birkaç sorunu dile getiren “Perceptrons” kitabını yayınlamışlardır. Araştırmalar 2010 yılından sonra toparlanmış ve 2012 yılında, ImageNet yarışmasının bir parçası olarak bir sinir ağı, görüntü tanıma görevinde insan performansını geçmeyi başarmıştır. O zamandan beri, yapay sinir ağlarına olan ilgi artmakta ve teknoloji gelişmeye devam etmektedir (Al-Massri, ve ark., 2018).

Yapay Sinir Ağı, öğrenme yeteneği ve veriler üzerinde sınıflandırma, örüntü tanıma ve tahmin için kullanılabilen bir ağ modeli oluşturma yeteneği nedeniyle farklı uygulama alanlarında yaygın olarak kullanılmaktadır. Sinir ağının diğer sınıflandırma tekniklerinin sahip olmadığı en umut verici özelliği, ağı simüle etmeye ve daha önce ağa maruz kalmayan yeni veriler üzerinde uygulanabilecek ve daha fazla kullanılacak bir model oluşturmaya yardımcı olmasıdır (El-Khatib, ve ark., 2019). Verileri üreten sistemin, olasılık modelinin altında yatan varsayım-

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BÖLÜM 8

ÖZYİNELEMELİ SİNİR AĞLARI

Erhan Turan

1. GİRİŞ

Yapay sinir ağlarını kabaca üç ana alt grup olarak sınıflandırılmaktadır. Bunlar; genel ileri-besleme sinir ağları (Feedforward Neural Networks, FNN), evrişimli sinir ağları (Convolutional Neural Networks, CNN) ve özyinelemeli sinir ağları (Recurrent Neural Networks, RNN), modern sinir ağları modellerinin çoğunluğunu kapsamaktadır. Günümüzde bu ana alt gruplar içerisinde melez modeller de özel problemlerde daha fazla verimlilik için kullanılmaktadır.

Bu bölümde, ardışık veriler üzerinde diğer yapay sinir ağlarına göre daha hızlı çalışan ve/veya daha iyi sonuçlar verebilen özyinelemeli sinir ağlarından, yaygın özyinelemeli sinir ağları, R programlama dili ile uygulamalı örneklerle anlatılmaktadır.

Literatür incelemesinde yapay sinir ağ modellerinin gelişimiyle ilgili çalışmalardan bahsedilmektedir. Bu yöntemlerden temel olan ve yaygın olarak kullanılan genel RNN ağları, uzun kısa-süreli bellek (Long Short-Term Memory, LSTM) ağları ve geçitli özyinelemeli birim (Gated Recurrent Unit, GRU) ağları yapısal olarak açıklanmakta ve uygulamalar altında R programlama dili ile Keras modülü kullanılarak sınıflandırma için örnekler sunulmaktadır.

2. LİTERATÜR İNCELEMESİ

Yapay sinir ağları, yüzeysel olarak biyolojik sinir ağlarından esinlenerek tasarlanmış bir yapay öğrenme yöntemleri sınıfıdır. Biyolojik sinir ağlarından ilk yapay sinir ağı *Perceptron* modeli McCulloch ve Pitts (1943) tarafından tanımlanmış fakat zamanla yapay sinir ağları biyolojik sinir ağlarından daha farklı modellere evrilmiştir (Goodfellow ve diğerleri, 2016). Bu model tek bir sinir hücre-

madığı sürece tek katmanlı ve dikkatlice seçilmiş parametreler ile yeterli sonuç alınabilmektedir.

Ardışık veriler ile eğitilerek anlamlı ilişkileri ortaya çıkarabilen yapıları, zamana dayalı verilerin analizinde de kullanışlı olabilmektedir. Qing ve Niu'nun (2018) çalışması, saatlik hava durumu bilgileri ile güneş ışığının parlama değerinin tahmin edilmesi üzerine, LSTM ağ modelinin BPNN gibi ağlardan çok daha iyi sonuçlar elde etmesi, özellikle LSTM ve GRU gibi geçitli modellerin başarılı olabileceğini göstermektedir. Fakat her zaman serisinden oluşan veri bu sinir ağı modelleri için bile uygun olmayabilir. Örneğin borsadaki bir firmanın geçmişe yönelik verilerinden faydalanarak bir sonraki gün veya hafta için yükselme ve düşme şeklinde ikili sınıflandırması yapılmak istenirse size çıkardığı model sadece o verilerin doğrultusunda oluşacak bir sonuçtur, gelecekte gelişecek özgün durumlar için modelin hata payı kabul edilen sınırın üstüne çıkabilir. Bir başka büyük sorun ise yakın zamanda bütün dünyayı etkileyen pandemi ile yıllardır oturmuş örüntülere sahip sistemlerin dahi son dönemde çok farklı zamana dayalı veri üreteceği de dikkate alınmalıdır.

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Bölüm 9

BERT MODELİ İLE DUYGU ANALİZİ UYGULAMA ÖRNEĞİ

İbrahim Öztürk, Mehmet Gökhan Bakal

1. GİRİŞ

Günümüzde üretilen özellikle metin tabanlı veri miktarı hızla artmaktadır. Dolayısıyla metin tabanlı veriler üzerinden otomatik anlam çıkarma veya metin sınıflandırma yapabilme önemli problem alanlarından biridir. Makine Öğrenmesi literatüründe hâlihazırda var olan çözümlerin yanı sıra daha hızla yeni, efektif ve özgün ileri yöntemler geliştirilmektedir. Bu çalışmada da ileri tekniklerden biri olan BERT (Bidirectional Encoder Representations from Transformers) modeli ve temel kullanılan detayları yaygınca kullanılan bir veri seti üzerinde duygu analizi ile R dili kullanarak uygulamalı olarak sunulacaktır.

Bu çalışmada Metin İşleme veya Doğal Dil İşlemenin (DDİ) genel hatlarıyla tanıtılarak DDİ kullanılarak gerçekleştirilmiş bazı uygulama örnekleri ve uygulama alt yapılarına ait teorik düzenlemeler sunulacaktır. Ardından bu çalışmanın ana unsuru olan BERT modelinin tanımı ve model altyapısı detaylandırılacaktır. İkili sınıflandırma problemi üzerinden seçilen veri kümesinde gereken düzenlemeler yapıp hazır hâle getirilecektir. Oluşturulan veri kümesi eğitim, validasyon ve test alt kümelerine parçalanarak model performansı değerlendirilecektir.

2. LİTERATÜR İNCELEMESİ

Elektronik ve bilgisayar dünyasındaki hızlı ilerleyiş ile paralel olarak insanların kullandığı ve maruz kaldığı bilgi çok hızlı bir şekilde artmaktadır. Bu bilgi yığınları içerisinde aranılanın tespit edilebilmesi ve kullanılabilir kılınabilmesi için bilgilerin kurallı şekillerde düzenlenebilmesi gerekmektedir. Bu aşamada Makine Öğrenmesi yaklaşımları diğer alanlarda olduğu gibi metin işleme tarafında da do-

Kayıp ve doğruluk üzerinden öğrenme sonuçları test veri kümesi ile validasyona tabi tutulduğunda da %99 oranında bir doğruluk ve %3 civarında bir kayıp yaşanmıştır.

```
17371/17371 [=====] - 768s 44ms/step - loss:
0.0034 - binary_accuracy: 0.9997
Kayıp: 0.003383721224963665
Doğruluk: 0.9996545910835266
```

4. SONUÇ

Bu çalışmada Doğal Dil İşleme veya Metin İşleme alanlarında oldukça yeni bir altyapı olan BERT için temel oluşturan kodlayıcı ve kod çözücüler, dikkat ve öz-dikkat mekanizmalarının ardından BERT modeline ait teorik altyapı sunulmuştur. Beraberinde duygu analizi çerçevesinde sık kullanılan veri kümelerinden biri seçilerek ikili sınıflandırma çerçevesinde bir uygulama gerçekleştirilmiştir. Uygulama ile ilgili gereken tüm paketler, paket kurulumları ve ortam kurulumları detaylı olarak kod parçalarıyla sunulmuştur. İkili sınıflandırma neticesinde tek öğrenme fazında oldukça yüksek doğruluk oranlarına erişilebilmiştir.

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Bölüm 10

HİBRİT MODELLEME İLE SINIFLANDIRMA YAKLAŞIMI

Mehmet Gökhan Bakal, İbrahim Öztürk

1. GİRİŞ

Günümüz dünyasında dijital dönüşümün hızla ilerlemesi hemen her alanda üstselsel olarak artan hızda veri yığınları oluşturmaktadır. Bu verilere örnek olarak haber yayınları, akademik makaleler, hasta kayıtları ile sağlık verileri, e-postalar ve sosyal medya paylaşımları gibi temel dijital kayıtlar öne çıkmaktadır. Yüksek boyutlu bu veri yığınlarının analiz edilerek anlamlandırılması için veri madenciliği ve makine öğrenmesi kapsamındaki hesaplamalı yöntemlere ciddi seviyede ihtiyaç duyulmaktadır. Bu bağlamda çözülmesi el yordamlarıyla kolay olmayan problemlerden birisi de birden fazla sınıfa ait verilerin otomatik olarak doğru kategorilerde sınıflandırılması işlemidir (Kolukısa vd., 2021). Bu anlamda sınıflandırma işleminin temeldeki zorluk nedeni ise katlanarak artan devasa boyutlardaki veri hacimlerinin manuel olarak analiz edilememesidir. Bu nedenle, araştırmacılar sayısallaştırılmış veri parçalarını işlemek için yoğun bir şekilde hesaplama tekniklerinden yararlanmaktadırlar (Labrinidis ve Jagadish, 2012; Bakal vd., 2018). Sınıflandırma görevlerinde ayrıca metinsel veriler üzerinde metin madenciliği de veri madenciliğinin bir alt dalı olarak Doğal Dil İşleme (NLP), Bilgi Getirme ve Makine Öğrenimi (ML) algoritmaları çeşitli alanlarda farklı yaklaşımlarla (Manning ve Schütze, 1999; Grishman, 2015; Bakal vd., 2021) kullanılmaktadır.

Bu bölüm çalışmasının amacı, makine öğrenmesi alanındaki sınıflandırma görevinin Gradyan Artırma Makineleri, Karar Ağacı Algoritması ve Yapay Sinir Ağı modelleri ile açıklanması ve sınıflandırma görevinin topluluk model yaklaşımı ile R dilinde uygulamasının IRIS veri seti üzerinden gerçekleştirilmesidir. Bu

Elde edilen performans değerleri Tablo 3'te gösterilmektedir. Modellerin performans değerlerine göre, en düşük logloss değeri en düşük yapay sinir ağı temelli model ile en yüksek değer ise gradyan artırma makineleri modeli ile elde edilmiştir.

Model	Logloss	MPCE
Karar Ağacı	0.5873598	0.1212121
Gradyan Artırma Makineleri	0.6073296	0.1212121
Yapay Sinir Ağı	0.06600335	0.03333333
Topluluk Öğrenme Modeli	0.1155815	0.03333333

Tablo 3. Modellerin Performans Ölçüt Skorları

Topluluk (*ensemble*) öğrenme modeli ise 0,1155 değeri ile logloss kriterinde ikinci en başarılı model olmuştur. Karar ağacı ve gradyan artırma makineleri modellerinin görece daha başarısız olması topluluk modelinin sınıflandırma performansını olumsuz olarak etkilemiştir. Öte yandan, model başına hata ortalaması (MPCE) değerlerine yapay sinir ağı modeli ve topluluk sınıflandırma modeli, karar ağacı modeli ve gradyan artırma makineleri modellerine göre aynı düzeyde daha başarılı olmuştur. Bu sonucun oluşmasında yine en önemli etken yapay sinir ağı temelli modelin yüksek başarı sağlamasıdır. Her ne kadar diğer modeller daha yüksek hata değerine sahip olsalar da topluluk temelli sınıflandırma yaklaşımının doğası gereği bir modelin hatalı sınıflandırma sonucunu bir diğer modelin kapatması sayesinde topluluk öğrenme modeli en düşük, sınıf başına ortalama hata değerini yapay sinir ağı modeli ile sağlamıştır.

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VERİTABANI GELİŐTİRME TEMELLERİ

Veritabanı Kavramları, Veritabanı Tasarımı

SQL ile Çözömlü Örnekler

Dr. Eftâl Őehirli

Dr. Muhammed Kâmil Turan

Dr. Birsen Gülden Özdemir



Veritabanı Geliştirme Temelleri

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İçindekiler

Ön Söz.....	iii
Yazarlar Hakkında.....	v
Teşekkür.....	ix

Bölüm 1

Veritabanı Kavramları	1
1.1. Veritabanı Nedir?	2
1.2. Veritabanı Kullanıcıları	2
1.2.1. Veritabanı Yöneticileri	2
1.2.2. Veritabanı Tasarımcıları	2
1.2.3. Uygulama Geliştiren Yazılımcılar	2
1.2.4. Veritabanı Son Kullanıcıları	3
1.2.5. Veritabanı Yönetim Sistemi Geliştiren Yazılımcılar	3
1.3. Veritabanı Kullanımının Avantajları	3

Bölüm 2

Veritabanı Kavramsal Tasarımı	5
2.1. ER Diyagram Tasarımı	7
2.1.1. Veri Modeli – Veritabanı (Database).....	7
2.1.2. Veri Modeli – Tablo (Entity)	7
2.1.3. Veri Modeli – Özellik (Attribute).....	7
2.1.4. Veri Modeli – İlişki (Relation - Relationship)	10
2.1.5. Veri Modeli – Bağımlı Tablo (Weak Entity)	12
2.1.6. Veri Modeli – Bağımlı İlişki (Weak Relation)	13
2.1.7. Veri Modeli – Anahtar (Key).....	13
2.2. ER Diyagramı Örnekleri.....	14
2.2.1. Senaryo 1	14
2.2.2. Senaryo 2	16
2.2.3. Senaryo 3	18
2.2.4. Senaryo 4	20

Bölüm 3

Veritabanı Mantıksal Tasarımı.....	23
3.1. İlişkisel Şema Oluşturulması (Relational Schema).....	24
3.1.1. Mapping İşlemi - Adım 1.....	24
3.1.2. Mapping İşlemi - Adım 2.....	26
3.1.3. Mapping İşlemi - Adım 3.....	28
3.1.4. Mapping İşlemi - Adım 4.....	30
3.1.5. Mapping İşlemi - Adım 5.....	32
3.2. Fonksiyonel Bağımlılık	33
3.3. Normalizasyon.....	34
3.2.1. 1 NF Kuralı.....	35
3.2.2. 2 NF Kuralı.....	36
3.2.3. 3 NF Kuralı.....	38

Bölüm 4

SQL.....	41
4.1. DDL Komutları.....	44
4.1.1. Create.....	44
4.1.2. Alter.....	45
4.1.3. Drop.....	45
4.1.4. Truncate.....	45
4.1.5. Add.....	46
4.1.6. Constraint.....	46
4.1.7. Primary Key.....	47
4.1.8. Foreign Key.....	48
4.1.9. Not Null.....	49
4.1.10. Unique.....	49
4.1.11. Default.....	50
4.1.12. Check.....	51
4.1.13. Index.....	51
4.1.14. Identity.....	52
4.1.15. References.....	52
4.1.16. Backup.....	53
4.2. DML Komutları.....	53
4.2.1. Select ... From.....	53
4.2.2. Insert Into ... Values.....	54
4.2.3. Update ... Set ... Where.....	54
4.2.4. Delete From.....	55

4.2.5. Where.....	55
4.2.6. And	56
4.2.7. Or.....	56
4.2.8. Not	57
4.2.9. Between	57
4.2.10. In.....	58
4.2.11. Is Null	58
4.2.12. Is Not Null	59
4.2.13. Like.....	59
4.2.14. As.....	60
4.2.15. Exists	61
4.2.16. Any	61
4.2.17. All.....	62
4.2.18. Distinct.....	62
4.2.19. Top.....	63
4.2.20. Percent	63
4.2.21. Order By	64
4.2.22. Case	65
4.2.23. Join	65
4.2.24. Group By	67
4.2.25. Having	68
Bölüm 5	
Veritabanı Fiziksel Tasarımı.....	69
5.1. Birinci Yöntem SQL Kullanmak	72
5.2. İkinci Yöntem MS SQL Server Arayüzü Kullanmak	76
Bölüm 6	
Tablolara Yeni Kayıtlar Ekleme İşlemi	89
6.1. Birinci Yöntem SQL Kullanmak	92
6.2. İkinci Yöntem MS SQL Server Arayüzü Kullanmak	95
Bölüm 7	
SQL ile Soru Cevap.....	109

Bölüm 8	
SQL ile Bağlantılı C# Programı Geliştirme	125
 Bölüm 9	
SQL ile Bağlantılı Python Programı Geliştirme	139
 Bölüm 10	
View – Stored Procedure – Trigger	143
10. 1. View (Görünüm).....	144
10. 2. Stored Procedure (Saklı Yordam).....	150
10. 3. Trigger (Tetikleyici)	157
 Bölüm 11	
Yedekleme – Taşıma – Geri Yükleme.....	167
Referanslar.....	177
Son Söz	178

Referanslar

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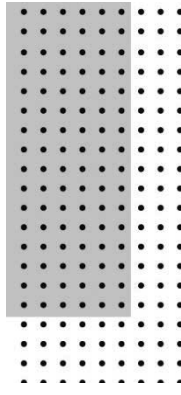
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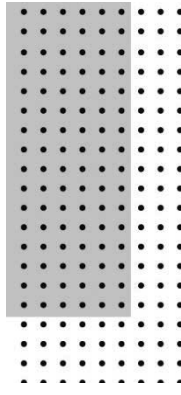
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İÇİNDEKİLER

YAZAR LİSTESİ	iii
ÖN SÖZ.....	v
BÖLÜM 1	
ETİK KAVRAMI.....	1
BÖLÜM 2	
AYRIMCILIK YAPMAMA-TARAFSIZLIK.....	9
BÖLÜM 3	
İNSANİ YARDIM.....	15
BÖLÜM 4	
MESLEK ETİĞİ.....	35
BÖLÜM 5	
AFET YÖNETİMİNDE ETİK.....	49
BÖLÜM 6	
AFET ÖNCESİNDE ETİK İLKELER	59
BÖLÜM 7	
AFET SIRASINDA ETİK İLKELER	67

BÖLÜM 8	
AFET SONRASINDA ETİK İLKELER.....	73
BÖLÜM 9	
AFETLERDE ÇEVRE VE ETİK	87
BÖLÜM 10	
AFETLERDE HAYVAN HAKLARI VE ETİK.....	105
BÖLÜM 11	
ULUSAL ARAMA VE KURTARMA MEVZUATI	115
BÖLÜM 12	
INSARAG YAKLAŞIMI	137
BÖLÜM 13	
ULUSLARARASI ARAMA KURTARMA MEVZUATI.....	143
3	
BÖLÜM 14	
ARAMA KURTARMADA ETİK SORUMLULUKLAR.....	153
BÖLÜM 15	
ULUSLARARASI ARAMA KURTARMADA ETİK.....	163
BÖLÜM 16	
AFETLERDE İNFODEMİ.....	173
BÖLÜM 17	
AFETLERDE MEDYANIN ETİK ROLÜ: GAZETECİ GÖZÜYLE KAHRAMANMARAŞ DEPREMLERİ	179



BÖLÜM 1

ETİK KAVRAMI

GİRİŞ

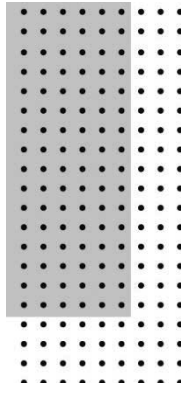
Krizlerle birlikte yaşamaya çalıştığımız dünyamızda krizlerin odağındaki “insan”ın tutunabileceği temel ihtiyaç “etik yaklaşım” olacaktır. Etik yaklaşım; krize neden olan yaşam biçiminin değiştirilmesi ve sonucunda oluşan afetlerin önlenmesi, afetlere müdahalede son derece önemlidir. Yardım ya da insana yardım (afetler de dâhil) söz konusu olduğunda gündeme gelen etik, günümüzde daha çok bir yazılı normlar bütünü anlamında kullanılmaktadır. Etik birçok kural ortaya koymaktadır. Bu duruma rağmen etik; düzenlemeler ve bürokratik kurallarla eş tutulmamalıdır. İnsani yardım alanındaki çalışmaların uzmanlık gerektiren, salt teknik bir konu olarak ele alınması yeterli olmayacaktır. Afet durumunda olağan dışı koşullar hâkim olduğu için yasal düzenlemeler, yönergeler vb. denetim araçları geçerliliğini yitirebilir. Yine bu özel koşullar nedeniyle sahada ikilemler-problemlerle karşılaşılabilir. Bu durumda güncel hayatta kullanılan etik ilkeler işe yaramaz hâle gelecektir. Böylece yardım-hizmet alanında çalışanlar için dışsal olmaktan çok, içsel bir etik anlayışı önem kazanmaktadır. Bu nedenle sahada çalışanların etik konusunda bireysel felsefi bir anlayışa sahip olmaları son derece önemlidir.

Daha fazla yaşanabilir bir dünya için insan, doğa ve yaşama dair değerler vazgeçilmezdir. Değerleri insan oluşturur. Bu değerleri etik inceler, sorgular ve yorumlar. Değer ile ilgili sorunlar ve bu sorunlara ilişkin tartışmalar sonucunda etik yargılar oluşmaktadır. İnsana, doğaya, yaşama değer verme beraberinde etik kavramını öne çıkarmaktadır. Örnek olarak çevre etiği, çevre felsefesi gibi alanlar gösterilebilir. Bu anlamda çevre, doğa ve insan ilişkileri bütünlüğünde konuyu ele almak daha doğru olacaktır. Afetler söz konusu olduğunda tam da bu bütünlük önem kazanmaktadır. Afetlerin meydana gelmesi ve afet sonrası çalışmalar çevre, doğa ve insan ilişkileri bütünlüğünün bozulması ve yeniden kurulması üzerine gerçek-

inandıkları dinlerinden bağımsız olarak) değer vermek gerekir. “İlke”ye ve dolayısıyla değerlere sahip olunduğunda işler kolaylaşacaktır. Çünkü her problem durumunda çözüme bu ilke rehberlik edecektir. Bu anlamda insanlarla ilgili yardım ya da hizmet mesleklerinde “diğer insanlar” ve “değerler” en başta gelmesi gereken kavramlardır. Etik değerlere sahip olarak yaşayabilmek ve mesleği etik değerlere uygun olarak icra edebilmek için normlardan-prosedürlerden daha çok etik değerleri içeren felsefe bilgisine (felsefi bir eğitime) ihtiyaç vardır. Zamana karşı yarışılan afet durumlarında yapılacak tüm çalışmaların insan onuruna zarar vermeyecek biçimde olması gerekir. Bunu ancak bilgi sahibi, konu ile ilgili etik anlayış geliştirmiş, inisiyatif alabilen bireyler yapabilir. Bu kişi toplumsal kuralların ve değerlerin göreliliğinin farkında ve eleştirel bakış açısına sahip olmalıdır. Yardım-hizmet alanında çalışanlar için dışsal olmaktan çok içsel bir etik anlayışı önem kazanmaktadır. Bütün bu nedenlerden dolayı afet alanında çalışan uzmanların; etik ilke ve prensipleri içselleştirmeleri ve aynı zamanda etik kararlar vermede yetkinleşmeleri şarttır. Sahada çalışanların etik konusunda bireysel felsefi bir anlayışa sahip olmaları son derece önemlidir. Afetlerin meydana gelmesi ve afet sonrası çalışmalar çevre, doğa ve insan ilişkileri bütünlüğünün bozulması ve yeniden kurulması üzerine gerçekleşmektedir. Evreni bir bütün olarak anlamaya çalışan felsefe bu noktada işe yarar sonuçlar sunabilir.

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BÖLÜM 2

AYRIMCILIK YAPMAMA-TARAFSIZLIK

GİRİŞ

Toplumlar kendi içlerinde bir bütünü oluştursalar bile farklı toplumsal, kültürel, siyasi, psikolojik geçmişe sahip bireylerden oluşur. Farklı geçmişleri olan bu bireylere yardım söz konusu olduğunda sahip oldukları bu farklılıkları dikkate alan bir hizmetin verilmesi gerekmektedir. Fakat uygulamaya bakıldığında bu bireylerin farklılıklarından dolayı zaman zaman ayrımcılığa maruz kaldığı görülebilir. Bu türden uygulamalar günümüzde bir hak ihlali olarak değerlendirilmektedir. Çünkü insan hakları açısından vatandaşların, eşit ve adil bir şekilde hizmet-yardım almaları gerekir. Buradaki etik ilke “Her insan doğuştan değerli ve saygıyı hak eden bir varlıktır.” şeklinde ifade edilebilir. Bu ilke ile beraber yaşlılık, toplumsal cinsiyet, dil, din, etnik köken vb. konulara karşı duyarlı olmak gereği ortaya çıkmıştır.

Literatüre bakıldığında toplumda dezavantajlı grupların (yaşlı, kadın, engelli vb.) ayrımcılığa maruz kalma olasılıklarının daha yüksek oldukları görülmektedir. Bu kişilere hizmet-yardım söz konusu olduğunda dolayı ayrımcılık karşıtı - tarafsız bir uygulamayı hayata geçirmek gerekmektedir. İnsanlara hizmet-yardım alanında günlük hayatta çoğu zaman karşılaşılan olumsuz durumlarda yeterli bilgi ve farkındalığın olmadığı görülmektedir.

AYRIMCILIK NEDİR?

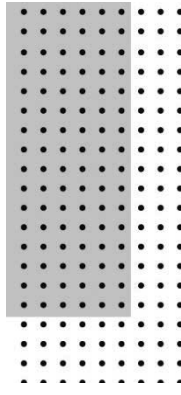
Yardım-hizmet alanında, farklılıklarından (biyolojik, kültürel, sosyal, etnik vb.) dolayı ötekileştirilen insanların sorunlarının çözümünde yetersiz kalınması, farklı anlayışların meydana gelmesine neden olmuştur. Ayrımcılık karşıtı uygulama bu uygulamalardan biridir. Ayrımcılık karşıtı uygulama, insan ve insanların sahip oldukları yaşlılık, toplumsal cinsiyet, dil, din, etnik köken vb. farklılıkları nedeniyle maruz kaldıkları her türden sözlü ve sözlü olmayan, olumsuz tutum ve

AFETLERDE ETİK YAKLAŞIM

bakış açısına önem vermelidir. Ancak bu sayede yapılan hizmetin değerlendirilmesi, geliştirilmesi, etik ilkelere uygun ve ayrımcılık olmadan yapılması mümkün olacaktır.

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BÖLÜM 3

İNSANİ YARDIM

GİRİŞ

Günümüz dünyasında giderek artan savaşlar, kıtlık, iklimsel kriz, afetler, ulusal ve uluslararası çatışmalar, kaynakların dağıtımındaki veya kaynaklara ulaşımındaki eşitsizlikler bireysel yaşamlardaki, gelir kaynaklarındaki, bölgesel ve ulusal istikrardaki sürdürülebilirliğin tehlikeye girmesine ve insani ihtiyaçların giderek artmasına neden olmakta, beraberinde global kalkınma planlarının sekteye uğramasına yol açmaktadır.

Doğal ya da insan kaynaklı afetler veya süreçler ortaya çıktığında mağdurlara insan onuruna yakışır bir hayat için yardım ederek acıyı hafifletmek ve hayata bağlamak insani yardımın gelişimindeki temel motivasyondur.

İnsani yardıma odaklanmış birçok ulusal ve uluslararası kuruluş, devlet kökenli kuruluşlar, sivil toplum kuruluşları (STK), özel sektör ve gönüllüler bu alandaki ana aktörlerdir. Tarafsızlık, insancılık, bağımsızlık, yansızlığın temel değerler olarak kabul edildiği ve hesap verebilirliğin ön plana çıkarıldığı etkin ve etik insani yardım ile kırılğanlığın azaltılması sağlanabilir.

Kitabın bu bölümünde; insani yardımın tanımı, amacı, insani yardımın temel prensipleri ve standartları, insani yardım gerektiren durumlar, insani yardım paydaşları, insani yardım çeşitleri ve insani yardımın etik hususlara yönelik görünümü aktarılmaya çalışılmıştır.

İNSANİ YARDIM TANIMI

İnsani yardım terimi birçok açıdan farklı ele alış tarzlarına odaklanmaya izin verebilen bir kavramdır. Bu durum çok sayıda tanımlamayı ve bunlardan kaynaklanan felsefi ve ideolojik tartışmaları da beraberinde getirir. Tanımlar, insani yardımı sağlayan tarafın fikirleri, motivasyonları, tutumları, inançları, ideolojileri, duygu-

Alışıl gelmiş uygulamalarda, insani yardım söylemleri, çatışan değerleri çözmez ve etik sorunları tanımlamaz ve açıkça adlandırmaz (Clarival ve Biller-Andorno, 2014). İnsani yardım personelleri -çoğunlukla eğitim derecesi, uzmanlık alanı gibi konularda heterojen bir grup- çoğu zaman yönetim ile ilgili ve ya jeopolitik sorunlar yaşamaz, sorunların kaynağı büyük oranda sınırlı kaynakların tahsisi gibi durumlar nedeniyle ortaya çıkar (Asgary ve Lawrence, 2020; Hurst, Mezger ve Mauron, 2009) Bu ve benzeri durumların etik sonuca ulaştırılması ve insani yardım personeline saha içi rehber olacak çerçevenin belirlenmesi gerekir. Açıklığa kavuşturulmayan ikilemler insani yardım personeline tükenmişliğe, ahlaki sıkıntılara, psikolojik istikrarsızlığa neden olabilir (Asgary ve Lawrence, 2020).

İnsani yardım kuruluşlarına, etkin ve insancıl faaliyetler sergileyebilmeleri, personeline ortaya çıkabilecek olumsuz sonuçlardan kaçınabilmeleri ve etik yetkinliğe ulaşabilmeleri için aşağıdaki yaklaşımlar önerilebilir (McGowan vd., 2020):

- İnsani yardım personeli için pratik etik rehberlik hizmeti sunulmalıdır.
- İnsani yardım kuruluşlarınca bünyelerindeki etik alan araştırmaları desteklenerek genişletilmelidir.
- Kurum içi ve sahada etik müzakere ve uzlaşma kültürü teşvik edilmelidir.
- Etik ikilemlerde karar verme araçlarını kullanılmalıdır.
- Ahlaki-etik sıkıntı içindeki personel kurumsal olarak desteklenmelidir.

İnsani yardım sektörünün etik hususlar konusunda ele alması gereken bir başka bakış açısı da yardımdan faydalananların etik deneyimlerine dair görüşlerinin alınıp sonraki yaklaşımlar için değerlendirilmesidir (Asgary ve Lawrence, 2020).

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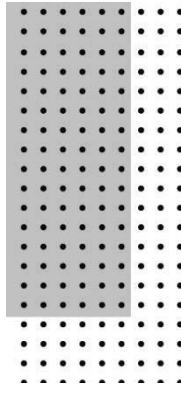
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BÖLÜM 4

MESLEK ETİĞİ

GİRİŞ

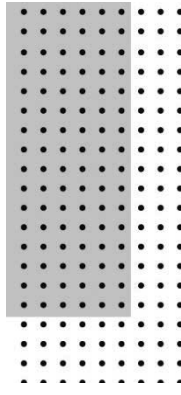
Globalleşen dünyada kitle iletişim teknolojilerinin çok hızlı gelişmesi ile birlikte insan yaşamının neredeyse tamamının etkileneceği yeni gelişmelerle karşılaşmaktadır. Bu gelişmeler toplum yapısını etkilemekte ve değişimlere sebep olmaktadır. Toplum yapısında önem teşkil eden insan davranışları; psikoloji, yönetim bilimi ve hukuk disiplinlerini ilgilendirdiği kadar etik disiplini de etkilemektedir. Çünkü insan davranışlarının ahlaki boyutu toplumda sosyal düzeni sağlamak açısından oldukça önem taşımaktadır. İnsanlar buldukları yaşam alanlarını sosyal, siyasal, ekonomik ve kültürel açıdan doğrudan etkileyen davranışlar sergileyip yaşanacak gelişmelere ve değişimlere öncülük etmektedir. Yaşanan değişim ve dönüşümler insan davranışları, toplumların sahip oldukları değer yargıları ve toplumsal, bireysel ideolojiler üzerinde de köklü değişiklikler meydana getirmektedir. Bu bağlamda hızlı değişimler neticesinde oluşan dinamik yapı da, etik sorunları da beraberinde getirerek etik, ahlak, değerler gibi kavramların irdelenmesini gerektirmektedir.

Etik konusu sosyal bilimcilerin uzun senelerdir tartıştıkları, tanımlamaya çalıştıkları, insanlık tarihi kadar eski bir konudur. Etik iyi ve kötü, doğru ve yanlış vb. kavramların ayrımını yapabilmek için norm ve ilkeler oluşturmaya çalışan bir bilimdir (Frankena, 2007: 36). Etik kavramı, ahlak kavramıyla aynı anlamda kullanılsa da her ikisinin de birbirinden farklı kavramlar olduğu sonradan anlaşılmıştır. Ahlak etiğin araştırma alanıdır bu nedenle etiğin tanımı yapılırken ahlak üzerinde durulmaktadır. Etik, ahlak yasalarının sistematize ve standardize edilmiş hâlidir. Aristoteles, Kant gibi bazı filozoflar ahlakın felsefi düzlemde incelenmesini etik olarak nitelendirmektedir. Etik insanların eylemlerini bazı standartlar doğrultusunda doğru veya yanlış olarak değerlendirir. Bu nedenle etik için en önemli husus insan eylemidir. İnsan “düşünen” ve “eylemde bulunan” bir varlık olarak

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BÖLÜM 5

AFET YÖNETİMİNDE ETİK

GİRİŞ

Afetler “Toplumun tamamı veya belirli kesimleri için fiziksel, sosyal, ekonomik kayıplar doğuran, normal hayatı ve insan faaliyetlerini durduran veya kesintiye uğratan, beklenmeyen bir anda ortaya çıkan doğal ya da insan kaynaklı olaylar”dır (Oktay 2023). Bu yönüyle afetler hayatın kaçınılmaz bir parçasıdır. Toplumların afetlerle karşılaşma riski ve tehlikesi altında olmaları, afetlerin hem anlık hem de uzun vadede etkilerinin olması, afetlerle birlikte yaşama becerilerini geliştirmelerini zorunlu kılmaktadır (Akyel 2007).

Her yıl milyonlarca insan afetlerden etkilenmekte, çok sayıda can kayıpları ve yaralanmalar yaşanmakta bunun yanında ciddi ekonomik kayıplar oluşmaktadır. Afetler toplum, ekonomi ve çevre üzerindeki etkileri nedeniyle sürdürülebilir kalkınmayı tehlikeye atar. Çevresel bozulma, her türlü eşitsizliği artırarak ve risklerin artmasına katkıda bulunarak ekonomik ve sosyal kırılganlığı artırmaktadır (Prieur 2010).

“Çağdaş Afet Yönetimi” afetlerin önlenmesi ve zararlarının azaltılabilmesi için afete yol açabilecek tehlike ve risklerin iyi bilinmesini, gerekli önlemlerin önceden alınmasını, en akılcı yol ve yöntemlerle ortadan kaldırılmasını veya yol açabilecekleri olumsuz etkilerin azaltılmasını gerektiren bir mücadeledir. Bu mücadele içerisinde, her bir vatandaşın en yetkili makamlara kadar, herkese görev ve sorumluluk düşmektedir (Erkal ve Değerliyurt 2011; Jenson 1997).

Son yıllarda başta Birleşmiş Milletler (BM) olmak üzere, pek çok uluslararası kuruluş, afet yönetiminde etiğin önemi üzerinde durmaktadır. Özellikle afetzedelerin

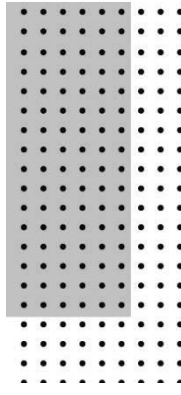
- Risk azaltma çalışmaları öncelikli olarak ele alınmalı, acil eylem planı hazırlanarak toplumun tüm kesimi ortak sorumluluk ve iş birliği içinde hareket etmelidir.
- Ülkemizin çeşitli afetler açısından yüksek riskli olması nedeniyle eğitim öğretimin tüm aşamasında okullardaki müfredatlara afet etiği ile ilgili konular eklenmelidir.
- Toplumun afet etiği konusunda bilinçlendirilmesi için eğitim materyalleri hazırlanmalı, bunların kullanımında medya, görsel işitsel araçlardan faydalanılmalıdır.
- Afete müdahalede afet öncesi, afet anı ve afet sonrası dönemin özelliklerine göre etik yaklaşım ilkelerine özen gösterilmelidir.
- Nüfusun özellikle korunmasız gruplarına (çocuklar, yaşlılar, sağlık bakımındaki ve cezaevlerindeki bireyler, engelli kişiler) hoşgörü, merhamet, saygı çerçevesinde insanca davranmalı bakımını planlamak için özel çaba gösterilmelidir.

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BÖLÜM 6

AFET ÖNCESİNDE ETİK İLKELER

GİRİŞ

Afetler, aniden ölüm veya ölüme neden olan olağanüstü olaylardır. Çok sayıda insanın yaralandığı bir felaket bir durumdur ve en önemlisi yerel kapasiteyi aşan bir olaydır ayrıca hem ulusal hem de uluslararası düzeyde dış yardım talebinde bulunduğu durumdur. Afetlerin diğer büyük ölçekli olaylardan farkı çok sayıda insan için korkunç sonuçlar doğuran sorunlar ve normal günlük yaşamda kabul edilebilir hayati tehlike derecesidir (Beck, 1992).

Afetlerde karşılaşılabilecek spesifik sorunların önceden tahmin edilmesi, olayların dinamik ve öngörülemeyen doğasından dolayı zorlayıcı olabilmektedir. Ancak çeşitli afet türleri sırasında ortaya çıkma eğiliminde olan ortak sorun kategorileri vardır. Bu kategorileri anlamak, daha iyi hazırlıklı olma ve müdahale çabalarına yardımcı olabilir. Bu sorunların niteliğinin ve kapsamının, afetin türüne (doğal, teknolojik, biyolojik vb.) ve özel koşullara bağlı olarak büyük ölçüde değişebilir (Bellah ve ark., 1985; Davis. & Fowler, 2010; Allen, 1993; Anonymous, 1999; Beatley, 1989).

AFETLERDE KARŞILAŞILABİLECEK SPESİFİK SORUNLAR

Afetlerde karşılaşılan sorunlar, afetin türüne, ölçeğine, konumuna ve etkilenen nüfusa bağlı olarak büyük ölçüde değişiklik gösterebilir. Farklı afet türlerinde karşılaşılabilecek bazı spesifik sorunlar şunlardır;

İletişim Arızaları

Kesintiye uğrayan iletişim ağları, kritik bilgilerin yayılmasını engelleyebilir, bu da karışıklığa ve müdahale çabalarında gecikmelere neden olabilir. Ayrıca bilgi ve söylentiler hızla yayılarak paniğe ve yanlış bilgilendirilmiş kararlara yol açabilir.

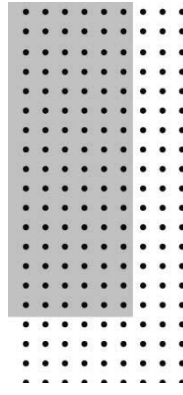
toplulukların ihtiyaç ve haklarına saygı gösterilmesini sağlayabilir. Topluluklar, bu etik ilkeleri afete hazırlık planlarına ve politikalarına entegre ederek kriz zamanlarında bireylerin refahını ve haklarını daha iyi koruyabilirler.

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BÖLÜM 7

AFET SIRASINDA ETİK İLKELER

GİRİŞ

Dünyada özellikle içinde bulunduğumuz yüzyılda çeşitli afetler ile karşılaşmıştır. Ülkeden ülkeye farklılık gösteren saldırılar, depremler, tsunamiler, nükleer santral kazalar, terör ve salgın hastalıklar gibi bir dizi doğa ve insan kaynaklı afetler yaşamış ve literatüre her geçen gün yenileri eklenmektedir (Usta ve Yükseler, 2021). Bunların yanı sıra iklim değişikliğine bağlı olarak iklim göçleri, iklim mülteciliği bunlar dışında iklim ile ilişkili sel, kuraklık, taşkın, çölleşme gibi afetlerin sayısı ve şiddetinde artışlar olmuş (Usta ve Yükseler, 2021) ve bunlara ek olarak ülkemizi derinden etkileyen 6 Şubat 2023 Kahramanmaraş merkezli deprem insanlık için ağır sonuçlar doğurmuştur.

Afet sırası dönemi, müdahale çalışmalarının yapılmış olduğu dönem olarak bilinir. Ayrıca bu dönem karmaşa ve krizin olduğu dönemdir. Afet öncesinde yapılmış olan planların ve türlü önlem hazırlıklarının yaşama geçtiği kritik öneme sahip bir dönemdir. Afet bölgesinde, insan haklarını ihlal edecek birçok farklı durum ortaya çıkmaktadır. İlk olarak mevcut düzen bozulur, bireyler temel ihtiyaçlarını karşılamak için yardıma ihtiyaç duyarlar, aile yapısı parçalanabilir, ciddi nüfus hareketleri meydana gelebilir (Ekşi, 2015). Afet sırasında bu kriz döneminde tüm dikkatlerin toplanmış olduğu aşama, yapılan hazırlıkların son aşamasıdır. Bu aşamanın başarılı olması diğer aşamaların başarısıyla doğrudan ilişkilidir (Gökkaya ve Dinç 2020; Kaya, 2013). Bu dönemde en önemli hedef mümkün olduğunca yüksek sayıda insanın hayatını kurtarmak esastır. Bunun yanı sıra temel ihtiyaçların karşılanması, geçici barınma önlemlerinin alınması ve güvenliğin sağlanması gereklidir. Tüm bunlarla birlikte hayatı tekrar normale döndürme çalışmaları afet öncesi dönemde yapılan plan ve programların hazır ve etkin olmasıyla mümkündür (Gökkaya ve Dinç 2020; Bilik, 2015).

SONUÇ

Afet sırasında etik ilkeler, farklı kültür, inançlara ve değerlere sahip bütün insanlar için tüm insanları gözeterek evrensel olmalıdır. Ayrıca afetzedelerin ve afete müdahale ekiplerinin hassasiyetleri göz önünde bulundurulmalıdır. Ayrımcılık yapmaksızın tüm insanların afet durumunda acil yardım alması, bu etik ilkeler bakımından oldukça önemlidir. Önemli bir konu olarak yağmacılığın önüne geçilmesi, bunu fırsat bilen kişilere izin verilmemesi olmalıdır. Bir diğer önemli konu da çevrenin korunması ve yeniden iyileştirme sürecine başlanmasıdır. Özellikle afetten etkilenmiş insanların ibadet, toplanma yerlerinin ve afetzedelerin boş zamanlarında geçirebilecekleri sosyal aktiviteler oluşturabileceği ortamların oluşturulmasının da “afet sırası etik ilkeler”in en önemli öğelerinden biri olması gerekir.

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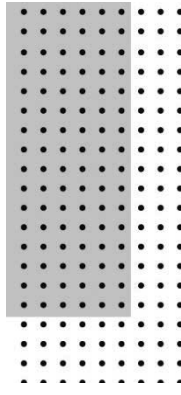
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BÖLÜM 8

AFET SONRASINDA ETİK İLKELER

GİRİŞ

Neyin doğru, neyin yanlış olduğuna ilişkin davranış kuralları ve ahlaki yargıların incelenmesi olarak tanımlanan etik kavramı kritik zamanlarda ön plana çıkmaktadır (Geale, 2012). Özellikle afet gibi kaotik durumlarda etik ikilemler ön safta görevli kişiler tarafından iyi uygulanmalıdır. Sıradan hayat durumları için oluşmuş etik ilkelerin, afet dönemlerinin olağan dışı şartlarında geçerliliğini ve etkisini koruması zor bir durumdur. Etik yükümlülük olarak yönetimden, başlıca kayırmacılık ve ayrımcılığı engellemesi, halkla uyum içinde, sert ve hiyerarşik bir idare anlayışının dışında, katılım mekanizmasını kullanan, saydam ve hesap verebilir bir idare anlayışını benimsemesi beklenir. Afetlerde etik ilkeler, hem yönetime hem de halka ışık tutan önemli bir faktördür (Gökkaya ve Dinç, 2020). Bu bölümün hazırlanmasında kavramsal çerçeve oluşturulurken iki önemli nokta dikkate alınmıştır. Bunlardan birincisi afet yönetimi döngüsü, diğeri ise uluslararası Kızıllaç örgütünün benimsemiş olduğu etik ilkelerdir. Afet ve acil durumların etik yönetimi, afet yönetiminin hafifletme, planlama, müdahale ve iyileştirme döngüsünün bir parçası olarak iletişim, eğitim ve öğretim, farkındalık oluşturma, kaynak edimi ve planlama ve tahsisi içeren karmaşık bir iştir. Afet yönetiminin temel amacı elbette önlemedir. Afet meydana geldiğinde zamanında, etkili, kültürel açıdan duyarlı ve cinsiyete uygun bir müdahale hayata geçirilmelidir. Böyle bir müdahale, afetten etkilenenlerin, müdahale edenlerden farklı adalet standartlarına ve etik geleneklere sahip olabileceğini kabul etmelidir. Bu nokta özellikle uluslararası ortamda doğrudur. Bu tür farklılıkların tanınması ve takdir edilmesi, mağdurun onurunun korunmasına ve sürdürülebilir iyileşmeye yönelik çalışmalara yardımcı olur (Geale, 2012).

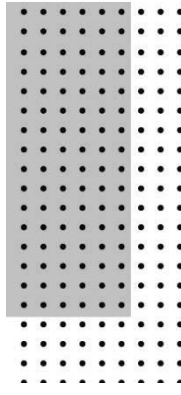
aştıkça ve gelişmiş ve gelişmekte olan ülkelerdeki toplumlar içinde ve arasında var olan küresel bölünme ve eşitsizlikler arttıkça bu tür zorluklar da artmaktadır. Gelişmiş ülkelerden kendi çalışmaları için araştırma tamamlamak isteyen doktora öğrencilerinin gelişini anlattı. Bazı durumlarda mağdurlar anketi yanıtlayanlar tarafından tacize uğramış hissettiler ve çoğu durumda yerel bilgi ve toplumsal gelenek eksikliği kültürel hassasiyetleri rahatsız eden durumlar yarattı. Ancak araştırmacılar ve etik uzmanları bu tür sorunların üstesinden gelmek için birlikte çalışabilirler (Geale, 2012).

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BÖLÜM 9

AFETLERDE ÇEVRE VE ETİK

GİRİŞ

Canlı bir sistem üzerinde etkili olan ve onun biçimini, işlevini ve hayatta kalmasını etkileyen fiziksel, kimyasal ve biyotik faktörlerin bileşimi çevre olarak tanımlanır. Bir kişinin çevresi, onun ana rahmine düşmesinden ölümüne kadar aldığı uyarıların toplamı olarak da tanımlanabilir (Singh, 2006; Chu ve Karr, 2017). Yüksek yaşam kalitesi ve tüketicilerin gereksinimleri nedeniyle temel çevre sorunu önemli ölçüde artmıştır. Çağdaş toplumlar için gerekli olan kozmetikler, böcek ilaçları, kişisel bakım ürünleri, steroid hormonları, tehlikeli kimyasal atıkların boşaltılması, pestisitlerin dağıtılması, biyolojik olarak parçalanamayan malzemelerin kullanımı, gübrelerin kullanımı, zararlı sera gazları ve çamurun bertaraf edilmesi gibi ciddi tehlikelere neden olan çok sayıda çevresel tehlike vardır (Khan vd., 2022).

Çevre etiği, insanın doğal çevreyle olan etik ilişkisiyle ilgili olup insanın çevreyle ahlaki ve etik ilişkisini dikkate alan ve insanların, insan olmayan dünyanın (insan olarak kabul edilmek için yeterli olmayan bazı insani özellikler sergileyen herhangi bir varlık) korunması ve bakımına yönelik ahlaki yükümlülüğüne dayanan felsefi bir disiplindir. Doğru ve yanlış kavramı ya da değerler kişiden kişiye ve zamana göre değişse de evrensel olarak kabul edilmiş bazı etik ilkeler vardır. İnsanlığa çevreyi koruma konusunda yardımcı ve yol gösterici olabilecek evrensel olarak kabul edilmiş bu ilkeler etik değerlerdir. Çevre etiği, insanın çevreyle ahlaki ve etik ilişkisini ele alan felsefi disiplin olarak tanımlanabilir. Dolayısıyla insanı çevreyi doğru şekilde yönetmeye zorlayan bir etik değerler sistemidir (Jazib, 2018).

Geleneksel olarak çevre etiği afet alanında zayıf bir rol oynamıştır ancak iki sebepten dolayı giderek önem kazanmıştır. Birincisi, doğal sistemlerin bozulmasının doğal afetlerin daha şiddetlendirmede oynadığı rolün giderek daha fazla tanınmasıdır. ABD'de 7 eyalette yaklaşık 2 bin kişinin hayatını kaybetmesine neden olan

AFETLERDE ETİK YAKLAŞIM

- Doğa yalnızca insanlar için değil yeryüzünde bulunan tüm türler için vardır.
- Doğal kaynaklar sınırlıdır ve yalnızca insanlara veya şimdiki insan nesline ait olmayıp diğer yaşam formları ve gelecek nesiller de dâhil olmak üzere herkes tarafından paylaşılmaktadır.
- Ekonomik büyüme, dünya ortamına en az zarar verene kadar iyidir.
- Sağlıklı bir ekonomi sağlıklı bir çevreye bağlıdır.
- İnsanlığın başarısı, doğanın geri kalanını kendi çıkarımız için kullanmaya çalışırken onlarla en iyi şekilde nasıl iş birliği yapabileceğimize bağlıdır (Jazib, 2018).

Modern çevre etiği alanı 1970'lerde ortaya çıkmıştır. Çevre etiğine ilişkin ilk akademik konferans 1971 yılında Georgia Üniversitesinde düzenlenmiş, ilk dergi "Çevre Etiği" 1978'de yayım hayatına başlamıştır. 1980'lerden itibaren çevre etiğine ilişkin araştırma, yayım ve öğretim hızla genişlemiştir (Palmer, 2014). Çevre etiği 1970'lerin başında felsefenin yeni bir alt disiplini olarak ortaya çıkması, bunu geleneksel insan merkezciğe meydan okuyarak yapması, ilk olarak, insanların yeryüzündeki diğer türlerin üyelerine karşı varsayılan ahlaki üstünlüğünü sorgulamıştır. İkinci olarak, doğal çevreye ve onun insan dışı içeriklerine içsel değer atamak için rasyonel argümanların olasılığını araştırmıştır (Brennan ve ark., 2022).

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BÖLÜM 10

AFETLERDE HAYVAN HAKLARI VE ETİK

GİRİŞ

Hayvanlar, insanlara sadece geçim kaynağı ve üretken varlıklar olarak değil aynı zamanda psikolojik olarak da insanların hayatında büyük bir öneme sahiptir. Birçok insan hayvanları yaşamlarının ayrılmaz bir parçası olarak kabul eder, onlarla yaşar, onlara değer verir ve ailelerinin bir parçası gibi görür (Thompson vd., 2014). Bu nedenle hayvanlarını kaybettiklerinde büyük bir üzüntü yaşayabilirler. Hayvan haklarına ve korunmasına yönelik çeşitli yasal ve toplumsal çabalara rağmen afet ve acil durumların hayvanların haklarına nasıl etki ettiği genellikle yeterince ele alınmamaktadır. Kitabın bu bölümü hayvanların afetlerde yaşayabileceği sorunları, evcil hayvan sahiplerinin yaşayabileceği travmaları ve müdahale ekiplerinin yaşayabileceği zorlukları ele almayı amaçlamaktadır.

AFETLERDE HAYVAN HAKLARI VE ETİK

Afetler, zenginlik, coğrafya veya ülke ayrımı yapmaksızın herkesi etkileyebilir ve hayvanların yaşamı da tehlikeye girebilir (Sawyer ve Huertas, 2018). Afetler, insanların gıda güvenliğini tehdit edebilir ve maddi kayıplara neden olabilir. Bu da toplum sağlığını olumsuz etkileyebilir. Özellikle hayvanlara dayalı geçim kaynaklarına sahip olan insanlar, afetlerden daha fazla etkilenebilirler. Bu kişiler hem sahip oldukları hayvanları hem de geçim kaynaklarını kaybedebilirler. Sonuç olarak, afetler sadece insanlara değil aynı zamanda hayvanlara da zarar verebilir ve bu nedenle afet durumlarında hayvan haklarına ve refahına daha fazla dikkat gösterilmesi gerekmektedir. “Evcil hayvan sahipliği”, hem insanlar hem de hayvanlar için doğal afetlerin etkilerine karşı artan hassasiyetle ilişkilidir. Birçok bakıcı (“sahip”), evcil hayvanlarını yanlarında götüremezlerse afet bölgesinden tahliye olma- yabilir ve bu nedenle hem kendilerini hem de evcil hayvanlarını artan yaralanma veya ölüm riskine maruz bırakırlar. Ancak bazı sahipler, evcil hayvanlarını terk

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BÖLÜM 11

ULUSAL ARAMA VE KURTARMA MEVZUATI

GİRİŞ

Arama ve kurtarma, afet veya acil durumun yaşanmasıyla birlikte etkilenen birey veya bireylerin yerlerinin tespit edilmesi ve kurtarılmasını amaçlayan bir faaliyet alanıdır. Yaşanan olayın türü ve yerine göre söz konusu krizler karşısında gerçekleştirilecek arama kurtarma faaliyetleri çeşitlenmekte ve her biri için özel ekip ve ekipman gerekliliği doğmaktadır. Nitekim literatürde arama kurtarma faaliyetlerinin, olay türlerine göre farklı şekillerde sınıflandırıldığını görmek mümkündür. Ulusal mevzuat açısından bakıldığında arama kurtarma faaliyetlerinin iki ana ekseninde şekillendiği görülmektedir. Denizde ve havada meydana gelen acil durumlarda arama kurtarma faaliyetleri bir eksen oluştururken karada meydana gelen afet ve acil durumlarda arama kurtarma faaliyetleri diğer eksen oluşturmaktadır. Bu bağlamda arama kurtarma faaliyetleri, *denizde ve havada arama kurtarma* ve *karada arama kurtarma* olmak üzere iki ana başlıkta sınıflandırılabilir. Buradaki her bir başlık altında farklı türde olayların gerçekleşmesinden dolayı arama kurtarma faaliyetine göre alt türlerin olduğunu söylemek mümkündür. Ayrıca bilimsel ilerlemeler, hızlı nüfus artışı, afet ve acil durumların sayısının artması, iklim değişikliğinin etkilerinin giderek hissedilmesi gibi birçok unsura bağlı olarak gelecekte farklı türde olayların yaşanması hâlinde arama kurtarma faaliyetlerinin sayısının ve türlerinin artabileceği de söylenebilir. Örneğin havacılık sektörünün gelişmesi ve hava araçlarının atmosfer dışına çıkması gibi durumlar neticesinde havada arama kurtarma çalışmaları ortaya çıkmış ve günümüzde atmosfer içi ve atmosfer dışı olmak üzere iki alt türü bulunmaktadır. Bunun yanı sıra, son yüzyılda Orta Doğu'da ve Afrika kıtasında gerçekleşen iç çatışmalar ve savaşlar sonucunda bireylerin yasal olmayan yollardan ve uygun olmayan deniz araçları ile Avrupa kıtasına

melerin yeterli olmadığı görülmektedir. Bu bağlamda yasal ve idari düzenlemelere ihtiyaç duyulmaktadır.

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BÖLÜM 12

INSARAG YAKLAŞIMI

GİRİŞ

Afetler, acil durumlar, engellenemeyen doğa olayları, insan eliyle yaratılan kriz ve kazalar gibi yeni dünyanın kaçınılmaz gerçekleri her geçen gün sayıca artmakta, neden oldukları yıkımlar gittikçe daha da şiddetli olmaktadır. Tüm ülkeler de yıkımları azaltmanın yollarını aramaktadır.

Afet zararlarını azaltmada hazırlık, müdahale ve rehabilitasyon dönemleri için yapılan çalışmaların yanında tüm dünyanın iş birliğini zorunlu kılacak tecrübeler de neredeyse hemen her gün yaşanmaktadır. Gelişmiş ülkelere göre daha dezavantajlı durumda olan az gelişmiş ve gelişmekte olan ülkelerde afet yıkımı daha büyük çaplı olmaktadır.

Dünyanın büyük deprem tecrübelerinden olan 1985 Meksika ve 1988 Ermenistan depremlerinde beraber çalışan Kentsel Arama Kurtarma (USAR) oluşumunun ardından 1991 yılında yeni ve daha büyük çaplı bir insani ağ gelişmiştir. Bu Uluslararası Afet Zararlarının Azaltılması Stratejisinin (ISDR) uygulamasına katkı sağlayan bir ağ oluşumudur. Sivil toplum kuruluşları (STK), Birleşmiş Milletlere (BM) bağlı ülkelere memurlar, USAR uygulayıcıları ve yetkin afet yöneticilerinden oluşan bir sivil inisiyatif birliği olarak “International Search and Rescue Advisory Group: Uluslararası Arama ve Kurtarma Tavsiye Grubu” (INSARAG) meydana gelmiştir. Oluşum temeli BM’nin 2002 yılında uluslararası yardımların eş güdümüne dair aldığı kararlara dayanmaktadır (Pekkan vd., 2018; INSARAG, 2023a).

INSARAG afetten çöküş yaşayan bir ülkeye ilkeli ve etkin şekilde USAR yardımı hazırlayıp harekete geçirme, ulusal ve uluslararası çapta kapasite

INSARAG kurumsal internet sitesi (INSARAG, 2023a), INSARAG hakkındaki genel bilgilerle beraber daha önceki faaliyetler ve gelecekteki etkinlik planları ve kılavuzların yönergeleriyle ilgili paylaşımlar yapar (INSARAG, 2023b). INSARAG USAR Dizini; INSARAG üyesi devletler, STK'lar ve bunların USAR ekiplerine ilişkin ayrıntıları içeren özgün bir veri tabanıdır. Dizin aynı zamanda Politika ve Operasyonel Odak Noktalarıyla ilgili kurumsal iletişim bilgilerini de içerir.

Arama-Kurtarma (USAR) ekipleri uzmanlık ve kapasitelerine göre Hafif, Orta ve Ağır sınıf Arama Kurtarma ekipleri olarak da kategorilere ayrılır.

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BÖLÜM 13

ULUSLARARASI ARAMA KURTARMA MEVZUATI

GİRİŞ

Mevzuat uygulamada var olan hukuk kurallarını tanımlayan bir terimdir. Mevzuat belirli bir alanda yapılacak faaliyetlerin sınırlarını, ölçülerini belirlemekte ve aynı zamanda o işi mevzuata uygun yapan kişileri korumaya almaktadır. Mevzuatın getirdiği kurallar herhangi bir faaliyeti gerçekleştiren kişilerin o iş dolayısıyla sorumlu tutulup tutulamayacağını da belirlemeye yaramaktadır. Afet veya acil durumlarda hasta/yaralının yerinin belirlenmesi ve tehlikeli bölgeden güvenli bölgeye nakledilmesi süreçlerini içeren arama kurtarma faaliyetleri de belirli mevzuat kuralları çerçevesinde yürütülmelidir (Kılıç, 2015; Sevim, 2023).

Afetlerin oluş sayıları ve etkisi her geçen gün artmaktadır. Afetler nedeniyle her yıl birçok insan yardıma muhtaç duruma düşebilmektedir (Demirbilek, 2023). Büyük yıkımlara ve toplumların yaşamının yok olmasına neden olabilen afetlerle mücadele için iyi bir hazırlık, yetişmiş insan gücü ve güçlü bir mevzuat son derece önemlidir (Demirbilek ve Gökkaya, 2022). Mevzuat yapılan işlerin uygulanmasını ve denetlenmesini kolaylaştırmaktadır. Yaşanan afetler sonrası doğru bir şekilde gerçekleştirilen arama kurtarma faaliyetleri, can ve mal kaybını azaltılmasında önemli rol oynamaktadır. Bu durum arama kurtarma faaliyetlerinin belirli kurallar çerçevesinde yürütülmesinin önemini artırmaktadır. Bu kapsamda ülkeler kendi içlerinde afetlere müdahale kurumlarının işleyişi ve arama kurtarma faaliyetlerinin ne şekilde yürütülmesi gerektiğine dair farklı mevzuat düzenlemelerine sahiptir. Ülkeler içerisinde yürütülen arama kurtarma organizasyonları ülkelerin iç mevzuatı kapsamında ele alınarak yürütülmektedir. Bununla birlikte yapılacak arama kurtarma faaliyetlerinin gerçekleştirildiği sahanın ve alanın uluslararası bölge olması yapılacak faaliyetlerde dikkat edilmesi gereken kuralları da farklılaştırmaktadır.

da deniz sınırı gözetim operasyonlarının önemli ve ayrılmaz bir parçası olması gerektiği belirtilmektedir (European Commission, 2023a).

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BÖLÜM 14

ARAMA KURTARMADA ETİK SORUMLULUKLAR

GİRİŞ

Doğa ve insan kaynaklı afetler, normal günlük yaşamı ve durumu zorlu bir hâle dönüştürmektedir. Çoğu zaman insanlar yıkılmış binaların içinde ya da güvenli olmayan koşulların ortasında sıkışıp kalırlar ya hayatlarını kaybeder ya da hayatta kalma şansları çok azdır. Afetler ile doğrudan ya da dolaylı etkileşim hâlinde olan arama kurtarma ekipleri de insanları güvenli bir şekilde kurtarmak ve afet durumunda ertelenen hayat akışını normale çevirmek üzere etkin bir rol oynamaktadır. Arama kurtarma ekiplerinin afetlere ve afet mağdurlarına karşı etik sorumlulukları bu yönden oldukça önem arz etmektedir.

Arama kurtarma ekipleri, afetzedenin durumundaki değişimleri ilk önce tespit eden ekipler olduğu için beklenmeyen durumda meydana gelen karmaşık problemlerle sıkça karşılaşmaktadır. Bu problemlerin büyük bölümünü etik problemler meydana getirir. Dolayısıyla afetzedeye yaklaşımda etik karar verme süreci isteyen durumlar ortaya çıkmaktadır (Eryiğit ve ark., 2011). Bir afet ve acil durumda arama kurtarma ekiplerinin en temel etik sorumluluğu afet bölgesine erken ulaşması ve olaya müdahale etmesidir. Arama kurtarma ekipleri, ellerindeki çeşitli araçları kullanarak çöken yapıların enkazları içinde hayatta kalanları aramak, bilgi toplamak ve kazazedelerin güvenli bir şekilde kurtarılmasını sağlamak için en uygun hareket tarzını benimsemekle görevlidir.

Afet bölgesinde ilk müdahale yapacak ekiplerin seçiminde, ekibin hızlı ve efektif olması, kurtarma ekipleri belirlenirken göz önünde bulundurulması gereken önemli faktörlerdendir. Hızlı ve efektif bir ekip, afetlerden sağ veya yaralı kurtulan bireyleri güvenli bir bölgeye yerleştirerek olası kayıpları en aza indirgeyebilir. Ekip-

SONUÇ

Afet ve acil durumlarda arama ve kurtarma ekipleri ile karar vericilerin insan haklarını dikkate alarak farklı kültürdeki insanların kültürel değerlerine ve inançlarına hitap etmesi, afet mağdurlarının hassasiyetini dikkate alması gerekmektedir. Ayrım yapılmaksızın tüm insanların bir afet ve acil durum anında acil yardım alması, etik sorumlulukların başında gelmektedir. Meydana gelen afet sonrası kurtarma çalışmaları ile diğer faaliyetleri engelleyecek ve etik olmayan yağmacılığa dikkat edilmeli, bu durumu fırsat bilen kişiler tespit edilerek afet bölgesinden uzaklaştırılmalıdır. Afet sonrası yeniden iyileştirme sürecine hızlıca geçilebilmesi ve çevrenin korunması, gerekli halk sağlığı tedbirlerinin en hızlı şekilde alınması gerekmektedir. Özellikle toplanma yerlerinde bulunan afet mağdurları için ibadethanelerin açılması ve boş vakitlerinde zaman geçirebilmeleri için sosyal aktiviteler oluşturup kişiler arası sosyal bağlantıları hızlıca kurmak afet sırası etik sorumlulukların oldukça önemli öğelerindedir. Her bir etik sorumluluk, tüm ekipler ve yetkililer için ayrı bir yükümlülük olmakla beraber arama kurtarma çalışanları bu sorumlulukları göz önünde bulundurmalı ve yerine getirmelidir. Afet sırası uyulan her etik sorumluluk afetzedeleri daha sıkı hayata bağlamaktadır. Bu bakımdan arama kurtarmada görevli ekiplerin etik sorumlulukları her bir insan hayatı için son derece önem arz etmektedir.

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BÖLÜM 15

ULUSLARARASI ARAMA KURTARMADA ETİK

GİRİŞ

Geçmişten günümüze meydana gelen afetlere müdahalede arama ve kurtarma görevinin daha etkili olabilmesi için ulusal ve uluslararası seviyede çalışmalar yapılmaktadır. Bu çalışmalar, yerel veya ulusal seviyede arama kurtarma faaliyetlerini güçlendirirken bir taraftan uluslararası seviyede arama kurtarma yapan ekipler ile ortak bir iletişim, ortak bir dil konuşabilmek için iş birliğini gerektirmektedir. Farklı ülkelere mensup arama kurtarma ekiplerinin afetlere müdahale aşamasında düzenli ve sistematik çalışabilmesi için de sistem ve mekanizmalar geliştirilmektedir. Uluslararası arama kurtarma faaliyetlerinde etkinliğin sağlanması ve koordinasyonun güçlenmesini amaçlayan bu gelişmeler beraberinde arama kurtarmada etik değer ve davranışlar ilkelerini yaygınlaştırarak gündeme getirmektedir. Çünkü arama kurtarma faaliyetleri, kritik ikilemler ile oldukça sık karşılaşılabilen ve en kısa sürede, o an mümkün olan en doğru kararı verebilmek için, etik değerler, standartlar ve ilkelerin rehberliğine en çok ihtiyaç duyulan faaliyetlerdir. Uluslararası arama kurtarma operasyonlarının başarılı ve insan odaklı bir şekilde gerçekleştirilmesini sağlamak için insan hayatın saygı ve öncelik, profesyonellik ve uzmanlık, hızlı tepki, görgü kurallarına uygunluk, risk yönetimi ve güvenlik, eşitlik ve adalet, gönüllülük ve istek, mülkiyet ve saygı, insani yardım ilkelerine uygunluk, eğitim ve kapasite geliştirme, uzun dönemli destek, yerel toplulukların katılımı, çevre duyarlılığı ile iş birliği ve koordinasyon temel etik kurallarını içermesi gerekir.

Herhangi bir arama kurtarma faaliyeti gerektiren bir bölgede; Birleşmiş Milletlere (BM) üye ülkelerde arama kurtarma faaliyeti gösteren resmî kurumların ve BM çatısı altında bulunan üye ülkelerde uluslararası seviyede arama kurtarma faaliyet-

SONUÇ

Uluslararası arama ve kurtarma faaliyetleri, doğal afetler, kazalar, terör saldırıları gibi acil durumlarda insan hayatını korumak ve yardım etmek amacıyla yapılan önemli operasyonlardır. Bu türdeki faaliyetlerde etik sorumluluklar oldukça önemlidir çünkü insan hayatı ve refahı söz konusu olduğunda en üst düzeyde yeterlilik gerekmektedir. Uluslararası arama ve kurtarma operasyonlarında etik sorumluluklar, insan yaşamının korunması, profesyonellik, iş birliği ve toplumsal değerlere saygı gibi temel prensipler etrafında şekillenir. Her durumda, insani değerler ve etik standartlar gözetilmelidir. İnsan hayatına saygı, tarafsızlık ve adil yaklaşım, koordinasyon ve iş birliği, risk yönetimi, iletişim, çevresel koruma ve yerel kültüre saygı bu etik standartlardan bazılarıdır. Bu etik ilke ve sorumlulukların dikkate alınması, uluslararası arama ve kurtarma operasyonlarının başarılı bir şekilde sonuçlanmasında önemli bir rol oynamaktadır.

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BÖLÜM 16

AFETLERDE İNFODEMİ

GİRİŞ

Afet, dilimize Arapçadan geçen bir kelime olup mecazen “olumsuz sonuçlar doğuran durum” ve gerçekte “çeşitli doğa olaylarının sebep olduğu durum” anlamlarında kullanılmaktadır (<https://sozluk.gov.tr/> , t.y.). Her ne kadar kelime anlamı doğa olaylarına atıfta bulunuyor olsa da literatürdeki afet sınıflandırmasında trafik kazaları, yapı çökmeleri, savaş, tehlikeli madde kazaları, yangın, patlama gibi durumlar insan eliyle meydana gelen afetlere örnek olarak listelenmektedir. Afetleri kaynağına, meydana geldiği yerin özelliklerine, önceden tahmin edilebilme durumuna, başlangıç şekline, süresine, sıklığına ve büyüklük belirteçleri gibi özelliklerine göre sınıflandırılmak mümkündür (Altıntaş, 2012; Waeckerle, 1991). Bu bölümde afetlerin tüm sınıflandırmalarından bağımsız olarak afetler kapsamında sağlık açısından yapılacak çalışmaların bilgi akışı ile etkilenmesinden bahsedilecektir.

AFETLER VE SAĞLIK HİZMETLERİ

Kurumların kaynak kapasitelerinin dalgalanması veya genişlemesinin afetlerde en önemli kavramlardan biri olduğu belirtilmektedir (Koçak vd., 2021). Kurumların afet nedeniyle hem malzeme hem de insan kaynaklarını kaybetmeleri ihtimali ile faaliyet kapasitelerinin azalması kadar bölgesel, ülke geneli veya uluslararası yardımlarla faaliyet kapasitelerinin artması ve gelen yardımların sonlandırılması ile yeniden kapasite daralması da yaşanabilmektedir. Mevcut malzeme ve uzman insan iş gücünün sağlık ekonomisi prensipleri çerçevesinde kullanılması ancak önceliklere göre gerekliliklerin ortaya konulabileceği sağlıklı bilgi akışı ile mümkündür.

Afetlerde normal zamanlardaki sağlık hizmetleri sunum konseptinden farklı olarak özellikle sahada çalışanlar için hastane öncesi alanda güçlü bir acil sağlık hizmet-

proje kapsamında faaliyet gösteren Avrupa Gerçeklik Kontrol Standartları Ağı (The European Fact-Checking Standards Network) bağımsızlık, şeffaflık ve gazetecilik kalitesi standartlarına bağlı olan bilgi doğrulama kuruluşlarından oluşan bir birlik olduğunu beyan etmektedir (<https://efcsn.com/>, t.y.) .Doğruluğundan tereddüt edilen bilgilerin kontrol edilmesi için bu tür birliklerin üyesi olan kuruluşlardan yardım alınabilmektedir.

SONUÇ

İnfodemi geleneksel medyanın, dijital medya kullanımına tacını devretmesi ile birlikte küresel bir sorun olarak ortaya çıkmıştır. Afet dönemleri gibi toplumun ve kurumların gerekli müdahale ve yardımları organize etmek için doğru bilgiye en fazla ihtiyaçlarının olduğu dönemlerde bilgi düzensizliği nedeniyle yanlış ve yanıltıcı bilginin ön plana çıkararak karışıklığa yol açtığı, hem tüm dünyayı etkileyen Covid-19 pandemisi boyunca hem de ülkemizdeki 10 ili etkileyen Kahramanmaraş merkezli iki depremden sonra gözlenmiştir. Bu durum afetlerde sağlık hizmet sunumunu planlamak için ihtiyaç duyulan bilgiye ulaşılmasını engelleyen bir olumsuzluktur. Bu olumsuz deneyimlerin tekrarlanmaması için bir sonraki olası afetten önce resmî kurum ve kuruluşların yöneticileri ve çalışanları ile birlikte dijital sosyal medyanın asıl kullanıcıları olan tüm halkın bu mecraaya yönelik okuryazarlıklarını geliştirmek için gerekli çalışmalar yapılmalıdır (Esen, 2021; Eyuboğlu ve Kodak, 2023).

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Bilimsel Yaklaşım ve Farklı Yönleriyle
ANAEROBİK PERFORMANS

Doç. Dr. İbrahim CAN



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İçindekiler

Ön Söz	v
--------------	---



Enerji Sistemleri ve Kaynakları	1
Enerji	1
Enerji Sistemleri	4
Fosfojen (ATP-CP) Sistemi	8
Glikolitik (Laktik Asit veya Anaerobik Glikoliz) Sistem	10
Aerobik Sistem (Oksidatif Fosforilasyon)	12
Enerji Üretimi ve Kapasitesi	21
Substrat Tükenmesi ve Yenilenmesi	22
Fosfojenler	22
Glikojen	23
Enerji Kaynakları	25
Karbonhidratlar	25
Yağlar	30
Egzersizde Karbonhidrat ve Yağ Kullanımı	32
Proteinler	37



Egzersiz ve Enerji Kullanımı	39
Kısa Süreli ve Yüksek Yoğunluklu Egzersizler	39
Laktat Üretimi ve Kullanımı	41
Laktat ve Laktik Asit Arasındaki Farklılıklar	42
Laktat Eşiği ve Kan Laktat Birikiminin Başlangıcı (OBLA)	43
Egzersiz Sonrası Aşırı Oksijen Tüketimi	48
Uzun Süreli ve Devamlı Egzersizler	52
Aralıklı (Interval) Egzersizler	54
Anaerobik Enerji Transferinde Bireysel Farklılıklar	57



3

Anaerobik Performans 59

Anaerobik Performans	59
Güç	60
Kuvvet	62
Hız	63
Anaerobik Güç ve Kapasite	64

4

Yükselti ve Anaerobik Performans 67

Atmosfer Basıncı	67
Yükselti.....	68
Aklimatizasyon.....	70
Yükselti ve Aerobik Performans.....	72
Yükselti ve Anaerobik Performans.....	73

5

Spor Branşlarında Anaerobik Aktiviteler ve Performans 77

Spor Branşlarına Göre Anaerobik Aktivite Örnekleri	77
Futbol.....	78
Basketbol	83
Hentbol	86
Voleybol	89
Tenis	91
Taekwondo	93
Karate.....	94
Boks.....	97
Kick Boks	99
Judo.....	101
Güreş.....	105

viii

6

Anaerobik Performansı Etkileyen Faktörler 111

Cinsiyet.....	111
Kas Kütleli	113
Kas Lif Tipleri	114
Kas Lif Boyutu (Hacmi)	120
Kas Yapısı ve Kuvveti	121
Substrat Mevcudiyeti	121
Metabolik Yolların Verimliliği	122
Reaksiyon Ürünlerinin Birikimi	122
Aerobik Enerji Sisteminin Katkısı	122
Kalıtım	123
Antrenman	124

7

Farklı Popülasyonlarda Anaerobik Performans 125

Çocuklar ve Gençlerde Anaerobik Performans.....	125
Yaşlılarda Anaerobik Performans.....	134
Kadınlarda Anaerobik Performans	137

8

Anaerobik Performansın Değerlendirilmesi..... 141

Güç Ölçümünde Kullanılan Yaygın Yaklaşımlar	141
Kuvvet Plakaları	142
Ergometreler	143
Doğrusal (Linear) Pozisyon Dönüştürücüler	144
Kontak veya Switch Matları ve Süre Ölçme Araçları.....	144
Hesaplama Yöntemleri	145
Pnömatik Ölçüm Sistemleri	145
Akselerometreler ve Giyilebilir Sensörler	146
Anaerobik Performans Ölçüm Yöntemleri	147
Anaerobik Güç ve Kapasite Testleri	149
Wingate Anaerobik Güç Testi	149

Dikey Sıçrama (Sargeant) Testi.....	157
Durarak Uzun Atlama Testi.....	163
Bosco Çoklu Sıçrama Test.....	166
Margaria-Kalamen Basamak Koşu Testi	167
Koşu Temelli Anaerobik Sprint Test (RAST)	170
Ağırlıklı Squat Sıçrama ve Bench Throw Testi	172
Sağlık Topu Fırlatma Testleri	175
Sağlık Topu Göğüs Pası Testi.....	175
Baş Üstü İleri Sağlık Topu Fırlatma Testi	178
Baş Üstü Geriye Sağlık Topu Fırlatma Testi	182
Dönerek İleri Sağlık Topu Fırlatma Testi	186
300 Yard Mekik Koşusu Testi	188
Line (Çizgi) Drill Testi	189
Cunningham and Faulkner's Test	191

Kaynaklar 193



Kaynaklar

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İÇİNDEKİLER

SUNUŞ	iii
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BÖLÜM-1

DİZİLER	1
Aritmetik Dizi	3
Geometrik Dizi.....	4
Dizilerin Yakınsaklığı.....	5
Alt Limit – Üst Limit	8
Sınırlı Diziler	9
Cauchy Dizisi.....	10
Eşit Diziler	13
SORULAR.....	14
DİZİLER İLE İLGİLİ SORULAR	15
CEVAPLAR	17

BÖLÜM-2

SERİLER.....	21
Pozitif Terimli Serilerde Yakınsaklık Testleri.....	24
İntegral Testi	24
α -serisi.....	26
Karşılaştırma Testi	27
Serilerin Toplamı	28
Oran Testi (D'Alembert Kriteri).....	31
Kök Testi (Cauchy Kriteri)	33
Raabe Testi.....	35
Alterne Seriler.....	37
SORULAR.....	40
SORULAR.....	43
KUVVET SERİLERİ	45
SORULAR.....	48
SERİLERİN TÜREVİ ve İNTEGRALI	49
FONKSİYONLARIN SERİYE AÇILIMLARI.....	53
SORULAR.....	56
TAYLOR ve MACLAURİN SERİLERİ.....	57

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İÇİNDEKİLER

ÖN SÖZ	iii
Birinci Bölüm - GASTRONOMİ	1
1.1. Gastronomi ile İlgili Temel Kavramlar	1
1.2. Gastronomi Turizmi	5
İkinci Bölüm - ARTVİN	9
2.1. Artvin İlinin Genel Özellikleri	9
2.1.1. Artvin İlinin Tarihi	9
2.1.2. Artvin İlinin Coğrafi Konumu	11
2.1.3. Artvin İlinin Fiziki Özellikleri	13
2.1.3.1. Yeryüzü Şekilleri	13
2.1.3.2. İklim	16
2.1.3.3. Bitki Örtüsü	17
2.1.3.4. Yaban Hayvanları	18
2.1.3.5. Yeraltı Suları ve Kaplıcalar	18
2.1.3.6. Toprak Özellikleri	19
2.1.3.7. Yeraltı Zenginlikleri	19
2.1.4. Artvin İlinin Beşerî Özellikleri	20
2.1.4.1. Nüfus Durumu	20
2.1.4.2. Ekonomik Durumu	22

2.2. Artvin İlinin Turizm Kaynakları	25
2.2.1. Artvin İlinin Doğal Turizm Kaynakları	25
2.2.2. Artvin İlinin Kültürel Turizm Kaynakları	31

Üçüncü Bölüm - ARTVİN GASTRONOMİSİ35

3.1. Artvin İlinin Tarihi ve Gastronomisi	35
3.2. Artvin İlinin Coğrafi Konumu ve Gastronomisi	36
3.3. Artvin İlinin Fiziki Özellikleri ve Gastronomisi	37
3.4. Artvin İlinin Nüfusu ve Gastronomisi	38
3.5. Artvin İlinin Ekonomisi ve Gastronomisi	39
3.6. Artvin İlinin Turizmi ve Gastronomisi	40

Dördüncü Bölüm - ARTVİN GASTRONOMİ DEĞERLERİ45

4.1. Artvin İlinin Mutfak Kültürü	45
4.1.1. Merkez İlçesi Mutfak Kültürü	47
4.1.2. Ardanuç İlçesi Mutfak Kültürü	48
4.1.3. Arhavi İlçesi Mutfak Kültürü	49
4.1.4. Borçka İlçesi Mutfak Kültürü	51
4.1.5. Hopa İlçesi Mutfak Kültürü	52
4.1.6. Kemalpaşa İlçesi Mutfak Kültürü	53
4.1.7. Murgul İlçesi Mutfak Kültürü	53
4.1.8. Şavşat İlçesi Mutfak Kültürü	54
4.1.9. Yusufeli İlçesi Mutfak Kültürü	55
4.2. Artvin İli Mutfağına Özgü Terimler ve Kavramlar	57
4.3. Artvin İli Mutfağına Özgü Araç - Gereçler ve Ekipmanlar	63
4.4. Artvin İli Mutfağına Özgü Pişirme Yöntemleri	67
4.5. Artvin İli Mutfağına Özgü Özel Gün ve Törenler (Ritüeller).....	70
4.6. Artvin İli Mutfağına Özgü Öğünler ve Servis Şekilleri	74
4.7. Artvin İli Gastronomisine Özgü Yöresel ve Tarımsal Ürünler	77
4.7.1. Çay	77
4.7.2. Mısır	78
4.7.3. Fındık	79
4.7.4. Karalahana.....	79

4.7.5. Kivi	80
4.7.6. Beyaz Patates	80
4.7.7. Fasulye	81
4.7.8. Isırgan Otu	81
4.7.9. Kuşburnu	81
4.7.10. Pazı	82
4.7.11. Zeytin	82
4.7.12. Karayemiş	83
4.7.13. Turunçgiller	83
4.7.14. İhlamur	84
4.7.15. Bal.....	84
4.7.16. Peynir ve Tereyağı	85
4.7.17. Su Ürünleri.....	86
4.7.18. Silor (Siron - Ziron - Sırın)	88
4.7.19. Ev Makarnası ve Erişte	88
4.7.20. Pekmez	89
4.7.21. Baharatlar	89
4.7.22. Reçel ve Marmelat	90
4.7.23. Pestil ve Köme	90
4.7.24. Diğer Ürünler	91
4.8. Artvin İli Gastronomisine Özgü Coğrafi İşaretli Ürünler	93
4.9. Artvin İli Gastronomisine Özgü Yemekler ve Bazı Yemeklerin Reçeteleri	95
4.9.1. Çorbalar	96
4.9.2. İştah Açıcılar ve Atıştırma İçecekleri	98
4.9.3. Sebze ve Ot Yemekleri	101
4.9.4. Et ve Balık Yemekleri	104
4.9.5. Hamur İşleri Ürünleri	106
4.9.6. Tatlılar ve İçecekler	109
4.10. Artvin İlinin Gastronomi Değerleri	111
KAYNAKÇA	115

KAYNAKÇA

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İÇİNDEKİLER

YAZAR LİSTESİ	iii
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1. BÖLÜM

GASTRONOMİNİN TARİHİ VE GELİŞİM SÜREÇLERİ	1
Hüsnüye Koçak Başaran.....	1
Giriş	1
1.1 Gastronominin Tarihi ve Gelişim Süreçleri	2
1.1.1. Tarih Öncesi Çağlar	2
1.1.2. Tarihî Çağlar	4
Sonuç	12
Kaynakça.....	13

2. BÖLÜM

MUTFAK ORGANİZASYONU VE ÖRGÜT YAPISI.....	17
Zühal Özdemir Yaman, Mehmet Güllü	17
Giriş	17
2.1. Mutfak Organizasyonu.....	18
2.2. Mutfakta Örgüt Yapısı	21
2.2.1. Mutfaklardaki Birimler ve İşlevleri	22
Sonuç	27
Kaynaklar.....	27

3. BÖLÜM

MUTFAKTA ÜRETİM HAZIRLIKLARI, PLANLAMALAR VE KULLANILAN EKİPMANLAR.....	29
Mehmet Güllü, Zühal Özdemir Yaman	29
Giriş	29
3.1. Mutfakta Üretim Hazırlıkları	30
3.1.1. Kasaplık Ürünlerde Hazırlık	31
3.1.2. Deniz Mahsullerinde Hazırlık.....	31
3.1.3. Soğuk İşlenen ve Servis Edilen Ürünlerde Hazırlık.....	31

3.1.4. Pastane Ürünlerinde Hazırlık	32
3.2. Hazırlık Alanlarında Planlama	32
3.3. Hazırlık Alanlarında Kullanılan Ekipmanlar	33
3.3.1. Bıçaklar, Doğrama Levhaları ve Yardımcı Malzemeler	34
3.3.2. Gastronom Küvetler ve Çelik Saklama Kapları	36
3.3.3. Karıştırma (Mikser), Parçalama (Blender) Soyma ve Kıyma Makineleri	36
Sonuç	38
Kaynakça.....	39

4. BÖLÜM

MENÜ VE REÇETE HAZIRLAMA	41
Kerem Çırak	41
Giriş	41
4.1. Menü Kavramı	42
4.1.1. Tüketici Yönünden Menü	43
4.1.2. İşletme Yönünden Menü.....	44
4.2. Standart Reçete Hazırlama	50
Sonuç	52
Kaynakça.....	53

5. BÖLÜM

GASTRONOMİDE YİYECEK HAZIRLAMA VE PIŞİRME PRENSİPLERİ	57
Sibel Ayyıldız	57
Giriş	57
5.1. Yiyecek Üretiminde Gıdaların Hazırlaması	58
5.1.1. Doğrama Yöntemleri	58
5.1.2. Marinad Yöntemi	60
5.2. Yiyecek Üretiminde Pişirme Prensipleri.....	61
5.2.1. Etlerde Pişirmenin Önemi ve Pişirme Yöntemleri	63
5.2.2. Su Ürünlerinde Pişirmenin Önemi ve Pişirme Yöntemleri	64
5.2.3. Sebzelerde Pişirmenin Önemi ve Pişirme Yöntemleri	67
5.2.4. Kuru baklagillerde Pişirmenin Önemi ve Pişirme Yöntemleri..	68
Sonuç	70
Kaynakça.....	71

6. BÖLÜM

GASTRONOMİDE LEZZET YAPILANDIRILMASI.....	77
İbrahim Yılmaz.....	77
Giriş	77
6.1. Lezzetin Oluşumu	78
6.1.1. Lezzet Oluşumunda Tadın Etkisi.....	78
6.1.2. Lezzet Oluşumunda Aromanın Etkisi.....	80
6.1.3. Lezzet, Tat, Aroma ve Etkileşimi	81
6.2. Baharatlar	83
Kaynakça.....	87

7. BÖLÜM

DUYUSAL ANALİZ YÖNTEMİ VE DUYUSAL ANALİZ YÖNTEMİ İLE ÜRÜN GELİŞTİRME.....	91
Hüseyin Avni Kırmacı, Zuhâl Kırmacı.....	91
Giriş	91
7.1. İnsan Duyuları.....	92
7.2. Lezzetin Temel Bileşenleri	96
7.3. Duyusal Değerlendirme Sırasında Kontrol Edilen Değişkenler.....	98
7.4. Ölçüm Teorisi	104
7.5. Duyusal Test Türleri	108
7.6. Özellik Farkı Testleri	112
7.7. Analitik Tanımlayıcı Testler	115
7.8. Duyuşsal Testler.....	118
Sonuç	122
Kaynakça.....	123

8. BÖLÜM

GASTRONOMİDE İÇECEKLER.....	127
Özlem Özer Altundağ.....	127
GİRİŞ.....	127
8.1. İçeceklerin sınıflandırılması.....	127
8.2. Alkollü içecekler	133
8.3. Damıtılmış Alkollü İçkiler	134
Sonuç	134
Kaynakça.....	135

9. BÖLÜM

GASTRONOMİDE SUNUM VE SERVİS TEKNİKLERİ..... 139

Fatih Türkmen, Emre Aykaç 139

Giriş 139

9.1. Sunum, Servis Kavramları ve Önemi 140

9.2. Alakart Sunum/Servis Teknikleri 141

9.3. Genel Servis İlkeleri 149

Sonuç 152

Kaynakça 152

10. BÖLÜM

YİYECEK VE İÇECEK İŞLETMELERİNDE GIDA ATIKLARI VE YÖNETİMİ 155

Aydan Bekar 155

Giriş 155

10.1. Gıda Atığı Kavramı ve Sınıflandırılması 156

10.2. Yiyecek İçecek İşletmelerinde Gıda Atıkları ve Oluştığı Alanlar 157

10.2.1. Satın alma 159

10.2.2. Depolama 160

10.2.3. Mutfak 160

10.2.4. Servis 161

10.2.5. Hazır Ürün Depolama 162

10.3. Atık Hiyerarşisi ve Atıkların Engellenmesi 163

10.4. Gıda Atıklarının Ekonomik, Toplumsal ve Doğal Etkileri 167

Sonuç 170

Kaynakça 170

11. BÖLÜM

SÜRDÜRÜLEBİLİR GASTRONOMİ 173

Seza Zerman 173

Giriş 173

11.1. Sürdürülebilirlik 174

11.2. Yiyecek 176

11.3. Gastronomi 179

11.4. Sürdürülebilir Gastronomi 180

11.5. Sürdürülebilir Gastronominin Engelleri	182
Sonuç	184
Kaynakça.....	185

12. BÖLÜM

GASTRONOMİ, TÜKETİM KÜLTÜRÜ ve DİN 187

Ayşe Nur Uslu 187

Giriş	187
12.1. Semavi Dinler	187
12.1.1. Yahudilik ve Gastronomi	188
12.1.2. Hristiyanlık ve Gastronomi	189
12.1.3. İslamiyet ve Gastronomi	190
12.2. Semavi Olmayan Dinler	193
12.2.1. Hinduizm ve Gastronomi	193
12.2.2. Budizm ve Gastronomi	194
12.2.3. Caynizm (Jainizm) ve Gastronomi	195
12.2.4. Şintoizm ve Gastronomi	195
12.2.5. Sihizm ve Gastronomi.....	196
12.2.6. Konfüçyanizm ve Gastronomi	196
Sonuç	197
Kaynakça.....	198

13. BÖLÜM

GASTRONOMİNİN KÜRESELLEŞMESİ VE YERELLEŞMESİ 203

Gökhan Yılmaz..... 203

Giriş	203
13.1. Küreselleşme ve Gastronomi	204
13.2. Yerelleşme ve Gastronomi	206
13.3. Küreyerelleşme ve Gastronomi	207
Sonuç	213
Kaynakça.....	214

14. BÖLÜM

GASTRODİPLOMASİ	219
Nuray Türker	219
Giriş	219
14.1. Gastrodiplomasi Kavramı, Gelişimi ve Önemi	220
14.2. Gastrodiplomasi Faaliyetleri: Bazı Ülkelerden Örnekler	225
14.3. Türkiye'nin Gastrodiplomasi Etkinlikleri	233
Sonuç	237
Kaynakça.....	241

15. BÖLÜM

GASTRONOMİDE POPÜLER KÜLTÜR VE SOSYAL MEDYA	245
Özge Kılıçarslan	245
Giriş	245
15.1. Popüler Kültür, Gastronomi ve Sosyal Medya Arasındaki İlişki	246
15.2. Sosyal Medyada İşlevsel Güdü	247
15.3. Sosyal Medyada Sosyal Güdü.....	248
15.4. Sosyal Medyada Psikolojik Güdü	251
15.5. Instagram Kahvesi: Popüler Dalgona Kahvesi.....	252
Sonuç	253
Kaynakça.....	254

16. BÖLÜM

GASTRONOMİDE TURİSTİK ÜRÜN UNSURLARI	257
Ayşegül Acar	257
Giriş	257
16.1. Gastronomi ve Turizm	258
16.1.1. Turistik Ürün.....	259
16.1.2. Turistik Bir Ürün Olarak Gastronomik Ürün.....	261
16.2. Gastronomide Turistik Ürün Unsurları	263
16.2.1. Yiyecek Odaklı Gastronomi Turizm Ürünleri	265
16.2.2. Yer Odaklı Gastronomi Turizm Ürünleri.....	266
16.2.3. Etkinlik Odaklı Gastronomi Turizm Ürünleri.....	268
16.2.4. Tesis Odaklı Gastronomi Turizm Ürünleri	269
Sonuç	272

Kaynakça.....	273
---------------	-----

17. BÖLÜM

GASTRONOMİ VE TEKNOLOJİ.....	277
-------------------------------------	------------

Burak Pınaroğlu.....	277
-----------------------------	------------

Giriş	277
-------------	-----

17.1. Dijital Gastronominin Ortaya Çıkışı	277
---	-----

17.2. Teknoloji ve Mutfak Sanatlarının Kesişimi	279
---	-----

17.3. Teknolojinin Mutfak Sanatlarında Uygulanması	280
--	-----

17.4. Gastronomide Teknoloji Kullanımının Yararları ve Sınırlamaları.....	283
---	-----

17.5. Gastronomide Kullanılan Teknolojik Araçlar	284
--	-----

17.5.1. Nesnelerin İnterneti.....	285
-----------------------------------	-----

17.5.2. Yapay Zekâ, Robot Şefler ve Gastronomi	285
--	-----

17.6. Gastronominin Geleceği.....	288
-----------------------------------	-----

Sonuç	291
-------------	-----

Kaynakça.....	292
---------------	-----

18. BÖLÜM

GASTRONOMİDE PAZARLAMA.....	297
------------------------------------	------------

Samet Gökkaya.....	297
---------------------------	------------

Giriş	297
-------------	-----

18.1. Gastronomi ve Turizm	298
----------------------------------	-----

18.2. Gastronomi Trendleri.....	299
---------------------------------	-----

18.3. Gastronomide Markalaşma	302
-------------------------------------	-----

18.4. Gastronomi Açısından Pazarlama Karması.....	304
---	-----

Sonuç	307
-------------	-----

Kaynakça.....	308
---------------	-----

1. BÖLÜM

GASTRONOMİNİN TARİHİ VE GELİŞİM SÜREÇLERİ

Hüsniye Koçak Başaran

Giriş

Değişen ve gelişen dünyada yemek olgusu değişmiş ve karşımıza gastronomi kelimesini çıkarmıştır (Karaköse, 2023). Gastronomi, insanların sofraya düzenlerinden yiyeceklerine kadar her ayrıntıyı kapsayan ve sürekli gelişim gösteren bir bilim dalıdır (Özdemir, 2022). Gastronomi mutfak sanatı, başka bir ifade ile güzel pişirme akademisidir (Küçükaslan ve Baysal, 2009).

Gastronomi kelimesi, Yunanca “gastros” (mide) ve “nomos” (yasa) kelimelerinin birleştirilmesiyle meydana gelmiştir. “Gastro” sözcüğü mide ve tüm sindirim sistemini kapsayan bir kavram, “Nomos” sözcüğü ise kural ve düzenlemeler olarak tanımlanmaktadır (Yılmaz, 2017). Türk Dil Kurumu, gastronomi kelimesini; “gerek yiyecek içecek yapma yöntemlerine gerek yemek pişirme tekniklerine ilişkin bilgilerin tümü” ve “sağlığa uygun, iyi düzenlenmiş, hoş ve lezzetli mutfak, yemek düzeni ve sistemi” olarak tanımlamaktadır (TDK, 2023). Gastronomi; tarihsel gelişim sürecinden itibaren yiyecek ve içeceklerin tüm özelliklerinin ayrıntılı bir şekilde kavranması, uygulanması, geliştirilmesi ve modern koşullara uyarlanmasına kadar sahip olduğu tüm sanatsal ve bilimsel unsurları içeren bir disiplin olarak tanımlanmıştır (Eren, 2007). Gastronominin ilk tanımları, yiyecek ve içeceklerin hazırlanması hakkında olmuştur (Karaköse, 2023). Buna karşın daha sonraki tanımlar; gastronominin fizyolojik olgularının dışında ekonomik, kültürel, ekolojik, psikolojik, toplumsal ve siyasi süreçlerin de içinde bulunduğu çok yönlü yapılarla ilişkilidir (Ayyıldız ve Şahingöz, 2018; Karaköse, 2023). Diğer bir

göre bu çarpıcı değişim ve gelişimler, daha farklı hizmetler sunan yiyecek içecek işletmelerinin ortaya çıkmasını sağlamıştır. Örneğin street food, slow food ve fast food gibi yeni mutfak akımları toplumların tüketim alışkanlıklarını etkilemiştir (Özdemir, 2022).

Tüm bu bilgiler ışığında gastronomi tarihinin insanlık tarihi kadar köklü bir geçmişe sahip ve hızla büyüyen bir bilim dalı olduğu söylenebilir. Sonuç olarak mutfak kültürlerinin yaşatılabilmesi için gastronomi tarihinin günümüzle bağlantısı kurulabilmelidir. Bu anlamda devlet, özel sektör ve üniversiteler ile iş birliği sağlanarak konunun uzmanlarının daha verimli ve derinlemesine araştırma yapabilmelerine destek sağlanmalıdır.

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2. BÖLÜM

MUTFAK ORGANİZASYONU VE ÖRGÜT YAPISI¹

Zühal Özdemir Yaman, Mehmet Güllü

Giriş

Tüm canlılar için mutlak olan fizyolojik ihtiyaçların başında hayatta kalma ve bunun için de yeme-içme zorunluluğu yer almaktadır. Bu ihtiyacı giderebilmek her canlının yaşamı boyunca değişmeyen tek uğraşı olmuştur. Bunun için bazı canlılar besin kaynağına ulaşabilmek amacıyla toprağa kök salarak en aşılmaz kayaları aşarken bazı canlılar ise ölüm kalım savaşına girerek kendilerinin ve yavrularının beslenebilmesi için yiyecek bulma çabası içine girerler. Tüm bu canlılardan farklı olarak insan ise önce avcı-toplayıcı olarak başladığı yiyecek-içecek bulma serüvenini ilerletmiş ve kendi yiyecek-içeceğini üretir hâle gelmiştir. Bununla birlikte yeme-içme fiilini bir ihtiyaç olmaktan öteye taşıyarak kültürel bir boyut kazandırmış ve tarihî süreç içerisinde geliştirerek yiyecek-içecek üretimi için özel alanlar oluşturmuştur. Bu alanlarda hem tarlada yetiştirdiği tarımsal ürünleri hem de hayvansal ürünleri işlemiş, farklılaştırmış ve yeni ürünler meydana getirmiştir. Aynı zamanda bu faaliyetleri için çeşitli hazırlama, pişirme, sunum ve tüketim ekipmanları ile yeme-içme alışkanlıkları geliştirmiş ve tümüne ortak isim olarak mutfak adını vermiştir. Mutfak kavramı; bireylerin, ailelerin ya da küçük toplulukların yeme-içme alanları olmanın yanı sıra toplumların

¹ Bu bölüm, “Gastronomi ve Mutfak Sanatları Lisans Programlarından Sektör, Öğrenci ve Öğretim Elemanı Beklentilerinin Değerlendirilmesi” başlıklı doktora tez (Özdemir, Z. 2017) çalışmasından yararlanılarak hazırlanmıştır.

Sonuç

Turizm alanı içerisindeki önemi her geçen gün daha da artan gastronomi, kendi başına diğer tüm turizm dallarının başarılı olup olmamalarında bir kriter olarak değerlendirilebilir. Konaklanan bir işletmenin, gezilen bir yörenin ya da sağlık amacıyla ziyaret edilen bir tesisin hizmet kalitesi, tüketicilerin söz konusu yerlerde aldıkları yiyecek-İçecek hizmet kalitesiyle ölçülmektedir. Mutfakta gerçekleşen operasyonlarda sunulan turistik ürünlerin önceden hazırlanması, depolanarak sonradan satılması veya müşterinin fark ettiği bir ürün hatasının telafisi mümkün olmamaktadır. Ürün üretildiği yerde tüketildiği için her açıdan kusursuz olmalıdır. Bunun sağlanabilmesi ancak kusursuz bir organizasyon ve örgüt yapısının oluşturulmasıyla mümkündür. Ninemeier (2001) de bu görüşlere paralel olarak bir işletmenin ekonomik açıdan başarılı ya da başarısız olmasını, doğrudan mutfak personelinin yapacak işlemleri etkin planlamasına, kontrol etmesine ve müşteriyi cezbedecek yiyecek-İçecek hizmetlerini sağlamasına bağlamıştır. Bu bölümde mutfakta organizasyon ve örgüt yapısı literatür incelemesi neticesinde ana hatlarıyla ele alınmaya çalışılmıştır. Mutfak örgütsel yapısı içerisinde yer alan birimlerde görevli yöneticiler dışındaki personele yer verilmemiştir. Ayrıca mutfak organizasyonu ve örgüt yapısı; fast-food işletmeleri, bir ya da iki kişinin çalıştığı küçük işletmeler ve tüm işlerin işletme sahibinin kontrolünde olduğu işletmeler göz ardı edilerek irdelenmiştir.

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3. BÖLÜM

MUTFAKTA ÜRETİM HAZIRLIKLARI, PLANLAMALAR VE KULLANILAN EKİPMANLAR

Mehmet Güllü, Zühal Özdemir Yaman

Giriş

Gastronomi bilimi içerisinde yer alan en önemli öge, hiç kuşkusuz yiyecek ve içeceğin kendisidir. Bu önemli gastronomik turizm unsurunun hazırlandığı temel alanların tümü mutfak olarak adlandırılabilir. Ancak mutfak kavramını günümüz turizm alanı içerisinde var olan işletmelerin özelliklerine bağlı olarak farklı bölümlere ayrılmış durumdadır. Satın alma, depolama, hazırlık, pişirme, servis ve bulaşikhane söz konusu sınıflandırmada temeli oluşturan ana bölümlerdir.

Üretim hazırlıkları aşaması, turistik ürünün mikro-bütünlük (her aşamada hatasızlık) özelliğinden hareketle servis öncesi en önemli aşama olarak düşünülebilir. Uygun koşullarda ve doğru tekniklerle yapılmayan bir hazırlık, ürünün pişirilme ve sunumunu olumsuz etkilemekle kalmayıp insan sağlığı için bir tehdit unsuru hâline gelmesine de yol açabilmektedir. Çiğ-pişmiş veya hayvansal-bitkisel gıdaların hatalı üretim proseslerinden geçirilmesi, insandan-gıdaya/gıdadan-insana meydana gelebilecek çeşitli kontaminasyonlar kalitesiz veya başarısız ürünün çok daha ötesinde sorunlara yol açabilmektedir. Bu doğrultuda üretim hazırlıklarının en doğru şekilde yürütülmesi amacıyla uygun planlamalar yapılması önem taşımaktadır. Ayrıca her anlamda sağlıklı sonuç alınabilmesi için gıda ve insan faktörünün yanı sıra

yönelik bilgilere yer verildiğinden söz konusu diğer hazırlıklara, planlama ve ekipmanlara yer verilmemiştir.

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4. BÖLÜM

MENÜ VE REÇETE HAZIRLAMA

Kerem Çırak

Giriş

Temelde menü servis edilecek yiyecek içeceklerin listelendiği belgeler olarak kabul edilmekte olup işletme bakış açısıyla incelendiğinde bir listeden çok daha fazla nitelik barındırmaktadır (Gisslen, 2021). İşletmelerdeki hemen her yönetsel karar menü ve reçetelere bağlı kalınarak gerçekleştirilmekte bu durum da menü ve reçeteleri önemli bir yönetim aracı konumuna taşımaktadır. Bunun yanı sıra menüler satın alma, maliyet yönetimi, insan kaynakları yönetimi, hazırlık ve üretim planlaması süreçlerinin yönetimine temel oluşturmaktadır. Benzer biçimde Kivela (2003) menü planlamasını bir binanın inşaat sürecine benzediğini ve işletmenin kurulması sırasında karar verilmesi gereken ekipman seçimi, satın alma ve stok yönetimi, personel seçimi, tedarikçi seçimi gibi hayati kararların menü ile gerçekleştiğini vurgulamaktadır. İşletme yönetimi ve sürdürülebilir iş akışının sağlanabilmesi için doğru planlanmış bir menü başarının temelini oluşturmaktadır.

Başarılı bir menünün arkasında tüm detayları düşünülerek hazırlanan standart reçeteler yer almaktadır. İşletme başarısında doğru planlanmış bir menü, iyi bir menünün hazırlanmasının temelinde de kusursuz hazırlanmış standart reçete yer almaktadır. Öyle ki menülerin işletme için önemli bir yönetim aracı olduğunun farkında olan yiyecek-içecek işletmeleri senelerce süren menü planlama ve ar-ge çalışmaları yürütmekte, hazırlanan standart reçeteleri sürekli test ederek hatalardan arındırarak işletmenin hedeflerini doğru

Menü kartlarını yalnızca tüketici perspektifinden ele almak kısıtlı bir bakış açısı sunmaktadır. Menü kartları, işletme yönetimi için en önemli yönetim aracı olarak görülmektedir. Maliyet yönetimi, insan kaynakları yönetimi, işletme kurulumu gibi hemen her aşama iyi hazırlanmış bir menü ile oluşturulmaktadır. Öyle ki işletmenin açılacağı yerden tesis yapısına kadar her aşamada menüler yol gösterici görevi görmektedir. Doğru hazırlanmış bir menü işletmeye rekabet avantajını kazandırırken menü hazırlama sürecinin yanlış yönetilmesi işletmeleri ekstra maliyetlere ve başarısızlığa sürükleyebilmektedir.

Menünün işletmeler için hayati bir öneme sahip olmasında standart reçetelerin de destekleyici rolü unutulmamalıdır. Bir standart reçete, servis edilen yiyeceklerin kalite standartlarını koruyarak hizmet kalitesinin devamlılığını sağlamaktadır. Bunun yanı sıra standart reçeteler; maliyet yönetimi, stok yönetimi, personel yönetimi, satın alma kontrolleri gibi yönetsel süreçlerde pek çok avantaj sağlamaktadır. Buna bağlı olarak yiyecek içecek işletmeleri için doğru hazırlanmış menü kartlarının başarı anahtarı olduğu ve standart reçetelerin de menü kartlarının meydana gelmesini sağlayan önemli bir yönetim aracı olduğu unutulmamalıdır.

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5. BÖLÜM

GASTRONOMİDE YİYECEK HAZIRLAMA VE PIŞİRME PRENSİPLERİ

Sibel Ayyıldız

Giriş

Pişirme, yiyeceklerin besin kalitesini artırmak ve yiyecekleri tüketilebilir bir yemeğe dönüştürmek için ısı uygulama işlemidir (Baldwin, 2012). Gıdaların duyuşal özelliklerini (renk, koku ve kıvam vb.) korumak, lezzet arttırmak ve sindirime destek olmak için gerçekleştirilen pişirme işlemi aynı zamanda yiyeceklerin bozulmasına neden olan mikroorganizmaları ortadan kaldırmayı amaçlar (Koçak, 2012; Ranjan, Dasgupta ve Walia, 2017; Tayar ve Hecer, 2016). Isıtma işlemi sırasında aldehitler ve ketonlar gibi hoş tatlar ve melanoidinler gibi fonksiyonel maddeler üretilir (Nagai, Kai ve Tanoue, 2017). Pişirme ayrıca yiyeceklerde bulunan nişastaların, proteinlerin, karbonhidratların, lipidlerin ve vitaminlerin biyoyararlılığını değiştirebilir (Suresh, Manjunatha ve Srinivasan, 2007; Margier vd., 2018). Bununla birlikte yanlış uygulanan pişirme işlemleri, aşırı besin kaybına ve gıda kalitesinin bozulmasına da neden olabilir (Fabbri ve Crosby, 2016). Tüm bu bilgiler kapsamında, pişirme yöntemlerinin bilinmesi ve doğru prensiplerle uygulanması bakımından oldukça önemli bir konudur. Gastronomide sağlıklı ve güvenli gıda yaklaşımı, yiyecek içecek işletmelerini ve gastronomi turizmini etkileyen önemli faktörlerden biridir. Bu nedenle bu çalışmanın konusu gastronominin önemli alanlarından biri olan yiyecek üretimidir. Çalışmanın amacı ise yiyecek üretim aşamasında gerçekleşen hazırlama ve pişirme ile ilgili yön-

Gastronominin önemli unsurlarından biri olan yiyecek üretimini konu alan bu çalışma, yiyecek üretim aşamasında gerçekleşen hazırlama ve pişirme ile ilgili yöntem ve prensipleri detaylı bir şekilde incelemiştir. Yapılan çalışmanın gastronomiye ilgisi olan bireyleri destekleyeceği ve mevcut literatüre katkı sağlayacağı düşünülmektedir.

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6. BÖLÜM

GASTRONOMİDE LEZZET YAPILANDIRILMASI

İbrahim Yılmaz

Giriş

Lezzet, tüketici tercihleri üzerinde oldukça etkili olan önemli bir unsurdur. Yiyeceklerin tüketiminde beş duyu organımızın algıladığı uyaranlar lezzet kavramını oldukça değiştirmektedir. Örneğin, yemeğin sunumu yani görünümü ya da yemeğin çıtırtısı lezzet algılamamızı oldukça değiştirmektedir. Bununla birlikte o yemekle ilgili daha önce yaşadığımız deneyimler de lezzet algımızın şekillenmesinde etkili olmaktadır (Small, 2012).

Lezzet algısı, tat ve aromanın ve tüketicinin duygusal durumunun birleşimi ile oluşan bir algıdır ve yiyecek içecek işletmeleri için oldukça önemli bir kavramdır. Çünkü lezzetsiz bir gıdayı hiçbir tüketici isteyerek tüketmez. Bu sebeple lezzetin oluşumunu iyi kavramak oldukça önemlidir. Özellikle gıda sektörü için de lezzet ve lezzet algısı oldukça önemli olup bu sektörde çalışanların tat ile lezzet kavramlarını doğru tanımlaması ve bilmesi önemlidir (Boyacı ve İçigen, 2021).

Bu bölümde lezzet, tat, aroma kavramları ve bunların birbiri ile olan etkileşimleri ayrıntılı olarak incelenmiştir. Bununla birlikte bu çalışmada, yemeklerde en önemli lezzet belirleyicisi olan baharatların yiyeceklerde lezzet oluşumuna etkisi işlenmiştir.

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7. BÖLÜM

DUYUSAL ANALİZ YÖNTEMİ VE DUYUSAL ANALİZ YÖNTEMİ İLE ÜRÜN GELİŞTİRME

Hüseyin Avni Kırmacı, Zuhal Kırmacı

Giriş

Gıda ürünlerinin tüketicilerin duyularını nasıl etkilediğini belirlemek gıda endüstrisinin en önemli hedeflerinden biridir. Bu aynı zamanda daha sağlıklı tarifler geliştiren beslenme uzmanları ve diyetisyenler için de öncelikli bir konudur. Beş duyumuz vücudumuzun bekçisi olarak hareket ettiğinden, sağlıklı gıdanın faydaları ancak duyularımız onu kabul ederse elde edilecektir. Bu nedenle, beş duyu tarafından algılanan tüketici tepkisi, gıda gelişiminin hayati bir ölçüsü olarak kabul edilir. Gıdaların değerlendirilmesinde hiçbir aygıt duyuların yerini tutamayacağı için insanlar denek olarak kullanılmaktadır. İnsanların potansiyel önyargılarına ve ilgili maliyetlere rağmen bu tür çalışmalar giderek yaygınlaşmaktadır.

Duyusal değerlendirme, görme, koklama, dokunma, tatma ve ses duyuları aracılığıyla algılanan ürünlere yönelik tepkileri uyandıran, ölçen, analiz eden ve yorumlayan bilimsel bir yöntemdir (Stone ve ark.,2004). Yaygın olarak kabul gören bu tanım, Gıda Teknolojileri Enstitüsü ve Amerikan Test ve Malzeme Derneği de dâhil olmak üzere çeşitli profesyonel kuruluşlar bünyesindeki duyu analizi değerlendirme komiteleri tarafından kullanılmaktadır (Lawless ve ark.,2010). Diğer bilimsel ölçüm yöntemleri gibi duyu analizi değerlendirme de hassasiyet, doğruluk, duyarlılık ve yanlış-pozitif sonuçlardan

8. İkili karşılaştırma testi, belirli bir özelliğin belirlendiği bir nitelik farkı testidir. Denekten, ölçülen özelliğin daha fazla miktarda bulunduğu örneği belirlemek için sunulan iki örneği test etmesi istenir. Denek sadece şans eseri %50 oranında haklı çıkma şansına sahiptir.
9. Tanımlayıcı duyusal testler, duyusal değerlendirmede kullanılan en kapsamlı ve bilgilendirici araçlardır. Tanımlayıcı testler iyi eğitilmiş bir panel gerektirir ve asla tüketicilerle kullanılmamalıdır çünkü tutarlı ve tekrarlanabilir veriler tanımlayıcı testlerin önemli bir parçasıdır. Tanımlayıcı testlere örnek olarak Lezzet Profili Analizi (FPA), Kuantitatif Tanımlayıcı Analiz (QDA), Doku Profili Analizi (TPA) ve Duyusal Spektrum (SS) tekniği verilebilir.
10. Duyusal testler kabul testlerini ve tercih testlerini içerir. Kabul testinin birincil görevi beğenme derecesini derecelendirmek iken tercih görevi daha çok beğenilen ürünü tanımlamayı amaçlar.

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8. BÖLÜM

GASTRONOMİDE İÇECEKLER

Özlem Özer Altundağ

Giriş

İnsanlar, iecek tüketime anne sütüyle başlamış olup yaşamsal ihtiyacı karşılamanın ötesinde serinletici, keyif verici ve rahatlatıcı gibi etkilere sahip olması sebebiyle çok eski çağlardan itibaren farklı çeşitlerde iecekler üretmiş ve tüketmiştir. Çeşitli bitkilerden ve meyvelerden elde edilen çaylar, meyve ve sebze suları, tahıllardan elde edilen fermente iecekler, süt bazlı iecekler, asitli ve şekerli iecekler, alkollü iecekler ve kahve günümüzde sıklıkla tüketilen iecek çeşitleridir (Süren ve Kızıleli, 2021).

Tarihte yaşanan baskılar, savaşlar neticesinde birçok ülkeye çok sayıda göç yaşanmıştır. Göç eden topluluklar, göç ettikleri yerlere gelenek, göreneklerinin yanı sıra yeme-ime kültürlerini de beraberlerinde getirmişlerdir (Uslu ve Kırmacı, 2021). Ayrıca gelişmiş ülkelerde değişen yaşam tarzları, yenilikçi ürünler ve sağlık endişeleri ayrıca birçok gelişmekte olan ülkede harcayabilir gelirlerin artması ve Batı kültürünün artan etkisi ile paketlenmiş, alkolsüz, su bazlı ieceklerin tüketimi dünya çapında artmaktadır (Levy ve Shrapnel, 2014).

8.1. İeceklerin Sınıflandırılması

Geniş iecek kategorisi, değişen enerji yoğunluğuna sahip hem şekerle tatlandırılmış hem de şekersiz iecekleri içerir (Levy ve Shrapnel, 2014).

Alkolsüz içecekler

Çay

Çay, suyun yanı sıra dünya çapında en çok tüketilen içeceklerden biridir ve büyük ilgi görmektedir (Qiu vd., 2023). Yeşil çay, beyaz çay, sarı çay, oolong çayı, siyah çay ve koyu çay gibi çeşitli çaylar fermantasyon seviyesine göre üretilmektedir (Chong, He, Rao, Li ve Ke, 2021). Çin çayı olarak da geçen Oolong çayı yarı fermente bir çaydır. Yaklaşık 5000 yıl önce Çin'de ortaya çıkan yeşil çay, dünya çapında en çok tüketilen içeceklerden biri konumundadır (Dong vd., 2022). Fermente olmayan tek çay kategorisi olan yeşil çay, *Camellia sinensis* bitkisinin taze yapraklarından üretilmektedir (Wang, Chen, Zhou, Zhao ve Wang, 2022). Yeşil çay taze çay yapraklarının su buharı ile işlenip küçük toplar hâline getirilip kurutulmasıyla elde edilmektedir. Yeşil çay, Asya'da, özellikle Çin ve Japonya'da en popüler içeceklerden biridir (Zhao vd., 2021).



Resim 1. Çay (Kişisel Arşiv, 2023).



Resim 2. Kahve (Kişisel Arşiv, 2023).

Kahve

Kahve siyah çaydan sonra dünya çapında en sık tüketilen içeceklerden bir diğeridir. Tüketim kalıpları, kültürel gelenekler/arka planlar ve toplumda kökleşmiş alışkanlıklar nedeniyle ülkeler arasında farklılık göstermektedir. Norveç, Avrupa'da kişi başına kahve tüketiminde liderdir. Kafeinli içecekler içmenin son on yılda popülerlik kazandığı ve ABD nüfusunun yaklaşık %85'inin günde bir veya daha fazla kafeinli içecek içtiği tespit edilmiştir (Frosztega vd., 2023).

Brezilya, 1880'lerden günümüze dünyanın en büyük *Coffea Arabica* ve *Coffea Canephora* kahve üreticisi olmuştur ancak aynı zamanda iç tüketimde zaman zaman düşüşler yaşamıştır. Son zamanlarda Brezilya, tarımsal, endüstriyel ve tüketici hizmetleri açısından artan bir yenilik göstermekte ve özellikle pazar payının yaklaşık %10'unu temsil eden özel veya gurme kahveler kategorisinde yüksek kaliteli kahvelere yönelik artan bir talebi sürdürmektedir (Teles ve Behrens, 2020).

Bitki çayları

Bitki çaylarına olan talebin artması, araştırma ve ticari faaliyetlerinde artışa neden olmuştur. Bitkisel çaylar, sıcak veya soğuk suda yapraklar, meyveler, kabuklar, kökler veya çiçekler gibi çeşitli bitki materyallerinin sulu infüzyonlarıdır (Mosii, Pheko-Ofitlhile, Kobue-Lekalake ve Mazimba, 2023).

Salep

Salep Türkiye’de çok eski zamanlardan beri kullanılan bir içecektir. Özellikle 8. yüzyıldan itibaren İslam'a geçişle birlikte şarap ve kırmızı gibi alkollü içeceklerin yasaklanmasıyla birlikte bunların yerini alkolsüz içecekler olan boza, şıra ve salep almıştır (Ece Tamer, Karaman ve Utku Copur, 2006). Orkide köklerinden elde edilen un, Akdeniz ülkeleri ve Türkiye’de geleneksel olarak “salep” veya “sahlep” adı verilen bir içecek olarak hazırlanmaktadır. Salep içeceğinin hazırlanması için önce süt, şeker ve salep tozu ile karıştırılıp kaynatılır ve son olarak üzerine toz tarçın serpilerek sıcak olarak içilir; geleneksel, koyulaştırılmış sütlü bir içecektir (Bozdoğan, Yaşar ve Korkut, 2016; Kiziltas, Goren, Alwasel ve Gulcin, 2022).

Boza

Türkçede boza adı, darı anlamına gelen Farsça *buze* kelimesinden gelmektedir. Ancak Orta Asya'da yaşayan Türkler bu içeceğe *basso* adını vermişlerdir. Doğu Avrupa ülkelerinde (*braga* veya *brascha*), Balkanlar'da (*busa*) ve Mısır'da (*bouza*) üretilen benzer içecekler de vardır. Geçmişte boza, Türk ülkelerinde tarifte ufak farklılıklarla üretilmekte ve tüketilmektedir. Boza, mısır, pirinç ve buğday unları gibi tahıllardan yapılan, oldukça viskoz, geleneksel, fermente edilmiş bir Türk içeceğidir. Boza çeşitli unlardan (arpa, yulaf, mısır, buğday) yapılır ama en kaliteli ve lezzetli boza darı unundan yapılmaktadır. (Arici ve Daglioglu, 2002).

Meyve suları

Soğuk içecekler meşrubatlar olarak bilinmektedir. Meşrubatlar içerisinde meyve suları ve gazlı içecekler yer almaktadır. Ayrıca maden suyu, limonata ve ayran da soğuk içecekler arasında yer almaktadır. Meyve suları taze mey-

velerin sıkılmasıyla elde edilen ve henüz mayalanmamış (fermentasyona uğramamış) içeceklere verilen gelen bir adlandırmadır. Mekanik şekilde elde edilmiş olan meyve pulpu (püresi) veya konsantresinin en az %40 meyve pulpu içerecek şekilde su, sakkaroz ve diğer katkı maddeleriyle hazırlanan hâline meyve nektarı denilmektedir. Meyve suları tüketicilere 6-10°C’de servis edilmektedir (Güler ve Güler, 2000).

Gazlı içecekler

Türk Gıda Kodeksi Alkolsüz İçecekler Tebliği’ne göre meyveli içecek, aromalı içecek, meyveli şurup, aromalı şurup, meyveli içecek tozu, aromalı içecek tozu, meyveli doğal mineralli içecek, aromalı doğal mineralli içecek, yapay soda, kola, tonik ve aromalı sular tanımlanmaktadır. Gazoz, içerisinde belli miktarda sitrik asit veya tartarik asit, şeker ve saf karbonik asid ile içilebilir bulunan üründür (Türk Gıda Kodeksi, 2007). Gazlı içeceklerin tüketicilere uygun sıcaklıkta servis edilmesi önemlidir. Gazlı içeceklerin servis sıcaklığı +3 ile +5°C olması önerilmektedir (Güler ve Güler, 2000).

Şerbet

“Şerbet” kelimesi, Arapçada “içmek” anlamına gelen “şarba” kökünden türemiştir. Geçmişten günümüze, yemeklerin yanında, hastalıkların tedavisinde veya ferahlamak amacıyla tüketilmektedir. Günümüzde meyve suları ile asitli ve şekerli içeceklerin yerini alabilecek, sağlıklı ve içinde en az bir meyvenin ana madde olmasıyla baharat ve lezzet verici otların karışımıyla hazırlanan içeceklerdir (Süren ve Kızıleli, 2021). Şerbetlere ekşiliğini artırmak için sağlığa zararlı olmasa bile herhangi bir asit katılması, kokulandırılması için esans konulması, boya ve koruyucu madde eklenmesi yasaktır. Şerbetler yapıldıkları meyvenin adı ile satılmaktadır (Güler ve Güler, 2000).

Şerbet yapımında bal, gül yaprakları, meyveler, baharatlar, kuruyemişler ve bunların karışımları yaygın olarak kullanılmaktadır. Osmanlı döneminden günümüze lohusa, bal, gül, meyan, sirkeçübün ve kızılıçlık gibi birçok şerbet taşınmış konumdadır. (Ceyhun Sezgin ve Durmaz, 2019).

Ayran

Türkiye'de su ile seyreltilmiş ve tuzla tatlandırılmış sade yoğurttan oluşan ayran geleneksel bir içecek olarak önemli bir sıvı alımı kaynağıdır (Kabak ve Dobson, 2011; Nergiz-Unal, Akal Yıldız, Samur, Besler ve Rakicioğlu, 2017). Ayran, Anadolu'da yüzlerce yıldır evlerde geleneksel olarak yoğurda su ve tuz karıştırılarak üretilir. Ancak günümüzde, *Streptococcus thermophilus* ve *Lactobacillus delbrueckii subsp. bulgaricus* ile süt fermantasyonları yoluyla endüstriyel ölçekte üretilmektedir. Fermantasyon, pH 4.4–4.6 elde edilene kadar devam etmektedir. Pıhtı daha sonra tuzlu su eklenerek seyreltilir. Bitmiş ürünün pH değeri 4,2–4,3'tür. Ayranın bileşimi kullanılan sütün türüne, yağ giderme etkinliğine ve seyreltme oranına bağlı olarak değişir. Ürün, kabul edilebilir duyuşal özelliklerle buzdolabında 15 güne kadar saklanabilmektedir (Kabak ve Dobson, 2011).

Kefir

Bir diğer mayalandırmayla elde edilen içekte kefiridir. Kefir kelimesi Türkçede “keyif” kelimesinden gelir ve “iyi duygu” anlamına gelir. Kefir, kefir danelerindeki mikroorganizmalarla simbiyotik ilişki içinde bir arada bulunan probiyotiklerle fermente edilmiş Kafkasya ve Anadolu yörelerine ait olduğu düşünülen geleneksel bir içecektir. Kefir, ürün çeşitlendirmesi sağlamak için yeni fonksiyonel içeceklerin üretimine izin veren farklı substratlara adapte edilebilir özelliktedir. Güvenli ve ucuz olması nedeniyle de kefirin beslenme potansiyelinde küresel olarak büyük bir ilgi olduğu görülmektedir (Kabak ve Dobson, 2011; Dertli ve Çon, 2017; Azizi vd., 2021).

Kefir, inek, keçi, koyun veya manda gibi çeşitli hayvan sütlerinin fermantasyonundan üretilir ve ağızda gaz veya köpük hissi veren maya benzeri belirgin bir tat ile karakterize bir içecektir. Kefir, üretiminde kullanılan tanelerin laktik asit bakterileri (*Lactobacillus*, *Lactococcus*, *Streptococcus*, *Leuconostoc*), maya ve asetik asit bakterileri gibi çeşitli ve karmaşık mikrobiyotaya sahip olması nedeniyle oldukça karmaşık bir tada sahiptir (Biçer vd., 2021).

Sporcu İçecekleri

Sporcu içecekleri, özellikle proteinden zengin olanları genç nesil tarafından tercih edilen ve buna bağlı olarak da son yıllarda tüketimi artmış içecekler arasında yer almaktadır. Ek olarak kolajen içeren yeni içecekler de hem sağlık hem de güzellik amacıyla popüler hâle gelmiş içecekler arasındadır. Bunların dışında keten tohumu, yulaf, meyve ve sebzelerin karışımı ile elde edilen shakeler de son yıllarda tüketimi artmış diğer içecekler arasındadır (Yıldız, 2017).

8.2. Alkollü İçecekler

Bira

Bira Türk standartlarına göre malt ve diğer ekstrakt verici maddelerin öğütülüp sıcak su ile belirli metotlara göre işlenmesiyle elde edilen şıranın, şerbetçiotu veya preparatlarının kayıtılıp soğutulmasıyla elde edilen fermente bir alkollü içkidir. Ekstrakt verici olarak farklı tahıllar kullanılabilir. Örneğin pirinç, mısır, darı, buğday, arpa ya da yulaf ile farklı kalitelerde biralara üretilmektedir (Güler ve Güler, 2000). Biranın has aromasını şerbetçiotu sağlasa da günümüzde genç ve kadın tüketiciler tarafından meyve kokulu ya da meyveli biralarda talep edilmektedir. Özellikle zor bulunan biralara menüsüne ekleyen işletmeler “adanmış bira turistleri” ya da “bira gee’leri” için bulunmaz bir hazine konumundadır (Thacker, 2015).

Şarap

Taze üzüm veya üzüm şırasının fermentasyonu ile elde edilen alkollü bir içkidir. Renklerine göre beyaz şarap, pembe şarap ve kırmızı şarap olarak sınıflandırılmaktadır. İçerdikleri maddelere göre de sek şaraplar, dömisek şaraplar, tatlı şaraplar, vermutlar ve köpüklü şaraplar olarak sınıflandırılmaktadırlar. Tüketim alışkanlıklarındaki değişikliklere bağlı olarak ülkelerin farklı bölgelerinde bulunan az bilinen üzümlerden elde edilen şarapların tüketimine karşı bir ilgi artışı söz konusudur. Aynı şekilde pembe şaraplar da ilkbahar dışında da uygun yemeklerle eşleştirerek sofralarda yerini almakta-

dır. Ayrıca genç tüketiciler tarafından talep edilen şeftalili, greyfurtlu, kolalı şaraplarda menülere eklenmektedir (Güler ve Güler, 2000; Yıldız, 2017).

8.3. Damıtılmış Alkollü İçkiler

Damıtılmış alkollü içkiler alkol oranları diğer alkollü içkilere göre daha yüksek olan ve bira şarap gibi alkollü içkiler bir ya da daha fazla kez damıtılmasıyla elde edilen içkilerdir. Bu içkiler arasında Brendi, Kanyak, Cin, Votka, Viski, Rom, Tekila ve Rakı sayılabilir (Güler ve Güler, 2000; Bostancı, 2012).

Rakı

Rakı, Anadolu topraklarında yaşamış olan çeşitli uygarlıkların kültürel mirasının bir sentezidir ve geleneksel üretim yöntemiyle günümüze kadar ulaşmıştır (Şimşek, 2021). Rakı, ulusal bir içecek olarak Türkiye'de üretilmekle birlikte Almanya başta olmak üzere tüm Avrupa'da bulunan temel bir üründür (Anlı vd., 2007).

Rakı, kuru üzüm, yaş üzüm ya da her ikisinden elde edilen sumanın anason tohumu veya anason tohumundan elde edilen saf anason esansı ile üretilen alkol oranı %85 olan alkollü bir içkidir (Güler ve Güler, 2000; Şimşek, 2021). Rakı ve Uzo, Ege Denizi'nin iki yakasından gelen kardeşler gibi diğerlerinden daha çok benzerlik göstermektedir. Türkiye'de rakı üretimi, modern damıtma sistemleri ile donatılmış büyük resmî yasal şirketler tarafından yapılmaktadır. Ancak Orta ve Güney Anadolu'nun bazı bölgelerinde ev yapımı geleneksel rakı üretimi hâlen devam etmektedir (Anlı vd., 2007).

Sonuç

Küresel olarak Birleşmiş Milletler Gıda ve Tarım Örgütü (FAO) tarafından izlenen içeceklerin tüketimi, son 40 yılda %20'den fazla artış göstermiştir. Ayrıca son yarım yüzyılda, yeni seçenekler de son derece hızlı bir şekilde ortaya çıkmıştır. Süt, şarap, bira, çay ve kahve gibi köklü içeceklerle sporcu içecekleri, enerji içecekleri, şerbetler ve limonata gibi yüksek kalorili ve

bunların yanı sıra farklı aroma vericilerin etkisiyle alkollü içecekler de eklenmiştir (Wolf, Bray ve Popkin, 2008).

Teknolojideki yenilikler ve değişen tüketici beklentileri, içecek endüstrisinin gelişimini farklı özelliklere sahip yeni ürünler üretmeye zorlamaktadır. Bu durum göz önünde bulundurulduğunda endüstriyel anlamda tüketicilerin beklentilerini karşılayan, yetiştiricilerle uzun vadeli ortaklıklar yoluyla yerel şifalı bitkileri de içine alan içeceklerin üretilmesinin desteklemesi ve teşvik edilmesi gerekmektedir (Ece Tamer vd., 2006).

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9. BÖLÜM

GASTRONOMİDE SUNUM VE SERVİS TEKNİKLERİ

Fatih Türkmen, Emre Aykaç

Giriş

Yemek yemek genellikle konuğun odak noktasıdır. Ancak lezzetli ve çekici yiyecekler üretmek şefe, doğru ve gösterişli bir servis yapmak da servis elemanına düşer. Yemek sunumu, şeflerin mutfak çalışanlarının yeteneklerini ön plana çıkarmalarını sağlayan önemli bir konudur. Menü seçimleri ve yemek sunumu, tema, münü, servis tarzı ve konukların beklentileri dâhil olmak üzere yemek sunum ve servisi operasyonunun tüm yönlerini entegre eden nihai bir sonuçtur. Nitekim amaç asla sadece bu beklentileri ve standartları karşılamak değil, onları daha da ileri taşıyarak aşmak olmalıdır.

Yiyecek ve içecek sektöründe lezzet her zaman birinci planda olsa da yemek servis ve sunum teknikleri, bu lezzeti perçinleyen önemli bir unsurdur. Profesyonel yemek sunumları, tarifleri görsel bir şölene dönüştürerek konuklar için unutulmaz bir deneyim yaşatılmasına yardımcı olur. Bunun için servis ve sunum teknikleri hakkında bilgi sahibi olmak ve bazı püf noktalarına dikkat etmek son derece önemlidir.

Uluslararası literatürde profesyonel yiyecek içecek işletmelerinin kalitesini yansıtabilecek sunum ve servis teknikleri konusu ile alakalı servis ve sunumların nasıl olması gerektiğine dair önemli bilgiler farklı kaynaklardan derlenerek bu bölümde bir araya getirilmiştir.

Bu bölümde servis konusu hakkında özellikle alakart olarak masa servisine yönelik uluslararası standartta yer alan usuller değerlendirilmeye çalışılmıştır. Burada belirtilen servis usulleri dışında büfe servisi, kafeterya servisi, self servis, paket servisi, oda servisi, ziyafet (banket) servisi, satış makinaları yoluyla servis, gel-al servis gibi birçok servis yöntemi de bulunmaktadır. Ancak bu tür servis türleri alakart servis kadar profesyonellik gerektirmeyen servislerden olduğu için bu bölüm dâhilinde değerlendirilmemiştir.

Sonuç

Turizm sektörünün vazgeçilmez yapı taşlarından olan gastronomi bilimi ister bağımsız işletmeler, isterse turizm işletmeleri bünyesinde uygulansın kendine özgü bazı prensipleri ve disiplini olan konuları içermektedir. Gastronominin pek çok farklı turizm türünde hizmet kalitesi açısından turizm işletmelerine olumlu etkileri güncel çalışmalarda da özellikle ifade edilmektedir (Öztürk ve Işınkaralar, 2018; Öztürk vd., 2020; Öztürk vd., 2021; Dönmez ve Türkmen, 2015; Türkmen ve Dönmez, 2015).

Bu noktada gastronomi bilimi içerisinde bulunan sunum ve servis teknikleri de konukların hem yemek yeme deneyimlerini ve yemekten aldıkları keyfi artırmak adına hem de bu hizmetleri sunan işletmelerin hizmet kalitesi anlamında farklılaşmasında oldukça etkili bir konu olarak değerlendirilmelidir.

Bu bölümde değinilmiş olan alakart servis teknikleri daha çok profesyonel bilgi ve servis elemanı tecrübesi gerektirdiğinden bazı işletmeler tarafından tam anlamıyla tercih edilmese de uluslararası standartlarda literatürde yer alan, turizm sektöründe servis bölümünde çalışanlar tarafından mutlaka bilinmesi gereken ve uygulayan işletmelere ayrı bir prestij katan servis teknikleridir.

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10. BÖLÜM

YİYECEK VE İÇECEK İŞLETMELERİNDE GIDA ATIKLARI VE YÖNETİMİ

Aydan Bekar

Giriş

Küreselleşmenin getirdiği yenilikler, nüfus yoğunluğunun artması, tüketim alışkanlıklarının değişmesi gibi unsurlar tüm dünyada olduğu gibi ülkemizde de gıda atıklarının artmasına neden olmaktadır. Birleşmiş Milletler insan tüketimi için üretilmiş hazır hâldeki gıdaların %17'sinin hiç dokunulmadan çöpe atıldığını vurgulamaktadır. Küresel bir sorun hâline gelen gıda atıkları çevrenin kirlenmesine neden olurken bir taraftan da ülkeleri ekonomik olarak olumsuz etkilemekte ve etik sorunları beraberinde getirmektedir. Milyonlarca insanın açlıkla mücadele ettiği ya da açlıktan öldüğü düşünüldüğünde, insan tüketimi için hazırlanan gıdaların çöpe atılması üzerinde durulması gereken önemli bir sorundur.

Gıda atıklarının olduğu önemli sektörlerden biri de yiyecek ve içecek sektörüdür. Yiyecek ve içecek hizmetini veren otel, restoran, kafe vb. işletmelerde satın alma, depolama, hazırlık ve servis aşamalarında değişen miktarlarda gıda atıkları oluşmaktadır. Bu süreçte atık yönetimi hiyerarşisine uygun olarak oluşan gıda atıklarının önlenmesine/azaltılmasına, yeniden kullanılmasına veya gerekliyse bertaraf edilmesine yönelik önlemler alınmadığında atıkların azaltılması ve sürdürülebilir üretim ve tüketim anlayışının benimsenmesi mümkün olmayacaktır.

Sonuç

Gıdaların israf edilmesinin birçok olumsuz etkisinin olduğu bir gerçektir. Nüfus yoğunluğunun hızlı bir şekilde arttığı ve doğal kaynakların kısıtlı olduğu dikkate alındığında gıda israfını azaltmak için önlemler alınması gelecek nesiller için çok önemlidir. Bu önlemler hem ulusal hem de küresel çapta alınmalı ve yürütülmelidir. Gıda atıkları çevre kirliliğine neden olan, ülke ekonomilerini olumsuz etkileyen, dorudan veya dolaylı olarak halk sağlığını bozan, kaynakların gereksiz harcanmasına neden olan önemli bir sorundur. Öte yandan dünyada azımsanmayacak sayıda insan açlıkla mücadele ederken; yenilebilir gıdaların çöpe atılması etik bir sorundur.

Gıda atıkları hem hane düzeyinde hem de hizmet ve perakende sektöründe farklı oranlarda ve farklı aşamalarda oluşmaktadır. Bu bağlamda ulusal ve uluslararası mevzuata ve çalışmalara uygun olarak gıda atık değerlendirme hiyerarşisine uygun hareket edilmesi gerekmektedir. Ayrıca tüm tüketicilere gıda tüketimi, gıda okuryazarlığı ve israf ile ilgili farkındalık eğitimleri verilmesi çok önemlidir. Öte yandan tüm dünyada olduğu gibi ülkemizde de birçok kurum, kuruluş, dernek ve vakıflar gıda atıklarının önlenmesine/azaltılmasına, değerlendirilmesine ve tüketicilerin bilinçlenmesine yönelik çalışmalar yapmaktadır. Örneğin bazı ülkelerde uygulanan, günümüzde ülkemizde de var olan gıda bankası bu çalışmalara güzel bir örnektir. Gıda bankası, bağışlanan veya tüketilebilir nitelikteki üretim fazlası gıdaların tedarikini sağlayan, uygun depolama koşullarında depolayan ve bu gıdaları direkt veya farklı yardım kuruluşları ile ihtiyaç sahiplerine dağıtan, kâr amacı gütmeyen bir organizasyondur. Gıda israfı ile mücadele etmek her vatandaşın en önemli sorumluluklarından biri olmalıdır.

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11. BÖLÜM

SÜRDÜRÜLEBİLİR GASTRONOMİ

Seza Zerman

Ulusların kaderi, beslenme tarzlarına bağlıdır.

(Jean Anthelme Brillat-Savarin, Lezzetin Fizyolojisi)

Giriş

Günümüzde sosyal medya, kitle iletişim araçları ve ulaşım araçlarındaki ilerlemenin hem bilginin hem de bireylerin mobilitesini artırdığı söylenebilir. Buna bağlı olarak yiyecek, mutfak kültürü, bu kültüre ait unsurlar (şefler, endemik bitkiler, yöresel yemekler) de mobil hâle geldi, bu noktada yiyecekler farklı iklimlerde, farklı mevsimlerde ve farklı coğrafyalarda talep edilir, erişilebilir ve tüketilebilir hâle geldiği sonucuna ulaşılabilir.

Bu değişimlere bağlı olarak günümüzde, Freedman'ın da belirttiği üzere damak tadı, sabit kuralların dışına çıkarak yeni serüvenlerde bireysel tercihler hâline gelmeye başladı. Ulusal mutfaklar, otantik yemekler bakımından bölgesel mutfaklardan daha etkili hâle geldi. Freedman'ın örneğine göre Fransız mutfağı ulusallıktan uzaklaşarak ihracata uyum sağlayacak şekilde uyarlanan bölgesel ürünleri derleyerek genel bir mutfak hâline geldi; benzer şekilde İtalyan mutfağı da ulusal referanslardan çok ihracata yönelik bir tanıtma ve paketleme malzemesi hâline geldi (Freedman, 2018).

Bu süreçlerde yiyecek ve gıda fiziki faydasının yanında sosyal ve duygusal faydaları içeren bir unsur hâline gelirken; yemeğin yetiştirme, hazırlama, sunum ve saklama aşamalarındaki bütüncül yapıyı ve ilişkileri ifade eden

Özet olarak gıda ve gıdanın geleceği sadece damak tadıyla değil, insanın özgürlüğü ile de ilgili konulardır (Freedman, 2008). Zira soğuk savaşın ilk mücadelesi mermi ya da bomba gibi askeri unsurlar üzerinden değil, süt, şeker, tuz gibi yiyecek maddeleri zerinden yapıldı (Standage, 2020). Bu nedenle gastronominin sürdürülebilir şekilde devamı sadece çevresel değil, sosyal, askeri güvenlik gibi unsurların ana nedenidir.

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12. BÖLÜM

GASTRONOMİ, TÜKETİM KÜLTÜRÜ ve DİN

Ayşe Nur Uslu

Giriş

Din; yılın hangi günlerinde ve dönemlerinde, hangi yiyeceklerin yenilip hangilerinin yenilmeyeceği ile ilgili riritüeller, kutsal olarak kabul edilen yiyecekler ve gastronomik semboller gibi çok sayıda uygulama açısından belirleyici olmaktadır (Uca ve Yüncü, 2021). Dinlerin büyük bir çoğunluğu yaşam tarzı ile ilgili prensipler ve beslenme ile ilgili emirler içermektedir. Örneğin çoğu dindeki kutsal yazılar ve dogmalar yenilmesi ve yenilmemesi gereken yiyecekler ile yemekleri hazırlama ve yeme şekli hakkında bilgi vermiştir. Ayrıca kutlama şölenlerinin önemini vurgulayan bu unsurlar, dine mensup ihtiyaç sahiplerini doyurmayı da teşvik etmiştir (Aulet, Fernandes ve Timothy, 2022). Din, kültürel bir faktör olarak gastronomi ile etkileşim içerisinde. Kitabın bu bölümünde, Semavi dinler ve Semavi olmayan dinlerdeki yeme içme ritüelleri, yeme içmeye yönelik emir ve yasaklar, oruç, bayram gibi özel günler ele alınmıştır.

12.1. Semavi Dinler

Bu bölümde semavi dinler olan Yahudik, Hristiyanlık ve İslamiyet gastronomi ve tüketim boyutlarıyla ilişkilendirilerek incelenmiştir.

(2019) göre yemeğin masaya gelene kadar geçirdiği tüm süreçlerde dinin etkisi görülmektedir.

Yapılan bu çalışma dinî yapıların beslenme kültürü üzerinde ne kadar etkili olduğunu göstermektedir. Bununla birlikte beslenme eyleminin dinî ritüellerin önemli bir parçası olduğu da aşikârdır. Birçok toplumda dinî bayramlarda ve özel günlerde (Noel, Paskalya vb.) yeme içme ritüellerinde tüketilen yiyeceklerde dinin etkilerini görmek mümkündür. Örneğin Hristiyanların Paskalya bayramında “*Büyük perhiz*”’i de içeren süreçte balık ve et tüketilmez.

Çalışmanın bir diğer önemli sonucu da oruç gibi ibadet uygulamalarında gastronomi unsurlarının önemli bir aracı rolü olduğudur. Birçok dinde gerçekleştirilen bu oruç uygulamaları dinlere göre farklılık göstermektedir. Örneğin Müslümanlarda ve Yahudilerde oruç; tüm yiyecek ve içeceklerden tamamen uzak durmak şeklindeyken, Hristiyanlarda oruç; hayvansal gıdaların, alkollü içeceklerin veya bazı yiyecek ve içecek türlerinden uzak durulması şeklindedir.

Hayvansal gıdaların tüketilmesi konusunda da dinlerde farklı uygulamalar görülmektedir. Domuz eti Müslümanlar ve Yahudiler açısından haram olarak kabul edilirken, Hristiyanlar tarafından yaygın bir şekilde tüketilmektedir. Hinduizm, Budizm ve Caynizm’e inanların çoğu canlılara şiddet uygulanmasına karşı olduğundan vejetaryendir.

Tüm bu bilgiler ışığında, gastronomide ve din ilişkisi konusunda yapılan bu çalışmanın okuyucuya katkı sağlayacağı öngörülmektedir.

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13. BÖLÜM

GASTRONOMİNİN KÜRESELLEŞMESİ VE YERELLEŞMESİ

Gökhan Yılmaz

Giriş

Gastronomik ürünlere ilişkin tüketim ya da deneyimin anlaşılabilmesi için küreselleşme ve yerelleşme ikileminin açıklanmasına ihtiyaç duyulmaktadır. Bu bağlamda öncelikle gastronomik ürünlerin ne anlama geldiği sorusunun yanıtlanması gerekmektedir. Gastronomik ürünler, tüketicilerin veya turistlerin belirli bir süre kullanabileceği ya da tüketebileceği, merkezinde gastronomik unsurların (yiyecek-içecek gibi) yer aldığı ürün, hizmet veya bunların bileşiminden oluşan faaliyetler (gastronomi festivalleri gibi) şeklinde açıklanmaktadır (Yılmaz, 2021). Ana akım yazında gastronomik ürünlerin küreselleşmesi ve yerelleşmesine ilişkin nispeten az sayıda çalışma (Hall ve Mitchell, 2000; 2002; Askegaard ve Kjeldgaard, 2007) olduğu dikkat çekmektedir. İlk olarak küreselleşmenin yemek veya mutfak kültürü (Orkun, 2009; Fendal, 2012; Díaz Méndez, 2014; Bingör, 2016; Gürhan, 2017), restoranlar (Lane, 2011), yemek programları (Kanık, 2016), gurmeler (Çaycı, 2019) gibi gastronomik ürünlere ya da paydaşlara yönelik etkileri ele alınmaktadır. Öte yandan fast food restoranları (Taylan, 2008; Khan ve Khan, 2013; Crawford, Humphries ve Geddy, 2015; Ulaş Kadioğlu, 2019), etnik yiyecekler (Mak, Lumbers ve Eves, 2012; Kim, Choe ve Lee, 2016; Hwang, Kim ve Choe, 2018; Nahar, Ab Karim, Karim, Ghazali ve Krauss, 2018) gibi gastronomik ürünlerin küreyerelleşmesi de araştırmalara konu olmaktadır. Yerelleşme ise ağırlıklı olarak turistik tüketim içerisinde çekicilik (Harring-

faaliyet gösterdiği ülkenin yerel kültürünü ve özelliklerini dikkate alarak lavaş, köfte ve ayranı bir araya getirerek oluşturduğu menü, bu işletmelerin nasıl küresel düşünüp yerel olarak hareket ettiğine de somut bir örnek teşkil etmektedir. Bu durum küreselleşme ve yerelleşmeyi ayrı ayrı anlayışlar olarak düşünmek yerine birbirinin tamamlayıcısı olarak görmek gerektiğine işaret etmektedir.

Ana akım yazında gastronomi ile küreselleşme ve yerelleşme ilişkisi gerek kavramsal gerekse görgül bulgular ışığında ayrı ayrı incelenmektedir. Bu çalışmada ise söz konusu olgular belirli bir süreç çerçevesinde birbiriyle ilişkilendirerek ele alınmaktadır. Hâl böyle olunca bu çalışmanın gastronomik ürünlerin küreselleşmesi, yerelleşmesi ve küreyerelleşmesine dair teorik bir çerçeve çizdiği ve bu konuları çalışmak isteyen araştırmacılara bütüncül bir yol haritası sunduğu öngörülmektedir. Aslında teorik de olsa küreselleşme ve yerelleşmenin birbirini tamamlayan bir süreç olduğunu destekleyen az sayıdaki öncül çalışmalardan (Robertson, 1995; Hall ve Mitchell, 2002) biri olarak kabul edilebileceği düşünülmektedir. Pratik açıdan bakıldığında ise daha geniş kitlelere ve pazarlara ulaşmak isteyen yiyecek ve içecek işletmelerinin, yerel tüketicilerin istek ve beklentileri doğrultusunda ürünlerini hazırlaması ve buna ilişkin birtakım pazarlama stratejileri geliştirmesi gerektiği söylenebilir.

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14. BÖLÜM

GASTRODİPLOMASİ

Nuray Türker

Giriş

Mutfak diplomasisi olarak da adlandırılan gastrodiplomasi, bir ülkenin yemek ve mutfak kültürünün uluslararası ilişkilerin geliştirilmesi ve diplomasi için bir araç olarak kullanılması anlamına gelmektedir. Gastronomi ve diplomasi kelimelerinden oluşan gastrodiplomasi, ülkeler arasında iyi ilişkiler kurmak, kültürel anlayışı geliştirmek ve bir ulusla ilgili olumlu algı yaratmak için o ülkenin mutfak geleneklerinin ve yemek kültürünün diplomatik platformlarda kullanılmasıdır.

Gastrodiplomasi ülkeler açısından büyük önem taşımaktadır. Gastrodiplomasi, kültürel alışverişi kolaylaştırdığı, bir ülkenin yumuşak gücünü geliştirdiği, ekonomik faydalar sağladığı, insanlar arası ilişkileri güçlendirdiği, barışın inşasına katkıda bulunduğu ve kamu diplomasisini güçlendirdiği için ülkeler açısından önemlidir.

Gastrodiplomasi, günümüzün sert ve rekabetçi dünyasında yumuşak bir güç olarak kullanılmaktadır. Yumuşak güç, bir ülkenin istenen sonuçlara ulaşmak için baskı veya kuvvet uygulamadan ikna yöntemini ve ülkenin çekiciliklerini kullanarak diğer ulusları etkileme yeteneğini ifade etmektedir (Nye, 2004). Gastrodiplomasi, hem ulusal hem de uluslararası bağlamlarda halkla ilişki kurmak için erişilebilir ve tehdit edici olmayan bir yol sağlar. Bir ülkenin mutfağının ön plana çıkarılması ülkenin itibarını artırabilir ve insanların o ulusun kültürü ve halkı hakkındaki algılarını olumlu yönde etkileyebilir. Ülkeler, mutfaklarını tanıtarak uluslararası arenada ilgi uyandırabilir, yurt

Dijital platformların ve sosyal medya platformlarının yükselişi, hükûmetlere ülke mutfaklarını sergilemeleri ve küresel izleyicilerle etkileşim kurabilmeleri için uygun bir zemin sağlamaktadır. Gelecekte de gastrodiplomasi faaliyetlerinin yürütülmesinde, ülke ve yemek kültürlerinin tanıtılmasında bu platformların önemi artmaya devam edecektir. Günümüz tüketicisi sağlık ve sürdürülebilirlik konularına karşı daha ilgili ve hassastır. Bu nedenle tüm toplumlarda geleneksel ve organik tarım uygulamalarını teşvik etmeye, yerel gıda sistemlerini desteklemeye ve yerel gıda kültürlerini öne çıkarmaya doğru bir eğilim söz konusudur. Gastrodiplomasi, sürdürülebilir tarım uygulamalarının desteklenmesinde önemli rol oynayabilir.

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15. BÖLÜM

GASTRONOMİDE POPÜLER KÜLTÜR VE SOSYAL MEDYA

Özge Kılıçarslan

Giriş

Medya, iletişim ve bilgilendirme fonksiyonunun yanı sıra kültürel dönüşümlerin yaşanmasında ve aktarılmasında önemli bir rol üstlenmektedir (Karaduman, 2017). Öyle ki günümüzde popüler kültürün, medyanın etkisinde kaldığı birçok araştırmacı tarafından belirtilmektedir (Ishak ve Rahman, 2022; Karaduman, 2017). Gazete, radyo ve dergiden sonra televizyon, bilgilendirme işlevinden ziyade kitleleri etkileme fonksiyonu ile dikkat çekmiştir. Filmler, diziler, televizyon programları gibi kitlelerin davranışlarını etkileyen geleneksel medya biçimlerinin yanı sıra söz konusu geleneksel medya türlerini tamamlayan ve bazı durumlarda onların yerini alan Instagram, Facebook gibi modern sosyal medya anlayışının doğması, popüler kültür ile medyanın iç içe geçmesine neden olmuştur.

Günümüzde sosyal medya kullanımının yaygınlaşması ve sosyal medyada geçirilen sürenin artması, sosyal medya araçlarının, geleneksel medya araçlarından çok daha fazla kültüre yön verdiği ve geniş kitleleri etkileyip harekete geçirdiğini düşündürmektedir. Öyle ki 2023 yılı itibarı ile dünyanın %60'ının sosyal medya kullandığı belirlenmiş ve yaklaşık 4,80 milyar kullanıcıya ulaşan sosyal medyada günlük ortalama geçirilen sürenin 2 saat 24 dakika olduğu tespit edilmiştir (Chaffey, 2023). Traveler Value Index (2023) verileri ise sosyal medyanın, televizyon, dergi gibi geleneksel bilgi kaynakları kadar turistik aktivitelere ilham olduğunu göstermiştir. İstatistik veriler

sosyal; son olarak iyi hissetmek veya uzaklaşmak için psikolojik olarak güdülenmektedir. Bilimsel veriler de toplumun gastoronomi temelli görsel içerikler aracılığı ile sosyal medyayı artan şekilde benimsemesini *işlevsel, sosyal ve psikolojik* güdülere bağlamaktadır.

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16. BÖLÜM

GASTRONOMİDE TURİSTİK ÜRÜN UNSURLARI

Ayşegül Acar

Giriş

Turizm endüstrisindeki sürekli değişim ve gelişmeler, turistlerin seyahat alışkanlıklarını büyük ölçüde etkilemektedir. Gastronomi turizmi, alternatif bir turizm türü olarak ortaya çıkmış olup seyahat edenlerin ilgi ve tercihlerinde önemli bir değişim yaratmıştır. Geleneksel turizm anlayışını, lezzet ve mutfak kültürleriyle birleştiren gastronomi turizmi, destinasyonları zengin yemek çeşitliliği ve yerel tatlarla birlikte sunduğu kültürel deneyimlerin öne çıktığı bir turizm türüdür (Akgöl, 2014). Turistlerin seyahatleri sırasında gıda ve içecek hizmetleri satın almak zorunda kaldığı düşünüldüğünde, bu hizmetlerin kalitesi, turistik deneyimlerini şekillendirmede önemli bir rol oynamaktadır (Kozak vd., 2011). Standart hizmetlerin ötesinde, sunulan hizmetler ve ürünlerin arkasındaki hikâyeler, doğal ve kültürel unsurlarla desteklenerek kalıcı iyi bir izlenim ve gastronomik deneyim sağlamaktadır (Nebioğlu, 2016).

Gastronomi turizmi, turistlerin yerel lezzetlerle etkileşime girebileceği ve yeni kültürel deneyimler yaşayabileceği bir fırsat sunmaktadır. Ancak burada üzerinde durulması ve ayırımının yapılması gereken husus, gastronominin bir turistik ürün olarak mı ele alındığı yoksa gastronomideki turistik ürün unsurlarının mı vurgulandığıdır. Bu durumda, net bir ayırım yapmak önemlidir. Gastronomi turizmi, bir turistik ürün olarak ele alınırken, destinasyonların gastronomik çekiciliğini vurgulayan bir kavram olarak karşımıza çıkmakta-

layabilirler. Aynı zamanda turistik ürünlerin sürdürülebilirliğini sağlamak için, yerel ekonomi ve kültürel mirasın korunmasına özen gösterilmelidir. Bu amaçla, gastronomi turizminin gelişimi için tüm paydaşların iş birliği ve uyumlu çabaları önemlidir.

Sonuç olarak gastronomi turizmi, turistik ürünler ve yerel mutfak kültürüne odaklanan bu çalışma, turizm sektörü ve gastronomi alanındaki profesyonellerin ve akademisyenlerin dikkatini çekmeyi hedeflemiştir. Gastronomi turizmi ve turistik ürünlerin potansiyelinden yararlanmak için, gelişmiş pazarlama stratejileri, eğitim merkezleri ve iş birliği çabalarının desteklenmesi gerekmektedir. Bu sayede, gastronomi turizmi daha sürdürülebilir ve katma değeri yüksek bir turizm türü olarak gelecekteki yerini sağlamlaştırabilir.

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17. BÖLÜM

GASTRONOMİ VE TEKNOLOJİ

Burak Pınarođlu

Giriş

Gastronomi bilimi, gıdaların üretim, dağıtım ve sunum süreçlerinde teknolojik yeniliklerden yararlanmaktadır. Bu çalışmada teknoloji ve gastronomi etkileşimi, literatür taraması ve doküman analizi gibi nitel araştırma yöntemleriyle araştırılmaktadır. Araştırmanın ana amacı teknoloji ve dijital dönüşümün gastronomi üzerindeki etkilerini tespit etmektir. Gastronomide belirli teknolojilerin genel teknolojik gelişmelerle birlikte geliştiđi gözlemlenmiştir. Artırılmış gerçeklik, nesnelerin interneti (IoT), yapay zekâ (AI), robot teknolojisi, mobil uygulamalar ve 3D baskı gibi dijital yenilikler sektörde giderek yaygınlaşmaktadır. Gastronomi, teknoloji trendlerine ayak uydurmakta ve gelecekte de bu eğilimi sürdürmesi beklenmektedir. Bu nedenle, dijital teknolojilerin gastronomi alanında kullanımının artık bir bilim-kurgu olmaktan çıkıp gıda endüstrisinde giderek daha sık kullanılan bir trend olduđu sonucuna varılabilir.

17.1. Dijital Gastronominin Ortaya Çıkışı

Teknolojik gelişmeler çeşitli sektörlerde devrim yaratmıştır. Gastronomi endüstrisi de bu sektörlerden birisidir. Lipson ve Kurman (2013) tarafından ortaya atılan “dijital gastronomi” kavramı, gıda bilimi, mutfak sanatları ve dijital teknolojinin kesişimini ifade etmektedir. Yemek hazırlama ve sunmaya yönelik bu yenilikçi yaklaşım, gastronomi ortamını dönüştürerek tüketici-

yenilikçi yaklaşımların benimsenmesini kolaylaştırarak gıda sektöründe sürdürülebilir ve etkili büyümeyi destekleyebilir. Gastronomi mutfak sanatları alanında teknoloji ve inovasyonun kullanılmasının sağladığı yararlar ve faydalar konusunda sürekli bilgi paylaşımı yapılarak gastronomi sektörünün büyüme ve gelişme hızı artırılabilir.

Sonuç olarak gastronomi alanında teknolojik gelişmelerin ve yeniliklerin uygulanması, endüstri bazında büyümesi için bir zorunluluk hâline gelmiştir. Bu süreçte, kesintisiz bilgi alışverişinin yanı sıra çalışan eğitimi, gelişen teknolojilere uyum sağlamayı sağlarken, endüstri büyümesinde de hayati bir rol oynayacağı düşünülmektedir.

Her geçen gün daha fazla teknoloji ile iç içe geçen gastronomi, dünya çapındaki araştırmacılar arasında yeni ve ilgi çekici bir konu olarak kabul ediliyor. Bu çalışmanın konu ile ilgili mevcut literatüre katkı sağlayacağı ve bundan sonraki araştırmalar için bir kaynak olarak değerli olacağı öngörülmektedir.

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18. BÖLÜM

GASTRONOMİDE PAZARLAMA

Samet Gökkaya

Giriş

Günümüz pazarlama anlayışı klasik manadaki mal ve hizmetler yerine mal ve hizmetlerle etkileşim hâlinde bulunan insanlar, olaylar, tarihî ve kültürel alanlar, geçmiş tecrübeler ve fikirleri de kapsamaktadır. Pazarlama sadece mal ve hizmetleri talep edecek tüketim noktalarının bulunması olmaktan çıkmış, yaşam alanlarımızın geliştirilmesi, kaynakların verimli ve hedefe yönelik kullanımı ve hatta bir kentin tercih edilebilirliğini artırmak için de kullanılmaya başlanmıştır (Elmacıoğlu ve Seçme, 2023). Özellikle kültürel değerleriyle ön plana çıkan kentlerin pazarlama stratejileri oluşturdukları ve bu stratejileri uygulamaya çalıştıkları ifade edilebilir.

Kültür turizm destinasyonları olarak ifade edebileceğimiz mutfak kültürleriyle ön plana çıkan kentler, kendilerini gastronomi ürünleriyle pazarlamaya çalışmakta ve bu kapsamda pazarlama karması elemanlarını kullanmaktadır. Günümüzde gastronomi ve turizm arasındaki bağ gün geçtikçe kuvvetlenmektedir. Turizm hareketleri içerisinde gastronominin rolü anlaşıldıkça destinasyon yöneticilerinin gastronomi turizmi ile ilgili yaptıkları faaliyetlerde de artış gözlemlenmektedir. Ziyaretçilerin fizyolojik ihtiyaçlarını karşılamak için zorunlu olarak sunulan yiyecek ve içecekler günümüzde fizyolojik ihtiyaçları karşılamının ötesine geçmiştir. Artık insanlar birlikte olma, statü, prestij gibi nedenlerle yiyecek içecek tüketmektedir. Bu nedenlerle son yıllarda gastronominin turistik faaliyetlerde temel motivasyon nedeni hâline geldiği ifade edilebilmektedir.

heyecan verici bir yolculuk vaat etmektedir. Bu trendler, yemek deneyimini sadece bir beslenme şekline çok daha fazlasına dönüştüren etkileyici ve ilgi çekici bir sektörün varlığını sürdüreceğini göstermektedir. Gastronomide markalaşma süreci, özenle ve stratejik bir şekilde yönetilmelidir. Marka kimliğinin oluşturulması, hedef kitlenin ihtiyaç ve beklentilerine uygun olarak planlanmalıdır. Lezzet ve sunum, markanın temelini oluştururken, görsel tasarım, renkler ve mesajlar da markanın algılanışını şekillendirmektedir. Farklılaşma, güven, müşteri bağlılığı ve büyüme imkânları gibi avantajlarıyla markalaşma, gastronomi dünyasında başarıya ulaşmak için önemli bir stratejidir. Gastronomi pazarlaması, stratejik bir planlama ve sürekli takip gerektiren bir süreç olarak ifade edilebilmektedir. Müşteri odaklılık, kalite, yenilikçilik ve duygusal bağ oluşturma, gastronomi işletmelerinin başarılı bir pazarlama süreci yürütmesinde kritik rol oynamaktadır. Restoranlar ve gıda işletmeleri için etkili pazarlama stratejileri, müşteri tabanını genişletmek, sadık müşteri kitlesini oluşturmak ve rekabet avantajı sağlamak açısından büyük önem taşımaktadır.

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İÇİNDEKİLER

YAZAR LİSTESİ.....	iii
ÖN SÖZ	v

1. BÖLÜM

<i>Yenilikçi ve Isıl Olmayan Teknolojilerin Gıda Sanayinde Kullanımı: Yüksek Basınç.....</i>	<i>1</i>
Sencer Buzrul	

BÖLÜM 2

<i>Nanoliflerin Et Ürünlerinde Kullanımı.....</i>	<i>23</i>
Halime Alp, Kübra Ünal	

BÖLÜM 3

<i>Sürdürülebilir Gıda Ambalajları: Doğal Biyopolimer Bazlı Nanokompozit Filmler</i>	<i>41</i>
Aysun Oraç	

BÖLÜM 4

<i>Gıda Kaynaklı Biyoaktif Peptitlerin Özellikleri ve Fonksiyonelliklerinin in Silico Analizler ile Değerlendirilmesi</i>	<i>79</i>
Hale İnci Öztürk	

BÖLÜM 5

<i>Yoğurdun Yapısının Geliştirilmesinde Kullanılan Yeni Teknolojiler.....</i>	<i>119</i>
Çiğdem Konak Göktepe	



BÖLÜM 6

<i>Tahıl ve Baklagillerden Elde Edilen Protein İzolatları ve Gıdalarda Fonksiyonel Kullanımı</i>	159
Hilal Arslan Bayrakçı	

BÖLÜM 7

<i>Gıda Proseslerine Yeni Yaklaşım: 3 Boyutlu Baskı (3D Printing) Teknolojisi</i>	199
Sevil Çıkrıkçı Erünsal	

BÖLÜM 8

<i>Atıştırmalık Et Ürünleri</i>	225
Sümeyra Sultan Tiske İnan, Gizem Şahin	

BÖLÜM 9

<i>Meyve Atıklarının Gıda Endüstrisinde Değerlendirilme Olanakları</i>	265
Evrım Burcu Uncu Kırtış, Süheyla Tuna	

BÖLÜM 10

<i>Yeni Nesil Probiyotikler: Taksonomileri, Güvenlikleri, Uygulamaları ve Potansiyel Sağlık Faydaları</i>	295
Talha Demirci	

BÖLÜM 11

<i>Et ve Et Ürünlerinin Fonksiyonelleştirilmesi Üzerine Güncel Çalışmalar</i>	325
N. Meziyet Dilek	

1. BÖLÜM

Yenilikçi ve Isıl Olmayan Teknolojilerin Gıda Sanayinde Kullanımı: Yüksek Basınç

Sencer Buzrul

1. GİRİŞ

Hepimiz yiyip içiyoruz ve bunu istisnasız her gün yapıyoruz. Belki de günlük yaşamımızın içerisinde bu kadar yer kaplaması nedeniyle gıda söz konusu olduğunda hepimiz konuşuyor, tabiri caizse konunun uzmanı gibi davranıyoruz. Gıda tüketicisi olarak bize “Yiyecek ve içeceklerinizin nasıl olmasını istersiniz?” diye sorsalar, hemen herkes benzer şeyler söyleyecektir: “Sağlıklı, lezzetli, besleyici değeri yüksek, ucuz, raf ömrü uzun, doğal, ya da doğala en yakın, katkı maddesi içermeyen, yıl boyunca market raflarında bulunan vb.” Aslına bakılırsa tüketici olarak gıdalla ilgili isteklerimiz çelişkilerle doludur. Şöyle ki, bir ürünün hem katkı maddesi içermemesi hem uzun bir raf ömrüne sahip olması hem de besin değerinin yüksek olması çok kolay değildir. Biz bunlara tüketici çelişkileri diyoruz. Bir kısmı çelişkili de olsa günümüz tüketicilerin talep ettikleri gıda ürünlerini ortaya çıkarma çabası gıda sanayinde birtakım yeni teknolojilerin türemesine neden olmuştur. Kitabın bu bölümünde yenilikçi ve ısıl olmayan gıda teknolojilerinden olan yüksek basınç işlemlerinden bahsedeceğiz. Ancak detaylara geçmeden siz okuyuculara kısa bir ön bilginin verilmesi gerektiğini düşünmekteyiz.

Geleneksel ısıl işlemler (örneğin sütün veya meyve suyunun pastörize edilmesi) gıdaların raf ömrünün uzamasını ve mikrobiyal açıdan güvenilirliğini sağlarken, gıdalarda besin, vitamin ve renk kaybına veya değişimine neden olabilmekte, gıdalarda kullanılan bazı katkı maddelerinin ise -o gıda-

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BÖLÜM 2

Nanoliflerin Et Ürünlerinde Kullanımı

Halime Alp, Kübra Ünal

1. GİRİŞ

Enkapsülasyon işlemi; maddenin uygun bir kaplama bileşeniyle kaplanması sonucu raf ömrünün uzatılması ve daha etkin olması amacıyla uygulanmaktadır. Enkapsülasyon tekniği, ürünün stabilitesinin korunmasına ve kontrollü şartlarda salınımına avantaj sağlayan bir uygulamadır (Dordevic vd., 2015; Atak, Yıldız ve Uslu, 2017).

Nutrasötik bileşenlerin gıda sistemlerinde ideal bir enkapsülasyon işlemi ile enkapsülasyonu, biyoyararlanımı tehlikeye atmadan hem gıda işleme sırasında hem de sindirim sisteminden geçiş sırasında nutrasötik yükü biyokimyasal olarak sert ortamlardan korumuş olacaktır. Ayrıca, lipofilik veya sulu bir ortamda biyoaktif maddelerin çözünürlüğünü artıracak ve depolama veya işleme sırasında gelişebilecek olumsuz duyuşsal özellikleri de maskeleyecektir (Babazadeh, Jafari ve Shi, 2019). Sprey kurutma, dondurarak kurutma ve emülsifikasyon gibi bazı teknikler, biyoaktif bileşenlerin enkapsülasyonunda kullanılmaktadır. Ancak biyoaktif yüklü lipozomların biyopolimer kaplaması için püskürterek kurutma ve dondurarak kurutma gibi teknolojilerin, kurutma prosesi sırasındaki kullandıkları yüksek işlem sıcaklıkları, çevreye duyarlı biyoaktif maddelere zarar vermektedir ve enerji açısından pahalı bir süreçtir. Bu zorluklar ele alındığında, elektrohidrokinamik işleme de dâhil olmak üzere ortaya çıkan yeni teknolojilerin benimsenmesine iten güçler olarak sayılabilmektedir (Gómez-Mascaraque, Sipoli, de La Torre ve López-Rubio, 2017).

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BÖLÜM 3

Sürdürülebilir Gıda Ambalajları: Doğal Biyopolimer Bazlı Nanokompozit Filmler

Aysun Oraç

1. GİRİŞ

Gıda ambalajı, gıda ürünlerinin dış kontaminasyondan korunmasında ve raf ömürleri boyunca kalite, bütünlük ve güvenliklerinin korunmasında kritik bir rol oynar. Geleneksel gıda ambalaj malzemelerinin %75'inden fazlası, hafiflikleri, şekillendirilebilirlikleri, sağlamlıkları ve maliyet etkinlikleri nedeniyle petrol türevi polimerler tarafından üretilen, biyolojik olarak parçalanamayan plastik malzemelerdir (X. Zhao vd., 2020). Ancak bu sentetik polimerler bozunmaz ve plastik atıkların ve molozların çoğu çevreyi büyük ölçüde kirletir. Bu sebeple bu ambalajlar yüksek çevre ve insan sağlığı risklerine neden olmaktadır (Abejón vd., 2020; Rochman vd., 2013). Bu sorunları çözümü için biyolojik olarak parçalanabilen polimer malzemelerin geliştirilmesi ve kullanılması zorunlu hâle gelmiştir.

Son zamanlarda, yeşil kimyanın gereksinimlerini karşılayabilen yenilenebilir ve çevre dostu malzemeler sürdürülebilir gıda ambalaj uygulamaları için geniş çapta araştırılmaktadır. Biyo bazlı polimerler, geleneksel petrol bazlı gıda ambalaj malzemelerinin yerini alma konusunda muazzam potansiyele sahip, sürdürülebilir, yüksek performanslı malzemelerdir. Bu malzemelerin biyolojik olarak parçalanabilirlikleri ve yenilenebilirlikleri nedeniyle potansiyel çevre ve insan sağlığı risklerini ortadan kaldıracılabileceği düşünülmektedir (Atta vd., 2022; Rhim vd., 2013a). Bununla birlikte, biyopolimerler, sentetik polimerlerle karşılaştırıldığında, düşük termal ve mekanik özel-



ve diğer çevresel faktörler gibi çeşitli özelliklerini geliştirebilir. Ayrıca nano-biyoteknolojideki gelişmelerin, biyoaktif gıda bileşenleri ve ambalajlamadaki emtianın sağlık gereksinimlerine de büyük katkı sağladığı açıktır. Yenilikçi malzemelerin kullanımı ve bunların endüstriyel düzeyde uygulanması, gıda maddelerinin kalitesini ve güvenliğini teyit etmenin yanı sıra fiyatları düşürüp etkinliği de arttıracaktır. Sonuç olarak, biyopolimer bazlı nanokompozitler, sürdürülebilir, uygun maliyetli, aktif ve akıllı ambalaj malzemeleri olarak gıda endüstrisinde geniş bir uygulama yelpazesi için muazzam bir potansiyel sergilemektedir.

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BÖLÜM 4

Gıda Kaynaklı Biyoaktif Peptitlerin Özellikleri ve Fonksiyonelliklerinin in Silico Analizler ile Değerlendirilmesi

Hale İnci Öztürk

1. GİRİŞ

Proteinler, her canlı organizmaların hayati faaliyetlerini sürdürebilmeleri için temel bileşenler olan makromoleküllerdir. İnsanlar ihtiyaç duydukları miktarda ve kalitede proteinleri besinler aracılığıyla sağlamaktadır. Son zamanlardaki çalışmalar, prekürsör olarak gıda proteinlerinin belirli amino asit dizisi ve kompozisyonuna sahip peptitlere parçalanması ile insan vücudunda belirli fonksiyonlara veya sistemlere fayda sağladığı ortaya konmuştur (Karami ve Akbari-Adergani, 2019). Bu peptitler, biyoaktif peptitler veya fonksiyonel peptitler olarak adlandırılmaktadır. Bu spesifik peptit sekanslarının antimikrobiyal, antihipertansif, kolesterol düşürücü, antioksidan, immünomodülatör, antitrombotik, mineral bağlayıcı ve daha birçok fonksiyonel özelliği gösterdiği bildirilmiştir (Öztürk ve Akın, 2021b). Ayrıca bu peptitler belirtilen fonksiyonel özelliklerinden birini tek içerebildiği bazı peptitler birden fazla fonksiyonel özellik gösterebilmektedir. Birden fazla fonksiyonel özelliğe sahip biyoaktif peptitler multifonksiyonel olarak tanımlanmaktadır. Gıda proteinleri üzerine gerçekleştirilen çalışmalarda da multifonksiyonel peptitlerin çeşitli gıdalarda meydana geldiği ortaya konmuştur (Öztürk ve ark., 2021; Palma-Albino ve ark., 2021; Taniguchi ve Ochiai, 2017). Dolayısıyla gıda proteinleri besin değerine ek olarak fonksiyonel özellikleri açısından son yıllarda bilimsel olarak büyük ilgi görmektedir (Capriotti ve ark., 2016).



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BÖLÜM 5

Yoğurdun Yapısının Geliştirilmesinde Kullanılan Yeni Teknolojiler

Çiğdem Konak Göktepe

1. GİRİŞ

Dünya çapında oldukça popüler bir süt ürünü olan yoğurt, *Streptococcus thermophilus* ve *Lactobacillus delbrueckii* subsp. *bulgaricus* tarafından sütün fermente edilmesiyle üretilmektedir (Purwandari ve ark., 2007). Üretim teknolojisi açısından; piyasadaki yoğurtlar pıhtısı kırılmamış yoğurtlar, pıhtısı kırılmış yoğurtlar ve ayran olmak üzere temelde 3 ana grupta toplanmaktadır. Pıhtısı kırılmamış yoğurtlar genellikle ambalajda fermente edilir ve geleneksel imajlarıyla bağlantılı olarak daha sert bir jel yapısına ve doğal bir lezzete sahiptirler. Pıhtısı kırılmış yoğurtlar ise fermentasyon tankında fermente edildikten sonra pıhtı karıştırılarak kırılır. Bu işlem ona yarı katı bir yapı kazandırırken genellikle stabilizatörler, meyve parçaları ve çeşitli aromalar eklenmektedir (Loveday ve ark., 2013). Ayran ise geleneksel olarak yoğurda su ve tuz katılarak veya endüstriyel olarak seyreltilmiş sütün fermentasyonu ve fermentasyondan sonra tuz içeren su ile daha fazla seyreltilmesiyle üretilir (Koksoy ve Kilic, 2004). Fermente süt ürünlerinin popülaritesini belirleyen en önemli özellikleri arasında reolojik, tekstürel ve duyuusal karakteristikleri sayılabilir (Lee ve Lucey, 2010).

Yoğurdun tekstürel özellikleri, yoğurt sütüne uygulanan sıcaklık ve süre, starter bakterilerin türü ve miktarı, fermentasyon sıcaklığı, depolama koşulları ve daha özel olarak süt bazlı protein kompozisyonu gibi çeşitli parametrelerden etkilenmektedir (Kristo ve ark., 2003; Lucey ve ark., 1998;



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BÖLÜM 6

Tahıl ve Baklagillerden Elde Edilen Protein İzolatları ve Gıdalarda Fonksiyonel Kullanımı

Hilal Arslan Bayrakçı

1. GİRİŞ

Dünya protein gereksinimleri, gıda güvenliği ve proteince yetersiz beslenme ile ilgili artan endişelerle küresel bir sorun olmaya devam etmektedir (Blandford, 1996). 2050 yılına kadar 9 milyar olacağı tahmin edilen dünya nüfusu ile küresel gıda güvenliğinin önündeki en büyük zorluklardan biri, protein gereksinimlerinin sağlıklı ve çevreye duyarlı bir şekilde karşılanabilmesini sağlamaktır (de Boer vd., 2014; Smetana vd., 2018). Hayvansal proteinler, besleyici ve fonksiyonel özellikleri açısından bitki bazlı proteinlere göre rekabet avantajına sahip olsa da protein içeriği pazarı, hayvansal bazlı ürünlerin tüketimiyle ilişkili farklı etnik, dini, diyet ve ahlaki tercihlere sahip tüketicilerin taleplerini karşılamak için yoğun bir şekilde alternatif, yeterince kullanılmayan konsantre bitki proteinleri kaynakları aramaktadır (Hadnadjev vd., 2017a). Et, iyi beslenme profili, eşsiz ve çekici tadı ile uzun zamandır vazgeçilmez bir besin kaynağı olmuştur. Ancak dünya çapında ete olan talebin sürekli artması, arz konusunda endişelere yol açmıştır (Zheng vd., 2022). Özellikle 2050 yılına kadar et tüketiminin %50'den fazla artacağı tahmin edilmektedir (Bonny vd., 2017). Bu talebin artmasıyla, etle ilgili etik ve çevresel sorunun ele alınması gerekliliği ortaya çıkmıştır (P. Kumar vd., 2017). Toprak ve su kaynaklarına olan talebin artması, sera etkisinin neden olduğu ekolojik değişiklikler ve hayvan refahı gibi sorunlar bunlardan bazılarıdır (Clark vd., 2017). Ayrıca vejetaryen gıdaların geliştirilmesi, vejetaryenlerin, hayvan refahı savunucularının ve sağlıklı diyet yapanların destek-



zemelerin kompostlaştırılmasını teşvik ettiğinden, biyobozunur plastikler gelişmiş ülkelerde pazar ivmesi kazanmaktadır (Agriculture and Agri-Food Canada, 2015).

Soya proteini, film oluşturucu özellikleri nedeniyle kapsamlı bir şekilde incelenmiştir. Çalışmaların çoğunda %90'dan fazla protein içeren ve izoelektrik çöktürme (pH 4.5) ile elde edilen soya proteini izolatu kullanılmıştır. Soya sütü, soya unu ve fraksiyonlarına ayrılmış soya proteinlerinin kullanımı da bildirilmiştir (Mariniello vd., 2003; Seung ve Rhee, 2004).

Buğday gluteni, plastikleştirildiğinde, tahıllar ve diğer bitki proteinleri arasında viskoelastik özelliklere sahip viskoz karışımlar oluşturma yeteneği bakımından benzersizdir (Gällstedt vd., 2004). Glutenden yapılan filmler saf ve şeffaftır, böylece saflık ne kadar yüksek olursa, mekanik özelliklere sahip o kadar güçlü bir film üretilir (Hernández-Muñoz vd., 2004). Gluten, yer fıstığını kaplamak ve boyaları ve tatlandırıcıları kapsüllemek için kullanılır. Doymamış yağ asitlerinin püskürtülerek kurutulmuş gliadin tozu ile mikrokapsülasyonu, oksidasyonu azaltır ve diğer numunelere kıyasla en düşük miktarda peroksit üretir. Gluten bazlı biyobozunur filmler, esnek olmalarına rağmen yeterli dayanıklılığa sahiptir ve aynı zamanda nispeten şeffaftır. Gluten filmi ayrıca antioksidanlar, antimikrobiyaller ve tatlandırıcılar gibi katkı maddelerinin taşıyıcısı olarak işlev görebilir ve gıda kalitesinin korunmasına yardımcı olabilir (Gontard vd., 1993).

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BÖLÜM 7

Gıda Proseslerine Yeni Yaklaşım: 3 Boyutlu Baskı (3D Printing) Teknolojisi

Sevil Çıkrıkçı Erünsal

1. GİRİŞ

Doğal kaynakların verimli şekilde değerlendirilmesi ve sürdürülebilir yaklaşımlar, küresel sorunlara verilen önemin artmasıyla son yıllarda oldukça gündem kazanmıştır. Özellikle artan nüfusun ihtiyaçlarını karşılamaya yönelik en temel konulardan biri olan gıdanın kaynaklarının korunması, güvenli tüketimi, mevcut kaynakların yeni teknolojilerle farklı ihtiyaçlara cevap verebilen formlara dönüştürülmesi ve sıfır atık üretimi gibi amaçlara yönelik yeni yollar araştırılmakta ve gelişen teknoloji ile bu konulara yönelik çalışmalar hızla ilerlemektedir. 3D gıda yazıcıları bu noktada pek çok avantajı nedeniyle ön plana çıkan uygulamalar arasında sayılabilir.

Sürdürülebilirlik sadece mevcut kaynakların korunması değil aynı zamanda verimli ve akılcı bir yolla üretmek anlamına da gelmektedir. Kısaca gıda sektöründe sürdürülebilirlik, gıdaların çiftlikten çatala olan hazırlanma, işlenme, saklanma ve tüketim gibi aşamalarına ait ekonomik ve ekolojik oluşabilecek zararı en az seviyeye indirme girişimi şeklinde tanımlanabilir (Taş ve Olum, 2020). 3D gıda baskısı, istenilen formlarda kişiye özel üretim ortamı ve beslenme programı sağlayan, gıda atıklarının yeni ürün geliştirmede kullanımını sağlayan, isteğe bağlı üretim avantajı ile gıda israfını önleyen bilgisayar destekli bir teknolojidir. Gıda yazıcıları, karmaşık şekillerin de basımına olanak tanımakta, özel hasta vb. kişisel ihtiyaçlara göre yeni ürünlerin geliştirilmesinin önünü açmakta, malzeme ve iş gücünden tasarruf sağ-

lenmekte, basımı yapılacak ürünler için hazırlanacak anketlerin bireyler tarafından doldurulması sonucu her tüketicinin ihtiyacı olan besinlerin belirlenmesi ve her katmanda farklı bileşenlerin yer almasıyla bu bileşenlerin birbiri ile etkileşiminin önlenmesi ve böylece sipariş üzerine kişisel ürünlere talebin artması umut edilmektedir. Gelişen dijitalleşme ve pek çok aplikasyon yardımı sayesinde ileride bu alanın gelişiminin son derece hız kazanacağı düşünülmekte ve günlük hayatı kolaylaştıran pek çok kullanım ile karşımıza çıkması beklenmektedir.

Özetle, gıda yazıcıları, gıda endüstrisinde gelecekte hem bireysel hem de ticari kullanımda sürdürülebilir teknolojiler arasında yaygınlaşması beklenen yöntemler arasında olup mevcut durumların iyileştirilmesi ve dijitalleşmedeki ilerlemeler ile bu yazıcıların son derece umut vadeci sonuçlar doğuracağına inanılmaktadır.

Teşekkür

Bazı şekiller BioRender (2023 versiyonu) çevrim içi programı kullanılarak oluşturulmuştur (<https://biorender.com/>).

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BÖLÜM 8

AtıŖtırmalık Et Ürünleri

Sümevra Sultan Tiske İnan, Gizem Şahin

1. GİRİŞ

Et, bünyesinde doğal olarak bulunan proteinler, yağ asitleri, vitaminler, mineral maddeler gibi besin öğelerince oldukça zengin bir yapı arz eden biyolojik değeri yüksek mükemmel bir gıda maddesidir. Kaliteli besin öğeleri, yüksek nem içeriđi ve uygun pH değeri nedeniyle çiđ etin raf ömrü oldukça kısadır. Çiđ et ve et ürünlerinin raf ömrünü uzatmak amacıyla geçmişten günümüze kadar geçen süreçte tuzlama, kurutma, çeşnilendirme, tütsüleme vb. çok çeşitli muhafaza tekniklerinden yararlanılmıştır. Bu tekniklerin çiđ et ve et ürünlerinin bozulma sürecini geciktirdiđi ve raf ömrünü uzattığına yönelik yapılan birçok çalışma mevcuttur. Et katkılı atıŖtırmalık gıdaların gelişiminin kökeni, bozulmayı geciktirmek amacıyla en eski muhafaza tekniklerinden biri olan kurutma uygulamasına dayanmaktadır. Paleolitik çağda (eski taş devrinde) tarımın benimsenmesinden önce, gıdalar insanlar tarafından çođu kez toplayıcılık yoluyla elde ediliyordu. Bu dönemde insanlar, göçebe ortamlarında ana geçim stratejisi olarak avlanmayı ve toplanmayı benimseyerek hayatta kalmışlardır. Bu insanların uzun süre bozulmadan saklanabilen, hafif, yüksek besleyicilik ve enerji değerine sahip olduğundan dolayı bir yerden başka bir yere yolculukları sırasında yanlarında genellikle kurutulmuş et bulundurdıkları ve avlanma faaliyetleri sırasında bunları tükettikleri bildirilmiştir. Avcılıđın MÖ 10.000'li yıllara (Mezolitik dönemin başlangıcı) kadar insanların yaşamında başlıca geçim faaliyeti olduğuna belirtilmiştir. Kurutulmuş et ürünlerinden olan Pemmikanın ve charqui'nin Avru-

6. SONUÇ

Et katkılı ve atıřtırmalık et ürünleri hızlı ve kolay erişilebilirlik, yüksek besleyicilik değerine sahip olma ve ana öğün yerine tüketilebilme gibi avantajlarından dolayı oldukça popüler olup, alışveriş listelerinde ve tüketici tercihlerinde önemli bir yere sahiptir. Atıřtırmalık gıdaların besleyicilik değerlerini geliştirme amacıyla zenginleştirme ve/veya güçlendirme çalışmalarının yanı sıra oda sıcaklığında raf ömrünü uzatma ve depolanma stabilitesini iyileştirmede çeşitli teknolojik çalışmalara yoğunlaşmıştır. Bu teknolojik çalışmalar arasında hızlı kurutma işlemleri, doğal koruyucu maddelerin formülasyona dâhil edilmesi, ambalajlama/paketleme uygulamalarında inovatif yaklaşımlar gibi konulara öncelik verilmektedir. Ayrıca, üretim maliyetlerini düşürebilmek, nispeten daha ucuz protein kaynaklarından faydalanılabilme olanaklarının yanı sıra sürdürülebilir üretim ve tüketim olanaklarına yönelik çok farklı sayı ve çeşitte atıřtırmalık ürün formülasyonları üzerine de çalışmalar devam etmektedir (Çizelge 1).

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BÖLÜM 9

Meyve Atıklarının Gıda Endüstrisinde Değerlendirilme Olanakları

Evrım Burcu Uncu Kırtış, Sühayla Tuna

1. GİRİŞ

Meyve ve sebzeler içerdikleri biyoaktif bileşikler nedeniyle beslenme ve insan sağlığı üzerinde önemli bir role sahiptir. Taze olarak tüketilebildikleri gibi, yarı işlenmiş veya işlenmiş ürün olarak da tüketilebilmektedir. Tüketicilerin bilinçlenmesi ve dünya nüfusunun hızla artması nedeniyle gıdaya, özellikle de meyve ve sebze ve ürünlerine olan talep artmaktadır. Talebi karşılamak için meyve, sebze ve ürünlerinin üretiminin artması ise, ortaya çıkan atık miktarının da artmasıyla sonuçlanmaktadır. Meyve ve sebzelerin hasat sonrası işlenmesi ve depolanması sürecinde (hatta hasattan tüketiciye ulaşıncaya kadar geçen tüm aşamalarda) önemli miktarda işleme yan ürünü veya atığı ortaya çıkmaktadır (Coman ve ark., 2020, Sharma ve ark., 2021). Birleşmiş Milletler Gıda ve Tarım Örgütü (FAO), dünyada üretilen gıdanın en az üçte birinin yani yaklaşık 1.3 milyar metrik ton gıdanın her yıl kaybolduğunu veya israf edildiğini (FAO, 2019) ve meyve ve sebzelerdeki kayıp ve israfın tüm gıda türleri arasında en yüksek olduğunu tahmin etmektedir (Gustavsson ve ark., 2011). Meyve ve sebze atıkları fenolik bileşikler, flavonoidler, karotenoidler, antosiyaninler gibi birçok biyoaktif bileşik açısından zengindir. Bu atıkların değerlendirilmesi, çevre kirliliğinin önlenmesi açısından önemli olduğu kadar, aynı zamanda artan nüfusun ihtiyaçlarının karşılanmasını kolaylaştıracak ve tüketim kaynaklarının daha verimli ve sürdürülebilir kullanımını sağlayacaktır (Pagotto, M. ve Halog, A., 2016; Andrade ve ark., 2019).



Üzümlere uygulanan işlemler sonrası açığa çıkan fazla miktardaki bu posanın kullanılmaması, atılması, üretim yerlerinde birikmesi, uzun süre beklemesi çevre kirliliğine neden olmaktadır (Sarıçiçek ve Kılıç, 2002; Bekar, 2016). Üzüm atıkları (posası) zengin kimyasal bileşimi göz önüne alındığında ucuz ve fonksiyonel bir besin kaynağıdır. Zengin biyoaktif bileşime sahip olması nedeniyle üzüm atıklarından katma değeri yüksek ürünlerin geliştirilmesi, mevcut gıda üretiminde tahıl, et, meyve ve sebze ve süt ürünlerinin üretiminde çeşitli amaçlarla değerlendirilmesi hem mevcut kaynaklarımızın etkin kullanımını hem de çevre açısından önem taşımaktadır. Bu konu birçok araştırmacının da dikkatini çekmektedir. Son dönemde atıkların değerlendirilmesi ile ilgili birçok çalışma yapılmaktadır.

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BÖLÜM 10

Yeni Nesil Probiyotikler: Taksonomileri, Güvenlikleri, Uygulamaları ve Potansiyel Sağlık Faydaları

Talha Demirci

1. PROBIYOTİK TANIMI VE TARİHÇESİ

Son zamanlarda moleküler biyoloji ve informatik alanında gerçekleşen yeni buluşlar ve devrim niteliğindeki gelişmeler araştırmacıları insan bağırsak mikrobiyomunun kompozisyonunu ve fonksiyonunu karakterize etme konusunda teşvik etmektedir, fakat aslında insan bağırsağı ve mikroorganizmalar arasındaki bağlantılar ve bu bağlantıların sağlık üzerine etkileri konusundaki çalışmalar yaklaşık yüz yıllık bir geçmişe sahiptir. 1889 yılında Tissier bir bebeğin bağırsağından ilk kez bifidobakteri izole etse de sağlık faydası için bağırsak mikrobiyotasının değiştirilmesi gerektiği konsepti ilk kez Elie Metchnikoff tarafından ortaya koyulmuştur (1907). Metchnikoff uzun ömürlü Bulgar köylülerinin beslenme alışkanlıklarını gözlemlemiş ve düzenli şekilde laktik asit bakterilerince zengin fermente yoğurt tükettiklerini ve bu sayede uzun yıllar yaşadıklarını belirtmiştir. 1930 yılında da Minoru Shirota *Lac ticaseibacillus casei* subsp. Shirota içeren ve ilk ticari probiyotik ürün olarak kayda geçen probiyotik Yakult ieeğini satışı sunmuş ve ardından hem üreticilerin hem araştırmacıların ve de tüketicilerin probiyotik ürünlere olan ilgisi hiç azalmadan devam etmiştir (O'Toole ve ark., 2017; Singh ve Natraj, 2021).



Aynı zamanda izolasyon ve karakterizasyon kısımlarında, sonrasında biyüretim ve depolama aşamalarında oksijene hassasiyet engelleri aşılrsa da bu bakteriler için en büyük soru işaretlerinden birisi gastrointestinal sistemden geçerken canlılığını sürdürebilmeleri, düşük pH, sindirim enzimleri ve safra tuzları gibi hücre yapılarını bozabilecek fizikokimyasal ve biyolojik çevre koşulları karşısındaki davranışlarıdır. Bu tür engelleri aşabilmek de yine formülasyonlara ve gıda matrislerine çeşitli koruyucu maddelerin ilavesi, hücre immobilizasyonu ve subletal stres uygulamaları gibi protokoller ile mümkün olabilmektedir.

6. SONUÇ

Birçok metabolik, inflamatuvar ve nörolojik hastalıkla ilişkilendirilen bağırsak mikrobiyotası disbiyosisinin sağlıklı hâle gelmesi için aslında en iyi yollardan bir tanesi beslenme düzenini değiştirmektir. Yüksek yağlı, yüksek karbonhidratlı gıdalardan, aşırı şekerden ve yapay tatlandırıcılardan uzak durarak lif, sebze ve fermente gıda ağırlıklı bir beslenme düzeni oluşturmak bağırsaktaki faydalı bakterileri arttıracaktır. Fakat bu tavsiyelere toplumda uyabilen birey sayısı oldukça azdır. Bu durumda yeni nesil probiyotik bakteriler bağırsak mikrobiyotasının mikrobiyal çeşitliliğini düzenlemek ve restore etmek hususunda önemli bir alternatiftir. İlerleyen dönemde güvenlik endişeleri ortadan kaldırılan ve özellikle insan denemeleriyle faydası net bir şekilde ortaya konan çok sayıda yeni nesil probiyotik adayının tedavi süreçlerine ve ilaç kapsamına girebileceği tahmin edilmektedir.

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BÖLÜM 11

Et ve Et Ürünlerinin Fonksiyonelleştirilmesi Üzerine Güncel Çalışmalar

N. Meziyet Dilek

1. GİRİŞ

Günümüzde beslenme alışkanlıklarının değişmesi ve buna bağlı olarak toplumda kanser, kalp hastalıkları gibi kronik hastalıkların görülme sıklığının artması tüketicileri ve dolayısıyla gıda üreticilerini sağlıklı ürünlere yönlendirmektedir. Özellikle et ve et ürünleri tüketiminin kanser ve kalp-damar hastalıkları başta olmak üzere birçok hastalıkla ilişkilendirilmesi tüketicilerin et ürünlerine karşı olumsuz tutum geliştirmesine neden olmaktadır. Son yıllarda “fonksiyonel gıdalar” kavramı tüketiciler ve gıda üreticileri için oldukça ilgi çekici hâle gelmiştir. Fonksiyonel gıdalar, hastalık riskini düşüren ve/veya sağlığa faydalı gıda maddeleri olarak tanımlanmaktadır. Tüketiciler bilgi ve bilinç düzeylerinin artmasına bağlı olarak vücuda alınan gıda maddelerinin beslenme işlevinin yanı sıra sağlık üzerinde olumlu etkilere sahip olmasını da talep etmektedir. Bu durum gıda üreticilerini ve araştırmacılarını gıdaların fonksiyonel özelliklerinin artırılması için çalışmalar yapmaya yönlendirmiştir. Bu bölümde, et ve et ürünlerinin daha sağlıklı ve fonksiyonel hâle getirilmesi için yapılan uygulamalar ele alınmaya çalışılmıştır.

2. FONKSİYONEL GIDA TANIMI

Son yıllarda yapılan çalışmalar beslenme ile sağlıklı yaşam arasında önemli bir ilişkinin olduğunu ortaya koymuş, bu durum da tüketicilerin sağlıklı ürün taleplerinin artmasına yol açmıştır. Fonksiyonel gıdalar, temel

formülasyonlarına dâhil edildiği çalışmalar yapılmaktadır. Et ürünlerinin daha sağlıklı ve fonksiyonel hâle getirilmesinde kullanılacak fonksiyonel gıdanın kolay temin edilebilir, ucuz, ürünün teknolojik ve duyuşal özelliklerini olumsuz etkilemeyecek özellikte olması başlıca dikkat edilecek hususlardır. Bir diğer dikkat edilecek nokta ise; bu yeni nesil et ürünlerinin pazarlanması ve tüketimlerinin uzun vadeli etkilerinin değerlendirilmesi ve nihai olarak bu ürünleri yemenin faydaları konusunda müşterileri ikna etmektir. Tüm bu gereklilikler göz önüne alındığında bu alanda daha fazla araştırmaya ihtiyaç olduğu görülmektedir.

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Contents

About The Authors..... iii

CHAPTER 1

From Society 1.0 to Society 5.0.....1

Assoc. Prof. Dr. Sinan Yılmaz

CHAPTER 2

**Being Able to Learn and Manage the Learning
Organization in the Age of Technology and Information.....43**

Prof. Dr. Fatma Zehra Tan - Asst. Prof. Alper Tunga Şen

CHAPTER 3

**Innovative Thinking: Digital Transformation
at the Age of Industry 4.085**

Prof. Dr. Fatma Zehra Tan - Dr. Adem Özdemir

CHAPTER 4

Psychological Safety: A Game-Changer for Innovation.....121

Assoc. Prof. Dr. Ozan Büyükyılmaz - Doctorant Buket Arslan

CHAPTER 5

Linking Innovation and Strategy Beyond the Economic Theory Perspective.....173

Assoc. Prof. Dr. Bahar Aşcı

CHAPTER 6

Impact of Human Resource Practices on Innovation203

Dr. Ahmet Ferda Çakmak

CHAPTER 7

Innovation and Marketing.....243

Dr. Hülya Akdemir Cengiz

CHAPTER 8

Innovation and Tourism Management.....279

Dr. Ayşegül Acar

CHAPTER 9

Example of Innovative Entrepreneurship Start-Up.....311

Prof. Dr. Fatma Zehra Tan - Ali Soltani Shirazi

Short Biographies of the Authors343

CHAPTER 1

E-BOOK QR CODE

Humans have relied on their capacity to create, invent, and innovate for survival throughout their existence. From humble beginnings as primitive hunter gatherers to space explorers in the information age they have developed technologies that have helped them adapt to their environment and thrive. There have been epochs of transformational technological innovation that have reshaped human society.

5 W 1 H

- **What:** Innovation and new technology based transformation of society.
- **Who:** Humans.
- **Why:** To survive, adapt to changing conditions, solving new challenges.
- **When:** Ongoing since at least the last 50,000 years.
- **Where:** Until recently limited to earth, since the 1950s, including space.
- **How:** Through endless ingenuity whereby new learning and knowledge provides different understandings of the challenges faced. Through constant innovation and creativity better solutions to already solved problems are found, in addition to making great efforts to solve novel challenges.

KEYWORDS

Societal progress
Neolithic Revolution
The Industrial Revolution
Industry 4.0
Society 5.0

LINKS ABOUT CHAPTER

Human Population through Time
Origins
Transition from Society 1.0 to 2.0
Neolithic Revolution
The Industrial Revolution
The Second Industrial Revolution
The Third Industrial Revolution
The Fourth Industrial Revolution

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Being Able to Learn and Manage the Learning Organization in the Age of Technology and Information

Fatma Zehra Tan
Alper Tunga Şen

CHAPTER 2

E-BOOK QR CODE

One of the most important competitive factors for businesses in this period in which we live in the information age emerges as an information and learning phenomenon. Knowledge of the business consists of learning. Learning, organizational learning, and learning organizations concepts are essential for businesses in this context. In our study, we aimed to define the outline of a literature review related to these terms.

5 W 1 H

- The process of improving the learning abilities and experiences of organizations.
- Provides significant contributions to the organization by activating ordinary intelligence, increasing innovation ability by uniting the workforce, and creating an accessible environment.
- We are living in the age of knowledge and technology for building a collaboration in business we must know how to learn and how to be a learning organization.
- The ideas and origins of organizational learning can be traced back to the early 1900's. Philosophers, psychologists, business professionals and many more have influenced the concept of organizational learning as a process.
- Argris and Schon (1978) were the first ones to approach organizational learning as a matter for research as itself. Those researchers considered organizational learning a process of detecting, revealing, and fixing mistakes.
- Peter Senge, who approaches learning from a behavioural perspective, claims that behavioural changes should occur due to learning.

KEYWORDS

Societal progress
Neolithic Revolution
The Industrial Revolution
Industry 4.0
Society 5.0

LINKS ABOUT CHAPTER

https://youtu.be/Zs3ML5ZJ_QY
<https://hbr.org/1993/07/building-a-learning-organization>
<https://youtu.be/40meQNZI3KU>
<https://youtu.be/79ovhfwMXk8>

5. For an organization to be considered a learning organization, they need to take in new ideas and be willing to do what?
- Spend money on training
 - Built a database to keep them
 - Take action on them
 - Write them down
 - None of them

Answer Key

1. b - 2. c - 3. d - 4. a - 5. c

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CHAPTER 3

E-BOOK QR CODE

The digital age has changed the way businesses operate, and companies that are slow to adapt are at risk of falling behind their competitors. Digital transformation requires companies to embrace change and adopt new technologies and processes. Innovative thinking is crucial in this process because it enables companies to find new and better ways to improve their operations and remain competitive. In the age of Industry 4.0, digital transformation and innovation are crucial for companies to remain competitive and meet the demands of customers.

5 W 1 H

- **What:** Development of digital transformation around innovative thinking in the era of Industry 4.0.
- **Why:** In recent days, the concepts of innovative thinking and industry 4.0 have started to gain importance for businesses along with digitalization.
- **How:** Based on this importance, it is thought that it will be useful to include new information in the literature on this subject.
- **When:** Industry 4.0 and digital transformation have started to enter the life of humanity in a short period of time with the discovery of the element silicon.
- **Where:** The term Industry 4.0 was first used at the Hannover Fair in Germany in 2011.
- **Who:** In October 2012, Robert Bosch GmbH and Henning Kagermann formed a working group and submitted the 4th Industrial Revolution proposal file to the German Federal Government

KEYWORDS

Innovation
Innovative Thinking
Digitalization
Digital Transformation
Industry 4.0

LINKS ABOUT CHAPTER

<https://www.youtube.com/watch?v=ystdF6jN7hc>
<https://www.youtube.com/watch?v=APhSAIeqLkQ>
https://www.youtube.com/watch?v=EqRIYpaUP_g
https://www.youtube.com/watch?v=GjdGqf_3oSs
<https://enterprisersproject.com/wh-at-is-digital-transformation>
<https://www.youtube.com/watch?v=jU9br5C-wqI>

4. Where did Industry 4.0 first start?

- a) USA
- b) England
- c) Japan
- d) Germany
- e) China

5. What can be defined as digitalizing all processes, starting from the procurement process with the new technology and including all business functions, and as a result, designing and producing products to meet customer demands with customer integration, collecting data from all processes and processing this data, and responding to customer needs in a way to gain competitive advantage?

- a) Innovation
- b) Digital transformation
- c) Innovation Thinking
- d) Industry 4.0
- e) Tecnology

Answer Key

1. c - 2. a - 3. e - 4. d - 5. b

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CHAPTER 4

E-BOOK QR CODE

Fierce competition due to customer expectations, technology, and globalization has compelled businesses to innovate to survive and succeed. Innovation is crucial for firms' competitiveness, longevity, and performance. Psychological safety, where employees can express themselves without fear, is key to creating an innovative culture.

5 W 1 H

- **What:** Psychological safety is feeling safe to take interpersonal risks within a group, enabling team members to share ideas, make suggestions and speak up without fear of negative consequences.
- **Who:** Psychological safety affects everyone within a team or organization, especially those involved in innovation processes such as R&D, product development, or creative teams.
- **Why:** Psychological safety is crucial for innovation as it encourages team members to take risks and share perspectives, leading to more creative and innovative solutions.
- **When:** Establish psychological safety at the outset of a project or team formation to ensure team members feel comfortable contributing and taking risks throughout the innovation process.
- **Where:** Psychological safety is relevant in any team or organizational context where innovation is important, including R&D, product development, or other teams creating new products, services, or processes.
- **How:** Encourage open communication, active listening, and constructive feedback. Model vulnerability and risk-taking. Promote diverse perspectives and experimentation.

KEYWORDS

Psychological safety
Innovation
Trust
Productive conflict
Team performance
Leadership
Accountability

LINKS ABOUT CHAPTER

<https://youtu.be/LhoLuui9gX8>

<https://youtu.be/eP6guvRt0U0>

<https://youtu.be/73FfNvGePMg>

https://youtu.be/_1Ub1xfSQ1s

<https://youtu.be/lmyZMtPVodo>

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CHAPTER 5

E-BOOK QR CODE

The common definition of innovation is the effective commercial exploitation of novel concepts. The emphasis placed on innovation's role in strategy is largely a product of the social and economic climate that is currently in place. Business organizations have increasingly had to react to change more quickly if they wish to succeed in the marketplace in what Drucker termed the “knowledge economy”. The successful implementation of new ideas is so crucial that a company must first find a consumer before it can adjust to deliver the goods and services required to continue turning a profit. From this point of view this chapter's aim is to put forth the link between the innovation and strategy for new business eras.

5 W 1 H

- **What:** The relationship between strategy and innovation in the framework of economic theories.
- **Why:** The roots of innovation lies in 1850's world. So, to understand the need of change for economies we need to know the theoretical roots.
- **How:** Business issues are all related to economic theories, then literature review is the key method.
- **When:** Innovation mentions in the other words the need of change started after Industrial Revolution.
- **Where:** Specially in England and spread through European economies and then to all over the world.
- **Who:** Firstly, Schumpeter talked about innovation, then Peter Drucker gave importance to the matter and linked it with strategy for competitive advantage.

KEYWORDS

Strategy
Competitive advantage
Knowledge economy
New ideas
Drucker and Schumpeter

LINKS ABOUT CHAPTER

<https://www.fastcompany.com/most-innovative-companies/list>

<https://www.bcg.com/publications/most-innovative-companies-historical-rankings>

<https://www.moonshots.io/episode-40-peter-drucker-all-of-it>

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CHAPTER 6

E-BOOK QR CODE

Thriving in today's business environment needs constant innovation, and the relationship between human capital and innovation lies at the heart of an organization's ability to compete and succeed. Human resource management (HRM) and related HR practices can help organizations manage their dependence on these resources by attracting, retaining, and developing employees with the necessary knowledge and skills.

5 W 1 H

- **What:** Human resource practices in innovation refer to the policies and procedures that organizations implement to attract, develop, and retain talent with the skills, knowledge, and abilities required to drive innovation within the organization.
- **Who:** HR practices help organizations build and maintain relationships with key external stakeholders, such as industry experts, academics, and professional networks, to ensure they have access to the latest information and knowledge.
- **Why:** Human resource practices help to attract and retain talent, foster a culture of creativity, and provide resources and support for employees to develop new ideas and technologies.
- **When:** The process of fostering innovation through HR practices can happen at any stage of an organization's lifespan, from start-up to maturity. It is an ongoing process that requires continuous attention and adaptation to changing organizational needs, market conditions, and technological developments.
- **Where:** HR practices should be integrated into the organization's overall strategy and be aligned with its goals and objectives to ensure that innovation is prioritized and effectively supported throughout the company's lifecycle.
- **How:** Resource dependency theory suggests that organizations can reduce their dependence on external resources by building their internal capabilities. HR practices, such as training and development, performance management, and knowledge management, can help organizations develop and leverage their internal resources to achieve their innovation goals.

KEYWORDS

Innovation
Recruitment and hiring
Training and development
Performance management
Culture and leadership Industry
4.0

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CHAPTER 7

E-BOOK QR CODE

With the disappearance of borders in the globalizing world, customer expectations and the speed of change have increased significantly. Therefore, companies invest in continuous innovation activities to maintain their market share and profitability. Innovation is fundamental to the survival of most companies today. Marketing and innovation, as two dynamic concepts, have complementary features. Both activities are result-oriented and aim to provide profitability to companies. While the concept of innovation is evaluated in terms of marketing, each marketing mix element, including product, price, distribution, and promotion, should be evaluate separately. One of the main goals of companies is to accurately identify and meet changing consumer expectations. Accordingly, the main purpose of this chapter is to explain the relationship between marketing and innovation and related concepts.

5 W 1 H

- **What:** Marketing innovation is the implementation of a new marketing method that includes elements of the marketing mix known as the 4Ps (product, price, place, promotion) or a combination of these.
- **Who:** In 1954, Peter Drucker stated that business, whose primary objective is to create a customers, have two essential functions: marketing and innovation.
- **Why:** Besides supporting new products and ideas, marketing activities can also be considered an innovation element. Hence, marketing and innovation are two interrelated concepts. Consequently, it is crucial to examine the relationship between these two concepts.
- **When:** Marketing activities should occur throughout all processes, from the emergence of innovation to developing new products and services to introducing these innovations into the market.
- **How:** The changing market structure, increasing environmental concerns, and technological advancements have influenced and transformed customer expectations. Businesses attempting to meet these expectations have had to emphasize marketing and innovation activities more

KEYWORDS

Marketing innovation,
4P's of innovation
Innovation strategies
Digital marketing and
innovation

LINKS ABOUT CHAPTER

<https://www.youtube.com/watch?v=Mtjatz9r-Vc>

<https://www.youtube.com/watch?v=XnJyI2z9smU>

<https://www.youtube.com/watch?v=IHIQjbG7ttg&t=336s>

<https://www.youtube.com/watch?v=bEusrD8g-dM>

4. Which of the following is not one of the 4Ps of innovation?
- a) Product
 - b) Process
 - c) Position
 - d) Paradigm
 - e) Place
5. Which of the following cannot be one of the reasons for implementing innovation strategies?
- a) Maintain or increase market share.
 - b) Increase production costs.
 - c) Improve production quality.
 - d) Improve working conditions.
 - e) Improve existing technology.

Answer Key

1. d - 2. d - 3. a - 4. e - 5. b

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CHAPTER 8

E-BOOK QR CODE

Innovation in tourism refers to the introduction of new ideas, technologies, and processes that improve the customer experience, streamline operations, and enhance the competitiveness of the business in the management of tourism businesses and destinations. By embracing innovation, tourism businesses and destinations can stay competitive and adapt to changing market conditions and customer preferences. The goal of this study is to show the relationship between tourism management and innovation.

5 W 1 H

- **Who:** is the innovation intended for? Innovation could include tourists, tourism businesses, or government organizations responsible for tourism management.
- **What:** is innovation? Innovation could be a new technology, service, or product that is designed to enhance the tourism experience.
- The origins of the innovation concept can be traced back to the early work of Schumpeter (1934), who defined innovation as the process of creating new products, processes, and business models that disrupt existing markets and create new ones. In the tourism context, innovation has been studied extensively since the 1990s, particularly in destination development, tourism product design, and tourism marketing.
- **Why:** is innovation important? This could be to attract more tourists, improve the tourism experience, or increase revenue for tourism businesses. Embracing innovation, tourism businesses and destinations can stay competitive and adapt to changing market conditions and customer preferences.
- **Where:** will the innovation be available? This could be a specific location, such as a tourist attraction or destination, or a wider area, such as a country or region.
- **How:** will the innovation be implemented? This could involve partnerships between businesses, funding from government organizations, or a marketing campaign to promote innovation.

KEYWORDS

Innovation
Innovative in tourism
Tourism management
Innovation strategies in tourism industry

LINKS ABOUT CHAPTER

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<https://www.travelpulse.com/gallery/technology/10-technology-innovations-changing-the-travel-industry.html>

<https://www.forbes.com/sites/forbestechcouncil/2021/07/22/how-technology-is-revolutionizing-the-travel-industry/?sh=5f2c110e764e>

<https://www.tourism-review.com/top-10-innovations-in-tourism-management-news11106>

4. Why is it important for tourism businesses and destinations to embrace innovation?

- a) To maintain traditional practices that have worked in the past
- b) To reduce costs by cutting corners on customer service
- c) To stay competitive in a rapidly changing market
- d) To limit access to certain tourist attractions
- e) None of the above

5. How can government organizations responsible for tourism management promote innovation in the industry?

- a) By imposing strict regulations on tourism businesses
- b) By providing funding for research and development of new ideas and technologies
- c) By limiting access to certain tourist attractions
- d) By promoting traditional practices that have worked in the past
- e) None of the above

Answer Key

1. a - 2. d - 3. a - 4. c - 5. b

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CHAPTER 9

E-BOOK QR CODE

In the business world, innovation and entrepreneurship are related terms. Entrepreneurship involves three actions of planning, beginning and maintaining another business. In an economy, entrepreneurship is the taking of risks by innovators known as entrepreneurs. Innovation is the process of translating ideas into products that add value. It fulfills the requirements and meets the preferences of customers.

5 W 1 H

- **What:** The relationship between innovation, entrepreneurship and start up
- **Why:** The majority of start-ups fail within the first five years
- **How:** entrepreneurship and innovation can survive the business.
- **When:** The companies that survive after the first five years, continue to expand at a faster rate and contribute significantly to employment and productivity growth
- **Where:** Innovation is when someone discovers something but is unable to transform it into a commercial idea. That's where an entrepreneur becomes meaningful.
- **Who:** Drucker focuses on innovation as a specific tool for entrepreneurship.

KEYWORDS

Innovation and entrepreneurship
The importance of innovation in entrepreneurship
The stages of innovation in entrepreneurship
Start up
Start-up and entrepreneurship
Start-up and innovative entrepreneurship policies

LINKS ABOUT CHAPTER

<https://m.youtube.com/watch?v=vt s7vU0rOv Q&t=2947s>

<https://m.youtube.com/watch?v=rq i-n0hA4uo>

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OTONOM GANGLİONLAR

Beynin Derin İstihbarat Ağları

Prof. Dr. Mehmet Dumlu Aydın



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Prof. Dr. Mehmet Dumlu Aydın

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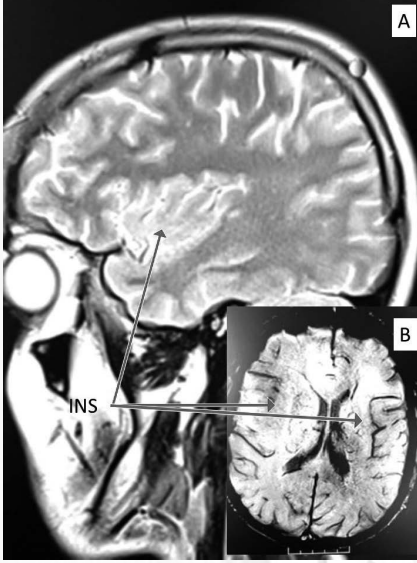
Eser ve Muhtevası Hakkında	ix
Ön Düşünüş.....	xiii
Beynin Derin Devleti Üzerine Nöroteleolojik Düşünceler.....	xiv
Merkezi Otonomik Kontrol.....	1
İnsular Korteks.....	1
Ön Singulat Korteks.....	2
Amigdala.....	2
Hipotalamus	3
Periaquaduktal Gri Madde	3
Parabrakial ve Kolliküler Çekirdekler	5
Nukleus Traktus Solitarius.....	5
Ventrolateral Medulla.....	6
Sempatik Sinir Sistemi.....	9
Parasempatik Sinir Sistemi	10
Enterik Sinir Sistemi.....	12
Gladyonun Özeti	13
Parasempatik Ganglionlar.....	15
Siliyer Ganglion.....	16
Karotid Ganglionu/Karotid Cismi.....	19
Petroz Ganglion	23
Vagal Sinirler	24
Nodoz Ganglion.....	26
Hilar Parasempatik Ganglionlar	27
Ptergopalatin Ganglion	28
Submandibular ve Sublingual Ganglionlar.....	29
Otik Ganglion.....	29
Fasiyal Sinir-Genikulat Ganglion	30

Trigeminal Ganglion	31
Trigeminal Sinir ve Skalp	34
Trigeminal Sinir ve Susuzluk Hissi	35
Sempatik Ganglionlar	36
Sempatik ve Parasempatik Sistemin Kombine Fonksiyonları	39
Sempatik Zincir ve Çölyak Ganglion	40
Pelvik Ganglionlar	41
Onuf Nükleusu	46
Beyin Omurilik Sıvısı	47
Asidozis-Alkalozis	51
Derin Beyni Etkileyen İlaçlar	51
Akciğerler	52
Sinirler.....	54
Enterik Sinir Sistemi-Barsaklardaki Sinir Sistemi.....	54
Epikardiyak/Intrakardiyak Ganglionlar	55
Otonom Ganglionlar ve Kalp İlişkileri	60
Kaynaklar	62
Gladyonun Düş ve Rüyalarının Nöro-Diyalektiği	70
Spinal Kord-Omurilik	71
Onuf Nükleusu ve Sakral Parasempatik Network	72
Perspektiflerimiz	77
Kaynaklar	78
Dorsal Kök Ganglionları.....	82
Pudental Sinir Hasarının Cinsel Organlarda Kendi Keşfettiğimiz Tat Tomurcuklarını Harap Ederek Cinsel Hazzı Hisseden Devreleri Yıkıma Uğratişının Mekanizmaları	88
Spinal Kord Hasarının Yol Açtığı Cinsel Bozukluklar	91
Onuf Nükleusu Hasarının Neden Olduğu Spermatogenez Bozuklukları	92
Son Sözler ve Gelecek Perspektifleri	93
Kaynaklar	94

İçindekiler

Pudental Sinir Hasarının Rat Memesindeki Tat Tomurcuklarını Tahrip Ederek Annelik Fonsiyonlarını Zayıflatması Hakkındaki Sonuçlarımız.....	100
Kaynaklar.....	103
Otonom Ganglionlar ve Psikiyatri	106
Yanık (İncinmiş) Kalp Sendromu	107
Pudental Sinir İskemisinin Orgazmik Duyular Üstünde Olumsuz Etkileri	108
Spinal Kord İskemisinin Neden Olduğu Cinsel Bozukluklar	111
Adamkiewicz Arterinin Önemi:	112
Son Sözler ve Gelecek Perspektifleri.....	113
Kaynaklar.....	113
Otonom Ganglionların Nöro-Pato-Psikiyatrik Yönü	118
Kraniyal Ganglionlar ve Psikiyatrik Hastalıklar	122
Trigeminal Ganglion ve Psikiyatrik Hastalıklar	123
Trigeminal Sinirin Foto/Fonofobideki Rolü	125
Nodoz Ganglion ve Psikiyatrik Hastalıklar	126
Karotid Ganglionun/Cismin Panik Ataktaki Rolü	126
Alzheimer Hastalığı ve Otonom Ganglionlar	128
Somatizasyon Bozuklukları ve Vagal Sinirler	129
Kaynaklar	130
Beyinde Hafızayı Silen Karadeliklerin Oluşumu: Alzheimer-Parkinson Hastalığının Kökenine Metaforik Bir Yaklaşım.....	136
Dada Black Hollerinin Oluşum Psikofiziği	136
Dada Black Hollerinin Nörofiziği.....	136
Covid 19 ve Otonom Ganglionlar.....	143
Kaynaklar.....	144
Kitabın Özeti.....	144
Gladyonun Şarkısı.....	145
Yazar Hakkında.....	147

Merkezî Otonomik Kontrol



Resim-1: Beyinde gladyonun yönetim-denetim ve arşiv görevini gören insula (INS) izlenmektedir.

gastrointestinal fonksiyonlar ve miksiyonun refleks kontrolü ile ilgilidir. Pontomezensefalik ağlar ağrı modülasyonunu ve strese karşı davranışsal refleksleri koordine eder. Ön beyin düzeyindeki merkezler, hipotalamus, singulat korteks, amigdala ve insula ise iç ve dış homeostazisi modüle ederek iç ve dış ortama uyumu sağlar. Sıfır ve sonsuzluk arasındaki köprüdür.

İnsular Korteks

İnsular korteks, öncelikle lateral hipotalamusun hem sempatik hem de parasempatik bilgilerini kontrol eden visseromotor alandır (Loewy, 1982; Westerhaus, 2001). Insula esas olarak interoseptif bir kortektir. Üreme, yaşama ve beslenme için gerekli olan visseral fonksiyonları idare eder (Craig, 2003; Saper, 2002). İnsular korteks, otonom organların karakutusudur.

Kardiyak ganglionlar gladyo, ferratio, sibernatio ve mentationun duygusal yazılımının yüklendiđi çipler olabilir. Kim demiş gladyatörler aşktan anlamaz diye... Çünkü aşk denkleminin kökleri karmaşıktır. Ve bu karmaşık kökler gönüle dolaşıktır. Çözemez gül düğümü...

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Gladyonun Düş ve Rüyalarının Nöro-Diyalektiği

Düş, bilinç evrenimizin temsilcisi olan beyin kabuğundaki hayal tohumlarının loblar arası izdüşümünün uyanık bilince yansımasıdır. Rüya ise bilinç okyanuslarında daha derinlere düşmüş olan solgun bilinçsiz düşlerimizin otonom ganglionlardaki kayıtlarının beyin kabuğu tarafından bilinç diline tercüme edilmesidir. Düş sibernatio, rüya gladyonun bir güncellenme fonksiyonu olabilir. Beyin kabuğunun yazılım potansiyeli kadar düş; otonom ganglionların yazılım hacmi kadar da rüya potansiyelimiz vardır.

Mehmet Dumlu Aydın

Zihin bilimi gelişen teknolojilerle yeniden anlamlandırılmaya başlanmıştır. Fonksiyonel manyetik görüntüleme teknikleri ile beyindeki imajların resimleri çizilebilmektedir. EEG dalgalarını mors alfabesi felsefesiyle okumanın geleceği yola çıktı geliyor. Jung, Freud gibi bilim adamları insan davranışının bilinç dışı boyutuna bağlı olarak yoğun düşündüler ama kullandıkları yöntemlerin doğuş ve etki mekanizmalarını keşfedemediler. Beyin hasarlı insanların incelenmesi ve mikroelektrot kayıtları ile çok ilginç keşiflerin önünü açtılar. Karmaşık ve muazzam güncel teknolojiler beynin bilinçli yazılımı olan bilinçaltında iş gören kısımlarını anlamamız hususunda devrim yarattılar. Bu kısımdan Subliminal Dünya diye bahsettiler. Başımıza gelen bütün bu bilinçaltı/dışı olayların ölçülemez boyutları bize gündelik hayatımızda pek az rol oynuyor gibi gelebilir. Ama aslında bunlar bilinçli olduğunu sandığımız düşünce ve eylemlerimizin görünmez kökleridir diyor C. Jung. Bizim bu eserde ortaya koymaya çalıştığımız beynin galdyosu, zihin/akıl adlı yazılımımızın altında yatan değil dimdik duran şaşırtıcı ve tuhaf güçlerin veya bu bilinç ötesi içgüdülerin genellikle iradi ve rasyonel kabul edilen davranışlarımız üzerindeki etkileri şimdiye kadar tahmin olunandan daha derin ve karmaşıktır. Eğer kendimizi, toplumu ve dünyayı anlamak istiyorsak ve bizi engelleyen etkenleri anlayıp üstesinden gelmek istiyorsak, her birimiz kendi içimizde gizli olan

dorsal kök ganglionları yoluyla omuriliğe girdiği bildirilmiştir (Richardson J Br J Anaesth, 2009).

Omurilik, gladyonun zamansız çalıştığı derin ve karanlık bir tüneldir.

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Dorsal Kk Ganglionları

Dorsal kk ganglionları uyardıkları dokuların yazılımsal ve donanımsal beyinleridir.

Mehmet Dumlu Aydın

Duyusal nronların hcre gvdeleri, zel duyuların entegrasyonu iin beyin ve omuriliđin dıřında ganglionlarda veya organlarda bulunur. Ganglionlar, omurilik veya belirli kraniyal sinir kkleri boyunca yer alır ve duysal nronların ve dendritlerin hcre gvdeleri deride, kaslarda, tendonlarda, eklemlerde ve i organlarda bulunur. Bu dendritler, dokunma, titreřim, esneme, sıcaklık ve ađrıyı hissetmek gibi bir rol oynar. Spinal sinirlerle iliřkili ganglionlara dorsal kk ganglionları denir. Dorsal kk ganglionundaki her bir duyu nronunun hcre gvdesi, dıř ortamdan dendritlerden dorsal kk ganglionundaki hcre gvdesine uzanan ve daha sonra omuriliđe devam eden uzun bir aksona sahiptir. Aksonun gangliondan omuriliđe uzanan blm benzer aksonlarla demet hlindedir. Bu demetlere dorsal kk denir. Spinal ganglion hcreleri bařlangıta bipolar hcrelerdir. Bununla birlikte, bazı nronlar ge-liřim sırasında T-řekilli bir řekilde atallanan tek bir gvde oluřturmak zere birleřerek psdounipolar sinir hcrelerini oluřtururlar.

Arka omurilik kk, duyu nronlarının hcre gvdeleri ve spinal gangliondan oluřan bir icik ierir. Bu nronların biri perifere ve diđeri omuriliđe giden iki dalı vardır. Dorsal kk ganglionları, hcre kmeleri veya sinir lifleri demetleri arasında hcre sıraları olarak bulunur. Bu nedenle, spinal ganglionlar, omuriliđin evreye g eden gri maddesi olarak kabul edilebilir. Nral krestin diđer trevleri, otonom gangliyon, paraganglia ve adrenal medulla hcreleridir. Spinal ganglionun kapslnde spinal sinirin perinryumu vardır, bunun bađ dokusu ieriye dođru uzanır ve her nronun etrafında bir kılıf oluřturur. En iteki kılıf ektodermal uydu hcreler tarafından oluřturulur ve periferik sinirin Schwann hcrelerinin etrafındakine benzer bir bazal zar ile

nusu ağ dejenerasyonunun hem cinsel işlev bozukluklarına hem de anorgazmiye ve hatta literatürde bahsedilmeyen infertiliteye neden olabileceğini dünyaya duyurmuş bulunmaktayız.

Bronislaw Onuf-Onufrowicz (1863-1928). Rusya doğumlu Polonya asıllı Amerikalı nörolog, Zürih Üniversitesinde tıp okudu. Forel'in öğrencisiydi. 1890 dolaylarında ABD'ye göç etti. Patoloji Enstitüsünde Ira van Gieson'un yöneticiliğinde çalıştı. Omurilikte kendi adıyla anılan Onuf çekirdeğini keşfetmesiyle tanınır. Onuf'u bu konularda ilk kez zikretmekten bahtiyarız.

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İrade Üzerine Bir Aforizma

Düşündüğünü uygulamakta özgürsün ama düşündüğünü düşünmekte özgür müsün?

(ANONİM).

Oysa irade beyin kabuğu ile gladyonun anlaşmasından doğan ortak bir yazılım ve eylem sergilemesi hâlidir. Gladyo ne düşünüleceğini beyin kabuğuna bildirir. Beyin kabuğu da ne yapılacağını gladyoya bildirir.

Mehmet Dumlu Aydın

İrade bir sistemin kinetik ya da statik konunumu kendi bilinci yönetiminde sürdürbilmesi kudretidir. İnsan için taraf ederse herhangi bir eylemine karar vermesi, başlaması, devam ettirmesi ve sonlandırması işleminde beyin kabuğu ile gladyonun tüm iç ve dış şartları değerlendirerek onunla uyumlu ya da zıt biçimde bir eylem sergilemesi kudretidir. Su içme ihtiyacını hissetmeden ve dilde bulunan susuzluğu hissetme hücreleri bunu beyne bildirir. Bu su içme eyleminin düşünülmesi hususundaki sinyali beyin kabuğu eyleme döker, su arama işini başlatır. Ve bu hücreler doyunca gladyo su içme işlemini sonlandırır. Trigeminal, fasiyal, glossofaringeal ve vagal sinirler bu eylemde müşterek çalışır.

Vicdan Üzerine Aforizmalar

Gladyo ile beyin kabuğu arasındaki bilgi akışını sağlayan önemli sinirlerden biri olan ve en zengin ağ ihtiva eden vagal sinir beyindeki yıldırımları gladyonun yönettiği iç organlara taşıyan bir paratoner, bu organlarda patlayan yanardağların külünü de beyne taşıyan bir volkan bacasıdır. Vicdan iradenin işlediği eylemden dolayı beyin kabuğu ile gladyonun birlikte denge hâlinde oluşudur. Gladyo beyinden aldığı sinyalleri tüm iç organlara iletir ve onların cevabını da beyne gönderir. Bu işlemde vagal sinir adlı bir sinir ağı vardır. Bu sinir gladyonun eyaletleri olan kalbin, akciğerlerin, böbreklerin,

bildirilmiştir (Aydın MD, Int. J. Devl Neuroscience, 2006). Adamkiewicz arter vazospazmı ile ilişkili Onuf'un nükleus dejenerasyonu (Çağlar O, Revista In de Andrologia, 2022) hayvanlarda emzirme anorgazmisinin olası nedeni olabilir. Çünkü bu yol hayvanlarda meme ve genital organları birlikte innerve eder. Vertebral yaralanmalar, intervertebral disk herniasyonu veya intervertebral foramen stenozu sonrası dorsal kök ganglionunun sıkışması da bu anorgazmiye yol açabilir (Sapunar D, J Pain Res,2012; Aydın MD, Int J Neurosci 2018). Adamkiewicz arteri cinsel fonksiyonların düzenlenmesinde çok büyük klinik öneme sahiptir. Spinal subaraknoid kanama Adamkiewicz arteri vazospazmının indüklediği iskemiye bağlı olarak Onuf'un çekirdeğinde ve sakral parasempatik pleksusta nörodejenerasyona, üretral tat tomurcuklarında atrofiye neden olarak da (Çağlar O, Revista Int Androl, 2020) emzirmeden kaynaklanan orgazm duyusunun kaybolmasına neden olabilir.

Vagal/pudental sinirin bu meme tat tomurcuklarını innerve ettiğini ve emziren annelerin meme tat tomurcuklarından aldığı hedonik duyguyu, literatürde şimdiye kadar adı geçmeyen üst beyin merkezlerindeki tat bilgisi düzenleme ve hesaplama merkezlerine ilettiğini ve anneliğin kutsal sayılan duyusunun buradan kaynaklandığını düşünmekteyiz.

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Otonom Ganglionlar ve Psikiyatri

Otonom ganglionlar ve oluşturdıkları network, aynı zamanda beyin kabuğunun altındaki fay hatlarıdır. Akıl Depremleri'ne yol açarlar.

Mehmet Dumlu Aydın

Otonom sinir sisteminin ve ganglionlarının bilinç dışı davranışlar üzerinde önemli rolleri vardır (Hall JL, Prog Neurol Psychiatry, 1972; Richins Ca, Prog Neurol Psychiatry. 1963). Otonom sinir sistemi beyin kabuğunun altında bulunan fay hatları gibidir. Nasıl ki fay hatlarının kırılması depremlere yol açıyorsa otonom sinir sisteminin ve ganglionların yazılım çatlama da ruhsal depremlere yol açar. Tüm serebral depremlerden otonom ganglionlar arasındaki istihbarat ağının bozulması ya da hacklenmesi sorumlu olabilir (Aydın MD). Gladyo beynin irrasyonel şifrelerini kırar.

Otonom sinir sistemi, sempatik ve parasempatik sinir sistemi aracılığıyla mesajlar alır ve gönderir. Sempatik sinir sistemi, kalbin kardiyο-hızlandırıcı merkezini, artan solunum ritmini ve bronşların genişlemesini ve arteriyel kasılmayı düzenler, gaz değişimi için akciğerleri modüle eder. Nörotransmitter olarak adrenalın-noradrenalın kullanır. Sempatik sinir sisteminin aksine, parasempatik sistem kalbin kardiyomoderatör merkezini, solunum ritmini ve solunumu yavaşlatır. Nörotransmitter olarak asetilkolin kullanır. Sempatik ve parasempatik bölümler, hayati fonksiyonların dinamik bir modülasyonunu korumak için antagonist olarak işlev görür. Bu sistemler, sırasıyla stellat ganglion ve vagus siniri aracılığıyla kalbe etki eder. Bu mesajların sinoauriküler düğümüne yönelik etkileşimi, kalp hızı değişkenliğinin izlenmesiyle ölçülebilen normal kardiyak değişkenlikten sorumludur. Kalp hızı öncelikle vagal aktivite tarafından kontrol edilir. Kalpten gelen duyuşal veriler merkezî sinir sistemine geri iletilir. Kalp atış hızı değişkenliği, hem merkezî sinir sisteminin otonom sinir sistemini nasıl düzenlediğinin hem de periferik nöronların bilgiyi merkezî seviyeye nasıl ilettiğinin bir göstergesidir. Kalp atış hızı değişkenliği sempatik-parasempatik sistem alternansının bir sonucudur. Son zamanlarda

Son Sözler ve Gelecek Perspektifleri

Orgazmik sensasyon canlılarda ulaşılabilecek en yüksek hazzın zirvesidir. Genital tat tomurcuklarının uyarılmasının gladyoya ve beynin sivil bürokrasisine yaptırılmayacağı iş yoktur. Bu sistem en tehlikeli ve en faydalı gladyodur. O gladyolar gladyosudur.

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Otonom Ganglionların Nöro-Pato-Psikiyatrik Yönü

Yöneticilikte kendilerini mahir sanan hücreler; gladyonun da yardımıyla kendilerine karşı sinyal üreten hücreleri organizmadaki yazılıma göre tembel ve bilgisiz olarak kodlanan hücreler tarafından ya aşırı enerjiye sahip antihiyerarşik ya da aşırı stabil ve yeterince yazılım üretemeyen katı tutumlu bağınaz hücrelere göre çok reformik ilan ederek immun sistemin ateşlerine atılır, lenf nodlarında çürütülür ya da yazılımlarını yok etmek için denerve edilirler. Böylece beynin derin iletişim ağları donanım ve yazılım devrelerini logaritmik tarzda kaybederek hızlı bir yıkıma sürüklenir. Hem beyin adlı donanım ve hem de bu donanımın ürünü olan akıl adlı yazılım yavaş yavaş ve farkedilmeden yok olur gider. Dolayısı ile beynin bu derin ağ teşkilatının zarar görmesi telafisi imkânsız otoimmun hastalıkları da beraberinde getirir.

Mehmet Dumlu Aydın

Otonom sinir sistemi, sempatik ve parasempatik sinir sistemi aracılığıyla mesajlar gönderir. Sempatik sinir sistemi, kalbin kardiyo-hızlandırıcı merkezini, artan solunum ritmini ve bronşların genişlemesini ve arteriyel kasılmayı düzenleyen akciğerleri innerve eder. Nörotransmitter olarak adrenalin-noradrenalin kullanır. Sempatik sinir sisteminin aksine, kalbin kardiomodulator merkezini, solunum ritmini yavaşlatan akciğerleri ve bronşların kasılmasını ve arteriyel genişlemeyi innerve eder. Nörotransmitter olarak asetilkolin kullanır. Sempatik ve parasempatik bölümler, hayati fonksiyonların dinamik bir modülasyonunu korumak için antagonist olarak işlev görür. Bu sistemler, sırasıyla stellat ganglionu ve vagus siniri aracılığıyla kalbe etki eder. Bu mesajların sinoauriküler düğüme yönelik etkileşimi, kalp hızı değişkenliğinin izlenmesiyle ölçülebilen normal kardiyak değişkenlikten sorumludur. Kalp hızı öncelikle vagal aktivite tarafından kontrol edilir. Kalpten gelen duyu verileri merkezî sinir sistemine geri beslenir. Kalp atış hızı değişkenliği, hem

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Beyinde Hafızayı Silen Karadeliklerin Oluşumu: Alzheimer-Parkinson Hastalığının Kökenine Metaforik Bir Yaklaşım

Hergün bir tanıdık görüntü ya da ses Alzheimer hastalığını ebediyen erteleyebilir.

Mehmet Dumlu Aydın

Makalenin İngilizce aslında, yeni keşfedilen bu hafıza silici ve beyin yutucu kara deliklere verilen ‘‘Dada-Black Hole-DADA-BH’’ kısa ismi, **Data Deleting Amyloid Black Hole**’ tamlamasındaki siyah harflerden alıntıdır.

Dada Black Hollerinin Oluşum Psikofiziği

Black holler, sıfırın fizikteki temsilcileridir. Toplama ve çıkarma işleminde bugün için etkisiz görünen sıfır; böldüğü sayıyı sonsuz parçaya ayırırken çarpıldığı sayıyı yok eder. Karadelikler de maddenin sıfırlanmış hâlidir. Onu önce sonsuz parçaya ayırır sonra da sıfır kütle/hacimde toplayarak bağısladığı sonsuz bir çekim gücü ile tüm evreni yutacak hâle getirir. Soyut anlamda ölüm, canlının kendi içinde taşıdığı sıfırla çarpılması sonra da sıfıra bölünerek sonsuz parçaya ayrışmasıdır.

Dada Black Hollerinin Nörofiziği

Beynin donanımında koku ve tat sinyalleri, yazılımında işe ışık ve ses sinyalleri daha etkindir. Beyni yutan karadelikler, özellikle hafıza alanlarında koku ve tat sinyallerinin bozulmasıyla oluşan ve öncelikli olarak beyin yazılımı olan hafızayı silen, sonra da yazılım ve donanımı birlikte yutarak yok eden tehlikeli elektromanyetik kütlelerdir. Bu kütlelerin oluşumunda koku ve tat sinyallerinin bozulması kadar; 85 desibel üstü sesler ve 80 Watt üstü ışıklar da sorumludur. Koku ve tat yollarıyla bulaşan COVID-19’un DADA-BH’ler oluşturması da muhtemeldir.

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Kitabın Özeti

Eğer beyin adlı organizasyon bir Devleti temsil ediyorsa otonom ganglionlar bu devletin istihbarat ağını temsil ederler. Her organın yakınında ya da içinde bulunan bu ganglionlar aynı zamanda o organın beyni olarak işlev görürler. Kendi içlerinde bağımsız olan bu teşkilat, dış ilişkilerde beyin sapı üzerinden insula ve limbik loba bağlıdır. Yani, derin beyinde olup biten sayısız faaliyetten yalnızca otonom ganglionların temsil ettiği gladyo, omurilik ve beyin sapının temsil ettiği ferratio, insular korteks, limbik lob ve amigdalanın temsil ettiği sibernatio haberdar edilir. Bütün bu alanlarda özetlenen bilgiler neşe-depresyon, huzur-huzursuzluk, labilite-stabilite ve hatta salaklık-deha ikilileri şeklinde mentatiouyu temsil eden beyin kabuğuna gönderilir. Her iki sağ ve sol beyin kabuğu bu bilgileri, ihtiva ettiği milyarlarca nöral devreden oluşan networkun onayına sunar ve geçerlilik kazanan bilgilerin her birinin birer kopyası kendi alanıyla ilgili işlemci çekirdekler olan otonom ve somatik ganglionlarda depolanırken bunların birer kopyası da aynı zamanda hippokampal dosyalarda kayıt altına alınır.

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SANATTA MATEMATİK
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İÇİNDEKİLER

Sunuş..... vii

BÖLÜM 1..... 1

- a. Matematik Nedir? 3
- b. Sanat Nedir? 4
- c. Matematik ve Sanat İlişkisi 5

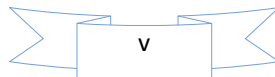
BÖLÜM 2..... 7

DOĞADA MATEMATİK..... 9

- a. Simetri 9
 - İnsan Vücudunda Simetri 13
 - a. Dış Görünüşte Simetri 13
 - b. İç Organlarda Simetri 14
 - Bazı Simetrik Şekiller 15
 - Güzelliğin Temelleri 16
- b. Altın Oran 18
 - Kepler Üçgeni 20
 - Altın Oranın Tarihçesi 21
 - Doğada Altın Oran 23
 - İnsan Bedeni'nde Altın Oran 23
 - İnsan Eli'nde Altın Oran 24
 - İnsan Kafası'nda Altın Oran 24
 - İnsan Yüzü'nde Altın Oran 24
 - Akciğerde Altın Oran 26
 - İnsan Kulağı'nda Altın Oran 26
 - Bitkilerde Altın Oran 27
 - Sanatta Altın Oran 28
 - Leonardo Da Vinci ve Altın Oran 29
 - Deniz Kabukları'nda Altın Oran 31
 - Yumuşakçalarda Altın Oran 32
 - Deniz Kabukları'nda Altın Oran 33

Boynuzlar ve Dişler’de Altın Oran.....	34
Mikro Dünyada Altın Oran.....	34
Mikro Organizmalarda Altın Oran.....	35
DNA’da Altın Oran.....	37
Kar Kristallerinde Altın Oran	37
BÖLÜM 3.....	39
SANATTA MATEMATİK	41
a. Mimaride Matematik	41
Mimar Sinan;	41
Gize Piramitleri.....	45
Partenon Tapınağı.....	47
Taç Mahal.....	47
Sidney Opera Evi	48
b. Resimde Matematik.....	48
Leonardo Da Vinci.....	49
MC Esher.....	50
c. Müzikte Matematik.....	53
d. Sinemada Matematik.....	56
e. Edebiyatta Matematik.....	57
Edebiyatın Matematikle İlişkisi	57
Şiir’de Matematik	58
BÖLÜM 4.....	59
KEŞİFLERDE MATEMATİK.....	61
a. Thales	61
Thales Teoremleri;	62
Bazı Geometrik Teoremler	63
Thales’in Piramit Problemi.....	65
b. Arşimet (Archimedes) (M.Ö. 287-212)	67
Altın Taç.....	71
Bir Orduyu Tek Başına Yenen Matematikçi.....	72
Kaldırma Kuvveti.....	72
c. Isaac Newton (1642-1727).....	73
Elma Efsanesi	75
Isaac Newton’un Sözleri.....	76

d. Galileo Galilei (1564-1642).....	77
e. Albert Einstein (1879-1955).....	78
Einstein'ın Sözlerinden	81
Einstein'ın Araştırmaları	82
BÖLÜM 5.....	83
EVRENDE MATEMATİK VE	
İNSAN VUCUDUNDA MATEMATİK.....	85
a. Evrende Matematik.....	85
Evrenin Oluşumu - Büyük Patlama (Big Bang).....	87
Senaryo:.....	87
Büzülme (Geriye Gidiş)	89
Evrenin Sırları.....	90
b. İnsan Vücutunda Matematik	92
Vücudumuzla İlgili İlginç Bilgiler	96
İnsan Vücudunun Sırları.....	99
Bazı İlginç Saptamalar	101
BÖLÜM 6.....	105
DOĞADA MATEMATİK.....	107
a. Fraktallar	107
b. Bal Petekleri.....	109
c. Kar Taneleri	111
d. Örüntüler.....	114
e. Bir Anlatı	115
KAYNAKÇA	117
YAZARDAN NOT	118
ÖZ GEÇMİŞLER	119



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SAYISAL ve SÖZEL ANLATILAR

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İÇİNDEKİLER

SUNUŞ iii

BÖLÜM 1

SAYISAL BÖLÜM	1
MATEMATİK HİKÂYELERİ	3
Matematiğin Doğuşu:	3
Kaplumbağa Paradoksu:	3
Atatürk ve Geometri:	5
Nasrettin Hoca'nın Heybe Hikâyesi:	8
Mazeretli Öğrenciler:	9
Matematikçi Milletvekili:	10
Golf Maçı:.....	11
Matematikçi Gauss'un Hikâyesi:	12
Öklid ve Riemann Uzaklığı:	13
Avcı Hikâyesi:	14
Balon Hikâyesi:	15
İskoç Koyunlarının Hikâyesi:	16
Robert Weiner (1884-1944).....	17
Somun Bölme	18
Temel ve Fadime	19
Üçgenin Alanı	20
Bez Katlama	21
Satranç Tahtası	22
Tek Başına Orduyu Yenen Adam	24
Ağanın Atları	25
Çocuk ve Babası	26
Doğada Matematik.....	27



MATEMATİK İLE İLGİLİ SÖZLER	29
MATEMATİK FIKRALARI	33
MATEMATİKÇİLERİN SÖZLERİ	37
MATEMATİK BİLMECELER	55
CEVAPLAR	60
MATEMATİK İLE İLGİLİ KAMYON ARKASI YAZILAR	63

BÖLÜM 2

SÖZEL BÖLÜM	65
GÜZEL SÖZLER	67
BAZI ANLATILAR	85
ATASÖZLERİ	97
KAMYON ARKASI YAZILAR	113
FIKRALAR	117
TABELALAR	139
 KAYNAKÇA	 141
 ÖZ GEÇMİŞLER	 143

KAYNAKÇA

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İÇİNDEKİLER

ÖN SÖZ	iii
TEŞEKKÜR.....	v
ŞEKİL LİSTESİ.....	xi
TABLO LİSTESİ.....	xiii
KISALTMALAR ve SİMGELER LİSTESİ	xv
GİRİŞ	1
1. SPOR	3
1.1. Takım Sporları.....	5
1.2. Bireysel Sporlar	8
2. YÜZME.....	9
2.1. Yüzme Teknikleri.....	11
3. ÇOCUKLARDA FİZİKSEL GELİŞİM DÖNEMLERİ.....	15
3.1. Gelişim	15
3.2. Büyüme.....	17
3.3. Kilo Değişimi	17
3.4. Motor Gelişim Evreleri.....	17
3.5. Refleks Dönem	19
3.6. İlk Hareket Dönemi	19
3.7. Temel Hareketler Dönemi	20
3.8. Spor Dönemi.....	20
3.9. Uzmanlaşma Aşaması.....	21
4. BÜYÜME VE GELİŞMEYİ ETKİLEYEN SÜREÇLER.....	23
4.1. Genler	23
4.2. Kalıtım	24
4.3. Cinsiyet.....	24
4.4. İnsanın Fiziksel Yaşam Koşulları	24
4.5. Sosyoekonomik Düzey	25

5. ANTROPOMETRİ.....	27
5.1. Antropometri ve Spor	30
6. ANTROPOMETRİK TESTLER NELERDİR?	31
6.1. Beden Kitle İndeksi	31
6.2. Bel/Kalça Oranı	31
6.3. Uzunluk Ölçümleri	32
6.4. Çevre Ölçümleri	33
6.4.1. Üst Kol Çevresi	33
6.4.2. Ön Kol Çevresi.....	33
6.4.3. Üst Bacak Çevresi.....	33
6.4.4. Baldır Çevresi	34
6.4.5. Kalça Çevresi.....	34
6.4.6. Göğüs Çevresi.....	34
6.5. Deri Kıvrım Kalınlığı Ölçümleri	34
6.6. El Uzunluğu Ölçümleri.....	35
6.7. El Genişliği Ölçümü	35
6.8. El Yüzey Alanı	36
6.9. El Kuvveti Ölçümü.....	36
7. İNSAN GENOM PROJESİ VE GENLER	37
7.1. Spor Genetiği.....	38
7.2. Polimorfizm	38
7.3. Sporda Performansı Etkileyen Faktörler.....	38
8. ATLETİK PERFORMANS VE GENLER.....	43
8.1. <i>ACTN3</i> rs1815739 Polimorfizmi	44
8.2. <i>IL-6</i> rs1800795 Polimorfizmi	45
8.3. <i>MCT1</i> rs1049434 Polimorfizmi	45
8.4. <i>COL1A1</i> rs1800012 Polimorfizmi	45
8.5. Çalışma Grupları.....	46
8.6. Çalışma Dizaynı	46
8.6.1. Kullanılan Aletler.....	47
8.6.2. Kimyasal Maddeler	47
8.6.3. Kullanılan Genotiplerin Dizi Sekansı	47
8.6.4. Kullanılan Bilgisayar Programları	48
8.7. Kullanılan İnceleme Yöntemleri.....	48
8.7.1. Antropometrik Ölçümler Nasıl Yapılır?.....	48

İçindekiler

8.7.2. Fonksiyonel Testler	50
8.7.3. Genetik Analiz	50
8.7.4. Periferik Kandan DNA İzolasyonları	51
8.7.5. DNA Miktarının Ölçülmesi	51
8.9. DNA Genotiplenmesi	51
8.9.1. <i>ACTN3</i> rs1815739 Polimorfizminin Belirlenmesi	51
8.9.2. <i>IL-6</i> rs1800795 Polimorfizminin Belirlenmesi	52
8.9.3. <i>MCT1</i> rs1049434 Polimorfizminin Belirlenmesi	52
8.9.4. <i>COL1A1</i> rs1800012 Polimorfizminin Belirlenmesi	52
8.10. Yüzme Performansının Antropometrik Ölçümlerle İlişkisi	57
9. YÜZÜCÜLERDE ANTROPOMETRİ VE POLİMORFİZMİN GENEL OLARAK DEĞERLENDİRİLMESİ.....	67
10. KAYNAKÇA.....	69
11. ÖZ GEÇMİŞ	78

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İÇİNDEKİLER

Yazarlar Listesi	iii	4	Üst Ekstremitte Uygulamaları.....	45
1 Nöromotor Gelişim.....	1	4.1.	GİRİŞ	45
1.1. GİRİŞ	1	4.2.	PRONE ÜST EKSTREMİTE PROGRESYONU	45
1.2. İNSAN GELİŞİMİ	1	4.3.	ÜST EKSTREMİTE BECERİLERİ	46
1.2.1 Motor Gelişim	2	4.4.	İNCE MOTOR BECERİ GELİŞİMİ.....	47
1.2.2. Gelişimin Temel Yapı Taşları (Kilometre Taşları).....	3	4.5.	OMUZ KUŞAĞI.....	49
1.2.3. Bebek ve Çocuklarda Yürüyüşün Gelişimi ..	4	4.5.1.	Kuvvetlendirme	52
5.2.4. Yürümeye Yeni Başlayan Bebek Ayağı	9	4.5.2.	Stabilite.....	55
1.3. DUYUSAL VE ALGISAL GELİŞİM.....	10	4.6.	DİRSEK	58
1.3.1. Görsel Duyuda Gelişim	10	4.7.	EL BECERİLERİ.....	60
1.3.2. Kinestetik Duyu Gelişimi	11	4.7.1.	Kavrama ve Bırakma Aktiviteleri	62
1.3.3. İşitme Duyusu Gelişimi	12	4.8.	ÜNİTE SONU	63
1.3.4. Duyular Arası Entegrasyon.....	12	4.8.1.	Olgu Örneği 1	63
Kaynaklar	13	4.8.2.	Olgu Çrneği 2	64
2 Üst Motor Nöron Lezyonu Olan Çocuklarda Kuvvetlendirme Egzersizleri ve Etkileri	15	Kaynaklar	64	
2.2. GİRİŞ	15	5 Alt Ekstremitte Egzersizleri	65	
2.2.2. Spastik Serebral Palsili Çocuklarda Meydana Gelen Yumuşak Doku Adaptasyonları	16	5.1. GİRİŞ	65	
2.2.3. Sorularla Kuvvetlendirme Egzersiz Uygulamaları	18	5.2. NORMAL GELİŞİM SÜRECİNDE VE ALT EKSTREMİTE FONKSİYONEL BECERİLERİ	66	
Kaynaklar	22	5.3. KALÇA ÇEVRESİNE YÖNELİK EGZERSİZLER	67	
3 Nöromotor Gelişimi Destekleyen Terapötik Egzersizler	23	5.3.1. Kalça Eklemi Gelişimi	67	
3.1. GİRİŞ	23	5.3.2. Kalça Çevresi Değerlendirme.....	67	
3.2. SEREBRAL PALSİ (SP)	24	5.3.3. Kalça Dislokasyon Problemlerinin Değerlendirilmesi	69	
3.2.1 Serebral Palsi Rehabilitasyonunda Dikkat Edilecek Noktalar.....	24	5.3.4. Kalça Problemi Olan Çocuklarda Kalça ve Pelvis Çevresine Yönelik Egzersiz Yaklaşımları.....	70	
3.2.2. Hipotonik Çocuğa Yönelik Terapötik Egzersizler	26	5.4. DİZ EKLEMİNE YÖNELİK EGZERSİZLER	78	
4.2.3. Spastik Tip Serebral Palsiye Yönelik Terapötik Egzersizler	30	5.4.1. Diz Eklemine Gelişimi	78	
4.2.4. Diskinetik Tip Serebral Palsiye Yönelik Terapötik Egzersizler	36	5.4.2. Diz Eklemi Problemlerinde Özel Değerlendirme Yöntemleri	78	
4.2.5. Ataksik Tip Serebral Palsiye Yönelik Terapötik Egzersizler	38	5.4.3. Diz Çevresine Yönelik Egzersiz Uygulamaları	79	
3.3. ÜNİTE SONU	40	5.5. AYAK- AYAK BİLEĞİ EKLEMİNE YÖNELİK EGZERSİZLER	83	
3.3.1. Olgu Örneği	40	5.5.1. Ayak-Ayak Bileği Deformiteleri	83	
3.3.2. Olgu Örneği	41	5.5.3. Ayak- Ayak Bileği Eklemine Yönelik Egzersiz Yaklaşımları	85	
3.3.3. Olgu Örneği	42	5.6. AYAKTA DURMA	89	
3.3.4. Olgu Örneği	42	5.6.1 Ayakta Durma Dengesini Geliştirmeye Yönelik Egzersiz Uygulamaları	89	
Kaynaklar	43	5.7. YÜRÜME EGZERSİZLERİ	91	
		5.7.1. Görsel Yürüme Analizi	91	
		5.7.2. Nörolojik Etkilenimli Çocuklarda Görülen Patolojik Yürüyüş Tipleri	93	
		5.7.3. Yürüme Egzersizleri	94	

5.8.	ALT EKSTREMİTE CERRAHİ VE POSTOP REHABİLİTASYON PROTOKOLLERİ	95	8	Pediatrik Rehabilitasyonda Kuvvetlendirme Eğitimi ve Eğlenceli Aktiviteler	169		
5.8.1.	Kalçada Görülen Deformitelere Yönelik Uygulamalar ve Tedavi Protokolleri	95	8.1.	GİRİŞ	169		
5.8.2.	Kalça Cerrahileri ve Postoperatif Rehabilitasyon Protokolleri	97	8.2.	KUVVETLENDİRME EĞİTİMİ NASIL BELİRLENİR?	169		
5.8.3.	Diz Postop Rehabilitasyon Uygulamaları... ..	98	8.2.1.	Egzersizin Tipi	170		
5.8.4.	Diz Cerrahileri ve Pos-top Rehabilitasyon Protokolleri	98	8.2.2.	Egzersizin Yoğunluğu ve Gücü	170		
5.8.5.	Ayak-Ayak Bileğine Yönelik Cerrahiler ve Rehabilitasyon Protokolleri	99	8.2.3.	Egzersizin Frekansı	170		
5.9	OLGU ÖRNEKLERİ	101	8.2.4.	Egzersizin Süresi	170		
5.9.1	Örnek 1	101	8.3.	KUVVETLENDİRME EGZERSİZ YAKLAŞIMLARI	171		
5.9.2	Örnek 2	101	8.3.1.	İzokinetik Kuvvetlendirme Egzersizleri ..	171		
5.9.3	Örnek 3	101	8.3.2.	İlerleyici Dirençli Egzersiz	172		
Kaynaklar	101	8.3.3.	Bisiklet ve Yürüme Bandı Eğitimi	178	8.4.	KUVVETLENDİRMEDE EĞLENCELİ AKTİVİTELER	179
6	DUYUSAL ENTEGRASYON	103	8.4.1.	Sanal Gerçeklik	179		
6.1.	GİRİŞ	103	8.4.2.	Dans Terapi	180		
6.2.	DUYUSAL ENTEGRASYON NEDİR?	104	8.4.3.	Trambolin Egzersizleri	180		
6.3.	VESTİBÜLER SİSTEM	106	8.4.4.	Akuatik Terapi	181		
6.4.	PROPRİYOSEPTİF SİSTEM	107	8.4.5.	Pilates Egzersizleri	182		
6.5.	TAKTİL SİSTEM	107	8.4.6.	Rekreasyonel Aktiviteler	183		
6.6.	VESTİBÜLER SİSTEM AKTİVİTE ÖNERİLERİ ...	108	8.5.	OLGU ÖRNEĞİ	183		
6.7.	MOTOR PLANLAMA -PRAKSİS AKTİVİTE ÖNERİLERİ	120	8.6.	ICF PARAMETRELERİ ÇERÇEVESİNDE KUVVETLENDİRME EĞİTİMİNE BAKIŞ: BİR SEREBRAL PALSİ ÖRNEĞİ	184		
6.8.	TAKTİL SİSTEM AKTİVİTE ÖNERİLERİ	131	Kaynaklar	184	9	RİSKLİ BEBEKLERDE FİZİYOTERAPİ VE REHABİLİTASYON UYGULAMALARI	187
6.9.	BÖLÜM SONU – VAKA ÖRNEKLERİ	136	9.1.	GİRİŞ	187		
Kaynaklar	137	9.2.	RİSKLİ BEBEK KAVRAMI	187	9.3.	RİSKLİ BEBEKLERDE GÖRÜLEN DUYUSAL PROBLEMLER	190
7	DENGE VE STABİLİZASYON EGZERSİZLERİ	139	9.3.1.	Taktil Suyu	190		
7.1.	GİRİŞ	139	9.3.2.	Vestibüler Suyu	190		
7.2.	FARKLI TANI GRUPLARINDA DENGE VE STABİLİZASYON	140	9.3.3.	Koku ve Tat Duyusu	191		
7.2.1.	Serebral Palsi'de Denge ve Stabilizasyon	140	9.3.4.	İşitme	191		
7.2.2.	Down Sendromu'nda Denge ve Stabilizasyon	145	9.3.5.	Görme	191		
7.2.3.	Gelişimsel Koordinasyon Bozukluğunda Denge ve Stabilizasyon	146	9.4.	RİSKLİ BEBEKLERDE DEĞERLENDİRME	192		
7.2.4.	İşitme Engelli Çocuklarda Denge ve Stabilizasyon	147	9.4.1.	Değerlendirme ve Müdahale Ekibi	192		
7.2.5.	Charcot Marie Tooth'ta Denge ve Stabilizasyon	147	9.4.2.	Yenidoğan Yoğun Bakım Ünitelerinde Çalışan Fizyoterapistin Roller ve Yetkinlikleri	192		
7.2.6.	Otizm Spektrum Bozukluğunda Denge ve Stabilizasyon	149	9.4.3.	Ön Değerlendirme	193		
7.3.	DENGEYİ GELİŞTİRMEYE YÖNELİK EGZERSİZ ÖRNEKLERİ	150	9.4.4.	Postüral Kontrol ve Kas Tonusu	194		
7.3.1.	Denge ve Koordinasyon Bozukluğuna Özgü Spesifik Egzersizler	150	9.4.5.	Refleksler ve Anormal İşaretler	195		
7.3.2.	Diğer Denge ve Stabilizasyon Egzersiz Örnekleri	158	9.4.6.	Duyu Değerlendirmesi	196		
7.4.	ÜNİTE SONU	163	9.4.7.	Motor Gelişim ve Gelişimsel Takip	197		
7.4.1.	Olgu Örneği	163	9.5.	RİSKLİ BEBEKLERDE ERKEN MÜDAHALE	199		
7.4.2.	Olgu Örneği	164	9.5.1.	Yenidoğan Bireyselleştirilmiş Gelişimsel Bakım ve Değerlendirme Programı (NIDCAP)	199		
Kaynakça	164	9.5.2.	Aile Merkezli Bakım	200	9.5.3.	Kanguru Anne Bakımı	200
		9.5.4.	Pozisyonlama	201	9.5.5.	Hareket Açıklığının ve Aktif Hareketin Artırılması	203
		9.5.5.	Hareket Açıklığının ve Aktif Hareketin Artırılması	203	9.5.6.	Masaj Uygulaması	203

9.5.7. Ağrıyı ve Stresi Azaltmak İçin Çevresel ve Davranışsal Stratejiler.....	204
9.5.8. Motor Gelişimin Desteklenmesi	205
Kaynaklar	212
10 Pediatrik Rehabilitasyon Ekipmanları ve Zenginleştirilmiş Çevre..215	
10.1. GİRİŞ	215
10.1.1. Pozisyonlama Amacıyla Kullanılan Ekipmanlar	216
2.1.2. Duyusal Bütünlüğü Sağlamak ve Artırmak Amacıyla Kullanılan Materyaller	217
10.1.3. Teknoloji Destekli Rehabilitasyon Araçları	218
10.1.4. Kuvvetlendirme Amacıyla Kullanılan Ekipmanlar	219
10.1.5. Ayakta Durma ve Yürüme Yardımcıları	220
10.1.6. Giyilebilir Giysiler (Terapötik Giysiler)	222
2.1.7. Denge ve Koordinasyon Amacıyla Kullanılan Ekipmanlar	222
10.1.8. El becerilerini Desteklemek Amacıyla Kullanılan Araçlar	223
10.2.1. Zenginleştirilmiş Çevre	224
Kaynaklar	227
11 Farklı Hastalıklarda Spor ve Rekreasyon Aktiviteleri .....229	
11.1. GİRİŞ	229
11.2. ADAPTİF SPOR VE REKREASYONEL AKTİVİTELER.....	230
11.2.1. Paralimpik Spor Branşları	231
11.3. FARKLI TANI GRUPLARINDA SPOR VE REKREASYON	234
11.3.1. Serebral Palsili Bireylerde Spor ve Rekreasyonel Aktiviteler	234
11.3.2. Spina Bifidalı Bireylerde Spor ve Rekreasyonel Aktiviteler	237
11.3.3. Down Sendromlu Bireylerde Spor ve Rekreasyonel Aktiviteler	238
11.3.4. Otizm Spektrum Bozukluğu Olan Bireylerde Spor ve Rekreasyonel Aktiviteler	239
11.3.5. Duchenne Musküler Distrofili Bireylerde Spor ve Rekreasyonel Aktiviteler	240
11.4. PARALİMPİK SPORCU ÖRNEKLERİ	241
11.5. ÜNİTE SONU	242
11.5.1. Olgu Örneği	242
11.5.2. Olgu Örneği	242
11.5.3. Olgu Örneği	242
Kaynaklar	243
12 Kognitif ve Algı Rehabilitasyonu .....245	
12.1. NÖROGELİŞİMSEL SORUNU OLAN ÇOCUKLAR İLE ÇALIŞIRKEN YAŞANABİLECEK SORUNLAR	245
12.2. İLETİŞİM BECERİLERİ.....	246
12.3. DİKKAT BECERİLERİNİ ARTIRMA	251
12.4. HAFIZA BECERİLERİ	252
12.5. ORGANİZASYONEL BECERİLER	253
12.6. MOTİVASYON	254
12.7. MAES TERAPİ NEDİR? (HAREKET ANALİZİ VE EĞİTİM STRATEJİLERİ).....	255
12.8. ÜNİTE SONU	257
12.8.1. Olgu Örneği	257
12.8.2. Olgu Örneği	258
12.8.3. Olgu Örneği	260
12.8.4. Olgu Örneği	261
Kaynaklar	263
13 Osteopati ve Osteopatide Kraniosakral Tedavi 265	
13.1. GİRİŞ	265
13.2. OSTEOPATİ VE FELSEFESİ	265
13.3. OSTEOPATİNİN TANIMI	266
13.3.1. Osteopatinin Terapötik Prensipleri.....	267
13.4. OSTEOPATİNİN DÜNYADAKİ YERİ VE KULLANIM ALANLARI	268
13.5. PEDIATRİDE OSTEOPATİNİN TERAPÖTİK ETKİSİ.....	269
13.6. OSTEOPATİDE KRANİO SAKRAL TEDAVİ	277
13.6.1. Beyini Saran Zarlar ve BOS.....	278
13.7. LİTERATÜRDEN PEDIATRİK OSTEOPATİ	279
13.8. OSTEOPATİK MANUEL TERAPİDE DOKUNMANIN ROLÜ	283
13.9. ÜNİTE SONU	284
13.9.1. Olgu Örneği	284
13.9.2. Olgu Örneği	284
Kaynaklar	285
14 Çocuklarda Hippoterapi Uygulamaları . 287	
14.1. GİRİŞ	288
14.2. HİPPOTERAPİ İLE İLGİLİ ÖNEMLİ TANIMLAR	288
14.2.1. At destekli Aktiviteler	288
14.2.2. At Destekli Terapiler	288
14.2.3. Terapötik Binicilik.....	288
14.2.4. Hippoterapi	288
14.2.5. At Destekli Psikoterapi.....	288
14.2.6. At Yardımlı Öğrenme.....	288
14.3. TARİHÇE	288
14.4. HİPPOTERAPİ İLE İLGİLİ TEORİLER	289
14.4.1. Dinamik Sistem Teorisi	289
14.4.2. Duyusal Entegrasyon Teorisi	291
14.4.3. Nöronal Grup Seçimi Teorisi	292
14.5. HİPPOTERAPİ TAKIMINDA YER ALAN ÜYELER.....	293
14.5.1. Hippoterapi Takımında Yer Alan Üyelerin Görevleri	293
14.6. HİPPOTERAPİDE SEÇİLEN ATIN ÖZELLİKLERİ	293
14.6.1. Postüral Parametreler	294
14.6.2. Yürüme Parametreleri.....	295
14.6.3. Davranışsal Parametreler	295
14.7. HİPPOTERAPİDE TEDAVİ KOMPONENTLERİ	296
14.8. HİPPOTERAPİNİN ETKİLERİ	299
14.8.1. Fiziksel Etkiler	299
14.8.2. Psikolojik ve Sosyal Etkiler	302
14.9. HİPPOTERAPİ UYGULAMA SÜRESİ	303
14.10. HİPPOTERAPİ UYGULAMALARINDA ENDİKASYON VE KONTRAENDİKASYONLAR	303
Kaynaklar	303

15 Nöromuskuler Elektrik Stimülasyonu .. 305	16 Sanal Gerçeklik..... 313
15.1. GİRİŞ 305	16.1. GİRİŞ 313
15.2. NMES'İN PARAMETRELERİ 306	16.2. TANIM VE MEKANİZMA..... 313
15.2.1. Frekans..... 306	16.3. PEDIATRİK REHABİLİTASYONDA SANAL
15.2.2. Stimülasyon Frekansının Artırılması ve Azaltılması..... 306	GERÇEKLIK UYGULAMALARI 314
15.2.3. Atım Durasyonu/Genişliği 306	16.3.1. Serebral Palsi ve Sanal Gerçeklik
15.2.4. Görev Döngüsü..... 307	Uygulamaları 315
15.2.5. Amplitüd/Yoğunluk 307	16.3.2. Obstetrik Brakial Pleksus
15.2.6. Elektrotların Yerleşimi 307	Yaralanmaları ve Sanal Gerçeklik
15.2.7. Stimülasyon Dozajı..... 307	Uygulamaları 315
15.3. PEDIATRİK REHABİLİTASYONDA NMES 307	16.3.3. Down Sendromu Rehabilitasyonunda
15.3.1. Serebral Palsi ve NMES 308	Sanal Gerçeklik Uygulamaları..... 316
15.3.2. Obstetrik Brakial Pleksus	16.3.4. Pediatrik Nöromuskuler Hastalıklar ve
Yaralanmaları ve NMES 308	Sanal Gerçeklik 316
15.3.3. Pediatrik Spinal Kord Yaralanmaları ve	16.4. ÜNİTE SONU 317
Spina Bifida Rehabilitasyonunda NMES . 309	16.4.1. Örnek Vaka..... 317
15.3.4. Pediatrik Nöromuskuler Hastalıklar ve	Kaynakça 317
NMES..... 309	
15.4. ÖRNEK VAKA..... 310	Dizin 319
Kaynaklar 311	Prof. Dr. Tülay Tarsuslu 321

NÖROMOTOR GELİŞİM

Tülay Tarsuslu

Kısa İçerik

- 1.1 Giriş
- 1.2 İnsan Gelişimi
 - 1.2.1. Motor Gelişim
 - 1.2.2. Gelişimin Temel Yapı Taşları (Kilometre Taşları)
 - 1.2.3. Bebek ve Çocuklarda Yürüyüşün Gelişimi
 - 1.2.4. Yürümeye Yeni Başlayan Bebek Ayağı
- 1.3. Duyusal ve Algısal Gelişim
 - 1.3.1. Görsel Duyuda Gelişim
 - 1.3.2. Kinestetik Duyu Gelişimi
 - 1.3.3. İşitme Duyusu Gelişimi
 - 1.3.4. Duyular Arası Entegrasyon

1.1. GİRİŞ

Normal gelişim, pediatrik rehabilitasyon alanında çalışan bir fizyoterapistin öncelikli olarak bilmesi gereken konular arasındadır. Gelişimsel sapmaları belirleyebilmek, doğru değerlendirme ve analiz normal sürecin bilinmesi ile gerçekleştirilebilecektir. Bu bölüm; okuyucunun normal gelişim, motor gelişim prensipleri, motor gelişim ile dinamik sistemler arasındaki etkileşim, motor gelişimi etkileyen değişkenler, yaşa uygun motor gelişim parametreleri, duyuşal gelişim ve yaşa uygun gelişim özellikleri duyu-algı-motor gelişim süreci ve bu sistemlerin birbiri üzerine etkisi hakkında bilgi ve fikir sahibi olmasını amaçlamaktadır.

1.2. İNSAN GELİŞİMİ

İnsanlarda gelişim, diğer birçok canlıya göre oldukça farklıdır. Kaldı ki bebek ve çocuklardaki gelişim de yetişkinlerdekinden oldukça farklıdır. Bu farklılık, hem sorunların tespiti sırasında hem de rehabilitasyon programlarında mutlaka göz önünde bulundurulur.

Çocuklarda gelişim, yetişkinlerden farklılık gösterir: (1) Çocuklarda çoklu organ maturasyonu (olgunlaşması) ve hızlı büyüme söz konusudur. (2) Hızlı gelişimsel kilometretaşları söz konusudur ve (3) Giderek artan fonksiyonel beceri kazanımı vardır. Bu anlamda normal büyüme ve gelişmenin ne zaman normal olduğu, normal varyasyonlarının ve normalden sapmaların ne olduğu ve ne zaman görülebileceğinin mutlaka bilinmesi gerekmektedir. Bu durum, etkin bir değerlendirme ve rehabilitasyon programı açısından oldukça önemlidir. Çocukluk çağı hastalıkları, bu normalden sapmaların yaygın şekilde görülebildiği durumları kapsamaktadır ve yaş grubuna göre özelliklerde değişkenlikler olabilmektedir.

fazda da duyu modaliteleri arasındaki transferi içeren yüksek seviyeyi ifade eder.

Duyusal entegrasyon, gelişimsel süreç içerisinde bebeğin büyüme ve gelişmesine paralel olmakla birlikte bebeğin meraklı, keşfedici, araştırmacı kimliği, kognitif fonksiyonu ile de ilişkilidir. Duyular arası bütünleşme ayrıca duyuşal gelişim sıralamasına ve duyuşal içi (intersensory integration) ve duyuşal arası (intrasensory integration) entegrasyona da bağlıdır. Duyusal entegrasyonun zor veya daha spesifik özellikleri ergenlik döneminde gelişmeye devam eder.

Bebeklerde basit duyuşal stimulusları birleştirmek zor iken çocuklarda yüksek seviye entegrasyondan bahsetmek mümkün olabilmektedir. Duyular arası bütünleşme, duyunun kendi içindeki gelişimi ile çok yakından ilişkilidir. Çocuklar, ayrıca spatio-temporal alandaki duyuşal stimulus entegrasyonunu da öğrenebilmektedir. Öncelikle spatial-spatial entegrasyon görevlerinde uzmanlaşır, daha sonra karmaşık spatial ve temporal görevleri ve en sonunda da temporal-temporal görevlerde uzmanlaşırlar. Bunun için görülen obje ve/veya şeklin hafızada ututulmasını sağlayan kognitif gelişimin önemi unutulmamalıdır.

Uyarı! Duyusal bütünleşme belli bir sıralama ile bebek/çocuğun motor ve kognitif gelişimi paralelinde ilerler. Herhangi bir basamakta sorun yaşanması duyuşal bütünleşmeyi de olumsuz etkileyecektir.

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ÜST MOTOR NÖRON LEZYONU OLAN ÇOCUKLARDA KUVVETLENDİRME EGZERSİZLERİ VE ETKİLERİ

2

Tülay Tarsuslu

Kısa İçerik

- 2.2. GİRİŞ
- 2.2.2. Spastik Serebral Palsili Çocuklarda Meydana Gelen Yumuşak Doku Adaptasyonları
- 2.2.3. Soru-Cevaplarla Kuvvetlendirme Egzersiz Uygulamaları

2.2. GİRİŞ

Çocuklarda erken rehabilitasyon ve egzersiz yaklaşımları, kas iskelet sistemi adaptasyonlarının önlenmesi bakımından da oldukça önemlidir. Bilindiği üzere bebek ve çocuklarda motor performans, vücut yapı ve sistemlerinin durumu, çevre baskısı ve bebeğe görünen durum/olay/hareketin ne olduğuna bağlı olarak değişkenlik göstermektedir. Yani büyüme ve gelişme çağında bebeğin yeni ve zorlu ortamlarda keşfedici olması, problem çözme davranışı ve tekrarlayan uygulamalar göstermesi, motor gelişimi ve motor performansı bakımından önemlidir. Bu keşfedici süreç içerisinde bebek, bazı hareketlerin diğerlerinden daha etkili olduğunu da keşfetmekte ve deneyimlemektedir. Yapılan pratiklerle fleksibilite ve kompleksitede de artış görülmektedir. Böylelikle beceri gelişimi de desteklenmiş ve bebeğin yetenekleri de yavaş yavaş kazanılmış olur.

Beyin lezyonları, hareket paternlerinde bozukluklarla karakterizedir. Bu durum, motor kontrol kaybı, kas zayıflığı ve kas imbalansı ile sonuçlanmakta, uzun dönemde adaptif değişimlerle sonuçlanmaktadır. Organize ve amaca uygun eğitim ve egzersiz programlarının yokluğunda, bu yetersiz hareket paternleri, stereotipik ve alışkanlık/sonradan kazanılmış hareket paternlerine dönüşmektedir. Meydana gelen bu değişimlerde, beceri ve yeteneklerden bahsetmek mümkün değildir. Erken dönem rehabilitasyon programları ile bu duruma müdahale edilmemesi, daha sonraki süreçlerde tedaviyi ve tedaviden elde edilecek başarıyı daha da zorlaştırmaktadır. Erken rehabilitasyon programları ile meydana gelmesi olası bu olumsuz gelişmelerin önlenmesi ve müdahalesi hedeflenmektedir. Yani spesifik kas aktivasyonu ve ekt-

Önemli! Kuvvet antrenmanları ve kuvvetlendirme egzersizleri sırasında daha büyük çocuklar ve ergen SP'li bireyler **sağlıklı** çocuklardan daha hızlı yorulmaktadır. Dinlenme aralarının bu doğrultuda planlanması önemli olacaktır.

Sonuç olarak, kas tonus artışı olan çocuklarda doku adaptasyonları mutlaka göz önünde bulundurulmalı ve her ne kadar egzersizin yarattığı etkiler sağlıklı çocuklarda olduğu gibi olsa da problem yaşayan çocukların (örneğin SP'li çocuklar) egzersiz uygulamasına vereceği cevapların farklılık göstereceği unutulmamalıdır. Bu nedenle egzersiz uygulamalarının etkilerini gözlemleyebilmek için çocuğa özel programlar çizilmeli ve gelişmelerin gözlenebilmesi için zaman tanınmalıdır. Bozulmuş bir dokuyu yeniden tamir etmek, düzeltmek ve işlevsel hâle getirebilmek için spesifik çalışmanın yanı sıra fonksiyonel becerileri de egzersiz uygulamalarına dâhil etmek gerekmektedir. Yani kuvvetlendirme eğitimlerine tek bir kas ve/veya eklemle başlayıp daha sonra, çoklu eklem ve kas eğitimleri şeklinde devam etmek ve fonksiyonel becerilerle desteklemek önemlidir.

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NÖROMOTOR GELİŞİMİ DESTEKLEYEN TERAPÖTİK EGZERSİZLER

Seda Ayaz Taş, Eylem Tütün Yümin

3

Kısa İçerik

- 3.1. GİRİŞ
- 3.2. SEREBRAL PALSİ (SP)
 - 3.2.1 Serebral Palsi Rehabilitasyonunda Dikkat Edilecek Noktalar
 - 3.2.2. Hipotonik Çocuğa Yönelik Terapötik Egzersizler
 - 3.2.3. Spastik Tip Serebral Palsiye Yönelik Terapötik Egzersizler
 - 3.2.4. Diskinetik Tip Serebral Palsiye Yönelik Terapötik Egzersizler
 - 3.2.5. Ataksik Tip Serebral Palsiye Yönelik Terapötik Egzersizler
- 3.3. ÜNİTE SONU
 - 3.3.1. Olgu Örneği
 - 3.3.2. Olgu Örneği
 - 3.3.3. Olgu Örneği

3.1. GİRİŞ

Nöromotor bozukluk denilince ilk akla gelen çocukluk çağı tanıları arasında yer alan SP, pediatrik rehabilitasyonun önemli bir kısmını oluşturmaktadır. Bununla birlikte kas hastalıkları (musküler distrofiler ve spinal musküler atrofiler), obstetrik brakial pleksus yaralanmaları, juvenil miyastania gravis, hareket bozuklukları (tremor vb.), otizm spektrum bozuklukları, Down sendromu gibi çocukluk döneminde karşılaşılan durumlar da motor, kognitif, dil ve uyum ile ilişkili sorunlar nedeniyle sıklıkla nöromotor bozukluklar olarak ele alınmaktadır. Bununla beraber prematüre doğan bebekler de nöromotor bozukluklar açısından risk taşımaktadır.

Nöromotor bozukluğu olan çocuklarda rehabilitasyon süreci ve sonuçları var olan sorunu tespit etmek ve çocuğun kapasitesini ölçmeye yönelik değerlendirme sürecinden önemli derecede etkilenmektedir. Çocuklarda değerlendirme ve müdahale, normal gelişim, biyomekanik özellikler, tipik ve atipik gelişim özellikleri, hareket ve postüral kontrol, aktivite ve katılımın yaşam boyu analizine dayanmaktadır. Terapötik müdahaleler, çocuğun kronolojik yaşı göz önünde bulundurularak sosyal-emosyonel-kognitif-duyusal ve fiziksel gelişimine uygun olarak pozisyonlanması, anormal hareket paternlerinin yerine normal hareket paternlerinin öğretilmesi ve desteklenmesi, kas tonus regülasyonu, var olan becerilerin oyun ve günlük yaşam aktiviteleri ile desteklenmesi, gelişebilecek ikincil problemlerin (deformite, kontraktür gibi) önlenmesine yönelik uygulamaları içermektedir. Yapılan bu uygulamalar, motor öğrenme temelli olup beyin plastisitesini aktive edecek, hareket/aktivite tekrarı, biyomekanik gelişim çerçevesinde büyüme ve gelişmenin desteklenmesi ve egzersiz/oyun yaklaşımlarından oluşmaktadır.

hat boyunca yürüyemediği, statik ayakta duruşta salınımlar gösterdiği, dinamik denge içeren futbol vb. aktivitelerde zorlandığı görüldü. Günlük yaşamında farklı zeminlerde (engebeli, taşlı vb.) denge zaafiyetleri yaşadığı ve düştüğü gözlemlendi. Göz hareketleri yavaş olup hareket geçişlerinde göz hareketleri daha geriden geliyordu. Postür al reaksiyonlarda göz hareketlerinin katılımı yetersizdi. Emosyonel olarak çekingen, sosyal yönü zayıf bir çocuktur. Kaba Motor Fonksiyon Sınıflama Seviyesi'ne göre (KMFSS) seviye 2, El Becerileri Sınıflandırma Sistemi'ne göre (EBSS) seviye 1, İletişim Becerileri Sınıflandırma Sistemi'ne göre (İBSS) seviye 1 düzeyindeydi. Tedavi programında gövde ve kalça stabilizasyonunun geliştirilmesi, statik ve dinamik denge eğitimi, göz hareketleri ile kombine egzersizler postür al egzersizler, yürüme eğitimine odaklanıldı. Resim 3.57'deki gibi ayakta postür al stabilizasyonu geliştirmek amacıyla itme ve aproksimasyon uygulamaları yapıldı. Haftada 2 kez 45 dakikalık seanslar şeklinde 3 aylık terapi süreci sonunda, çocuğun statik pozisyondaki salınımlarının ve düşme sıklığının azaldığı, düz bir hattı takip ederek yürüyebildiği, yürümede gözlenen proksimal stabilizasyon yetersizliklerinin azaldığı gözlemlendi. Günlük yaşamında bisiklet sürme, futbol oynama gibi rekreasyonel aktivitelere yönlendirildi.



Resim 3.57. Ataksik çocukta stabilizasyon amacıyla ayakta üst ekstremitesi ile itme ve alt ekstremiteye aproksimasyon uygulamaları

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ÜST EKSTREMİTE UYGULAMALARI

Demet Gözaçan Karabulut

Kısa İçerik

- 4.1. GİRİŞ
- 4.2. PRONE ÜST EKSTREMİTE PROGRESYONU
- 4.3. ÜST EKSTREMİTE BECERİLERİ
- 4.4. İNCE MOTOR BECERİ GELİŞİMİ
- 4.5. OMUZ KUŞAĞI
 - 4.5.1. Kuvvetlendirme
 - 4.5.2. Stabilite
- 4.6. DIRSEK
- 4.7. EL BECERİLERİ
 - 4.7.1. Kavrama ve Bırakma Aktiviteleri
- 4.8. ÜNİTE SONU
 - 4.8.1. Olgu Örneği 1
 - 4.8.2. Olgu Örneği 2

4.1. GİRİŞ

Üst ekstremitte omuz kompleksi ile başlar ve sternum, klavikula, kostalar, skapula ve humerusun mekanik olarak ilişkili olduğu eklemler sayesinde üst ekstremitte geniş bir hareket açıklığı sağlanır. Dirsek, el bileği ve el kompleksi ile üst ekstremitte becerileri günlük yaşam aktivitelerine özgü bir biçimde aktif olarak kullanılır. Mevcut pediatrik hastalıklarda üst ekstremitte problemlerinin varlığında fonksiyonel bozukluklar yaygın olarak gözlenmektedir. Güncel rehabilitasyon programları içerisinde artık pasif modaliteler temel unsur olarak düşünülmemekte ve terapötik egzersizlerden daha fazla yararlanılmaktadır. Yapılan tüm terapötik egzersizlerle kazanılan becerilerin günlük yaşam içine aktarılması, motor öğrenme prensiplerine dayandırılması ise en önemli konulardandır. Bu bölümde, üst ekstremitte becerilerini kazandırmak, ince motor becerilerini artırmak ve günlük yaşam aktivitelerini desteklemek amacıyla taşıyan aktivite ve egzersiz önerileri üzerinde durulacaktır.

4.2. PRONE ÜST EKSTREMİTE PROGRESYONU

Yenidoğan bir bebekte doğum sonrası ilk ay, tüm vücutta olduğu gibi üst ekstremitelerde de fizyolojik fleksiyon pozisyonu hâkimdir. Fizyolojik fleksiyonun azalmaya başlamasıyla birlikte prone pozisyonda pelvis yerle temas etmeye başlar. Fizyolojik fleksiyonun tamamen kaybolmasıyla bebek yüzüstü pozisyonda düz bir şekilde yatabilir. Bebeğin prone pozisyonda ön kollar üzerinde yükselmesi için pelvis stabilizasyonu, antigraviteye karşı başın kaldırılabilmesi, üst ekstremitelerin neonatal pozisyondan farklı hareket edebilmesi gerekir (Resim 4.1).

4.8.2. Olgu Örneği 2

12 yaşında sol unilateral Serebral Palsi (SP) tanılı kız çocuğu. Kaba Motor Sınıflama Sistemi (KMFSS) seviye 1, El Becerileri Sınıflama Sistemi (EBSS) seviye 2. 3 yaşından bu yana, haftada iki seans olmak üzere, bir rehabilitasyon merkezinde fizyoterapi ve rehabilitasyon eğitimi alıyor. Etkilenmeyen taraf ekstremite kas gücü ile karşılaştırıldığında omuz, dirsek çevresi ve ön kol kasları zayıf. Ön kol supinasyon yönünde hareket kısıtlılığı mevcut. Değerlendirmeler sonucunda üst ekstremite fizyoterapi ve rehabilitasyon programına serratus anterior, rhomboid, biceps brachii, brakialis, brakioradialis ve triceps kası kuvvetlendirme eğitimi, ön kol supinasyon germe egzersizleri dâhil ediliyor. Bunun yanında el bileği ekstansiyon ve fleksiyon yönünde dirençli kuvvetlendirme egzersizleri ve el becerilerine yönelik çocuğun yaşına uygun olan aktivite ve egzersizler uygulanıyor. Seansları daha eğlenceli hâle getirmek ve çocuğun katılımını artırmak amacıyla, üst ekstremite enduransını da artırmaya yönelik, basket topu, farklı büyüklükteki pilates toplarıyla farklı açılardan ve farklı hızlarda top atıp yakalama aktivitesi uygulanıyor. Kuvvetlendirme eğitimi için bölüm içeriğinde bulunan görsellerden yararlanılarak egzersiz programı oluşturuldu ve uygun ev programı önerisi verildi.

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ALT EKSTREMİTE EGZERSİZLERİ

Çağrı Muti, Sefa Karabulut

Kısa İçerik

- 5.1 GİRİŞ
- 5.2 NORMAL GELİŞİM SÜRECİNDE VE ALT EKSTREMİTE FONKSİYONEL BECERİLERİ
- 5.3 KALÇA ÇEVRESİNE YÖNELİK EGZERSİZLER
 - 5.3.1. Kalça Eklemi Gelişimi
 - 5.3.2. Kalça Çevresi Değerlendirme
 - 5.3.3. Kalça Dislokasyon Problemlerinin Değerlendirilmesi
 - 5.3.4. Kalça Problemi Olan Çocuklarda Kalça ve Pelvis Çevresine Yönelik Egzersiz Yaklaşımları
- 5.4 DİZ EKLEMİNE YÖNELİK EGZERSİZLER
 - 5.4.1. Diz Eklemine Gelişimi
 - 5.4.2. Diz Eklemi Problemlerinde Özel Değerlendirme Yöntemleri
 - 5.4.3. Diz Çevresine Yönelik Egzersiz Uygulamaları
- 5.5. AYAK- AYAK BİLEĞİ EKLEMİNE YÖNELİK EGZERSİZLER
 - 5.5.1. Ayak- Ayak Bileği Deformiteleri
 - 5.5.2. Ayak- Ayak Bileği Problemlerinde Özel Değerlendirme Yöntemleri
 - 5.5.3. Ayak- Ayak Bileği Eklemine Yönelik Egzersiz Yaklaşımları
- 5.6. AYAKTA DURMA
 - 5.6.1. Ayakta Durma Dengesini Geliştirmeye Yönelik Egzersizler
- 5.7. YÜRÜME EGZERSİZLERİ
 - 5.7.1. Görsel Yürüme Analizi
 - 5.7.2. Nörolojik Etkilenimli Çocuklarda Görülen Patolojik Yürüyüş Tipleri
 - 5.7.3. Yürüme Egzersizleri
- 5.8. ALT EKSTREMİTE CERRAHİ VE POSTOP REHABİLİTASYON PROTOKOLLERİ
 - 5.8.1. Kalçada Görülen Deformitelere Yönelik Uygulamalar ve Tedavi Protokolleri
 - 5.8.2. Kalça Cerrahileri ve Post-op Rehabilitasyon Protokolleri
 - 5.8.3. Diz Postop Rehabilitasyon Uygulamaları
 - 5.8.4. Diz Cerrahileri ve Post-op Rehabilitasyon Protokolleri
 - 5.8.5. Ayak- Ayak Bileğine Yönelik Cerrahiler ve Rehabilitasyon Protokolleri
- 5.9. OLGU ÖRNEKLERİ

5.1. GİRİŞ

Pediyatrik rehabilitasyonda alt ekstremiteye yönelik egzersizler gerek ailelerin beklentileri gerekse fizyoterapistin bakış açısına göre rehabilitasyonun önemli bir kısmını kaplar. Günümüz pediyatrik rehabilitasyonunda fonksiyonel egzersizler daha önem kazanmaktadır. Ancak fonksiyonel bir beceriyi elde etmek için bölgeye veya soruna yönelik özel çalışılması gerekliliği de unutulmamalıdır.

Pediyatrik rehabilitasyonda egzersiz programı çizmek için olmazsa olmaz parametrelerden birisi de iyi bir gözlem ve ayrıntılı değerlendirmedir. Fizyoterapistte başvuran çocuk hastanın tek bir değerlendirme ile tedavi edilmesi yanıltıcı sonuçlara neden olabilmektedir. Bu nedenle değerlendirmeler mümkün olduğunca tekrarlanmalı ve yeni gözlemler not edilerek terapi planı elde edilen bulgular doğrultusunda yeniden gözden geçirilmeli ve güncellenmelidir.

5.9 OLGU ÖRNEKLERİ

5.9.1 Örnek 1

2 yaşında kuadriparezi SP olan hastamızın Kaba Motor Fonksiyon Sınıflama Sistemi'ne göre (KMFSS) skoru 5 olarak belirlendi. Sezeryan doğumla 2000 gr olarak doğmuştur. Doğumdan sonraki erken ilk haftalarda gece gündüz ağlaması olan huzursuz bir bebekmiş. Yapılan değerlendirmelerde, gövde ve baş kontrolünün olmadığı gözlemlendi. Alt ekstremitelerde özellikle adduktor kas grubunda Modifiye ashworth Skalasına göre (MAS) 2 değerinde spastisite saptandı. 3 ay boyunca haftada 2 seans olacak şekilde tıp merkezimizde takibe alındı. Diğer günlerde ev egzersizleri verildi.

Egzersiz topu üzerinde gövde çalışmaları yüzüstü pozisyonda baş kontrolü çalışmaları, destekli ayakta durma ve adduktor kas grubu için aktif dinamik germe egzersizleri yapıldı. 3 ay sonunda baş kontrolünün sağlandığı kısa süre de olsa oturmada durabildiği gözlemlendi.

5.9.2 Örnek 2

36 haftalık erken doğum ile 2200 g olarak dünyaya gelen Efe doğum sonrasında 20 gün küvezde kalmıştır. 1 yaşında diparetik SP tanısı konmuştur. Tanı konduktan sonra fizyoterapi ve rehabilitasyon programında başlamıştır. 2 yaşında alt ekstremitede çoklu seviye botulinum toksin Tip A uygulaması yapılmış, 4 yaş civarında da bağımsız yürümeye başlamıştır. 7 yaşında, bilateral gastrosoleus kaslarından gevşetme cerrahisi olmuştur.

Şu anda 9 yaşında olan hastamızın yapılan değerlendirmesinde bağımsız ayakta durabildiği, 400 metre kadar yürüebildiği gözlenmektedir. Yapılan görsel yürüme analizinde erken topuk kalkışı ve dizlerde hafif bükük diz yürüyüşünün olduğu kaydedilmiştir. Aynı zamanda sağ alt ekstremitte internal rotasyon pozisyonundadır. 10 cm yükseklikteki basamağa desteksiz çıkamamaktadır. Değerlendirme sonucunda, fizyoterapi programı şu şekilde düzenlenmiştir: dorsi fleksiyon yönünde dinamik germe egzersizleri, dorsi fleksör kasları kuvvetlendirme, bağımsız ayakta dururken denge ve stabilizasyon egzersizleri, farklı zeminlerde yürüme egzersizleri, 5 cm yükseklikteki basamakta desteksiz adım alma çalışmaları, duyu minderi ve bosu topuyla proprioseptif duyu çalışmaları, destekli merdiven inme çıkma

çalışmaları, erken topuk kalkışı için çift aşamalı eklemli AFO önerilerek çocuk ortopedistinden konsültasyon istenmiştir.

5.9.3 Örnek 3

Doğum öyküsünde normal doğum, normal ağırlık ve zamanında doğumla dünyaya gelen hastamızın 10-11 ay civarında hareketlerinin yavaş olduğunun fark edilmesi üzerine doktora başvurulmuş ve yapılan tetkiklerde, 1 yaşında metabolik sendrom tanısı almıştır. 1.5 yaşından beri fizyoterapi ve rehabilitasyon programına devam eden hastamız şu anda 2.5 yaşındadır. Yapılan değerlendirmede, tonus artışının olmadığı belirlenmiştir. Bağımsız oturabilmekte ve destekli yürüebildiği, bağımsız ayakta durma süresinin de 30 sn kadar olduğu kaydedilmiştir. 2 ay boyunca haftada 2 seans fizyoterapi ve rehabilitasyon programına alınan hastanın, özellikle ayakta durma dengesini artırmaya yönelik farklı zeminlerde durma çalışmaları, destekli-desteksiz yürüme çalışmaları, adım alma sıralama çalışmaları gerçekleştirilmiştir. Tedaviden 2 ay sonra 15 adım desteksiz yürüebildiği ve 3 dk.ya kadar bağımsız ayakta durduğu gözlenmiştir.

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DUYUSAL ENTEGRASYON

Esra Cömert

Kısa İçerik

- 6.1. GİRİŞ
 - 6.2. DUYUSAL ENTEGRASYON NEDİR?
 - 6.3. VESTİBÜLER SİSTEM
 - 6.4. PROPRIYOSEPTİF SİSTEM
 - 6.5. TAKTİL SİSTEM
 - 6.6. VESTİBÜLER SİSTEM AKTİVİTE ÖNERİLERİ
 - 6.7. MOTOR PLANLAMA -PRAKSİS AKTİVİTE ÖNERİLERİ
 - 6.8. TAKTİL SİSTEM AKTİVİTE ÖNERİLERİ
 - 6.9. BÖLÜM SONU
- Vaka Örneği -1
Vaka Örneği -2

6.1. GİRİŞ

Duyusal entegrasyon vücuttan ve çevreden alınan duyu bilgilerin işlenmesi, bütünlenmesi ve organize edilmesidir. Duyu bütünleme teorisi ilk kez 1972 yılında Amerikalı bir ergoterapist olan A.J. Ayres tarafından ortaya atılmıştır.

Anne karnından itibaren duyular aktif olarak gelişmeye başlar. İlk olarak kalp atışının duyulmasıyla birlikte intereseptif (içten gelen) duyu aktif hâle gelir. Embriyonun olgunlaşmasıyla birlikte dokunma (taktil), işitme ve vestibüler sistem gebeliğin beşinci haftasından itibaren gelişmeye başlar. Ancak vestibüler sistemin gelişmesi işitme sistemine göre daha hızlıdır. Bebeğin anne karnında hareket etmesiyle birlikte propriyoseptif sistem olgunlaşmaya başlar. Hamilelik süresince anne rahminde amniyon sıvısının verdiği baskı ve rahim duvarından aldıkları uyarı ile dokunma, propriyoseptif ve vestibüler sistem gelişmeye devam eder. Görme sistemi, 6. ile 20. hafta arasında şekillenir ancak uterusun karanlık ortamında aktif değildir. Prematüre doğan bebeklerde bu gelişimsel süreç, doğum haftası, kilosu ve küvözde geçirilen sürece bağlı olmakla birlikte sekteye uğrar.

Anne karnında, vestibüler, propriyoseptif ve taktil duyu ön planda gelişmeye devam ediyorken; yenidoğan yoğun bakım ünitesinde zaman geçiren bebeklerde görme ve işitsel duyuların gelişimi daha ön plandadır. Anne karnında gelişim için temel oluşturan ve bebek doğduktan sonra 12. aya kadar devam eden primitif refleksler daha çok vestibüler, propriyoseptif ve taktil uyaran temellidir. Primitif refleksler, dışsal bir uyarana karşı verilen istemsiz ve hızlı cevaplardır. Bebek, ritmik hareketler yaptıkça bu refleksler inhibe olur (veya değişime uğrayarak yerini kalıcı denge ve

VAKA ÖRNEĞİ-2

D.B. 1 yaş 7 aylık. Ebeveynleri dışındaki kişilerin ona yaklaşmasından çok hoşlanmıyor. Uykuya geçişte çok zorlanıyor ve gün içerisinde de uyku süresi yaşına uygun süreden daha kısa olarak gerçekleşmektedir. Sadece anne göğsünü emerek ve ayakta belli bir ritimde sallanarak uykuya geçiyor. Geceleri çok sık uyanıyor. Anne D. B.'nin ev içerisinde sandalyeye tırmanma, koltuğa çıkma gibi aktivitelerden kaçınan genel olarak sakin bir çocuk olmasına karşın oyun grubunda yaşlılarıyla birlikte hareketli ve dokunsal uyararı içeren aktivitelerde huzursuz olduğunu, etraftan gelen beklenmedik yüksek seslerden tedirgin olduğunu, ağladığını veya sakinleşmek için annesine sarılma ihtiyacı duyduğunu ifade edilmektedir. Beslenme sürecinde erken bebeklikte ilk ek gıdaya geçişte besin çeşitliliğinin daha fazla olmasına karşın beslenme rutinlerinin daha zor gerçekleştiği ve belirli tat ve dokudaki yiyecekleri tercih ettiği belirtiliyor.

VAKA ANALİZİ: Yapılan değerlendirmede, 11 aylık olduğunda çok kısa süre emekleyip 1 yaş civarında bağımsız yürümeye geçmesine karşın hâlâ denge reaksiyonlarının yeterli olmadığı sıklıkla düştüğü ve kendini yerden kaldırmakta zorlandığı gözlemlenmiştir. Bebeklerde Duyusal Fonksiyon Testi sonuçlarına göre, dokunsal derin basınca, uyumsal motor fonksiyonlarda, görsel dokunsal entegrasyonda ve oküler motor kontrol parametrelerinde yetersiz, vestibüler uyarana tepki parametresinde ise normal olarak değerlendirilmiştir. Ancak baş pozisyonunun değiştiği ve yoğun vestibüler uyararı içeren aktivitelerden kaçındığı gözlemlenmiştir.

Yapılan gözlem ve değerlendirme sonuçlarına göre D. B.'nin, primer olarak dokunsal ve propriyoseptif duyunun entegrasyonunda zorlandığı, bu durumun vücut farkındalığı gelişimini olumsuz etkilediği, buna bağlı olarak da motor planlama deneyimlerinin ve denge-düzeltilme reaksiyonları gelişiminin olumsuz etkilendiği ve yeni becerileri deneyimlemekten kaçındığı tespit edilmiştir. Elde edilen bütün bu bulguların, yaşlıları veya ebeveynleri dışında kişilerle de sosyal etkileşimde zorluklar yaşadığı ve/veya yaşayacağı şeklinde yorumlanmıştır. Uykuya geçişte ve sürdürmekte etraftan gelen dokunsal uyarıları filtrelemekte zorlandığı, bu durumda uyku kalitesinde zorluklara yol açtığı öngörülmüştür.

VAKA ÖRNEĞİ-2 – AKTİVİTE ÖNERİLERİ

- Vücut farkındalığı gelişimini destekleyecek oyun çadırı, tünel gibi düzenlemelerle içine girip çıkmasını teşvik etmek üzerine kurgulanacak oyunlar.
- Şişme yatak, sünger zemin gibi daha yoğun propriyoseptif ve taktil girdi alabileceği yüzeylerde yürüme, eğilip kalkma gibi aktiviteler.
- Bedenini farklı olarak konumlandırabileceği düzenlemelerde tırmanma aktiviteleri.
- Tüm bedene oyun ve şarkılar eşliğinde uygulanabilecek etkileşim temelli masaj.
- Büyük yastıklar veya pilates topuyla sıkıştırma aktiviteleri.
- Ağır ve büyük nesnelere taşıma, itip çekme.
- Dokunsal uyararı içeren oyunlar.
 - Top havuzunda gerçekleşecek oyunlar.

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DENGE VE STABİLİZASYON EGZERSİZLERİ

Fatma Uğur, Meral Sertel

Kısa İçerik

- 7.1. GİRİŞ
- 7.2. FARKLI TANI GRUPLARINDA DENGE VE STABİLİZASYON
 - 7.2.1. Serebral Palsi'de Denge ve Stabilizasyon
 - 7.2.2. Down Sendromu'nda Denge ve Stabilizasyon
 - 7.2.3. Gelişimsel Koordinasyon Bozukluğu'nda Denge ve Stabilizasyon
 - 7.2.4. İşitme Engelli Çocuklarda Denge ve Stabilizasyon
 - 7.2.5. Charcot Marie Tooth'ta Denge ve Stabilizasyon
 - 7.2.6. Otizm Spektrum Bozukluğu'nda Denge ve Stabilizasyon
- 7.3. DENGİYİ GELİŞTİRMEYE YÖNELİK EGZERSİZ ÖRNEKLERİ
 - 7.3.1. Denge ve Koordinasyon Bozukluğuna Özgü Spesifik Egzersizler
 - 7.3.1.1. Oturma Pozisyonu
 - 7.3.1.2. Emekleme Pozisyonu
 - 7.3.1.3. Köprü Kurma
 - 7.3.1.4. Dizüstü Pozisyon
 - 7.3.1.5. Yarım Dizüstü Pozisyon
 - 7.3.1.6. Destekli Ayakta Durma
 - 7.3.1.7. Sıralama
 - 7.3.1.8. Bağımsız Ayakta Durma
 - 7.3.1.9. Yürüyüş
 - 7.3.2. Diğer Denge ve Stabilizasyon Egzersiz Örnekleri
- 7.4. ÜNİTE SONU
 - 7.4.1. Olgu Örneği
 - 7.4.2. Olgu Örneği

7.1. GİRİŞ

Denge, genellikle vücudun kütle merkezini destek yüzeyi içinde tutma yeteneği olarak adlandırılır. Görsel, sensorimotor ve vestibüler reseptörlerden gelen duyu bilgilerin bütünleştirilmesi ve yeterli kas sinerjilerinin üretilmesi, kişilerin destek yüzeyi ve zeminin sabit kaldığı statik koşullar altında (örneğin ayakta durma) ve kütle merkezi ile destek yüzeyinin yer değiştirdiği dinamik koşullar altında (örneğin yürüme) dengeye ulaşmasını ve sürdürmesini sağlar. Shumway-Cook ve Woollacott'a göre denge; (1) statik sabit durum dengesi (ayakta/otururken sabit bir pozisyonu sürdürme), (2) dinamik sabit durum dengesi (yürürken sabit bir pozisyonu sürdürme), (3) proaktif denge (tahmini bir postüral bozukluğun beklentisi) ve (4) reaktif denge (önceden tahmin edilmeyen bir postüral bozukluğun kompensasyonu) olmak üzere 4'e ayrılır.

Tüm yaş gruplarında normal fonksiyon için denge gereklidir. Çocuklarda denge, ayrılmaz bir şekilde motor gelişim ve temel hareket becerileri ile bağlantılıdır. Dengenin gelişimi doğumdan itibaren başlar. Tipik olarak gelişen bebekler, ayakta

tekerlekli sandalyeyi kontrol etmekte güçlük yaşamaktadır. Bu durumun, çocuğun sosyal katılımını etkilediği gözlenmiştir.

Fizyoterapi programında ilk olarak, olgunun anormal pozisyonlarla karakterize düzgün olmayan duruşunun düzeltilmesi ve eklemlerinin doğru pozisyonlanması planlandı. Tonus regülasyonu için antagonist yöndeki hareketlerin artırılması ve normal hareketin fonksiyonel aktiviteler içerisinde öğretilmesi hedeflendi. Ayakları yer ile destekli oturma pozisyonunda eğitim verildi. Sakrum üzerine oturmanın engellenmesi ve iskiyal sekilere eşit ağırlık vererek düzgün oturmanın sağlanması için oturma yüzeyine üçgen kama yerleştirilerek olgu pozisyonlandı. Bu pozisyonda unilaterale ve bilateral fonksiyonel uzanma aktiviteleri çalışıldı. Ritmik hareketler kasılmayı azaltacağı için bir salıncak üzerine olgu sırtüstü pozisyonda yatırılarak öne-arkaya sallanma egzersizi yapıldı. Olgu egzersiz topuna oturtularak fizyoterapistin pelvisten uygulayacağı el teması ile öne-arkaya ve sağa-sola top hareket ettirilerek denge ve koruyucu reaksiyonların geliştirilmesi amaçlandı. Bu egzersizler sonrasında çocuğun oturma dengeinde iyileşme ve üst ekstremitelerde fonksiyonel hareketlerinde gelişme kaydedildi.

7.4.2. Olgu Örneği

16 yaşında erkek hasta, 11 yaşında yürümede zorlanma şikâyeti ile hastaneye başvurmuştur. Yapılan genetik test ve diğer tetkikler sonucunda Charcot-Marie-Tooth Tip 1A tanısı konmuştur. Annenin 4 hamileliğinden 2 canlı doğum gerçekleşmiştir. Kardeş sağlıklıdır. Ailede benzer rahatsızlığı olan biri olmamakla birlikte akraba evliliği bulunmamaktadır. Hastanın şikâyetleri yürümede denge kaybı ve takılıp düşmedir. Hastanın kilosu 52 kg, boyu 170 cm ve vücut kütle indeksi 19 kg/m² dir. Sağ ve sol ayak bileğinde 15° pasif dorsi fleksiyon limitasyonu vardır. Hamstring ve gastrocnemius kaslarında bilateral kısalık mevcuttur. Bir yıl önceki değerlendirmesi ile kıyaslandığında en belirgin postüral değişiklik omurga deformitesindeki artış olarak değerlendirilmiştir. Sol torakolomber C skolyozu mevcuttur. 6 dk yürüme testinde, yürüme mesafesi 440 m'dir. Pediatrik Berg Denge Skalası toplam skoru 48/56'dir. Duyu değerlendirmesinde Semmens Weinstein Duyu testi yapılmış ve bilateral S1 (Tibial ve sural sinirin distal dalı) dermatom alanlarında koruyucu duyunun azaldığı belirlenmiştir.

Hastanın değerlendirme sonuçlarına göre tedavi programında aşağıdakiler uygulandı:

- Hamstring ve gastrocnemius kaslarına germe egzersizleri verildi.
- Ortez yaklaşımları bakımından bilateral gece moldu önerildi. Ayrıca hasta yürüyüş moldu açısından değerlendirildi ve bilateral yürüyüş moldu önerildi.
- Alt ekstremitelerde ve üst ekstremitelerde distaline masaj ve duyu eğitimi yapıldı.
- Proprioseptif stimülasyonu sağlamak için farklı yüzeylerde yürüme eğitimi verildi ve düz çizgi üzerinde tandem, semi-tandem ve topuk üzerinde yürüme egzersizleri yapıldı.
- Ayakta durmada, ayaklar bitişik pozisyonda top atma ve tutma aktiviteleri, yerden top alıp atma gibi aktiviteler çalışıldı.
- Ayrıca gövde kaslarını ve ekstremitelerde distallerindeki kasları kuvvetlendirmek için Propriyoseptif Nöromusküler Fasilitasyon (PNF) tekniklerinden faydalanıldı.

Bu tedaviler sonucunda, hastanın tek ayak üzerinde durma süreleri artmış, Pediatrik Berg Denge skorunda iyileşmeler not edilmiştir. Duyu kaybının azaldığı tespit edilmiştir.

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PEDİATRİK REHABİLİTASYONDA KUVVETLENDİRME EĞİTİMİ VE EĞLENCELİ AKTİVİTELER

8

Duygu Korkem Yorulmaz, Saniye Aydoğan Arslan

Kısa İçerik

- 8.1. GİRİŞ
- 8.2. KUVVETLENDİRME EĞİTİMİ NASIL BELİRLENİR?
 - 8.2.1. Egzersizin Tipi
 - 8.2.2. Egzersizin Yoğunluğu ve Gücü
 - 8.2.3. Egzersizin Frekansı
 - 8.2.4. Egzersizin Süresi
- 8.3. KUVVETLENDİRME EGZERSİZ YAKLAŞIMLARI
 - 8.3.1. İzokinetik Kuvvetlendirme Egzersizleri
 - 8.3.2. İlerleyici Dirençli Egzersiz
 - 8.3.2.1. Ekipmanlar İle Yapılan İlerleyici Dirençli Egzersiz Örnekleri
 - 8.3.3. Bisiklet ve Yürüme Bandı Eğitimi
- 8.4. KUVVETLENDİRMEDE EĞLENCELİ AKTİVİTELER
 - 8.4.1. Sanal Gerçeklik
 - 8.4.2. Dans Terapi
 - 8.4.3. Trambolin Egzersizleri
 - 8.4.4. Akuatik Terapi
 - 8.4.5. Pilates Egzersizleri
 - 8.4.6. Rekreatif Aktiviteler
- 8.5. OLGU ÖRNEĞİ
- 8.6. ICF PARAMETRELERİ ÇERÇEVESİNDE KUVVETLENDİRME EĞİTİMİNE BAKIŞ: BİR SEREBRAL PALSİ ÖRNEĞİ

8.1. GİRİŞ

Son yıllarda, özellikle serebral palsi (SP) başta olmak üzere pediatrik rehabilitasyonda kas zayıflığı ve buna bağlı sorunların giderilebilmesi bakımından kuvvetlendirme eğitimine odaklanılmıştır. Pediatrik kronik hastalıklarda motor performans bozukluğunun temel nedenlerinin başında kas kuvveti gösterilmektedir. Birçok pediatrik kronik hastalıkta görülen kas zayıflığı; bozulmuş kas fizyolojisi, antagonist kasların yetersiz koaktivasyonu, sekonder miyopati veya yetersiz ya da azalmış motor ünite deşarjı ile bağlantılıdır. Motor becerilerini yeteri kadar gerçekleştiremeyen çocuklarda kas zayıflığı günlük yaşam aktivitelerini olumsuz yönde etkilemektedir. Dolayısı ile çocuğun sosyal katılımı ve fonksiyonel kapasitesi de azalmaktadır.

Bu bölümde, çocuklarda kuvvetlendirme eğitiminin önemi, kuvvetlendirme programları ile ilgili detaylar, kuvvetlendirme egzersiz örnekleri ve eğlenceli boş zaman aktiviteleri üzerinde durulacaktır.

8.2. KUVVETLENDİRME EĞİTİMİ NASIL BELİRLENİR?

“Ulusal Güç ve Kondisyon Derneği (National Strength and Conditioning Association-NSCA)” çocuklarda kuvvetlendirme eğitimine özel bir rehber geliştirmiştir. Bu

- Köprü kurma aktivitesi; bu çalışma ile kalça çevresi ekstansör kaslar kuvvetlenebilir.
- Üst ekstremitede bilateral aktivite kullanımını artırmak ve etkilenmiş ekstremitede omuz çevresi kasları kuvvetlendirmek adına tam taban teması ile oturma pozisyonunda ağırlıklı top atıp tutma aktivitesi yapılabilir.
- Etkilenen tarafta genel bir kuvvetlendirme ve elongasyon istiyorsak platform üzerinde ağırlık aktarma ve topa uzanma aktivitesi yapılabilir.

ÖNEMLİ!!! Bütün aktiviteler çocuğun motivasyonunu ve katılımını artıracak şekilde oyun içerisinde fonksiyonel olarak tasarlanmalıdır. Verilen uygulamalar örnek amaçlıdır. Amaca yönelik ve bireye özgü egzersizler çoğaltılabilir.

8.6. ICF PARAMETRELERİ ÇERÇEVESİNDE KUVVETLENDİRME EĞİTİMİNE BAKIŞ: BİR SEREBRAL PALSİ ÖRNEĞİ

Kuvvetlendirmenin pozitif ve negatif sonuçları, sağlık tanımı için çerçeve olan "İşlevsellik, Engel ve Sağlığın Uluslararası Sınıflandırılmasının" (ICF) kullanımıyla ele alınmıştır. Bu çerçevede, kişideki bozukluk, engeller, aktivite sınırlamaları ve katılım kısıtlamaları bakımından ele alınabilir. ICF tanımlarına göre, 5 bozukluk, vücut işlevi veya yapısında sapma veya kayıplardır, faaliyet sınırlamaları görevlerin veya eylemlerin yapılmasındaki güçlüklerdir ve katılım kısıtlamaları yaşam durumlarına ilgi ile ilintili sorunlardır. Bir kişinin işlevselliği ve engeli, çevre gibi içeriksel faktörler ile sağlık koşulu (bu durumda SP) arasındaki dinamik etkileşim olarak düşünülür.

Bozukluk: Kuvvet eğitiminin SP'li kişilerde spastisiteyi ve kontraktürleri artırdığı yönünde hiçbir deneysel kanıt yoktur. Klinisyenlerden bazıları, spastik SP'li kişilerin güçsüz olmadığını ve genellikle gözlemlenen işlevsel faaliyetlerin bozuk performansının asıl olarak spastisitenin bir sonucu olduğunu ileri sürmüştür. Klinik gözlemlere dayalı olarak, güç eğitimi ile ilgili olan artmış çabanın nörolojik hastalığı olan kişilerde spastisiteyi artıracığı ve bunun da artan kas ve eklem kontraktürlerine ve azalan motor fonksiyona yol açacağı hipotezi ileri sürülmüştür. Bu gö-

rüş, var olan literatürde desteklenmemiştir. Güç eğitiminin spastisite üzerindeki etkisini inceleyen çalışmalar, kuvvetlendirmenin spastisite üstünde hiçbir etkisi olmadığını veya hatta olasılıkla, spastisiteyi azaltabileceğini göstermiştir. Benzer şekilde kuvvetlendirme programlarının SP'li kişilerde ROM'u azaltacağı görüşünü destekleyen hiçbir kanıt yoktur. Aslında, kanıtlar, kuvvet eğitiminin özellikle alt ekstremitelerde ROM artışına yol açabileceğini ileri sürmektedir.

Faaliyet: Yapılan çalışmalar da bireylerin üst ekstremitede kaslarını hedefleyen bir kuvvet eğitim programını tamamlamalarından sonra Kaba Motor Fonksiyon Ölçümünün (KMFÖ) boyut D ve E'sinde önemli gelişmeler bulunmuştur. KMFÖ faaliyetlerinin bu kısımları, örneğin tek başına ayakta durma, oturmadan ayakta durmaya geçme, yürüme, koşma, tekmeleme, sıçrama ve basamaktan yukarı doğru ve aşağı doğru yürümeyi ölçer. Yürüme hızı ile ilgili yapılan bir çalışma da kuvvetlendirmeden sonra pozitif etki bulurken bir diğer çalışma da hiçbir değişiklik bulunamamıştır. Bu bulgu, bireysel gereksinimlere uygun hâle getirilen kuvvet eğitim programlarının, bireysel olmayan programlardan daha iyi işlevsel sonuçlara yol açabileceğini ileri sürmektedir. Ayrıca üst ekstremitede kuvvetlendirme egzersizleri, tekerlekli sandalyede olan SP'li çocukların performansını geliştirebilir.

Katılım: Kuvvet eğitiminin SP'li kişilerin sosyal katılımı üstüne etkilerini inceleyen çok az araştırma yapılmıştır. Ancak anekdot olarak, programın tamamlanmasında sonra katılımcıların bir kısmının, düzenli toplum egzersiz programına katılacak kadar kendilerine güvendikleri bildirilmiştir.

Bağlamsal Faktörler: Bağlamsal faktörler, güç eğitim programlarının etkilerini değerlendirmede önemli bir noktadır. En iyi programı uygulamak için, klinisyenlerin farklı çevre ve kişisel bağlamsal faktörlerin etkileri hakkında bilgiye gereksinimleri vardır. Bu bağlamsal faktörlerin önemine rağmen sağlam sonuç çıkarmak için daha fazla çalışmaya ihtiyaç vardır.

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RİSKLİ BEBEKLERDE FİZYOTERAPİ VE REHABİLİTASYON UYGULAMALARI

Ayşe Numanoğlu Akbaş, Elif Dilan Atılğan

Kısa İçerik

- 9.1. GİRİŞ
- 9.2. RİSKLİ BEBEK KAVRAMI
- 9.3. RİSKLİ BEBEKLERDE GÖRÜLEN DUYUSAL PROBLEMLER
 - 9.3.1. Taktil Duyu
 - 9.3.2. Vestibüler Duyu
 - 9.3.3. Koku ve Tat Duyusu
 - 9.3.4. İşitme
 - 9.3.5. Görme
- 9.4. RİSKLİ BEBEKLERDE DEĞERLENDİRME
 - 9.4.1. Değerlendirme ve Müdahale Ekibi
 - 9.4.2. Fizyoterapistin Roller ve Yetkinlikleri
 - 9.4.3. Ön Değerlendirme
 - 9.4.4. Postüral Kontrol ve Kas Tonusu
 - 9.4.5. Refleksler ve Anormal İşaretler
 - 9.4.6. Duyu Değerlendirmesi
 - 9.4.7. Motor Gelişim ve Gelişimsel Takip
- 9.5. RİSKLİ BEBEKLERDE ERKEN MÜDAHALE
 - 9.5.1. Yenidoğan Bireyselleştirilmiş Gelişimsel Bakım ve Değerlendirme Programı (NIDCAP)
 - 9.5.2. Aile Merkezli Bakım
 - 9.5.3. Kanguru Anne Bakımı
 - 9.5.4. Pozisyonlama
 - 9.5.5. Hareket Açıklığının ve Aktif Hareketin Artırılması
 - 9.5.6. Masaj Uygulaması
 - 9.5.7. Ağrıyı ve Stresi Azaltmak İçin Çevresel ve Davranışsal Stratejiler
 - 9.5.8. Motor Gelişimin Desteklenmesi

9.1. GİRİŞ

Bu bölümde, riskli bebeklere yönelik fizyoterapi değerlendirmeleri ve müdahaleleri özetlenmiştir. Bebeklere yönelik bakım planı dinamiktir, bebek büyüdükçe ve değiştikçe bakım planı da değişiklik göstermektedir. Fizyoterapistler, bebeğin durumunda değişiklik olup olmadığını, hedeflere ve sonuçlara ulaşıp ulaşılmadığını ve hedeflere ulaşmak için müdahale planında değişiklik gerekip gerekmediğini belirlemekle yükümlüdürler. Bu açıdan pediatrik fizyoterapistlerin bilgi birikimlerini artırmaları ve güncel gelişmeleri takip etmeleri önem arz etmektedir.

9.2. RİSKLİ BEBEK KAVRAMI

Riskli bebek; 37 haftadan erken doğan bebekler ile term (zamanında) dönemde doğan düşük doğum ağırlıklı bebekler başta olmak üzere nöro-motor gelişim açısından risk altında olan, sağlık uzmanlarının yakın gözetiminde bulunması gereken be-

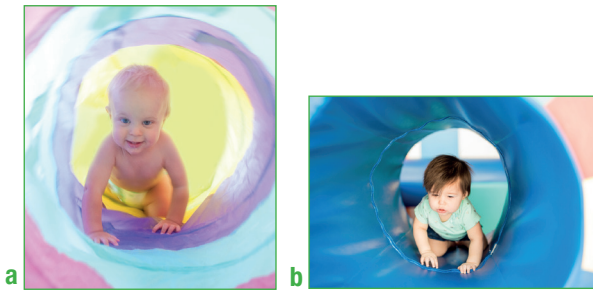
Önemli! Kısıtlandırılmış alanda çalışmak, bebeğe postüral kontrol becerilerini geliştirmek için iyi bir fırsat sunar.

Resim 9.44'te daha derin bir kutuda alan kısıtlaması kullanılarak bebeğin destekli ayakta durmayı deneyimlemesi gösterilmiştir. Bu şekilde bir düzenleme yapılması bebeğe hareketi kendisinin başlatabilmesi için bir fırsat sunar.



Resim 9.44. Ayakta durma için alan kısıtlaması

Alan sınırlamasından yararlanmak, motivasyonel amaçlarla da kullanılabilir. Örneğin yüzüstü pozisyona gelmeyi veya bu pozisyonu sürdürmeyi tercih etmeyen bir bebek bile tünelin içinden geçmeyi eğlenceli veya cezbedici bulabilir. Bu sayede yüzüstü kurulumlarda geçirilen vakit artırılabilir. Kısıtlı alan, görsel bir referans noktası sunduğu için kısıtlı alanın görsel duyusu etkilenen bebeklerde kullanımı ayrıca önemlidir (Resim 9.45 a ve b).



Resim 9.45. Kısıtlı alan bebeğe görsel bir referans noktası sunar., **9.45a.** Oyun tüneli içinde üst ekstremitelerde ağırlık taşıma., **9.45b.** Silindir rulo içinde üst ekstremitelerde ağırlık taşıma

Bu bölümde riskli bebek kavramı, riskli bebeklerde fizyoterapi değerlendirmeleri ve müdahaleleri özetlenmiştir. Bebeklerle çalışacak fizyoterapistlerin bilgi ve becerilerini güncel tutmaları elzemdir. Bu alanda çalışacak fizyoterapistlerin,

çok zor bir dönem geçiren kırılğan bebekler ve ailelerini en doğru şekilde yönlendirebilmeleri için iletişim becerilerini geliştirmeleri gerekmektedir.

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PEDİATRİK REHABİLİTASYON EKİPMANLARI VE ZENGİNLEŞTİRİLMİŞ ÇEVRE

Seda Ayaz Taş, Eylem Tütün Yümin

Kısa İçerik

10.1. GİRİŞ

- 10.1.1. Pozisyonlama Amacıyla Kullanılan Ekipmanlar
- 10.1.2. Duyusal Bütünlüğü Sağlamak ve Artırmak Amacıyla Kullanılan Materyaller
- 10.1.3. Teknoloji Destekli Rehabilitasyon Araçları
- 10.1.4. Kuvvetlendirme Amacıyla Kullanılan Ekipmanlar
- 10.1.5. Ayakta Durma ve Yürüme Yardımcıları
- 10.1.6. Giyilebilir Giysiler (Terapötik Giysiler)
- 10.1.7. Denge Ve Koordinasyon Amacıyla Kullanılan Ekipmanlar
- 10.1.8. El Becerilerini Desteklemek Amacıyla Kullanılan Araçlar

10.2. ZENGİNLEŞTİRİLMİŞ ÇEVRE

10.1. GİRİŞ

Rehabilitasyon süreci, oldukça karmaşık ve uzun solukludur. İstenilen hedeflere ulaşılabilmesi, multidisipliner ekibin bir arada çalışması ve dirsek temasının çok iyi olmasıyla mümkündür. Bu nedenle günümüzde rehabilitasyon yaklaşımları ekip yaklaşımı kavramı içinde ele alınmaktadır ve rehabilitasyonun başarısı için bu durum bir zorunluluktur. Çocuğa ve aileye ait özelliklerin, engel yaratan ya da yaratabilecek durumların her çocukta farklı tablolar oluşturması nedeniyle ilgili disiplinlerin rehabilitasyondaki rolleri de değişiklik göstermektedir. Bireysel tedavi planına veya bu kapsamda yer alan terapi planlarına, kesinlik kazanmış bir tanıdan sonra yapılan kapsamlı bir değerlendirmeden sonra karar verilmesi en doğru yaklaşımdır. Öncelikle ailenin beklentileri ve çocuğun ihtiyaçları ile birlikte çocukların çok yönlü terapi ihtiyaçlarının bütüncül değerlendirilmesi gerekmektedir. Bu değerlendirmeler aynı anda, ilgili uzman hekim, terapist ve ilgili sağlık profesyonellerinin bir arada olduğu bir ortamda, aile ve çocuğun ev, okul gibi yaşam alanlarının dikkatli gözlemlenmesiyle yapılmalıdır. Bireysel ve detaylı değerlendirmenin ardında sağlık profesyonelleri çocuk için en doğru hedefleri belirleyerek ortak görüş sunmalıdır. Bu şekliyle çocuk ve aile için en etkili bireysel terapi ve bakım programlarının belirlenmesi mümkün olabilmektedir.

Kronik engelli bireylerde, yardımcı cihaz ve ortez kullanımı gerek fiziksel fonksiyonların korunması gerekse günlük yaşam aktivitelerinin desteklenmesi ve yaşam kalitesinin artırılması bakımından rehabilitasyon ekibinin vazgeçilmez unsurlarıdır. Yardımcı cihaz kullanımının, sosyal etkileşim, motivasyon, öz güven, beceri kazanımı (yazı yazma), kognitif beceriler, dikkat süresinin artışı, problem çözme, akademik becerilerde ve üretkenlikte artış gibi birçok olumlu etkileri mevcuttur.

Bu bölümde, pediatrik rehabilitasyon uygulamaları sırasında yaygın olarak kullanılan ekipmanlar, kullanım alanları ve amaçlarından bahsedilecektir. Akış şeması, kullanım amaçlarına göre sıralanmıştır.

dengeğini koruması beklenmektedir. Bağımsız olarak destek yüzeyi içerisinde oturmada farklı yönlere ağırlık aktararak, keşfederek motor öğrenmeyi destekleyecektir.



Resim 10.30. Proksimal gelişim aralığında, uygun destekle oturma

Proksimal gelişim aralığı, çocuğun kendi potansiyelini ortaya çıkarabileceği aralıktır. Terapi- de planlanan aktiviteler, çocuğun proksimal gelişim aralığına göre olmalıdır. Yani ne çok zor ne de çok kolay olmalıdır. Çocuk, proksimal gelişim aralığı içinde ona sunulan ortamda aktif olarak hareket etmelidir. Terapist mümkün olduğunca, *hands off* durumunda (pasif) ama her zaman, iletişim ve etkileşim hâlinindedir. Kullanılan materyaller, her ortamda bulunabilen kullanışlı araçlardır. Resim 10.30'da bez kolileriyle oluşturulan ortamda oturma becerisini deneyimleyen bir çocuk görülmektedir. Terapist, çocuğa dokunmayıp hands off durumunda olup, çocuğun oturma becerisine aktif katılımını iletişim, etkileşim temelli oyunlar ve bez kolileriyle oluşturulmuş çevre düzenlemeleri ile sağlamaktadır.



Resim 10.31. Araba lastikleri ile oluşturulan ortamda sıralama ve uzanma becerisi

Ayakta durma, sıralama, yürüme gibi becerilerin gerçekleştirilmesi, başlangıçta çocuklar için etrafta destek yoksa oldukça zor olduğundan çocuklar oturmayı ve oturma pozisyonunda

kalçaları üzerinde hareket ederek bir yerden bir yere gitmeyi tercih edebilirler. Çocukları bu becerilere hazırlamak için Resim 10.31'de de iki araba lastiği içinde ayakta durma ve sıralama becerileri çalışılabilir. Böylece çocuk istediğinde destek alabileceği, performansını tam olarak sergileyebileceği uygun desteğe sahip olup beceriyi gerçekleştirecek, motivasyonu artacak ve motor öğrenme desteklenecektir. Resim 10.32'deki gibi oturma becerisinin farklı varyasyonları, oturmada uzanma becerileri, oturmada denge ve düzeltme reaksiyonlarının gelişimi ile birlikte gövde kaslarının güçlenmesi sağlanır. Resim 10.33'teki gibi oturmadan ayağa kalkma becerisi ile alt ekstremitte kas gücünün artırılması zenginleştirilmiş çevre ortamında desteklenmektedir.



Resim 10.32. Zenginleştirilmiş çevrede oturma becerisi varyasyonları



Resim 10.33. Zenginleştirilmiş çevre müdahalesinde oturmadan ayağa kalkma

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FARKLI HASTALIKLARDA SPOR VE REKREASYON AKTİVİTELERİ

Sezen Tezcan, Eylem Tütün Yümin

Kısa İçerik

- 11.1. GİRİŞ
- 11.2. ADAPTİF SPOR VE REKREASYONEL AKTİVİTELER
 - 11.2.1. Paralimpik Spor Branşları
- 11.3. FARKLI TANI GRUPLARINDA SPOR VE REKREASYON
 - 11.3.1. Serebral Palsili Bireylerde Spor ve Rekreatyonel Aktiviteler
 - 11.3.2. Spina Bifidalı Bireylerde Spor ve Rekreatyonel Aktiviteler
 - 11.3.3. Down Sendromlu Bireylerde Spor ve Rekreatyonel Aktiviteler
 - 11.3.4. Otizm Spektrum Bozukluğu Olan Bireylerde Spor ve Rekreatyonel Aktiviteler
 - 11.3.5. Duchenne Musküler Distrofili Bireylerde Spor ve Rekreatyonel Aktiviteler
- 11.4. PARALİMPİK SPORCU ÖRNEKLERİ
- 11.5. ÜNİTE SONU
 - 11.5.1. Olgu Örneği
 - 11.5.2. Olgu örneği
 - 11.5.3. Olgu örneği

11.1. GİRİŞ

Kronik engelli çocukların tipik gelişen sağlıklı yaşlılarına göre fiziksel aktivite düzeyleri düşüktür. Bu çocuklarda görülen motor, duyuşsal, bilişsel, dil, iletişim ve/veya sosyal becerilerdeki gecikmiş gelişim çocukların aktivitelere katılım kısıtlılıklarına neden olmaktadır.



Resim 11.1 Egzersiz ve rekreasyon amaçlı adaptif araç

Spor ve rekreasyonel aktiviteler, kişinin boş zamanlarında gerçekleştirdiği aktivitelerdir. Bu aktiviteler, özellikle kronik engelli bireylerde mobilite fonksiyonlarını

tivite olarak okçuluk sporunu yapmak istiyordu. Fizyoterapistin yönlendirmesi doğrultusunda aile evinin bahçesine bir hedef tahtası konumlandırılarak birey için uygun ekipmanları temin etmiştir. Fizyoterapist seanslarda alt ekstremiteler ile ilgili uygun rehabilitasyon yaklaşımları ile birlikte üst ekstremitelerin eklem hareket açıklığının korunması, kas kuvvetinin artırılmasına yönelik uygulamaları ve okçuluk sporunu yaparken çok önemli olan el göz koordinasyonunu artırmaya yönelik aktiviteleri de rehabilitasyon programına dâhil etmiştir. Birey çok istemesine rağmen gerek yaşadığı şehrin şartları gerek ailenin imkânları dâhilinde yarışa dayalı bu sporu yapamasa da evinin bahçesinde bu sporu yapmaktan çok mutlu olduğunu dile getirmiştir.

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KOGNİTİF VE ALGI REHABİLİTASYONU

Ceren Durmuş

Kısa İçerik

- 12.1. NÖROGELİŞİMSEL SORUNU OLAN ÇOCUKLAR İLE ÇALIŞIRKEN YAŞANABİLECEK SORUNLAR
- 12.2. İLETİŞİM BECERİLERİ
- 12.3. DİKKAT BECERİLERİNİ ARTIRMA
- 12.4. HAFIZA BECERİLERİ
- 12.5. ORGANİZASYONEL BECERİLER
- 12.6. MOTİVASYON
- 12.7. MAES TERAPİ NEDİR? (HAREKET ANALİZİ VE EĞİTİM STRATEJİLERİ)
- 12.8. ÜNİTE SONU
 - 12.8.1. Olgu Örneği
 - 12.8.2. Olgu Örneği
 - 12.8.3. Olgu Örneği
 - 12.8.4. Olgu Örneği

12.1. NÖROGELİŞİMSEL SORUNU OLAN ÇOCUKLAR İLE ÇALIŞIRKEN YAŞANABİLECEK SORUNLAR

Tipik gelişen çocuklar motor ve bilişsel görevleri gerçekleştirmek için deneme yanılma yöntemine başvururlar. Küçük bilim insanları gibi davranarak pek çok deney yaparlar. Hatalardan öğrenir ve her defasında değişiklikler yaparak tekrar denerler. Bunu yaparken net bir amaçları yokmuş gibi görünürler. Yapmak istedikleri ve yaptıkları, yaşadıkları deneyimden aldıkları haz kaynaklıdır. Nörogelişimsel problemleri olan çocuklarla çalışırken çoğunlukla karşılaşılan zorluklardan biri, tipik gelişen yaşlıları kadar araştırmacı davranmadıklarını gözlemlemektir. Bu durum çocukların hareket kapasiteleri, bilişsel kapasiteleri ve/veya bazı durumlarda da her ikisinin yetersiz olmasından kaynaklanabilmektedir.

Çocuğun keşfetme/öğrenme sürecindeki denemeleri tekrar tekrar başarısız olursa sonunda çocuk denemekten vazgeçecektir. Bu durumda, çocuğu denemeye ikna etmek gelişimini desteklemek bakımından oldukça önemlidir. İkna sürecinde, çocukları sözlü telkin ile ikna etmeye çalışmak genellikle başarısızlıkla sonuçlanabilmektedir. Böyle durumlarda, üzerinde durulması gereken nokta, çocuğun limitasyonu sebebiyle kendisine ilgi çekici gelmeyen durum ve olayları cazip hâle getirmektir.

Çocuktan yapması beklenen görevle ilgili olarak sözel yönergeler yetersiz kalacağından modelleyerek göstermek daha uygun olacaktır. Terapötik aktiviteyi, özellikle çocuğun bilişsel seviyesine uygun seçmek ve motor kapasitesine göre modifiye etmek gerekir. Örneğin nesne sürekliliği gelişmemiş bir vaka ile çalışırken materyalin görme alanından çıkmayacağı aktiviteler kullanmak önemlidir.

Terapist- “Hmm şimdi anladım, demek burası mutfak. Sizin evinizde bir banyo var mı?”

Çocuk- “Anne banyo neresi?”

Terapist- Çocuk ile göz teması sağlayarak “Sen neresinin banyo olmasını istersen orası banyo olacak. Mutfağı koyduğun gibi istediğin yeri seçebilirsin.”

Çocuk- 5 dakika boyunca, yaptığı evde mutfak ve banyodan sonra bir salon ve kendi odasını belirler. Daha sonra baba figürünü mutfağa, anneyi salona, kendisini ve abisini odaya yerleştirip sesini değiştirerek kendisini ve abisini konuşturur.

Terapist- Boşta kalan en küçük figürü alarak çocuğun okulda oyuncak için kavga ettiği arkadaşları Ilgaz rolünü oynar. Hayalî kapıyı çalar, sesini değiştirerek “ Tık tık tık. Merhaba, ben geldim, Ilgaz. Evde kimse var mı?”

Çocuk- Kendi figürü ile Ilgaz figürünün yanına gider. Hayalî kapıyı açarmış gibi yapar ve normal sesini kullanarak “Niye geldin sen?”

Terapist- “Seninle oynamaya geldim. Bana da oyuncak verir misin?”

Çocuk- Kendi figürü ile terapistin tuttuğu Ilgaz figürüne vurarak “Sana oyuncak yok, git burdan.”

Terapist- Normal sesi ile fısıldayarak “Ne istiyorsun? Ilgaz’a söyleyebilirsin ne istediğini.” Ilgaz figürünü çocuğun figürünün önüne koyar.

Çocuk- “Ilgaz, önce ben oynamak istiyorum.”

Terapist- Normal sesi ile “Sırayla mı oynayacaksınız?”

Çocuk- Sesini değiştirerek “Ilgaz, bu oyuncak benim o yüzden sıra bende.”

Terapist- Sesini değiştirerek “Ama ben şimdi oynamak istiyorum.”

Çocuk- Kendi figürü ile Ilgaz figürünü devirir ve terapiste bakar.

Terapist- Oyundan kopmadan Ilgaz figürünü düzelterek normal sesi ile “Ilgaz iyi misin? Kalkmana yardım edeyim, canın acımış olabilir.” Çocuğa bakarak “Sence Ilgaz’ın canı acımış mıdır?”

Çocuk- Elindeki figürü bırakır, aşağı bakarak normal sesi ile “Evet”

Terapist- Ilgaz figürünü eline alıp çocuğun göz hizasına getirir normal sesi ile “ Ilgaz’a bir şey söylemek ister misin?”

Çocuk- Figürünü eline alarak Ilgaz figürüne yaklaştırır sesini değiştirerek “Özür dilerim.”

Terapist- Terapist başıyla onaylayarak çocuğa gülümser “Ilgaz ile paylaşmak istediğin bir oyuncuğun var mı?”

Çocuk- Ilgaz figürünü terapistin elinden alarak salona koyar, odada abisi ile 2 dakika kadar daha oynadıktan sonra elinde birşey tutarmış gibi yapar ve elindekini hayali oyuncuğu Ilgaz figürünün önüne koyar, sesini değiştirerek “Ilgaz, al sana oyuncak.”

Terapist- Sesini değiştirerek “Yaşasın! Teşekkür ederim. ”

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OSTEOPATİ VE OSTEOPATİDE KRANİOSAKRAL TEDAVİ

Canan Turan

Kısa İçerik

- 13.1. Giriş
- 13.2. Osteopati ve Felsefesi
- 13.3. Osteopatinin Tanımı
 - 13.3.1. Osteopatinin Terapötik Prensipleri
- 13.4. Osteopatinin Dünyadaki Yeri ve Kullanım Alanı
- 13.5. Pediatrikte Osteopatinin Terapötik Etkisi
- 13.6. Osteopatide Kraniosakral Tedavi
 - 13.6.1. Beyni Saran Zarlar ve BOS
- 13.7. Literatürde Pediatrik Osteopati
- 13.8. Osteopatik Manuel Terapide Dokunmanın Rolü
- 13.9. Ünite Sonu
 - 13.9.1. Olgu sunumu 1
 - 13.9.2. Olgu sunumu 2

13.1. GİRİŞ

Osteopati, günümüzde, Dünya Sağlık Örgütü tarafından bilimsel teşhis ve tedavi yöntemi olarak kabul görmektedir. Bazı Avrupa ülkelerinde çok ciddi 6 yıllık eğitim programı karşılığında profesyoneller yetişmektedir. Ülkemizde de osteopatlar, çok ciddi bir eğitim sonrasında yetkinliğe sahip olarak mezun olmaktadır.

Osteopati tamamlayıcı tıp bilimi olarak birçok hastalığın teşhis ve tedavisinde kullanılmakla birlikte pediatri de yoğun bir şekilde kullanılabilir.

Bu bölümde; osteopatinin temeli ve felsefesi, dünyadaki yeri ve kullanım alanları, pediatrik rehabilitasyon alanında osteopatinin terapötik etkileri ve dokunmanın iyileşme süreçlerindeki etkilerinden bahsedilecektir.

13.2. OSTEOPATİ VE FELSEFESİ

Dr. Andrew Taylor Still 19. yüzyılın sonlarında üç çocuğunu menenjit nedeni ile kaybedince sağlık, hastalık ve hasta bakımı kavramları üzerine düşünmeye başlamıştır. Bu konular üzerine düşünürken yaşadığı zamanın dini ve felsefi akımlarından etkilendiği bilinmektedir. İnsan denilen varlığın, evren ve doğanın bir parçası olduğu, bu olgularla uyum içinde yaşadığında kendi kendini şifalandırma gücünün farkındalığına erişebileceğine vurgu yapan felsefeyle uyumlu bir tedavi şekli geliştirmek istemiştir. Mevcut tıbbi bilgisi ve insanın kendini şifalandırma gücü inancını birleştirerek yeni bir tedavi şekli geliştirmiştir. Bu tedavi şeklinin temel felsefesini, hastalık, sağlık ve hasta bakımı üzerinden tanımlamıştır.

seansına gelmektedir. Epileptik nöbetleri mevcuttur. Uzun yıllardır kabızlık şikâyeti bulunmaktadır. Hastaya haftada 3 defa lağman yapılmaktadır.

Değerlendirme sonucunda; mevcut diskinetik tabloya eşlik eden,

- Ağız ve dil hareketlerinde zayıf kontrol.
- Çiğneme fonksiyonunda kayıp.
- Annesi her besini yediğini ifade etmektedir.
- Baş ve gövde kontrolü yok.
- Thorakal vertebralar gergin ve hareket kısıtlılığı mevcut.
- Yoğun gelen ağız kokusu.
- Manuel bağırsak muayenesinde yoğun yapışıklıklar olduğu, tüm visseral yapıların birlikte hareket ettiği tespit edildi.

Değerlendirme bulguları sonrasında 3 aylık, haftada 3 kez OMT'nin yapılması öngörüldü. Yapılan uygulamalar aşağıda özetlendiği gibidir:

- Thorakal bölgede her seviye tek tek mobilize edildi.
- Kostalar her seviyede mobilize edildi.
- Her mobilizasyonun ardından baş ve gövde desteklenerek oturma pozisyonuna getirildi.
- Ağız hareketlerinin kontrolü için temporomandibular eklem ve bağlantılı yapılar mobilize edildi.
- Sırtüstü baş desteklenerek yatış pozisyonunda visseral yapılar tek tek mobilize edildi.

Üç ay süren tedavinin sonunda anne, son 3 haftadır lağman uygulanmadığını ifade etmiştir. Hasta aktif bir şekilde gayta boşaltımını kendi sağlayabiliyordu. Ağız kokusu kayboldu. Hastanın çevresine olan ilgi seviyesinde önemli bir artış ve göz kontağı ve göz takibinde önemli gelişmeler olduğu gözlemlendi. Oturma pozisyonuna gelme ve pozisyonu koruma becerilerinde kontrollü ve aktif hareketin arttığı belirlendi.

Unutmayalım! Beden; zihin, ruh ve çevre ile birlikte bir bütündür. İyi olma hâli bu bütünlüğün uyum içinde olabilmesi ile mümkündür.

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ÇOCUKLARDA HİPPOTERAPİ UYGULAMALARI

Hande Kaba, Fahri Cumhuri Elmacı

Kısa İçerik

- 14.1. GİRİŞ
- 14.2. HİPPOTERAPİ İLE İLGİLİ ÖNEMLİ TANIMLAR
 - 14.2.1. At Destekli Aktiviteler
 - 14.2.2. At Destekli Terapiler
 - 14.2.3. Terapötik Binicilik
 - 14.2.4. Hippoterapi
 - 14.2.5. At Destekli Psikoterapi
 - 14.2.6. At Yardımlı Öğrenme
- 14.3. TARİHÇE
- 14.4. HİPPOTERAPİ İLE İLGİLİ TEORİLER
 - 14.4.1. Dinamik Sistem Teorisi
 - 14.4.2. Duyusal Entegrasyon Teorisi
 - 14.4.3. Nöronal Grup Seçimi Teorisi
- 14.5. HİPPOTERAPİ TAKIMINDA YER ALAN ÜYELER
 - 14.5.1. Hippoterapi Takımında Yer Alan Üyelerin Görevleri
 - 14.5.1.1. Terapist
 - 14.5.1.2. At Tutucusu
 - 14.5.1.3. Yan Yürüyücüler
- 14.6. HİPPOTERAPİDE SEÇİLEN ATIN ÖZELLİKLERİ
 - 14.6.1. Postüral Parametreler
 - 14.6.1.1. Göğüs
 - 14.6.1.2. Ön Bacaklar ve Omuz
 - 14.6.1.3. Profil
 - 14.6.1.4. Yanlar
 - 14.6.1.5. Kalça
 - 14.6.1.6. Arka Bacaklar
 - 14.6.2. Yürüme Parametreleri
 - 14.6.3. Davranışsal Parametreler
- 14.7. HİPPOTERAPİDE TEDAVİ KOMPONENTLERİ
- 14.8. HİPPOTERAPİNİN ETKİLERİ
 - 14.8.1. Fiziksel Etkiler
 - 14.8.1.1. Kas Simetrisini Geliştirir
 - 14.8.1.2. Dengeyi Geliştirir
 - 14.8.1.3. Kas Kuvvetini Artırır
 - 14.8.1.4. Normal Eklem Hareket Açıklığını Artırır
 - 14.8.1.5. Baş ve Gövde Stabilesinde Artış Meydana Getirir
 - 14.8.1.6. Kaba Motor Fonksiyonu Geliştirir
 - 14.8.2. Psikolojik ve Sosyal Etkiler
- 14.9. HİPPOTERAPİ UYGULAMA SÜRESİ
- 14.10. HİPPOTERAPİ UYGULAMALARINDA ENDİKASYON VE KONTRAENDİKASYONLAR

dir. Otizm spektrum bozukluklarında vakaların %68'inde agresif davranışlar görülmektedir. Çalışmalar, atla yapılan terapilerin çocuklardaki agresif davranışlarda azalma gösterdiğini belirtmektedirler. Ancak burada çocuğun ata zarar verecek hareketlerde bulunuyor olmaması gerekmektedir. Bu tür davranışlar hem çocuğun güvenliği hem de atın konforu ve sağlığı açısından bir kontraendikasyon oluşturmaktadır. Otizm spektrum bozukluğu olan çocuklarda 12 hafta boyunca haftada bir yapılan tedavi ile adaptif davranışların ve sosyal katılımın arttığı görülmektedir. Ek olarak; problem çözme durumlarında daha kısa tepki süresi de hippoterapinin etkileri arasında gözlenmiştir. Bununla birlikte hippoterapinin uyumsuz davranışların düzelmesinde ve empati kurmada etki gösterdiği saptansa da sosyalleşme ve iletişimde belirgin bir düzelleme sağlamadığını belirten kanıtlar da bulunmaktadır.

Önemli! Agresif ve hırçın davranış sergileyen otizm spektrum bozukluğu olan çocuklarda çocuğun ata zarar verici davranışlar sergilememesi özellikle dikkat edilmesi gereken parametrelerdendir. Bu durum, hem çocuğun güvenliği hem de atın sağlık ve konforu açısından önemlidir.

14.9. HİPPOTERAPİ UYGULAMA SÜRESİ

Hippetoterapi seansları genel olarak toplamda 40-45 dk. olacak şekilde planlanmaktadır. Ancak tedaviye ilk başladığı dönemde bu süre 20-30 dk. olarak planlanabilir. Hippetoterapi uygulamaları, haftada 1 ya da 2 kez düzenli olarak devam ettiği rehabilitasyon programına ek olarak verilebilmektedir. Tedavinin toplam süresi 6-12 hafta arasında değişmektedir.

Kanıtlar yeterli olmasa da spastik tip serebral palsi tanısı almış bir çocuğa hippoterapi uygulamasının 4 yaş ve üzerinde başlanmasının uygun olduğu düşünülmektedir.

Uyarı! Yeterli kanıt olmasa da SP'li çocuklarda hippoterapi uygulamalarının 4 yaş ve sonrasında daha uygun olacağı belirtilmektedir.

14.10. HİPPOTERAPİ UYGULAMALARINDA ENDİKASYON VE KONTRAENDİKASYONLAR

Hippetoterapinin başarılı olabilmesi için uygun at seçimi kadar hastanın tedaviye uygunluğu

da büyük önem taşımaktadır. Bu nedenle hippoterapi yapacak sağlık profesyonellerinin endikasyon ve kontraendikasyonları iyi irdelemesi gerekir. Örneğin Down Sendromlu bir çocuk ile hippoterapi seansları yapılmak isteniyorsa öncesinde mutlaka atlantoaksiyal instabilite varlığı araştırılmalıdır. Böyle bir komplikasyonun varlığı hippoterapi seanslarında çocuk için hayati risk oluşturur. Çocuğun sahip olduğu hastalık endikasyon oluştursa da başka bir neden aynı hasta için kontraendikasyon oluşturabilmektedir. Örneğin serebral palsi hippoterapiden en fazla fayda gören hastalık grubudur. Ancak hastada açık yaralar bulunuyorsa bu çocuk hippoterapi için uygun olmayacaktır. Tablo 14.2.3'te endikasyon ve kontraendikasyon yaratan durumlar gösterilmiştir.

Tablo 14.2.3. Hippetoterapi uygulamalarında endikasyon ve kontraendikasyon yaratan durumlar

Endikasyonları	Kontraendikasyonları
Otizm	Kırılgan kemikler
Serebral palsi	Hemofili
İletişim problemleri	Hayvanlara karşı şiddet uygulama eğilimi
Serebrovasküler olay/inme	Kontrol edilemeyen epilepsi
Gelişim geriliği	Akut disk hernisi
Down sendromu	Atlantoaksiyal instabilite
Lisan problemleri	Koksartroz
Musküler distrofiler	Kalıcı kateterler
Spinal kord yaralanmaları	Ağırlığı taşıyan yüzey üzerinde açık yaralar
Multiple skleroz	Stabil olmayan spinal kord ve platinler
Travmatik beyin yaralanmaları	
İşitme bozukluğu	

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NÖROMUSKULER ELEKTRİK STİMÜLASYONU

Merve Kurt, Dilan Savaş, Tülay Tarsuslu

Kısa İçerik

- 15.1 GİRİŞ
- 15.2. NMES'İN PARAMETRELERİ
 - 15.2.1. Frekans
 - 15.2.2. Stimülasyon Frekansının Artırılması ve Azaltılması
 - 15.2.3. Atım Durasyonu/Genişliği
 - 15.2.4. Görev Döngüsü
 - 15.2.5. Amplitüd/Yoğunluk
 - 15.2.6. Elektrotların Yerleşimi
 - 15.2.7. Stimülasyon Dozajı
- 15.3. PEDIATRİK REHABİLİTASYONDA NMES
 - 15.3.1. Serebral Palsi ve NMES
 - 15.3.2. Obstetrik Brakiyal Pleksus Yaralanmaları ve NMES
 - 15.3.3. Pediatrik Spinal Kord Yaralanmaları ve Spina Bifida Rehabilitasyonunda NMES
 - 15.3.4. Pediatrik Nöromuskuler Hastalıklar ve NMES
- 15.4. ÜNİTE SONU
 - 15.4.1. Örnek Vaka

15.1. GİRİŞ

Elektrik stimülasyonu (ES) yeni bir teknik değildir. Tarihi, kas kasılmalarına neden olmak ve bir dizi fizyolojik tepki üretmek için ovuşturulmuş kehribar ve torpido balıklarını kullanan Eski Yunanlılara kadar uzanmaktadır. 18. ve 19. yüzyıllarda Volta ve Faraday'ın araştırmaları ile fizik alanındaki ilerlemeler ve Galvani ve Duchenne'in nörofizyolojik çalışmaları sonucu daha güvenilir, kontrol edilebilir elektrik kaynaklarının kullanımına kadar dayanmaktadır. İlerleyen dönemlerde ise denerve kasların, alternatif akıma yanıt vermediği, yalnızca doğru akım ile uyarılabildikleri tespit edilmiştir. Ancak serebral palsi (SP) ya da inme gibi üst motor nöron lezyonunun olduğu durumlarda, kas kasılmasının, sağlam bir motor nöronun alternatif bir akımla uyarılması ile sağlanabileceği görülmüştür.

ES, rehabilitasyon kliniklerinde ve araştırma laboratuvarlarında çok çeşitli koşulları tedavi etmek ve/veya değerlendirmek için yaygın olarak kullanılmaktadır. Rehabilitasyon uzmanları, ağrıyı azaltmak, kasları uyarmak, kas gücünü artırmak, eklem hareket açıklığını, ödemi azaltmak, atrofiyi önlemek ve hatta yaraların iyileşmesine yardımcı olmak için ES'den yararlanmaktadır. Pediatrik rehabilitasyonda en yaygın olarak kullanılan ES yöntemleri; nöromusküler elektriksel stimülasyon (NMES), fonksiyonel elektrik stimülasyonu (FES) ve eşik elektriksel stimülasyondur (EES).

NMES, yüzeysel iskelet kaslarında kas kasılmalarını tetiklemek için, kas içi sinir dallarının aktivasyonunu sağlayacak bir dizi aralıklı stimülasyonun uygulanmasını



Resim 15.1.3. Sağ taraf quadriceps femoris kasına yönelik NMES uygulaması



Resim 15.1.4. Sağ taraf tibialis anterior kasına yönelik NMES uygulaması

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SANAL GERÇEKLİK

Dilan Savaş, Merve Kurt, Tülay Tarsuslu Şimşek

Kısa İçerik

- 16.1. GİRİŞ
- 16.2. TANIM VE MEKANİZMA
- 146.3. PEDIATRİK REHABİLİTASYONDA SANAL GERÇEKLİK UYGULAMALARI
 - 16.3.1. Serebral Palsi ve Sanal Gerçeklik Uygulamaları
 - 16.3.2. Obstetrik Brakiyal Pleksus Yaralanmaları ve Sanal Gerçeklik Uygulamaları
 - 16.3.3. Down Sendromu Rehabilitasyonunda Sanal Gerçeklik Uygulamaları
 - 16.3.4. Pediatrik Nöromuskuler Hastalıklar ve Sanal Gerçeklik
- 16.4. ÜNİTE SONU
 - 16.4.1. Örnek Vaka

16.1. GİRİŞ

Teknolojik gelişmelerle birlikte diğer birçok alanda olduğu gibi sağlık alanında da yenilikçi ve teknolojik yaklaşımların kullanımı büyük artış göstermiştir. Geçmişte benzer problemler sebebiyle kaybedilen bebekler bu gelişmeler sayesinde kurtarılabilen, gelişebilecek sağlık sorunları önlenilebilmekte ve önemli toplumsal role sahip yetişkin bireyler olarak topluma kazandırılmaktadırlar. Bu bölümde, son yıllarda nörorehabilitasyon alanında yaygın olarak kullanılan; denge, postural kontrol ve yürüyüş üzerinde önemli katkıları olduğu vurgulanan sanal gerçeklik uygulamalarından bahsedilecektir.

16.2. TANIM VE MEKANİZMA

Sanal gerçeklik (SG), kullanıcılara gerçek dünyadaki nesnelere, olaylara benzeyen ve/veya benzer hissettiren ortamlara girme fırsatları sunmak amacıyla bilgisayar donanımı ve yazılımı ile oluşturulan etkileşimli simülasyonların kullanılması olarak tanımlanmaktadır. SG uygulamaları, kullanıcının hareketine yanıt veren simülasyonlar kullanarak işlevsel etkinlikler gerçekleştirilirken sanal bir ortamda etkileşim sağlamaktadır.

Nörorehabilitasyon ilkeleri, motor öğrenme ve beyin plastisitesini uyarmak için; yoğun tekrar ve uygulama dozu, göreve yönelik ve hedefe özel fonksiyonel eğitim, randomize değişkenler kullanma, yoğun duyuşsal uyarım ve artan zorluğu içermelidir. Sanal gerçeklik temelli motor rehabilitasyon, önemli bir öğrenme bileşeni olan performans hakkında anında hem duyuşsal hem de motor geri bildirim sağlayarak

için NMH'li çocuklarda SG uygulamaları ile ilgili daha fazla çalışma yapılmasına ihtiyaç duyulmaktadır.

16.4. ÜNİTE SONU

16.4.1. Örnek Vaka

7 yaşında, DMD tanılı hasta Brooke Üst Ekstremitte Fonksiyonel Sınıflandırmasına göre Seviye 1'de, Vignos Skalasına göre ise Seviye 3'te yer almaktaydı. Hastanın, Motor Fonksiyon Ölçümü 32 (MFM-32) toplam puan oranı %90,62 iken alt skorları sırasıyla D1: %79,48, D2: %100, D3: %95,23 şeklinde idi. Balance Master Sistemi kullanılarak yapılan denge değerlendirmesinde, dengenin kliniğe uyarlanmış duyuşsal etkileşim testinde (DKUDET) gövde salınım hızı gözler açık durumda 1,2 °/sn, gözler kapalı durumda ise 1,6 °/sn olarak kaydedildi. Stabilité limitleri testinde (SLT) ise reaksiyon zamanı 0,93 sn, hareket hızı 3,3 °/sn, yön kontrolü %40 olarak kaydedildi. Hand-held dinamometre ile yapılan kas kuvvet değerlendirmesi bulguları Tablo 16.2.1'de özetlendi. Hasta 4 yaşından itibaren haftanın 2 günü düzenli rehabilitasyon programına alınmakta, 1 günü de yüzmeye gitmektedir.

Tablo 16.2.1. SG öncesi kas kuvvet değerlendirme bulguları

Kas grubu	Sağ	Sol
Quadriceps Femoris	3,2	4,3
Tibialis Anterior	3,8	3,7
Hamstring	4,4	4,1
Gluteus Maksimus	4,7	4,5
Kalça Fleksörleri	4	3,7

Tedavi hedefleri; geleneksel fizyoterapi ve rehabilitasyon programına alınan hastanın motivasyonunu artırmak, yapılan çalışmalarda SG'nin etkinliği ile ilgili olarak belirtilen alanlarda kazanımlar sağlamak amacıyla fizyoterapi ve rehabilitasyon programına X-BOX Kinect sisteminin dâhil edilmesi planlanmıştır. Amaç, yorgunluk sınırı içerisinde oyun aktiviteleri ile kas kuvvet ve endüransı, denge parametrelerinde önemli kazanımlar elde etmektir.

Program dâhilinde hasta XBOX Kinect 360 kullanılarak haftada 3 kez 12 haftalık sanal gerçeklik eğitimine dâhil edildi. Her seans toplam 45 dakikadan oluşmakta idi. Ancak oyunlar arasında yorgunluk oluşturmamak için ara verilerek

toparlanma sağlandı ve çocuğun aktif olarak oyun oynadığı süre 30 dakika olarak belirlendi. Seçilen oyunlar hem alt hem de üst ekstremitelerin fonksiyonel kullanımını içerdi. Seçilen bazı oyunlar şu şekildeydi: sabit ve hareketli hedeflerin olduğu kaleye gol atma, kalede top kurtarma, bowling toplarını yuvarlama, plaj voleybolu, boks, uzun atlama, engelli koşu, üzerine atılan cisimlerden kaçma, akvaryumda oluşan çatlakları el ve ayaklar ile kapatma. Oyunlar seans süresini tamamlayacak şekilde farklı kombinasyonlar ile gerçekleştirildi.

Rehabilitasyon programı sonucunda yapılan değerlendirmede, hastanın Brooke veya Vignos Skalalarındaki seviyelerinde bir değişiklik tespit edilmedi. MFM-32 toplam puan oranı %96,87'ye yükselirken alt skorları sırasıyla D1: %94,87, D2: %100, D3: %95,23 şeklinde belirlendi. Balance Master Sistemi ile yapılan denge değerlendirmesinde, DKUDET'te gövde salınım hızı gözler açık durumda 1 °/sn'ye, gözler kapalı durumda ise 1,1 °/sn'ye düşüş gösterdi. SLT'de ise reaksiyon zamanı 0,39 sn, hareket hızı 3,6 °/sn, yön kontrolü %66 olarak kaydedildi. Kas kuvvet değerlendirmesi bulguları Tablo 16.2.2'de özetlendi.

Tablo 16.2.2. Tedavi sonrası kas kuvvet değerlendirme bulguları

Kas grubu	Sağ	Sol
Quadriceps Femoris	7,4	8,2
Tibialis Anterior	5,7	6,0
Hamstring	5,0	5,1
Gluteus Maksimus	7,0	6,5
Kalça Fleksörleri	6,8	7,9

Son değerlendirme verilerine göre, 12 haftalık eğitim sonrası hastanın fonksiyonel seviyesinde, alt ekstremitte kas kuvvetinde ve dengesinde gelişimler kaydedildi.

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İÇİNDEKİLER

YAZARLAR LİSTESİ	iii
ÖN SÖZ	vii
BÖLÜM 1 ADLİ PSİKOLOJİYE GİRİŞ	1
Giriş.....	1
1.1. Adli Psikolojinin Tarihçesi	1
1.2. Adli Psikolojinin Tanımı	3
1.3. Uygulamada ve Akademide Adli Psikologların Görevleri	4
1.4. Çalışma Alanları	7
1.4.1. Mağdura İlişkin Çalışmalar	7
1.4.2. Suç Davranışı ve Suçlu Rehabilitasyonu	8
1.4.3. Yasal Konular	9
Sonuç	10
Özet.....	11
Tartışma Soruları	11
Kaynakça	12
BÖLÜM 2 SUÇ VE ŞİDDET.....	15
Giriş.....	15
Ön Söz	15
2.1. Suç Kavramına Bakış	17
2.1.1. Suçun Tanımı	17
2.1.2. Suç Kavramının Menşei ve Tarihi Gelişimi	18
2.2. Suçu Açıklayan Etmenler.....	19
2.2.1. Suçun Nedenleri.....	20
2.2.1.1. Biyolojik Nedenler	20
2.2.1.2. Psikolojik Nedenler	22
2.2.1.3. Sosyal Nedenler	23
2.3. Günümüzde Suç Kavramı ve Hukuki Perspektif	25

2.4.	Suçun Kuramsal Altyapısı ve Suç Türleri	26
2.4.1.	Suç Kavramının Gelişimi Bağlamında Suç Kuramları.....	27
2.4.1.1.	Birey Eksenli Suç Kuramları	27
2.4.1.2.	Sosyal Etkileşim Kuramları	28
2.4.1.3.	Çevre Eksenli Suç Kuramları	28
2.4.1.4.	Çatışma ve Güç Eksenli Suç Kuramları	28
2.4.2.	Suç Davranışına İlişkin Psikoloji Kuramları.....	28
2.4.2.1.	Kişilik Kuramları Perspektifinden Suç Kavramı.....	28
2.4.2.2.	Öğrenme Kuramları Perspektifinden Suç Kavramı.....	31
2.4.2.3.	Bilişsel ve Sosyal Gelişim Kuramları Perspektifinden Suç Kavramı	32
2.5.	Şiddetin Tanımı	35
2.5.1.	Şiddetin Unsurları	36
2.6.	Şiddetin Türleri	37
2.6.1.	Fiziksel Şiddet	38
2.6.2.	Cinsel Şiddet	38
2.6.3.	Duygusal Şiddet	39
2.6.4.	Ekonomik Şiddet	39
2.6.5.	Siber (Dijital) Şiddet	40
2.7.	Şiddet Döngüsü	41
2.8.	Şiddetin Suç Penceresinden Görünümü	43
	Özet.....	44
	Tartışma Soruları	45
	Kaynakça	45
BÖLÜM 3	AİLE İÇİ ŞİDDET	51
	Giriş.....	51
3.1.	Aile İçi Şiddet Kavramı ve Tanımı.....	51
3.2.	Aile İçi Şiddetin Dünyadaki Yaygınlığı.....	53
3.3.	Aile İçi Şiddetin Türleri	54
3.3.1.	Duygusal/Psikolojik Şiddet.....	54
3.3.2.	Fiziksel Şiddet	55
3.3.3.	Cinsel Şiddet	55
3.3.4.	Ekonomik Şiddet.....	56
3.3.5.	Siber Şiddet.....	57
3.4.	Aile İçi Şiddetin Psikolojik ve Fiziksel Sonuçları.....	57
3.5.	Aile İçi Şiddeti Açıklayan Kuramlar.....	59
3.5.1.	Psikodinamik Kuramlar	59
3.5.1.1.	Nesne İlişkileri Kuramı.....	60
3.5.1.2.	Bağlanma Kuramı	61
3.5.1.3.	Travma Olarak Şiddet.....	61

3.5.2.	Sosyal Kuramlar	62
3.5.2.1.	Kontrol Kuramı	62
3.5.2.2.	Kaynak Kuramı	63
3.5.2.3.	Ekzosistem Faktör Kuramı	63
3.5.2.4.	Sosyal İzolasyon Kuramı	63
3.5.4.	Bilişsel/Davranışçı Kuramlar	64
3.5.4.1.	Sosyal Öğrenme Kuramı	64
3.5.4.2.	Davranışsal Genetik	65
3.5.4.3.	Reaktif Saldırganlık	65
3.5.4.4.	Öğrenilmiş Çaresizlik	66
3.5.5.	Aile ve Sistem Kuramları	66
3.5.5.1.	Aile Sistemleri Kuramı	66
3.5.5.2.	Aile Yaşam Döngüsü Kuramı	67
3.5.5.3.	Mikrosistem Faktör Kuramları	67
3.5.5.4.	Aile İçi Stres Teorisi	67
3.5.6.	Yapısal Sistem Sorunlarına Odaklanan Kuramlar	68
3.5.7.	Kültürel Kuramlar	70
3.5.7.1.	Feminist Kuram	70
3.6.	Risk Faktörleri ve Şiddetin Sürmesinin Nedenleri	70
3.6.1.	Çocukluk Çağında Aile İçi Şiddete Maruz Kalma ve Tanık Olma/Sosyoekonomik ve Sosyokültürel Etkenler	70
3.6.2.	Bireysel Özellikler	71
3.7.	Aile İçi Şiddette Mağdur ve Saldırgan Özellikleri	73
3.7.1.	Mağdur Özellikleri	73
	Sonuç	74
	Özet	74
	Tartışma Soruları	75
	Kaynakça	75
BÖLÜM 4	KADINLARDA ŞİDDET VE SUÇ DAVRANIŞLARI	81
	Ön Söz	81
	Giriş	82
4.1.	Kadın Suçluluğunun Demografik Özellikleri ve Türkiye'deki Durum	85
4.2.	Kadın Suçluluğunu Açıklayan Yaklaşımlar	88
4.2.1.	Evrimsel Psikoloji Bakış Açısıyla Kadınlarda Şiddet ve Suç Davranışları	88
4.2.2.	Gelişim Psikolojisi Bakış Açısıyla Cinsiyete göre Şiddet ve Antisosyal Davranışlar	89
4.2.3.	Feminist Kriminoloji Bakış Açısıyla Kadınlarda Şiddet ve Suç Davranışları	90

4.3.	Kadınlarda Mağduriyet-Suç Döngüsü	92
4.4.	Psikopatoloji, Kadın ve Suç	94
4.4.1.	Psikopati ve Kişilik Bozuklukları	95
4.4.2.	Travma Sonrası Stres Bozukluğu	96
4.4.3.	Madde Kötüye Kullanımı/Bağımlılığı.....	97
4.5.	Şiddet İçeren Suç Davranışları Gösteren Kadınların Tipolojileri.....	98
4.5.1.	Adam Öldürme ve Kendi Çocuğunu Öldürme (Filisid) Suçları	98
4.5.2.	Kadın ve Cinsel Suçlar	101
4.5.3.	Kadınlar ve Terör Suçu	102
4.6.	Suçta Yönelen Kadınların İhtiyaçları ve Tedavisi	103
	Sonuç	104
	Özet.....	105
	Tartışma Soruları	106
	Kaynakça	107
BÖLÜM 5	AİLE İÇİ ÇOCUK CİNSEL İSTİSMARI	119
	Giriş.....	119
5.1.	Çocukluk Dönemi Cinsel İstismarı	120
5.1.1.	Aile İçi Çocuk Cinsel İstismarı ve Ensest.....	121
5.1.2.	Aile İçi Çocuk Cinsel İstismarının Yaygınlığı.....	122
5.2.	Aile İçi Cinsel İstismarın Ortaya Çıktığı Ailelerin Özellikleri.....	124
5.2.1.	Baba (ya da Baba Figürü) Cinsel İstismarı	125
5.2.2.	Kardeş Cinsel İstismarı	128
5.3.	Aile İçi Çocuk Cinsel İstismarında Failin Özellikleri.....	132
5.4.	Aile İçi Çocuk Cinsel İstismarının Etkileri.....	134
5.4.1.	Cinsel İstismarın Çocuk ve Ergenlerin Psikolojik Sağlığı ile İlişkisi.....	136
5.4.2.	Cinsel İstismarın Çocuk ve Yetişkinlerin Cinsel Davranışları ile ilişkisi	138
5.4.3.	Cinsel İstismarın Yetişkinlerin Psikolojik Sağlığı ile ilişkisi..	139
5.5.	Cinsel İstismarın Adli Psikolojik Değerlendirmesi	140
	Sonuç	144
	Özet.....	145
	Tartışma Soruları	146
	Kaynakça	146
BÖLÜM 6	SUÇLU PROFİLLEME.....	157
	Giriş.....	157
6.1.	Suçlu Profillemenin Tarihçesi.....	158
6.2.	Suç Sınıflandırmaları ve Profilleme	161
6.3.	Suçlu Profillemede Temel Yaklaşımlar	163
6.4.	Suçlu Profilleme Basamakları.....	168

6.5.	Adli Bilimler ve Suçlu Profillemeye	172
6.6.	Suçlu Profillemeye Psikoloji Biliminin Katkıları	174
6.6.1.	Suç Motivasyonu.....	176
6.7.	Yasal Uygulamalarda Suçlu Profillemenin Rolü	176
6.8.	Suçlu Profillemeye Getirilen Eleştiriler	178
	Sonuç	180
	Kaynakça	181

BÖLÜM 7	CEZA ADALET SİSTEMİNDE ALKOL-MADDE KULLANIMI VE BOZUKLUKLARI	185
	Giriş.....	185
7.1.	Ceza Adalet Sisteminde Madde Kullanımı	186
7.2.	Madde Kullanımının Diğer Suçlarla İlişkisi	189
7.3.	Alkol-Madde Kullanımında ve Bağımlılığında Cezai ve Hukuki Ehliyet	191
7.4.	Alkol ya da Uyuşturucu/Uyarıcı Madde Etkisinde Araç Kullanımı....	194
7.5.	Aile İçi Şiddette Alkol ve Madde Kullanımının Rolü	196
7.6.	Alkol ve Madde Kullanımının Görgü Tanıklığı Belleğine Etkileri	198
7.7.	Rızası Olmadan Hastaneye Yatış	200
7.8.	Ceza Adalet Sisteminde Alkol ve Madde Kullanım Bozukluklarına Müdahale.....	201
	Sonuç	203
	Özet.....	204
	Tartışma Soruları	205
	Kaynakça	206

BÖLÜM 8	ÇOCUK VELAYETİ VE EBEVEYNLİK DEĞERLENDİRMELERİ	211
	Ön Söz	211
	Giriş.....	211
8.1.	Velayetin Tarihsel Süreci.....	212
8.2.	Velayetin Hukuki Boyutu	213
8.2.1.	Velayet Sürecinde Çocuk Hakları ve Çocuğun Yüksek Yararı.....	213
8.2.1.1.	Çocuk Hakları	213
8.2.1.2.	Çocuğun Yüksek Yararı	214
8.2.1.3.	Velayeti Alan ve Almayan Ebeveynin Hakları. 215	
8.3.	Velayetin Psikolojik Boyutu.....	217
8.3.1.	Velayetin Değerlendirilmesi.....	217
8.3.2.	Ebeveynle ve Çocukla Görüşmenin Önemi	218
8.3.3.	Görüşmede Kullanılan Ek Kaynaklar ve Kullanılan Ölçekler.....	221
	Sonuç	222

	Özet.....	223
	Kaynakça	224
BÖLÜM 9	YAŞILARDA ADLİ PSİKOLOJİK DEĞERLENDİRME VE UYGULAMALAR.....	227
	Giriş.....	227
	9.1. Yaşlı İhmal ve İstismarı.....	228
	9.1.1. Yaşlı İhmal ve İstismarı Türleri	229
	9.1.2. Yaşlı İhmal ve İstismarı İçin Risk Faktörleri	232
	9.1.3. Yaşlı İstismar ve İhmalinin Değerlendirilmesi	238
	9.2. Yaşlılarda Sık Rastlanan Adli Psikiyatrik Durumlar	239
	9.3. Yaşlılıkta Ceza Sorumluluğu ve Hukuki Sorumluluk	242
	9.4. Olgü Örnekleri ile Yaşlılarda Adli Psikolojik ve Psikiyatrik Değerlendirme	247
	9.4.1. Olgü-1	247
	9.4.2. Olgü-2	247
	9.4.3. Olgü-3	248
	Sonuç	248
	Özet.....	249
	Tartışma Soruları	249
	Kaynakça	249
BÖLÜM 10	CEZA İNFAZ HİZMETLERİNDE PSİKOLOJİ UYGULAMALARI	255
	Giriş.....	255
	10.1. İnfaz ve İyileştirme Sürecinde Hükümlü/Tutuklu Ruh Sağlığı ve Ceza İnfaz Kurumlarında Görülen Ruhsal Bozukluklar	255
	10.2. Ceza İnfaz Kurumlarında Yetişkinlere Yönelik Psikoloji Uygulamaları ve Psikologların Görevleri	258
	10.3. Ceza İnfaz Kurumlarında Suça Sürüklenen Çocuklarla İlgili İnfaz Hizmetleri ve Psikososyal Müdahaleler	269
	10.3.1. Çocuk Ceza İnfaz Kurumları	271
	10.3.2. Ceza İnfaz Kurumlarındaki Suça Sürüklenen Çocuklara Yönelik Psikososyal Müdahaleler.....	272
	10.4. Denetimli Serbestlik Müdürlüklerinde Yetişkinlere Yönelik Psikoloji Uygulamaları ve Psikologların Görevleri.....	274
	10.4.1. Denetimli Serbestlik Hizmetlerinin Kapsamı.....	275
	10.4.1.1. Denetimli Serbestlik Müdürlüklerinde Psikoloji Uygulamaları.....	277
	10.4.1.2. İyileştirme Çalışmaları Kapsamı	279
	10.4.1.3. Denetimli Serbestlik Müdürlüklerinde Uygulanan Müdahale Programları	279

10.4.2. Denetimli Serbestlik Müdürlüklerinde Suça Sürüklenen Çocuklarla İlgili İnfaz Hizmetleri ve Psikososyal Müdahaleler	281
10.5. Ceza İnfaz Kurumlarında Annesinin Yanında Kalan Çocuklar	284
10.6. İnfaz Hizmetlerinde Görevli Personelin Yaşadığı Zorluklar ve İş Birliği	287
Sonuç	288
Özet	289
Tartışma Soruları	290
Kaynakça	291

BÖLÜM 11

YENİDEN SUÇ İŞLEME VE RİSK VE İHTİYAÇ

DEĞERLENDİRMESİ	295
Giriş	295
11.1. Yeniden Suç İşleme	296
11.1.1. Risk Faktörleri	297
11.1.1.1. Dinamik ve Statik Risk Faktörleri	299
11.2. Risk ve İhtiyaç Değerlendirmesi	301
11.2.1. Yeniden Suç İşlemeyi Açıklayan Modeller	302
11.2.1.1. Risk-İhtiyaç ve Uygunluk Modeli	302
11.2.1.2. İyi Yaşam Modeli	303
11.2.2. Risk Değerlendirme Araçları	305
11.2.2.1. Dünyadaki Değerlendirme Araçları	305
11.2.2.2. Türkiye'deki Değerlendirme Araçları	307
11.2.2.3. Suça Sürüklenen Çocuklara Yönelik Risk ve İhtiyaç Değerlendirmesi	308
11.2.3. Yeniden Suç İşlemeyi Önlemeye Yönelik Müdahaleler	309
11.2.3.1. Ceza İnfaz Kurumlarında Yapılan Çalışmalar ..	311
11.2.3.2. Denetimli Serbestlik Müdürlüklerinde Yapılan Çalışmalar	312
Sonuç	314
Özet	314
Tartışma Soruları	316
Kaynakça	317

BÖLÜM 12

ÇOCUĞA YÖNELİK KÖTÜ MUAMELE VE MÜDAHALE

YAKLAŞIMLARI	321
Giriş	321
12.1. Çocuğa Yönelik Kötü Muamele Türleri	322
12.1.1. Çocuk İhmali	322
12.1.2. Çocuk İstismarı	324
12.2. Çocuğa Yönelik Kötü Muamelede Risk Faktörleri	326

12.3. Çocuğa Yönelik Kötü Muameleye Müdahale Yaklaşımları	327
12.3.1. Adli Bildirim	328
12.3.2. Koruyucu ve Destekleyici Tedbirler	331
12.3.3. Adli Görüşme	332
12.3.4. Sağlıkla İlgili Müdahaleler	335
12.3.4.1. Tıbbi Bakım.....	336
12.3.4.2. Ruh Sağlığı	339
12.3.5. Aileye Yönelik Müdahaleler	341
Sonuç	344
Özet.....	346
Tartışma Soruları	347
Kaynakça	349

BÖLÜM 13

GÖRGÜ TANIKLIĞININ GÜVENİLİRLİĞİNİ ETKİLEYEN

PSİKOLOJİK FAKTÖRLER	355
Ön Söz	355
Giriş.....	355
13.1. Temel Kavramlar	357
13.2. Görgü Tanıklığının Güvenilirliği	358
13.3. Görgü Tanıklığının Güvenilirliğini Etkileyen Psikolojik Faktörler	358
13.2.1.1. Anksiyete (Kaygı)/Stres	358
13.2.1.2. Stern'in Katkıları.....	359
13.2.1.3. Deffenbacher'in Katkıları	359
13.2.1.4. Clifford ve Scott'un Katkıları	360
13.2.2. Yeniden Yapılandırıcı Hafıza (Reconstructive Memory).....	361
13.2.2.1. Barlett'in Katkıları	361
13.2.2.2. Allport ve Postman'ın Katkıları.....	362
13.2.2.3. Schrenck-Notzing'in Katkıları	363
13.2.3. Silah Odağı Etkisi (Weapon Focus Effect)	364
13.2.3.1. Loftus, Loftus ve Messo'nun Katkıları	364
13.2.3.2. Carlson ve Arkadaşlarının Katkıları.....	365
13.2.4. Yönlendirici Sorular.....	366
13.2.4.1. Loftus'un Katkıları	366
Sonuç	367
Özet.....	368
Tartışma Soruları	370
Kaynakça	370

BÖLÜM 14

MAĞDURİYET PSİKOLOJİSİ

Giriş.....	375
14.1. Mağdurbilim (Viktimoloji).....	375
14.1.1. Mağdurbilim Kuramları.....	378
14.1.1.1. Yaşam Tarzı Kuramı.....	378

	14.1.1.2.	Rutin Aktiviteler Kuramı.....	378
	14.1.1.3.	Fırsatlar Kuramı.....	378
	14.1.1.4.	Kırık Camlar Kuramı.....	379
	14.1.1.5.	Rasyonel Seçim Kuramı.....	379
	14.2.	Mağdur Tanımı ve Mağdur Hakları.....	380
	14.3.	Psikoloji Perspektifinden Suç Mağduriyetine Yaklaşım.....	382
	14.3.1.	Mağdurlar ile Çalışmada Psikoloğun Görev ve Sorumlulukları.....	383
	14.3.2.	Suç Mağduriyetine Yönelik Riskli ve Kırılgan Gruplar.....	386
	14.3.3.	Suç Korkusu.....	387
	Sonuç		388
	Özet		389
	Tartışma Soruları		389
	Kaynakça		389
BÖLÜM 15	ADLİ GÖRÜŞME VE ETİK		393
	Ön Söz		393
	Giriş		393
	15.1.	Adli Görüşme.....	395
	15.1.1.	Hukuk Yargılamaları Kapsamında Yapılan Adli Görüşmeler.....	395
	15.1.2.	Ceza Yargılamaları Kapsamında Yapılan Adli Görüşmeler.....	396
	15.1.3.	Teknik Görüşmeler.....	397
	15.2.	Adli Görüşmenin Amacı.....	398
	15.3.	Adli ve Klinik Görüşmelerin Farkları.....	398
	15.3.1.	Adli Görüşmenin Yapılandırılması.....	399
	15.3.2.	Adli Görüşmede Kayıt Tutma.....	401
	15.3.3.	Adli Görüşmede Etik İlkeler.....	401
	15.4.	Uygulamalar.....	403
	Sonuç		403
	Özet		403
	Anahtar Kelimeler		404
	Tartışma Soruları		404
	Kaynakça		405
BÖLÜM 16	ADLİ PSİKOLOJİDE BİLİRKİŞİLİK VE ADLİ RAPOR HAZIRLAMA		407
	Giriş		407
	Ön Söz		407
	16.1.	Bilirkişilik.....	408
	16.1.1.	Bilirkişi Olma Süreci.....	411
	16.1.2.	Bilirkişi Görüşünün Sunulması.....	412
	16.1.3.	Bilirkişi Raporunda Yer Alması Gereken Unsurlar.....	415
	16.2.	Adalet Sisteminde Psikolog Bilirkişiler.....	416

16.3. Adalet Sisteminde Psikolog Bilirkiřilerin Hazırladıđı Raporlar.....	417
16.3.1. Sosyal İnceleme Raporları (SİR)	417
16.3.2. Adli Görüşme Raporu.....	421
Sonuç	427
Özet.....	427
Anahtar Kelimeler.....	427
Tartışma Soruları	427
Kaynakça	428
YAZAR ÖZ GEÇMİŐLERİ.....	431

BÖLÜM 1

ADLI PSİKOLOJİYE GİRİŞ

Gökçe Baykuzu Gündüz - Gülsen Erden

Giriş

Psikoloji birçok bilimsel kuram ve kuramcının temsil ettiği, laboratuvarlarda ya da gerçek hayatta araştırmalara ve araştırmacılara kaynak sağlayan farklı çalışma alanları ile geniş bir yelpazeye sahip bir bilim alanıdır. Bilim dünyasının bir adım ötesinde yıllar boyu yerli ve yabancı popüler medya kanallarında ve edebiyatta psikolog temsilleri genellikle psikoterapist olarak karşımıza çıkmıştır. Öte yandan en az psikoterapistlik kadar dikkat çekici bir diğer temsil ise kriminal dizilerde gördüğümüz suçlu profileme uzmanları ya da dram yapımlarında velayet değerlendirmesi yapan psikologlar olmuştur. Bu temsiller farklı rolleri ile adli psikolojinin medyadaki yansıması olarak sunulmuştur. Her ne kadar psikolojinin ve özelden adli psikolojinin tanıtılmasına katkı sağlamış olsa da medyanın dikkat çektiği bu temsillerden farklı olarak, gerçek hayatta adli psikoloji hem araştırma hem de uygulama alanları ile çok daha teknik, kurallara bağlı, kuramsal temelleri olan, içgüdüsellikten uzak, bilimsel ve kanıta dayalı olarak tanımlanan bir psikoloji alt alanıdır. Adli psikologluk da adli psikoloji alanının gerektirdiği bilimsel yeterlik ve yetkinliğin lisans eğitimi üzerine alınan lisansüstü eğitimlerle tanımlanan bir ünvanıdır.

1.1. Adli Psikolojinin Tarihçesi

Adli psikolojinin tarihsel anlamda ortaya çıkışına, günümüzde uygulama ve araştırma açısından popüler olan konularına bakıldığında, sıklıkla, hukuk ve adalet sisteminin ihtiyaç duyduğu noktalarda sahneye çıktığı görülmektedir.

Tarihsel olarak bakıldığında adli psikolojiye dair en erken uygulamalar 19. yüzyılın sonları ve 20. yüzyılın başlarına kadar takip edilebilmektedir. Özellikle suç davranışının kuramsal temelinde adli psikolojiyle ortak yönleri olan kriminolojinin (suç bilimi) kurucusu olarak kabul edilen Cesare Lombroso'nun çalışması, ilk dönem çalışmaları-

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BÖLÜM 2

SUÇ VE ŞİDDET

Çiğdem Ünlü Çeber

Giriş

Campanella'nın *Güneş Ülkesi*, Platon'un *Devlet* ya da Thomas More'un *Düş Ülkesi* (*Ütopya*) yapıtlarının dışında suç davranışının görülmediği bir dönem ya da coğrafyaya bugüne değin hiç rastlanmadığı düşünüldüğünde; suçun, insanların sosyal gelişimine, değerlerine ve temel çıkarlarına bağlı olarak sürekli değişen bir kavram olduğu görülmektedir.

Nedenleri, sonuçları, toplumsal ve bireysel yaşam üzerindeki etkileri bakımından oldukça karmaşık bir sosyal olgu olan suç; insanlık tarihi kadar eski sayılabilecek bir kavramdır. Suça ilişkin olarak kişinin özgür iradesi ile biyolojik, psikolojik, sosyolojik, ekonomik ve politik faktörlerin hemen hepsinin farklı kurgularıyla suçu açıklayan birçok kuram geliştirilmesine karşın bu faktörlerin hiçbirisi suçun neden meydana geldiğini tek başına açıklayamamaktadır. Geçmişten günümüze suç kavramı; toplumların sosyal, ekonomik ve manevi şartlarına göre şekillenmiştir. Günümüzde geline noktaya bakıldığında, artık suç ve şiddet davranışlarına neden olan bireysel ve çevresel etmenler ile fizyolojik etmenlerin de oldukça ayrıntılı olarak araştırıldığı görülmektedir.

Bu bağlamda okuyucunun suçun tarihsel gelişiminden, suçu açıklayan kuramların alandaki yansımalarının neler olduğuna, şiddet eyleminin nedenleri ve sonuçları bağlamında tartışılmasına değin çok yönlü bir farkındalığa sahip olmasının adli psikoloji eğitimine devam eden, bu alana ilgi duyan ve sahada çalışan bireyler için çalışmaları temel teşkil edeceği değerlendirilmektedir.

Ön Söz

Hukukun normatif (küralsal) yapısı ile psikolojinin çok boyutlu karakteri bu iki alanın birlikte çalışılmasında bazı bilimsel sorunları açığa çıkarır. Örneğin hukuk bir

Anahtar Kelimeler

Suç, şiddet, kişilik, saik, edim, şiddet döngüsü.

Tartışma Soruları

1. Her suç davranışı şiddet içermekte midir?
2. Sosyal bilişsel süreçlerin suç davranışının öğrenilmesinde ne gibi etkileri olabilmektedir?
3. Mağdurun şiddet döngüsünden çıkabilmesi için ne gibi adli psikolojik müdahaleler uygulanabilir?
4. Suçun önlenmesine yönelik çalışmalarda şiddet unsurları nasıl ele alınabilir?

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BÖLÜM 3

AİLE İÇİ ŞİDDET

Melike Ceylan

“Kadınları geride bırakan toplum, geride kalmaya mahkûmdur.”

Mustafa Kemal Atatürk

Giriş

Aile içi şiddet, her gün karşılaştığımız sosyal bir sorundur. Aile içi şiddet konusunda farkındalık yaratmak ve mağdurlara destek sağlamak bu açıdan oldukça önemlidir. Aile içi şiddet konusunun çeşitli yönlerden anlamak, aile içi şiddeti önlemek ve herkes için daha güvenli bir toplum yaratmak açısından önem arz etmektedir. Aile içi şiddet, mağdurların zihinsel ve fiziksel sağlığı üzerinde uzun süreli etkileri olabilecek karmaşık bir konudur. Şiddet döngüsünü kırmak için aile içi şiddetten etkilenen mağdurlara destek ve kaynak sağlamak en önemli unsurdur. Özellikle aile içi şiddetin mağdurları anneler ve çocuklardır. Aile içi şiddeti önlemede kilit faktör, arkasındaki nedenleri anlamaktır. Bu mağdurlar için barınak ve danışmanlık hizmetleri gibi destek ve kaynakların sağlanması gerekmektedir. Ayrıca toplumu sağlıklı ilişkiler konusunda eğitmek ve şiddeti sürekli kılan toplumsal normları ele almak da aile içi şiddeti önlemeye yardımcı olabilir. Bu bölümde aile içi şiddet kavramı, yaygınlığı, türleri, nedenleri ve sonuçları tartışılacaktır.

3.1. Aile İçi Şiddet Kavramı ve Tanımı

Aile içi şiddet kavramı, genellikle kadın ve çocukların mağdur olduğu bir problemdir. Hem dünyada hem de ülkemizde ciddi bir toplumsal problem olarak karşımıza çıkmaktadır. Her üç kadından biri yaşamının herhangi bir zamanında partneri tarafından cinsel, fiziksel veya duygusal şiddete maruz kalmaktadır. Aile içi şiddet, yakın bir partner tarafından hâlihazırda veya geçmişte gerçekleştirilen çeşitli fiziksel, cinsel ve/veya psikolojik eylemlerin bir bütünü olarak adlandırılabilir (Rodriguez ve ark.,

şiddeti önleyici çalışmaların önemi, ailelere destek ve eğitim sağlama, mağdurların güvenliğini sağlama, hukuki ve psikolojik yardım hizmetlerine erişimi kolaylaştırma gibi adımlar atılabilmektedir. Bu bağlamda aile içi şiddetin ciddiyetini anlamak, etkilerini değerlendirmek ve önleme stratejilerini keşfetmek önem arz etmektedir. Aile içi şiddetin önlenmesi ve mağdurların desteklenmesi için toplumun ve bireylerin birlikte çalışması gerekmektedir.

Anahtar Kelimeler

Aile içi şiddet, kadına yönelik şiddet, fiziksel şiddet, cinsel şiddet, psikolojik şiddet.

Tartışma Soruları

1. Aile içi şiddetin ortaya çıkmasındaki en önemli etkenler nelerdir?
2. Aile içi şiddet kuramlarını tartışınız.
3. Aile içi şiddeti sürmesine sebebiyet veren etkenleri çevrenizdeki örnek olaylarla ilişkilendiriniz ve açıklayınız.

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BÖLÜM 4

KADINLARDA ŞİDDET VE SUÇ DAVRANIŞLARI

Merve Koçak Çapkın

Ön Söz

Dünya genelinde hüküm giyen kadınların artması, kadınlardaki şiddet ve suç davranışlarının ilgi odağına alınmasına yol açmıştır. Ceza adalet sistemine giren kadınların ekonomik sorunlar yaşamakla birlikte, düşük sosyal desteğe sahip ve eğitim düzeyi düşük kadınlar oldukları görülmektedir (Chesney-Lind ve Shelden, 2004). Kadın hükümlüler, çocukluk döneminde başlayan travmatik istismar ve ihmal yaşantılarının ardından, fiziksel ve ruhsal sağlık problemleri ile birlikte madde kötüye kullanım sorunları yaşamaktadır (Asberg ve Renk, 2012; Coid ve ark., 2001; Flynn ve ark., 2011; Jordan ve ark., 1996; Huang ve ark., 2006; Widom, 2000). Aynı zamanda, ceza adalet sistemindeki kadınların erkeklere göre, çocuklar için birincil bakım veren ve tek destek kaynağı olmaları daha olasıdır (Glaze ve Maruschak, 2008).

Suçta yönelen kadınların çocukluk öykülerindeki travmatik kötü muamele deneyimleri dikkat çekmektedir. Kadınlarda çocukluk dönemi cinsel istismar yaşantılarının ileriki yaşantıda şiddet davranışları, alkol ve madde kötüye kullanımı, seks işçiliği ve suç öyküsü bulunan erkek partnerle birlikte yaşama ile ilişkili olduğu bulunmuştur (Frost ve ark., 2006). Kadın suçluluğunun bir diğer özelliği, kendini savunma motivasyonu ile uygulanan şiddet davranışları olmaktadır. Örneğin, kadınlar, kendilerinin veya çocuklarının ciddi yaralanma ya da öldürülme tehdidi altında maruz kaldıkları yoğun şiddet ve tehditlerden kurtulmak için eşini öldürebilmektedirler (Browne ve ark., 1999a). Mağduriyetten doğan suç döngüsünün kadın suçluluğunun önemli bir özelliği olduğu görülmektedir.

Kadın suçluluğunun doğasını, özelliklerini, kapsamını ve etiyojisini anlamak, öncelikle önlenmesine ve sonrasında ise yeniden suç işleme riskinin azaltılmasına katkıda bulunacaktır. Ayrıca bu suçtan doğrudan etkilenen failer ve mağdurların (çocuklar, eşler, aile üyeleri gibi) tedavisinin yanı sıra kadın suçluluğunu önlemek için başlatılan girişimlerin etkililiğini artıracaktır. Rehabilitasyon çalışmalarında toplumsal cinsiyete

2. Kadın suçluluğu ile ilişkilendirilen ataerkil toplum yapısı ve cinsiyet rolleri, ülkemizde kadın suçluluğu ile nasıl ilişki göstermektedir?
3. Suça yönelen kadınlar için cinsiyete özgü bir müdahale programı hazırlasanız çalışma alanlarınızda hangi ihtiyaçlara odaklanırsınız?
4. Sizce kadın suçluluğuna yönelik rehabilitasyon çalışmalarında grup terapilerine nasıl yer verilebilir?

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BÖLÜM 5

AİLE İÇİ ÇOCUK CİNSEL İSTİSMARI

Ebru Akın - Şennur Tutarel Kışlak

Giriş

Dünya Sağlık Örgütü (World Health Organization/WHO, 2006) çocuğa kötü muameleyi; çocuğun sağlığına, hayatta kalmasına, gelişimine veya onuruna fiilî olarak zarar veren ya da zarar verme potansiyeli olan, sorumluluk, güven veya güç ilişkisi bağlamında her türlü fiziksel ya da duygusal kötü muamele, cinsel istismar, ihmal veya çocuktan ticari amaçlı ya da başka bir şekilde faydalanma içeren tüm eylemler olarak tanımlamaktadır. Alanyazındaki araştırma bulguları, çocuğa kötü muamelenin tüm dünyada oldukça sık görüldüğünü ve hem çocukluk hem yetişkinlik döneminde çok sayıda fiziksel ve psikolojik sağlık sorunuyla da ilişkili olduğunu ortaya koymaktadır (Kalmakis ve Chandler, 2015; Petruccelli ve ark., 2019; Sheffler ve ark., 2020). Bu nedenle çocuğa kötü muamele, günümüzde önemli bir halk sağlığı problemi olarak ele alınmaktadır (Ports ve ark., 2020; Tonmyr ve ark., 2020).

Bu bölümde çocuğa kötü muamele kapsamında yer alan ve yetişkinlik yaşamında yarattığı güçlükler nedeniyle WHO'nun 24 global risk faktörü arasında belirlediği (Mathers ve ark., 2009) çocuk cinsel istismarı olgusu, aile içi cinsel istismar yaşantıları temelinde ele alınacaktır. Aile içi çocuk cinsel istismarı, aile dışından bireylerin gerçekleştirdiği istismardan farklı özellikleri bulunan, açığa çıkması daha zor ve mağdur üzerinde akut ve kronik olarak daha yıkıcı etkiler gösteren bir durumdur. Olgunun tüm yönleriyle anlaşılması, mağdurun rehabilitasyonu ve istismarın önlenmesi için geliştirilen müdahalelerin temelini oluşturmaktadır.

Bu bölüm yedi alt başlıktan oluşmaktadır. Birinci bölümde, çocukluk dönemi cinsel istismarının kapsamı ve özellikleri ele alınmaktadır. İkinci bölümde, geçmişten günümüze yaygın olarak kullanılan bir terim olan ensest ile aile içi çocuk istismarı kavramı arasındaki farklılıklar açıklanmaktadır. Üçüncü bölümde, aile içi çocuk istismarının hem uluslararası alanyazındaki hem de Türkiye'deki yaygınlığına ilişkin bul-

Tartışma Soruları

1. Aile içi çocuk cinsel istismarını ifade etmek için ensest teriminin kullanılması hangi açılardan uygun değildir?
2. Türkiye’de aile içi çocuk cinsel istismarına ilişkin yürütülen araştırmalar, istismarın özelliklerine dair hangi bulgulara dikkati çekmektedir?
3. Baba cinsel istismarının görüldüğü ailelerin temel özellikleri nelerdir?
4. Kardeşler arasındaki keşif amaçlı cinsel etkileşimler ve cinsel oyunlar, kardeş cinsel istismarından nasıl ayırt edilebilir?
5. Kardeş cinsel istismarının görülme olasılığını artıran risk faktörleri nelerdir?
6. Aile içi çocuk cinsel istismarı faillerinin özelliklerine dair kuram ve araştırmalar hangi risk faktörlerine vurgu yapmaktadır?
7. Dört faktör travma modeline göre, çocuk cinsel istismarı hangi yollarla travmaya yol açmaktadır?
8. Aile içi çocuk cinsel istismarı mağdurları, çocukluk ve yetişkinlik döneminde psikopatolojinin gelişimi açısından ne tür riskler altındadır?
9. Aile içi çocuk cinsel istismarına yönelik adli değerlendirmenin temel prensipleri nelerdir?

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BÖLÜM 6

SUÇLU PROFİLLEME

Adonis Çiğdem Erkunt Kanoğlu

Giriş

Profilleme, suçlu profilleme veya psikolojik profilleme olarak da adlandırılabilen suçlu profilleme, soruşturmaya yardımcı olmak için olay yeri ve mağdura ilişkin bulguları değerlendirerek, failin kişilik özellikleri, davranış eğilimleri ve demografik özellikleri hakkında öngöründe bulunmaktır (Douglas, Ressler, Burgess ve Hartman, 1986; Hicks ve Sales, 2006). Profilleme, aynı zamanda adli bir olayın muhtemel failini belirleyebilmek için bir suç veya suçlar dizisinde ortaya konmuş davranış kalıplarının analiziyle, olası şüphelileri belirlemeye yarayan bir suçla mücadele yöntemidir.

Profilleme, son yıllarda değeri daha net anlaşılmaya başlanan, soruşturma alanını daraltmak için kullanılan değerli bir araçtır. Suçun gerçekleşmesinin ardından olay yerine intikal eden profilleme uzmanları suçun sebebini, olayın oluş sırasını, olay esnasında yaşananları, failin mağduru nasıl seçtiğini ve mağdurun olay sırasındaki hareketlerini geriye dönük olarak anlamaya çalışırlar. “Davranış kişiliği yansıtır” prensibi (Douglas, Ressler, Burgess ve Hartman, 1986) esas alınır ve fail yaş, cinsiyet, medeni durum ve çalışma durumu gibi bireysel özelliklere odaklanılarak tariflenmeye çalışılır. Olay yerinden elde edilen bulgular failin yaşı, cinsiyeti, ırkı, eğitim düzeyi, medeni durumu, geçmiş suç öyküsü, askerlik durumu, aile geçmişi, sosyo ekonomik düzeyi, ikamet ettiği yer, sosyal hayatı ve ilgi alanları gibi bilgileri ortaya çıkartmak için kullanılır.

Şiddet içeren suçlar, kamuoyunun, otoritelere faili yakalama konusunda baskı yaptığı suçlardır. Daha fazla şiddetin önüne geçebilmek için fail mümkün olduğunca çabuk yakalanmalıdır. Zamana karşı yarışırken, soruşturma sırasında stratejik davranmak bir zorunluluktur. Olası failin karakter özelliklerini bilmek, soruşturmayı yapan otoritelerin sorgulamada kullanmak üzere teknikler ve stratejiler geliştirmesini sağlar. Profilleme, yalnızca failin belirlenmesi ve suçun çözümü açısından değil, gelecek

bilgilerin geçerli ve tutarlı olması ayrıca mahkeme tarafından kabul edilebilir bilgi olarak kabul edilmesi ancak bu şekilde mümkündür.

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BÖLÜM 7

CEZA ADALET SİSTEMİNDE ALKOL-MADDE KULLANIMI VE BOZUKLUKLARI

Merve Vatansever

Giriş

Jack London, 1913 yılında kaleme aldığı ve alkole John Barleycorn olarak hitap ettiği kitabında şu satırlara yer verir: “John Barleycorn töre kurallarını hiçe saydırarak insanı suç işlemeye kışkırtıyordu. Ayıkken akıllarından bile geçirmeyecekleri şeyleri, sarhoş kafayla yapanlara her yerde rastlıyordum. Bu kadarla kalsa yine iyi. Sarhoşluğun asıl kötü yanı, insana çektirdiği cezaydı. Ağır suç yıkıcı oluyordu...” (London, 1913/2019, s.107). Jack London, kitabı boyunca 1900'lerin başında Amerika'da alkollü içeceklerin tüketiminin kişiyi nasıl etkilediğine dair çarpıcı örnekleri hem kendinden hem de gözlemlediği diğer insanlardan yola çıkarak sunar. Geçmişten günümüze alkol, uyuşturucu ve uyarıcı madde kullanımının bireyin fiziksel ve psikolojik sağlığı üzerinde olumsuz etkilere neden olduğu yaygın olarak bilinmektedir. Alkol ve uyuşturucu maddelerin birey ve çevre üzerindeki olumsuz etkileri, toplumda bu maddelerin kullanımına ilişkin birtakım sınırlamalar ve yasaklar getirilmesine neden olmuştur. Madde kullanımının yasa dışı olması, birtakım hukuki, sosyal ve toplumsal sorunları doğurmaktadır. Ceza adalet sistemi içerisinde uyuşturucu ve uyarıcı maddelerin kullanımına, suç işlendiği sırada alkol ve madde etkisinde olma durumuna ilişkin yasal düzenlemelere gidilmiştir. Medeni hukuk kapsamında ise alkol ya da madde bağımlılığının kişinin kendisini ve ailesini ekonomik anlamda zor bir duruma sokması hâlinde hukuki ehliyetin kısıtlanması ve vesayeti gerektiren bir durum olarak ele alındığı görülmektedir.

Bu bölümün amacı, ceza adalet sistemi içerisinde alkol ya da madde kullanımı ve bağımlılığı ile ilgili olabilecek durumları ele almak ve tartışmaktır. Bölüm boyunca psikologların adli sistemde, hastanelerde ve diğer kuruluşlarda alkol ya da madde kullanımını ve bağımlılığını ile ilgili karşılaşılabilecekleri konular üzerinde durulacaktır. Bölüm öncelikle ceza adalet sisteminde madde kullanımının suç olarak Türk Ceza Kanunu

8. Denetimli serbestlik müdürlüklerinde madde kullanımı olan yükümlüler için yürütülen süreç nasıl işlemektedir?

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BÖLÜM 8

ÇOCUK VELAYETİ VE EBEVEYNLİK DEĞERLENDİRMELERİ

Belgin Üstün Güllü

Ön Söz

“Anne gezindiğin bağ, baba yaslandığın dağdır. Ömrünün en güzel çağı annen ve babanla olandır.” Ataol Behramoğlu, bu dizeleri sıralarken sizce çocuğun mutlaka anne ve babası ile birlikte yaşamasının önemine, anne babanın birlikte olduğu koşullarda çocuğun en güzel hayatı yaşayacağına mı vurgu yapmıştır? Ya da sizce çocuk en çok anne ve babası birlikteyken mi mutludur? Anne ya da baba ile ayrı ayrı mutlu olamaz mı çocuk? Nedir çocuk için anne ve babası ile olan çağı en güzel yapan?

Çocuğa bir dal verirsiniz dünyalar onun olur, bazen bir dünya verirsiniz tutunacak dal bile bulamaz. Çocukları mutlu etmek için dünyayı ayaklarına sermeye gerek yok. İstedikleri zaman gezinecekleri bir bağ, güvenerek korkmadan gidecekleri bir dağa ihtiyaç duyuyorsa bırakın o bağda gezsinler, bırakın o dağa yaslansınlar.

Bu bölümü okurken o bağ ve dağda neler oluyor? O bağ ve dağın birlikte olmadığı koşulda ortaya çıkan süreç nedir? Çocuğun en güzel çağını yaşaması ve yüksek yararı için yazılı hukuki kurallar neler söylüyor? Velayete karar verirken çocuğun ve ebeveynin hakları nelerdir? Velayetin değerlendirilmesi sürecinde nelere dikkat edilir? göreceğiz.

Giriş

Kadın ve erkek evli kaldıkları süre boyunca çocuklarının bakımından birlikte sorumluluktadırlar. Bu sürede velayet hakkı anne ve babadadır ve bu hakka sahip olan anne ve babalar tüm hak ve yükümlülüklerini de birlikte üstlenmekte ve birlikte yerine getirmektedirler. Boşanma söz konusu olduğunda ise çocuğun velayeti anne ya da babadan birine bırakılmaktadır.

sahip olması önemlidir. Bu bilgi ve becerilere sahip olan uzmanın, özellikle çatışmalı boşanma sürecinde fazlasıyla yıpranan ve arada kalan çocuğun daha fazla zarar görmemesi, velayetine karar verirken uyum sorunları yaşamaması hem ruhsal hem de fiziksel açıdan zarar görmemesi açısından ayrıntılı ve ciddi değerlendirmeler yapması önem taşımaktadır.

Çocuk ve yetişkinlerle yapılan görüşmelerin yanı sıra değerlendirme sürecinde çocuğun velayetiyle ilgili olabilecek (mahkeme dosyası, suç kayıtları, gibi) kaynaklardan yararlanmak, aileden ya da avukatlardan varsa ek bilgiler almak, verilecek her bilgiyi dikkate almak ve gerekirse bir liste tutmak önemlidir. Velayetin kime verileceği konusunda ihtiyaç hâlinde velayet değerlendirme süreçlerinde psikolojik testlerden de yararlanılmaktadır. Bu testler arasında; zekâ testleri, başarı testleri, psikoeğitimsel testler yer almaktadır.

Anahtar Kelimeler

Velayet, velayetin değerlendirilmesi, çocuğun üstün yararı, ebeveyn yabancılaştırma sendromu.

Tartışma Soruları

1. Velayetin değerlendirilmesinde çocuğun üstün yararı nedir?
2. Velayeti alan ve almayan ebeveynlerin ne gibi hakları bulunmaktadır?
3. Velayeti değerlendirme sürecinde çocukla görüşmenin önemini açıklayınız.
4. Velayeti değerlendirirken yaygın olarak kullanılan ölçekler nelerdir? Ölçeklerden yararlanmanın ne gibi faydaları vardır?

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BÖLÜM 9

YAŞLILARDA ADLİ PSİKOLOJİK DEĞERLENDİRME VE UYGULAMALAR

Gülbahar Baştuğ - Erguvan Tuğba Özel Kızıl

Giriş

Tüm dünyada ve ülkemizde yaşlı nüfus giderek artmaktadır. Ülkemizdeki nüfus projeksiyonlarına göre yaşlı nüfus oranının 2023 yılında %10,2, 2030 yılında %12,9, 2040 yılında %16,3, 2060 yılında %22,6, 2080 yılında ise %25,6 olacağı öngörülmektedir (TUİK 2018). Günümüzde Türkiye, %7-10 arasındaki yaşlı nüfus oranı ile “yaşlı” bir ülke durumundadır. Değişen demografik yapıyla beraber geriatric sendromlar ve yaşlılarda görülen psikiyatrik bozuklukların da artması beklenmektedir. Dünya Sağlık Örgütü (DSÖ) tarafından 60 yaş ve üzerindeki yaşlı nüfusun yaklaşık %15’inin psikiyatrik bir bozukluk, %20’den fazlasının ise baş ağrısı dışında nörolojik ya da psikiyatrik bir bozukluğa bağlı sorun yaşadığı, nörolojik ve psikiyatrik bozuklukların yeti yitimine ayarlanmış yaşam yılının (disability adjusted life years-DALY) %6,6’sından sorumlu olduğu bildirilmiştir. Bu yaş grubunda en sık görülen psikiyatrik bozuklukların demans ve depresyon olduğu, dünya genelindeki yaşlıların %5’inin demans, %7’sinin depresyon, %3,8’inin anksiyete bozuklukları, %1’inin madde kullanım bozukluklarından etkilendiği, kendine zarar verme davranışı ile ilişkili ölümlerin dörtte birinin 60 yaş ve üzerindeki bireylerde görüldüğü belirtilmiştir. Ek olarak yaşlılarda madde kötüye kullanımının genellikle gözden kaçtığı ya da yanlış tanı aldığı ifade edilmiştir. Yaşlıların birçok yaşamsal stresöre (yeti yitimi, kronik ağrı, kırılmalık, diğere sağık sorunları, yas, emeklilikle birlikte sosyoekonomik statünün düşmesi vb.) de maruz kaldıkları ve her 6 yaşlıdan birinin istismara uğradığı bildirilmiştir (World Health Organization, 2017).

Özetle, yaşlı nüfusun artmasına paralel olarak önümüzdeki yıllarda yaşlı adli olguların da artması, dolayısıyla yaşlılarda adli psikiyatrik ve psikolojik değerlendirmele rin önem kazanması söz konusu olacaktır. Bu bölümde yaşlılarda sık rastlanan ihmal ve istismar ile adli psikiyatrik durumlar ve adli psikiyatrik değerlendirmede dikkat edilmesi gereken hususlar örnek olgularla ele alınmıştır.

Özet

Yaşlı nüfusun artması ile beraber yaşlıda adli psikiyatrik ve psikolojik değerlendirme önem kazanmaktadır. Yaşlılarda genellikle sık karşılaşılan AH gibi nörobilişsel bozukluklar nedeniyle ceza sorumluluğu ya da fiilî ehliyet değerlendirmesi yapılmakta ayrıca yaşlılar sıklıkla ihmal ve istismar nedeniyle de adli olgu olarak karşımıza çıkmaktadırlar. Yaşlılarda fiziksel, duygusal/psikolojik istismar, ekonomik istismar, ihmal, kendini ihmal ve terk edilme gibi ihmal ve istismar türleri görülebilmektedir. Fiziksel hastalıklar, bilişsel ve psikiyatrik bozuklukların varlığı, ekonomik sorunlar, bakım veren stresi gibi etmenler yaşlılarda istismar ve ihmal için başlıca risk faktörleridir. Yaşlı adli olguların değerlendirilmesinde yaşlanmayla beraber bireylerde ortaya çıkan fiziksel, psikolojik ve bilişsel değişikliklerin bilinmesi, olgunun önceki durumu ile kıyaslanmanın yapılabilmesi için mutlaka yakınından/yakınlarından bilgi alınması ve tıbbi kayıtlarının incelenmesi oldukça önemlidir. Rutin adli psikiyatrik değerlendirmelerde olduğu gibi yaşlılarda da hastalık değil, hasta olduğu prensibi ile değerlendirme yapılmasının uygun olduğu bilinmektedir. TMK'ya göre yaşlı birey sadece akıl hastalığı/zayıflığı veya mal varlığını kötü yönetme nedeniyle değil yaşlılığı, sakatlığı veya ağır hastalığı sebebiyle işlerini yürütemediğinde de kısıtlanabilir. 65 yaş ve üzerindeki bireylere noterlikler tarafından istenen akli meleke raporları ile ilgili değerlendirmelerin mümkün olduğunca detaylı bir şekilde yapılması ve raporlanması gereklidir.

Anahtar Kelimeler

Yaşlı, ihmal, istismar, ceza sorumluluğu, adli psikolojik değerlendirme.

Tartışma Soruları

1. Yaşlı istismar ve ihmali nasıl değerlendirilir?
2. Demansı olan yaşlı hastalarda ceza sorumluluğu değerlendirmesinde dikkat edilecek hususlar neler olabilir?
3. Fiilî ehliyet kavramını açıklayınız.
4. Yaşlılarda kısıtlanmaya neden olabilecek durumları sayınız.

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BÖLÜM 10

CEZA İNFAZ HİZMETLERİNDE PSİKOLOJİ UYGULAMALARI

Nalan Peker Güneş

Giriş

Bu bölümde yargılama aşamasında ve hüküm sonrası cezaların infaz sürecinde; ceza infaz kurumları ve denetimli serbestlik müdürlüklerinde verilen hizmetlerden, bu hizmetlerde psikologların görevlerinden bahsedilecektir. 2000’li yılların başından itibaren ülkemizde infaz hizmetlerinde önemli değişiklikler ve gelişmeler olmuştur. Psikologların önce ceza infaz kurumlarında sonraki yıllarda denetimli serbestlik müdürlüklerinde istihdam edilmesi ile birlikte yapılan çalışmalar artmıştır.

İnfaz hizmetleri hem kamunun yararını gözetmek hem de bireysel refahı sağlamak adına yapılan tüm müdahaleleri içermektedir. Önleme ve koruma aşamalarını geçmiş artık müdahale aşamasına gelmiş suça karışan bireylerle bire bir çalışmalar yürüten psikologlar infaz konusunda bilgi sahibi olmak, suç odaklı çalışmanın ne olduğunu bilmek, bireysel ve grup olarak tutuklu veya hükümlülerle nasıl çalışılması gerektiğini öğrenmek durumundadır.

10.1. İnfaz ve İyileştirme Sürecinde Hükümlü/Tutuklu Ruh Sağlığı ve Ceza İnfaz Kurumlarında Görülen Ruhsal Bozukluklar

Suç işleyen bireylerin rehabilitasyon ya da iyileştirilmesi ve ruhsal rahatsızlıklarının giderilmesi, toplumu korumak ve onların mağdurlara verdikleri zararı azaltmak kadar değerlidir. Her ne kadar hükümlünün bireysel refahı ve kamu güvenliği terazinin iki ayrı kefesinde duruyor gibi görünse de bu iki olgu birbirlerini besleyen ve destekleyen konulardır. Yapılacak rehabilitasyon çalışmaları ve terapötik müdahaleler bu çerçevede önem kazanmaktadır. Ceza infaz kurumuna kabul edildikten sonra bireyler araştırma-değerlendirme, risk analizi, sürecinden geçişler ve kendilerine en uygun eğitim-iyileştirme çalışmasına alınırlar. Suçun işlenmesi ve yeniden suça karışma ko-

10. Suç alanında çalışan meslek gruplarının yaygın olarak yaşadıkları zorluklar ve çözüm önerileri nelerdir?

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BÖLÜM 11

YENİDEN SUÇ İŞLEME VE RİSK VE İHTİYAÇ DEĞERLENDİRMESİ

Gamze Erhan - Gamze Gündoğdu Mercimek

“İlk defa geldim dedim polise. Sen açılışı yaptın, daha çok gelirsin dediler.” (Dağdelen, 2017).

Denetimli serbestlik sisteminde görev yapan meslek elemanının böyle bir yargıya varmasına sebep ne olabilir? Bu kişi, denetimli serbestlik sistemine gelen ortalama profile uygun bir dış görünümüne mi sahipti ya da bakışı, duruşu, jest ve mimiklerinden dolayı mı etiketlendi? Meslek elemanının kendi yargılamasından ayrı olarak, erken tahliye ile denetimli serbestliğe başvuran bir kişinin yeniden suç işleyeceğini tahmin etmek mümkün müdür? Bu riski önceden saptarsak, kişinin tekrar suça yönelmesini önleyebilir miyiz? Bunların ötesinde zorlu ceza infaz kurumu yaşantı deneyimlerine, sicilindeki suç öyküsünden dolayı iş bulmakta zorlanma, toplum içinde damgalanma gibi sorunlarla mücadele etmelerine rağmen bu kişiler neden tekrar suça yönelmektedir? Dağdelen’in (2017) denetimli serbestlik sistemi içinde yaptığı bir çalışmasında, başka bir yükümlü de bu soruyu bizlere sormaktadır.

“Burası iyi tamam. Hocalarla falan görüştük de suçu niye işledin falan diye soruluyor da ama bence şey öylesine şey olardan. Sormak gerektiği için soruluyor. Sorup da bir yere varmıyor. Devletin o konulara bir ilgisi yok. Bir adam bir kere bu suçu işlediğinde sen bu suçu neden işledin diye soran yok.” (Dağdelen, 2017).

Risk değerlendirme araçları yeniden suç işleme olasılığını hesaplarken, bu sorunun cevabını da aramaktadır.

Giriş

Suçun tekrarının önlenmesi için öncelikle nedenlerinin doğru bir şekilde anlaşılması gerekmektedir. Suçun önlenmesi ve suça karışmış bireylerin eski yaşantılarına sağlıklı bir şekilde dönebilmeleri için bu nedenlerin doğru şekilde değerlendirilerek uygun müdahalelerin yapılması önemlidir. Değiştirmek istenilen bir alanda ölçme ve

6. Denetimli serbestlik sisteminde bireyin ihtiyaçlarına yönelik bir plan hazırlanmasının gerekliliği nedir?
7. Risk değerlendirme araçları, bireyin yeniden suç işlemede risk düzeyini belirlerken hangi durumları dikkate almaktadır
8. Risk değerlendirme araçlarının zayıf yanları nelerdir?

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BÖLÜM 12

ÇOCUĞA YÖNELİK KÖTÜ MUAMELE VE MÜDAHALE YAKLAŞIMLARI

Gülçin Orhan - Hatice Demirbaş

“Çocuk istismarı, ömür boyu insanlığa bir gölge düşürür.” -Herbert Ward

Giriş

Çocuğa yönelik kötü muamele, on sekiz yaşını doldurmamış çocukların mağduru olduğu her türlü ihmal ve istismar yaşantısıdır. Bu yaşantı çocuğa yönelik sorumluluk, güven ya da güç ilişkisi bağlamında çocuğun sağlığına, gelişimine, hayatta kalmasına ya da onuruna karşı fiili veya potansiyel bir zararla neticelenen her çeşit fiziksel ve/ya da duygusal kötü muameleyi, özensizliği, ihmali, cinsel istismarı, ticari ya da başkaca sömürüyü içermektedir (World Health Organization, 2020). Çocuğa yönelik kötü muamele, hem bir çocukluk çağı travması (Herman, 2011) hem de çocuk hakları ihlali olup tüm toplumlarda farklı yaygınlıklarda ve hiç de azımsanmayacak oranlarda görülen önemli bir sorundur (Adli İstatistikler, 2020; Türkkkan ve Odacı, 2022). Öyle ki Dünya Sağlık Örgütünün (2020) son verilerine göre 2-4 yaşları aralığındaki her dört çocuğun yaklaşık üçü, bakım verenleri tarafından düzenli şekilde bedensel cezaya ve/veya psikolojik şiddete maruz kalmıştır. Rakamlar, bize her beş kadından ve on üç erkekten birinin 0-17 yaş aralığında çocuk veya genç bir birey iken cinsel istismara uğradığını göstermektedir. Yirmi yaşın altındaki 120 milyon kız ve genç kadın, bir tür zorla gerçekleşen cinsel ilişkinin mağduru olmuştur. Ülkemiz bazındaki son istatistikler, güvenlik güçlerine mağdur sıfatıyla başvurusu olan 170961 çocuğun %88,1'inin suç mağduru olduğunu göstermiştir (TÜİK, 2021). Yine ülkemiz ceza mahkemelerinde çocuğun cinsel istismarı suçu ile açılan dosya sayısı 17948 olup devam eden dava sayısı sırasıyla Marmara (%30,5), Akdeniz (%15,8), İç Anadolu (%12,8) ve Güneydoğu Anadolu (%12,6) Bölgelerindedir (Adli İstatistikler, 2020). Bu resmî veriler bize durumun ne ciddi boyutlarda olduğunu göstermektedir (Türkkkan, Odacı ve Bülbül, 2021).

Bazen sizler de çocuğun gelişimi, psikolojisi ve çocuk yetiştirme tutumları konusunda desteğe gereksinim duyabilirsiniz. “Sır versem saklar mısınız?” (Moore-Mallinos, 2008) adlı kitabı okuyabilirsiniz. Ayrıca böyle durumlarda çevrenizden ya da uzman olmayan başka kimselerden aldığımız önerilerden ziyade profesyonel desteğe yöneliniz. Kendinizle ve/veya çocuğunuzla ilgili konularda ruh sağlığı uzmanlarına başvurmakta çekinmeyiniz ve başvuruda gecikme göstermeyiniz.

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BÖLÜM 13

GÖRGÜ TANIKLIĞININ GÜVENİLİRLİĞİNİ ETKİLEYEN PSİKOLOJİK FAKTÖRLER

Nesrin Duman

Ön Söz

Bir suça tanık olduğunuzu varsayın. Bu bir hırsızlık, gasp, soygun, arabadan ateş etme veya yağma suçu olabilir. O sırada bir suçun işlendiğini biliyor veya bilmiyor olabilirsiniz. Belki de birkaç dakika içinde patlayacak olan bir binadan çıkan birini görmüşsünüzdür. Belki olaydaki mağdur kişi sizsiniz ya da belki de bir görgü tanığıydınız. Koşullar ne olursa olsun, güçlü ya da zayıf, adaletin işleyişi için önemli sonuçlar doğurabilecek bazı hafıza izleri vardır. Suçluyu gördüğümüz için polis sizden bir açıklama yapmanızı isteyecektir. Daha sonra, belki sadece saatler sonra veya belki aylar sonra, suçlunun kimliğini tespit etmeye çalışmak için karakola çağrılacaksınız. Daha sonra size bir odada yan yana sıralanmış insanlar ya da masaya yayılmış fotoğraflar gösterilecek ve o vahim olayda gördüğümüz kişinin karşınızda duran ya da resimdeki insanlardan biri olup olmadığını belirtmeniz istenecek... (akt. Lorenza, 2003; Wells, 1993)

Giriş

Görgü tanıklığı, hukuki bir terimdir. Kişilerin şahit (tanık) oldukları bir olayı anlatmalarını ifade eder. Görgü tanıklığı, mahkeme sürecinde oldukça önemli bir yere sahiptir. Tanık beyanı hem ceza hem de hukuk yargılamasında takdiri delil olarak kabul edilmektedir. Özellikle bazı olaylarda ve tabi davalarda, tanık beyanı delilinden başka bir delille ispat imkânının olmaması durumunda görgü tanıklığı daha da önem kazanmaktadır. Bu noktada yargılamanın selameti için delilin yani görgü tanığının beyanlarının güvenilir olması elzemdir.

Tanık, bir olayla ilgili olarak beş duyu organından (görme, duyma, dokunma, tatma, koklama) en az birisi ile bilgi edinen kişidir (Altunkaya, 2022). Bir kimsenin bir olay veya konu ile ilgili olarak tanıklık yapabilmesi daha doğrusu beyanlarının mah-

eşitsizliği, aşağılanma ve baskı, aile problemleri, sevilen birinin kaybı ise terör suçu işleyen kadınların motivasyonlarındandır (Berko ve ark., 2010; Jacques ve Taylor, 2009). Bölüm kapsamında son olarak ise kadın suçluların tedavi ihtiyaçlarına ve önerilerine değinilmiştir. Cinsiyete özgü suç riski yönetimi ve tedavi planlarının uygulanmasında önemli olabilecek noktalar vurgulanmıştır.

Anahtar Kelimeler

Kadın suçluluğu, kadın ve şiddet, feminist kriminoloji, mağduriyet-suç döngüsü, psikopatoloji ve kadın suçluluğu, kadın suçlularda psikopati, travma sonrası stres bozukluğu, kadın ve adam öldürme suçu, filisid, kadın cinsel suçlular, kadın ve terör suçu.

Tartışma Soruları

1. Psikopatoloji ve suç arasında kesin ve nedensel bir ilişki bulunmamasına rağmen suça yönelen kadınlarda görülen psikolojik sağlık sorunlarını nasıl açıklarsınız?
2. Kadın suçluluğu ile ilişkilendirilen ataerkil toplum yapısı ve cinsiyet rolleri, ülkemizde kadın suçluluğu ile nasıl ilişki göstermektedir?
3. Suça yönelen kadınlar için cinsiyete özgü bir müdahale programı hazırlasanız çalışma alanlarınızda hangi ihtiyaçlara odaklanırsınız?
4. Grup terapilerine, sizce kadın suçluluğuna yönelik rehabilitasyon çalışmalarında nasıl yer verilmelidir.

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BÖLÜM 14

MAĞDURİYET PSİKOLOJİSİ

Hilal Kaya Bal

“Büyük bir millet, gururunda, haklarında, tarihinde mağdur ve muzdaripti.”

Ahmet Hamdi Tanpınar

Giriş

Mağduriyet olgusunun en az suçun tarihi kadar eski olduğunu söylemek yanlış olmayacaktır. Nitekim suç mağduru denildiğinde, cürmün (suçun) ortaya çıkışı ile zarar gören bireyler ya da başka kurbanlar anlaşılmaktadır (Katoğlu, 2012). Ceza muhakemesi ve ceza hukuku açısından kritik olan suç mağduriyeti (Katoğlu, 2012), uzun yıllar göz ardı edilmiş; suç ve suçlunun araştırıldığı kadar öncelikli bir araştırma alanı olamamıştır (Erem, 1988).

Mağduriyet, ceza hukuku ve ceza muhakemesinin olduğu kadar kriminoloji, sosyoloji ve psikoloji gibi farklı bilim dallarının da inceleme alanı içerisinde yer alır. Erem (1988), suçluyu araştırmak kadar mağdurun neden mağdur olduğunun araştırılması, suça eğilim gibi suç mağduriyetine eğilimin de incelenmesi gerektiğine işaret ederken klasik ceza adalet sisteminin, toplumsal boyutta infiale sebep olmuş olgular da dâhil olmak üzere zamanla mağduru sürecin dışında bıraktığına ve mağdurun kendisini nasıl koruyabileceğine odaklanmaktan ziyade; toplumun kendisini suça karşı korumasına odaklandığını ifade eder.

Bölümün ilerleyen aşamalarında mağdurbilime ilişkin tarihsel süreçlere, mağdurbilim kuramlarına ve mağduriyetin psikoloji perspektifinden ele alınışına değinilecektir.

14.1. Mağdurbilim (Viktimoloji)

Mağdur kelimesi, Türk Dil Kurumunca “haksızlığa uğramış, zarar görmüş kişiyi” tanımlamaktadır (2023). Ferguson ve Turvey (2009), Latince bir terim olarak ‘victima’

oluşu, mağdurların yeterince destek alamayışı ve ihmal edilişi, suç olgusunun toplumsal bir sorun olarak devam ediyor olması gibi etmenler toplumun güvenlik ve adalet algısını zedeler ve suç korkusunu besler görünmektedir.

Özet

Bu bölümde ele alınan suç mağduriyeti kavramı, yalnızca psikoloji perspektifinden değil yanı sıra hukuksal boyutu ve yasal tanımlamaları ile ek olarak adalet sistemi içerisinde mağdurun konumuna değinilmiştir. Alanyazında suç mağduriyetini inceleyen bir bilim dalı olarak viktimolojiden ve viktimoloji kuramlarından kısaca bahsedilmiştir. Yeni bir yaklaşım olarak ortaya atılan, Amerika ve Avrupa ülkelerinde pratikte kullanımı bulunan onarıcı adalet yaklaşımına ilişkin bilgiler paylaşılmıştır. Suç mağduriyetinin bireysel boyutta yol açtığı zorluklara ve bu kişilerde görülebilecek belirtilere odaklanılmış; psikologların suç mağduriyeti ile çalışırken sorumluluk alanlarının neler olabileceği üzerinde durulmuştur. Suç mağduriyetinin toplumsal boyutta etkileri olabileceği alanyazın ışığında suç korkusu kavramı ile ilişkilendirilerek kısaca ele alınmıştır.

Anahtar Kelimeler

Suç mağduriyeti, viktimoloji, mağduriyet psikolojisi.

Tartışma Soruları

1. Adli psikolojik değerlendirmelerin klinik psikolojik değerlendirmeden farkları nelerdir?
2. Mağduriyetin oluşması için gereken unsurlar nelerdir?
3. Onarıcı adalet yaklaşımı ile klasik ceza adalet yaklaşımının farkları nelerdir?
4. Kırık camlar kuramının öne sürdüğü sav nedir?

Kaynakça

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BÖLÜM 15

ADLİ GÖRÜŞME VE ETİK

Beyzanur Kovan

Ön Söz

Adli görüşme, çoğu zaman kişilerde gizemli ve heyecan dolu bir dizi olay içerdiği yönünde izlenim bıraktığından oldukça ilgi çekici bir kavramdır. Bu durum üzerinde çeşitli televizyon programları, diziler ve filmler etkili olabilmektedir. Bununla birlikte mağdur kişinin hakkını savunabildiği ve bunun sonucunda suçlunun etkin bir şekilde suça konu eyleminin karşılığını aldığı düşüncesi adil dünya inancımızla örtüşmektedir ve adli görüşmelerin çoğunlukla yalnızca bu amaca hizmet ettiği düşüncesi yaygındır. Ancak adli sistem içerisinde yalnızca bir suçun mağduru olan bireyler bulunmaz. Boşanma gibi kişiler arası ilişkilerde, kamu yararını ilgilendiren velayet düzenlemesinde, korunmaya ihtiyacı olan bir çocuk ya da suça sürüklenen bir çocuk tespit edildiğinde ilgili kişilerle yapılan görüşmeler de birer adli görüşmedir.

Adalet sistemi, kurallı ve sınırları keskin bir şekilde kanunlarla belirlenmiş bir yapıdır. Dolayısıyla adli destek görevlileri tarafından bireylerin olumlu ya da olumsuz yaşam deneyimlerine dair sonsuz ayrıntıları ve ihtimalleri içeren görüşmelerin de belirli sınırlar içerisinde adalet sistemine uyumlanması gerekmektedir. Bu noktada bir adli destek görevlisinin sınırlılıklarını belirleyen ve güvenli bir şekilde görevini ifa etmesini sağlayan şey etik kurallardır.

Giriş

Adli Destek Görevlisi Nedir?

Üniversitelerin psikoloji, psikolojik danışmanlık ve rehberlik ile sosyal hizmetler bölümlerinden mezun olarak Adli Destek ve Mağdur Hizmetleri Dairesi Başkanlığı

nır, beni zorlamak istemiyorsanız bildirmeyin” açıklamasında bulundu. Bu durumda;

- a. Adli destek görevlisi yarar-zarar dengesini gözeterek suç duyurusunda bulunmalı mıdır?
 - b. Adli destek görevlisinin suç duyurusunda bulunması görüşmede bulunduğu kişi ile arasındaki profesyonel ilişkiye zarar verir mi?
 - c. Adli destek görevlisinin suç duyurusunda bulunması hâlinde aynı dosyada çalışmaya devam etmesi uygun mudur?
2. Adli destek görevlisi, adli görüşme içerisinde kişinin ifadelerinde çelişkili bir durum tespit ettiğinde bunu kişiye doğrudan sormalı mıdır? Ceza yargılaması dosyası ya da hukuk yargılaması dosyası olması durumunda adli destek görevlisinin tutumu farklı mı olmalıdır?
 3. Adli destek görevlisi velayet değişikliği için açılmış olan bir dava dosyası kapsamında yaptığı bir görüşme içerisinde velayete konu olan çocuğun başka bir olay dolayısıyla mağdur ya da tanık olarak ifade vermesi gerektiğini ve bu sebeple de çok heyecanlı ve korkuyor olduğunu fark ettiğinde bu duruma ilişkin çocuğa genel bilgilendirme yapması sınırlarını aşması olarak değerlendirilebilir mi?
 4. Kapalı ve açık uçlu sorular hangi durumlarda kullanılmalıdır? Hangi durumlarda kapalı uçlu sorular yönlendirmeye sebep olabilir?

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BÖLÜM 16

ADLİ PSİKOLOJİDE BİLİRKİŞİLİK VE ADLİ RAPOR HAZIRLAMA

Gülşah Şükran Kale Yolcu

Giriş

Psikolojinin alt dallarının biri olan adli psikoloji, hukuk ve psikolojinin kesişiminde yer alması sebebiyle hem psikoloji disiplininde hem de hukuk alanında yer alan konuları içermektedir. Bu konulardan önemli bir tanesi de bilirkişiliktir. Nitekim adli psikoloji uygulamalarının büyük bir kısmı bilirkişilik uygulaması olarak gerçekleşmektedir. Yargılama süreçlerinde psikolojinin konusuna giren her konuda (*gelişim psikolojisi, bilişsel psikoloji, klinik psikoloji, trafik psikolojisi vb. gibi*) psikologlar uzman oldukları konular hakkında yazılı ya da sözlü olarak bilirkişi görüşü sunabilmektedirler. Yargı kararlarının psikologların bilirkişi olarak sundukları görüşler doğrultusunda şekillendiği düşünüldüğünde konunun önemi daha iyi anlaşılabilir. Özellikle de genel adalet sisteminden ayrı ve özel bir önem taşıyan çocuk adalet sistemine özgü olarak düşünüldüğünde uzman görüşlerinin olmazsa olmaz olduğu vurgulanmalıdır. Çocuk suçluluğu, velayet, kişisel ilişki kurulması, evlat edinme gibi konularda verilen yargı kararlarında, hazırlanan bilirkişi raporlarının çocukların geleceklerini etkileyen en önemli dayanaklardan olduğu unutulmamalıdır.

Ön Söz

Hukuk sisteminin temel amacının toplumsal düzeni sağlamak olduğu söylenebilir. Toplumı meydana getiren bireyler ve kurumların nasıl davranması veya nasıl davranmaması gerektiğini ortaya koyan hukuk kuralları devlet gücüyle desteklenir. Nitekim yapılmaması gereken bir davranış yapıldığında ya da yapılması gereken bir davranış yapılmadığında bunun yaptırımını sağlayacak bir otoriteye ihtiyaç vardır. Böylece her devlet, kendi hukuk sisteminin işleyişini sağlayabilecek bir adli sistem oluşturmuştur. Adli süreçler adli kararların alındığı ve işletildiği süreçler olarak tanımlanabilir. Sağlıklı bir adli karar alma süreci ise doğru ve en kesin bilgiyi elde etmekten geçer.

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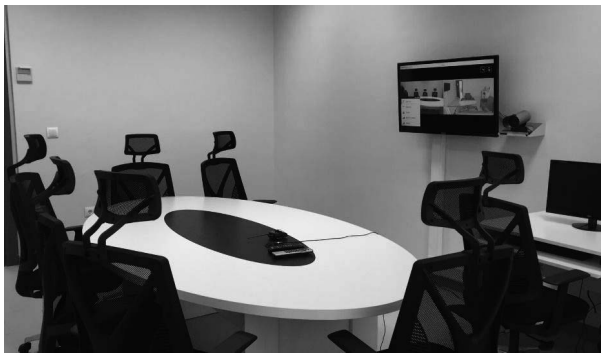
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2. Basım

ANESTEZİ TEKNİKER/TEKNİSYENLERİ İÇİN TEMEL ANESTEZİ UYGULAMALARI

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İÇİNDEKİLER

BÖLÜM 1	PREOPERATİF DEĞERLENDİRME.....	1
I.	Tıbbi Öykü ve Sistemlerin Gözden Geçirilmesi.....	1
II.	Fiziksel Durumun Değerlendirilmesi.....	2
III.	Hastaya Ait Risk Faktörlerinin Değerlendirilmesi	4
IV.	Perioperatif Riski Arttıran Koşullar	7
V.	Preoperatif İstenmesi Gerekli Olan Testler	17
VI.	Preoperatif İlaç kullanımı	20
VII.	Preoperatif Sıvı ve Gıda Alımının Sınırlandırılması	34
	Kaynaklar	35
BÖLÜM 2	GENEL ANESTEZİ ÖNCESİ MALZEME VE HASTA HAZIRLIĞI.....	37
I.	Genel Anestezi Öncesi Malzeme Hazırlığı	37
II.	Genel Anestezi Öncesi Hasta Hazırlığı	44
	Kaynaklar	46
BÖLÜM 3	PREMEDİKASYON VE SEDASYON.....	47
I.	Premedikasyon ve Sedasyonun Amaçları.....	47
II.	Sedatif ve Hipnotikler	49
III.	Antihistaminikler	53
IV.	Mide Asidi ve Volümünü Azaltan İlaçlar	54
	Kaynaklar	56
BÖLÜM 4	MONİTÖRİZASYON VE İZLEM	57
I.	Temel Anestezi Monitörizasyonu	57
II.	Oksijenizasyon Monitörizasyonu.....	59
III.	Ekspire Edilen Gazların Monitörizasyonu	61
IV.	Karbondioksit Monitörizasyonu	61

V.	Dolaşım Monitörizasyonu	63
	Kaynaklar	74
BÖLÜM 5	HAVA YOLU AÇIKLIĞI VE ALTERNATİF HAVA YOLU YÖNTEMLERİ.....	75
I.	Anatomi.....	75
II.	Hava Yolunun Değerlendirilmesi	76
III.	Hava Yolu Kontrolünde Kullanılan Ekipmanlar	78
	Kaynaklar	84
BÖLÜM 6	GENEL ANESTEZİ İNDÜKSİYONU	85
I.	Tanım ve İndüksiyona Hazırlık.....	85
II.	İndüksiyon Uygulama Yolları	86
III.	Adjuvan Ajanlar	96
IV.	Nöromusküler Bloker Ajanlar (NMBA)	99
	Kaynaklar	103
BÖLÜM 7	ENDOTRAKEAL ENTÜBASYON	105
I.	Endotrakeal Entübasyon Endikasyonları	105
II.	Endotrakeal Entübasyondan Önce Hastanın Değerlendirilmesi. 107	
III.	Entübasyonda Kullanılan Araç, Gereçler ve Hazırlıklar.....	110
IV.	Endotrakeal Entübasyonun Yapılışı	113
V.	Laringoskopi ve Endotrakeal Entübasyona Bağlı Komplikasyonlar	115
	Kaynaklar	117
BÖLÜM 8	GENEL ANESTEZİ İDAMESİ	119
I.	Monitörizasyon ve Sistemlerin Takibi	120
II.	İdame Döneminde İlaçların Takibi.....	123
III.	Aldığı Çıkardığı Sıvı ve Kanama Takibi	126
IV.	Hasta Pozisyonunun Önemi	127
V.	İntraoperatif Dokümantasyon.....	128
	Kaynaklar	128
BÖLÜM 9	GENEL ANESTEZİ ESNASINDA GELİŞEBİLECEK KOMPLİKASYONLAR.....	129
I.	Solunum Sistemi ile İlgili Komplikasyonlar	129
II.	Dolaşım Sistemi ile İlgili Komplikasyonlar	131
III.	Isı Değişiklikleri	134

IV. Periferik Sinir Hasarları.....	136
V. Alerjik ve Anafilaktik Reaksiyonlar	136
VI. Farkında Olma	137
VII. Gastrointestinal Sistem Komplikasyonları.....	137
Kaynaklar	138
BÖLÜM 10 GENEL ANESTEZİNİN SONLANDIRILMASI	139
I. Ekstübasyon İçin Hazırlık	139
II. Ekstübasyon Süreci.....	141
III. Ekstübasyon Sırasında Görülebilen Komplikasyonlar	143
IV. Ekstübasyon Sonrası Bakım	144
Kaynaklar	145
BÖLÜM 11 HASTA TRANSFERİ	147
I. Hastane İçi Transfer.....	147
II. Hastane Dışı Transfer	150
Kaynaklar	151
BÖLÜM 12 REJYONEL ANESTEZİ HAZIRLIĞI.....	153
I. Monitörizasyon ve Hasta Hazırlığı	153
II. Ekipman	155
III. İlaçlar	159
Kaynaklar	162
BÖLÜM 13 NÖROAKSİYEL ANESTEZİ UYGULAMALARI	163
I. Nöroaksiyel Anestezide Temel Bilgiler	163
II. Nöroaksiyel Anestezi Teknikleri	168
III. Nöroaksiyel Anestezinin Komplikasyonları	173
Kaynaklar	176
BÖLÜM 14 PERİFERİK SİNİR BLOĞU UYGULAMA HAZIRLIĞI..	177
I. Blok Uygulama Alanı Genel Hazırlığı	177
II. Periferik Blok Sonrası Hastanın Değerlendirilmesi	180
III. Hasta Kontrollü Analjezi (HKA) Hazırlama	181
Kaynaklar	181
BÖLÜM 15 PERİFERİK SİNİR BLOĞU UYGULAMALARI	183
I. Üst Ekstremité İçin Periferik Sinir Blokları	183
II. Alt Ekstremité Periferik Sinir Bloğu Uygulamaları	188
Kaynaklar	194

BÖLÜM 16 REJYONEL İNTRAVENÖZ ANESTEZİ	
UYGULAMASI VE TAKİBİ	195
I. Tarihçe.....	195
II. Endikasyonları	196
III. Kontrendikasyonları	196
IV. Teknik	196
V. Yan Etkiler ve Komplikasyonlar	200
Kaynaklar	201
BÖLÜM 17 SEDOANALJEZİ UYGULAMASI VE TAKİBİ	203
I. Tanımlar	203
II. Sedoanaljezi Uygulanan Prosedürler.....	205
III. Risk Faktörleri.....	205
IV. Komplikasyonlar	207
V. Ekipman.....	207
VI. Sedoanaljezi Öncesi Hastayı Değerlendirme	207
VII. Monitörizasyon	208
VIII. İlaçlar	208
IX. Taburculuk Kriterleri.....	211
Kaynaklar	212
BÖLÜM 18 POSTOPERATİF AĞRI VE TEDAVİSİ.....	213
I. Postoperatif Ağrının Oluşumu	213
II. Ağrı ve Sistemler.....	213
III. Postoperatif Ağrıyı Değerlendirme.....	214
IV. Postoperatif Ağrı Tedavisi	216
V. Postoperatif Kronik Ağrı	220
Kaynaklar	220
BÖLÜM 19 GÜNÜBİRLİK VE AMELİYATHANE DIŞI ANESTEZİ	
UYGULAMALARI.....	223
I. Günübirlilik Anestezi Uygulamaları	223
II. Ameliyathane Dışı Anestezi Uygulamaları.....	226
III. Özel Girişimlerde Anestezi Uygulamaları	236
Kaynaklar	251

BÖLÜM 20 ZOR VE BAŞARISIZ HAVA YOLUNUN	
ACİL YÖNETİMİ.....	253
I. Zor Hava Yolu	253
II. Başarısız Hava Yolu	257
III. Spesifik Hasta Gruplarında Zor ve Başarısız Hava Yolu.....	259
Kaynaklar	263
BÖLÜM 21 TEMEL VE İLERİ YAŞAM DESTEĞİ	265
I. Kardiyak Arrestin Tanımı ve Tanınması	265
II. Temel Yaşam Desteği	267
III. İleri Yaşam Desteği	273
Kaynaklar	280
BÖLÜM 22 ANAFİLAKSİ	281
I. Etiyoloji ve İnsidans	281
II. Perioperatif Anafilaksi Nedenleri	281
III. Risk Faktörleri.....	283
IV. Klinik Bulgular.....	284
V. Tanı.....	284
VI. Tedavi	285
Kaynaklar	286
BÖLÜM 23 MALİGN HİPERTERMİ	289
I. Epidemiyoloji.....	289
II. Fizyopatoloji ve Klinik Özellikler	290
III. Tanı ve Ayırıcı Tanı.....	291
IV. Malign Hipertermi Kriz Yönetimi ve Tedavisi	292
V. Malign Hipertermi Riski Olan Hastalarda Anestezi Yönetimi	294
Kaynaklar	295
BÖLÜM 24 MASİF HEMORAJİ.....	297
I. Temel Bilgiler ve Tanımlar	297
II. Masif Hemorajiyi Hazırlayıcı Durumlar.....	300
III. Olası Masif Hemorajiyi İçin Alınacak Önlemler	301
IV. Masif Hemorajinin Tedavisi.....	304
V. Masif Transfüzyonun İstenmeyen Sonuçları	306
Kaynaklar	307

BÖLÜM 25 ŞOK	309
I. Şokun Tanımı ve Tipleri	309
II. Şokun Tedavisi.....	314
Kaynaklar	316
DİZİN	319

Bölüm 1

PREOPERATİF DEĞERLENDİRME

Fatma Işıl Şengül, Betül Kozanhan

Preoperatif yani ameliyat öncesi dönem, operasyonun planlanması ile başlar ve anestezi indüksiyonu ile son bulur. Bu dönemde hastanın kapsamlı olarak değerlendirilmesi, cerrahi prosedür ve anestezi işleminin başarısı açısından oldukça önemlidir. Preoperatif değerlendirmede temel amaç cerrahi tedaviyi olumsuz yönde etkileyebilecek risk faktörlerini erken saptamak ve eğer mümkün ise bu durumu ameliyat öncesi dönemde düzelterek olası komplikasyonları önlemek ya da en aza indirmektir. Yeterli bir preoperatif değerlendirme; planlanan cerrahi işlemin ertelenmesini önleyerek ve oluşabilecek komplikasyonları minimuma indirerek perioperatif morbiditeyi ve hastanede yatış süresini kısaltır ve perioperatif bakım maliyetini azaltır. Preoperatif değerlendirme için en uygun zamanlama, hastanın genel sağlık durumu, diğer bakım sağlayıcılarla olan ilişkisi, planlanan prosedür risk derecesi ve prosedürün aciliyetine bağlıdır. Preoperatif dönemde anestezi ve postoperatif bakım için bir plan oluşturulur ve hasta bilgilendirilerek onamı alınır. Bu bölümde preoperatif değerlendirme konusu kapsamlı bir biçimde ele alınmıştır.

I. Tıbbi Öykü ve Sistemlerin Gözden Geçirilmesi

Preoperatif değerlendirmede hasta hikâyesinin sağlıklı bir şekilde elde edilmesi, fizik muayene bulguları ve laboratuvar testleri kadar önemlidir. Bu amaçla perioperatif olumsuz olaylarla ilişkili olduğu gösterilen koşulları tespit etmek için hazırlanmış çeşitli tarama soruları kullanılabilir (Tablo 1) (1). Hastanın tıbbi geçmişi, mevcut hastalıkları ve bunların süresi ve ciddiyeti, kullandığı ilaçlar, alerji varlığı, tütün ve madde bağımlılığı, geçmiş cerrahi öyküsü ve hasta ya da aile üyelerinde anestezi ile geçmiş deneyimler ve sorunlar öğrenilmelidir. Daha önceki ameliyatlarda hava yolu yönetimi zorluğu, ameliyat sonrası ciddi bulantı ve kusma varlığı, malign hipertermi veya psödokolinesteraz eksikliği açısından aile öyküsü sorulmalıdır. Anestezi sonrası aşırı boğaz ağrısı, anestezi ile ilgili dış yaralanması veya “küçük boy solunum tüpü gerektirmesi” öyküsü, solunum yolu yönetiminde zorluğa işaret eder. Önceki anestezi işlemine ait kayıtların gözden geçirilmesi hava yolu yönetimini planlamaya yardımcı olabilir. Hava yolu yönetimi sırasında zarar görme

Tablo 8. Elektif Cerrahi Öncesi Açlık Süreleri (19)

		Elektif cerrahi	Acil cerrahi
Risk faktörü olmayan hasta Aspirasyon riski önemsenmeyecek kadar düşük	Berrak sıvı	Kısıtlama yok	Kısıtlama yok
	Anne sütü	Kısıtlama yok	
	Yemek, mama, anne sütü dışındaki sütler	2 saat açlık süresi	
Hafif riskli Hasta açısından; <ul style="list-style-type: none"> • Ciddi sistemik hastalık • Sınırdan obezite (VKİ 30-39 kg/m²) • Bir yaşına kadar olan çocuklar • Hiyatal herni İşlem açısından; <ul style="list-style-type: none"> • Endoskopi • Bronkoskopi 	Berrak sıvı	Kısıtlama yok	Kısıtlama yok
	Anne sütü	2 saat açlık süresi	
	Yemek, mama, anne sütü dışındaki sütler	4 saat açlık süresi	
Orta riskli Hasta açısından; <ul style="list-style-type: none"> • Hayatı tehdit eden ciddi sistemik hastalık varlığı, • Ciddi obezite (VKİ ≥40 kg/m²), OSA • Hava yolu anormallikleri • Hiperemezis, özefageal anormallikler (akalazyza, atrezi, TOF, gastroparezi), bağırsak obstrüksiyonu (ileus, pilor stenozu vb.) İşlem açısından; <ul style="list-style-type: none"> • Ventilasyon desteği öngörülen hasta 	Berrak sıvı	2 saat açlık süresi	Kısıtlama yok, uygunsuzsa ketamin kullanılmalı
	Anne sütü	4 saat açlık süresi	
	Yemek, mama, anne sütü dışındaki sütler	6 saat açlık süresi	

VKİ: Vücut kitle indeksi, OSA: Obstrüktif uyku apnesi TOF: Trekea-özefageal fistül

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Bölüm 2

GENEL ANESTEZİ ÖNCESİ MALZEME VE HASTA HAZIRLIĞI

Aslı Alkan, Handan Güleç

Genel anestezi, cerrahi ve diğer ağrılı müdahalelerin, yeterli analjezi ve yeterli kas gevşemesi ile hızlı ve güvenli bir şekilde uygulanmasını sağlar. Bu sürecin başarılı olabilmesi için preoperatif klinik değerlendirmenin yanı sıra; yapılacak cerrahi müdahaleye yönelik ameliyathane odasının ve odadaki malzemelerin eksiksiz bir şekilde hazırlanması gerekmektedir. Bu hazırlık sürecinde anestezi teknisyenleri kilit rol oynamaktadır. Kullanılacak ilaçlar, cihazlar ve monitörlerin muhafaza edilmesi, hazırlığı, kullanımı ve kullanım esnasında karşılaşılabilecek olası sorunların yönetimi konusunda anestezi teknisyenleri yeterli bilgi sahibi olmalıdır. Ayrıca, hastanın servisten ameliyathaneye kabulü yanı sıra operasyon öncesinde uygun monitörizasyonu ve intraoperatif olası sorunların yönetimi konusunda bilgi ve beceri kazanmaları gerekmektedir (1, 2). İşte bu bölümde genel anestezi öncesi malzeme ve hasta hazırlığından ayrıntılarıyla bahsedilmiştir.

I. Genel Anestezi Öncesi Malzeme Hazırlığı

1. İlaç ve Diğer Malzemelerin Hazırlanması

Yapılacak cerrahiye uygun kullanılacak infüzyon sıvıları, ilaçlar ve gerekli malzemelerin eksiksiz olarak temin edilmesi, uygun şartlarda muhafaza edilmesi ve gerektiği takdirde en hızlı şekilde ulaşılabilmesinin sağlanması zorunludur. Preoperatif hazırlıkta ilk aşama anestezi teknisyeninin ameliyat odasına hastanın kabulünden önce gelerek ilaç ve diğer malzemeleri hazırlaması ile başlar.

Anestezi Teknisyeninin Görev ve Yükümlülükleri

- Perioperatif dönemde kullanılan her türlü ilaç, sıvı, tıbbi malzeme ve sarf malzemenin temini,
- Kullanılan malzemelerin belirli aralıklarla kontrol edilmesi, bitmekte olan veya azalan malzemelerin temininin sağlanması,

dir. Damar yolu açmak için kullanılacak kateter hastanın yaşı ve cerrahi işlemin kanama riskine göre belirlenmelidir. Kalından inceye doğru 16, 18, 20, 22 ve 24 F numaralı intraketler masada hazır bulunmalıdır.

Hastanın genel durumu, cerrahi sürenin uzunluğu, kanama riskinin fazla olması gibi durumlarda standart monitörizasyon ve damar yoluna ek olarak arteriyel kan basıncı ölçümü, santral venöz kateter gibi ek hazırlıklar gerekebilir. Bu işlemler için gerekli malzemeler steriliteye özen gösterilerek hazırlandıktan sonra, sterilite kurallarına uyularak anestezi teknisyenin de yardımı ile anestezi uzmanı tarafından uygulanır.

Postoperatif ağrı için ameliyat sonrası analjezi sağlamak amacıyla epidural veya devamlı periferik sinir bloğu kateterleri takılması gerekebilir. Bu gibi durumlarda anestezi uzmanı ile önceden iletişim kurularak ek hazırlık yapılmalıdır.

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Bölüm 3

PREMEDİKASYON VE SEDASYON

Handan Güleç, Abdulkadir But

Operasyon öncesi ameliyata gireceği anı bekleyen her hasta, bir ameliyat endişesi ile beraber anksiyeteye sahiptir. Özellikle çocuklar, anne-babadan ayrılmanın verdiği endişe ile daha fazla anksiyete hissedebilir. Preoperatif stresin hasta üzerinde olumsuz biyolojik ve psikolojik sonuçları vardır. Premedikasyon ve sedasyon cerrahi öncesi sadece anksiyeteyi gidermez, aynı zamanda kolay bir anestezinin ön hazırlığını da sağlar. Örneğin premedikasyon ile ağız içi sekresyonların azalması, daha konforlu bir entübasyona olanak verir. Bu bölümde premedikasyon ve sedasyonun amaçları ve bu amaçla kullanılan çeşitli ilaçların özelliklerinden bahsedilmiştir.

I. Premedikasyon ve Sedasyonun Amaçları

Premedikasyon terimi ilk kez 1920 yılında Amerikalı Mc Meckan tarafından kullanılmıştır. Halk arasında cesaret iğnesi olarak da bilinen premedikasyon, ameliyat öncesi, özellikle korku ve heyecanı gidermek için gerekli ilaçların uygun yollar-
dan hastaya uygulanması olarak tanımlanır.

Premedikasyonun Amaçları

- Operasyon öncesi korku, heyecan ve endişeyi gidermek,
- Sekresyonları azaltmak,
- İstenmeyen refleksleri önlemek,
- Metabolizmayı yavaşlatarak anestezik madde gereksinimini azaltmak,
- Amnezi sağlamak,
- Mide pH ve volümünü azaltarak aspirasyon riskini ortadan kaldırmak,
- Postoperatif bulantı ve kusmayı önlemektir.

d. Nizatidin

Famotidin gibi uzun etki süreli bir H₂ reseptör blokeridir. Büyük bir kısmı değişmeden böbreklerden atılır. Duodenum ülserlerinin tedavisi için kullanılır. Böbrek yetmezliği varlığında doz kreatinin klerensindeki düşme ile orantılı bir şekilde azaltılır. En sık görülen yan etkileri terleme ve ürtikerdir.

3. Metoklopramid (Metpamid)

Metoklopramid alt özafageal sfinkter tonüsünü artırır ve gastrik boşalımı kolaylaştırır. Etki başlangıcı oral uygulamadan 30-60 dk, İM ya da İV uygulamada ise 1-3 dakikadır. Özellikle, diyabet hastaları, gebeler, gastroparezisi olan hastalarda preoperatif gastrik boşalmayı hızlandırır ve gastrik sıvı volümünü azaltmak için kullanılır. Metoklopramid ilişkili yan etkiler; anksiyete, huzursuzluk ve depresyon gibi santral yan etkiler ile hiperprolaktinemi ve QT interval uzamasıdır. Dozu 10 mg'dır.

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Bölüm 4

MONİTÖRİZASYON VE İZLEM

İsmail Tuna Geldigitti, Necla Dereli

Monitörizasyon Latince’de uyarmak, hatırlatmak ya da ihtar etmek anlamına gelen *monere* kelimesinden gelir. Anestezi sırasında hastanın mevcut klinik verilerinin yorumlanarak o andaki veya gelecekteki istenmeyen talihsizlikler veya olayların fark edilmesini sağlar. Anestezi sırasında anestezi ajanlarının kardiyopulmoner depresan etkileri, homeostaz değişiklikleri ve hastaların farmakolojik, cerrahi veya fizyolojik müdahalelere yanıt vermeleri nedeniyle anestezi alan her hasta monitörize edilmelidir. Hastaların monitörize edilmesi; solunum devresinden ayrılma, hipoventilasyon, endobronşiyal ya da özofageal entübasyonu, hipoksi, hipovolemi, anestezi aşırı dozu, pnömotoraks, hava embolisi, hipotermi, hipertermi, asit baz dengesi bozuklukları ve kardiyak disritmiler gibi istenmeyen olayların fark edilmesini sağlar.

Anestezi sırasında sirkülasyon, ventilasyon, oksijenizasyon ve doku perfüzyonunun yeterli olup olmadığı monitörize edilmelidir. Bu standartlar tüm anestezi süresince geçerlidir. Ancak acil durumlarda yaşam destekleyici önlemler önceliklidir. Tüm bu önlemler, kaliteli bir hasta bakımını sağlamak içindir. Bu bölümde temel monitörizasyon parametrelerinden ve bu parametrelerin izleminden bahsedilmiştir.

I. Temel Anestezi Monitörizasyonu

Monitörizasyon tüm genel anestezi, rejonel anestezi ve monitörize anestezi işlemleri sırasında kullanılır. Temel anestezi monitörizasyonu ilk kez 1986’da Amerikan Anesteziyolojistler Derneği (ASA) tarafından belirlenmiş ve standardize edilmiştir (1). Devamlı monitörizasyon sırasında kısa kesintiler olabilir. Bu standartlar doğumdaki hastanın izleminde veya ağrı yönetimi sırasında kullanıma uygun değildir.

tasyona ve serebral ödeme neden olur. Tedavide geç kalmırsa hastalar organ yetmezlikleri veya dissemine intravasküler koagulyasyon ile kaybedilebilir.

Anestezi indüksiyonunu takiben masseter spazmı veya kas rijiditesi meydana gelmesi, taşikardi ve EtCO₂ artışı anestezi ekibini uyarmalıdır. Ateş daha geç ortaya çıkan bir belirti olup vücut sıcaklığı 5 dakikada 1°C yükselebilir.

BUNU BİLİYOR MUSUNUZ?

EtCO₂'nin beklenmedik şekilde 2-3 kat yükselmesi malign hipertermi'nin en erken ve en duyarlı belirtisidir.

Malign hipertermi hayatı tehdit eden bir olay olup tanı konulduğu anda volatil anestetik uygulaması kesilmeli, hastalar %100 oksijen ile ventile edilmeli ve hızla dantrolen tedavisine başlanmalıdır (10).

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Bölüm 5

HAVA YOLU AÇIKLIĞI VE ALTERNATİF HAVA YOLU YÖNTEMLERİ

Gökhan Yıldız, Handan Güleç

Hava yolu açıklığının sağlanması ve hava yolu kontrolünün devam ettirilmesi anestezi pratiğinin en temel becerilerinden biridir. Anestezi uzmanlarının yanı sıra anestezi teknisyenleri de hava yolunun kontrolü konusunda yeterli bilgi ve beceriye sahip olmalıdır. Hava yolu anatomisine hakim olmak, anamnez ve fizik muayeneye gereken önemi göstermek ve kullanılacak hava yolu araçlarını tam ve eksiksiz sağlamak özellikle acil durumlarda anestezi ekibi ve hasta açısından hayat kurtarıcı olacaktır.

Endotrakeal tüpün bir laringoskop ya da alternatif araçlar aracılığıyla trakea içerisine yerleştirilmesi işlemine *entübasyon* denir. Entübasyon işlemi hava yolunun açık tutulması, solunumun kontrol altına alınması, aspirasyon riskinin azaltılması, cerrahi esnasında hava yolunun güvence altına alınması ve resusitasyon esnasında hava yolu kontrolü sağlar. Bu nedenle entübasyon işleminin sağlanabilmesi için her türlü bilgi ve alet kullanımı anestezi uzmanlarının ve anestezi teknisyenlerinin öncelikli alanıdır. Entübasyon işlemi gerçekleştirilemediğinde veya zor olduğu düşünüldüğü durumlarda ise alternatif hava yolu yöntemlerine ve gereçlerine hakim olunması gerekir (1).

Hava yolunun devamlılığının sağlanmasının zor olduğu olgular, yıllar içerisinde “zor hava yolu” kavramının gelişmesine ve “zor hava yolu algoritmalarının” gelişmesine neden olmuştur. “Zor entübasyon” 2003 yılında Amerikan Anestezist Derneği (ASA) tarafından “geleneksel laringoskopi ile uygun bir tüpün, deneyimli bir anestezist tarafından üçten fazla girişim, 10 dakikadan fazla süre veya her ikisi ile uygun yerleştirilememesi” olarak tanımlanmıştır. Zor entübasyon insidansı genel popülasyonda %1.5-13.2 olarak raporlanmış ve obez hastalarda bu oran %10.3-20.2 olarak tespit edilmiştir (2). Tüm bu gelişmeler ve bilgilerin ışığında bu bölümde üst hava yolu anatomisi, hava yolunun değerlendirilmesi ve muayenesi, hava yolu açıklığının kontrolü için donanım ve yöntemler konularına değinilecektir.

I. Anatomi

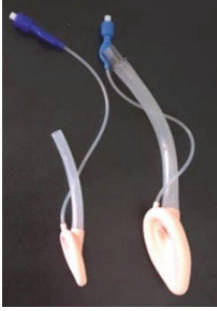
Üst hava yolu; ağız ve burun boşluğu, larinks (gırtlak), farinks (yutak)’ten oluşur. Farinks; kafa tabanından özafagus (yemek borusu) girişine kadar olan bölüme verilen addır. Ağız ve burun boşlukları burada birleşir. Orofarinks, nazofarinks ve

f. Özofageal Trakeal Kombitüp

Yapışık iki tüpten oluşur, özofagus ya da trakeaya yerleşmeleri havalandırma açısından problem oluşturmaz. Uçlarında 15 mm'lik konnektörleri bulunur. Uzun olan tüpün ucu kapalıdır, bu sayede gaz tüpün yan tarafında bulunan deliklerden çıkar. Kısa olan tüpün ucu açıktır ve yan tarafında delik yoktur. Oral yolla körlemesine yerleştirilir. İki adet kafı bulunur, proksimaldeki orofarengal balon 100 cc, distaldeki özofagealbolon 15 cc'lidir ve ikisinin arasında hava delikleri bulunur. Özofageal balon mide içeriğinin aspire edilmesini önler.

g. King Laringel Tüp

Tek lümenlidir, küçük özofageal ve büyük hipofarengal olmak üzere iki adet kafı vardır. İki kaf da tek bir şişirme hattından şişirilir. İki kaf arasında yanlarda hava geçişine izin veren delikler vardır. Resim 7 ve Resim 8'de LMA örnekleri gösterilmiştir.



Resim 7. Klasik LMA



Resim 8. Proseal LMA

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Bölüm 6

GENEL ANESTEZİ İNDÜKSİYONU

Nuran Akıncı Ekinci, Betül Kozanhan

Genel anestezi; anestezi ajanlar ile oluşturulan, otonom, kardiyovasküler, solunum ve termoregülatör sistemlerde fizyolojik stabilitenin sürdürülmesi ile birlikte bilinçsizlik, amnezi, antinosisepsiyon ve immobilité gibi spesifik davranışsal ve fizyolojik özellikler içeren geri dönüşümlü bir durumdur. 1930'lu yıllarda eter ve kloroform ile maruz kalma süresi ve dozu ile ilişkili ortaya çıkan belirtilere göre genel anestezinin 4 evresi; indüksiyon, eksitasyon, cerrahi anestezi ve medüller depresyon (doz aşımı) olarak tanımlanmıştır. Günümüzde ise modern anestezi ajanlar çok daha hızlı etki sağladığı için bu fazlar; indüksiyon (anesteziye başlama), idame (anestezinin devamı) ve recovery (anesteziden uyanma) olarak değiştirilmiştir. Bu bölümde, genel anestezi indüksiyonunun özellikleri, indüksiyon teknikleri ve indüksiyonda kullanılan anestezi ajanlar ayrıntılı olarak anlatılmıştır.

I. Tanım ve İndüksiyona Hazırlık

Genel anestezi indüksiyonu; anestezi ilaçlarının verilmesi ile başlayan ve bilinç kaybı ile sonuçlanan anestezinin başlangıç safhasıdır. Bu dönem preoksijenasyonun başlamasından itibaren hastanın solunum ve hemodinamik parametrelerinin stabil hâle gelip gerekli anestezi derinliğe ulaşmasını sağlayan süreyi kapsar. İndüksiyon, özellikle solunum sistemi ve kardiyovasküler sistemde akut değişikliklerin gözlemlendiği bir evre olması nedeniyle önemlidir. Aynı zamanda, indüksiyon aşaması hastanın cerrahi sonrası hatırlayabileceği bir evre olması sebebi ile daha sonraki uygulamalar için belirli bir deneyim oluşturur. Bu nedenle indüksiyon öncesinde sessiz ve sakin bir ortamda hasta ile iletişim sağlanmalı ve sırasıyla yapılacak işlemlerle ilgili kısa ve anlaşılır bilgiler verilerek hastanın kaygı ve korkusu azaltılmaya çalışılmalıdır. Yapılan işlemler sırasında hastanın mahremiyetine saygı gösterilmelidir.

Tablo 3. Nöromusküler Bloke Edici Ajanların Özellikleri

NMB Ajan	Veküronyum	Roküronyum	Panküronyum	Mivakur-yum	Atrakur-yum	Sisatrakur-yum	Süksinilkolin
Etki süresi	Orta	Orta	Uzun	Kısa	Orta	Orta	Ultra kısa
Entübasyon dozu (mg/kg)	0.10-0.20	0.60-1.00 (RSI için 1.20)	0.08-0.12	0.20	0.50-0.60	0.15-0.20	0.60-1.50
Başlangıç zamanı (dk)	3-4	1-2	2-3	3-4	3-5	4-6	1
Etki süresi (dk)	20-35	30-50 (RSI için 60-80)	60-120	15-20	20-35	30-60	5-10
İdame dozu (mg/kg)	0.01	0.10	0.02	0.10	0.10	0.01	N/A
Yan etkiler	Yüksek dozda vagal blok	Minimal	Vagal blok (taşikardi) Katekolamin salınımı	Histamin salınımı	Histamin salınımı laudanosin ve akrilat üretimi	Yüksek dozda histamin salınımı	Miyalji. Çocuklarda ve tekrarlayan dozlarda bradikardi, asistol. Dual blok Anafilaksi

RSI: Hızlı seri indüksiyon

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Bölüm 7

ENDOTRAKEAL ENTÜBASYON

Nil Kaan

Endotrakeal entübasyon; hava yolu açıklığını sağlamak, güvenli hâle getirmek, solunumu kontrol etmek ve desteklemek amacıyla laringoskopi yardımıyla trakea içine bir tüpün yerleştirilmesidir. Bu işlem için belli bir eğitim ve beceri gerektirdiği için deneyimli sağlık çalışanları tarafından yapılmalıdır. Hastanelerde genellikle anestezi uzmanlarının ve anestezi teknikerlerinin sorumluluğundadır.

Endotrakeal entübasyon, en sık cerrahi girişim nedeniyle genel anestezi uygulamalarında kullanılmaktadır. Bunun yanında acil servislerde ve yoğun bakımlarda, kardiyopulmoner resüsitasyon sırasında, solunum desteği sağlamak ve sürdürmek amacıyla acil ve elektif durumlarda da uygulanır.

Anestezi teknikerleri, endotrakeal entübasyon için gerekli alet ve ekipman hazırlığını yapmak yanında hava yolu anatomisi hakkında bilgi sahibi olmalı, hastanın entübasyonu ile ilgili olarak anamnez alabilmeli ve fizik muayeneyi değerlendirebilmelidir.

I. Endotrakeal Entübasyon Endikasyonları

Genel Anestezi Altında Ameliyat Olacak Hastalarda Endotrakeal Entübasyon Endikasyonları

- Kas gevşetici verilmesi ve pozitif basınçla solunum desteğinin sağlanması gereken ameliyatlarda,
- Baş-boyun ameliyatları; hava yolunun cerrahi ekiple paylaşıldığı ve anestezi uzmanının ameliyat sırasında hava yoluna uzak kalacağı durumlar,
- Anestezi uzmanının hava yolunu kolayca kontrol edemediği, hastanın yüz üstü, oturur, yan yatar veya baş aşağı pozisyonlarda olduğu ameliyatlarda,
- Göğüs, karın veya kafa içi ameliyatlarında,

3. Endotrakeal Ekstübasyondan Sonraki Komplikasyonlar

Ekstübasyondan sonra en sık görülen komplikasyon boğaz ağrısı ve yutma güçlüdür. Hastaya uygun olandan daha büyük endotrakeal tüp kullanılması, kaf balonunun fazla şişirilmesi riski artırabilir. Boğaz ağrısı genellikle kendi kendini sınırlar ve 24 ila 72 saat içinde düzelir. Aynı travmalara bağlı ses kısıklığı da görülebilir.

Larinks spazmı (laringospazm); özellikle çocuklarda sık görülen hava yollarının refleks olarak daralması veya ödemlenmesi sonucu ekstübasyondan sonra hastanın yeterince ventile edilememesine yol açan ciddi bir komplikasyondur. Maske ile %100 oksijen verilerek pozitif basınçlı ventilasyon uygulanır, çene mandibula köşelerinden yukarı ve öne doğru kaldırılır-itilir. Laringospazm devam ederse kas gevşeticisi ve/veya propofol gibi bir İV anestezi ilaç verilip tekrar entübasyon gerekebilir.

Endotrakeal entübasyonun süresi uzadıkça hava yollarında tüpün neden olduğu travmatik komplikasyon riski de artar. Bunlar trakea mukozasında iskemi, kıkırdak hasarı, larinkste granülom, polip gelişimi vb. komplikasyonlardır.

BUNU BİLİYOR MUSUNUZ?

Laringospazm noktası: Kulak kepçesinin arka alt bölümünün çene kemiği ile birleştiği noktaya kuvvetli bası yapılması laringospazmı tedavi edebilir.

DİKKAT ET!

Entübasyondan sonra endotrakeal tüpün kafi, ventilasyon yaparken hava kaçacağını engelleyecek kadar şişirilmelidir. Gereğinden fazla şişirilen kafflar trakeaya bası yaparak kan dolaşımının azalmasına ve travmatik yaralanmalara yol açabilir.

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Bölüm 8

GENEL ANESTEZİ İDAMESİ

Ezgi Erkuç

Anestezi idame dönemi, hastanın yaşamsal fonksiyonlarının korunarak, anestezi hâlinin cerrahi girişim süresince uygun derinlikte devam ettirildiği safhadır. Anestezinin bu döneminde, hastanın dikkatli izlemi indüksiyon ve sonlandırma aşamaları kadar önemlidir. Hangi anestezi tipi uygulanırsa uygulansın iyi yetişmiş yetkin bir anestezi personeli mutlaka ameliyat odasında bulunmalıdır. Anestezi teknisyeni, yaşamsal bulgulardaki normalden sapmaları zamanında fark etmek, gerekli önlemleri almak, anestezi uzmanına zamanında haber vermek ve acil durumlarda yapılacak ilaçları hazır bulundurmak durumundadır.

Anestezinin İdame Aşamasındaki Hedefler

- Cerrahi için anesteziyi sağlamak (bilinçsizlik, amnezi, hareketsizlik, cerrahi uyarılara cevapsızlık).
- İstenmeyen hoş olmayan cerrahi uyarılara karşı yeterli analjezi sağlamak.
- Fizyolojik dengeyi devam ettirmek (hemodinamik denge, oksijenizasyon, solunum, ısı).
- İlaçların takibini yapmak (kas gevşeticiler, inhalasyon anesteziikleri, narkotik ilaçlar ve anestezi olmayan ilaçlar).
- Sıvı dengesi ve kanama takibini yapmak (1).

Tüm bu hedeflerin yerine getirilebilmesi için anestezi teknisyen/teknikerinin genel anestezi idamesi ile ilgili konular hakkında detaylı bilgi sahibi olması gerekmektedir. Bu bölümde genel anestezi idamesi ile ilgili ayrıntılara yer verilmiştir.

lemeler yapılmalıdır. Ameliyat devam ederken herhangi bir bası (göz, göğüs, dış genital organlar, yüze yakın geçen sinirler) olasılığına dikkat edilmelidir. Herhangi bir bası durumu ile karşılaşırsa gerekli önlemler alınmalı ve cerrahi ekip uyarılmalıdır (10).

V. İntraoperatif Dokümantasyon

Anestezi indüksiyonu tamamlanıp idame dönemine geçtikten sonra hastaya ait bilgilerin, kullanılan ilaç ve malzemelerin anestezi fişine yazılarak dokümanite edilmesi gerekir. Başlangıçtan itibaren aksi bir durum belirtilmediyse 5 dk ara ile saturasyon, tansiyon ve nabız not edilmelidir. Ek olarak yapılan ilaçların ne zaman ve hangi dozda yapıldığını anestezi formunda işaretlemek önemlidir. Anestezi ve cerrahi ekipte yer alan çalışanlar, hastaya yapılan ek monitörizasyon işlemleri, anestezi tekniği, hasta pozisyonu, periferik kanülasyonun yeri, sıvılar, kullanılan kanın numarası, idrar miktarı, kan gazları ve zor entübasyon gibi önemli parametrelerde özellikle belirtilmelidir.

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Bölüm 9

GENEL ANESTEZİ ESNASINDA GELİŞEBİLECEK KOMPLİKASYONLAR

Aysun Kurtay, Handan Güleç

Anestezi uygulamalarında hastanın yaşı, genel durumu, yandaş hastalıkları, kullandığı ilaçlar ve yapılacak cerrahi girişim türü anesteziye özellik kazandırır. Ancak hangi anestezi yöntemi uygulanırsa uygulansın girişim sırasında ve sonrasında hafif bir reaksiyondan ölüme kadar götürebilen çeşitli komplikasyonlar görülebilir. Daha iyi monitörizasyon ve anestezi teknikleri, kesintisiz hasta takibi, gelişmiş eğitim, daha kapsamlı protokoller, uygulama standartları ve aktif risk yönetme programları gibi stratejiler ile ciddi anestezi komplikasyonlarının sıklığı azaltılabilir.

Genel anestezi esnasında gelişebilecek komplikasyonlar solunum ve dolaşım sistemi, ısı değişiklikleri, periferik sinir hasarı, alerjik reaksiyonlar ve farkında olma başlıkları altında toplanabilir. Bu bölümde bu konulara ayrıntılı olarak değinilmiştir.

I. Solunum Sistemi ile İlgili Komplikasyonlar

Güvenli bir anestezi için hava yolunun devamlılığı şarttır. Hava yolu ile en sık karşılaşılan sorunlar anestezi devresinde basınç ve hacimle ilgilidir. Devrede kaçak olması, vaporizatörlerin yanlış doldurulması, birden fazla vaporizatörün aynı anda kullanılması, inspirasyon ve ekspirasyon yollarında tıkanma, anestetik ajanın yeterince verilmemesi, otomatik ventilasyonun başlamaması, hastada uygulanan pozisyon değişikliği ya da hastanın baş kısmında yapılan uygulamalar sırasında endotrakeal tüpün anestezi sisteminden ayrılması (diskonneksiyon) sık rastlanılan sorunlardır.

Hava yolunda daralma veya tıkanıklık durumlarında yetersiz tidal volüm, göğüs duvarı, substernal ve klavikular çekilme, yardımcı solunum kaslarının kullanılması, gürültülü solunum, göğüs ve karın hareketlerinde uyumsuzluk, siyanoz ve cerrahi sahada kan renginin koyulaşması gibi belirtiler görülmektedir (1-4).

İntraoperatif dönemde görülen solunum bozuklukları birçok nedene bağlı gelişebilir. Solunum bozukluklarında nedene yönelik araştırma yapılarak gerekli önlemler alınmalıdır.

Ameliyat sonrası dönemde bulantı-kusma (POBK) anestezi ve cerrahinin en sık görülen komplikasyonlarından birisidir. Cerrahi sonrası 24-48 saat içinde gelişen bulantı, öğürme veya kusma olarak tanımlanır. POBK hasta memnuniyetini azaltır, iyileşme süresini uzatır. Aspirasyon, dehidratasyon, elektrolit imbalansı ve sütür hatlarının ayrılmasına neden olabilir. POBK gelişiminde hastaya özgü risk faktörleri (kadın cinsiyet, taşıt tutma öyküsü, sigara içmeme, 50 yaşından küçük olmak), anestezi risk faktörleri (volatil anestezipler, anestezi süresi, postoperatif opioid kullanımı, nitroz oksit kullanımı) ve cerrahiye ait risk faktörleri (kolesistektomi, laparoskopik cerrahi ve jinekolojik cerrahiler, çocuklarda şaşılık cerrahisi) rol oynar. POBK yönetiminde, riskli hastaları belirleme, risk faktörlerini azaltma ve uygun profilaksi ve tedavi uygulanmalıdır.

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Bölüm 10

GENEL ANESTEZİNİN SONLANDIRILMASI

Mehmet Şahap, Abdulkadir But

Başarılı bir anestezi yönetiminin en önemli parçalarından biri uyanma safhasının iyi yönetilmesidir. Anesteziyi sonlandırma dönemine geçici olarak kaybolan bilinç ve refleksler geri döndürülür, kas tonusu tekrar eski haline gelir. Uyanma döneminde yaşanan olumsuz durumlar nedeni ile hastalar da anestezi ile ilgili deneyimlerinin kötü hatırlanmasına neden olmaktadır. Anestezi teknisyen/teknikerinin genel anestezinin sonlandırılması aşamasında da hastanın takibini dikkatli bir şekilde yapması gerekmektedir. Bu bölümde genel anestezinin sonlandırılması ilgili ayrıntılara değinilmiştir.

I. Ekstübasyon İçin Hazırlık

Genel anestezi uygulaması için trakeaya yerleştirilen endotrakeal tüpün anestezi sonunda yerinden çıkarılmasına ekstübasyon adı verilir. Başarılı bir ekstübasyon için gerekli tüm ekipmanlar ve ilaçlar hazır tutulmalı hasta güvenli bir şekilde anesteziden uyandırılmalıdır. Başarılı bir ekstübasyon için planlama yaparken aşağıdaki sıralama gözetilmelidir.

- Ekstübasyonu planlamak
- Ekstübasyon için hazırlık yapmak
- Ekstübasyon
- Ekstübasyon sonrası bakım ve takip.

Genel anesteziden uyanma anestezinin riskli safhalarından biridir. Bu döneme hastayı hazır hale getirmek, ekstübasyon sırasında büyük kolaylıklar sağlar. Genel anestezinin sistemlere ve reflekslere olan hakimiyeti yavaş yavaş azalacak ve hasta tekrar normal fizyolojik metabolizmasına dönecektir. Bu değişiklikler sırasıyla kontrole solunumdan spontan solunuma geçiş, gevşemiş olan vücut kaslarının tonusunun tekrar kazanılması, öksürük, yutkunma gibi reflekslerin tekrar geri kazanıl-

basıncı ve nabızda dalgalanmalar görülebilir. Ekstübasyon sonrasında hasta normal fizyolojik durumuna dönene kadar çok yakın ve dikkatli bir takip yapılmalıdır. Anestezi sonrası gelişen komplikasyonların yarısı ilk bir saatte gerçekleşir ve anestezi derlenme dönemindeki komplikasyonların prognozu anestezi sırasındaki komplikasyonlardan daha kötüdür (10).

Genel anestezi uyanan hasta kendi başına yeterli ventilasyon sağlayana kadar ve yeterli kas tonusuna ulaşana kadar ameliyat odasında bekletilmelidir. Bu koşulları sağladıktan sonra hastalar anestezi sonrası derlenme ünitesine (ASDÜ) transport edilmelidir. Hasta ameliyat odasından ASDÜ'ye transfer edilirken mutlaka üst solunum yollarının açıklığı ve etkili solunumunun devam ettiği eşlik eden anestezi doktoru veya anestezi teknisyeni tarafından izlenmelidir. Yeterli ventilasyon varlığı göğüs kafesinin kalkması ve inmesi ile takip edilmeli ya da mobil pulse oksimetri yardımıyla oksijen saturasyonu izlenmelidir. Ekstübasyon döneminde solunum yetmezliği olan hastaların ASDÜ'ye transferinde oksijen desteği gerekebilmektedir. Bu durumda seyyar oksijen tüpleri ile hastalar hipoksemiden korunmalıdır. ASDÜ'ye getirilen hastalar orada bulunan doktor, hemşire ya da anestezi teknisyenine ayrıntılı bir şekilde sunulmalıdır. Hastanın kısa demografik bilgileri, ameliyat bilgisi, mevcut hastalıkları, vaka sırasında yaşanan önemli hadiseler, anestezi şekli, cerrahi veya anestezi açısından dikkat edilmesi gereken uyarılar ASDÜ'ye ekibine aktarılmalıdır (11).

Hastaların solunum, dolaşım ve nörolojik fonksiyonları ASDÜ'de deneyimli personellerce dikkatlice izlenmelidir. Hastalar ağrı ve postoperatif gelişebilecek komplikasyonlar açısından takip edilmeli ve gerektiğinde ilgili doktorlara haber verilmelidir. Genel anestezi uygulanan hastalar ASDÜ'e geldiklerinde ilk olarak periferik oksijen saturasyonu ve kan basıncı ölçülmeli ve gerekirse oksijen desteği verilmelidir. Kan basıncı ölçümü 5'er dakika aralıklarla yapılmalı ve kayıt edilmelidir. Hastaların vücut sıcaklıkları ölçülmelidir. Hipotermiye bağlı titreme ile oksijen ihtiyacı artacağından hastalar normotermik olana kadar ısıtılmalıdır. Özellikle pediatri grubunda hipotermi oluşmamasına özen gösterilmelidir (2).

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Bölüm 11

HASTA TRANSFERİ

Berrin Koşar, Handan Güleç

Cerrahi işlemi tamamlanan hastanın operasyon masasından anestezi sonrası bakım ünitesine (ASBÜ) transferi güvenli bir şekilde gerçekleştirilmelidir. Diğer taraftan kritik durumdaki bir hastanın tedavi ve bakım olanaklarının daha iyi olduğu başka bir bölüme, ameliyathaneye, yoğun bakım ünitesine ya da diğer bir kuruma transferi gerekebilir. Transfer sırasında hastada gelişebilecek riskler, dikkatli bir planlama, uygun personel ve malzeme seçimi ile mümkün olduğunca azaltılmaya çalışılmalıdır. Bu bölümde hasta transferi ile ilgili karşılaşılabilecek riskler ve alınması gereken önlemler detaylı bir şekilde bahsedilmiştir.

I. Hastane İçi Transfer

Hastanın acil biriminden, ameliyathanelerden veya servislerden yoğun bakıma gelmesi veya hastanın yoğun bakımdan tetkik ve girişimsel işlemler için nakil edilmesidir. Transfer kararında, planlanan girişimin yararı ve transferin riski göz önüne alınmalıdır. Transfer riski, tıbbi risk ve seyahat risklerini kapsar. Tıbbi risk, hastanın tıbbi durumu, transfer sırasındaki ısı değişikliği, hızlı veya yavaş hareket etme etkisi olabilir. Seyahat riski, transfer sırasında vibrasyon ve çarpışma riski olabilir (1).

Transfer risklerini en aza indirmek için öncesinde hasta durumu stabilize edilmelidir. Güvenli bir seyahate hazırlamak için gerekli tanı ve tedaviler (venöz girişimler, entübasyon gibi) yapılmalıdır. Kurum içi veya kurumlar arası hasta taşınması sırasında, eşlik eden deneyimli personel tarafından yaşamsal fonksiyonların aralıksız izlenmesi, herhangi bir durumda hasta için gerekli olan girişimlerin yapılabilmesine olanak sağlayacaktır.

Hastanın bulunduğu ve gönderileceği birimlerde hekim-hekim ve yardımcı sağlık çalışanı-yardımcı sağlık çalışanı arasında gerekli iletişim sağlanmalıdır. Hastane

göz önünde bulundurularak entübe olmayan hastalara da oksijen vermek gerekebilir. Hastaların uçakla uzun mesafeli transferi tolere edebilmeleri için stabil olmaları gereklidir. Örneğin akut miyokard infarktüsünden iki hafta sonra hastanın medikal transferi uygundur (9). Transfer, karadan (kara ambulansı) veya havadan (helikopter ve sabit kanatlı uçaklar) sağlanabilir. Tüm transport şekillerinde gürültü, vibrasyon ve türbülans artar.

Sonuç olarak, kritik durumdaki hastanın, transfer sırasında olumsuz etkilenmemesi ve risklerin ortadan kaldırılması ancak dikkatli bir planlama yapılması, deneyimli sağlık personelinin olması ve uygun donanım seçimi ile mümkündür.

DİKKAT ET!

Eğer hava yolu transportu yapılıyor ise ortaya çıkabilecek sorunlara hazırlıklı olunmalıdır. Artan yükseklikle beraber oksijen basıncı azalırken; gaz hacimleri artar, eğer hacim artmıyorsa basınç artar. Uçakla yapılan transportta entübe olmayan hastalarda SpO₂ takibi yapılmalı ve ek oksijen desteği verilmelidir. Entübasyon tüplerinin kaf basınçları uçuş sırasında ayarlanmalı veya kaf su ile şişirilmelidir.

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Bölüm 12

REJYONEL ANESTEZİ HAZIRLIĞI

Murat İzgi, Fatma Sarıcaoğlu

Rejyonel anestezi hastanın bilinç durumu değiştirilmeden, lokal anestetik ajanlar kullanılarak vücudun belirli bir bölgesindeki ağrı duyusunun ortadan kaldırılması olarak tanımlanabilir. Nöroaksiyel sinir blokları (spinal anestezi ve epidural anestezi) ve periferik sinir blokları bu kapsamda uygulanan çeşitli rejyonel anestezi yöntemleridir. Bu işlemler operasyondan hemen önce operasyonun gerçekleştirileceği ameliyat odasında uygulanabileceği gibi daha ideal olarak ayrı bir rejyonel blok odasında da uygulanabilir. Bu işlemler için ayrılmış bir blok odası, hastanın ameliyathaneye devir süresini kısaltırken aynı zamanda ideal ortamın temin edilmesini sağlayacaktır (1). Yakın dönemde, özellikle periferik sinir bloğu uygulamalarında, sinir stimülatörü ve ultrasonografi (USG)'nin klinik kullanımda yerini alması ile rejyonel anestezi uygulamalarının popülerliği artmıştır. Bu bölümde rejyonel anestezi işlemleri esnasında kullanılacak olan ve hazır bulundurulması gereken ekipman ve ilaçlar ile hasta hazırlığına değinilmiştir.

I. Monitörizasyon ve Hasta Hazırlığı

Hastalar işlemin yapılacağı odaya alındıktan sonra standart ASA kriterlerine göre vital bulgular (EKG, pulse oksimetri ve tansiyon manşonu) monitörize edilmelidir. Ardından venöz damar yolu açılarak uygun kristalloid sıvı infüzyonu başlanır. Uygulanacak bloğa göre hastaya pozisyon verilir (oturma pozisyon, lateral dekübit pozisyonu vb.) ve işlem yapılacak alan steril şartlarda boyanıp örtülür (Resim 1-3)

BUNU BİLİYOR MUSUNUZ?

Rejyonel anestezi hastanın bilinç durumu değiştirilmeden, lokal anestetik ajanlar kullanılarak vücudun belirli bir bölgesindeki ağrı duyusunun ortadan kaldırılması işlemidir.

önerilmektedir (1, 10). Açılmamış ambalajları 25°C'nin altındaki oda sıcaklığında saklanmalıdır. Açıldıktan sonra 24 saat içerisinde kullanılmalıdır (11, 12).

3. Sedatif İlaçlar

- a. Midazolam
- b. Fentanil
- c. Ketamin
- d. Propofol

DİKKAT ET!

%20 intralipit solüsyonu lokal anestezi-
lerin sistemik toksisitesinin tedavisinde,
özellikle kardiyak arrest gelişen hastalarda
kardiyopulmoner resüsitasyona dirençli
durumlarda hayat kurtarıcıdır.

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Bölüm 13

NÖROAKSİYEL ANESTEZİ UYGULAMALARI

Halil Çetingök

Nöroaksiyel anestezi uygulamaları spinal, epidural, kaudal ve kombine spinal/epidural anestezi yöntemlerini kapsar. Nöroaksiyel anestezi uygulamasında iğne ucu ile vertebral kolon içerisine girilerek lokal anesteziklerin direk olarak spinal kord ve/veya sinirler çevresine verilmesi ve sonucunda nöral iletinin bloke edilmesi sağlanır. Nöral iletinin başlıca üç komponenti olan sempatik, duysal ve motor ileti bu blokajdan etkilenir. Blokajın kuvveti ve etkilediği vücut alanı uygulanan teknik, seviye ve kullanılan ilaç miktarına göre değişmektedir. Tek seferlik enjeksiyon yapılabileceği gibi kateter takılması yoluyla devamlı blokaj da uygulanabilir.

Nöroaksiyel anestezi yöntemleri 100 yıldan uzun zamandır uygulanagelmektedir. Tek başına veya genel anestezi ile kombine olarak uygulanmasının perioperatif morbidite ve mortaliteyi düşürdüğü, postoperatif venöz tromboz ve pulmoner tromboemboli insidansını azalttığı, kanama ve buna bağlı transfüzyon ihtiyacını azalttığı, kronik akciğer hastalığı olanlarda solunum sistemi komplikasyonları azalttığı, periferik doku kan akımı ve oksijenasyonunu arttırdığı, cerrahiye sekonder ortaya çıkan nöroendokrin stres yanıtı azalttığı ve bu yolla bazı kanserlerde rekürrens ihtimalini azalttığı çeşitli çalışmalar ile gösterilmiştir. Bu avantajlar sayesinde nöroaksiyel anestezi/analjezi teknikleri uygun hastalarda genel anesteziye iyi bir alternatif oluşturmaktadır ya da genel anestezi ile birlikte uygulanarak daha düşük bir komplikasyon oranına ulaşmasını sağlamaktadır.

Bu bölümün ilk kısmında nöroaksiyel anestezi yöntemlerine ait temel bilgiler, ikinci kısmında ise spinal, epidural, kaudal ve spinal/epidural kombine blokların spesifik özellikleri anlatılmıştır.

I. Nöroaksiyel Anestezide Temel Bilgiler

Başarılı ve güvenli bir nöroaksiyel anestezi tekniği uygulaması teknik ile ilgili anatomi ve fizyoloji, işlemin etki mekanizması, hazırlık, pozisyon vb. temel bilgi altyapısının yeterli olmasına bağlıdır.

c. Kaşıntı

Çoğunlukla opioidlerin intratekal verilmesi sonrası gözlenir. Ortaya çıkması ve rahatsız edici boyutta olması durumunda opioid antagonistleri kullanılabilir.

d. Bulantı ve Kusma

Çoğunlukla nöroaksiyel anestezi sonrası hipotansiyon gelişmesi veya uyanık hastalarda visseral uyarı sonrası gelişir. Uyarı sonlandığında veya hipotansiyona müdahale edildiğinde düzelir.

e. Bel Ağrısı

Genellikle pozisyon verilmesi sırasında kas ve ligamanlarda oluşan zorlanma veya iğnenin kemik yapıların periostuna sürtünmesi nedenlidir. İstirahat, sıcak uygulama, masaj ve basit analjezikler ile kendiliğinden düzelir.

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Bölüm 14

PERİFERİK SİNİR BLOĞU UYGULAMA HAZIRLIĞI

Gözen Öksüz, İsmet Topçu

Rejyonel anestezi uygulamaları tüm dünyada giderek yaygınlaşmaktadır. Özellikle ultrasonografinin kullanımının artması periferik blok uygulamalarının hem çeşitliliğini hem sıklığını arttırmıştır (1). Blok ve hastaya göre ilaç dozları, teknik ekipmanların kullanımı ve blok hazırlığında farklılıklar görülebilmektedir (2). Blok öncesi hazırlık aşamasında, uygulama esnasında ve uygulama sonrasında intraoperatif ve postoperatif hasta takibini yapan anestezi teknikerlerinin periferik blok uygulamaları ilgili bilgi sahibi olmaları çok önemlidir.

Periferik blok işlemleri ayrı bir blok uygulama alanında ya da ameliyathane odasında uygulanabilir. Her iki mekanda da gerekli ekipman ve ilaçların hazır olması gerekmektedir. Blok uygulaması yapılacak hastanın genel anestezi alacak şekilde anestezi hazırlığı tamamlanmalıdır. Blok uygulamalarının endikasyon, kontraendikasyon, komplikasyon ve yan etkilerin iyi bilinmesi ve gerekli önlemlerin alınması bu hazırlığın bir parçasıdır (3). Bu bölümde, periferik blok uygulama hazırlığı konusunda önemli hususlara detaylı olarak değinilmiştir.

I. Blok Uygulama Alanı Genel Hazırlığı

Bir periferik blok uygulamasından önce, işlemin steril koşullarda uygulanabilmesi ve yarıda kalmaması açısından, bazı hazırlıkların önceden yapılması gerekmektedir. Bu hazırlıklar hem hasta güvenliği hem de yapılacak işlemin kalitesi açısından oldukça önemlidir.

Periferik Blok İşlemi Öncesi Hazırlanması Gereken Malzeme ve İlaçlar

- Hasta onam formu ve blok takip formu bulunmalıdır.
- Monitörizasyon için gerekli ekipman hazırlanmalıdır.
- Ultrasonografi cihazı probu ve cilt sterilizasyonu için gerekli malzemeler hazırlanmalıdır.

III. Hasta Kontrollü Analjezi (HKA) Hazırlama

HKA, bir kateter yerleştirilerek sinir bloğunun etki süresini uzatmak için sinir etrafına lokal anestezi infüzyonu ile yapılabileceği gibi, sinir bloğuna destek olarak İV yoldan infüzyon şeklinde opioid verilmesiyle de uygulanabilir. HKA hazırlanırken bolus doz, kilitli kalma süresi, infüzyon hızı veya saatlik maksimum verilebilecek dozlar belirlenir. Dozlar hasta özellikleri, ağrının şiddeti ve bloğun etki süresine bağlı olarak ayarlanmalıdır (13).



Resim 1. Rejyonel anestezi arabası



Resim 2. Sinir stimütörü



Resim 3. Ultrasonografi cihazı

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Bölüm 15

PERİFERİK SİNİR BLOĞU UYGULAMALARI

Gözen Öksüz, İsmet Topçu

Periferik sinir blokları anestezi uygulamalarının önemli bir parçasıdır. Anestezi teknikleri periferik sinir blok uygulama hazırlığında, uygulama sırasında ve hasta takibinde çok önemli bir yere sahiptirler. Periferik sinir blokları genellikle alt ve üst ekstremitelerde cerrahilerinde anestezi amacı ile toraks ve batin cerrahilerinde ise analjezi amacı ile uygulanmaktadır (1). Ultrasonografi (USG) cihazı kullanımının yaygınlaşması blok uygulamalarının çeşitliliğini artırmıştır. Anestezi tekniklerinin periferik sinir blok uygulama tekniklerinin ekipman ve ilaç hazırlığı yanı sıra blok için kontrendike durumlar ve olası komplikasyonlar hakkında da bilgi sahibi olmaları gerekmektedir (2). Bu bölümde üst ve alt ekstremitelerde sık uygulanan periferik sinir bloklarının genel özellikleri, endikasyon, kontrendikasyon ve komplikasyonlarına yer verilmiştir.

I. Üst Ekstremité İçin Periferik Sinir Blokları

1. Servikal Pleksus Bloğu

Üst dört servikal sinirin anterior dalı ile oluşan servikal pleksus transvers proseslerinin lateralinde yer alır. C2-4 sinirlerin kutanöz dalları sternokleidiomastoid kasını orta arkasından çıkar ve boynun anterolateralinin duyusunu inerve eder. Diyafragma frenik sinir (C3, 4, 5) tarafından innerve edilir. Blok alanı antiseptik solüsyonu ile temizlendikten sonra USG eşliğinde C2, C3, C4 köklerinin duyusal sinirlerini bloke edecek şekilde 10-20 ml lokal anestezi (%0,5 bupivakain %2 lidokain karışımı veya benzer etkinlikte lokal anestezikler) ile yüzeysel servikal pleksus bloğu uygulanır (Resim 1). Ayrıca, daha az tercih edilen, C2, 3, 4 spinal sinirlerin foramen çıktıkları yerde bloke edilmesi ile derin servikal blok uygulanmasıdır (3).

Servikal Pleksus Bloğu Endikasyonları

- Karotis cerrahisi
- Yüzeysel boyun cerrahisi

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Bölüm 16

REJYONEL İNTRAVENÖZ ANESTEZİ UYGULAMASI VE TAKİBİ

Pakize Kırdemir, Sabri Özden

Rejyonel intravenöz anestezi (RİVA) arteriyel dolaşımın sistemik basınç üzerinde bir basınçla turnike ile bloke edildiği bir ekstremitenin distal bölümünden intravenöz olarak lokal anestezi enjeksiyonu ile analjezi sağlama yöntemidir. Mekanizması dolaşımın durdurulması sonucu gelişen iskemi ve anoksiye bağlı olarak damar permeabilitesinin artmasıyla damar içine verilen lokal anestezi solüsyonunun yavaşça doku içine difüze olması ve sinir liflerini bloke etmesidir. Kullanılan ajan dokuda kalıcı hasar oluşturmadan, geçici fonksiyonel bozulma yapar. Basit ve hızlı etkili bir yöntemdir. Teknik başarısızlık oranı düşüktür ve yüksek güvenilirlik derecesine sahiptir (1). Doku içine difüze olan lokal anestezi daha sonra dolaşıma absorbe olarak ortamdaki uzaklaştırılır (2). Özellikle kısa süreli üst ekstremitte cerrahisinde daha yaygın olmak üzere alt ekstremitte cerrahilerinde de uygulanır. Bu bölümde bir anestezi tekniker/teknisyenin RİVA ile ilgili bilmesi gerekenlere detaylı olarak değinilmiştir.

I. Tarihçe

Spinal blok uygulamaları ile bilinen cerrahi profesörü August Bier tarafından 1908'de RİVA uygulamaları tanımlanmıştır. Bu nedenle günümüzde Bier blok olarak adlandırılır. Bier RİVA uygulamak için kolun bir bölümünün dolaşımını engellemek için iki turnike kullanmış ve sonra bu bölümden bir vene %0,5'lik prokain solüsyonu enjekte etmiştir. Uygun ilaç seçimi ile daha kaliteli ve uzun anestezi sağlanabilir (3). Bier'den önce Berlin'de çalışan cerrahi profesörü Von Es-march cerrahi girişimlerde kullanılmak üzere kauçuktan yapılmış bandajı geliştirmiştir. Es-march bandajının en önemli problemi 1000 mmHg'e kadar ulaşan yüksek basıncı olmasıydı (4). 1963'de Holmes prokainden daha güvenilir anestezi verdiği görülen lidokaini ve çift lümenli turnikeyi kullanmıştır (5). Günümüzde yeni lokal anestezi ajanlarının gelişmesi, opioid ve lokal anestezi kombinasyonlarının kullanımı ile daha uygun ve güvenli RİVA uygulamaları geliştirilmiştir (3).

RİVA'nın bir diğer sınırlayıcısı da turnikenin indirilmesinden sonra postoperatif ağrı kontrol eksikliğidir, çünkü anestezi solüsyon genel sirkülasyona hızlıca dağılır. Brakiyal pleksus analjezinin geleneksel olarak RİVA ile karşılaştırıldığında üstün olduğu düşünülür. Son yıllarda ropivakain ile yapılan çalışmalarda turnike indirildikten sonra analjezinin devam ettiği gösterilmiş ve ropivakain daha çok kullanılır hâle gelmiştir (4).

İdeal RİVA solüsyonu (hızlı başlangıç, azaltılmış lokal anestezi dozları, azalmış turnike ağrısı ve uzamış analjeziyi) sağlayabilmek için günümüzde lokal anesteziyelere adjuvan ajanlar eklenmektedir. En çok kullanılanlar arasında opioidler, non-steroid antiinflatuar ilaçlar, klonidin, kas gevşeticiler, neostigmin ve bikarbonat bulunmaktadır (4).

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Bölüm 17

SEDOANALJEZİ UYGULAMASI VE TAKİBİ

Gökçe Gişi Akgöz, Hafize Öksüz

Sedoanaljezi günümüz anestezi pratiğinde ameliyathanede ve ameliyathane dışı ortamlarda birçok girişim sırasında uygulanmakta ve girişimin başarıyla tamamlanmasını sağlamaktadır. Bu işlem sırasında hayatı tehdit eden ciddi komplikasyonlarla karşılaşılacağı için teknik ve sedatif/analjezik ilaçların farmakolojisi iyi bilinmeli ve komplikasyonlarla mücadele edebilecek bilgi ve beceriye sahip olunmalıdır. Bu bölümde sedoanaljezi uygulaması ve bu uygulama esnasında dikkat edilmesi gereken hususlara değinilmiştir.

I. Tanımlar

Prosedürel sedasyon ve analjezi; ağrı ve rahatsızlık oluşturabilecek işlemlerin etkin bir şekilde yapılmasını sağlamak için kısa etkili sedatif ve analjezik ilaçların kullanıldığı ve oluşabilecek yan etkilerin monitörizasyonla takip edildiği bir anestezi uygulamasıdır. Sedasyon ve analjezi Amerikan Anestezolojist Derneği'nin (ASA) tanımına göre minimal sedasyondan genel anesteziye kadar değişen bir süreklilik içerir. ASA'nın tanımına göre sedasyon düzeyleri Tablo 1'de gösterilmiştir. Aşağıdaki gibi sedasyon ve analjezi farklı düzeylerde tanımlanmasına rağmen ayrı klinik aşamalara bölünmesi zordur.

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POSTOPERATİF AĞRI VE TEDAVİSİ

Ferdi Gülaştı, Sinem Sarı

Postoperatif ağrı cerrahi kesi ile başlayan, inflamatuvar sürecin de dâhil olduğu akut bir ağrıdır. Postoperatif ağrı kişiye sadece ızdırap veren bir durum değil, aynı zamanda başta kardiyovasküler ve solunum sistemi olmak üzere pek çok sistemi olumsuz etkileyerek yüksek morbidite ve mortaliteye sebep olan ciddi bir sorundur. Postoperatif ağrı ile mücadele etmek için çeşitli tedavi programları geliştirilse de günümüzde hâlâ önemli bir sorundur. Bu bölümde postoperatif ağrının mekanizmasına ve tedavisine ayrıntılı bir şekilde değinilmiştir.

I. Postoperatif Ağrının Oluşumu

Cerrahi kesi ile başlayan, ameliyat sırasındaki doku hasarı ve inflamasyon sebebiyle devam eden uyarılar, substans P, glutamat, bradikinin, histamin, prostoglandinler ve serotonin gibi nörotransmitterlerin salınımına yol açar. Bu uyarılar tekrarlayıcı bir şekilde duyuşal sinir uçlarında elektrokimyasal aktiviteye dönüştürülür. Sonrasında oluşan elektriksel durum spinal kordun arka boynuzundan geçerek ağrının algılandığı talamusa iletilir (1).

II. Ağrı ve Sistemler

Şiddetli ağrı sempatik aktivitede artış, kas spazmı ve hastada hareketsizlik yaratır. Postoperatif ağrı ile artan sempatik aktivite taşikardi, periferik direnç artışı ve hipertansiyona sebep olur. Kalp üzerinde artan bu iş yükü akut miyokard enfarktüsü ile sonuçlanabilir (2). Ayrıca artan sempatik aktivite intestinal ve gastrik hareketleri azaltmakta ve idrar retansiyonuna neden olmaktadır. Ağrının sebep olduğu kas spazmları akciğer havalanmasını azaltarak hipoksi ve hiperkarbi ile sonuçlanabilmektedir (2). Hareketsizlik ise kan pıhtılaşmasına yatkınlık oluşturmakta, sonrasında derin ven trombozu ve pulmoner emboli gelişebilmektedir.

den fazla analjezik ilaç ve yöntemin birlikte kullanılması ile tek analjezik ilacın yüksek dozda kullanılması ile ortaya çıkabilecek yan etki riski azaltılır.

Hasta Kontrollü Analjezi (HKA); ağrının bireysel olduğu, tüm hastalara uygulanacak ilaç dozlarının aynı olmaması gerektiği prensibine dayanarak ve hastanın kendisinin bu tedaviyi kontrol etmesi gerektiği düşünülerek tasarlanan bir tedavi yöntemidir. Bu amaçla hastanın analjezi dozunu belirlerken aktif rol aldığı bir sistem yaratılmıştır (13).

HKA; intravenöz, subkutan, oral, nazal, inhalasyon, sublingual, epidural ve intratekal yollar ile uygulanabilir (13, 14). Bu yöntemin kullanılması için HKA infüzyon pompası gerekmektedir. HKA infüzyon pompalarının ortak özelliği hastaya belirlenmiş doz sınırları ve kilitli kalma süre içerisinde analjezik vermektedir. Bu cihazın kullanımı için belirli parametrelerin cihaz üzerinde ayarlanması gerekir. Bunlar;

BUNU BİLİYOR MUSUNUZ?

Multimodal analjezi, farklı etki mekanizmasına sahip birden fazla analjezik ilaç ve yöntemin birlikte kullanılmasıdır.

- **Yükleme Dozu:** Erken postoperatif dönem ağrının en çok olduğu dönem olup yükleme dozu ile analjezik etkinin hızlı başlanması sağlanır. İlaç yükleme dozuyla analjezi sağlayacak plazma düzeyine en kısa sürede ulaştırılır.
- **Bolus Doz:** Sedasyon oluşturmadan yeterli analjeziyi sağlayacak bir doz belirlenmelidir. Düşük miktarda belirlenen bu doz hastanın butona basması ile hastaya verilir.
- **Bazal İnfüzyon:** Sürekli infüzyon olan bu doz ilacın plazma düzeyinin etkili konsantrasyon düzeyinin altında kalmamasını sağlamaktır.
- **Kilitli Kalma Süresi:** Bolus dozlar arasındaki süreyi belirler. Bu süre dolmadan hasta istese de cihaz bolus doz uygulamaz.

V. Postoperatif Kronik Ağrı

Cerrahi sonrası postoperatif akut ağrının 3 aydan daha uzun sürmesi postoperatif kronik ağrı (PKA) olarak adlandırılır (15). PKA oluşması hastaların yaşamlarının sonraki dönemlerinde hayat kalitesini olumsuz etkileyen ciddi bir komplikasyondur. PKA oluşumunun engellenmesinde ana rol anestezi ekibindedir.

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Bölüm 19

GÜNÜBİRLİK VE AMELİYATHANE DIŞI ANESTEZİ UYGULAMALARI

Hüseyin Yıldız

Günümüzde tıp ve teknolojiadaki gelişmeler sayesinde birçok cerrahi müdahale günübirlik yapılmaktadır. Sağlık harcamalarını en aza indirmek için, ameliyathane dışında tanı ve tedavi amacıyla uygulanan invaziv olmayan girişimlerle birlikte daha invaziv girişimler de uygulanır hâle gelmiştir. Bu durum anestezi uygulamalarında yeni bir alan oluşturmuş ancak aynı zamanda potansiyel komplikasyon ve uygulama alanlarına ait zorluklar ve riskleri de beraberinde getirmiştir (1-3). Cerrah tarafından günübirlik işlemlerin hızlı bir şekilde yönetilmesi, ameliyathane dışı işlemlerde anestezi uygulamalarına aşına olmayan personelle çalışma zorunluluğu ve yeterli anestezi ekipmanının yokluğu durumu daha da vahim hâle getirebilir. Hem anestezi hekimi hem de anestezi tekniker/teknisyeni açısından azami dikkat gerektiren bu alan hakkında geniş bilgi sahibi olmak, günübirlik ve ameliyathane dışı anestezi uygulamalarının daha güvenilir bir şekilde gerçekleştirilmesini sağlayacaktır. Bu bölümde günübirlik ve ameliyathane dışı anestezi uygulamalarına detaylı olarak değinilmiştir.

I. Günübirlik Anestezi Uygulamaları

Cerrahi tedavinin uygulandığı gün evine gönderilmesi planlanan hastalara uygulanan cerrahiye, günübirlik cerrahi tanımı kullanılır. Bu cerrahi için, uygulanan anesteziye ise günübirlik anestezi denir (1-3). Günübirlik cerrahi uygulamalarının; hasta, sağlık çalışanı ve hastaneler için birçok avantajları vardır (örn. hastanın hastanede kalış süresinin kısalması, enfeksiyon riskinin azalması, beslenme ve aile düzeninin etkilenmemesi, kaynakların verimli kullanılması, personel ihtiyacı ve maliyeti azalması vb.). Cerrahi teknolojinin gelişmesi, minimal invaziv girişimlerin yapılması, modern anestezi ilaçlar, kısa etkili opioidler ve kas gevşeticiler, revers ajanların etkinliği (flumazenil, naloksan, sugammadex) gibi birçok faktöre bağlı olarak, günümüzde birçok cerrahi türünün günübirlik yapılabilmesine olanak sağlamıştır. Genel anestezi uygulanan ameliyathanedeki standart donanım günübirlik operasyon odalarında da uygulanmalıdır. Günübirlik cerrahi işlemlerde, operasyon süresi önemli kriterlerden biridir. Ortala-

21. Solunumun düzenli hâle gelmesi gözlemlenir.
22. Maske ile oksijen verilir.
23. Kas gücünün geri döndüğünü gösteren bulgular takip edilir.
24. Nöbet aktivitesi santral ve periferik olarak monitörize edilir. Santral monitörizasyonda EEG nöbetin süresini kaydeder. Periferik monitörizasyonda turnike uygulanarak dolaşımdan izole edilen el veya ayak hareketleri nöbet süresini gösterir.
25. Yapılan işlemler kayıt altına alınır.

6. Obstetrik/Jinekolojik Müdahaleler

a. Yumurta Toplama (Oocyte Pick Up, OPU)

Genellikle ASA I- II grubu hastalardır. İşlem 15-30 dakika sürer. İşlem sırasında steril ortam gerekmektedir. Sıklıkla ameliyathane ortamlarında yapılır. Ortamda gamet ve embriyoyu etkileyecek, radyasyon, dezenfektan kokusu vs. gibi maddeler bulunmamalıdır. Gamet ve embriyo için en az zararlı anestezi ajanları kullanılmalıdır. Sıklıkla propofol, midazolam, fentanil veya remifentanil kullanılır. Ketamin gamet ve embriyo için riskli bir ajandır.

b. Histerosalpingografi (HSG) İşlemlerinde Uygulama

Genelde ASA I-II grubu genç bayan hastalardır. İşlem, kadın-doğum, radyoloji ve anestezi ekipleri ile yapılır. Ağrılı bir işlemdir. Sedasyonla gerçekleştirilir. Sedasyonda propofol en uygun ajandır. Kontrast madde alerjisi, radyasyon maruziyeti ve işlem sonrası hemoraji ve karın ağrısına dikkat etmek gerekmektedir (18).

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Bölüm 20

ZOR VE BAŞARISIZ HAVA YOLUNUN ACİL YÖNETİMİ

Hamit Yoldaş

Anestezi uygulanan hastalarda optimum oksijenasyon ve ventilasyonun sağlanması en temel uygulamalardan biridir. Ancak hava yolu yönetimindeki zorluk ya da başarısızlıklar istenmeyen minör (dişlerde veya vokal kordlarda yaralanma gibi) ve majör (anoksik beyin hasarı, kalp iskemisi, kalp yetmezliği ve nihayetinde ölüm gibi) olaylarla sonuçlanabilir. Zor hava yolları acil pratikte oldukça yaygındır ve tüm acil entübasyonların %20'si gibi büyük bir oranda olduğu tahmin edilmektedir. Genel entübasyon başarısızlığının insidansı ise düşük olup, yaklaşık %1 veya daha azdır. Entübe edilemez, oksijenize edilemez (CICO) durumunun acil entübasyon ortamındaki insidansı 1/5000 ve tüm ameliyathane entübasyonlarında ise 1/20000 olarak tahmin edilmektedir. Zor hava yolu öngörülen olgularda, anestezi indüksiyonu öncesi, zor hava yolu algoritmalarını da içine alan bir plan yapılarak entübasyonu başarmak hedeflenmelidir. Bu bölümde zor ve başarısız hava yolunun tanımı, algoritması ve bu durumda uygulanan yaklaşımlara yer verilmiştir.

I. Zor Hava Yolu

Zor hava yolu klasik eğitim almış bir uzmanın maske, entübasyon veya her ikisinde zorlukla karşılaştığı durum olarak tanımlanmaktadır.

1. Preoperatif Değerlendirme ve Planlama

Cerrahi öncesi hava yolu ile ilgili potansiyel problemlerin saptanması ve planlama yapılması ile hava yolu girişimi güvenilir bir şekilde yönetilebilir. Bu şekilde bir strateji benimsenmesi komplikasyon riskini azaltmada önemlidir (1). Maske ventilasyonu, supraglottik hava yolu yerleştirilmesi, trakeal entübasyon ve ön boyun değerlendirilmesinde zorluğa yol açabilecek faktörlerin saptanması açısından preoperatif hava yolu değerlendirmesi rutin olarak her hastada yapılmalıdır. Benzer olarak aspirasyon riskinin değerlendirilmesi de hava yolu yönetimi planlamasının temel bir bileşenidir. Cerrahi öncesinde gastrik içeriğin hacimi ve pH derecesini azaltmak

ve regürjitasyon riski nedeni ile uygulanmamaktadır. Başarısız entübasyon sonrası hastanın uyandırılması her zaman için optimum seçenek olmayabilir. Bununla birlikte anne veya fetüs ile ilgili bir risk söz konusu değil ise uyandırmak ve daha sonra alternatif bir anestezi teknik ile devam etmek doğru seçim olabilir.

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Bölüm 21

TEMEL VE İLERİ YAŞAM DESTEĞİ

Bahar Kuvaki

Temel yaşam desteği tüm vatandaşların bilmesi gereken hayat kurtarıcı bir ilk yardım uygulamasıdır, ancak ülkemizde tüm vatandaşların ilk yardım eğitimi almalarını sağlamak oldukça zordur (1). Avrupa Resüsitasyon Konseyinin başlattığı ve Resüsitasyon Derneğinin de iş birliği yaptığı çeşitli kampanyalar (örn. Restart a Heart Day/Hayata El Ver) ile halktan kişilerin ilk yardım eğitimi alması, kardiyak arresti tanınması ve kardiyak kompresyonlara başlaması teşvik edilmektedir (2).

22 Mayıs 2014 tarihli 29007 sayılı Resmî Gazetede, sağlık meslek mensupları ile sağlık hizmetlerinde çalışan diğer meslek mensupları, yetkili kişilerce acil sağlık hizmeti ulaşıma kadar almış olduğu eğitim doğrultusunda ilk yardım gereklerini yerine getirir denilmektedir. Anestezi teknikerleri ile ilgili yönetmelikte de “almış oldukları eğitim doğrultusunda kardiyopulmoner resüsitasyon gibi ilk yardımın gereklerini yerine getirir” denilmektedir. Ayrıca normal ameliyathane uygulamaları yanı sıra ileri yaşam desteği gibi uygulamalarda ekip anlayışı içerisinde sağlık hizmeti sunumun devamlılığının sağlanmasında anestezi teknikerlerinin önemli rolleri vardır (3). Bu bölümde anestezi tekniker/teknisyenin bilmesi gereken temel ve ileri yaşam desteği ile ilgili detaylara değinilmiştir.

I. Kardiyak Arrestin Tanımı ve Tanınması

1. Kardiyak Arrest Nedir?

Kardiyak arrest kalbin dolaşıma kan pompalama yetisini yitirmesi, yani kalbin durmasıdır. Kardiyak arrest farklı şekillerde ortaya çıkabilir. Bazı durumlarda kalpte elektriksel bir aktivite vardır ve EKG monitöründe kalp kasının çalıştığı izlenimi veren görüntüler olabilir. Yani kalp kasında “seğirme” olabilir, ancak mekanik aktivite yoktur. Kalbin içindeki kan organların dolaşımını sağlayan damarlara pompalanamaz ve dolaşım durmuştur.

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Bölüm 22

ANAFİLAKSİ

Bilal Katipoğlu, Eyüp Horasanlı

Anafilaksi, ani başlayan ve yaşamı tehdit eden sistemik bir aşırı duyarlılık reaksiyonudur (1). Mast hücreleri ve bazofillerden salınan histamin gibi mediyatörlere bağlı olarak gelişir. Gıdalar, ilaçlar, böcek veya arı sokması en sık rastlanan anafilaksi nedenleridir (2). Klinik semptom ve belirtiler doğrultusunda anafilaksi tanısı hızla konulmalı ve acilen tedavi başlanmalıdır.

Perioperatif anafilaksi, operasyon sırasında gelişen, ölümcül seyredabilen sistemik alerjik bir reaksiyon olarak tanımlanır (3). Genel anestezi sırasında birden fazla farmakolojik ajan kullanılması nedeniyle anafilaksi görülen olguların kapsamlı olarak değerlendirilmesi gerekir. Ayrıca, genel anestezi altında alerjik bir reaksiyonun tanınması zor olabilir. Bu nedenle, anafilaksi konusunda farkındalık oluşması önemlidir. Bu bölümde; perioperatif anafilaksi insidansı, etiyolojisi, risk faktörleri, klinik bulguları, tanı ve tedavisi gözden geçirilecektir.

I. Etiyoloji ve İnsidans

Anafilaksi, ilk defa 1902 yılında Paul Jules Portier ve Charles Richet tarafından köpeklerde deniz anası toksini ile yapılan çalışmada tanımlanmıştır (4). Zaman içerisinde, besinler, ilaçlar ve pek çok kimyasal ajanlarla da açığa çıktığı görülmüştür. Anestezi esnasında en sık ilaçlara bağlı anafilaksi görülmektedir. Genel anestezi sırasında anafilaksi insidansı 1:10.000–1:20.000 arasındadır (5).

II. Perioperatif Anafilaksi Nedenleri

Perioperatif anafilaksi nedenleri; intravenöz (İV) anestezikler, nöromusküler bloke edici ajanlar (kas gevşeticiler), sugammadeks, lokal anestezikler, lateks, klorheksidin, protamin sülfat, antibiyotikler ve kolloidler olarak sayılabilir.

3. Sıvı Tedavisi

Anafilakside damar yolu açılır ve sıvı tedavisi 10 dk içinde 10-20 ml/kg (%0,9 NaCl/izotonik) olarak başlanır. Daha sonra hastanın kliniğine göre bu miktar 100 ml/kg'a kadar artırılabilir.

4. Diğer İlaçlar

Yeterli kanıt olmamasına rağmen, kortikosteroidler uzamış reaksiyonları önlemeye yardımcı olabilir. Metilprednizolon 2 mg/kg İM veya İV olarak yavaş infüzyon ile verilir. Altı saatte bir gerekirse doz tekrarı yapılabilir. Antihistaminikler anafilaksi tedavisinde sıklıkla kullanılan ilaçlardır ancak yalnızca kaşıntı ve ürtiker gibi semptomları azaltmak amacı ile kullanılması önerilmektedir (23). Anafilakside tedaviye cevap alınmadığı durumlarda hastanın beta bloker kullanımı mutlaka sorgulanmalıdır. Eğer beta bloker kullanım öyküsü varsa glukagon erişkinlerde 1-5 mg, çocuklarda ise 20-30 µg/kg iv yolla verilmelidir (24).

Perioperatif anafilaksi tedavisi, anafilaksi tedavisine benzer şekilde adrenalin ve sıvı replasmanı ile hızlı hemodinamik resüsitasyona dayanır. Ameliyathanede veya yoğun bakım ünitesinde hastaların İV erişimi olduğundan, ilk tedavide İV adrenalin yaygın olarak kullanılır (25). Diğer birçok alanda ise anafilaksi için İM adrenalin kullanılmalıdır. Perioperatif anafilaksi gelişen erişkin hastalarda, şiddetli hipotansiyon veya şok durumunda 10-100 µg İV bolus adrenalin yapılır ve 1-2 dakika içerisinde doz tekrarlanır veya 2-10 µg/dk hızında infüzyona başlanarak etkili doza kadar titre edilir. Çocuk hastalarda ise başlangıç dozu 0,1-1 µg/kg/dk'dır (21). Kardiyopulmoner arrest gelişen hastalarda hızla resüsitasyona başlanmalıdır. Eş zamanlı olarak hava yolu güvenliği de sağlanmalıdır.

Perioperatif anafilaksi gelişen hastalar, olası etkenin belirlenmesi için mutlaka alerji uzmanına yönlendirilmelidir. Bu yaklaşım özellikle gelecekte güvenli bir şekilde anestezi alması için önemlidir.

BUNU BİLİYOR MUSUNUZ?

Perioperatif anafilaksi tedavisinde öncelikle İV adrenalin tercih edilmelidir.

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Bölüm 23

MALİGN HİPERTERMİ

Pakize Kırdemir, Mustafa Soner Özcan

Günümüzde anestezi pratiğinde, rejyonel anestezi tekniklerinin gelişmesine rağmen, hastaların birçoğu genel anestezi altında opere olmaktadır. Genel anestezi uygulanacak hastalar, premedikasyon dâhil olmak üzere, herhangi bir dönemde (indüksiyon, idame, uyanma/derlenme) komplikasyonlar ile karşı karşıya kalabilmektedirler. Genel anestezi uygulamalarında süksinilkolinin kullanımının sınırlı olmasına karşın, inhalasyon anestezi indüksiyonda ve sıklıkla idamede kullanılmaktadır.

Malign hipertermi (MH) tüm inhale volatil anesteziyelere (halotan, izofluran, sevofluran, desfluran) ve depolarizan kas gevşeticilere (süksinilkolin) bağlı gelişen, ilerleyici kas yıkımı ve hipermetabolizma ile karakterize, nadir görülen farmakogenetik bir kas hastalığıdır. Nadir görülür, ancak erken tanınmaz ve müdahale edilmezse oldukça ölümcül bir durumdur. Bu bölümde, bir anestezi acili olan MH krizinin nasıl tanınması ve tedavi edilmesi gerektiğinden ayrıntılı olarak bahsedilmiştir.

I. Epidemiyoloji

MH dünyanın tüm bölgelerinde ve tüm etnik gruplarda görülebilmektedir. MH atağı görülme sıklığı 1:3000-1:100.000 arasında olduğu tahmin edilmektedir (1). Erkeklerde kadınlara oranla 2 kat fazla görülmektedir. Görülen ataklar çocuklarda, özellikle 15 yaş altında daha fazladır (%52) (1). Akut kriz tetikleyici ajanlarla olan ilk maruziyette ortaya çıkabilmesine karşın, genellikle hastaların yarıya yakınında daha önce birçok defa aynı ajanlarla genel anestezi aldıkları bilinmektedir. Hatta ABD’de bir hastada 31. maruziyet sonrası akut kriz geliştiği kaydedilmiştir (2).

BUNU BİLİYOR MUSUNUZ?

Daha önce deneyimlenmiş sorunsuz genel anestezi öyküsü, bu hastaların malign hipertermi krizi açısından güvende olduğunu göstermez.

3. Mutlaka hastalara yeni solunum devresi, LMA (laringeal maske), endotrakeal tüp kullanılmalıdır.
4. Dantrolen mutlak suretle temin edilmelidir, olmadan hastaya anestezi verilmemelidir.
5. Bu tip MH gelişme riski olan hastalara, gerekli bilgiler verilerek eğer mümkünse reyonel anestezi de ilk olarak düşünülebilir.
6. Anestezi verilmeden önce MH kriz yönetimini gözden geçirmek faydalı olacaktır.

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Bölüm 24

MASİF HEMORAJI

Güray Demir

Günlük anestezi pratiğinde ameliyathane ya da ameliyathane dışı anestezi uygulamalarında anestezi ekibinin sıklıkla karşılaştığı hayati tehlike oluşturan ve gerçek anlamda acil olan durumlardan biri masif hemorajiler (kanamalar)'dir. Masif hemoraji hastaneye travma nedeni ile getirilmiş hastalarda olabileceği gibi ameliyatlarda ya da endoskopi gibi işlemler sırasında beklenmedik bir şekilde de ortaya çıkabilir. Hızlı bir şekilde cerrahi olarak müdahale edilmez ise sıklıkla ölüm ile sonuçlanırlar.

Masif hemorajinin tedavisi esnasında, anestezi tekniker/teknisyenleri ekibinin bir parçası olarak anestezi hekimleri ve hastaya müdahale eden cerrahlar ile iş birliği içinde olmalıdırlar. Durumun ciddiyetinin farkında olarak hastaya nelerin yapılması gerektiğini çok iyi bilmek zorundadırlar. Bilgili ve deneyimli bir ekip masif hemorajisi olan bir hastayı doğru adımlar ile hızlı bir şekilde müdahale ederek hayata döndürebilir. Bu bölümde masif hemoraji ile ilgili bir anestezi tekniker/teknisyeninin bilmesi gereken konulara detaylı olarak değinilmiştir.

I. Temel Bilgiler ve Tanımlar

Kan, bütün organların beslenmesini sağlayan eritrosit gibi hücreler ve plazmadan oluşan ve damar içi alanda tüm vücudu dolaşan sıvıdır.

Kanın Görevleri

- Gazların taşınması (hücrelere oksijen götürülmesi, oluşan karbondioksitin vücuttan atılması için akciğerlere taşınması),
- Hücreler için gerekli besinlerin taşınması,
- Hemostazın (pıhtılaşmanın) sağlanması,
- Bağışıklığın sağlanması,
- Hormon ve enzimlerin ilgili organlara taşınması olarak sıralanabilir.

- Dilüsyonel trombositopeni: Masif transfüzyon sırasında yeterinde trombosit verilmemesi trombosit sayısının düşmesine neden olur. Trombosit sayısının düşmesi kanamaya eğilimi artırır.
- Dissemine intravasküler koagülasyon (DİC)/Yaygın Damar İçi Koagülasyon Bozukluğu: Normalde çalışmaması gereken durumda pıhtılaşma sisteminin çalışarak damar içinde kontrolsüz pıhtıların oluşmasıdır. Bu durum damar içinde tıkanıkların olmasına neden olduğu gibi pıhtılaşma faktörlerinin ve trombositlerin tükenmesine de neden olarak kanamanın artmasına da neden olur.
- Hemolitik transfüzyon reaksiyonu: Bu durum daha çok yanlış kan verilmesi durumunda ortaya çıkar. Fakat masif transfüzyon durumunda kişiye O Rh (-) kan gurubundan anti-A, anti-B antikorları içeren kan ürünlerinin verilmesi durumunda bu antikorlar hastanın eritrositleri ile etkileşime girerek eritrositlerin parçalanmasına yani hemolize neden olabilir.
- Sitrat zehirlenmesi ve hiperkalemi: Banka kanlarında sitrat kan ürünlerinin hazırlanmasında pıhtılaşmayı önleyici olarak kullanılır. Hastaya fazla miktarda kan verildiğinde vücut için belli bir düzeyin üzerinde zararlı olan sitrat miktarı artar ve sitrat zehirlenmesine neden olur. Benzer olarak potasyum düzeyinin hazırlanmış kanda yüksek olması hiperkalemiye neden olabilir.
- Hipotermi: Kan bankalarında kan ürünleri 4° korunurlar. Fazla miktarda kan verilmesi vücut ısısının 36,5° olduğu bir durumda vücut ısısını ciddi olarak düşürecektir.
- Bu durumlar dışında masif transfüzyon yapılması vücutta asit-baz bozuklukları, hava embolisi, demir fazlalığı, bakteriyel bulaş, hipervolemi (sıvı fazlalığı) gibi sorunlara da yol açabilir.

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Bölüm 25

ŞOK

Yaşar Gökhan Gül, Yunus Oktay Atalay

Çeşitli cerrahi ve tıbbi hastalıklar sonucu gelişebilen ve bir klinik acil olan şok, oksijen sunumunun azalması ve/veya oksijen tüketiminin artması sonucu hücresel düzeyde doku hipoksisi olarak tanımlanmaktadır. Şokun etkileri başlangıçta geri dönüşümlüdür ancak hızla geri dönüşümsüz bir hâle gelip multiorgan yetmezliğine ve ölüme neden olabilir. Bu bakımdan erken tanı ve tedavi çok önemlidir (1). Bu bölümde şokun tanımı, evreleri, tipleri tanımlanacak, tanı ve tedavisinden bahsedilecektir.

I. Şokun Tanımı ve Tipleri

Şok çoğunlukla dolaşım sal yetmezlikten (hipotansiyon, doku perfüzyonunun azalması) kaynaklanır. Doku kanlanmasındaki azalma ile dokuya oksijen sunumu azalır, hücre enerji metabolizması değişir ve sonuç olarak doku hasarı başlar. Oksidatif metabolizma yerini anaerobik metabolik yola bırakır. Hücresel hipoksi, hücre membranı iyon pompasında disfonksiyon, intraselüler ödem, intraselüler içeriğin ekstraselüler alana kaçması ve intraselüler pH regülasyonunun bozulmasına neden olur. Bu biyokimyasal değişiklikler, sistemik asidoza ve endotelial disfonksiyona neden olur. Sonuç olarak bölgesel kan akımında azalma ortaya çıkar. Serum laktat düzeyinin artması hipoperfüzyon ve doku hipoksisinin bir göstergesidir (2,3).

BUNU BİLİYOR MUSUNUZ?

Şokun etkileri başlangıçta geri dönüşümlüdür ancak hızla geri dönüşümsüz bir hale gelip multiorgan yetmezliğine ve ölüme neden olabilir. Bu bakımdan erken tanı ve tedavi çok önemlidir.

Şokun 3 Evresi

Pre-şok evresi: Kompanse şok ya da kriptik şok olarak da adlandırılır. Azalmış doku perfüzyonuna kompensatuar yanıt ile karakterizedir. Başka bir sağlık problemi olmayan sağlıklı bireyde, hipovolemik şokun pre-şok/erken evresinde ortaya çıkan kompensatuar taşikardi ve periferik vazokonstriksiyon semptomatik bir seyire ne-

solüsyon infüzyonunun koagülasyon faktörlerinde ve plateletlerde dilüsyona neden olarak koagülopatiyeye neden olabileceği unutulmamalıdır (22-24). Ayrıca fazla sıvı replasmanı kalp yetmezliği, pulmoner hipertansiyon gibi klinik durumlarda dekompanzasyona neden olarak hastanın genel durumunu daha da bozabilir. Travma hastalarında da kristaloid ve kolloidin birbirine üstünlüğü gösterilememiştir (25).

Travmatik şok resüsitasyonunda; ortalama arter basıncı penetran yaralanma var ise >65 mmHg, künt travma var ise >85 mmHg üzerinde, kalp atım hızı 60-100 atım/dk, oksijen saturasyonu $> \%94$, idrar çıkışı 0.5 ml/kg/saat olacak şekilde tutulmalıdır. Serum laktat düzeyi her saat başı değerlendirilmeli, laktat düzeyinin 2 mmol/L altında olması sağlanmalıdır. Asit baz defisitinin normal sınırlarda, mikst santral venöz oksijen basıncının $> \%70$ olması hedeflenir. Kan transfüzyonu yapılacak hastalarda mutlaka hasta kan grubu ile uyumlu, cross-match yapılmış kan ürünleri kullanılmalıdır. Transfüzyon güncel kılavuzlar rehberliğinde yapılmalıdır. (26, 27, 28).

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8. Basım

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Prof. Dr. Ümit Deniz

Prof. Dr. Ömer Rıfıkı Önder



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İÇİNDEKİLER

Bölüm 1: ANNE ÇOCUK SAĞLIĞI VE ÖNEMİ1	1
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>	
<i>Prof. Dr. Ömer Rifki ÖNDER (Ankara Üniversitesi Sağlık Bilimleri Fakültesi)</i>.....1	1
Bölüm 2: ÜREME SİSTEMİ ANATOMİSİ VE FİZYOLOJİSİ.....11	11
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>.....11	11
Bölüm 3: GEBELİK VE DOĞUM.....23	23
<i>Dr. Derviş ÖZER (Sağlık Bakanlığı Kadın Doğum Doktoru)</i>	
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>.....23	23
Bölüm 4: AİLE PLANLAMASI, ÖNEMİ VE DOĞURGANLIĞIN DÜZENLENMESİ.....41	41
<i>Prof. Dr. Ömer Rifki ÖNDER (Ankara Üniversitesi Sağlık Bilimleri Fakültesi)</i>.....41	41
Bölüm 5: YENİDOĞAN.....71	71
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>	
<i>Dr. Derviş ÖZER (Sağlık Bakanlığı Kadın Doğum Doktoru)</i>.....71	71
Bölüm 6: BEBEK VE ÇOCUK BAKIMI .....93	93
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>	
<i>Dr. Elif ÖZER (Sağlık Bakanlığı Aile Hekimi)</i>.....93	93
Bölüm 7: BEBEK VE ÇOCUK BESLENMESİ .....109	109
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>	
<i>Dr. Elif ÖZER (Sağlık Bakanlığı Kadın Doğum Doktoru)</i> .....109	109
Bölüm 8: OKUL ÖNCESİ DÖNEMDE BÜYÜME VE GELİŞME.....129	129
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>.....129	129

Bölüm 9: ÇOCUK ENFEKSİYON HASTALIKLARI.....	149
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>	
<i>Dr. Elif ÖZER (Sağlık Bakanlığı Aile Hekimi)</i>	<i>149</i>
Bölüm 10 : BAĞIŞIKLAMA VE AŞILAR	177
<i>Prof. Dr. Ömer Rıfki ÖNDER (Ankara Üniversitesi Sağlık Bilimleri Fakültesi).....</i>	<i>177</i>
Bölüm 11 : PARAZİTER ENFEKSİYONLAR.....	191
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi)</i>	
<i>Dr. Elif ÖZER (Sağlık Bakanlığı Aile Hekimi)</i>	<i>191</i>
Bölüm 12: CİNSEL YOLLA BULAŞAN ENFEKSİYONLAR(CYBE) VE HIV/AIDS.....	203
<i>Prof. Dr. Ömer Rıfki ÖNDER (Ankara Üniversitesi Sağlık Bilimleri Fakültesi)</i>	
<i>Prof. Dr. Ümit DENİZ (Gazi Üniversitesi Gazi Eğitim Fakültesi).....</i>	<i>203</i>
Bölüm 13: İLK YARDIM.....	217
<i>Öğretmen Hatice ÖZTÜRK (Milli Eğitim Bakanlığı Keçiören Anadolu Sağlık Meslek Lisesi).....</i>	<i>217</i>
KAYNAKLAR	305

KAYNAKÇA

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AŞAĞIDAKİ KAREKODDAN
ULAŞABİLİRSİNİZ.**



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RAPOR
HAZIRLAMA

ARAŐTIRMA VE YAYIN ETİĐİ İLE

PROF. DR. NİYAZİ KARASAR

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İÇİNDEKİLER

	Sayfa
ÖNSÖZ İkinci Yazım ve Yirmibirinci Basım	v
ÖNSÖZ Birinci Yazım ve Basım	ix
İÇİNDEKİLER	xi
ŞEKİLLER LİSTESİ	xvii
ÇİZELGELER LİSTESİ	xix
BÖLÜM 1. GİRİŞ	
Problem	1
Amaç	9
Önem	10
Varsayımlar	11
Sınırlıklar	11
Yöntem	11
Tanımlar	14
BÖLÜM 2. İÇERİK VE BİÇİM	
Temel Amaçlar	17
İçerik	18
<i>Temel İlkeler</i>	18
<i>Bölüm ve Alt bölümler: Anahatlar</i>	19
Biçim	20
<i>Temel İlkeler</i>	20
<i>Uygulamalar</i>	21
Yazı alanı	21
Satır aralıkları	22
Satırbaşı	23

Sayfaların numaralandırılması	23
Bölüm ve altbölüm başlıkları ve tanımlanmaları.....	24
Bölüm ve altbölümlerin numaralandırılması	27
İçindekiler sayfasının oluşturulması	28

BÖLÜM 3. BÖLÜM VE ALTBÖLÜMLER

Kapsamlı Araştırma Raporları.....	31
<i>Ön Bölüm.....</i>	<i>31</i>
Başlık (kapak) sayfası	31
Raporun başlığı.....	32
Raporu hazırlayan.....	32
Raporun niteliği	33
Raporun sunulduğu kent, kurum ve tarih	33
Öz	34
Değerlendirme kurulu.....	35
Önsöz ya da teşekkür	35
Yazar ya da özgeçmiş.....	36
İçindekiler	37
Çizelge ve şekiller listesi	39
<i>Ana Bölümler</i>	<i>40</i>
Giriş.....	41
Problem	41
Amaç	46
Önem.....	49
Varsayımlar	50
Sınırlıklar	51
Tanımlar	51
Yöntem.....	52
Araştırma modeli	53
Evren ve örneklem (ya da çalışma grubu)	53
Veriler ve toplanması	54
Verilerin çözümü ve yorumlanması.....	55
Bulgular ve yorumlar	55
İçerik.....	55
Sunum.....	57
Sonuç.....	58
Özet.....	59
Yargı.....	59
Öneriler.....	59

<i>Arka Bölüm</i>	60
Ek'ler	60
Kaynakça	62
Kısa Raporlar	63
<i>Araştırma Önerisi</i>	63
İçerik	64
Biçim	65
<i>Ders Ödevi ve Küçük Araştırma-İncelemeler</i>	66
<i>Bilimsel Makale</i>	67

BÖLÜM 4. AKTARMALAR

Aktarma ve Alıntı	69
Aktarma Çeşitleri	69
<i>Doğrudan Aktarma</i>	70
Biçim	70
Çıkarma, ekleme ve düzeltme	71
Çevirerek aktarma	73
Özel durumlar	74
<i>Dolaylı Aktarma</i>	74
Alıntının Ölçüsü	75
Alıntıda Temel Kabul	75
Alıntıda Anlam Kayması!	75

BÖLÜM 5. KAYNAK GÖSTERME

Temel İlke ve Amaçlar	77
Kaynak Tanıtıcı Bilgiler	78
<i>Yazar Adı</i>	78
<i>Eser Adı</i>	79
<i>Yayın Bilgileri</i>	79
Kaynak Gösterme Formatları	81
Metin Sonunda Kaynak Gösterme: Kaynakça	83
<i>Tanımı ve Yeri</i>	83
<i>Kaynakça Formatları: Örnekler</i>	83
Chicago, Turabian ve MLA formatları	86

APA Formatı	86
Karasar Formatı	87
<i>Kaynakça Çeşitleri</i>	89
Yalın kaynakça	89
Açıklamalı kaynakça	89
<i>Kaynakların Düzeni</i>	90
Metin İçinde Kaynak Gösterme	91
<i>Dipnot</i>	91
Tanımı ve yeri	91
Dipnot biçimleri	92
Ayrıntılı ilk geçiş dipnotu	92
Dipnot yineleme bağlaçları	93
Dipnotların yazılışı	95
Dipnotların numaralandırılması	96
Karışık dipnot örnekleri	98
<i>Kaynakça Bağlacı</i>	98
Özel Kaynakça ve Dipnot Örnekleri	100
<i>Yazar Sayısına ve Türüne Göre</i>	101
Tek yazarlı	101
Çok yazarlı	102
Kurum yazarlı	102
Çeviri	103
Derleme	103
Ayrı bölüm yazarlı	104
Yazar adı yazılı olmayanlar	105
<i>Yayın Türlerine Göre</i>	105
Dizi yayınlar	105
Dergiler	106
Gazeteler	106
Yayımlanmamış tez, rapor ve bildirimler	107
Yasal metinler	108
Arşiv belgesi	109
Kutsal kitaplar	109
<i>Diğerleri</i>	110
Yabancı dilde yazılmış kaynak ve Türkçe başlığı	110
Yazışma, görüşme ve demeçler	111
TBMM'deki konuşmalar	112

İkincil kaynaklar.....	112
Görüntü ve ses kayıtları	113
Elektronik medya	114

BÖLÜM 6. ÇİZELGE VE ŞEKİLLER

Çizelge.....	115
<i>Temel Öğeleri ve Hazırlanışı</i>	<i>116</i>
Numara ve Başlık.....	116
Çerçeve.....	118
İçerik	118
Çizelge dipnotları	121
<i>Çizelge Çeşitleri.....</i>	<i>123</i>
İstatistiksel anlamlılık test çizelgesi: ANOVA örneği	123
Kesik çizelge	127
Yarı çizelge	128
Şekil.....	129
<i>Temel Öğeleri ve Hazırlanışı</i>	<i>129</i>
Numara ve başlık	129
Çerçeve.....	130
İçerik	130
Şekil dipnotları	131
<i>Şekil/Grafik Çeşitleri</i>	<i>132</i>
Çizgi grafikleri	132
Sütun grafikleri	137
Daire grafikleri.....	139
Öteki şekiller	139
Mutlak ve Görelî Değerlerin Kullanımı.....	140
Çizelge ve Şekillerin Rapora Yerleştirilmesi.....	142
Çizelge ve Şekillerde Anlaşılabilirlik ve Doğruluk Denetimi.....	143

BÖLÜM 7. RAPORUN YAZILMASI VE ÇÖĞALTILMASI

Önemli Bazı Yazı Kuralları.....	145
<i>Geçici Anahatlar</i>	<i>146</i>
<i>Raporun Uzunluğu ve Denge</i>	<i>148</i>
<i>Gerçek Anlatım.....</i>	<i>148</i>

<i>Genel Anlatım</i>	149
<i>Kısaltmalar</i>	150
<i>Geçmiş ve Geniş Zamanlı Cümleler</i>	150
<i>Dil ve Anlatım</i>	150
<i>Anlatımda Olasılıklı Yapı</i>	151
<i>Sayılar ve Yüzde (%) İşareti</i>	152
<i>Formüller</i>	152
<i>Tırnak İşareti</i>	153
<i>Gizli Anlamlar!</i>	153
Yazmaya Başlama Zamanı	155
Birörneklik	156
Eleştirme ve Geliştirme	156
Raporun Basılması ve İlgililere Sunulması	157
BÖLÜM 8. ARAŞTIRMA VE YAYIN ETİĞİ	
Etik Kavramı ve Önemi	159
Telif Hakları ile İlgili Yasal Düzenlemeler	160
Kurumsal Düzenlemeler: Yönetmelik ve Yönergeler	166
Yaygın Etik İhlali: İntihal ve Denetlenmesi	178
Sonuç	179
BÖLÜM 9. SONUÇ	
Özet	181
Yargı	184
Öneriler	185
EKLER	187
KAYNAKÇA	203

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2. Basım

ATIKSU ARITMA TESİSLERİNİN PROJELENDİRİLMESİ

Prof. Dr. Nusret Şekerdağ



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İÇİNDEKİLER

BÖLÜM 1	ATIKSULARIN ÖZELLİKLERİ.....	1
BÖLÜM 2	MEKANİK ARITMA	3
2.1.	IZGARALAR	3
2.1.1.	Izgara proje Kriterleri.....	3
2.1.2.	Izgara Yük Kayıpları.....	4
2.1.3.	Problemler	6
2.2.	DEBİ ÖLÇÜMÜ VE AKIM KONTROLÜ	10
2.3.	KUM TUTUCULAR	11
2.3.1.	Kum Tutucu Çeşitleri.....	11
2.3.2.	Dikdörtgen planlı(yatay akışlı) kum tutucular	12
2.3.3.	Havalandırmalı Kum Tutucu Hesabı.....	17
2.3.4.	Problemler	18
2.4.	POMPA İSTASYONLARI.....	30
2.5.	YAĞ TUTUCULAR	31
2.5.1.	Problemler	31
2.6.	ÖN ÇÖKTÜRME HAVUZLARI	32
2.6.1.	Projelendirme kriterleri	32
2.6.2.	Dairesel Çöktürme Havuzları	33
2.6.3.	Dikdörtgen Çöktürme Havuzları.....	34
2.6.4.	Problemler	36
BÖLÜM 3	BİYOLOJİK ARITMA.....	47
3.1.	BİYOLOJİK BÜYÜMENİN KİNETİĞİ.....	47
3.2.	AKTİF ÇAMUR METODUNUN TEORİSİ	49
3.2.1.	Proses Dizayn ve Kontrol İlişkileri	53
3.2.2.	Sistemde Teşekkül Eden Çamur Miktarı.....	55
3.2.3.	Havalandırma Havuzu Hacmi.....	56
3.2.4.	Oksijen İhtiyacı Hesabı	56
3.2.5.	Oksijen Kapasitesi	57
3.2.6.	Problemler	58
3.3.	HAVALANDIRMA SİSTEMLERİ.....	78
3.3.1.	Amacı	78
3.3.2.	Kabarcıklı Havalandırıcılar	79
3.3.3.	Mekanik Havalandırıcılar	82
3.3.4.	Saf Oksijen Sistemleri.....	82

3.3.5.	Hava ihtiyacının Hesabı	82
3.3.6.	Problemler	83
3.4.	İLERİ ARITMA SİSTEMLERİ.....	93
3.5.	DAMLATMALI FİLTRELER	95
3.5.1.	Genel Bilgi	95
3.5.2.	Damlatmalı Filtrelerde Yük Birimleri.....	96
3.5.3.	Damlatmalı Filtrelerde Biyokimyasal Olayın Kinetiği	100
3.5.4.	Damlatmalı filtrelerde Biyolojik Verim	102
3.5.5.	Problemler	103
3.6.	DÖNEN BİYODİSKLER.....	120
3.6.1.	Kornegay Yaklaşımı	122
3.6.2.	Reynolds Formülü.....	122
3.6.3.	Biyodisklerin yerleşimleri	123
3.6.4.	Problemler	124
3.7.	MEMBRAN BİYOREAKTÖRLER	131
3.7.1.	Problemler	132
3.8.	STABİLİZASYON HAVUZLARI VE MEKANİK HAVALANDIRMALI HAVUZLAR	134
3.8.1.	Genel bilgiler	134
3.8.2.	Aerobik Stabilizasyon Havuzlarının Hesabı	137
3.8.2.1.	Aerobik Havuzların Boyutlandırılması	138
3.8.2.2.	Alglerin Ürettiği Oksijenin Nomogramlar Yardımları İle Bulunması	139
3.8.3.	Fakültatif Havuzların Hesabı	146
3.8.4.	Taban Çökeltisinin ve Yığılan Katı Madde Miktarının Tayini	146
3.8.5.	Problemler	146
BÖLÜM 4	SON ÇÖKTÜRME HAVUZLARI	155
4.1.	GENEL	155
4.2.	HAVUZ TİPLERİ.....	155
4.2.1.	Dairesel Çöktürme Havuzları	155
4.2.2.	Dikdörtgen Çöktürme Havuzları.....	156
4.3.	PROBLEMLER	159
BÖLÜM 5	ANAEROBİK (HAVASIZ) ARITMA	161
5.1.	GENEL	161
5.2.	ANAEROBİK ARITMA SİSTEMLERİ.....	161
5.2.1.	Tasarım Parametreleri	161
5.2.2.	Çamur Yapısı, Miktarı ve Niteliği	162
5.2.3.	Hacim Hesabı	164

5.2.3.1.	Bekleme Süresine Göre Hacim Hesabı	164
5.2.3.2.	Nüfusa bağlı Olarak Hacim Hesabı.....	164
5.2.3.3.	Katı Madde ve Organik Madde Yüküne Göre Hacim Hesabı	165
5.2.3.4.	Anaerobik Çürütücü Hacmi için Formül ile Hesap	166
5.2.4.	Gaz Miktarı Hesabı	166
5.3.	ÇAMUR YOĞUNLAŞTIRILMASI	167
5.4.	ÇAMURUN STABİLİZASYONU	170
5.5.	ÇAMURUN SUYUNUN ALINMASI.....	171
5.5.1.	Çamur Kurutma Yataklarının Hesabı.....	172
5.5.2.	Problemler	173
BÖLÜM 6	ARITMA TESİSİNİN HİDROLİĞİ.....	175
6.1.	BORULARDA AKIM.....	175
6.1.1.	Sürekli Yük Kayıpları	176
6.1.2.	Yersel Yük Kayıpları	179
6.1.3.	Çökeltim Havuzu Giriş Borularında Akım.....	180
6.2.	AÇIK KANALLARDA AKIM.....	183
6.2.1.	Üniform Akımlar	183
6.2.2.	Üniform Olmayan Akımlar	184
6.2.2.1.	Yandan Savaklanan Kanallar	188
6.2.2.2.	Giriş Dağıtım Kanalları	190
6.3.	ÇÖKELTME HAVUZU DIŞLI SAVAK HESABI	194
6.4.	YERSEL YÜK KAYIPLARI	195
6.4.1.	Ani Genişleme ve Ani Daralma	196
6.4.2.	Klor Temas Tankında Yük Kaybı.....	197
6.5.	KESKİN KENARLI SAVAKLAR	197
6.6.	PARSHALL SAVAKLARI.....	198
6.7.	VENTURİ ÖLÇEĞİ.....	199
6.8.	PROBLEMLER	202
BÖLÜM 7	BİR PROJE ÖRNEĞİ.....	209
7.1.	GİRİŞ.....	209
7.2.	NÜFÜS DEĞERLERİ.....	209
7.3.	DEBİLERİN HESABI.....	212
7.3.1.	2032 yılı İçin Debi Hesabı.....	212
7.3.1.1.	Evsel Atıksular	212
7.3.1.2.	Sızma Debisi	212
7.3.1.3.	Sanayi Debisi	213
7.3.1.4.	Ortalama Günlük ve Saatlik Debi	213

7.3.1.5.	Hesap Debisi (Tasarım debisi = Proje debisi)	213
7.3.1.6.	Maksimum Saatlik Debi	214
7.3.1.7.	Minimum Saatlik Debi	214
7.3.2.	2047 Yılı İçin Debi Hesapları	214
7.3.2.1.	Evsel Atıksular	214
7.3.2.2.	Sızma Debisi	214
7.3.2.3.	Sanayi Debisi	215
7.3.1.4.	Ortalama Günlük ve Saatlik Debi	215
7.3.1.5.	Hesap Debisi (Tasarım debisi = Proje debisi)	215
7.3.1.6.	Maksimum Saatlik Debi	215
7.3.1.7.	Minimum Saatlik Debi	215
7.3.3.	Kirlilik Yükleri	215
7.3.3.1.	2032 Yılı Evsel Atıksu Kirlilik Yükü Değerleri	216
7.3.3.2.	2047 Yılı Evsel Atıksu Kirlilik Yükü Değerleri	216
7.3.4.	Endüstriden Gelen Kirlilik Yükü	216
7.3.4.1.	2032 Yılı Kirlilik Yükü	217
7.3.4.2.	2047 Kirlilik Yükü	217
7.3.5.	Endüstriden Gelen Kirlilik Yükü	217
7.3.5.1.	2032 Yükü	217
7.3.5.2.	2047 Yılı Yükü	217
7.3.6.	Kirlilik Konsantrasyonları	218
7.3.6.1.	2032 Yılı Konsantrasyonları	218
7.3.6.2.	2047 Yılı Konsantrasyonları	218
7.3.7.	Pompa Hesapları (Terfi merkezi)	219
7.3.7.1.	Pompa Emme Haznesi Hesabı ve Pompa seçimi	219
7.4.	MEKANİK ARITMA ÜNİTELERİNİN TASARIMI	223
7.4.1.	Izgara Hesabı	223
7.4.1.1.	Izgara Öncesi Bağlantı Kanalı	223
7.4.1.2.	İnce Izgara Hesabı	224
7.4.1.3.	Izgar Çubukları Arasındaki Yük Kaybı	226
7.4.1.4.	Kaba Izgara Hesabı	226
7.4.1.5.	Izgarada Tutulan Katı Madde Miktarı	228
7.5.	KUM TUTUCU HESABI	228
7.5.1.	Parabol Kesitli Uzunlamasına Kum Tutucu Hesabı (Venturi Kontrollü)	228
7.5.2.	Kum Toplama Haznesi Hesabı	240
7.5.3.	Keskin Kenarlı dikdörtgen savak Kullanıldığı zaman Kum tutucu Hesabı	241

7.5.4.	Orantılı Akım Savağı İle Teçhiz Edilmiş Kum Tutucu Hesabı.....	246
7.5.5.	Havalandırmalı Kum Tutucu Kullanılması Halinde Kum Tutucu Hesabı	251
7.6.	ÖN ÇÖKTÜRME HAVUZU HESABI.....	253
7.6.1.	Dikdörtgen Ön Çöktürme Havuzu	253
7.6.2.	Dairesel Ön Çöktürme Havuzu Hesabı	264
7.7.	BİYOLOJİK ARITMA.....	269
7.7.1.	Havalandırma Havuzu Hesabı	269
7.7.2.	Azot ve Fosfor Giderimi Halinde Havalandırma Havuzu Boyutlandırılması	281
7.8.	SON ÇÖKTÜRME HAVUZLARI	284
7.9.	DEZENFEKSİYON ÜNİTESİ HESABI.....	289
7.10.	KLORİNATÖR HESABI.....	290
7.11.	ÇAMUR STABİLİZASYONU.....	291
7.12.	ÇAMUR YOĞUNLAŞTIRMA HESABI.....	291
7.13.	ANAEROBİK ÇAMUR ÇÜRÜTME TANKI HESABI.....	293
7.14.	ÇAMUR ÇÜRÜTÜCÜDEN ÇIKAN ÇÜRÜMÜŞ ÇAMUR MİKTARI	294
7.15.	BELT FİLTRE PRES HESABI	295
7.16.	GAZ ÜRETİMİ VE GAZ DEPOSU	297
7.17.	KARIŞTIRMA TANKI HESABI	298
7.18.	ÇÜRÜMÜŞ ÇAMUR BERTERAF ALTERNATİFLERİ	300
7.19.	ALTERNATİF BİYOLOJİK SİSTEMLER	302
7.19.1.	Damlatmalı Filtre Boyutlandırılması	302
7.19.2.	Stabilizasyon Havuzları ve Mekanik Havalandırma Havuzları	304
BÖLÜM 8	HİDROLİK PROFİLİN ÇIKARILMASI.....	305
8.1.	GİRİŞ.....	305
8.2.	HAVALANDIRMALI KUM TUTUCU HESABI	309
8.3.	PARSHALL SAVAĞI VE YÜK KAYBI HESABI	311
8.3.1.	Parshall Savağı Emme Çukuru Arası Hesap	313
8.4.	KLOR TEMAS TANKI İLE ÇIKIŞ RÖGARİ ARASI HESAP.....	314
8.5.	ÇIKIŞ RÖGARİ İLE SON ÇÖKTÜRME HAVUZU ARASI HİDROLİK HESAP.....	317
8.6.	SON ÇÖKTÜRME HAVUZU 3. DAĞITIM YAPISI ARASI HİDROLİK HESAP.....	321
8.7.	DAĞITIM YAPISI HESABI	323

8.8. DAĞITIM YAPISI HAVALANDIRMA HAVUZU ARASI HİDROLİK HESAP	324
8.9. HAVALANDIRMA HAVUZU İLE 2. DAĞITIM YAPISI ARASINDA HİDROLİK HESAP	327
8.10. ÖN ÇÖKTÜRME HAVUZU İLE 2. DAĞITIM YAPISI ARASI HİDROLİK HESAP.....	331
8.11. ÖN ÇÖKTÜRME HAVUZU BİRİNCİ DAĞITIM YAPISI ARASINDA HİDROLİK HESAP	335
8.12. POMPA İSTASYONU İLE 1.DAĞITIM YAPISI ARASINDA HİDROLOİK HESAP	339
8.13. ÇAMUR POMPALARI VE ÇAMUR BORULARI HİDROLİK HESABI	345
8.13.1. Ön Çöktürme Havuzu 4.DY Arası Çamur Hidrolik Hesabı.....	345
8.13.2. Son Çöktürme Havuzu Geri Devir Pompa İstasyonu Arası Çamur Hidrolik Hesabı.....	349
8.13.3. Geri Devir Pompa İstasyonu İle 4.DY Arası Çamur Hidrolik Hesabı	356
8.13.4. Yoğunlaştırıcı ile 4.DY arası Çamur Hidrolik Hesabı	356
8.13.5. Yoğunlaştırıcılarda Süzüntü Suyu Kanalı Hidrolik Hesabı.....	358
8.13.6. Çamur Yoğunlaştırıcı İl Pompa İstasyonu Arası Hidrolik Hesap.....	360
8.13.7. Çamur Yoğunlaştırıcı Pompa İstasyonu ile Çamur Çürütücü Arası.....	361
8.13.8. Süzüntü Suyu (Duru su) pompaları.....	362
Kaynaklar	365

KAYNAKLAR

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İÇİNDEKİLER

BÖLÜM YAZARLARI	iii
ÖN SÖZ	V

BÖLÜM 1

DOĞA, FİZİKSEL SAĞLIK VE HAREKET BAĞLANTISI

1. Doğal ve Yapay Çevrenin Beden Üzerindeki Etkileri ile Fiziksel Sağlıkla Bağlantısı	1
1.1. Işık ve Aydınlatma	2
1.2. Havalandırma	3
1.3. Ses	4
1.4. Isı ve Nem	6
1.5. Renk	7
1.6. Koku	7
2. Doğa, Sağlık ve Fiziksel Aktivite Düzeyi Arasındaki Güçlü Bağ	8
3. Doğanın Hareket Gelişimi Üzerindeki Etkileri	11
4. Doğanın Yürüme Becerisinin Gelişimi Üzerindeki Etkilerinin Örneklerle İncelenmesi ..	14
Kaynakça	18

BÖLÜM 2

DOĞA VE PSİKOLOJİK SAĞLAMLIK

1. Psikolojik Sağlık Kavramının Doğuşu	23
2. Psikolojik Sağlık	26
3. Risk ve Koruyucu Faktörler	28
3.1. Bireysel Koruyucu Faktörler	30
3.2. Ailesel Koruyucu Faktörler	31
3.3. Çevresel Koruyucu Faktörler	32
4. Doğa ve Psikolojik Sağlık İlişkisi	33
4.1. Doğada Olmanın Sağladığı Yararlar	34
5. Çocuklarda Psikolojik Sağlamlığın Geliştirilmesine Dönük Öneriler	36
5.1. Doğa Temelli Okul Felsefesi	37

5.2. Doğada Mutlu Aileler	39
Kaynakça	43

BÖLÜM 3

ÇOCUK, DOĞA VE ÖZ DÜZENLEME

1. Öz Düzenleme Nedir?	47
2. Doğada Olmanın Öz Düzenleme Becerilerine Etkisi	49
3. Doğanın Dikkat Üzerine Etkisi	52
4. Öz Düzenlemeli Öğrenme	55
5. Doğa ve Öz Düzenlemeli Öğrenme	56
Kaynakça	57

BÖLÜM 4

ÖZEL GEREKSİNİMLİ ÇOCUKLAR İÇİN DOĞA

1. Özel Gereksinimli Çocuklar ve Öğrenme Süreçleri	63
2. Özel Gereksinimli Çocuklar İçin Doğal Öğrenme Ortamı	65
3. Özel Gereksinimli Çocuklar İçin Doğada Eğitim: Planlama ve Uygulama	68
4. Doğayı Oyun Ortamı Olarak Değerlendirmek	75
Kaynakça	78

BÖLÜM 5

ERKEN ÇOCUKLUK YILLARINDA ÇOCUK-DOĞA İLİŞKİSİ

1. Giriş	81
1.1. Doğanın Bireyler Üzerindeki Etkileri	82
1.2. Erken Çocukluk Yıllarında Çocuk-Doğa İlişkisi	84
1.3. İnsan-Doğa Bağlantısı (Human Nature Connection, HNC)	86
1.4. Çocuk-Doğa Bağlantısı	87
1.5. Doğaya Bağlı Olma, Doğa ile İlişkili Olma ve Biyofili	89
1.6. Modern Dünyada İnsan-Doğa İlişkisi	91
1.7. Doğa Pedagojisi ve Doğa Temelli Eğitim Modellerine Giriş	93
1.8. Orman Okulu	95
2. Sonuç	101
Kaynakça	102

BÖLÜM 6

DOĞAYLA UYUM: ÇOCUĞUN BİLİŞSEL GELİŞİMİ

1. Bilişsel Gelişime Bakış	110
1.1. Doğadaki Çocuk: Bilişsel Gelişimde Köşe Taşları	110
1.2. Bilişsel Gelişimin Beş Gerçeği	119
2. Bilişsel Gelişim Hakkında Bilim İnsanları Neler Diyor?	121
2.1. Jean Piaget ve Bilişsel Gelişim	121

2.2. Lev S. Vygotsky ve Bilişsel Gelişim	125
2.3. Jerome Bruner ve Bilişsel Gelişim	127
2.4. Bilgi İşleme Kuramı	128
2.5. Zihin Kuramı	129
3. Büyümüş de Küçülmüş, Her Şeyi Biliyor!	130
3.1. Öğrenme.....	131
3.2. Dikkat	131
3.3. Algı.....	133
3.4. Bellek	134
3.5. Bilişsel İşlevler	134
3.6. Yürütücü İşlevler.....	135
3.7. Problem Çözme	137
3.8. Üst Biliş.....	138
4. Doğanın Bilişsel Gelişim ve Düşünmeye Yansıması	139
5. Ekran Arka Planı: Doğa Manzarası	140
6. Çocuklar ve Yaşamlarındaki Yetişkinler İçin Doğada Etkinlik Önerileri	142
Kaynakça	147

BÖLÜM 7 DOĞA VE BİLİM

1. Erken Çocuklukta Bilim Neden Önemlidir?	152
2. Erken Çocuklukta Bilim Eğitiminin İçeriği	156
3. Doğada Bilim Deneyimlerinde Yetişkin Rolü.....	164
4. Bildiklerimin / Öğrendiklerimin Ötesine Nasıl Geçebilirim?	171
Kaynakça	174

BÖLÜM 8 DOĞA VE MATEMATİK

1. Giriş	177
2. Doğa ve Matematik İlişkisi.....	178
3. Doğa ve Matematik Eğitimi	179
4. Doğada Matematiği Öğrenmede Doğal Materyaller	183
5. Doğada Matematik İçin Öğretimsel Stratejiler ve Öneriler	184
Kaynakça	188

BÖLÜM 9 DOĞA VE ÇOCUK EDEBİYATI

1. Uygarlık Tarihinde İnsan ve Doğa İlişkisi	191
2. Çocuk Edebiyatı ve Doğa	193
2.1. Şiir ve Şarkılar	198
2.2. Masal ve Fabllar	199

2.3. Tekerlemeler	201
2.4. Parmak Oyunları.....	202
2.5. Bilmeceler.....	203
2.6. Hikâyeler ve Resimli Çocuk Kitapları	204
Kaynakça	209

BÖLÜM 10

DOĞA VE ERKEN OKURYAZARLIK

Giriş	213
1. Erken Okuryazarlık Becerileri.....	214
2. Erken Okuryazarlık Becerilerinin Alt Bileşenleri.....	215
2.1. Sözcük Bilgisi	216
2.2. Dinlediğini Anlama	217
2.3. Harf Bilgisi	217
2.4. Sesbilgisel Farkındalık.....	218
2.5. Yazı Farkındalığı.....	219
3. Doğada Erken Okuryazarlık Becerileri	219
3.1. Doğada Sözcük Bilgisi	221
3.2. Doğada Dinlediğini Anlama	228
3.2. Doğada Harf Bilgisi	232
3.3. Doğada Sesbilgisel Farkındalık.....	234
3.4. Doğada Yazı Farkındalığı.....	238
4. Doğada Yapılabilecek Etkinliklere Yönelik Web Siteleri	241
Kaynakça	243

BÖLÜM 11

DOĞA VE OYUN

1. Oyun	248
2. Doğada Oyun	251
3. Doğada Oyun Oynamanın Faydaları.....	254
4. Doğada Oyun Materyalleri	261
5. Doğa Oyunlarında Öğretmenin Rolü	262
Kaynakça	265

BÖLÜM 12

DOĞA VE YARATICILIK

1. Yaratıcılık Nedir?	271
2. Çocuklarda Yaratıcılığı Desteklemek Neden Önemlidir?	273
3. Doğa Çocukların Yaratıcılığını Nasıl Destekler?	274
3.1. Mekân	275
3.2. Zaman.....	276

3.3. Materyaller	277
3.4. Yetişkin Desteği	280
4. Doğada Yaratıcı Oyun	282
5. Yaratıcılığı Destekleyen Doğal Oyun Alanlarının Düzenlenmesi	285
Kaynakça	289

BÖLÜM 13 DOĞA VE SANAT

1. Giriş	291
2. Sanat Nedir?	291
2.1. Erken Çocukluk Döneminde Sanat Eğitimi	293
3. Drama ve Doğa İlişkisi	295
3.1. Neşeli Orman Draması	295
3.2. Ormanda Fırtına Draması	296
4. Doğa Eğitimi ve Sanat İlişkisi.....	297
4.1. Doğadaki Materyallerle Sanat	298
5. Sanat ve Doğa Eğitiminde Öğretmenlerin Rolü	299
Kaynakça	300

BÖLÜM 14

DOĞA VE ÇOCUK BAĞLAMINDA SOSYAL ÇEVRE VE YETİŞKİN ROLÜ

1. Giriş	303
2. Doğa-Çocuk Bağı ve Sosyal Çevre.....	304
2.1. Doğa ve Çocuk Bağında Akranlar ve Kardeşlerin Rolü.....	304
2.2. Doğa ve Çocuk Bağında Yetişkinin Rolü ve Önemi	305
2.3. Doğa ve Çocuk Bağını Desteklemek İsteyen Yetişkinlere Öneriler	311
Kaynakça	316

YAZAR ÖZ GEÇMİŞLERİ	319
Doç. Dr. Banu Özkan.....	319
Doç. Dr. Dilan Bayındır	319
Doç. Dr. Ezgi Akşin Yavuz.....	320
Doç. Dr. Nilgün Cevher Kalburan.....	320
Doç. Dr. Simge Yılmaz Uysal	320
Dr. Öğr. Üyesi Büşra Çelik.....	321
Dr. Öğr. Üyesi Firdevs Burçak	322
Dr. Öğr. Üyesi Hande Arslan Çiftçi.....	322
Dr. Öğr. Üyesi Özlem Dönmez.....	323
Dr. Öğr. Üyesi Tringa Shpendi Şirin	323
Dr. Öğr. Üyesi Yakup Burak.....	324
Dr. Öğr. Üyesi Zeynep Kılıç	324

Öğr. Gör. Dr. Eda Bayraktaroğlu.....	325
Öğr. Gör. Dr. Melda Kılıç.....	325
Dr. Şeyma Değirmenci	325
Bilim Uzmanı Öznur Arslan Nizam.....	326
Okul Öncesi Öğretmeni Emel Özdemir	326
Okul Öncesi Öğretmeni Ezgi Baş	326

Bölüm 1

DOĞA, FİZİKSEL SAĞLIK VE HAREKET BAĞLANTISI

Zeynep Kılıç

1. Doğal ve Yapay Çevrenin Beden Üzerindeki Etkileri ile Fiziksel Sağlıkla Bağlantısı

İnsan hayatı, insan eli değmemiş ve hiçbir müdahale olmadan varlığını devam ettiren doğal çevre (Daniel, 2001) ve bu doğal çevre içerisinde insanların doğaya müdahale ederek kendi elleriyle oluşturdukları şehirler, yollar, barajlar, binalar gibi yaşam alanlarını içeren yapay çevrede (Hartig vd., 2011, akt; Çabuk, 2019) geçmektedir.

Yapay çevreyi oluşturan, içinde yaşanan, çalışılan ve eğitim alınan binaların insan bedeninin alışık olduğu doğal yaşam şartları ile insanların istek ve ihtiyaçlarını karşılayabilmesi gerekmektedir. Soygeniş (2019), insanların binalara yani kendi oluşturdukları yapay çevrelere ilişkin isteklerinin ışık, hava sirkülasyonu, ses, ısı ve nem ile ilgili olduğunu ifade etmektedir. Murphy ve Thorne (2010) da okul binalarının tasarlanması noktasında belirtilen gereksinimlerin karşılanmasının önemli olduğunu belirtmiştir. Belirtilen tüm bu gereksinimler insan bedenindeki fizyolojik fonksiyonlar üzerinde etkiye sahiptir ve dolayısıyla da fiziksel sağlığa etki etmektedir. Bakır ve arkadaşlarının (2014) da belirttiği üzere gelişim çağında olan çocuklar, çevresel koşullara karşı yetişkinlerden daha duyarlıdır. Bu nedenle doğal çevreye bağlı insan gereksinimleri ve bu gereksinimlerin fiziksel sağlığa olan etkileri ele alınırken belirtilen gereksinimlerin yapay çevre içerisinde nasıl sağlandığına da yoğun bir şekilde değinilmiştir. Çünkü günümüz çocukları; sokaklarda, oyun bahçelerinde ya da herhangi bir açık hava ortamında geçirdiği zamandan çok daha fazlasını okul, kurs, oyun merkezi gibi yapay çevreye dâhil olan kapalı alanlarda (binalarda) geçirmektedirler.

İnsanların oluşturdukları yapay çevrede yaşamak için doğal çevreden alışık oldukları ve talep ettikleri gereksinimler olan ışık, aydınlatma, havalandırma, ses, ısı,

desteklemektedir. Bu nedenle her zaman ayakkabı ile değil zemin özelliklerinin uygun olduğu, çıplak ayakla yürümenin uygun olduğu zeminlere sahip olan yerlerde çocukların ayakkabısız yürümeye de teşvik edilmesi gerekmektedir. Böylece çocuk, bastığı zemine uygun bir şekilde ayak tabanının yerleşmesini hissedebilecektir.

Tek bir hareket becerisi üzerinden kısaca açıklanmaya çalışıldığında bile doğal çevrenin çocukların hareket becerilerinin gelişiminde ve desteklenmesinde ne kadar önemli bir etkiye sahip olduğu görülmektedir. Bu nedenle aileler ve öğretmenlerin, çocukların doğal çevrelerde zaman geçirmesi gereken imkânları sağlamaları elzemdir. Kitabın diğer bölümlerinde de aktarılacağı üzere şunu söyleyebiliriz; doğa, çocuğun bütüncül olarak gelişimi için ona birçok fırsatı aynı anda sunmaktadır. Çocuğun lehine çok yoğun fırsatlar sunan bu ortamın en iyi şekilde değerlendirilebilmesinde ise yetişkinlere görev düşmektedir. Kendisine görev düşen yetişkinlerden kasıt ise sadece ebeveynler ve öğretmenler değil, yerel ve ulusal yönetimde söz sahibi olan, çocuğun gelişimi ve eğitimi üzerine politikalar geliştiren herkesi kapsamaktadır.

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Bölüm 2

DOĞA VE PSİKOLOJİK SAĞLAMLIK

Firdevs Burçak

DOĞA VE PSİKOLOJİK SAĞLAMLIK

“Doğa, bir çocuğa anne ve babasının dünyasından farklı, daha bilge ve büyük bir dünya sunar. Yıkıcı bir ailede ya da mahallede yaşayan bir çocuk için şifa sunar.

Bir şans verildiğinde, bir çocuk dünyanın karmaşasını ormana getirecek, onu derede yıkayacak, o karmaşanın görünmeyen tarafında nelerin yaşadığını görmek için üzerinde düşünecektir.

Doğada çocuk özgürlük, hayal gücü ve mahremiyet bulur: yetişkinlerin dünyasından uzak bir yer, farklı bir huzur”.

Richard Louv

Last Child in the Woods

(Doğadaki Son Çocuk)

1. Psikolojik Sağlamlık Kavramının Doğuşu

Psikolojik sağlamlığa ilişkin araştırmaların kökleri, 50 yıl öncesine kadar uzanmaktadır. Başlangıçta çok geniş olmayan bu araştırma alanı, son 20 yılda yaşanan değişimler sonucunda önemli ölçüde yol katederek psikolojik sağlamlığa ilişkin yeni araştırmaların açığa çıkmasında önemli bir rol oynamıştır. Bu duruma yol açan faktörler, yirminci yüzyılın sonlarına doğru ortaya çıkan teknolojik gelişmelerin sonucunda oluşan karmaşıklık ve çeşitli zorluklarla karşılaşan gençlerin sayısının artması; psikolojik sağlamlıkla ilişkili olan risk ve koruyucu faktörlerin işleyişinin anlaşılmasındaki zorluklara karşı daha sağlam bir zihniyetin tüm gençlikte yaygınlaştırılma çabası olarak sıralanabilir (Goldstein ve Brooks, 2013).

bütüncül olarak destekleyerek, psikolojik sağlık için gerekli olan koruyucu mekanizmaların desteklenmesinde önemli bir rol oynayacaktır.

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Bölüm 3

ÇOCUK, DOĞA VE ÖZ DÜZENLEME

Dilan Bayındır

Doğada olmanın çocuklar için pek çok faydası olduğu bilinmektedir. Öncelikle doğada olmanın çocukların öz düzenleme becerileri için önemi ele alınmıştır. Bu bölümde, öncelikle öz düzenleme kavramı açıklanacak, sonrasında öz düzenleme becerileri ile doğada olmanın ilişkisine dair çalışmalara ve önerilere yer verilecektir. Bölümün son kısmında ise öz düzenlemeli öğrenme davranışları ile doğada olmak arasındaki ilişkiye değinilecektir.

1. Öz Düzenleme Nedir?

Araştırmacıların karşılaştığı önemli bir sorun, öz düzenleme ve öz düzenlemeli öğrenmenin açık tanımlarını sağlamaktır (Dinsmore vd., 2008). Bu konuda çalışmalar yapan araştırmacıların standart tanımlar kullanmadıkları görülmektedir. Bu durum, anlaşılabilir olmakla birlikte sorunludur (Schunk 2000). Süreçleri nasıl tanımladığımız, onları değerlendirmek için kullandığımız yöntemleri ve araştırma sonuçlarımızı nasıl yorumladığımızı etkilemektedir. Bu nedenle bu bölüme başlarken öncelikle öz düzenleme kavramı hakkında net bir tanımın bulunmadığını vurgulayarak başlamak yerinde olacaktır.

Sosyal bilişsel kuram, bilgiyi işleme kuramı, sosyal kültürel kuram başta olmak üzere farklı kuramlar öz düzenleme kavramını tanımlar. Bu alandaki çağdaş araştırmalar; Flavell (üstbiliş), Bandura (öz düzenleme) ve Zimmerman'dan (öz düzenlemeli öğrenme) büyük ölçüde etkilenmiştir (Schunk, 2008). Öz düzenleme kavramı üzerinde en önemli etkinin ise Bandura (1986) tarafından şekillendirilen sosyal bilişsel gelenek ve bu geleneğin takipçisi araştırmacılar tarafından ortaya konduğu söylenebilir. Bandura sonrasında, Zimmerman, Schunk, Pintrich ve Pajares'in çalışmaları bu konudaki önemli çalışmalar olarak kabul edilmektedir (Sakız ve Yetkin-Özdemir, 2014). Schunk (2001), öz düzenlemeyi bireylerin belli bir amaca ulaşmak için bilişsel, üstbilişsel ve motivasyonel stratejilerden faydalanarak

Sibthorp ve arkadaşları (2015), bir dönem boyunca süren dış alan macera eğitimi programına katılan üniversite çağındaki öğrencilerin, daha fazla kendi kendini yöneten öğrenciler olacaklarını varsaymıştır. Çalışma sonunda, açık hava macera eğitimine katılan öğrencilerde motivasyon ve öz yeterlilik düzeylerinin değişmediği, bunun nedeninin öğrenen özelliklerinden kaynaklandığı sonucuna varılmıştır. Ancak dış alan macera eğitimi sırasında özellikle girişim ve kontrol düzeyi ölçümlerinde önemli gelişmeler olduğu görülmüştür. Bu ölçümler, öğrenme sürecini planlama, uygulama ve değerlendirme için proaktif olarak kontrol ve inisiyatif almayı gösteren eylemleri değerlendirmektedir.

İlgili literatürün bize gösterdiği gibi doğada olmak öz düzenlemeli öğrenme için katkı sağlamakta olup bu konuda daha fazla araştırma yapılması gerektiği açıktır.

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ÖZEL GEREKSİNİMLİ ÇOCUKLAR İÇİN DOĞA

Tringa Shpendi Şirin

1. Özel Gereksinimli Çocuklar ve Öğrenme Süreçleri

Çocukların dinamik varlıklar olarak kabul edilmesi, onlara erken dönemden itibaren öğrenme fırsatları sunulmasına yol açacaktır (Tuğrul, 2002). Çocuklara sunulan bu fırsatlar onların yeni olgular öğrenmelerine ve deneyimler edinmelerine olanak sağlayacaktır. Erken dönemde çocuklar birbirinden farklı şekillerde öğrenirler, bundan dolayı çocuklara doğrudan ve dolaylı öğrenme sürecinde farklı durumları deneyimleme fırsatı vermemiz, onların öğrenmelerini desteklemek anlamına gelmektedir (Lind, 2005; Saçkes, Trundle ve Flevares, 2009). Aileler ve öğretmenler, çocukların bu öğrenme ihtiyacını yeni bilgiler ve deneyimler sunarak desteklemeye çalışmaktadırlar (Tuğrul, 2002). Ancak bu noktada dikkat edilmesi gereken bir konunun altını çizmek çok önemlidir, bu da çocuğun gelişim düzeyi ve buna bağlı olarak gereksinim ve ihtiyaçlarıdır. Anlaşılacağı üzere her çocuğun kendine özgü bireysel farklılıkları vardır ve öğrenme sürecin planlanmasında aile ya da öğretmen olarak çocukların ihtiyaçlarını göz önünde bulundurmak çok önemlidir (DEC, 2007; Snow ve Van Hemel, 2008). Öğrenme her çocuğun hakkıdır ancak bunun yanı sıra her çocuğun ihtiyaç duyduğu şekilde öğrenim görmeye hakkı olduğunu da bilmemiz gerekmektedir. Diğer çocuklardan farklı olarak bazı çocukların gelişim alanlarında özel gereksinimlerine bağlı ihtiyaçları vardır; bu ihtiyaçlar özellikle fiziksel, bilişsel, sosyal duygusal gibi alanları kapsamaktadır. Bunun için eğitim sürecini tasarlarken her çocuğun ihtiyaçlarını göz önünde bulundurmak önemlidir (Cavkaytar, 2015).

Özel gereksinimli çocuklar, özel eğitime ihtiyacı olan çocuklardır ve genellikle görme yetersizliği, zihinsel yetersizlik, işitme yetersizliği, fiziksel (bedensel) yetersizlik, dil ve konuşma bozukluğu, duyu ve davranış bozukluğu, öğrenme güçlüğü, otizm spektrum bozukluğu, çoklu yetersizlikler ve özel yetenekli çocuklar olarak bilinmektedirler [Özel Eğitim Hizmetleri Yönetmeliği, Millî Eğitim Bakanlığı

- Hareket özgürlüğü,
- Farklı ortamlarda ve farklı alanlarda nasıl davranmaları gerektiğini tecrübe ederek öğrenmeleri,
- Sınıfı içerisinde bulunan materyallerin yanı sıra farklı materyallerle öğrenmeleri,
- Öğretmen ve ailelerinden öğrenmelerini desteklemek için sınıfta uygulanan yöntemlerin yanı sıra alternatif öğrenme yöntemlerini de deneyimlemeleri,
- Arkadaş edinme,
- Sosyal açıdan kabul görmeleri için fırsat sunmaktadır.

Doğada yapılan eğitimden özel gereksinimli çocuklar faydalanabileceği gibi tipik gelişim gösteren çocuklar, öğretmenler ve aileler de faydalanabilmektedirler. Doğa, farklılıkları gözetmeksizin bütün insanlara kendilerini bulmalarına ve özgür hissetmelerine olanak sağlamaktadır.

Sonuç olarak özel gereksinimli çocukların ihtiyaç ve ilgileri doğrultusunda onlara fırsatlar sunan bir ortamda öğretim yapılması, onların bilişsel, fiziksel, dilsel, sosyal ve duygusal açılardan gelişme göstermelerini sağlayacaktır. Kendileri tanıma, yeni deneyimler edinme, diğer çocuklarla bir arada olmak ve ilgi duydukları konulara daha yakın olmak doğada yapılan eğitimin sunduğu bir fırsattır. Burada dikkat etmemiz gereken bir konu ise her şeyi doğadan beklememek, söz konusu özel gereksinimli çocuklar olduğunda iyi bir öğretim planlamasının ne kadar önemli olduğunu göz önünde bulundurmanız gerekmektedir. Ayrıca öğretim sürecinde öğretmen ve aile iş birliği de bir o kadar önemlidir. Özel gereksinimli çocukların okulda ya da evde edindikleri beceriler ya da kazandıkları olumlu davranışlar/söndürdükleri problem davranışlar açısından öğretmen ve ailelerin birlikte çalışması bu beceri/davranışların kalıcı olması ve genelleme yapmaları açısından önemlidir. Özel gereksinimli çocukların kazandıkları becerileri genelleyebilmeleri ise onların topluma uyum sağlamaları ve kabul görmeleri anlamına gelmektedir. Bu da özel gereksinimli çocukların birey olarak, bizim de toplum olarak en önemli hedefimizdir. Doğanın sunduğu öğretim fırsatlarını ve doğada öğrenmenin çocuklar için önemi göz önünde bulundurularak, doğanın daha etkin bir şekilde kullanılması için öğretmenler ve aileler olarak bizler de elimizden gelenini yapmalıyız.

Kaynakça

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ERKEN ÇOCUKLUK YILLARINDA ÇOCUK-DOĞA İLİŞKİSİ

Simge Yılmaz Uysal

1. Giriş

Bu bölümde;

- Doğanın bireylerin fiziksel ve ruhsal sağlıkları üzerindeki etkileri,
- Erken çocukluk yıllarında çocukların doğa ile ilişkisinin nasıl kurulduğu ve bu ilişkide erken yıllarda önemli yaşam deneyimlerinin rolü,
- Çocuk-doğa ilişkisinin kurulmasının doğa için ne gibi katkılar sağlayacağı,
- İnsan-doğa ilişkisi ve bu ilişkinin boyutları,
- Çocukların doğa ile bağ kurmaları sonucunda öğrendikleri somutlaştırılmış yetenekler ve bu yeteneklerin ne ifade ettiği,
- Doğaya bağlı olma, doğa ile ilişkili olma ve biyofili kavramları,
- Günümüzde insan doğa ilişkisindeki kopukluklar ve nedenleri,
- Doğadan uzaklaşmaya bağlı olarak gelişen biyofobi,
- Biyofobinin etkilerini azaltabilecek önlemler,
- Bireyleri doğa ile buluşturmada eğitimin rolü,
- Doğa pedagojisi ve doğa temelli eğitim,
- Doğa temelli eğitim modellerinden Orman Okulu,
- Avustralya'da Doğa Anaokulları çerçevesinde Çalı Okulu (Bush School/Bush Kinder ve Beach School (Sahil Okulu) örnekleri ele alınacaktır.

doğa ile etkileşim kurabilecekleri ve tüm duyularını aktif olarak kullanabilecekleri doğrudan doğa deneyimlerinin sunulması, kısa ve uzun vadede onların doğaya karşı tutumlarını ve davranışlarını olumlu yönde etkileyecektir. Özellikle küçük çocukların doğa ile güçlü bağlar kurmaları, onların çevre yanlısı davranışlar göstermelerine zemin hazırlayacak ve onların doğayı seven, doğaya sahip çıkan ve doğa için harekete geçen aktif bireyler olmaları konusunda katalizör rolü görecektir. Bu anlamda, çevre eğitimi kapsamında açık alanda gerçekleştirilen doğa temelli eğitim yaklaşımlarının (ör.; Orman Okulu, Çalı Okulu, Sahil Okulu vb.) öneminin anlaşılması ve bu yaklaşımların etkili bir şekilde yaygınlaşması; bireylerin çevre ile ilgili istedik kazanımlar elde etmeleri, doğa ile bağlarını güçlü tutmaları ve uzun soluklu olarak sürdürülebilir bir yaşama katkıda bulunmaları bakımından önemli sayılabilir. Türkiye'nin ve dünyadaki pek çok ülkenin dâhil olduğu geniş topraklarda yeşeren ormanların ve farklı doğal açık alanların, uygun pedagojik uygulamalar yapan donanımlı öğretmenlerle günden güne "öğrenme alanı" olarak algılanmaya ve kullanılmaya devam etmesi, hem sağlıklı nesillerin yetişmesi hem de sağlıklı ve sürdürülebilir dünyanın geleceği bakımından umut vaat etmektedir.

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Bölüm 6

DOĞAYLA UYUM: ÇOCUĞUN BİLİŞSEL GELİŞİMİ

Ezgi Akşın Yavuz, Öznur Arslan Nizam

Ormanlardan denizlere, nehirlerden volkanlara, topraktan yıldızlara, yeryüzü ve gökyüzünde doğayla ilgili her şey bir bütündür. Bu bütünlüğün her bir parçası, sürekli bir diğeri ile etkileşim hâindedir. Birbirlerinden etkilenir ve birbirlerini etkilerler. Hastalıkları da iyileşmeleri de birlikte deneyimlerler. Doğanın bir parçası olarak insanoğlu da doğanın dönüşümü sırasında kendisini konumlandığı yeri zamanla değiştirmiş hatta öyle ki doğayı değiştirmeye çalışmıştır. 2000’li yıllar itibarıyla somut olarak deneyimlediğimiz ısı değişiklikleri, seller, buzulların erimesi, ozon tabakasının delinmesi gibi pek çok olumsuzlukla birlikte doğaya saygıyla yaklaşan ve onun parçası olarak yaşamlarını sürdürmeyi tercih edenlerimiz de vardır.

Bütünlüğü sağlamak için ahenk gereklidir. Doğayla uyum çok boyutlu olsa da bir çocuğun doğayla uyumunda bilişsel gelişimine neler olduğu onun *düşünceleri* ile ilgilidir. Evrendeki varlığımızda olduğu gibi doğa ve insanı ayrı düşünememe hâli, bireyin gelişim alanlarını da birbirinden bağımsız düşünememe için geçerlidir. Ancak konuyu daha detaylı ele alabilmek adına bilmek/biliş kökeninden gelen ve çoğu zaman düşünmekle ilişkilendirilen bilişsel gelişimi doğayla uyum çerçevesinde yeniden ele almanın gerekli olduğu inancındayız. Bu kapsamda öncelikle bilişsel gelişimin ne olduğundan ve çocuğun bilişsel gelişimin *gelişimsel köşe taşlarını* doğada nasıl deneyimlediğinden ve bilişsel gelişimin beş gerçeğinden bahsedeceğiz. Ardından bilişsel gelişime dair bilim insanlarının bakış açılarını sunacak ve bilişsel gelişimle ilgili önemli kavramlardan bahsedeceğiz. Çağımızda çokça ele alınan dikkat ile ilgili durumların burada sizlere farklı bakış açısı kazandıracığını düşünüyoruz.

Son olarak doğanın bilişsel gelişim ve düşünmeye yansımalarına değinerek birkaç etkinlik önerisiyle sizlerle fikir paylaşımında bulunacağız. Hazırsanız çamurlu ayakların, ıslanmış kıyafetlerin, ayak izlerinin, böceklerin, taşların, hayvanların, rüzgârın, ışığın, gölgenin, sıcaklığın, yağmur sesinin, dalgaların ve yağmur ardından gelen enfes kokunun eşliğinde beynimizde, öğrenmemizle, düşünmemizle ilgili neler oluyor yakından bakalım.

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Bölüm 7

DOĞA VE BİLİM

Nilgün Cevher Kalburan , Eda Bayraktarođlu

Bir Öğrenme Hikâyesi*

Bademli Anaokulu, her yıl komşu okulda düzenlenen, tüm okulların katılabildiđi takas etkinliğinde aldıkları kabak çekirdeklerini okul bahçesine ekeli yaklaşık 2 ay oldu ve tüm okul olgunlaşmış balkabaklarını hasat etmenin heyecanını yaşıyordu.

Okuldaki tüm sınıfların program dahilinde suladıđı, toprađını havalandırıp yabani otlardan temizlediđi bahçede herkese yetecek kadar balkabađı yetişmişti. Cem Öğretmenin 5 yaş sınıfı hasat ettikleri kabakları saydılar, ağırlıklarını ölçtüler, balkabađı ile ilgili geçmiş deneyimlerini paylaştılar ve bir dizi çocuk kitabı, bitkiler ansiklopedisi, eğlenceli şarkılar ve bilmeceler sürece dahil edildi.

Sırada bu balkabaklarını nasıl tüketebilecekleri ile ilgili güzel bir tartışma vardı. Deniz, büyükannesinin meşhur bir balkabađı çorbası tarifi olduğundan bahsetti; Gökçen ise babasının yaptıđı balkabađı tatlısını anlattı. Okulun mutfađı sınıf etkinliklerine destek vermek için her zamanki gibi açık ve yemek personeli de katkı sağlamak için hazırıldı. Çocuklar balkabađını nasıl değerlendirecekleri ile ilgili oylama yapıp grafik üzerinde işaretlediler. Çorba da tatlı da çocuklar tarafından seçilince (kaç kişinin seçtiđi önemli deđil) sonraki birkaç günün planı ortaya çıktı.

Cem Öğretmen, emekli bir sanat öğretmeni olan Deniz'in büyükannesi ile buluşup çocuklar için tarif kartı (görsel-yazılı) hazırlamasına yardımcı oldu. Ardından Gökçen'in babası ile çocuklarla birlikte tatlı yapabilecekleri gün için randevulaştılar ve sürecin nasıl gerçekleşeceđi hakkında ortak kararlar aldılar.

Öğretmen çocuklarla oluşturulan planı, aylık planında belirlediđi kazanımlar ve kavramlar üzerine inşa ederek günlük eğitim akışlarını oluşturdu. Gökçen'in babasıyla birlikte hazırlanan balkabađı tatlısından sonra geriye kalan kabak

doğal unsurların bir parçası olduklarını hissettirmeli ve sistemi değiştirecek müdahaleler yerine doğada kendi işlevlerini keşfedecekleri deneyimler yaşamalarını teşvik etmeliyiz. Dolayısıyla doğanın bir parçası olduğumuzu hatırlayarak kararlarımızın ve eylemlerimizin doğa üzerindeki etkilerini göz önünde bulundurmamız. Bilim keşfindeki pusulamız “Doğaya Saygı” olmalıdır.

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Bölüm 8

DOĞA VE MATEMATİK

Melda Kılıç

1. Giriş

“Doğanın muazzam kitabının dili matematiktir. Evren dediğimiz kitap, yazıldığı dil ve harfler öğrenilmedikçe anlaşılabilir. O, matematik dilinde yazılmış; harfleri üçgen, daire ve diğer geometrik şekillerdir. Bu dil ve harfler olmaksızın kitabın bir tek sözcüğünü anlamaya olanak yoktur”.

Galileo Galilei

Her köşesinde merakı ve öğrenmeyi teşvik eden önemli fırsatlar barındırması nedeniyle doğa, çocuklar için “harika bir öğretmen ve arkadaş” olarak nitelendirilmektedir (Keeler, 2008). Doğada olmak, çocuklar için heyecan verici ve eğlencelidir. Çocukların yeni bilgileri öğrenmelerinde bu heyecandan yararlanmak ve onlar için farklı öğrenme deneyimleri yaratmak etkili bir yoldur (McLennan, 2017). Günümüzde çocukların doğadan yoksun ve doğayla anlamlı bir bağ kurmadan büyüdükleri gerçeğiyle karşı karşıyayız. Louv (2016), çocukların doğadan yoksun kalmasının onlarda zihinsel, fiziksel ya da ruhsal pek çok soruna (dikkat bozukluğu, obezite, depresyon vb.) neden olabileceğini, bunun aksine doğayla deneyimlerinin de bu alanlarda çocukların gelişimlerine önemli katkılar sağlayacağını altını çizmiştir. Doğayla iç içe olmak; sağlık, odaklanma yeteneği gibi bilişsel beceriler, yaratıcılık, çevreye duyarlılık ve sorumluluk açısından önemli faydalar getirir. Araştırmacılar, doğada öğrenmenin ve olumlu deneyimlerin çocukların odaklanma ve konsantrasyon yeteneğinde gelişme (Taylor ve diğerleri, 2001), iletişim ve iş birliği becerilerinin gelişimi (Moore ve Wong, 1997), stres yönetimi ve problemlerle başa çıkma yeteneğinin güçlenmesi (Wells ve Evans, 2003) açısından yararlarına dikkat çekmektedir.

kendi buldukları doğal nesnelere örüntüler oluşturma çalışmaları yapılabilir. İlk çalışmalarda basit ABAB (örneğin, yaprak-taş-yaprak-taş) örüntü modeli üzerinde çalışmak uygun olacaktır. Çalışmalar, çocukların gelişim özelliklerine göre AABAAB, ABBABB, ABCABC gibi farklı örüntü modelleri çerçevesinde genişletilebilir.

Çocukların simetriyi anlamalarında doğada yapacakları etkinlikler önemlidir. Çocuklarla doğal çevrede simetri örnekleri aramak eğlenceli ve çok öğretici olacaktır. Çocukların çevrelerinde nerede simetri örnekleri gördükleri ya da nelerin simetrik olmadığını düşündükleri üzerinde çalışılabilir. Çocuklar, buldukları örnek nesnelere bir araya getirebilirler. Bu nesnelere incelendikten sonra fotoğraflanabilir. Fotoğrafların çıktısı alınarak küçük bir ayna yardımıyla simetri çizimleri bulunarak test edilebilir. Hatta bu fotoğraflardan simetrik olmayan ve simetrik nesnelere olarak gruplandırılarak grafik oluşturulabilir.

Sonuç olarak doğada matematiği öğrenmenin ya da doğa temelli bir matematik eğitiminin çocuklar açısından önemli fırsatlar barındırdığı görülmektedir. Erken yaşların çocuğun gelişimi ve öğrenmesi açısından kritik olduğu göz önünde bulundurulduğunda konu daha da dikkat çekmektedir. Yukarıda yer alan öğretimsel stratejiler ve öneriler dışında çocukların gelişimsel özellikleri ve bireysel farklılıkları dikkate alınarak okulların imkân ve çevre olanakları bağlamında düzenlemelere gidilerek eğitim etkinliklerinin düzenlenmesi mümkün olabilmektedir. Tüm bu bilgiler ışığında okul öncesi eğitimcilerinin doğanın matematikle buluştuğu noktada yer almaları ve bu uğurda gereken gayreti göstermeleri son derece önemlidir.

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1. Uygarlık Tarihinde İnsan ve Doğa İlişkisi

İnsanın doğa ile olan ilişkisi insanlığın varoluşu kadar eskidir. İnsan, doğayı etkilemiş ve ondan etkilenmiştir (Gülay ve Önder, 2011). Uygarlık tarihi boyunca insan-çevre ilişkisi incelendiğinde *ilkel dönemde* avcı-toplayıcı insanların doğayı olduğu gibi kabul ettikleri ve uyum sağlama gayretinde oldukları görülmektedir. Bu dönemde ateşin bulunması; savunma ve avlanma araçları edinmeye, beslenme ve enerji kaynağı oluşmasına, ölüm oranının düşüp yaşam süresinin uzamasına ve nüfusun artmasına katkı sağlamıştır. *Tarım ve yerleşme döneminde* yerleşik hayata geçilmiş, avcılık ilerlemiş, bitkisel üretim ve hayvancılık faaliyetleri görülmüş ve buradan iki ayrı uzmanlık alanı doğmuştur. İhtiyaç duyulan aletlerin yapılması ve ilkel ticaretin gelişmesi ile üçüncü uzmanlık alanı ortaya çıkmıştır. Gelişen bu sistemler, ilkel dönemde mikro ölçekli tahribatın tarım ve yerleşme döneminde makro ölçekli tahribata doğru ilerlemesine yol açmıştır (Atasoy, 2015).

Sanayileşme ve kentleşme dönemi buhar makinası ve kömür kullanımı ile başlamıştır. Sanayi Devrimi öncesinde toplam enerjinin %80-85'i canlıların emeği ve kas gücünden elde edilirken Sanayi Devrimi ile doğadaki petrol, kömür ve doğal gaz gibi yenilenemeyen enerji kaynakları kullanılmaya başlanmıştır. Ekonomik büyüme, göçler ve kentleşme, sağlık sistemindeki gelişmeler ve artan yaşam süresi/nüfus, dünya savaşları, endüstri ürünlerinin doğada birikmesi ve artan enerji üretimi/tüketimi küresel çapta değişikliklere neden olmuştur (Atasoy, 2015; Ertürk, 1996).

İçinde bulunduğumuz dönem ise *iklimsel ve kozmik dönemdir*. Bu dönemde insan, dünyanın eksenini dışındaki canlıları ve uygarlıkları arama çabası içerisinde. Yeni uzay sistemlerini ve yeni yaşamları keşfetmeyi hedeflemektedir. Bilim ve teknolojiye gelişmeler müthiş bir hızda ilerlemektedir, öyle ki tarım devrimi 5000 yıl sürerken ABD nüfusunun dörtte birinin elektriğe kavuşması 46 yıl, internete

(Uyanık Balat ve Arslan Çiftçi, 2019). Bazı resimli çocuk kitapları, çocukları doğada gözlem yapmaya ve yeni bakış açıları kazandırmaya yönelik olarak tasarlanmıştır. Örneğin, *Bir Orman* isimli çocuk kitabında çocuğa farklı bir bakış açısı sunulmaktadır: “Bir yaprağı ışığa tutup, ona arkasından bakarsan yaprağın damarlarını görürsün” (Resim 11). Gözlem yapmak çocukların anlama ve anlatma becerilerini destekler, doğadaki varlıkları ezber ile değil gerçek ortamında öğrenmelerini sağlar, zihin gelişimine katkı sağlar, araştırma ve öğrenme merakını artırır (Şimşek ve Çınar, 2017). Doğadaki yaşantılarını kaydetmesini sağlayan *Yeşil Günlük* ise bir anı kitabı olarak kullanılabilir. Hem bilgilendirici öğeler hem de etkileşim unsurları içeren bu kitapta çocuk tohumları keselere koyabilir, anılarını resmedebilir ya da büyük yaş gruplarında not edebilir ve farklı ağaç türlerini öğrenebilir.

Etkileşimi artıran bu kitaplar ile çocuk, doğada bilimsel araştırmalar yapan bir bilim insanı gibi yaşantılar geçirebilir. Aynı zamanda yetişkin için neler yapılabileceğine dair fikir veren ve etkili kullanılabilecek eğitsel materyale dönüşebilir.

Kaynakça

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Bölüm 10

DOĞA VE ERKEN OKURYAZARLIK

Yakup Burak, Emel Özdemir

Giriş

Dünyanın ilk üniversitesi olarak kabul edilen Platon'un okulu "Akademia" zeytin ağaçlarıyla çevrili yemyeşil bir bahçenin içerisindeydi ve öğrenciler, günün çoğunu burada geçirmekteydiler. Yine Antik Yunan'da Samoslu Epikuros tarafından açılan okulda ise bahçede yapılan toplantılar sebebiyle öğrenciler, "Bahçe Filozofları" olarak adlandırılmışlardır. Zaman geçtikçe Comenius, Rousseau, Pestalozzi, Goring, Locke, Froebel ve Dewey gibi büyük düşünürler de doğada eğitimin önemini vurgulamış ve bu konuda pek çok akıma öncülük etmişlerdir. 18. yüzyıla gelindiğinde ise Alman Philantropolar, çocuğun doğa ve atölye gezileri ile teorik bilgilerini pratiğe dökerek deneyim, beceri ve bilgi kazanacaklarını belirtmişlerdir (Aytaç, 2018). Kuzey Avrupa ülkelerindeki yaşam tarzının veya kültürünün gözlemlenmesi ve bu kültürün dünyaya yayılması sonucu popülerliği artan yeni bir yaklaşım olarak kabul edilen doğa/orman okulları özellikle Türkiye'de geleneksel eğitim ortamına alternatif olarak kabul edilmektedir (Canlı ve Temel, 2022).

Geleneksel eğitim sisteminden farklı olan doğada öğrenme kavramı aslında var olan öğrenme merakına çok daha uygundur. Ama nedendir bilinmez; insanlık, yüzyıllardır içi sıralarla dolu olan kapalı alanlara ve masa başında oturmayı gerektiren geleneksel yapıya emanet etmiştir. Ancak yapılan akademik çalışmalar, çocuğun gerçek deneyimler yaşamasının çok önemli olduğunu vurgulamaktadır (Civelek ve Akamca, 2017; Öztürk ve Bayrak, 2017). Ucu bucağı olmayan ve sürekli değişen doğanın bir parçası olan çocuğun, ait olduğu yerde çok daha anlamlı deneyimler yaşayacağı ise şüphesizdir. Zıplanacak su birikintileri, kazılmayı bekleyen çukurlar, yapış yapış çamurlar, tırmanılacak ağaçlar, kovalanacak hayvanlar, yayılan kokular, rengârenk çiçekler, çatırtılar, vızıltılar ve cıvıltılar... Keşfedilmeyi bekleyen doğa, yaparak yaşayarak öğrenme için bulunmaz bir hazinedir. Bu hazine, bütün zenginliği

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Bölüm 11

DOĞA VE OYUN

Şeyma Değirmenci

“Doğa ziyaret edilen bir yer değil yuvamızdır”.

Gary Snyder

Çocuklar, gün boyu dokunmak, tatmak, denemek ve keşfetmekle meşgul insanlardır. Sürekli hareket hâlinde geçen bu sürecin kendi içindeki sihirli anlarını göremeyen bazı yetişkinler, çocukluğu sadece yetişkinliğe geçiş sürecindeki bir çeşit hazırlık aşaması olarak düşünürler. Bu bakış açısı, çocukluğun barındırdığı zenginliklerin yok sayılması, onu sadece bir ara dönem olarak ele alınması sorununu beraberinde getirir. Oysa çocukluk dönemi, başlı başına macera ve keşif dolu bir dönem olarak hayatın başrolünü almayı hak etmektedir (Wilson, 2007).

Hayatın bu kıymetli döneminde çocukların anaokullarında oynadıkları oyunlarla veya belirli branşların spor antrenmanlarıyla yeterli düzeyde hareket ettikleri düşünmek, bu ortamların sunduğu hareketin dışında bir seçeneğin olmadığına inanmak çok sağlıklı değildir. Çocuklar, yapılandırılmış ortam ve zamanlarda yaptığı fiziksel aktivitelerin yanı sıra kendi sınırlarını keşfedebildikleri, yetişkin liderliğinden uzakta aktif serbest oyunlar oynamaya ihtiyaç duyarlar. Bu ihtiyaçlarını karşıladıkları yer de tıpkı yetişkinler gibi doğadır. Erken çocukluk dönemindeki çocukların günlük olarak doğada oyun oynama ihtiyaçları bulunmaktadır. Önceki bölümlerde de işlendiği gibi çocuğun doğa ile geçirdiği zaman, bütünsel gelişimine olumlu destek veren oldukça önemli bir etmendir. Bu desteği sağlarken doğanın sunduğu taş, toprak, dal, yaprak, çiçek gibi doğal materyalleri nasıl kullanacağını keşfetmek, çocukların hayal gücü egzersizi yapmalarına olanak tanıyacaktır. Çocuk, bu materyallerin her birini tanıır; benzerlik ve farklılıklarına göre sınıflandırmasını yapar. Bir dalın ilk koptuğundaki hâlini görebilir; günler geçtikçe, yapraklarının nasıl canlılığını kaybederek kurduğunu fark edebilir ve en sonunda dökülüşünü gözlemleyebilir. Doğal malzemelerin yılın veya günün her zamanında aynı olmayışı (günebakan çiçeğindeki

başında dışarı çıkma kısıtlamaları sebebiyle zorunlu olarak doğadan uzaklaşıldı. Bu süreç, birçok insanın açık havayı özlemesi ve kısıtların kalkmasının ardından hızla doğaya koşmalarını sağlarken bir kısım insanın ise çocuklarını dışarıdaki “virüslerden” korumak amacıyla doğadan daha da uzaklaştıkları görülmüştür (De Lannoy vd., 2020; Guerrero vd., 2020; Mitra vd., 2020).

Her yaş ve kültürde doğada oynanan oyunlara rastlanmaktadır. Üstelik bu durum insanlık tarihi boyunca böyle devam etmektedir. Doğanın bir parçası olan insanın doğa içerisinde var olması, kendisini çevreleyen doğayı tanıması ve saygı duyması çocukluktan itibaren doğayı deneyimleyebilmesi ile mümkündür. Çocuk bu deneyimleri sayesinde kendisini, kültürünü, sosyal ve fiziksel çevresini anlamlandırabilecektir. Tüm bu sürecin yetişkinlerin uygun desteklemeleri ile daha sağlıklı bir hâle geleceği, bu konunun her mevkideki yetişkinin görev ve sorumluluğu dâhilinde olduğu unutulmamalıdır. İçinde yaşadığımız yüzyılda çocukların doğaya ulaşmaları konusu, özellikle kentlerde yaşayan çocukların doğaya ulaşmaları, şehir içlerine doğal ortamların entegre edilmesi toplumsal otoritelerin sorumluluğundadır. Toplumsal otoritelerin sorumluluk bilinciyle oluşturdukları doğa ortamlarına çocukların ulaştırılması ve en verimli kullanılması ise öğretmenlerin ve ebeveynlerin sorumluluğundadır. Elbette doğa ile buluşma bir sorumluluk ve ödev olarak algılanamaz. Çünkü daha önce de bahsettiğimiz gibi doğada olmak, her yaşta insan için en önemli ihtiyaçtır; mutluluk ve neşe kaynağıdır. Bu sebeple doğa ile yapılan bu buluşmalarda Gary Snyder’ın da dediği gibi “Doğa ara sıra ziyaret edilen bir yer değil yuvamızdır.” düşüncesini benimsemek gerekir. Doğa ile bu düşünce ışığında gerçek bir buluşma yaşamak; kendimizi, hayatı ve evreni anlamlandırmamızda, hayata anlam ve neşe katmamızda en büyük kaynağımız, yuvamız olan doğa ile uyum içerisinde yaşamamızın yolunu bulmamızla mümkündür.

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Bölüm 12

DOĞA VE YARATICILIK

Hande Arslan Çiftçi

“Ağaca tırmanmak, bir çocuğun yeni bir dünya keşfetmesidir”.

Froebel, İnsanın Eğitimi, 1826

Dünyamız, yaratıcılığını geliştirme ve ifade etme fırsatı bulan ve bu niteliğini çok çeşitli yaşam koşullarında uygulayabilen kişilere ihtiyaç duymaktadır. Yaratıcı düşünme; iklim değişikliği, biyolojik çeşitlilik kaybı, kaynak tükenmesi ve zamanımızın diğer acil çevre sorunlarının çözümünde ayrılmaz bir parça olacaktır (Csikszentmihalyi ve Wolfe, 2014). Bu nedenle yaratıcılık, sadece okulda değil okul ortamının ötesinde önemli bir rol oynamaktadır.

Dünyamızın sürdürülebilirliği için yaratıcı bireylere ihtiyaç duyulmasının yanı sıra çocukların doğa ile olumlu deneyimlerinin temel faydalarından biri yaratıcılıklarını geliştirme fırsatı bulmalarıdır. Bu bağlamda bu bölümde, doğa ve erken çocuklukta yaratıcılık arasındaki bu karşılıklı ilişki ayrıntılı bir şekilde ele alınmaktadır.

1. Yaratıcılık Nedir?

Yaratıcılık, herhangi bir alanda veya disiplinde fikir üretmek veya bir şeyler üretmek ve bunları değerli bir şeye dönüştürmekle ilgilidir. Yaratıcılık karmaşıktır ve gelişiminde birçok faktör rol oynar. Herkesin yaratıcı olma potansiyeli vardır. Bu, geliştirilebilen ve geliştirilmesi gereken bir beceridir ancak küçük çocukların doğal olarak sahip oldukları ve beslenmesi gereken bir kapasitedir (Education Scotland, 2011). Gardner (1993), her çocuğun yaratıcı potansiyelle doğduğunu ve üç ile beş yaş arasındaki yaşların yaratıcılığın gelişimi için kritik yıllar olduğunu belirtmiştir.

Yaratıcılığın ana ilkelerinin şunlar olduğu öne sürülmüştür (Duffy, 1998, s. 18):

- Bir şeyleri yeni bir şekilde görme yeteneği,
- Geçmiş deneyimlerden öğrenme ve bunu yeni durumlarla ilişkilendirme,

	18. İnşaat ve bahçe alanları için araçlar, bakım araçları, tekerlekli oyuncaklar, kum oyun ekipmanları gibi dış mekân oyun ekipmanları için depo. Depo, binanın veya çitin yanında olabilir ve çocukların görüşünü engellemelidir. Depolama, çocukların her oyun süresinin sonunda ekipmanı toplamasına ve kaldırmasına yardımcı olmalıdır.
	19. Dış mekân oyun alanlarından montlara, tuvaletlere ve çeşmelere kolay erişim. Grup etkinlikleri (sanat, okuma vb.) için gölgeli alanlar, banklar, masalar ve destek malzemeleri.
	20. Engeli olan tüm çocuklar için erişilebilirlik, materyaller ve ekipman.

Kaynak: Frost vd., 2012.

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Bölüm 13

DOĞA VE SANAT

Banu Özkan, Ezgi Baş

1. Giriş

Sanat; kişinin duygu ve düşüncelerini en iyi ifade ettiği yoldur. Sanat eğitimi, insana çocukluktan başlayarak akıl yürütme, yaratıcılığını geliştirme, hayal kurma, problem çözme, el, zihin ve göz koordinasyonu geliştirme gibi becerileri kazandırır. Yaratıcılık sanat için önemli bir beceridir. Yaratıcılık ve sanat, birbirini besleyen bir döngü hâlinindedir. Yaratıcılığın geliştirilmesinde ise sanat eğitiminin önemli bir yeri vardır. Doğa ise yaratıcılığın gelişimi için çocuğa sayısız fırsat sunar.

Sanat eğitimi, çevreyle ilk tanışma, görme, algılama, adlandırma ve düzenleme ile başlayarak ürün verme, üründen tat alma olarak gelişme gösterir (Kırıçoğlu, 2005). Çocuklar doğayla iç içe olmayı çok severler. Çünkü doğa içinde bulunan unsurlar, çocuklar için birer oyun materyalidir. Bir ağaç dalı, bir taş, çimler, böcekler gibi doğada pek çok şey, çocuklar tarafından keşfedilmeyi bekler. Tüm bu keşif süreci ve oyunlar, çocukta yaratıcılığın ve estetik zevklerin gelişimine de destek olur. Doğayı sanatsal olarak yorumlayan ve anlamlandıran bireyin kendisidir.

Doğa, çocuğun içindeki yaratıcılığı, keşfetme ve merak duygusunu ortaya çıkaran bir unsurdur. Doğadaki materyaller (taş, ağaç, çiçek, kozalak gibi), çocuklar için bir oyun materyalidir. Çocuklar, bunları kullanarak oluşturdukları oyunlarda sanatsal yaratıcılıklarını da kullanırlar. Sanatın özünde üretmek vardır. Çocuk, doğada bulunan malzemelere şekil vererek kendi oyununu ve oyun materyalini üretmiş olur.

2. Sanat Nedir?

Sanat, bir duygu, güzellik ve tasarımın anlatımında kullanılan yöntemlerin tümü veya bu anlatımlar sonucunda oluşan üstün yaratıcılık olarak tanımlanmaktadır (TDK, 2022). Bir nevi insanın kendini özgün yollarla ifade edebilmesi olarak tanımlanan

gelişimine katkıda bulunmaya çalışmalıdırlar. Çocuklar, yeteri kadar tanındıklarında güçlü ve yetenekli olduğu alanları keşfedilip yardıma ihtiyacı olduğu zamanlarda desteklenebilmektedirler (Uysal ve İnce, 2020). Öğretmenler de bu alanda gerekli ortam düzenlemeleri yapmalı ve çocuğun etkili öğrenmesine katkıda bulunmalıdırlar. 2-6 yaşlardaki küçük çocuklara sanat eğitimi verilirken onun bedensel, ruhsal, zihinsel, fiziksel, psikomotor özellikleri göz önünde bulundurulmalı ve ona göre programlanmalıdır (San, 2019).

Küçük çocuklar birbirlerinden doğal olarak öğrendikleri için yetişkinlerin yanı sıra çocukların çalışmaları için de modeller sağlanarak çocukların konuşması teşvik edilebilir. Çocuklar sanat eserlerini tartışmaya ve yorumlamaya teşvik edilerek uygun olduklarında kesme ve yapıştırma teknikleri gibi manipülatif becerileri modellenebilir. Tartışma yaptırabilmek için yetişkinlerin eserlerinden ve diğer çocukların eserlerinden örnekler kullanılabilir (Smith, 1982; Wilson ve Wilson, 1982; Stokrocki 1995 Akt: Enid Zimmerman ve Laura Zimmerman, 2000).

Okul öncesi eğitimin, çocuklarda doğayla ilgili tutum ve davranış geliştirmeleri açısından oldukça önemli bir payı vardır. Bunun yerine getirilebilmesi, çok sayıda unsura bağlıdır. Bu unsurlardan birisi, uygulanan eğitim programıdır. Bu program, konu öğretimini hedef almayan, buna karşın çocukların gelişim özelliklerini dikkate alan, esnek bir içeriğe sahip olmalıdır. Öğretmenin kullandığı programın dayandığı ilkeleri doğru anlaması ve uygulamalarını buna göre yapması, eğitim amaçlarının gerçekleştirilebilmesi için temel şarttır. Çevre eğitiminde, bireylere yeni davranışlar kazandırmada birçok faktör etkindir. Bunlar çevre eğitim programı, eğitim ve öğretim kademeleri ile müfredat içeriği ilişkisi, çalışma ortamları, eğiticilerin niteliği gibi faktörlerdir. Çevre eğitiminin etkin bir şekilde verilmesi bu parametrelerdeki bilgi birikimine bağlıdır (Oluk, 2008; Evren, 2008).

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DOĞA VE ÇOCUK BAĞLAMINDA SOSYAL ÇEVRE VE YETİŞKİN ROLÜ

Özlem Dönmez

1. Giriş

Erken çocukluk yılları, çocuğun hayatında gelişim ve öğrenmenin en hızlı olduğu yıllardır. Çocuğun doğduğu andan itibaren doğayla iç içe olması gereklidir (Yılmaz ve Olgan, 2017). Çocukların erken yaşlarda öğrenmesini tetikleyen en önemli şey meraktır. Çocuklar, bu dönemde duyularını kullanarak, gözlem yaparak, soru sorarak, merak ederek, deneyerek, problem çözerek, yaparak yaşayarak ve oyun oynayarak keşifler yapar ve öğrenirler.

Doğa ile iç içe olan ve bağ kuran çocuklar doğadaki yaşamı, çeşitliliği ve düzeni erken yaşlarda fark eder, saygı duyar; merak ve keşif duygusu tetiklenir, gözlem yapma becerileri gelişir; açık uçlu deneyimler sayesinde daha çok risk alır; bağımsız bir birey olma yolculuğunda sorumluluk alır, yaşam becerileri desteklenir; bilişsel, sosyal, duygusal, dil, fiziksel gelişimi desteklenir; ekosistemin ve çevresel süreçlerin farkındalığını kazanır; başarabilme duygusunu tadar, takdir etme duygusunu geliştirir; dikkat, odaklanma ve konsantrasyonu geliştirir; bilimsel süreç becerileri desteklenir; düşünme kapasiteleri zenginleşir, eleştirel düşünme, neden-sonuç ilişkisi ve problem çözme becerileri gelişir; yeni oyunlar kurar, oynayarak ve eğlenerek öğrenir; kendini ifade etme becerileri gelişir; yaratıcılıkları desteklenir; iş birliği içinde grup çalışmaları yapabilme becerileri desteklenir; öz düzenleme, öz farkındalık ve öz güveni geliştirir (Savolainen, 2021; Paslı, 2019; Köşker, 2019; Cooper, 2015; Samborski, 2010).

Kitabın bu bölümünde doğa ve çocuk bağında sosyal çevrenin rolü ve önemi; okul öncesi eğitim programı, akranlar, öğretmenler, okul yöneticileri ve aileler bağlamında ele alınmıştır. Bu kapsamda çocukla etkileşim hâlinde olan öğretmenler, okul yöneticileri, akranlar, kardeşler ve ailelerin doğa-çocuk ilişkisindeki yeri ve önemine ilişkin bilgiler ile doğa-çocuk bağının desteklenmesi için öneriler sunulmuştur.

yetişkinin gözetiminde güvenli bir ortamda insanlarla iletişim kurması desteklenmelidir.

6. Çocuğun doğaya çıkarken bez bir çanta içinde bir kalem ve bir defter ile çıkması, fotoğraf çekmesi, çizim yapması, yaprak, taş, kozalak toplaması ve bunları eve getirip tek tek anlatması, sohbet etmesi, topladığı doğal materyalleri kullanarak bir sanat çalışması yapması gibi etkinlikler çocuğun doğadaki deneyimlerini ev ortamına taşımasına destek olacaktır.
7. Günlük hayatın bir parçası olan yemek yeme, resim yapma gibi eylemler, çocuğun doğayla bağ kurabilmesi için balkon, bahçe gibi dış mekânlarda gerçekleştirilebilir.

Tüm bu öneriler ışığında, doğa-çocuk bağında ebeveyne, öğretmene ve okul yöneticilerine sorumluluklar düştüğü söylenebilir. Doğa ile kurulan bağ, erken çocukluk yıllarından itibaren başlayarak yaşam boyu sürmektedir. En etkili öğrenmeler bu dönemde gerçekleşir. Sosyal çevrede çocuğa sunulan deneyimler, öğrenmede büyük rol oynar. Hem çevresel hem sosyal uyaranlarla desteklenen çocuklar doğa ile olumlu bağlar kurmaktadır.

Çocuğun ilk sosyal çevresi ailesidir. Ailede ebeveynleri ve kardeşleri ile edindiği deneyimler çocuk için hayati öneme sahiptir. Okul öncesi eğitim kurumunun hayatına girmesi ile sosyal çevresi genişlemeye başlayan çocuk, öğretmenleri ve akranları ile de etkileşime girmeye başlar. Çocuğun hem ev hem okul ortamındaki yetişkinler ve çocuklarla doğadaki deneyimleri, doğa ile bağını belirlemektedir.

Bu bölümde, doğa ve çocuk bağında sosyal çevrenin rolü ve önemi; akranlar, öğretmenler, okul yöneticileri ve ebeveynler bağlamında incelenmiştir. Bu doğrultuda çocukla etkileşim hâlinde olan yetişkinler ve çocukların doğa-çocuk ilişkisindeki yeri ve önemine ilişkin bilgiler verilmiş, doğa-çocuk bağının desteklenmesi için öneriler sunulmuştur. Özetle, çocuğun doğa ile olumlu etkileşimler kurabilmesi için yetişkinlerin çevre düzenlemesine, kullandıkları dile ve çocuklarla etkileşimlerine dikkat etmeleri ve çocuğun doğa ile olan bağını desteklemeleri önerilmektedir.

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İÇİNDEKİLER

YAZARLAR LİSTESİ	iii
ÖN SÖZ	v
BÖLÜM 1 ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMANIN TARİHSEL GELİŞİMİ	1
Çocuk ve Ergenlerle Psikolojik Danışmanın Tarihsel Gelişimi	1
Çocuk Ruh Sağlığının Tarihsel Gelişim Sürecinde Okul Psikolojik Danışmanlığı.....	9
Çocuk ve Ergenlerle Psikolojik Danışmanın Hedefleri.....	10
Özet	12
Kaynakça	13
BÖLÜM 2 ERGENLERLE PSİKOLOJİK DANIŞMADA GELİŞİMSEL YAKLAŞIM	15
Giriş	15
Evrimsel Açıdan Gelişimi Anlamak.....	17
Gelişim Açısından Sihirli Yıllar: 0-6 Yaş.....	20
Yaşamın İlk Üç Yılında Nörobilişsel Gelişim Yaklaşımı.....	20
Duyusal İşleme	27
Gelişimde Bilişsel Yaklaşım.....	31
Gelişimde Sosyal ve Duygusal Yaklaşım	37
Duygusal ve Sosyal Gelişimde Kritik Konular.....	40
Gelişimsel Psikolojik Danışma ve Terapi	46
Çocuk ve Ergenlerle Psikolojik Danışmada Dikkat Edilecek Konular	50
Özet	54
Kaynakça	54

BÖLÜM 3	ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMADA ETİK.....	57
	Etik.....	57
	Psikolojik Danışmada Temel Etik Değerler ve İlkeler	60
	Psikolojik Danışmanların Yaşadıkları Etik İkilemler.....	70
	Çocuk ve Ergenlerle Psikolojik Danışmada Dikkat Edilmesi Gereken Hususlar	74
	Özet	88
	Kaynakça.....	89
BÖLÜM 4	PSİKOLOJİK DANIŞMA SÜRECİNİ YAPILANDIRMA	91
	Çocuk ve Ergenlerle Psikolojik Danışmada Süreci Yapılandırma.....	91
	Psikolojik Danışma Ortamı	92
	İlk Görüşme.....	94
	Çocuk ve Ergenle İlk Danışma.....	96
	Hedef Belirleme.....	99
	Değerlendirme	101
	Aileyi Bilgilendirme.....	107
	Özet	110
	Kaynakça.....	110
BÖLÜM 5	ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMA YAKLAŞIMLARI	113
	Giriş.....	113
	Psikanalitik Yaklaşımlar.....	114
	Davranışçı ve Bilişsel Yaklaşımlar.....	127
	Hümanistik Yaklaşım.....	135
	Sosyal Yapılandırmacı Yaklaşımlar.....	141
	Özet	151
	Kaynakça.....	151
BÖLÜM 6	YARATICILIK, SANAT VE OYUN TEMELLİ YAKLAŞIMLAR.....	155
	Yaratıcılık.....	155
	Psikolojik Danışma ve Yaratıcılık.....	156
	Çocuk ve Ergenlerle Psikolojik Danışmada Yaratıcılık	158
	Çocuk ve Ergenlerle Psikolojik Danışmada Kullanılan Yaratıcı Sanat Türleri.....	160
	Özet	180
	Kaynakça.....	181

BÖLÜM 7	TİPİK GELİŞİM GÖSTEREN ÇOCUK VE ERGENLERDE EN SIK GÖRÜLEN DAVRANIŞ SORUNLARI VE YAKLAŞIMLAR	187
	Giriş.....	187
	Normal ve Normal Dışı Davranışı Tespit Etmek.....	188
	İçselleştirmeye Dayalı Davranış Sorunları ve Müdahale	188
	Dışsallaştırmaya Dayalı Davranış Sorunları ve Müdahale	198
	Özet	205
	Referanslar.....	205
BÖLÜM 8	GELİŞİMSEL FARKLILIKLARI OLAN ÇOCUKLARDA DAVRANIŞ SORUNLARI VE YAKLAŞIMLAR	207
	Gelişimsel Farklılıklar	207
	Gelişimsel Farklılıklarda Değerlendirme Süreci	208
	Gelişimsel Farklılıklarda Gruplama	211
	Gelişimsel Farklılıklarda Özel Eğitim	215
	Özel Eğitim Gerektiren Çocuklarda Davranış Problemleri.....	217
	Davranış Problemlerine Müdahale	218
	Özet	228
	Kaynakça.....	229
BÖLÜM 9	TRAVMA VE STRESLİ YAŞAM DENEYİMLERİNE SAHİP ÇOCUK VE ERGENLERE YAKLAŞIM.....	233
	Giriş.....	233
	Çocuklarda ve Ergenlerde Ruh Sağlığı, Stres, Travma ve Kriz.....	234
	Çocuklarda ve Ergenlerde Travmatik Stres Tepkileri	237
	Travmatik Stres Yaşayan Çocuklarda ve Ergenlerde Psikolojik Dayanıklılık.....	240
	Travmatik Stres ve Kriz Yaşayan Çocuklara ve Ergenlere Yapılan Psikolojik Müdahalelerden Üç Örnek	242
	Travmatik Stres ve Kriz Yaşayan Çocuklara ve Ergenlere Yönelik Eğitimde Bir Uygulama Örneği: Travmaya Duyarlı Okullar.....	247
	Özet	248
	Kaynakça.....	249
BÖLÜM 10	ÇOCUK VE ERGENLERLE BİREYSEL VE GRUPLA PSİKOLOJİK DANIŞMA.....	255
	Giriş.....	255
	Çocuklarla Psikolojik Danışma.....	256
	Çocuklarla Grupa Psikolojik Danışma.....	260

Ergenlerle Psikolojik Danışma	262
Ergenlerle Grupla Psikolojik Danışma	265
Çocuk ve Ergenle Çalışmada Psikolojik Danışma Odası.....	268
Psikolojik Danışmada İlk Görüşmeler, Devam Eden	
Görüşmeler ve Sürecin Sonlandırılması	270
Çocuklarla Psikolojik Danışma Vaka Örnekleri	274
Ergenlerle Psikolojik Danışma Vaka Örnekleri.....	280
Ergenlerle Grupla Psikolojik Danışma Örneği.....	281
Özet	282
Kaynakça.....	282
BÖLÜM 11 ÇOCUK VE ERGENLERLE YÜRÜTÜLEN	
PSİKOEĞİTSEL MÜDAHALELER.....	285
Giriş.....	286
Psikoeğitim Grupları ve Diğer Grup Türleri	286
Psikoeğitim, Psikolojik Danışma ve Psikoterapi Gruplarının	
Karşılaştırılması	287
Çocuklar ve Ergenler İçin Psikoeğitim Grubu Planlamasında	
Dikkat Edilecek Genel İlkeler	290
Okullarda Psikoeğitim Grup Çalışmaları.....	298
Okullarda Çocuk ve Ergenler İçin Psikoeğitim Grup Çalışma Konuları ...	300
Çocuklar İçin Örnek Bir Psikoeğitim Grup Planı	303
Özet	310
Kaynakça.....	311
BÖLÜM 12 ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMADA	
ÇOK KÜLTÜRLÜ YAKLAŞIM	315
Giriş.....	315
Çok Kültürlü Yaklaşım ve Psikolojik Danışma	317
Mültecilere Yönelik Çok Kültürlü Psikolojik Danışma Yaklaşımı	320
Çocuk ve Ergenlerle Psikolojik Danışmada Çok Kültürlü Yaklaşım.....	323
Psikolojik Danışmanların Çok Kültürlü Psikolojik Danışma Yetkinliği.....	326
Özet	330
Kaynakça.....	330
BÖLÜM 13 AİLE DANIŞMANLIĞI YAKLAŞIMLARI VE	
UYGULAMALARI	337
Giriş.....	337
Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları.....	339
Depresif ve Kaygılı (Anksiyeteli) Çocuk ve Ergenlerle Aile	
Danışmanlığı Uygulamaları	341

Dikkat Eksikliği ve Hiperaktivite Bozukluğu Olan Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları	345
Davranış Problemi Olan Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları	348
Boşanmış Ebeveynlere Sahip Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları	353
Evlad Edinilmiş Çocuklara Yönelik Aile Danışmanlığı Uygulamaları.....	357
Özet	361
Kaynakça.....	361

BÖLÜM 14 ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMADA GELECEĞE İLİŞKİN YÖNELİMLER	367
Giriş.....	367
Psikolojik Danışma ve Terapi Modelleri	370
Mindfulness (Bilinçli Farkındalık) Temelli Terapiler	377
EMDR (Göz Hareketleri ile Duyarsızlaştırma ve Yeniden İşleme) Terapisi	381
Doğa Temelli Terapiler.....	382
Özet	384
Kaynakça.....	384

YAZAR ÖZ GEÇMİŞLERİ.....	393
Prof. Dr. Fatma Ebru İkiz	393
Doç. Dr. Asude Özdemir	394
Doç. Dr. Eda Ermağan Çağlar	394
Doç. Dr. Esra Asıcı.....	394
Doç. Dr. Oya Onat Kocabıyık	395
Doç. Dr. Seda Donat Bacioğlu	395
Doç. Dr. Tuğba Türk Kurtça.....	396
Doç. Dr. Zöhre Kaya.....	396
Dr. Ayşe Devrim Masalçı Burçak.....	396
Dr. Öğr. Üyesi Berke Kırıkkanat	397
Dr. Öğr. Üyesi Dilaram Billur Örnek.....	397
Dr. Öğr. Üyesi Dilber Tezel.....	398
Dr. Psikolojik Danışman Ezgi Denizel Güven	398
Uzm. Psk. Danışman Ferdi Yağan.....	399
Uzm. Psk. Danışman Özgür Tönbul.....	399
Güneş Gülaydın.....	400

BÖLÜM 1

ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMANIN TARİHSEL GELİŞİMİ

Seda Donat Bacıoğlu

İçerik

Çocuk ve Ergenlerle Psikolojik Danışmanın Tarihsel Gelişimi

Çocuk Ruh Sağlığının Tarihsel Gelişim Sürecinde Okul Psikolojik Danışmanlığı

Çocuk ve Ergenlerle Psikolojik Danışmanın Hedefleri

Özet

Kaynakça

Çocuk ve Ergenlerle Psikolojik Danışmanın Tarihsel Gelişimi

Ruh sağlığı hizmetleri içinde çocuk ve ergenlere yönelik sunulan ruh sağlığı hizmetlerinin tarihsel gelişimi eski bir geçmişe dayanmaktadır. Duygusal sorunları, davranış bozuklukları olan çocukların anlaşılması, bakımı ve tedavisine artan ilgi olmasına rağmen bunlar, ruh sağlığı alanında nispeten yeni bir olaydır. Yetişkin ruh sağlığı tedavi literatürü, eski uygarlıklarda Trepanasyon (baş delgi ameliyatı) ve şeytan çıkarma gibi tedavi uygulamaların dayanan oldukça geniş bir literatüre sahipken, çocuk ruh sağlığı tedavisi literatürü ancak 20. yüzyılın başlarına dayanmaktadır (Achenbach, 1974; Kanner, 1948). Oysaki çocuk ruh sağlığı tedavisi literatüründeki önemli gelişmeler şöyle sıralanmaktadır: Fransız Jean Marc Gaspard Itard'ın 1799'da başlayan "*Aveyron'un Vahşi Çocuğu*"nu tedavi etme girişimleri, Amerikalı Clifford Whittingham Beers'in zihin sağlığı ile ilgili olarak Ulusal Zihinsel Hijyen Hareketi'nin öncülüğünü yapması ve çocuk kliniklerinin kurulması, Fransız Alfred Binet'in zekâ testi geliştirmeye ilgili çalışmalarının zihinsel yetersizliği olan çocuklar için bireyselleştirilmiş öğretim ve özel eğitim sınıfları sağlamak üzere öncü bir hareket olması ve son olarak Anna Freud ve Melanie Klein'in Freudyen psikanalizin çocuklara uygulanması-na ilişkin çalışmalarıdır (Morris ve Kratochwill, 2007).

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BÖLÜM 2

ERGENLERLE PSİKOLOJİK DANIŞMADA GELİŞİMSEL YAKLAŞIM

Ezgi Denizel Güven (Phd)

İçerik

Giriş

Evrimsel Açıdan Gelişimi Anlamak,

Gelişim Açısından Sihirli Yıllar: 0-6 Yaş

Yaşamın İlk Üç Yılında Nörobilişsel Gelişimsel Yaklaşım

Duyusal İşleme

Gelişimde Bilişsel Yaklaşım

Gelişimde Sosyal ve Duygusal Yaklaşım

Sosyal ve Duygusal Gelişimde Kritik Konular

Gelişimsel Psikolojik Danışma ve Terapi

Çocuk ve Ergenlerle Psikolojik Danışmada Dikkat Edilecek Konular

Özet

Kaynakça

Giriş

Gelişim, doğum öncesi evreden başlayan, ölüme kadar devam eden; biyolojik, psikolojik ve sosyal alanlarda meydana gelen, belli bir sıra ile ortaya çıkan değişim ve olgunlaşma sürecidir. Gelişimi bütüncül bir bakış açısı ile ele almak, hangi yaşta olursa olsun insanı bütünüyle görebilmemizi sağlar. Gelişimin genel seyrinde bir alanın baskın olduğu bir zaman dilimi olsa da bu, diğer gelişim alanlarının baskın alandan etkilenmediği ya da kendi gelişimini durdurduğu anlamına gelmez. Çünkü bir insanın duyuşsal, fiziksel, zihinsel, duygusal, ilişkisel gelişimi eş zamanlı ve kendi içinde etkilidir. Örneğin, ergenlik dönemine giren bir çocuğun baskın gelişim alanı biyolo-

Ergenler genellikle mizahtan hoşlanırlar. Ancak özellikle fiziksel görünüşleri, ilgileri ve arkadaşlarıyla ilgili kendilerine yapılan esprilerden rahatsız olurlar ve öyle olmasa bile kendileriyle alay ediliyormuş düşüncesine kapılabilirler. Bu yüzden mizahın keskin bir bıçak gibi olduğu söylenebilir. Doğru zamanda ve hassas bir şekilde yapıldığında bağı güçlendirirken dikkatsizce ve nezaket dışı yapıldığında öfkeyi tetikleyip ilişkinin kesilmesine neden olabilir.

Metaforlar ve anekdotlar, okul çağı çocukları ve ergenler tarafından genellikle dikkat çekici bulunur. Metafor kullanırken danışanın diliyle ve bilişsel kapasitesiyle uyumlu metaforlar, anlamı güçlendirerek danışanın konuyu anlamlandırmasına yardımcı olur. Erken çocukluk döneminde ve okul çağı çocuklarında resimli terapötik kitaplar ve çocuk edebiyatı eserleri metafor olarak kullanılabilir. Örneğin, bedensel sınırların öğreniminde “Bedenim Bana Ait”, travma çalışırken “Çok Kötü Bir Şey Oldu” ya da “Boşluk”, yılmazlıkla ilgili “Pes Etmek Yok” gibi kitaplardan yararlanılabilir. Kitaplar, çocukların hikâyedeki kahramanla özdeşim kurup kendi durumlarını daha rahat anlamaları ve ifade etmelerine yardımcı olur. Bu nedenle, çocuk ve ergenlerle yapılan psikolojik danışma oturumlarında ihtiyaç dâhilinde kitaplara, hikâyelere ve metaforlara yer verilmelidir.

Özet

Çocuk ve ergenlerle çalışmak, gelişimi ve gelişimle birlikte gelen ihtiyaçları bütünsel olarak ele almayı gerektirir. Çocukla ilişki kuran ve yardım sunan ruh sağlığı çalışanlarının çocuğun bilişsel, duygusal ve sosyal gelişimini doğru değerlendirmesi ve ona uygun yaklaşımı, seçtiği yaklaşım doğrultusunda kullanacağı materyalleri hassas şekilde belirlemesi uygun psikolojik müdahaleyi beraberinde getirecektir. Gelişimsel yaklaşım, ebeveynlere çocuğunun gelişimsel gerçekliği ve ihtiyaçları hakkında doğru yönlendirmeler yapmasına imkân verecektir. Gelişimsel süreçlere hâkim, bireysel farklılıkları ve ihtiyaçları gözeten psikolojik müdahale yaklaşımı, çocuk ve ergen açısından en kapsamlı ve güvenli yaklaşımlar arasında yer almaktadır.

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BÖLÜM 3

ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMADA ETİK

Fatma Ebru İkiz

İçerik

Etik

Psikolojik Danışmada Temel Etik Değerler ve İlkeler

Psikolojik Danışmanların Yaşadıkları Etik İnkilemler

Çocuk ve Ergenlerle Psikolojik Danışmada Dikkat Edilmesi Gereken Hususlar

Yetkinlik

Gönüllülük ve Razi olma

Gizlilik ve Güvenirlik

Sadakat ve Sır

Zorunlu Raporlama

Çatışan İdealler ve Çıkarlar

Kayıtları Ayırıştırma

Dava Taleplerini Karşılama

Sonlandırma

Özet

Kaynakça

Etik

Psikolojik danışman, okul psikolojik danışmanı olarak, aile psikolojik danışmanı olarak ya da pedagoğ olarak farklı ünvanlarla farklı kurumlarda hizmet verebilir. Özellikle 18 yaş altı reşit olmayan çocuk ve ergen bireylere ve çevrelerindeki yetişkinlere koruyucu, önleyici, gelişimsel ve iyileştirici işlevleri olan ruh sağlığı hizmetini sunar. Hangi kurumda hangi ünvanla olursa olsun aile, çocuk ve genç ile çalışacak olduğunda mesleki etik ilkelere ve yasalara uygun davranmakla yükümlüdür. Psikolojik danışma-

almalıyız. Üçüncüsü, çalıştığımız kurum ya da kuruluşun yasal yükümlülüklerine uygun olanlar çerçevesinde yaklaşmalıyız.

Bir çocuk veya ergen psikolojik danışmanı olarak etkili bir şekilde performans sergilemek, neredeyse her zaman ebeveynler veya velilerle iletişim ve etkileşimi içerir. Çocuk psikolojik danışmanları, özellikle çocuk velayeti anlaşmazlıkları olmak üzere dava ile sonuçlanabilecek durumların farkında olmalıdırlar. Çocuk ve ergenlerle psikolojik danışma uygulaması, danışana ve ailesine kendi tepkilerimizi ve onların bize ve tedavi durumuna olan tepkilerini sürekli olarak izleme sorumluluğunu bize sunar. Psikolojik danışmanın dikkat etmesi gereken ebeveynlerin özerk kararlar alma hakları ile ebeveynlerin çocuklarının yüksek yararını destekleme görevini dengelemek ve en iyi karara varmaya çalışmaktır. Her şey sadece aktarım ve karşı aktarım değildir. Saygılı olmanın yanı sıra çocuk veya ergen, psikolojik danışmayı başkaları tarafından dayatıldığı gibi deneyimlemek yerine bilinçli bir kararla sürece katıldığını hissettiğinde ergenle çalışma ittifakı güçlenir.

Unutulmaması gereken husus şudur: Psikolojik danışman etik ve yasal çerçeveye uygun davranırsa hem danışanlar zarar görmez hem uzmanın kendisi zarar görmez, hem de aileye ve topluma fayda sağlanmış olur.

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BÖLÜM 4

PSİKOLOJİK DANIŞMA SÜRECİNİ YAPILANDIRMA

Tuğba Türk Kurtça

İçerik

Giriş

Psikolojik Danışma Ortamı

İlk Görüşme

Çocuk ve Ergenle İlk Danışma

Hedef Belirleme

Değerlendirme

Aileyi Bilgilendirme

Vaka Örneği ve Tartışma

Özet

Kaynakça

Çocuk ve Ergenlerle Psikolojik Danışmada Süreci Yapılandırma

Gelişim üzerinde uzun yıllardır yapılan çalışmalar, çocuk ve ergenlerin yetişkinlerden farklı olduklarını ortaya çıkarmış ve yaşa göre bu farklılaşmayı açıklayan çeşitli gelişim kuramları geliştirilmiştir. Dolayısıyla çocuk ve ergenleri içeren herhangi bir çalışma yapılırken, alan yazına hâkim olan bu araştırma ve kuramlar göz ardı edilemez. Çocuklar ve ergenler söz konusu olduklarında psikolojik danışmanlar tarafından bilişsel, duygusal, sosyal, dil gelişimi açısından yetişkinden farklı oldukları, sorunlarını yetişkinlerden farklı tepkilerle gösterebilecekleri, tipik gelişimin ne olduğu gibi konuların dikkate alınması ve gelişme duyarlı olunması gerekmektedir (Belser, 2017; Dixon vd., 2021; Paladine ve Delorenzi, 2021; Swank ve Anthony, 2021; Tucker, 2021a; 2021b). Ayrıca psikolojik danışma süreci yürütülürken, çocuğun ve ergenin kendi isteğiyle danışmanlık

Özet

Özetle; çocuk ve ergenle psikolojik danışma, bu konuda yetkinlik ve yeterliliğe sahip psikolojik danışmanlar tarafından gerekli donanımlara sahip danışma ortamında yetişkin olmayan danışanlara verilen bir psikolojik danışma hizmetidir. Danışma ortamının, hem gizliliği sağlayacak görüşme odasına hem de danışanlar ve ebeveynleri için bir bekleme odasına sahip olması beklenmektedir. Ayrıca odada kil, oyuncak, kitap gibi donanımlar, çocuğun boyutuna uygun sandalye ve çocuğun hareket edebileceği bir alan olması gerekmektedir. Psikolojik danışmanın görevi, psikolojik danışmanın ne olduğunu, süreçte danışan ve danışman rol ve sorumluluklarını, etik ilkeleri çocuk ve ergenlerin anlayabileceği bir şekilde açıklamaktır. Çocuk ve ergenlerle psikolojik danışmada hedef belirlerken de iyi bir değerlendirme yapılması gerekmektedir. Psikolojik değerlendirmede çeşitli test teknikleri ve test dışı teknikler kullanılmaktadır. Her ne kullanılırsa kullanılsın elde edilen verilerin yorumlanmasında kullanılan tekniklerin sınırlılıklarına dikkat edilerek bir değerlendirme yapılmalıdır.

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BÖLÜM 5

ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMA YAKLAŞIMLARI

Zöhre Kaya

Ferdi Yağan

İçerik

Giriş

Psikanalitik Yaklaşımlar

Davranışçı ve Bilişsel Yaklaşımlar

Hümanistik Yaklaşım

Sosyal Yapılandırmacı Yaklaşımlar

Özet

Kaynakça

Giriş

Tarihsel sürecinde ilk psikolojik danışma kuramları daha çok yetişkinler esas alınarak geliştirilmiş ve yetişkin sağaltımında kullanılmıştır. Bu durum, kuramların ve kuramlara ilişkin tekniklerin, çocuk ve ergenlere uyarlanmasını geciktirmeye birlikte nasıl uygulanacağı konusunda tartışmaların da uzun süre devam etmesine neden olmuştur. Çocuk ve ergenler, gerek gelişimsel gerekse kişisel ve sosyal gereksinimleri açısından toplumdaki diğer bireylerden farklılık göstermektedirler. Dolayısıyla çocuk ve ergenlere yönelik yapılacak psikolojik danışma hizmetleri, kendine özgü birtakım beceri ve yeterlilikleri gerektirmektedir. Çocuk ve ergenlerle çalışacak olan ruh sağlığı uzmanlarının bu süreci yürütürken psikolojik danışma kuramlarını ve bu kuramlara ait temel kavramları, teknikleri ve uygulamaları iyi bilmeleri, danışanlarına daha yararlı olmaları açısından oldukça önem taşımaktadır.

danışanın bundan sonraki adımlarının neler olabileceğine yönelik düşünmesini sağlayacaktır.

7. Kamtın Kayıt Altına Alınması: Öyküsel terapide yeni öyküleri destekleyecek ya da takdir edecek bir grubun olması hâlinde yerleşik hâl alabileceğine inanılmaktadır. Dolayısıyla yeni öyküleri takdir edebilecek bir grubun bilinçli olarak aranması söz konusudur. Diğer bir kayıt yöntemi ise danışmanın oturumlar arası danışana yolladığı mektuplardır. Danışman mektuplarda oturumlar arası farkları kayıt altına alır. Mektupta bir taraftan danışanın katettiği gelişmelere değinilirken aynı zamanda danışanın bunu görmesi de fark ettirilir. Danışanın sorunla baş etmedeki gücünün kanıtını gösterir (White, 1997).

Özet

Çocuk ve ergenler, gelişimin doğası gereği yetişkinlerden farklılık göstermektedirler. Dolayısıyla çocuk ve ergenlere yönelik yapılacak psikolojik danışma hizmetleri, kendine özgü birtakım beceri ve yeterlilikleri gerektirmektedir. Çocuk ve ergenlerle psikolojik danışma hizmeti yürütürken, psikolojik danışma kuramlarını ve bu kuramlara ait temel kavramları, çocuk ve ergenlerle kullanılan teknikleri ve uygulamaları iyi bilmek, danışanlara daha yararlı olmak açısından oldukça önem taşımaktadır. Geleneksel ve modern kuramlara dayalı bir psikolojik danışma bir psikolojik danışma süreci yürütmek için iyi bir eğitim ve süpervizyon desteği almak, psikolojik danışman yetkinliği açısından gereklidir. Çocuk ve ergenlerin yaşadıkları sorunlara profesyonel yaklaşım, danışanla kurulan terapötik ilişki etrafında terapötik koşulları oluşturmak, temel psikolojik danışma becerilerine sahip olmak, kurama dayalı teknik kullanmak ile gerçekleşmektedir.

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BÖLÜM 6

YARATICILIK, SANAT VE OYUN TEMELLİ YAKLAŞIMLAR

Esra Asıcı

İçerik

Yaratıcılık

Psikolojik Danışma ve Yaratıcılık

Çocuk ve Ergenlerle Psikolojik Danışmada Yaratıcılık

Çocuk ve Ergenlerle Psikolojik Danışmada Kullanılan Yaratıcı Sanat Türleri

Müzik Terapisi

Dans ve Hareket Terapisi

Görsel Sanat Terapisi

Oyun Terapisi

Drama Terapisi

Şiir Terapisi (Bibliyoterapi)

Yaratıcı Sanat Uygulamalarına Örnekler

Özet

Kaynakça

Yaratıcılık

Yaratıcılık sözcüğü, Latince “creare” kelimesinden türetilmiştir. “Creare”; yapmak, inşa etmek, biçimlendirmek gibi anlamlara gelmektedir (Holm-Hadulla ve Hofmann, 2012). En basit şekilde yaratıcılık; bir şeyi yapmayı, şekillendirmeyi ya da var etmeyi anlatır. Yaratıcılık, yeni ve uygun bir ürün (düşünce ya da iş) ortaya koyma yeteneğidir. Bu bağlamda yaratıcılığın iki ana bileşeni vardır: (1) **yenilik** ve (2) **uygunluk**. Yenilik orijinal, beklenmedik ya da şaşırtıcı olmayı; uygunluk ise işlevsel, yararlı ya da değerli bir ürün ortaya koymayı ifade etmektedir (Fisher, 2004; Gladding, 2011; Kaufman, 2016; Sternberg ve Lubart, 1999). Yaratıcılık, doğuştan gelen bir yetenek

deki ve en gizli kalmış duyguların keşfedilmesine yardımcı olmaktadır. Bu süreçte çocuklar kendilerini sözel olarak ifade etme konusunda henüz yeterince iyi olmadıklarından, çocukların sadece konuşmaya dayalı bir psikolojik danışma sürecinden fayda görmeleri mümkün değildir. Psikolojik danışma sürecinde kullanılan yaratıcı sanat uygulamaları, çocukların kaygısını azaltarak daha rahat hissetmelerini sağlar. Psikolojik danışma sürecinde yaratıcılık; müzik, dans ve hareket, görsel sanatlar (çizim, boyama, fotoğraf vb. gibi), oyun ve oyuncaklar, drama ya da edebiyat (şiir, roman, öykü vb. gibi) kullanımı ile karşımıza çıkmaktadır.

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BÖLÜM 7

TİPİK GELİŞİM GÖSTEREN ÇOCUK VE ERGENLERDE EN SIK GÖRÜLEN DAVRANIŞ SORUNLARI VE YAKLAŞIMLAR

Dilaram Billur Örnek

İçerik

Giriş

Normal ve Normal Dışı Davranışı Tespit Etmek

İçselleştirmeye Dayalı Davranış Sorunları

Anksiyete

Mükemmeliyetçilik

Depresyon

Dışsallaştırmaya Dayalı Davranış Sorunları

Öfke ve Agresyon

Erteleme

Başarısızlık

Özet

Kaynakça

Giriş

Normal gelişimin bebeklik, çocukluk ve ergenlik boyunca incelenmesi, çocukluk çağındaki normal dışı davranışın anlaşılması bakımından oldukça değerlidir. Normal gelişimin, normal dışı davranışı dışlayacağını düşünmek yanlış olur. Her ne kadar normal gelişim görülse de gelişim aşamalarındaki normal süreçlerin içsel ya da dışsal etkilerle kesintiye uğraması, davranışsal sorunlarının görülmesine yol açabilmektedir (Kapur, 2011). Davranış sorunlarının nedenlerini anlamak, hem koruyucu ve önleyici hem de sağaltıcı süreçlerde uygun planlamalar yapabilmek için önem arz eder.

Özet

Gelişim sorunu göstermeyen çocuklarda net bir biçimde patolojik olarak da nitelenebilecek ancak hem çocukların hem de ailelerin yaşamını zorlaştırabilen pek çok davranış sorunundan bahsedilebilir. Bu bölümde, içselleştirmeye ve dışsallaştırmaya dayalı davranış sorunları ele alınmıştır. İçselleştirmeye dayalı davranış sorunları, çocuğun iç dünyasında kalan, iç dünyasında onu rahatsız eden ve pek çok davranış problemi-ne yol açma özelliği taşıyan sorunlardır. Elbette bu içsel sıkıntıların dışarıda belirli görünüşleri vardır ancak çoğu zaman dışı vurumundan asıl içsel sorunu fark edebilmek kolay değildir. Dışsallaştırmaya dayalı davranış sorunları ise çok daha açık ve görünür davranışsal örüntülerle ortaya çıkar ve çeşitli yaşam alanlarında etkin sonuçları vardır.

İster içselleştirme ister dışsallaştırma özelliğinde olsun çocuk ve ergenlerin davranışlarının altında yatan mantık dışı inanışları ve düşünce hatalarını ortaya çıkarmak için çabalamak, hem davranışın ortaya çıkış sebebini bularak odaklanmak hem de danışanda farkındalık sağlamak adına oldukça kıymetlidir. Hangi gelişim döneminde olduğundan bağımsız olarak çocuklar, çeşitli davranışsal sorunlar ile başa çıkmada sosyal desteğe ihtiyaç duyacaklardır. En yakın sosyal destek unsuru ise ailedir. Çocuğun geliştirdiği mantık dışı inanışlar ve bilişsel hataların çoğu zaman ailenin çeşitli konuları ele alış şekilleri gözlemlenerek yerleştiği düşünülürse davranış sorunları ile baş ederken üzerinde çalışılan irrasyonel inanışlar ve düşünce hataları konusunda ebeveynlerin de eğitilmesi önem arz edecektir. Bu bağlamda hem çocuğu baş ettiği sorunlarla yeniden ilişkilenecek konusunda hem de bir güç kaynağı olarak yanında durmak konusunda desteklemek adına ailenin çalışmaya dâhil edilmesi kaçınılmazdır.

Bu bölüme dâhil edilen egzersizler sıklıkla danışma sürecine katkı sunma amacı taşımaktadırlar ancak aynı zamanda sürecin bir parçası olan ebeveynlerin egzersizleri kullanma ve uygulamada iş birliği yapması da oldukça kıymetlidir.

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BÖLÜM 8

GELİŞİMSEL FARKLILIKLARI OLAN ÇOCUKLARDA DAVRANIŞ SORUNLARI VE YAKLAŞIMLAR

Dilber Tezel

İçerik

Gelişimsel Farklılıklar

Gelişimsel Farklılıklarda Değerlendirme Süreci

Gelişimsel Farklılıklarda Gruplama

Gelişimsel Farklılıklarda Özel Eğitim

Gelişimsel Farklılığı Olan Çocuklarda Davranış Sorunları

Davranış Problemlerine Müdahale

Olumlu Davranışları Artırmaya Yönelik Uygulamalar

Davranış Problemlerini Azaltmaya Yönelik Müdahaleler

Örnek Uygulamalar

Özet

Kaynakça

Gelişimsel Farklılıklar

Yaşam boyu devam eden gelişim sürecinde gelişimin temelini oluşturan bebeklik ve çocukluk yılları ayrı bir öneme sahiptir. Pek çok çocuk normal gelişim sürecinden geçerek büyüye de çocukların bir bölümü, doğum öncesi, bebeklik, çocukluk veya daha ileri yaşlarda gelişimsel farklılıklara yol açan risklere maruz kalmakta, bu risklerden az ya da çok etkilenmektedir.

Bedensel özellikleri ve öğrenme yetenekleri açısından tüm bireyler farklılıklar gösterirler. Ancak çoğu zaman bu farklılıklar büyük değildir ve normal koşullarda genel eğitim hizmetlerinden yararlanmada ciddi problemlere yol açmazlar. Bununla birlikte özel gereksinimli bireyler olarak adlandırılan bireylerin bedensel özellikleri ve/veya

nış problemlerinin ortaya çıkmasını önleyici olmaktadır. Ancak uzun vadede iyi planlanmış müdahale programlarının uygulanmasına ihtiyaç duyulmaktadır.

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BÖLÜM 9

TRAVMA VE STRESLİ YAŞAM DENEYİMLERİNE SAHİP ÇOCUK VE ERGENLERE YAKLAŞIM

Berke Kırıkkanat

İçerik

Giriş

Çocuklarda ve Ergenlerde Ruh Sağlığı, Stres, Travma ve Kriz

Çocuklarda ve Ergenlerde Travmatik Stres Tepkileri

Travmatik Stres Yaşayan Çocuklarda ve Ergenlerde Psikolojik Dayanıklılık

Risk Faktörleri

Koruyucu Faktörler

Travmatik Stres ve Kriz Yaşayan Çocuklara ve Ergenlere Yapılan Psikolojik

Müdahalelerden Üç Örnek

Travma Odaklı Bilişsel Davranışçı Terapi

Travma Sistemleri Terapisi

Birinci ve İkinci Düzey Krize Müdahale

Travmatik Stres ve Kriz Yaşayan Çocuklara ve Ergenlere Yönelik Eğitimde Bir

Uygulama Örneği: Travmaya Duyarlı Okullar

Özet

Kaynakça

Giriş

Yaşamın farklı farklı dönemlerinde stresli yaşam olayları ile karşılaşan çocuklar ve ergenler, yaşadıkları olumsuz deneyimler neticesinde gelişimsel sorunlar yaşamaktadırlar. Bununla birlikte çeşitli ruhsal problemlerle boğuşan çocuklar ve ergenler, mevcut travmatik stresle başa çıkamamaktadırlar. Dünya genelinde çocuklarda ve ergenlerde travmatik stresin ne kadar yaygın olduğunu araştıran çalışmalar, oldukça yaygın bir popülasyonun varlığına dikkat çekmektedir. Dünya Sağlık Örgütü'nün (WHO) 8

2019). İlgili projenin bulguları ele alındığında travmaya dair psikoeğitsel çalışmaların, önleyici müdahalelerin ve travma sonrası stres belirtileri sergileyen çocuklara ve ergenlere yönelik yapılan psikolojik hizmetlerin oldukça değerli olduğu görülmüştür. Özellikle öğretmenlerin travmaya dair bilgilerinin artmasıyla birlikte güvenli sınıf iklimini oluşturabilmeleri ilgili projenin çıktıları arasındadır (Maya Vakfı, 2019). Adı geçen proje dışında Türkiye’de Psikososyal Koruma, Önleme ve Krize Müdahale Hizmetleri Yönergesi temel alınarak okullarda psikolojik danışmanlar, travma konusunda gerekli psikoeğitsel çalışmalarla, konsültasyon ve bireysel psikolojik danışma hizmetleriyle buldukları okulların travmaya karşı hazırlıklı olmalarında etkindirler (T.C. Millî Eğitim Bakanlığı Özel Eğitim ve Rehberlik Hizmetleri Genel Müdürlüğü, 2019). Ancak ilgili yönergeden anlaşılacağı üzere yapılan tüm çalışmalar, okul psikolojik danışmanın yaptıklarıyla sınırlıdır. Bu anlamda Türkiye’de travmaya duyarlı okul kültürünün yaygınlaştırılabilmesi önemli bir gerekliliktir.

Tartışma Soruları

- 1) *Stres, travma ve kriz kavramları arasında farklılıklar neler olabilir?*
- 2) *Okul çağı döneminde bir çocuğun travmatik stres karşısında verdiği tepkiler, okul öncesi dönemde olan bir çocuktan nasıl farklılaşmaktadır?*
- 3) *Bir çocuğun travmatik bir olayı (ör.; depresyon, taşkın vb.) deneyimlediğini varsayalım. Çocuğun travma öncesi, travma anı ve travma sonrası maruz kalabileceği risk faktörleri neler olabilir?*
- 4) *Travma Sistemleri Terapisi ile Travma Odaklı Bilişsel Davranışçı Terapinin arasındaki farklılıklar neler olabilir?*
- 5) *Travmaya duyarlı okul kültürünün gelişmesi için okul psikolojik danışmanları çalıştıkları eğitim kurumlarında neler yapabilirler?*

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BÖLÜM 10

ÇOCUK VE ERGENLERLE BİREYSEL VE GRUPLA PSİKOLOJİK DANIŞMA

Ayşe Devrim Masalcı Burçak

İçerik

Giriş

Çocuklarla Psikolojik Danışma

Çocuklarla Grupla Psikolojik Danışma

Ergenlerle Psikolojik Danışma

Ergenlerle Grupla Psikolojik danışma

Çocuk ve Ergenlerle Çalışmada Psikolojik Danışma Odası

Psikolojik Danışmada İlk Görüşmeler, Devam Eden Görüşmeler ve Sürecin

Sonlandırılması

Çocuklarla Bireysel Psikolojik Danışma Vaka Örnekleri

Çocuklarla Grupla Psikolojik Danışma Vaka Örnekleri

Ergenlerle Bireysel Psikolojik Danışma Vaka Örnekleri

Ergenlerle Grupla Psikoloji Danışma Vaka Örnekleri

Özet

Kaynakça

Giriş

Aileyi nasıl iyileştireceğimi bilince, dünyayı da iyileştirebileceğime inanıyorum.

Virginia Satir

Toplumun en küçük birimi ailedir. Ailelerin ruhsal açıdan sağlıklı olma hâli toplumun da ruhsal sağlığını gösterir. Aile üyelerinin birbirleriyle ilişkileri, ebeveynlerin birbirlerine ve çocuklarına davranışları, çocukların arkadaşlarına ve diğer yetişkinlere davranışlarını doğrudan ya da dolaylı yolla etkilemektedir. Aile içindeki problemler,

konuşmalarında duyguları ifade etmede, duyguları fark etmede, yatıştırma da kullanılan yöntemleri paylaştıkça, aralarındaki ortak noktaları gördükçe rahatladıklarını ve yeni deneyimlere daha cesaretle açık hâle geldiklerini görmüştür. Grup oturumları sonlandığında grubun duygularını ifade etmede ve sınır belirlemede daha rahat olduklarının bilgisi alınmış; bu durum, psikolojik danışmanca da gözlemlenmiştir. Grup oturumları ve bireysel görüşmeler bittiğinde ölçekler tekrar uygulanmıştır. Tüm üyelerin puanlarında anlamlı düzeyde azalma olmuştur. Danışanların bireysel ve grup danışma sürecinin yardımıyla ikincil maladaptif üzüntü duygusu birincil haklı öfke duygusuna dönüşmüştür.

Özet

Psikolojik danışma, en yalın tanımıyla psikolojik danışman ile danışan arasındaki etkileşimlerle gerçekleşen profesyonel yardım sürecidir. Sürecin psikolojik danışman ve danışan arasında olduğunu söylesek de psikolojik danışma tek bir danışanla olabileceği gibi grupla psikolojik danışma şeklinde de yapılabilir. Yine danışanlar çiftler ya da aileler de olabilir. Çocuk ve ergenlerle yapılan psikolojik danışma süreci temel prensipleri açısından değişiklik göstermese de kullanılan teknikler ve işleyiş açısından yetişkinle sürdürülen psikolojik danışmadan farklıdır. Sözü kullanmayan çocuklarla bireysel ve grupla psikolojik danışmada oyun, çocuğu anlamada ve problemi çözmede en etkin yollardandır. Konuşma becerisi olsun ya da olmasın çocuklarla hem oyun hem de oyun dışı, kum-hamur-resim-kutu oyunları-kartlar ve farklı sanatsal faaliyetler psikolojik danışma sürecinde kullanılır. Oyun ve diğer uygulamalardaki sembolleri ve sözsüz dili anlamak çocuk ve ergenlerle çalışan psikolojik danışmanın becerileri arasında olmalıdır. Zira ergenler, sözle kendilerini ifade etmeyi tercih etmektedirler. Bireysel psikolojik danışmada çocuk ve ergenin bireysel sorunlarına çözüm üretmeye yönelik çalışılır. Grupla psikolojik danışma, çocuk ve ergenlerin ortak problemlerine yönelik uygulamaları içerir. Grup danışmalarına ortalama 4-6 çocuk, 8-10 ergen alınır. Grupla psikolojik danışmada ergenler duygularını ifade ederler, kabul gördüklerini hissederek; kendilerini yalnız hissetmezler ve olaylara farklı çözüm yolları üretebilmeyi öğrenirler.

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<https://www.bapt.info/> British Association of Play Therapists

BÖLÜM 11

ÇOCUK VE ERGENLERLE YÜRÜTÜLEN PSİKOEĞİTSEL MÜDAHALELER

Oya Onat Kocabıyık

İçerik

Giriş

Psikoeğitim Grupları ve Diğer Grup Türleri

Psikoeğitim, Psikolojik Danışma ve Psikoterapi Gruplarının Karşılaştırılması

Çocuklar ve Ergenler İçin Psikoeğitim Grubu Planlamasında Dikkat Edilecek Genel İlkeler

Grup Öncesi Karar Verme

İhtiyaç Analizi

Grup Hedefleri

Grup Kompozisyonu

Grup Büyüklüğü

Oturum Süresi ve Sayısı

Oturum Yapısı

Çevresel Faktörler

Kullanılacak Materyaller

Grup Liderinin Dikkat Etmesi Gereken Hususlar

Okullarda Psikoeğitim Grup Çalışmaları

Okullarda Çocuk ve Ergenler İçin Psikoeğitim Grup Çalışma Konuları

Çocuklar İçin Örnek Bir Psikoeğitim Grup Planı

Özet

Kaynakça

edilecek genel ilkelere yer verilmiştir. Ayrıca okullarda psikoeğitim gruplarında önleme, geliştirme ve iyileştirmeye yönelik uygulamaları ile okullarda çocuk ve ergenler için psikoeğitim grup çalışma konuları incelenmiştir. Son olarak, çocuklar için örnek bir psikoeğitim grup planına yer verilerek grup oturumu uygulamaları açıklanmıştır.

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BÖLÜM 12

ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMADA ÇOK KÜLTÜRLÜ YAKLAŞIM

Eda Ermağan Çağlar

İçerik

Giriş

Çok Kültürlü Yaklaşım ve Psikolojik Danışma

Mültecilere Yönelik Çok Kültürlü Psikolojik Danışma Yaklaşımı

Çocuk ve Ergenlerle Psikolojik Danışmada Çok Kültürlü Yaklaşım

Psikolojik Danışmanların Çok Kültürlü Psikolojik Danışma Yetkinliği

Özet

Kaynakça

Giriş

Dil, dinî inanç, engellilik durumu, ekonomik sınıf, ırk, etnik köken, cinsiyet kimliği ve cinsel yönelim, ulusal köken gibi bireyin kültürel kimliğini, hayat içerisinde kendini algılayışını şekillendiren her bir etmen aynı zamanda psikolojik danışmanlık sürecinin önemli noktalarını oluşturmaktadır. Psikolojik destek sürecinin en işlevsel ve kabul edici bir şekilde yürütülebilmesi de danışanın kültürel değerlerinin, yargılarının, danışana sunulan destekte onun kültürel dinamiklerinin göz önünde bulundurulmasına bağlıdır.

Birleşmiş Milletler Mülteciler Yüksek Komiserliği (BMMYK) (2021); doğal afetler, siyasi nedenler, savaşlar gibi çok sayıda nedenden ötürü dünya nüfus hareketliliğinin en yüksek hacminin yaşandığına dikkati çekmiştir. Birleşmiş Milletlerin 2021 raporuna göre 2019 yılı itibarıyla yaklaşık 80 milyon insanın yerinden edilmiş olduğu ve yerinden edilen bu grubun ise 26 milyonunun mülteci statüsüne sahip olduğu belirtilmiştir (The United Nations, 2021). Söz konusu raporda da belirtildiği üzere en çok sayıda mülteciye

kinlikleri edinebilmek ve mesleki müdahaleler çerçevesinde uygulayabilmek için eyleme dönüştürmek yetkinliklerine yer verilmektedir. Ayrıca, söz konusu model, danışmanların bu yetkinlikleri sosyal adalet savunuculuğu müdahaleleri olarak kişiler arası, kurumsal, topluluk, kamu politikası ve uluslararası/küresel olmak üzere birden fazla düzeyde hareket etmelerini tavsiye etmektedir (Ratts ve ark., 2016).

Özet

Psikolojik destek sürecinin işlevsel ve kabul edici yürütülmesi, danışanların kültürel değerlerinin, yargılarının, inançlarının ve özelliklerinin fark edilmesine ve danışana onun kültürel bağlamı kapsamında müdahale edilmesine bağlıdır. Son yıllardaki nüfus hareketlilikleri ve beraberinde gelen toplumsal ve bireysel temelli müdahale yaklaşımlarında kültürel duyarlılık ön plana çıkmaktadır. Bu noktada çok kültürlülük, çeşitlilik, farklılıklara yönelik duyarlılık 21. yüzyıl psikolojik danışmanlık yaklaşımının merkezinde bulunmaktadır.

Bu nedenle, çocuk ve ergenlerle çok kültürlü yaklaşım kapsamında çocuk, ailesi ve çevresi hakkında edinilen bilgilerin yanı sıra bireyin geçmiş ve mevcut zamandaki kültürleşme geçmişine, ırk/etnik olarak kendini nasıl tanımladığına, parçası olduğu grubun toplum içerisindeki statüsünü nasıl algıladığına, kültürel olarak benimsediği kimliğe ve bu alanlarla kendini nasıl ilişkilendirdiğine dair bilgileri edinmek önemlidir. Bu nedenle, söz konusu bölümde, Jones'un (2003) Üç Aşamalı Çok Kültürlü Danışmanlık ve Terapi Modeli'ne değinilmiş; çocuk ve ergenlerle yapılan çok kültürlü psikolojik danışma görüşme modelinde aile, akran, ırk, etnik köken ve bireysel konular başlıklarına yer verilmiştir. Kategoriler kapsamında çok kültürlü psikolojik danışma yaklaşımına uygun çocuk ve ergenlerle yapılan görüşmelerde psikolojik danışmanların kullanılabilecekleri örnek sorular paylaşılmıştır.

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BÖLÜM 13

AİLE DANIŞMANLIĞI YAKLAŞIMLARI VE UYGULAMALARI

Asude Özdemir

Özgür Tönbül

İçerik

Giriş

Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları

Depresif ve Kaygılı Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları ve Vaka Örneği

DEHB Olan Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları ve Vaka Örneği
Davranış Problemi Olan Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları ve Vaka Örneği

Boşanmış Ebeveynlere Sahip Çocuk ve Ergenlerle Aile Danışmanlığı Uygulamaları ve Vaka Örneği

Evlât Edinilmiş Çocuklara Yönelik Aile Danışmanlığı Uygulamaları ve Vaka Örneği

Özet

Kaynakça

Giriş

Aile, eş alt sistemi, ebeveyn alt sistemi ve kardeş alt sistemi olmak üzere alt sistemlerden oluşan bir yapıdır. Bu yapının sağlıklı olması, bütün alt sistemlerin işlevlerini yerine getirmesiyle mümkün olmaktadır. Bu alt sistemlerden biri olan ebeveyn alt sisteminde hem ebeveynlerin çocuklarıyla kurdukları sağlıklı iletişim hem de çocukların ebeveynleri ile geliştirdikleri güvenli bağlanma çocukların ruh sağlığını olumlu yönde etkiler. Buna karşın aile içinde yaşanan tartışma, bu tartışmaya bağlı oluşan gerginlik; ebeveynler ve çocuklar için stres oluşturmakta ve sistemi zorlamaktadır.

oyunlara tepki vermediği görülmüştür. Psikolojik danışman, oyun videosunu izledikten sonra duygusal teması daha da arttırmalarını istemiştir. Kucaklama ve dokunma zamanlarının fazlaştırılması ve olumlu duygu ifade edilmesi ile Mehmet ve ebeveynleri arasında duygusal sıcaklığın başladığı görülmüştür. Diğer oturumda daha sakin oyun oynadıkları, ailenin Mehmet ile oynarken endişelerinin azaldığı, daha içten yaklaştığı görülmüştür. Sekizinci oturumdan itibaren grupta ailelerin ebeveynlik endişeleri konuşulmuştur. Mehmet'i evlat edinen ailenin endişelerinin azaldığı görülmüştür. Daha sağlıklı ebeveynlik becerileri konusunda bilgi paylaşımı yapıldı. Ebeveynlerin duygu paylaşımları, evlat edinme konusundaki endişeleri ve gelecek dönemlerde kendilerini neler beklediği konusundaki aktarılanlarla ÇEİT oturumları sonlandırılmıştır.

Mehmet ve ailesinin sonraki dönemlerde altı ayda bir yapılan bireysel psikolojik danışma süreçlerinde birbirlerine uyum sağladıkları görülmüştür. Anne ve babanın olumlu etkileşim kurdukları, oyun oynama sanatlarını geliştirdikleri ve bağlanma örüntülerini güvenli bir şekilde oluşturmaya çalıştıkları görülmüştür.

Özet

Hem okullarda hem de çocuk ve ergenlerle ilgili diğer kurumlarda görevli psikolojik danışmanlar, danışmanlık sürecinde çoğunlukla ailelerle birlikte çalışmaktadırlar. Ailelere yönelik psikolojik destek hizmeti sunan psikolojik danışmanlar açısından aile danışmanlığı alanındaki gelişmeler dikkat çekici olmalıdır. Günümüzde yapılan birçok çalışmada, çocuk ve ergenlerle çalışan psikolojik danışmanların ailelerle birlikte daha çok çalışması gerektiğine odaklanılmaktadır (Crespi, Gustafson ve Borges, 2006).

Günümüzde çocuk ve ergenlerin karşılaştığı birçok sorunun çözüm merkezi olarak psikolojik danışmanlar görülmektedir. Bu durum, psikolojik danışmanın özellikle akademik, eğitsel, kişisel ve sosyal danışmanlık sürecinde aile ortamını keşfetmesi çocuk ve ergene sunacağı hizmetin daha kaliteli olmasını sağlayacaktır. Psikolojik danışman hangi aile danışmanlığı yaklaşımı ve tekniğini kullanırsa kullansın amacı, çocuk ve ergeni daha iyi tanımak olmalıdır. Bu yüzden kurumun şartları, ailenin yapısı, çocuk ve ergenin farkındalık düzeyi gibi birçok etkeni önceden bilip aile danışmanlığı tekniklerini uygun şekilde kullanabilmelidir. Sonuç olarak psikolojik danışma alanının alt alanı olan okul psikolojik danışmanlığı ve aile psikolojik danışmanlığının birlikte etkin bir şekilde entegre edilerek kullanımı öğrenci ve ailelere yaklaşımı kolaylaştıracaktır.

Kaynakça

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BÖLÜM 14

ÇOCUK VE ERGENLERLE PSİKOLOJİK DANIŞMADA GELECEĞE İLİŞKİN YÖNELİMLER

Güneş Gülaydın

İçerik

Giriş

Psikolojik Danışma ve Terapi Modelleri

Bibliyoterapi

Öyküsel (Narrative) Terapi

Oyun Temelli Yaklaşımlar ve Oyun Terapileri

Kum Oyunu Terapisi

Theraplay Oyun Terapisi

Deneyimsel Oyun Terapisi

Travma Odaklı Oyun Terapileri

Çevrim İçi Oyun Terapisi

Mindfulness (Bilinçli Farkındalık) Temelli Terapiler

EMDR (Göz Hareketleri ile Duyarsızlaştırma ve Yeniden İşleme) Terapisi

Doğa Temelli Terapiler

Macera Terapisi

Özet

Kaynakça

Giriş

Dünya Sağlık Örgütü (DSÖ) tarafından sağlıklı olma tanımı, yalnızca fiziksel olarak sağlıklı ve hastalığa sahip olmama hâli değil bireyin fiziksel, sosyal ve ruhsal anlamda bir bütün olarak iyi olma hâli olarak tanımlanmaktadır (World Health Organization WHO, n.d.). Amerikan Psikolojik Danışma Derneğinin (American Counseling Association, 2020) psikolojik danışma alanı tanımı içerisinde bireylerin ruhsal sağlık alanında

ramlarının psikolojik, duygusal, davranışsal ve kişiler arası ilişkiler alanlarında olumlu yönde etkisi olduğu ve bu etkilerin bireylerin hayatında uzun vadede devam ettiği görülmektedir. (Bowen ve Neill, 2013).

Ülkemizde macera terapisi yeterli düzeyde tanınırlığa sahip olmamakla birlikte uygulamasına rastlanmamaktadır. Yurt dışında ise macera terapisi farklı terapi yöntemlerinin yanında veya tek başına bir terapi yöntemi olarak kullanılmaktadır. Bu alanda yapılan birçok araştırma uluslararası literatürde mevcuttur (Baştemur, 2019). Ülkemizin coğrafi, fiziki koşulları ve doğal güzellikleri göz önünde bulundurularak macera terapisi alanında uzmanlaşmış psikolojik danışmanların yetişmesinin çocuk ve ergenlere yönelik hem önleyici hem de müdahale edici çalışmalarda oldukça faydalı olacağı düşünülmektedir. Bu alanda uzmanlaşan psikolojik danışmanların özellikle okullarda çocuk ve ergenlere yönelik kapsayıcı, önleyici ve müdahale edici psikolojik destek verebileceği öngörülmektedir.

Özet

Amerikan Okul Psikolojik Danışmanları Derneğinin (American School Counselors Association, ASCA) oluşturduğu “Ulusal Model”e (ASCA, 2005) göre okul psikolojik danışmanlarının en önemli sorumluluklarından birisi, öğrencilerin uyumlu, üretken ve sağlıklı bireyler olarak yetişmeleri amacıyla kişisel/sosyal, eğitsel/akademik ve mesleki/kariyer şeklinde gruplara ayrılan üç gelişimsel alanda yardımcı olmaktır. Ülkemizde de okullardaki psikolojik danışma ve rehberlik hizmetlerine yönelik hedefler bu üç gelişimsel alan dikkate alınarak oluşturulmuştur (MEB, 2019). Gerek okullarda gerek bireysel psikolojik danışmanlık süreçlerinde çocuk ve ergenlerin psikolojik iyi oluşlarını artırmaya yönelik gelişimsel alanlarda destek verirken psikolojik danışma alanındaki yeniliklerin takip edilmesi, çağın gereklerine göre yöntem ve tekniklerin gözden geçirilerek güncellenmesi, her çocuk ve ergenin biricik olduğu düşünülerek bireye yönelik terapi yöntemlerinin uygulanması tedavi sürecinde büyük önem taşımaktadır. Psikolojik danışmanların çocuk ve ergenlere yönelik yeni yaklaşımlara açık olması, lisans ve yüksek lisans düzeyindeki ders müfredatlarının psikoloji ve psikolojik danışmanlık alanındaki yeniliklere göre düzenlenmesi, alanda yetişen öğrenci ve uzmanların yenilikleri takip ederek kendilerini geliştirmeleri tedavi sürecine sağlayacağı katkılar açısından önem arz etmektedir.

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Prof. Dr. Gonca Atıcı



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İÇİNDEKİLER

İKİNCİ BASKIYA ÖN SÖZ	V
SUNUŞ	vii
ÖN SÖZ.....	ix
ŞEKİLLER, TABLOLAR VE GRAFİKLER LİSTESİ.....	xv
KISALTMALAR LİSTESİ.....	xvii

1. BÖLÜM PARA KAVRAMI

1.1. Paranın Tanımı.....	1
1.2. Paranın Özellikleri.....	2
1.3. Paranın Fonksiyonları.....	3
1.3.1. Değişim Aracı Olmak	3
1.3.2. Değer Ölçüsü (Hesap Birimi) Olmak	3
1.3.3. Değer Saklama Aracı Olmak	4
1.4. Paranın Evrimi	4
1.4.1. Mal Para	4
1.4.2. Metal Para.....	4
1.4.2.1. Tek Metal Sistemi.....	5
1.4.2.2. Çift Metal Sistemi	5
1.4.2.3. Altın Madeni (Sikke) Para Sistemi	6
1.4.2.4. Altın Külçe Sistemi.....	6
1.4.2.5. Altın Kambiyo Sistemi (1944-1973).....	8

1.4.3. Kâğıt Para	11
1.4.3.1. Banknot ve Kâğıt Paranın Ortaya Çıkışı	12
1.4.3.2. Kâğıt Para Sistemi	13
1.4.3.2.1. Senyoraj	13
1.4.4. Kaydi Para	14
1.4.4.1. Kaydi Paranın Yaratılması.....	14
1.4.4.2. Para Arzı Tanımları	16
1.5. Dijital Varlık Taksonomisi	16

2. BÖLÜM

İKTİSAT DÜŞÜNÇESİNDE PARA

2.1. Merkantilist Düşünceye Geçiş Sürecinde Para.....	21
2.2. Merkantilist Düşünce de Para	22
2.3. Fizyokrazi ve Para	24
2.4. Klasik Para Teorisi	25
2.5. Neoklasik Para Teorisi	27
2.6. Parasal ve Finansal Sistemin Evrimi	31
2.7. Küresel Finans Krizi ve Merkez Bankaları	35
2.8. Kriptografi ve Kripto Paranın Yakın Tarihi	38

3. BÖLÜM

BITCOIN

3.1. Bitcoin'e İlişkin Temel Konular	41
3.2. Bitcoin'le İlgili Önemli Konular	47
3.2.1. Bitcoin ve Arzı	47
3.2.2. Bitcoin ve Fiyat Volatilitesi	49
3.2.3. Bitcoin ve Piyasa Balonu	51
3.2.4. Bitcoin ve Yeraltı Ekonomisi.....	58
3.2.5. Bitcoin ve Siber Hırsızlık	59
3.2.6. Bitcoin ve Ponzi Finansman	61
3.2.7. İçsel Değer, Paranın Fonksiyonları ve Bitcoin	63
3.3. Bitcoin'e İlişkin Riskler	65

4. BÖLÜM BLOKZİNCİRİ

4.1. Blokzincirine İlişkin Temel Konular	67
4.1.1. Blokzincirinin Temel Özellikleri	67
4.1.2. Blokzincirinin İşleyişi	69
4.1.3. Bitcoin Blokzincirinin Yapısı.....	72
4.1.4. Madencilik (Mining)	77
4.1.5. Oyun Teorisi	82
4.1.5.1. İşbirliği Olan ve Olmayan Oyunlar	84
4.1.6. Düğüm (Node).....	87
4.1.7. Mutabakat Algoritmaları.....	90
4.1.8. İş İspatı (Proof of Work)	91
4.1.9. Pay İspatı (Proof of Stake).....	92
4.1.10. Blokzinciri Çeşitleri	93
4.1.11. Blokzinciri ve Akıllı Sözleşmeler (Smart Contracts)	95
4.1.12. Akıllı Sözleşmelerin İşleyişi	97
4.1.13. Blokzinciri ve Kullanım Alanları	99
4.1.13.1. Merkez Bankası Dijital Para Birimi.....	100
4.1.13.2. Dijital Kimlik.....	100
4.1.13.3. İhracatın Finansmanı	102
4.1.13.4. Bireysel Bankacılık	103
4.1.13.5. Sendikasyon Kredileri	104
4.1.13.6. Mikrofinans	105
4.1.13.7. ICO, IEO, IDO ve STO'lar	105
4.1.13.8. Muhasebe.....	110
4.1.13.9. Denetim.....	111
4.2. Blokzinciri ve Kullanımı	112

5. BÖLÜM KRİPTO PARALAR

5.1. Kripto paralar.....	115
5.1.1. Bitcoin (BTC).....	116
5.1.2. Ethereum (ETH).....	119
5.1.3. Tether (USDT).....	124
5.1.4. BNB.....	126

5.1.5. USD Coin (USDC)	127
5.2. Sabit Coin'ler (Stablecoins).....	128
5.2.1. Örnek Olay 1 (Beanstalk Atağı)	131
5.2.2. Örnek Olay 2 (TerraUSD'nin Çöküşü)	132
5.2.3. Örnek Olay 3 (FTX Krizi).....	138

6. BÖLÜM

DİJİTAL EKONOMİ VE FİNANSAL SİSTEM

6.1. Özel para, İtibari Para, Sabit Coin ve	
Merkez Bankası Dijital Para Birimi	141
6.2. Merkeziyetsiz Finans (DeFi) ve Yönetişim	145
6.3. Uluslararası Ödemeler Bankası (BIS), Merkez Bankası	
Dijital Para Birimi'ne (Central Bank Digital Money, CBDC)	
Yönelik Çalışmalar.....	146

7. BÖLÜM

ÜLKELERİN KRİPTO PARA VE BLOKZİNCİRİ TEKNOLOJİSİNE YÖNELİK YAKLAŞIMLARI

7. Ülkelerin Kripto para ve Blokzinciri Teknolojisine Yönelik	
Yaklaşımları	155
7.1. Mali Eylem Görev Gücü (Financial Action Task Force, FATF)	158
7.1. Amerika Birleşik Devletleri	159
7.2. Çin	160
7.3. Japonya	162
7.4. İsviçre	163
7.5. Avrupa Birliği	163
7.6. Türkiye	164
SON SÖZ.....	167
KAYNAKÇA.....	171

KAYNAKÇA

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İÇİNDEKİLER

SUNUŞ	İİİ
SÖZÜN ÖZÜ	V
EĞİTİME GİRİŞ KİTABININ SİZE KAZANDIRACAKLARI	Vİİ
1. BÖLÜM EĞİTİM-ÖĞRETİMLE İLGİLİ TEMEL KAVRAMLAR	1
EĞİTİMİN KAPSAMI	2
EĞİTİM- ÖĞRETİM-PEDAGOJİ	4
BİR SİSTEM OLARAK EĞİTİM VE TÜRLERİ	6
Örgün Eğitim.....	7
Yaygın Eğitim	7
Algın Eğitim.....	8
EĞİTİMİN ÇEŞİTLİ TANIMLARI	12
YETİŞKİN EĞİTİMİ NEDİR?	16
EĞİTİM VE ÖĞRETİMİN ÖZELLİKLERİ	18
ÖĞRETİM.....	21
ÖĞRETİMİN ÖZELLİKLERİ	24
Öğretim Sisteminin Başlıca Öğeleri	25
Öğretim Sürecini Oluşturan Temel Unsurlar	26
EĞİTİM-ÖĞRETİMİN AMAÇLARI	31
EĞİTİM BASAMAKLARINA GÖRE HEDEFLER.....	37
BİR ÖĞRETİM KURUMU OLARAK OKUL.....	39
EĞİTİMDE-ÖĞRETİMDE PROGRAM VE PLANLAMA.....	42
ÖĞRENİM-ÖĞRETİM ANLAYIŞLARI.....	51
EĞİTİMDE ÖLÇME VE DEĞERLENDİRME	53

2.BÖLÜM	EĐİTİMİN EKONOMİK TEMELLERİ.....	57
	HERHANGİ BİR EĐİTİM SİSTEMİNİN MALİYET AÇISINDAN	
	BEŐ ÖNEMLİ ÖGESİ	59
	Hedefler.....	59
	Çıktılar	59
	Yararlar	59
	İřleyiř	59
	Girdiler.....	60
	EĐİTİM DÜŐÜNCESİNİN TARİHSEL SÜREÇ İÇİNDE EKONOMİK	
	ANLAMDA ÖNEMİ.....	60
	EĐİTİM TALEBİ VE ÖZELLİKLERİ	61
	MESLEKİ KONUM VE EĐİTİM İLİŐKİSİ	65
	EKONOMİK GELİŐME VE EĐİTİM TEMELLİ BİLGİ	67
	EĐİTİM HARCAMALARI	69
	EKONOMİK OLARAK KAYNAK SAVURGANLIĐI (İSRAFI)	72
	EĐİTİMLE EKONOMİK KAZANÇ ARASINDAKİ İLİŐKİ	78
	KALKINMA FAKTÖRÜ VE EKONOMİK TALEP.....	79
3. BÖLÜM	EĐİTİMİN TOPLUMSAL TEMELLERİ	83
	EĐİTİMİN TOPLUMSAL FONKSİYONLARI	84
	J. DEWEY'E GÖRE OKULUN TOPLUMSAL FONKSİYONLARI	88
	EĐİTİM VE KÜRESELLEŐME.....	93
	EĐİTİM VE İLETİŐİM.....	94
4. BÖLÜM:	EĐİTİMİN YASAL TEMELLERİ	97
	KURALLAR	97
	Dinî Kurallar:.....	97
	Görgü Kuralları	98
	Ahlak Kuralları	98
	Etik Kurallar	98
	Hukuk Kuralları	98
	AMAÇ ODAKLI MEVZUAT	101
	ANAYASA.....	105
	KANUN	107
	TÜZÜK	113
	YÖNETMELİK	115

5. BÖLÜM	EĞİTİMİN TARİHSEL TEMELLERİ	117
	TARİHSEL YÖNTEM.....	120
	MESLEKİ EĞİTİMİ ŞEKİLLENDİREN BAZI UYGULAMALAR.....	122
	Ahilik.....	123
	İş Dışındaki Eğitim.....	123
	Ahilikte Ehliyet Dereceleri	125
	ENDERUN MEKTEBİ.....	126
	TÜRKİYE'DE ÖĞRETMEN YETİŞTİRME	130
	MİLLÎ EĞİTİMDE ÖRGÜTSEL YAPI	135
6. BÖLÜM	EĞİTİMİN PSİKOLOJİK TEMELLERİ.....	143
	PSİKOLOJİNİN TANIMI	144
	EĞİTİM PSİKOLOJİSİ.....	145
	GELİŞİMLE İLGİLİ BAZI TEMEL KAVRAMLAR	150
	ÇEŞİTLİ BOYUTLARIYLA BİREYİN GELİŞİMİ, GELİŞİM	
	DÖNEMLERİ VE GELİŞİM ÖDEVLERİ	150
	ÖĞRENME PSİKOLOJİSİ	158
	ÖĞRENMEYLE İLGİLİ BAZI TEMEL KAVRAMLAR VE ÖĞRENME	
	TEORİLERİ.....	160
	ÖĞRENENLERİN ÖZ DÜZENLEME GELİŞİMLERİNİ	
	KOLAYLAŞTIRMA KRİTERLERİ	166
7. BÖLÜM	EĞİTİMİN POLİTİK TEMELLERİ	169
	ULUSAL DÜZEYDE EĞİTİM POLİTİKALARI	169
	OLUŞ BIÇIMLARINA GÖRE POLİTİKA TÜRLERİ.....	173
	ÇEŞİTLİ SİYASAL SİTEMLERDE İSTENEN İNSAN TİPİ VE EĞİTİM	177
	YÖNETİM ŞEKLİNE GÖRE EĞİTİM	181
8. BÖLÜM	EĞİTİMİN FELSEFİ TEMELLERİ	191
	FELSEFE NEDİR?	191
	BİLİM İLE FELSEFE ARASINDA İLİŞKİ	193
	ÇEŞİTLİ DİSİPLİN VE ALANLARIN FELSEFE YOLUYLA	
	KAYNAŞTIRILMASI	196
	FELSEFENİN DÖRT DEĞİŞİK ALANI.....	199
	Ontoloji (Varlık Bilgisi)	199
	Epistemoloji (Bilgi Sorunu)	200
	Aksiyoloji (Değerler)	204
	Felsefenin Alanı Olarak Mantık	206
	ÇEŞİTLİ FELSEFİ AKIMLARA GÖRE EĞİTİM	209

İdealizm	210
Realizm	212
Natüralist Akım.....	215
Varoluřçuluk.....	218
Pragmatizm	224
EĐİTİM FELSEFESİ.....	235
9. BÖLÜM GELECEĐİN EĐİTİMİ	243
ENDÜSTRİ GELİřİM DÖNEMLERİ	244
Birinci Endüstri Dönemi.....	245
İkinci Endüstri Dönemi	245
Üçüncü Endüstri Dönemi.....	245
Dördüncü Endüstri Dönemi (Endüstri 4.0)	245
EĐİTİMDE MEVCUT DURUM	248
TÜRK EĐİTİM SİSTEMİNDE GELECEĐE YÖNELİK	
BECERİLER NELERDİR?.....	250
DÖRDÜNCÜ ENDÜSTRİ DÖNEMİNDE (ENDÜSTRİ 4.0) EĐİTİM	253
MESLEKİ EĐİTİMİN GELECEĐİ.....	255
YÜKSEKÖĐRETİMDE GELECEK.....	261
KÜRESELLEřME EĐİLİMLERİ VE YÜKSEKÖĐRETİM	266
YAřAMSAL EĐİTİM PROGRAMLARI (VİTAL CURRICULUM)	273
EĐİTİMDE YÜKSELEN DEĐERLER	275
SINIF İÇİ ÖĐRETİM SÜREÇLERİNİ ETKİLEYEN FAKTÖRLER	276
SON SÖZ	279
KAYNAKÇA	281

KAYNAKÇA

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Elektrik ve Elektronik Ölçmeleri

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İÇİNDEKİLER

Bölüm 1 ÖLÇÜ VE CİHAZ PRENSİPLERİ

1. GİRİŞ	1
2. TEMEL VE TÜRETİLMİŞ BİRİMLER.....	1
3. SAYILARIN DEĞERLENDİRİLMESİ	3
3.1. Rakamların Yuvarlaklaştırılması.....	4
3.2. Dolaylı Ölçmeler ve Hataların Değerlendirilmesi.....	6
4. STANDARTLAR.....	8
4.1. Giriş.....	8
4.2. Standardizasyon	9
4.2.1. Standardizasyonun Üreticiye Faydaları.....	9
4.2.2. Standardizasyonun Ekonomiye Faydaları	10
4.2.3. Standardizasyonun Tüketiciye Faydaları	10
4.3. Standart Tanımı	10
4.4. Standartların Sınıflandırılması	11
4.5. Standartların Hazırlanışı.....	11
4.6. Ölçme ve Kalibrasyonun Standartlardaki Yeri.....	11
4.7. Dünyada Metrolojinin Tarihi Gelişimi	12
4.8. Ülkemizde Metrolojinin Tarihi Gelişimi.....	13
4.9. Ölçme ve Kalibrasyonun Önemi	14
4.10. Bazı Metrolojik Terimlerin Tanımı.....	16

4.11. Standart ve Çeşitleri	16
4.11.1. Uluslararası Standartlar	17
4.11.2. Primer veya Birincil Standartlar	17
4.11.3. Sekonder veya İkincil Standartlar	17
4.11.4. Referans Standartlar	17
4.11.5. Çalışma Standartları	17
4.11.6. Transfer Standartları	17
4.12. Kalibrasyon Sisteminin Kurulması	18
4.13. Kalibrasyon Şartları	18
4.14. Kalibrasyon Periyotlarının Tesbiti ve Denetlenmesi	18
4.15. Bir Ölçme İşleminde Dikkat Edilmesi Gereken Hususlar	19
4.16. Ölçü Raporunda Bulunması Gereken Bilgiler	19
4.17. Kalibrasyon Sertifikasında Bulunması Gereken Bilgiler	19
4.18. Kalibrasyon Etiketinde Bulunması Gereken Bilgiler	20
4.19. Önemli Temel ve Elektriksel Standartların Tanımı	20
5. HATALAR	25
5.1. Sistem veya Cihaz İçeri Hatalar	25
5.2. Sistem veya Cihaz Dışı Hatalar	26
5.3. Rastlantı Hataları	26
6. STATİK KARAKTERİSTİKLER	27
6.1. Doğruluk	27
6.2. Hassasiyet	28
6.3. Duyarlılık	30
6.4. Lineerlik	30
6.5. Lineersizlik	31
7. DİNAMİK KARAKTERİSTİKLER	32
7.1. Transfer Fonksiyonu	33
7.2. Sıfırıncı Mertebeli Cihaz	34
7.3. Birinci Mertebeli Cihaz	34
7.4. İkinci Mertebeli Cihaz	35
7.5. Gecikme Zamanı	37
7.6. Dinamik Lineersizlik	37

8. ÖLÇÜ HATALARININ İSTATİSTİK ANALİZİ	38
8.1. Ortalama, Sapma ve Standart Sapma	38
8.2. Gauss Dağılımı.....	40
8.3. Veri Dağılımı	42
8.3.1. En Küçük Kareler Tahmini Doğrusu	42
8.3.2. Korelasyon (İlişki) Katsayısı.....	43
9. ÖLÇÜ SİSTEMİNİN ELEMANLARI.....	46
10. CİHAZ TASARIM KRİTERLERİ.....	47
11. CİHAZIN ETİKET ÖZELLİKLERİ	48
11.1. Giriş ve Transdüser Özellikler	48
11.2. İşaret İşleme Özellikleri	49
11.3. Çıkış Özellikleri	50
11.4. Hata ve Güvenirlilik.....	50
11.5. Fiziksel ve Diğer Özellikler	51
12. ÖLÇÜ ALETLERİNİN KARAKTERİSTİK SEMBOLLERİ	52
PROBLEM VE SORULAR.....	54

Bölüm 2

TOPRAKLAMA, EKLANLAMA VE GÜRÜLTÜ

1. GİRİŞ	59
2. ELEKTRİKSEL GÜRÜLTÜ	59
2.1. Termal Gürültü.....	60
2.2. Shot Gürültü.....	62
2.3. Titrek ve Burst Gürültü	63
2.4. İşaret - Gürültü Oranı	63
2.5. Gürültü Figürü.....	63
2.6. Reaktansın Gürültü Etkisi	65
2.7. Kaskad Bağlı Amplifikatörlerdeki Gürültü	65
2.8. Eşdeğer Gürültü Sıcaklığı	67
2.9. Eşdeğer Gürültü Direnci	67
2.10. SINAD Oranı	67

2.11. Gürültü Ölçümü	68
2.12. Diyotlu Gürültü Üretici.....	68
2.13. Tanjantlı Gürültü Ölçme Tekniği.....	69
2.14. Gürültü Ölçü Devresi.....	70
3. GİRİŞİM.....	71
3.1. Elektriksel Kuplajlı Girişim	71
3.2. Manyetik Kuplajlı Girişim	72
3.3. Elektromanyetik Girişim (EMI).....	73
4. TOPRAK VE TOPRAKLAMA.....	73
4.1. AC Güç Hatları	73
4.2. Toprak Arızası.....	74
4.3. Cihaz Topraklaması	77
4.4. Toprak Çevrimleri.....	78
5. DİAFONİ	82
6. EKLANLAMA VE FİLTRELEME.....	82
6.1. Elektrik Alanı ve Düzlemsel Dalga Ekranlaması.....	83
6.2. Manyetik Ekranlama	84
6.3. Filtreleme	85
7. ELEKTRİĞİN FİZYOLOJİK ETKİLERİ.....	86
PROBLEMLER	87

Bölüm 3

DOĞRU AKIM ÖLÇMELERİ

1. GİRİŞ	89
2. DÖNER BOBİNLİ GALVANOMETRE.....	89
3. DC AMPERMETRE.....	92
3.1. Tek Kademeli Ampermetre.....	92
3.2. Çok Kademeli Ampermetre	94
3.3. Ampermetrenin Yükleme Etkisi.....	95
3.4. DC Ampermetre Kullanılırken.....	97

4. DC VOLTMETRE	97
4.1. Voltmetrenin Yükleme Etkisi ve Duyarlılığı	99
4.2. DC Voltmetre Kullanılırken.....	102
5. DİRENÇ ÖLÇMELERİ VE OHMMETRELER.....	102
5.1. Ampermetre - Voltmetre Metodu.....	103
5.2. Ölçü Aleti İç Direncinin Ölçülmesi.....	105
5.2.1. Yarım Skala Metodu	105
5.2.2. Gerilim - Akım Metodu	105
5.3. Seri Ohmmetre	106
5.4. Paralel Ohmmetre.....	109
5.5. Çapraz Bobinli Ölçü Aleti.....	110
5.6. Oranmetreli Ohmmetre	112
5.6.1. Hareketli Bobinli Oranmetreli Ohmmetre.....	112
5.6.2. Çapraz Bobinli Oranmetreli Ohmmetre	112
5.7. Meger	113
5.8. Wheatstone Köprüsü ile Direnç Ölçümü.....	114
5.8.1. Wheatstone Köprüsünün Duyarlılığı.....	117
5.8.2. Dengesiz Wheatstone Köprüsü	117
5.9. Küçük Değerli Direnç Ölçümü	119
5.9.1. Kelvin Köprüsü ile Direnç Ölçümü	119
5.10. Büyük Değerli Direnç Ölçümü	121
5.10.1. Büyük Direnç Ölçümünün Zorlukları	121
5.10.2. Korunmalı Metot ve Kablo İzolasyon Direncinin Ölçümü	122
5.10.3. Hacimsel ve Yüzeysel Direncin Ölçümü	123
5.10.4. Yük Kaybı Metodu ile İzolasyon Direncinin Ölçümü	124
5.10.5. Megaohm Köprü Metodu ile İzolasyon Direncinin Ölçümü.....	126
5.11. Toprak Direncinin Ölçümü	127
5.11.1. Gerilim Düşümü Metodu ile Toprak Direncinin Ölçümü	128
5.11.2. Toprak Test Cihazı ile Toprak Direncinin Ölçümü.....	129
5.12. Kablo Arıza Yerinin Ölçülmesi.....	130
6. MÜLTİMETRELER	133
7. POTANSİYOMETRE DEVRELERİ.....	137

7.1.	Potansiyometrenin Gerekliği.....	137
7.2.	Sürgülü Potansiyometre	137
7.3.	Otomatik Potansiyometre.....	139
8.	GERİLİM REFERANSLARI.....	140
8.1.	Yarıiletken Referans Kaynaklar	140
9.	ÖLÇÜ CİHAZLARININ KALİBRASYONU	142
9.1.	Potansiyometrik Metot.....	142
9.2.	Karşılaştırma Metodu.....	145
10.	UYGULAMALAR.....	146
10.1.	DC Ampermetre ve Voltmetre Uygulamaları	146
10.2.	DC Köprü Uygulamaları	148
10.2.1.	Sıcaklık Kontrol Devresi.....	148
10.2.2.	Yüksek Sıcaklık Ölçümü.....	149
	PROBLEM VE SORULAR.....	150

Bölüm 4

ALTERNATİF AKIM ÖLÇMELERİ

1.	GİRİŞ	157
2.	SİNÜZOİDAL İŞARET.....	158
3.	AC ÖLÇÜMÜNDE FREKANSIN ETKİSİ.....	159
4.	ELEKTRODİNAMİK ÖLÇÜ ALETİ.....	161
4.1.	Elektrodinamik Ölçü Aletlerinin Temel Özellikleri.....	164
5.	DÖNER DEMİR PLAKALI ÖLÇÜ ALETİ.....	165
6.	DÖNER MIKNATISLI ÖLÇÜ ALETİ.....	166
7.	ISIL ÖLÇÜ ALETLERİ.....	166
7.1.	Sıcak Telli Ölçü Aleti.....	166
7.2.	Isılçift Ölçü Aleti	167
7.3.	Isıl Ölçü Aletlerinin Üstünlük ve Eksiklikleri.....	170
8.	TEPE DEĞER VOLTMETRESİ	172

9. ELEKTROSTATİK VOLTMETRE.....	173
9.1. Dairesel Hareketli Elektrostatik Voltmetre	173
9.2. Doğrusal Hareketli Elektrostatik Voltmetre	174
10. AC İŞARETLERİN DOĞRULTULARAK ÖLÇÜLMESİ	174
10.1. Yarım Dalga Doğrultuculu Bir AC Voltmetre	174
10.1.1. Yarım Dalga Doğrultuculu AC Voltmetrenin Eksiklikleri.....	179
10.2. Tam Dalga Doğrultuculu AC Voltmetre	179
11. 1 V'TAN KÜÇÜK AC GERİLİMLERİN ÖLÇÜLMESİ	183
12. DEĞİŞİK DALGA ŞEKİLLERİNİN ÖLÇÜMÜ.....	185
13. ÖLÇÜ TRANSFORMATÖRLERİ	186
13.1. Gerilim Transformatörleri	187
13.2. Akım Transformatörleri	188
14. AC ÖLÇÜ ALETLERİNİN ÖZELLİKLERİ	190
PROBLEM VE SORULAR.....	192

Bölüm 5 **GÜÇ ÖLÇMELERİ**

1. GİRİŞ	195
2. AC GÜÇ.....	196
3. GÜÇ FAKTÖRÜNÜN DÜZELTİLMESİ	198
4. TEK FAZLI ELEKTRODİNAMİK WATTMETRE	200
5. ÜÇ FAZLI DEVRELERDE GÜÇ VE ÖLÇÜLMESİ.....	202
5.1. Üç Wattmetre Metodu	204
5.2. İki Wattmetre Metodu	205
6. WATTMETRE SABİTİ	207
7. REAKTİF GÜÇ ÖLÇÜMÜ VE VARMETRE	209
8. ÜÇ FAZLI WATTMETRE	210
9. HALL-ETKİLİ WATTMETRE	210
10. GÜÇ FAKTÖRÜ METRESİ.....	212

11. ENERJİ SAYACI.....	213
12. YÜKSEK FREKANSLARDA GÜÇ ÖLÇÜLMESİ.....	216
12.1. Ses Frekanslarında Güç Ölçümü.....	216
12.2. Radyo Frekanslarında Güç Ölçümü.....	218
12.2.1. Kalorimetrik Güç Ölçü Aleti.....	219
12.2.2. Bolometre.....	220
PROBLEM VE SORULAR.....	221

Bölüm 6

DEVRE ELEMANLARININ ÖLÇÜMÜ

1. GİRİŞ.....	225
2. DİRENÇLER.....	225
2.1. Dirençteki Güç Kaybı.....	226
2.2. Direnç Stabilesi.....	226
2.3. Direnç Toleransları.....	226
2.4. Direnç Serileri.....	226
2.5. Renk Kodları.....	227
2.6. Direnç Çeşitleri.....	228
2.7. Direnç Malzemeleri.....	230
3. KONDANSATÖRLER.....	231
3.1. Kondansatörün Çalışma Gerilimi.....	231
3.2. Kondansatördeki Kaçak Direnç.....	231
3.3. Kondansatörün İzolasyon Direnci.....	232
3.4. Kondansatörün Güç Faktörü.....	232
3.5. Kondansatör Çeşitleri.....	232
4. EMPEDANS TANIMI.....	234
5. ALÇAK FREKANSLARDA DİRENÇ ÖLÇÜMÜ.....	236
6. ALÇAK FREKANSLARDA EMPEDANS ÖLÇÜMÜ.....	239
7. ALÇAK FREKANSLARDA KAPASİTE ÖLÇÜMÜ.....	239
7.1. Kapasite Kaçak Direncinin Ölçülmesi.....	240

7.2. AC Köprüsü ile Alçak Frekanslarda Kapasite Ölçümü.....	240
7.3. Paralel Direnç - Kondansatör Karşılaştırma Köprüsü	243
8. ALÇAK FREKANSLARDA SELF ÖLÇÜMÜ	244
9. EMPEDANS KÖPRÜLERİ	248
10. DEVRE ELEMANLARININ YÜKSEK FREKANSLARDAKİ ÖLÇÜMÜ	248
10.1. Yüksek Frekanslarda Self Ölçümü.....	250
10.2. Yüksek Frekanslarda Kapasite Ölçümü	251
10.3. Yüksek Frekanslarda Direnç Ölçümü	252
PROBLEM VE SORULAR.....	253

Bölüm 7

TRANSDÜSERLER

1. GİRİŞ	257
2. GERGİ TRANSDÜSERİ	260
2.1 Gergi Transdüserinin Genel Özellikleri	260
2.2. Yarıiletken Gergi Ölçer.....	263
3. SICAKLIK TRANSDÜSERLERİ	266
3.1. Rezistif Sıcaklık Detektörü (RTD).....	266
3.2. Isılçift	269
3.2.1. Isılçift Çıkışının Ölçümü.....	272
3.2.2. Kompanzasyon Devreleri.....	272
3.3. Termistörler.....	273
3.3.1. Termistörlerin Uygulama Alanları	275
3.3.2. Termistör ile Sıcaklık Ölçümü.....	275
3.3.3. Termistör ile Sıcaklık Kontrolü	276
3.3.4. Termistörlü Devrelerde Sıcaklık Kompanzasyonu	276
3.4. Entegre Devre Sıcaklık Transdüserleri.....	278
3.4.1. LM335 Serisi	279
3.4.2. LM34 Serisi	281
3.4.3. AD592 Serisi.....	282
4. FOTOELEKTRİK TRANSDÜSERLER	283

4.1.	Fotoemiyon Transdüserler.....	283
4.1.1.	Işık Kuvvetlendirici Tüp.....	283
4.2.	Fotoiletken Transdüserler.....	284
4.2.1.	Fotodiyot.....	287
4.2.2.	Fototransistörler.....	289
4.3.	Fotovoltaj Piller.....	291
5.	YER DEĞİŞTİRME TRANSDÜSERLERİ.....	292
5.1.	Kapasitif Transdüserler.....	292
5.1.1.	Diferansiyel Kapasitif Transdüser.....	294
5.1.2.	Dielektrik Sabitine Bağlı Olarak Yer Değişiminin Ölçümü.....	296
5.1.3.	Kapasitif Transdüserlerin Üstünlükleri.....	296
5.1.4.	Kapasitif Transdüserlerin Eksiklikleri.....	297
5.1.5.	Kapasitif Transdüserlerin Kullanım Alanları.....	297
5.2.	Endüktif Transdüserler.....	297
5.2.1.	Self Endüktans Yöntemine Göre Çalışan Transdüserler.....	298
5.2.2.	Karşılıklı Endüktans Değişimi Prensibine Göre Çalışan Transdüserler.....	300
5.2.3.	Eddy Kaybı Oluşturma Prensibine Göre Çalışan Transdüserler.....	300
5.2.4.	Endüktif Transdüser ile Doğrusal ve Dairesel Yer Değişiminin Ölçümü.....	301
5.2.5.	Manyetik Sıvı Akış Transdüseri.....	302
5.2.6.	Lineer Değişimli Diferansiyel Transformator.....	303
5.2.7.	Dairesel Değişimli Diferansiyel Transformator.....	307
5.2.8.	Manyetik Metot ile Açıl Hız Ölçümü.....	308
5.2.9.	Hall Etkili Transdüser.....	310
5.2.10.	Magneto-rezistör.....	312
5.2.11.	Magneto-Elastik Transdüserler.....	312
5.2.12.	Magneto-Striktif Transdüserler.....	313
5.3.	Piezo-elektrik Transdüserler.....	313
5.3.1.	Piezo-elektrik Malzeme ve Transdüserlerden Beklenenler.....	314
6.	İŞARET İŞLEYİCİLERİ.....	317
7.	SES ÖLÇEN TRANSDÜSERLER.....	318

PROBLEM VE SORULAR.....	318
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Bölüm 8

OSİLOSKOP

1. OSİLOSKOP NEDİR?	323
2. OSİLOSKOBUN BLOK DİYAGRAMI.....	324
3. KATOD IŞINLI TÜP	325
3.1. Katod Işınli Tüpün Yapısı	325
3.2. Katod Işınli Tüpün Ekran Malzemeleri.....	327
3.3. Katod Işınli Tüpün Ekranı.....	328
3.4. Elektrostatik Hızlandırma	329
3.5. Elektrostatik Saptırma	330
3.6. Düşey İşaretin Görüntülenmesi	333
4. DÜŞEY SAPTIRMA SİSTEMİ.....	336
4.1. Düşey Amplifikatör.....	336
4.2. Zayıflatıcılar.....	337
5. YATAY SAPTIRMA SİSTEMİ	342
5.1. Yatay Amplifikatör	342
6. TARAMA OSİLATÖRÜ VE SENKRONİZASYON DEVRESİ.....	342
6.1 Tarama Osilatörü.....	342
6.2. Senkronizasyon veya Tetikleme Devresi	345
6.3. Taramanın Hızlandırılması.....	348
7. OSİLOSKOBUN ÜSTÜN ÖZELLİKLERİ	348
7.1. Çift Taramalı Osiloskop.....	349
7.2. Gecikmeli Tarama.....	351
7.3. Örnekleme Osiloskop.....	354
7.4. Hafızalı Osiloskop.....	355
7.4.1. Özel CRT'li Hafızalı Osiloskop.....	356
7.4.2. Hafızalı Dijital Osiloskop	357
8. OSİLOSKOP PROBLARI	357

8.1.	1 × Probu.....	358
8.2.	Kompanze Edilmiş Zayıflatıcı Prob.....	358
8.3.	Yüksek Gerilim Probu.....	360
8.4.	Modülatör Probu.....	360
8.5.	Aktif Prob.....	360
8.6.	Akım Probu.....	361
9.	OSİLOSKOBUN KALİBRASYONU.....	361
10.	OSİLOSKOP İLE ÖLÇMELER.....	361
10.1.	Gerilim Ölçümü.....	362
10.2.	Periyot ve Frekans Ölçümü.....	364
10.3.	Lissajons Yöntemi ile Frekans Ölçümü.....	364
10.4.	Faz Ölçümü.....	366
10.5.	Akım Ölçümü.....	368
10.6.	Güç Ölçümü.....	368
10.7.	Kare Dalga Testleri.....	368
10.8.	Darbeli İşaretin Ölçümü.....	372
11.	ÖRNEK BİR OSİLOSKOP ÖN PANELİ VE KONTROL DÜĞMELERİ.....	373
	PROBLEM VE SORULAR.....	375

Bölüm 9 KAYIT CİHAZLARI

1.	GİRİŞ.....	379
2.	ANALOG KAYIT CİHAZLARININ TEMEL YAPILARI.....	379
3.	GALVANOMETRİK KAYDEDİCİLER.....	381
4.	POTANSİYOMETRİK KAYDEDİCİLER.....	384
5.	X-Y KAYDEDİCİLERİ.....	386
6.	KAYDEDİCİLERİN ÖZELLİKLERİ.....	387
7.	MANYETİK KAYDEDİCİLER.....	388
7.1.	Manyetik Kaydedicilerin Üstünlükleri.....	389
7.2.	Manyetik Kaydedicinin Blok Diyagramı.....	389

7.3.	Manyetik Kayıt Metotları.....	391
7.4.	Doğrudan Kayıt Sistemi.....	392
7.4.1.	Doğrudan Kayıtın Üstünlükleri.....	393
7.4.2.	Doğrudan Kayıtın Eksiklikleri.....	393
7.5.	Frekans Modülasyonlu (FM) Kayıt.....	393
7.5.1.	FM Kayıt Sisteminin Üstünlükleri.....	394
7.5.2.	FM Kayıt Sisteminin Eksiklikleri.....	395
7.6.	Darbe Süre Modülasyonlu (PDM) Kayıt Sistemi.....	396
7.6.1.	PDM Kayıt Tekniğinin Üstünlükleri.....	397
7.6.2.	PDM Kayıt Tekniğinin Eksiklikleri.....	397
7.7.	Dijital Manyetik Kayıt Sistemi.....	397
8.	KAYDEDİCİLERİN UYGULAMALARI.....	399
8.1.	Sıcaklık Kaydı.....	400
8.2.	Ses Seviyesi Kaydı.....	400
8.3.	Elektrik ve Elektronik Uygulamalar.....	400
8.4.	Vericilerdeki Uygulamalar.....	402
8.5.	Veri Analizindeki Uygulamalar.....	403
8.6.	Mikrodalgadaki Uygulamalar.....	403
8.7.	Dijital Sistemlerdeki Uygulamalar.....	403
8.8.	Elektrokardiyografi.....	404
8.9.	Elektroansefelografi.....	404
	PROBLEM VE SORULAR.....	405

Bölüm 10

ELEKTRONİK VOLTMETRELER

1.	GİRİŞ.....	407
2.	ANALOG ELEKTRONİK VOLTMETRELERİN ÖZELLİKLERİ.....	407
3.	DİFERANSİYEL AMPLİFİKATÖR.....	408
4.	ELEKTRONİK ANALOG VOLTMETRE.....	411
4.1.	Elektronik DC Voltmetre.....	411
4.1.1.	Diferansiyel Amplifikatörlü Elektronik DC Voltmetre.....	411

4.1.2.	Emetör Takipçili Elektronik DC Voltmetre	414
4.1.3.	Doğrudan Bağlantılı Amplifikatörlü DC Voltmetre.....	418
4.1.4.	Operasyonel Amplifikatörlü DC Voltmetre	418
4.1.5.	Kıyıcı Amplifikatörlü DC Voltmetre	419
4.1.6.	Elektronik AC Voltmetre	421
5.	ELEKTRONİK VOLTMETRE PROBLARI	423
6.	GERÇEK EFEKTİF DEĞER VOLTMETRESİ	424
7.	ELEKTRONİK MÜLTİMETRE.....	425
	PROBLEM VE SORULAR.....	427

Bölüm 11

DİJİTAL CİHAZLAR

1.	GİRİŞ	429
2.	ANALOG VE DİJİTAL CİHAZLAR.....	429
3.	DİJİTAL VOLTMETRELER	430
4.	ANALOG-DİJİTAL DÖNÜŞTÜRÜCÜLER	431
4.1.	Tek Eğimli Analog - Dijital Dönüştürücü	431
4.2.	İki Eğimli Analog - Dijital Dönüştürücü.....	434
4.3.	Gerilim-Frekans Dönüştürücüleri.....	436
4.4.	Basamak Eğimli Analog - Dijital Dönüştürücü.....	438
4.5.	Ardışıl Yaklaşımlı ADC.....	439
4.6.	Yük Eksiltmeli Analog - Dijital Dönüştürücü.....	440
5.	KADEME SEÇİCİ	441
6.	EFEKTİF DEĞER - DC DÖNÜŞTÜRÜCÜLERİ	442
6.1.	Ortalama Efektif Değer - DC Dönüştürücüleri	442
6.2.	Gerçek Efektif Değer - DC Dönüştürücüleri.....	442
7.	DİRENÇ VE AKIMIN GERİLİME DÖNÜŞTÜRÜLMESİ.....	445
8.	DİJİTAL MÜLTİMETRELER	445
9.	DİJİTAL VOLTMETRELERİN ÖNEMLİ ÖZELLİKLERİ	446

10. SAYICI DEVRELER.....	449
10.1. İkili Sayıcı.....	450
10.2 Onlu Sayıcı.....	453
11. SAYICILAR.....	454
11.1. Toplama Prensibine Göre Çalışan Elektronik Sayıcı	455
11.2. Frekans Ölçen Elektronik Sayıcı.....	455
11.3. Periyot Ölçen Elektronik Sayıcı.....	456
11.4. Oran Ölçen Elektronik Sayıcı	457
11.5. Zaman Aralığı Ölçen Elektronik Sayıcı	457
11.6. Ortalama Değer Ölçen Elektronik Sayıcı.....	458
11.7. Resiprop Sayıcı	458
12. İŞARET ŞEKİLLENDİRİCİ VEYA DÜZENLEYİCİ	459
13. SAAT OSİLATÖR.....	460
14. ELEKTRONİK FREKANSMETRE VE SAYICILARDAKİ HATALAR.....	461
14.1. Osilatör Kararlılığı ve Kayma	461
14.2. Saat Frekansı Bölücülerindeki Hatalar.....	462
15. ALÇAK FREKANSLARIN ÖLÇÜMÜ.....	464
16. YÜKSEK FREKANSLARIN ÖLÇÜMÜ	465
16.1. Önkademe veya Frekans Bölücü Yöntemi	466
16.2. Transfer Osilatör Yöntemi	467
16.3. Heterodin Frekans Dönüştürücü Yöntemi.....	468
17. FREKANS AYARI.....	469
17.1. Doğrudan Karşılaştırma ile Frekans Ayarı.....	469
17.2. Osiloskop ile Frekans Ayarı.....	469
17.3. Radyo İstasyonları ile Frekans Ayarı.....	470
18. FAZ FARKI ÖLÇÜMÜ	471
19. YÜKSELME VE DÜŞME ZAMANLARININ ÖLÇÜMÜ	471
PROBLEM VE SORULAR.....	472

Bölüm 12

İŞARET KAYNAKLARI VE ANALİZÖRLERİ

1. GİRİŞ	475
2. İŞARET KAYNAKLARI	475
3. POZİTİF GERİBESLEME VE OSİLYASYON	477
4. ALÇAK FREKANS SİNÜZOİDAL DALGA OSİLATÖRLERİ	478
4.1. Faz Kaymalı Osilatör	478
4.2. Wien Köprü Osilatörü	479
5. YÜKSEK FREKANS SİNÜZOİDAL DALGA OSİLATÖRLERİ	481
5.1. Colpitts ve Hartley Osilatörleri	481
5.2. Kristal Osilatörler	483
6. MODÜLASYONLU İŞARET JENERATÖRÜ	485
6.1. Genlik Modülasyonlu İşaret	485
6.2. Frekans Modülasyonlu İşaret	487
7. FONKSİYON JENERATÖRLERİ	488
8. TARAMA FREKANSLI OSİLATÖR	491
9. FREKANS SENTEZCİLİ OSİLATÖR	493
10. DARBE OSİLATÖRLERİ	494
11. İŞARET ANALİZÖRLERİ	497
12. DİSTORSİYON ANALİZÖRÜ	497
13. DALGA ANALİZÖRÜ	499
14. SPEKTRUM ANALİZÖRÜ	501
15. FOURİER ANALİZÖRÜ	504
PROBLEM VE SORULAR	505

Bölüm 13

BİLGİSAYAR KONTROLLÜ ÖLÇÜ SİSTEMLERİ

1. GİRİŞ	507
2. ANALOG SİSTEMLER	507

3. ANALOG - DİJİTAL SİSTEMLER	510
3.1. Dijital Arabirim.....	511
4. IEEE-488 STANDARDI VE VERİ YOLU	512
5. BİR SES FREKANS AMPLİFİKATÖRÜNÜN TEST EDİLMESİ	513
6. BİR RADYO ALICISININ TEST EDİLMESİ.....	514
7. BİLGİSAYAR KOTROLLÜ ÖLÇÜ SİSTEMİNDEKİ CİHAZLAR.....	517
8. IEEE 488' İN ELEKTRİKSEL ÖZELLİKLERİ.....	522
9. DİJİTAL KONTROLÜN AÇIKLANMASI	525
10. MİKROİŞLEMCİLİ BİR ÖLÇÜ SİSTEMİNE AİT ZAMANLAMA ÖRNEĞİ ...	525
11. RS-232 STANDARDI.....	527
12. AKIM ÇEVİRİMLERİ.....	529
13. UZUN MESAFE VERİ İLETİMİ	530
PROBLEM VE SORULAR.....	532
KAYNAKLAR.....	533

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İÇİNDEKİLER

EDİTÖRÜN ÖN SÖZÜ	Vii
SUNUŞ	ix
ERKEN ÇOCUKLUKTA STEM EĞİTİMİ	1
UYGULAMA ÖRNEKLERİ	13
YEŞİL DÜNYAMIZ	15
Canlılar ve İhtiyaçları.....	15
Minik Carettalar Denize	39
BİLİŞİM DÜNYASI	63
Kerem ile Aslı'nın Anahtar Macerası.....	63
Opti ve Pesî'nin Kahramanı	94
MAKİNELER DÜNYASI	113
Evimiz İklim Değişikliğine Hazır mı?	113
Pırpır'ın Evi	136
HAYAL DÜNYAMIZ	153
Çikolata Diyarına Nasıl Ulaşacağız?	153
Dino ile Ölçüm Zamanı.....	172
EKLER.....	189
Ek 1: Veli Bilgilendirme Mektubu.....	189
Ek 2: Veli Davet Mektubu	190
Ek 3: Öz Değerlendirme Formu	191
Ek 4: Akran Değerlendirme Formu.....	192
Ek 5: Bilişsel Süreç: Araştırma (Bilgi Edinme) Rubriği.....	193
Ek 6: Bilişsel Süreç: Fen Rubriği.....	194
Ek 7: Bilişsel Süreç: Mühendislik Rubriği.....	195
Ek 8: Bilişsel Süreç: Matematik Rubriği	196

Ek 9: Sosyal Ürün: Sunum Rubriği	197
Ek 10: STEM Çalışmaları Değerlendirme Alanım.....	198
Ek 11: Yeni Dönem Planlarım.....	199
Ek 12: İzometrik Kâğıt	200
EDİTÖR HAKKINDA	201
YAZARLAR HAKKINDA	203

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ERKEN ÇOCUKLUKTA STEM EĞİTİMİ

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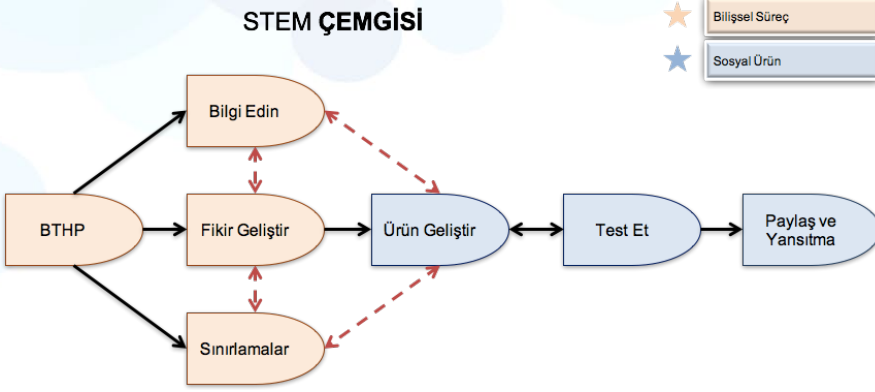
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GİRİŞ

Okul öncesi eğitim, küçük çocukların ilköğretim sınıflarında kazanacakları daha ileri içerik bilgisini oluşturmak için gereken pek çok beceriyi kazandıkları, gelişimlerinde önemli rol oynayan bir dönemdir. Bu dönemde çocuklar, bilime karşı sevgi ve ileriki yıllarda öğrenmelerine aracılık edecek yetenekleri için yeterli duygusu geliştirebilirler (Moomaw, 2103). Çocukların doğuştan bilim insanı ve bir mühendis oldukları göz önüne alındığında, erken çocukluk döneminde STEM eğitime yönelik çalışmalara çok az yer verilmesi bir talihsizlik olarak değerlendirilmektedir (Tippett & Milford, 2017). Erken çocukluk ortamları genel olarak sosyokültürel, yapılandırmacı bir modele göre oluşturulur. Merak, ilgi, inisiyatif, kalıcılık, dikkat ve yaratıcılık içeren öğrenme yaklaşımları, STEM/STEAM eğitim girişiminin önemli özellikleridir ve küçük çocukların bilgiyi nasıl öğrendikleri ve inşa ettikleri ile doğrudan ilgilidir (Katz, 2010).

Erken Çocuklukta STEM Eğitimi Neden Önemlidir?

Araştırma temelli matematik ve fen öğrenme fırsatları sağlanan çocukların geçirdiği yaşantıların sonraki eğitim basamaklarını etkilediği bilinmektedir. Bu sebeple fen ve matematik eğitiminin desteklenmesi eğitimcilerin çok önemseydiği bir konu olarak karşımıza çıkmaktadır. Erken çocukluk döneminde çocukların en doğal ilgilerinden biri çevreyi gözlemlemek, araştırma yapmak ve keşfetmek olduğundan, fen eğitiminin içeriği çocuklar için ilgi çekicidir (Brenneman, Stevenson Boyd & Frede, 2009). Bu keşifler yoluyla küçük çocuklar STEM eğitimini oluşturan fen, teknoloji, mühendislik ve matematik disiplinlerine ait pek çok kavramı kazanmaya başlarlar.



Şekil 2. STEM Çemgisi (Corlu, 2017)

STEM çemgisi; bilgi temelli hayat probleminin ilgili sınırlamalar, meslek, görev ve sorumluluklar ile birlikte sunumuyla başlamaktadır. Model bilişsel süreç ve sosyal ürün olmak üzere iki bölümü kapsamaktadır. Bilimsel süreçte yer alan bilgi edinme ve fikir geliştirme aşamaları öğretmen ve öğrencilerin problemi anlamak ve çözüm önerileri geliştirmek için gerekli olan hazırlık sürecine dair etkinlikleri kapsamaktadır. Bilgi edinme ve fikir geliştirme basamaklarında öğretmen ve öğrencilere açık uçlu araştırma soruları bağlamında problemi incelemeleri, alternatif çözüm önerileri üzerinde çalışmalarını ve yaratıcı fikirler üretmeleri önerilmektedir. Bilgi edinme ve fikir geliştirme basamaklarında gerçekleştirilen bilişsel hazırlık sürecinden sonra öğrenci ve öğretmenler, iş birliği içerisinde sosyal ürün oluşturma sürecine başlarlar. Ürün geliştirme basamağında temaya göre farklılaştırılmış ürünler üzerinde çalışılır. Test etme basamağında ise bir test düzeneği oluşturulur ve BTHP ile sınırlamalar göz önünde bulundurularak ürün test edilir (Yabaş & Corlu, 2021). Ürünler; “Makineler Dünyası” teması için çalışan bir prototip, “Yeşil Dünyamız” teması için bir deney tasarımı, “Bilişim Dünyası” için bir program ya da algoritma ve “Hayal Dünyamız” için örüntü ya da matematiksel model olarak farklılaştırılabilmektedir (Aşık vd., 2017).

STEM yaklaşımının erken çocukluk eğitimine entegrasyonu, çocuklara sadece bilim, matematiksel düşünme ve mühendislikte öğrenmeyi teşvik eden anlamlı deneyimler ve içerik sağlamayı içermez, ayrıca çocukların öğrenme deneyimleri, süreçte edinilenleri yansıtmaya (paylaşma), konuşma, sunum yapma ve dokümantasyon süreçlerini de içermelidir (Van Meeteren & Zan, 2010).

Kaynakça

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7. Basım

FİNANSAL TABLOLAR ANALİZİ

- ✓ TMS/TFRS'YE GÖRE KALEME ALINMIŞ
 - ✓ PİYASADAN GERÇEK ÖRNEKLER ÜZERİNDEN ANALİZLER
 - ✓ KPSS, SMMM, BANKACILIK VB. KURUM SINAVLARI
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İÇİNDEKİLER

BİRİNCİ KISIM FİNANSAL TABLOLAR

1. BÖLÜM

FİNANSAL TABLOLARA İLİŞKİN GENEL BİLGİLER	4
FİNANSAL TABLOLARIN NİTELİKLERİ	4
FAYDALI FİNANSAL BİLGİNİN ÖZELLİKLERİ.....	6
FİNANSAL TABLOLARIN KULLANICILARINA SUNDUĞU BİLGİLER.....	7
FİNANSAL TABLOLARIN SINIRLARI	7
FİNANSAL TABLOLARDA YER VERİLMESİ GEREKEN BİLGİLER.....	8
DÜZENLENECEK FİNANSAL TABLOLAR	8
TEK DÜZEN MUHASEBE SİSTEMİ'NE (TDMS) GÖRE FİNANSAL TABLOLAR.....	8
TÜRKİYE MUHASEBE STANDARTLARI / TÜRKİYE FİNANSAL RAPORLAMA STANDARTLARI'NA (TMS/TFRS) GÖRE FİNANSAL TABLOLAR.....	11
TMS'NİN FİNANSAL TABLOLARA ETKİSİ	13
BİÇİMSEL YAPI (SINIFLANDIRMA) BAKIMINDAN FARKLILIKLAR	14
KAPSAM BAKIMINDAN FARKLILIKLAR	15
DEĞERLEME BAKIMINDAN FARKLILIKLAR	16
GENEL AMAÇLI FİNANSAL TABLOLAR	17
FİNANSAL DURUM TABLOSU (BİLANÇO).....	17
Finansal Durum Tablosu Düzenleme Biçimleri	18
KAPSAMLI GELİR TABLOSU.....	19
Kapsamlı Gelir Tablosu Düzenleme Biçimleri	19
Rapor Tipi Kapsamlı Gelir Tablosunun Gösterimi	19
NAKİT AKIŞ TABLOSU	20
ÖZ KAYNAK DEĞİŞİM TABLOSU.....	22
DİPNOTLAR	22
ÖZEL AMAÇLI FİNANSAL TABLOLAR	23
KÂR DAĞITIM TABLOSU	23
FON AKIM TABLOSU	24
SATIŞLARIN MALİYETİ TABLOSU	25
KONSOLİDASYON VE KONSOLİDE FİNANSAL TABLO KAVRAMI	26

2. BÖLÜM

FİNANSAL DURUM TABLOSU (BİLANÇO).....	34
BİÇİM BAKIMINDAN FİNANSAL DURUM TABLOSU.....	35
Hesap Tipi Finansal Durum Tablosu.....	35
Rapor Tipi Finansal Durum Tablosu.....	35
KAPSAM BAKIMINDAN FİNANSAL DURUM TABLOSU.....	36
Özet Finansal Durum Tablosu.....	36
Ayrıntılı Finansal Durum Tablosu	37
TMS/TFRS'YE GÖRE DETAYLI RAPOR TİPİ FİNANSAL DURUM TABLOSU (BİLANÇO) ÖRNEĞİ	38
FİNANSAL DURUM TABLOSUNDA (BİLANÇODA) YER ALACAK BİLGİLER.....	41
FİNANSAL DURUM TABLOSUNUN GENEL YAPISI VE SINIFLANDIRILMASI.....	42
VARLIKLARIN (AKTİFLERİN) BÖLÜMLENDİRİLMESİ	43
I. DÖNEN VARLIKLAR.....	44
Nakit ve Nakit Benzeri Varlıklar (Hazır Değerler)	46
Finansal Yatırımlar (Menkul Kıymetler).....	47
Ticari Alacaklar.....	47
Diğer Alacaklar	48
Stoklar	49
Peşin Ödenmiş Giderler	49
Cari Dönem Vergisiyle İlgili Varlıklar.....	49
Diğer Dönen Varlıklar.....	50
Satış Amaçlı Sınıflandırılan Duran Varlıklar.....	50
II. DURAN VARLIKLAR	50
Ticari Alacaklar.....	51
Diğer Alacaklar	51
Finansal Yatırımlar (Menkul Kıymetler).....	52
Öz Kaynak Yöntemiyle Değerlenen Yatırımlar	52
Yatırım Amaçlı Gayrimenkuller	53
Maddi Duran Varlıklar	54
Maddi Olmayan Duran Varlıklar	54
Peşin Ödenmiş Giderler	55
Ertelenmiş Vergi Varlığı	55
Diğer Duran Varlıklar	55
KAYNAKLARIN (PASIFLERİN) BÖLÜMLENDİRİLMESİ	55
I. KISA VADELİ YABANCI KAYNAKLAR	56
Kısa Vadeli Borçlanmalar	57
Uzun Vadeli Borçlanmaların Kısa Vadeli Kısımları	58
Diğer Finansal Yükümlülükler.....	58
Ticari Borçlar	58
Finans Sektörü Faaliyetlerinden Borçlar.....	58
Çalışanlara Sağlanan Faydalar Kapsamında Borçlar.....	59
Diğer Borçlar.....	59

II. UZUN VADELİ YABANCI KAYNAKLAR	59
III. ÖZ KAYNAKLAR.....	61
Ödenmiş Sermaye	62
Geri Alınmış Hisse Senetleri (-).....	62
Karşılıklı İştirak Sermaye Düzeltmesi (-).....	62
Hisse Senetlerine İlişkin Primler.....	63
Kâr veya Zararda Yeniden Sınıflandırılmayacak Birikmiş Diğer Kapsamlı Gelirler veya Giderler.....	63
Kâr veya Zararda Yeniden Sınıflandırılacak Birikmiş Diğer Kapsamlı Gelirler veya Giderler.....	64
Kârdan Ayrılan Kısıtlanmış Yedekler	64
Geçmiş Yıllar Kârları/Zararları	64
Dönem Net Kârı/Zararı	65

3. BÖLÜM

KAPSAMLI GELİR TABLOSU	68
TEK TABLO YAKLAŞIMINA ÖRNEK	69
İKİ TABLO YAKLAŞIMINA ÖRNEK.....	71
Dönem Kârı/Zararı Bölümünde Raporlanması Zorunlu Kalemler	75
Dönem Kârı/Zararını Oluşturan Bölümler	75
Sürdürülen Faaliyetler Bölümü	75
Durdurulan Faaliyetler Bölümü.....	77
Gelir Tablosu ile Nakit Akış Tablosu Arasındaki İlişki	78
DİĞER KAPSAMLI GELİR/GİDER BÖLÜMÜ	79
TMS/TFRS'LERİN GELİR TABLOSUNA ETKİLERİ.....	80

4. BÖLÜM

NAKİT AKIŞ TABLOSU	84
NAKİT AKIŞ TABLOSUNUN DÜZENLENMESİ VE KULLANICILARA SUNDUĞU BİLGİLER	85
NAKİT AKIŞLARI İLE NET KÂR KAVRAMLARI.....	86
NAKİT AKIŞLARININ SINIFLANDIRILMASI	87
İşletme Faaliyetlerinden Kaynaklanan Nakit Akışları.....	88
Yatırım Faaliyetlerinden Kaynaklanan Nakit Akışları	89
Finansman Faaliyetlerinden Kaynaklanan Nakit Akışları.....	90
NAKİT AKIŞ TABLOSU DÜZENLEME YÖNTEMLERİ.....	90
Brüt (Direkt - Dolaysız) Yöntem.....	92
Net (Endirekt - Dolaylı) Yöntem.....	95

5. BÖLÜM

ÖZ KAYNAK DEĞİŞİM TABLOSU	100
ÖZ KAYNAK DEĞİŞİM TABLOSUNDA SUNULACAK BİLGİLER	101
Öz Kaynakları Artıran İşlemler	101
Öz Kaynakları Azaltan İşlemler	102
ÖZ KAYNAK DEĞİŞİM TABLOSUNUN DÜZENLENMESİ	103

6. BÖLÜM

ÖZEL AMAÇLI FİNANSAL TABLOLAR	108
KÂR DAĞITIM TABLOSU	108
FON AKIM TABLOSU	111
SATIŞLARIN MALİYETİ TABLOSU	114

İKİNCİ KISIM FİNANSAL ANALİZ

7. BÖLÜM

FİNANSAL ANALİZLERE İLİŞKİN GENEL BİLGİLER	117
FİNANSAL ANALİZ.....	120
FİNANSAL ANALİZ SONUÇLARINDAN YARARLANAN GRUPLAR	121
FİNANSAL ANALİZ KRİTERLERİ	122
FİNANSAL ANALİZ TÜRLERİ.....	123
KAPSAM BAKIMINDAN FİNANSAL ANALİZ TÜRLERİ	124
Statik Analiz.....	124
Dinamik Analiz	124
YAPAN KİŞİ BAKIMINDAN FİNANSAL ANALİZ TÜRLERİ	125
İç Analiz	125
Dış Analiz.....	125
YAPILMA AMACI BAKIMINDAN FİNANSAL ANALİZ TÜRLERİ.....	125
Yönetim Analizleri	126
Kredi Analizleri.....	126
Yatırım Analizleri	127
FİNANSAL ANALİZ TEKNİKLERİ	127
Dikey Analiz (Yüzde Yöntemiyle Analiz)	128
Yatay Analiz (Karşılaştırmalı Tablolar Analizi)	128
Eğilim (Trend) Analizi	129
Oran Analizi	129

8. BÖLÜM

DİKEY ANALİZ (YÜZDE YÖNTEMİ İLE ANALİZ).....	131
DİKEY ANALİZ.....	132
GELİR TABLOSUNUN DİKEY ANALİZİ.....	133
FİNANSAL DURUM TABLOSUNUN DİKEY ANALİZİ.....	137
Genel Toplam Yöntemi.....	138
Grup Toplamı Yöntemi.....	138
DİKEY YÜZDELERE GÖRE DÜZENLENMİŞ KAPSAMLI GELİR TABLOSUNUN YORUMU (FORD AŞ).....	146
DİKEY YÜZDELERE GÖRE DÜZENLENMİŞ FİNANSAL DURUM TABLOSUNUN YORUMU (FORD AŞ).....	149
DİKEY YÜZDELERE GÖRE DÜZENLENMİŞ KAPSAMLI GELİR TABLOSUNUN YORUMU (TOFAŞ AŞ).....	153
DİKEY YÜZDELERE GÖRE DÜZENLENMİŞ FİNANSAL DURUM TABLOSUNUN YORUMU (TOFAŞ AŞ).....	156

9. BÖLÜM

YATAY ANALİZ (KARŞILAŞTIRMALI TABLOLAR ANALİZİ).....	157
YATAY ANALİZ.....	158
FİNANSAL TABLOLARIN YATAY ANALİZİ.....	159
İki Dönemli Yatay Analiz.....	159
İkiden Fazla Dönemli Yatay Analiz.....	161
Sabit Baz Yöntemi.....	162
Hareketli Baz Yöntemi.....	162

10. BÖLÜM

EĞİLİM (TREND) ANALİZİ.....	180
FİNANSAL TABLOLARIN EĞİLİM ANALİZİ.....	181
Eğilim Analizinde Dikkat Edilmesi Gereken Faktörler.....	183
EĞİLİM ANALİZİNE İLİŞKİN ÖRNEK UYGULAMA.....	184
EĞİLİM ANALİZİ YÖNTEMİYLE DÜZENLENMİŞ FORD AŞ'YE AİT FİNANSAL DURUM VE KAPSAMLI GELİR TABLOLARININ YORUMU.....	193
A) Dönen Varlıklar ile Kısa Vadeli Borçlardaki Değişimler.....	193
B) Duran Varlıklar ile Devamlı Sermayedeki Değişimler.....	193
C) Dönen Varlıklar ile Duran Varlıklardaki Değişimler.....	194
D) Yabancı Kaynaklar ile Öz Kaynaklardaki Değişimler.....	195
E) Stoklar ile Satışlardaki Değişimler.....	196
F) Ticari Alacaklar ile Satışlardaki Değişimler.....	196
G) Satışlar ile Satışların Maliyetindeki Değişimler.....	197
H) Brüt Kâr, Faaliyet Kârı ve Dönem Kârındaki Değişimler.....	198

11. BÖLÜM

ORAN ANALİZİ: LİKİDİTE VE KALDIRAÇ ORANLARI	199
ORAN ANALİZİ.....	200
ANALİZLERDE KULLANILAN ORANLAR.....	201
LİKİDİTE ORANLARI.....	201
1. CARİ ORAN	203
2. ASİT TEST (LİKİDİTE) ORANI	204
3. STOK BAĞIMLILIK ORANI	206
4. NAKİT ORANI.....	206
KALDIRAÇ ORANLARI	207
1. BORÇLARIN AKTİF TOPLAMINA ORANI (FİNANSAL KALDIRAÇ ORANI, TOPLAM BORÇ ORANI)	209
2. ÖZ KAYNAKLARIN AKTİF TOPLAMINA ORANI.....	209
3. ÖZ KAYNAKLARIN TOPLAM BORÇLARA ORANI (FİNANSMAN ORANI).....	210
4. KISA VADELİ BORÇLARIN TOPLAM BORÇLARA ORANI (BORÇLARIN VADE YAPISI ORANI)	211
5. DURAN VARLIKLARIN DEVAMLI SERMAYEYE ORANI.....	212
LİKİDİTE VE KALDIRAÇ ORANLARINA İLİŞKİN ÖRNEK UYGULAMA - I.....	213
LİKİDİTE VE KALDIRAÇ ORANLARINA İLİŞKİN ÖRNEK UYGULAMA – II	216
LİKİDİTE ORANLARININ HESAPLANMASI VE YORUMLANMASI.....	218
KALDIRAÇ ORANLARININ HESAPLANMASI VE YORUMLANMASI	220

12. BÖLÜM

ORAN ANALİZİ: FAALİYET, KÂRLILIK VE BÜYÜME ORANLARI	223
FAALİYET ORANLARI.....	224
1. STOKLARIN DEVİR HIZI	225
A) Ticaret İşletmelerinde Stokların Devir Hızı	226
B) Üretim İşletmelerinde Stokların Devir Hızı	226
Yarı Mamül Stokları Devir Hızı	227
Mamül Stokları Devir Hızı	228
Stok Tutma Süresi.....	228
2. TİCARİ ALACAKLARIN DEVİR HIZI	230
Ticari Alacakların Ortalama Tahsil Süresi	231
3. TİCARİ BORÇLARIN DEVİR HIZI.....	232
Ticari Borçların Ortalama Ödenme Süresi	233
Nakde Dönüşüm Süresi (Faaliyet Döngüsü, Net Etkinlik Süresi).....	234
4. VARLIKLARIN DEVİR HIZI.....	235
5. ÖZ KAYNAKLARIN (ÖZ SERMAYENİN) DEVİR HIZI	236
KÂRLILIK ORANLARI.....	237
1. KÂR MARJLARI.....	238

Brüt Kâr Marjı.....	239
Esas Faaliyet Kâr Marjı.....	239
Sürdürülen Faaliyetler Dönem Kâr Marjı.....	239
Dönem Kâr Marjı.....	239
Toplam Kapsamlı Gelir Marjı.....	240
2. VARLIKLARIN KÂRLILIK ORANI.....	240
3. ÖZ KAYNAKLARIN KÂRLILIK ORANI.....	242
4. HİSSE SENEDİ BAŞINA KÂR.....	243
BÜYÜME ORANLARI	244
1. SATIŞLARDAKİ BÜYÜME ORANI	245
2. DÖNEM KÂRINDAKİ BÜYÜME ORANI	245
3. TOPLAM VARLIKLARDAKİ BÜYÜME ORANI	246
4. ÖZ KAYNAKLARDAKİ BÜYÜME ORANI.....	247
FAALİYET, KÂRLILIK VE BÜYÜME ORANLARINA İLİŞKİN.....	248
ÖRNEK UYGULAMA - I	248
FAALİYET, KÂRLILIK VE BÜYÜME ORANLARINA İLİŞKİN ÖRNEK UYGULAMA - II.....	253
FAALİYET ORANLARININ HESAPLANMASI VE YORUMLANMASI	256
KÂRLILIK ORANLARININ HESAPLANMASI VE YORUMLANMASI.....	258
BÜYÜME ORANLARININ HESAPLANMASI VE YORUMLANMASI	261

13. BÖLÜM

ORAN ANALİZLERİ: FİNANSAL PERFORMANSIN ÖLÇÜMÜ.....	263
FİNANSAL PERFORMANSIN KÂR ODAKLI ÖLÇÜMÜ	264
FİNANSAL KALDIRAÇ VE ÖZ KAYNAKLARIN KÂRLILIĞI ARASINDAKİ İLİŞKİ	265
FİNANSAL PERFORMANSIN DEĞER ODAKLI ÖLÇÜMÜ: PİYASA KATMA DEĞER ve EKONOMİK KATMA DEĞER (MARKET VALUE ADDED and EKONOMİK VALUE ADDED - MEVA and EVA)	267
BİRLEŞTİRİLMİŞ ORANLAR: DUPONT ANALİZİ	268
ORAN ANALİZİ KULLANIMINDA DİKKAT EDİLECEK HUSUSLAR	272
FİNANSAL ANALİZLERDE SAYILARIN ÖTESİNE BAKMAK.....	273

ÜÇÜNCÜ KISIM İLERİ ANALİZLER

14. BÖLÜM

NAKİT AKIŞ ANALİZLERİ.....	277
NAKİT AKIŞ TABLOSUNUN ANALİZİ	278
NAKİT AKIŞ TABLOSU ANALİZLERİNE İLİŞKİN ÖRNEK UYGULAMA - I.....	279

NAKİT AKIŞ TABLOSU ANALİZLERİNE İLİŞKİN ÖRNEK UYGULAMA - II.....	280
NAKİT AKIŞ TABLOSUNUN ANALİZİNDE MODEL OLUŞTURMA	281
NAKİT AKIŞ MODELLERİNE İLİŞKİN ÖRNEK UYGULAMA - I.....	283
NAKİT AKIŞ MODELLERİNE İLİŞKİN ÖRNEK UYGULAMA - II.....	284
NAKİT AKIŞ ORANLARI	285
1. İşletme Faaliyetlerinden Nakit Akışları / Kısa Vadeli Borçlar.....	285
2. İşletme Faaliyetlerinden Nakit Akışları / Toplam Borçlar	286
3. İşletme Faaliyetlerinden Nakit Akışları / Toplam Varlıklar.....	286
4. Hisse Senedi Başına İşletme Faaliyetlerinden Nakit Akışı	287
5. İşletme Faaliyetlerinden Nakit Akışı / Ödenen Temettüler.....	287
NAKİT AKIŞ ORANLARINA İLİŞKİN ÖRNEK UYGULAMA - I	288
NAKİT AKIŞ ORANLARINA İLİŞKİN ÖRNEK UYGULAMA - II.....	291

15. BÖLÜM

KREDİ ANALİZLERİ	298
İŞLETMELERDE KREDİ TALEBİNİ DOĞURAN ETMENLER	299
KREDİNİN MALİYETİ.....	299
Kredi Analizlerinde 5K (5C) Kuralı.....	301
Kredi Değerliliği ve Kredilendirme Süreci	301
KREDİ DERECELENDİRME VE KREDİ DERECELENDİRME KURULUŞLARI	303
KREDİ DERECELENDİRME.....	303
DÜNYA'DA VE TÜRKİYE'DE KREDİ DERECELENDİRME KURULUŞLARI ..	304
Dünya'da Kredi Derecelendirme Kuruluşları	304
Türkiye'de Kredi Derecelendirme Kuruluşları.....	305
KREDİ DERECELENDİRME KURULUŞLARININ NOT SİSTEMLERİ.....	306
ŞİRKET DERECELENDİRME KRİTERLERİ.....	308
NİTELİKSEL ANALİZLER -KREDİ ORANLARI-.....	309
İŞLETMELERİN BORÇLARINI ÖDEYEMEMESİ DURUMUNUN TAHMİNİ –FİNANSAL BAŞARISIZLIK TAHMİNİ–	310
İŞLETMELERİN BORÇLARINI ÖDEYEMEMESİ DURUMUNUN TAHMİNİYLE İLGİLİ ÖRNEK UYGULAMA.....	313

16. BÖLÜM

YATIRIM ANALİZLERİ VE DEĞERLEME	321
YATIRIM ANALİZLERİ	322
TEMEL ANALİZ.....	322
MAKROEKONOMİ ANALİZİ	323
MAKROEKONOMİ ANALİZİNDE KULLANILAN GÖSTERGELER	323
Gayri Safi Yurtiçi Hasıla (GSYH)	323
Enflasyon ve Faiz Oranları.....	325

İstihdam.....	326
Döviz Kuru ve Döviz Rezervleri.....	326
SEKTÖR (ENDÜSTRİ) ANALİZİ	327
FİRMA ANALİZİ	329
Firmayı Tanıma ve Faaliyetlerini Değerlendirme	329
FİNANSAL ANALİZLERLE GEÇMİŞİ DEĞERLENDİRME VE GELECEĞİ TAHMİN ETME	331
FİRMA DEĞERİNİN TESPİTİ ve YATIRIM KARARINI VERME.....	331
FİRMA DEĞERİNİN TESPİTİ	331
FİRMA DEĞERİNİ TESPİT YÖNTEMLERİ.....	332
Borsa Performans Oranları Yardımıyla Firma Değerinin Tespiti.....	332
Fiyat / Kazanç (F/K) Oranı.....	334
Fiyat / Nakit Akımı (F/NA) Oranı.....	336
Piyasa Değeri / Defter Değeri (PD/DD) Oranı.....	338
İndirgenmiş Nakit Akımları (Net Bugünkü Değer) Yöntemiyle Firma Değerinin Tespiti	340
FİRMA DEĞERİNİN TESPİTİNDE KULLANILAN DİĞER YÖNTEMLER.....	348
Defter (Muhasebe) Değeri.....	348
Net Aktif Değer.....	349
İşleyen Teşebbüs Değeri	349
Yeniden Yapma Değeri.....	350
Tasfiye Değeri.....	350

DÖRDÜNCÜ KISIM

17. BÖLÜM

KPSS, SMMM, BANKALAR VE DİĞER KURUM SINAVLARINA HAZIRLIK .	351
KAYNAKÇA	413
EKLER.....	419

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İÇİNDEKİLER

YAZARLAR	V
SUNUŞ	Vii
ÖN SÖZ	ix
1. BÖLÜM	GASTRONOMİ MÜHENDİSLİĞİNE GİRİŞ.....	1
2. BÖLÜM	YEMEĞİN YAPISI: GIDA FİZİĞİ	11
3. BÖLÜM	YEMEĞİN MİKRO YAPILARI VE ETKİLEŞİMİ: GIDA KİMYASI.....	43
4. BÖLÜM	YEMEĞİN HÜCRELERİ VE MİKROPLARI: GIDALARIN BİYOLOJİSİ	73
5. BÖLÜM	BİR TUTAM MATEMATİK: GASTRONOMİ MATEMATİĞİ.....	93
6. BÖLÜM	YEMEĞE YOLCULUK: ÜRÜN VE PROSES TASARIMI.....	119
7. BÖLÜM	MUTFAKTA ISI VAR: BESLENME VE MUTFAK TERMODİNAMIĞI	145
8. BÖLÜM	VÜCUDUMUZDAKİ MOLEKÜLLER VE BESİNLER: BESLENME ...	163
9. BÖLÜM	ÇİFTLİK VE ÇATAL ARASINDAKİ YEMEK: GIDA GÜVENLİĞİ.....	181
10. BÖLÜM	BEYİN VE HÜCRE ARASINDA: NÖROGASTRONOMİ VE BESLENME FİZYOLOJİSİ	199
11. BÖLÜM	YEMEĞİN TADI TUZU NASIL? YEMEĞİN TASARIMI VE DUYUSAL DEĞERLENDİRME.....	217
12. BÖLÜM	YEMEĞİN TARİHİ, KÜLTÜRÜ VE GELENEKLERİ.....	243
13. BÖLÜM	MÜHENDİSLİK İÇEREN BİR MENÜ.....	255

1. BÖLÜM

GASTRONOMİ MÜHENDİSLİĞİNE GİRİŞ

Murat Doğan

Giriş

Bir şefin hazırladığı yemeğin tadı, lezzeti, görselliği gibi tüm özelliklerini bütüncül bir bakış açısıyla değerlendirmesi gerekmektedir. Bu bakış açısı da gastronomi alanının mühendislik bilgi, beceri ve deneyimlerine açılması ile mümkün olacaktır. Yemeğin mühendislikle ilişkisinin gözler önüne serilmesi ve bir şefin mühendislik becerilerini kullanarak yemek üretme süreçlerini yönetmesi en önemli kazanımların başında gelmektedir. Yemeğin kalitesi ve lezzeti üretim süreçlerine bağlıdır ve bu nedenle bir şef, mühendislik bilimini kullanarak üretim süreçlerini geliştirebilmelidir. Aslında yemek hazırlama süreci bir mühendislik sürecidir ve reçetelerin; süreç yönetimi, hazırlama işlemleri, pişirme işlemleri gibi bileşenlerin etkin bir şekilde yönetilmesi gerekmektedir. Bu süreçlerin doğru bir şekilde yönetilebilmesi için yiyeceğin fiziksel, kimyasal, biyolojik ve termodinamik özelliklerine dikkat edilmelidir. Tüm bu nedenlerden dolayı bir şefin gastronomi mühendisliği alanında kendini geliştirmesi kaçınılmazdır. Teknolojideki ilerlemeler pişirme süreçlerini değiştirmiş ve gıda tedarik zincirini küresel hâle getirmiştir. Sonuç olarak bu bölümde; gastronomi mühendisliğinin ne olduğu, gastronomi mühendislerinin ne iş yaptığı, yiyeceklerin mühendislik prensiplerine dayalı bir şekilde üretilmesi ve gastronomi mühendisliğinin bileşenleri konularına kısaca değinilmiştir.

Yemeğin Mühendisi Olur mu?

Şefler olarak misafirlerimize sunduğumuz yiyeceklerin iki temel özelliği mevcuttur. Bunlar maddi ve maddi olmayan özelliklerdir. Misafirlerimiz yemeğin tadını, lezzetini, dokusunu ve görselliğini değerlendirerek kalitesini fiziksel olarak değerlendirmiş olurlar. Bunlar maddi özelliklerdir. Aynı zamanda misafirlerimiz yemeğin servis edilme şekliyle tutun da işletmenin nezaketine kadar maddi olmayan yönlerden etkilenirler. İşletme ve yönetim bilimi, “değeri maksimize et” demektir. Bir şefin bu değeri maksimize edebilmesi adına yemeğin somut ve soyut yönlerini dikkate alarak yola çıkması önemlidir. Tüm bunlara ek olarak yemeğin kalitesi ve lezzeti üretim süreçlerine derinden bağlıdır.

gelebilmektedir. Mutfakta ölçme, tartma ve tarifleri ölçeklendirebilecek yeteneği sağlayan matematik ise yemek hazırlama sürecinde matematiksel işlemlerin yapılmasında etkilidir. Doğru ölçüm ve hesaplamalar bir yemek tarifinin başarısını etkilemektedir. Bu bağlamda matematik becerileri yiyecek-içecek sektöründe çalışan şefler için çok önemlidir. Yemeğe yolculuğu sağlayacak olan ürün ve proses tasarımının anahtarı temel mühendislik bilgisi ve yemeğin ve mutfağın termodinamiği yiyeceklerin hazırlanması sürecinde çok önemlidir. Bu olgu ısı işlemlerin yiyeceklerin fiziksel ve kimyasal nitelikleri üzerinde çeşitli etkilere sahip olduğu ifade etmektedir. Çiftlik ve çatal arasındaki yemeğin gıda güvenliğine sorunsuz yolcuğu tüketici güvenini sürdürmek ve ekonomik kalkınmayı desteklemek açısından önemlidir. Gıda güvenliğini etkileyen faktörler arasında hijyen kurallarına uyum, eğitilmiş personel, doğru mutfak uygulamaları ve uygun saklama sıcaklığı yer almaktadır.

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2. BÖLÜM

YEMEĞİN YAPISI: GIDA FİZİĞİ

Nevruz Berna Tatlısu

Giriş

Fizik; enerji, zaman ve maddenin uzaydaki ilişkilerini gözlemleyen, deneysel, sınırsız teoriye dayanan bir bilim dalıdır. Gıda bilimi; mekanik, elektromanyetizma, termodinamik, katı hâl ve atom fiziği gibi pek çok fizik alt dalını doğrudan kullanır. Gıdaların, özellikle son yıllarda yapısal tasarım mühendisliğindeki popülerleşen önemi, gıdaların pek çok farklı bilim alanında kullanıldığı farkındalığı, gıda fiziğine yönelik bir ilgi alanı doğurmuştur. Gıdadan ürün yapılandırmasında tasarım ilkelerinin anlaşılabilirliğini, teknolojinin ve ilgili tekniklerin kullanımını sağlayan gıda fiziği, gıda mühendislerinin ve gıda teknolojisi uzmanlarının gıdanın yapısal değişikliklerini incelemelerine, süreç parametrelerini manipüle etmelerine ve gıda matrisine yüklenecek optimum içerik madde miktarını belirlemelerine yardımcı olabilmektedir ^[1].

Sistem tarafından işlenirken gıdada meydana gelen değişikliklerin anlaşılması, gıda malzemelerine yönelik sistemlerin etkin yürütülmesini sağlamaktadır. Ham gıdalar, doğası gereği biyolojiklerdir ve bu nedenle onları diğer üretilmiş ürünlerden ayıran sürece bağlı belirlenebilir ve benzersiz özelliklere sahiptirler. Gıda malzemeleri esas olarak biyolojik kökenli olduğundan doğal olarak oluşan ham maddelerde yaygın olarak bulunan düzensiz şekillere, normal olmayan frekans dağılımına, çeşitliliğe, besinsel içeriğe, olgunluğa ve alternatif faktörlere göre değişen özelliklere sahiptir ve çevresel faktörlerden, kimyasal, mikrobiyolojik reaksiyonlardan ve dahası enzimatik aktivitelerden etkilenirler. Bu nedenle bir gıdanın gözlemciden bağımsız, ölçülebilir, nicelleştirilebilir ve bileşenlerinin durumunu tanımlayan özellikleri fiziksel özellikleri olarak kabul edilir. Bir gıdanın mekaniksel, termal, elektriksel, optik, ses ve elektromanyetik işlemlerle süreçlerinin incelenmesi neticesinde belirlenen parametreler, o gıdanın fiziksel özelliklerini oluşturur ^[2].

Gıdaların fiziksel özelliklerini karakterize etmek için kullanılan bazı tanımlayıcı terimler arasında tokluğa karşı açlık, sertliğe karşı yumuşaklık, kuruluğa karşı nemlilik, gevrekliğe karşı elastiklik, pürüzlülüğe karşı pürüzsüzlük, gevrekliğe karşı ıslaklık ve ayrıca sıkılık, yapışkanlık, çiğnenebilirlik, olgunluk, yumuşaklık, pulluluk, kumluluk vb.

güvenliği sağlamak, yeni ve iyileştirilmiş gıda ürünleri geliştirmek üzere işleme operasyonları tasarlayabilmek ve bu operasyonları kontrol edebilmek için gıda üretimlerinin yürütüldüğü şirketlerde başucu kaynağı olarak kullanılması hedeflenmiştir.

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3. BÖLÜM

YEMEĞİN MİKRO YAPILARI VE ETKİLEŞİMİ: GIDA KİMYASI

Kübra Sağlam

Giriş

Gıda kimyası; gıda maddelerinin mikroyapılarını, bitkisel veya hayvansal kaynaklı gıdaların oluşumundan, üretiminden, pişirilmesinden, işlenmesinden, doğrudan tüketimine veya ambalajlanmasına, depolanmasına kadar gıda üretim zinciri sürecindeki kimyasal reaksiyonları ve bu reaksiyonların oluşturduğu yapıları inceleyen bir bilim dalıdır. Gıda kimyasının temel bileşenleri arasında karbonhidratlar, yağlar, proteinler, vitaminler, mineraller ve su yer alır. İnsan beslenmesinde bu bileşenlerin çeşitli gıdalarla birlikte alınması önemlidir. Gıda kimyasının bilinmesi, gıdaların üretimi, hazırlanması, analizi ve muhafazası için kullanılan yöntemlerde besin değerlerinin korunması ve halk sağlığının en uygun yöntemlerle desteklenmesi için hayati öneme sahiptir. Bu bölümde, gıda maddelerinin yapılarını, dokularını ve lezzetlerini belirleyen bileşenlerin üretiminden tüketimine kadar olan süreçteki kimyasal reaksiyonları ve bu reaksiyonların oluşturduğu yapılar incelenmiştir.

Gıda Kimyası

İnsanlığın günlük işleyişi kadar yeme-içme konusunda da büyük bir öneme sahiptir. Bu, gastronominin temel taşıdır. Yeme-içme, insanların sağlıklı ve dengeli bir yaşam sürdürmesi için gereklidir ve vücudun ihtiyaç duyduğu besinleri karşılamaya yöneliktir. Aynı zamanda yeme-içme deneyimi sırasında, gıdaların kimyasal bileşimi ve reaksiyonları; lezzet, aroma, renk ve dokuyu belirleyerek tat alma duygularını da etkileyerek insanların yaşam kalitesini artırır. Bu nedenle yeme-içme konusu, insan yaşamının vazgeçilmez bir parçasıdır ve insanların fiziksel ve psikolojik sağlığını etkileyen önemli bir faktördür ^[24].

Gıda kimyası; yemeklerin tadı, görünümü ve kokusu gibi birçok yönüyle ilgilidir ^[5]. Bu bileşenlerin özellikleri, yemeklerin yapılarını, dokularını ve lezzetlerini belirler. Örneğin, proteinler ısıya maruz kaldıklarında koagüle olabilir ve bu da yemeğin dokusunu değiştirir ^[6]. Tatlar, lezzetler ve aroma maddeleri, yemeklerin tadını ve kokusunu belirleyen önemli faktörlerdir. Tatlar genellikle tatlı, tuzlu, ekşi ve acıdır. Aroma

girerek kahverengi pigmentlerin oluşmasını ve etin içindeki proteinlerin denatüre olması ve yağların okside olması sonucu etin dokusu ve lezzeti değişerek karakteristik koku ve lezzet özelliklerinin ortaya çıkmasını sağlar ^[81]. Böylece etin lezzetini ve aromasını artırır. Bu nedenle biftek gibi etlerde pişirme yöntemi ve sıcaklık seçimi, etin lezzeti ve dokusu üzerinde önemli bir etkiye sahiptir ^[6].

Asit-Baz Reaksiyonları

Pişirme sürecinde asit-baz reaksiyonları yemeğin pH seviyesi üzerinde belirgin bir etkiye sahiptir. Bazı yemeklerin pişirilmesi sırasında asit-baz dengesi değişebilir ve pH seviyesinde değişiklikler meydana gelebilir. Bu değişiklikler; gıdanın tadını, dokusunu ve rengini etkileyebilir. Örneğin, limon suyu gibi asidik bir bileşenin pişirme sırasında kullanılması, yemeğin pH seviyesini düşürerek asidik özelliklerini artırır. Bununla birlikte aşırı ısıtma ve oksidasyon gibi faktörler, yağların sağlık açısından zararlı hâle gelmesine yol açabilir ve aroma ile lezzet oluşumuna olumsuz etki edebilir ^[36].

Pişirme sürecinde pH ve sıcaklık gibi faktörlerin kontrolü büyük önem taşır. Kimyasal reaksiyonlar belirli bir pH aralığında gerçekleşir, bu nedenle yemeğin pH değeri ayarlanmalıdır. Aynı şekilde farklı sıcaklık seviyeleri; farklı kimyasal reaksiyonları tetikleyebilir, bu yüzden pişirme sırasında sıcaklık kontrolü önemlidir ^[73].

Mayalama süreci sırasında ekşi mayalı ekmek yapımında ise laktik asit bakterilerinin sentezlediği asitler, ekmeğin pH seviyesinin düşmesine neden olur. Bu asitler, ekmek hamurunun küflenmesini önler ve ekmeğin raf ömrünü uzatır ^[34]. Bu durumda asit-baz reaksiyonları ekşi mayalı ekmek yapımındaki önemli bir faktördür.

Sonuç

Gıdalarda gerçekleşen kimyasal reaksiyonlar, pişirme işlemi sırasında gerçekleşir ve yemeğin lezzeti, kokusu, rengi ve besin değeri üzerinde etkili olmaktadır. Pişirme sırasında bu reaksiyonların kontrol altında tutulması, yemeğin kimyasının bilinmesi daha lezzetli, sağlıklı ve besleyici yemeklerin hazırlanmasına yardımcı olabilir. Gıda kimyası, pişirme sırasında meydana gelen bu kimyasal reaksiyonları anlamak ve kontrol etmek için önemlidir. Bu; daha lezzetli, besleyici ve sağlıklı yemeklerin hazırlanmasına yardımcı olabilir. Bu örnekler, gıda kimyasının gastronomi alanında ne kadar önemli olduğunu ve yemeklerin yapısını, dokusunu, lezzetini ve besin değerini nasıl etkilediğini göstermektedir. Gıda kimyası, yemeklerin pişirilmesi sırasında oluşan kimyasal reaksiyonları anlamak ve kontrol etmek için önemlidir.

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4. BÖLÜM

YEMEĞİN HÜCRELERİ VE MİKROPLARI: GIDALARIN BİYOLOJİSİ

Furkan Demirgöl

Giriş

Tüm canlılarda olduğu gibi insanların da yaşamsal fonksiyonlarını devam ettirebilmeleri için mutlaka beslenmeye ihtiyaçları vardır. İnsanların temel besin kaynaklarını, sindirilebilir özellikteki bitki, hayvan ve makro-mantarlar oluşturmaktadır. Bu kaynaklar aynı zamanda başka canlılar için de oldukça besleyici ve elverişli ortamlar olabilmektedir. Tıpkı insanlar gibi mikroorganizmalar da canlılıklarını sürdürebilmek ve nesillerini devam ettirebilmek için su, karbon ve azot ile çeşitli vitamin ve mineraller ihtiyacı duyar. Dolayısıyla tüm bu makro ve mikro elementleri içeren insan gıdaları, aynı zamanda bazı mikroorganizmaların da sevdikleri gıdalardır. Çok az sayıdaki gıda (yüksek sıcaklıklarda ısı işlem görmüş gıdalar gibi) hariç tüm gıdalar, belirli miktar ve çeşitlilikte farklı mikroorganizmaları içerirler ^[1]. Mikroorganizmalar, özelliklerine ve şartların uygunluğuna bağlı olarak gıdalarda sayılarını hızla artırabilir ve kısa süreler içinde inanılmaz miktarlara ulaşabilir. Bu açıdan insanların günlük diyetlerinin önemli bir parçasını, bilinçli ya da bilinçsiz şekilde tükettikleri mikroorganizma hücrelerinin oluşturduğu söylenebilir. 2014 yılında ABD’de yapılan bir çalışmaya ^[2] göre ABD Tarım Bakanlığının (USDA) önerisine göre (taze meyve-sebze, tam tahıllar, süt ürünleri ve yağsız etten oluşan) beslenenlerin her gün yaklaşık olarak 1,3 milyar kob (koloni oluşturan birim), vegan beslenenlerin her gün yaklaşık 6 milyon kob ve ortalama bir ABD’li gibi beslenenlerin (et ve süt ürünleri ile hazır gıdaları içeren) her gün yaklaşık olarak 1,4 milyon kob canlı mikroorganizma tükettikleri bildirilmiştir. Her gün diyetle, canlı mikroorganizma hücresi kadar, hatta çok daha fazla miktarda ölü mikroorganizma hücresinin tüketildiği düşünüldüğünde gıdalar sadece makro-mantar, bitki ve hayvan hücrelerinden değil, azımsanmayacak miktarlarda mikroorganizma hücrelerinden oluşmaktadır. Bu kapsamda gıdalar, mikroorganizmaların insanlara taşınması için önemli araçlardır. Ancak burada gıdaların mikroorganizmaların insanlara taşınmasında sadece araç olarak görev almadıkları, aynı zamanda doğrudan mikroorganizmaların hedefleri olabildikleri ve mikroorganizmaların gıdalarda gerçekleştirdikleri çeşitli metabolik faaliyetler sonucu gıdaların özelliklerinde belirli değişiklikler meydana geldiği göz ardı

gelişmeye devam etmeleri ve burada ürettikleri toksinler aracılığıyla ortaya çıkmaktadır [56]. Gıda kaynaklı toksikoenfeksiyon tipi hastalığa en sık neden olan bakteriler; *Aeromonas hydrophila*, *Bacillus cereus* (ishal tipi), *Clostridium perfringens*, enteropatojenik *E. coli* (EPEC), enterotoksijenik *E. coli* (ETEC) ve *Vibrio cholerae*'dir [57].

Sonuç

İnsanlar, hayatta kalabilmek için tüketmek zorunda oldukları gıdalarla birlikte her gün önemli miktarlarda mikroorganizma hücresi de tüketmektedirler. Sanılanın aksine mikroorganizmaların büyük çoğunluğu insanlar için zararsızdır. Bilinen yaklaşık 1400 insan patojeni mikroorganizma türü vardır ancak bu patojenler gezegendeki toplam mikrobiyal tür sayısının %1'inden çok daha azını oluşturmaktadırlar [58]. Hatta pek çok mikroorganizma türü insanlara çeşitli şekillerde fayda sağlamaktadır. Bununla birlikte bazı mikroorganizmaların veya mikroorganizmalar tarafından üretilen çeşitli metabolitlerin gıdalarla birlikte tüketilmesi ishalden kansere ve hatta ölüme kadar çok ciddi sağlık sorunlarının ortaya çıkmasına neden olabilmektedir. Gıda-mikroorganizma ilişkisinin iyi bilinmesi, gıda kaynaklı sağlık sorunlarının önüne geçilmesini sağlayacağı gibi faydalı mikroorganizmalar aracılığıyla gıdaların hem çeşit olarak hem de besinsel olarak zenginleştirilmesini sağlayacaktır.

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5. BÖLÜM

BİR TUTAM MATEMATİK: GASTRONOMİ MATEMATİĞİ

Gizem Hulağa Kaderoğlu

Giriş

Malzemelerin ölçülmesi, bileşenlerin orantılarının hesaplanması, tariflerin dönüştürülmesi, bir tarifin birkaç porsiyon için yeniden boyutlandırılması, öğün başına maliyetin belirlenmesi ve porsiyonlara ayrılması, toplama, çıkarma, çarpma ve bölme gibi temel matematik işlemlerini içerir. Malzemelerin yanlış ölçülmesi, bir tarifin başarılı veya başarısız olmasının en önemli nedenlerinden biridir. Ayrıca kesin olmayan ölçümler ve dönüşüm hesaplamaları, gıda maliyetlerini artırır. Yanlış porsiyonlama, tüketici memnuniyetsizliğine neden olur. Bu nedenle tüm şeflerin temel matematik işlemlerini anlamaları önemlidir.

Yemek servis operasyonlarını başarılı bir şekilde yürüten kişiler, bir tabak maliyetine doğru bir şekilde ulaşmak ve bir menüyü fiyatlandırmak için temel matematiğin gerekli olduğunu bilirler. Yemek servisinde diğer alanlara göre matematik kullanımı basittir. Burada kullanılan toplama, çıkarma, çarpma ve bölme, anlaşılması gereken temel matematiksel fonksiyonlardır. Bir hesap makinesi, matematiğin arkasındaki nedeni anladığımız sürece hesaplamaların doğruluğuna yardımcı olabilir. Aynı şekilde basit bir bilgisayar tablosu veya daha karmaşık bir envanter ve satın alma yazılım paketi de kullanılabilir ancak bilgisayar programlarının hesapladığı bilgileri anlamak için temeldeki matematiğin bilinmesi yine de gereklidir.

Ticari yemek hizmeti operasyonları kâr amaçlı işletmelerdir ve halka açıktır. Birçok ticari yemek servis işletmesi, açılışlarının ilk beş yılında işsizlikle karşı karşıya kalmaktadır. Bu noktaya gelmelerinin yaygın sebeplerinden biri, yanlış reçete maliyeti veya yanlış porsiyon kontrolleriyle ilgili nakit akışı sorunlarıdır. Yıkıcı olan bu hatalar genellikle temel matematikteki basit hatalardan kaynaklanmaktadır. Mutfakta doğru matematiğin uygulanması, nasıl yemek pişirildiğini ve yapılacak iş için ne kadar süre harcanacağını etkileyecektir. Bir işletmenin mutfağında rastlanılan yanlış ölçüm yapılması gibi bir yanlış matematik nedeniyle beklenenden daha düşük verimde sonuç alınması veya yiyecek maliyetlerinin artırılması gibi durumlarla karşılaşabilen işletme, sektördeki yerini

Sonuç

Matematik bilimi, her alanla olduğu gibi gastronomi alanıyla da multidisipliner bir yaklaşım içindedir. Gastronomi sektöründe mutfak malzemelerinin satın alınışı, menü hazırlığı, porsiyonlama, tariflerdeki ölçeklendirmelerin uygulanışı, işletmelerin maliyet hesaplamaları, zaman yönetimi gibi pek çok konuda matematiğin kullanımı karşımıza çıkmaktadır. Sektörde sıklıkla karşılaşılabileceği için matematiğin anlaşılması ve doğru kullanılması da bu nedenle çok önemlidir. Kullanım alanlarında matematiğe gerekli önemi gösteren işletmeler müşteri memnuniyetini kazanacak ve rakipleri arasında fark yaratacaktır.

Bir yiyecek içecek işletmesindeki satın alma, depolama, reçetelendirme, porsiyonlama ve servis etme gibi aşamalarda doğru matematik kullanımı, işletmenin eksiksiz servis yapabilmesini, gıda israfının önüne geçilebilmesini, gelir gider dengesini koruyabilmesini ve hatta kâr elde edebilmesini sağlayacaktır. Bu nedenle bu kitap bölümünde temel matematik işlemlerinden başlanarak gastronomi alanında matematikle karşılaşılabilecek alanlar tek tek başlıklar altında ele alınmıştır. Özellikle mutfakta kullanılan ölçü çeşitleri ve birimlerinin öğrenilmesi hem ulusal hem de uluslararası düzeyde bir hizmet sunabilmeyi sağlayacaktır. Maliyet, menü, envanter vb. hesaplamalar da iyi anlaşıldığı takdirde işletmelerde tekdüzeliği sağlayarak başarıyı işletmelere getirecektir. Mutfakta sağlanacak tekdüzelik ile herhangi bir problem çıktığında sorunun nerede olduğu kolaylıkla anlaşılabilir ve çözülecektir. Aynı zamanda bu tekdüzelik müşterilerin geliş sayısını artıracak ve her seferinde memnun ayrılmalarını sağlayarak işletmenin imajını rekabet piyasasında üst sıralara çıkaracaktır. Bu gibi sağladığı faydalar nedeniyle matematiğin gastronomide kullanımına gereken önem verilmelidir.

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6. BÖLÜM

YEMEĞE YOLCULUK: ÜRÜN VE PROSES TASARIMI

Murat Ay

Giriş

Gastronomi, yerel yemek çeşitlerini ve mutfakları daha iyi anlamamıza yardımcı olan eşsiz bir bilim dalıdır. Günümüzde yemek yeme alışkanlığının evden dışarıda yemek yemeye doğru değiştiği görülmektedir. Bu durum da yiyeceklerin kalitesi, maliyeti, tadı ve sağlıklı olmasının yanı sıra çeşitliliği ve üretim yönteminin önem kazanmasını sağlamaktadır. Gıdaların endüstriyel işlenmesi proses mühendisliği kavramını ön plana çıkarmaktadır. Bu kavram; mutfak, yemek pişirme, gastronomi ve mühendislik bilgilerini içine almaktadır. Özellikle gıda malzemeleri biliminin, deneysel gastronomik formülasyonlara ve pişirme tekniklerine ışık tutabileceği, bunların tencere ve fırınlarda meydana gelen olaylara da uyarlanabileceği ve sonuçların aşılara basit terimlerle sunulabileceği düşünülmektedir. Bununla birlikte proses mühendisliğinin gastronominin güvenlik, sürdürülebilirlik, beslenme ve daha iyi gıda kullanımı ile ilgili boyutunda önemli katkılar sağladığı muhakkaktır. Bu bölümde, yemek pişirmede kullanılan proses mühendisliği konuları hakkında bilgi verilmesi amaçlanmıştır.

Yemeğe Yolculuk

Günümüzden yaklaşık 2 milyon yıl önce ateşin keşfedilmesi, zamanla yemeğin pişirilerek tüketilmesine yol açmıştır. Bu durum da gıdaların işlenmesinin başlangıcı olarak kabul edilmektedir^[1]. MÖ 10.000’li yıllarda tarımın başlamasıyla, hasattan sonra güneşte kurutma ve doğal fermantasyon yoluyla mevsimlik gıdaların korunması ihtiyacı ortaya çıkmıştır. Coğrafi keşiflerin hız kazandığı 16. yüzyıla gelindiğinde ise Avrupa yemekleri Doğu ve Yeni Dünya’dan gelen yiyeceklerle zenginleşmiştir. Bu süreçte yöresel mutfaklar ve geleneksel gıda teknolojileri sağlam ve destekleyici bir bilimsel alt yapı olmadan gelişmiştir. Bilim ve gastronomi, tarihsel olarak açıkça izole edilmiş iki disiplindir. Buna iyi bir örnek, Nicholas Kurti’nin 1969’da söylediği ünlü cümledir: “Venüs’ün atmosferindeki sıcaklığı ölçebildiğimiz hâlde, suflelerimizin içinde neler olup bittiğini bilmememiz, uygarlığımızın üzücü bir yansımasıdır”^[2].

alanlarına bağlantılı olmamalıdır.^[30] Aynı şekilde mutfak yöneticileri için ofisler planlanmalı, şef ofisi camekânlı ve bütün üretim alanına hâkim bir yere konumlandırılmalıdır^[32].

Sonuç

Günümüzden milyonlarca yıl önce ateşin bulunması insanların beslenmesinde de köklü bir değişimin temellerinin atılmasına neden olmuştur. Günümüze gelen süreçte yemek yemek sadece fizyolojik bir ihtiyaç olmaktan çıkmış, haz ve esenlik ile ilişkili bütünsel yansımaları içeren gastronomi kavramını ortaya çıkarmıştır. Ancak gastronominin bir bilim dalı olarak kabul edilmesi ve gastronominin temelini oluşturan mutfaklarda bilimin kullanılmaya başlanması son zamanlarda mümkün olmuştur. Oysaki tüketicilerin “lezzetli ve hijyenik yemek” beklentilerini karşılayabilmek ancak bilimin uygulandığı mutfaklarda gerçekleştirilebilir. Ürünlerin işlenmesi sırasında malzemelerde meydana gelen değişimlerin modellenmesi, yeni ürünlerin geliştirilmesi, teknolojilerin mutfaklara uygulanması ve hepsinden önemlisi üretimin hijyen kurallarına ve standartlara uygun bir mutfakta gerçekleştirilmesi “proses mühendisleri” ile mümkündür.

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7. BÖLÜM

MUTFAKTA ISI VAR: BESLENME VE MUTFAK TERMODİNAMIĞI

Abdullah Baycar

Giriş

Canlılığın ortak ihtiyaçlarından biri olan beslenme, günümüzde insanlar için gereksinimden öte anlamlar ifade etmeye başlamıştır. Lezzet, sağlık, estetik ve maliyet gibi faktörler bu anlamlardan bazılarıdır. Belli dönemlerde yaşanan değişim ve dönüşümler bu faktörlerin gelişmesinde önemli rol oynamıştır. Ateşin keşfi, bu dönüşümün kritik noktalarından biri olarak kabul edilmektedir. Taşların birbirine vurulması veya ahşap çubukların sürtünmesiyle oluşturulan ateş; besin güvenliği, saklama süresi ve lezzet tatmini gibi farklı amaçlarla kullanılmıştır. Baca ve şömine gibi kısımlarda kontrolsüz açık ateş 18. yüzyılda sobaların icadıyla daha kullanışlı hâle bürünmüştür. Zamanla ısı gereksinimi ateş dışı kaynaklarla kontrollü, güvenli, etkili ve pratik bir şekilde mutfakta kullanılma imkânına ulaşmış oldu. Tandır, saç, pileki, fırın, ocak, evaporatör, pastörizatör, ekstrüder gibi birçok konveksiyonel ve/veya modern gereç tarih boyunca ateşin mutfakta kullanım vasıtalarından sadece bazılarıdır ^[1, 3].

Mutfaklarda ısı verme prensibine dayalı teknikler gibi ısı alma prensibine dayalı tekniklerin de yiyeceklerde kullanımı geçmişten bugüne sürekli var olmuştur. Önceki dönemlerde yiyeceklerin sarnıç gibi daha soğuk yerlerde raf ömürlerinin uzatılması amacıyla bekletilmesi bu duruma örnek olarak gösterilebilir. Aynı şekilde yüksek kesimlerden getirilen kar ve buz kütlelerinin şerbet soğutulmasında kullanımı eski dönemlerde ısı alma prensibinin de yiyeceklerde farklı yöntemlerle kullanıldığına örnek başka bir örnektir. Son zamanlarda soğutucu ve dondurucu dolapların pratik yapıya ulaşmasıyla kullanımları daha fazla yaygınlık kazanmıştır. Bu tür dolaplar, küçük ve büyük hacimli bütün mutfaklarda ana gereç hâline gelmiştir ^[4, 5].

Bilim ve teknolojinin mutfakta daha farklı varyasyonlarda moleküler gastronomi ile yer almaya başlamamıştır. Bu vasıtayla ısı; yiyeceklerde bilim, sanat ve mühendislik gösterisine dönüşmüştür. Sıvı azot ve karbondioksitin mutfaklar da kriyojenik dondurucu olarak kullanılmasıyla yemeklerde işlevselliğin farklı bir boyuta evrilmiş olması bu durumun çarpıcı örneği olarak gösterilebilir. Nitekim bu yöntemlerle ağız ve burundan

çiğ formda tüketilemeyip ancak haşlama gibi ısı işlemlerle yumuşatılması buna örnek gösterilebilir. Aynı şekilde makro yapılu birçok bileşiğin ısı işlemler sonucunda daha basit yapılara parçalanarak sindirim ve emilimi artmaktadır. Buna karşın ısı işlemler besin öğelerinde azalmaya da sebep olmaktadır.

Mutfakta ısı yönetiminin önemli hususlarından biri de ısı veren ve ısı alan makina ve teçhizatın enerji tasarrufu ve ergonomi açısından dizaynıdır. Soğutucu ve ısıtıcı makinaların birbirine mesafeli bir şekilde tasarlanması enerjinin daha verimli kullanılmasını sağlamaktadır. Ayrıca mutfak sıcaklığı; çalışan refahı ve huzuru açısından da önem teşkil etmektedir. Yüksek sıcaklık, mutfakta hamur gibi yarı mamullerin hazırlanmasını zorlaştırırken düşük sıcaklık, fermantasyon gibi mutfak işlemlerini yavaşlatmaktadır. Her ürün ve yemek için ideal sıcaklıklar belirlenmiş, mutfak kısımları sıcaklıkları ve bu kısımlar arası gerekli izolasyon önerileri geliştirilmiştir.

Sonuç olarak çalışan ergonomisi, besin güvenliği, yiyecek hijyeni, raf ömrü, tat-aroma, biyoerişilebilirlik vb. birçok faktörü etkileyen sıcaklık, mutfakta kontrollü ısının transferiyle sağlanmaktadır. Bu bağlamda ısının yönetimi mutfakta çoklu etmeni birden dikkate almayı gerektiren yüksek düzeyde mühendislik kabiliyet gerektirmektedir.

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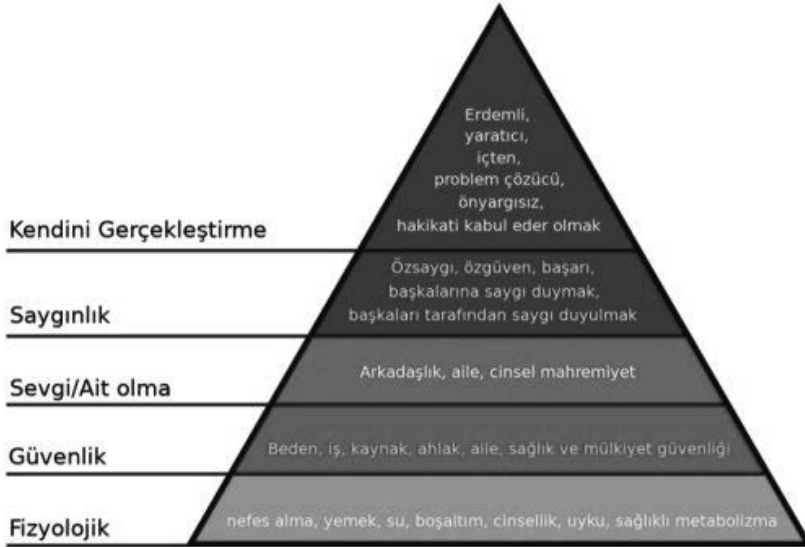
8. BÖLÜM

VÜCÜDUMUZDAKİ MOLEKÜLLER VE BESİNLER: BESLENME

Ayşe Seray Çetin

Giriş

İnsanlığın var olmasından bu yana hayatın devamlılığı için beslenme temel şarttır. Yemek yeme, Maslow'un ihtiyaçlar hiyerarşisi teorisinde ilk basamakta yer alan fizyolojik ihtiyaçların içindedir ^[1]. Ama fizyolojik bir ihtiyaçtan daha fazlasını ifade eden yemek, sadece beslenme olarak düşünülemez. Çünkü yemek, kültürel bir olgu olarak da karşımıza çıkmaktadır. Hayatın devamlılığı için gerek duyulan besinleri tüketime hazır hâle getirmek yemeği sadece fizyolojik bir ihtiyaç olmaktan çıkararak kültürle de ilişkili bir olguya dönüştürmüştür. Her kültürde belli başlı olarak hangi gıdaların yenilip yenilmeyeceği veya nasıl tüketileceği kurallarla belirlenmiştir. Ayrıca yemek; sadece fiziksel olarak değil, ruhsal olarak da doygunluk sağlamaktadır ^[2, 3].



Şekil 1. Maslow'un İhtiyaçlar Piramidi ^[4,5]

Gıda alerjisi ile baş edebilmek için tüketicilerin menü ile ilgili sorularını yanıtlayabilecek ve yemeklerin içeriklerine hâkim, çapraz temas ve kontaminasyonlar hakkında bilgi sahibi olan ve bunlardan kaçınmak için izlenecek yolları bilen, bu konularda eğitim almış çalışanların işletmelerde bulunması gerekmektedir [67].

Tüm bunlar dışında ambalajlı ürünler de alerji bakımından büyük tehlike taşımaktadır. Bu sebeple 29960 sayılı Gıda Etiketleme ve Tüketicileri Bilgilendirme Yönetmeliği'ne uyularak ambalajlı ürünlerin etiketlenmesi hususuna dikkat edilmelidir.

Bir ürünün ambalajının üzerinde yer alan bilgilere etiket adı verilmektedir [68]. Etiketler, gıda alerjisi veya intoleransına sahip bireylerin alerjenlerden korunması ve olası alerjik reaksiyonların önüne geçilmesi için önemlidir. Bu noktada her tüketicinin etiket okumayı bilmesi ve etiket okuma alışkanlığı kazanması gerekmektedir. Alerji ve intoleranslardan kaçınmak için yapılacak olan gıda etiketi okuma eylemi sadece enerji ve besin öğelerine bakmakla sınırlı kalmamalıdır. Etiket üzerinde yönetmeliğe uygun olarak gerekli bildirimlerin yapılmış olmasına ve bunları doğru yorumlamaya dikkat etmek önemlidir. Bazen gıda üreticileri ürünlerin içindeki bileşenleri değiştirse bile ambalajı değiştirmezler. Dolayısıyla bir ürün ne kadar sık tüketilip alınan bir ürün olsa bile etiketi her defasında okumak gerekmektedir [69].

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9. BÖLÜM

ÇİFTLİK VE ÇATAL ARASINDAKİ YEMEK: GIDA GÜVENLİĞİ

Esra Doğu Baykut

Giriş

Gıda güvenliği, insanların var olduğu her dönemde önemli olan küresel bir sorundur. Dünya Sağlık Örgütü'nün (WHO) tahminlerine göre her yıl kontamine gıda tüketimi sebebiyle 420 bin ölüm meydana gelmektedir ^[1]. Halk sağlığını koruyabilmek için hem gelişmekte olan ülkeler hem de gelişmiş ülkeler gıda güvenliğini sağlamaya çaba göstermektedir. Gıda kaynaklı hastalıklar sadece insanların sağlığını etkilemekle kalmaz, aynı zamanda işletmeler ve ülkeler için ekonomik sonuçlar da doğurur. Etkili gıda güvenliği sistemleri, tüketicinin gıda sistemine olan güvenini sürdürmekte ve ekonomik kalkınmayı desteklemekte hayati öneme sahiptir.

Tüketiciler, satın aldıkları gıdayı tedarik edenlerin kendilerine zarar vermeyecek ürünleri üretmek için her türlü özeni göstermelerini bekleme hakkına sahiptir. Dünyadaki tüm ülkeler, hiçbir tüketicinin gıda tüketimini takiben herhangi bir enfeksiyon veya hastalık yaşamaması için çaba göstermektedir ve hemen hemen her ülkenin gıda güvenliği ile ilgili standartları bulunmaktadır. Gıdaların tehlikelerinden arınmış olmasını sağlamak, tüm gıda işletmeleri için ekonomik boyutunun yanı sıra yasal ve ahlaki bir görevdir.

Gıda güvenliği programları, gıda kaynaklı tehlikeleri azaltmanın etkili bir yolu olarak çiftlikten sofraya yaklaşımına giderek daha fazla odaklanmaktadır. Bu yaklaşıma göre gıda güvenliği geniş alandır ve tam olarak ele almak için tohum veya hayvancılığı kapsayan birinci üretim dâhil olmak üzere tüketiciye ulaşan son ürüne kadarki süreçteki tüm gıda zincirinin takibi ve izlenebilirliği sağlanmalıdır.

Son yıllarda ev dışı yemek tüketimi sürekli artmaktadır. Restoranlar, catering işletmeleri, yiyecek içecek hizmeti veren oteller ve hastane, okul gibi diğer kurumlarda gıda güvenliğinin sağlanması önem arz etmektedir. Gıda üretiminin tüm aşamalarında hijyen ve sanitasyon kurallarına uyulması, çalışanlara gerekli eğitimlerin verilerek standartlara uygun mutfaklarda doğru şekilde üretimin yapılması gerekmektedir. Yemeklerin uygun olmayan sıcaklıklarda saklanması, kötü kişisel hijyen, kontamine

Gıda endüstrisinde gıda güvenlik yönetim sistemlerinin uygulanması hem sanayicilere hem distribütörlere hem de müşterilere gıda güvenliğini garanti eder. Tüketicilerin uluslararası standartlara uygun, kaliteli, güvenilir ve sağlık açısından risk oluşturmayan ürün ve hizmet almalarını sağlar. Gıda ticaretinin artan küreselleşmesi, uluslararası gıda güvenliği kontrol önlemlerini uyumlu hâle getirme ihtiyacına da yol açmıştır. Standartların, spesifikasyonların ve düzenlemelerin uyumlaştırılması uluslararası ticaret için kritik öneme sahiptir. Uyumlaştırmanın amacı, ticaretin önündeki engelleri azaltmak ve böylece gıda ürünlerinin ülkeler arasında daha serbest dolaşımını artırmaktır.

Gıda kaynaklı tehlikeler, gıda zincirinin herhangi bir basamağında ortaya çıkabilir ve gıda güvenliğini tehlikeye sokabilir. Bu nedenle çiftlikten çatala yaklaşımının benimsenmesi ve gıda tedarik zinciri boyunca etkin bir kontrolün gerçekleştirilmesi önemlidir. Gıda güvenliğinin sağlanabilmesi için birincil üretimden tüketiciye kadar gıda tedarik zincirinin tüm aşamalarındaki birimlerin sorumluluklarını yerine getirmesi ile sağlanabilir.

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10. BÖLÜM

BEYİN VE HÜCRE ARASINDA: NÖROGASTRONOMİ VE BESLENME FİZYOLOJİSİ

Umay Sevgi Vardar

Gizem Hılağa Kaderoğlu

Giriş

Yemek yemek neden insanlar için bu kadar önemli bir duyuşal deneyimdir? Diđer canlılardan farklı olarak insanların yemek yerken yüzlerinde farklı ifadeler oluşur. Biz insanların yemek yerken zevk aldığımızın çıkarımını yüzlerinden rahatlıkla yapabiliriz. Hatta bundan duyulan zevk, iyi yemek yemeyi bir meslek olarak karşımıza çıkarmış ve gastronomi sektörünün önünü açmıştır.

Ateş keşfetmenin ve yemek pişirmenin yanı sıra, insanlar lezzetleri algılamak için benzersiz bir şekilde uyarlanmıştır. Lezzet, tat almaktan çok daha fazlası olarak ifade edilmektedir. Hazırladığımız ve yediğimiz yiyecekler aromalı moleküller içerse de aslında aromanın kendisi anatomimiz, fizyolojimiz, sinir sistemimiz arasındaki ilişki tarafından oluşturulmakta ve beyinde yorumlanmaktadır. Bu ilişki gastronomi alanında bir trend hâline gelen nörogastromoni kavramı ile anlaşılmaya çalışılmaktadır. Bu kavram temelde, bize lezzeti nasıl algıladığımızı göstermekte; bu sayede damak tadı gibi insana özgü özellikler ya da dünya genelinde yerel ve bölgesel mutfakların ortaya çıkışı gibi noktaların arka planları hakkında bilgi sahibi olunabilmektedir ^[1].

Nörogastromoni kavramı, disiplinlerarası çalışmaların yürütülmesi ile insan beyinde yemek yeme deneyimi esnasında gerçekleşen durumları ortaya koymaktadır. İnsanların yemek yeme tercihlerini değiştirmek için kullanılabilmesi gibi beslenme alışkanlıklarını sağlıklı hâle yönlendirebilme, hastalıklarda kullanılabilme, yeme deneyimini iyileştirme gibi durumlarda da etkili rol almaktadır. Kavramın daha iyi anlaşılabilmesi için bölümde nörogastromoni kavramının tanımına ve gelişim sürecine, kavramla ilgili diđer temel tanımlara, beyinde oluşan mekanizmalara, ilgili etken parametrelere, hastalıklarda ve sağlıklı beslenme durumlarında kullanılma olanaklarına yer verilmiştir.

anlaşmıştır. Nörogastronomi aracılığıyla sağlıklı beslenme, obezite, uyuşturucu vb. bağımlılıklar, şeker hastalığı veya Alzheimer gibi nörodejeneratif hastalıklar üzerine olumlu gelişmeler sağlanabilmektedir. Sağlıklı beslenme ya da hastalıklar dışında sevilmeyen gıdaların insanlara farkında olmadan yedirilebilmesi noktasında ya da tat duyusunu kaybetmiş bir bireye yeniden tat alabilmesi işlevsellikleri de bulunmaktadır. Ayrıca farklı duyu kombinasyonlarının kullanımı ile yemek yeme esnasındaki deneyimleri unutulmaz hâle getirebilmekte; yemekten alınan lezzeti çok yüksek noktalara çıkarabilmektedir.

Genel anlamda nörogastronomi, insanların gıda ile olan ilişkisinin fiziksel ve psikolojik yönlerinin anlaşılmasını ve nasıl yediğinden öte neden yediği sorusunun cevabını arayan, obezite vb. yeme bozukluklarından kaynaklanan hastalıkların önüne geçilmesi için alternatif çalışmalar yürütülen bir alan/kavramdır. Kavramın iyi anlaşılması ve beyindeki lezzet mekanizmasının çözülerek tüketim esnasında kullanılması ile bireylere farklı yeme deneyimleri sunulabilecektir. Nörogastronomi üzerine çalışanların diğer bilim insanları ile bir araya gelerek farklı duylardan ve farklı bilim dallarından ya da unsurlardan faydalanarak yürütecekleri çalışmalar ya da gerçekleştirecekleri menüler insanların yeme kalitesini artıracak bir etkiye sahiptir. Bu nedenle kavram üzerine gerçekleştirilecek çalışmalar ile gelecekte lezzet algısındaki hoşnutsuzlukların, beslenme şekli kaynaklı hastalıkların, tat kayıplarının, vb. durumların yaşanmasının önüne geçileceği; hedonik zevklere yönelik işletmelerde duyu unsurlarının daha fazla kullanımının olacağı düşünülmektedir.

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11. BÖLÜM

YEMEĞİN TADI TUZU NASIL? YEMEĞİN TASARIMI VE DUYUSAL DEĞERLENDİRME

Emel Çirişođlu

Ayşe Seray Çetin

Giriş

Gıdaların hazırlanışında alternatifler üretebilmek için temel tatların tanınması gereklidir. Besinler, burunda, ağızda, boğazda ve midede sinir hücrelerini uyaran küçük moleküller (reseptörler) barındırmaktadır. Bu hücreler aracılığıyla beyne, alınan tatlarla ilişkin mesajlar iletilmekte ve bunun sonucunda ise tatlı, ekşi, acı, tuzlu, umami olmak üzere tatların hissedilmesini sağlamaktadır ^[1].

Gıdaların lezzeti, içerdığı aromatik maddelere bađlı olarak deđişkenlik gösterir. Gıdaların lezzetinin büyük bir kısmı (%80'i) koku maddelerinden gelmektedir. Gıdaların lezzet tasarımlarının yapılması, aynı ve benzer bileşenlerin eşleştirilmesi, benzer aromatik maddeleri içeren gıdaların bir araya getirilmesi ile yapılmaktadır ^[2]. Böylelikle lezzetin yoğunluğu artırılmaktadır. Lezzet, yiyeceklerle ilişkili duyuşsal algıların toplamını ifade etmektedir ^[3]. Brillat-Savarin, lezzetlerin sayısının sonsuz olduğunu ve her çözünür cismin hiçbir şeye benzemeyen özel bir tadı olduğunu belirtmektedir. Bu yüzden tüm lezzetlerin deđerlendirilmesi ve sınıflandırılmasının zor olduğunu ve lezzetlerin eşleştirilerek sonsuz lezzet dizilerinin ortaya çıkabileceđini ifade eder. Bu sebeple lezzetlerin etkilerini tanımlarken acı, tatlı, ekşi, şekerli, asitli, kekremsi gibi genel ifade kalıpları kullanılmış, lezzetlerin tatsal nitelikleri yaklaşık olarak ifade edilmiştir ^[4].

Bu bölümde tat ve lezzet kavramları detaylı olarak ele alınmıştır. Gıdalardaki tat, koku ve aroma maddeleri, lezzetli bileşenler, duyuşsal algı ve tüketici tercihleri, tüketici istekleri, duyuşsal algılama süreci, duyuşsal kararı etkileyen tercihler, gıda-lezzet tasarımları ve gıda eşleştirmeleri ele alınmıştır.

deneyimleri farklı kanallardan başka tüketicilere aktarma gibi değişkenlere evrildiği göz önünde bulundurulmalıdır. Böylelikle gıda-lezzet tasarımlarının tüketici beklentilerini karşılaması yönünde kolaylık sağlanacaktır.

Son dönemlerde gastronomi uzmanları, mutfak şeflerinin inovasyon ve yaratıcılık üzerine daha çok yoğunlaştığı göz önünde bulundurulduğunda Türk gastronomisinin çeşitliliği sayesinde lezzet ağının genişletilmesi, mutfak kültüründe sıklıkla yer alan lezzetlere dair aroma bileşenlerin ortaya koyulması, bu bileşenlerin ve gıdalarda yer alan aroma moleküllerinin araştırılması ve eşleştirilmesi ile Türk gastronomisinin gelişimine katkı sağlanabilir. Aynı zamanda tüketicilerin yeni arayışlarına hitap eden ve şeflerin yaratıcılığını da ortaya koyan çok yönlü bir faaliyet alanı oluşturulmasına olanak sağlar. Yapılacak eşleştirmeler sayesinde mutfak kültürüne özgü yeni lezzet ağları oluşturulabilir.

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12. BÖLÜM

YEMEĞİN TARİHİ, KÜLTÜRÜ VE GELENEKLERİ

Oğuzhan Köklü

Giriş

Gıda, insanlık tarihindeki en belirleyici ve yönlendirici faktörler arasında gelmektedir. Tüm faaliyetleri için enerjiye ihtiyaç duyan insanoğlunun bu enerjiyi temin ettiği birinci unsur tükettiği besinlerdir. Dolayısıyla, geçmişe baktığımızda toplu ya da bireysel fark etmeksizin insan davranışlarını biçimlendiren en temel şeyin gıda olduğunu görmekteyiz.

Gıdaya erişim ihtiyacı insanları devamlı hareket hâlinde tutmuş ve büyük atılımların önünü açmıştır. İnsanlık tarihindeki kritik olay ve dönemlere bakıldığında gıdanın etkisine mutlaka rastlanılmaktadır.

Hâl böyleyken gıdanın insan hayatında kültürel bir zemine yerleşmesi şaşırtıcı olmayacaktır. Açıkça görülmektedir ki dünyanın neresinden olursa olsun tüm insan toplulukları özel gün ve olayları yemek eşliğinde ölümsüzleştirme âdeti edinmiştir. Bu sayede her toplum yemek üzerinden köklü bir gelenek ve kültür meydana getirmiştir. Bu kültür, toplumların yemek vasıtasıyla kendilerine has kimlikler geliştirmesinin önünü açarak beslenmeye dair elementler üzerinden insan gruplarının birbirinden ayrışmasını da sağlamıştır. Bu bölümde gastronomi mühendisliğinin sosyal bileşenlerinden yemek tarihi, kültürü ve gelenekleri hakkında detaylı bilgi verilmiştir.

Tarihsel Süreç

İnsanlık, varoluşundan bu yana gıdaya erişmek için farklı metotlara başvurmuştur. Bu metotlar, dönemin kolektif zekâsına ve olanaklarına bağlı olarak kendini göstermiştir. İlk olarak milyonlarca yıl boyunca insanlığın temel gıda üretim yöntemi avcılık ve toplayıcılık olmuştur. Küçük kümeler hâlinde örgütlenen insanlar, doğadan hazır olarak elde ettikleri besinler ya da kendi öldürdükleri hayvanlar üzerinden beslenmelerini sağlamışlardır ^[1].

Mantıksal açıdan bakacak olursak toplayıcılığın avcılıktan daha kadim bir alışkanlık olduğu düşünülebilir. Şüphesiz ki avcılık faaliyeti daha yoğun bir zekâ, koordinasyon, öğrenme süreci ve fiziksel kabiliyet gerektirir. Bunların oluşabilmesi için de belli bir süre

yerleşmiştir ki toplu hâlde helva yiyen yahut büyük miktarda helva kavrulduğunu gören her bir Türk insanı, ilk olarak birinin öldüğü düşüncesine kapılır.

Benzer şekilde Türk kahvesi de varlığının ötesinde anlamlar kazanmış bir içecektir. “Bir kahvenin 40 yıl hatırı vardır.” sözüyle Türk toplumunda kahvenin muhabbeti, ahbablığı, iyi ilişkileri ifade ettiği vurgulanmaktadır. Bunun dışında, kız isteme törenlerinin ayrılmaz bir ögesi de yine kahvedir. Kahvenin taşıdığı bu kavramsal zenginlik onu Türk toplumu içinde özel bir konuma yerleştirmektedir.

Bu gibi örnekleri çoğaltmak mümkündür. Ekmek, nar, tuz, şerbet, rakı, güllaç, ramazan pidesi, simit gibi sayısız gıda ürünü salt birer yiyecek olmanın ötesinde anlamlar barındırmakta ve toplumsal ölçekte kültürel boyutlar taşımaktadır. Elbette burada örnek olarak gösterilen gıdalar Türk toplumu için geçerli olup farklı toplumlarda bambaşka manalar yüklenebilmektedir. Bu manaların deşifre edilmesiyle, farklı insan topluluklarının zihinsel kodlarının deşifre edilmesi mümkün hâle gelecektir.

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13. BÖLÜM

MÜHENDİSLİK İÇEREN BİR MENÜ

Tolgahan Tabak

Mehmet Taş

Hayrettin Mutlu

Giriş

Son 50 yıllık araştırmaların geneli incelendiğinde gıda endüstrisindeki gelişmeler ve gıda geliştirme konularının hızlı bir yükselişte olduğu ortaya çıkmaktadır. Endüstriyel gıdaların üretimleri maliyet ve gıda güvenliği sebebi ile gıda mühendisliğinin gelişmesine sebep olmuştur. Modern tüketicinin dışarıda yemek yeme eğilimlerinin artması ve bu eksene dâhil olması lezzet, görsellik, sağlık ve haz duygularının da ön plana çıkmasını sağlamıştır. Bu pragmatik değişiklikler, gıdaların daha nano boyutlarda ele alınmasına sebep olarak birçok bilim dalı için yemek biliminin daha derinlemesine incelenmesini sağlamıştır ^[1, 2].

Kaliteli ve zevk odaklı yemek yeme eğilimi gıda mühendisleri tarafından anlaşılacakla birlikte yeni arayışları ortaya çıkarmıştır. Yemeği bir zevk alınan malzeme odağı hâline getirebilen şeflerin yaratıcılığı ve lezzet karışımları birçok bilim alanı tarafından incelemeye alınmıştır. Alanında birçok bilim altyapısı barındıran yemek hazırlama proses süreci; ısı aktarımı, uygun iletkenlik, sosların emülsiyonları, kütle transfer ekstraksiyonları, boyutlarını küçültmek ve dondurarak kurutma gibi birçok yöntemi ortak kullanır. Gıda mühendisliği ve gastronominin ortak altyapı ile çalışması gastronomi mühendisliğinin (GM) ortaya çıkmasını sağlamıştır. Hızlı gıda üretim prosesleri ve şeflerin yaratıcılık- yeteneklerinin bilimsel olarak incelenmesi geleceğin birçok yeni mesleğinin ve yemeklerinin doğuşunun mesajını vermektedir ^[3].

Aşçılar ve bilim arasındaki bu ilişki moleküler ve fizik tabanlı mutfak anlayışıyla daha ön plana çıkmış ve birçok kantitatif çalışmanın mutfakta yer almasını sağlamıştır. Aynı zamanda bilim ile ortak iş birliği içerisinde bulunan şefler yeni teknikleri geliştirmiş ve gıdalarda alınan haz duygularını arttırmışlardır. Bazı deneyler eşsiz dokular ve şaşırtıcı tatların ortaya çıkmasını sağlamıştır ^[4, 5]. Bu bölümde mühendislik bilgi ve deneyimleri ışığında menü tasarlama ve yiyecek üretme süreçleri örnekleri ile birlikte detaylı olarak açıklanmıştır.

belirleyebilmek ve bilimi gündelik hayata mal edebilmek için başarısızlıklar güvenli kaydedilmesi gereken analizlerdir. Bilim insanları gıdaları neden, niçin, nasıl tüketilmesi üzerine yaptığı sayısız analizler, gelecekte mutfaklarda bilime daha çok ihtiyacımız olduğunun en belirgin kanıtı olduğunu inkâr edemeyiz.

Mutfaklar da değişen koşullara uyum sağlamalı ve bunun için gerekli tedbirleri almalıdır. Bu ise ancak bilimsel yaklaşım ile mümkün olabilir. Gelecek için yönltilmesi gerekli soru aslında; yiyecek ve içeceklerin sunumu, yenilikleri içermesi ve de geçmişin anlaşılabilmesi bakımından gastronomi mühendisliğinin hayata geçirdiği bilimsel yaklaşım nasıl yaygınlaştırılabilir? Çünkü mutfakta yaratıcılık, yeni içerik ve tekniklerden daha çok, mevcut malzemelerin ve bileşiklerin nasıl birlikte kullanılacağı ile alakalıdır. Gıdaların yapıları daha iyi anlaşıldığında ve yeni yapılar oluşturabilme yeteneklerimiz arttığında, gıdaları daha sağlıklı ve zevk için tasarlamaya yaklaşacağız.

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1. Basım

GENÇLİK DÖNEMİ DİN EĞİTİMİ

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GENÇLİK DÖNEMİ DİN EĞİTİMİ

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İÇİNDEKİLER

ÖN SÖZ	Vii
GİRİŞ	ix
I. BÖLÜM GENÇLİK DÖNEMİ GELİŞİM ÖZELLİKLERİ	1
1. Çocukluktan Ergenliğe Geçiş	.....	2
2. Ergenliğin Doğası ve Gelişim	.....	5
3. Biyolojik Gelişim Özellikleri	.....	12
4. Bilişsel Gelişim Özellikleri	.....	23
5. Psikososyal Gelişim Özellikleri	.....	31
6. Ahlaki Gelişim Özellikleri	.....	47
II. BÖLÜM GENÇLİK DÖNEMİ DİNÎ VE MANEVÎ GELİŞİMİ	.....	55
1. Din ve Maneviyata Genel Bakış	.....	56
2. Dinî Gelişim Araştırmaları	.....	62
3. Gençlik, Din ve Maneviyat	.....	66
4. Dinî ve Manevi Gelişim Özellikleri	.....	72
4.1. Olgun Dindarlık Arayışı	.....	76
4.2. Anlama Arayışı	.....	78
4.3. Bireysel Dinî Yönelim	.....	80
4.4. Soyut Dinî Düşünce Yönelimi	.....	83
4.5. Evrensel İnanç Yönelimi	.....	90
6. Dinî ve Manevi Gelişim ile İlgili Bazı Konular	.....	94
6.1. Dinî Şüphe	.....	94
6.1.1. Şüphenin Çeşitleri	.....	97
6.1.2. Şüphenin Sebepleri	.....	99
6.2. Ruh Sağlığı	.....	106
6.3. Bağlanma	.....	110
6.4. Cinsellik	.....	114

6.5. Bağımlılık.....	123
6.6. Dinî İstismar ve Aşırılıklar.....	130

III. BÖLÜM GENÇLİK DÖNEMİ DİNİ TASAVVUR VE

TECRÜBE GELİŞİMİ.....137

1. Dinî Tasavvur Gelişimi 137

1.1. Allah Tasavvuru.....	137
1.1.1. Kur'an'da Allah Tasavvuru.....	138
1.1.2. Ergenlerde Allah Tasavvuru.....	139
1.1.3. Allah Tasavvurunun Gelişimi	141
1.1.4. İnanç Eğitimi	154
1.2. Kader Tasavvuru	158
1.2.1. İslam'da Kader.....	159
1.2.2. Kader Eğitimi	163

2. Dinî Tecrübe Gelişimi..... 169

2.1. Dua.....	169
2.1.1. İslam'da Dua	169
2.1.2. Gelişimsel Açıdan Dua	172
2.1.3. Dua Eğitimi	177
2.2. İbadet.....	180
2.2.1. İslam'da İbadet.....	181
2.2.2. Gelişimsel Açıdan İbadet	185
2.2.3. İbadet Eğitimi	190
2.3. Ölüm	194
2.3.1. İslam'da Ölüm.....	195
2.3.2. Ölümle İlgili Bazı Güncel Problemler	197
2.3.3. Gelişimsel Açıdan Ölüm.....	200
2.3.4. Ölüm Eğitimi	207

IV. BÖLÜM GENÇLİK DÖNEMİ DİN EĞİTİMİ:

MODEL VE İLKELER.....217

1. Din Eğitimi Modelleri 220

1.1. Dostluk Modeli.....	220
1.2. Özgürlükçü Model.....	222
1.3. Hermenötik Model	224
1.4. Manevi Farkındalık Modeli	226

2. Din Eğitimi İlkeleri 229

2.1. Öğrenme Alanlarını Bütünleştirmek	229
2.2. Gençlerle Teoloji Geliştirmek.....	232

2.3. Kutsal ile Anlam Kazanmak.....	234
2.4. Hizmet Temelli Öğrenmeyi Teşvik Etmek	236
2.5. Manevi Gelişimi Desteklemek	238
SONUÇ	243
KAYNAKÇA	247
ÖZ GEÇMİŞLER	259
Prof. Dr. Mustafa Köylü.....	259
Prof. Dr. Cemil Oruç	260

KAYNAKÇA

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1. Basım

**E-Ticaret, Dijital Pazarlama ve
Sosyal Medya Kapsamında**

GİRİŐİMCİLİK

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E-Ticaret, Dijital Pazarlama ve Sosyal Medya Kapsamında Girişimcilik

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İÇİNDEKİLER

GİRİŞİMCİLİKTE TEMEL KAVRAMLAR.....	1
FİKİR YARATMA VE GELİŞTİRME	27
FİZİBİLİTE (UYGULANABİLİRLİK ÇALIŞMASI).....	43
İŞ MODELLERİ VE İŞ PLANI HAZIRLAMA	59
E-TİCARET VE DİJİTAL PAZARLAMADA HUKUKİ ZEMİN.....	73
E-TİCARETİN TEMELLERİ.....	105
DİJİTAL PAZARLAMA	121
REKABET VE PAZAR ANALİZİ.....	137
GİRİŞİMCİLİKTE SOSYAL MEDYA KULLANIMI.....	163
GİRİŞİMCİLİK EKOSİSTEMİNDE FİNANSAL TEKNOLOJİ.....	177
KOBİLERDE STRATEJİK YÖNETİM	191

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Sabri Öz, Müge Öz

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Bahattin Gökhan Topal

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İÇİNDEKİLER

TEŞEKKÜR	vii
EDİTÖR HAKKINDA	ix
SUNU	xi

1. BÖLÜM

GÜLTEN ÜLGEN'LE YAŞAM HİKÂYESİ ÜZERİNE SÖYLEŞİ

Ailesi ve Çocukluk Yılları	1
Öğrencilik Yılları	7
Mesleki Yaşamı	17
Akademik Kariyeri	26
Katıldığı Kongreler/Toplantılar	33
Yayınları	37
Emeklilik ve Sonrası	42
Seyahatleri	45
Hobileri	61

2. BÖLÜM

GÜLTEN ÜLGEN HAKKINDA ANI YAZILARI

HOCALARININ YAZILARI	71
Prof. Dr. Hıfzı Doğan	71
Nebahat Samur	72
ÖĞRENCİLERİ VE MESLEKTAŞLARININ YAZILARI	74
Ahmet Sevgi	74
Dr. Aysel Çağdaş	75
Aysel Dinçer	78

Prof. Dr. Aysun Umay.....	80
Prof. Dr. Binnur Yeşilyaprak.....	81
Dr. Cemal Kalsen.....	82
Prof. Dr. Dalokay Kılıç.....	84
Doç. Dr. Eda Yazgın.....	86
Dr. Emine Arzu Oral.....	87
Prof. Dr. Gülsün Parlar.....	89
Hatice Doğruol.....	91
Yrd. Doç. Dr. Huriye Güven Albayrak.....	92
Dr. İpek Gönüllü.....	94
Melda Yenerim.....	97
Mürşide Şan Güven.....	100
Prof. Dr. Nilüfer Cihangir.....	101
Olca Gökçel Özbek.....	102
Doç. Dr. Ramin Aliyev.....	103
Sara Kılınç.....	105
Selma Bora Morgül.....	107
Yrd. Doç. Dr. Semra Cantekinler.....	108
Prof. Dr. Serap Etike.....	110
Sevim Öztürk.....	113
Süheyla Akpınar.....	114
Şerife Şahin.....	116
Dr. Tülay Üstündağ.....	117
AİLE BİREYLERİ VE ARKADAŞLARININ YAZILARI.....	121
Abdulhakim Eren.....	121
Ata Kazancı.....	122
E. Ferhan Aras.....	123
Firdevs Sezal.....	124
Janset Bay.....	124
Prof. Dr. O. Cenap Tekinşen.....	126
Serpil Karataban.....	128
Sevim Yücesoy.....	129
Sıdkı Kazancı.....	130
Tülay Hüdaioğlu.....	131
Vasfiye Ülgen.....	132
Yüksel Kasapoğlu.....	133
Zerrin Sezal.....	134
Zeynep Arıkan.....	135

EKLER**EK-1: İYİ BİR ÖĞRENME NASIL OLUR?137****EK-2: “ANILARLA KÜLTÜREL ÇİZGİLER” KİTABI
HAKKINDAKİ OKUR GÖRÜŞLERİ145**

Berrin Bilginer 145

Hatice Ertuğrul Başkonuş 146

Süheyla Akpınar 146

Şeyda Akpınar Şen 146

Zekai Bilgen 147

Tülay Üstündağ 148

Özge Kazancı 149

EK-3: GÜLTEN ÜLGEN'İN ATIFTA BULUNULAN ESERLERİ151

- b. Fazla tekrardan kaçınmalı, öğrenciyi bıktırmamalı,
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İÇİNDEKİLER

ÖN SÖZ	V
GİRİŞ	1
1. Pa'al Çatısı.....	4
1.1. Pa'al Çatısının Düzenli Fiilleri	4
1.1.1. Geçmiş Zaman Durumu	6
1.1.2. Şimdiki Zaman Durumu	7
1.1.3. Gelecek Zaman Durumu	8
1.1.4. Emir Durumu	8
1.1.5. Pa'al Çatısının İstisna Fiilleri.....	9
1.1.6. Pa'al Çatısının Kök Ünsüzü BeGeD-KeFet Olan Fiilleri	13
1.2. Pa'al Çatısında Düzensiz Fiillerin Çekimi	14
1.2.1. 'פ Pey-Gronit Fiilleri	16
1.2.2. 'פ Fiilleri.....	24
1.2.3. 'פ Fiilleri.....	26
1.3. İkinci Ünsüzünden Kaynaklı Düzensiz Çekimlenen Fiiller	28
1.3.1. Ayn-Gronit ('ע) fiilleri	28
1.3.2. Ayn Yud- Ayn Vav (י"ע/י"ע) Fiiller	35
1.4. Üçüncü Kök Ünsüzünden Kaynaklı Düzensiz Çekimlenen Fiiller	43
1.4.1. Lamed-Alef (ל"א) Fiilleri	43
1.4.2. Lamed Yud- Lamed Hey (ל"י/ל"י) Fiilleri.....	50
1.4.3. Son Ünsüzü Patakh Gnuva Olan Fiiller.....	55
1.4.4. İkinci ve Üçüncü Fiil kök Ünsüzü Aynı (ע"ע) Olan Fiiller.....	63
2. Pi'el Çatısı	65
2.1. Pi'el Çatısının Düzenli Fiilleri	66
2.1.1. Geçmiş Zaman Durumu	66
2.1.2. Şimdiki Zaman Durumu	67
2.1.3. Gelecek Zaman Durumu	68
2.1.4. Emir Durumu	68
2.2. Pi'el Çatısının Düzensiz Fiilleri	69
2.2.1. İlk veya İkinci Ünsüzü Yud Olan Fiiller.....	69
2.3. Pi'el Çatısının Fiil Kökünde Boğaz Ünsüzü Olan Fiilleri.....	73
2.3.1. İkinci Kök Ünsüzü Reş (ר) Olan Fiiller	74

2.3.2. İkinci Kök Ünsüzü Alef, Hey, Khet ve Ayn ה,א (ו,ח,) Olan Fiiller.....	76
2.3.3. Üçüncü Kök Ünsüzü Patakh Gnuva (ו,ח) Olan Fiiller	84
2.3.4. Üçüncü Kök Ünsüzü Alef (א) Olan Fiiller	89
2.3.5. Üçüncü Kök Ünsüzü Hey (ה) Olan Fiiller	93
2.3.6. Üçüncü Kök Ünsüzü Aynı Olan (ו"ו Fiiller)/İkinci Fiil Kökü Ünsüzü Vav Olan (ו) Fiiller	98
3. Hif'il Çatısı.....	102
3.1. Hif'il Çatısının Düzenli Fiilleri.....	105
3.1.1. Geçmiş Zaman Durumu	105
3.1.2. Şimdiki Zaman Durumu	106
3.1.3. Gelecek Zaman Durumu	107
3.1.4. Emir Durumu	107
3.2. Hif'il Çatısının Düzensiz Fiilleri	110
3.2.1. İlk Kök Ünsüzü Alef (א) Olan Fiiller.....	110
3.2.2. İlk Kök Ünsüzü Ayn (א) Olan Fiiller	114
3.2.3. İlk Kök Ünsüzü Khet (ח) Olan Fiiller	117
3.2.4. İlk Kök Ünsüzü Nun (נ) Olan Fiiller	122
3.2.5. İlk Kök Ünsüzü Yud (י) Olan Fiiller	124
3.2.6. İlk Kök Ünsüzü Vav (ו) Olan Fiiller	126
3.2.7. İkinci Kök Ünsüzü Vav (ו) ve Yud (י) Olan Fiiller (ו"ו-ו"י)	129
3.2.8. İkinci Kök Ünsüzü ile Üçüncü Kök Ünsüzü Aynı Olan Fiiller/ו"ו Fiiller	135
3.2.9. Üçüncü Kök Ünsüzü Khet (ח) ve Ayn (א) Olan Fiiller.....	137
3.2.10. Üçüncü Kök Ünsüzü Hey (ה) Olan Fiiller/ ה"ו veya ו"ה Fiilleri	142
4. Nif'al Çatısı.....	144
4.1. Nif'al Çatısının Düzenli Fiilleri	145
4.1.1. Geçmiş Zaman Durumu	145
4.1.2. Şimdiki Zaman Durumu	146
4.1.3. Gelecek Zaman Durumu	147
4.1.4. Emir Durumu	148
4.2. Nif'al Çatısının Düzensiz Fiilleri	150
4.2.1. İlk Ünsüzü Boğaz Olan Fiilleri	150
4.2.2. İlk Ünsüzü Yud/Vav (י/ו) olan Fiiller.....	160
4.2.3. İkinci Ünsüzü Alef, Hey, Khet, Ayn (א,ח,ה,א) Olan Fiiller.....	162
4.2.4. İkinci Ünsüzü Yud/Vav (י/ו) olan Fiiller/ו"ו-ו"י	164
4.2.5. İkinci ve Üçüncü Kök Ünsüzü Aynı Olan Fiiller/ו"ו Fiiller	166
4.2.6. Üçüncü Kök Ünsüzü Alef (א) Olan Fiilleri	168
4.2.7. Üçüncü Kök Ünsüzü Patakh Gnuva (א,ח) Olan Fiiller	170
4.2.8. Lamed Hey ve Lamed Yud (ה"ל/ו"ל) Fiillerinin Çekimi.....	174
5. Hitpa'el Çatısı.....	177
5.1. Hitpa'el Çatısının Düzenli Fiilleri	179
5.1.1. Geçmiş Zaman Durumu	179
5.1.2. Şimdiki Zaman Durumu	180
5.1.3. Gelecek Zaman Durumu	181
5.1.4. Emir Durumu	181

5.2. Hitpa'el Çatısının Düzensiz Fiilleri	186
5.2.1. İlk Fiil Kökü Ünsüzü Zayn, Samekh, Şin, Sin ve Tsadi (ץ ,ש ,שׁ ס ,ט) Olan Fiiller	186
5.2.2. İlk Kök Ünsüzü Dalet, Tet ve Tav (ת ,ט ,ד) Olan Fiiller.....	194
5.2.3. İkinci ve Üçüncü Kök Ünsüzü Aynı Olan Fiiller	203
5.2.4. İkinci Ünsüzü Alef, Hey, Khet, Ayn (א ,ה ,ח) Olan Fiiller	208
5.2.5. Üçüncü Kök Ünsüzü Patakh Gnuva (נ/ע) Olan Fiiller	217
5.2.6. Dört Kök Ünsüzlü Fiillerin Çekimi.....	221
6. İbranice Pasif/Edilgen Fiil Kategorisi	228
6.1. Pasif/Edilgen Fiil Çatılarının Tanımı.....	228
7. Nif'al Çatısının Edilgen Çatı Olarak Tanımı.....	228
8. Pu'al Çatısı	231
8.1. Pu'al Çatısının Düzenli Fiilleri	232
8.1.1. Geçmiş Zaman Durumu	232
8.1.2. Şimdiki Zaman Durumu	233
8.1.3. Gelecek Zaman Durumu	233
8.2. Pu'al Çatısının Düzensiz Fiilleri.....	234
8.2.1. İkinci Kök Ünsüzü Alef Hey, Ayn (א ,ה ,ע) Olan Fiiller	234
8.2.2. İkinci ve Üçüncü Kök Ünsüzü Hey (ה) Olan Fiiller	239
8.2.3. İkinci ve Üçüncü Kök Ünsüzü Aynı Olan Fiiller/ע"ו-ע"י	241
8.2.4. Üçüncü Kök Ünsüzü Patakh Gnuva (ע ,ח) Olan Fiiller	243
8.2.5. Üçüncü Fiil Ünsüzü Alef (א) Olan Fiiller.....	245
8.2.6. Fiil Kökü Dört Ünsüzden İbaret Olan Fiiller.....	247
9. Huf'al Çatısı.....	250
9.1. Huf'al Çatısının Düzenli fiilleri	250
9.1.1. Geçmiş Zaman Durumu	251
9.1.2. Şimdiki Zaman Durumu	251
9.1.3. Gelecek Zaman Durumu	252
9.2. Huf'al Çatısının Düzensiz Fiilleri	254
9.2.1. İkinci Kök Ünsüzü Alef, Hey, Khet ve Ayn (ע ,ה ,ח ,א) Olan Fiiller	254
9.2.2. İkinci ve Üçüncü Kök Ünsüzü Anı Olan Fiiller/ע"ע Filleri.....	258
9.2.3. Üçüncü Kök Ünsüzü Patakh Gnuva (ע ,ח) Olan Fiiller	260
9.2.4. Üçüncü Kök Ünsüzü Hey (ה) Olan Filler	264
10. Fiil+Fiil Kullanımı	265
10.1. Yardımcı Fiiller	267
10.1.1. "İstemek, Arzulamak"/לְצוֹת Fiili	267
10.1.2. Geçmiş Zaman Durumu	267
10.1.3. Şimdiki Zaman Durumu	268
10.1.4. Gelecek Zaman Durumu	268
10.1.5. Emir Durumu	269
10.2. "- ebilmek"/יבול Fiili.....	269
10.2.1. Geçmiş Zaman Durumu	269
10.2.2. Şimdiki Zaman Durumu	270
10.2.3. Gelecek Zaman Durumu	271
10.3. "Zorunda Olmak", "Mecbur Olmak"/צָרִיךְ Fiili.....	272
10.3.1. Şimdiki Zaman Durumu	272

10.4. "Olmak"/להיות Fiili	273
10.4.1. Geçmiş Zaman Durumu	273
10.4.2. Gelecek Zaman Durumu	274
10.4.3. Emir Durumu	275
11. Fiilden Oluşan İsimler	280
11.1. Pa'al Çatısının İsim Durumu	280
11.2. Pi'el Çatısının İsim Durumu	282
11.3. Hif'il Çatısının İsim Durumu	283
11.4. Nif'al Çatısının İsim Durumu	285
11.5. Hitpa'el Çatısının İsim Durumu	286
12. İbranice Söz Dizimi Kuralları.....	287
12.1. Basit/Sade Cümle	288
12.1.1. Sade Cümlelerde Kullanılan Zaman Sözcükleri/משפטי זמן	289
12.1.2. Sade Cümlelerde Sebep Belirten Bağlaçların Kullanımı/שיבה משפטי	291
12.1.3. Sade Cümlelerde Sonuç Belirten Bağlaçların Kullanımı/תוצאה משפטי	293
12.1.4. Sade Cümlelerde Amaç Belirten Bağlaçların Kullanımı/תכלית משפטי	294
12.1.5. Sade Cümlelerde <i>Rağmen, Karşın</i> Bağlacının Kullanımı 1/משפטי ניגוד	295
12.1.6. Sade Cümlelerde <i>Rağmen, Karşın</i> Bağlacının Kullanımı 2/משפטי ויתור	296
12.2. Bileşik Cümle	297
12.2.1. Bileşik Cümlelerde Zaman Bağlaçlarının Kullanımı/משפטי זמן	298
12.2.2. Bileşik Cümlelerde Sonuç Bağlaçlarının Kullanımı/משפטי תוצאה	299
12.2.3. Bileşik Cümlelerde <i>Ama, Ancak, Lakin</i> Bağlaçlarının Kullanımı/משפטי ניגוד	300
12.2.4. Bileşik Cümlelerde <i>Rağmen</i> Bağlacının Kullanımı/משפטי ויתור	301
12.3. Bağlı Cümle	302
12.3.1. Bağlı Cümlelerde Zaman Bağlaçlarının Kullanımı/משפטי זמן	303
12.3.2. Bağlı Cümlelerde Sebep Bağlaçlarının Kullanımı/משפטי שיבה	304
12.3.3. Bağlı Cümlelerde Şart Bağlaçlarının Kullanımı/משפטי תנאי	305
12.3.4. Bağlı Cümlelerde <i>Rağmen</i> Bağlacının Kullanımı/משפטי ויתור	307
TERİMLER LİSTESİ.....	309
KAYNAKLAR.....	313

Kaynaklar

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İÇİNDEKİLER

ÖN SÖZ	iii
YAZARLAR LİSTESİ	V
BÖLÜM 1 KARIYER PSİKOLOJİK DANIŞMASINA GİRİŞ:	
TEMEL KAVRAMLAR VE KONULAR	1
Hazırlık Soruları	1
Konuyla İlgili Temel Kavramlar	2
Kariyer Psikolojik Danışmasına İlişkin Temel Kavramlar ve Konular	10
Kariyer Psikolojik Danışması Yeterlikleri	11
Kariyer Psikolojik Danışmasında Etik İlke ve Standartlar	13
Değerlendirme ve Sonuç	15
Değerlendirme Soruları	16
Kaynakça	16
BÖLÜM 2 PARSONS'UN ÖZELLİK ETMEN KURAMI	19
Hazırlık Soruları	19
Kuramla İlgili Genel Bilgiler	19
Kurama Dayalı Olarak Geliştirilen Ölçme Araçları	23
Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı	26
Kariyer Rehberliği Süreci	28
Üç Aşamalı Kariyer Rehberliği Modeli	28
Altı Aşamalı Kariyer Rehberliği Modeli	31
Değerlendirme ve Sonuç	33
Değerlendirme Soruları	34
Kaynakça	34
BÖLÜM 3 HOLLAND'IN TİPOLOJİ KURAMI	37
Hazırlık Soruları	37
Giriş	37
Temel Kavramlar	40
Değerlendirme ve Sonuç	56

	Değerlendirme Soruları.....	59
	Kaynakça	59
BÖLÜM 4	KARİYER PSİKOLOJİK DANIŞMASINDA	
	PSİKODİNAMİK KURAMLAR.....	63
	Giriş.....	63
	Roe'nun Kişilik Gelişimi Teorisi	63
	Hazırlık Soruları	63
	Erken Çocukluk Döneminde Ebeveyn-Çocuk İlişkileri	65
	Kurama Dayalı Olarak Geliştirilmiş Ölçme Araçları	69
	Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı.....	71
	Kurama Dayalı Kariyer Psikolojik Danışmanlığı Süreci	71
	Değerlendirme ve Sonuç.....	72
	Değerlendirme Soruları.....	73
	Myers-Briggs Tip Teorisi.....	73
	Hazırlık Soruları	73
	Dış Dünyayı Değerlendirme Yolu: Algılama ve Yargılama	76
	Dışa Dönüklük ve İçte Dönüklük.....	79
	MBTI'da Bulunan 16 Tip ve Özellikleri	80
	Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı.....	83
	Kurama Dayalı Kariyer Psikolojik Danışmanlığı Süreci	83
	Değerlendirme ve Sonuç.....	84
	Değerlendirme Soruları.....	85
	Kaynakça	85
BÖLÜM 5	KARİYER GELİŞİM KURAMLARI	89
	Hazırlık Soruları	89
	Kuramla İlgili Temel Bilgiler, Konular	89
	Ginzberg ve diğerlerinin Meslek Seçim Kuramı	90
	Super'ın Yaşam Boyu Yaşam Alanı Kuramı.....	92
	Benlik	95
	Gelişimsel Dönemler ve Gelişimsel Görevler	96
	Kariyer Olgunluğu	101
	Kurama Dayalı Olarak Geliştirilmiş Ölçme Araçları	101
	Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı.....	102
	Kurama Dayalı Kariyer Psikolojik Danışmanlığı Modeli/Süreci	103
	Değerlendirme ve Sonuç.....	108
	Değerlendirme Soruları.....	109
	Kaynakça	109
BÖLÜM 6	GOTTFREDSON'IN DARALTMA VE UZLAŞMA KURAMI.....	113
	Giriş.....	113
	Hazırlık Soruları	114

	Kariyer Gelişim Süreci	114
	Kurama Dayalı Geliştirilmiş Ölçme Araçları.....	123
	Kuramın Dezavantajlı Gruplara Yönelik Bakış Açısı.....	124
	Kurama Dayalı Kariyer Psikolojik Danışma Süreci	127
	Değerlendirme ve Sonuç.....	131
	Değerlendirme Soruları.....	132
	İzleme Önerileri.....	133
	Kaynakça	133
BÖLÜM 7	KARİYER KARARI VERMEDE SOSYAL ÖĞRENME VE PLANLANMIŞ ŞANS KURAMI	137
	Hazırlık Soruları	137
	Kariyer Kararı Vermede Sosyal Öğrenme Kuramı	137
	Planlanmış Şans Kuramı	145
	Değerlendirme ve Sonuç.....	151
	Değerlendirme Soruları.....	152
	Kaynakça	152
BÖLÜM 8	SOSYAL BİLİŞSEL KARİYER KURAMI.....	155
	Hazırlık Soruları	155
	Giriş	155
	Temel Kavramlar	156
	Sosyal Bilişsel Kariyer Kuramının Modelleri	164
	Kurama Dayalı Olarak Geliştirilmiş Ölçme Araçları	168
	Nicel Değerlendirme Yöntemleri	168
	Nitel Değerlendirme Yöntemleri.....	169
	Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı.....	170
	Kariyer Psikolojik Danışmanlığı Süreci	173
	Değerlendirme ve Sonuç.....	177
	Değerlendirme Soruları.....	178
	Kaynakça	178
BÖLÜM 9	KARİYER YAPILANDIRMA KURAMI.....	181
	Hazırlık Soruları	181
	Kuramın Temel Felsefesi	183
	Kuramın Temel Kavramları	185
	Kurama Dayalı Olarak Geliştirilmiş Ölçme Araçları	188
	Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı.....	193
	Kariyer Psikolojik Danışmanlığı Süreci	194
	Değerlendirme ve Sonuç.....	199
	Değerlendirme Soruları.....	201
	Kaynakça	201

BÖLÜM 10	SİSTEMLER KURAMI YAKLAŞIMI	205
	Hazırlık Soruları	205
	Giriş	205
	Tarihsel Süreçte Sistemler Kuramı Yaklaşımı	207
	Temel Kavramlar	210
	İçerik Etmenleri	215
	Süreç Etmenleri	217
	Yaklaşım Dayalı Olarak Geliştirilmiş Ölçme Araçları	220
	Yaklaşımın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı	226
	Kariyer Psikolojik Danışmanlığında Sistemler Kuramı Yaklaşımı'nın Kullanımı	228
	Değerlendirme ve Sonuç	233
	Değerlendirme Soruları	235
	Kaynakça	235
BÖLÜM 11	ÇALIŞMA PSİKOLOJİSİ KURAMI	239
	Hazırlık Soruları	239
	Kuramın Tarihsel Gelişimi ve Ortaya Çıkışı	239
	Kuramın Merkezi: İnsana Yakışır İş	241
	İnsana Yakışır İşin Yordayıcıları	242
	Moderatör Değişkenler	246
	İnsana Yakışır İşin Sonuçları	249
	Aracı Bir Değişken Olarak Psikolojik İhtiyaçlar	250
	Nihai Sonuçlar: İyi Oluş ve Çalışmaktan Duyulan Memnuniyet	251
	Kurama Dayalı Olarak Geliştirilen Ölçme Araçları	252
	Kuramın Dezavantajlı Gruplara İlişkin Bakış Açısı	254
	Çalışma Psikolojisi Kuramının Kariyer Psikolojik Danışmanlığında Kullanımı	255
	Çalışma Psikolojisi Danışmanlık Modeli	256
	Değerlendirme ve Sonuç	259
	Değerlendirme Soruları	259
	Kaynakça	259
BÖLÜM 12	KABUL VE KARARLILIK TERAPİSİ VE BİLİNÇLİ FARKINDALIK UYGULAMALARI	265
	Hazırlık Soruları	265
	Kabul ve Kararlılık Terapisi	265
	İş Yaşamında Psikolojik Esneklik	271
	Kariyer Psikolojik Danışmanlığında ACT	273
	ACT Egzersiz ve Metaforları	277
	Kariyer Psikolojik Danışmanlığında Bilinçli Farkındalık	283
	Bilinçli Farkındalık ve Kariyer Gelişimi Kavramlarıyla İlişkisi	286

Kurama Dayalı Olarak Geliştirilmiş Ölçme Araçları	288
Kuramın Dezavantajlı Gruplar İçin Sunduğu Bakış Açısı.....	288
Değerlendirme ve Sonuç.....	288
Değerlendirme Soruları.....	289
Kaynakça	289
BÖLÜM 13 KARIYER PSİKOLOJİK DANIŞMASINDA YAPILANDIRMACI	
YAKLAŞIMA DAYALI DİĞER KURAM VE MODELLER	295
Hazırlık Soruları	295
Umut Eylem Kuramı	296
Sonuç ve Değerlendirme	306
Kariyer Teker Modeli.....	306
Değerlendirme ve Sonuç.....	312
Kariyer Yelkenlisi Modeli.....	312
Değerlendirme ve Sonuç.....	316
Bölüme İlişkin Genel Sonuç ve Değerlendirme	317
Değerlendirme Soruları.....	317
Kaynakça	318
ÖZ GEÇMİŞLER.....	321

Bölüm 1

KARİYER PSİKOLOJİK DANIŞMASINA GİRİŞ: TEMEL KAVRAMLAR VE KONULAR

Nurten Karacan Özdemir

Hazırlık Soruları

1. Meslek, uzmanlık alanı, iş, kariyer, çalışma ve uğraşı gibi kavramlar arasındaki farklar neler olabilir?
2. İçinde bulunduğumuz çağdaki değişim ve gelişimlerin iş yaşamına yansımaları nasıl olabilir?
3. Küresel ve yerel krizler (COVID-19 pandemisi, iklim krizi, ekonomik krizler, doğal afetler vb.) sonrasında, kariyer gelişiminde öne çıkan konular neler olabilir?

İnsan, bütüncül bir varlıktır. Pek çok alandaki gelişimi, birbiri ile etkileşim hâlinindedir. Fiziksel, duygusal, sosyal, akademik, kariyer gelişimi bir arada ilerler. Bir alandaki gelişiminde bir güçlük yaşıyorsa, bunun diğer gelişim alanlarına da yansımaları kaçınılmazdır. Örneğin, bir öğrencinin akademik gelişimi iyiyken, sosyal gelişiminde güçlükler yaşıyorsa, ya da tam tersi yaşıyorsa, bu durumda bu öğrencinin bir bütün olarak iyilik hâlinin yüksek, denge ve uyum içinde olacağını söylemek güç olacaktır. Bu nedenle, bireyi bir bütün olarak desteklemek esastır. Bu gelişim alanlarından biri de yukarıda belirtildiği üzere kariyer gelişimidir. Kariyer gelişimi, artık yaygın olarak bilinen şekliyle, doğumdan yaşamın sonuna kadar süren gelişimsel bir süreçtir (Super, 1990). Bireyin doğduğu çevre, sosyoekonomik durumu gibi çevresel değişkenlerin yanı sıra aldığı eğitimler, katıldığı kurslar, gittiği okul, yetenekleri, ilgileri, değerleri, kişilik özellikleri gibi bireysel değişkenlerin karşılıklı etkileşimi sonucu şekillenir ve gelişimi sürer. Bireyin kariyer gelişimini desteklemede, öncelikle bu alana yönelik temel kavramları bilmek ve yardım sürecinin doğasına dair bilgi ve beceri sahibi olmak önemlidir.

Bu bölümde, öncelikle, kariyer gelişim sürecinin daha iyi anlaşılabilmesine katkı sağlamak amacıyla kariyer, meslek, iş, çalışma gibi bazı temel kavramlar ele alınacaktır. Kariyer psikolojik danışması sürecinin doğasının anlaşılabilmesi için kariyer rehberliği, kariyer psikolojik danışması, mesleki rehberlik, meslek danışmanlığı gibi yardım sürecine yönelik kavramlar arasındaki farka değinilecektir. Son olarak, kariyer psikolojik danışması

lere iş piyasasında yerlerini koruyabilmek için küresel olarak rekabet edebilme ve gelişmeleri yakalama gibi bir zorunluluğu getirirken, iş görenlere ise bu iş piyasasında bir yer bulabilmek için gelişmeleri yakalayacak şekilde sürekli olarak kendini güncelleme ve becerilerini yükseltme gereğini getirmiştir. Öte yandan, hem işveren hem de iş gören açısından öne çıkan bu gereklilikler kariyer psikolojik danışması hizmetlerinde de sürekli bir yenilenme ve gelişmeyi gerekli kılmaktadır. Bu bağlam içinde kariyer psikolojik danışmanlarına değişen paradigmlar doğrultusunda iş dünyasındaki değişikliklerin farkında olma ve güncel durumu takip edebilme, iş gücünün bu koşullar içinde deneyimleyebileceği olası zorluklara dair farkındalığını artırma ve bu yeni çağın getirebileceği potansiyel etik kırılmalara karşı yetkinliğini artırma konularında önemli görevler düşmektedir.

Değerlendirme Soruları

1. 21. yüzyılın çalışma yaşamında getirdiği değişiklikler ne gibi kavram ve tanımları ön plana getirmiştir?
2. Kariyer gelişimini desteklemeye yönelik hizmet türleri nelerdir? Bunlar arasındaki farkları sıralayın.
3. Kariyer psikolojik danışması hizmetlerinin etkili bir şekilde sunulabilmesinde, kariyer psikolojik danışmanları ne gibi yeterliklere sahip olmalıdır?
4. Kariyer psikolojik danışmasında temel etik ilke ve standartları listeleyin.
5. Kariyer psikolojik danışmasında etik ikilem durumlarına örnekler verin. Bu örneklerden birini seçerek etik karar verme sürecini örnek üzerinde uygulayın.

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Bölüm 2

PARSONS'UN ÖZELLİK ETMEN KURAMI

Ahmet Ayaz

Hazırlık Soruları

1. Kendinizi ne kadar iyi tanıyorsunuz, güçlü yönlerinizin, geliştirilebilir yönlerinizin, ilgi ve yetenekleriniz ne kadar farkındasınız?
2. Seçtiğiniz meslek içerisinde çalışabileceğiniz alanları belirlerken hangi kaynaklardan ne tarz araştırmalar yapıyorsunuz?

Kuramla İlgili Genel Bilgiler

Parsons'un Özellik Etmen Kuramı, kariyer psikolojik danışmanlığı hizmetleri kapsamında birçok açıdan öncü bir yaklaşımdır. Kariyer rehberliğinin öncüsü olarak kabul edilen Frank Parsons, meslek seçim sürecini bilimsel bir yöntem eşliğinde bir uzman tarafından profesyonel bir hizmet alanı olarak tanımlayan ve uygulayan ilk isimdir (Taylor, 1994). Parsons (1909), meslek seçiminin kişinin yaşamındaki en önemli karar verme süreçlerinden biri olduğunu ve bu seçimin kişinin tüm yaşamını etkilediğini belirtmektedir. Kariyer yaşamı boyunca çeşitli sektörlerde çalışan Parsons, hem kendi bilgi birikiminin hem de dönemin iş piyasasında ortaya çıkan ihtiyaçların etkisiyle kişilerin meslek seçim süreçlerini yapılandıran ve doğru meslek seçim süreci olarak belirttiği modelini hayata geçirmiştir.

Parsons ABD iş piyasasının köklü değişimler geçirdiği bir dönemde yaşamıştır (Spokane ve Glickman, 1994). 1900'lü yıllara kadar ABD'de tarımda insan gücü yoğun olarak kullanılmıştır. Ancak teknolojinin tarımda kullanılmaya başlamasıyla birlikte iş gücüne olan ihtiyaç azalmaya başlamıştır. Şehirler çiftliklerden göç eden işsiz çiftçi ailelerle kalabalıklaşmaya başlamıştır. Bununla birlikte gelişen teknolojiyle birlikte farklı sektörlerde iş gücü ihtiyacı da artış göstermiştir. Teknolojideki bu hızlı değişim süreciyle ABD'nin iş gücü piyasasının doğası da köklü değişim içerisine girmiştir (Lerner, 1987). Ülkede bir yandan işsiz kalan insanların sayısı artmış, diğer yandan da yeni çalışanlar arayan işverenlerin sayısı çoğalmıştır. Önceden aile üyeleri arasında yaşanan mesleki aktarım zamanla

geçirse de kariyer psikolojik danışmanlığı sürecinde merkezî ve hayati bir rol oynamaya devam etmektedir.

Değerlendirme Soruları

1. Üniversite tercih sürecinde hangi bölümü seçeceğine karar vermekte zorlanan bir öğrenciye Özellik Etmen Kuramı kapsamında nasıl yardım edersiniz?
2. Özellik Etmen Kuramı'nı günümüz koşulları kapsamında değerlendirdiğinizde kurama yönelik sizin eleştirileriniz neler olurdu?
3. Özellik Etmen Kuramı'nın güncel kariyer kuramlarına ne gibi etkileri olmuştur?

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Bölüm 3

HOLLAND'IN TİPOLOJİ KURAMI

Melda Meliha Erbaş

Hazırlık Soruları

1. Sizi tanımlayan yetenek ve kişilik özellikleri nelerdir?
2. Zamanınızı neler yaparak geçirmekten hoşlanırsınız?
3. Bu özelliklerinizi göz önünde bulundurduğunuzda ne tür mesleklerin size daha uygun olduğunu düşünüyorsunuz?

Giriş

John L. Holland, Tipoloji Kuramı'nın temellerini, İkinci Dünya Savaşı sırasında ABD ordusunda asker seçimi ve sınıflandırma ile ilgili bir görevde çalıştığı esnada atmıştır. Holland, bu süreçte, askerlerin mesleki geçmişlerinin bazı benzerlik ve farklılıklar taşıdığını, askerler arasında buna göre birtakım sınıflandırmalar yapılabileceğini fark etmiştir. Buradan hareketle bireyleri kişilik tipleri ve sahip oldukları ilgi alanlarına göre sınıflandırmaya yönelik çalışmalara başlamıştır (Niles ve Haris-Bowlsbey, 2009). Holland, bu çalışmalarını sistematik bir kuram hâline getirerek ilk olarak 1959 yılında *Journal of Counseling Psychology* dergisinde yayınlamıştır. 1966 yılında kuramın revize edilmiş hâlini içeren *The Psychology of Vocational Choice: A Theory of Personality Types and Model Environments* (Meslek Seçiminin Psikolojisi: Kişilik Tipleri Teorisi ve Çevre Modelleri) adlı kitap yayınlamıştır. 1973 yılında ise altıgen model geliştirilerek kuram daha sistematik bir hâle getirilmiş ve *Making Vocational Choices: A Theory of Careers* (Meslek Seçimi Yapmak: Bir Kariyer Teorisi) isimli kitap yayımlanmıştır. 1970'lerde mesleki kimlik kavramı da kurama eklenmiş, 1985 yılında yapılan bir revizyondan sonra 1997 yılında kuram iş çevrelerinin tanımlarına yönelik açıklamaların da geliştirilmesi ile son hâlini almıştır (Gottfredson, 1999).

Holland'ın Tipoloji Kuramı, bireyleri var olan özelliklerine uyumlu olan bir mesleki çevre ile eşleştirmeyi amaçlaması nedeniyle özellik-faktör kuramları arasında sınıflandırılmaktadır. Özellik Faktör Kuramı, genel olarak her bireyin birbirinden farklı birtakım

Amerika Birleşik Devletleri'nde yaşayan Amerikalılar üzerinde yapılmış olması nedeniyle farklı kültürlerde kuramın nasıl bir geçerliliğe sahip olduğu hâlâ tartışmaya açıktır.

Değerlendirme Soruları

1. Holland'ın Tipoloji Kuramı'nda üzerinde durduğu altı kişilik tipi ve bu kişilik tiplerinin özellikleri nelerdir?
2. Tipoloji Kuramı'na dayalı bir kariyer psikolojik danışmanlığı süreci nasıl ilerler? Bu süreçte hangi ölçme araçları ve etkinliklere yer verilebilir?
3. Kuramın güçlü ve sınırlı yanları nelerdir?

İzleme/İnceleme Önerileri



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Bölüm 4

KARİYER PSİKOLOJİK DANIŞMASINDA PSİKODİNAMİK KURAMLAR

Hakan Büyükçolpan

Nurten Karacan Özdemir

Giriş

Bu bölümde psikodinamik yaklaşıma dayalı olarak oluşturulan Anne Roe'nun İhtiyaçlar Yaklaşımı ve Myers-Briggs Tip Teorisi (MBTT) ele alınmıştır. Bu kuramlar, kariyer gelişimine psikodinamik açıdan açıklamalar sunmaktadırlar. Bu bağlamda, Anne Roe'nun kuramı temelleri çocukluk döneminde atılan, ebeveyn-çocuk arasındaki iletişimin biçiminin ve bu doğrultuda gelişen psikolojik ihtiyaçların kariyer yönelimleri üzerindeki olası etkilerini ele almaktadır. Bir başka deyişle, erken çocukluk deneyimlerinin kariyer gelişimi üzerindeki, özellikle de meslek seçimi üzerindeki önemi vurgulanmaktadır. MBTT ise Jung'un kişilik tiplerine dayalı bir yaklaşımdır. Bireylerin meslek seçimleri ve yönelimlerinde kullanılabilecek ya da bu süreci anlamlandırmaya katkı sağlayabilecek bir ölçme aracı içermetedir. Bu açıdan bakıldığında MBTT doğrudan bir kuram olmasa da psikodinamik kuramlardan Jung'un doğuştan getirilen kişilik tiplerine dayalı olarak geliştirildiği için daha önceki sınıflandırmalarda da olduğu gibi (Bk. Yerin-Güneri, 2020) psikodinamik kuramlar başlığı altında ele alınmıştır.

Roe'nun Kişilik Gelişimi Teorisi

Hazırlık Soruları

1. Çocukların meslek seçiminde ebeveynlerin (veya diğer bakım verenlerin) etkisi olduğunu düşünüyor musunuz? Eğer düşünüyorsanız ebeveynlerin çocukların meslek seçimi üzerinde nasıl bir etkisi olabilir?
2. Ailenin çocukla olan ilişkisinin çocuğun meslek seçimi ve kariyer kararı verme biçimi üzerinde ne gibi etkileri olabilir?
3. Kişinin temel psikolojik ihtiyaçlarının meslek seçimi ve kariyer kararı verme sürecinde ne gibi etkileri olabilir?

özellikleri ve kişilik kodlarını eşleştirme sistemine dayanan bir kariyer danışma süreci kullanmaktadır. Eşleştirme sistemine dayandığı için kariyer psikolojik danışmanlığı sürecinde bireyin; ilgileri, yetenekleri, değerleri, çevresel ve sosyoekonomik faktörler vs. gibi bireyin kariyer gelişimini etkileyen pek çok etmeni göz ardı ettiği söylenebilir. Bu sebeple, geçerli ve güvenilir bir ölçme aracının olması, farklı kişilik tipleri ve kişilik tiplerine uygun mesleklerin yer alması gibi pek çok avantajının yanında kariyer psikolojik danışmanlığı sürecinde tek başına kullanılmaması ve bireyin kariyer gelişimini etkileyen diğer faktörlerin de göz önünde bulundurulması gerektiği söylenebilir.

MBTI’da bulunan kişilik tiplerini düşündüğünüzde, kişilik özelliklerinizin hangi tipe daha uygun olduğunu düşünüyorsunuz? Seçtiğiniz bölüm veya yaptığınız mesleğin MBTI’ya göre kişilik tipinize göre uygun olup olmadığını tartışın.



Değerlendirme Soruları

1. Size göre, MBTI’nın farklı avantaj ve dezavantajları nelerdir?
2. MBTI’yi kariyer psikolojik danışmasında kullanacak olsanız nelere dikkat edersiniz?

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Bölüm 5

KARİYER GELİŞİM KURAMLARI

Selen Demirtaş Zorbaz

“Çocuklar ıslak beton gibidir, üzerlerine ne düşse iz bırakır.”

Haim Ginott

Hazırlık Soruları

1. Şu an kariyerinizde hangi noktadasınız? Seçtiğiniz bu meslek kariyer yolculuğunuzda ulaştığınız bir yer mi yoksa yolculuktaki duraklardan sadece bir tanesi mi?
2. Sizce erken yaşam dönem deneyimleriniz, şu an yürüdüğünüz kariyer yolunuzu nasıl etkilemiş olabilir?
3. Şu an meslek/iş değiştirmeye karar vermiş olduğunuzu varsayın, sizce üniversite okurken yanlış kariyer tercihi yapmış olduğunuzu fark etmeniz kariyer gelişiminiz hakkında ne söylemektedir?

Kuramla İlgili Temel Bilgiler, Konular

Gelişim teorilerinin ana varsayımlarından biri, bireylerin gelişim evreleri sırasında değişiklikler yaşadığı ve değişen yaşam rollerine uyum sağladıklarıdır (Zunker, 2006). Söz konusu varsayım; sosyal, duygusal, fiziksel vb. gelişim alanlarında olduğu gibi kariyer gelişim alanına da uyarlanabilmektedir. Dolayısıyla kariyer gelişim kuramları bireyler büyüdükçe ve olgunlaştıkça farklı kariyer gelişim evrelerinden geçtiklerini ve her evrede tamamlaması gereken çeşitli görevler olduğunu varsaymaktadırlar. Gelişim kuramları denildiğinde akla gelen ilk isimler Ginzberg ve Super olmakla beraber onların kuramları çeşitli kaynaklarda kariyere psikososyolojik bakış açısı altında da toplanmaktadır (Chen, 2003). Bu bölümde gelişimsel kuramların temelini atan Ginzberg ve diğerlerinin görüşlerinden bahsedilmiş, daha sonra Ginzberg ve diğerlerinin görüşlerini eleştirerek ve daha da geliştirerek yaklaşımını oluşturan Super’ın kuramına değinilmiştir.

sahip olan ülkelerdeki bireylerle çalışırken kültürel duyarlılığı hesaba katmaktır. Dolayısıyla kariyer psikolojik danışmanları danışanlarıyla gelişimsel yaklaşıma dayalı psikolojik danışma yaparken gelişimsel dönemlerin ve yaşların ve o dönemdeki başarılması gereken görevlerin çalıştıkları kültürde değişebileceğini göz önünde bulundurmalı ve kuramın varsayımlarını kesinlik olarak ele almamalıdır.

Gelişimsel yaklaşımlara bakıldığında dikkat çeken şeylerden biri de şüphesiz kavramların parça parça olması ve bir bütünlük içerisinde sunulmamasıdır. Nitekim Super, hiçbir zaman bir kuram yarattığını ifade etmediğini tam tersine kendisinin yayınlarda daha çok *kuramsal yaklaşım* ifadesini kullanmaya çalıştığını verdiği bir röportajda da ifade etmiştir (Pappas, 1990). Super ve onu takip eden diğer kuramcılar kariyer gelişimi araştırmaları ve uygulamalarına etki etmeye devam edeceklerdir (Brown, 2002). Dolayısıyla gelişimsel yaklaşımların daha çok araştırılmaya ve geliştirilerek bütünleştirilmeye ihtiyacı bulunmaktadır.

Bunları biliyor muydunuz?

2013 yılında kariyer gelişim kuramları ile ilgili yayınlanan makaleler tarandığında (Sampson vd., 2014); 357 makale içerisinde sosyal bilişsel kariyer kuramları 35 kez, kariyer yapılandırma kuramı 19 kez, Holland'ın RIASEC kuramı 17 kez, büyük beşli faktör kuramı 11 kez, meslek talepleri-kaynakları modeli 8 kez, yaşam boyu-yaşam alanı kuramı 8 kez, benlik adanmışlığı kuramı 8 kez, daraltma ve uzlaşma kuramı 8 kez, çalışmanın ilişkisel kuramı 5 kez, bilişsel bilgi yapılandırma kuramı 4 kez, pozitif psikoloji 4 kez, sosyal değişim kuramı 4 kez tanımlanmış ve vurgulanmıştır. Diğer bir ifade ile Super'ın yaşam boyu-yaşam alanı kuramı eski bir kuram olsa da hâlâ kariyer kuramları içerisinde kendine bir yer bulmakta ve Super'ın kendisinin de belirttiği gibi gelecek kuramcılar onun kuramını daha da ileriye götürmektedirler.

Değerlendirme Soruları

1. Lise 11. sınıfta bir danışanınızın geldiğini ve sınava az bir süre kaldığı hâlde hâlâ okumak istediği bölüme karar veremediği için yaşadığı sıkıntıyı anlattığını düşünün. Bu danışanla gelişimsel kuramlar ışığında çalışmak isteseyiz nasıl bir değerlendirme yaparsınız? Kariyer psikolojik danışması sürecinde özellikle nelere dikkat edersiniz?
2. Ginzberg ve diğerlerinin ve Super'ın gelişimsel dönemlerine baktığımızda sizce hangi dönemler Türkiye'deki bireyler için daha gerçekçi bir bakış açısı sağlamaktadır? Neden?

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GOTTFREDSON'IN DARALTMA VE UZLAŞMA KURAMI

Özlem Haskan Avcı

Giriş

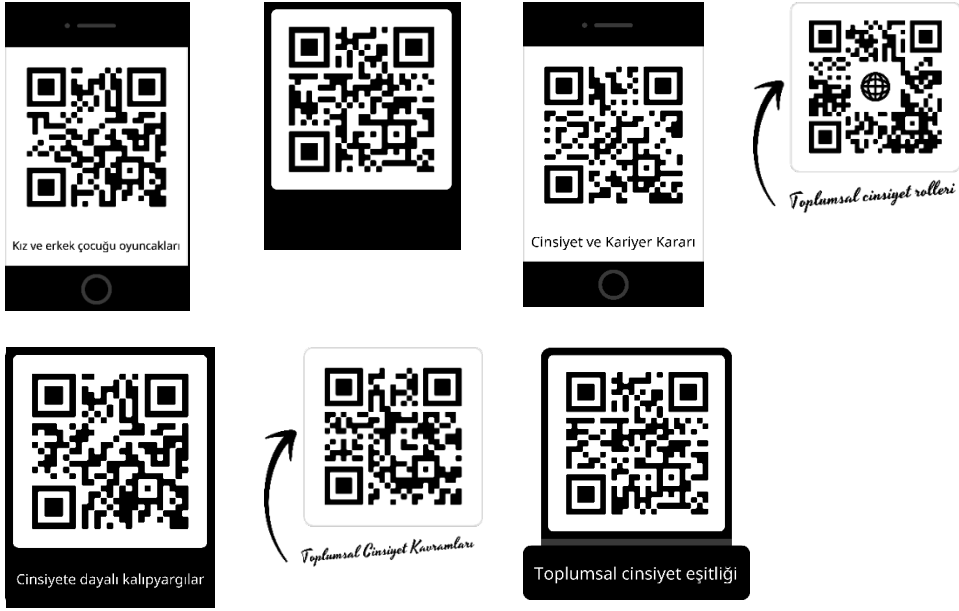
1970'lerde sosyoloji alanında yüksek lisans öğrencisiyken, kariyer alanının insani yönlerden uzak biçimde insana yaklaşımı beni şaşırtmıştı: Bu yaklaşımda bizler aslında insan değiliz, aynı amaçları (statü ve güç) arayan takas edilebilir varlıklarız. Öyle olmasaydı başkalarının yolumuza koyduğu engellere karşılık hepimiz eşit olarak “ileriye giderdik”... Kariyer psikolojik danışması alanı neden artık birey-iş eşleşmesindeki ikiz sütunlardan birine pek fazla dikkat göstermiyordu? Ayrıca yetenekler ve uygulamadaki rolü hakkında ne olup da bu kadar sınırlı şey söylüyordu? Aslında, ne olup da yeteneklerin ölçülmesi konusuna bu kadar uzak kalınmıştı? Bunun nedeni elbette yeteneklerin önemsiz olması değildi. Gerçekten de okul psikolojik danışmanları bana yeteneği nasıl ele alacakları meselesinin en büyük endişeleri olduğunu söylüyorlardı.

Yeni doğan ve henüz beşikte olan bin kadar bebeği hayal edin. Ne dış dünya hakkında ne de kendileri hakkında neredeyse hiçbir şey bilmiyorlar. On yıl sonra hepsi, bu ikisi hakkında çok şey öğrenmiş olacak. Yirmi yıl içinde hepsi, çoğunlukla farkında olmadan yaşamlarını şekillendiren birçok karar vermiş olacak. Otuz yıl sonra, bu bin kişi çok çeşitli mesleklere ve sosyal alanlara yayılmış olacak. Şans kimin nerede olacağı konusunda bir rol oynayacak ancak sonuçlar rastgele ya da sürpriz olmayacak. Bin yenidoğan, tıpkı yetişkinler gibi, meslekleri öncelikle erillik-dişillik ve prestij düzeyi olmak üzere iki boyutta ele alacaklar.

Bunların yanı sıra muhasebeciden mühendise, sanatçıdan öğretmene farklı alanlardan bireylerin kişilikleri hakkında ortak kalıp yargı paylaşacaklar. Benzer algılarına rağmen, ebeveynlerinin sınıf ve cinsiyet farklılıklarına dair kalıp yargın çoğunu yeniden üretecekler: Kızlar çoğunlukla “kadın” işini, oğlanlar “erkek” işini ve alt sınıftaki gençler üst sınıftan akrabalarına kıyasla daha düşük prestijli işleri isteyeceklerdir. Bazıları ilgilerine uygun olmayan işlere zorlanacak ancak birçoğu bunu zaten kendi tercihiyle yapacak. Peki yetişkinliğin eşiğindeki bu kafa karıştırıcı durumu ne açıklar? Daraltma ve uzlaştırma kuramı, bu konuyu anlayabilmede dört gelişim sürecinin anahtar olduğunu ileri sürüyor

(Gottfredson, 2003, s.1, 2).

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Bölüm 7

KARİYER KARARI VERMEDE SOSYAL ÖĞRENME VE PLANLANMIŞ ŞANS KURAMI

Semra Uçar

Hazırlık Soruları

1. Kariyer psikolojik danışmanlığında Sosyal Öğrenme Kuramı nasıl kullanılabilir?
2. Planlanmış Şans Kuramı ve Sosyal Öğrenme Kuramı arasında nasıl bir fark var?
3. Planlanmış Şans Kuramı, şans faktörüne kariyer psikolojik danışmanlığında nasıl yer vermektedir?

Kariyer Kararı Vermede Sosyal Öğrenme Kuramı

Sosyal Öğrenme Kuramı'nın Krumboltz tarafından kariyer psikolojik danışmanlığı alanına taşınması ile birlikte bu süreç kariyer gelişiminden söz ederken öğrenmelerin de süreç için önemli ve kolaylaştırıcı bir faktör hâline dönüşmesini sağlamıştır. Krumboltz'un çalışmalarına sonrasında eşlik eden önemli isimlerden biri de Kathleen E. Mitchell'dir. Mitchell ve Krumboltz, kariyer psikolojik danışmanlığı alanına Sosyal Öğrenme Kuramı'nı entegre ederken bireylerin daha aktif olmalarını ve kariyer gelişimi süreçlerini kontrol eden yetkin bireyler hâline gelmelerini vurgularlar. Öte yandan, bireylerde söz konusu olan bu potansiyellerin zaten yer aldığını savunmaktadırlar. Kariyer psikolojik danışmanlığı sürecinde de sosyal öğrenmeler merkezdedir. Çünkü söz konusu öğrenmeler bireyi ilgilendiren birçok faktörü etkilemektedir. Bunlar arasında tutumları, inançları, kişilik özellikleri gibi faktörler yer almaktadır (Mitchell ve Krumboltz, 1996).

Kariyer kararı vermede sosyal öğrenme kuramı, kariyer kararı verme sürecinde rol oynayan dört faktörden söz etmektedir. Bunlar genetik donanım ve özel yetenekler, çevresel koşullar ve olaylar, araçsal ve ilişkisel öğrenme deneyimleri ve görev yaklaşımı becerileridir. Bunlar, kariyer seçimlerinin altında yatan nedenleri açıklamada yardımcı faktörler olarak rol oynamaktadırlar. Aynı zamanda, bu faktörlerin her birinin bir diğeri ile etkileşimi de kariyer kararı verme süreçlerini etkilemektedir (Krumboltz, 1979). Kariyer kararı vermede etkili dört faktör aşağıda açıklanmıştır (Krumboltz vd., 1976; Sharf, 2013).

daha işlevsel olarak kullanılabilmesine de imkân sağlayabilir. Planlanmış Şans Kuramı, kariyer yönünü netleştiremeyen danışanlar için de değişen dünyada kendilerine kariyer bağlamında yer edinmelerine duyarlı bir yaklaşımdır. Bireyi merkeze alarak bireyin yaşam koşulları ile güncel ihtiyaçları dikkate almakta, dezavantaj perspektifine odaklanmak yerine fırsat perspektifine odaklanmaktadır. Bu yönleriyle de aynı zamanda öğrenmeleri öne çıkaran bir yaklaşımdır.

Değerlendirme Soruları

1. Planlanmış Şans Kuramı ile kariyer psikolojik danışmanlığı sürecini yapılandırmanız hâlinde nelere dikkat edersiniz?
2. Krumboltz'un kariyer psikolojik danışmanlığına entegre ettiği Sosyal Öğrenme Kuramı'nın hangi yönleri bu yaklaşımda öne çıkmaktadır?

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Hazırlık Soruları

1. Sizce insanlar, sahip olduğu özellikler yoluyla kariyer gelişimlerine yön verebilme gücüne sahip midir? Yoksa kariyer gelişimi, birtakım dışsal faktörler tarafından yönetilen bir süreç midir?
2. Kariyer gelişimi üzerinde hangi faktörler etkili olmaktadır?
3. Kariyer gelişiminde ortaya çıkan engeller ve sahip olunan destek sistemi, bireylerin kariyer seçimlerini nasıl etkileyebilir?
4. Benzer becerilere sahip olan insanların sergilediği performanslar niçin birbirinden farklılık göstermektedir? Bu tür durumlarda bireylerin performans başarılarını farklılaştıran özellikler neler olabilir?

Giriş

Son yıllarda kariyer gelişiminde bilişsel süreçlere ve bilişsel değişkenlerin rolüne odaklanmaya yönelik artan bir ilgi söz konusudur. Bilişsel devrim olarak adlandırılan bu durum, bireyleri kariyer gelişimlerine aktif bir biçimde yön veren özneler olarak görme eğilimini ortaya çıkarmıştır. Böylece üzerinde kontrol sahibi olamadıkları birtakım özelliklerin (intrapşik özellikler, mizaç, çevresel faktörler gibi) kurbanı olarak görmek yerine bireylerin kendi kariyer gelişimlerinde aktif roller üstlenebilecekleri kabul edilmeye başlanmıştır (Lent vd., 2002). Bu görüşü paylaşan kuramlardan birisi de Sosyal Bilişsel Kariyer Kuramı'dır.

Sosyal Bilişsel Kariyer Kuramı (SBKK), bireylerin sahip olduğu özelliklerin ve içinde buldukları çevrenin karşılıklı olarak birbirini etkilediğini vurgulayan Bandura'nın (1977) Sosyal Bilişsel Kuramı'na dayanmaktadır (Lent vd., 1994). Bu kuram, bireylerin kontrol edebildikleri özellikleri (inançlar, beklentiler vs.) yoluyla içinde buldukları çevreyi değiştirme gücüne sahip olduklarını öne sürmektedir. Aynı zamanda içinde bulunulan

Değerlendirme Soruları

1. Danışanların kariyer gelişimlerine destek olmada SBKK'den nasıl faydalanırsınız?
2. Sizce SBKK'nin güçlü ve zayıf yönleri nelerdir?
3. Bireyler, sahip oldukları hangi özellikler yoluyla kariyer gelişimlerine yön verebilirler?
4. Gerçekçi olmayan inanç ve beklentiler, kariyer gelişimi üzerinde ne tür etkiler yaratabilir?

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Hazırlık Soruları

1. Sizce kariyer gelişiminiz ile hikâye anlatımı arasında nasıl bir ilişki olabilir? Hikâyeler kariyer gelişiminizi nasıl etkileyebilir?
2. Yaşamınızdaki anılarınızı hikâyeleştirerek bir kâğıda yazınız. Bu anıları incelediğinizde tekrar eden nasıl örüntüler görüyorsunuz?
3. Kariyer hikâyenizi değiştirmek isteseydiniz nasıl değiştirirdiniz?

21. yüzyıl geniş çaplı değişiklikleri içeren bir yüzyıl olarak karakterize edilmektedir. Dördüncü Sanayi Devrimi, COVID-19 pandemi süreci, internetin hızı ve insanların dünyanın her yerine erişimi çok hızlı bir şekilde telefon gibi araçlar ile yapabilmeleri gibi bireylerin kariyer gelişimlerini de etkilemektedir. Özellikle bu yüzyıldaki tüm değişimleri bazı kuramcılar akışkan modernlik olarak (Bauman, 2005); bazı araştırmacılar ise bu yüzyılın değişkenliğini, belirsizliğini, karmaşıklığını ve muğlaklığını ifade eden VUCA dünyası (değişkenlik-volatility, belirsizlik-uncertainty, karmaşıklık-complexity, muğlaklık-ambiguity; U.S. Army Heritage and Education Center, 2019) olarak karakterize etmektedirler. Her ne kadar farklı isimler ile karakterize edilse de küreselleşme ve teknolojiye eğrisel değişimlerin sonuçları olarak bu yüzyılın çalışma dünyasının 20. yüzyıldan oldukça farklı olduğu bilinmektedir. 20. yüzyılda daha istikrarlı bir kariyer gelişim süreci söz konusuken ve kariyer gelişimi “merdiveni tırmanmak” olarak karakterize ediliyorken; 21. yüzyılda istikrarlı kariyer günlerinin sona ermeye başladığı söylenebilir. Birçok işin doğasının ve gerektirdiği becerilerin de değişmesi ile belirsiz ve esnek çalışma ortamlarına doğru bir dönüşümün olduğu ve kariyer geçişlerinde artışın söz konusu olduğu görülmektedir (Amundson, 2005; Schwab, 2015). Bu anlamda bu yüzyıl için kariyer psikolojik danışmanlığı çatısı altında önceki yıllarda sunulan hizmetlerden daha farklı hizmetlere ihtiyaç duyulduğu söylenebilir.

Kariyer psikolojik danışmanlığı alanının ilk ortaya çıktığı dönemlerden itibaren gelişimi incelendiğinde, kariyer psikolojik danışmanlığında birinci dalga olarak ifade edilen

Değerlendirme Soruları

1. Kendi kariyer gelişiminizi düşündüğünüzde, nasıl hikâyeler ortaya çıkıyor? Bu hikâyeleri Kariyer Yapılandırma Kuramı açısından inceleyiniz.
2. Kariyer uyum yeteneklerini açısından kendinizi değerlendirdiğinizde, ne görüyorsunuz? Sizce hangi kariyer uyum yetenekleriniz daha zayıf ya da güçlü? Neden?
3. Kariyer gelişiminizi Kariyer Yapılandırma Kuramı'nın Uyum Modeli açısından değerlendirdiğinizde ne fark ettiniz? Uyum sonuçları açısından ne tarz yaşantılarınız var?
4. Uyum sonuçlarınızı hangi nitelikleriniz etkilediğini Kariyer Yapılandırma Kuramı'nın Uyum Modeli boyutları açısından tartışınız.
5. Kariyer Yapılandırma Kuramı'nı dezavantajlı gruplar ile kullanırken nelere dikkat etmelisiniz?

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Bölüm 10

SİSTEMLER KURAMI YAKLAŞIMI

Tansu Mutlu Çaykuş

Hazırlık Soruları

1. Sahip olduğunuz bireysel özelliklerinizin kariyer kararlarınızı nasıl etkilediğini düşünürsünüz?
2. Bugüne kadar kariyerinizle ilgili aldığımız tüm kararları düşündüğünüzde; bu kararlarınızda belirleyici rol oynayan kişiler ve/veya durumlar nelerdir? Bu etmenler kariyer kararlarınızda nasıl bir rol oynadı?
3. İçinde yaşadığımız kültür, kariyer kararlarınızı nasıl etkilemektedir?

Giriş

Bireyin kariyer gelişimini inceleme, betimleme ve açıklama girişimleri Parsons'un Mesleki Büroyu 1909 yılında kurmasıyla birlikte başlayıp günümüze kadar devam etmiştir. Yaklaşık son yüz yılı kapsayan bu süreç içerisinde pek çok kariyer gelişimi kuramı geliştirilmiş, bu kuramların varsayımlarını test etmeye yönelik araştırmalar yapılmış, kariyer gelişim müdahaleleri uygulanmış ve bu müdahalelerin etkililiği değerlendirilmiştir. Yapılan araştırmaların sonuçları, uygulamalar ve geliştirilen müdahaleler zaman içerisinde kariyer gelişim kuramlarının değişime uğramasına ve bu kuramların temelinde yatan yaklaşımların değişmesine neden olmuştur. McMahon ve Patton (2018), söz konusu değişimlerin öncelikli olarak kariyer gelişim süreciyle ilgili yapılan çalışmalarda gerçekleştiğini vurgulamaktadır. Tarihsel olarak kariyer psikolojik danışması alanında yapılan çalışmalar gözden geçirildiğinde; önceki araştırmaların ve kariyer gelişim müdahalelerinin ilgi, kişilik ve değer gibi bireysel özelliklere ve bu özelliklerin kariyer gelişimi üzerindeki etkisine odaklanma eğiliminde olduğunu söylemek mümkündür. Farklı disiplinlerin kariyer psikolojik danışması alanına yansımalarıyla birlikte geleneksel olarak ihmal edilen coğrafi konum, sosyoekonomik koşullar ve eğitim ortamları gibi bağlamsal faktörlerin kariyer gelişimi üzerindeki etkileri keşfedilmeye başlanmıştır (Savickas, 2015). Araştırmalarla zenginleşen kariyer psikolojik danışması alanında zaman geçtikçe sosyal adaleti sağlamaya

farklılıklarına ve ihtiyaçlarına göre değerlendirme aracını kolaylıkla seçme özgürlüğünü tanımaktadır. Öte yandan nitel değerlendirme araçları uygulanması sonrasında puanların ortaya çıkmaması, diğer bireylerin sonuçlarıyla karşılaştırma imkânı sunmaması ve yorumların öznel olması nedeniyle eleştirilmektedir. Sistemler Kuramı Yaklaşımı'nda nicel değerlendirme araçları olmadığı için kariyer psikolojik danışmanları kendi yetkinlik ve bakış açılarına göre sonuçları yorumlamakta ve bu nedenle nitel-nicel değerlendirme sonuçlarını birlikte yorumlama imkânı bulamamaktadır.

Değerlendirme Soruları

1. Hangi etmenler bireylerin kariyer gelişim sürecinde rol oynamaktadır? Bu etmenler, bireylerin kariyer geçiş ve kariyer planlama sürecini nasıl etkilemektedir?
2. İçerik ve süreç etmenleri arasındaki benzerlik ve farklılıklar nelerdir?
3. Dezavantajlı gruplarda yer alan bir danışanla çalışırken Sistemler Kuramı Yaklaşımı'nı benimsemeyeniz durumunda nelere dikkat edersiniz?

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Bölüm 11

ÇALIŞMA PSİKOLOJİSİ KURAMI

Ayşenur Büyükgöze-Kavas

Furkan Kirazcı

Hazırlık Soruları

1. Sizce insana yakışır bir işin hangi özelliklere sahip olması gerekir?
2. Sizce bir bireyin yaşadığı ötekileştirilme deneyimleri onun iş hayatını nasıl etkiler?

Kuramın Tarihsel Gelişimi ve Ortaya Çıkışı

21. yüzyılın gelişi ve bu yüzyılda meydana gelen olaylar dünya çapındaki ekonomik, sosyal ve kültürel birçok kurumun doğasında oldukça derin ve hızlı bir değişimi tetiklemiştir. Teknolojinin baş döndürücü bir hızla gelişimi ve buna bağlı olarak ani bir şekilde küreselleşen dünyaya ayak uydurmak ise gittikçe zorlaşmaya başlamıştır. Dünya genelindeki bu hızlı değişimin ise en çok hissedildiği alanlardan birisinin kuşkusuz ekonomik piyasalar olduğu söylenebilir. Ekonomik piyasalardaki bu değişim ise küreselleşmeye bağlı olarak artan rekabet ile daha çok tetiklenmiştir. Buna göre bazı ülkelerdeki rekabetçi küresel piyasa güçleri, yüksek vasıflı ve üretken iş gücü için artan bir talep yaratmışlardır. Yüksek vasıflı çalışanlara yönelik artan talep ise eğitimde mükemmellik ve daha yüksek standartlara yönelik istekleri küresel çalışma hayatının temel taşları hâline getirmiştir (Coutinho vd., 2008). Buna bağlı olarak şirketler ve kurumlar, çalışanların; çeşitli yabancı dilleri bilmelerini, saygın üniversitelerden mezun olmalarını, teknolojiyi etkin bir şekilde kullanmalarını, analitik düşüncelerini, psikolojik esneklik ve problem çözme yeteneğine sahip olmalarını beklemektedirler (Blustein, 2006). Peki bütün bu aranan yeterliliklere sahip olmak için toplumun her kesiminden insanın ulaşabileceği kaynaklar eşit midir? Diğer bir deyişle herkes iyi bir eğitim alma ve iş gücü piyasasındaki rekabete ayak uydurabilmek için kendini geliştirme konusunda eşit fırsatlara sahip midir? İşte problem tam da bu kısımda başlamaktadır. İnsanların çoğu eğitim imkânlarının dağılımı ve iş fırsatlarının mevcudiyetindeki büyük değişimlerle boğuşmak zorunda kalırken, geleneksel kariyer gelişimi ve kariyer psikolojik danışmanlığı kuramlarının temel varsayımları toplumdaki bu

Değerlendirme ve Sonuç

İlk olarak Blustein'in (2006) çalışma psikolojisi çerçevesi olarak ortaya koyduğu çalışmalar daha sonra 2016 yılında Duffy ve diğerleri tarafından geliştirilerek Çalışma Psikolojisi kuramı olarak yayımlanmıştır. Kuram özellikle orta sınıf beyazların ve kariyer seçimlerinde tamamen özgür olduğu varsayılan bireylerin kariyer gelişimini açıklamaya çalışan klasik kuramlara karşı çıkmakta ve onların ötekileştirilmiş, sosyoekonomik düzeyi düşük, işsiz ve geçici işlerde çalışmak zorunda kalanlar ve benzeri grupların kariyer gelişimini açıklamakta yetersiz kaldığını belirtmektedir. Kuram odağına insana yakışır işi almış, ilk aşamada insana yakışır işin yordayıcılarını sonrasında da insana yakışır işin sonuçlarını açıklamaya çalışmıştır. Kuramın klasik kuramlardan en büyük farkı, farklı nedenlerle ötekileştirilmiş bireyleri de dikkate almasıdır. Kuram çerçevesinde önerilen modelin sınanabilmesi için birçok ölçme aracı da geliştirilmiştir. Bu yönüyle yani önermelerinin sınanabilir olması kuramın güçlü yanlarından biri olarak değerlendirilebilir. Ancak kurama ilişkin deneysel çalışmaların ve uygulamaların oldukça az olması da geliştirmeye açık bir yön olarak karşımıza çıkmaktadır.

Değerlendirme Soruları

1. Sizce bireyin sahip olduğu hangi özellikler onun insana yakışır bir iş elde etmesini kolaylaştırıcı olabilir?
2. Sizce insana yakışır bir işe sahip olmanın sonuçları neler olabilir?

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Bölüm 12

KABUL VE KARARLILIK TERAPİSİ VE BİLİNÇLİ FARKINDALIK UYGULAMALARI

Gökçen Aydın

Hazırlık Soruları

1. Üçüncü dalga bilişsel davranışçı yaklaşımların kariyer psikolojik danışmanlığına yönelik bakış açısı nasıldır?
2. İş yaşamında psikolojik esneklik nedir?
3. Kariyer psikolojik danışmanlığında bilinçli farkındalık uygulamaları nelerdir?

Kabul ve Kararlılık Terapisi

(Acceptance and Commitment Therapy; ACT)

Bilişsel davranışçı yaklaşımın üçüncü dalgası olarak kabul edilen Kabul ve Kararlılık Terapisi (Acceptance and Commitment Therapy; ACT), bireylerin acı, keder, üzüntü gibi olumsuz deneyimlerini değiştirmek yerine farkındalıkla kabul etme ve değerleri doğrultusunda kararlı adım atması yönünde bir yaklaşım benimser (Hayes vd., 1999). Kuramın İngilizce yazılışının baş harflerinden oluşan ACT, tek tek harflerin telaffuz edilmesiyle değil, bütün olarak İngilizce telaffuzuyla (/ækt/) okunur. Bu nedenle bölüm boyunca Kabul ve Kararlılık Terapisi'ni temsil edecek şekilde ACT kullanılmıştır.

1980'li yılların başında Steven C. Hayes tarafından ortaya atılan ve geçtiğimiz 20 yıl boyunca gerek teorik gerekse uygulamada oldukça ilerleme kaydeden ACT, post-modern dünyada kabul edilen kanıt temelli psikoterapi yaklaşımları arasında yerini almıştır (Hayes vd., 2006). ACT'e göre, insan yaşamı yalnızca olumlu (mutluluk, sevinç, coşku gibi) duygu ve deneyimlerden değil, olumsuz ve acı veren (kaygı, hüznün, endişe gibi) deneyimlerden oluşur ve bireyler bu olumsuz duygu ve düşünceleri yaşamın kaçınılmaz bir parçası olarak ele almalıdır (Hayes ve Lillis, 2012). Bireylerin enerjisini problemlerle savaşarak onları değiştirmek ya da bastırmaya çalışmak yerine değerleri doğrultusunda bir yaşam sürmeye yönelttiğimizde, daha anlamlı bir hayat yaşayacaklarına inanılır. Bu nedenle ACT

neklığın artırılmasını amaçlayan ACT uygulamaları yaşantısal deneyimler, metaforlar ve egzersizler aracılığı ile kazandırılabilir. Dolayısıyla uygulamalı eğitimlere katılarak, ACT'in kariyer psikolojik danışmanlığında kullanılması alanında uzmanlaşmak önemlidir.

Değerlendirme Soruları

1. Kabul ve Kararlılık Terapisi'nin (ACT) kariyer psikolojik danışmanlığına yönelik bakış açısı nasıldır?
2. İş yaşamında psikolojik esneklik nasıl sağlanır?
3. Kabul ve Kararlılık Terapisi ve bilinçli farkındalık uygulamalarının ortak özelliği nedir?
4. Kariyer psikolojik danışmanlığında bilinçli farkındalık uygulamaları hangi problem alanlarında kullanılabilir?

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Bölüm 13

KARİYER PSİKOLOJİK DANIŞMASINDA YAPILANDIRMACI YAKLAŞIMA DAYALI DİĞER KURAM VE MODELLER

Habibe Bilgili

Hazırlık Soruları

1. Umut, bireyin gelecekte olumlu sonuçlar elde edeceğine dair inancını temsil ederken; eylem, davranışı, işi veya harekete geçmeyi ifade etmektedir. Buna göre bu kavramlar, bireyin kariyer gelişiminde nasıl bir rol oynuyor olabilir?
2. Gelecekte ne gibi işler yapabilirsiniz veya hangi iş alanlarında çalışabilirsiniz? Bunlar üzerine düşünün. Peki, kariyer seçeneklerinizi belirlerken bu süreçte hangi unsurlar daha çok etkili oldu?
3. Bir yelkenli, rüzgâr gücünden yararlanarak yol alan bir çeşit teknedir. Yelkenli, su da hem rüzgâr enerjisiyle hareket eder hem de rüzgâra karşı yol alır. Bu durumda kariyer yelkenlisi modelinde, yelken, rüzgâr ve su, kariyer sürecindeki bazı unsurları ifade ediyor olsaydı bunlar neler olurdu?

Bu bölümde son zamanlarda kariyer psikolojik danışmanlığında yapılandırmacı yaklaşımın bakış açısına dayalı olarak geliştirilen, Umut Eylem Kuramı (Niles vd., 2011; Niles vd., 2021), Kariyer Teker Modeli (Amundson, 1989; Amundson vd., 2005) ve Kariyer Yelkenlisi Modeli (Korkut-Owen vd., 2015b) tanıtılmıştır. Yapılandırmacı yaklaşım, bireylerin çevresel olaylara yüklediği anlamlar üzerinde durur ve birey ile çevre arasındaki etkileşimi vurgular. Kariyer psikolojik danışmanlığında, yapılandırmacı yaklaşım, geleneksel bakış açısından uzaklaşılması, yaşam boyu kariyer gelişiminin ön plana çıkması ve bireylerin kendi kariyerini yönetmeye başlamalarıyla önem kazanmıştır. Yapılandırmacı yaklaşıma dayalı kariyer psikolojik danışmanlığında, danışana aktif rol verildiği, danışanla iş birliği içinde çalışıldığı, yaşam boyu kariyer gelişimine bütüncül bakıldığı, danışanın yaşam-kariyer ilişkileri üzerinde düşünmesi için teşvik edildiği ve bu ilişkileri değiştirmesi ve uyarlaması için cesaretlendirildiği görülmektedir (Patton ve McMahon, 2006a). Bu bakış açısıyla geliştirilen ve bu bölümde sunulan Umut Eylem Kuramı, Kariyer Teker Modeli ve Kariyer Yelkenlisi Modeli, danışanın kariyer psikolojik danışmanlığında aktif bir şekilde rol almasına ve kendini keşfetme sorumluluğunu almasına dayanır. Bu kuram ve modellerin ortak özelliklerinden bir

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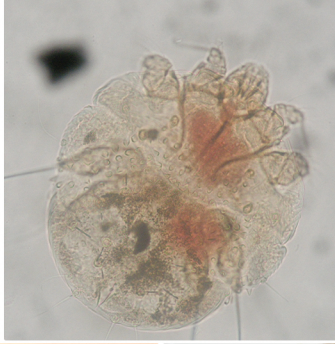
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MEDİKAL VE VETERİNER ENTOMOLOJİ



PROF. DR. MÜKREMİN ÖZKAN ARSLAN
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MEDİKAL ve VETERİNER ENTOMOLOJİ

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İÇİNDEKİLER

ÖN SÖZ	Vii
PROF. DR. MÜKREMİN ÖZKAN ARSLAN	İx
PROF. DR. BARIŞ SARI	Xi
BÖLÜM 1 MEDİKAL VE VETERİNER ENTOMOLOJİYE GİRİŞ	1
MEDİKAL VE VETERİNER ARTROPODOLOJİNİN ÖNEMİ	3
ARTROPODOLOJİNİN TARİHÇESİ	4
ARTROPODLARIN ZARARLI ETKİLERİ	6
ARTROPODLARIN HASTALIK ETKENLERİNİ NAKLETME ŞEKİLLERİ	14
ARTROPODLARIN YARARLI ETKİLERİ	15
ARTROPODLARDA ÜREME VE ÇOĞALMA (REPRODUCTION)	16
ARTROPODLARDA GENEL MORFOLOJİK-FİZYOLOJİK ÖZELLİKLER	16
ARTROPODLARDA AĞIZ ORGANELLERİ	20
ARTROPOD ENFESTASYONLARINDA İMMUNİTE	21
ARTROPODLARIN SINIFLANDIRILMASI	23
BÖLÜM 2 CRUSTACEA (KABUKLULAR) SINIFI	25
BÖLÜM 3 MYRIAPODA SINIFI	29
BÖLÜM 4 INSECTA SINIFI (HEXAPODA, ENTOMA, BÖCEKLER)	31
İNSEKTLERDE MORFOLOJİK VE BİYOLOJİK ÖZELLİKLER	31
İNSEKTLERDE BİYOLOJİK GELİŞME (METAMORPHOSIS -METAMORFOZ -BAŞKALAŞIM)	35
INSECTA SINIFININ SINIFLANDIRILMASI (CLASSIFICATION)	37
EXOPTERYGOTA BÖLÜMÜ	38
ORTHOPTERA TAKIMI (SYN: BLATTARIA, BLATTODEA)	39
HEMIPTERA TAKIMI (HETEROPTERA, TAHTAKURUSU)	41
ODONATA TAKIMI	45
THYSANOPTERA TAKIMI	46

DERMAPTERA TAKIMI	47
PLECOPTERA TAKIMI	47
ISOPTERA TAKIMI	47
PSOCOPTERA TAKIMI (=COPEOGNATHA)	48
PHTHIRAPTERA (BİTLER)	48
MALLOPHAGA TAKIMI	49
ANOPLURA (SIPHUNCULATA) TAKIMI	52
BİT ENFESTASYONLARI	56
ENDOPTERYGOTA BÖLÜMÜ (HOLOMETABOLA BÖLÜMÜ).....	60
COLEOPTERA TAKIMI	60
HYMENOPTERA TAKIMI	62
NEUROPTERA TAKIMI (PLANIPENNIA)	65
LEPIDOPTERA TAKIMI.....	65
SIPHONAPTERA (APHANIPTERA) TAKIMI	68
PİRE ENFESTASYONLARI	73
DIPTERA TAKIMI	78
NEMATOCERA ALTTAKIMI.....	81
CULICIDAE (SİVRİSİNEKLER) AİLESİ.....	81
CERATOPOGONIDAE (HELEIDAE, ACİSİNEKLER) AİLESİ	87
SIMULIIDAE (MELUSINIDAE, KARA SİVRİSİNEKLER) AİLESİ.....	91
PHLEBOTOMIDAE (PSYCHODIDAE, KUM SİNEKLERİ) AİLESİ.....	94
BRACHYCERA ALTTAKIMI	97
TABANIDAE AİLESİ.....	97
CYCLORRHAPHA ALTTAKIMI	101
MUSCIDAE (KARASİNEKLER) AİLESİ.....	101
MYIASIS	104
CALLIPHORIDAE AİLESİ (YAPIŞKAN SİNEKLER, MAVİ-YEŞİL ET SİNEKLERİ).....	108
SARCOPHAGIDAE (ETSİNEKLERİ, BOZ ETSİNEKLERİ) AİLESİ	111
OESTRIDAE (BURUN SİNEKLERİ) AİLESİ	113
GENUS: <i>OESTRUS</i> (OESTROSIS)	114
GENUS: <i>RHINOESTRUS</i>	119
HYPODERMATIDAE (DERİSİNEKLERİ) AİLESİ.....	119
GENUS: <i>HYPODERMA</i> (HYPODERMOSIS)	119
GENUS: <i>PRZHEVALSKIANA</i>	126
GASTEROPHILIDAE (MİDESİNEKLERİ) AİLESİ	127
GENUS: <i>GASTEROPHILUS</i> (GASTEROPHILOSIS)	127
CUTEREBRIDAE AİLESİ	131
HIPPOBOSCIDAE (ATSİNEKLERİ, BİTSİNEKLERİ, PUPİPAR SİNEKLER) AİLESİ	134
GLOSSINIDAE (ÇECESİNEKLERİ) AİLESİ	138
BRAULIDAE AİLESİ	140

BÖLÜM 5	ARACHNİDA (=ARACHNOİDEA) SINIFI.....	143
	SCORPIONIDEA TAKIMI	144
	ARANEIDEA TAKIMI	145
	ACARINA TAKIMI	147
	METASTIGMATA ALTTAKIMI	148
	IXODİDAE (MERA KENELERİ VEYA SERT KENELER)	150
	KENELERDE İDENTİFİKASYON ANAHTARI	161
	ARGASİDAE (MESKEN KENELERİ, YUMUŞAK KENELER).....	163
	IXODİD VE ARGASİD KENELER ARASINDAKİ MORFOLOJİK FARKLAR.....	164
	IXODİD VE ARGASİD KENELER ARASINDAKİ BİYOLOJİK FARKLAR.....	166
	KENELERİN ÖNEMİ (MEDİKAL ÖNEMİ, ZARARLARI).....	171
	KENE ENFESTASYONLARINDA İMMUNİTE.....	178
	KENE ENFESTASYONLARINDA TEDAVİ	181
	MESOSTIGMATA ALTTAKIMI.....	181
	TROMBICULİDAE AİLESİ	189
	TARSONEMİDAE AİLESİ	190
	PEDICULOIDİDAE (PYEMOTİDAE) AİLESİ	192
	CHEYLETİDAE (CHEYLETİELLİDAE) AİLESİ.....	193
	PSORERGATİDAE AİLESİ.....	194
	MYOBIİDAE AİLESİ.....	195
	DEMODİCİDAE AİLESİ	196
	UYUZDA (SCABİES, MANGE) TEDAVİ	229
	AİLE: ACARİDAE (SYN: TYROGLYPHİDAE)	236
BÖLÜM 6	PENTASTOMİDA SINIFI.....	241
	LİNGUATULİDAE AİLESİ	242
	POROCEPHALİDAE AİLESİ	243
BÖLÜM 7	EKTOPARAZİTER MÜCADELE	
	(ARTROPODLARDA KONTROL)	245
	EKTOPARAZİTER İLAÇLARIN SINIFLANDIRILMASI	248
	EKTOPARAZİTER İLAÇLARIN UYGULAMA ŞEKİLLERİ	255
	İNSEKTİSİT-AKARİSİT UYGULAMALARINDA DİKKAT	
	EDİLECEK HUSUSLAR	257
	EKTOPARAZİTER İLAÇLARA KARŞI DİRENÇ	259
KAYNAKLAR		287

KAYNAKLAR

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İÇİNDEKİLER

YAZARLAR LİSTESİ	iii
ÖN SÖZ	1
BÖLÜM 1	TEKNOLOJİK DEVAMLILIK FETİŞİZMİ:
	META İNSAN VE YENİ SANAL YAŞAM
	5
	GİRİŞ
	5
	İnsanın En Büyük Fetışı: Teknolojik Devamlılık.....
	7
	Siber Meta-Gerçeklik.....
	9
	Meta İnsan
	11
	Tekno-Kronolojik Bakışla Metaverse’e Doğru
	15
	İnsan Olmanın Geleceği Üzerine
	18
	Sonuç.....
	19
	Kaynakça
	21
BÖLÜM 2	SANAL EVRENDE “YAŞAMAK” ÜZERİNE.....
	23
	GİRİŞ
	23
	Yaşama Sanatı Üzerine Düşünsel Argümanlar
	25
	Toplumsal Yaşam Biçimlerinin Yaşama Sanatı Üzerindeki Etkisi.....
	26
	Bilgi Toplumunun Özellikleri
	28
	Dijital Toplum
	31
	Yaşamaya Yeni Bir Ortam: Metaverse.....
	34
	Sonuç.....
	38
	Kaynakça
	39
BÖLÜM 3	SANAL DÜZLEMDE GÖRSEL KÜLTÜRÜN VE
	İMGENİN TEMSİLİ
	41
	GİRİŞ
	41
	Sanal Ortamın Yeni Adı: Metaverse
	44
	Görsel Kültür
	48
	İmge
	50
	Sonuç.....
	53
	Kaynakça
	54

BÖLÜM 4	GOFFMAN'IN BENLİK SUNUMU KURAMI BAĞLAMINDA METAVERSE OYUNLARINDA KİMLİK İNŞASI	57
	GİRİŞ	57
	Metaverse ve Oyun Kavramları.....	59
	Sanal Bir Sosyalleşme Aracı Olarak Metaverse'de Oyun.....	62
	Benlik Sunumu Kuramı Çerçevesinde Avatar Kimliğinin İnşası	66
	Sonuç.....	73
	Kaynakça	74
BÖLÜM 5	METAVERSE EVRENİNDE SANATIN MORFOLOJİSİNİN GERÇEKLIK ALGISINA ETKİLERİ	77
	GİRİŞ	77
	Bir Konsept Olarak Sanat ve Teknoloji İlişkisinden	
	Etkileşimli Sanata	79
	Yeni Bir Gerçeklik Ortamı: Metaverse	81
	Metaverse ile ya da Metaverse'de Sanat	83
	Sonuç.....	91
	Kaynakça	92
BÖLÜM 6	TEKNOLOJİK YENİLİĞİN MESİHVARİ SUNUMU: METAVERSE VİZYONU ÖRNEĞİ	95
	GİRİŞ	95
	Bilimsel Organizasyonlarda Vaade Dayalı Gelecek Vizyonu	96
	Bilim ve Teknolojinin Mesihvari Sunumunun Yapısal Özellikleri ...	100
	Facebook ve Halkla İlişkiler Krizleri	104
	Metaverse Sunumu	106
	Sonuç.....	112
	Kaynakça	114
BÖLÜM 7	YENİ NESİL EKONOMİ: METAVERSE.....	117
	GİRİŞ	117
	Sanal Dünya Kavramı.....	118
	Metaverse Kavramı	119
	Metaverse'de Ekonomik Çerçeve.....	123
	Metaverse Ekonomisinde Tahminler	124
	Metaverse ile Genişleyen Pazar Ekonomisi.....	127
	Sonuç.....	129
	Kaynakça	131
BÖLÜM 8	SOSYAL MEDYA VE METAVERSE BAĞLAMINDA DİJİTAL PAZARLAMA ÜZERİNE BİR DEĞERLENDİRME ...	133
	GİRİŞ	133
	Sosyal Medya Pazarlaması	134

Metaverse Ekosistemi ve Pazarlama.....	137
Pazarlama Bağlamında Metaverse Ekosisteminin Fırsatları.....	138
Pazarlama Bağlamında Metaverse Ekosisteminin Tehditleri	141
Sonuç.....	142
Kaynakça	144
BÖLÜM 9 METAVERSE VE DİJİTAL REKLAMCILIK EKSENİNDE HİPER KİŞİSELLEŞTİRİLMİŞ REKLAMLARIN YÜKSELİŞİ	147
GİRİŞ	147
Metaverse ve Dönüşen Reklamcılık Pratikleri.....	148
Kişiselleştirme ve Kişiselleştirilmiş Reklamlar	151
Hiper Kişiselleştirmenin Kavramsal Arka Planı	152
Metaverse Ekseninde Hiper Kişiselleştirme ve Hiper Kişiselleştirilmiş Reklamlar	154
Sonuç.....	155
Kaynakça	156
BÖLÜM 10 METAVERSE DERGİCİLİĞE YENİ BİR SOLUK GETİREBİLİR Mİ?	161
GİRİŞ	161
Metaverse ve Toplumsal Yaşam.....	163
Habercilikte Metaverse	166
Dergicilik Özelinde Metaverse	169
Metaverse Dünyasındaki İlk Dergi: Red-Eye Metazine	170
Metaverse'e Adım Atan İlk Basılı Dergiler: L'Officiel ve MO	176
Sonuç.....	180
Kaynakça	181
BÖLÜM 11 METAVERSE TERAPİ ODALARI: SANAL GERÇEKTE SEANS GERÇEKLEŞTİRMEK.....	183
GİRİŞ	183
Terapi Öncesi Klinik Ön Değerlendirmenin Metaverse'deki Yeri ..	184
Çocuk ve Ergenler İçin Metaverse Oyun Seansları Konsepti	187
Yetişkinler İçin Metaverse Terapi Seansları Konsepti.....	190
Metaverse Terapi Odalarına Yaklaşırken: Sanal Gerçeklikte Örnekler.....	193
Metaverse Terapi Seanslarına Dair Etik Değerlendirmeler	196
Sonuç.....	198
Kaynakça	200
YAZARLAR HAKKINDA	205
Serdar Kuzey Yıldız / Editör	205
Aslı Yapar Gönenc	205
Ceren Bilgici.....	206

Fatma Nazlı Köksal	206
Gülsün Bozkurt	206
Hakan Sağlam	207
Nur İnci Namlı	207
Özge Özkök Şişman	207
Selin Kiraz Demir	208
Tuğçe Ayçin	208
Umur Bedir	209
Zuhal Sönmezer	209

Bölüm 1

TEKNOLOJİK DEVAMLILIK FETİŞİZMİ: META İNSAN VE YENİ SANAL YAŞAM

Serdar Kuzey Yıldız

GİRİŞ

İnsan, yeryüzünde kendine atfedilmiş büyük varoluş misyonunu yerine getirmeye çalışan bir iz bırakıcı olarak tarihin her döneminde bir üst basamağa tırmanmanın yolunun teknolojiyi geliştirmekten geçtiğinin her zaman farkındadır. Erken dönemlerde gündelik yaşayışı köklü değişimlere uğratarak heyecanı ve korkuyu aynı anda yaşatabilen inovatif icatlar dikkat çeker. Bu teknolojilerin kullanımı eşit değildir. Ancak her yeni teknoloji icat edildiği topraklar içerisinde yaygınlık kazandıktan sonra yavaş yavaş sınırları aşmaya başlar ve kullanım alanı görece küresel bir hâl alır. Üstelik her bir inovasyon onlarca yıllık deneyimin ve deneylerin ürünüdür; eklektik bir anlayışla birbirlerinin üzerine bina edilirler. Tarihte genellikle askerî kapasitenin artırılması, güvenliğin sağlanması, düşmana gözdağı verme gibi kaygılar sonucunda ortaya çıkan ve gelişen haberleşme sistemleri, telekomünikasyon altyapısı ve nihayetinde internet teknolojisi bu duruma en iyi örneklerdir. Bu teknolojilerin sivilleşmesi uzun yıllar almışsa da bugün her birinin modern bireyin dünyasındaki yeri bilinçsiz birer sahiplikten ibarettir. Teknolojinin neredeyse haftalık güncellemelerle kabuk değiştirdiği günümüzde çağın ruhunun tüketmek olduğu da göz önüne alındığında insanı şaşırtabilecek yeni bir teknolojik ürünü ortaya koymanın zorluk derecesi daha iyi idrak edilebilir.

Medeniyetler için maddi refahın sağlanması, yaşam kalıplarının ve toplumsal davranışın dizayn edilmesinin koşulu her çağda teknoloji olmuştur. Üstelik tarih öncesinden modern çağa kadar uzanan insanın yaşama direnme ve tarihte iz bırakma içgüdüünün dayanağı da teknolojidir. Teknolojinin temeldeki iddiası insanın iyileştirilmesi, bir önceki nesilden daha iyi olmasıdır. Birincil

sındadır. İnsan deneyimlemekte olduğu bu evrimi yanlış yorumlarsa ve tarihteki hatalarından ders almazsa Stephenson'ın Snow Crash romanında tasvir ettiği distopik metaverse gerçek olabilir. Ancak metaverse doğru inşa edildiği takdirde fırsatlarla ve zenginliklerle dolu bir dünya bizi beklemektedir. Tıpkı her yeni teknolojik ilerlemede olduğu gibi.

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Bölüm 2

SANAL EVRENDE “YAŞAMAK” ÜZERİNE

Gülsün Bozkurt

GİRİŞ

İnsanı diğer canlılardan ayıran en önemli özelliklerden biri içinde yaşadığı dünyayı ihtiyaçları doğrultusunda sürekli dönüştürebilme yetisidir. Başlangıçta doğada hayatta kalma ve doğaya uyma dürtüsü etrafında şekillenen yapıp etmeler zamanla doğayı kontrol edebilme noktasına evrilmiştir. Ürettiği teknolojiyle bugünkü dünyayı hayatta kalmanın ötesindeki anlam arayışlarıyla donatan insanın bir sonraki yolculuğu ise merak konusudur.

Kant'ın yetkinleşmenin ön koşulu olarak ileri sürdüğü aklını kullanma cesareti (Kant, 1784) insanın aydınlanmasına dayanak oluşturan en önemli adımlardandır. Bu cesaret insanın düşünmesine, sorgulamasına, eleştirmesine ve her daim kendini ve çevresini dönüştürebilmesine olanak tanımaktadır. Bu farkındalıkla yol alan insan kendi yaşama deneyimini inşa eder. Başkasının kılavuzluğunda belirlenmiş bir hayat kişiyi kendi dünya atıflarının dışında bir yerde konumlandırır. Yaşama sanatı iyi veya kötü, doğru ya da yanlış her bireyin kendini nasıl gerçekleştirmek istediğinin ve günün sonunda nasıl gerçekleştiğinin somutlaştırılmasıdır.

Düşünce tarihinde insanın neden ve nasıl yaşadığı, yaşamayı nasıl anlamlandırdığı üzerine yapılmış pek çok çalışma mevcuttur. Hem disiplinler nezdinde hem de bireysel olarak ele alınan bu türden sorgulamalara mutlak cevaplar verilememesi bu arayışı ve sorgulamayı anlamsız hâle getirmez. Bilakis yaşamın devingenliği insana ait bu sorgulamalara sürekli bir cevap arama çabasıyla anlam kazanır.

İnsanın hem yaşama hem de yaşamına dair belli bir farkındalık geliştirebilmesi için öncelikle yaşamayı bir mesele hâline getirmesi gerekmektedir.

eğitim, boş zaman kavramı, hobiler ve daha pek çok şey yalnızca yaşamayı değil yaşamayı geliştiren düşüncenin biçimlendirilmesini de hedeflemektedir.

Etrafımızı kuşatan akıllı nesnelere, yalnızlığın üstesinden gelmeye çalıştığımız platformlar, online pratiklerimiz ve daha birçok dijital aktivite bir anlamda bizi çağı yönlendiren bir aracın gölgesinde yaşamaya mecbur bırakmaktadır. Büyük anlamlar yüklenen metaverse evren de insanın nasıl düşünmesi ve konumlanması gerektiği konusunda ileri sürülen potansiyel bir gelecek vaadidir ve bu varsayımların bugüne kadar geliştirilen diğer pratiklerden farkı tam anlamıyla muğlaktır. Bugün için gerçekleşmesi uzak bir ihtimal olan bu geleceğin insanın kendini mutlu hissetmesine ne kadar hizmet edip edemeyeceği ise herkesin gelecek hakkında kendi düşüncesini ortaya koymasından daha fazlası değildir. Nihayetinde bizi daha iyi hissettiren her yeniyi kucaklama refleksimiz metaverse evren varsayımını çalışabilecek popüler bir alan hâline getirirse de tepeden inme bu yeni evren dayatması pek çok açıdan şüphe uyandırmaktadır. Büyük anlamlar yüklenen metaverse de insanın nasıl düşünmesi ve konumlanması gerektiği konusunda ileri sürülen potansiyel bir gelecek vaadidir. Bugün için gerçekleşmezi uzak olan bu geleceğin insanın kendini gerçekleştirmesine ne kadar hizmet edip edemeyeceği ise herkesin kendi anlamlandırabileceği varoluşsal yolculuğunu yorumlamasından başka bir şey değildir.

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Bölüm 3

SANAL DÜZLEMDE GÖRSEL KÜLTÜRÜN VE İMGENİN TEMSİLİ

“İnsanların yok oluşundan bahsederken bunu soyut bir metafor olarak kullanmıyorum. Kastettiğim şey şu: Hemen hemen iki bin yıldır alfabe ile şekillenen Avrupalı ve Batılılara özgü zihinsel uzamın yerini, bilgisayarın şekil verdiği yeni bir algısal uzam alıyor. Başka bir deyişle baskın bir metafor olan alfabetik metin diğer bir metafora; bilgisayar ekranına toslamış durumda.”

Barry Sanders, (1999: 136)

Fatma Nazlı Köksal

GİRİŞ

Dijital dönüşüm olarak adlandırılan süreç, giderek artan bir şekilde insanların gündelik yaşam pratiklerine entegre olmakta ve kültürel yapıyı etkilemektedir. Özellikle yeni imgesel formların ortaya çıkması ve insanların imgelere yönelik algı ve anlamlandırma biçimlerinin çeşitlenmesi, görsel kültüre yönelik yansımalarla daha da görünür hâle gelmiştir (Burnett, 2004). Gitgide küresel bir görünüm kazanan kültürel yapı ve bu yapıyı genişleten dil ve iletişim, tüm lisanslarda konuşulabilen “dijital görüntü” üzerinden şekillenmektedir (Hall ve Evans, 1999). Söz konusu şekillenme, görsellik üzerinden yaratılan bir kültüre de zemin oluştururken, teknolojinin kültüre yansıması, görsel imgelerin önemli birer kültürel kod hâlini almasına ve dijitalleşen imgelerin giderek yaygınlaşmasına neden olmaktadır. Rubinstein ve Sluis, teknolojiyle birlikte günümüz iletişim ortamlarını etkileşimli imgeler sunan dijital görüntüler mekânı olarak tanımlar ve dijital görüntülerin “çoğulculuk ve çokluğun ürünü olarak ne görünür ne de görünmez olarak şüphesiz paradoksal bir nesne” olduğunu belirterek dijitalleşen görüntülerin doğruluğundan ziyade olgusallığına dikkat çeker (Rubinstein ve Sluis, 2013: 24-37).

kontrol altına alan sanal bir ortamın yeni adıdır ve bu nedenle hakikat'i değil sanı'yı güçlendiren sentetik bir aklın ürünüdür.

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Bölüm 4

GOFFMAN'IN BENLİK SUNUMU KURAMI BAĞLAMINDA METAVERSE OYUNLARINDA KİMLİK İNŞASI

Hakan Sağlam

GİRİŞ

Teknoloji şirketlerinin son yıllarda önemli ölçüde yatırım yaptığı üç boyutlu sanal bir evreni ifade eden metaverse, “Meta” adını alan ünlü sosyal medya platformu Facebook’un güncel açıklamaları sayesinde geniş bir kitlenin ilgisini çekmeye başlamıştır. Toplumsal ilişkilerin yapısını önemli ölçüde etkileyecek olan metaverse’ün; ticaret hayatından eğitim sektörüne, sosyal-kültürel faaliyetlerden hukuki sisteme kadar uzanan geniş bir alanda önemli değişikliklere kapı açacağı öngörülmektedir. Teknolojinin yeni bir toplumsal düzen oluşturması anlamında ikinci bir evren olarak da görülebilecek metaverse, önünde durulamayacak “dijital bir patlama”ya işaret etmekte ve sağladığı büyük avantajların yanında evrimi kestirilemeyen çok sayıda belirsiz nokta içermektedir.

Teknolojinin şekillendirdiği metaverse evreninde sosyal yaşamın önemli bir parçası olarak boş zaman ve eğlence alışkanlıkları da önemli değişimler geçirmekte, fiziksel katılım olmadan bir avatarla kurgusal evrende varoluş deneyimi bambaşka bir sürecin başladığını göstermektedir. Metaverse’ün gelişim gösterdiği ilk alanlardan olan dijital oyunlarda, oyuncular avatarları yoluyla diğer oyuncularla tanışarak etkileşim kurmakta ve sanal kimlikleriyle oyunun haz verici evreninde bir akış yaşamaktadır. Bireylere kendilerine benzer ya da hayal ettikleri, sahip olmak istedikleri özellikleri bünyesinde bulunduran avatarları vasıtasıyla sanal kimlikler inşa edebilme olanağı sağlayan metaverse, bu özelliğiyle oyuncular için bir benlik sunumu alanı olarak da değerlendirilebilir.

Gadamer’e göre oyunlar bireyin saf kendiliği ifade edişidir. Oyunun doğasındaki süreklilik ve amaçsızlık sabit şekilde kendini yenilemektedir. Böylece

Metaverse oyunlarındaki sanal kimlik inşasında kişi ilk olarak gerçek hayattaki kimliğini çevrim içi temsiliyle birleştirmektedir. Kişinin benliği ile avatar benliği zamanla birbirlerini yansıtır hâle gelmekte ve kişi için avatari onun basit bir temsilden öteye geçerek kendini gördüğü paralel gerçekliğini ifade etmektedir. Kişinin gerçek hayatındaki kimliği ile avatar kimliği arasındaki farkın mümkün olan en az seviyede olması, hatta (düşük bir ihtimal de olsa) kaybolması, sağlıklı bir psikolojik sürece işaret eder. Avatari ile sanal ortamda gerçek hayattakine göre daha fazla vakit geçiren bireyin avatar kimliğinin gerçek hayattaki kimliğine hükmetmeye başladığı durumlarda bunun sadece gerçek hayattaki kimliği üzerine değil, avatar kimliği üzerinde de etkileri olacaktır. Bu durum kişilerin benlik sunumlarını da belirli ölçüde etkileyecektir. Bunun sebebi, kişinin gerçek hayattaki kimliği ile avatar kimliği arasında karşılıklı olarak birbirlerini etkileyen diyalektik bir sürecin kaçınılmaz hâle gelmesidir. Kişinin avatar kimliğinin gerçek hayattaki kimliğine bağlı gelişebileceği gerçeğinden hareketle, gerçek hayattaki kimliğinden (aslından) koparak farklı bir doğrultuda gelişmeye başlayan bir avatar kimliğin yol açtığı çelişkiler bireyi gerçeklik algısından uzaklaştıracak bir aşamaya ulaştığında psikolojik sorunlara zemin hazırlayacaktır. Bu psikolojik sorunların neler olabileceği ve hangi boyutlara ulaşabileceği gerçek ve sanal kimliklerin birbirleri üzerindeki etkilerini ele alacak siber psikolojinin klinik araştırmaları neticesinde kapsamlı olarak aydınlatılabilir.

Bireylerin sosyalleşme süreçlerinin sağlıklı gelişmesini etkileyen çok sayıda faktör olmakla birlikte basit bir boş zaman geçirme ve eğlence etkinliği olarak değerlendirilemeyecek oyunlar, bireyin sadece kendine yönelik (içsel) eğilimleri değil, sosyal ilişkilerinin niteliğine yönelik de (dışsal) önemli ipuçları sağlamaktadır. Bu nedenle özellikle oyun bağımlılığı noktasına gelmiş kullanıcıların davranışsal problemlerini içeren psikopatolojilerden korunmak için dijital okuryazarlık becerilerinin geliştirilmesi büyük önem arz etmektedir. Sağlıklı bir toplumsal yapının ancak sağlıklı psikolojiye sahip bireyler sayesinde oluşabileceği gerçeğinden hareketle, ilkökul seviyesinde başlayan, dijital okuryazarlığı da içeren medya okuryazarlığı eğitimi sayesinde bireylerin teknolojinin faydaları kadar zararları konusunda da eğitilerek bilinçlenmeleri sağlanmalıdır.

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Bölüm 5

METAVERSE EVRENİNDE SANATIN MORFOLOJİSİNİN GERÇEKLIK ALGISINA ETKİLERİ

Selin Kiraz Demir

GİRİŞ

Bundan yaklaşık otuz bin yıl geriye gittiğimizde sanatın insan hayatındaki sarsılmaz yerinin izlerine rahatlıkla rastlayabiliriz. Kişinin kendini ifade aracı olmasının yanı sıra inanç ve ritüellerin sembolik bir formu olarak da düşünülen sanatın ilk örneklerini, Batı geleneğindeki estetik felsefesinin merkezine yerleşen bir üslup takip etmiştir. Rotamızı Orta Çağ'a çevirdiğimizde ise sanatın neredeyse hiç okuryazar olmayan toplumları eğitmeye hizmet eden bir işleve sahip olduğunu görürüz. Klasik rasyonellik ve güzellik değerlerinin sanatsal ifade biçimlerini dönüştürdüğü bir döneme denk gelen Avrupa Rönesansı'na baktığımızda sanatçılara artık zanaatkâr değil, gerçek bir entelektüel gözüyle bakıldığını ve toplumdaki görece düşük statülerinin yerini bir saygınlık aldığını söyleyebiliriz. Tüm bu gelişmeler yaşanırken sanatsal üslupta benimsenen dönüşümler çoğu kez toplumsal değişimlerin bir sonucu olarak yansıtılır.

İlk sanatın neden yapıldığını tam olarak bilmek olanaksızdır ama kuşkusuz olan şudur ki insanlar gördükleri bazı şeyleri kalıcı hâle getirmek istemişlerdir. Dolayısıyla sanatın ilk örnekleri, üretenin doğada gördüklerini -yapabildiği kadar- gerçeğe en yakın hâlde yansıtmasıyla değerlendirilir. Zamanla sanatın gerçeğe olan bağının sarsıldığı, onun yerine kişisel duygu ve düşüncelerin dışavurumu için etkili bir alan olarak ifade bulduğu söylenebilir. Böyle bir durumda ise çeşitli ikonlar, sembeler ve semboller sanatın ayrılmaz bir parçası hâline gelmiştir. Doğada bireyin psikolojisini etkileyen her varlık, nesne, form ya da renk, sanata bir ifade biçimi olarak yansır ve ona bir anlamda ruh kazandırır. Nedeni ne olursa olsun sanat yüzyıllardır bireyin hayatının vazgeçilmez

bir ortam ve bir aradalık bu yeni dünya düzeninin en önemli bileşenleri gibi görünüyor. Böyle bir atmosferde yeni teknolojilerin bireyleri görece özgür bir platformla buluşturması da oldukça değerli bir gelişme olarak görülebilir.

Yüzyıllardır hayatı anlamlandırmamızı sağlayan ve yaşamı daha değerli kılan, kişinin kendini ifade aracı olarak ortaya çıkan sanat ve sanata dâhil olan her alan da çağın tüm pratikleri gibi teknoloji ile evrilerek sarsılmaz varlığını sürdürmüştür. Bireyin imkânları ve kullandığı araçlar geliştikçe ürettiği sanat eserinin ulaşılabilirliğinin arttığı ve zaman/mekân sınırının ortadan kalktığı rahatlıkla söylenebilir. Yalnızca bu bile sanat ve teknoloji ilişkisine mesafeli bakmanın bir haksızlık olacağını göstermektedir. Fakat yine de teknolojinin herkese aynı anda ve aynı şekilde ulaşmıyor olması, sanatın üretimi ve sunulmasında da eşit olmayan süreçleri beraberinde getirebilmektedir.

Bugün geldiğimiz noktada teknolojinin sanata olan etkisindeki en tartışmalı noktalardan biri, bu araçlara ulaşılma imkânının sınırlı olmasıdır. Bu durum, mevcut gerçekliğin sınırlarını aşabilmenin maddi koşullara bağlanmasına sebep olabilmektedir; bu da sanatın özüne vurulabilecek darbelerden biridir. Çünkü herkesin sanata ihtiyacı vardır ve sanat hem üretimi hem de tüketimi bakımından toplumdaki herkesin ulaşabileceği bir yerde konumlanmalıdır. Şu da bir gerçektir ki insanlık tarihinde mağara duvarlarına çizilen ilk resimler için farklı materyallere ihtiyaç duyulmamıştır. Sanatın sanat olabilmesi ve kendi gerçekliğini inşa edebilmesi için yalnızca teknolojiye gereksinim duyulmaz, ama teknolojiyle de gelişebilir ve dönüşebilir. Dönüşmelidir de.

Çalışma kapsamında ele alınan farklı sanat alanlarındaki yeni deneyimler ve gelecekte yapılması planlanan etkinlikler bize sanatın metaverse'ün bir parçası olmaya, onu beslemeye ve ondan beslenmeye niyetli olduğunu göstermektedir. Hiç şüphesiz yeni tanımlar, kavramlar, türler ve araçların sanata dâhil olmasıyla birlikte sanatın özü ve değeri korunarak yeni gelişmeler yaşanmaya; hem üretime hem de tüketicisine katkı sağlamaya devam edecektir.

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Bölüm 6

TEKNOLOJİK YENİLİĞİN MESİHVARİ SUNUMU: METAVERSE VİZYONU ÖRNEĞİ

Umur Bedir

GİRİŞ

Facebook'un, yeni adıyla Meta, CEO'su Mark Zuckerberg, 28 Ekim 2021 tarihinde yaptığı ve bir saatten uzun süren video sunumunda metaverse vizyonunu tüm kamuoyuna ve tabii ki potansiyel ortaklarına takdim etti. İncelikli bir halkla ilişkiler çalışmasının ve gerek multimedya özellikleri gerekse içeriği açısından güçlü bir prodüksiyonun ürünü olduğu daha ilk bakışta anlaşılan bu sunum, gelecekte kurulması planlanan metaverse evreninde bütün bir yaşamın (sosyal ilişkiler, eğlence, oyun, spor, iş, eğitim, ticaret) nasıl şekilleneceğini ele almaktaydı. İnsanın bedensel ve coğrafi sınırlılıklarından özgürleştiği, maddi eşitsizliklerinin ortadan kalktığı, bildiğimiz dünyanın ve internetin toksik ilişkilerinden ve kaotik yapısından arınmış (veya en azından öyle olacağı idealize edilen) bu yeni metaverse evrenini tüm ayrıntılarıyla betimlerken, Zuckerberg'ün de inananlarına cennette sonsuz haz, mutluluk ve uyumlu bir yaşamı vadeden bir peygamber kisvesine büründüğünü söylemek hiç de abartılı bir yorum olmaz. Dinî mitoslarda "insanlığın kurtuluşu" motifi bir peygamber veya misyoner üzerinden cisimleşen manevi gücün önderliğine bağlanırken, çağdaş mitlerde bunun yerini teknolojik yeniliğin ve yüksek teknoloji endüstrisinin gücü almıştır.

Bu araştırmada teknolojik yeniliğin mesihvari (*messianic*), belirli ölçülerde abartılmış ve mistifiye edilmiş sunumu metaverse örneği üzerinden ele alınacaktır. Konunun bu tekil örneğin de ötesine geçen bir öneme haiz olmasının nedeni, söz konusu sunum biçiminin yüksek teknoloji endüstrisinin genelinde ve onun diğer popüler ikonları tarafından da sıklıkla kullanılıyor olmasıdır. Araştırmanın ilk bölümünde mesihvari sunumu yüksek teknoloji endüstrisinin ayrılmaz bir parçası ve hatta doğal koşulu hâline getiren dinamikler irdelenme-

tehdit eden yanlış bilgilerin yayılması, otoriter rejimlerin palazlanması, çocuk ve ergenlere yönelik duygusal zararlar gibi pek çok soruna gözlerini yuman bir şirkete bu konuda nasıl güvenebiliriz?

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GİRİŞ

Teknolojik gelişmelerin üstün bilgi ve ekonomi ile iç içe geçtiği günümüz küresel dünyasında yeni nesil anlayış metaverse etrafında şekillenmeye başlamıştır. Sosyal medya platformlarıyla iletişime ve dolayısıyla tüketime aracılık eden büyük markalar, sanal bir yaşam evreni sunan metaverse içinde yer almaya; ürün ve hizmetlerinin alıcısıyla bu yeni dünyada buluşmaya hazırlanıyor.

İlk kez 1992 yılında Neal Stephenson'ın “Snow Crash” romanında kullanılan “metaverse” sözcüğü, “meta: öte” ve “verse: evren” anlamlarını taşımaktadır. “Evren ötesi” şeklinde tercüme edilebilen bu kavramsal ile kitlesel tanışıklık ise Facebook sosyal medya sitesi sahibi Zuckerberg'ün platformunun adını “Meta”ya dönüştürmesi ile ortaya çıkmıştır. Zuckerberg ekonomik anlamda metaverse projesi ile ilgili gelecek tahminlerinde önde gelen isimlerden biri olarak görülüyor. Proje, sosyal medya kullanıcıları tarafından hâlâ çözülmeyi bekleyen bir bulmaca misali karışık ve analitik hesaplarla tanımlanacak kadar da matematiksel sanal bir dünya olarak değerlendirilmektedir.

Ekonomik hedeflerin örtüştüğü yeni nesil bilişim ve teknolojik imkânlar doğası gereği tüketime özgü ve renkli bir sanal seyahati öngören yapısıyla kâr maksimizasyonu bağlamında iyi bir pazar olarak görülmeye başlanmıştır. Bunda tüketim toplumunun payı büyük olmakla birlikte dijital yetkinlikler, pazarda yoğunlaşan üreticinin sahip olduğu sermaye yapısı ile ilişkili görülmektedir.

İlgili çalışmanın amacı metaverse ekonomisini açıklamaktır. Bu bağlamda öncelikle metaverse ekonomisinin çerçevesi belirlenecek, daha sonra ise yapılan güncel araştırmalarda sunulan ekonomik öngörülere değinilecektir. Kaynak tara-

öngörüler, bu yeni sanal ortamların paydaşlarının da yer aldığı bir inovasyon buluşmasında ortaya konulmuştur. Bu etkinlik ile ortaya konulan öngörüler ise 2035 yılını ve ileri tarihleri yansıtmaktadır. Çalışmaların hızlı bir şekilde başladığının açıklandığı toplantıda metaverse'ün, sosyalleşme, ticaret, eğitim ve sanat gibi pek çok noktada sağlayacağı imkânlardan söz edilmiştir. Kurulan Dijital Ofis bünyesinde çalışmalara devam edilmektedir. Tüm bu tahminler metaverse'e yapılan yatırımlar için büyük önem taşımaktadır.

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URL-1: <https://dao.decentraland.org/en/>

URL-2: <https://www.youtube.com/watch?v=w-xngdHu6dM>

Bölüm 8

SOSYAL MEDYA VE METAVERSE BAĞLAMINDA DİJİTAL PAZARLAMA ÜZERİNE BİR DEĞERLENDİRME

Ceren Bilgici

GİRİŞ

Ağlar çağı olarak da adlandırılan günümüzde yeni iletişim teknolojilerinin toplumsal yaşantının her alanında belirleyici olduğu söylenebilmektedir. Bu bağlamda; internet, akıllı telefonlar ve sosyal medya platformları bireylerin hayatında vazgeçilmez bir konuma gelmiştir. Jan van Dijk, artık bireylerin gündelik hayatlarını sürdürebilmek için elektronik iletişim ağlarına ihtiyaç duyduklarını ve hatta büyük çoğunluğun bu ortamlar ve cihazların olmadığı bir dünyayı hayal bile edemediğini belirtmektedir (van Dijk, 2016: 11-12).

İnternetin gündelik hayatta kullanılmaya başlamasını takip eden süreçte Web 2.0 teknolojilerinin yaygınlaşması sosyal medya platformlarının gelişiminin önünü açmıştır. Bu çerçevede, giderek hızlanan mobil internet altyapıları ile gelişen akıllı telefonların sunduğu imkânlar bireylerin kesintisiz olarak ağa bağlı olmalarına olanak sağlamıştır. Zaman içerisinde üretici konumuna geçen kullanıcılar sahip oldukları akıllı telefonların kameralarını kullanarak gerçekleştirdikleri üretimleri ile sosyal medya platformlarında yoğun olarak yer almaya başlamıştır. Daha fazla kullanıcının hem tüketici hem üretici olarak kesintisiz şekilde sosyal medya platformlarına bağlı olması ve günlerinin büyük çoğunluğunu bu platformlar üzerinde geçirmeye başlaması sosyal medya platformlarının ticarileşme süreciyle paralellik göstermektedir. Web 3.0 ile birlikte ise yapay zekâ teknolojilerinin dijital ortamlarda giderek artan etkileri ve algoritmalarının gelişimi ile sosyal medya endüstrisi her geçen gün daha fazla kullanıcının daha fazla zamanını sosyal medya üzerinde geçirdiği bir yapının oluşumunun önünü açmıştır. Ekim 2021’de Facebook şirketinin “Meta” adını alarak yeniden markalama yapması ve metaverse yatırımlarını duyurmasıyla birlikte (Meta,

ve şirketlerin, markaların üzerinde bu alanda giderek artan baskı ve beklentilerin oluşacağı da kaçınılmaz olarak tahmin edilmektedir.

Sonuç olarak henüz gelişmekte olan bir deneyim alanı olarak tanımlanabilen metaverse ekosistemi pazarlama alanına pek çok olası fırsat sunarken bazı tehditleri beraberinde getirmektedir. Gelecek araştırmalarda metaverse ve pazarlama ilişkisi ile ilgili tüketici öngörülerini üzerinden değerlendirmeler yapılması bu yeni alanla ilişkili tüketici beklentilerini ve değerlendirmelerini ortaya çıkarmak açısından faydalı olacaktır.

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Bölüm 9

METAVERSE VE DİJİTAL REKLAMCILIK EKSENİNDE HİPER KİŞİSELLEŞTİRİLMİŞ REKLAMLARIN YÜKSELİŞİ

Özge Özkök Şişman

GİRİŞ

Bilişim ve iletişim teknolojilerinin gelişmesiyle yaşanan toplumsal dönüşümlerin bir sonucu olarak reklam endüstrisinde dijital temelli yeni araçlara ve yöntemlere yönelik bir ihtiyaç ortaya çıkmıştır. İnternet teknolojisine erişimin kolaylaşması, sosyal medya platformlarının kullanım ağının genişlemesi ve mobil cihazların kullanımının yaygınlaşmasıyla birlikte reklamcılık pratikleri de dijital temelli bir sistem üzerinde yeniden tanımlanmaktadır. Dijital reklamcılığın değişen dinamikleri çerçevesinde markalar ve hedef kitle arasındaki sınırlar zayıflamış, kullanıcının bilgiye erişim kolaylığı ekseninde tüketici merkezli bir yapı ortaya çıkmıştır (Tran 2017: 231). Tüketicinin sosyal medya ve dijital ekranlar aracılığıyla gündelik yaşamında 360 derece reklam iletisine maruz kaldığı günümüzde, bireylerin karşılaştıkları her reklamı algılaması zorlaşırken markaların tüketicilerin dikkatini çekebilmek, akılda kalabilmek ve pazardaki güçlü rekabet ortamında varlığını devam ettirebilmek adına tüketicisine doğru zamanda, doğru mesajı, doğru platform üzerinden iletmesi gerekliliği doğmuştur (Tsang vd., 2004).

Dijitalleşen reklamcılık, geleneksel reklamcılık anlayışından farklı olarak kitlesel reklam pratiklerinden kişiselleştirilmiş reklamlara doğru bir devinim yaşamıştır. Kişiselleştirilmiş reklamlar, internet ortamında kullanıcı olan bireylerin ilgi alanları ve internet geçmişleri aracılığıyla ihtiyaçları, tüketim rutinlerinin tespit edilmesini ve bireylere kişisel olarak sunulan reklam içeriklerini ifade eden bir kavramdır (Tucker 2014: 547). Alanyazında “çevrim içi davranışsal reklamcılık” olarak da adlandırılan (Li ve Huang 2016; Boerman vd.,

derin öğrenme, makine öğrenimi, büyük veri ve küçük veri unsurlarıyla biçimlenen metaverse reklamcılığı, hiper kişiselleşmiş reklamcılık anlayışıyla dijital pazarlama iletişimi yaklaşımına yeni bir açılım getirmiştir. Günümüzde büyük veri ve küçük veri uygulamalarının yetersiz kalmasının bir sonucu olarak ortaya çıkan hiper kişiselleştirilmiş reklamlar her bir kullanıcıyı kişisel olarak analiz etmekte ve her bir kullanıcının kişisel deneyimleri, dijital ayak izleri çerçevesinde oluşturulan reklam içeriklerini ifade etmektedir. Bu doğrultuda markaların sayıca artış gösterdiği günümüzde sorgulayan, araştıran ve gücünün farkında olan yeni tüketici profili, hiper kişiselleştirilmiş reklamlar aracılığıyla markalarla doğrusal bir ilişki geliştirebilmektedir. Marka sadakatinin sorgulanması, dijitalleşme ve hız kavramlarının da önemini ortaya çıkarmıştır. Bu bağlamda metaverse ekosisteminde dijital reklamcılık pratikleri hiper kişiselleştirilmiş bir bağlamda doğrudan kullanıcıyı hedeflemektedir. Tamamen sanal bir dünyayı ifade eden metaverse, hiper kişiselleştirilmiş reklamlar aracılığıyla kullanıcının kişisel özellikleri, istekleri, ihtiyaçları ile paralel olarak biçimlenmektedir.

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Bölüm 10

METAVERSE DERGİCİLİĞE YENİ BİR SOLUK GETİREBİLİR Mİ?

Aslı Yapar Gönenç, Tuğçe Ayçin

GİRİŞ

Günümüzde dijitalleşmenin ulaştığı doruk noktalardan biri metaverse dünyası olarak karşımıza çıkmaktadır. İnsanların avatarları aracılığıyla sanal gerçeklik âleminde yaşamlarını sürdürecekleri iddiası toplumsal yaşamın her alanında olduğu gibi habercilik alanında da yeni uygulamaların ortaya çıkmasına yol açmaktadır.

Yapılan araştırmalar insanların sanal dünyada giderek daha fazla vakit geçirdiklerini göstermektedir. Özellikle gençlerin sanal dünyada harcadıkları zaman neredeyse tüm günlerini kapsamaktadır. We Are Social 2021 verilerine göre Türkiye’de günlük internet ortamında geçirilen süre 7 saat 57 dakika, yani neredeyse 8 saate yakındır. Bu durum dünya genelinde de benzer şekilde 7 saattir. Ayrıca Radyo Televizyon Üst Kurulu (RTÜK) tarafından 2022 yılında yapılan “Gençlerin Medya Kullanımı ve Dijital Okuryazarlık Araştırması”, Türkiye’de yaşayan 15-21 yaş arası gençlerin %71’inin habere sosyal medya üzerinden ulaştığını göstermektedir. Bu oran televizyon için %70, internet haber siteleri için %46, yazılı basın için %18 ve radyo için %10 şeklinde tespit edilmiştir (RTÜK, 2022).

İletişim teknolojilerinin hızla gelişmesiyle yeni nesil için yeni haber teknolojilerinin ve etkileşim ortamlarının gelişmesi doğaldır. Gerçekte, metaverse sözcüğü yeni bir sözcük değildir. Terim ilk olarak 1992 yılında Neal Stephenson’ın bilim kurgu romanı “Snow Crash”de (Parazit) “meta” ve “universe” kelimelerinin, yani “meta” ve “evren” sözcüklerinin bir bileşimi olarak kullanılmıştır. İnsanların özellikle de gençlerin sanal gerçeklik âleminde daha çok

Tüm kitle iletişim araçlarında olduğu gibi metaverse'ün de bir ticari yatırım alanı olduğunu unutmamakta yarar bulunmaktadır. Metaverse, dergicilik ve habercilik alanına yeni özellikler getirirse de tüketim toplumunun yeni oyuncuğu olarak değerlendirilebilir. Fakat her şeye rağmen alana yeni bir soluk getireceği bir gerçektir. Gelişmelerin ne doğrultuda olacağı, ülkemizde bu alana yönelik yatırımların ne düzeyde olacağı gibi soruların yanıtları da zaman içerisinde uygulamaların gelişmesiyle ortaya çıkacaktır. Türkiye açısından bakıldığında dergicilik alanında öncelikle hızlı bir biçimde dijitalleşmenin tamamlanması ve metaverse ortamına giriş yapmak için uygun altyapının oluşturulması gerekmektedir.

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Bölüm 11

METAVERSE TERAPİ ODALARI: SANAL GERÇEKLİKTE SEANS GERÇEKLEŞTİRMEK*

Nur İnci Namlı

GİRİŞ

Spike Jonze’un senaristlik ve yönetmenlik görevinde yer aldığı 2013 yapımı “Her” filmi, yoğun bir depresif dönemden geçen Theodore’un bir yapay zekâ ile “tanıştıktan” sonraki sürecini anlatmaktadır. Film, aslında yakın bir gelecekte geçer; gerek kullanılan teknoloji gerek filmin geçtiği dünya aslında günümüzden sadece birkaç yıl sonrasına işaret etmektedir. Bununla birlikte filmdeki en önemli detay, yalnızlığı ve kararsızlığı derinden yaşayan ana karakterin bir yapay zekâ programını bilgisayarına yükledikten sonra yaşadıklarıdır. Artık onunla günü bitirip başlatmak bir rutin hâline dönüşmüştür. Film boyunca yapay zekâ programında yarattığı karakter olan Samantha’nın, Theodore’un kararlarındaki boşlukları doldurmasını izleriz. Ancak tabii ki bir süre sonra bu durum çığırından çıkar ve Samantha ile diğer tüm işletim sistemleri fiziksel dünyadan ayrılır. Ayrılmadan önce Theodore, Samantha’ya nereye gittiğini sorar. Aldığı cevap hayranlık vericidir:

Anlatması zor. Ama günün birinde oraya gelirsen gel ve beni bul. Bizi hiçbir şey ayıramaz. Hiç kimseyi seni sevdiğim gibi sevmedim.

Buradan çıkarılacak soru şudur: Bir işletim sistemi (örneğin Siri) size gerçekten hissettiği duygularla mı cevap verir; yoksa büyük veriden o duygu setine uygun olanı seçip saniyeler içerisinde mi size sunar? Bir adım ötesini daha düşünelim. Samantha bir psikolog olsaydı ve Theodore’la psikolog-danışan ilişkisi kursaydı her şey nasıl olurdu? Theodore ile “başka bir evrende” seanslar gerçekleştirselerdi hangi problemler veya çözüm yolları ortaya çıkabilirdi?

* Bu bölümde bahsi geçen tüm vakalar için danışanlardan ve ailelerden gerekli sözlü izinler alınmıştır.

kenara bırakılarak tanılar üstü yaklaşımla terapi sürecinin ilerlemesi yapay zekâların biz insan psikoterapistleri yönlendirmesiyle sağlanacaktır. Zihin insana özgü olabilir, ancak zihnin yönlendireceği yapay zekâ ile aralanacak kapının ardında belki de çok farklı senaryolara şahit olacağız.

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İÇİNDEKİLER

YAZAR LİSTESİ.....	iii
ÖN SÖZ (2. BASKI İÇİN)	xi
A. KLİNİK MİKROBİYOTA	
BÖLÜM A1 İNSAN MİKROBİYOM PROJESİ, MİKROBİYOTANIN GELECEĞİ VE KİŞİYE	
ÖZEL TIP UYGULAMALARI.....	1
Giriş.....	1
Mikroorganizmalardan Mikrobiyomlara Tarihsel Bir Bakış.....	2
İnsan Sağlığında Mikrobiyom.....	2
Mikrobiyom Tanımı ve Mikrobiyom Çalışmaları	3
Metagenomik ve İnsan Sağlığının Gelecek Perspektifleri.....	4
İnsan Mikrobiyom Projesine Giriş ve Projenin Amacı	5
NIH İnsan Mikrobiyom Projesinin Birinci Aşaması.....	6
NIH İnsan Mikrobiyom Projesinin İkinci Aşaması.....	7
Vajinal Mikrobiyom, Gebelik ve Erken Doğum.....	8
Bağırsak Mikrobiyomu ve İnflamatuvar Bağırsak Hastalığı.....	9
Mikrobiyom Araştırmaları Nereye Gidiyor?.....	11
Sentetik Biyoloji ve İnsan Mikrobiyomu	12
Sonuç.....	14
Kaynaklar	14
BÖLÜM A2 İMMÜN SİSTEM VE BAĞIRSAK MİKROBİYOTASI	17
Giriş.....	17
Kaynaklar	27
BÖLÜM A3 MİKROBİYOTA, BESLENME VE İMMÜN SİSTEM	29
İmmün Beslenme.....	30
Glutamin	32
Arjinin	33
Omega-3 (Eicosapentaenoic Acid [EPA] ve Docosaheptaenoic Acid [DHA]).....	34
Nükleotidler	34
D Vitamini	35
A Vitamini.....	36
Selenyum	37
Çinko.....	38
Fitokimyasallar	38
Polifenoller	38
Flavonoidler	39
Kaynaklar	42

BÖLÜM A4	ALLERJİK HASTALIKLAR VE HİSTAMİN İNTOLERANSINDA MİKROBİYOTA	45
	Allerjik Hastalıklar ve Mikrobiyota	45
	Histamin İntoleransı ve Mikrobiyota	50
	Kaynaklar	51
BÖLÜM A5	MİKROBİYOTA VE EPİGENETİK ETKİSİ	57
	Giriş.....	57
	Epigenetik Tanımı ve Epigenetik Mekanizmalar.....	57
	DNA Metilasyonu	58
	Histon Modifikasyonu.....	59
	Kodlanmayan RNA (Non-Coding RNAs) Regülasyonu.....	60
	Epigenetik Regülasyon ve Mikrobiyal Metabolit İlişkisi	61
	Kısa Zincirli Yağ Asitleri (KZYA)	61
	B Grubu Vitaminler ve Folat	62
	Epigenetik Tedavi Stratejileri	62
	Kaynaklar	63
BÖLÜM A6	MİKROBİYOTA/MİKROBİYOM ÇALIŞMALARINDA ETİK	67
	Giriş.....	67
	Kaynaklar	73
BÖLÜM A7	MİKROBİYOTA ÇALIŞMALARINDA ÖRNEK ALIMI VE DNA İZOLASYONU .	77
	Bağırsak Mikrobiyota Çalışmaları İçin Örnek Alımı.....	78
	Oral Örneklerin Alınması	82
	Mikrobiyota Çalışmaları İçin DNA İzolasyonu.....	83
	Kaynaklar	86
BÖLÜM A8	MİKROBİYOTA ÇALIŞMALARINDA MOLEKÜLER TANI YÖNTEMLERİ	87
	Giriş.....	87
	Kültür Temelli Yöntemler	87
	Kültür Bağımsız Yöntemler: Moleküler Mikrobiyolojik Metotlar	88
	16S rRNA Belirteç Geni	89
	Floresan İn-Situ Hibridizasyon (FISH).....	89
	Polimeraz Zincir Reaksiyonu (PCR)	90
	Parmak-İzi Analiz Yöntemleri (DGGE, TGGE, T-RFLP)	91
	Kantitatif PCR (qPCR).....	92
	Dijital PCR (dPCR).....	93
	DNA Mikroarray	94
	Dizi Analiz Yöntemleri.....	94
	Yeni Bir Mikrobiyom Analiz Yöntemi Olarak Hücreden Bağımsız DNA'nın (cfDNA) Dizilenmesi	97
	Mikrobiyom Çalışmalarında Deney Modelleri: Hastalık Gelişiminde Mikrobiyom Değişiminin Etkisi.....	97
	Mikrobiyom Çalışmalarının Geleceği.....	98
	Sonuç.....	98
	Kaynaklar	98
BÖLÜM A9	YENİ NESİL SEKANS SİSTEMLERİNDE GÜNCELLEME VE MİKROBİYOTA ANALİZİ	101
	Giriş.....	101
	Birinci Nesil Dizileme	101
	Sanger Zincir Sonlandırma Yöntemi	101
	İkinci Nesil Dizileme.....	102
	İllumina Dizileme.....	103

	YNS ile Mikrobiyota Analiz Yöntemleri	104
	Mikrobiyota Analiz Yöntemi İçin Yazılım Araçları.....	104
	Üçüncü Nesil Dizileme Yöntemleri ve Getirdiği Yenilikler.....	105
	Üçüncü Neslin Mikrobiyota Analizlerine Katkısı ve İkinci Nesille Karşılaştırmaları	106
	Mikrobiyota Analizlerinde İleriye Dönük Hedefler	107
	Kaynaklar	107
BÖLÜM A10	MİKROBİYOM VERİSİNİN BİYOİNFORMATİK ANALİZİ.....	109
	Mikrobiyom Analiz Çeşitleri	110
	Ön İşlemler	111
	Taksonomik Analizler	112
	Amplikon Dizileme Verisinin Taksonomik Analizleri	112
	Metagenom Dizileme Verisinin Taksonomik Analizleri.....	114
	Fonksiyonel Analizler	114
	Ekolojik Analizler	115
	İleri Analizler	117
	Kaynaklar	118
BÖLÜM A11	VİRAL MİKROBİJENOM / VİROM / VİRAL BİOİNFORMATİK.....	121
	Giriş.....	121
	İnsanda Bulunan Virom Yüğü	122
	Vücutta Kalış Süresi ve Patojenite.....	122
	Virom Türleri.....	123
	Faj	123
	Ökaryotik Virüsler.....	124
	Vücudun Farklı Bölgelerinde Virom.....	124
	Sonuç.....	127
	Kaynaklar	127
BÖLÜM A12	FUNGAL MİKROBİYOM; MİKOBİYOM	129
	Derinin Fungal Mikrobiyomu.....	130
	Ağız ve Akciğerlerin Fungal Mikrobiyomu.....	131
	Gastrointestinal Kanalın Fungal Mikrobiyomu	132
	Fungal Mikrobiyom Analizi.....	133
	Kaynaklar	134
BÖLÜM A13	PARAZİT ENFEKSİYONLARI VE İNSAN MİKROBİYOTA İLİŞKİSİ	137
	Giriş.....	137
	Sonuç.....	142
	Kaynaklar	142
BÖLÜM A14	DOĞUM ŞEKLİ VE MİKROBİYOTA İLİŞKİSİ.....	145
	Kaynaklar	147
BÖLÜM A15	HAYATIN ERKEN DÖNEMİNDE MİKROBİYOTANIN ŞEKİLLENMESİ.....	149
	Giriş.....	149
	Mikrobiyotayı Etkileyen Faktörler	150
	Sonuçta İlk 1000 Gün.....	154
	Kaynaklar	154
BÖLÜM A16	BAĞIRSAK MİKROBİYOTASI VE BESLENME DÜZENİ ARASINDAKİ İLİŞKİ: FETAL YAŞAM, ERKEN ÇOCUKLUK ÇAĞI VE YAŞAMIN İLERLEYEN DÖNEMLERİ	157
	Giriş.....	157
	Bağırsak Mikrobiyotasının Oluşumu ve Beslenme Düzeni.....	157

	Bağırsak Mikrobiyotasını Etkileyen Besin Öğeleri	159
	Bağırsak Mikrobiyotası ve Normal Beslenme Düzenleri	164
	Sonuç.....	166
	Kaynaklar.....	166
BÖLÜM A17	ANNE SÜTÜ VE MİKROBİYOTA GELİŞİMİ	171
	Giriş.....	171
	Doğum Öncesi Mikrobiyota Gelişimi.....	172
	Anne Sütü Mikrobiyotası.....	173
	Donör Anne Sütü ve Mikrobiyota.....	174
	Anne Sütünün İnfant Mikrobiyotasının Gelişimi Üzerindeki Etkisi	175
	Anne Sütü Mikrobiyotasının Kaynağı.....	177
	Anne Sütü Oligosakkaritleri.....	178
	Sonuç.....	179
	Kaynaklar.....	179
BÖLÜM A18	ÇEVRESEL FAKTÖRLER VE MİKROBİYOTA.....	183
	Beslenme	183
	Antibiyotikler	184
	Diğer İlaçlar.....	185
	Ağır Metaller	185
	Nanomateryaller ve Gıda Katkı Maddeleri.....	187
	Emülgatörler.....	188
	Koruyucular	189
	Egzersiz.....	189
	Sigara.....	189
	Alkol.....	190
	Hava Kirliliği	190
	D Vitamini	190
	Stres.....	190
	Kaynaklar.....	190
BÖLÜM A19	ANTİBİYOTİK KULLANIMI VE MİKROBİYOTA	193
	Giriş.....	193
	Sonuç.....	198
	Kaynaklar.....	198
BÖLÜM A20	SAĞLIK VE HASTALIKTA ORAL KAVİTE MİKROBİYOTASI	201
	Oral Mikrobiyota Kaynaklı Oral Hastalıklar ve Durumlar	202
	Oral Mikrobiyota ve Sistemik Hastalıklarla İlişkisi	204
	Oral Mikrobiyota Odaklı Tedaviler ve Gelecek Beklentileri	208
	Kaynaklar	209
BÖLÜM A21	KARDİOVASKÜLER HASTALIKLAR VE MİKROBİYOTA	213
	Giriş.....	213
	Obezite.....	214
	Ateroskleroz.....	215
	Hipertansiyon.....	215
	Hiperlipidemi	216
	Bağırsak Mikrobiyotası Düzenlenmesiyle Tedavi.....	216
	Sonuç.....	217
	Kaynaklar	217
BÖLÜM A22	SOLUNUM SİSTEMİ VE MİKROBİYOTA	219
	Giriş.....	219
	Solunum Sistemi ve Mikrobiyota.....	219

Sonuç.....	226
Kaynaklar.....	226
BÖLÜM A23 MİKROBİYOTA VE KANSER.....	229
Kanser Tedavileri ve Mikrobiyota.....	231
İlaç Metabolizması.....	232
Kemoterapiye Yanıt.....	232
Kemoterapi Toksisitesi.....	233
Radyoterapi ve Mikrobiyota.....	233
İmmünoterapi ve Mikrobiyota.....	234
İmmün Kontrol Noktası İnhibitörleri.....	234
Kanser Tanı ve Taramasında Mikrobiyota.....	234
Kaynaklar.....	235
BÖLÜM A24 MİKROBİYOM VE DERMATOLOJİ	239
Deri Mikrobiyomu.....	239
Sağlıklı Derinin Mikrobiyomu.....	239
Dermatolojik Hastalıklarda Deri ve Bağırsak Mikrobiyomu.....	240
Deride Bakteri Dışıdakiler.....	244
Kaynaklar.....	244
BÖLÜM A25 İNFLAMATUVAR ROMATİZMAL HASTALIKLAR VE MİKROBİYOTA	247
Mikrobiyota, Mikrobiyom ve Disbiyozis Nedir?.....	247
Mikrobiyota ve İnflamatuvar Artritler.....	250
Mikrobiyota ve Romatoid Artrit (RA).....	251
Mikrobiyota ve Spondiloartrit (SpA).....	252
Popüler Stratejiler ve Fermente Gıdalar.....	254
Sonuç.....	255
Kaynaklar.....	255
BÖLÜM A26 MİKROBİYOTANIN VİRAL HEPATİTLER VE DİĞER KARACİĞER HASTALIKLARI İLE İLİŞKİSİ	259
Giriş.....	259
Bağırsak-Karaciğer Aksı.....	260
Disbiyozis ve Karaciğer Hastalıkları Arasındaki İlişki.....	260
Hepatit B Virüsü (HBV) Enfeksiyonu.....	260
Hepatit C Virüsü (HCV) Enfeksiyonu.....	261
HAV ve HEV Enfeksiyonu ve Mikrobiyota.....	262
Alkolik Karaciğer Hastalığı.....	262
Non-Alkolik Yağlı Karaciğer Hastalığı, Non-Alkolik Steatohepatit.....	263
Hepatik Ensefalopati (HE) ve Spontan Bakteriye Peritonit (SBP).....	264
Hepatosellüler Kanser.....	264
Mikrobiyotaya Dayalı Güncel Yaklaşımlar ve Tedavi Seçenekleri.....	265
Kaynaklar.....	267
BÖLÜM A27 NONALKOLİK YAĞLI KARACİĞER HASTALIĞI (NAFLD-NASH) VE MİKROBİYOTA	271
Giriş.....	271
NASH'te Bağırsak Mikrobiyotasında Görülen Değişiklikler.....	272
Bağırsak-Karaciğer Aksı ve Disbiyozis.....	273
NASH Tedavisinde Mikrobiyotaya.....	275
Sonuç.....	277
Kaynaklar.....	277

BÖLÜM A28	ALKOL, KARACİĞER HASTALIĞI VE BAĞIRSAK MİKROBİYOTASI	281
	Alkol Kullanımı	281
	Mikrobiyota.....	282
	Mikrobiyota Analizi	282
	Alkolün Mikrobiyota Üzerine Etkileri	282
	Alkolün Disbiyozis Patogenezi.....	283
	Alkolik Karaciğer Hastalığında (AKH) İntestinal Bariyer	284
	Alkolik Karaciğer Hastalığında Bağırsak-Karaciğer Aksı.....	284
	Alkolik Karaciğer Hastalığında Mikrobiyotanın Rolü.....	284
	Alkolik Karaciğer Hastalığı Tedavisinde Mikrobiyota	285
	Sonuç.....	285
	Kaynaklar	285
BÖLÜM A29	ÇÖLYAK HASTALIĞI VE MİKROBİYOTA	287
	Giriş.....	287
	Erken Dönem Besleme Şekli ve Mikrobiyota	288
	Çölyak Hastalığında Bağırsak Mikrobiyotasında Değişimler	288
	Glutensiz Diyetlerin Mikrobiyotaya Potansiyel Etkisi	291
	Çölyak Hastalığında Probiyotiklerin Rolü	292
	Sonuç.....	292
	Kaynaklar	293
BÖLÜM A30	İNFLAMATUVAR BAĞIRSAK HASTALIĞI VE BAĞIRSAK MİKROBİYOTASI	295
	Bağırsak Mikrobiyotası ile İnflamatuvar Bağırsak Hastalığı İlişkisi.....	295
	Bağırsak Mikrobiyotası, Beslenme ve İnflamatuvar Bağırsak Hastalığı İlişkisi.....	299
	Kaynaklar	302
BÖLÜM A31	İRRİTABL BAĞIRSAK SENDROMU VE MİKROBİYOTA	305
	IBS ve Mikrobiyota.....	306
	Kaynaklar	307
BÖLÜM A32	GIDA KATKI MADDELERİNİN MİKROBİYOTA VE METABOLİZMA ÜZERİNE ETKİLERİ	309
	Giriş.....	309
	Tatlandırıcılar	310
	Emülgatörler.....	312
	Nanopartiküller	313
	Lezzet artırıcılar	314
	Kıvam artırıcılar	314
	Topaklanmayı önleyiciler	315
	Koruyucular	315
	Sonuç.....	317
	Kaynaklar	317
BÖLÜM A33	BAĞIRSAK MİKROBİYOTASININ OBEZİTE, İNSÜLİN DİRENCİ VE DİYETTEKİ ROLÜ	319
	Bağırsak Mikrobiyotası Obezite ve İnsülin Direnci.....	320
	Mikrobiyota İlişkili İnflamasyon.....	320
	Enerji Eldesi	323
	Bağırsak Mikrobiyotası ve Glukoz Metabolizması.....	325
	Bağırsak Mikrobiyotası ve Yağ Asidi Oksidasyonu, Sentezi Enerji Harcaması	325
	Bağırsak Mikrobiyotası ve Safra Asitleri.....	326
	Bağırsak Mikrobiyotasının Endokannabinoid Sistem Üzerine Etkileri.....	327

Mikrobiyota ve Beslenme	327
Kaynaklar	332
BÖLÜM A34 BAĞIRSAK MİKROBİYOTASI VE DİYABETES MELLİTUS	335
Bağırsak Mikrobiyotası	335
Mikrobiyotanın Görevleri	340
Mikrobiyotanın Hastalıklarla İlişkisi	341
Mikrobiyota ve Diyabet ilişkisi	341
<i>Antibiyotikler</i>	345
Kaynaklar	346
BÖLÜM A35 ENFEKSİYON HASTALIKLARININ PATOGENEZİNDE	
MİKROBİYOTANIN ROLÜ	349
Mikrobiyotanın Hastalıklardaki Temel Rolü	352
Mikrobiyota Temelli Tedaviler	352
Diyetin Etkisi	353
Antibiyotik Kullanımı ile Disbiyotik Patofizyolojisi	353
Bağırsak Mikrobiyotasının Enfeksiyon Patogenezindeki Yeri	353
Viral-Bağırsak Bakteri Etkileşimleri	355
Solunum Sistemi Mikrobiyota Enfeksiyon İlişkisi	356
Deri Mikrobiyotası ve Enfeksiyonlar	356
Mikrobiyota-Alerji İlişkisi ve Tedavisi	357
Vajen Mikrobiyotası ve Bakteriyel Vaginosis (BV)	357
Erkek Ürogenital Mikrobiyotası/Enfeksiyon/İnfertilite	357
Biyofilm İnfeksiyonları ve Mikrobiyota	358
Mikrobiyota Kistik Fibrozis İlişkisi	359
Sonuç	359
Kaynaklar	359
BÖLÜM A36 SİRKADİYEN RİTİM VE MİKROBİYOTA	361
Giriş	361
Sirkadiyen Ritimin Moleküler Mekanizması	361
Sirkadiyen Ritim Düzenleyiciler	362
Sirkadiyen Ritimi Bozan Etmenler	364
Sirkadiyen Ritim ve Beslenme İlişkisi	364
Bağırsak Mikrobiyotasının Sirkadiyen Ritmi	366
Bağırsak Mikrobiyotası Sirkadiyen Ritim Etkileşimlerinde Etkili Olan Faktörler	367
Vardiyalı Çalışma	368
Diyet Kompozisyonu ve Öğün Zamanı	369
Kaynaklar	370
BÖLÜM A37 MİKROBİYOTA VE NÖRODENERASYON	373
Giriş	373
Mikrobiyota ve Nörodejenerasyon	376
Mikrobiyota ve Alzheimer Hastalığı	378
Mikrobiyota ve Parkinson Hastalığı	380
Mikrobiyota ve Multipl Sklerozis	382
Kaynaklar	383
BÖLÜM A38 NÖROMÜSKÜLER KAVŞAK HASTALIKLARI VE MİKROBİYOTA	385
Nöromüsküler Kavşak Bozuklukları	385
Miyastenia Gravis	385
Human Mikrobiyota (Mikrobiyal Flora) ve Disbiyozis	387
Miyastenia Gravis ve Mikrobiyota İlişkileri	388
Kaynaklar	393

BÖLÜM A39	EPİLEPSİ VE MİKROBİYOTA	395
	Epilepsi Nedir?.....	395
	Epilepsi Etiyopatogenezi ve Mikrobiyota.....	395
	Kaynaklar	398
BÖLÜM A40	MİKROBİYOTA VE OTİZM SPEKTRUM BOZUKLUKLARI (OSB).....	401
	Gelişimsel Süreçte Mikrobiyota	401
	OSB’de Mikrobiyota Farklılıkları	402
	Mikrobiyota ve OSB’de Görülen Gastrointestinal Semptomlar	403
	Mikrobiyota-OSB İlişkisinde Muhtemel Mekanizmalar.....	403
	Mikrobiyota ve OSB Tedavisi	407
	Sonuç.....	409
	Kaynaklar.....	409
BÖLÜM A41	PSİKİYATRİK BOZUKLUKLAR VE MİKROBİYOTA	413
	Giriş.....	413
	Mikrobiyota-Bağırsak Beyin Ekseni.....	413
	Anahtar Bağlantı Yolakları ve Nörobiyolojik Mekanizmalar	414
	Mikrobiyota ve Psikiyatrik Hastalıklar	416
	Kaynaklar.....	422
BÖLÜM A42	CİNSEL FONKSİYON BOZUKLUKLARI VE MİKROBİYOTA	425
	Giriş.....	425
	Mikrobiyota ve Seksüel Disfonksiyon	426
	Sonuç.....	429
	Kaynaklar	430
BÖLÜM A43	ERKEK MİKROBİYOTASI VE İNFERTİLİTE	433
	Giriş.....	433
	Erkek Genital Sistem Mikrobiyotası.....	433
	Semen Mikrobiyotası ve İnfertilite	437
	Kaynaklar	442
BÖLÜM A44	ÜRİNER MİKROBİYOTA (ÜROBİYOM).....	447
	Kaynaklar	453
BÖLÜM A45	KADIN ÜREME SİSTEMİ MİKROBİYOTASI	455
	Vajinal Mikrobiyota	455
	Kadın Genital Mikrobiyotası ve İnfertilite	456
	Gebelik, Doğum ve Mikrobiyota.....	458
	Endometriyozis ve Mikrobiyota.....	459
	Genital Sistem Mikrobiyotası ve Menopoz.....	459
	Sonuç.....	460
	Kaynaklar	460
BÖLÜM A46	HASTALIKTA SAĞLIKTA; KBB VE MİKROBİYOTA	463
	Oral Mikrobiyota.....	463
	Sinonazal Mikrobiyota.....	465
	Otolojik Mikrobiyota	467
	Kaynaklar	468
BÖLÜM A47	OKÜLER MİKROBİYOTA	471
	Giriş.....	471
	Sağlıklı Gözün Oküler Mikrobiyotası	472
	Hasta Gözün Oküler/Ekstraoküler Mikrobiyotası	474

Sonuç.....	478
Kaynaklar.....	479
BÖLÜM A48 KRONİK İNFLAMASYON VE MİKROBİYOM	481
Kaynaklar.....	488
BÖLÜM A49 FEKAL MİKROBİYOTA TRANSPLANTASYONU (FMT) (GAİTA MİKROBİYOTA NAKLİ).....	493
Giriş.....	493
Fekal Mikrobiyota Transplantasyonu.....	503
Kaynaklar.....	509
BÖLÜM A50 MİKROBİYOM VE METABOLOM ARASINDAKİ ETKİLEŞİMİNİN İNSAN SAĞLIĞI İLE İLİŞKİSİ.....	511
Giriş.....	511
Mikrobiyom ve Metabolom Tanımı.....	511
Omiks'lerin Önemi ve Anlamları.....	511
Mikrobiyota ve Metabolom İlişkisi.....	513
Mikrobiyom ve Metabolom Etkileşimin İnsan Sağlığına Etkileri.....	514
Kaynaklar.....	517
BÖLÜM A51 MİKROBİYOM VE MAKİNE ÖĞRENME.....	519
Makine Öğrenmesi.....	520
Hastalıklar, Mikrobiyom ve Makine Öğrenmesi.....	524
Kaynaklar.....	527
B. PROBİYOTİKLER	
BÖLÜM B1 PROBİYOTİKLER VE PREBİYOTİKLER	529
Bağırsak Mikrobiyotası ve Probiyotikler.....	530
Probiyotik Mikroorganizmalar ve Özellikleri.....	531
Probiyotiklerin İnsan Sağlığındaki Kullanımı.....	532
Prebiyotikler.....	536
Probiyotikler ve Kişisel Tıbbi Yaklaşım.....	537
Türkiye Probiyotik Rehberi.....	537
Sonuç.....	538
Kaynaklar.....	538
BÖLÜM B2 METABOLİK SENDROM TEDAVİSİNDE PROBİYOTİKLER	541
Kaynaklar.....	545
BÖLÜM B3 NÖROİNFLAMASYON VE MİKROBİYOTA	547
Mikrobiyota ve İmmün Sistem Arasındaki Etkileşim.....	547
İnflamazom.....	548
Mikroglia ve Astrositler.....	549
Nörogenesis.....	550
Vagus Siniri.....	550
Nörotransmitterler.....	551
Beyin-Kan Bariyeri.....	552
Sızdıran Bağırsak, Sızdıran Beyin ve Yol Açtığı Hastalıklar.....	552
Psikobiyotikler.....	553
Sonuç.....	554
Kaynaklar.....	554

BÖLÜM B4	DERMATOLOJİDE PROBİYOTİKLER	559
	Giriş.....	559
	Kaynaklar.....	568
BÖLÜM B5	PROBİYOTİKLERİN BAKTERİYEL ENFEKSİYONLARDAKİ ÖNEMİ	571
	Probiyotiklerin Bakteriyel Patojenlere Etkileri	571
	Probiyotiklerin Bakteriyel Enfeksiyonlardaki Rolü	573
	Kaynaklar	577
BÖLÜM B6	ÇOCUKLUK ÇAĞI VİRAL GASTROENTERİT, SOLUNUM YOLU VE DİĞER VİRAL ENFEKSİYONLARDA PROBİYOTİK KULLANIMI	581
	Giriş.....	581
	Viral Gastroenteritler ve Etkenleri	581
	Rotavirüsler	581
	Norovirüs	582
	Sapovirüs.....	582
	Adenovirüs	582
	Viral Gastroenteritlerde Probiyotik Kullanımı	583
	Probiyotiklerin Viral Gastroenteritte Etki Mekanizmaları	583
	Çocuklarda İshalin Tedavisinde Probiyotik Kullanımı	584
	Çocuklarda İshalin Önlenmesinde Probiyotik Kullanımı.....	585
	Üst Solunum Yolu Enfeksiyonlarında Probiyotik Kullanımı	587
	Probiyotik Kullanımının Diğer Viral Hastalıklardaki Rolü.....	588
	SARS-CoV-2 Enfeksiyonu / COVID-19 Hastalığında Probiyotik Kullanımı	588
	Kaynaklar	588
BÖLÜM B7	PERİNATAL VE YENİDOĞAN DÖNEMLERİNDE MİKROBİYOTA VE PROBİYOTİKLER.....	591
	Perinatal Mikrobiyota.....	591
	Yenidoğan Mikrobiyotasının Gelişimi	594
	Yenidoğanlarda Probiyotik Kullanımı.....	603
	Sonuç.....	608
	Kaynaklar	608
BÖLÜM B8	OBSTETRİK PRATİKTE MİKROBİYOTANIN ÖNEMİ, PERİNATAL SONUÇLARA ETKİSİ VE PROBİYOTİK	615
	Giriş.....	615
	Kaynaklar	619
BÖLÜM B9	HASTANE ENFEKSİYONLARI VE ÇOKLU İLACA DİRENÇLİ ENFEKSİYONLARI ÖNLEMEDE PROBİYOTİKLERİN ROLÜ	621
	ÇİD Mikroorganizmalara Bağlı Hastane Enfeksiyonlarının Kontrolü	622
	Kontrol Stratejilerinde Mikrobiyotanın Yeri.....	622
	ÇİD Mikroorganizma Kolonizasyonunun ve Hastane Enfeksiyonlarının Önlenmesinde Probiyotiklerin Kullanılması	624
	Prebiyotik ve Sinbiyotiklerin Hastane Enfeksiyonlarını Önlemedeki Rolü.....	628
	Kaynaklar	629
BÖLÜM B10	PROBİYOTİKLERDE GELECEK	631
	Kaynaklar	632
BÖLÜM B11	PROBİYOTİKLER-PREBİYOTİKLER VE ALLERJİK HASTALIKLARIN ÖNLENME VE TEDAVİSİNDEKİ ROLLERİ	635
	Giriş.....	635
	Probiyotikler: Tanımlama.....	635

Prebiyotikler: Tanımlama.....	635
Probiyotiklerin ve Prebiyotiklerin Allerjik Hastalıklarda Kullanılma Nedenleri.....	636
Probiyotiklerin Allerjik Hastalıklarda Lokal ve Sistemik Etki Mekanizmaları.....	636
Prebiyotiklerin Allerjik Hastalıklarda Lokal ve Sistemik Etki Mekanizmaları.....	636
Allerjik Hastalık Öncülü Atopik Dermatitin Gelişimini Önlemede Probiyotiklerin Rolü.....	637
Probiyotiklerin Atopik Dermatit Tedavisindeki Rolü	638
Atopik Dermatit Gelişimini Önlemede Prebiyotiklerin Rolü.....	639
Probiyotiklerin Atopik Dermatit Tedavisindeki Rolü.....	640
Sonuç.....	640
Diğer Allerjik Hastalıklarda Probiyotiklerin ve Prebiyotiklerin Kullanımı	640
Allerjik Hastalıkların Geneli Üzerine Probiyotiklerin ve/veya Prebiyotiklerin Etkisi.....	643
Kaynaklar.....	645

C. AKILCI BESLENME

BÖLÜM C1	BAĞIRSAK MİKROBİYOTASI VE MAKROBESİN ÖGELERİ.....	651
	Karbonhidratlar	652
	Yağlar	653
	Proteinler	654
	Kaynaklar.....	656
BÖLÜM C2	BAĞIRSAK MİKROBİYOTASI VE MİKROBESİN ÖGELERİ.....	659
	İntestinal Mikrobiyota ve Vitaminler	659
	Suda Çözünen Vitaminler.....	660
	Yağda Çözünen Vitaminler	665
	Mikrobiyota ve Mineraller	668
	Sonuç.....	669
	Kaynaklar.....	669
BÖLÜM C3	PREBİYOTİK OLARAK FRUKTOOLİGOSAKKARİTLER METABOLİZMALARI VE SAĞLIĞA FAYDALARI.....	673
	Giriş.....	673
	Tanımı, Yapısal Özellikleri ve Besinsel Kaynakları.....	673
	Güvenilirliği.....	674
	Metabolizması.....	674
	Prebiyotik Olarak Sağlık Üzerine Olası Etkileri.....	675
	Kaynaklar	679
BÖLÜM C4	FARKLI BESLENME MODELLERİNİN BAĞIRSAK MİKROBİYOTASI ÜZERİNE ETKİSİ	681
	Giriş.....	681
	Akdeniz Diyeti.....	683
	Vejetaryen Diyet.....	684
	Yüksek Proteinli Diyetler	685
	FODMAP Diyet	686
	Glutensiz Diyet.....	686
	Düşük Karbonhidrat İçeren Diyetler	687
	Batı Tarzı Diyetler	688
	Açlık Diyetleri.....	689
	Paleolitik/Paleo Diyet.....	689
	Kaynaklar.....	690

BÖLÜM C5	FONKSİYONEL VE FERMENTE BESİNLERİN MİKROBİYOTA ÜZERİNE ETKİSİ	693
	Giriş.....	693
	Fonksiyonel Besinlerin Mikrobiyota Üzerindeki Etkileri.....	694
	Fermente Besinlerin Mikrobiyota Üzerindeki Etkileri	697
	Sonuç.....	702
	Kaynaklar	702
BÖLÜM C6	BAĞIRSAK SAĞLIĞINDA POST- VE PARABİYOTİKLER	705
	Giriş.....	705
	Probiyotiklerden Post- ve Paraprobiyotiklerin Doğuşu.....	705
	Probiyoaktif Bileşenler	706
	Post- ve Paraprobiyotiklerin Tanımı	707
	Paraprobiyotiklerin Bağırsak Sağlığına Etkileri	710
	Postbiyotiklerin Bağırsak Sağlığına Etkileri.....	712
	Sonuç.....	716
	Kaynaklar	716
BÖLÜM C7	GIDA KATKI MADDELERİ VE BAĞIRSAK MİKROBİYOTASINA ETKİLERİ... 721	721
	Giriş.....	721
	Gıda Katkı Maddeleri ve Sınıflandırılması.....	722
	Gıda Katkı Maddeleri ve Mikrobiyota.....	723
	Sonuç.....	729
	Kaynaklar	729
BÖLÜM C8	BAĞIRSAK GEÇİRGENLİĞİNDE SEBEP VE TEDAVİ OLARAK BESLENME ... 733	733
	Bağırsak Bariyerinin Yapısı.....	733
	Bağırsak Geçirgenliği	735
	Beslenme ve Bağırsak Geçirgenliği.....	736
	Kaynaklar	741
BÖLÜM C9	SPORCU BESLENMESİNDE MİKROBİYOTA VE PROBİYOTİKLER	745
	Giriş.....	745
	Egzersiz Mikrobiyotaya Etkisi	746
	Sporcu Sağlığı ve Probiyotikler	750
	Sporcu Performansı ve Probiyotikler	752
	Kaynaklar	753
BÖLÜM C10	COVID-19 VE AKILCI BESLENME	757
	Giriş.....	757
	Beslenme ve COVID-19	757
	Beslenme ve Bağışıklık Sistemi	764
	Sonuç.....	768
	Kaynaklar	768
BÖLÜM C11	MİKROBİYOTA RESTORASYONUNDA BESLENME VE GIDA TAKVİYELERİNİN ROLÜ	771
	Giriş.....	771
	Mikrobiyota Restorasyonunda Beslenmenin Rolü.....	772
	Mikrobiyota Restorasyonunda Besin Öğeleri	776
	Mikrobiyota Restorasyonunda Gıda Takviyeleri.....	778
	Sonuç.....	782
	Kaynaklar	782
DİZİN	.....	789

A. KLİNİK MİKROBİYOTA

Bölüm A1

İNSAN MİKROBİYOM PROJESİ, MİKROBİYOTANIN GELECEĞİ VE KİŞİYE ÖZEL TIP UYGULAMALARI

Ferhat Gürkan Aslan

Mustafa Altındış

Giriş

Mikroorganizmalar doğada her yerde bulunur, akla gelebilecek her ortamda yaşarlar ve insan yaşamında önemli bir rol oynarlar. Bitki büyümesi, toprak besin döngüsü ve deniz biyojeokimyasal döngüsü gibi temel ekosistem süreçlerini modüle ederek ekosistem işleyişinde önemli bir rol oynarlar. İnsan vücudunu kolonize eden sayısız mikroorganizma (sinbiyotik, patojenik ve kommensal), topluca insan mikrobiyotasını oluşturur. Mikrobiyal topluluklar, farklı konakçılar ve fiziksel ortamlar içinde belirli bir yapı üstlenirler. İşleyen bir mikrobiyom, önemli fizyolojik süreçlere katkıda bulunduğu için, konakçı organizmalar için zorunludur. Sonuç olarak, bir konakta yaşayan mikroorganizmaların tanımlanması ve karakterizasyonu, onların farklı konak fenotipleri ve mikroorganizmaların konaklarını etkilediği biyokimyasal yollar, konak-mikrobiyom araştırmalarının ana odak noktasıdır ⁽¹⁾.

‘Omic’ çağı, biyolojik araştırmaları tüm yönleriyle hızlandırmış olsa da, etkileri özellikle, mikrobiyal topluluklar ve insan mikrobiyomu çalışmalarında belirgin olmuştur. İlk insan genomunun yayınlanmasından bu yana geçen 18 yıl içinde, mikrobiyom çalışmaları, ağız boşluğu ve bağırsakların kültür temelli araştırmalarından, insan vücudundaki tüm ekolojik ortamlarda mikrobiyal biyokimyanın moleküler profillerine doğru büyümüştür. Epidemiyoloji ve model sistemler, mikrobiyomdaki değişiklikler ile otizmden kansere kadar değişen koşullar arasındaki ilişkileri belirlemek için kullanılmıştır. Örneğin, kalp hastalıklarını tedavi etmek için kullanılan ilaçların etkinliği veya greft-versus-host hastalığı sırasında hayatta kalmayı etkileyen mikrobiyal ve immünolojik mekanizmalar tanımlanmıştır. İnsan mikrobiyomu üzerine yapılan güncel çalışmalar, temel biyolojik ve beklenmeyen dönüşümlerin kaynağı olmanın yanında, bir dizi yeni bulgu ve açık soruları ortaya çıkarmıştır. Her insan, yaşamın erken dönemlerinde edinilen, ortam ve popülasyonlar arasında farklılık gösteren ve yıllarca devam edebilen veya nispeten hızlı değişimler geçirebilen, büyük ölçüde bireysel, kendi mikrobiyal suş takımını taşıyor gibi görünmektedir. Mikrobiyal çeşitlilik, vücudun farklı ekolojik boşluklarında farklı şekillerde kendini gösterir; örneğin, bağırsakta daha fazla çeşitlilik beklenir ancak, dışı üreme sisteminde disbiyotik durumlar ve advers olay riski ile ilişkilendirilebilir. Mikrobiyom, inflamatuvar bağırsak hastalığı (İBH) ve diyabet gibi durumlar için uyarıcı olabilir ancak, mikrobiyom bağlantılı çeşitli sağlık durumları ve bu bağlantıların temelleri henüz keşfedilmemiştir ⁽²⁾.

Mikrobiyomlar hakkındaki bilgimizi geliştirmek, son yirmi yılda sadece bilim camiasında değil, aynı zamanda halk arasında, özellikle yeni tıbbi tedaviler için büyük umut vaat eden bir alan olarak popüler bir konu hâline geldi. İnsan mikrobiyomu artık “son organımız” olarak kabul ediliyor. Sadece son 10 yılda 1,7 milyar Amerikan Dolarından fazla harcanan insan mikrobiyom araştırması, yeni başlanan bir tıbbi araştır-

lamalarını ve sonuçlarını daha iyi anladıkça mikrobiyal replasman tedavilerinin standart bir uygulama hâline gelmesi muhtemeldir.

Sentetik genomik alanının paralel gelişimi ve genişlemesi, insan sağlığını modüle etmek için kullanılabilir sentetik insan mikrobiyomları veya bunların sentetik ürünleri için yeni fırsatlar yaratmaktadır. Sentetik biyoloji, sıtma tedavilerine ve influenza aşısı üretimine yönelik uygulamalarda zaten başarılı olduğunu kanıtladı. Sentetik biyoloji yaklaşımları, insan vücuduna dâhil edilebilen ve izlenebilen değiştirilmiş türler geliştirmek için büyük bir fırsat oluşturmaktadır. Probiyotiklerin veya mühendislik uygulanmış suşların verimliliği, vitaminler gibi ikincil bileşiklerin üretiminin artırılmasını ya da biyoaktif yüklerin taşınmasını sağlayacak şekilde bazı yolakların değiştirilmesi yoluyla iyileştirilebilir. Bağırsak veya cilt gibi bir hastalık bölgesinde mayalar, küçük ökaryotlar ya da bakterilerin biyoaktif bileşikler üreteceği, taşıma sistemi gibi görev göreceği düşünülebilir. Ayrıca sentetik doğal-ürün ilaçları üretmek için kullanılabilirler⁽⁶²⁾. Sentetik fajlar insan sağlığını olumsuz yönde etkileyen bakteri popülasyonlarını modüle etme imkânını sunar⁽⁶³⁾. Canlı mikroorganizmalar üzerinde uygulanan mühendislik, mevcut ilaçlardan ve tedavi yaklaşımlarından farklı olan yeni fikri haklar ve ürünleri ortaya çıkarır. Yasal çerçeveden bakılınca, özellikle de değiştirilmiş türlerin sağlıklı insan mikrobiyomuna ve genel olarak doğal çevreye katılacağı düşünüldüğünde, sentetik biyoloji ve insan mikrobiyom araştırmaları alanlarının kaynaştırılmasında önemli zorluklarla karşılaşılacağı beklenebilir. Sağlığımıza daha fazla katkı sağlaması amacıyla doğal mikrobiyal floramızı kullanma yönünde keşiflerde bulunduğumuz, bu konu, üzerinde daha fazla tartışılmayı ve kamu farkındalığını gerektirmektedir⁽²³⁾.

Sonuç

Son dönemde, gastrointestinal sistem ve diğer vücut bölgelerindeki bakteri, arkeae, mantar, protist ve virüslerin varlığının insan sağlığının vazgeçilmez bir bileşeni olduğu anlaşılmıştır. Mikroorganizmaların bu iyi dengelenmiş topluluğu, konakçı metabolizmasına ayarlanmış olup insan mikrobiyomu olarak anılmaktadır. Araştırmacılar şu anda öncelikli olarak “insan vücudunun çeşitli bölgelerindeki mikrobik toplulukların kompozisyonları, zarar ve faydaları nelerdir?” konusuna odaklanmış durumdadır.

İMP, hastalık ve sağlıkta yerleşik insan mikrobiyomundaki değişimlerin rolü hakkında tıp bilimini daha iyi bilgilendirmek için veri, araç ve kaynaklar sağlayarak insan mikrobiyolojisinin sınırlarını anlamak üzere tasarlanmıştır. Gelecekteki çalışmalar için referans görevi görececek bir veri tabanı sağlayacaktır. İMP'nin başlatıldığı, teknolojik değişim döneminde; DNA dizileme maliyeti düşmekte ve üretim miktarı artmaktadır. Metagenomik çalışmalarda yeni nesil teknolojilerin kullanımı için standartlar belirlemek ve doğru, kalite kontrollü veri üretmek için İMP, gelecekteki insan mikrobiyomu araştırmalarında bir temel oluşturacaktır.

Son birkaç yılda Mikrobiotanın insanlardaki rolünü açıklayan anlamlı çalışmalar olmakla birlikte bugün ihtiyaç duyduğumuz şey, bu rolü yürüten molekülleri ve mekanizmaları doğru şekilde anlayabilmek ve bu bilgileri sağlığı iyileştirmek ve hastalıkları azaltmakta kullanmaktır. Bu konuda bilimsel, sosyal, kültürel, etik, yasal ve eğitimsel zorlukların şimdiden ele alınması, özellikle hastalık yükünün büyük olduğu ve insan bağırsak mikrobiyomu ile ilişkili keşiflerin uygulanmasının büyük etkiye sahip olacağı düşük gelirli ülkeler göz önünde bulundurulduğunda kritik öneme sahiptir.

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İMMÜN SİSTEM VE BAĞIRSAK MİKROBİYOTASI

Şefik Şanal Alkan

Çevremizdeki tüm kalıtsal nesnenin belirlenmesi demek olan metagenomik (*çevrekalıt*) alanındaki yeni bulgular bizim dünya görüşümüzü değiştirmekle kalmadı. Artık kendi vücudumuzu, minicanlıları da içeren karışık hücresel bileşimi olarak görüyoruz. Ayrıca, bağışıklık sisteminin hem sağlıkta hem de hastalık durumlarındaki rolünü yeniden düşünmek zorundayız. Şimdi iyice anladık ki, yaşamımız, vücudumuzun çeşitli bölgelerine konuşlanmış ve adına mikrobiyota (*minicanlı örtüsü*) denilen mikrop topluluklarıyla olan karşılıklı iş birliğine, ortak yaşama (*simbiyoz*) bağlı. Biz, konak (ev sahibi) olarak, doğumdan önce ve sonra vücudumuz katılan ortakçı minicanlıları tanır, onlara yerlerini gösterir, sınırlarını belirtiriz. Vücudumuzdaki bakteri, fungus ve diğer tek hücreli mikrobiyotanın içerdiği tüm kalıtsal (genetik) madde demek olan mikrobiyom, bizim işlevlerimizi etkiler. Tüm hayvanlarda ve bitkilerde mikrobiyomun içeriği ve işlevi çok önemlidir. Bu yüzden bir canlının kendi hücreleriyle birlikte taşıdığı mikrobiyom, o çevre için benzersiz/biricik bir öge sayılır ki biz buna holobiyont (*yaşarkitle*) diyoruz. Holobiyont (konak ve konakçıları), kendi içinde iletişimi ve herkese yarar sağlayan iş birliğini sürdürebilmek için, milyonlarca yıllık birlikte evrilmenin şekillendirdiği /orya çıkardığı araçları kullanır. Normal koşullarda, mikrobiyota, hastalık yapıcı (*patojen*) minicanlıların vücuda yerleşmesini engeller. Ancak, her ilişkide olabileceği gibi yanlışlıklar olabilir, işler ters gidebilir. Ya konağın bağışıklık sistemindeki bir aksaklık, ya da minicanlının, kalıtımındaki sık görülen değişiklikler, konak-konakçılar (ortakçılar) arasındaki devingen/hareketli dengeyi bozabilir. Böyle bir dengesizlik (*dysbiosis*) durumunda mikrobiyotadaki birçok minicanlı hastalık yapıcı etkide bulunabilir ki bunun sonucunda, yangısal (*inflammatory*) hastalıklar, aşırı şişmanlık, ya da şeker hastalığı ortaya çıkabilir. Bir konağın bağırsak dışındaki mikrobiyotası da önemlidir ama biz bu kısa derlemede, göreceli öneminden ötürü, sağlıkta- hastalıkta, bağırsak mikrobiyotası ile bağışıklık dizgesi arasındaki ilişkiye odaklanacağız.

Giriş

Son birkaç yıldır, minicanlı bilimi (mikrobiyoloji) ve bağışıklık bilimi (immünoloji) alanında kendimizi köklü bir düşünce değişikliği içinde buluyoruz. Bu yüzden, minicanlılarla ilişkilerimize ve bağışıklığın görevine ilişkin bilinenlere çok değişik bir açıdan bakamamız gerekiyor. Onun için yazıya bu değişikliği başlatan Amerikalı cesur, evrimci, devrimci bir bayan bilimciyle, Lynn Margulis'la (1938-2011) başlamak uygun olur.

Evrim deyince nasıl ki aklımıza Charles Darwin geliyorsa, minicanlılarla ortak yaşam (symbiosis) denince akla Lynn Margulis gelir. Evrim bilimci Ernst Mayr'in deyişiyle, çekirdekli hücrelerin evrimini anlamak, "belki de tarihteki en önemli ve en çarpıcı olaydır" ve bunu büyük ölçüde Dr. Margulis'e borçluyuz. Peki, Margulis'un fark ettiği şey neydi? O, içiçe ortakyaşam (*endosymbiosis*) kuramını ortaya atarak, minicanlıların, tüm canlılar alemi sanıldığından çok daha derinden etkilediğini, bir yaşamın-başka yaşama aşırı derecede bağılılığını (codependence) gösterdi¹.

bulgularından kuşku duymuyoruz; sözünü ettiğimiz şey, gazetecilerin, para babalarının, halkın yanlış anlamalarla gereksiz ve aldatıcı reklamlarla boğulmasına karşı çıkmak.. Birçok şeyi bilmiyoruz: Örneğin, mikrobiyota-hastalık ilişkilerinde sadece bir “bağıntı” mı (*correlation*) yoksa neden-sonuç ilişkisi mi var? Ayrıca, bütün mikrobiyota çalışmaları 16SrRNA (nükleotid) dizini üzerinedir ve bu güvenilir fakat oldukça kaba bir karşılaştırmadır. Nükleotid dizin’inin ötesinde, işlevsel farklılıklara da bakmak gerekir. Ayrıca, bazı fare deneylerinin insan için anlamı nedir bilmiyoruz^{53,54}.

Öte yandan, birçok bilinmez varken, yapılmaya başlanan dışkı aktarım tedavisinin nerelere varacağını beklememiz gerekecek^{55,56}.

Son yıllarda özellikle Amerikada sağlıkçılar, ilaç firmaları, doktorlar ve hastalar arasında büyük bir savaş patlak verdi: ne üzerine dersiniz? İnsan dışkısı zerine. Çünkü, dışkıyla mikrobiyota aktarımı (DMA) özellikle *Clostridioides difficile*’in yol açtığı bağırsak hastalığını ortadan kaldırıyor. Aynı şey şeker hastalığında, kanserde olmayacak diye bir şey yok. Ancak, doğru yapılmayan DMA den sonra birkaç hasta ölünce işler karıştı. Aktarılan insan dışkısı ilaç değil, kan değil, organ değil... Bunun denetimi nasıl yapılacak? FDA’nın işi zor. Kim derdi ki insan dışkısı hem sağlıkçılar, hem de ilaç firmaları için “altın madeni” gibi kıymetlensin⁵⁷.

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Bölüm A3

MİKROBİYOTA, BESLENME VE İMMÜN SİSTEM

Ishak Özel Tekin

“Gıdanız ilacınız olsun, ilacınız da gıda”

Hipokrat

Bedenimizi paylaşan kommensal, sinbiyotik ve patojenik mikroorganizmaların (bakteri, mantar, protozoa, virüs vb.) oluşturduğu ekolojik topluluk “mikrobiyota”, bu çevrede yaşayan mikroorganizmaların toplam genomu ise “mikrobiyom” olarak adlandırılmaktadır. Mikrobiyota gelişiminde, doğum şekli ve yenidoğan beslenmesinden, çevresel ve kültürel faktörlere, antibiyotik kullanımından, fiziksel aktiviteye kadar çok sayıda faktör rol almaktadır. Vücudumuz sahip olduğu memeli hücrelerinin yaklaşık on katı kadar yararlı bakteriye ev sahipliği yapmaktadır¹.

Bu bölüm özellikle vücudun paydaşları olan yararlı mikroorganizmalar, bunların çeşitliliği ve davranışlarında etkili olan beslenme ve her iki sistemle de etkileşim hâlindeki immün sistemin ilişkilerine ayrılmıştır.

Beslenme tüm vücut hücrelerinin ve buna bağlı olarak organizmanın hayatta kalması, büyümesi, gelişmesi, üremesi için elzemdir. Sağlıklı bir yaşam için gereken enerji ve yapıtaşlarının elde edilmesi dengeli ve düzenli bir beslenmeyle mümkün olabilmektedir. Bağışıklık sistemi ile beslenme arasında çok yakın bir ilişki bulunmakta ve yetersiz beslenme yalnızca, enerji ve protein eksikliği olarak düşünülmemesi gereken, çok daha fazlası olan bir olgu olarak karşımıza çıkmaktadır. Günümüzde bağışıklık sistemi penceresinden ele alındığında bireyin beslenmesindeki amaç enerji, protein, mineral ve benzeri gereksinimleri karşılamak yanında, kişinin hastalıklara karşı direncini arttırmak, bağışıklık yanıtlarını tam bir sağlık için düzenlemek olarak açıklanabilir².

Beslenme eyleminin girdisini oluşturan başlıca yapılar, su, karbonhidratlar, proteinler, yağlar, vitaminler ve mineraller olarak altı başlıkta toplanabilir. Bunlardan üçü (karbonhidratlar, proteinler ve yağlar) vücudun kullanacağı enerjinin başlıca kaynağını oluştururlar. Vitaminler bu üç yapı taşı gibi organik maddeler olup, onların enerji oluşturmalarına yardım ederler. Buna karşın mineraller ve su inorganik moleküllerdir³.

İnsanda yetersiz beslenme, özellikle protein-enerji malnütrisyonu tüm yaşamsal faaliyetleri etkilediği gibi başta enfeksiyon hastalıklarının morbidite ve mortalitesini artırmak üzere bağışıklık sisteminin gelişimi, işlevleri ve düzenlenmesini olumsuz yönde etkilemektedir. Bunun gibi aşırı beslenme ve eşlik eden metabolik bozukluklar da bağışıklık işlevlerini bozmakta, konak mikrobiyotasını olumsuz etkilemekte ve enfeksiyon hastalıklarına yatkınlığı artırmaktadır⁴. Ayrıca hem yetersiz beslenme hem de aşırı beslenme vücutta inflamasyonu artırmakta, edinsel (adaptif) immün yanıtları bozmaktadır⁵. Beslenmenin bağışıklık sistemindeki önemi tartışmasız olmasına rağmen bu ilişki oldukça karmaşıktır. Bu karmaşıklık üç ana tema üzerinden özetlenebilir:

Tablo 3. Bağırsak mikrobiyotasının bağırsaklar ve immün sistemdeki temel etkileri.**Bağırsak Mikrobiyotasının Bağırsaklar ve İmmün Sistemdeki Temel Etkileri**

- Bağırsak homeostazisinin önemli bir parçasıdır
- Epitel hücreleri arası sıkı bağlantıların oluşmasında etkilidir
- Musin katmanının kalınlaşmasında ve mukus salgısı üzerinde etkilidir
- Epitelin hasara yanıtını düzenler
- Bağırsaklarda lenfoid dokunun gelişimine katkıda bulunurlar
- Paneth hücrelerinden antimikrobiyal peptid üretimini artırır
- IgA salgılayan plazma hücreleri ve aktive T hücrelerinin mukozal alanlara gelmesine yardımcı olurlar
- GİS dışı sekonder lenfoid organ T ve B hücre bölgelerinin gelişimine katkı sunarlar
- Bağırsak epiteli ve immün hücrelerde TLR ve NOD ekspresyonunu değiştirirler

Tablo 3 ile gösterilen temel etkilerin çok daha fazlası gösterilmiştir. Fazla yer tutmaması nedeniyle kısaca özetlenen bu etkilerden de görülebileceği gibi mikrobiyotanın bu vazgeçilmez özellikleri probiyotikler ve ilişkili ürünlerin (prebiyotik, postbiyotik gibi) hastalıkta ve sağlıkta kullanımına bir alt yapı hazırlamıştır.

Yirmi yıldan daha uzun bir süre önce prebiyotikler tanımlanmıştır. O zamandan beri fruktan (fruktooligosakkaridler-FOS ve inulin) ve galaktanlar (galaktooligosakkaridler-GOS) başlıca prebiyotikler olarak kabul edilirken, artık polifenoller ve poliansature yağ asitleri de bu grubun içine girmiştir³² (Şekil 1). Bu da polifenollerin bağırsıklık sistemi üzerindeki yukarıda örneklenen doğrudan etkileri dışında mikrobiyota üzerinde de etki eden çok yönlü bağırsıklık düzenleyici özelliklerini desteklemektedir.

İmmün beslenmenin klinik uygulamalardaki yeri ve uygulama şekilleri konusunda yanıtlanması gereken çok sayıda soru vardır ve bu soruların yanıtları bilinmeden tedaviye başlanmamalıdır:

- Hastalığın fizyopatolojisini ne kadar biliyoruz?
- Etkilenen bağırsıklık sistemi elemanları hangileridir ve etkilenme düzeyi nasıldır?
- Hastanın beslenme durumunun tabloya etkisini biliyor muyuz?
- Hangi bileşenleri, nasıl bir kombinasyonla, hangi dozlarda ve ne süreyle uygulamalıyız?
- Bu bileşenlerin birbirleriyle olan etkileşimlerini biliyor muyuz?

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ALLERJİK HASTALIKLAR VE HİSTAMİN İNTOLERANSINDA MİKROBİYOTA

Özlem Koyuncu Özyurt

Allerjik Hastalıklar ve Mikrobiyota

Son yıllarda, dünya çapında birçok gelişmiş ve hızlı büyüyen ülke, astım, atopik dermatit ve gıda allerjileri gibi alerjik hastalıkların prevalansında çarpıcı bir artış kaydetmiştir^{1,2}. Yapılan çalışmalarla alerjik hastalıkların artan prevalansında, insan mikrobiyotasının bozulmasının merkezi bir rolü olduğunu göstermektedir. İnsan bağırsağında ve diğer organlarda yerleşik mikrobiyal toplulukların hem doğuştan gelen hem de edinilmiş bağışıklık tepkilerini modüle ettiği gösterilmiştir³. Disbiyotik bir mikrobiyota, alerjik hastalıklar da dâhil olmak üzere, yaşamın ilerleyen dönemlerinde immün aracılı bozukluklara daha fazla duyarlılık ile ilişkilendirilmiştir.⁴

Daha ileri çalışmalar, yaşamlarının ilk yıllarını kırsal ortamlarda, hayvanlarla yakın temas hâlinde yaşamış ve pastörize edilmemiş süt tüketmiş çocukların alerji insidansının daha düşük olduğunu göstermiştir⁵. Bu çalışmalar, yaşamın ilk aylarında bağışıklık sisteminin gelişimini etkileyebilecek bazı yenidoğan ve maternal faktörleri tanımlamaya ve böylece alerjik hastalıkların gelişme potansiyelinde kilit bir rol belirlemeye izin veren bu hastalıklarda mikrobiyotanın bir rolünün varsayılmasına yol açmıştır⁶.

Mikrobiyota bileşiminin yaşamın ilk birkaç yılında dinamik olarak değiştiği ve doğum öncesi ve doğum sonrası çeşitli çevresel ve konakla ilgili faktörlerden etkilenebileceği iyi bilinmektedir⁷. Bu faktörler arasında, artan kanıtlar, doğum şekli, emzirme, erken antibiyotik kullanımı ve tamamlayıcı beslenmenin zamanlaması ve türü gibi bazı perinatal faktörlerin, farklı antijenlere karşı immün tolerans yanıtlarının geliştirilmesinde kilit bir belirleyici olarak ortaya çıkan bağırsak mikrobiyota bileşimini önemli ölçüde modüle edebileceğini göstermektedir⁸.

Günümüzde, alerjik hastalıklara karşı koruyucu bir mikrobiyotanın kurulmasına yol açtığı bilinen faktörler şunlardır: yaşamın ilk yıllarında antibiyotik tedavilerinin olmaması, ilk 4 ay boyunca emzirme, vajinal doğum, bebeklik döneminde veya hamilelik sırasında evde evcil hayvanların varlığı ve hamilelik sırasında maternal antibiyotik tedavilerinin yokluğu. Tüm bu faktörler, aslında, daha düşük çocukluk alerjisi oranlarıyla bağlantılıdır⁵.

Alerjik Hastalıkların Gelişiminde Mikrobiyotanın Rolü

Mikrobiyotanın, hücresel gelişimden organ ve doku oluşumuna kadar bağışıklık tepkisini modüle edebileceği iyi bilinmektedir ve etkilerini bağışıklık sisteminin hem doğuştan gelen, hem de edinilmiş dallarıyla çoklu etkileşimler yoluyla uygular^{9,10}.

HİT'li hastalarda dengesiz bir bağırsak florası ve bağırsak bakteri bileşiminde bir değişiklik olduğu gösterilmiştir⁹¹. Bu disbiyoz durumu, bağırsakta bir mukozal inflamasyonu teşvik edebilir. Histamini parçalayan DAO, olgun enterositler tarafından sentezlendiğinden ve mukozal epitel hücrelerinde depolandığından bu hücrelerin inflamasyonundan kaynaklı bir bozulma, DAO sentezinin azalmasına da katkıda bulunabilir⁹². Bu, histamin intoleransının tipik semptomlarına neden olan endojen histamin düzeylerinin artmasına neden olabilir. Bu hastalarda sızdıran bağırsak gelişimine neden olabilir ve sonuç olarak kronik ve inflamatuvar hastalıklar gelişebilir⁹¹.

Disbiyozisin görüldüğü, inflamatuvar bağırsak hastalığı ve astım gibi birçok inflamatuvar hastalıkta, bu hastaların bağırsaklarında histamin salgılayan bakterilerin arttığını göstermiştir^{93,94}. Bu nedenle, bu veriler bakteri kaynaklı histaminin, histamin aracılı patolojilere katkıda bulunduğunu göstermektedir⁸¹. Çalışmalar ayrıca mikroorganizmalar tarafından salgılanan histaminin, konakçı histamin reseptörü 2 aracılığıyla bağırsaktaki bağışıklık tepkilerini etkilediğini ve anti-inflamatuvar etkiler gösterebileceğini göstermiştir^{95,96}.

Çok çeşitli Gram pozitif ve Gram negatif bakterilerin histamin sentezinde görevli olan Histidin dekarboksilaz enzimini kodlayan genlere sahip olduğu ve histamin sentezlediği bulunmuştur⁹⁷. HDK içeren türler 6 filumda bulunmuştur: *Proteobacteria*, *Actinobacteria*, *Bacteroidota*, *Firmicutes*, *Fusobacteriota*, *Verrucomicrobiota*⁹⁸. *Proteobacteria* filumunda genişleme, inflamatuvar bağırsak hastalığı gibi proinflamatuvar hastalıkların bir özelliği olan bağırsak disbiyozunun potansiyel bir göstergesi olarak kabul edilir⁹⁹. Bu altı bakteri filumundan en sık histaminin salınımının görüldüğü cinsler, Enterobacteraleslerden bazı *Morganella*, *Enterobacter*, *Hafnia*, *Proteus* ve *Photobacterium* gibi bakteri suşları ve yanı sıra laktik asit bakterilerinden *Lactobacillus*, *Enterococcus* ve farklı *Pseudomonas* suşlarıdır¹⁰⁰. Histamini sentezleme kapasitelerinin yanı sıra daha yeni araştırmalar bazı bakterilerin histamini metabolize edebildiğini göstermiştir. Özellikle *Pseudomonas* türleri, muazzam bir metabolik çok yönlülük ile karakterize edilir ve de la Torre ve ark. *Pseudomonas putida* U suşunun tek karbon kaynağı olarak histamin içeren minimal bir ortamda aerobik olarak büyüebildiğini ortaya çıkardı¹⁰¹. Yine bir başka çalışmada, *Pseudomonas aeruginosa* PAO1 suşunun, tek bir karbon ve nitrojen kaynağı olarak histamin üzerinde büyüebildiği bulunmuştur, bu da fonksiyonel bir histamin katabolizma yolunu barındırdığını gösterir¹⁰².

Histamin salgılayan *Lactobacillus rhamnosus*'un uygulanmasının, çeşitli interlökinlerin salgılanmasında ve tümör nekroz faktöründe bir azalma ile kanıtlandığı gibi bir anti-enflamatuvar etkiye sahip olduğunu göstermiştir. Bu etki, histamin 2 reseptöründe eksik olan hayvanlarda kaybedilmiştir, bu da mikrobiyota kaynaklı histaminin immünomodülatör olabileceğini göstermiştir¹⁰³. Daha yeni çalışmalar, bağırsaktaki bakteriyel histamin salınımının sadece konakçı bağışıklık sisteminin lokal modülasyonuna neden olmadığını, aynı zamanda akciğerdeki gibi uzak mukozal bölgelerde immünolojik sonuçlar doğurabileceğini öne sürmüştür¹⁰⁴.

Bağırsak mikrobiyotasında bakteriyel histamin salgılanmasının sindirim bozuklukları ile ilişkili olduğuna dair kanıtlar vardır. Tipik olarak bağırsak mikrobiyotasında bulunan suşlar için histamin salınım kapasitesinin belirlenmesi ile, hastaların mikrobiyotasının bileşiminden histaminle ilgili bozuklukların teşhisini kolaylaştacaktır.

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Bölüm A5

MİKROBIYOTA VE EPIGENETİK ETKİSİ

Emel Uzunoğlu

Giriş

İnsan Genom Projesi ile birlikte geliştirilen yüksek çıktılı teknolojiler insan mikrobiyomu, epigenomu ve mikrobiyotanın neden olduğu epigenetik modifikasyonlar hakkında pek çok veri elde edilmesini sağlamıştır. Bu bilgiler otoimmün hastalıklardan metabolik hastalıklara, kanserden kardiyovasküler hastalıklara kadar pek çok hastalık ile ilgili ışık tutmuştur.

Mikrobiyota kısaca belirli bir çevrede yaşayan canlı mikroorganizmalar olarak tanımlanır. Mikrobiyom tanımı ise bu çevrede yaşayan bakteri, virüs, mantar, parazit, archaea gibi canlılara ek olarak, bu canlıların genomlarını, metabolitlerini ve onları çevreleyen ekosistemi de kapsar.¹Bağırsak mikrobiyotası “ikinci genom” olarak adlandırılmaktadır.² Sahip olduğu 2.000.000 gen ile insanda kodlanan gen sayısından x100 kat daha fazla gen içermektedir.³

Mikrobiyom tanımından da anlaşılacağı üzere, mikrobiyotada yaşayan mikroorganizmalar içerisinde buldukları çevre ile iletişim hâlinindedirler. Salgıladıkları moleküller ile farklı mekanizmalar üzerinden konağın fizyolojisini değiştirebilirler. Son yıllarda gittikçe artan sayıda çalışma ile konağın epigenetik mekanizmaları üzerindeki etkileri araştırılmaktadır. Üç farklı mekanizma ile mikrobiyota ürünlerinin konakçı da epigenetik değişiklikler yarattığı düşünülmektedir: 1)DNA veya histon modifikasyonları için gerekli olan substratların sentezi 2) epigenetik modifiye edici enzimlerin ekspresyonu ve/veya aktivitelerinin regülasyonu 3) konak hücrelerine ait intrinsik yolların aktivasyonu.⁴

Epigenetik Tanımı ve Epigenetik Mekanizmalar

Epigenetik; DNA sekansında hiçbir değişiklik oluşturmadan genlerin ifadesini değiştirebilen ve kalımsal olarak aktarılabilen değişiklikleri inceleyen bilim dalıdır. “Epi-” Yunanca “üzerinde” anlamını taşır. “Epigenetik”; genetik kod dışında yer alan, genlerin ekspresyonunu artıran veya gen ifadesini durduran faktörlerle ilgilenir.⁵

Gen ekspresyonu, epigenetik modifikasyonlar üzerinden diyet ve çevrenin etkisi ile değiştirilebilir. Özellikle metabolik hastalıkların yönetiminde epigenetiğimizi etkileyen faktörler kritik bir öneme sahiptir.⁶ Konak tarafından sindirilen besinler bağırsak mikrobiyotası tarafından fermente edilip çeşitli metabolitler üretilir. Mikrobiyota aracılı metabolitler epigenetik modifikasyonda rol oynayan enzimlerin substratı olarak görev yaparlar, bu enzimlerinin aktivitesini regüle ederler, konak genlerinin ekspresyonunu değiştirirler, intestinal epitelyal hücrelerde inflamasyonu tetikleyerek çeşitli metabolik hastalıklara neden olurlar.⁷Günümüzde histon deasetilaz (HDAC) inhibitörleri, besin takviyeleri, probiyotik ve prebiyotikler ve fekal bakteri transplantasyonu gibi farklı epigenetik modülasyonlar hâlen araştırma aşamasındadır.^{8,9,10,11,12,13}

bize özellikle metabolik hastalıklarla ilgili canlı bakterilerin tedavide kullanılmasının yükselen bir trend olduğunu göstermektedir.

Ciddi kurallarla sınırlama getirilmiş olsa da fekal mikrobiyota transplantasyonu (FMT) tedavide güncelliğini korumaktadır. Yeni çalışmalar FMT'nun konak ve immün hücre epigenomu üzerine etkilerine yoğunlaşmaktadır. Allagraft transplantasyon olog transplantasyondan daha başarılı olmuştur. FMT sonrası artan *Prevotella* spp. nin direkt ilişkili olduğu AFAP1 metilasyonu insülin sensitivitesi üzerinden metabolik sendromun tedavi edilmesi ile ilgili yeni bir yaklaşım getirmiştir.⁶⁶

Mikrobiyom tedavilerinden biri olan faj terapisi bakteriyofajları kullanır. Genetik mühendislik yardımıyla elde edilmiş bakteriyofajlar antimikrobiyal ajan olarak kullanılarak patojenleri uzaklaştırabilmektedir. Fajlar disbiyozis, diyabet ve obezite için de yeni tedavi yaklaşımları olarak görülmektedir.⁶⁷ FMT sırasında da fajlar restorasyonda çok önemlidirler. Fekal virüs transplantasyonu (FVT) olarak bilinen, donör fecesinden aseptik filtrasyonla bakteriyel komponentlerin uzaklaştırılması bakteriler tarafından gelişen invaziv enfeksiyonları önlemektedir. Bu şekilde yapılan transplantasyonlarda obezite ve T2DM semptomlarını geriletmiştir.⁶⁸

Mikrobiyotadan elde edilen metabolitlerin özellikle KZYA epigenetik substratlar olarak kullanılması kromatin yapısını, gen ekspresyon düzeylerini, konağın transkriptomunun yeniden düzenlenmesini sağlayabilir. Ancak bu çalışmalar henüz çok yeni ve çeşitli kısıtlılıklara sahiptir. Mikrobiyota üzerinden sağlanacak epigenetik değişikliklere ilişkin daha fazla ve kapsamlı çalışmalara ihtiyaç vardır.

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MİKROBİYOTA/MİKROBİYOM ÇALIŞMALARINDA ETİK

Selma Altındış

Merve Pilavcı Adıgül

Giriş

Genel olarak mikrobiyota, insanlarla birlikte yaşayan mikroorganizmaların tamamını, mikrobiyom ise insanlarla kommensal olarak yaşayan mikroorganizmaların taşıdıkları genleri ifade etmektedir⁽¹⁾. Literatürde mikrobiyotanın “*sanal bir organ*”^(2, 3), “*yeni bir organ*”⁽⁴⁻⁷⁾ ya da “*süper organ*”^(8, 9) şeklinde tanımlanmalarına rastlanmaktadır. Çünkü araştırmalar, vücudumuzu oluşturan hücrelerin %10’undan daha azının insan hücreleri olduğu, kalan %90’nın ise bakteri hücrelerinden(mikroplar) oluştuğunu belirtmektedir⁽¹⁰⁾. Başka bir deyişle insan vücudu, aslında vücut hücrelerimizden 10 kat daha fazla mikrobiyal hücreden oluşan bir süper organizmadır⁽¹¹⁾.

Gümümüzde insan mikrobiyomu çalışmalarının sayısı, sahip olduğumuz bilgiler ve kullandığımız teknolojiler nedeniyle kısıtlıdır. Ancak bu konudaki çalışmaların gelecekte sağlayacağı fırsatlar ve sunacağı terapötik imkânlar nedeniyle hızla artacağı ve yaygınlaşacağı düşünülmektedir. Farklı disiplinlerce yapılan mikrobiyom çalışmalarında etik ile yakından ilişkili kişisel kimlik, mahremiyet, mülkiyet, araştırma etiği, halk sağlığı ve biyobankalar gibi bazı kavramların öne çıktığı görülmektedir⁽¹²⁻²¹⁾. Bu çalışmalara eşlik eden bir dizi etik, yasal ve sosyal sonuçlar görülebilir⁽²¹⁾. Yapılan araştırmaların ortaya koyduğu sonuçların^(7, 21-25) yanı sıra etik açıdan mikrobiyota konusunu ele alan çalışmalar^(12-15, 18-21), bu konunun önemini vurgulamaktadır. Dolayısıyla bu bölümde mikrobiyota çalışmalarında karşılaşılabilecek potansiyel etik ve yasal sorunlar, öne çıkan bu kavramlar üzerinden ele alınmaktadır.

Kişisel Kimlik ve Etik

Kişisel kimlikle ilgili en bilindik soru, ben kimim ya da biz kimiz? sorusudur. Ayrıca insan mikrobiyom araştırmalarından elde edilen bilgilerle, hücrelerimizin yarısından fazlası insan hücreleri değilse, bireysel bir insan olmak ne demektir?⁽²⁰⁾

Kimlik “en geniş anlamıyla, bireyin tüm özelliklerini kapsar”⁽²⁶⁾. Kimlik, “hem kendisi ile diğerleri arasında bir farklılaşma içerir, hem de kendisiyle diğerleri arasındaki özdeşlemelerden hareketle inşa edilir”⁽²⁷⁾. Kişilik, farklı disiplinler tarafından ele alınmasına rağmen üzerinde görüş birliğine varılmış ortak bir tanıma sahip değildir^(28, 29, 30). Ortak bir tanımının olmamasının nedeni kavramın son derece geniş bir içeriğe sahip olmasıdır⁽³¹⁾. Kişiliğin sahip olduğu fiziksel, bilişsel ve toplumsal içerik⁽³⁰⁾ bireyin ilgileri, tutumları, yetenekleri, konuşma biçimi, dış görünüşü ve çevresine uyumuna ilişkin özelliklerini kapsar ve bireye özgüdür^(31, 32).

Kişilik genellikle temel ve ayırt edici özellikler olmak üzere iki ana kategoride tanımlanmaktadır. Bunlar; biri bireyin doğuştan sahip olduğu diğeri sonradan edindiği donanımlardır. “Birincisi, bireyin psiko-sosyal varlığının biyolojik içeriğine, ikincisi ise sosyal boyutuna vurgu yapmaktadır”^(31, 33).

me, depolama, izleme ve dağıtım ve gibi işlem prosedürlerinin dikkate alınması gereken diğer konulardandır⁽⁵⁹⁾.

Biyobankaların kullanımının artmasıyla birlikte, biyobanka ve örnek bankalarının kuralları ve yönetimi ile ilgili olarak alan yazında şu sorular gündeme gelmektedir^(12, 17, 20):

➤ Biyolojik numunelere kimler erişim sağlamalı? Örneğin Kamu güvenlik kurumlarının, benzersiz ve tanımlanabilir bağışçı bilgileri içerebilen insan mikrobik numunelerini toplayıp saklayan Biobankayı ziyaret etmesine izin vermeli miyiz?

➤ Hangi bilgiler paylaşılmalı?

➤ Bilgilerin paylaşımı ve örneklerin hangi projeleri destekleyeceği ile ilgili kararları kimler vermelidir?

➤ Araştırmacıların veya biyobankaların bir katılımcının tesadüfi bulgularını veya genetik araştırmanın yarattığı bireysel araştırma sonuçlarını rapor etme sorumluluğunun olup olmadığıdır?⁽¹⁷⁾

Ayrıca mikrobiyom çalışmalarına etik çerçevenin oluşturulmasında aşağıdaki soruların cevap bulması önemli katkı sağlayacaktır⁽⁵⁹⁾:

➤ Post-genomik çağın etik eğilimleri ve yasal çerçeveleri nelerdir?

➤ Teknik gelişmeler ve yeni çalışma tasarımlarıyla ilgili yeni konular var mı?

➤ Bu gelişmeler, klinisyenlerin tutumlarını ve hastalarla olan ilişkisini nasıl etkiliyor?

Sonuç olarak günümüzde insan mikrobiyomu ve bunun insan sağlığı ve hastalığı üzerindeki etkisi hakkındaki bilgilerimiz son birkaç yılda kayda değer bir şekilde iyileşmesine rağmen, aslında güçlü kanıtlar hâlâ sınırlıdır⁽²⁰⁾. Ancak bu konudaki çalışmaların gelecekte hızla artacağı düşünülmektedir. Dolayısıyla konuya ilişkin etik konuların tüm boyutlarıyla değerlendirilmesi, çalışmalarda karşılaşılabilecek etik ve yasal sorunlara şimdiden çözüm üretilmesi, doğurabileceği olumsuz sonuçlar nedeniyle önemlidir. Mikrobiyota ve mikrobiyom çalışmalarında gelişebilecek muhtemel sorunların çözümüne yönelik adımların atılması için ilgili kavramlara ilişkin etik konuların ivedilikle ele alınması önerilmektedir.

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MİKROBİYOTA ÇALIŞMALARINDA ÖRNEK ALIMI VE DNA İZOLASYONU

Mehmet Köroğlu

İnsan vücudunun çeşitli bölgelerinde (ağız, boğaz, solunum sistemi, gastrointestinal sistem (GİS), deri ve ürogenital sistem gibi) hastalık yapmadan yaşayan mikroorganizmalar bulunmaktadır. Daha önceden normal flora olarak isimlendirilen bu durum şimdilerde mikrobiyota ve mikrobiyotanın sahip olduğu genetik materyale de mikrobiyom denilmektedir. Bu iki terim, çoğu kez aynı anlamda ve birbirinin yerine kullanılmaktadır. İnsan vücudunda başta bağırsaklar olmak üzere mikrobiyota değişikliklerinin birçok hastalıkla ilişkili olduğu saptanmıştır ⁽¹⁾. Nükleik asit dizi analizi teknolojilerinin de gelişmesi ile mikroorganizma çeşitliliği ve mikroorganizmaların miktarı ölçülebilmekte olup, bu konuda çok sayıda bilimsel çalışma yapılmaya başlanmıştır ⁽²⁻⁵⁾. Bu tip çalışmaların en önemli basamaklarından birisi hatta en önemlisi numunenin uygun şartlarda toplanması, transferi, saklanması ve yine uygun koşullarda dizileme işlemlerine hazır hâle getirilmesidir. Bu aşamalarda oluşabilecek hatalar ve eksiklikler çalışma sonucunu ciddi şekilde etkileyecektir ^(3,6,7).

Mikrobiyota çalışmaları; çalışma grupları oluşturulması ve vakaların seçimi, örneklerin toplanması (alınması, transportu, stabilizasyonu ve saklanması), nükleik asit izolasyonu, moleküler çalışmalar (amplifikasyon-sekans analizi), biyoinformatik-istatistiksel analizler, sonuçların analizi ve yorumu aşamalarından oluşmaktadır. Kontrol grubunda yer alacak bireyler, araştırmanın amacına göre özenle seçilmelidir. Ayrıca aşağıda belirtilen hususlar mutlaka dikkate alınmalı ve kaydedilmelidir ^(2-5,8,9).

- Yaş; insan vücut mikrobiyotası yaklaşık 2 yaşında erişkin mikrobiyotasına benzer bir hâl alır. Ancak bağırsak mikrobiyotasının, 3 yaşından sonra stabil hâle geldiği kabul edilmektedir. Bir kısım çalışmalarda 18-40 yaş aralığının çocukluk, ergenlik ve menopoz dönemindeki değişikliklerden en az etkilenen dönem olduğu vurgulanmıştır.
- Antibiyotik kullanımı çok önemlidir (birçok çalışmada raporlanmıştır). Özellikle yakın dönemde antibiyotik kullanımının ciddi etkileri vardır. Antibiyotiğin türüne ve dozuna göre bağırsak mikrobiyotasının normal hâline dönebilmesi için 6 ay hatta 4 yıldan daha fazla süre gerekebilmektedir.
- Diğer ilaçlar; metformin, proton pompa inhibitörleri, kortikosteroidler, sitokinler, immünosupresif ajanlar veya büyük doz probiyotikler takviye edici gıda kategorisinde yer alan birçok yardımcı beslenme maddesi (balık yağı, argan yağı gibi).
- Menapoz, puberte gibi hormonal durumları.
- Sigara-tütün ve alkol kullanım alışkanlıkları.
- Diyetleri, diyet takviyeleri kullanımı ve yakın zamandaki diyet değişiklikleri, katı diyet tipleri (ketojenik diyet, alkali tip diyet gibi).
- Malnütrisyon.

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Bölüm A8

MİKROBİYOTA ÇALIŞMALARINDA MOLEKÜLER TANI YÖNTEMLERİ

Barış Otlu

Yusuf Yakupoğulları

Giriş

Doğduğumuz anda sadece kendi ökaryotik hücrelerimizden ibaret olan vücudumuzun özellikle cilt yüzeyi, ağız boşluğu ve bağırsak gibi bölgeleri hayatımızın ilk birkaç yılı içerisinde çok sayıda bakteri, arke, mantar ve virüsler ile kolonize olmaktadır. Bu hücrelerin tamamının oluşturduğu topluluk **insan mikrobiyomu** olarak adlandırılır ki neredeyse vücudumuzun geri kalanındaki hücrelerin 10 katı kadar hücre içermekte, insan genomundan çok daha fazla sayıda gene sahip olmakta ve vücut ağırlığının birkaç kilosunu oluşturmaktadır^{1,2}. Mikrobiyotanın insan sağlığı ve hastalıkları üzerindeki etkisi uzun süredir bilinmekle birlikte, kültür-bağımsız tekniklerin kullanılmaya başladığı 1990'lı yıllardan itibaren mikrobiyota-konak etkileşimi ve mikrobiyota-hastalık ilişkisi ile ilgili bilgilerimizde çok önemli artışlar olmuştur. Elde edilen bu yoğun bilgi sonrasında klasik yöntemlerin bu nişin sadece temsili bir 'enstanesini' verebildiği düşünölmeye başlanmıştır³. Mikrobiyota çalışmalarında kullanılan mikrobiyolojik yöntemlerin tarihsel gelişimine bakıldığında; genel olarak kültür-temelli yöntemler ve kültür-bağımsız yöntemler olarak iki grupta incelenebilir. Bu bölümde, insan mikrobiyom araştırmalarında kullanılan kültür temelli yöntemler üzerinde kısaca durulduktan sonra moleküler esaslı metotlar hakkında son yıllarda elde edilen verilerin özetlenmesi ve yöntemlerin sunduğu avantaj ve dezavantajlarının vurgulanması amaçlanmıştır.

Kültür Temelli Yöntemler

İlk bakteriyel kültür ortamı, ya infüzyon ile ya da çeşitli kaynaklardan elde edilen etin enzimatik sindirimi ile hazırlanan jelöz sıvı ortamlar olmuştur. Aslen Spallanzani tarafından 18. yüzyılda geliştirilmiş ve daha sonra 19. yüzyılda Pasteur tarafından saflaştırılmış olan bu maddeler, insanların hastalık gelişen bölgelerinden alınan klinik numuneler içindeki bakterilerin laboratuvar ortamında üretilmesine olanak vermiştir. Robert Koch, bakteriyel kolonilerin üreme ve morfolojik özelliklerine göre ayırımı sağlayacak katı kültür ortamlarına ihtiyaç olduğunu fark ederek patates dilimleri üzerinde ilk kez koloni oluşumunu tanımlamıştır. Koch aynı zamanda, patates dilimleri üzerinde sınırlı sayıda mikroorganizmanın üreyebildiğini belirtmiş ve büyük olasılıkla in-vitro ortamda kültüre edilemeyen organizma fenomeni ilk kez bu tarihte ortaya çıkmıştır⁴. Üretilen mikroorganizmaların tanımlanması için günümüze kadar izolatların in vitro üreme özelliklerinin temel alındığı fenotipik tanımlama tekniklerinde önemli gelişmeler yaşanmıştır. Ancak son yıllarda, "jel mikrodamla" ve "mikrobiyal kültür çipleri" (microPetri dishes) gibi geliştirilen kültür yöntemleri ve ko-kültür gibi yeni yaklaşımların da kullanıma girmesiyle kültür-temelli yöntemler daha da sofistike hâle gelmiştir^{5,6,7}. Yirminci yüzyılın başına kadar spesifik mikrobiyal türler; organizmanın seçilerek üretilmesini sağlayan birtakım özel kültür ortamlarına ekil-

Mikrobiyom Çalışmalarının Geleceği

İnsan mikrobiyomunun analizine yönelik metotlar hızla gelişmektedir. Hastalık gelişiminde mikrobiyomun rolüne dair dinamikler aydınlatıldıkça analitik teknolojilere yapılacak yatırımların daha da artacağı öngörülmektedir. Gelişmeler, sadece mikroorganizma kompozisyonunun saptanması yönünde sınırlı kalmayacak aynı zamanda mikrobiyom içi etkileşimleri ve mikrobiyom-konak ilişkilerini daha detaylı olarak ortaya koyacaktır. Ayrıca, mikrobiyom çalışmaları için minimum örneklem büyüklüğü hesaplamaları, istatistiksel analiz metotları ve modelleme çalışmalarında önemli aşamaların kaydedileceği beklenmektedir⁷¹.

Mikrobiyota, göreceli olarak devamlılık arz eden bir yapı olmakla beraber zaman içerisinde iç ve dış faktörler sonucunda sık değişikliğe uğrayan bileşenlere sahiptir. Bu değişkenliği doğru bir şekilde inceleyebilmek için daha iyi yapılandırılmış boylamsal çalışmalara ve buradan elde edilen verinin yorumlanması için yeni analiz yöntemlerine gereksinim duyulmaktadır. Böylelikle zaman içinde takson, konak ve çevre arasındaki karmaşık ilişkiler aydınlatılabilecektir. Son zamanlarda, boylamsal verileri görselleştirmek ve mikrobiyal ekolojiden uyarlanmış tahminler oluşturmak için geliştirilen yeni analiz metotları kullanıma sunulmuştur⁷¹⁻⁷⁴. Günümüzde shotgun metagenomik ve metatranskriptomik için evrensel ve kapsamlı analitik "pipeline" ihtiyacı hâlen bulunmaktadır. Bu ağın kurulması, veri paylaşımını ve analitik süreçler sonunda elde edilen bilginin yorumlanmasını kolaylaştıran ve standardizasyonu sağlamaya katkı sunan önemli bir sistemin altyapısını oluşturacaktır. Günümüzde mikrobiyom analizleri hâlen çok pahalı olup üst düzey teknoloji, laboratuvar ve deneyime olan gereksinim gibi bazı sınırlılıkları hâlen giderilememiştir.

Sonuç

Mikrobiyota çalışmalarının farklı uygulamaları için geliştirilmiş kantitatif, kalitatif veya her ikisinin bulunduğu sonuçlar verebilme potansiyelinde çok sayıda moleküler teknik bulunmaktadır. Bir mikrobiyota çalışması planlanacağı zaman, hangi tekniğin kullanılacağına karar verirken maliyetin ve ihtiyaç duyulan analiz derinliğinin göz önüne alınması gerekmektedir. Son zamanlarda geliştirilen yüksek-çıkıtlı teknikler, mikrobiyota üyelerinin filogenetik karakterizasyonu ve mevcut organizmaların kantitasyonlarını sağlamaları açısından avantajlıdır. Diğer yöntemlere kıyasla pahalı olmakla birlikte, tekniklerin maliyetleri geçmişe kıyasla düşmektedir. İnsan mikrobiyotası ile ilgili mevcut moleküler çalışmaların çoğu, klinik ölçümlerle belirli OTU'ları veya organizmaları ilişkilendirmeye çalışan hipotezler üretmek üzere yapılmaktadır. Bunlar hastalıkların biyolojik belirteçleri olarak yararlı bilgiler vermektedir. Ancak 16S rRNA dizilemesi, tüm genom dizileme ve metagenomik çalışmalar ile metabolomik, metaproteomik ve metatranskriptomik gibi mikrobiyal topluluğun aktivitesinin ölçülmesine yönelik çalışmaların kombine edilmesi ve böylece mikrobiyota-konak etkileşiminin gerçek anlamda ortaya konulması daha yararlı olacaktır. Bu sayede hastalık önleme ve yönetimi için yeni stratejiler geliştirilebilecektir.

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YENİ NESİL SEKANS SİSTEMLERİNDE GÜNCELLEME VE MİKROBİYOTA ANALİZİ

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Gamze Gürsoy

Yağmur Yeşilyurt

Giriş

DNA dizileme, bir DNA ipliğindeki Adenin, Timin, Guanin ve Sitozin bazlarının tam olarak hangi düzende dizili olduklarını ortaya çıkarmak amacıyla yapılan bir analizdir. İlk DNA izolasyonundan ve DNA'nın yapısının keşfinden sonra, bilim insanları DNA'yı dizilemek amacıyla birçok girişimde bulunmuştur. Yürütülen çalışmaların sonucunda, 1965 yılında Robert Holley ilk tRNA'yı dizileyerek 1986 yılında Nobel Ödülü'nü kazanmıştır ^[1]. 1972 yılında ise Walter Fiers bakteriyofaj MS2'nin kaplama proteinini kodlayan genin DNA'sını dizileyerek tam bir geni dizileyen ilk kişi olmuştur ^[2, 3]. Fiers'ın başarısının ardından, Fredrick Sanger alternatif bir DNA dizileme yöntemi üzerinde çalışmaya devam ederek, 1977'de bir "zincir sonlandırma yöntemi" olan ve günümüzde "Sanger Dideoksi Dizileme Yöntemi" olarak bilinen radyoaktif işaretlenmiş ve kısmen sindirilmiş parçalar ile ilk DNA dizileme yöntemini geliştirmiştir ^[4]. Ayrıca 1980'de Allan Maxam ve Walter Gilbert, DNA'nın kimyasal modifikasyonuna dayanan ve günümüzde "Maxam-Gilbert Kimyasal Kırılma Yöntemi" olarak anılan DNA dizileme yöntemini bilim camiasına tanıtmıştır. Bu yöntem ise, DNA dizisini spesifik bazlardan kıran kimyasalların kullanılmasını içermektedir ^[5]. Nükleik asit dizileme alanı, Sanger zincir sonlandırma ve Maxam-Gilbert dizileme yöntemlerinden sonra, 2005 yılında ortaya çıkan Yeni Nesil Dizileme (YND) yöntemleri ile hızlı bir ivme kazanmıştır. 2009 yılı ise "üçüncü nesil dizileme" teknolojilerinden bahsedilmeye başlandığı yıl olmuştur. Yeni Nesil Dizileme yöntemleriyle elde edilen kısa okumaların dezavantajlarından sonra, daha uzun okumaların hızlı ve verimli şekilde dizilenmesi isteği önem kazanarak Oxford Nanopor ve PacBio uzun okuma teknolojilerinin oluşumuna önayak olmuştur. Üçüncü Nesil Dizileme teknolojilerinin artan kullanımı mikrobiyota araştırmalarının da önünü açmıştır.

Birinci Nesil Dizileme

Kısa okumaya dayalı birinci nesil dizileme yöntemleri, nükleik asit moleküllerinin büyük ölçülerde okunmasını gerektirir ve son teknolojilere kıyasla oldukça düşük verim üretirler. Tercih edilen yöntemlere göre değişiklikler olsa da genellikle her deney, jel şeridi başına yaklaşık olarak 1000 nükleotid bazına kadar yalnızca birkaç okuma üretir ve oldukça kısa nükleik asit dizilerini dizilemek için kullanılırlar. Birinci nesil dizilemenin ana yöntemlerinden biri aşağıda açıklanmıştır.

Sanger Zincir Sonlandırma Yöntemi

1977 yılında Sanger ve ekibi, güvenilirliği sebebiyle uzun yıllar boyunca yaygın olarak tercih edilecek bir enzimatik dizileme yöntemi geliştirmiştir ^[6]. Zincir sonlandırma yöntemi olarak anılan bu

rinin tespiti bu bölgeler dizilenecek yapılmaktadır. Ancak YND teknolojileri ile kısa okumalar elde edilmesinden dolayı 16s rRNA sekanslama ile bakteri taksonomik seviye tespiti bu 9 bölgenin yalnızca birkaçını (özellikle de V3-V4 bölgelerini) hedefleyerek yapılmaktadır^[20]. Bu durum, bakterilerin taksonomik sınıflandırmalarının en fazla cinse kadar ayırt edilebilmesine sebep olmaktadır. Ancak aynı cinse sahip bakterilerin, farklı türlerinin insan sağlığına etkilerinin değişkenlik gösterdiği bilinmektedir.

Kısa okumaların dezavantajlarından sonra geliştirilen ve uzun okuma sağlayan üçüncü nesil dizileme teknolojileri, laboratuvar aşamasında oldukça hızlı sonuçlar alınmasını sağlarken aynı zamanda da 16s rRNA geninin tamamının primerler ile çoğaltılmasını sağlamıştır. Bu sayede bölgenin tamamının kapsanmasıyla elde edilecek sonuçlar çok daha güvenilir olmaktadır.^[21]

Genom boyunca dağılmış homopolimer bölgelerin ortaya çıkarılması, dizileme sonucunda genomların başarılı ve düzgün bir biçimde elde edilmesindeki en önemli noktalardan biridir. İkinci nesil dizileme yöntemleri ile homopolimer bölgelerdeki kısa okumaları birleştirerek uzun bölgeleri yeniden oluşturmak bir sorundur. Üçüncü nesil yöntemler ile gelen uzun okumalar sayesinde tekrar eden bölgelerden daha uzun okumalar elde edilmesi bu soruna bir çözüm sunmuştur. Bu sayede kısa okumaya dayalı teknolojilerle yapılan çalışmalara kıyasla üçüncü nesil ile gelen uzun okuma yöntemleri ile bakterilerin taksonomik sınıflandırmalarında daha düzgün tanımlamalar sağlanabilmektedir. Doğru taksonomik bilgi sayesinde ise hastalık-bakteri ilişkisi odaklı yürütülen araştırmalar başta olmak üzere, sonraki analizlerden ve çalışmalardan elde edilen sonuçların güvenilirliğinin de artmasına katkıda bulunulmuştur.

Mikrobiyota Analizlerinde İleriye Dönük Hedefler

Günümüzde biyoteknolojinin önem ve hız kazanması ile DNA dizileme teknolojisinde köklü değişiklikler meydana gelmiştir. Birinci nesil ile ortaya çıkan dizileme yöntemlerinin verim ve okuma sayısı ikinci nesil ile oldukça arttırılmıştır. Son teknolojilerin sayesinde ise uzun okuma yapan üçüncü nesil dizileme yöntemleri, tek DNA moleküllerinin doğrudan dizilenmesine olanak sağlamıştır. Yürütülen mikrobiyota çalışmaları, uzun okumalar sayesinde 16s rRNA bölgesinin tamamının kapsanmasıyla artan taksonomik sınıflandırma doğruluğu ile önem kazanmıştır. Hızla gelişen teknoloji ve yürütülen çalışmalar ile 16s rRNA korunmuş bölgesine ek olarak 5s rRNA ve 23s rRNA korunmuş bölgeleri için de uzun okumalar ile tam kapsama elde etmek mikrobiyota analizlerinde bakteri taksonomik sınıflandırmalarının daha doğru tespit edilmesini sağlayabilecektir. Bu doğrultuda dizileme sonucunda bakterilerin tür ve hatta alttür seviyesine kadar doğru tespit edilebilmesi hedefler arasında yer alacaktır. Hastalık tespiti için biyobelirteç görevi görebilecek bakterilerin alt tür seviyesine kadar doğru tespit edilmesi, bu hastalıkların teşhis ve tedavisi için önemli olacaktır.

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Bölüm A10

MİKROBİYOM VERİSİNİN BİYİNFORMATİK ANALİZİ

Aycan Gündoğdu

Özkan Ufuk Nalbantoğlu

Mevcut biyoteknoloji, günümüzde mikrobiyom verisinin büyük oranda yeni nesil DNA dizileme teknolojileri kullanılarak üretilmesini sağlamaktadır. Her ne kadar düşük çıktılı konvansiyonel teknolojiler (örn. Gerçek zamanlı-kantatif PZR, Western blot analizleri, Sanger dizileme vb.) belli bir hedefe yönelik analiz imkânı sağlamakta ve mikrobiyota çalışmalarında kısıtlı bir kullanım alanı bulsa da, omik teknolojilerin yaygınlaşması ile metagenom yaklaşımları bu alanın en yaygın teknolojisi hâline gelmiştir. Öte yandan, bahsi geçen düşük çıktılı teknolojiler için konvansiyonel istatistikî yöntemler kullanılarak veri analizi yapmak mümkün olsa da, metagenom gibi yüksek miktardaki karmaşık veriler için ayrıntılı biyoinformatik analiz süreçlerine ihtiyaç duyulmaktadır. Bu kısımda, mikrobiyom analizi için ihtiyaç duyulan biyoinformatik süreçler ve bu amaçla ortaya konulmuş belli başlı çözümler sunulmaktadır.

Metagenom teknolojileri, çevresel bir örnekteki türlere ait genetik materyalin herhangi bir izolasyon veya kültürleme aşaması olmadan doğrudan incelenmesi yaklaşımına dayanmaktadır. Habitatlarında genellikle karmaşık simbiyotik ilişkiler içerisinde bulunan mikrobiyal türlerin ortamından izole edilerek kültürlenmesi günümüzde ancak bilinen türlerle sınırlıdır. Dolayısıyla her ne kadar çevresel örneklerin doğrudan analizi fikri basit ve akılcı olsa da, teknolojik olarak uygulanabilir hâle gelmesi ancak 21. yüzyıl başından itibaren mümkün olabilmektedir. Çünkü, çevresel örneklerde bulunan binler seviyesindeki tür sayısı ve dolayısıyla milyonlar seviyesindeki genin hep birlikte dizilenebilmesi için yeni nesil dizileme teknolojileri gibi yüksek çıktı sağlayabilen sistemler henüz kısa bir süre önce bilim dünyasına sunulabilmektedir.

Bu doğrultuda, günümüz mikrobiyom çalışmaları yoğunlukla iki temel DNA dizileme tekniği üzerinde şekillenmiştir. Bunlar, yalnızca seçilmiş marker dizilerin biyoçeşitliliğini ortaya koyacak şekilde 16S/18S rRNA genleri ve ITS (Internal Transcribed Spacer *bölgesi*) parçalarının dizildiği *amplikon dizileme* ve çevresel örnekteki tüm DNA materyalinin dizildiği *metagenom dizilemedir*.

Amplikon dizileme, düşük maliyetli ıslak laboratuvar gereksinimi ve biyoinformatik analiz için yaygın ve yüksek hesaplama gücü gerektirmeyen iş akışlarına sahip olduğundan yaygın kullanılmaktadır. Amplikon dizilemenin amacı, mikrobiyal türlerde evrensel olarak bulunan ve filogenetik sinyaller taşıyan DNA parçalarının hedefli olarak dizilenmesidir. Bu sayede, bir mikrobiyom içerisindeki tüm mikrobiyal taksonlar duyarlılığı yüksek bir şekilde genetik olarak örneklenmekte, dahası dizilenen ampliconların taşıdığı filogenetik sinyallerden faydalanılarak örnekteki türlerin varlığının ve örneğin biyoçeşitliliği ortaya çıkarılması mümkün olmaktadır. 16S ribozomal kısa alt ünite geni, bakterilerde korunmuş olarak bulunan ve prokaryot sistematiğinde altın standart olarak kullanılan marker dizi olduğundan genellikle bakteri çeşitliliğinin hedeflendiği mikrobiyota çalışmalarında kullanılmaktadır. 18S

Mikrobiyom biyoinformatiği oldukça dinamik ve yeni olgunlaşmakta olan bir bilim dalıdır. Bu bölümde bahsi geçen standartlaşmış temel analizlerin ötesinde, bilimsel çalışmalar için gereksinim duyulan ileri analizler, kapsamlı veri bilimi yöntemleri göz önünde bulundurularak her çalışma için ayrı ayrı ve bir deney tasarımı sistematigi içerisinde tasarlanmak zorundadır.

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VİRAL MİKROBİGENOM / VİROM / VİRAL BİOİNFORMATİK

Semra Öz

Mustafa Altındış

Sağlıklı insan vücudu her zaman çok sayıda yabancı hücre ve virüs içermektedir. İnsan mikrobiyomunun viral bileşeni **virom** olarak adlandırılır. Akut, kalıcı veya latent enfeksiyona neden olan virüsler ve insan genomuna entegre edilmiş endojen retrovirüsler gibi virüsler de dâhil olmak üzere insanlarda bulunan tüm virüslerin toplanmasıdır.

Virüslerin sıklıkla klinik olarak sessiz oldukları ve konağın kendilerine karşı koymasını önleyecek, viral kalıcılığa ve aktarıma katkıda bulunacak ideal bir denge buldukları varsayılmıştır. Bulunan yeni virüslerin bazısında ise ana konakçılara avantaj sağladıkları ortaya çıkmıştır. Çoğu virüs sürekli patojen değildir ve daima zararsızdır fakat konağın sağlık ve immünolojik durumlarına bağlı olarak farklı sonuçlara neden olabilir.

İnsan viromu hakkındaki bilgilerimiz bu konudaki çalışmalar arttıkça genişlemektedir. Yeni nesil tanı yöntemleri kullanarak hasta örneklerinden viromunu birkaç saat hatta birkaç dakika içinde analiz etme hastalıkların daha hızlı tanı, tedavi ve kontrolünü sağlayacaktır. Virüsler ve insan viromu çok karmaşık yapıya sahip olup bu konuda yapılacak geniş çaplı çalışmalara ihtiyaç duyulmaktadır. Bu bölümde; insan viromu tipleri, vücutta bulunabileceği yerler ve insan sağlığına etkileri tartışılacaktır.

Giriş

Yakın geçmişe kadar klinik olarak anlamlı bir bulaşma olmadıkça insan organizması virüsler açısından steril kabul ediliyordu. Oysa sağlıklı insan vücudu her zaman çok sayıda yabancı hücre ve virüs içermektedir ⁽¹⁾. İnsan vücudunda, ökaryotik (insan) hücelere göre on kat daha fazla sayıda mikrobik hücre ve viral parçacık vardır ve çoğu insan konaklarıyla karmaşık kommensal veya mutualizm ilişkisi hâlindeyler ⁽²⁾. Bu yüzden insan mikrobiyotasını oluşturan bu türler yalnızca invaziv hastalık vektörleri olarak görülmemeli ve insan organizmasının ayrılmaz bir parçası olduğu kabul edilmelidir ⁽³⁾.

İnsan mikrobiyomunun viral bileşeni **virom** olarak adlandırılır. Virom, akut, kalıcı veya latent enfeksiyona neden olan virüsler ve insan genomuna entegre edilmiş endojen retrovirüsler gibi virüsler de dâhil olmak üzere insanlarda veya insanlar üzerinde bulunan tüm virüslerin toplanmasıdır ⁽⁴⁾.

Son zamanlarda, DNA dizilerinin geliştirilmesi ve yeni yüksek verimli DNA sekans teknikleri patojenlerin hızlı, tarafsız ve hassas şekilde keşfedilmesi ve karakterize edilmesinin yolunu açmıştır ⁽⁵⁾. Sekans teknolojisindeki gelişmelere rağmen, mikrobiyomun bakteriyel olmayan bileşenlerini ele alan az sayıda çalışma vardır. Bakterilerin aksine virüsler için ortak belirteç eksikliği, virom elementlerinin heterojenliği, düşük biyokütle örnekleri ile çalışma zorluğu, konak DNA arka planı ile karıştırılma, viromanın analizi için yetersiz biyoenformatik araçlar çalışmalarının azlığının birkaç nedenidir ⁽⁶⁾.

Mikrobiyotanın virüs enfeksiyonları üzerindeki etkileri konakçı için koruyucu veya zararlı olabilir. Mikrobiyota, influenzaya karşı adaptif immün yanıtları pozitif olarak düzenlerken, Mouse Mammary Tumor Viruse (MMTV) karşı antivirüs adaptif yanıtlarını baskılar ve hedef hücrelere virüs bağlantısını artırarak poliovirüs ve reovirüsün replikasyonunu kolaylaştırır. Dolayısıyla, mikrobiyota virüs-konakçı etkileşimlerinde ikili bir rol oynamaktadır. Şu anda mikrobiyota ile ilgili araştırmaları yönlendiren açık bir soru, mikrobiyotanın nasıl manipüle edilebileceğidir. Böylece konak, zararlı enfeksiyonlardan korunabilecektir. Mikrobiyotadan yararlanan patojenler söz konusu olduğunda, bu etkileşimleri azaltmak için bir yol bulunmalı, böylece patojen yayılımını / yayılmasını önleyebilmeliyiz. Bu, mikrobiyotanın bileşimini manipüle ederek (bir virüs tarafından istismar edilen belirli bir mikropun azaltılması) veya viral patojen ile patojene fayda sağlayan spesifik bakteriyel bileşikler arasındaki etkileşimleri bloke ederek yapılabilir. Mikrobiyota-patojen etkileşimleri alanındaki gelecekteki keşifler şüphesiz bulaşıcı hastalıklarda terapötik müdahaleler için yeni fırsatlar ortaya çıkaracaktır⁽³⁴⁾.

Sonuç

İnsan viromu bu konudaki bilgilerimiz arttıkça genişlemektedir. Yeni nesil tanı yöntemleri kullanarak hasta örneklerinden viromunu birkaç saat hatta birkaç dakika içinde analiz etme hastalıkların daha hızlı tanı, tedavi ve kontrolünü sağlayacaktır ve gelecekte tanıda standart bir uygulama hâline gelebilir. Gereksiz antibiyotik kullanımı ve antibakteriyel direnç azaltılabilir. Genomik yaklaşımlar, moleküler epidemiyolojik çalışmaların, hangi virüslerin hangi coğrafi bölgelerdeki hastalıklarla ilişkili olduğunu anlamada yardımcı olabilir. İnsan virüslerinin mutasyon yoluyla veya hayvan virüsleriyle rekombinasyon yoluyla daha patojen hâle gelmesi de mümkündür. Virüsler ve insan viromu çok karmaşık yapıya sahip olup bu konuda yapılacak geniş çaplı çalışmalara ihtiyaç duyulmaktadır.

Not: Birinci baskıdaki gibi basılmıştır.

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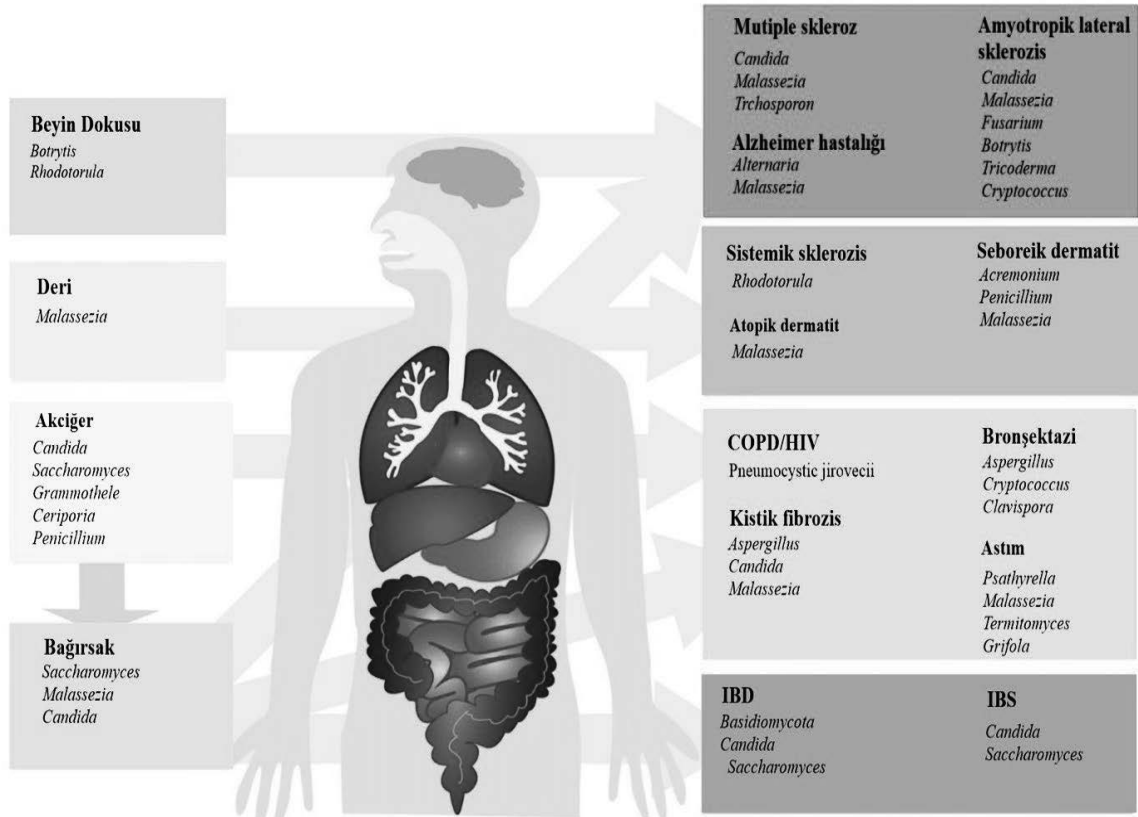
Bölüm A12

FUNGAL MİKROBİYOM; MİKOBİYOM

Sema Aşkın Keçeli

Mustafa Altındış

Mikrobiyom terimi, tüm mikrobiyomun mantar bileşenini tanımlamak için kullanılır. Her insanda genel mikrobiyotanın bir parçası olarak mantarlar, bakteriyel mikrobiyota topluluğundan oldukça küçüktür. Bununla birlikte, fungal mikrobiyomun insanların sağlıkları üzerine etkisi; özellikle konağın immün yetmezlik gibi tehlikeye girmesi hâllerinde patojen mikroorganizmaların çoğalmasına rezervuar olması, enflamatuvar hastalıklar ve metabolik bozukluklarda potansiyel bir kofaktör gibi davranması önemlidir.



Şekil 1. Sağlık ve hastalıkta mikrobiyoma genel bakış (Kaynak 1'den uyarlanmıştır).

COPD(KOAH): Kronik Obstrüktif Akciğer Hastalığı; **HIV:** İnsan İmmün Yetmezlik Virüsü; **IBD:** İnflamatuvar bağırsak hastalığı; **IBS:** Irritabl bağırsak sendromu.

(ITS4ng) kullanıldığında daha kapsamlı bir fungi tanımlanması elde edildiği ve daha az taksonomik sapmaların olduğu bildirilmiştir.⁴⁹

ITS bölgelerinin sekanslama sonuçları elde edildikten sonra, sonuçların analizi biyoinformatik çalışmalar ile gerçekleştirilir. Kalite kontrollü referans veritabanlarının eksikliğinden dolayı yeni fungal tür tanımlanması veya sıklıkla karşılaşılan fungal türlerin eşeyli veya eşeysiz formlarına farklı isimler ile tanımlanması gibi sorunlar ile karşılaşmaktadır.⁵⁰ Gen bankasına eklenen ITS sekanslarının çoğunda “tanımlanamayan fungus” veya “tanımlanamayan OTU” şeklindedir. ITS bölgesini referans olarak kullanılan veritabanları INSDC, UNITE and Warcup’tır. En sık kullanılan ve fungal sekansların arındırılmış olduğu gelişmiş veri tabanı ise “UNITE” veritabanıdır. Fungal metagenomik analizindeki zorlukların giderilmesine yönelik “FindFungi” olarak adlandırılan biyoinformatik bir yöntem geliştirilmiş ve yalancı pozitifliklerin tespit edilmesinin mümkün olduğu ileri sürülmüştür.⁵¹

Sekans işlemi sonlandıktan sonra fungi tanımlanması ve sayısı belirlenmiş olur. Veritabanı hizalamaları, en iyi eşleşmeyi bulmaya yarayan iyi bir yöntemdir, fakat bu eşleşmenin ne derece doğru olduğunu araştırmak gerekmektedir. Fungal tür sekans çalışmalarına göre, ITS sekansları klinik açıdan önemli iki tür olan *Candida* ve *Aspergillus* türlerinin tanımlanmasında oldukça yararlıdır, fakat *Cladosporium* türleri arasındaki ITS varyasyonu çok yetersizdir.⁵¹ Fungal mikrobiyom analizinde yapılan sekans çalışmaları problemler gibi gözükse de internal kontrollerin olduğu daha birçok çalışma ile bu problemlerin çözülmesi muhtemeldir.

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PARAZİT ENFEKSİYONLARI VE İNSAN MİKROBİYOTA İLİŞKİSİ

İpek Mumcuoğlu

Fatma Cevahir

Parazit enfeksiyonları, az gelişmiş ülkeler başta olmak üzere tüm dünyada milyarlarca insanın sağlığını tehdit etmektedir. Bu enfeksiyonlar, asemptomatik enfeksiyondan kronik hastalığa kadar değişen klinik tablolar oluşturabilmektedir. Son dönemde insan mikrobiyomu üzerine yapılan çalışmalar, özellikle bağırsak mikrobiyotasının hastalık ifadesindeki farklılıkları açıklamaya yardımcı olabileceğini ileri sürmektedir. Bu çalışmalarla, mikrobiyotanın parazit kolonizasyonuna ve konakta kalıcılığına etki ettiği gibi parazit enfeksiyonu varlığının da mikrobiyotayı değiştirebileceğini bildirilmiştir. Mikrobiyota bileşiminin değişmesi (disbiyoz), birçok enfeksiyon ve inflamatuvar hastalığın patogenezi ile ilişkilendirilmiştir. Mikrobiyota, insan parazitleri ve konakçı bağışıklık sistemi arasındaki etkileşimleri anlamak, paraziter enfeksiyonları ile tedavi ve mücadelede yeni ufuklar açabilir. Bu derlemenin amacı, bu alandaki son bilgileri özetlemektir.

Giriş

İnsanlar bağırsak, mukoza ve derisi çeşitli bakteri, mantar, virüs ve ökaryotik parazitler tarafından kolonize edilir. Mikrobiyota terimi, insan vücudunda yaşayan ortak mikropların ekolojik bir topluluğunu temsil eder. Mikrobiyom terimi ise, mikrobiyotanın toplam genomunu temsil etmektedir⁽¹⁾. Bağırsak mikrobiyotamız, yaklaşık 10^{12} organizma/g ve en az 1000 farklı bakteri türü içerir⁽¹⁾. Mikrobiyota bileşimleri bir kişiden diğerine değişebilir⁽²⁾. İnsan mikrobiyota çalışmaları, yüksek mikrobiyal çeşitlilik ile sağlıklı veya asemptomatik enfeksiyonların ilişkili olduğunu ve hastalık durumlarının genellikle azalmış bakteri çeşitliliği ile bağlantılı olduğunu ileri sürmüştür⁽³⁾. Mikrobiyotanın, bağışıklık sisteminin gelişmesi ve eğitiminde rolü olduğu bilinmektedir. Mikroorganizmalar, sadece bağışıklık savunmasını modüle etmekle kalmaz, aynı zamanda patojenlerin kolonizasyonunu ve istilasını çeşitli metabolik ürünleriyle sağlar.

Küresel olarak, ishal çocuklarda ikinci önde gelen ölüm nedenidir ve vakaların büyük bir kısmına parazitik protozoonlar ve helmintler neden olmaktadır⁽⁴⁾. *Entamoeba*, *Cryptosporidium* ve *Giardia*, 357 milyon vakaya neden olmuş ve yılda yaklaşık 34.000 ölümle sonuçlanmıştır⁽⁵⁾. Sıtma yılda yaklaşık 660.000 insanı öldürür ve bunların çoğu beş yaşın altındaki küçük çocuklardır⁽⁶⁾. Son tahminler, gelişmekte olan ülkelerde şu anda yaklaşık iki milyar insanın bağırsak helmintleri ile enfeksiyondan muzdarip olduğunu göstermektedir⁽⁷⁾. Parazitlerin neden olduğu önemli sağlık yüküne rağmen, enfeksiyonlar asemptomatik olabilir veya özellikle protozoon parazitlerde klinik sunum geniş varyasyonlar gösterebilir⁽⁸⁾. Hastalık şiddetini etkileyen faktörler hâlâ tam olarak anlaşılamamıştır⁽⁸⁾. Artan sayıda çalışma, bağırsak mikrobiyotasının hastalık progresyonu üzerinde önemli bir etkisi olabileceğini göstermektedir^(8,9).

rilmesi ve hastalıkları tedavi etmek için helmintlerin kullanılması tedavi maliyetini düşürmenin olası bir yolu olabilir ⁽⁴⁶⁾. Ancak, helmintlerin immünmodülatör potansiyelinin, tedaviyi sağlayan helmintler yoluyla mikrobiyotadaki değişiklikleri içerip içermediği hâlâ belirsizdir.

Sağlıklı bir donörden hastalıklı insanlara fekal transplantasyon, inflamatuvar bağırsak hastalığı ve *Clostridium difficile* ile ilişkili diyare için bir tedavi olarak başarıyla kullanılmıştır ⁽⁴⁷⁾. Bağırsak bakterisi topluluklarında helmint kaynaklı değişikliklerin, insanlarda bağışıklık ve metabolik hastalıkların şiddetinde değişikliklere neden olması beklenmektedir. *Trichuris suis* veya *Necator americanus* ile enfeksiyon da dâhil olmak üzere helmint bazlı terapötikler, alerji ve inflamatuvar bağırsak hastalığında kullanılmıştır ⁽⁴⁸⁾. *N. americanus* çölyak hastalığının tedavisinde de kullanılmış fakat semptomlarda herhangi bir farklılık gözlenmemiştir ⁽⁴⁹⁾.

Birkaç çalışma, helmint enfeksiyonunun, midenin bakteri kolonizasyonunu önleyerek *Helicobacter* kaynaklı mide adenokarsinomlarına karşı koruma sağlayabileceğini bildirmiştir ⁽⁵⁰⁾. Makak maymunlarında *T. trichiura*'nın deneysel enfeksiyonunun, idiyopatik kronik ishalden muzdarip maymunlarda klinik semptomları iyileştirdiği bildirilmiştir ⁽⁴⁶⁾. Fare modelleri ve insan çalışmaları, kronik helmint enfeksiyonunun konakçının immün yanıtını düzenlediğini ve insanlarda alerjik, otoimmün ve inflamatuvar bozukluklar üzerinde faydalı bir etki sağladığını göstermiştir ⁽⁹⁾.

Sonuç

Mikrobiyota ve parazitler birbirleriyle farklı şekillerde etkileşebilir; mikrobiyota parazit virulansını değiştirebilir, parazitler disbiyozise neden olabilir ve hem parazitler hem de mikrobiyota konak bağışıklığını modüle edebilir. Son çalışmalar, bağırsak mikrobiyotasının paraziter enfeksiyonlarda klinik varyasyonu etkilediğini göstermiştir. Öte yandan, hem insan hem de hayvan çalışmaları, hem protozoon hem de helmint enfeksiyonlarının bağırsak mikrobiyotasını etkileyebileceğini göstermektedir. Konak bağışıklığının mikrobiyota modülasyonunun altında yatan kesin mekanizmalar henüz tam olarak anlaşılmamıştır; ancak, mikrobiyota bileşenlerinin hem doğuştan gelen hem de adaptif immün hücre popülasyonlarını değiştirebileceği giderek daha belirgin hâle gelmektedir. Mikrobiyota ve konakçı bağışıklık sistemi ile parazit etkileşimlerinin incelenmesi, insan immünolojisinin temel mekanizmalarını daha iyi anlamamıza yardımcı olacaktır. Bağırsak mikrobiyotası ve parazitler arasındaki etkileşimlerin araştırılması, parazit enfeksiyonlarının teşhisine, tedavisine ve önlenmesine yardımcı olacak ek bilgiler sağlayacaktır. Ayrıca inflamatuvar ve otoimmün hastalıkların tedavisinde de yardımcı olabilir.

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DOĞUM ŞEKLİ VE MİKROBİYOTA İLİŞKİSİ

Adeviye Elçi Atılğan

Mikrobiyota, insanın anne rahmine düştüğü andan ölümüne kadar tüm yaşamı boyunca fizyolojik ve biyolojik açıdan gelişiminde önemli rol oynayan, çok sayıda ve çeşitte mikroorganizma tarafından oluşturulan kompleks ve dinamik bir ekosistemdir. Öyle ki kaynaklarda insan vücudundaki kendi total hücre sayısından 10 kat daha fazla mikroorganizmanın bu sistemde yer aldığından bahsedilir¹. Bu kadar mikroorganizmanın insan genomundan 360 kat daha fazla genoma sahip olduğu belirtilmektedir¹. Sürekli değişen ve gelişen, insan hayatının her anında önemli rol oynayan kompleks bir ekosistem olduğu, spermin yumurtayı döllemesinden doğumla devam eden süreçlere tek tek baktığımız zaman daha iyi anlaşılacaktır.

Spermiler, milyarlarca mikroorganizmadan oluşan vajen biyotasından geçerek yumurtayı dölemek için vajinadan uterin kaviteye doğru hızla hareket ederler. Bu noktada vajen biyotasındaki bozulma, sperm hareketini olumsuz yönde etkileyen önemli bir faktördür². Barbonetti ve ark'nın çalışmasında, vajinanın doğal florasında baskın olan Laktobasillerin, insan spermelerini, Bakteriel Vajinozis(BV) varlığında ortaya çıkan inflamatuvar sitokinler ve radikal oksijen türevlerinin sperm hareketi üzerine olan yavaşlatıcı etkisinden koruduğunu, böylece kadının fertilizasyon potansiyelini arttırdığı gösterilmiştir². Ovulasyonla atılan ovum, fallop tüpleri tarafından yakalanarak tubanın ampulla kısmında spermle buluşur ve döllenmiş ovum-zigot, uterus içerisine doğru tubanın peristaltik hareketleriyle gönderilir. Fallop tüpleri ve intraabdominal çevrenin mikrobiotasında bozulma (Pelvik inflamatuvar hastalık, salpenjit, ooforit vs) fallop tüplerinin ovumu yakalayamamasına ve zigotun tubadan uterusu transferinin bozulmasına neden olmaktadır³. Zigot uterin kaviteye geldikten sonra Intrauterin mikrobiota embriyonun büyümesine ve gelişmesine olanak sağlar. Bundan sonra embriyo, amnion sıvısı içerisindeki mikrobiyota ile yaşamını sürdürür.

Plasentada Bifidobakterium ve Lactobasillerin varlığının gösterilmesi, mekonyumda bakterilerin gösterilmesi, İnokule edilen hayvanların fetuslarının mekonyumunda işaretli bakterilerin saptanması, intrauterin ortamın, plasentanın da, amnion sıvısının da steril bir ortam olmadığını açıkça göstermiştir^{4,5}. Anneden plasenta aracılığıyla hemotojen yolla ve vajinadan assendan yolla hergün amnion sıvısına ve büyümekte olan fetüse milyonlarca mikrobiota transferi olur⁵. Gebelik haftası miada gelince bu ekosistem doğum için artık hazırdır. Doğum eylemiyle vajinal kanaldan geçip ilk nefesini alan bebeğin mikrobiyotası sıvı ortamından hava ortamına adaptasyonunu kolaylaştırmak için değişir ve çeşitlenir. Yolculuk, annenin bebeğe ten tene teması ile devam eder. Memebaşı cildinin florası ve klostrum ile bebeğin oral yolundan enterik sistemine milyarlarca mikroorganizma kolonizasyonu olur^{6,7}. 2 ayrı hastane, 4 ameliyathane odası ve 11 farklı bölgeden örnek alınarak yapılan bir çalışmada, her örnekte farklı mikroorganizmaların saptandığı görülmüştür⁷.

Gebelik seyrince vajinal mikrobiyotanın içeriği, gestasyon haftasının ilerlemesi ile Lactobacillus spp.'nin hâkimiyetine girer⁸. Doğum şeklinin erken neonatal intestinal mikrobiyota üzerine belirgin

ritis gibi sistemik hastalıklara karşı koruyucu olabileceği düşünülerek yola çıkılmıştır ancak öneri için veriler yetersiz bulunmuştur. Amerikan Jinekoloji ve Obstetri Derneği(ACOG) 2017 yılında Vajinal Seeding ile ilgili son olarak bir guideline yayınlarken şu şekilde uyarılarda bulunmuştur²⁷:

1. Sezeryan sonrası Vajinal Seeding işleminde, Grup B Streptokok, HIV, Clamidya, HSV, Gonore, HIV gibi ajanların bebeğe bulaşarak ciddi enfeksiyon yapma riski vardır.Bu nedenle Sezer-yan ile doğum sonrası vajinal tohumlama henüz eldeki verilerle önerilmemektedir. Sağlık çalışanları ve aileler bu yönde cesaretlendirilmemelidir.
2. Bu işlem sadece etik kurul onayı olan klinik çalışmalarda yapılabilir.
3. Aile ısrarcı ise işlem kaynaklı neonatal enfeksiyon riskleri aileye tek tek anlatılmalıdır.
4. Aileye anne sütü ile 6 ay beslenmenin bebeğin enterik florası için, vajinal seeding e göre daha yararlı olacağı anlatılmalıdır.
5. Vajinal Seeding için annenin HSV, Grup B Streptokok, HIV, Clamidya, HSV, Gonore ve HIV taramaları temiz olmalıdır.
6. Tüm işlemler onaylı ve kayıt altında olmalıdır.
7. Pediatri hekimi muhtemel neonatal enfeksiyonlar açısından bilgilendirilmiş olmalıdır.

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HAYATIN ERKEN DÖNEMİNDE MİKROBİYOTANIN ŞEKİLLENMESİ

Elif Özözen Şahin

Mustafa Altındış

Giriş

İnsan vücudunun birçok bölgesinde (ağız, boğaz, solunum sistemi, gastrointestinal sistem-GİS, deri ve ürogenital sistem gibi) hastalık gelişmesine sebep olmadan yaşayan mikroorganizmalar bulunmaktadır. Önceleri bu bölgelerde yaşayan mikroorganizmaları “flora”, “mikroflora” olarak isimlendirirken günümüzde **mikrobiyota** olarak tanımlanmaktadır. Mikrobiyotanın sahip olduğu genetik materyale de **mikrobiyom** denmektedir ⁽¹⁾. Mikrobiyota gelişiminde, beslenme, fizyolojik ve hastalık durumu, çevresel ve kültürel faktörler, antibiyotik kullanımı, hijyen koşulları gibi birtakım faktörler rol oynamaktadır. Rakamlara bakacak olursak vücudumuzda yaklaşık 100 trilyon hücre bulunmakta, yararlı bakteri sayısı da bunun 10 kat fazlasını oluşturmaktadır. 70 kg’lık bir insanın yaklaşık 1-2 kg’ı bakterilerden oluşmaktadır. Bu bakterilerin yaklaşık %90’ı bağırsaklarda yerleşmiş durumdadır. Yine insan vücudundaki canlı hücre sayısı açısından bakıldığında, bu hücrelerin sadece %10’u insan hücresi, diğerleri bakteri hücreleridir. Genom sayısı bakımından da bakterilerin genomu insan genom sayısından kat kat fazladır. Tüm bu rakamlar göz önüne alındığında, aslında mikrobiyota sanal bir organdır ve işlevleri, genetik yapısı, metabolizması birçok organdan daha büyüktür. Diğer bir konu ise bağırsaklarımızın içerdiği nöronlara bakıldığında, beynimizdeki kadar nöron içerdiği görülmektedir, hatta bu nedenle bağırsaklarımıza ikinci beyin denilmektedir ⁽²⁻⁴⁾.

Çocukluk çağında antibiyotik kullanımı dünyanın birçok yerinde yaygındır ve antibiyotiklerin mikrobiyotanın olgunlaşması dolayısı ile insan sağlığı üzerindeki etkileri zayıf bir şekilde tanımlanabilmiştir. Ortalama bir Amerikalı çocuk, 2 yaşına kadar yaklaşık en az üç kür antibiyotik alır ve 10 yaşına kadar da en az 10 kür antibiyotik kullanılır. Başka ülkelerde bu oran daha da az değildir. Antibiyotikler bağırsak mikrobiyotasını doğrudan bozar, bu da çocuklarda ve yetişkinlerde değişen kompozisyon durumlarına yol açar, ancak bu değişikliklerin konakçı fizyolojisi üzerindeki sonuçları bütün yönleri ile iyi anlaşılmamıştır. Çocuklarda antibiyotik maruziyeti artan obezite riski, diyabet, inflamatuvar bağırsak hastalığı, astım ve alerji ile ilişkilendirilmiştir. Daha önce, antibiyotik maruziyetinin farelerde artan adipoziteye yol açtığı, erken yaşlarda yoğun AB maruziyetinin konak metabolizması üzerinde uzun süreli olumsuzluklara yol açtığını ve bozulmuş bağırsak mikrobiyotasının konakçıda olumsuz etkilere aracılık ettiği de birçok çalışmada gösterilmiştir ⁽⁵⁾.

Doğum şekli ve bebek diyeti gibi diğer değişkenlerde erken yaşamda bağırsak mikrobiyotasını etkiler ve yaşamın ilerleyen dönemlerinde yağlanma ve diğer klinik etkilerle ilişkilidir. Sezaryen doğum (C/S), muhtemelen doğum sırasında maternal mikroplara daha az maruz kalması nedeniyle astım, alerji, tip 1 diyabet ve obezite ile ilişkilendirilmiştir. Formül besleme benzer şekilde bağırsak mikrobiyotasını bozar, bağırsıklık gelişimini ve normal metabolizmayı da olumsuz etkileyebilir. Yetişkinlerde antibiyotik

Sonuçta İlk 1000 Gün...

Mikroplar ve insan son birkaç yüz bin yılda birlikte gelişmiştir ve mikroplar insan sağlığı ile güçlü bir şekilde ilişkilidir. Gebe kalmadan önce, erkek ve dişi üreme sistemi mikroorganizmaları doğurganlıkta önemli bir rol oynar ve gebe kalma sırasında bir etkisi olabilir. Maternal mikroplardaki değişiklikler, fizyolojik ve hormonal değişikliklere paralel olarak hamilelik sırasında da görülür ve hamilelikte immün toleransın artmasında katkıları olacaktır. Mikroplar uterus, endometriyum, fallop tüpleri ve sperm gibi bilinen steril alanlarda ve ayrıca plasenta ve amniyotik sıvı gibi maternal fetal interfazda ve meme dokusunda / anne sütünde belirlenmiştir. Tüm bu veriler, erken kontaminasyon ve gebelik sırasında erken mikrobiyal temasın önemli etkisini göstermektedir.

Ayrıca, anne-bebek vertikal geçişi bebeklerin bağışıklığı, dolayısı ile sağlıklı olma ile ilgilidir. Kona-mikrop etkileşiminin bağışıklık sistemi tarafından kontrol edildiği göz önüne alındığında, gebe kalmadan yaşamın ilk yıllarına kadar olan süre boyunca bağışıklık sistemi ve mikrobiyota arasındaki temel ilişki ve bununla ilgili faktörler daha iyi anlaşılacaktır. Bu süre, herhangi bir olayın insan sağlığını etkileyen metabolik, immünolojik ve mikrobiyolojik programlama üzerinde önemli bir etkiye sahip olabileceği bir 'fırsat penceresi' olarak bilinir.

Diyet ve beslenme katkısı yanı sıra besin takviyesinin de, yaşamın ilk 1000 günü boyunca mikrobiyota üzerinde etkisi olduğu gösterilmiştir. Bununla birlikte, perinatal dönemde hangi gıdaların, gıda bileşenlerinin ve diğer diyet örüntülerinin mikrobiyotayı nasıl etkilediğinin belirlenmesinde daha pek çok çalışmaya gereksinim vardır. Son gözlemler 'yeterli bir mikrobiyotayı' sağlamak ve anne/yenidoğan sağlığı üzerinde olumlu bir etkiye sahip olmak için gebelik ve gebelik öncesi/sonrasında probiyotikler, prebiyotikler, sinbiyotik ve postbiyotiklerin kullanımı konularında artan bir araştırma eğilimi olduğunu göstermektedir⁽⁴²⁻⁴⁵⁾.

Konağın bağışıklık sistemi ile mikrobiyota etkileşimlerinin, yaşamın erken dönemlerinde oldukça kritik olduğu bir görülmektedir. Bu dönemdeki etkileşimin yaşamın sonraki dönemlerinde bağışıklık sistemi dengesi ve inflamatuvar hastalıklara karşı duyarlılığa katkıda bulunan immünolojik mekanizmalar üzerinde uzun süreli etkileri olabileceği görüşü her geçen gün daha fazla kabul edilmektedir. Bununla birlikte, bu etkileşimlerin mekanizmaları hâlâ net olarak ortaya konulamamıştır. Yenidoğan dönemindeki disbiyozis daha belirsiz bir durumdur ve saptanması zordur. Yenidoğan dönemindeki disbiyozisin erişkin dönemdeki immunité ve immünolojik hastalık riski üzerindeki uzun vadeli etkileri konusunda daha çok çalışma yapılmasına ihtiyaç vardır. Bu tür modülatör etkilere ilişkin daha ayrıntılı bilgiler, bağışıklıkla ilgili bozuklukların anlaşılması, önlenmesi ve tedavisi üzerinde etkili olabilir.

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BAĞIRSAK MİKROBİYOTASI VE BESLENME DÜZENİ ARASINDAKİ İLİŞKİ: FETAL YAŞAM, ERKEN ÇOCUKLUK ÇAĞI VE YAŞAMIN İLERLEYEN DÖNEMLERİ

Nergis Ekmen

Murat Kekilli

Giriş

İnsan bağırsak mikrobiyotası, son on yılda geniş çapta tartışılan bir konu hâline gelmiştir. Bağırsak mikrobiyotası, konak organizmanın normal fonksiyon göstermesinde önemli bir rol oynar. Mikroorganizmalar ve insan vücudu arasındaki etkileşimin mekanizmaları hakkında daha fazla bilgi elde edilmesini sağlayan ve sayıları giderek artan çalışmalar da bu durumu onaylamaktadır. Konak da yaşam tarzını değiştirerek bağırsak mikrobiyotasını etkileyebilir ve doğal beslenme bu noktada son derece önemli bir faktördür. Konuyla ilgili bir çalışma, kalori alımının günlük 2400 kcal'den 3400 kcal'ye artması hâlinde (%24 protein, %16 yağ ve %60 karbonhidrat içeren benzer besin ögesi profiliyle) 3 gün içinde Firmicutes miktarının arttığını ve Bacteroidetes miktarının azaldığını göstermiştir.¹ Kalori alımı azaldığında ise bağırsak mikrobiyotasında bunun tersi bir durum görülmektedir.² Enerji alımının etkilerinin incelenmesi kolay değildir. Normal kalori alımı kişiden kişiye değişir ve yaş, alışkanlıklar, metabolizma gibi faktörlere bağlıdır. Bu nedenle, bu derlemede özellikle farklı besin ögesi bileşikleri üzerinde durulmuştur.

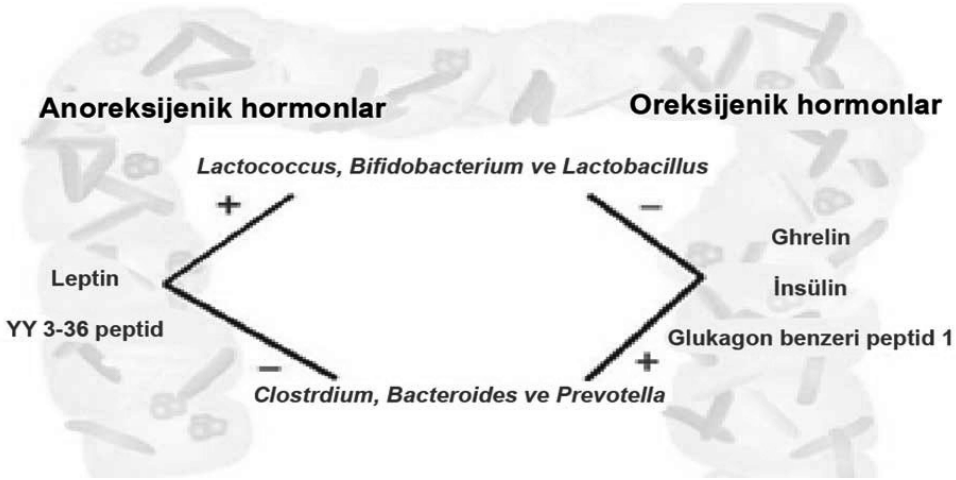
Beslenme alışkanlıkları, vücuttaki bakterilerin ne tüketebileceğini, yani mikrobiyotanın "beslenme" şeklini belirler. Bakterilerin metabolik aktivitesi daha çok bakteriyel genom ve epigenom ile tanımlanır. Sakkarolitik bakteriler karbonhidratları metabolize edebilir; bu bakteri grubunda *Bacteroides*, *Bifidobacterium*, *Lactobacillus*, *Eubacterium*, *Propionibacterium*, *Escherichia*, *Enterococcus*, *Peptostreptococcus*, *Fusobacteria* ve diğerleri yer alır. Proteolitik bakteriler protein fermantasyonundan enerji elde eder ve bu grubu *Streptococcus*, *Staphylococcus*, *Proteus*, *Escherichia* ile bazı *Clostridium*, *Fusobacteria*, *Bacillus*, *Propionibacterium* türleri ve diğer bakteriler temsil eder. Bu grubun bazı üyeleri katı şekilde proteolitik özellikler sergilerken, bazıları ise hafif sakkarolitik aktivite gösterir veya aktif olarak karbonhidrat fermantasyonuna katılır. Dolayısıyla, hem proteinleri hem de karbonhidratları metabolize edebilen pek çok bakteri vardır. Bu bölümde yayınlanmış çalışmalar ışığında bağırsak mikrobiyotası ve beslenme ile ilgili bazı sorulara kısmen de olsa cevap verilmesi ve daha fazla araştırma yapılmasını gerektiren bilgi boşluklarının belirlenmesi amaçlanmıştır.

Bağırsak Mikrobiyotasının Oluşumu ve Beslenme Düzeni

Antenatal dönem ve doğum

Bağırsak mikrobiyotası kolonizasyonu antenatal dönemde başlar.^{3,4} Yakın zamanda yapılan çalışmalar amniyotik sıvı, plasenta, göbek kordonu kanı ve mekonyumda bakteri bulunduğunu kanıtlamıştır.^{3,5} Annenin hamilelikten önce ve hamilelik dönemindeki beslenme şekli, çocuğun bağırsak mikrobi-

(GLP)-1, insülin gen ekspresyonunu ve insülin salgılanmasını etkiler⁹⁶ bazı yazarlar bunun mikrobiyota bileşimine de bağlı olduğu kanaatindedir (Şekil 4).^{97,98}



Şekil 4. Mikrobiyota ve iştah.

Sonuç

Karaciğer hastalığı, obezite, tip 2 diyabet, ateroskleroz ve irritabl bağırsak sendromu gibi birçok hastalıkta bağırsak mikrobiyotasında değişiklik olduğu gözlenmiştir. Bağırsak mikrobiyotasının bileşimi ile beyin,⁹⁹ depresyon¹⁰⁰ ve bazı diğer bozukluklar¹⁰¹ arasındaki bağlantılara ilişkin son derece etkileyici araştırma bulguları elde edilmiştir. Beslenme düzeni, bağırsak mikrobiyotası bileşimini belirleyen başlıca faktörlerden biridir. Pişirme yöntemleri, besin katkı maddeleri, probiyotik ve prebiyotik tüketimi ile beslenme düzeni değişiklikleri, her yaştan insanda önemli olan bağırsak mikrobiyotası bileşiminin etkilenmesi bakımından iyi araçlar olarak değerlendirilebilir.

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Bölüm A17

ANNE SÜTÜ VE MİKROBIYOTA GELİŞİMİ

Rabiye Güney

Nursan Çınar

Giriş

Mikroorganizmaların hastalıkların gelişmesinde nedensel bir rolünün olduğunun anlaşılması hem tıp tarihi hem de insanlık tarihi için bir dönüm noktası niteliği taşımaktadır. Ancak bu durum araştırmacılar tarafından mikroorganizmaların hastalıklardan korunmada etkisinin incelenmesini uzun süre arka planda bırakmıştır. Mikroorganizmaların hastalıkların önlenmesindeki etkisi uzun yıllar önce bazı yazarlar tarafından gündeme getirilmiş olmasına rağmen, bu konu özellikle son yirmi beş yılda daha fazla ilgi görmeye başlamıştır. Bu dönemde yapılan araştırmalar insan vücudunda daha önce steril olduğu düşünülen pek çok sıvı ve alan da dâhil olmak üzere yoğun bir non-patojen mikroorganizma varlığının bulunduğunu göstermiştir. Non-patojen mikroorganizmalar vücut hücreleri ile kommensal ve mutualist bir ilişki içerisinde yaşamını sürdürmekte ve yerine getirdikleri görevler ile adeta bir organ görevini üstlenmektedir.

Mikrobiyota kavramı; “Belirgin bir ekolojik yer veya çevre içerisinde bulunan mikroorganizmalar topluluğu” olarak tanımlanmaktadır. İnsan mikrobiyotasını bireylerin vücudunda yaşayan kommensal, simbiyotik ve patojenik mikroorganizmalar oluşturmaktadır. Sıklıkla mikrobiyota kelimesi yerine kullanılmakta olan mikrobiom kelimesi ise; “Belirli bir yerde yaşayan mikrobiyotanın genetik havuzunu ve bunların çevre ile ilişkisini” kapsamaktadır^{1,2}. Son yıllarda vücuttaki mikrobiyota ve mikrobiyomların tespit edilmesi özellikle kültürden bağımsız moleküler yöntemler sayesinde oldukça kolaylaşmıştır³. Yapılan araştırmalar sonucunda, insan vücudunda insanın kendi hücre sayısının en az on katı kadar, yani yaklaşık 10^{14} mikroorganizma olduğu, bunların yüzde yetmişinden fazlasının kolonda bulunduğu ve gastrointestinal sistemde 35.000’den fazla bakteri türünün yaşadığı tahmin edilmektedir^{4,5,6}.

Yetişkinlerde kişiye özel ancak sabit bir intestinal mikrobiyota bulunmaktadır. Çoğunlukla *Bacteroides* ve *Firmicutes*’ların yer aldığı anaerob bakterilerden oluşan intestinal mikrobiyota, beslenme süreci başta olmak üzere vücuttaki fizyolojik, metabolik, immünolojik ve nöral işlevlerde görev almaktadır^{1,7}. Mikrobiyota içeriğindeki değişiklikler ise insan sağlığını ciddi ölçüde etkilemektedir. Günümüzde nekrotizan enterokolit, infantil kolik, obezite, tip 2 diyabet, astım, alerji ve atopik hastalıklar, enflamatuvar bağırsak hastalığı, metabolik sendrom ve ateroskleroz gibi pek çok bulaşıcı olmayan hastalığın intestinal mikrobiyota ile yakın ilişkisi olduğu ortaya konulmuştur^{1,3,4,6,8,9,10,11}. Özellikle bebeklik dönemi mikrobiyotası gastrointestinal sistem mukozasının gelişimine ve olgunlaşmasına büyük bir katkı sağlamaktadır¹². Ayrıca, anne sütüne atfedilen pek çok yararın özellikle *Bifidobakteriler* başta olmak üzere, anne sütü mikrobiyotasından kaynaklandığı anlaşılmıştır¹³. Süt oryante mikrobiyom adı verilen *Bifidobakteriler*, bebeklik döneminde enfeksiyonlardan, yetişkinlikte ise çeşitli kronik hastalıklardan korunmada önemli bir rol oynar. Tuzun ve ark.¹⁴ anne sütü mikrobiyotasında bulunan *Bifidobakterilerin*

Sonuç

Anne sütü non-patojen mikroorganizmaları içeren ve yaşamın ilk yıllarında bebeğin mikrobiyota gelişimine katkı sağlayan önemli bir besindir. Erken yaşlardaki mikrobiyota gelişimi gelecek yıllardaki sağlık durumu için belirleyici niteliktedir. Bu nedenle, TNSA 2018'e⁵⁹ göre ilk altı ayda sadece anne sütü ile beslenme oranı yüzde 41 olan ülkemizde emzirmeyi teşvik programlarına titiz bir şekilde devam edilmesi gerekmektedir. Bunun yanında ebeveynlere ve topluma mikrobiyota gelişimini olumsuz etkileyecek gereksiz antibiyotik kullanımı, sezaryen doğum konularında ve anne sütü ile beslemenin bağırsak mikrobiyotasının oluşumundaki etkisine ilişkin eğitimler yapılmalıdır⁶⁰. Yenidoğan kliniklerinde de mümkün olduğunca bebeğin kendi annesinin sütünden yararlanılmalıdır.

Özellikle yenidoğan hemşirelerinin klinik uygulamaları açısından, yenidoğan ünitelerinde soğutucuda saklanarak depolanan anne sütündeki non-patojen mikroorganizmaların nasıl etkilendiğine yönelik olarak daha fazla çalışmaya gereksinim duyulmaktadır. Ayrıca anne sütü ve bağırsak mikrobiyotasının tespitine yönelik örnek toplama, transfer ve saklama sürecinde, sonuçların doğru alınabilmesi için dikkat edilecek konular bilinmeli ve kliniklerde buna yönelik standartlar oluşturulmalıdır⁶¹.

Anne sütündeki mikroorganizmaların kaynağına ilişkin tartışmalar ise hâlen devam etmektedir. Bakterilerin annenin bağırsak mikrobiyotasından, süt mikrobiyotasına taşınmasına ilişkin mekanizma tam olarak açıklanamamıştır ve yeni araştırmalara gereksinim bulunmaktadır. Son olarak, anne sütü mikrobiyotasının geliştirilmesi için gebelik ve laktasyon döneminde anneye uygulanan probiyotik ve prebiyotik takviyesinin anne sütü mikrobiyotasını etkilediği bilinmektedir. Ancak bu girişimin bebek mikrobiyotasının gelişimi ve sağlığı üzerindeki etkisini inceleyen daha fazla araştırmaya ihtiyaç duyulmaktadır.

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ÇEVRESEL FAKTÖRLER VE MİKROBİYOTA

Gülfem Terek Ece

Tanı yöntemlerindeki gelişmeler ve yeni nesil sekanslama yöntemleri, her geçen gün yeni çalışmalar yapılmasına ve birçok hastalık/hastalık grupları ile ilişkilendirilmesine sebep olmuştur. Bu ilişkilendirmelerle birlikte mikrobiyotayı etkileyen faktörler de en çok çalışılan konular arasında yerini almıştır.

2007 yılında 300 gönüllü ile başlatılan İnsan Mikrobiyom Projesi ile insan vücudundaki tüm mikroorganizmaları belirlemek, insan mikrobiyom değişikliklerinin hastalıklarla ilişkilendirilip ilişkilendirilemeyeceğini araştırmak hedeflenmiştir. Bu proje deri, gastrointestinal yolak, oral kavite, solunum mukozaları, ürogenital sistem gibi geniş yüzeylere yerleşmiş en az 5000 filogenetik bakteri çeşidinin tanımlanmasına imkân sağlamıştır. ⁽¹⁾

Kabaca insan vücudundaki hücrelerin 10 katı kadar bakteri bulunduğu bilinmektedir. ⁽²⁾ Mikrobiyotanın büyük kısmı başta sindirim sistemi olmak üzere deri, genitoüriner sistem ve solunum sisteminde kolonize olmuştur. Bakterilerin başlıca bulunduğu yer bağırsak olması nedeniyle intestinal mikrobiyota üzerinde daha fazla araştırma yapılmaktadır. ⁽³⁻⁴⁾

Bağırsak mikrobiyotası son derece dinamik yapıdadır. Doğumdan sonra farklılaşmaya başlayarak yaklaşık 2.5 yaş civarında erişkin benzeri çeşitliliğe sahip olur. Yapılan çalışmalar farklı coğrafik bölgelerde yaşayan toplumların yanında yaşam stilinden antibiyotiklere maruziyete; doğum şeklinden çevresel faktörlere kadar birçok faktörün bu dinamik yapıya etki ettiğini göstermektedir.

Günümüzde teknolojinin yaşamın her alanına girmesi, yaşam biçimi ve beslenme tarzındaki değişikliklerle birlikte özellikle sanayi toplumlarının birçok çevresel etkene maruziyeti mikrobiyotayı doğrudan ya da dolaylı yoldan etkilemektedir. Bu bölümde mikrobiyotayı etkileyen çevresel faktörler incelenecektir.

Beslenme

Beslenme tüm toplumların sağlığı üzerine doğrudan ya da dolaylı etkileri olan faktörlerin başında gelmektedir. Beslenmenin mikrobiyota üzerine etkilerini değerlendirmek amacıyla birçok çalışma yapılmaktadır.

Coğrafi değişikliklerin mikrobiyotaya etkilerinin araştırıldığı çalışmalarda posa ve bitkisel protein ağırlıklı beslenen Afrikalı çocukların bağırsak mikrobiyotasının içeriği hayvansal kaynaklı protein ve yağ ağırlıklı beslenen İtalyan çocuklarından daha zengin bulunmuştur. Çalışma sonuçlarına göre İtalya'da yaşayan çocukların mikrobiyotalarında *Firmicutes* ve *Proteobacteria* oranları Afrika'da yaşayan çocukların ise *Prevotella*, *Xylanibacter* ve *Treponema* oranları daha yüksektir. ⁽⁵⁾

Yapılan çalışmalar beslenmenin mikrobiyal çeşitliliği, mikrobiyal taksonomiye, genetik bilgiye, gen ekspresyonlarını ve enzim aktivitelerini etkileyerek hem bağırsak mikrobiyota kompozisyonunu hem de

Ayrıca sigara içen bireylerin bağırsak mikrobiyom çeşitliliğinde azalma *Proteobacteria*, *Bacteroides* phyla, *Clostridium* ve *Prevotella* türlerinde artış saptanırken, *Actinobacteria*, *Firmicutes*, *Bifidobacterium* ve *Lactococcus*'ta azalma tespit edilmiştir. ⁽⁴⁶⁾ Sigaranın intestinal mikrobiyom üzerine etkisini oksidatif stresi arttırması, intestinal tight junction değişimi, bağırsak müsin içeriğinin farklılaşması ve asit-baz dengesindeki değişimlerdir. Sigaranın oksidatif stresi arttırdığına yönelik çok sayıda çalışma bulunmaktadır. Sigara aynı zamanda intestinal müsin içeriğinde ve tight junctionlarda bozulmaya yol açabilir. Yapılan çalışmalar sigara içimine bağlı olarak değişen intestinal mikrobiyotanın inflamatuvar bağırsak hastalıkları ve obeziteyle ilişkili olabileceğini göstermektedir. ⁽⁴⁴⁾

Alkol

Alkol alımı ile oral mikrobiyom etkilenmektedir. Oral bakteriler ve funguslar; alkol ve diet ile alınan şekerleri metabolize ederek karsinojenik asetaldehite çevirir. ⁽⁴⁷⁾ Bunun yanı sıra sigara içimi ile de kondense olarak karsinojenik nitrozaminlere dönüşerek oral karsinogenez sürecine yol açmaktadır ⁽⁴⁴⁾. Alkol; bakteriler üzerine direkt sitotoksik etki gösterebilmektedir. Hayvan çalışmalarında %20 oranında alkol alındığında *Streptococcus mutans* kolonizasyonunu arttırmaktadır ve ratların oral biofilmlerindeki saptanabilir bakteri sayısını azaltmaktadır. ⁽⁴⁸⁾

Alkol ve bağırsak mikrobiyomu arasındaki süreç özellikle alkol bağımlılarında değerlendirilmiştir. Bu durumun intestinal bariyer fonksiyonunu bozarak sızdıran bağırsağa, proinflamatuvar patojenik mikrobiyal ürünlerinin oluşmasına ve karaciğer metabolik yollarını bozulmasına neden olmaktadır. ⁽⁴⁹⁾

Hava Kirliliği

Hava kirliliği dünya çapında bir çevre kirliliği sorunudur. Hava kirliliği bağırsak mikrobiyota kompozisyonunu bozduğu özellikle *Firmicute* 'lerin türlerinde azalmaya yol açtığını gösteren çalışmalar bulunmaktadır. Bu durum ayrıca inflamatuvar hastalıklarla da ilişkilendirilmektedir. ⁽⁵⁰⁾ Hayvan çalışmalarında özellikle *Bacteroidetes*, *Firmicutes* ve *Verrucomicrobia* içeriğini değiştirmektedir. Bu durum butirat konsantrasyonunu azaltmakta ve intestinal bariyerin bozulmasına yol açmaktadır. ⁽⁵¹⁾

D Vitamini

Vitamin D cathelicidin and DEFB4 (defensin, beta 4) transkripsiyonunu etkileyerek bağırsak mikrobiyomunu etkileyebilir. Vitamin D eksikliğinin bağırsak mikrobiyom disbiyosizine ve ciddi kolite yol açtığını gösteren çalışmalar bulunmaktadır. ⁽⁵²⁾

Stres

Stres bağırsak bakterileri üzerinden sağlığımızı etkilemektedir. Stres özellikle bağırsak geçirgenliğini arttırmakta ve disbiyozise yol açmaktadır. Stres ayrıca inflamatuvar süreç gelişime yol açmaktadır. Özellikle askeri birliklerde yapılan çalışmalarda bağırsak kompozisyonunun eğitim koşulları ile değiştiği bildirilmiştir. ⁽⁵³⁾

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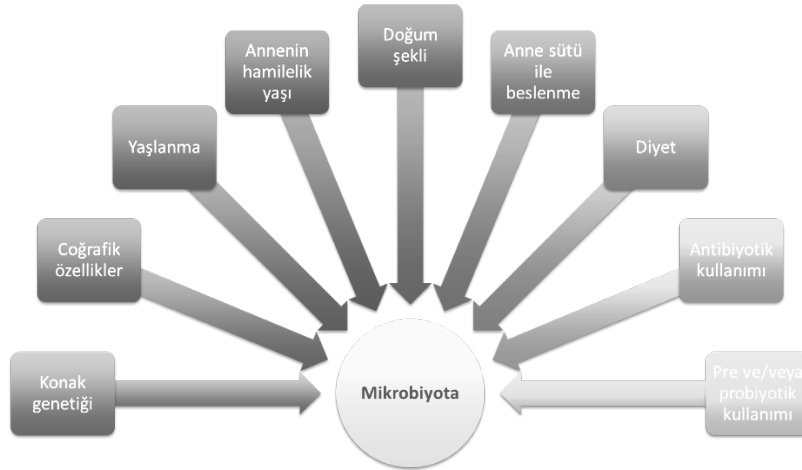
Bölüm A19

ANTİBİYOTİK KULLANIMI VE MİKROBİYOTA

Serap Süzük Yıldız

Giriş

Son yıllarda bireysel farklılıkların var olmasına rağmen sağlıklı olma durumu ile mikrobiyota arasındaki ilişkiyi ortaya koymaya yönelik metagenomik çalışmaların sayısı gün geçtikçe artmaktadır. En çok çalışılan konulardan biri de antibiyotik kullanımı ile mikrobiyota arasındaki ilişkileri ortaya koymaya yönelik çalışmalardır. Bağırsak mikrobiyotasının, sağlığın korunmasından iyileştirilmesine kadar önemli bir rol oynadığı artık bilinmektedir. Bağırsak mikrobiyotasının gelişimine etki eden en önemli faktörler Şekil 1’de özetlenmiştir. Kritik hastalıkların ve bu hastalıklarda kişiye uygulanan bazı zorunlu müdahalelerin mikrobiyom üzerinde zararlı kabul edilebilecek etkileri vardır. Antibiyotikler enfeksiyon hastalıklarının tedavisinde kullanılan hayat kurtarıcı ilaçlardır. Ancak bu ilaçlar hedefteki patojen mikroorganizmalardan başka, mikrobiyotamızdaki pek çok mikroorganizmanın da zarar görmesine neden olabilmektedir. Antibiyotiklerin profilaktik kullanımındaki klinik ihtiyaç ile zarar arasındaki dengeyi belirlemek bazen zor olabilir. Uzun süreli antibiyotik tedavisi gerektiren enfeksiyonlarda, antibiyotiklerin uzun süreli kullanım potansiyelleri göz önüne alındığında, bağırsak mikrobiyomu üzerinde antibiyotiklerin etkileri hızlı ve uzun süreli olabilmektedir.



Şekil 1. Bağırsak mikrobiyotası üzerine etki eden faktörler.

Antibiyotik kullanımına bağlı mikrobiyotanın bozulabilmesi göz önüne alındığında, tedavi sonunda, aslında tam bir iyileşmeden bahsetmek de mümkün olmayabilir. Ayrıca, antibiyotik kullanımına bağlı fırsatçı patojenlerin artması ve bu patojenlerin tedavilerinin gittikçe zorlaşan enfeksiyonlara yol

yonu girer, böylece nitrat (NO₃⁻) oluşur. Zorunlu aerobik bakterilerin aksine, Enterobacteriales üyeleri, son elektron alıcısı olarak nitrat, S-oksit ve N-oksit kullanarak anaerobik solunum yapabilirler. *E. coli* ve aerobik bakteriler sağlıklı bağırsak ekosisteminde daha az sayıda bulunur, streptomisin ile tedavi edilmiş farelerde değişen ekosistem şartlarında önemli ölçüde artma eğilimindedirler. *Salmonella* türleri ise, nütrofiller tarafından üretilen reaktif oksijen ürünlerini kullanarak anaerob solunum yapabilirler^{64,65}. Bu yolla mikrobiyotada oluşan disbiyozise bağlı olarak patojen bakteriler alternatif elektron alıcılarını kullanarak mikrobiyotada daha baskın hâle gelebilirler⁶⁶.

Bir diğer önemli nokta ise bağırsak ekosistemindeki dengeyi sağlayan bakteriosinlerdir. Bakterilerin bağırsak epitelinde kolonizasyonları salgıladıkları biyosinler aracılığı ile olmakta ve istenmeyen bakterilerin bağırsak mikrobiyotası içinde kolonizasyonunu önlemektedir. Antibiyotiklerin kullanımında yararlı bakterilerin kaybına bağlı olarak bakteriosin üretimi de düşeceğinden, patojen bakterilerin kolonizasyonunun daha hızlı ve kalıcı olması muhtemeldir. Bu durumun antibiyotiğe bağlı disbiyozisde önemli bir faktör olacağı varsayılmaktadır⁶⁷.

Sonuç

Günümüzde iklim değişimleri, küreselleşme, insan seyahatleri ya da göç gibi zorunlu hareketleri, sağlık sunumundaki yetersizlikler, hijyen ve sanitasyonun azalması gibi birçok faktör insanları enfeksiyona açık hâle getirmektedir. Enfeksiyon tedavilerinde ise antibiyotik kullanımı kaçınılmazdır. Hatta bugün tedavi için uygulanan işlemlerin birçoğu hastaların daha fazla antibiyotik tüketimine neden olabilmektedir. Tedavide kar zarar hesabı yapmanın mümkün olmadığı durumlar söz konusu olabilir. Ancak tedavinin oluşturacağı disbiyozisin boyutları hekimler tarafından bilinmelidir. Ayrıca hem hastanelerde hem de yaşamda enfeksiyon kontrol ve önleme stratejilerinin uygulanması antibiyotik kullanımı için kısıtlayıcı bir faktör olabilir. Bu yönde geliştirilecek politikaların uygulanması, yaygınlaştırılması ve içselleştirilmesi gerekmektedir.

Kısa Süreli Etkiler

Kommensal bakterilerin kolonizasyonunda azalma
Mikrobiyota yapısında değişimler
Metabolizma ve besin maddelerinin emiliminde bozukluklar
Maya (*S. cerevisiae*) ve / veya *C. difficile*'nin miktarında artma
Enfeksiyonlara karşı yatkınlıkta artma

Uzun Süreli Etkiler

Bağırsak mikrobiyotasında antibiyotik direnç genlerinin kalıcılığı
Tekrarlayan *C. difficile* enfeksiyonları
Mikrobiyal çeşitlilikte azalma ve bazı taksonların kaybı

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SAĞLIK VE HASTALIKTA ORAL KAVİTE MİKROBİYOTASI

Doğukan Yılmaz

Vücudun dış dünyaya açılan kapısı olan oral kavite, yaklaşık 215 cm²'lik bir yüzey alanına sahiptir. Bu alan; bakteri, fungus ve virüslerin bulunduğu, içerik olarak insan vücudunun en zengin mikrobiyal yaşam alanlarından birini oluşturur ^[1]. Bakteriler, oral mikrobiyotadaki en yoğun taksonomik gruptur ve kolonizasyonları postpartum periyotta başlar. Oral kavitede bulunan bakterilerin yarısından azının aerobik mikrobiyolojik metotlarla kültüre edilebildiği ve yaklaşık 500 ila 700 türün bulunduğu tahmin edilmektedir ^[2]. Doğumla beraber Firmicutes, Proteobacteria, Actinobacteria, Bacteroidetes, Fusobacteria, Spirochaetes grupları baskın olarak izole edilir. Daimi dişlenmeyle beraber gram (-) anaerobik bakteri türlerinin sayısında artış gözlenir ^[3]. Oral mikrobiyota, kişiden kişiye hatta aynı bireyde, ağız içerisindeki farklı bölgelerde değişiklikler gösterir. Bu farklılık ve dinamik ilişkiyi anlamak açısından oral kavite morfolojik ve fizyolojik olarak farklı ekosistemlerde incelenebilir ^[4]. Gelişim devam ettikçe oral kavitede farklı habitatlar gelişmeye başlar. Değişik anatomik, fizyolojik yapılar, oksijen miktarı, besin içeriği, ısı ve konak bağışıklık yanıtının etkisine göre bu habitatlarda bazı mikroorganizma grupları daha baskın gözlenir ^[5]. Oral mikrobiyotanın bir habitatı tercih etmesindeki en önemli özellik, belirli bir alanın yüzeysel dokusunun; oral mukoza gibi yumuşak dokular veya diş minesi gibi sert dokulardan oluşup oluşmadığıdır ^[6]. Oral mikrobiyotanın gelişimi, süt dişlerinin sürme döneminin sonunda gerekli olgunluğa ulaşır ^[7]. Mantar ve virüs gibi oral mikrobiyotanın diğer elemanlarının ise, ağız içinde daha geç yaşlarda izole edildiği gösterilmiştir. Bu organizmaların daha çok oral kavite ile ilişkili burun boşluğu, sinüs, yutak gibi bölgelerden oral kaviteye ulaşım yaptığı düşünülmektedir ^[8]. Ağız içi, devamlı olarak kıvamlı bir sıvı olan salya ve diş eti oluşu sıvısı adı verilen sıvıların etkisi altındadır. Oral mikrobiyotayı oluşturan toplulukları etkileyen bir başka özellik de yüzey anatomisinden bağımsız olarak bölgenin tükürük bezlerine yakınlığı ve ilişkisidir ^[9]. Salyanın yapısı, akış hızı ve pH gibi biyokimyasal özellikleri mikrobiyal kolonizasyonu direkt etkileyebilmektedir ^[10]. Salyanın her mililitresinde yaklaşık 1.4x10⁸ CFU bakteri bulunmaktadır ^[9]. Çoğunluk olarak Actinobacteria, Bacteroides, Firmicutes, Fusobacteria, Proteobacteria, Spirochaetes ve TM7 filumları bulunmaktadır ^[11]. Zengin mikrobiyal içeriği ile salya mikrobiyotası; çürük, periodontitis, oral skuamöz hücreli karsinom, pankreas kanseri gibi ağız içi ve dışı sistemik hastalık ve durumların teşhisinde önemli bir materyal olarak kullanılabilir ^[11]. Oral anatomik bölgelere göre en çok izole edilen bakteri grupları Şekil 1'de kısaca özetlenmiştir.

çalışmalarla, zorunlu misafirlerimiz olan bu organizmaları lehimize kullanarak daha uzun ve sağlıklı bir yaşam şansı elde edebiliriz.

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Bölüm A21

KARDİYOVASKÜLER HASTALIKLAR VE MİKROBİYOTA

Perihan Varım

Mehmet Bülent Vatan

Ceyhun Varım

Giriş

Kardiyovasküler Hastalıklar (KVH) dünya genelinde ölümlerin en sık nedenidir. Her yıl yaklaşık olarak 17.5 milyon insan KVH'dan ölmektedir. Bu dünyadaki tüm ölümlerin %31'i demektir. KVH'dan ölümlerin 2030 yılında 23 milyona ulaşması öngörülmektedir.¹ KVH için sigara kullanımı, sağlıksız beslenme, obezite, fiziksel inaktivite, yüksek kan basıncı (hipertansiyon), yüksek kan yağları ve di-yabet gibi risk faktörleri mevcuttur. Son yıllarda yapılan çalışmalar özellikle modifiye edilebilen risk faktörleri üzerinde yoğunlaşmıştır. Bağırsak Mikrobiyotası ile son dönemde yapılan çalışmalarda Mikrobiyota ile hem metabolik hem de kardiyovasküler hastalıklar arasında ilişki olduğu gösterilmiştir.²

İnsan vücudunda 100 trilyon hücre bulunduğu tahmin edilmektedir. Bunun 10 misli fazlası kadar da yararlı bakterilerimiz mevcuttur. Vücudun deri, ağız, vajina, bağırsaklar gibi çeşitli bölgelerinde yerleşmiş bu bakterilere o bölgenin “florası”, yeni adıyla “mikrobiyota” denmektedir. Mikroorganizmaların genomuna ise “mikrobiyom” adı verilmektedir. İnsan vücudu %10 kendi hücresi ve %90'ı mevcut konağa yerleşmiş mikrobiya hücrelerden oluşmaktadır.³ Bağırsaktaki mikrobiyota ise 2 kilo ağırlığında ve hem işlevi hem de ağırlığı nedeniyle artık bir organ olarak kabul edilmektedir.⁴

Sağlıklı bireylerde mikrobiyota çok sayıda ve çeşitli mikroorganizmaları içmektedir. Doğumdan hemen sonra oluşmaya başlayan Mikrobiyota beslenme, genetik, yaş ve yaşanan coğrafi bölgeye göre değişiklik gösterir. Enfeksiyonlar, antibiyotik kullanımı gibi tedavi uygulamaları sonrası bağırsak mikrobiyotası değişebilir.⁵

Sağlıklı bireylerde bağırsak florasında 6 bakteriyel küme vardır:

1. **Firmicutes** (*Clostridium*, *Eubacterium*, *Ruminococcus*, *Butyri vibrio*, *Anaerostipes*, *Roseburia*, *Faecalibacterium* vb. Gram pozitif cinsleri kapsamakta)
2. **Bacteroidetes** (*Bacteroides*, *Porphyromonas*, *Prevotella* vb. Gram negatif cinsleri kapsamakta)
3. **Proteobacteria** (Enterobacteriaceae gibi Gram negatif cinsleri kapsamakta)
4. **Actinobacteria** (Gram pozitif *Bifidobacterium* cinsini kapsamakta)
5. **Fusobacteria**
6. **Verrucomicrobia** (*Akkermansia* vb. cinsleri kapsamakta)

Prebiyotikler, mikrobiyota kompozisyonunu değiştirir, mikrobiyota fermantasyonunu iyileştirir, açlık hissini azaltır ve postprandiyal glukoz cevabını düzeltir. Bu etkiler esnasında plazma GLP-1 ve Peptit YY'nin arttığı saptanmıştır.⁴⁰

Simbiyotikler ise probiyotik ve prebiyotiklerin kombinasyonudur.

Fekal transplantasyon, sağlıklı bireylerden alınan gaitanın süspansiyon hâline getirilerek enema, nazoduodenal/nazojejunal sonda veya endoskopik yöntem ile hasta bireyin intestinal lümenine verilmesidir. İntestinal mikrobiyota ilk kez Eiseman ve arkadaşları tarafından 1958 yılında tedavide kullanılmıştır.⁴¹ Psödömembranöz enterokolit 4 olguda enema ile fekal transplantasyon yaparak aldığı başarılı sonuçlar almıştır.

Bütirat üreten intestinal Mikrobiyota miktarının artması ile insülin duyarlılığında artış olduğunun saptanması diyabetik hastaların tedavisinde mikrobiyota modifikasyonunun kullanımı fikri ortaya çıkmıştır.¹⁶ Bunun yanında yapılan bir çalışmada bütirat üretimi zengin Mikrobiyota olumunun enterohepatik dolaşım üzerine olumlu etkiler oluşturarak plazma serbest safra asit miktarını artırdığı, intestinal lipid emilimini azalttığı; böylece plazma kolestrol seviyesinde azalma sağladığı gösterilmiştir. Yine Firmicutes/Bacteroidetes oranlarında değişim saplanarak obezitede azalma olduğu tespit edilmiştir.⁴²

Sonuç

Mikrobiyota güncel araştırmalar doğrultusunda artık yeni bir organ olarak değerlendirilmeye başlanmıştır. Kardiyovasküler hastalıklar ve risk faktörleri üzerine olan etkileri de araştırılmaktadır. Özellikle insanlar üzerinde geniş katımlı çok merkezli çalışmalar yapılarak mikrobiyotanın kardiyovasküler hastalıkların patofizyolojisindeki yeri ve tedavideki etkinliği daha iyi anlaşılacaktır.

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Yusuf Aydemir

Uzun yıllardır, kültür temelli araştırmaların sonuçlarına dayanılarak, akciğerlerin steril olduğuna inanılıyordu. Hatta bu yüzden akciğerler, İnsan Mikrobiyom Projesi'ne dâhil edilmedi. Bununla birlikte, son zamanlarda geliştirilen kültürden bağımsız yöntemler ile sağlıklı insanların akciğerlerinde, sayı bakımından az, ancak çeşitliliği fazla bakteri türlerinin yaşadığı gösterilmiştir. Ancak, günümüzde devam eden araştırmalarda önemli metodolojik ve teknik engeller bulunmaktadır. Akciğer mikrobiyomundaki nicel ve/veya nitel değişiklikler hastalık oluşumu, ilerlemesi ve alevlenmelere katkıda bulunabilir. Akciğer mikrobiyomunun bileşimi ve immünolojik etkileri hakkında bilgi, özellikle kistik fibroz, bronşektazi, astım ve kronik obstrüktif akciğer hastalığı gibi hastalıklarda önemli patojenik kazanımlar sağlayacaktır. Gelecekte büyük kohortları içine alan, çok merkezli çalışmaların akciğer mikrobiyomu hakkındaki bilgimize ve anlayışımıza katkıda bulunacağını düşünüyoruz.

Giriş

İnsan vücudunda kommensal olarak yaşayan mikroorganizmaların varlığı çok uzun zamandır bilinmektedir. Bu mikroorganizmaların çok büyük kısmı, geniş yüzey alanı ve zengin beslenme ortamı nedeniyle intestinal sistemde bulunur¹. Tarihsel olarak kültüre bağımlı araştırmalar, insanla birlikte yaşayan bu binlerce türün ortaya çıkarılmasını kısıtlamıştır. Hâlen, mikrobik türlerin çoğu kültüre edilememektedir. Son yıllarda bu durum değişmiş, teknolojik ilerlemelere paralel olarak geliştirilen moleküler teknikler ile kültürden bağımsız olarak, mikroorganizmalardaki DNA fragmanlarının tesbitine dayalı yöntemler geliştirilmiş ve bu sayede "İnsan Mikrobiyom Projesi" başlatılmıştır^{2,3}.

Tanım olarak mikrobiyota; belirli bir bölgede veya yaşama ortamında bulunan tüm mikroorganizmaları tanımlar. Teknik nedenlerle bu alanda yapılan çalışmaların çoğu bakterilerle yapılmış olsa da, mikrobiyota, bakteri virüs ve mantar dâhil insan vücudundaki tüm mikropları kapsar. İnsan vücudunda yaşayan mikroorganizma sayısının, insan hücre sayısından 10 kat fazla olduğu hesaplanmıştır. Bu durum mikrobiyotanın genel sağlık/iyilik hâlinin sürdürülmesinde ve hastalıklarda önemli rollere sahip olduğu anlayışını kuvvetlendirmektedir⁴.

Solunum Sistemi ve Mikrobiyota

Akciğerler, insan vücudunun tamamen dışarıya açık en büyük organı olmasına rağmen, uzun yıllar boyunca, mukus katmanı ile silli silindirik epitelden oluşan mekanik bariyer ve gelişmiş makrofaj fago-sitoz gücü sayesinde, steril olarak kabul edildi. Bu kabulde vücut yüzeyindeki bakteri türlerinin %70'inden fazlasının standart kültür teknikleri ile üretilmemesi rol oynuyordu ve geleneksel kültür temelli araştırmalar bronş ağacını sağlıklı bireylerde steril olarak tanımlamıştı⁵. Sağlıklı kişilerde kültür teknikleri ile elde edilen bakteriler üst solunum yolları florasına aitti ve bunların dışında alt solunum

Probiyotikler canlı mikroplar olup yeterli miktarda verildiğinde olumlu etkileri gözlenmiştir. En yaygın olarak incelenen probiyotikler, *Lactobacillus* ve *Bifidobacterium*'dur. Birkaç çalışmada, alerjik pulmoner inflamasyonun modüle edilmesinde *Lactobacillus* suşlarının etkisi incelenmiş, *Lactobacillus casei* alerjik hava yolu inflamasyonunu arttırırken, *Lactobacillus reuteri* ve *Lactobacillus plantarum*'un alerjik reaksiyonun azalttığı bildirilmiştir^{40,41}.

Oral olarak verilen mikrobik ürünlerin, deneysel modellerde alerjik hava yolu hastalığı üzerine etkisi gösterilmiştir. Örneğin bir çalışmada, her yerde bulunan saprofitik mikobakteri olan *Mycobacterium vaccae*'nin, ısı ile öldürüldükten sonra subkutan ya da intragastrik uygulandığında alerjik hava yolu hastalığının gelişimini önleyebildiği gösterilmiştir⁴².

Havayolu mikrobiyotasının çeşitliliğindeki azalmalar KOAH ve KF'da olduğu gibi hastalık alevlenmesine yol açan bakterilerin artışı ile ilişkili olduğundan, bir biyobelirteç olarak kullanılabilir.

Her şeye rağmen fekal transplantasyon gibi seçeneklere sahip intestinal mikrobiyotaya müdahalelerine göre, solunum sistemi olarak oldukça geride olduğumuz açıktır.

Sonuç

Akciğerlerin "steril" olduğu anlayışının geç ve zor da olsa yıkılması, havayolu mikrobiyotaya çalışmalarını hızlandırmıştır. Teknik zorluklara rağmen sağlıklı havayolu mikrobiyotasının belirlenmesi, gelecekte; hem akciğer sağlığının sürdürülmesinde, hem de KOAH, Astım, Kistik fibrozis, Bronşiektazi gibi hastalıklarda alevlenmelerin azaltılarak, hastalığın progresyonunun ve fonksiyon kaybının yavaşlatılmasında yarar sağlayabilir.

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Bölüm A23

MİKROBİYOTA VE KANSER

Ahmed Cihad Genç

İlhan Hacıbekiroğlu

Kanser, bir dizi genetik bozukluk sonucu oluşan kompleks bir hastalıktır. Tüm dünyada, kalp hastalıklarından sonra en sık rastlanan ölüm nedeni olması nedeniyle çok önemli bir halk sağlığı sorunudur¹. Kanser oluşumuna neden olan faktörlerin nitel ve nicel artışının yanı sıra tanı olanaklarının gelişmesi ile paralel bir artış gösteren olgu sayıları, gerek ülkemiz ve gerek ise küresel anlamda, birçok kurum ve kuruluşun, kanserle daha fazla ilgilenmesi sonucuna yol açmıştır. Günümüzde, kanserogenezde rol oynayan birçok faktörün net olarak tanımlanmış olmasına, moleküler mekanizmaların ortaya çıkarılarak bunların terapötik hedef olarak kullanımına rağmen, sağkalım artışları elde edilse de, kanserin küratif bir hastalık hâline getirilememesi nedeniyle, kanser etiopatogenezinde sorumlu potansiyel aktörlerin aranmasına devam edilmektedir. Bu sayede kanser kaynaklı kişisel, toplumsal ve ekonomik kayıplar önlenebilecek ve belki de kanser uzun yıllar sonrasında, kürabl hastalıklar arasında yerini alabilecektir.

Mikrobiyota, vücudumuzun epitelyal bariyer yüzeylerinde yaşayan bakteri ve diğer organizmaları (fungus, protozoa, virüs vs.) ya da birlikte yaşadığımız özel türlerin tamamını tanımlamaktadır². Mikrobiyota, hematopoez, inflamasyon ve immünite başta olmak üzere birçok fizyolojik fonksiyon üzerinde etkisi bulunmaktadır³. Mikrobiyotanın insan sağlığı ve kanser dâhil pek çok hastalıkla ilişkisinin gösterilmesi ile bu alanda çalışmalar hız kazanmış ve mikrobiyotanın artık, yeni bir organ olarak değerlendirilmesi gerektiği görüşü ortaya çıkmıştır⁴. Yaş, coğrafi farklılıklar, diyet alışkanlıkları, antibiyotikler, probiyotikler gibi faktörler intestinal motilite, pH, redoks durumu, mikronutrientler, sekresyonlar (asit, safra, mukus, enzimler) gibi tanımlanmış birçok etiyolojik faktör, mikrobiyotanın kompozisyonunun farklılık göstermesine yol açabilmekte ve bu değişiklikler diabetes mellitus, kardiyovasküler hastalıklar ve kanser dâhil birçok kronik hastalık ile ilişkili bulunmuştur⁵⁻⁷.

Tüm kanserlerin yaklaşık 15'inde patojenik mikroorganizmalar etken olarak tanımlanmıştır⁸. Karaciğer, serviks, mide, nazofarenks ve kaposi sarkomunun ağırlıklı olarak enfeksiyon ajanları nedeniyle oluştuğu ve bu tümörlerin oluşmasında Hepatit B ve C, HPV, *Helicobacter pylori* ve Epstein Barr virüsü gibi patojenlerin uzun süreli varlığı gerekmektedir. Bu ajanlar, tümör supresyonunun bozulması, konakçı DNA'sında virüsün onkogenik etkileşimi, lokal immün yanıtı bozması gibi farklı biyolojik yöntemlerle tümör oluşumuna neden olmakta idiler. Ancak, vücudumuzdaki simbiyotik ve kommensal organizmaların karsinogenezdeki rolü açık değildi. Günümüzde insan mikrobiyota projesi kapsamındaki araştırmalar sonucunda, vücudumuzda doğumdan itibaren var olan, vücut homeostazisinde aktif rol oynayan mikroorganizmaların rolleri daha iyi anlaşılmasına başlanması, onkoloji alanında da heyecan verici gelişmelere yol açmıştır⁹. Son zamanlarda yapılan çalışmalarda, Mikrobiyotanın, özellikle bağırsak Mikrobiyotasının kanserin inisiasyonu, progresyonu ve vücuttaki yaygınlığı ile yakın bir ilişki içinde bulunduğu, yani karsinogenezin her aşamasında anahtar bir rol oynayabileceği, ek olarak da, anti

lıklar gözlenmiştir⁷². Bu bulgular ışığında yapılan çalışmalarda, Mikrobiyota ilişkili testlerin kanser tarama stratejilerinde kullanımı gündeme gelmiştir. Gaitada gizli kan testlerine ilave olarak bazı *Fusobacterium* türlerinin kullanıldığı metagenomik testlerde, sensitivitede %45 artış saptanmıştır⁷³.

Sonuç olarak;

Kanser de dâhil olmak üzere birçok hastalığın oluşumu ve tedavi aşamalarında anahtar rollere sahip olan mikrobiyota, güncel araştırmalar ışığında, artık yeni bir organ olarak değerlendirilmeye başlanmıştır. Son zamanlarda yapılan çalışmalarda, kompleks karsinogenez aşamaları ve antikanser tedavilere yanıt ve toksisite de dâhil olmak üzere kanserin her aşamasında çok önemli roller oynayan Mikrobiyota, onkoloji alanındaki potansiyel terapötik hedef olarak değerlendirilmektedir. Gelecekte, mikrobiyotanın karsinogenezdeki rolünün daha iyi anlaşılması ile kanser tanı, tarama ve tedavisindeki yerinin artacağı öngörülmektedir.

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Bölüm A24

MİKROBİYOM VE DERMATOLOJİ

Bahar Sevimli Dikicier

Mikrobiyom, mikropları, genomlarını ve ait oldukları çevreyi tanımlayan bir terimdir. İnsan mikrobiyomunun insan genomuna göre çok daha çeşitlilik içermesi nedeniyle anlaşılması için büyük çalışmalar yapılmaktadır. İnsan mikrobiyom projesi nazal, oral, deri, gastrointestinal ve ürogenital bölgelerin mikrobiyomunu çalışmayı amaçlamaktadır. Referans mikrobiyomların tanımlanmasıyla hastalık durumlarına neden olan potansiyel nedenler ve birliklilikler karşılaştırılabilecektir. Bu amaçla ‘İnsan Genom Projesi’ne paralel 2008’de ‘Uluslararası İnsan Mikrobiyom Konsorsiyumu’ kurulmuş ve Avrupa İnsan Bağırsak Kanalı Metagenomu (MetaHIT) insan mikrobiyomuna yönelik araştırmaları teşvik etmek ve daha geniş bilimsel kitlelere kaynak sağlamak amacıyla başlatılmıştır^(1,2).

Deri Mikrobiyomu

Deri, insan vücudunun en büyük organı olarak seboreik, nemli ve kuru olmak üzere mikroçevreler içerir. 16SrRNA dizileme çalışmalarına göre mikrobiyotanın %90’ını Actinobacteria, Firmicutes ve Proteobacteria oluşturur. Gastrointestinal kanaldakinin tersine deri mikrobiyomunda kişiler arası ve aynı kişide bölgeler arası farklılıklar vardır⁽³⁻⁶⁾. Deri mikrobiyotasını kalıcı-uzun süreli üyelerle geçici-kısa süreli üyeler oluşturur⁽⁷⁾. Stafilokoklar, Propionibakteriler, Mikrokoklar, Korinebakteriler, Brevibakteriler ve Acinetobakterler kalıcı mikrobiyota üyeleridir. *S. epidermidis* ve *P. aknenin* iki temel kommensal türü olduğu düşünülmektedir. Her iki tür de kültürde üretilmiş ve genomlarının tümü dizilenmiştir. *S. epidermidis*’in *S. aureus* gibi diğer patojenlerin kolonizasyonunu önlediği düşünülmektedir, fakat bir yandan da intravenöz kateter enfeksiyonlarının önemli bir nedenidir, ayrıca biyofilm oluşturabilmektedir. *P. aknenin* ise izole edilmiş yüzlerce zinciri olmasına rağmen sadece bir zincir tamamen dizilenmiştir⁽⁸⁾.

Sağlıklı Derinin Mikrobiyomu

Deri, yağlı/yağsız, kıllı/kılsız, nemli/kuru, katlantılı/pürüzsüz bölgeler gibi fizyolojik ve topografik olarak farklı koşullarda yaşayan mikrobiyal toplulukları içeren bir ekosistemdir^(9,10). Kıl folikülleri, sebace bezler, ektrin ve apokrin bezler kendi mikrobiyotasına sahip mikroçevreler oluştururlar.

İnsan genom projesinde deri, geniş bir sağlıklı birey gurubunda çalışılmak için seçilen bölgelerdendir. Derinin bakteriyel toplulukları doğum şekline göre değişir: vajinal yolla doğan bebeklerde derideki 16SrRNA bulguları vajinal bakterilere benzerken (*Lactobacillus* ve *Prevotella* yoğunluktadır) sezaryenle doğanlarda deri bakterilerine benzerdir (*Acinetobacter*, *Bacillales*, *Micrococcineae* ve *Staphylococcus*)^(11,12). Hayatın ilk yılında derideki bakteriyel topluluklar bireyler arası yüksek değişiklik gösterir. Bu değişiklikler hem bakteri popülasyonu içeriği hem de bu popülasyonun edinilme zamanı için geçerlidir⁽¹³⁾. Küçük çocuklarda *Streptococcus*, Betaproteobacteria, Gammaproteobacteria baskın iken

Kronik yaralar

Diğer bir sürmekte olan çalışma alanı diyabetik yaralardır. Ülser derinliği arttıkça anaerob bakteri birlikteliği artarken stafilokok yoğunluğu azalmış saptanmış, ülser süresi uzadıkça bakteriyel çeşitlilikte artma, proteobakteri yoğunluğunda görece artış saptanırken yine stafilokok yoğunluğunda azalma izlenmiştir. Glisemik kontrolün en kötü olduğu olgularda stafilokok ve sterptokoktan zengin ülserler oluştuğu bildirilmiştir ^(61, 62).

Kozmetik ürünler

Şirketler, deri bariyeri bütünlüğünü ve deri kalitesini iyileştirmek için “doğal cilt mikrobiyomunu” oluşturma ve sürdürme konusunda vaatlerde bulunan teknolojilerinin faydalarını tanıtmak için yarışıyor. Bu iddiaları destekleyecek bilimsel kanıtları yetersiz olsa da, probiyotiklerin UV hasarını azaltmada ve deri hidrasyonunu ve dermisi yenileyen antioksidan özelliklere sahip olduğu kabul edilmektedir. Gelecekte Kore gıda ürünlerinden izole edilen bir probiyotik olan *Bacillus licheniformis*'in tüketiminin nematod *Caenorhabditis elegans*'ın (*C. elegans*) ömrünü uzatabileceği gösterilmiştir. Probiyotiklerin yaşlanma karşıtı faydalarını gösteren ilk modellerden biri olan bu çalışmanın bulgularının insanlarda uygulanabilirliği henüz gösterilmemiştir ⁽¹⁶⁾.

Deride Bakteri Dışındakiler

Şimdiye kadarki çalışmaların çoğu bakteriler üzerine yoğunlaşmışsa da deri, mantar ve virüsler gibi başka mikroplara da konaklık eder. Mantarlar için ribozomal RNA geninin ‘internal transcribed spacer region’ (ITS) olarak tanımlanan kısmı dizilenmiştir. ITS1 bölgesi bakteri ve virüslerde olmayan fungal DNA’yı hedefler. ITS1 dizilemesi ile ayak dışında çoğu deri bölgesinde çarpıcı bir *Malassezia* baskınlığı tanımlanmıştır ⁽⁶²⁾. Ayağın topuk, baş parmak ve başparmak tırnağını içeren bölgelerinde en yüksek mantar çeşitliliği izlenmiştir. Metagenomik dizileme ribozomal genlerin spesifik bölgelerinin dizilenmesi yerine bir örnekte mevcut tüm DNA’yı dizileyen bir yöntem olarak bir örnekteki bakteri, virüs ve mantarları ayırabilme imkânı sağlamaktadır ^(63, 64).

Virüsler hastalık etkeni olmalarının yanında gen transferi için vektör işlevi görerek bakterilerde genetik varyasyonların oluşmasını sağlamaktadır ⁽¹⁵⁾. İnsan viromu hakkında henüz yeterli bilgiye sahip değiliz. Buna neden olan fakörler; virüslerin hücre kültürlerinde çoğaltılmasının zorluğu, metagenomik analizlerin teknik olarak çok küçük genom yapılarını belirleyememesi, yöntemlerin genellikle total DNA’nın dizilenmesi esasına dayanması nedeniyle RNA virüslerinin saptanamaması, virüslerin hızlı değişiklik geçirmeleri nedeniyle viral genom veri bankalarının oluşturulamamasıdır ⁽⁶²⁻⁶⁵⁾.

Deri mikrobiyomunda artopodlardan ise en önemlisi demodeks akarı olup lipofiliktir. *D. folliculorum* kıl follüküllerinde, *D. brevis* sebace bezler ve göz kapağı kenarındaki meibomial bezlerde bulunur ⁽⁶⁶⁾.

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İNFLAMATUAR ROMATİZMAL HASTALIKLAR VE MİKROBİYOTA

İbrahim Tekeoğlu

Emre Uzun

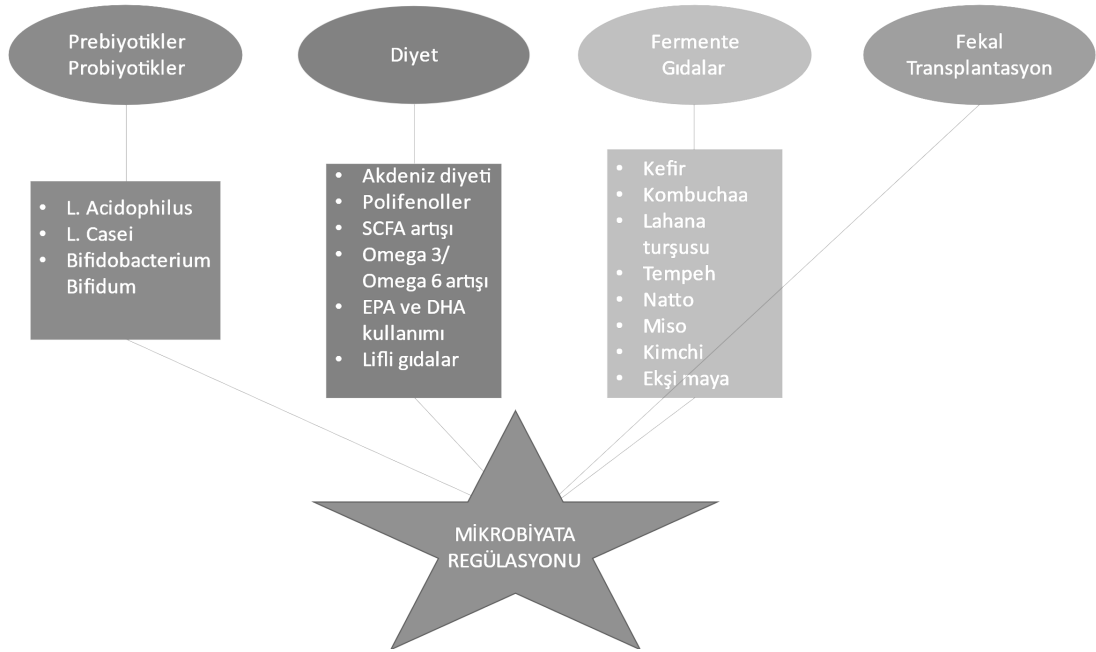
Mikrobiyal DNA dizilişinin (DNA sequencing) ve mukozal bağışıklığın daha iyi anlaşılmasına paralel olarak, mikrobiyal etkenler ile vücudumuz arasındaki etkileşim hakkındaki bilgilerimiz katlanarak artmıştır. Daha önceleri sadece hastalığa etken olan spesifik ajanlar üzerinde durulurken, son yıllarda yapılan çalışmalar sayesinde romatizmal otoimmün hastalıkların etyopatogenezi de rol oynayabilecek bakteri ve virüslerin araştırılmasına karşı merak ortaya çıkmıştır. Human Microbiome'un bir disiplin olarak gelişmesiyle, insan mikrobiyotasının romatizmal hastalığın patogeneziindeki potansiyel katılımını gösteren önemli kanıtlar ortaya çıkmıştır. Bu derin, çift yönlü etkileşim ve bunun hastalıklardaki sonuçları yepyeni bir araştırma alanına yol açmıştır.

Burada en çok romatoid artrit (RA), sedef hastalığı (PsO), inflamatuvar bağırsak hastalığı (IBH) ve ilgili spondiloartrit (SpA), ankilozan spondilit (AS), reaktif artrit (ReA) ve SpA'daki bağırsak mikrobiyomunun rolüne odaklanan hayvan ve insan çalışmalarından elde edilen verileri eleştirel olarak gözden geçireceğiz. Bu makaleyi terapötik amaçlı sindirim sistemine mikrobik manipülasyon uygulamasının inflamatuvar hastalıklara etkisini açıklayarak sonuçlandıracağız.

Mikrobiyota, Mikrobiyom ve Disbiyozis Nedir?

Mikrobiyota insanlarla birlikte yaşayan özel mikrobiyal türlerinin tamamını, mikrobiyom ise insanlarla kommensal olarak yaşayan mikroorganizmaların genlerini ifade etmektedir. Mikrobiyotanın dengesinin bozulması patojenlerin artmasına ve organizmaya zarar vermesine disbiyozis denir^[1]. Vücudumuzda yaşayan 100 trilyonun üzerinde hücrenin doğasında prokaryotik olduğunun artık farkındayız. Aslında bağırsak mikrobiyal markerlar diyetten kompleks polisakkaritleri indirgemek ve gerekli vitaminleri ve amino asidi çıkarmak için gereklidir.

Mikrobiyomlar bireyler arasında değişmekle birlikte, temsil edilen bakteri türlerinde ailesel ve işlevsel benzerlikler bulunmaktadır^[2]. Sağlıklı insan popülasyonlarında bağırsak mikrobiyolojisi analizinde yaklaşık 1150 bakteri türü ortaya çıkmıştır. Çoğunluk (%50-75) Firmicutesler, onu takiben de bacteroidetes (%10-50) ve actinobacteria (%1-10) ile daha az %1'i proteobakterilerden oluşmaktadır. Her organın mikrobiyotaya bileşimi organın pH'sına ve hücresel mekanizmalarına göre değişiklik arz etmektedir (Şekil 1)^[3]. Farklı coğrafyalarda bağırsak mikrobiyomunun bileşimi, özellikle beslenme alışkanlıkları ile ilişkili olarak değişiklik göstermektedir^[4].



Şekil 2. Mikrobiyota düzenlenmesi ile ilgili yaklaşımlar.

Mikrobiyotanın yapısının ve ona yönelik manuplasyonların eninde sonunda RA, PsA veya SpA'nın tedavisi için adapte edilip edilemeyeceğini anlamak için iyi tasarlanmış klinik araştırmalara ihtiyaç duyulmaktadır.

Sonuç

Yapılan çalışmalar ile intestinal mikrobiyotanın önemi daha iyi anlaşılmış, bu karmaşık sistemin aydınlatılması ile çok ciddi sonuçlar ortaya çıkmıştır. Disbiyozis tablosunun eşlik ettiği hastalıkların araştırılması ve intestinal mikrobiyota kompozisyonundaki değişikliklerle ilişkilendirilmesi, patogenezi tam olarak açıklanamamış birçok hastalığın tedavisi için de umut vericidir. İntestinal mikrobiyotanın etkileri ve önemi anlaşıldıkça, mikrobiyota manipülasyonunun ve özellikle de FMT'nin bir tedavi modeli olarak kullanılabilirliği gün geçtikçe kabul görmektedir.

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**MİKROBİYOTANIN VİRAL HEPATİTLER VE
DİĞER KARACİĞER HASTALIKLARI İLE İLİŞKİSİ***Tuba Dal**Ferzan Arslan*

Bağırsak mikrobiyotası (BM), birbiriyle ve insan vücudu ile simbiyotik ilişkide bulunan bakteri, protozoa, archaea, mantar ve virüslerden oluşan bir ekosistem olup yeni bir metabolik organ olarak tanımlanır. Bağırsak mikrobiyotası, sindirim sistemi dışında böbrekler, beyin, kardiyovasküler sistem, kemik ve eklem sistemi gibi ekstraintestinal organ ve sistemlerle de ilişkilidir. Son yıllarda yapılan çalışmalarda, bağırsak-karaciğer aksının insan yaşamı için hayati bir önem taşıdığı savunulmaktadır. Bağırsak disbiyozisinin ve mikrobiyota kompozisyonunun viral hepatitler, alkolik karaciğer hastalığı (AKH), non-alkolik yağlı karaciğer hastalığı (NAYKH), non alkolik steatohepatit (NASH), karaciğer sirozu ve hepatoselüler karsinom (HSK) gibi karaciğer hastalıklarının etiopatogenezinde ve seyirinde rol alabileceğine dair çalışmalar mevcuttur. Bu bölümde mikrobiyotanın viral hepatitler ve karaciğer hastalıkları ile ilişkisi literatür eşliğinde değerlendirilmiştir.

Giriş

Bağırsak mikrobiyotası insan sağlığının fizyolojisi ve insana ait patolojik durumlar, sindirim, B vitamini sentezi, immünomodülasyon, anjiyogenez ve sinir fonksiyonu üzerinde etkilidir. Bağırsak mikrobiyotasının gastrointestinal, hepatik, kardiyovasküler, endokrin sistem ve solunum sisteminde gelişen birçok hastalığın patogenezi üzerinde bir etkisi olduğu günümüzde kabul görmektedir. Bağırsak mikroorganizmalarının çoğunun standart teknikler ile kültürünün yapılması zordur. Ancak günümüzde filogenetik belirteçler olan 16S/18S ribozomal RNA dizilimine dayalı yeni nesil dizileme sistemlerinin gelişimi ile birlikte mikrobiyota çalışmalarında büyük yol katedilmiş; BM'nin 100 trilyondan fazla bakteriden oluştuğu ve insan genomundan 150 kat daha fazla gen içerdiği belirlenmiştir⁽¹⁾. Firmicutes filumu (%79,4) (*Ruminococcus*, *Clostridium* ve *Eubacteria*), Bacteroidetes (%16,9) (*Porphyromonas*, *Prevotella*), Actinobacteria (%2,5) (*Bifidobacterium*), Proteobacteria (%2,5) ve Verrumicrobia (%0,1) baskın olan bakteri grubunu oluşturmaktadır^(2,3). Lactobacilli, Streptococci ve *Escherichia coli* bağırsakta az sayıda bulunur. Bağırsak mikrobiyotasının kompozisyonu genetik ve çevresel faktörlere bağlı olarak değişiklik göstermektedir. Örneğin, normal doğumla doğan çocuklar, annenin bağırsak florasının yaklaşık %40'ını miras alırken, sezeryan ile doğan bebeklerde mikrobiyota annenin cilt florasından, hastane ortamından ve diğer çevresel faktörlerden etkilenebilir. Yaşamın ilk iki yılında BM'nı belirleyen en belirgin faktör diyetdir. Sonraki yıllarda ise çekirdek olarak kabul edilen mikroorganizma türlerinde çok fazla değişiklik olmamakla birlikte, yaşa, diyete, ilaçlara ve çevreye bağlı olarak insanlar arasında mikrobiyota farklılık gösterir. Son on yılda yayınlanan çalışmalar, BM'nin kanser ve otizm, depresyon, *Clostridium difficile* enfeksiyonu, enfamatuvar bağırsak hastalığı, irritabl bağırsak sendromu, kolorektal karsinom, enfeksiyöz ve enfeksiyöz olmayan kronik karaciğer hastalıkları, obezite, diabetes mellitus tip 2, ateroskleroz ve kronik böbrek hastalıkları gibi çeşitli hastalıkların patogenezinde rol oynadığı doğrulanmıştır⁽²⁻⁷⁾.

lerin ekspresyonunu da düzenler. Baicalin kaspaz-3, kaspaz-9 ve B-hücreli lenfoma 2 gibi apoptotik proteinlerin üretimini azaltır. Düşük çözünürlüğü ve zayıf biyoyararlanımı nedeniyle, yaygın terapötik uygulamalar için çalışmalara ihtiyaç duyulmaktadır⁽⁷⁴⁾.

Sonuç olarak, bağırsak-karaciğer aksı insan sağlığı ile yakından ilişkilidir. Bağırsak mikrobiyotasının kronik karaciğer hastalıklarının patogeneğinde önemli bir role sahip olduğu aşikârdır. Kronik karaciğer hastalıklarında, probiyotiklerin ve fekal mikrobiyota transferinin terapötik potansiyeli doğrulan- sa da, bu tedavi seçeneklerinin güvenilirliği ile ilgili veriler ve mikrobiyota-konak etkileşimleri üzerindeki etkileri ile ilgili çalışmalar yetersizdir. Mikrobiyotaya dayalı tedavilerin endikasyonlarının, kontren- dikasyonlarının, tedavi sürelerinin ve dozlarının belirlenmesi için geniş spektrumlu prospektif kontrollü çalışmalara ihtiyaç duyulmaktadır.

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**NONALKOLİK YAĞLI KARACİĞER HASTALIĞI (NAFLD-NASH) VE
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Nonalkolik yağlı karaciğer hastalığı (NAFLD), alkol kullanımı gibi başka bir neden yokken ortaya çıkan karaciğer yağlanması ile karakterize bir hastalıktır ⁽¹⁾. Eşlik eden inflamasyon veya fibrozis olmaksızın hepatositlerde basit yağ birikiminden inflamasyon, nekroz ve fibrozisle seyredabilen steatohepatite kadar değişen bir histolojik spektrumu kapsar ^(2,3). Belirgin inflamasyon olmayan karaciğer yağlanması nonalkolik yağlı karaciğer (NAFL), alkolik steatohepatitten histolojik olarak ayırt edilemeyen bir hepatik inflamasyon ile karakterize hâli ise nonalkolik yağlı karaciğer hastalığı (NASH) olarak adlandırılır. NASH hastalarının karaciğerinde meydana gelen inflamasyon hastaların yaklaşık %20'sinde fibrozis ve siroza ilerler, dolayısıyla kriptojenik sirozun en önemli nedenlerinden biri olarak gösterilmektedir ⁽⁴⁾. Sedanter yaşam tarzının da etkisi ile metabolik sendrom, obezite ve diyabetin hızla arttığı günümüz toplumunda NASH ve buna bağlı gelişen karaciğer sirozunun gittikçe daha önemli bir sağlık problemi hâline geldiği görülmektedir.

Günümüzde NAFLD karaciğerin en sık hastalıklarından olup endüstriyel açıdan gelişmiş batı ülkelerinde daha yaygın görülmektedir. Dünya genelinde prevalansı %10 ile 45 arasında değişmektedir ⁽⁵⁾. ABD'de yapılan çalışmalarda karaciğer biyopsilerinde NASH saptanma oranı %3 ile %5 arasında gösterilmiştir ^(6,7). Tip 2 diyabet, obezite, hipertansiyon, dislipidemi ve polikistik over sendromu olan bireyler gibi bazı hasta gruplarında NASH prevalansı daha yüksektir ^(5,8,9). Yaşla birlikte sıklığı artmakta olup çoğu hasta 40 ve 50'li yaşlarda tanı alır ⁽⁷⁾. Cinsiyet ile ilişkisi ise tartışmalıdır, bazı çalışmalar kadınlarda ⁽¹⁰⁾, diğer bazı çalışmalar ise erkeklerde ⁽¹¹⁾ daha sık görüldüğünü raporlamaktadır.

NAFLD patogenezi henüz tam olarak aydınlatılabilmemiş değildir. Genetik faktörler, çevresel faktörler, insülin direnci ve bağırsak mikrobiyotasındaki değişikliklerin etiyolojisinde rol alan başlıca faktörler olduğu düşünülmektedir ⁽¹²⁾. Bu faktörler arasındaki etkileşim, bozulmuş lipid metabolizması ve hepatositlerde aşırı lipid birikimi ile NAFLD gelişimine yol açar ⁽¹³⁾. İnsülin direnci, hepatik yağlanma ve steatohepatit gelişiminde anahtar role sahiptir ^(14,15). Ayrıca steatohepatitin inflamatuvar bileşeninin ortaya çıkmasında hepatositlerde oksidatif hasarın da etkili olduğu öne sürülmektedir ⁽¹⁶⁾.

Bağırsak mikrobiyotası vücutta pro-inflamatuvar ve anti-inflamatuvar sitokinler arasındaki dengenin sağlanmasında rol oynar. Kişinin mikrobiyota özellikleri ve bu mikrobiyotada meydana gelen değişimler potansiyel bir oksidatif stres kaynağı olarak NASH patogenezinde önem taşır. Yapılan çalışmalar NASH hastalarında sağlıklı popülasyona göre intestinal bakteriyel aşırı çoğalmanın (SIBO) daha sık olduğunu ve buna bağlı bağırsak geçirgenliğinin arttığını ortaya koymaktadır ^(17,18). Ayrıca bazı bakteri

te simbiyotik verilmesinin tek başına yaşam tarzı değişikliklerine göre NAFLD tedavisinde daha üstün olduğunu gözlemlemişlerdir⁽⁸⁴⁾. Hayvan deneyleri ve klinik çalışmalardan elde edilen veriler, hem prebiyotikler hem de simbiyotiklerin NASH tedavisinde etkin olabileceğini göstermektedir. Ancak bu alandaki araştırmalar ve bilgiler henüz yetersiz olup etki mekanizmaları net olarak ortaya konulmamıştır.

Fekal Mikrobiyota Transplantasyonu (FMT): FMT bağırsak mikrobiyotasının sağlıklı vericiden hasta alıcıya aktarıldığı nisbeten yeni bir tedavi yaklaşımıdır. Böylece disbiyozis düzeltilerek daha sağlıklı bir mikrobiyota oluşturulmaktadır. Çalışmalar sağlıklı bireylerden alınan FMT ile, metabolik sendromlu hastalarda insülin duyarlılığında, bağırsak mikrobiyota çeşitliliğinde ve kısa zincirli yağ asidi üretiminde artış sağlayarak yararlı etkileri olduğunu göstermiştir⁽⁹⁶⁾. NASH tedavisinde FMT konusunda yapılan çok az çalışma vardır. Yakın zamanda yapılan bir çalışma bu alanda oldukça umut verici bulunmuştur⁽⁹⁷⁾. Bu çalışmada yüksek yağlı diyetle indüklenen NASH'li farelerde FMT'nun, serum transaminazlarının yanı sıra vücut ağırlığını ve yağ miktarını azalttığı saptanmıştır. Ayrıca bağırsak mikrobiyotasında Bacteroides miktarında bir artış, Acinetobacteria ve Firmucites miktarında bir azalma ile birlikte endotokseminin düzeldiği görülmüştür. Karaciğer biyopsilerinde ise NASH skorunun azaldığı izlenmiştir. FMT'nun etkinlik ve güvenliğini değerlendirecek yeni çalışmalara ihtiyaç bulunmaktadır.

Sonuç

NASH, sıklığı tüm dünyada gittikçe artan, siroz ve hepatosellüler karsinoma yol açabilen oldukça yaygın ve ciddi bir hastalıktır. Yapılan çalışmalar bağırsak mikrobiyotasının NASH patogenezinde rolünün oldukça önemli olduğunu göstermektedir. Dolayısıyla NASH tedavisinde en önemli potansiyel hedeflerden birinin de bağırsak mikrobiyotası olduğu düşünülmektedir. Günümüzde gittikçe artan sayıda klinik çalışma mikrobiyota odaklı tedavilerin NASH'te etkinliğini göstermektedir. Ancak bu konuda geliştirilen terapötik ajanlar henüz prelinik aşamadadır. Mikrobiyota hedefli tedavilerde uygun formülasyonların geliştirilmesi ve etkinliğinin gösterilmesi için geniş kapsamlı randomize kontrollü çalışmalara ihtiyaç vardır.

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Bölüm A28

ALKOL, KARACİĞER HASTALIĞI VE BAĞIRSAK MİKROBİYOTASI

Mustafa Altındış

Bilal Toka

Kerem Yılmaz

Alkol bağımlılığı, bireylerde ve ailelerde yaşam kalitesini ve süresini olumsuz etkileyen multisistemik bir durumdur. Dünya çapında oldukça yaygındır ve Amerika Birleşik Devletleri'ndeki yetişkinler arasında tahmini yaşam boyu yaygınlık oranı yüzde 18'dir. Diğer birçok organ sistemi gibi karaciğeri de etkiler ve bazı hastalarda alkolik karaciğer hastalığı gelişimine yol açar. Alkolik karaciğer hastalığı basit steatozla seyredebileceği gibi karaciğerde ortaya çıkan inflamasyon sonucu alkolik hepatit ve siroza ilerleyebilir. Dünya çapında morbidite ve mortalitenin önde gelen nedenlerindedir.

Alkol alımı, henüz karaciğer hastalığı olmayanlarda da bağırsak mikrobiyotasında değişikliklere yol açabilir. Bu değişiklikler karaciğer hastalığının gelişimi ve ilerlemesi ile daha da belirginleşir ve hatta hastalığın ilerlemesinde rol alır. Hepatik safra asidi üretimi ve bakteriyel biyotransformasyon gibi fonksiyonel mikrobiyal özellikler karaciğer hastalığının evrelerine paralel olarak değişir ve aktif alkol alımına devam eden sirozlu hastalar ile siroz olmayanlar arasında da farklılıklar gösterir. Bu değişiklikler alkolik karaciğer hastalığı olmayan hastalarda alkolün kesilmesinden sonra düzelebilir. Alkol alımı devam etmesi hâlinde ise alkolik karaciğer hastalığı gelişir.

Alkolik karaciğer hastalığının tedavisinde probiyotikler, fekal mikrobiyal transplantasyonu ve antibiyotikler ile bağırsak mikrobiyotasında oluşturulan değişikliklerin etkili olabileceğini gösteren kanıtlar mevcuttur. Bağırsak mikrobiyota değişiklikleri santral sinir sistemi fonksiyonlarını da değiştirebilir ve bağırsak-beyin eksenini alkolü bırakanlarda tekrar başlama riskini azaltmak için potansiyel bir hedef olabilir.

Alkolik karaciğer hastalığının tedavisinde alkolün bırakılması dışında tedavi seçenekleri sınırlıdır. Bu hastaların birçoğu alkolü bırakamamakta ve aktif alkol kullanımını nedeniyle hastalık siroza ilerlediğinde karaciğer transplantasyonu için aday olamamaktadır. Tedavi seçeneklerini sınırlayan bu durum göz önüne alındığında bağırsak-karaciğer ekseninin araştırılması ve yeni tedavi stratejilerinin geliştirilmesi büyük önem taşımaktadır. Bu multisistemik hastalığın tedavisinde hem alkolün kesilmesini hem de mikrobiyota değişimini ele alan yeni stratejilere ihtiyaç vardır.

Bu bölümde, alkolün ve alkolik karaciğer hastalığının bağırsak mikrobiyotası ile olan ilişkisi incelenmiştir.

Alkol Kullanımı

Dünya genelinde yaklaşık iki milyar kişinin hergün alkol kullandığı ve 70 milyondan fazla kişinin alkol kullanım bozukluğu tanısı aldığı tahmin edilmektedir ⁽¹⁾. Kronik alkol tüketimi, alkolik karaciğer hastalığı, kanser gelişme riski, bağışıklık sistemi anormal fonksiyonu, doku hasarı ve organ işlev bozukluğu ile bağlantılıdır. Ayrıca akut ve kronik enfeksiyonlar, pankreatit, kalp hastalığı riskini de artırır.

fazla, Actinobacteria miktarının ise daha az olduğu, glutatyon metabolizmasının artmış ve biyotin metabolizmasının azalmış olduğu gözlenmiştir⁽²⁶⁾. Ayrıca alkol kullananlarda Fusobakterilerin mikrobiyotada daha fazla olduğu, Bacteroideslerin ise tersine daha az olduğu gözlenmiştir. Endotoksemi de şiddetli alkolik hepatitli hastalarda hafif olanlara göre daha fazla saptanmıştır⁽³²⁾. Ayrıca farelerde yapılan bir çalışmada AKH'da alkol alımının bakteriler dışında, fungal aşırıçoğalmaya yol açtığı ve bunda artan karaciğer hasarı ile ilişkili olduğu gösterilmiştir⁽³³⁾. Ayrıca alkolik hepatite bağlı siroz hastalarında fungal enfeksiyonların mortalitesi daha fazla olmaktadır⁽³³⁾. Bu veriler alkolik hepatitli hastalarda bağırsak mikrobiyal kompozisyonu ve fonksiyonunda önemli değişiklikler olduğunu ve alkolik hepatit seyrinde mikrobiyotanın önemli rolü olabileceğini göstermektedir.

Alkolik Karaciğer Hastalığı Tedavisinde Mikrobiyota

Alkole bağlı karaciğer sirozu gelişen birçok hasta alkolü bırakmakta zorluklar yaşamakta ve karaciğer transplantasyonu için aday olamamaktadır. Dolayısıyla bu hastaların tedavisinde transplantasyon dışındaki yaklaşımlar daha çok ön plana çıkmaktadır. Bağırsak mikrobiyotasının AKH gelişimindeki rolü göz önüne alındığında tedavide de önemli rol alabileceği düşünülebilir. Hayvan deneylerinde *A. muciniphila* ve *L. Rhamnosus*'un alkole bağlı intestinal bariyer bozuklukları ve sistemik enflamasyonda düzelmeye sağlayabileceği gösterilmiştir^(19,25). AKH hastalarında bağırsak mikrobiyota modifikasyonunun etkisini araştıran çalışmalar az sayıda, düşük hasta sayısı içermekle birlikte sonuçları umut vericidir. Kirpich ve arkadaşları *Bifidobacterium bifidum* ve *Lactobacillus plantarum* verilen hastalarda standart tedavilere göre serum ALT AST seviyelerinde düşüş saptandığını göstermişlerdir⁽³⁴⁾. Han ve arkadaşları ise *Bacillus subtilis* ve *Streptococcus faecium* verilen hastalarda plaseboya göre karaciğer fonksiyonları, sistemik inflamasyon ve endotoksemide iyileşme saptamışlardır⁽³⁵⁾. Ayrıca fekal mikrobiyota transplantasyonu yapılan hastalarda mikrobiyotadaki patojenik türlerin azaldığı, karaciğer fonksiyonları ile sağkalımda iyileşme olduğu gösterilmiştir⁽³⁶⁾. Mikrobiyotanın AKH tedavisindeki rolünü araştıran randomize kontrollü çalışmalar AKH tedavisinde yeni bir pencere açarak önemli katkı sağlayabilecektir.

Sonuç

Yapılan çalışmalar kronik alkol tüketimi disbiyozise neden olduğunu göstermektedir. Oluşan disbiyozis, karaciğer hastalıklarının oluşumuna neden olabilmektedir. Alkol ve AKH gibi alkolizmle ilişkilendirilmiş hastalıkların tanı ve tedavisinde bağırsak mikrobiyotası gelecekte önemli bir parametre olarak kullanılacaktır. Aynı zamanda disbiyozis ile ilişkilendirilen birçok hastalıkta kullanım alanı bulan prebiyotikler, probiyotikler, sinbiyotikler ve polifenoller AKH gibi alkol ile ilişkilendirilen durumların tedavisinde de kullanılabilir. Daha fazla çalışma ile alkolün bağırsak mikrobiyotası üzerine etkileri çok daha iyi anlaşılabilir ve mikrobiyal kompozisyon replasmanları tedavide daha etkili kullanım alanı bulacaktır.

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*Yasemin Ertaş Öztürk**Efsun Karabudak**Ödül Eğritiş Gürkan*

Giriş

Çölyak hastalığı, genetik olarak yatkınlığı bulunan bireylerde gluten ve ilişkili prolamınler tarafından tetiklenen ve glutene bağlı klinik manifestoların varlığı ile karakterize immün-aracılı sistemik bir bozukluktur¹. Çölyak hastaları anemi, osteopeni, nöropatiler, gibi ekstraintestinal semptomlar ile tiroid hastalıkları, otoimmün hepatit ve Tip 1 diyabet gibi otoimmün hastalıkların artmış riski altındadır^{2,3}. Gerek tanının konulmasında, gerek tedavinin etkin bir şekilde uygulanmasında karşılaşılan güçlükler hastaların yaşam kalitesini olumsuz yönde etkiler^{4,5}.

Ülkeden ülkeye değişiklik gösterse de epidemiyolojik veriler çölyak hastalığının her 100 bireyden ortalama birini etkilediğini göstermektedir^{6,7}. Hastalığın prevalansı her geçen gün artmaktadır ve bu artışta tanı yöntemlerindeki gelişmelerin yanı sıra çevresel faktörlerdeki değişikliklerin de payının göz ardı edilmemesi gerektiğine vurgu yapılmaktadır⁸. Zira genetik yatkınlığa sahip her bireyde çölyak hastalığının görülmemesi hastalığın patogeneğinde çevresel faktörlerin rolüne işaret etmektedir⁹ ve gün geçtikçe genetik, immünolojik ve çevresel etmenlerin birlikte rol oynadığı bu hastalığın oluşumuna katkı veren fizyolojik süreçlere yönelik çalışmalar derinleşmektedir. Bu noktada intestinal mikrobiyotada oluşan disbiyozis ve konakçı mikrobiyom ilişkileri çölyakın gelişiminde çevresel bir risk faktörü olarak ele alınmaktadır¹⁰. Yapılan çalışmalarda yeni çölyak tanısı alan ve tedavi altındaki çocukların mikrobiyotalarında farklı takson düzeylerinde ayrışmalar olduğu ortaya konmuş ve hastalığın aktif döneminde potansiyel patojen mikroorganizmalarda artış, potansiyel yararlı türlerde ise azalmalar saptanmıştır¹¹⁻¹³.

Hayat boyu sıkı bir şekilde uygulanması gereken glutensiz diyet tedavisi çölyak hastalığında etkinliği kanıtlanmış tek tedavi şeklidir. Diyetten glutenin çıkarılması hızlı bir şekilde semptomların gerilemesini sağlar¹⁴. Ancak, glutensiz diyetler iyi planlanmadığı takdirde besin ögesi dağılımında dengesizlikler ve yetersizlikler görülebilmektedir¹⁵. Bu durum intestinal mikrobiyotayı etkileyebilmektedir¹⁶. Dolayısıyla ince bağırsaktaki mikrobiyota değişimlerine hastanın diyetindeki değişimlerin kendisi de katkı verebilmektedir. Böylece tedavi süresince gözlemlenen mikrobiyota değişimlerinin hastalığın gerilemesi nedeniyle mi yoksa glutensiz diyet içeriğinin etkisiyle mi gerçekleştiğinin ayırımı yapmak güçleşmektedir^{9,10}.

Son yıllarda, bağırsak mikrobiyotasının hem potansiyel non-invaziv tanı hem de tedavi yöntemi olarak kullanılabilir ipuçları vermesi açısından çölyak hastalığının patofizyolojisindeki yeri belirlenmeye çalışılmaktadır⁹. Bu konuda umut vaat eden çalışmalar konakçı ve mikrobiyom çapraz etkile-

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**İNFLAMATUVAR BAĞIRSAK HASTALIĞI VE BAĞIRSAK
MİKROBİYOTASI**

Alpaslan Tanoğlu

Taner Akyol

İnflamatuvar bağırsak hastalıkları (İBH); genetik zemini olan, kronik inflamasyonun hâkim olduğu, aktivasyon ve remisyon dönemleriyle karakterize bir hastalık grubudur. Crohn hastalığı (CH) ve ülseratif kolit (ÜK) olmak üzere iki ana klinik formu ile daha nadir olarak rastlanılan ‘indetermine kolit’ten oluşmaktadır. Batılı ülkelerde daha sık rastlanmakla birlikte, hastalık insidansı tüm dünyada artmaktadır. İBH etiyojisi üzerine odaklanan bilimsel çalışmalar; konağın genetik özellikleri ve immün cevaplar, mikrobiyota ve çevresel etmenler üzerine yoğunlaşmaktadır⁽¹⁻³⁾.

Bağırsak mikrobiyotası içerdiği bakteri, fungus, virüs ve diğer mikroorganizma çeşitleri ile konakçı için ikincil bir organ sistemi gibi davranmakta ve çeşitli kritik roller üstlenmektedir. Son dönemlerde elde edilen bilimsel veriler, bağırsak mikrobiyotasındaki ‘disbiyoz’ olarak adlandırılan bozuklukların İBH ile ilişkili olduğunu ortaya koymuştur⁽⁴⁻⁶⁾. Yeni nesil dizileme tekniklerinin kullanıma girmesiyle birlikte, mikrobiyotadaki değişimlerin daha hassas belirlenebilmesi bu ilişkiyi destekler verilerin alınmasını kolaylaştırmıştır.

Bağırsak Mikrobiyotası ile İnflamatuvar Bağırsak Hastalığı İlişkisi**Bakteriyel Mikrobiyota**

Bağırsak mikrobiyotasında baskın olan komponent bakterilerdir. Bağırsaklarda yaklaşık 1000 çeşit bakteri türü olduğu ve bu türlerin sahip oldukları genlerin, insan genomuna göre 100 kat fazla olduğu, tahmin edilmektedir⁽⁷⁻⁸⁾. Bu kadar çeşitlilik gösteren ve geniş bir genom yapısına sahip olan bu bakteriyel içerik, sindirim faaliyetlerine katılmak ve zararlı mikroorganizmaların baskılanması gibi faaliyetlerde rol almanın yanı sıra bağırsakta immün sistem ile de etkileşime girmektedir⁽⁹⁻¹⁰⁾. Firmicutes, Bacteroidetes, Actinobacteria ve Verrucomicrobia türleri sağlıklı bağırsak mikrobiyotasında baskın olan bakteri türleri olmakla birlikte, hangi türlerin bağırsaklardaki düzeylerinin değişmesine bağlı inflamatuvar bağırsak hastalığı geliştiği net olarak cevaplanmayı bekleyen önemli bir soru olarak karşımızda durmaktadır^(11,12).

Bağırsak mikrobiyotası; proksimal ya da distal bağırsaklardaki yerleşimine göre ve mukozal-lüminal içerik etkileşimlerine bağlı olarak bireylerarası değişim gösterebilen bir yapıdır^(13,14). Doğumla birlikte gelişmeye başlayan bağırsak biyotası, yaşamın ilk yıllarında çeşitli besin ürünlerinin diyetle girmesiyle birlikte daha karmaşık bir hâle gelmektedir. Ancak ilerleyen yaşlarla birlikte; diğer çevresel etmenler, beslenme alışkanlıkları, antibiyotik kullanımı ve pre-probiyotik tüketimine göre mikrobiyota daha kararlı bir hâl almakta ve aynı zamanda kişisel özelliklere bürünmektedir^(15,16). Bu etmenlere ilave

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İRRİTABL BAĞIRSAK SENDROMU VE MİKROBİYOTA

Hakan Alagözlü

Tanı

Huzursuz Bağırsak Sendromu veya İrritabl Bağırsak Sendromu (İBS), organik bir hastalığın dışlandığı durumlarda semptomlara dayalı olarak tanısı konulan fonksiyonel bir hastalıktır. İBS yapısal veya biyokimyasal anomalilik içermez. Tanı koydurucu bulguları semptomlarıdır. İBS tanı kriterleri 1978'de Manning kriterlerinin yayımlanması ile gelişmeye başlamıştır. Manning kriterleri tanı koymada yetersiz olduğunda; 1989'da Rome kriterleri, 1999'da Rome II kriterleri, 2006'da Rome III kriterleri, 2016'da Rome IV kriterleri konulmuştur. Rome IV kriterlerine göre; son 3 ay içerisinde, haftada en az 1 gün olan karın ağrısına 3 bulgudan en az 2'sinin eşlik etmesi (semptomların defekasyonla hafiflemesi, dışkılama sıklığında değişmesi, dışkının şekil ve görünümünde değişme olması) ile İBS tanısı konulmaktadır. Semptomların hasta başvurmadan en az 6 ay önce başlamış olması gerekmektedir. ROME-II'de destekleyici bulgular olarak gösterilen acil defekasyon, ıkmama, yetersiz boşalma, mukuslu dışkılama ve şişkinlik, karında gerginlik hissi destekleyici bulguların sorgulanması İBS tanısı için yardımcı olabilir ⁽¹⁾.

Etiyoloji

Visseral hipersensitivite: Genellikle hastalar, karında şişkinlik hissinin çok fazla gaz oluşmasına bağlı olduğunu düşünür. Aslında çoğunlukla gaz miktarı normaldir, ancak İBS'li hastalar çok gaz varmış gibi algılar. Çünkü gaza karşı hipersensitivite mevcuttur ⁽²⁾. Visseral hipersensitivite, kendini alodini (ağrılı olmayan uyarıyı ağrılıymış gibi algılamak) veya hiperaleji (ağrılı uyarıyı olması gereken çok daha abartılı algılamak) şeklinde gösterebilir. İBS'li olgularda rektal balonla distansiyonda, İBS'li olguların ağrı eşiklerinin kontrol grubundan daha düşük olduğu tespit edilmiştir ⁽³⁾.

Gıda intoleransı: Hastalar, bazı gıda ürünleri ile semptomlarının arttığını, hatta atak geçirdiklerini ifade etmektedirler. Bunlar arasında yağlı gıdalar, gaz üreten gıdalar, bakliyatlar, alkol, kafein, gazlı içecekler, laktoz, fruktoz ve bazen çözünmeyen fiber sayılabilir. Gıda eliminasyon diyeti yapanlarda, dışkılama sıklığı, ağrı ve yaşam kalitesinde düzelme olduğu tespit edilmiştir ⁽⁴⁾. Gıdalar tüm İBS semptomlarından sorumlu değildir. Ancak farklı diyet uygulamaları İBS hastalarında düzelme sağlayabilmektedir.

Psikososyal faktörler: İBS'de, gastrointestinal semptomların, psikososyal süreçlerle beynin bağırsak aksını etkilemesi sonucu oluştuğu düşünülmektedir ⁽⁵⁾.

Post-Enfeksiyöz İBS

Enfeksiyöz gastroenteritli hastaların %4-36'sında Post-Enfeksiyöz İBS (PE-İBS) görüldüğü rapor edilmiştir ⁽⁶⁾. Akut bir gastroenterit atağını takiben oluşan süreklilik gösteren karın ağrısı ve diyare ola-

gerekse diyare dominant-İBS hastalarının fekal mikrobiyota sonuçları primer sonuçlarla tutarlı olduğu gösterilmiştir. Yalnız sadece Çin çalışmalarında İBS hastalarında sağlıklı kontrollere göre sadece fekal *Bacteriodes* sonuçlarında anlamlı artış bulunmuştur ($p < 0.01$)⁽¹⁸⁾.

İBS'de SİBO'da gördüğümüz metan üreten bakterilerin daha çok kabızlık yaptığı, bağırsak transit zamanını arttırdığını görmekte iken hidrojen üreten bakterilerin daha çok ishal tipi İBS yaptığını görmekteyiz⁽¹⁹⁾. İBS'nin ishal dominant tipinde bakterilerin, kontrol grubuna göre kolonositlerin enerji kaynağı olan butiratı ise daha az ürettiği görülmüştür⁽²⁰⁾. Başka bir çalışmada ise *Faecalibacterium prausnitzii* seviyelerinin ise anlamlı olarak düşük olduğu saptanmıştır⁽²¹⁾.

Sonuç olarak İBS bağırsak mikrobiyota disbiyozisi ile karakterize bir hastalıktır. Prospektif daha geniş skala içeren çalışmalar İBS'de görülen disbiyozise daha da ışık tutacaktır.

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GIDA KATKI MADDELERİNİN MİKROBİYOTA VE METABOLİZMA ÜZERİNE ETKİLERİ

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Giriş

Gıda katkı maddeleri gıdaların üretim süreci içerisinde gıdaların renk, tat, koku, besin değeri ve raf ömrü gibi özelliklerini iyileştirmek amacıyla gıdalara katılan maddelerdir. Bu maddeler gıda paketleri üzerindeki etiketlerin “içindekiler” kısmında belirtilmektedir. Gıda katkı maddelerinin kullanılmasına izin verilmeden önce birçok toksikolojik araştırma yapılmaktadır. Bu araştırmalar sonucunda öncelikle hayvanlar için güvenli miktarlar belirlenir, daha sonra emniyet katsayısı olan 100'e bölünerek insanlar için güvenli olan ADI (günlük alınmasına izin verilen) düzeyler belirlenir. Bu düzey üzerinden gıdalarda hangi miktarlarda kullanılacağı hesaplanır. Gıdalarda kullanılmaya başlandıktan sonra herhangi bir olumsuz etkiye yol açıp açmadığı takip edilir. Yapılan araştırmalar belirli periyotlarda değerlendirilerek olumsuz etkiye yol açan dozlar dikkate alınarak ADI değerleri düşürülebilir veya ciddi bir yan etki söz konusu ise kullanımı yasaklanır. Dolayısıyla kullanılmasına izin verilen katkı maddeleri orta düzeyde güvenli kabul edilir.

Yeni teknikler ve araştırma konuları ortaya çıktıkça katkı maddelerinin yan etkilerine ilişkin yeni bulgular ortaya koyulabilmektedir. Mikrobiyota konusu da son yıllarda üzerinde daha yoğun çalışılmaya başlanılan bir konudur. Mikrobiyota ve gıda katkı maddeleri ilişkisi yeni araştırmalara konu olmaktadır.

İnsan, %10 insan ve %90 mikrobiyal hücrelerin birleşiminden oluşan bir süperorganizmadır⁽¹⁾. İnsan ve mikrobiyal genomlar (hologenom) zaman içerisinde beraber gelişmiş, metabolizmaları ve varlıklarını sürdürebilme özellikleri ayrılmaz şekilde birbirlerine karışmıştır. Bakteriler, virüsler ve bazı tek hücreli ökaryotların oluşturduğu mikroorganizmaların bir arada toplanması ile mikrobiyota meydana gelir.

Bağırsak mikrobiyota genomu 3,3 milyondan fazla geni kodlamaktadır. Bu miktar yaklaşık olarak insan genomunun 150 katına tekabül etmektedir. Bağırsak mikrobiyomunda Firmicutes, Bacteroidetes, Actinobacteria, Proteobacteria, Fusobacteria ve Verrucomicrobia olmak üzere 6 bakteri şubesine (filumuna) ait binlerce tür bulunmaktadır. Bağırsak mikrobiyotası genotiplere, yaşanılan coğrafyaya, yaşam stiline ve yaşa bağlı olarak oldukça dinamik ve değişken bir yapıya sahiptir. Mikrobiyomik değişim doğumla birlikte başlar. İlk yılda dramatik olarak değişen mikrobiyom 2,5 yaşında erişkindekilere benzer şekilde ulaşır ve yaşlılık dönemine kadar göreceli olarak değişmeden kalır⁽²⁾.

Bağırsak mikrobiyotası birey sağlığı için oldukça önemlidir. Birçok fizyolojik olayın düzenlenmesinde görev alırlar. Bağırsaklardaki mukus tabakasında yerleşir ve şekillenmesinde yer alırlar. Lif gibi gıdaların sindirimine yardımcı olurlar; bazı vitamin ve amino asitleri sentezlerler, enerji metabolizması

Sonuç

Günümüze kadar çok az sayıdaki katkı maddesinin mikrobiyotaya üzerine etkileri araştırılmıştır. Bu çalışmalarda katkı maddelerinin çoğunluğu olumsuz, az bir kısmının ise olumlu gibi görünen etkiler göstermişlerdir. Çalışılanların büyük çoğunluğunu tatlandırıcılar oluşturmaktadır. Bu yüzden tatlandırıcılarla ilgili nisbeten bazı çıkarımlar yapılabilmektedir.

Sentetik tatlandırıcılar mikrobiyotayı etkilemekte ve mikrobiyotada oluşan değişiklik glikoz intoleransına ve muhtemel kilo artışına yol açmaktadır. Kalori değeri olmayan sentetik tatlandırıcıların yol açtığı bu sonuçlar aslında beklenen tersi yöndedir. Bununla beraber kilo vermek amacıyla sentetik tatlandırıcı kullanmanın faydasız olduğunu gösteren birçok çalışmanın da bir anlamda izahı yapılmış olmaktadır. Tatlandırıcılardan şeker alkollerini ise sentetik tatlandırıcıların aksine büyük oranda mikrobiyotayı olumlu yöne etkilemekte ve bir prebiyotik gibi davranmaktadır. Eritritol gibi istisnaları bir kenara koyarsak mikrobiyotaya açısından bu katkıların kullanılması olumlu bir etki yapmaktadır. Bunun yanında fazla kullanılması bağırsaklarda gaz oluşumunu artıracak ve özellikle spastik kolon gibi hastalığı olanlarda rahatsızlık oluşturabilecektir.

Tatlandırıcılar dışındaki katkı maddelerinin çokluğu, yapılan araştırma sayısının azlığı ve deney hayvanlarının ve modellerinin farklılığı nedeniyle net bir sonuç çıkarılamamaktadır. Bu yüzden gıda katkı maddelerinin birçoğu kullanılarak insanlar üzerinde yapılacak çok sayıda çalışmaya ihtiyaç vardır.

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**BAĞIRSAK MİKROBİYOTASININ OBEZİTE,
İNSÜLİN DİRENCİ VE DİYETTEKİ ROLÜ***Mendane Saka*

Obezite ve Tip 2 diabetes mellitus (T2DM), uzun süreli sağlık sorunlarıyla ilişkili yaygın, küresel düzeyde önemli kronik metabolik bozukluklardır. Bağırsak mikrobiyotasının, konak homeostazının korunmasında, obezite ve T2DM etiyojisinde ve ilerlemesinde temel patofizyolojik rollerde yoğun bir şekilde yer aldığı açık hâle gelmiştir ⁽¹⁾. Zayıf bireyler obezler ile karşılaştırıldığında obezlerde bağırsak mikrobiyotasının değişmiş ve daha az mikrobiyal çeşitlilik ile karakterize olduğu, obezlerden steril farelere mikrobiyota transferinin ise obez fenotip transferi ile sonuçlandığı belirlenmiştir ⁽²⁾.

Gastrointestinal sistemde (GİS), tüm vücutta bulunan hücrelerin yaklaşık 10 katı kadar mikroorganizma bulunmakta ve insan genomundan 150 kat daha fazla gen çeşitliliğine sahip olduğu düşünülmektedir. Vücudumuzda 2000 bakteri ailesi, 15.000-35.000 türün üzerinde bakteri bulunmaktadır ve bunların çok büyük bir kısmı bağırsaklarda yerleşmiştir ⁽³⁾. İnsan Mikrobiyom Projesinde bağırsak mikrobiyotasının binlerce tür içerdiği ve bu türlerin kişiye bağlı olarak değişiklik gösterdiği bulunmuştur (Tablo 1) ^(6,7,8). Mikrobiyota bireye göre farklılık gösterse de temel tür genlerinin birçok bireyde benzer olduğu görülmektedir ⁽⁶⁾. Bireyler yaşamı boyunca bağırsak mikrobiyotasını etkileyecek birçok evreden geçmektedir. Yaşamın bebeklik, yetişkinlik ve yaşlılık dönemi ile beraber ergenlik, gebelik ve emzicilik gibi farklı yaşam evrelerinde de bağırsak mikrobiyotasında farklılıklar gözlenmekte, aynı zamanda bireyin yaşam tarzı ve hastalıklara bağlı olarak da mikrobiyota değişmektedir.

Tablo 1. İnsan mikrobiyotasında baskın bakteriler.**Firmicutes (60-80%)***Ruminococcus**Clostridium**Lactobacillus***Bacteroidetes (20-30%)***Bacteroides**Prevotella**Xylanibacter***Actinobacteria (< 10%)***Bifidobacterium***Proteobacteria (< 1%)***Escherichia**Enterobacteria*

te, insulin direnci ve glukoz metabolizmasında düzelmeye sağlayabilir. Diyetin enerji ve makrobesin ögeleri açısından yeterli ve dengeli olması, günlük önerilerin üzerinde yağ ve protein tüketilmemesi, bitkisel protein kaynakları ve bitkisel yağların tercih edilmesi, besin çeşitliliğinin sağlanması, doğal prebiyotik kaynakları olan posa bileşenlerini içeren bitkisel kaynaklı besinler ile doğal probiyotik kaynakları olan fermente besinler ile zenginleştirilmesi önemlidir.

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BAĞIRSAK MİKROBİYOTASI VE DİYABETES MELLİTUS

Gülsüm Kaya

Aysun Kaya

'Tüm hastalıklar bağırsakta başlar'

Hipokrat, MÖ 400¹.

Diyabetes mellitus (DM) insidansı dünya çapında artmaktadır. 2019'da 463 milyon kişinin DM'li olduğu ve bu sayının 2030'a kadar 578 milyona ve 2045'e kadar 700 milyona ulaşacağı tahmin edilmektedir. Zaman içinde insan ve mikrobiyal genomlar birlikte gelişmiş, metabolizmaları ve varlıklarını sürdürebilme özellikleri ayrılamaz şekilde birbirlerine karışmıştır. Bağırsak mikrobiyotası, bakteriler, virüsler ve bazı tek hücreli ökaryotların oluşturduğu mikroorganizmaların bir arada toplanmasıyla meydana gelir. Bağırsak mikrobiyotası ile birçok hastalık arasında mekanistik bağlantı sağlayan hayvan ve insan çalışmaları bilinmekteydi. Fakat son yıllarda toplanan kanıtlar göstermiştir ki bağırsak mikrobiyotasında bulunan bakteriler çeşitli hastalıkların oluşumunda ve tedavisinde rol oynamaktadır. Faydalı bakterilerin azalması ve zararlı bakterilerin artması olarak tanımlanan mikrobiyal disbiyozis ile DM'nin ilişkili olduğunu gösteren çalışmalar mevcuttur. Mikrobiyal disbiyoziste karbonhidrat ve proteinlerin fermentasyonu yoluyla zararlı metabolitler artmakta ve safra asitlerinin bileşiminde değişiklikler oluşmaktadır. Bağırsak mikrobiyotasının vücut ağırlığı, safra asidi metabolizması, proenflamatuar aktivite ve insülin direnci ve bağırsak hormonlarının modülasyonu üzerindeki etkisi yoluyla konağı etkilediğine dair açık kanıtlar vardır. Bununla birlikte bağırsak mikrobiyotasının probiyotikler, prebiyotikler, antibiyotikler ve fekal mikrobiyota transplantasyonu kullanılarak modüle edilmesi, konakçıda glikoz metabolizmasında ve insülin direncinde iyileşme için faydalara sahip olabilir. Son yıllarda bağırsak mikrobiyotasının hastalık ve sağlık üzerine etkileri büyük ilgi görmüştür. Bağırsak mikrobiyotası ve DM arasındaki etkileşimin anlaşılması, hastalığın önlenmesi ve tedavisine önemli katkılar sağlayacaktır.

Bağırsak Mikrobiyotası

Zaman içerisinde insan ve mikrobiyal genomlar birlikte gelişmiş, metabolizmaları ve varlıklarını sürdürebilme özellikleri ayrılamaz şekilde birbirlerine karışmıştır. Bağırsak mikrobiyotası, bakteriler, virüsler ve bazı tek hücreli ökaryotların oluşturduğu mikroorganizmaların bir arada toplanmasıyla meydana gelir. Mikrobiyota, insanlarda bulunan mikroorganizmaların tamamı; mikrobiyom ise mikroorganizmaların genomudur². İnsan, %10 insan ve %90 mikrobiyal hücrelerin birleşmesiyle oluşan bir süperorganizmadır^{1,3}. İnsandaki gen sayısı 35.000 iken bakteriyel genom sayısı 2 milyondan fazladır. Bir başka deyişle vücudumuzdaki bakteri genomu, insan genomundan 150 kat daha fazladır. İnsan ve mikrobiyal genomunun birlikteliği hologenom olarak adlandırılmaktadır⁴. İnsan bağırsağında yerleşmiş bakterilerin yüzey alanı 400 m², bakteri ağırlığı ise yaklaşık 1.5-2 kg'dır^{2,5,6}. Bağırsak mikrobiyotası bakteriler, virüsler ve bazı tek hücreli ökaryotları içeren 100 trilyon (10¹⁴) hücreden oluşmaktadır⁷.

antidiyabetik etkisinde rol oynayabilir. Bununla birlikte, insanlarda uzun süreli antibiyotik kullanımı kilo almı ve obezite ile ilişkilendirilmiştir. Enfektif endokardit için 6 hafta boyunca vankomisin ve gentamisin tedavisi alan hastalarda önemli kilo artışı gözlenmiştir⁴⁷. Hernández ve arkadaşları, 14 gün boyunca intravenöz β -laktam tedavisinin, insan gastrointestinal sisteminde glikozidaz aktivitesini arttırdığını, beden kitle indeksi ve glikoz seviyesiyle ilişkili olduğunu gözlemlemişlerdir³¹. Farklı antibiyotiklerin ve uygulama yollarının metabolizma ve T2DM üzerindeki etkilerini araştırmak için ileri çalışmalar yapılmalıdır.

Fekal mikrobiyota transplantasyonu

FT, sağlıklı vericiden alınan gaitanın süspanse hâle getirilerek tedavi amacıyla alıcının sindirim sistemine nakledilmesi işlemidir⁴⁸. FT'de alıcının gastrointestinal sistemine yerleştirilen insan bağırsak mikrobiyotasının bir doku olarak düşünülmesi gereklidir⁴⁹. FT ilk kez tedavi amacıyla 1958'de Eiseman ve arkadaşları tarafından uygulanmış ve sağlıklı bireylerden alınan FM dört kritik psödomembranöz enterokolitli hastaya transplante edilmiştir⁴.

Son zamanlarda, FT dikkati çekici, etkili ve kabul edilebilir bir tedavi yaklaşımıdır. Yapılan bir çalışmada tekrarlayan *C. difficile* enfeksiyonu olan 19 hastaya kolonoskop aracılığı ile donör dışkısı infüze edilmiş ve 6 ay ile 5 yıl arasındaki hasta takiplerinde *C. difficile* enfeksiyonu olan tüm hastaların tedavisinde başarı sağlandığı raporlanmıştır⁵⁰. Bu sonuç aynı zamanda fekal transplantasyonun metabolik sendrom ve T2DM'deki terapötik etkisine olan ilgiyi de artmıştır. 6 hafta boyunca allojenik yağsız donörlerden ince bağırsak dışkı mikrobiyotası infüzyonları alan metabolik sendromlu hastalar, butirat üreten bağırsak mikrobiyotasındaki artışla birlikte periferik ve hepatik insülin hassasiyetinde bir iyileşme gösterdiği bildirilmiştir⁴⁶.

Sonuç olarak, 21. yüzyılın en hızlı büyüyen küresel sağlık acillerinden biri DM'dir. Bağırsak mikrobiyotası ile DM ve obezitenin ilişkili olduğunu gösteren çalışmalar dikkatleri bu konunun üzerine çekmiştir. Son zamanlarda yapılan çalışmalar ile bağırsak mikrobiyotasının önemi daha iyi anlaşılmış, DM'nin patogenezinde bu karmaşık sistemin aydınlatılması ile mikrobiyotanın hangi mekanizmalar ile konağın enerji metabolizmasına etki ettiği ortaya çıkarılmıştır. Mikrobiyotanın patogenezi ve önemi açığa kavuşturulmuş, gelecekte mikrobiyota bir belirteç olarak tanı ve tedavide kullanılacaktır. Bağırsak mikrobiyotasının probiyotikler, prebiyotikler, antibiyotikler ve FT kullanılarak modüle edilmesi, konakçıda glikoz metabolizmasını ve insülin direncini iyileştirmede faydalara sahip olabilir. DM'nin bağırsak mikrobiyotası değişimi üzerindeki etkilerini daha iyi anlamak ve DM'de yeni tedavilerin geliştirilmesini sağlamak için daha fazla ve uzun süreli çalışmalara ihtiyaç vardır.

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ENFEKSİYON HASTALIKLARININ PATOGENEZİNDE MİKROBİYOTANIN ROLÜ

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Ayşe Betül Şahin

Hande Toptan

İnsan üzerinde ve vücut boşluklarında; insan ile birlikte yaşayan kommensal, simbiyotik, parazitik ve patojenik mikroorganizmaların tümü insan mikrobiyomu olarak adlandırılır. Uzun yıllar hastalıklar ile ya da sağlıklı olma ile ilişkisi bilim insanları için ilgi çekici bir araştırma konusu olmuştur. Konakçının genetik özellikleri, beslenme alışkanlıkları, çevresel faktörler mikrobiyomun oluşmasına neden olduğu gibi her bireyde farklı özelliklerde olmasına yol açmaktadır. İnsan mikrobiyomunun içeriği, fonksiyonları, metabolik yollardaki etkileşimleri, çeşitli hastalıklarla ilişkileri, immün sistem üzerine etkileri ve hatta sağlıklı bireylerdeki yapısı; gelişen laboratuvar tekniklerinin ve ileri sekanslama tekniklerinin yardımı ile incelenmeye başlanmıştır. Özellikle İnsan Mikrobiyom Projesi (Human Microbiome Project-HMP) ve İnsan İntestinal Sisteminin Metagenomiği Projeleri (Metagenomics of the Human Intestinal Tract (MetaHIT) insan mikrobiyomu oluşturan genlerin ve genom raporlarının incelenmesinde en kapsamlı çalışmalardır.

Doğumdan itibaren gelişen insan mikrobiyomu, bağışıklık sisteminin gelişmesinde enfeksiyon hastalıklarını önlemede önemli rol oynamaktadır. Doğum ile birlikte bağırsak ilişkili lenfoid dokunun gelişmesi, efektör T hücreleri ve regülatör T hücreleri gibi T hücre alt gruplarının oluşmasında kommensal mikrobiyom rol alır. Diğer bir anlatımla, intestinal epitel ve mikrobiyomun hayat boyu sürececek sürekli bir etkileşim içinde olması doğal ve adaptif bağışıklık üzerinden intestinal bağışıklığın dengede kalmasını sağlar. Bu dengenin bozulmasının, birçok metabolik ve sendromik bozuklukların, sistemik ve enfeksiyon hastalıklarının ortaya çıkışı ile ilişkili olabileceği düşünülmektedir.

Miktar ve tür olarak tüm mikroorganizmaların tanımlanması, bu mikroorganizmaların birbirleri ve konakçı organizma ile ilişkileri, bu ilişkideki metabolik yollar, bu etkileşimin sonucu organizmanın bağışıklık cevapları daha farklı birçok değişkene ait karanlıkta kalan veriler ortaya çıkarıldıkça, öncelikle sağlıklı bireyin bu durumunun korunması ve daha sonra hastalıkların tedavisinde yeni umutların ortaya çıkması kaçınılmaz olacaktır.

Bir enfeksiyonun oluşması 3 yolla gerçekleşebilir:

1. Konağın enfeksiyona duyarlılığı (konağın immünitesi, alta yatan hastalık, yaş vb.),
2. Bakterinin virulansı,
3. Konakçı-bakteri arasındaki etkileşim için uygun ortamın olması.

Enfeksiyona neden olan fırsatçı patojenler (*E. coli*, *Candida* gibi) normal flora, steril vücut bölgelerinde bulunabilir. Eşlik eden hastalıklar, immünsüpresyon ve yanık vb durumlar bu bakteriler için

Biyofilm ile ilişkili hastalıklar;

Kateter protez enfeksiyonları, Endokardit kistik fibrozis osteomyelit, Vajinal tamponlara bağlı toksik sok sendromu (TSS), Prostatit, Yara yeri enfeksiyonları, Nekrotizan fasiit, Safra yolu enfeksiyonları, Kronik otitis media, Kronik sinüzit dental plaklar greft enfeksiyonu, Sütür enfeksiyonlarını biyofilm ile ilişkilendiren çalışmalar mevcuttur.

Mikrobiyota Kistik Fibrozis İlişkisi

Florada bulunan *S.pyogenes*, *H.influenzae*, *S.pneumoniae*, *N.meningitidis* ve *S.aureus* gibi patojenler, akciğer bariyeri hasarlanırsa lümeninden steril alana girerek ciddi enfeksiyonlar yapabilirler.

Bu nedenle akciğer mikrobiyotasında simbiyont ve patobiyontların sağlıklı oranlarda bulunması, böylece mukozanın gereksiz yangısal reaksiyonlara girmemesi önemlidir.

Kistik fibroz (kalın bir mukus, Mukosiliyer aktivite bozulmuş), KOAH ve astımda mikrobiyota değişmiş olduğundan hasta enfeksiyonlara açıktır.

Bağırsaktaki mikrobiyotanın kısa-zincirli-yağ asidi üreten hâle değişmesi durumunda akciğer mikrobiyotasının kompozisyonu değişerek alerji de gelişir. Sonuç olarak; hastalıklar ile mücadelede tek tek mikroorganizmaları değil biyofilm mimarisini ve bu yapı içinde quorum sensing sistemlerini hedef almak daha doğru bir yaklaşım olabilir.

Sonuç

Mikrobiyota/enfeksiyon ilişkisi; fekal mikrobiyota transferi ve probiyotiklerin kanıtlanmış terapötik rolleri ile mikrobiyomun bulaşıcı hastalıklarla ilişkisinin gözden geçirilmesidir. Mikrobiyota transplantasyonu ve mikrobiyom bileşimi ile bulaşıcı hastalık riski arasında güçlü bir ilişki gelecek konularıdır. Mikroorganizmalar ve enfeksiyonla mücadelede yeni yaklaşımlara gereksinim olduğu açıktır. Bu yeni yaklaşımların odağında da mikrobiyota ve detayları olacaktır. Akılcı ilaç kullanımı insan sağlığının her alanında olduğu gibi mikrobiyotanın da korunmasında göz ardı edilmemelidir.

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Giriş

Pek çok organizmanın zamana bağlı olarak dış dünyada tekrar eden etkenlere karşı döngüsel olarak biyokimyasal, fiziksel ve davranışsal olarak gösterdikleri değişikliklere biyolojik ritim adı verilmektedir. Biyolojik ritimler döngü sürelerine göre sirkadiyen, infradiyen, ultradiyen gibi alt gruplara ayrılmaktadır¹. Latince “*circa diem*” olarak ifade edilen sirkadiyen, kelime anlamı olarak yaklaşık bir gün olarak tanımlanmaktadır. Sirkadiyen ritim ise, dünyanın kendi eksenini etrafında yaklaşık 24 saat süren dönüşünün canlılar üzerinde oluşturduğu ritimlerin bir gün içinde tekrar edilmesidir. Sirkadiyen ritimler bakteriler, mantarlar, bitkiler ve hayvanlar dâhil birçok organizmada bulunan 24 saatlik ritim kalıplarıdır ve organizma içerisinde endojen olarak üretilirler². Sirkadiyen saatler hücrelerin, organların, sistemlerin ve davranışların 24 saatlik fonksiyonlarını düzenler. Organizmanın 24 saatlik yaşam periyodu, aktif olunan zamanlar, dinlenme zamanları, açlık-tokluk döngüleri, gastrointestinal fonksiyon, metabolik süreçler ve hücrel transkripsiyonlar ile transkripsiyonlar gibi çok çeşitli hücrel adaptasyonları kapsar³. Bireyin genel sağlık ve fizyolojik homeostazini belirlemede önemli role sahip olan sirkadiyen ritmin ana zamanlayıcısı anterior hipotalamusta bulunan suprakiazmatik çekirdektir. Ana merkez olan suprakiazmatik çekirdeğin (SCN) otonom sinir sistemi yolu ile periferel dokularda yer alan saatleri de senkronize ettiği, karaciğer, böbrek, pankreas ve bağırsaklar gibi periferel dokularda meydana gelen metabolik olaylarla birlikte karanlık-aydınlık ve uyku-uyanıklık döngülerinin koordinasyonunda rol aldığı bildirilmektedir⁵. Sirkadiyen ritimin, periferel saatlerden birisi olan gastrointestinal sistem saat fonksiyonları üzerinde geniş etkisi olduğu, bağırsak mikrobiyotasının da günlük ritimsel varyasyonlar gösterdiği ve vardiyalı çalışma, jet lag gibi sirkadiyen ritim bozukluklarına neden olan etmenlerin disbiyozise yol açtığı belirtilmektedir. Diğer taraftan bağırsak mikrobiyotasının da sirkadiyen ritmi etkilediği belirtilmektedir. Özellikle besin alımı zamanları bağırsak mikrobiyotasındaki günlük salınımları belirlemede ve beslenme gastrointestinal periferel saati için potansiyel bir zamanlayıcı olarak değerlendirilmektedir^{5,6}.

Sirkadiyen Ritimin Moleküler Mekanizması

Hücrel düzeyde sirkadiyen ritim, pozitif ve negatif geri bildirimler içeren moleküler bir ağ tarafından kontrol edilir (Şekil 1). Bu ağın pozitif geri bildirim döngüsündeki moleküler genler CLOCK ve BMAL1 isimli transkripsiyon faktörü kodlayan genlerdir. CLOCK (circadian locomotor output cycles kaput) bir histon asetil transferaz olup BMAL 1 (brain and muscle arnt like protein 1) ile heterodimerize olduğunda aktive olur. Heterodimer formunda aktifleşen CLOCK ve BMAL1 proteinleri, Period (Per 1, Per 2, Per 3) ve Cryptochrome (Cry 1, Cry 2) gibi sirkadiyen ritim genlerinin transkripsiyonunu düzenler. Sirkadiyen ritim genlerinin sentezini kontrol eden BMAL1 transkripsiyon faktörü de kontrole tabidir.

mekte, bağırsak mikrobiyotasının konakçı ile iletişim kurduğu bir feedback mekanizması aracılığı ile beyindeki ve karaciğerdeki sirkadiyen metabolik saatini düzenleme özelliği göstermektedir¹¹.

Sirkadiyen ritimlerin aydınlık/karanlık döngüleri ve yüksek yağlı diyet tüketimi gibi çevresel faktörlere bağlı bozulmalarının yanı sıra bağırsak mikrobiyotasındaki disbiyozise ve/veya bağırsak mikrobiyotasındaki sirkadiyen ritmin bozulması da sirkadiyen ritmi etkiler. Yaşam tarzı değişikliklerine bağlı beslenme ve yeme davranışlarındaki değişimler, modern yaşamın gereği sosyal jet lag, vardiyalı çalışma, uyku-uyanıklık döngüsündeki bozulmalar sirkadiyen ritimleri etkilemekte bu durum bağırsak mikrobiyotasında da değişimlere neden olmaktadır. Sirkadiyen ritimlerin aydınlık/karanlık döngüleri ve yüksek yağlı diyet tüketimi gibi çevresel faktörlere bağlı bozulmalarının yanı sıra moleküler sirkadiyen saatteki genetik mutasyonlar da bağırsak mikrobiyotasındaki disbiyozise ve/veya bağırsak mikrobiyotasındaki sirkadiyen ritmin bozulmasına neden olabilmektedir. Clock^{A19} mutasyonunun disbiyozis ile anlamlı derecede ilişkili olduğu ve proinflatuvar bakterilerin artışına sebep olduğu bildirilmektedir¹¹.

Hipofiz-adrenal ekseninin endokrin kontrolü altında olan bağırsak epitel hücrelerinin sirkadiyen saati döngüsel olarak glukokortikoid üretiminden sorumludur. Mikrobiyotanın disbiyozisi sonucu kortikosteroid düzeylerinde değişim meydana gelmekte ve bu durum metabolik bozukluklara yol açmaktadır²⁵. Bağırsak epitelyal hücrelerinin bütünlüğünün bozulması bağırsak geçirgenliğini arttırmakta, artan bağırsak geçirgenliği obezite, obezite ile ilişkili insülin direnci ve tip 2 diyabet gibi düşük dereceli inflamasyonla ilişkili hastalıkların gelişimine neden olmaktadır^{59,60}. Bağırsak bütünlüğünün bozulmasına yol açan etkenler konakta önemli proinflatuvar değişikliklere yol açmaktadır. Mikrobiyotada görülen değişimler genellikle proinflatuvar bakterilerin bolluğunun artmasıyla ve antiinflatuvar sayılan bütirat üreten bakterilerin bolluğunun azalmasıyla karakterizedir^{61,62}. Mikrobiyota kompozisyonu ve fonksiyonu sirkadiyen mukozal bağışıklık ritimleriyle de yakından ilişkilidir. Bağırsaktaki disbiyozis ve bağırsak geçirgenliğinin artması bağırsakta proinflatuvar sonuçlara neden olduğundan bağışıklık fonksiyonunu da değiştirir. Normal koşullar altında, bağışıklık sistemi sirkadiyen ritim ile düzenlenmektedir. Sirkadiyen ritim bozuklukları, bağırsak üzerinde direkt olarak olumsuz sonuçlara sebep olur^{63,64}.

Sonuç olarak, sirkadiyen ritimler 24 saatlik döngüde davranışları, organları ve yaşayan organizmadaki hücreleri düzenler. Bu ritimler, fonksiyonları ve sağlığı optimize etmek için biyolojik fonksiyonları düzenli ve öngörülebilir çevresel uyaranlara uyumlu hâle getirir. Bu ritimlerin bozulması, metabolik sendrom, kanser ve kardiyovasküler hastalıklar gibi metabolik bozukluklara neden olabilir. Bağırsak mikrobiyomu intrinsik sirkadiyen saatler ve konakçı organizma yoluyla sirkadiyen ritimler tarafından düzenlenmektedir. Mikrobiyota ritimleri, hem mikrobiyal topluluk yapısını hem de konakçı bağışıklık ve metabolik fonksiyonu önemli ölçüde etkileyebilen metabolik aktiviteyi değiştirebilen diyet ve beslenme zamanı ile düzenlenir. Bağırsak saatimizin doğru çalışması günlük osilasyon gösteren sağlıklı mikrobiyotaya, mikrobiyotaya da bireye özgü planlanan doğru zamanda ve içerikteki diyet planlamasına ihtiyaç duyar.

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MİKROBİYOTA VE NÖRODENERASYON

Aybala Neslihan Alagöz

İnsan bağırsağı; bakteriler, mantarlar, parazitler ve virüsler gibi çeşitli mikroorganizmaları içerir ve mikrobiyota; insanlarla birlikte yaşayan özel türlerin tamamını ifade eder. Pek çok iç ve dış etken sonucu gelişebilen sağlıklı mikrobiyota için, “disbiyozis” terimi kullanılmaktadır. Beyin ve bağırsak; enterik sinir sistemi (ESS), vagus siniri, immün sistem veya bağırsak mikroorganizmalarının metabolik süreçleri de dâhil olmak üzere çeşitli yollarla bağlanabilir. Disbiyozis durumunda, bu yollarda gelişen değişiklikler; nörodejenerasyonun, Alzheimer hastalığı (AH), Parkinson hastalığı (PH) ve Multipl Sklerozis (MS) gibi birçok nörolojik hastalığın gelişimine katkıda bulunabilir. Bağırsak-beyin aksı ve nörodejenerasyon arasındaki ilişkinin açıklığa kavuşması; prebiyotikler, probiyotikler ve diyet müdahaleleri, fekal transplantasyon gibi tedavi stratejilerinin geliştirilmesi açısından önem arz etmektedir.

Giriş

İnsan bağırsağı; bakteriler, mantarlar, parazitler ve virüsler gibi çeşitli mikroorganizmaları içerir ve vücudumuzdaki ökaryotik hücrelerin sayısının 10-100 katı kadar olan, 100 milyondan fazla bakteri, insan gastrointestinal kanalında bulunur. İnsan vücudu; yıllar süren ortak gelişimden sonra, bağırsak bakterileri ile karşılıklı yarar sağlayan simbiyotik bir hâle gelmiştir. Bağırsak bakterileri esas olarak; Firmikutes, Bacteroidetes, Proteobacteria, Actinomycetes, Verrucomicrobia ve Fusobacteria olarak altı ana filum içerir; Bacteroidetes ve Firmicutes baskın olan floralaradır^{1,2}.

Son yıllarda mikrobiyom ve mikrobiyota terimleri sıklıkla kullanılmaktadır. Mikrobiyota; insanlarla birlikte yaşayan özel türlerin tamamını, mikrobiyom ise insanlarla kommensal olarak yaşayan mikroorganizmaların taşıdıkları genleri ifade etmektedir^{3,4}.

İnsan vücuduyla simbiyotik olan mikrobiyota organizmaları, karmaşık bir mikro-ekolojik sistemi oluşturur ve bağırsak mikroorganizması popülasyonunun miktarı ve kalitesindeki bir değişiklik, bağırsak bariyer işlevini etkileyebilir, toksik maddelerin salgılanmasını arttırıp insan vücuduna faydalı maddelerin salgılanması azaltabilir; enteral ve diğer hastalıklara yol açabilir¹.

Özellikle yaş ve beslenme, bağırsak mikrobiyolojisi üzerinde önemli bir etkiye sahip olabilir ve sayısız insan ve hayvan çalışması, farklı diyetlerin mikrobiyotada önemli bir değişikliğe neden olabileceğini göstermiştir. Enfeksiyon ve hastalık, aynı zamanda, konağın normal bağırsak florası üzerinde olumsuz bir etkiye neden olabilir, dolayısıyla konak üzerinde sağlığa zararlı etkilere neden olur^{5,6,7}.

Mikrobiyota dengesinde bozulma olduğunda bağırsak geçirgenliğinde artma, kısa zincirli yağ asiti üretiminde değişme, kolon rezistansında azalma gibi değişiklikler olduğu gösterilmiştir (Şekil.1). Enflamatuvar bağırsak hastalığı, ateroskleroz, diyabetes mellitus, alkolik olmayan yağlı karaciğer hastalığı, metabolik sendrom, immün yetmezlik, otizm gibi birçok hastalıkta intestinal mikrobiyota içeriğinde

Parabacterioides distatonis ile kolonize edilmiş farelerde, daha yüksek seviyelerde Treg lenfositlerin gözlenmesi ve koruyucu rolü olduğu hipotezini ortaya çıkarmıştır⁵⁸.

Hem sağlık hemde hastalık sürecinde, bağırsak mikrobiyotasının konak üzerindeki etkileri son zamanlarda üzerinde çokça çalışılan konulardandır. Bağırsak mikroorganizmalarının bileşimindeki ve miktarındaki bozukluklar, hem ESS'ni hemde MSS'ni etkileyebilir. Bağırsak-beyin arasındaki bu iki yönlü iletişim; AH, PH ve MS gibi pek çok nörolojik hastalıkta rol oynamaktadır. Geçmiş yıllarda yapılan geniş kapsamlı araştırmalara rağmen, nörodejeneratif hastalıkların patolojik süreci ve progresyonlarını önleyici etkin tedaviler, büyük oranda bilinmemektedir. Bağırsak-beyin aksı ve nörodejenerasyon arasındaki ilişkinin açıklığa kavuşması; prebiyotikler, probiyotikler ve diyet müdahaleleri, fekal transplantasyon gibi tedavi stratejilerinin geliştirilmesi açısından önem arz etmektedir⁵⁹.

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NÖROMÜSKÜLER KAVŞAK HASTALIKLARI VE MİKROBİYOTA

Dilara Carı Güngör

Nöromüsküler Kavşak Bozuklukları

Nöromüsküler kavşak, motor sinir terminalinden kas lifine elektriksel sinyali taşıyan kimyasal bir sinaptır. Presinaptik terminalin depolarizasyonundan sonra, presinaptik terminalden asetilkolin molekülleri sinaptik aralığa dökülür ve postsinaptik membranda asetilkolin reseptörlerine bağlanarak lokal bir son plak potansiyeli oluşturur. Eğer bu son plak potansiyeli eşiği geçerse, membran boyunca yayılan bir aksiyon potansiyeli ve böylece kas kontraksiyonu oluşur.

Normalde kas membranında, güvenlik faktörü olarak, eşikten daha fazla bir depolarizasyon oluşur. Nöromüsküler bileşke bozukluklarının hepsinde temel sorun, değişik nedenlerle bu güvenlik faktörünün azalmış olmasıdır.

Nöromüsküler kavşağın presinaptik, sinaptik ve postsinaptik bölümlerini etkileyen bozukluklar, edinsel otoimmün veya toksik süreçlerin yanı sıra bir grup genetik mutasyonlar sonucu da oluşabilir. Nöromüsküler kavşakta geçiş bozukluğuna yol açan edinsel bozuklukların çoğu otoimmün doğadadır.

Nöromüsküler kavşak bozukluğu olan hastaların büyük çoğunluğunda ya Miyastenia Gravis (MG) ya da Lambert-Eaton Miyastenik Sendromu vardır. Bu iki hastalık da nöromüsküler kavşakta kritik rolü olan iyon kanallarına karşı otoantikörlerin oluşumu ile karakterizedir.

Bu bölümde, nöromüsküler kavşak hastalıklarında mikrobiyota ilişkisi incelenecektir. Şu ana kadar literatürde nöromüsküler kavşak bozuklukları ile ilgili mikrobiyota çalışmaları henüz MG ile sınırlı bulunmaktadır.

Miyastenia Gravis

Nöromüsküler bozukluklarının en büyük grubunu MG temsil eder ve prevalansı yaklaşık 10.000'de 1'dir, kadınlar erkeklerden yaklaşık iki kat daha sık etkilenirler ⁽¹⁾. MG, hareketle artan kas güçsüzlüğü (bitkinliği) ile karakterize, öncelikle okülobulber kasları tutan, postsinaptik yerleşimli nikotinik asetilkolin reseptörlerinin (AChR) hedef alındığı otoimmün kökenli bir hastalıktır. Normal bir nöromüsküler iletim, presinaptik sinir terminalinden salınan asetilkolinin postsinaptik yerleşimli asetilkolin reseptörü ile birleşmesi sonucu sağlanır. Antikörler, bu iletimin gerçekleşmesini engelleyerek hastalığa neden olurlar.

MG'nin patogenezinde katkıda bulunan dört faktör vardır. Birincisi anti-AChR antikörlerinin (Abs) efektör mekanizmasıdır. İkincisi, MG'de CD4+ T hücrelerinin rolüdür. Anti-AChR antikoru sentezinde B hücreleri ile etkileşime girmek ve onları uyarmak için aktive CD4+ T hücrelerine ihtiyaç vardır. Üçüncüsü, MG'de CD4+ T hücre alt tipleri ve sitokinlerin rolüdür. Th1 ve Th2, CD4+ T hücrelerinin

Hatta jeneralize MG’de, okuler MG’ye göre mikrobiyota değişikliklerinin daha fazla olduğu, bazılarında da hastalık şiddeti ile mikrobiyal bozuklukların arttığı rapor edilmektedir.

Elbette MG’nin nedeni tek başına mikrobiyota değişiklikleri değildir. Ancak disbiyozis, otoimmün bir hastalığı tetikleyen çevresel faktörlerden birisi olabilir. Çünkü bağırsak mikrobiyomunun bağışıklık sistemi homeostazını korumada önemli bir rolü bulunmaktadır.

Bu yöndeki kanıtlar arttıkça, probiyotikler, prebiyotikler, sinbiyotikler ve fekal mikrobiyota transplantasyonu gibi mikrobiyotayı restore etmesi ve düzeltmesi beklenen modalitelerin, belki de diğer tedavilere sinerjistik etki bakımından eklenmesi gündeme gelebilir.

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Bölüm A39

EPİLEPSİ VE MİKROBİYOTA

Arife Derda Yücel Şen

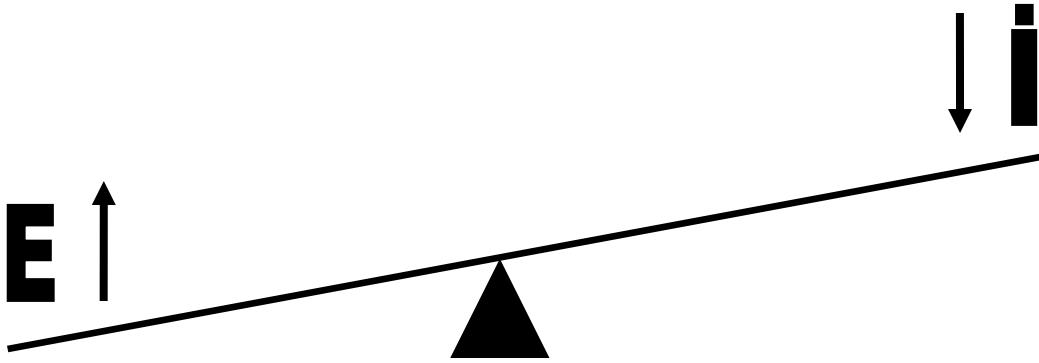
Kürşat Bora Çarman

Epilepsi Nedir?

Epilepsi tüm dünyada yaygın olarak görülen, kronik nörolojik bir hastalıktır. Epilepsi insidansı 20-70/100.000 arasında değişmektedir. Türkiye’de yapılan bir çalışmada 0-16 yaş arası çocuklarda yapılan bir çalışmada epilepsi prevalansı %0.8 olarak tespit edilmiştir.

Epilepsi esas olarak serebral korteksi etkileyen, tekrarlayan ve provoke edilmemiş epileptik nöbetlere yol açan, hücrel ve moleküler değişikliklerin neden olduğu çeşitli nöbet bozuklukları grubunu kapsar. Altta yatan nedene bakılmaksızın, bir epileptik nöbet eksitator ve inhibitör nörotransmitter olan glutamat ve gamma aminobütirik asit (GABA) arasındaki dengesizlik sonucu oluşur (Şekil 1).

Serebral malformasyon, enfeksiyon, travma, inme ve genetik mutasyonlar epilepside bireysel yatkınlığa katkıda bulunur, ancak çoğu epilepsi vakasının kesin nedenleri belirsizliğini korumaktadır.



Şekil 1. Nöbet oluşumunu artıran eksitasyon (E) ve/veya azalmış inhibisyon (I) sonucu meydana geldiğini gösteren basitleştirilmiş şekil.

Epilepsi Etiyopatogenezi ve Mikrobiyota

Her bireyin mikrobiyotasının bir parçası olarak bağırsaklarında yaşayan trilyonlarca bakteriye sahip olduğu tahmin edilmektedir. Gastrointestinal sistemin kalın bağırsağı, mikroorganizmaların büyük çoğunluğuna barınak sağlar. Her insanın tamamen benzersiz bir mikrobiyomu vardır ve stres, diyet, antibiyotik kullanımı, uzun süreli tedaviler, kronik hastalık süreçleri, fizyolojik değişiklikler ve coğrafi konum gibi çeşitli faktörlere bağlı olarak değişkenlik gösterir.

keton düzeyi artar. Bu keton cisimleri beyinde alternatif enerji kaynağı olarak kullanılır. Randomize kontrollü olarak gerçekleştirilen iki klinik çalışmada dirençli epilepside KD tedavisinin etkinliği %38 ve %50 olarak saptanmıştır. Son zamanlarda KD tedavisinin intestinal mikrobiyotayı değiştirdiği gösterilmiştir.

Olson CA ve ark ketojenik diyet uygulanan hayvanlarda intestinal mikrobiyotayı inceledikleri çalışmalarında *Akkermansia muciniphila*'da artış saptanmış. Antibiyotik tedavisi verilen hayvanların *Akkermansia muciniphila* verilmesi sonrası KD tedavisinin anti-epileptik etkinliğinin yeniden başladığı gözlenmiş. Yirmi dirençli epilepsi hastasına 6 ay boyunca KD tedavisi uygulandığı bir çalışmada tüm hastalarda α -diverty azalmış, tedaviye yanıtı, epileptik nöbetleri kontrol altına alınan 10 hastada KD sonrası *Firmicutes*'in azalmış, *Bacteroidetes*'in artmış olduğu, tedaviye yanıt vermeyen hastalarda ise Clostridiales, Ruminococcaceae, Rikinellaceae ve *Alistipes*'in fazla olduğu saptanmıştır.

Miljanovic ve ark SCN1A mutasyonlu fareler ile kontrol grubu üzerinde ketojenik diyet uygulayarak intestinal mikrobiyotayı incelemiş ve fareler arasında bağırsak mikrobiyotasında belirgin değişiklikler olduğunu ortaya çıkarmıştır. Firmicutes ve Bacteroidetes *phyla* arasındaki oran, Dravet genotipine sahip farelerde yüksek oranda tespit edildi, bu durum bir mikrobiyal disbiyoz anlamına geliyordu. Ketojenik diyet uygulaması sonrası, Dravet farelerinde çeşitli bakteri filumları ve cinslerinin oranlarının değiştiği gösterilmiştir.

Probiyotiklerin epilepsi tedavisinde kullanılması konusunda veriler oldukça kısıtlıdır.

Gómez-Eguílaz M ve arkadaşlarının 43 dirençli epilepsi hastasına karma probiyotik (*Lactobacillus acidophilus* DSM32241, *Lactobacillus plantarum* DSM32244, *Lactobacillus casei* DSM32243, *Lactobacillus helveticus* DSM32242, *Lactobacillus brevis* DSM11988, *Bifidobacterium lactis* DSM32246, *B. lactis* DSM32247 ve *Sterptococcus salivarius subs tthermophilus* DSM32245) verdikleri çalışmada tedavi süresince hastaların serum GABA seviyelerinin hızla arttığı, hastaların %28'inde nöbet sayısının %50'den daha fazla oranda azaldığı, tüm hastaların yaşam kalite ölçek puanlarının yükseldiği belirlenmiştir.

Mu ve ark hedefli probiyotik uygulamasının nöbet sıklığını azalttığını, bir kemirgen infantil spazm modelinde lökomotor aktiviteyi geliştirdiğini ve pediatrik epileptik ensefalopatiler için potansiyel bir terapötik yol olarak mikrobiyota manipülasyonu hakkında bilgi sağladığını göstermiştir.

Sonuç olarak son yıllarda mikrobiyota ile ilgili çalışmalar tıbbın tüm alanlarında olduğu gibi epilepsi ile ilgilide artmaktadır. Elde edilen veriler mikrobiyotanın epilepsi etiyopatogenesinde rolü olabileceğini göstermektedir.

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MİKROBİYOTA VE OTİZM SPEKTRUM BOZUKLUKLARI (OSB)

Muhammed Ayaz

Otizm spektrum bozuklukları (OSB), sosyal iletişim, sosyal etkileşim sorunları, tekrarlayan, sınırlı ilgi alanları ve davranışlarla kendini gösteren nörogelişimsel bir bozukluktur¹. Tüm dünyadaki prevalansının yaklaşık olarak %1,5 civarında olduğu tahmin edilmektedir² ve bilinmeyen nedenlerle görülme sıklığının zamanla arttığı düşünülmektedir³. Erkeklerde kızlara göre 4 kat daha fazla görülmektedir⁴. OSB etiolojisinde çevresel ve genetik birçok faktörün etkili olduğu düşünülmeye karşın, temel nedenler henüz yeterince anlaşılammıştır⁵. OSB semptomları üzerinde yeterince etkinliği kanıtlanmış bir tedavi de bulunmamaktadır. Semptomları hedef alan davranışsal ve eğitimsel yöntemler tedavinin temelini oluşturmaktadır. Eşlik eden sorunlara yönelik ilaç tedavilerinin ise kullanım alanları sınırlıdır⁶.

Mikrobiyotanın insan fizyolojisini etkilediği uzun süredir düşünülmekteydi. Son yıllarda gelişen teknoloji ve tetkik yöntemleri ile birlikte bu ilişkinin değerlendirilmesi mümkün hâle gelmiştir. Bu alanda elde edilen sonuçlarla mikrobiyota; konağın metabolizması, bağışıklık sistemi ve davranışında önemli etkileri olan bir faktör olarak kabul edilmektedir⁷.

Otizm Spektrum Bozuklukları'nın multifaktöryel bir etiolojisinin olduğu bildirilmektedir. Son yıllarda ortaya çıkan kanıtlar çevresel faktörlerin OSB etiolojisinde tahmin edilenden çok daha fazla etkili olduğunu göstermektedir⁸. Perinatal enfeksiyonlar, hastane yatışı ve erken antibiyotik maruziyeti gibi OSB'de potansiyel risk faktörleri mikrobiyota ile ilişkilendirilmiştir⁹. OSB tanısı alan çocuklarda gastrointestinal semptomların çok fazla olması ve bu semptomların hastalık semptomları ile korelasyon göstermesi de dikkatin bu alana yoğunlaşmasına neden olmuştur¹⁰. Bunun OSB ile birlikte görülen bir durum mu olduğu ya da bir neden mi olduğu henüz bilinmemektedir. Mikrobiyotadaki değişikliklerin OSB'de davranışsal sorunların gelişmesinde önemli bir rolü olduğu ileri sürülmektedir. Ancak bunun hangi mekanizmalarla gerçekleştiği, hangi moleküllerin anne karnında ve doğumdan sonra beyin gelişimini olumsuz etkilediği yeterince bilinmemektedir¹¹.

Gelişimsel Süreçte Mikrobiyota

Gebelik döneminde fetüsün büyük oranda steril bir ortamda olduğu ve doğumla birlikte mikrobiyotanın kolonize olmaya başladığı kabul edilmektedir. Ancak mikrobiyotanın insan yavrusu üzerine ilk etkileri prenatal dönemde başlar. Çünkü hamilelik sürecinde fetüs annenin mikrobiyotasındaki mikrobiyal ürünlere ve metabolitlere maruz kalmaktadır⁷. Annenin mikrobiyota özelliklerinin özellikle yavruların bağışıklık sistemini şekillendirdiği ve doğum öncesinde santral sinir sisteminin yerleşik bağışıklık hücreleri olan mikrogliaların işlevlerini düzenlediği gösterilmiştir¹².

Mikrobiyotada deęişim saęlayan tedavilerle hayvan alıřmalarında ümit verici sonuçlar elde edilmesine karřın insan alıřmalarında henüz aynı etkiden bahsetmek için yeterli düzeyde bilimsel kanıt bulunmamaktadır. alıřmalarda kullanılan ajanların içerikleri ve kullanım süreleri ile ilgili bir standart bulunmamaktadır. Ayrıca uygulanan ajanların yan etkileri de yeterince deęerlendirilmemiřtir. Bu alanda yapılan alıřmaların büyük çoęunluęu çok küçük örneklemlerde yapılmıřtır. alıřmaların çoęunluęunda düzelmeler ebeveyn geri bildirimlerine dayanmaktadır ve ebeveyn ölçeklerine dayanan sonuçların güvenilirlięi tartışmalıdır. Bu ajanların OSB’de net faydalarından bahsedebilmek için semptomlardaki deęişimlerin klinisyenler tarafından deęerlendirildięi daha büyük örneklemlerde yapılmıř alıřmalara ihtiyaç duyulmaktadır.

Sonuç

Otizm Spektrum Bozuklukları; etiolojisinde genetik ve çevresel birçok faktörün neden olduęu düřünülen, ancak temel nedenleri henüz net olarak bilinmeyen nörogeliřimsel bir bozukluktur. Aynı zamanda temel semptomları üzerinde belirgin olarak etkili bir tedavi de bulunmamaktadır. Son zamanlarda baęırsak mikrobiyotasının beyin geliřimi ve iřleyiři üzerindeki etkilerinin saptanmasıyla, OSB etiolojisinde de önemli bir faktör olabileceęi gündeme gelmiřtir. Bu eksende yapılan alıřmalar OSB’nin tedavisi ve prenatal dönemde beyin geliřiminin annenin mikrobiyotasından muhtemel etkileneşmesi nedeniyle de önlenmesi açısından umut vericidir. Mikrobiyota-beyin iliřkisinde mekanizmaların çözülmesi OSB’de sık görülen gastrointestinal semptomlar gibi dięer sistemler üzerindeki etkileri için de açıklayıcı olabilir.

Elimizdeki alıřma sonuçlarıyla OSB-mikrobiyota iliřkisini tamamen açıklamak mümkün deęildir. OSB çok geniř yelpazede semptomlarla ortaya ıkan heterojen bir bozukluktur. Belirgin fenotipik farklılıkların olması OSB’de mikrobiyota bileřiminde ortak özellikler bulmayı zorlařtırmaktadır. alıřma sonuçlarının birbiriyle eliřmesi mikrobiyota içerięinin hem konakla hem de birbirleriyle karmařık bir iliřki içinde olmalarından kaynaklanabilir. Ayrıca bu alanda yapılan alıřmaların birbirinden farklı metodlarla, farklı popülasyonlar ve fenotipik özelliklerde yapılması sonuçları genelleřtirmeyi zorlařtırmaktadır. OSB’li kiřişlerde sık görülen mikrobiyota farklılıkları, baęırsak geirgenlięi sorunları ve immün sistem sorunlarının hangisinin neden hangisinin sonuç olduęu da henüz bilinmemektedir.

Mikrobiyotada deęişim saęlamayı hedefleyen tedavilerle yapılan ilk alıřma sonuçları OSB’de sık görülen gastrointestinal semptomlar ve davranıřsal sorunlar üzerine faydalarının olabileceęini düřündürmüřtür. Bu alanda yapılmıř tedavi alıřmalarının çoęunluęunun çok küçük örneklemlerde yapılması, kullanılan tedavilerin içerięi ve süresi ile ilgili standartlarının olmaması, alıřmalarda tedavilerin uzun dönem etkilerinin ve yan etkilerinin deęerlendirilmemesi gibi çok önemli kısıtlılıkları bulunmaktadır. Mevcut alıřma bulgularıyla bu tedavilerin OSB temel semptomları üzerinde olumlu etkilerinin olduęunu söylemek ya da bir tedavi seeneęi olarak sunmak mümkün deęildir.

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Giriş

Son yıllarda mikrobiyota ve beyin üzerine yapılan araştırmalar, bağırsak mikrobiyotasının bağırsak-beyin eksenini üzerindeki etkisini ve bunun merkezi sinir sistemi ile ilişkili durumlar ve nöropsikiyatrik bozukluklarda potansiyel rol oynadığını vurgulamıştır ^[1]. Altta yatan biyolojik mekanizmalar tam olarak aydınlatılmamış olsa da araştırmalar bağırsak mikrobiyotası ve Santral Sinir Sistemi (SSS) arasında çift yönlü bir etkileşimin olduğunu düşündürmektedir. Bu etkileşim başlıca otonomik, nöroendokrin ve immün yollarla sağlanmaktadır. Bu yollardaki karşılıklı bilgi akışını ise vagus siniri, SSS sinyalizasyon sistemleri, nörotransmitter ve nörotrofinlerin üretimi-kontrolü sağlamaktadır ^[2].

İnsan ve hayvan çalışmaları sonucunda biriken kanıtlar bağırsak mikrobiyotasının normal beyin fonksiyonları, anksiyete bozuklukları, depresyon, şizofreni ve diğer psikotik bozukluklar, yeme bozuklukları ve otizm spektrum bozuklukları üzerinde rol oynadığını göstermektedir ^[3].

Her ne kadar probiyotik formülasyonların ruh sağlığını iyileştirebileceğine dair kanıtlardan 20. yüzyılın başlarından itibaren bahsedilse de, bağırsak mikrobiyotasının psikiyatrik bozuklukların patofizyolojisi üzerindeki rolü ancak DNA/RNA sekanslama teknolojilerindeki ilerlemelerin ardından fark edilmiştir ^[4, 5]. Aşağıda ayrıntılandıracağımız prelinik çalışmalar, çeşitli psikiyatrik hastalıklara sahip bireylerden alınan dışkı mikrobiyota örneklerinin, Germ free farelerde denenmesi sonrasında davranışsal ve fizyolojik profillerde değişimler ortaya çıkardığını tutarlı bir şekilde göstermiştir. Bu durum, psikiyatrik bozuklukların, bir biyobelirteç görevi görebilecek mikrobiyal bozulma modeli ile ilişkili olabileceğini düşündürmektedir.

Diğer yandan psikopatolojilerin ortaya çıkmasında mikrobiyota etkisi konusunda elde edilen tutarlı kanıtlara rağmen hastalıklara spesifik mikrobiyom türlerinin belirlenmesine yönelik çalışmalar oldukça yetersizdir. Bu bağlamda kültür temelli ve moleküler temelli mikrobiyom analiz sonuçlarının psikopatolojilere sahip bireylerde araştırılmasına yönelik çalışmalar son yıllarda artış göstermiştir ^[6].

Tüm dünyada milyonlarca insanın psikiyatrik hastalıklardan etkilenmesi nedeniyle bu hastalıkların mikrobiyota ile ilişkilendirilmesi büyük bir önem taşımaktadır. Bu bölümde major psikiyatrik hastalıkların mikrobiyota ile ilişkisinden ve bu konuda yapılmış olan güncel araştırmalardan bahsedeceğiz.

Mikrobiyota-Bağırsak Beyin Eksenini

Psikiyatrik hastalıklarla diyabet, kardiyovasküler hastalıklar ve metabolik sendrom gibi bozuklukların sıklıkla birliktelik gösterdiği bilinmektedir ^[7]. Fakat metabolik ve psikiyatrik bozuklukların birbirini etkilediği mekanizmalar hâlâ belirsizdir. Davranış ve metabolizmanın bağlantılı olabileceğini düşündüren

görülmüş ve bu bakterilerin Bipolar Bozukluğun patofizyolojisinde önemli bir rol oynamadığı öne sürülmüştür^[79].

Son olarak Bipolar Bozukluk ve bağırsak mikrobiyomu arasındaki bağlantıyı ortaya çıkarmak amacıyla 2021 yılında 13 araştırmanın dâhil edildiği sistematik bir derlemenin sonuçlarına göre; Bipolar Bozuklukta sağlıklı kontrol grubuna oranla bağırsaklarda daha az alfa çeşitlilik tespit edilmiş olup, raporlanan en belirgin taksonomik bulgu, dört çalışmada belirli bir mikroorganizma dalının (Ruminococcaceae familyası, Faecalibacterium cinsi ve Faecalibacterium prausnitzii türü) hasta ve sağlıklı grup arasında bağırsak mikrobiyotasını ayırt etmesiydi. Bütirat üretimi ile bilinen bu dalın üyeleri, üç çalışmada sağlıklı kontrol grubuna göre Bipolar Bozukluk grubunda düşük miktarda tespit edilmiş, ancak dördüncü çalışmada bu bulguların tam tersi elde edilmiştir. Ek olarak, Bacteroides-Prevotella grubu türleri iki çalışmada hasta grupta anlamlı olarak yüksekken, bir çalışmada daha düşük olarak bulunmuştur^[80]. Bu derleme ayrıca Faecalibacterium ve Bacteroides bolluğuna göre düşük α -çeşitliliğinin ve disbiyozisin Bipolar Bozukluğa karakterize mikrobiyal özellik olabileceğini düşündürmektedir. Azalan mikrobiyal zenginlik ve bütirat üretimi, aynı zamanda, Bipolar Bozukluğun altında yatan inflamatuvar patofizyolojiye dair kanıtları da beslemektedir^[80].

Sonuç olarak, hem metabolik hem psikiyatrik bozukluklarda bağırsak sağlığının önemli olduğu artık bilinmektedir. Fakat mikrobiyota konusunda araştırma yapmak metodolojik zorluklar nedeniyle nispeten güç gibi görünmektedir. Yeni çalışmaların mikrobiyota kompozisyonundaki dinamik değişimleri ve de bunların metabolik etkilerini kombine etmesi daha gerçekçi sonuçlar için yardımcı olacaktır. Mikrobiyom dalgalanmalarının günlük olarak haritalandırılması semptomlardaki dalgalanma ile ilişkilendirilebilirse bağırsak mikrobiyotasının beden zihin etkileşimine etkisi ortaya çıkabilir. Özetle mikrobiyotayı araştırmak için yeterli neden bulunmakla birlikte klinik uygulamalarda kullanmak için daha fazla kanıt ihtiyacı olduğu aşikârdır.

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CİNSEL FONKSİYON BOZUKLUKLARI VE MİKROBİYOTA*Hacı İbrahim Çimen**Hasan Salih Sağlam*

İdrar yolunun steril olduğu dogması yüzyıldan fazla sürmüştür. Yeni nesil sekanslama teknolojileri ve mikrobiyom araştırmaları için modifiye edilmiş kültür protokolleri sayesinde idrar yolunda değişken bir mikrobiyal spektrum keşfedildi. Üriner sistem mikrobiyotasının varlığı üzerine yapılan çalışmalar sonucunda bazı ürolojik hastalıkların tedavisinde probiyotik ve prebiyotiklerin kullanılıp kullanılmayacağı sorgulanmaya başlandı. Cinsel fonksiyon birçok faktörden etkilenmektedir. Bu faktörler üzerine mikrobiyomun etkileri bu bölümde tartışılarak, ilerleyen dönemlerdeki çalışmalar için yol gösterici olmak amaçlanmıştır.

Giriş

Sağlıklı bir insan vücudunun bakteri, mantar, virüs ve protozoa gibi çeşitli mikroorganizmaları barındırdığı bilinmektedir. Aslında vücut kendi hücrelerinden yaklaşık 10 kat daha fazla mikrobik hücre barındırır. Mikrobiyota terimi bir bireyin içinde ve üzerinde yaşayan mikroorganizmaları belirtirken; mikrobiyom terimi ise belirli bir konakta bulunan mikroorganizmaların genomları, genleri ve tüm ürünlerinin toplamını belirtir¹⁻³. Bunların büyük çoğunluğu bağırsaklarda yaşar⁴. Fakat cilt, üst solunum sistemi ve ürogenital sistemde de bulunur⁵. Canlılar sınıflamasında üst grupta yer alan insanlarda mikrobiyota büyük ölçüde korunmuş iken daha alt sınıflara doğru gittikçe değişkenlik artmaktadır. Tarihsel gelişimi içinde insanoğlu barındırdığı bakteri sayısı ve çeşitliliği ile genetik ve epigenetik farklılığını biriktirmiştir⁶.

Sağlıklı yetişkinlerin mikrobiyotalarını kapsamlı bir şekilde belirlemek, mikrobiyotanın hastalığı ve sağlıktaki rollerini tespit etmek için 2008 yılında İnsan Mikrobiyom Projesi (HMP) kuruldu. Başlangıçta gastrointestinal sistem, oral kavite, cilt, solunum sistemi ve vajinadan örneklemeler yapıldı. Üretral kontaminasyon nedeniyle suprapubik aspirasyon ve mesane biyopsisi gibi yöntemlerle örnek toplamanın yaratacağı etik sorunlar, ayrıca şimdiye kadar steril olduğu düşünülen bir sistemde değişik mikroorganizmaları araştırmanın zorlukları nedeniyle ilk başta mesane mikrobiyotası çalışmaya dâhil edilmedi⁷⁻⁹. Ancak, moleküler biyolojideki gelişmelerle yapılan idrar analizlerinde 'idrarin steril olduğu' dogması çürütülmüştür¹⁰. Sonrasında yapılan çalışmalarda sağlıklı bireylerin üriner mikrobiyom kompozisyonu çıkarılmaya çalışılmıştır (Tablo 1).

Tablodaki çalışmalarda da görüldüğü gibi mikrobiyomlar cinsiyet ve yaşla birlikte farklılık gösterebilmektedir. Bunun yanında mikrobiyomların çevresel faktörlerle ilişkisi de tam olarak ortaya konmadığından bu konu çok önemli ve bakir bir çalışma alanı olmayı sürdürmektedir¹⁸.

laştığımız birçok faktörden etkilenen dinamik bir yapıdır. Cinsel fonksiyonların korunmasının temelinde gastrointestinal ve üriner mikrobiyotanın sağlıklı olması yatmaktadır, diye görünmektedir.

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Giriş

İnsan mikrobiyotasının bakteri, virüs, mantar ve protozoa topluluklarından meydana geldiği bilinmektedir. Bu toplulukların genetik yükü ve çevre ile etkileşimi mikrobiyomu oluşturur. Bir başka ifadeyle mikrobiyom, mikrobiyotanın sahip olduğu genetik materyale verilen isimdir ve insan genomundan daha karmaşıktır. Moleküler biyolojideki yeni gelişmeler sayesinde şimdiye kadar steril olduğu düşünülen üriner sistemde dahi değişik seviyelerde mikrobiyal spektrumun olduğu gözlenmiştir. Mikrobiyotanın doğumdan önce bile insan fizyolojisini ve/veya patolojisini etkileyebileceği, infertilite de dâhil olmak üzere çeşitli hastalıklarda rol oynayabileceği saptanmıştır. Yapılan bazı çalışmalarda özellikle seminal vezikül mikrobiyotasının çiftlerin cinsel sağlığını, gebeliği ve yenidoğan sağlığını etkileyecek önemli bir faktör olduğu öne sürülmüştür. Sonuç olarak, son yıllarda mikrobiyomun daha ayrıntılı incelenmesiyle insan hastalıklarında mikrobiyotanın katkısı daha iyi anlaşılabilmiş ve hastalıkların tanı ve tedavisinde yeni yöntemlerin araştırılması daha fazla klinisyenin bu konuya ilgisini artırmıştır.

Erkek Genital Sistem Mikrobiyotası

İnsan vücudu kendi hücrelerinden 10 kat daha fazla mikrobik hücreye ev sahipliği yapmaktadır. Bunların çoğunun bağırsaklarda yaşadığı bilinmektedir ^[1]. Ayrıca cilt, üst solunum sistemi ve ürogenital sistemde de yaşayan mikrobik hücreler bulunur ^[2]. Daha öncesinde üriner sistemin steril olduğu düşünülse de yeni bakteri tanımlama yöntemlerinin gelişmesiyle burada da mikrobiyomların olduğu ifade edilmiştir ^[2]. Fakat, günümüzde üriner sistemde saptanan mikrobiyomların insanlar üzerindeki hastalıklar, çevresel ve mevsimsel faktörlerle ilişkisi henüz net olarak ortaya konulamamıştır ^{[3],[4]}.

Ejakülatta bakteri mikrobiyotasını göz önünde bulundurmadan seminal sıvı kültürü temel alınarak yapılan ilk çalışmalar; daha önce bilinen patojenleri tespit etmeye ve tanımlamaya odaklanmış ^{[5],[6],[7]} ve bakteriyosperminin fertilitiyi olumsuz yönde etkilediği fikri ortaya atılmıştır ^[8]. Bu çalışmaların semen mikrobiyolojisi hakkında önemli bilgiler sağlamalarına karşın, birçok bakteri türü kültürde ekime karşı dirençli olduğu için sınırlı kalmıştır. Bu sorunun üstesinden gelebilmek ve mikrobiyal çeşitliliği araştırabilmek amacıyla organizmaların tespitinde kültürde üretilmesine gerek duyulmayan yöntemlerin geliştirilmesine ihtiyaç duyulmuştur.

16S rRNA gen polimerazı tüm bakterilerde mevcut olan korunmuş bir bölgedir. Geniş aralıklı polimeraz zincir reaksiyonu (PCR) primerlerin kullanılmasıyla, 16S rRNA içinde bulunan korunmuş sekanslar tanımlanarak bakteriyel sınıflandırma ve filogenetik incelemelerde kullanılır. Bu yeni yöntem

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Zeynep Cansu Çalışkan

Işkın Pınar Zarakolu

Mikroorganizmalar, 19. yüzyılın sonuna kadar hastalıkların etkeni olarak kabul edilmemişlerdir. Etken oldukları anlaşıldıktan sonraki ilk yüzyılda ise daha çok patojen rollerine odaklanılmıştır. Son yıllarda kommensal mikroorganizmaların insan fizyolojisine etkisini anlamaya yönelik çalışmalar hız kazanmıştır. Özellikle moleküler genetik ve tanısal mikrobiyoloji alanlarında yaşanan gelişmeler, sağlık ve hastalıkta kommensal mikroorganizmaların ve mikrobiyotanın rolünün daha iyi anlaşılmasında rol oynamıştır.

Mikrobiyota bir biyolojik nişte bulunan mikroorganizmaların tümü (bakteri, virüsler, arkea ve ökaryotik mikroorganizma); mikrobiyom ise bu mikroorganizmalar (kommensal, simbiyotik, patolojik) tarafından üretilen RNA, proteinler, metabolitler gibi gen ve gen ürünlerinin tamamı olarak tanımlanmaktadır. Bazı bilim insanları gen ürünlerini metagenom (plazmidler de dâhil olmak üzere bir popülasyonun tüm genetik materyali) olarak tanımlamakta, mikrobiyom ifadesini biyotik ve abiyotik faktörleri içeren; konakçı, mikroorganizma genomları ve çevresel koşulları kapsayan daha geniş bir tanım olarak kullanmaktadır. Mikrobiyomun insan genomundan yüzlerce kat fazla olduğu, milyonlarca farklı gen içerdiği bildirilmiştir. Sayısız çalışma, farklı doku ve organların (göz, ağız, orofarenks, nazofarenks, dış kulak yolu, mide, bağırsaklar, üretra, vajen, cilt...) işleve göre farklılık gösteren mikrobiyota ve dolayısıyla mikrobiyom içerdiğini göstermiştir.

Ulusal Sağlık Enstitüleri tarafından desteklenen İnsan Mikrobiyom Projesi (Human Microbiome Project; HMP) ve Avrupa Komisyonu tarafından desteklenen İnsan İntestinal Sistem Metagenomiği (Metagenomics of the Human Intestinal Tract; MetaHIT) gibi büyük projeler, bireylerin birden fazla vücut bölgesinden örnek alarak; insan vücudundaki tüm mikroorganizmaları belirleme, çevresel faktörlere göre bireysel mikrobiyom farklılıklarını saptama, disbiyozun hastalıklarla ilişkisini araştırma, mikrobiyom saptanmasında kullanılacak yeni biyoinformatik program ve yaklaşımlar geliştirilmesini sağlama gibi amaçlara sahiptir. Her iki proje de 2008'de başlatılmış olup HMP'de dışkı, oral ve nazal kavite, cilt, gastrointestinal sistem, vajina gibi çeşitli biyolojik nişlerdeki bakteri toplulukları, bunların sağlık ve hastalık durumundaki rolü analiz edilmiştir. Başlangıçta, standart mikrobiyolojik yöntemler kullanılarak üriner mikrobiyomun belirlenmesindeki teknik zorluklar ve steril örnekleme için gereken suprapubik aspirasyon örneklerinin alınması etik dışı bulunduğu için sağlıklı bireylerde üriner sistem uzun süre steril olarak kabul edilmiştir. Moleküler biyoloji teknikleri ve kültür yöntemlerindeki gelişmeler üriner sistem, meme, plasenta, beyin gibi daha önce steril olduğu düşünülen çeşitli biyolojik nişlerdeki mikrobiyomun tanımlanmasına olanak sağlamıştır.

Günümüzde mikrobiyomun çeşitli hastalıklara karşı gerek koruma gerekse tedavi amacıyla etkili bir şekilde kullanılabileceğine dair veriler umut vericidir. Yapılan çalışmalar, mikrobiyomun doğal

altın standart olmayıp dışlama teşhisidir. Yapılan çalışmalarda *P. mirabilis*, *A. vaginae* ve *Finegoldia magna* türlerinde artış, *Lactobacillus* türlerinde azalmayla ilişkili bulunmuştur. Yapılan bir çalışmada *Lactobacillus*, *Corynebacterium*, *Streptococcus*, *Actinomyces*, *Staphylococcus* ve *Bifidobacterium* türleri hem OAB hem de kontrol gruplarından izole edilirken *Aerococcus* ve *Actinobaculum* türleri sadece OAB hastalarından izole edilmiştir.

Kronik prostatit/ kronik pelvik ağrı sendromu, Bu sendrom üriner disbiyozla ilişkilidir. *Clostridia*, *Bacteroides* ve *Porphyromonas* türleri gibi anaerop türlerde artış, *Bacillus* türlerinde azalma gözlenmiştir.

Nörojenik mesane, merkezi sinir sistemindeki değişikliklerden kaynaklanan, idrarın depolanmasını ve boşaltılmasını bozan bir üriner disfonksiyondur. Hasta bireylerin ürobiyomunda *E. coli*, *E. faecalis*, *P. aeruginosa*, *K. pneumoniae*, *Actinobaculum massiliense* gibi patojenlerin arttığı gösterilmiştir.

İnterstisyel sistit/ağrılı mesane sendromu, ÜSE yokluğunda mesane ve alt üriner sistemde ağrı, rahatsızlık hissiyle karakterizedir. Kadınlarda daha sıktır. *L. gasseri*, *P. mirabilis*, *P. aeruginosa*, *Francisella tularensis*, *Mycoplasma hyorhinis*, *Helicobacter heaticus*, *Clostridium perfringens*'de artış, *Corynebacterium* spp.'de azalma saptanmıştır. *Saccharomyces* spp. ve Epstein Barr virüsünde de artış saptanmıştır.

Kronik böbrek hastalığıyla takipli bireylerin ürobiyomu, sağlıklı bireylerin ürobiyomlarına göre daha az çeşitlilik gösterme, kronik böbrek hastalarında evre-3'ten evre-5'e doğru ürobiyom çeşitliliği daha da azalmaktadır. **Renal transplant sonrası** bireylerde ise *Escherichia* spp.ve *Enterobacter* spp. gibi potansiyel üropatojen mikroorganizmaların varlığı gösterilmiştir. Ayrıca posttransplant hastalarda BK virüs nefropatiye sebebiyet vermesi nedeniyle önemli olup JC virüsün akut rejeksiyona karşı koruyucu olabileceği düşünülmektedir.

Mikrobiyomun düzenlenmesine yönelik pek çok uygulama mevcut olup probiyotikler bu amaçla kullanılan canlı mikroorganizmalardır. Laktik asit üreterek lümen içi pH'yı düşürür, koruyucu münin oluşumunu artırır ve sekretuar IgA yapımını uyarırlar. Prebiyotikler ise probiyotik özellikteki mikroorganizmaların çeşidini ve/veya aktivitesini olumlu yönde etkileyen besin bileşimleridir. Fruktooligosakkaritler (FOS), inülin ve galaktooligosakkaritler (GOS) en çok bilinen prebiyotiklerdir. Simbiyotikler hem probiyotik hem prebiyotik özelliği olan besinlerken, postbiyotikler probiyotiklerin ürettiği metabolik yan ürünlerdir. Bu uygulamalara yönelik yapılan pek çok çalışma içinde özellikle *Clostridiodes difficile* enfeksiyonlarında FMT sonrası başarıyla tedavi edilen olgular bildirilmiştir. Vajinal mikrobiyota transplantasyonu (VMT) ise bakteriyel vajinoz ve rekürren üriner sistem enfeksiyonlarının tedavisi amaçlanmıştır. Ancak bu konunun aydınlatılması için daha fazla çalışmaya ihtiyaç vardır.

Son 20 yılda hızla ilerleyen çalışmalar sağlıkta ve hastalıkta mikrobiyomun rolünün daha iyi anlaşılmasına olanak sağlamıştır. Sadece enfeksiyon hastalıklarının değil birçok kronik hastalığın etkeni ya da etki eden unsuru olarak değerlendirilen mikrobiyom daha iyi anlaşıldıkça profilaksi, tanı ve tedavi açısından ihtiyaç duyulan gelişmelere ışık tutacaktır. Ürobiyomun steril olmadığı anlaşıldıktan sonra yapılan pek çok çalışma ile sağlıkta ve hastalıkta etkisi incelenmiştir. Ancak yoğunluğunun az olması, kontaminasyon riskinin fazla olması sebebiyle daha kapsamlı çalışmalara ihtiyaç vardır.

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Giriş

İnsan mikrobiyotasına ilgi ve mikrobiyota topluluklarının hastalıklarla ilişkisini anlama çabası, son yıllarda önemli ölçüde artmıştır. Günümüzde moleküler ve genetik teknolojilerdeki ilerlemeler, insan vücudundaki geniş mikroorganizma topluluklarının tanımlanmasına ve ayrıca bu bilginin terapötik çözümler geliştirmek için kullanılmasına izin vermektedir.

Gastrointestinal mikrobiyota ile ilgili çalışmalardan sonra, kadın üreme sağlığı ve mikrobiyota ilişkisine de artan oranda bir ilgi vardır. Mikrobiyomun insan fizyolojisindeki hayati rolü göz önüne alındığında, vajinal mikrobiyomun sadece ürogenital sağlık ve disbiyozda değil, aynı zamanda potansiyel olarak fertilizasyonda ve sağlıklı gebeliklerde de önemli bir rol oynadığı gösterilmiştir. Plasenta, meme, uterus ve fallop tüpleri gibi önceden steril kabul edilen dokularda da mikrobiyal toplulukların izole edilmesi, kadın sağlığında mikrobiyal floranın önemli bir rolü olduğunu, doğum öncesi, doğum ve doğum sonrası birçok faktörün, çevresel ve tıbbi müdahalelerle birlikte mikrobiyom aracılığıyla erken ve sonraki yaşamı etkilediğini düşündürmektedir.

Bu derlemede; kadın yaşamının tüm dönemlerinde üreme sistemi mikrobiyotasının yapısı, genel sağlık ve hastalıklarla ilişkisi literatürdeki son bulgular eşliğinde özetlenmiştir.

Vajinal Mikrobiyota

Vajinal mikrobiyomun araştırıldığı çalışmalarda farklı vajinal bölgelerden alınan örneklerde kadın vajeninde 200'den fazla filotipin mevcut olduğu gösterilmiştir. Ancak üreme çağındaki sağlıklı kadınlarda kadın üreme sisteminde, sağlıklı bir vajinal mikrobiyal toplulukta *Lactobacilli* baskınlığı mevcuttur⁽¹⁾. Araştırmacılar *Lactobacillus*'ların miktarı ve dağılımına göre farklılık gösteren beş çeşit mikrobiyal topluluk (CST) olduğunu tanımlamıştır. Gebe olmayan, doğurgan ve asemptomatik kadınlarda CST I (*Lactobacilli crispatus*), CST II (*Lactobacilli gasseri*), CST III (*Lactobacilli iners*) ve CST V (*Lactobacilli jensenii*) başta olmak üzere belirli bakteri toplulukları gösterilmiştir⁽²⁾.

Laktobasiller kadın alt genital traktüsünün savunma mekanizmalarının önemli bir parçasıdır. Kadın genital sağlığının korunmasında ve genitoüriner enfeksiyonların önlenmesinde çok önemli bir rol oynamaktadır⁽³⁾. Glikozun fermantasyonu yoluyla bol miktarda laktik asit ürettiği bilinen *Lactobacillus* suşlarının varlığı, vajen pH'sını düşürür (<4,5), vajinanın asit ortamının korunmasını sağlar⁽⁴⁾. Ayrıca, Laktobasiller, konağın genital enfeksiyonlara karşı korunmasında, laktik asit üretimine ek olarak, patojenlerin vajinal epitelyuma yapışmasını önleyerek, Hidrojen peroksit ve bakteriyosinler gibi antimikrobiyal bileşiklerin üretimi ile destekleyici bir ortam yaratırlar⁽⁴⁾. *Lactobacillus* türlerinin *Klebsiella* türleri, *Staphylococcus aureus*, *Escherichia coli* veya *Enterococcus faecalis* gibi istenmeyen türlerin büyümesini engellemek için antimikrobiyal bakteriyosinler ürettiği gösterilmiştir⁽⁵⁾ (Şekil 1).

bolizmasını artırabilir, serotonin sentezinin düzenlenmesini ve nöronların stabilize edilmesini sağlayabilir, dolaşımdaki insülin benzeri büyüme faktörü-1'i (IGF-1) artırabilir, kemik oluşumunu kolaylaştırır. Bu nedenle, *Odoribacter*'in neden olduğu kısa zincirli yağ asitlerinin artışı, postmenopozal kadınlarda obezite, hiperlipidemi, depresyon ve osteoporozu iyileştirebilir. Bununla birlikte, ürettiği hidrojen sülfür de inflamatuvar bir reaksiyona neden olabilir. Bu mekanizmalarla, *Odoribacter* sadece postmenopozal kadınlar üzerinde belirli bir koruyucu etki göstermekle kalmaz, aynı zamanda menopoz sonrası sendromla ilgili semptomları da tetikleyebilir ⁽⁴¹⁾.

Literatürde menopoz öncesi ve sonrası kadınlarda bağırsak florası farklılıklarının değerlendirildiği az sayıda ve heterojen çalışmalar mevcuttur. Menopoz sendromunun mekanizmasını açıklayacak, probiyotikler ve fekal mikrobiyota transplantasyonu gibi olası tedavi yöntemlerinin değerlendirildiği yüksek kalitede orijinal çalışmalara ihtiyaç vardır.

Sonuç

İnsan mikrobiyomu projesi, insan vücudunda dikkate değer bir mikrobiyal ekoloji çeşitliliği göstermiştir. Mikrobiyomun her insanın sağlık durumunun belirlenmesinde çok önemli bir rol oynadığı kabul edilmektedir. İnsan vücudundaki en basit kommensal bakteri topluluklarından biri olmasına rağmen, karmaşık dinamik yapısı ve konakçı immün modülasyonundaki önemli rolü gün geçtikçe anlaşılmaktadır. Kadın genital sisteminin mikrobiyomu da kadın sağlığı ve üremesi ile kritik bir şekilde ilişkilidir.

Genital mikrobiyom ve olumsuz sonuçlar arasında nedensel ilişkiler kurulabilmesi için servikojenital mikrobiyotayı daha iyi anlamak gerekmektedir. Kadınlar, diğer memelilere kıyasla, düşük çeşitlilik ile karakterize edilen ve genellikle *Lactobacillus*'un baskın olduğu benzersiz bir vajinal mikrobiyotaya sahiptir. Vajinal mikrobiyota, adet döngüsünde, cinsel aktivite varlığında, gebelikte, postpartum dönemde, menopoz sonrası ve farklı etnik kökenlere sahip kadınlar arasında da farklılıklar gösterebilir.

Yapılan moleküler temelli çalışmalar, üreme çağındaki sağlıklı kadının vajinal mikrobiyotasındaki laktobasil hâkimiyetinin enfeksiyona karşı ilk savunma hattı olarak önemini göstermiştir. Vajinal mikrobiyotayı oluşturan bakterilerdeki dengesizlikler, HIV de dâhil CYBH yakalanma riskinde artışa, fertilitenin azalmasına, infertilite tedavilerinin etkinliğinde değişikliklere, fetal mikrobiyomda bozulmaya ve ileri yaşam döneminde bazı hastalıkların gelişmesine yol açabilir. Bu nedenle kadın genital traktüs mikrobiyotası ile ilgili araştırmalar ve sonuçları, kadınlar, çocukları ve eşlerinin sağlığı için önemli etkilere sahip olacaktır.

Kadın üreme sağlığının vajinal mikrobiyotaya bağlı olduğuna dair önemli kanıtlara rağmen, mikrobiyom ve kadın üreme sisteminin işlevi arasındaki ilişki hâlâ büyük ölçüde bilinmemektedir. Kadın genital sistemi mikrobiyotasının fizyolojisinin tanımlanması, mikroorganizmalarla bağlantılı oluşabilecek hastalıkların uzun vadede daha iyi anlaşılabilmesi ve tedavi edilebilmesi için bu ilişkiyi daha iyi anlamak gereklidir. Bu konuda koruyucu ve iyileştirici stratejiler veya vajinal mikrobiyomu optimize etmek için kullanılacak tedavi modaliteleri geliştirmek için prospektif, iyi tasarlanmış, örnekleme ve araştırma yöntemlerinin standardize edildiği çalışmalara ihtiyaç bulunmaktadır.

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HASTALIKTA SAĞLIKTA; KBB VE MİKROBİYOTA

Sena Genç Elden

Mikrobiyota insan organizmasının iç ve dış yüzeyinde bulunan kommensal, simbiyotik ve patojenik mikroorganizmaların oluşturduğu ekolojik topluluktur. Toplu olarak, insan vücudu yaklaşık 100 trilyon mikrop için bir ev sahibi görevi görür¹. Mikrobiyal topluluk yenidoğan, çocukluk, genel sağlık veya hastalık durumundan etkilenerek zamanla gelişir ve farklı bölgelerde kolonize olur. Örneğin; Cilt bölgesi daha çok Bacteroidetes filumları bulunurken vajen bölgesinde Firmicutes filumları bulunur².

İnsan mikrobiyomunun, bağışıklık sistemlerinin uyarılması ve olgunlaşması, mukozal yapı ve işlevin desteklenmesi ve çeşitli patojenlerden korunmada 'kolonizasyon direnci' sağlaması nedeniyle konakçıya faydalı olduğu varsayılır³. Mikrobiyotada bozulmaların olması insan hastalıklarıyla ilişkilendirilmiştir⁴. Örneğin, antimikrobiyaller, mikrobiyota bileşimini önemli ölçüde değiştirebilir ve bağırsak ve ağız mikrobiyotasının çeşitliliğini azaltabilir. Bağırsakta bakteri çeşitliliğindeki azalma, tekrarlayan *Clostridium difficile* enfeksiyonlarına neden olabilir veya değişen mikrobiyota inflamatuvar bağırsak hastalığı, nekrotizan enterokolit ve irritabl bağırsak sendromu ile ilişkilendirilmiştir⁵⁻⁷.

Günümüze kadar yapılan mikrobiyota çalışmalarında daha çok gastrointestinal sisteme odaklanılmış ve diğer sistemlerle olan ilişkisi incelenmiştir. Bu kitap bölümünde; Kulak Burun Boğaz ve Baş Boyun Cerrahisi alanında çeşitli mikrobiyota barındırdığı bilinen alanlar üzerinde durulacak ve KBB hastalıklarıyla ilişkisi derlenecektir.

Oral Mikrobiyota

Orafarenkste virüsler, protozoalar, mantarlar, arkeler ve bakterilerden oluşan yoğun mikroorganizma kolonize hâldedir. Tipik olarak konakçı ile uyum içinde yaşayan diğer vücut bölgelerinde bulunan kommensal mikrobiyotanın aksine, ağız normal mikrobiyotası insanda diş çürükleri, periodontal hastalıklar, tonsillit ile ilişkilendirilmiştir^{4,8}. Bu nedenle, ağız hijyeni oral enfeksiyonları engellemek için gereklidir. Örneğin; yaygın bir oral bakteri olan ve fermente olabilen şekerlerin düzenli olarak tüketilmesine bağlı olarak artabilen diş çürüklerinin iyi bilinen bir nedeni *Streptococcus mutans*'tır⁹.

Ağızda oral mikrobiyotanın basit varlığı, kolonizasyon direnci olgusu olan patojenler tarafından kolonizasyonu engeller¹⁰. Ağızın tüm yüzeyleri kommensaller tarafından kolonize edildiğinden, patojenler için çok az bağlanma yeri mevcuttur. Bu etkinin önemi, antimikrobiyaller tarafından kommensal mikrobiyota bozulduğunda görülebilir. Örneğin; *Candida* türleri ve *Staphylococcus aureus* gibi fırsatçı patojenler tarafından enfeksiyonlar meydana gelebilir⁸. Bazı bakterilerin oral patojenlere karşı antagonistik etki gösterdiği bilinmektedir. Örneğin, *Streptococcus salivarius* K12 suşu, in vitro periodontitis ve ağız kokusu ile ilişkili Gram negatif türlerin büyümesini engelleyen bir bakteriyosin üretir¹¹ ve in vivo olarak ağız kokusu üzerinde yararlı etkileri olduğu gösterilmiştir¹².

baskın olduğu bulunmuştur. Pseudomonadaceae, Streptococcaceae, Fusobacterceae ve Pasteurellaceae dâhil olmak üzere birden fazla bakterinin, adenoid mikrobiyotasına egemen olduğu gösterilmiştir. Orta kulak ve bademcik mikrobiyotası arasındaki örtüşme minimum düzeyde olmasına rağmen, adenoid mikrobiyotasının hem orta kulakta hem de bademcikte tespit edilen bakterileri kapsadığı görülmüştür. Çalışma sonucunda, incelenen bölgelerde daha önce bilinmeyen bakteri toplulukları olduğu ve adenoid dokusunun hem orta kulak hem de bademcik için bir kaynak bölge olabileceği sonucuna varılmıştır^{4,50}.

Adenoidlerin hiperplazisi uzun zamandır orta kulak hastalığı ile ilişkilendirilmiştir, ancak bu ilişkinin kesin patogenezi henüz bilinmemektedir⁵⁴. Genişlemiş adenoidlerin üstaki borusunun mekanik tıkanmasına neden olduğu düşünülmektedir. Bu anatomik ventilasyon tüpü tıkanığında orta kulakta negatif basınç oluşur ve hastalık ortaya çıkabilir. Orta kulakta oluşan negatif basıncın hiperplastik adenoid yastığının yüzeyinden patojenik bakterileri çektiği düşünülmektedir⁵⁵.

Yeni moleküler dizileme teknikleri ve metagenomik çalışmalar, insan mikrobiyomunun insan sağlığı ve bazı hastalık durumları için önemini altını çizmiştir. Tüm veriler hastalıkların sıklıkla bir veya daha fazla patojenin ortaya çıkmasına neden olan mikrobiyotanın bozulmasıyla ilişkili olabileceğini göstermektedir.

Kulak burun boğaz-baş boyun cerrahisinde, hastalığın yokluğunda, önce baş ve boyun mikrobiyomunun bileşimini oluşturmak ve daha sonra olası erken tanı ve etkili tedavi için hastalık durumlarında mikrobiyal bileşimdeki değişikliklere odaklanmak için daha fazla çalışmaya ihtiyaç vardır. Bu umut verici metagenomik tıp alanı, umarız yakın gelecekte tanı ve tedavi uygulamalarında daha iyi sonuçlar verecektir.

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Bölüm A47

OKÜLER MİKROBİYOTA

Kübra Özata Gündoğdu

İsa Yuvaçı

Giriş

Belirli bir doku üzerinde bulunan bakteri, mantar, virüs, protozoa ve ökaryotların genetik materyaline mikrobiyom, bu dokuyu kolonize eden mikroorganizmalar topluluğuna ise mikrobiyota denir¹.

Normalde sağlıklı insan vücudunda bulunan mikroorganizmaları tanımlamak ve hastalıklarla olan ilişkisini incelemek amacıyla 2008 yılında başlanan İnsan Mikrobiyomu Projesi'nde insan vücudundaki 5 anatomik bölge çalışmaya dâhil edilmiş (gastrointestinal traktus, deri, ürogenital traktus, oral mukoza ve nazal mukoza), her vücut bölgesinin kendine özgü bir mikrobiyotası olduğu gösterilmiştir². İnsan mikrobiyotasına yönelik çalışmalar, hastalıkların patogenezi anlama ve yeni tedavi yöntemleri geliştirme açısından bize katkı sağlamaktadır.

Metagenomik dizileme, oküler mikrobiyomun çeşitliliği hakkında önemli bilgiler sunmasına ve geleneksel kültür temelli yöntemlerle daha önce tanımlanmamış mikrobiyal türleri ortaya çıkarmasına rağmen, benzer dizileme tekniklerini kullanan çalışmalar arasında tutarsızlık devam etmektedir. Bu nedenle bazen bir mikroorganizmanın varlığını kanıtlamak için kültür temelli yöntemlerin, kültür temelli olmayan yöntemlerle birleştirilerek kullanılması önerilmektedir³.

Göz anatomik olarak anterior kamara, posterior kamara, iris, lens, silier cisim, vitreus, retina, koroïden oluşan iç bölüm ve sklera, konjonktiva, kornea ve gözyaşı film tabakasından oluşan dış bölümden oluşmaktadır (Şekil 1)⁴. Göz, bu kapalı anatomik yapısı ve sıkı kan-retina bariyerinden dolayı steril kabul edilmiştir.

Oküler yüzey; kornea, konjonktiva, gözyaşı filmi ve göz kapaklarını içeren göz ile çevre arasındaki ara yüzdür. Oküler yüzey mikrobiyotası, kornea ve konjonktivada kolonize olan mikroorganizmalardan oluşur. Oküler yüzey mukozası doğrudan çevreye maruz kaldığından, potansiyel olarak patojenik mikroorganizmalara karşı bir savunma görevi görür. Bu süreçte gözümüz; mekanik (göz kırpma ve gözyaşı salgısı yoluyla oküler yüzeyin temizlenmesi), kimyasal (gözyaşı içindeki lizozim, laktoferrin ve defensinler dâhil antimikrobiyal elementler) ve immünolojik (nötrofiller ve Ig A) olarak kendini mikroorganizmalara karşı korur¹.

İlk olarak 1930 yılında Graham ve ark. tarafından yapılan çalışma sonucu oküler yüzey mikroorganizmalarının varlığına ilişkin kanıtlar ortaya çıkmaya başlamıştır⁵. Normalde enfeksiyona veya inflamasyona neden olmayan kommensal bakteriler, oküler yüzeyi kolonize ederek oküler mikrobiyotayı oluştururlar. Bu mikrobiyota, patolojik türlerin kolonizasyonunu engellemek ve oküler yüzey homeostazisini sağlamak açısından önemli bir yere sahiptir. Aynı zamanda bu kommensal mikrobiyotanın konak fizyolojisinin düzenlenmesinde ve bağışıklık sisteminin uyarılmasında temel roller oynadığı kanıtlanmıştır⁶.

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KRONİK İNFLAMASYON VE MİKROBİYOM

Ayşe Caner

İnflamasyon, vücudun yaralanmalara, infeksiyonlara, ölü hücelere ve zararlı uyarılara karşı cevap verdiği bir savunma tepkisidir. İnflamasyon normalde patolojik bir durum olmasına karşın, evrimsel amacı vücuttan zararlı ajanları temizlemek ve dolayısıyla yeniden büyümeye veya iyileşmeye zemin hazırlayarak homeostazi yeniden sağlamaktır.^{1,2} İnflamasyon, internal ve eksternal faktörler (mikrobiyal veya mikrobiyal olmayan) tarafından tetiklenmektedir. Mikrobiyal olmayan faktörler arasında alerjenler, irritant maddeler ve toksik bileşikler bulunmaktadır.² İnflamasyonun en güçlü tetikleyicileri ise mikroorganizmalar olup, bunlar lokal ve/veya sistemik inflamasyonu indüklemeye potansiyeli taşımaktadır. Bu nedenle, bağışıklık sistemi, inflamatuvar doku hasarını sınırlandırmak ve konağı patojenik enfeksiyonlardan korumak için bir dizi mekanizma geliştirmiştir.³ İnflamasyon süreci, dokuda hâlihazırda bulunan bağışıklık sistem hücreleri olan makrofajlar, dendritik hücreler, nötrofiller ve mast hücreleri tarafından başlatılmaktadır. Tehlike sinyalleri bu hücrelerin aktivasyonunu tetiklemekte ve inflamasyonun klinik belirtilerinden sorumlu süreci başlatan inflamatuvar mediatörlerin salınmasına neden olmaktadır. Genel olarak bu belirtiler kızarıklık, şişme, ağrı, ısı ve bozulmuş vücut fonksiyonları ile karakterize olmaktadır.⁴ İnflamasyon başladıktan sonra, bu süreç inflamasyonun nedeni kaldırılıncaya ve iyileşme başlayana kadar belirli bir düzeyde ilerlemektedir. Bununla birlikte, inflamasyonun nedeni ortadan kaldırılamazsa, inflamasyon devam etmekte ve zamanla yoğunluğu da değişiklik göstermektedir.^{1,4}

Mikrobiyotaya ile inflamasyon arasında karmaşık bir ilişki bulunmakta ve epitel hücreleri ile mukozal bağışıklık sisteminin patojenik ve patojenik olmayan ajanları ayırt etmesi çok önemli olmaktadır.⁵ Mikrobiyotaya, patojenik türler ile rekabet ederek ve mukozal tabakayı destekleyerek, infeksiyonlara karşı doğal bir savunma sağlamaktadır.⁶ Aynı zamanda, bağışıklık sistemi, patojenlere karşı korumayı optimize etmek ve gereksiz bağışıklık faaliyetlerinden kaçınmak için güçlü bir kontrol sistemi geliştirmiştir.¹ Bağırsak epitel hücreleri, bakteriyel antijenleri tespit etme, hem doğal hem de adaptif bağışıklık tepkilerini başlatma ve düzenleme yeteneğine sahiptir.^{5,7} Bu mikrobiyotaya-bağışıklık sistem arasındaki ilişkiler inflamasyona neden olmakta veya önleyebilmektedir. Bazı mikrobiyal türler bağışıklık sisteminin düzenleyici hücrelerini uyararak anti-inflamatuvar mekanizmalar ile inflamasyonu inhibe etmektedir.¹ Öte yandan, mikrobiyotaya ilişkili bazı metabolitler, bağırsaktan ayrılıp kan dolaşımına girerek, sitokinler ve diğer moleküllerin oluşmasını sağlayarak etkili bir şekilde inflamasyon yanıtı başlatmaktadır.⁸ Benzer şekilde, epitel dokusundaki hücreler, bakteriyel metabolitleri bağışıklık hücrelerine ileterek hem lokal hem de sistemik düzeyde inflamasyonu teşvik etmektedir. Bu durumların kalıcılığı subakut veya kronik inflamasyona yol açabilmekte ve daha sonra inflamatuvar hastalıkların gelişmesine neden olabilmektedir.¹

Monositler/makrofajların inflamasyonun başlamasında rolleri olduğu kadar, bunun sürdürülmesinde ve ortadan kalkmasında da kritik görevleri bulunmaktadır.^{1,9} Bazı mikroorganizma molekülleri ve IL-1 β /IFN-y gibi mediatörler tarafından indüklenen makrofajlar (M1), pro-inflamatuvar sitokinleri (TNF-

yılmasını kolaylaştırmaktadır.^{112,113} Mikrobiyota, kemoterapi veya immünoterapinin anti-tümör etkinliği için de gereklidir.¹¹⁴ Kemoterapi ve kontrol noktası-inhibitörlerin blokajı, *Bacteriodes* veya *Bifidobacterium* gibi bağışıklık sistem uyarıcı mikrobiyotanın translyasyonunu veya aşırı büyümesini indükleyebilir. Özellikle bu bakteriler dendritik hücre fonksiyonunu ve tümöre özgü CD8+ T hücre yanıtını artırabilmektedir.^{115,116} Bu veriler, mikrobiyotanın modüle edilmesi ile kanser immünoterapi etkisinin artırılabilirliğini düşündürmektedir.

Diyet, hastalıklar, ilaçlar ve diğer birçok faktör, bağırsak mikrobiyotasında bir dengesizliğe, disbiyoz ve artan bağırsak geçirgenliğine neden olmaktadır. Mikrobiyota, epitel hücreler, antijen sunan hücreler, lenfoid hücreler, adaptif immünojenik hücreler ile direk ve dolaylı olarak ilişki hâlinindedir. Bunlar ile beraber çeşitli mikrobiyotadan türetilmiş biyoaktif moleküller, bağırsakta ve distal bölgelerde inflamasyona ve metabolik bozukluklara yol açabilmektedir. Diğer bir deyişle, inflamasyon, mikroorganizmaların, bunların yapısal elemanlarının ve metabolizma ürünlerinin varlığından kaynaklanmaktadır. Düşük dereceli kronik inflamasyon ve disbiyoz birbirini şiddetlendirerek bir kısır döngü oluşturmaktadır, kronik inflamasyon, kanser, otoimmün hastalıklara ve nörodejeneratif bozukluklara neden olmaktadır. Mikrobiyotanın inflamatuvar profil üzerindeki etkilerini ve mekanizmalarını anlamak bu hastalıkların tanısı, tedavisi ve prognozu açısından önemli katkılar sağlayacaktır. Bununla birlikte, konuyla ilgili mevcut bilgilerin yeterli olmaması nedeniyle, mikrobiyota-inflamasyon arasındaki ilişkileri anlamak için moleküler ve translyasyonel düzeyde daha fazla araştırmaya ihtiyaç bulunmaktadır.

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FEKAL MİKROBİYOTA TRANSPLANTASYONU (FMT) (Dışkı Nakli & Gaita Nakli)

Ahmet Uygun

Giriş

FMT tanım olarak (= fekal bakteriyoterapi = fekal transfüzyon = gaita nakli= dışkı nakli) sağlıklı bir donörden alınan gaitanın, çeşitli işlemlerden geçirilerek, alıcının GİS'ne yerleştirilmesi işlemidir.

Tarihte ilk kez dışkı nakli 4. yüzyılda, ağız yoluyla “Sarı Çorba” adıyla Çin’de **Ge Hong** tarafından gıda zehirlenmesi ve ciddi diyare de oral olarak kullanılmıştır.

16. yüzyılda yüksek ateş, kronik diyare ve konstipasyonda kullanılmıştır.

17. yüzyılda veteriner tıbbında yaygın olarak kullanılmış,

20.yüzyılda “Sıcak deve feçesi” **Bedouins** tarafından tavsiye edilmiş, 2. Dünya Savaşı’nda, Afrika’da Alman askerleri tarafından kullanılmıştır.

1958’de insanda, modern tıpta, ilk kez **Eiseman B.** tarafından kullanılmıştır ^(1,2).

Son zamanlarda, çeşitli klinik durumlarda ve antibiyotiklere bağlı ishalin nedeni olan, *Clostridium difficile* enfeksiyonunun tekrarlayan ve dirençli ishal durumlarında yaygın olarak kullanılmaya başlanmış ve **2013’de FDA tarafından, Clostridium difficile** enfeksiyonunun tekrarlayan ve dirençli ishal durumlarının tedavisi için onaylanmıştır ⁽³⁾.

Bu onay gaita naklinin başka hastalıklarda da onaylanmasını gündeme getirmiştir.

İnsan oğlu nasıl sağlıklı bir şekilde ayakta kalıyor?.

İnsan oğlunun sağlıklı bir şekilde yaşaması için mutlaka;

1. GİS’in mukozal bütünlüğü tam olmalı,
2. İmmün sistem fonksiyonları yeterli olmalı ve
3. Sağlıklı bir mikrobiyotasının olması şarttır.

Çünkü bunlardan birisi eksik ya da yetersiz olursa, mutlaka çeşitli derecelerde ve çok çeşitli hastalıklar ortaya çıkmaya başlarlar.

Örneğin mikrobiyotamız; patojen bakterilerin ve virüslerin çoğalmasını inhibe ederek, biyolojik bir bariyer oluşturur, ayrıca patojen bakterilerin yapışmasını ve translokasyonunu inhibe eder.

Daha da önemlisi, Ig G, Ig A, Ig M’yi sentezleyerek kazanılmış immüniteye katkı sağlayarak, intestinal mukozayı korur.

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MİKROBİYOM VE METABOLOM ARASINDAKİ ETKİLEŞİMİNİN İNSAN SAĞLIĞI İLE İLİŞKİSİ

Kurtuluş Buruk

"Mens sana in corpore sano" "sağlıklı bir vücutta sağlıklı bir zihin"

Romalı şair Juvenal

Giriş

Genler, yaş, cinsiyet, davranışlar (egzersiz, uyku düzeni ve yeme alışkanlıkları gibi) ve çevre (sosyal ve biyolojik çevre), bireylerin sağlığını etkileyen ve kişisel yönleri olan faktörlerdir. Kişiselleştirilmiş sağlık (precision medicine, precision health) bireylerin bu faktörlerinin belirlenerek ve ölçülerek sağlıklarını korumak üzere kullanılmasıdır ⁽¹⁾. Kişiselleştirilmiş tıbbın önemli veri kaynaklarından biri de genomiks, transkriptomiks, proteomiks ve metabolomiks gibi alanları içeren biyomedikal bilimlerdir. Bu bölümde, insan vücudunda biyolojik bir sıvıda, bir dokuda veya vücut bölümündeki metabolomun varlık, miktar ve çeşitliliğinin mikrobiyal genom özellikleri (miktar ve çeşitlilik gibi) ve insan sağlığı ile ilişkisi irdelenecektir.

Mikrobiyom ve Metabolom Tanımı

Mikrobiyom en genel tanımıyla bir canlının içinde veya üzerinde bir bölgede, dokuda veya biyolojik örneklem biriminde simbiyotik veya patojenik yaşayan tüm mikroorganizmaların (ki bu mikroorganizma topluluğu mikrobiyota olarak adlandırılır) genomunu ifade eder ⁽²⁾. Mikrobiyota, içinde veya üzerinde yaşadığı canlının metabolik, besinsel, fiyolojik ve immünolojik süreçlerinde önemli rol oynamaktadır ⁽³⁾. Mikrobiyomiks, bir biyolojik sistemdeki mikrobiyal genomların tümünün araştırılması olarak tanımlanmaktadır ve aslında genomiksin bir alt alanıdır ⁽⁴⁾.

Metabolitler, hüresel metabolizma faaliyetleri sonucu ortaya çıkan ara veya son ürünlerdir. Metabolitler, enerji üretimi, sinyal iletimi, transkripsiyonun ve apoptozisin yönetimi gibi işlevlerinin yanında kofaktör olarak da görev alırlar. Günümüzde çoğunlukla insanda kan glikozu düzeyi ile diyabet veya fenilalanin düzeyi ile fenilketonüri ilişkisinde olduğu gibi bazı hastalıkların tanısında biyomarker olarak kullanılmaktadırlar ⁽⁵⁾. Bir hücre, doku, organ veya daha geniş bir ifadeyle bir canlı biriminden alınan örnekteki metabolitlerin tamamına metabolom adı verilmektedir. Metabolomun içeriğinin kalitatif veya kantitatif olarak incelenmesine, bir başka deyişle metabolom içeriğinin profilinin çıkarılma çalışmalarına metabolomiks denmektedir ⁽⁶⁾.

Omiks'lerin Önemi ve Anlamları

Çevre koşullarındaki değişime bağlı olarak gerçekleşen biyolojik karşı tepkinin ölçülmesi, olayla ilgili neden sonuç ilişkisinin kanıta dayalı olarak kurulması adına son derece önemlidir. Örneğin, yeni bir ilaç kullanan bireyin karaciğer hücrelerindeki biyolojik davranışın izlenmesi ile ilacın karaciğerde

ve dolaşıma geçen metabolitlerinin MS gelişimi ile ilişkili olduğunu belirtmektedir. Bağırsak mikrobiyotası miyeline karşı aktive olmuş Th17 hücrelerinin ve CD4+ Th hücrelerinin yanında mikrogliya ve astrositlerin fonksiyonlarını da etkilemektedir. Mikrobiyota bu görevini en sık KZYA üretimi üzerinden yürütmektedir. Deneysel modellerde MS benzeri tablonun şiddeti ile KZYA düzeyleri arasında ters ilişki söz konusudur. Ayrıca, hayvansal proteinden zayıf diyet, IL-17A salınımının azalmasına ve belirtilerin şiddetinin azalmasına neden olmaktadır. Modellerle yapılan çalışmalarda, *L. reuteri*, *A. calcoaceticus*, *A. muciniphila*, *Streptococcus türlerinin* Th1 üzerinden IFN-gamma ve Th17 üzerinden IL-17A salınımı ile demiyelinizasyonu tetiklerken, *L. murinus*, *L. helveticus*, *P. histicola* ve *Bifidobacterium türleri* de Treg hücrelerinin düzey ve sayısını artırarak koruyucu etki gösterdiği vurgulanmaktadır⁽³³⁾.

Romatod artrit (RA), genetik ve çevresel faktörler etkisiyle yönetilen sistemik bir otoimmün hastalıktır. Yapılan çalışmalarda mikrobiyotanın, T lenfositlerde TLR-2 (Toll-like receptor-2) ekspresyonunu uyarması, Th17 yanıtı üzerinden IL-17 üretimini artırması, KZYA üretimini azaltması gibi olumsuz etkileri ile RA oluşumuna ve şiddetine destek verdiği saptanmıştır. KZYA, bir taraftan bağırsak hücrelerinin sağlığını desteklerken, diğer taraftan hem innate immün sistem hücrelerinin (dendritik hücreler, makrofaj ve nötrofil) hem de adaptif immün sistem hücrelerinin (Th1, Th17, Treg ve B hücreleri) aktivitelerinin düzenlenmesine katkıda bulunmaktadır⁽³³⁾.

Bir başka otoimmün hastalık da tirotropin reseptörüne karşı otoantikör oluşması sonucu gelişen **Graves hastalığıdır (GH)**. Yapılan çalışmalar *Prevotella* ve *Bacteroides türlerinin* baskınlığının GH ile ilişkili olduğunu göstermiştir. Diğer otoimmün hastalıklarda olduğu gibi GH'de de mikrobiyotanın da katkı sağladığı KZYA'nin üretiminin dengesizleştiği, IL-17 sentezinin arttığı ve IL-10 sentezinin azaldığı saptanmıştır⁽³⁶⁾.

Görüldüğü gibi birçok hastalık mikrobiyotanın bileşimi ile ilişkilendirilmektedir. Oluşum mekanizmaları açıklanırken mikrobiyal metabolitlerin etkisi net olarak ifade edilmektedir. Dahası, mikrobiyotanın modülasyonu ile hastalık belirtilerinde düzelme görülmektedir. Geline nokta, bilim dünyası son on yıllarda multidisipliner çalışmaları ile mikrobiyota ve sağlık/hastalık ilişkisini araştırırken, mikrobiyom verisinin yanına metabolom verisini ekleyerek kanıt düzeyi yüksek bilgiler elde etmektedir. İlerleyen süreçte sağlıklı yaşam ile mikrobiyota ilişkisi, metabolom verileri ile daha da derinlemesine ilişkilendirilebilecek ve bu veriler ışığında geliştirilecek yöntem, biyomarker, ilaç/ürün ve bilgiler sağlığın korunmasında kullanılmak üzere kılavuzlarda yer alabilecektir.

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Bölüm A51

MİKROBİYOM VE MAKİNE ÖĞRENME

Uğur Sezerman

Ali Arslan

Pınar Onat

Berkay Yekta Ekren

Konak ve mikrobiyom

İnsan vücudu, mikroorganizmalarla simbiyotik bir ilişki içerisinde varlığını sürdürür¹. Bu mikroorganizmalar, vücudun çeşitli bölgelerinde mikrobiyom adı verilen kompleks ekosistemler oluşturur. Bu ekosistemler, vücudun dış çevre ile teması bulunan bölgelerde görülür ve mantarlar, virüsler, bakteriler gibi farklı organizmaları barındırabilir^{1, 7}. Oral, vajinal, intestinal, nazal ve deri mikrobiyotası insan vücudunda varlığını sürdüren mikrobiyom çeşitlerine örnek olarak verilebilir¹. Farklı bölgelerde kurulum gösteren bu mikrobiyota komüniteleri birbirleri ile etkileşim hâlinindedir dolayısıyla kompozisyonları birbirine bağlılık gösterir¹.

Mikrobiyotanın biyolojik aktiviteleri

Mikrobiyom komüniteleri, belirli proteinler, metabolitler ve RNA üretimi aracılığıyla hem konak-mikrop, hem de mikrop-mikrop etkileşimleri sağlar³. Bu etkileşimler bağışıklık sistemi, vitamin üretimi ve emilimi, metabolik süreçler gibi önemli fonksiyonları etkiler¹. Dolayısıyla mikrobiyotanın dengede bulunması, vücudun sağlığında büyük önem taşımaktadır. Mikrobiyota homeostazisinin bozulmasına “disbiyozis” adı verilir¹. Disbiyozis, insanlarda görülen Diyabet, Enflamatuvar Bağışıklık Hastalıkları (IBD) gibi birden çok hastalıkla ve bu hastalıkların seyri, ağırlığı gibi özellikleri ile ilişkili bulunmuştur^{3, 4}. Bu sebeple mikrobiyom verisinin, bazı hastalıkların tanısı, tahmini, hastalıklar için biyomarkör belirlenmesi ve hastalıkların seyri açısından bilgilendirici olarak kullanılabilceği düşünülmektedir⁶.

Mikrobiyotayı etkileyen faktörler

Mikrobiyom kompozisyonu, insan yaşamı boyunca değişiklik gösterir. Bu değişiklikler yaşla, diyetle, hastalıkla ilişkili olarak görülmektedir². İnsan hayatının ilk üç yılı, mikrobiyom kompozisyonunun gelecekteki dengesinin belirlenmesinde büyük rol oynamaktadır². Bu üç yılda hızlı ve büyük değişiklikler gösteren mikrobiyota kompozisyonu, yetişkinlik süresince diyetle ve yaşam tarzına bağlı olarak minimal değişiklikler gösterir, ama çoğunlukla stabildir². Sonrasında yaşlılık süresince daha belirgin ve kalıcı değişiklikler takip eder². Yaşlılıkta görülen bu değişikliklerin sebebinin de temelde kişinin yaşam tarzındaki mobilite, belirli hastalıklara bağlı ilaç kullanımı, beslenme farklılıkları gibi değişikliklerden kaynaklandığı düşünülür².

nobrevibacter miktarının gastrointestinal yoldaki gaz oluşumuyla positif korelasyona sahip olduğu incelenmiştir. Bunun yanında, *Methanobrevibacter*, *Bacteroides* cinsi ile ters orantıda buldukları görülmüştür³⁰.

Otoimünite ve tip 1 diyabet (T1D)

2018'de Vatanen ve ark. tarafından ele alınan ve farklı ülkelerden 763 bireyi içeren çalışmada, Random Forest sınıflandırması uygulanmış, IA kontrollerinde *Lactobacillus rhamnosus* ve *Bifidobacterium dentium* miktarının, IA hastalarının da daha fazla miktarda *Streptococcus mitis*, *Streptococcus oralis*, *Streptococcus pneumoniae* bulundurduğu gözlemlenmiştir. Bunun yanında, T1D hastalarında *Streptococcus thermophilus* ve *Lactococcus lactis* türlerinin daha az miktarda, *Bifidobacterium pseudicatenum*, *Roseburia hominis* ve *Alistipes shahii* türlerinin de daha fazla olduğu görülmüştür³¹.

Karaciğer hastalıkları

Skleroz kolanjit olarak da bilinen sclerosing cholangitis, 2017 yılında Pereria ve ark. tarafından ele alınmıştır. Çalışmada generalized linear model kullanılarak *Streptococcus* cinsinin hastalık şiddetinin artması ile arttığı gözlemlenmiştir³².

2020 yılının ilk yarısında Liu ve ark. tarafından karaciğer hastaları üzerinde yapılmış çalışmada, makine öğrenme yöntemi olarak gradient boosting kullanılmıştır. Acute-on-chronic liver failure, non-alcoholic fatty liver disease and cirrhosis hastalarında aile bazında, Erysipelotrichaceae, Streptococaceae, Enterobacteriaceae bakterilerinin daha fazla, cins seviyesinde, *Actinomyces*, *Lactobacillus*, *Veillonella*, *Prevotella* bakterilerinin hastalarda yüksek olduğu görülmüştür. Liver abscess ve sepsis hastalarında ise *Actinomyces*, *Escherichia*, *Klebsiella*, *Desulfovibrio*, bakterilerinin yüksek olduğu, fakat, *Faecalibacterium*, *Coprococcus* ve *Akkermansia* miktarlarının azaldığı gözlemlenmiştir. Çalışmada AU-ROCC uygulanmış, tür seviyesinde 0.895 ile en yüksek değere ulaşılmıştır. Tüm sınıflandırmalar ise %95 doğrulukla elde edilmiştir³³.

Mikrobiyom hastalık oluşum mekanizasında sadece bir faktörün etkisini incelememizi sağlamaktadır. Özellikle kompleks hastalıklar çok faktörlü hastalıklardır ve kişiye özel hastalık oluşum mekanizmalarını belirlemek ve kişiye özel tedavi adaylarını bulmak için farklı verilerin entegrasyonu gerekmektedir. Mikrobiyom verilerinin yanına da meta transkriptomik verilerinin entegrasyonu ve konak ile ilişkilerinin belirlemek ve konaktaki hastalık oluşumuna katkısı olacak diğer mekanizmaları belirlemek için hastanın genomik transkriptomik proteomik metabolomik verilerinin de entegrasyonu gerekmektedir (Figür 1). Makine Öğrenme yöntemleri kullanarak veri entegrasyonu ile kişiye özel hastalık oluşum mekanizmalarını aydınlatılması ve hastalık tetikleyen anahtar mekanizmaların belirlenmesi ve böylece tedavi adaylarının bulunması üzerine son yıllarda yeni çalışmalar yapılmayazşlanmıştır. Bu alan makine öğrenme yöntemlerinin Mikrobiyom ile beraber en önemli uygulamalarının geliştirileceği bir alandır.

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B. PROBİYOTİKLER

Bölüm B1

PROBİYOTİKLER VE PREBİYOTİKLER

Meltem Yalınay

Günümüzde sağlıklı yaşam, beslenme ve tıbbi tedavilere katkıda bulunabilmesi için destek ürünlere ilgi ve farkındalığın çok arttığını görmekteyiz. Probiyotikler, prebiyotikler, bunları içeren çeşitli fonksiyonel gıdalar tüm dünyada yaygın olarak kullanılmaktadır. Probiyotik, prebiyotikler ve sinbiyotik ürünlerin sağlık koşuluna katkıları, yapılan binlerce araştırma ile de her geçen gün daha çok aydınlatılmaktadır. Bunların yanı sıra bu güncel alan, probiyotik bakterilerin canlılığını kaybetmesi durumunda paraprobiyotikler ve probiyotik bakterilerin metabolizmaları sonucu ulaşılan etkinin ortaya konulabilmesine ilişkin postbiyotik kavramları ile de daha kapsamlı bir boyuta ulaşmıştır. Psikobiyotik tanımı ise bağırsak beyin eksenine dikkate alındığında, kommensal bağırsak bakterileri ile etkileşime girerek mental sağlık katkısı oluşturan canlı probiyotik bakteriler için kullanılmaktadır.

Eski Asur dilinden gelen yoğurt için kullanılan “lebeny” sözcüğü yaşam için anlamına gelmektedir. Probiyotik sözcüğü de Yunanca pro: için, bios: yaşam “yaşam için” kelimelerinden oluşmuştur. Genel olarak probiyotikler dost bakteriler, iyi bakteriler olarak bilinir. Probiyotikler Dünya Sağlık Örgütü (World Health Organization-WHO) ve Gıda Tarım Organizasyonu (Food and Agriculture Organization-FAO) tarafından “yeterli miktarlarda alındığı zaman konakta sağlık yararı oluşturan canlı mikroorganizmalar” olarak tanımlanır⁽¹⁾. Probiyotik, prebiyotik ve sinbiyotik kavramları yapılan sayısız araştırma ile bakteriyel birlikteliğin insan sağlığına faydalı etkileri ile ortaya konmasını tanımlamaktadır⁽²⁻⁵⁾. İdeal bir probiyotik fizyolojik ve genetik olarak tanımlanmalı, alındıktan sonra bağırsağa canlı olarak ulaşmalıdır.

Konakta yararlı bakterilerin çoğu laktik asit bakterileridir (LAB) ve yoğurt, fermente süt ürünleri veya diğer fermente ürünlerde günlük hayatımızda tüketilmektedir⁽⁶⁾. LAB'nin bağışıklık sistemi üzerine birçok etkisi olduğu bilinmektedir ve “genel olarak güvenilir - generally recognized as safe (GRAS)” tanımlanması gerekmektedir. LAB grubunda genellikle laktobasiller, laktokoklar ve streptokoklar bulunmakla birlikte bağırsaklarımızdaki tek yararlı bakteriler bunlar değildir. *Bifidobacterium* cinsleri^(6,7) ve *Enterococcus*, *Streptococcus*, *Escherichia* gibi diğer bakteriyel cinsler ve mayalardan *Saccharomyces boulardii*⁽⁸⁾ bunlar içinde yer almaktadır.

En meşhur LAB'lerinin güvenli kullanımla ilgili oldukça eski bir hikâyeleri vardır⁽⁹⁾. 1907'de Rus mikrobiyolog Elie Metchnikoff fermente süt ürünlerindeki canlı mikropların düzenli tüketilmesinin sağlığa katkısını ve uzun yaşamla ilişkili olabileceğini öne sürmüştür^(9,10). Fermente sütü bol miktarda tüketen uzun yaşayan Bulgar köylüleri gibi kolonik mikroflorayı bu şekilde modifiye etmeye başlamışlardır. Günümüzde geleneksel yoğurt mayalamada kullanılan Bulgar basili olarak bilinen *Lactobacillus bulgaricus*'u şimdiki adıyla *Lactobacillus delbrueckii* spp. *Bulgaricus* ve *Streptococcus thermophilus*'u kullanılmıştır. Metchnikoff'un uzun yaşam teorisindeki yoğurt laktobasilleri ile başlayan hikâyede suşa bağlı konakta birçok faydalı etkileri bulunan probiyotik LAB'leri tanımlanmıştır⁽¹⁰⁻¹⁴⁾. Havenaar and

'Türkiye Probiyotik Rehberi' adı altında yapılan çalışmanın esas amacı, ülkemizde bulunan probiyotik destek ürünlerin dökümünü yapmak ve bilimsel bir alt yapı üzerinden kanıt düzeyleri ile destek kullanım alanlarını ortaya koyacak derli toplu bir veri tabanı ve kaynak oluşturmaktır. Bu çalışma hazırlanırken dünyada daha önce oluşturulmuş çeşitli rehberler incelenmiş ve probiyotik tanımlamalarının doğru esas ve kanıt düzeyinde değerlendirilmeleri dikkate alınarak metodoloji oluşturulmuştur. PRISMA rehberleri, PubMed, Cochrane veri tabanı esas alınarak yayınlanmış meta-analizler dikkate alınmıştır. Bildirilen ürünler; ticari marka, probiyotik mikroorganizma suşu, ticari formu, KOB /(koloni oluşturulan birim)(CFU)/ birim, günlük önerilen kullanım miktarı, yaş/cinsiyet, kaynağa dayalı destek kullanım alanı, kaynağa göre kanıt düzeyi esas alınarak değerlendirilmeye çalışılmıştır. Çalışmaya probiyotik bir bakteride olması gereken bakteri cins, tür, suş kodu bilgileri olan mikroorganizmalar dâhil edilmiştir. www.probiyotikrehberi.com adresinden çalışmanın internet sayfasına ulaşım sağlanmaktadır.

Sonuç

Probiyotik mikroorganizmaların sistemik hastalıkların destek tedavisinde kullanımı çok güncel bir konudur. Bağırsak mikrobiyotik metagenom analizleri ile kişiye özel probiyotik uygulaması ve kişinin bütüncül tıbbi yaklaşımıyla bir uzman kontrolünde sürecin yürütülmesi en faydalı sonucu sağlayacaktır. Probiyotiklerin mekanizmalarını ve işlevselliğini anlama çalışmaları, bu dost bakterilerin geleceğini şekillendirecektir. Gen teknolojisi kesinlikle sadece farmakokinetik ve farmakodinamik özellikleri açıklamakla kalmayıp yeni suşlar geliştirmede de rol oynayacaktır. Probiyotiklerin önleyici ve terapötik ajanlar olarak rolünü daha da tanımlamak için iyi tasarlanmış, çift kör, plasebo kontrollü klinik çalışmalarla uzun süreçlerde daha sağlıklı sonuçlar elde etmek mümkün olacaktır.

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METABOLİK SENDROM TEDAVİSİNDE PROBİYOTİKLER

Gökhan GÜNGÖR

Metabolik sendrom, genetik ve çevresel faktörlerin etkisiyle meydana gelir. Artmış insülin direnci, glukoz intoleransı veya diyabetes mellitus, artmış bel çevresi, obezite, dislipidemi, hipertansiyon ile karakterize bir klinik sendromdur ve prevalansı giderek artmaktadır. Kardiyovasküler ve serebrovasküler olaylar, kronik böbrek hastalığı, non-alkolik yağlı karaciğer hastalığı, bununla ilişkili karaciğer sirozu, periferik arter hastalıkları gibi sekonder sistemik bozuklukların da eklenebileceği göz önüne alındığında dünyadaki önemli global sağlık sorunlarından birisidir.

Metabolik sendrom prevalansı erişkinlerde ortalama %22 olarak bildirilmekte ve prevalans yaş ile artmaktadır. Popüler beslenme alışkanlıkları ve sedanter yaşam tarzının yerleşmesiyle tüm dünyada prevalansının giderek artacağı tahmin edilmektedir. Ülkemizde metabolik sendrom görülme sıklığı, erkeklerde %28, kadınlarda ise %40 gibi oldukça yüksek değerlerdedir⁽¹⁾.

Metabolik sendromunda tanı kriterleri, Dünya Sağlık Örgütü, National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III)-2001 ve Uluslararası Diyabet Federasyonu tarafından kriter değerleri aynı olmakla birlikte bazı farklılıklar içermektedir. Tablo 1'de Metabolik Sendrom Tanı Kriterleri verilmiştir.

Metabolik sendrom tedavisinde, bugüne kadar bilinen konvasiyonel tedavi ve yaklaşımlar; düzenli fiziksel aktivite, yaşam tarzı değişiklikleri, alkol ve sigaranın bırakılması, diyetten şeker, tuz, doymuş ve trans yağların kısıtlanması, kilo verme, bunlar yeterli olmazsa oral antidiyabetik, insülin, antihipertansif, antihiperlipidemik ajanlar gibi çeşitli ilaçların kullanılmasıyla diyabet, hipertansiyon ve hiperlipideminin ilaçlarla kontrolünü içermektedir. Bu yaşam tarzı değişiklikleri ve ilaçlar en azından, metabolik sendromu oluşturan hastalık komponentlerinin hedef organ hasarlarını engellemekte ya da korumaktadırlar, ancak hastaların tümünde bu faydayı sağlayamayabilirler. Sadece %10'luk kilo kaybı bile metabolik sendromun bazı bileşenlerini kontrol altına alabilir. Düzenli fiziksel aktivite insülin direncini düzelterek glukoz, lipid ve kan basıncı kontrolünü sağlar ve kardiyovasküler riskleri azaltabilir. Birtakım gıda ve nutrientlerin içinde bulunan askorbik asit, hidroksitirozol, quercetin, resveratrol, tokoferol, antosiyaninler, katekinler, polifenoller gibi biyoaktif bileşenler, metabolik sendromun bazı bileşenlerini olumlu yönde değiştirebilirler. Metformin ve glutazonlar insülin direncini azaltırlar, diyabetin tedavisinde ilk seçilebilecek ilaçlardır, glisemik kontrolün sağlanamaması durumunda diğer oral antidiyabetikler ve insülinlere geçilebilir. Fibratlar serum trigliseridlerini azaltıp, High Density Lipoproteini (HDL) yükselterek kardiyovasküler riski azaltırlar, statinler total kolesterol ve Low Density Lipoprotein (LDL) düzeyini düşürmede etkili ajanlardır. Anjiyotensin converting enzim inhibitörleri ve anjiyotensin II reseptör antagonistleri hem antihipertansif etkileri, hem de kardiyoprotektif ve renoprotektif etkileri nedeniyle metabolik sendromda kullanılırlar. Kalsiyum kanal blokerleri ve alfa-blokerler metabolik sendromun diğer bileşenleri üzerinde olumsuz etki göstermeden hipertansiyonu kontrol edebilirler. An-

Son yıllarda *Verrucomicrobiota* filumunun bir üyesi olan *Akkermansia muciniphila* üzerine ilgi yoğunlaşmıştır. *Akkermansia*'nın lipopolisakkarit düzeylerini artırması; diyetteki lifleri glukoz ve lipid homeostazı üzerine etkileti olan asetat, propiyonat ve bütirata dönüştürmesi; IL-2, IFN-gama, IL-12p40, MCP-1 gibi inflamatuvar sitokinleri azaltması; intestinal permeabilite ve tight junction proteinlerini regüle etmesi; kısa zincirli yağ asidi üretimini artırması; LDL reseptör yolağı ilişkili aşırı lipid yükünü bas-kılaması gibi olumlu etkiler sonucunda, vücut ağırlığı, insülin direnci, kan basıncı, hiperglisemi ve lipid düzeylerinde azalma oluşturabileceği savunulmuştur⁽²³⁾.

Depommier C ve arkadaşları obez veya aşırı kilolu insanlarda, canlı veya pastörize edilmiş 1010 *Akkermansia muciniphila* bakterisinin, 3 aylık günlük oral takviyesinin güvenli ve iyi tolere edildiğini, bu süre sonunda plasebo ile karşılaştırıldığında, pastörize *Akkermansia muciniphila*'nın insülin duyarlılığını iyileştirdiğini, insülinemi ve plazma total kolesterolünü azalttığını, vücut ağırlığı, yağ kütlesi ve kalça çevresinde ise bazale göre hafif azalma sağladığını rapor etmiştir⁽²⁴⁾.

Akkermansia muciniphila'nın kızılçık ve üzüm özütü gibi diyet polifenollerini içeren prebiyotikler verilerek tetiklenmesinin, trofik etki ile *Akkermansia* için uygun ortam sağlayarak kolonizasyonunu artıracak ve metabolik sendromun bileşenlerine yönelik beklenen olumlu etkileri daha da artıracak ortaya konmuştur⁽²⁵⁻²⁷⁾.

Bu tip etkilerden yola çıkarak, prebiyotik ve probiyotiklerin nanoteknoloji yoluyla birlikte uygulanması da gündemdedir⁽²⁸⁾. Bu sayede probiyotikler için uygun ve trofik ortam sağlayacak prebiyotikler birlikte verilebilir, ayrıca mide bariyerini aşmak ve bağırsak seviyesinde yeterli bileşik konsantrasyonları elde etmek için çözümler sunulabilir.

Bütün bu çalışmalardan anlaşılmaktadır ki; probiyotiklerin bazıları metabolik sendromun insülin direnci, kan şekeri, lipidler, kan basıncı gibi bazı klinik bileşenlerini ve sendromla ilişkili bazı enflamatuvar biyobelirteçleri olumlu yönde iyileştirebilmektedir. Ancak bazıları da beklenildiği kadar olumlu bir etki göstermemektedir⁽²⁹⁾.

Daha da önemlisi, metabolik sendromun birden çok metabolik komponenti içermesi onu karmaşık hâle getirmektedir. Metabolik sendromdaki bu hasta çeşitliliği göz önüne alınırsa hangi hasta grubuna hangi probiyotiğin ne kadar dozda standardize edileceği ve ne kadar süre verileceği belirsizdir. Bu nedenlerle, probiyotiklerin metabolik sendromda kullanılabilirliği umut verici olmakla birlikte, rutin önerilere geçmesi zaman alacak gibi görünmektedir.

Dolayısıyla, şu ana kadarki bilgiler ışığında, metabolik sendromda probiyotiklerin tek başına kullanımları klinik olarak anlamlı değildir, ancak sağlıklı bir yaşam tarzı, diyet ve egzersiz önerileri, diğer ilaç tedavileri ile birlikte kombine kullanılması klinik olarak yarar sağlayabilir.

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NÖROİNFLAMASYON VE MİKROBİYOTA

Meltem Yalınay

İnsan mikrobiyotası özellikle bağırsak mikrobiyotasının içeriği ve mikrobiyomun filogenetik dağılımı insan sağlığı üzerindeki etkilerinden dolayı gün geçtikçe daha çok dikkat çekmektedir. Bağırsak mikrobiyotası normal fizyolojiyi veya hastalıklara duyarlılığı, metabolik, immünolojik aktivite ve konak ilişkileri üzerinden oluşturmaktadır.

Bağırsak-beyin eksenini mikrobiyota ve beyin arasındaki ilişkileri ve bu etkileşimden merkezi sinir sisteminde (MSS) ortaya çıkan sonuçları tanımlamak için kullanılmaktadır. İnsan sindirim sisteminin beyin gelişmesindeki rolü birçok çalışmada ortaya konmuştur.

Beyin ve mikrobiyota arasındaki iletişim, epitelyal reseptör aracılı sinyal oluşumu, immün modülasyon bakteriyel metabolitlerle enterik nöronların stimülasyonunu kapsar. Mikrobiyota ve immün sistem arasındaki etkileşim, inflamazom sinyal yolağı, MSS'deki immün hücreler olan mikroglia ve astrositler, nörogenezis, beyin-kan bariyeri, vagus siniri, mikrobiyotanın nörotransmitter yapımına etkisi, serotoninerjik etki bağırsak-beyin eksenini birçok boyutuyla ortaya koymaktadır.

Gastrointestinal sistemin beyin gelişimindeki rolü bilinmektedir. Mikrobiyal türlerdeki disbiyozis, atipik immune sinyalizasyon, konak homeostazisindeki dengesizlik ve MSS hastalıklarında ilerlemeyi indüklemektedir. Kommensal mikroorganizmalar ve MSS'nin farklı komponentleri arasındaki çapraz konuşma immün sinyalizasyonda önem taşımaktadır.

Mikrobiyota ve İmmün Sistem Arasındaki Etkileşim

MSS sıklıkla bağışıklığı ayrıcalıklı bir bölge olarak kabul edilmesine rağmen, fonksiyonel lenfatik damarlar (beyni çevreleyen dural meningeal zarda bulunan) ve geçirgen beyin-kan bariyeri sinyal iletimi için bir geçit görevi görebilir ve böylece MSS'de bağışıklık hücrelerinin rolünü ortaya koymuş olur. Gliyal hücrelere ek olarak, yerleşik bağışıklık hücreleri (makrofajlar, CD8⁺ T hücreleri, Treg hücreler ve diğer CD4⁺ T yardımcı (Th) hücre alt-grupları gibi) doğuştan gelen ve / veya uyarlanabilir bağışıklık yanıtlarında aktif olarak yer alırlar⁽¹⁻³⁾. Bağırsak mikrobiyotasının antijen uyarımı ve bağışıklık sinyalleme yollarının aktivasyonu yoluyla CD4⁺ T hücrelerinin farklı alt kümelerini desteklediği bildirilmiştir.

İnsan merkezi sinir sisteminin olgunlaşması ve gelişimi hem içsel hem de dışsal faktörler tarafından düzenlenir. Çoğunlukla mikroorganizma içermeyen (Germ free-GF) hayvanlardan veya geniş spektrumlu antibiyotiklerle tedavi edilen hayvanlardan yapılan çalışmalar, spesifik mikrobiyotanın MSS fizyolojisini ve nörokimyasını etkileyebileceğini göstermektedir.

İlişkili mikrofloradan yoksun GF fareleri öğrenme, hafıza, tanıma ve duygusal davranışlarda nörolojik eksiklikler gösterir^(4, 5). Konvansiyonel farelere kıyasla önemli nörotransmitterlerde (örn., 5-Hydroxytryptamine-HT, N-Nitrosodimethylamine-NMDA ve Brain derived neurotrophic factor-BDNF)

Psikobiyotiklerin yanı sıra beslenmenin rolünü de dikkate almak gerekir. Nörodejeneratif hastalıklarda; Alzheimer, Parkinson, motor-nöron hastalıklar grubunda ketojenik beslenme destek tedavilerde önemli bir yerde bulunmaktadır⁽¹²⁸⁾.

Sonuç

Mikrobiyal türlerdeki disbiyozis atipik immün sinyali, konak homeostazındaki dengesizliği ve de MSS hastalıkları gelişmesini indükleyebilmektedir. Bağırsak bariyerindeki bozulma ile ilişkili değişen mikrobiyota, mukozal immün sistem aktivasyonu ile inflamatuvar ve nöroaktif mediatörlerin salınımına ve sistemik dolaşımına ulaştığı beyinde kognitif ve davranış değişikliklerine yol açmaktadır. Beyin ve bağırsak, enterik sinir sistemi, vagus siniri, immün sistem veya bağırsak mikroorganizmalarının metabolik süreçleri de dâhil olmak üzere çeşitli yollarla bağlanabilir. Bağırsak ve beyin arasındaki iletişimi doğrudan nöronal iletiler, endokrin sinyaller ve bağışıklık sistemi düzenler.

Bağırsak mikroorganizmaları direkt olarak bağışıklık sistemini etkileyebileceği için, bağışıklık aktivasyonu MSS mikrobik etkilerin iletilmesi için bir yol olabilir.

Bağırsak mikrobiyotasının mikroglial aktiviteyi, kan-beyin bariyeri bütünlüğünü, nöroenezisi ve nörotransmitterlerin üretimini etkilediği kabul edilmektedir.

Beyin bağırsak eksenini non-enteral hücreler ve nörotransmitterlerle oldukça hassas bir dengede çalışmaktadır. Bağırsak mikrobiyota değişiklikleri, başta serotonin olmak üzere birçok nörotransmitter salınımını ve nörolojik iletileri etkilemektedir. Nöroinflamasyon sistemik ve lokal inflamasyon süreçleri, proinflamatuvar ve antiinflamatuvar sitokin dengesizlikleri, bağırsak mikrobiyota değişiklikleri ile oldukça sıkı ilişkiler taşımaktadır.

Karmaşık etiyojiler ve insanlarda güvenilir biyobelirteç eksikliği nedeniyle, MSS hastalıkları için etkili tedavi stratejileri büyük ilgi görmüştür. Bağırsak-beyin eksenini kavramı aktif olarak araştırılmaktadır ve birçok çalışma bağırsak mikrobiyota bileşimindeki değişikliklerin bazı klinik durumlarla ilişkili olduğunu doğrulamıştır. Mikrobiyota, bağışıklık sinyali ve MSS arasında biyolojik bir bağın varlığı, beyindeki hem nörolojik hem de immünolojik aktivitelerin ya doğrudan mikrobiyal metabolitler tarafından ya da dolaylı olarak mikrobiyotadan türetilmiş sistemik sinyallerle belirlenebileceğini gösterir. Terapötik modülatörlerin uygulamaları, depresyon gibi çeşitli duygudurum bozukluklarında umut verici sonuçlar vermiştir. Bununla birlikte, bağırsak-beyin ekseninin ayrıntıları hâlâ belirsiz olduğundan, gelecekteki çalışmalar için bağırsak mikroplarının belirli patolojik koşulların ilerlemesine veya gerilemesine katkıda bulunduğu özel mekanizmaları açıklığa kavuşturmak önemlidir. Bu çalışmalar, SSS bozukluklarının erken teşhisi ve müdahalesi için, mevcut terapötik yöntemlerin yanı sıra yeni biyobelirteçlerin tanımlanması ile birlikte ileri terapötik yaklaşımlar için bir temel sağlayabilir.

Gastrointestinal sistem mikrobiyomunun beslenme, pre ve probiyotiklerle regülasyonu ve modifikasyonu beyin ilişkili hastalıkların önlenmesi ve tedavi edilmesinde önem taşımaktadır. Psikotropik tedavilerin gerçek gücü için gelecekte yapılacak çalışmalara gerek duyulmaktadır.

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Bölüm B4

DERMATOLOJİDE PROBİYOTİKLER

Pelin Eşme

Ahmet Hakan Erbil

Giriş

Vücudumuzda patojenik, fırsatçı ve kommensal mikroorganizmalar tarafından oluşturulan doğal denge ‘mikrobiyom’ olarak adlandırılmaktadır. Patojenik bakterilerin çoğalması ya da kommensal bakterilerin azalması çeşitli hastalıkların ortaya çıkışına neden olmaktadır. Bu nedenle kommensal bakteriler, sağlıklı bir immün sistemin dengesinde oldukça önemli rol oynamaktadır¹.

Probiyotiklerin tanımı

Dünya Sağlık Örgütü’nün (2001)¹ tanımına göre ‘ekzojen olarak takviye edilebilen, floranın birer üyesi olan ve yeterli miktarlarda alınması konakçı sağlığı için gerekli lokal dengeyi olumlu yönde etkileyen kommensal ve canlı mikroorganizmalar’ *probiyotik* olarak tanımlanmıştır. Probiyotikler ise probiyotik mikroorganizmaların çoğalmasını destekleyen ve çoğunluğu oligosakkarid olan sindirilemeyen karbonhidratlardır². Öncelikle probiyotiklerin, gastrointestinal sistem hastalıklarındaki etkileri araştırılmıştır. Ancak günümüzde geniş meta analizler sayesinde probiyotiklerin artık sindirim sistemi hastalıklarındaki yararların ötesine geçerek infeksiyon hastalıklarının tedavisinde antibiyotik gereksinimini azalttığı, glukoz homestazını düzenlemeye yardımcı olduğu, inflamasyon parametrelerinde gerileme, kolesterol düzeylerinde düşme ve yara iyileşmesinin hızlandırılmasına kadar pek çok konuda fayda sağladığı bilinmektedir³. Probiyotiklerin, inflamatuvar deri hastalıklarından deri yaşlanmasına, derinin kandida enfeksiyonlarından kozmetik dermatolojiye varan etkileri konusundaki literatür de hızla büyüme göstermektedir⁴⁻⁹. Derimizin santimetre kare başına 1 milyon mikroorganizma içerdiği düşünülürse, probiyotiklerin deride bu denli önemli etkiler gösterebileceği aslında tahmin edilebilmektedir¹⁰.

Kutanöz mikrobiyom ve önemi

Kutanöz mikrobiyom, geniş mikrobiyal rezervuarı ile doğal ve kazanılmış immün yanıtta oldukça önemli rol oynamakta ve derinin bariyer bütünlüğünün devamlılığını sağlamaktadır. Kutanöz mikrobiyom yaş, cinsiyet, genetik, diyet, günlük temizlik rutinleri, deri pH’sı, fiziksel ve mental stress, cerrahi prosedürler, nem ve sıcaklık gibi pek çok çevresel faktörden etkilenebilmektedir^{11,12}. Derinin hidrasyonu ve sebum düzeyi ise kutanöz mikrobiyom kompozisyonunu ve çeşitliliğini belirlemede en önemli faktörler olarak kabul görmektedir¹³.

Kutanöz mikrobiyom, vücut bölgelerine göre de farklılık gösterebilir. Örneğin, Stafilokok ve Corynebacterium türleri nemli bölgeleri severken, Propionibacterium yağlı mikroçevrede daha çok bulunmaktadır. Bir bebeğin doğum şekli dahi kutanöz mikrobiyomu şekillendirebilmektedir. Normal vajji-

Kutanöz mikrobiyom bireye özgüdür ve intrinsik/ ekstrinsik faktörler ile kompozisyonu değişiklik gösterebilmektedir. Ancak bazı bireylerin kutanöz mikrobiyomdaki değişimlere neden daha eğilimli olduğu tam olarak bilinmemektedir. Kutanöz mikrobiyom kişiye özgü olduğundan her probiyotiğin her hastada fayda sağlaması olası değildir. Farklı deri tiplerinde ve farklı kutanöz hastalıklarda, ideal suş ve dozajlama konusu ise hâlâ soru işaretleri barındırmaktadır. Patojenik bakteriyi direk hedef alan probiyotiklerin takviye edilebileceği metodlar, bu konudaki gelişmelere ivme kazandıracaktır.

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PROBİYOTİKLERİN BAKTERİYEL ENFEKSİYONLARDAKİ ÖNEMİ

Demet Teker Düztaş

Ödül Eğritaş Gürkan

Yaşamın başlangıcından beri kitlesel ölümlere neden olan bakteriyel enfeksiyonlar, insan hayatı için ciddi bir tehdit oluşturmuştur. Bu tehdit karşılığında insanoğlu çareler aramış ve Fleming'in 1928 yılında jelatin kapağında kontamine hâlde üremiş mantar kolonilerinin, yakınındaki bakteri kolonilerini yok ettiğini farkettiğinde aranan çözüm bulunmuştur. *Penicillium* cinsi bu mantarın tedavide kullanılacak biçimde saflaştırması 1940'lı yılların başında başarılmış ve 1944'te bakteriyel enfeksiyonların tedavisinde kullanılmaya başlanmıştır. Bu tarihten itibaren antibiyotik çağı başlamış ve yeni antibiyotikler art arda keşfedilmiştir¹.

Antibiyotiklerin tarihi oldukça eskidir. İlk defa sentezlendiği mikroorganizmalar tarafından yaşadıkları ortamda avantaj sağlamak için kullanılmıştır. Antibiyotik sentezleyen bu mikroorganizmaların, ürettikleri antibiyotiklere karşı doğal direnç mekanizmalarına sahip olduğu bilinmektedir. Medeniyetle tanışmamış, antibiyotik kullanmayan izole toplumlardaki insanlarda mevcut bakteriyel suşlarda antibiyotik dirençli mikroorganizmaların varlığı, antibiyotik direncinin eskiden beri var olduğunu ve antibiyotik kullanımıyla ilişkisinin olmadığını kanıtlamaktadır¹. Ancak antibiyotiklerin standart olmayan doz ve sürelerde, gereksiz endikasyonlarla kullanımının antibiyotik direncini arttırdığı ve antibiyotiklerin seleksiyon etkisi ile dirençli mikroorganizmaların daha fazla ürediği bilinen bir gerçektir².

Antibiyotiklerin keşfiyle enfeksiyonsuz bir hayat sürmeyi uman insanoğlu, ne yazık ki artan antibiyotik direnci neticesinde kitlesel ölümlere neden olabilecek bakteriyel enfeksiyonlar açısından risk altında bulunmaktadır. Dünya Sağlık Örgütü bu riske karşılık klinik yararlılığın maksimumda olduğu, ancak ilaç ilişkili toksisite ve antimikrobiyal direncin minimumda olduğu doz ve sürenin gözetilerek akılcı antibiyotik kullanımını önermektedir³. Günümüzde akut enfeksiyonlarda reçete edilen antibiyotiklerin çoğu medikal anlamda yararsız olmasına karşılık, sosyolojik ve duygusal sebeplerle yazılmaktadır. Geçirilen enfeksiyona karşı "bir şey yapma isteği" antibiyotiklerin gereksiz kullanımının en sık nedenidir^{4,5,6}.

Probiyotikler; yeterli miktarda uygulandığında, konakçıya sağlık yararı sağlayan canlı mikroorganizmalardır⁷. Probiyotik etkileri değişkendir ve bu etkiler probiyotik suşuna, miktarına, uygulama yoluna ve uygulandıkları kişilerin doğal mikrobiyota içeriğine bağlı olarak değişmektedir. Probiyotik etkili bakterilerden en sık *Lactobacillus*, *Bifidobacterium* türleri bilinmekle birlikte son yıllarda yapılan çalışmalarda *Saccharomyces*, *Escherichia coli* ve *Bacillus* türleri de tanımlanmıştır. Bakteriyel enfeksiyonlarla ilgili çalışmalarda bu bakterilere ait spesifik suşlar kullanılmıştır.

Probiyotiklerin Bakteriyel Patojenlere Etkileri

Probiyotiklerin patojen bakterilere yönelik konakçı yararını gözeten birçok etkisi bulunmaktadır. Esas etkisi ise mevcut mikrobiyal çevrede bulunan diğer bakteri türleri ile besin için rekabet etmesi

rarlayan akut otitis media tanısı alan çocukları içeren Cárdenas ve ark.⁶⁷ yaptığı çalışmada, hastalara 1×10^9 CFU/gün *L. salivarius* PS7 verilmiş ve bu hastalarda son 6 aya göre otitis media tekrarlama sıklığında %84 azalma ile birlikte potansiyel otopatojen oranında da azalma gösterilmiştir. Probiyotiklerin çocuklarda akut otitis media üzerindeki etkilerini inceleyen Scott ve ark.⁶⁸ meta-analizinde ise probiyotiklerin hastalığın semptom süresini ve tekrarlama riskini azalttığına dair verilerin olduğunu ancak değerlendirme için daha çok çalışmaya ihtiyaç duyulduğu belirtilmiştir⁶⁸.

7. Prematüre yenidoğanlarda bakteriyel enfeksiyonların önlenmesinde probiyotiklerin rolü

Sağlıklı, term yenidoğanın bağırsaklarında ilk olarak fakültatif aeroblar kolonize olurken, anne sütü alımı ile anaeroblar da kolonize olmaya başlamaktadır⁶⁹. Mikroflora dengesi intestinal defans sisteminin doğru çalışması için gereklidir. Bağırsakta mikrobiyota dengesi doğum şekline, gestasyonel yaşa, anne sütü alımına ve ilaç kullanımına bağlıdır⁷⁰. İmmün sistemi yeteri kadar gelişmemiş prematürelere geç başlangıçlı sepsis ve bakteriyel enfeksiyonlar önemli bir morbidite ve mortalite sebebidir⁷¹. Probiyotikler intestinal bariyer fonksiyonu destekleyerek patojen mikroorganizmaların mukoz membranı geçmesini ve sepsisi önlemektedir⁷². Kanic ve ark.⁷³ plasebo kontrollü bir çalışmada, *L. acidophilus*, *E. faecium* ve *B. infantis* (günde 2 defa 1.2×10^7 CFU/gün) verilen çok düşük doğum ağırlıklı yenidoğanlarda geç başlangıçlı sepsis ve bakteriyel enfeksiyon görülme sıklığının anlamlı olarak azaldığı ve daha erken dönemde taburcu edildikleri belirtilmiştir. Probiyotik alan grupta nekrotizan enterokolit (NEK) izlenmediği ve çocuklarda probiyotik verilmesinin yan etkiye sebep olmadığı özellikle belirtilmiştir. Prematüre sorunlarının başında gelen, mikrofloranın bozulması nedeniyle bağırsak geçirgenliğinin artması ile klinik tablonun ortaya çıktığı NEK prematürelere ciddi bir mortalite nedenidir. Prematürelere probiyotik kullanımının NEK üzerindeki etkisini göstermeyi amaçlayan Bi ve ark.⁷⁴ meta-analizinde *Bacillus*, *Bifidobacterium*, *Lactobacillus*, *Saccharomyces* türleri ve bu türleri içeren karışımların NEK'yi önlemede, aynı zamanda da mortaliteyi azaltmada etkili olduğu gösterilmiştir. *Bifidobacterium* türünün sepsis, NEK ve mortaliteyi azaltmada güçlü etkileri olduğu özellikle belirtilmiş ancak uygun doz belirtilmemiştir. Prematürelere probiyotiklerin kullanım dozu ile ilgili daha fazla çalışmaya ihtiyaç duyulduğu oldukça açıktır.

Son dönemin popüler konusu olan probiyotikler, bakteriyel enfeksiyonlarda artan antibiyotik direncine karşılık iyi bir çözümü vadetmektedir. Ekonomik İşbirliği ve Kalkınma Örgütü (OECD) verilerine göre Türkiye, üye ülkeler arasında antibiyotiklerin hastalara en az etki ettiği ülke olarak değerlendirilmiş ve antibiyotik direnç oranı %38.8 olarak belirtilmiştir. Bilinçsiz antibiyotik kullanımının yaygınlığı bu direncin esas nedeni olarak gösterilmiştir⁷⁵. Akılcı ilaç kullanımı eksikliğinin ülkemizde antibiyotik dirençli bakteriyel enfeksiyonların daha sık görülmesine ve bu enfeksiyonların ciddi salgınlara yol açabileceği göz önünde bulundurulmalıdır. Probiyotik stratejilerinin bakteriyel enfeksiyonlarda, hem bakterilere direkt etkileri hem de antibiyotik etkilerini arttırmaları nedeniyle, korunma ve tedavide önemli rolü olduğu oldukça açıktır. Ancak probiyotik etkilerinin suş, doz ve uygulama yolu bağımlı olması nedeniyle, bu alanda daha fazla çalışma ile tedavi stratejilerinin daha net çizilmesi gerekmektedir.

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ÇOCUKLUK ÇAĞI VİRAL GASTROENTERİT, SOLUNUM YOLU VE DİĞER VİRAL ENFEKSİYONLARDA PROBİYOTİK KULLANIMI

Ayşegül Pala

Öner Özdemir

Giriş

Bu yazımızda öncelikle en sık görülen viral gastroenterit ve etkenlerinden bahsettikten sonra, probiyotiklerin bu hastalıkta ve diğer bazı hastalıklardaki kullanım ve yararı anlatılacaktır.

Viral Gastroenteritler ve Etkenleri

Akut gastroenterit daha çok virüslerin sebep olduğu gastrointestinal sistemde meydana gelen enfeksiyondur. Tüm yaş gruplarında görülmekle beraber dünyada morbidite ve mortalitenin en yaygın nedenlerinden biridir. Ateş, bulantı, kusma ve karın ağrısının eşlik ettiği veya etmediği ani ishal başlangıcı ile kendini gösterir. Viral ve bakteriyel gastroenteritin kliniğini ayırmak zor olsa da laboratuvar testleri ile kesin tanı konulabilir. ⁽¹⁾ Viral gastroenterit yeterli miktarda sıvı ve elektrolit desteği verilerek tedavi edilir. ⁽²⁾ Son yıllarda, akut viral gastroenterit vakalarında probiyotik kullanımını değerlendiren birçok araştırma ve klinik denemeler yapılmıştır ve çelişkili sonuçlar bildirilmiştir. Bu bölümde akut gastroenterite en sık neden olan bazı virüslere kısaca değinip akut viral gastroenteritte probiyotik kullanımından bahsedeceğiz.

Rotavirüsler

Rotavirüsler Reoviridae ailesinden olup çocuk yaştaki gastroenteritin ana sebebidir. Sekiz rotavirüs türünden (A'dan H'ye) A, B ve C insan ve hayvanlarda bulunurken D, E, F, G ve H sadece hayvanları enfekte eder. ⁽³⁾ Rotavirüs her yıl dünya genelinde 180.000-450.000 beş yaş altı çocuklar ölümünden sorumludur. Rotavirüs gelişmiş ve gelişen ülkelerdeki 3-5 yaş arası neredeyse tüm çocukları enfekte ettiği izlenmiştir. 3 aya kadarki bebeklerde annenin immün sisteminden dolayı enfeksiyonlar hafif geçerken 4-23 aylık çocuklarda hastalığın klinik insidansı en yüksek seviyeye ulaşır. Endüstriyel ülkelerde yapılan vaka kontrol çalışmalarında emzirme eksikliği, prematürite ve düşük doğum ağırlığının Rotavirüs gastroenteriti için risk faktörü oluşturduğu gösterilmiştir. ⁽⁴⁾ Rotavirüs kaynaklı gastroenterit gelişmiş ülkelerde daha çok kış aylarında görülürken gelişmekte olan ülkelerde mevsimsel farklılık azdır. Rotavirüsün bulaşması fekal-oral yoldan, kontamine el, su ve besinlerin tüketimi ile gerçekleşir. Enfeksiyon ve replikasyon intestinal villusların olgun enterositlerinde başlar ve böylece emilim ve sekresyon bozukluğu meydana gelir. ^(5,6) Klinik tablosu subklinik hastalık veya kısa süreli sulu ishalden kusma ve ateşin eşlik ettiği bol miktarda sık yapılan ishale kadar değişkenlik gösterir. Hastalık akut ateş ve kusma ile başlar ve 1-2 gün sonra bol sulu ishale devam eder. Kusma 1-2 gün sürerken gastrointestinal rahatsızlık 3-7 gün arasında seyredir. Bunun dışında Rotavirüsün konvülziyon, ensefalit ve serebellit gibi nörolojik sorunlara da sebep olduğu gösterilmiştir. ⁽⁷⁾ Rotavirüs gastroenteritinin akut yönetiminde amaç

Probiyotik Kullanımının Diğer Viral Hastalıklardaki Rolü

Probiyotik kullanımının pediatrik hastalarda viral gastroenterit ve solunum yolu enfeksiyonlarının dışında, literatürde çok kısıtlı da olsa bazı viral hastalıklarda kullanımına dair çalışmalar mevcuttur. Sakata ve arkadaşlarının⁽⁶⁵⁾ Japonya’da yaptıkları çalışmada, okul çağı çocuklarının *L. lactis* JCM 5808 şuşu içeren yoğurt tüketen çocuklarda influenza insidansının azaldığını göstermişlerdir. Luoto ve arkadaşlarının⁽⁶⁶⁾ 94 preterm süt çocuklarında randomize, plasebo-kontrollü yaptıkları çalışmada, LGG probiyotik kullanımının solunum yolları enfeksiyonu ve özellikle rinovirüs enfeksiyonu insidansını azalttığını bildirmişlerdir. Yazarlar probiyotik kullanımın rinovirüs enfeksiyonlarında hastalığın getirdiği maddi yükü azaltacağını da savunmuşlardır. Yeterli çalışma ve veri olmadığından bu hastalıklarda probiyotik kullanımına dair görüş birliği yoktur.

SARS-CoV-2 Enfeksiyonu / COVID-19 Hastalığında Probiyotik Kullanımı

COVID-19 hastalarının hastalık devam ederken ve iyileştikten sonra bile mikrobiyal disbiyozis ve intestinal rahatsızlıklar (diyare, bulantı, kusma) geçirmeye devam ettikleri bildirilmiştir. Wu ve arkadaşları⁽⁶⁷⁾ 13 COVID-19 hastası ve 15 sağlıklı hastada bağırsak mikrobiyotasını incelemişlerdir. Yazarlar COVID-19 hastalarında sağlıklı hastalara göre bağırsak mikrobiyotasının değiştiğini ve mikrobiota çeşitliliğinin azaldığını saptadılar. COVID-19 hastalarına 14 gün boyunca uygulanan probiyotik kullanımının 8 hastadan alınan örneklerden 6 (%75) hastada mikrobiyal içeriğinin iyileştiğini tespit etmişlerdir. Retrospektif bir COVID-19 çalışmasında, 58 COVID-19 tanısı almış ağır ve kritik hastada *Bifidobacterium* ve *Lactobacillus* probiyotik karışımı tedavisinin etkisi araştırılmıştır. Probiyotik ile beslenen COVID-19 hastalarında probiyotik ile beslenmeyen COVID-19 hastalarına göre diyare süresinin azaldığı kaydedilmiştir.⁽⁶⁸⁾ Tek merkezli, dört-kör, randomize bir klinik çalışmasında, COVID-19 hastaları plasebo ve probiyotik grubu olarak ikiye ayrılmış ve hastalara ayakta tedavi olarak *Lactiplantibacillus plantarum* KABP022, KABP023, KABP033 ve *Pediococcus acidilactici* KABP021 şuşları içeren probiyotik karışım verilmiştir. Probiyotik grubunda, 78/147 hasta komplet remisyona izlenirken plasebo grubunda bu oran 41/146 idi. Probiyotik tedavisinin ayrıca nazofaringeal viral yükü, akciğer infiltrasyon oranını, sindirim ve diğer sistemik semptomlarını plasebo grubuna göre azalttığı gözlenmiştir.⁽⁶⁹⁾ Kurian ve arkadaşları⁽⁷⁰⁾ probiyotiklerin intestinal kanalda biyolojik bariyeri kuvvetlendirdiğini, intestinal florayı düzenlediğini, innat ve adaptif immün sistemi modüle ederek immün sistemin gelişimine ve olgunlaşmasına katkı sağladığını, probiyotiklerin bu özellikleri ve COVID-19 enfeksiyonu-probiyotik kullanımı üzerindeki literatür çalışmaları da göz önüne alarak probiyotiklerin COVID-19’un önlenmesinde ve tedavisinde kullanılabileceğini iddia etmişlerdir.

Probiyotik alımının COVID-19 tedavisinde yararlı sonuçlar verdiği çalışmalarda gösterilmiştir, ancak daha fazla prelinik ve klinik çalışmaya ihtiyaç duyulmaktadır.⁽⁷¹⁾

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PERİNATAL VE YENİDOĞAN DÖNEMLERİNDE MİKROBİYOTA VE PROBİYOTİKLER*Fahri Ovalı***Perinatal Mikrobiyota**

Bağırsak, gebeliğin 3. haftasından itibaren gelişmeye başlar ve bir yandan organogenez devam ederken bir yandan da kolonizasyonun başlaması ile fonksiyonel gelişim sürer. Bağırsakta; bakteri, virüs, mantar, ökaryotlar ve diğer tek hücreliler gibi birçok organizma bulunur. Erken kolonizasyon, konsepsiyonla başlar ve ilk 1000 gün devam eder. Yenidoğanın mikrobiyal çeşitliliği ve buna bağlı yaşamsal fonksiyonları, doğum şekli, annesinin derisiyle teması ve anne sütü ile şekillenir. Bağırsak mikrobiyotası bir organizmalar “topluluğu” olarak değil, bebeği metabolik, trofik ve immünolojik olarak destekleyen aktif bir “organ” olarak ele alınmalıdır.

Gebelik sırasında fetusun normal gelişimi ve sağlıklı doğumunu sağlayabilmek için bir dizi immünolojik, hormonal ve metabolik değişiklikler olur. Bu kapsamda bağırsak, vajinal, oral ve plasental mikrobiyota da değişir. Fetal mikrobiyotanın kaynağı tam belli değildir ancak vajinal asendan yolla veya maternal oral kavite, bağırsak veya kan dolaşımı yoluyla mikroplar bağırsağa ulaşabilir. Bu değişikliği etkileyen genetik, etnik, genetik ve çevresel faktörler bulunur. Annenin diyeti, bulunduğu coğrafi bölge ve araştırma yöntemine göre de mikrobiyota farklı görülebilir. Fetusun steril bir ortamda bulunduğu ve ancak doğumdan sonra mikrobiyotanın olduğu paradigması artık geçerliliğini yitirmiştir. Otuz yıldan uzun bir süredir yapılan çalışmaların sonuçlarına göre plasenta, amniyon sıvısı, mekonyum ve fetustan oluşan fetomaternal üniteye birçok mikrobun bulunduğu artık bilinmektedir.⁽¹⁾ Diğer bir deyişle, maternal-fetal-mikrobiyal triad, bir “holobiont” oluşturmaktadır. Intrauterin mikrobiyota epigenetik değişiklikler ile birlikte fetusun immünesini, metabolizmasını ve ileri dönemdeki sağlık durumunu belirlemektedir.

Plasenta, amniyon sıvısı ve mekonyumdaki mikrobiyota, gestasyon yaşına göre değişkenlik gösterir.^(2,3) İlk trimesterde plasentada, miktarı az olsa bile metabolik olarak aktif olan Firmiküt, Teneriküt, *Proteobacteria*, *Bacteroidetes* ve *Fusobacteria* gibi kommensal bakteriler bulunur. Oral mikrobiyoma benzeyen bu mikrobiyom antenatal enfeksiyon, antibiyotik kullanımı ve prematüre doğumda farklılıklar gösterir.⁽⁴⁾ Maternal mikrobiyom, in utero olarak fetusa geçmekte ve fetal bağırsağı kolonize etmektedir. Diğer bir görüşe göre kandaki baskın mikrobiyom, mikropların organlar arasındaki dağılımını belirlemektedir.⁽⁵⁾ Eğer gerçekten bazı mikroplar preterm doğumu tetikliyor ise maternal diyetin değiştirilmesi veya farklı mikropların verilmesi ile preterm doğumun önlenebileceği düşünülebilir.

Gebe kadındaki intestinal disbiyosisin preterm doğum, preeklampsi, intrauterin büyüme geriliği dâhil birçok gebelik komplikasyonunda rol oynayabileceği belirtilmiştir.⁽⁶⁾ Plasentadaki mikropların sistemik perinatal inflamasyona yol açarak intrauterin büyüme geriliği ve merkezi sinir sistemi hasarına neden olabileceği gösterilmiştir.^(7,8) Hatta bu bebeklerde öğrenme güçlükleri, dikkat eksikliği ve gelişimsel gerilikler de görülmüştür.⁽⁹⁾ İkizler kullanılarak yapılan genetik ve çevresel etkilerin incelenme-

lere probiyotik verilmesi preterm doğumu önlemediği gibi yeni doğum yapmış annelere probiyotik verilmesinin de bebeklere herhangi bir faydası gösterilememiştir. ⁽¹⁹⁰⁾

Sonuç

İnsan mikrobiyomu genetik yük, prematürite, sezaryen, beslenme, antibiyotik ve probiyotik kullanımı, perinatal stres ve enfeksiyonlar gibi birçok faktörden etkilenir. Gebelik ve yenidoğan döneminde bağırsak mikrobiyotasının değişmesi, infantil kolik, inflamatuvar bağırsak hastalığı, nekrotizan enterokolit, astım, atopik hastalıklar, çöliak hastalığı, diyabet, duyulanım bozuklukları ve otizm spektrum bozuklukları gibi birçok hastalık ile ilişkilendirilebilir. Bu hastalıkların ortaya çıkması ve devam etmesinde probiyotiklerin rolüne dair yeni çalışmaların yapılmasına ihtiyaç vardır. Herhangi bir probiyotik ürününe ait elde edilen verilerin diğer probiyotikler için kullanılması mümkün değildir. Günümüzde probiyotiklerin kullanımı ile ilgili standart öneriler bulunmamaktadır. Probiyotiklerin uzun dönemde bağırsak mikrobiyomu ile bağırsakların immün, metabolik ve anatomik gelişimi üzerindeki etkileri de bilinmemektedir. Probiyotikler ilaç olarak kabul edilmedikleri için farmasötik ajanların tabi oldukları kurallara uymamaktadır. Dolayısıyla bu ajanların güvenlik çalışmaları ve bilgileri yeterli değildir. Bu ajanların da farmasötik ajanlar gibi faz II ve faz III çalışmalarının uygun şekilde yapılması ve üretim, saklama, pazarlama ve kalite kontrol önlemlerinin de standart hâle getirilmesi gerekmektedir. İmmün sistemleri zaten immatür olan prematüre bebeklerde bu ajanların uygunsuz kullanımının bazı istenmeyen etkilere yol açma potansiyeli olduğu unutulmamalıdır.

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OBSTETRİK PRATİKTE MİKROBİYOTANIN ÖNEMİ, PERİNATAL SONUÇLARA ETKİSİ VE PROBİYOTİK

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Giriş

Normal bir gebelik; anatomi, fizyoloji ve immün fonksiyonlar açısından dinamik değişimler ile karakterize bir süreçtir. Gebeliğin mikrobiyota ve mikrobiyotanın gebelik süreci, anne ve fetus üzerine olan etkileri bilinmezliğini korumakla birlikte, ilgi çeken bir çalışma konusu olmuştur. Dramatik bir hormonal değişimle ilişkili olan perinatal dönemde, bakteriyel kompozisyon, bağırsak fonksiyonu ve bağırsak geçirgenliğinde etkili immün ve inflamatuvar bir süreç başlar⁽¹⁾.

Östrojen ve progesteron, bağırsak mikrobiyotasının kompozisyonu, bakterilerin büyüme ve patojenitesi ile direkt ilişki içerisindedir. Progesteron yükselmesi ile artan *Listeria monocytogenes* enfeksiyonu ve preterm doğum ve ölü doğumla olan artmış birlikteliği bunun en güzel örneğidir⁽²⁾.

2015 yılında yapılan bir çalışmada, 40 gebenin gebelik esnasında ve gebelik sonrası erken dönem oral, vajinal ve bağırsak mikrobiyotasının haftalık incelenmesi ile yapılan çalışmada, normal sağlıklı bir kadın mikrobiyotasından çok farklı bir mikrobiyal çeşitlilik ile karşılaşılmıştır. Bu değişim bazı kadınlarda postpartum 1 yıla yakın bir süre devam etmiştir⁽³⁾.

Moleküler çalışmalar, gebelikte vajinal mikrobiyotada *Lactobacillus* dominant bir stabilite olduğunu göstermektedir (östrojen etkisi). *Lactobacillus*, patojen bakterilerin vajinadan asendan olarak maternal-fetal yüze ulaşması ve muhtemel etkilerine karşı koruyucu bir role sahiptir^(4,5).

Normalde steril olduğu düşünülmesine karşın yapılan çalışmalar sağlıklı bir gebelikte de bakteri ve virüslerin fetal-maternal ünite ve amniyotik sıvıda kolonize olabildiklerini göstermektedir. Bakteriyel ve viral kolonizasyon vajinadan uterusu asendan yolla, oral kaviteden plasentaya hemotojen yolla ve gastrointestinal mikrobiyomun etkisi ile olabilmektedir. Geçiş yolu her ne olursa olsun anneden bebeğe olan bu transfer gebelik, fetal gelişim ve fetal mikrobiyotanın postnatal döneme hazırlanması için fonksiyonel öneme sahiptir⁽⁶⁾.

Dysbiozis'in gebelik üzerindeki etki mekanizması net olmamakla birlikte kötü obstetrik sonuçlarla ilişkili olduğu ve gebeliğin farklı dönemlerinde meydana gelen etkilenimlerin gebelik sonuçlarını farklı etkilediği bilinmektedir⁽⁷⁾.

Gebelik sürecinde fetal ve maternal iyilik hâli ile yakın iletişim hâlinde olan 4 mikrobiyal çevreden bahsetmek mümkündür. Her biri farklı bir komplikasyon ve birbiri ile ilişkili olan bu sistemler: oral mikrobiyota, plasental mikrobiyota, bağırsak mikrobiyotası ve vajinal mikrobiyotadır.

Bağırsak mikrobiyotası ilk trimester'dan 3. Trimester'a dramatik bir değişim geçirir. Actinobacteria ve Proteobacteria artarken, Faecalibacterium adı verilen antiinflamatuvar aktiviteden sorumlu türde

Husein ve ark. 9-14 gestasyonel haftadan gebelik sonuna kadar günde bir kez oral *L. rhamnosus* GR-1 ve *L. reuteri* RC-14 verdikleri gebelerde, vajinal mikrobiyota restorasyonunun sağlanamadığı ve BV'in önlenmesine katkıda bulunmadığını göstermişlerdir⁽⁴⁵⁾. Husein ve ark. nin çalışmasına yapılan en önemli eleştiri ise Lamont ve ark.'nın kullanılan probiyotik içeriği ile ilişkili yorumlarıdır⁽⁴⁶⁾. Lamont ve arkadaşları, 180'in üzerinde *Lactobacillus* türü olduğunu, bu türlerin farklı miktarlarda laktik asit, H₂O₂ ve bakteriyosin sentezi ile ilişkili olduğunu ve kültür temelli çalışmaların moleküler temelli çalışmalara kıyasla bu türleri belirlemede yetersiz olduğunu vurgulamışlar ve sağlıklı bir vajinanın *L. crispatus*, *gasseri*, *iners* ve *jensenii* suşlarından en az birine sahip olması gerektiğini söylemişlerdir⁽⁴⁶⁾. Oysa Husein ve ark.'nın kullandıkları probiyotikte bu *Lactobacillus* türleri yer almamaktaydı⁽⁴⁵⁾. Lamont ve ark. gelecekte yapılacak probiyotik çalışmalarının *L. crispatus* üzerinde yoğunlaşması gerektiğini savunmuşlardır⁽⁴⁶⁾.

21 farklı çalışmanın incelendiği meta-analizde ise probiyotiklerin preterm eylemi azalttığına dair kanıt bulunamamıştır, gebelik sonuçları üzerine etkinin araştırıldığı daha kapsamlı çalışmalara ihtiyaç vardır⁽³²⁾.

Sonuç olarak, yapılan kültür bazlı ve moleküler çalışmalar obstetrik sonuçlar ile mikrobiyota arasında bir ilişki göstermekle birlikte, probiyotiklerin tedavi amaçlı kullanımı için probiyotik içeriği, kullanım süresi ve uygulanma şekli de göz önünde bulundurularak yapılacak daha kapsamlı, kanıta dayalı çalışmalara gereksinim vardır.

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HASTANE ENFEKSİYONLARI VE ÇOKLU İLACA DİRENÇLİ ENFEKSİYONLARI ÖNLEMEDE PROBİYOTİKLERİN ROLÜ

Elmas Pınar Kahraman Kılbaş

Mustafa Altındış

Antibiyotiklerin aşırı ve yanlış kullanımı, çoklu ilaca dirençli (ÇİD) bakterilerin seçilimi ile sonuçlanmıştır. ÇİD mikroorganizma adlı önemli bir halk sağlığı tehdidi hastane kaynaklı bakteriyel enfeksiyonların büyük bir bölümünü oluşturmaktadır. Yüksek insidans nedeniyle, geleneksel olmayan tedaviler günümüzdeki tedavi yöntemlerine ideal alternatiflerdir ve bu enfeksiyonları önlemeye yönelik bir yol göstericidir. Mikrobiyota teriminin anlaşılması ve bu alanda çalışmaların artması ile mikrobiyomun restore edilmesinin ve bütünlüğünün sürdürülmesinin, kolonizasyonu ve ÇİD mikroorganizma kaynaklı enfeksiyonları önlemede bir seçenek olarak düşünülmektedir. Bu kompleks mikroorganizma topluluğu, yaşam alanı ve besin kaynakları için rekabet ve konak ile arasında gelişen immünolojik ve biyokimyasal etkileşimler yoluyla ÇİD mikroorganizmalarla kolonizasyonu önleyebilir. Enfeksiyon kontrolü ve antibiyotik tedavisinin gelecekteki yönü, alternatif tedavi yöntemlerine doğru ilerlemektedir. Bu alternatif terapilerin gelişimine rağmen araştırmacılar bu yöntemleri geliştirmek için gerekli olan translasyonel bilimi engelleyen düzenleyici kurallarla kısıtlanmaktadır.

Hastane kaynaklı veya sağlık bakımı ile ilişkili enfeksiyonlar, Dünya Sağlık Örgütü (WHO) tarafından, bir hastanede veya başka bir sağlık kuruluşunda, enfeksiyonun bulunmadığı veya başvuru sırasında kuluçka döneminde bulunduğu enfeksiyonlar olarak tanımlanmaktadır. Tanım, hastanede kalış sırasında edinilen ancak taburcu olduktan sonra ortaya çıkan enfeksiyonları da kapsamaktadır. 1 Sağlık kurumuna başvurudan 48 saat sonra meydana gelen enfeksiyonlar genellikle hastane enfeksiyonları olarak kabul edilmektedir. Hastane enfeksiyonları, hem gelişmiş hem de gelişmekte olan ülkeleri etkilemekte olan dünya çapında görülen bir sorundur. Sadece Amerika Birleşik Devletleri'nde akut bakım hastanelerine başvuran tüm hastanede yatan hastaların %5 ila %10'unun hastane enfeksiyonu ile karşılaşacağı tahmin edilmektedir¹. Kabaca %25'inin yoğun bakım ünitesi (YBÜ) hastaları olduğu tahmin edilmektedir. Hastane enfeksiyonlarında riski, gelişmekte olan ülkelerde daha da yüksek oranlarda görülmektedir ve WHO'ya göre, hastaneye yatırılan tüm hastaların yaklaşık %15'i bu tür enfeksiyonlardan muzdariptir. Bu durum, hastanede yatış süresinin uzaması, antimikrobiyal direncin artması ve mortalite oranının artması ile sonuçlanır².

İnsan bağırsağında yaklaşık 3 milyon farklı geni kodlayan yaklaşık 3 lbs'lik bakteri (insan ana genomundan 100 kat daha fazla) bulunur³. Van Leeuwenhoek'un mikroskopik hayvan tanımından dört asır sonra Joshua Lederberg tarafından ortaya konan mikrobiyom terimi, vücut boşluklarımızı tam anlamıyla paylaşan kommensal, simbiyotik ve patojen mikroorganizmaların ekolojik topluluklarını tanımlamaktadır⁴. Bu mikroorganizmaların çoğu, sağlık ve hastalık belirleyicileri olarak görmezden gelinmiştir⁵. Günden güne kendini genişleten bu tanım, vücudumuzu oluşturan insan ve insan dışı hücrelerden (ve genomlarından) oluşan bir "süperorganizma" olarak kabul edilebilir^{2, 3}. İnsan mikrobiyomu karşılıklı yarar sağlayan bir ilişki içinde bizimle birlikte gelişmiştir.

lar ve profilaktik amaçlı kullanım süresi hakkında çok sayıda soru cevapsız kalmaktadır. Bu tür konular gelecekteki çalışmalarda ele alınabilir,

- Mikrobiyom ve konak bağışıklık sistemi arasındaki karmaşık moleküler etkileşimlerin belirlenmesi,
- Konakçı-mikrobiyom etkileşimlerini taklit eden moleküler terapötiklerin geliştirilmesinin teşvik edilmesi şeklindedir.

Tüm bu mikrobiyota iyileştirme stratejilerine rağmen patojen biyofilmler tarafından ortaya çıkan ve yerli mikrobiyotanın homeostatik etkilerinin ötesinde görünen kalıcı problemler vardır ve bu problemler ÇİD mikroorganizma kolonizasyonu için güvenli yaşam alanları sunabilirler⁶¹. Bu nedenle, patolojik biyofilmlerin anlaşılması ve mikrobiyotanın iyileştirilmesindeki ilerlemeler ÇİD mikroorganizma kaynaklı enfeksiyonların kontrolü için birlikte değerlendirilmelidir.

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Bölüm B10

PROBİYOTİKLERDE GELECEK

Tarkan Karakan

Probiyotikler insan sağlığı için faydalı olan mikroorganizmalar olarak özetlenebilir. Bu mikroorganizmalar günümüzde endüstrinin piyasada bulunan ürünlerinden ibaret gibi görünmektedir. Ama gelecek muhtemelen daha farklı olabilir.

İnsan vücudunda bulunan mikroorganizmaların-ki bunların büyük bir kısmı bağırsaklarda yer alır- ve bunların genomlarının toplamına **mikrobiyom** denilmektedir. Son 15 yıl insan mikrobiyomu ile hastalık ilişkisi araştırıldı ⁽¹⁾. Bu araştırmalar birçok hastalıkta sağlıklı insanlardan farklı bir mikrobiyom olduğu sonucunu bizlere gösterdi ⁽²⁾. Ancak tüm bu çalışmalara rağmen iki bilinmez gizemini korumaktadır:

1. Bu ilişki nedensel mi yoksa sadece birliktelik mi?
2. Diğeri ise konu ise sağlıklı mikrobiyomun tanımı nedir?

Bu soruların cevapları bu yıl içinde bazı çalışmalarla aydınlanmaya başladı ⁽³⁾. Mikrobiyotanın probiyotiklerle modülasyonu bazı hastalıklarda etkili olabilir. Bu hastalıklar akut gastroenterit, antibiyotik ilişkili ishaller, irritabl bağırsak sendromu (İBS) ve infantil kolik olarak sayılabilir. Kılavuzlarda bu hastalıklarda yüksek kanıt düzeyi bulunmaktadır. Diğer klinik senaryolarda ise probiyotiklerin etkisi hakkında sınırlı sayıda klinik çalışma bulunmaktadır ⁽⁴⁻⁷⁾. Probiyotiklerin nasıl etki ettiği ile ilgili daha çok prelinik çalışmalar bulunmaktadır ⁽⁸⁾. Genellikle patojen kolonizasyonunun engellenmesi, sekretuar IgA salgısının artması, immün regülasyonun sağlanması, toksinlerin nötralizasyonu gibi etkiler tanımlanmıştır. Ancak bu probiyotikler(genellikle Laktobasiller ve Bifidobakteriler) bağırsak mikrobiyota çalışmalarından önce de vardı ve yeni nesil dizileme yöntemleri ile keşfedilen mikroorganizmaların çok küçük bir kısmını oluşturmaktadır.

Gelecekte insan bağırsak mikrobiyotasında yeni keşfedilen bakteriler probiyotik olarak kullanılabilir. Buna en iyi örnek *Akkermansia muciniphilia*'dır. *A.muciniphilia* musin tabakası degrade eden bir bakteridir. Ancak obezite, diabetes mellitus ve metabolik sendromda azalmış olduğu bildirilmiştir ⁽⁹⁻¹³⁾. *A.muciniphilia* ile ilgili ilk klinik ön çalışma bu yıl içinde yayınlandı. Bu çalışmada 10^{10} CFU dozunda *A.muciniphilia*'nın canlı veya pastörize formu 3 ay boyunca 32 aşırı kilolu, insülin direnci olan deneklere verildi ⁽¹⁴⁾. Çalışmanın sonucunda bu probiyotiğin güvenli olduğu, insülin direncini, insülin seviyesini ve total kolesterolü azalttığı gösterilmiştir. Deneklerin vücut ağırlığında ve yağ kütlesinde de azalma saptanmıştır ⁽¹⁴⁾. İlginç olan sadece canlı *A.muciniphilia*'nın değil, pastörize yani canlı olamayan formunun da fayda etkili göstermesi olmuştur. Bu bilgi probiyotik bakteriler hakkında henüz bilmediğimiz mekanizmaların etkili olabileceğini göstermektedir.

Gelecekte bizi bekleyen neler var diye baktığımızda karşımıza üç farklı konsept çıkıyor:

1. Yapay mikrobiyotaya bileşenleri (mikrobiyotaya restorasyon tedavileri)
2. Bakteriofajlar
3. Post-biyotikler

Mikrobiyotaya restorasyon tedavilerinin öncüllerinden olan Rebiotix firmasının ürettiği RBX2660 isimli mikrobiyotaya bileşeni özellikle *Clostridioles difficile* (CD) tedavisinde faz çalışmalarını sürdürmektedir. Güvenlik çalışması ilk kez 2016 yılında tamamlanan ürünün, *C.difficile* profilaksisinde etkili olduğu gösterilmiştir^(15,16). Geçen yıl yapılan diğer bir çalışmada da benzer başarılı sonuçlar bildirildi. 2019 yılında da Faz 2b çalışması yapılmış bu hasta grubunun mikrobiyotaya profili ve bakteriyel çeşitliliğinde düzelme olduğunu bildiren bir çalışma yayınlandı⁽¹⁷⁾.

Bakteriofajlar bakterileri enfekte eden virüslerdir. Bakterileri kullanarak çoğalırlar ve bakteriyel mikrobiyotaya yön verebilirler. Bu özelliklerinden faydalanmak amacıyla hedeflenmiş bakteriofajların mikrobiyotaya modülasyonu için kullanılması hedeflenmiştir. Bu konuda birçok alanda çalışmalar devam etmektedir. Crohn hastalığında da benzer bir çalışma yapılmaktadır⁽¹⁸⁾.

Post-biyotikler probiyotiklerin veya bağırsak mikrobiyotasının ürettiği son ürünleridir. Bu ürünlerden konakçı için faydalı olan metabolitlere *post-biyotik* adı verilmektedir. En eski ve en iyi bilinen postbiyotikler kısa zincirli yağ asitleridir (Butirat, propriyonat ve asetat). Ancak son yıllarda metabolomiks ve proteomiks alanındaki gelişmeler sayesinde çok daha fazla son ürün saptanmıştır. Muhtemelen gelecekte bu ürünler içinden klinik uygulamaya geçebilecek postbiyotikler elimizde olacaktır⁽¹⁹⁾.

Sonuç olarak, probiyotiklerin geleceği gelişen analiz yöntemlerine paralel ilerlemektedir. Bu ürünlerin klinik kullanıma girebilmesi için ilaç benzeri bir regülasyon, analiz ve klinik çalışma dizaynlarına ihtiyaç vardır. Probiyotiklerin gıda takviyesi olmaktan çok daha öteye gidebilmesi için ilaç firmalarının bu ürünleri bu yönde dizayn etmeleri gerekmektedir. En önemli konuların başında da(çoğu zaman göz ardı edilen) güvenlik konusu yatmaktadır. Bu sadece enfeksiyon riski anlamında değil, mikrobiyotaya modülasyonunun gelecekteki riskleri (kanser, kronik inflamatuvar hastalıklar, psikiyatrik hastalıklar gibi) açısından da kayıt ve bildirimleri yapılmalıdır.

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PROBİYOTİKLER-PREBİYOTİKLER VE ALLERJİK HASTALIKLARIN ÖNLENME VE TEDAVİSİNDEKİ ROLLERİ

Öner Özdemir

Giriş

Yirminci yüzyılın son dekatından itibaren ‘vücudumuza faydalı mikroplar’ olarak adlandırılan ve değişik gıda ürünlerinin içine konulan probiyotikler ve onlara yaşama ortamını sağlayan prebiyotikler üzerinde yapılan araştırmalar ve yazılan makaleler her geçen gün artmaktadır ⁽¹⁻³⁾.*

Bu derlememize öncelikle probiyotikleri ve prebiyotikleri tanımlayarak başlamak istiyoruz. Daha sonra her ikisinin insan vücudunda meydana getirdiği ve alerjik hastalıkların oluşum (toplumdaki prevalansını) ve tedavisini etkileyebilecek mekanizmalara kısaca değineceğiz. Alerjik hastalıkların (atopik dermatit (AD), besin allerjisi, alerjik rinit ve astım) önlenme ve tedavisi üzerine rolleri güncel literatür verileri, önce randomize kontrollü çalışma (RKÇ)’lerden başlanarak, sonra mevcut metaanalizler ve rehber görüşleri, ışığında anlatılacaktır.

Probiyotikler: Tanımlama

Asırlardır fermente sütle (*Streptococcus thermophilus* ve *Lactobacillus bulgaricus*) vücuda alınan probiyotikler ‘ağızdan alındığında, konağın mikrobiotasını değiştirebilecek ve potansiyel olarak sağlığına yararlı olabilecek canlı mikroorganizmalar’ olarak tanımlanmaktadır ⁽⁴⁾. En sık kullanılan ve en iyi bilinen probiyotik bakteriler laktik asit bakterileri (LAB) olan Laktobasil ve Bifidobakteri’dir. Laktik asit bakterileri dışında kullanılan diğer türler ise *E. coli*, *Bacillus* gibi bakteriler ve *Saccharomyces* gibi mantarlardır ⁽³⁾. Bilinen en temel üç özelliği; insan kaynaklı olmaları, mide-bağırsak sisteminde değişik etkenlere karşı dirençli ve konağa faydalı olmalarıdır ⁽²⁾. Günümüzde özellikle ticari olarak piyasada satılan yoğurtların probiyotik içeriğinin yeterli olmadığı bilinmektedir.

Prebiyotikler: Tanımlama

Vücutta yerleşik olarak bağırsaklarda yaşayan ve vücuda faydalı probiyotik türü (Bifidobakteri/Laktobasil vb.) canlı bakterilerin gelişmesi için zorunlu ve üst gastrointestinal sistemde sindirilemeyen fakat kolonda fermente olan besin bileşenleridir. Fermentasyon sonrası bağırsak mikrobiotasının bileşimini ve aktivitesini vücuda faydalı olacak şekilde değiştirerek, bağırsak hareketlerini düzenlemekte ve patojen mikroorganizmaların üremesini önlemektedir ^(2,5). Tanımlamaya göre sadece bilinen iki tür hazmedilemeyen oligosakkarit (OGS) kriterleri karşılamaktadır. Bunlar galaktanlar ve inülin tipindeki

* Kısaltmalar: **AD**: atopik dermatit; **Th2**: yardımcı (helper) 2 T hücresi; **LAB**: laktik asit bakterileri; **OGS**: oligosakkarit; **scGOS**: kısa zincirli galaktooligosakkaritler, **lcFOS**: uzun zincirli fruktooligosakkaritler, **LGG**: Laktobasil rhamnosus GG, **SCORAD**: atopik dermatit skorlaması, **OVA**: ovalbumin, **IL**: interlökin, **Treg**: regülatör T hücreleri, **TLR**: Toll-like reseptör, **OVA**: ovalbumin, **RKÇ**: randomize kontrollü çalışma.

herhangi bir allerjik hastalığın korunma veya tedavisi için rutin tavsiye edilir duruma gelememiştir ⁽¹¹⁸⁻¹²⁰⁾.

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C. AKILCI BESLENME

Bölüm C1

BAĞIRSAK MİKROBİYOTASI VE MAKROBESİN ÖGELERİ

Murat Baş

Diyet, insan sağlığının çeşitli yönlerini etkiler ve obezite, tip 2 diyabet ve kardiyovasküler hastalıklar gibi kronik metabolik koşullarla ilişkilidir. Besin ögeleri sadece insan sağlığı için değil, aynı zamanda insan bağırsaklarında bulunan trilyonlarca mikroorganizmanın sağlığı ve sağkalımı için de gereklidir. Diyet; insanlar ve onların mikrobiyal sakinleri arasındaki ilişkinin temel bir bileşenidir; bağırsak mikroorganizmaları, temel biyolojik süreçler için beslenme ile alınan besin ögelerini kullanır ve bu işlemlerin metabolik çıktıları insan fizyolojisi üzerinde önemli etkilere sahip olabilir. İnsanlarda ve hayvan modelleriyle yapılan çalışmalar bu ilişkinin alt katmanlarını ortaya çıkarmaktadır ve sayısı giderek artan kanıtlar, diyetin insan sağlığı ve hastalıkları üzerindeki bazı daha geniş etkilerinin altını çizmektedir.

Sağlıklı bir diyeti neyin oluşturduğu konusundaki tartışmalar, beslenmenin bilimsel bir disiplin olarak ortaya çıkmasından ve devletlerin beslenme rehberleri oluşturmasından bu yana devam etmektedir ⁽¹⁾. Bağırsak mikrobiyotasının sağlık ve hastalığın önemli bir düzenleyicisi olarak ortaya çıkması bu sorunu daha da karmaşıklaştırmıştır. Diyet ile bağırsak mikrobiyotası arasında karşılıklı bir ilişki vardır, bu nedenle diyetel faktörler mikrobiyal bileşimin ve fonksiyonun en güçlü modülatörleri arasındadır. İntestinal mikroorganizmalar, konakçı fizyolojisi üzerinde potansiyel olarak derin etkiler yaratarak, alınan besin ögelerinin emilim, metabolizma ve depolanması süreçlerini etkiler.

İnsan bağırsak mikrobiyotası, trilyonlarca mikrobiyal hücre ve binlerce bakteri türünden oluşur. Özel kompozisyon içeriklerine göre bireyler arasında farklılık gösterir ve olgun mikrobiyota oldukça dirençli olmasına rağmen, hem iç, hem de dış uyaranlar tarafından bireysel olarak değişebilir. Bireylere özgü değişkenlik ve bağırsak mikrobiyotasının esnekliği, “sağlıklı” bir mikrobiyotayı tanımlamaya yönelik çabaları engellemiştir; ancak, zenginlik ve çeşitlilik gibi mikrobiyal stabilite belirteçleri, sıklıkla kronik hastalıklar ve metabolik disfonksiyon ile ters ilişkisi nedeniyle bağırsak sağlığının göstergeleri olarak kullanılırlar ⁽²⁾. Mikrobiyota esnekliği de ayrı bir fırsat yaratır; çeşitli dış etkenleri manipüle ederek, insan sağlığını iyileştirmek için bağırsak mikroplarının yapısal ve biyolojik çıktılarını yeniden şekillendirme potansiyeli vardır.

Diyet, bağırsak mikrobiyotasını etkileyen önemli bir dış etkidir ve diyetin mikrobiyal ekolojiyi değiştirme yeteneği uzun yıllar önce tanımlanmıştır ⁽³⁾. Kısa süreli-geçici diyet kaynaklı değişiklikler, vücut ağırlığından ve adipoz dokudan bağımsız olarak meydana gelir ve insan bağırsak mikrobiyotasındaki değişiklikler diyet manipülasyonundan sonraki 24 ila 48 saat içinde saptanabilir ⁽⁴⁾. Diyetin mikrobiyal ekoloji üzerindeki etkileri; insanlar gibi bağırsak mikroorganizmalarının da temel biyolojik süreçler için yakıt olarak alınan besin ögelerini kullandığı düşünülürse şaşırtıcı değildir. Bu nedenle, konakçı diyet örüntülerinde yapılan değişiklikler, bakteriyel metabolizma türlerini değiştirmekte ve tüketilen yakıt kaynaklarını kullanmak için en uygun türleri kayırmaktadır. Diyetin mikrobiyal yapıda yol açtığı

ri arasında, diyet sonrası kilo alımını öngörmek ve postprandial glisemik cevapların kontrolü için kişiselleştirilmiş diyet önerileri geliştirmek için mikrobiyota profilleri içeren algoritmaların geliştirilmesi yer almaktadır⁽⁵⁵⁾. Bu örnekler, potansiyel mikrobiyota-diyet etkileşimlerinin gerçekleştirilmesinin, beslenmeye gelecekteki yaklaşımları nasıl değiştirebileceğini göstermektedir.

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BAĞIRSAK MİKROBİYOTASI VE MİKROBESİN ÖGELERİ

Saniye Sözlü

Efsun Karabudak

İnsanların sağlıklı bir şekilde hayatlarını sürdürmesinde enerji sağlayan makro besin öğelerinin yanı sıra enerji sağlamayan ancak metabolizmada hayati rolleri olan mikro besin öğeleri (vitaminler, mineraller, iz elementler) de önem taşımaktadır. Mikro besin öğelerin metabolizmada enerji metabolizması, hücrel büyüme ve farklılaşma, bağışıklık sistemi, organ fonksiyonlarının devam ettirilmesi gibi kritik rolleri bulunmaktadır. Metabolizmadaki bu etkilerini doğrudan ince bağırsaklardan emilip hedef hücre veya dokuya transfer edilerek veya dolaylı olarak bağırsak kanalındaki mikrobiyota aracılığı ile gerçekleştirildiği düşünülmektedir ¹.

Bağırsak mikrobiyotasıyla ilişkili bağışıklık sistemi ve bağırsak bariyer fonksiyonu ve makro besin öğeleri arasında birçok çalışma bulunsa da ^{2,3}, konakçı-mikroorganizma-metabolik eksen içinde mikro besin öğeleri ve sağlık üzerine etkileri konusundaki çalışmalar yok denecek kadar azdır ¹. Bu nedenle, bu bölümde diyet ile alınan suda veya yağda çözünen vitaminler ve minerallerin bağırsak mikrobiyotası ve konakçı sağlığı üzerine etkileri ele alınmıştır.

İntestinal Mikrobiyota ve Vitaminler

Vitaminler, vücudun normal gelişimini sağlayan ve sağlığı koruyan temel mikro besin öğeleridir. Vitaminler besinlerin sindirimi ve emilimi yoluyla, bazı maddelerin dönüşümü ve senteziyle veya bağırsak bakterileri ile elde edilebilirler ⁴. Makro besin öğelerinin yanı sıra bağırsak mikrobiyotası bazı mikro besin öğelerinin hem sentezini hem de metabolik işlevini düzenler ³. Bağırsak mikrobiyotası başlıca K vitamini, biotin, kobalamin, folat, nikotinik asit, pantetonik asit, pridoksin, riboflavin ve tiamin olmak üzere B grubu vitaminlerini sentezleyebilir ⁵. Örneğin, insan bağırsağında bulunan laktik asit bakterileri (LAB) ve *Bifidobacteria* B grubu vitaminlerinin çoğunu ve K₂ vitaminini tek başına sentezleyebilecek yapıya sahiptir ⁵. Mikrobiyota tarafından üretilen bu vitaminlerin bakteri metabolizması için öneminin yanı sıra memelilerde metabolik ve fizyolojik yollarda da önemli fonksiyonları olduğuna dair kanıtlar bulunmaktadır ⁴.

Yapılan araştırmalar sonucunda bazı vitaminlerin sentezinde tek bir mikroorganizmanın rol almadığı, bunun yerine sentez basamakları için birbirini tamamlayan organizma çiftlerinin var olduğu tespit edilmiştir. Bağırsak bakterileri arasında çapraz-beslenme olarak nitelendirilen bu durumda bir bakteri tarafından üretilen vitaminin bir kısmının vitamin üretmeyen diğer bakteri tarafından kullanıldığı böylece büyümesi için gerekli vitamini sağladığı gösterilmiştir ⁶. Bakteriler arasındaki bu dönüşüm üretilen vitaminlerin konakçı için kullanılabilirliğini sınırlar. Ayrıca, genel olarak diyetle alınan vitaminler ince bağırsaktan emilirken, mikroorganizmalar tarafından üretilen vitaminlerin kolondan emilmesi de konakçının vitaminlerden faydalanmasını kısıtlamaktadır ⁷.

Batı diyetinde yüksek tuz alımı kardiyovasküler hastalıklara neden olabilmektedir. Deney hayvanları ve insanlarda yapılan çalışmada yüksek tuzlu diyetlerin hipertansif etkisini *Lactobacillus* seviyelerini azaltarak ve ardından proinflatuar T yardımcı 17 hücrelerinde artışa neden olarak yaptığı gösterilmiştir⁹⁰. Toplu olarak, şimdiki kadar mikrobiyota ve mikro besin ögeleri arasında tespit edilen etkileşimler ve şüphesiz keşfedilmeyi bekleyen sayısız diğer etkileşimler gelecekteki araştırmaların önemli bir yolunu temsil etmektedir.

Sonuç

Diyet ile alınan vitamin ve mineral yetersizliği bağırsak mikrobiyota yapısını etkileyebilir. Bağırsak mikrobiyotası tarafından üretilen vitaminler bağırsak immün yanıtını aktifleştirmede ve dış patojenlerin neden olduğu enfeksiyona karşı savunmada önemli bir rol oynamaktadır. Ancak, mikrobiyal vitaminler ve patojenler arasındaki doğrudan etkileşimin mekanizması hâlâ belirsizliğini korumaktadır.

Veriler aynı zamanda mikrobiyota odaklı diyet müdahale çalışmalarında mikro besin ögelerinin bileşiminin izlenmesinin önemini vurgulamaktadır ve vitamin ve mineral eksiklikleri için risk altındaki popülasyonlarda klinik denemelere ihtiyaç duyulmaktadır.

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PREBİYOTİK OLARAK FRUKTOOLİGOSAKKARİTLER METABOLİZMALARINI VE SAĞLIĞA FAYDALARINI

Hatice Bölükbaşı

Gamze Akbulut

Giriş

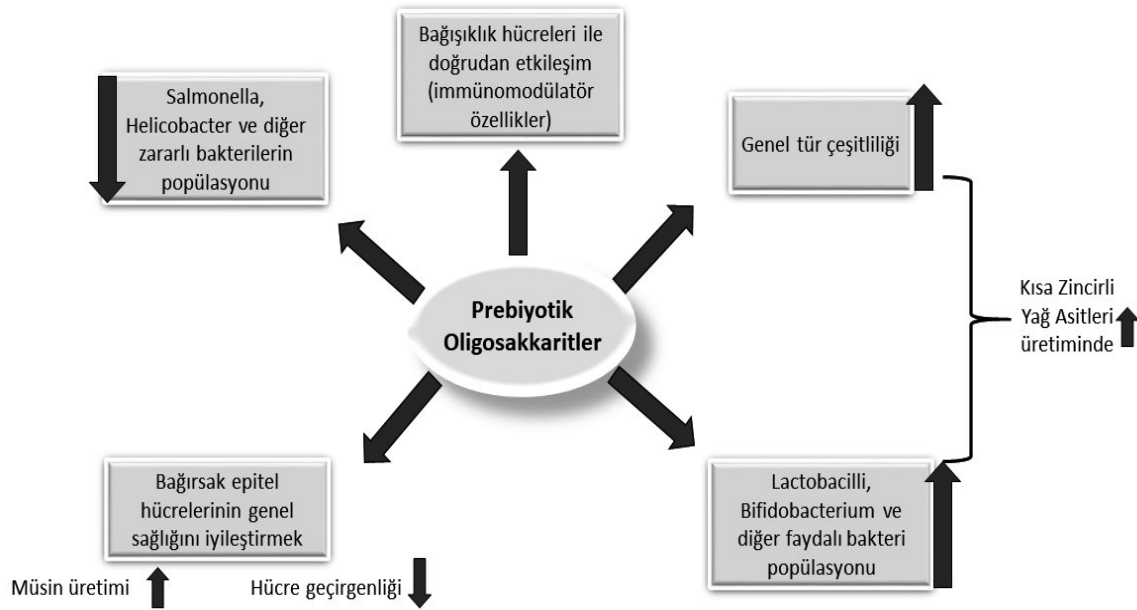
Prebiyotik; kolon mikrobiyotasındaki bakterilerin büyümesini ve/veya aktivitesini seçici olarak uyararak, konakçı sağlığını iyileştiren, sindirilemeyen besin bileşenleridir¹. Son yıllarda literatürde çeşitli sindirilemeyen oligosakkaritlerin (örneğin, fruktooligosakkaritler, galaktooligosakkarit, izomaltooligosakkaritler, ksilooligosakkaritler ve maltitol) mikrobiyota üzerindeki prebiyotik etkileri üzerine durulmaktadır. Başlıca prebiyotik özelliği taşıyan oligosakkaritlerden biri olan fruktooligosakkaritler (FOS) hem prebiyotik olma kriterlerini (1- mide asiditesine, memeli enzimleri tarafından hidrolize ve gastrointestinal absorpsiyona direnç gösterirler; 2- bağırsak mikrobiyotasında fermentasyona uğrarlar; ve 3- sağlığa katkıda bulunan bağırsak bakterilerinin büyümesinin ve/veya aktivitesinin seçici olarak uyarılmasını sağlarlar) karşılaması ile hem de sağlık üzerine olumlu etkileri ile diğer prebiyotiklerden daha fazla öne çıkmaktadır^{2,3}. Bu bölümde prebiyotik olarak fruktooligosakkaritlerin metabolizmaları ve sağlığa faydaları yer almaktadır.

Tanımı, Yapısal Özellikleri ve Besinsel Kaynakları

Fruktooligosakkaritler, ana bifidojenik oligosakkarit sınıflarından birini temsil eden sindirilemeyen karbonhidratlardır. Oligofruktoz, oligo fruktan, fruktoz oligomerleri, fruktanlar veya glukofruktanlar ortak adıyla da bilinmektedirler⁴. FOS'lar β (2-1) bağlarıyla bağlı fruktoz oligomerleridir. FOS'lar, 3 ile 10 arası monosakkaridin (en sondaki früktoz ve glukoz) α -glikozidik (1-2) bağlar ile bağlanması sonucu meydana gelmektedir (Şekil 1).

Fruktooligosakkaritler, yüksek oranda çözünür (oda sıcaklığında suda yaklaşık %80) ve düşük enerji içeriğine sahip karbonhidratlardır (1.0–1.7 kkal/g). FOS'ların saf formları, sakkaroz ile karşılaştırıldığında yaklaşık %30-35'lik bir tatlılığa sahiptir. Düşük pH'a kadar stabildirler ve 140°C'ye kadar ısıya dayanıklıdır. Teknolojik özellikleri nedeniyle FOS'lar; süt ürünlerinde, dondurulmuş tatlılarda, unlu mamullerde, ekmeklerde, kahvaltılık gevreklerde ve diyet ürünlerinde organoleptik özellikleri iyileştirmesi için kullanılmaktadır⁶.

Fruktooligosakkaritler; muz, sarımsak, soğan, domates, buğday, kuşkonmaz, enginar, pırasa, bal, çavdar, esmer şeker, arpa, marul, hindiba, yer elması, pancar, elma, muz, domates, çiçek soğanı gibi bitkilerde yüksek miktarda bulunmaktadır ve şeker otu bitkisi (Stevia rebaudiana Bertoni) atıklarından da elde edilebilmektedir^{5,7}.



Şekil 6. Oligosakkaritlerin prebiyotik aktivitesinin altında yatan farklı mekanizmalar⁹.

FOS takviyesi interlökin (IL)-1b, IL-6 ve interferon-gama (IFN-c) gibi proinflatuvar sitokinlerin seviyelerini azaltarak anti-inflatuvar yanıt göstermektedir. FOS, hepatik süperoksit dismutazın (SOD) azalmasını önlemekte ve potansiyel olarak glutasyon peroksidaz (GPx) aktivitesini modüle etmektedir²¹.

Etki mekanizmaları arasında;

- ~ lokal sitokin ve antikor üretimini modüle eden spesifik bağırsak bakterilerinde seçici artış/azalma sağlaması
- ~ bağırsakta KZYA üretiminde artış ve KZYA'nın lökositler üzerindeki G-bağlı protein reseptörlerine bağlanmasında artış sağlaması
- ~ bağırsak epitel hücreleri ve bağışıklık hücreleri üzerindeki karbonhidrat reseptörleri ile etkileşimi yer almaktadır²².

Sonuç olarak; FOS'lar diğer oligosakkaritler ile karşılaştırıldığında birçok özelliği ile ön plana çıkmaktadır. Prebiyotik olarak tanımlanan FOS'un, bifidobakterilerin ve laktobasillerin seçici büyümesini uyardığı ve bağırsak hücrelerine potansiyel olarak patojen olan mikroorganizmaların saldırısını engellediği için kolon sağlığı için faydalı olduğu doğrulanmıştır. İnsan gastrointestinal sisteminde yerleşik olan bakteri topluluğunun, bağırsak işleyişi ve insan sağlığı üzerinde temel bir etkiye sahip olduğu kabul edilmektedir. Fruktooligosakkaritler, gıda, tarım ve farmasötik uygulamalar dâhil olmak üzere birçok alanda kullanımı avantaj sağlamaktadır.

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FARKLI BESLENME MODELLERİNİN BAĞIRSAK MİKROBİYOTASI ÜZERİNE ETKİSİ

Hilal Yıldırım

Feride Ayyıldız

Giriş

Bağırsak mikrobiyotası en az 1000'den fazla bakteri türünü içeren farklı tür ve suşlardan oluşmuş geniş bir ekosistemdir. Bu flora geniş sayı açısından ayrı bir endokrin organ olarak değerlendirilebilir ve karbonhidrat sindirimi, zararlı mikroorganizmaların baskılanması, vitamin sentezi, immün sistem aktivitesi ve ilaç metabolizması gibi birçok hayati fonksiyonda görev alır.^{1,2} Doğumdan itibaren genetik faktörler, batı tarzı diyet, sedanter yaşam, sigara ve alkol kullanımı gibi pek çok endojen ve eksojen faktör faktörler bağırsaktaki mikrobiyal çeşitliliği ve miktarı etilemektedir.¹ Bağırsak mikrobiyotasındaki değişiklikler disbiyozu neden olamakta ve bağırsak disbiyozisi metabolik sendrom, metabolik hastalıklar, inflamatuvar bağırsak hastalıkları, obezite gibi pek çok hastalık prognozu ile ilişkilendirilmektedir.³ Bağırsak mikrobiyotasında bulunan bakterilerin dağılımı, çeşitliliği, türleri ve metabolik ürünlerine bağlı olarak konak için fayda ve zarar dengesi belirlenmektedir. Mikrobiyota, sağlık ve hastalık ilişkisi Şekil 1'de özetlenmiştir.⁴

Bağırsak mikrobiyotasındaki bakterilerin %90'ından fazlasını Gram negatif Bacteroidetes ve Gram pozitif Firmicutes oluşturmaktadır.² Bağırsaktaki bakterilerin fermantasyonu sonucu oluşan kısa zincirli yağ asitleri (KZYA) (asetat, propiyonat ve bütirat), bağırsak mikrobiyotası üzerinde direk anti inflamatuvar etki göstermektedir. İnflamatuvar bağırsak hastalıkları (İBH) gibi bazı hastalıklarda bakteri çeşitliliğinin daha az, aynı zamanda Bacteroidetes ve Firmicutes sayılarının daha düşük olduğu gösterilmiştir. Bacteroidetes ve Firmicutes'in birlikte azalması ise mikrobiyal metabolit olan bütirat konsantrasyonunun da azalmasına neden olarak bağırsak sağlığını olumsuz etkileyebilmektedir.⁵ Obezitede ise *Bacteriodes-Firmicutes* oranı değişmektedir. Literatürde çelişkili sonuçlar olsa da genel olarak obezlerde *Firmicutes* sayısı artarken, *Bacteriodes* sayısının azaldığı gösterilmiştir.⁶

Bağırsak mikrobiyotasındaki bu değişiklikler sonucu bozulan bağırsak bütünlüğü sızdıran bağırsak oluşumuna neden olur. Gram negatif bakteriler olan *Bacterides* türündeki artış ile birlikte bu bakterilerin hücre duvarlarından salınan liposakkaritlerin artışı metabolik endotoksemnin başlamasından ve proinflamatuvar sitokinlerin sekresyonunun tetiklenmesinden sorumludur. Bu süreç pek çok hastalık oluşumuna zemin hazırlamaktadır.⁷

Bağırsak mikrobiyotasını etkileyen en önemli faktörlerden biri diyetdir. Bağırsak mikrobiyotasındaki değişikliklerin %12'sinden genetik faktörler sorumlu iken, %57'sinden de diyetin sorumlu olduğu savunulmaktadır.⁸ Farklı beslenme türleri bağırsak mikrobiyal kompozisyonunu ve Firmicutes ve Bacteriodes arasındaki oranın değiştirerek çeşitliliği etkileyebilmektedir.⁹ Bağırsak mikrobiyotasında bulu-

Barone ve arkadaşları ise 15 İtalyan bireye (3 kadın, 12 erkek) Paleo diyet (işlenmemiş ürünlerin yer aldığı, tahıl, süt ve ürünleri, tuz ve rafine şekerin çıkarıldığı diyet) vererek takip etmişler ve çalışma sonunda Paleo diyetle bakteriyel çeşitliliğin arttığını gözlemlemişlerdir.⁶¹ Ancak Paleo diyetinin etkisini modern zamanda yaşayan insanların genetiği ve çevresel koşullarını da gözetererek yapılacak uzun dönem çalışma sonuçlarına göre değerlendirmek gerekmektedir.

Sonuç olarak farklı diyet modellerinin içerdikleri besin çeşitliliği ve farklı oranlardaki besin ögesi konsantrasyonları göz önüne alındığında bu diyet modellerinin bağırsak mikrobiyotasını etkilemesinin yanı sıra insan sağlığını ve kronik hastalıkları farklı düzeylerde etkileyebileceği düşünülmektedir. Bu diyet modellerinin bağırsak mikrobiyotası üzerindeki etkileri bilimsel olarak netlik kazanmadığından, bireye özgü enerji ve besin ögesi gereksinmelerini karşılayacak yeterli ve dengeli beslenme sağlığını korunmasında oldukça önemlidir. Ancak sadece kişinin beslenme tarzı değil aynı zamanda yaşı, cinsiyeti, genetik özellikleri, fiziksel aktivite düzeyi, alkol ve sigara kullanımı gibi birçok faktörün de bağırsak mikrobiyotasını etkileyebileceği unutulmamalıdır.

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FONKSİYONEL VE FERMENTE BESİNLERİN MİKROBİYOTA ÜZERİNE ETKİSİ

Sevinç Yücecan

İnsan sağlığı ve hastalıklarında bağırsak mikrobiyotası; konakçının metabolik, immünolojik ve nörolojik hatta fizyolojik durumunun belirlenmesinde kilit rol oynamaktadır. Hatta son çalışmalar organizmanın homeostazı ve homeorezinin modüle edilmesinde bağırsak mikrobiyotasının çok önemli rolü olduğunu göstermektedir. Bağırsak mikrobiyotası ile ilişkilendirilen fonksiyonel besin bileşenlerinin; örneğin polifenollerin, prebiyotik benzeri etki yaparak bağırsak mikrobiyota kompozisyonunu üzerinde etkili olabileceği belirtilmektedir. Yapılan çalışmalar polifenollerin; antimikrobiyal ve bakteriostatik etki göstererek seçici olarak patojen mikroorganizmaların büyümesini baskıladığını, probiyotikler gibi yararlı bakterilerin çoğalmasını uyararak mikrobiyotanın modülasyonunda etkili olduğunu göstermekte ve mikrobiyotada bulunan iyi huylu mikroorganizmaların da polifenoller katabolize ederek, doğal fenolik bileşiklerden daha aktif ve daha iyi emilen metabolitleri serbest bıraktığını belirtmektedir. Diyet polifenollerinin sağlığı geliştirici etkinliklerinin geniş bir yelpazesi araştırılmış olmakla birlikte, bağırsak ekolojisinin modülasyonu üzerindeki etkileri ve "polifenoller" "mikrobiyota" iki yönlü ilişkisinin etkileri hâlâ tam olarak anlaşılmamıştır. Bağırsak mikrobiyotasında üretilen ve sağlığı geliştiren polifenolik metabolitlerinin türü ve miktarı, bağırsak mikrobiyotasının kompozisyonuna ve işlevine bağlıdır. Polifenollerin sağlık etkilerinin tam olarak anlaşılması için klinik çalışmalarda bireylerin metabolizma tiplerine bakmak önerilmektedir. Fermente yiyecek ve içeceklerin etkileri de bağırsak mikrobiyota düzeyindeki etkisi ile değerlendirilmektedir. Sağlık, bağırsak mikrobiyotası ve fonksiyonel besinler ile fermente besinler arasındaki etkileşim özellikle mikrobiyota-bağırsak-beyin ekseninde irdelenmeye başlanmıştır. Günümüzde bu iletişimin birçok yol aracılığıyla iki yönlü olduğu anlaşılmıştır. Tam olarak mekanizma anlaşılmasa da immün faktörler, hormonlar, metabolitler, bazı transmitterler bu iletişime katkı sağlayabilmektedir. Fonksiyonel ve fermente besinlerin mikrobiyota üzerine etkileri anlaşılma-ya başlanmış olsa da konu ile ilgili daha ileri klinik çalışmaların yapılması salık verilmektedir.

Giriş

İnsan sağlığı ve hastalıklarında bağırsak mikrobiyotası; konakçının metabolik, immünolojik ve nörolojik hatta fizyolojik durumunun belirlenmesinde kilit rol oynamaktadır. Hatta son çalışmalar organizmanın homeostazı ve homeorezinin modüle edilmesinde bağırsak mikrobiyotasının çok önemli rolü olduğunu göstermektedir. Bu ekosistemdeki denge, konağın homeostazını yani metabolizma, enflamasyon, bağışıklık ve hücre proliferasyonunu korumada ve ayrıca beyin-bağırsak ekseninin düzenlenmesinde de kritik öneme sahiptir. Bu mikrobiyotayı diyet, antibiyotik alımı, ksenobiyotikler ve genetik faktörler gibi endojen ve çevresel faktörler etkilemektedir¹⁻⁵. Bu mikrobiyal ekosistemin bozulması'nın; enflamatuvar bağırsak hastalıkları, irritabl bağırsak sendromu, kolorektal kanser, obezite, diyabet, metabolik sendrom, kardiyovasküler hastalıklar, nörodejeneratif hastalıklar, şizofreni, otizm, anksiyete, depresyon gibi neuropsikiyatrik bozukluklar, alerji, astım gibi çeşitli sağlık sorunlarına yol açtığı belir-

ler, kalsiyum, magnezyum ve potasyumun kardiyometabolik risk faktörleri üzerinde yararlı etkisi olduğu da gösterilmiştir. Yoğurt ayrıca içerdiği bileşenleri ile kemik mineralizasyona katkıda bulunmaktadır. Fermente bir besin olan yoğurt tüketiminin akut direnç egzersizinden kaynaklanan kas ağrısını azalttığı da ileri sürülmüştür^{50,53,64-68}.

Fermente ürünler ile sağlık arasındaki ilişkiyi irdeleyen çalışmalarda; fermente besinlerin potansiyel antioksidan, hipokolesterolemik, antihipertensif, anti-inflamatuar, immünomodülatör, anti-karsinojenik, anti-allerjenik aktivite gösterdiği, kemik sağlığı, glisemik yanıt kontrolünde etkili olabileceği, ayrıca laktoz intoleransı ve konstipasyon gibi sindirim sistemi sorunlarına karşı kullanılabileceği, antibakteriyel ve antifungal özellikler gösterdiği bildirilmiştir. Fermente besinlerin sağlık üzerindeki etkisine yönelik mekanizmalar, içerdiği mikroorganizmalarla bağlantılı potansiyel probiyotik etkiler, fermentasyon türevli biyoaktif peptitler, biyojenik aminler ve fenolik bileşiklerin biyolojik olarak aktif bileşiklere dönüşümü ve ayrıca anti-nutrisyonel faktörlerin azalması ile ilintilidir⁵⁰⁻⁵⁶. Ancak fermente besinlerin sağlık üzerine etkileri ile ilintili daha ileri klinik çalışmalar yapılması, bu çalışmaların metagenomik, metatranskriptomik ve metabolomik yaklaşımlarla desteklenmesi salık verilmektedir.

Sonuç

Fonksiyonel ve fermente besinler ile bağırsak mikrobiyotası arasındaki sağlıklı ilgili potansiyel etki mekanizmaları henüz net değildir. Bu konularda; metagenomik, transkriptomik ve proteomik yaklaşımlarla daha ileri çalışmaların yapılması salık verilmektedir. Özellikle omik teknolojisinin yeni kültürlerinin gelişiminde önemli rol oynayabileceği, fonksiyonel besin bileşenleri ile probiyotik bakterilerin bağırsak mikrobiyotası üzerindeki işlevselliği ile etkinlik mekanizmalarının daha iyi belirlenebileceği ve açıklığa kavuşturulabileceği belirtilmektedir. Ayrıca fermente besinlerin sağlık üzerine etkileri ile ilintili de daha ileri klinik çalışmalar yapılması, bu çalışmaların metagenomik, metatranskriptomik ve metabolomik yaklaşımlarla desteklenmesi salık verilmektedir. Bu araştırmaların, fermente besinlerin insan diyetindeki önemini ve potansiyel olarak gerekliliğini ve ulusal beslenme kılavuzlarına dâhil edilmelerinin gerekçesini açıklığa kavuşturmada da çok yardımcı olabileceği öngörülmektedir.

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BAĞIRSAK SAĞLIĞINDA POST- VE PARABİYOTİKLER

Yasemin Çakır-Gökkurt

Efsun Karabudak

Giriş

Probiyotiklerin ve prebiyotiklerin daha önce kullanılan tanımları yakın zamanda gözden geçirilmiş ve güncellenmiştir. Güncellenen kavramlara göre, probiyotik, yeterli miktarlarda alındığında konakçıya sağlık yararı sağlayan canlı mikroorganizmalar, prebiyotik ise sağlık yararı sağlayan, konakçı mikroorganizmalar tarafından seçici olarak kullanılan bir substrattır. Farklı bakteri suşları konakçının bağışıklık sistemini etkileyerek bağışıklık tepkilerini modüle edebilmektedir. Bununla birlikte, canlı mikrobiyal hücrelerin yaygın kullanımından kaynaklanan güvenlik problemleriyle ilgili ortaya çıkan endişeleri ve raf ömrü sorunlarını ortadan kaldıracakları, mikrobiyal translokasyon ve enfeksiyon risklerini azaltabilecekleri için, canlı olmayan mikroorganizmalara veya mikrobiyal hücre özütlerine olan ilgi artmaktadır. Canlı olup probiyotik özellik gösteren veya göstermeyen mikroorganizmaların fermantasyon yoluyla veya besin bileşenleri üzerindeki etkileriyle üretebilecekleri metabolitleri ve/veya hücre bileşenlerinin sağlığa etkileri konusunda artan kanıtlar bulunmaktadır. Probiyotik, prebiyotik veya sinbiyotik kategorilerine girmeyen bu probiyoaktif bileşikler ifade etmek için postbiyotik, paraprobiyotik gibi farklı terimler kullanılmaktadır. Uluslararası Probiyotik ve Prebiyotikler Bilimsel Kuruluşu (ISAPP) tarafından 2021 yılında postbiyotiklerin tanımına ilişkin yayınlanan konsensus bazı araştırmacılar tarafından kabul edilmemiş ve eleştirilmiştir. Bu nedenle bu terimlere henüz uluslararası fikir birliği ile ortak bir terminoloji kazandırılmamıştır. Bu bölümde, canlı olmayan mikrobiyal hücrelerin veya ham mikrobiyal hücre fraksiyonlarının ve metabolitlerinin bağırsak mikrobiyotası üzerindeki etkileri hakkında bilimsel literatüre genel bir bakış sağlanması amaçlanmıştır.

Probiyotiklerden Post- ve Paraprobiyotiklerin Doğuşu

Modern probiyotik tarihi, 1900'lerin başında, Paris'teki Pasteur Enstitüsü'nde çalışan Rus bilim insanı, Nobel ödüllü Elie Metchnikoff'un öncü çalışmaları ile başlamaktadır. Metchnikoff fermantasyon sürecinden sorumlu olan mikroorganizmaların insan sağlığı üzerindeki olası etkilerini araştırmıştır. Bulgaristan kırsal halkının sağlıklı uzun yaşamlarının, yoğurt gibi fermente süt ürünlerinin düzenli tüketiminden kaynaklandığını ileri sürmüştü ve bunu *Bulgarian bacillus* (*Lactobacillus delbrueckii* subs. *bulgaricus*) ile ilişkilendirmiştir¹. Metchnikoff, laktobasillerin tüketilmesi ile bağırsak mikroflorasının olumlu yönde etkilendiğini, bozulmanın ve toksik mikrobiyal aktivitelerin azaldığını öne sürmüştür². Yararlı bakteri alımını öneren ilk kişi olan Metchnikoff'un “bağırsak mikroorganizmalarının gıdaya olan bağımlılığını, bağırsak florasının değiştirilebilmesi için bazı gıdaların özellikle tüketilmesini ve zararlı mikropların yararlı mikroplarla değiştirilmesinin mümkün kılınabileceğini” belirtmesi probiyotik kavramını doğurmuştur³.

Tablo 1. Postbiyotiklerin potansiyel etki mekanizmaları ¹⁵.

Etki mekanizması	İlgili postbiyotikler
Bağırsak mikrobiyotasının modülasyonu	Soya peptitleri
Antimikrobiyal etki	Bakteriyosinler
Anti adezyon etki	Biosümfaktanlar
Antiinflamatuvar etki	Laktat ve KZYA
Antikarsinojenik etki	Bütirat
Antiproliferatif etki	KZYA
Antihipertansif etki	ACE inhibitörleri
İmmün sistem uyarıcı etki	Kefiran (kefir ekzopolisakkaritleri)
Enfeksiyonun önlenmesi	Fermente sütün cell-free fraksiyonu
İştah/doyunluk kontrolü	Opioid ve antiopoid peptitler
Bağırsak bariyerinin güçlendirilmesi	Gama aminobütirik asit bakımından zengin süpernatant
Duygu durum modülasyonu	Gama aminobütirik asit
Kemik mineralizasyonu	Kazein fosfopeptitleri

Sonuç

Mikrobiyal metabolitler ve bunların hücre bileşenleri, ayrıca bazı mikroorganizmaların besin bileşenleri üzerindeki etkisinden türetilen bileşikler; probiyotikler, prebiyotikler ve sinbiyotiklerin yaptığı gibi sağlığı teşvik edebilir. Bugüne kadar esas olarak postbiyotikler, aynı zamanda paraprobiyotikler, parapsikobiyotikler, hayalet probiyotikler veya sadece mikrobiyal metabolitler olarak adlandırılmış olan bu bileşenler için yeni bir tanımlama yapılmış olmasına rağmen günümüzde evrensel olarak kabul edilmiş kapsamlı bir tanım ve sınıflandırma mevcut değildir. Kritik hastalarda, küçük çocuklarda ve prematüre yeni doğanlarda postbiyotik kullanmanın diğer “biyotikler” için çekici bir alternatif olabileceği öne sürülmüştür. Postbiyotiklerin, konakçıdaki fizyolojik, immünolojik, nöro-hormon biyolojik ve metabolik reaksiyonlar açısından yararlı bir etki üretmesini sağlayan aktif yapı ve etki mekanizmaları henüz açıklığa kavuşturulmamıştır. Literatürde bildirilen postbiyotik ürünlerin yararlı sağlık etkilerini açıklamak için araştırmalar hâlen devam etmektedir. Bu sağlık etkileri antiinflamatuvar, antiproliferatif, antioksidan, hipokolesterolemik, antihipertansif, antiobezojenik, hepatoprotektif ve antimikrobiyal aktiviteleri ile ilişkilendirilmektedir. Bu alandaki bazı açık sorular, hangi yapıların postbiyotik veya paraprobiyotik olarak nitelendirileceği, postbiyotik ve paraprobiyotikler hakkında güvenlik kaygıları olup olmadığı ya da besin ve takviyelerdeki varlığının nasıl izleneceği, sağlık yararlarının görülebilmesi için alınması gereken uygun dozun/miktarın belirlenmesi ile ilgilidir. Uluslararası fikir birliğine sahip uygun bir tanım ile sınıflandırmanın yapılması ve benimsenmesi; çalışılmasını, üretilmesini, pazarlanmasını, kalite kontrolünü ve yasal düzenlemelerinin yapılmasını kolaylaştıracaktır.

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GIDA KATKI MADDELERİ VE BAĞIRSAK MİKROBİYOTASINA ETKİLERİ

Duygu Ağagündüz

Giriş

Türk Gıda Kodeksi'ne göre gıda katkı maddeleri; “besleyici değeri olsun veya olmasın, tek başına gıda olarak tüketilmeyen ve gıdanın karakteristik bileşeni olarak kullanılmayan, teknolojik bir amaç doğrultusunda üretim, muamele, işleme, hazırlama, ambalajlama, taşıma veya depolama aşamalarında gıdaya ilave edilmesi sonucu kendisinin ya da yan ürünlerinin, doğrudan ya da dolaylı olarak o gıdanın bileşeni olması beklenen maddeleri” ifade etmektedir ¹. Bu tanımlama gıda kalitesini sürdürmek veya artırmak amaçlı eklenen gıdaları veya gıda kontaminasyonlarını kapsamamaktadır.

Modern dünyada gıda sanayiinde gıda katkı maddelerinin kullanımı kaçınılmazdır. Ülkemizde ve Avrupa Birliği (AB)'nde yaklaşık 300 civarında gıda katkı maddesinin çeşitli gıdalarda değişen miktarlarda kullanılmasına izin verilmektedir ². Amerika Birleşik Devletleri (ABD)'nde Gıda ve İlaç Dairesi (FDA)'nın kullanımına onay verdiği gıda katkı maddesi sayısı ise yaklaşık 3000'dir ³. Gıdalarda en yaygın kullanılan gıda katkı maddeleri; antioksidanlar, renklendiriciler, emülsifiyerler, stabilize edici maddeler, jelleştiriciler, koruyucular ve tatlandırıcılarıdır ⁴.

Gıda katkı maddelerinin kullanımına ilişkin ulusal ve uluslararası boyutta düzenlemeler bulunmaktadır. Ancak güvenilirlikleri her zaman sorgulanan bir konu olmuştur ⁵. Modern dünyada gıda katkı maddelerinin tüketimi arttıkça, alerjik reaksiyonlar, astım, migren, gastrointestinal sistem semptomları, çocuklarda hiperaktivite ve dikkat eksikliği vb. sağlık problemleri de artış göstermeye başlamıştır ^{6,7}. Son zamanlarda ise bağırsak mikrobiyotasına ve bununla ilişkili sağlık etkileri ilgi çekmeye ve önem kazanmaya başlamıştır.

İnsan, %10 insan ve %90 mikrobiyal hücrelerin birleşiminden oluşan bir süperorganizmadır. İnsan ve mikrobiyal genomların metabolizmaları ve varlıklarını sürdürebilme özellikleri ayrılmaz şekilde birbirlerine karışmıştır ⁸. Bağırsak mikrobiyotasındaki temel bakteri grupları Firmicutes, Bacteroidetes, Proteobacteria, Verrucomicrobia ve Actinobacteria'dır. Sayıca en baskın olarak bulunan bakteri grupları ise Gram pozitif Firmicutes ve Gram negatif Bacteroidetes gruplarıdır ⁹. Diyetel faktörler; probiyotikler, prebiyotikler, sinbiyotikler, antibiyotikler; stress, yaş, fiziksel aktivite durumu ve iklimsel faktörler gibi diyetel olmayan bazı faktörler bağırsak mikrobiyotası dengesine ve çeşitliliğine etki edebilmektedir ¹⁰.

Bağırsak mikrobiyotası ve konakçı arasındaki etkileşim insan sağlığı için önemli bir rol oynamaktadır. Birçok hastalığın etiopatogenezinde; disbiyoz, bağırsak mikrobiyotasındaki olumsuz değişimler ve inflamasyon önemli rol oynamaktadır ¹¹. Beslenmenin bağırsak mikrobiyotasının kompozisyonunda ve fonksiyonundaki rolü önemli ölçüde ortaya konmuştur ¹². Buna rağmen; gıda katkı maddeleri gibi minor gıda maddelerinin bağırsak mikrobiyotasına olan etkileri daha az ilgi çeken bir konu olmuştur ¹⁰.

Sonuç

Modern dünyada, işlenmiş gıdaların ve Batı tarzı diyetlerin tüketimlerinin bu kadar yaygınlaştığı bir çağda gıda katkı maddelerinin göz ardı edilmesi mümkün değildir. Gıda katkı maddelerinin olası sağlık etkilerinin yanında bağırsak mikrobiyotasını da etkileri bulunmaktadır. Bu etkilerini beyin bağırsak aksında sıklıkla nöroendokrin, metabolik ve genomik yollarla gerçekleştirebilmektedirler. Bir genelleme olarak gıda katkı maddelerin özellikle de sentetik olanlarının büyük otoriter kuruluşlar tarafından güvenli kabul edilmelerine rağmen; bağırsak mikrobiyotasında olumsuz yapı ve metabolik değişikliklerine neden olduğu, stress ve inflamasyon oluşturabildiği söylenebilir. Ancak tam tersine bağırsak mikrobiyotasının yapı ve çeşitliliği ile metabolizmasını olumlu etkileyebilen prebiyotik işlev gösteren doğal ve sentetik gıda katkı maddeleri de bulunmaktadır. Bu hususta; gıda sanayiinde ürünün reolojik, duyuusal ve teknolojik süreçleri göz önünde bulundurularak bağırsak mikrobiyotasını olumsuz etkileyenlerin daha az tercih edilmesinde ve/veya olumsuz etkilerin düzenlenmesini/azaltılmasını sağlayacak bir beslenme tarzının benimsenmesinde fayda olacağı düşünülmektedir. Yapay/sentetik katkı maddelerinin yerine doğal olan gıda katkı maddelerinin tercih edilmesi ancak bu hususta da doğal olsalar bile kullanılan doza dikkat edilmesi önemlidir. Ayrıca gıda katkı maddelerinin bağırsak mikrobiyotası üzerine etkileri çoğunlukla hayvan modellerinde değerlendirildiği için insanlar üzerinde yapılan geniş kapsamlı daha çok araştırmaya ihtiyaç bulunmaktadır. Ayrıca büyük otoriter kuruluşların gıda katkı maddelerinin güvenilirliklerini araştırırken bağırsak mikrobiyotasına olan etkilerinin de göz önünde bulundurulmasında fayda olacağı düşünülmektedir.

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BAĞIRSAK GEÇİRGENLİĞİNDE SEBEP VE TEDAVİ OLARAK BESLENME

Rana Nagihan Akder

Özge Küçükerdönmez

Uzun yıllar boyunca gastrointestinal sistemin görevinin besin öğelerinin sindirimi ve emilimi ile elektrolit-su homeostazını sağlanması olduğu düşünülmüştür. Gelişen teknoloji ile yapılan çalışmaların artırılması sonucunda, gastrointestinal sistemin bir bariyer mekanizması aracılığıyla moleküllerin çevre ve konakçı arasındaki alışverişini düzenleme becerisine sahip olduğu da gösterilmiştir¹. Bu bölümde bağırsak bariyer mekanizması, bağırsak geçirgenliği ve bu terimlerin beslenme ile ilişkisi güncel literatür eşliğinde anlatılmaya çalışılmıştır.

Bağırsak Bariyerinin Yapısı

Gastrointestinal sistem 200 m²'den daha geniş yüzeyi ile besin ve besinlerdeki mikroorganizmalarla sürekli etkileşim hâlinindedir^{2,3}. Dış ortam ile en sık etkileşim hâlinde olan sistemlerin başında gelen gastrointestinal sistem, alt özofagus sfinkterinden anüse kadar vücudun içini dış ortandan ayıran hücre katmanına sahiptir^{2,4}. Bağırsak lümeninde epitel bariyeri geçerek mukoza iltihabına neden olabilecek çok çeşitli çevresel faktör bulunması sebebiyle bu ayırma fonksiyonu büyük önem taşımaktadır⁴. Bu katman ayırma fonksiyonunun yanı sıra besinlerin emilimini düzenleyen, su ve elektrolit kaybını önleyen, yerleşik mikrobiyota ile bağırsak bağışıklık sistemi arasındaki etkileşimlere de izin veren kompleks bir yapıdır^{2,5}. Mikrobiyota, mukus tabakası, doğal ve adaptif bağışıklık hücreleri, vasküler / lenfatik / endokrin / nöroenterik / enzimatik sistemden oluşan bu kompleks yapıya 'Bağırsak bariyeri' denilmektedir².

Bağırsak bariyeri (Bkz. Şekil 1), hücresel ve ekstraselüler kısımdan oluşmaktadır. Hücresel kısım epitel hücreleri ve bu hücrelerin altında yer alan lamina propriayı kapsamaktadır. Hücresel kısım 5 farklı hücre tipini içermektedir: Kök hücre, mukus salgısı yapan goblet hücreleri, antimikrobiyal peptit (AMP) üreten Paneth hücreleri, emilim sağlayan enterositler (tüm hücrelerin yaklaşık %80'i), hormon salgılayan enteroendokrin hücreleri. İntestinal epitel hücrelerinin görevleri Tablo 1'de özetlenmiştir. Lamina propria ise dendritik hücreleri, intraepitelyal dendritik hücreleri, makrofajları, intraepitelyal lenfositleri, T düzenleyici hücreleri, TCD4+ lenfositleri, B lenfositleri ve plazma hücrelerini içermektedir⁶⁻⁹.

Ekstraselüler alan dış faktörlere karşı ilk savunma mekanizması olarak görev alır. Goblet hücreleri tarafından üretilen mukus tabakası, Paneth hücreleri tarafından salgılanan AMP'ler ve plazma hücreleri tarafından salınan sekretuar IgA dimerleri bu kısımda yer almaktadır^{6,7}. Mukus tabakası besinlerin geçişini kolaylaştırmak, epitel hücrelerini lümeninde bulunan sindirim enzimlerinin etkisinden korumak ve bakterilerin epitel hücrelerine yapışmasını önlemek adına büyük önem taşımaktadır^{3,7}. Sağlıklı intestinal mukus tabakasının bulunmadığı durumlarda intestinal epitel ile bakteriyel temasın artmasına bağlı olarak kimyasal ya da patojen kaynaklı inflamasyonlara ve enfeksiyonlara yakalanma riski de artacaktır¹⁰.

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SPORCU BESLENMESİNDE MİKROBİYOTA VE PROBİYOTİKLER

Ece Öneş

Duygu Sağlam

Giriş

Fiziksel aktivite, iskelet kaslarının enerji harcamasını sağlayan herhangi bir vücut hareketini kapsamakta olup günlük hayatta fiziksel olarak aktif olmak için çoğunlukla en çok tercih edilenler yürüyüş, koşu, bisiklet, yüzme ya da dans gibi aktivitelerdir. Dünya Sağlık Örgütü'nün (WHO) fiziksel aktivite kılavuzunda yetişkinler için haftada toplam 150 dk orta şiddetli veya 75 dk yüksek şiddetli egzersiz veya her ikisinin eşit sürede birlikte yapılmasını önermektedir ⁽¹⁾. Önerilen sürelerde ve düzenli olarak yapılan egzersizin;

- Kas ve kardiyorespiratuar fiziksel uygunluğu geliştirdiği,
- Kemik sağlığını geliştirdiği,
- Hipertansiyon, koroner arter hastalığı, inme, diyabet, depresyon ve bazı kanser çeşitlerinin (özellikle meme ve kolon kanseri) riskini azalttığı,
- Düşme olasılığını azaltarak özellikle kalça ve vertebra kırıklarını önlediği,
- Enerji dengesi ve ağırlık kontrolünde destekleyici rol oynadığı çalışmalarca gösterilmiştir.

Fiziksel inaktivite ise global olarak ölüm nedenlerinin başlıca risk faktörlerinden biridir. Bireyler için yeterli fiziksel aktivite seviyesine sahip olmamak, kanser, kalp hastalığı, felç ve diyabet riskini %20-30 oranında arttırırken yaşam beklentisini de 3-5 yıl kısaltmaktadır ⁽¹⁾.

Düzenli egzersiz; immünite, metabolizma ve mikrobiyom-bağırsak-beyin aksına odaklanmış birçok organın moleküler ve fizyolojik cevaplarını modüle ederek sistemik homeostazı etkilemektedir. Son zamanlarda, bağırsak mikrobiyotasının hastalıkların önlenmesi ve tedavisi üzerindeki etkilerinin yanı sıra sağlığın geliştirilmesi üzerindeki etkileri araştırılmakta ve egzersizin bu etkileri nasıl modüle edebileceği üzerine yoğun bir şekilde çalışılmaktadır. Örneğin, hayvan çalışmaları bağırsak mikrobiyotasındaki egzersize bağlı değişikliklerin, obezite ^(2,3), disbiyozis ⁽⁴⁾, metabolik sendrom ve diyabetin ⁽⁵⁾ modülasyonunda rol oynayabileceğini göstermiştir. İnsan çalışmaları ise düzenli egzersizin, bağırsak mikrobiyotasının yapısını ve çeşitliliğini etkileyerek sağlığın geliştirilmesinde yararlı bir rol oynadığını da bildirmiştir. Yüksek kardiyorespiratuar fitness düzeyine sahip olan katılımcıların bağırsak mikrobiyota çeşitliliğinin daha fazla olduğu ve bağırsak mikrobiyota homeostazında oldukça önemli olan bütirat üreten bakterilerin sayıca daha fazla olduğu gösterilmiştir ^(6,7).

Düzenli fiziksel aktivitenin her ne kadar hem mikrobiyota çeşitliliği hem de genel sağlık üzerine katkıları olsa da egzersizin yoğunluğunun arttığı özellikle dayanıklılık gerektiren sporlarda egzersize

yıl sonra yapılan bir diğer çalışmada ise bisikletçilerde *Lactobacillus fermentum* (PCC) (1×10^9 CFU/gün) suplementasyonunun VO₂max açısından herhangi bir iyileşme sağlamadığı vurgulanmıştır.

Sıcak hava koşullarında erkek koşucular ile yapılan bir çalışmada *L. acidophilus* 7.4×10^9 CFU/gün, *L. rhamnosus* 15.55×10^9 CFU/gün, *L. casei* 9.45×10^9 CFU/gün, *L. plantarum* 3.15×10^9 CFU/gün, *L. fermentum* 1.35×10^9 CFU/gün, *Bifidobacterium lactis* 4.05×10^9 CFU/gün, *Bifidobacterium breve* 1.35×10^9 CFU/gün, *B. bifidum* 0.45×10^9 CFU/gün ve *Streptococcus thermophilus* 2.25×10^9 CFU/gün içeren kapsül tüketimi sağlanmış ve diğer çalışmalardan farklı olarak probiyotik tüketen grupta plasebo grubuna göre treadmill testinde yorgunluğa ulaşma eşiğinin arttığı gözlemlenmiştir⁽⁵³⁾.

Sporcuların performansını da değerlendiren 2016 yılında yapılan iki probiyotik çalışmasından ilki sıcak hava koşullarında 7 gün boyunca *Lactobacillus casei* (1×10^{11} CFU/gün) suplementasyonunun performans açısından herhangi bir iyileşme sağlamadığını gözlemlerken⁽⁵⁶⁾, diğer çalışma 14 hafta boyunca *Lactobacillus helveticus* Lafti L10 (2×10^{10} CFU/gün) suplementasyonunun atletik performans etki etmediğini ancak sporcuların plasebo grubuna göre dinç olma hissine katkı verdiğini vurgulamıştır⁽⁵⁷⁾. Farelerle yapılan bir çalışmada 6 hafta boyunca *Lactobacillus plantarum* TWK10 (LP10) (2.05×10^8 CFU/gün veya 1.03×10^9 CFU/kg/gün) suplementasyonunun yüzme testinde %5'lik bir performans artışı sağlarken aynı zamanda toplam kas kütlelerinde ve tip I kas liflerinde artış; serum laktat, amonyak, kreatin kinaz, glukoz, albümin, üre, kreatinin ve trigliserid seviyelerinde azalmaya sebep olduğu gözlemlenmiştir⁽⁵⁸⁾.

Sonuç olarak yapılan çalışmalardaki katılımcı sayılarının az olması, suplementasyon sürelerinin genellikle kısa olması, performans etkilerinin doza bağımlı olması ve sporcular için henüz probiyotik kullanım önerilerinin bulunmaması ve çalışmalarda katılımcıların fiziksel aktivite düzeylerinin standartlaştırılmamış olması gibi birçok etken nedeniyle probiyotik kullanımının sporcularda atletik performansı arttırdığına dair kanıtlar yetersizdir ve ileri çalışmalara ihtiyaç duyulmaktadır.

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Bölüm C10

COVID-19 VE AKILCI BESLENME

K. Esen Karaca Çelik

Giriş

Akut solunum yolu enfeksiyonları dünyada hem mevsimsel grip salgınları hem de SARS-CoV-2 enfeksiyonunun neden olduğu yeni koronavirüs hastalığı (COVID-19) ile ilişkilendirilen morbidite ve mortalitenin önemli bir nedenidir. Dünya Sağlık Örgütü, dünya çapında mevsimsel influenza'nın hastaneye yatmayı gerektiren 3-5 milyon ağır hastalığa ve yılda 290.000-650.000 ölüme neden olduğunu tahmin etmektedir⁽¹⁾. Toplamda, akut solunum yolu hastalıklarının 2016 yılında dünya genelinde yaklaşık 2.38 milyon ölümden sorumlu olduğu tahmin edilmektedir^(2,3). Gerçekten de, 1990-2017 yılları arasında küresel olarak sepsis ilişkili ölümün en yaygın nedeni şiddetli alt solunum yolu enfeksiyonları olarak bilinmektedir⁽⁴⁾.

Yeni bir koronavirüsün neden olduğu hastalık olan COVID-19 ise insan sağlığını büyük ölçüde tehdit eden bir pandemi hâline gelmiştir. Koronavirüs esas olarak solunum sistemini hedefleyen başlıca patojenlerden biridir. Aralık 2019'un sonlarında, başlangıçta etiyolojisi bilinmeyen bir pnömoni tanısı ile hastanelere hastalar kabul edilmeye başlanmış, ilk raporlar COVID-19 hastalığına neden olan olası bir koronavirüs salgınının başlangıcını öngörmüştür. Devam eden salgın sonucunda Dünya Sağlık Örgütü tarafından küresel halk sağlığı acil durumu olarak ilan edilmiştir^(5,6).

Düzenli el yıkama, enfeksiyon belirtileri gösterenlerden kaçınma ve öksürürken ağız kapatma gibi solunum virüslerinin yayılmasını ve etkisini sınırlamaya yardımcı olmak için bir dizi standart halk sağlığı uygulaması geliştirilmiştir⁽⁷⁾. Ancak önceki salgınlardan elde edilen deneyimler, bir salgın geliştikçe, halk sağlığı faaliyetlerini doğrudan klinik yöntemlerin ötesine genişletmenin acil bir ihtiyaç olduğunu göstermiştir⁽⁸⁾. Bu nedenle COVID-19'un ortaya çıkmasından itibaren, acil durum hazırlıkları ilk savunma hattı olarak düşünülse de bireysel ve toplumsal dayanıklılık ana kaynak olarak ortaya çıkmıştır. Aslında, hem bireylerin hem de toplumun psikolojik ve davranışsal önlemleri, hem dayanıklılığı ve hem de bir pandemi karşısında halk sağlığı yaklaşımlarının etkinliğini artırmak için hayati belirleyicilerdir⁽⁹⁾. Bireylerin beslenme durumu uzun süredir strese ve bağımsızlığa karşı dayanıklılığın bir göstergesi olarak kabul edilmekte, yetersiz beslenme sonucu gelişebilen önemli stres faktörlerinin sağlıkla ilişkili uzun süreli etkilere yol açabileceği bilinmektedir^(10,11). Aslında, yetersiz beslenme sadece fiziksel değil aynı zamanda ruh sağlığı ile de ilişkilendirilmiştir⁽¹²⁾. Optimal beslenme ve besin alımı, birey ve toplum için önemli bir kaynaktır⁽¹³⁾. Bireysel düzeyde, uzmanlarının çoğu ortak olarak, COVID-19 da dâhil olmak üzere viral enfeksiyonlarla mücadele için diyet ve bağımsızlık arasında ilişki olduğunu belirtmektedir⁽¹⁴⁾.

Beslenme ve COVID-19

COVID-19 dünya salgını, bireylerin sağlıklı bir diyet uygulaması için birçok yeni zorluk getirmiştir. Birincisi, dünyanın birçok ülkesinde açıklanan 'evde kal' durumu, sağlık hizmetleri ve sınırlı sayıda

Sonuç

COVID-19 pandemisi döneminde doğru beslenme önerileri şu şekilde özetlenebilir:

- Öncelikle mikro besinler ve omega-3 yağ asitleri takviyesi yapılmalı, beslenme eksiklikleri ortadan kaldırılmalı ve optimal bağışıklık fonksiyonu desteklenmelidir. Bu, enfeksiyon riskini ve sonuçlarını azaltmaya yardımcı olan güvenli, etkili ve düşük maliyetli bir yoldur. Ancak takviye ürünleri alırken Avrupa Gıda Güvenliği Otoritesi gibi uzman yetkililer tarafından belirlenen üst güvenlik sınırlarına uyulmalıdır.
- İkinci olarak C ve D vitaminleri için RDA'nın üzerinde takviye yapılmalıdır. Son metaanalizler, hastalığın şiddeti ve C vitamini takviyesi ile yaşlı hastalarda ölüm riskinin ilişkili olduğunu, D vitamini desteğinin hem çocuklarda hem de yetişkinlerde solunum yolu enfeksiyonu riskini azalttığını göstermektedir.
- Üçüncü olarak yeterli Omega-3 yağ asitleri EPA ve DHA alımı inflamasyonun düzenlenmesini destekler.

Aşılardan ve hijyen önlemleri gibi halk sağlığı uygulamaları, akut solunum yolu virüsleri de dâhil olmak üzere enfeksiyonların yayılması ve sınırlanmasına yardımcı olan önemli önlemlerdir. Ancak SARS-CoV-2 enfeksiyonu ve COVID-19'un ciddi sonuçları ve solunum yolu enfeksiyonlarının morbidite ve mortalite rakamları genel olarak bu uygulamaların tek başına yeterli olmadığını göstermektedir. Bu nedenle, güvenli ve düşük maliyetli bir yol olan “bağışıklık sistemini desteklemek” bireyleri ve toplumu zarardan daha fazla korumak için güvenli ve uygun maliyetli bir yoldur. Optimal besin alımı, optimal bağışıklık fonksiyonunu destekler ve enfeksiyonların etkisini kontrol etmeye yardımcı olur. Bu nedenle, sağlığı iyileştirmek, viral enfeksiyonların etkisini azaltmak için, beslenme stratejilerinin genişletilmesi ve iyileştirilmesi desteklenmelidir.

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MİKROBİYOTA RESTORASYONUNDA BESLENME VE GIDA TAKVİYELERİNİN ROLÜ

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Giriş

Mikrobiyota sağlık ve hastalık durumlarının düzenlenmesinde kritik bir role sahiptir ^[1]. Mikrobiyota; deri, ağız, solunum sistemi, gastrointestinal kanal ve vajinayı kolonize eden tüm mikroorganizmalardan (bakteriler, mantarlar, arkeler, virüsler ve protozoanlar) meydana gelmiş olan ekolojik komünitedir. Ancak mikrobiyotanın %70.0'inden fazlası geniş yüzey alanı ve besin ögesi miktarı-çeşitliliği açısından zengin olması nedeniyle bağırsaklarda yaşam döngülerini devam ettirmekte ve bir organ gibi işlevi görmektedirler ^[2-5]. Bağırsak mikrobiyotasının bileşimi hakkında mevcut bilgilerin çoğu, fekal örneklerin 16S ribozomal RNA (rRNA) dizilemesi elde edilen verilerden oluşmakta ve bu nedenle bizlere özellikle kalın bağırsağın distal lümeninin mikrobiyal çeşitliliği hakkında kapsamlı bilgiler vermektedir ^[4, 6-8].

Son zamanlarda bazı mikroorganizmaların sağlık üzerine olumlu etkileri kapsamlı bir şekilde tanımlanmış olup bu mikroorganizmalar “potansiyel olarak faydalı” olarak ifade edilmektedir. Bunlar başlıca; *Bifidobacterium*, *Lactobacillus*, *Akkermansia*, *Fecalibacterium*, *Eubacterium*, *Roseburia*, *Ruminococcus* ve *Blautia* cinsleridir. Bunların aksine bazı mikroorganizmalar özellikle bulaşıcı olmayan kronik hastalıkların gelişi ve prognozunda rol oynayabilmekte ve sıklıkla “potansiyel olarak zararlı” olarak anılmaktadır. Bunlar ise *Clostridium*, *Enterobacter*, *Enterococcus*, *Bacteroidetes* ve *Ruminococcus* cinsleridir ^[9]. Buna göre genel olarak sağlıklı bir mikrobiyota; *Lactobacillus*, *Bacillus*, *Clostridium*, *Enterococcus*, *Ruminococcus*, *Eubacterium*, *Faecalibacterium* ve *Roseburia* cinslerini içeren Firmicutes filumu, *Bacteroides* ve *Prevotella* cinslerini içeren *Bacteroidetes* filumu, *Actinobacteria* ve *Verrucomicrobia* filumunu ve bunların sağlığı destekleyecek şekilde orantılı olma durumlarını içermektedir ^[4, 6-8]. Bağırsak mikrobiyotasının baskın mikroorganizmaları olan bakterilerin oluşturduğu en büyük koloniye sahip *Bacteroidetes* ve *Firmicutes* filumlarının oranı sağlıklı bireylerde *Firmicutes*:*Bacteroidetes* 1:1 ile 1:3 arasında değişmektedir ^[10]. Bu denge (öbiyozis) sağlıklı olma hâli ile ilişkilendirilirken; bu dengenin bozulmasının (disbiyozis) obezite, diyabet, gastrointestinal ve kardiyovasküler hastalıklar gibi birçok hastalığın patogeneğinde rol oynayabildiği belirtilmektedir ^[11-13].

Dinamik bir yapıya sahip olan bağırsak mikrobiyotası; genetik faktörler, yaş, cinsiyet, beslenme, antibiyotikler başta olmak üzere ilaç kullanım durumları, yaşam tarzı alışkanlıkları gibi birçok çevresel faktörden etkilenmektedir ^[14, 15]. Bu faktörler bağırsak mikrobiyal komünitesi ile metabolizma değişiklikleriyle ilişkilendirilmekte ve bunlarda meydana gelen bazı değişimler çeşitli patolojik durumlara neden olabilmektedir ^[16]. Bağırsak mikrobiyal metabolizmasının yanı sıra mikrobiyal-konakçı ko-metabolizmasının da sağlık ve hastalık durumlarını büyük ölçüde etkilediği bulunmuştur. Bağırsak mikrobiyotasındaki denge hâlinin bozulması ile bazı hastalıkların patogenezelemlerinin ilişkilendirilmesi; yeni

yürütülen bir çalışmada 69 mg dozunda veya 15×10^9 CFU *Lactobacillus acidophilus* DDS-1, *Bifidobacterium lactis* UABla-12, *Bifidobacterium longum* UABl-14 ve *Bifidobacterium bifidum* UABb-10 + 5,5 g/gün prebiyotik bileşen (2,75 g GOS ve geri kalan basit şekerler) içeren sinbiyotik kapsül uygulanmasının bağırsak mikrobiyotasında *Bifidobacterium* ve *Lactobacillus* bolluğunu arttırdığı, *Prevotella* ve *Gardnerella* bolluğunu azalttığı görülmüştür^[119].

Son zamanlarda "konakçıya sağlık açısından fayda sağlayan cansız mikroorganizmaların ve / veya bileşenlerinin hazırlanması" olarak tanımlanan postbiyotik takviyelerden ısı ile inaktive edilmiş *Lactobacillus helveticus* DS 4183, *Escherichiacoli* DSM 4087, *Streptococcus faecalis* DSM 4086, *Lactobacillus acidophilus* DSM 414'ten elde edilen metabolik ürünleri (KZYA, amino asitler ve vitaminler) içeren postbiyotik sıvının bağırsak lümen pH'nı düşürerek patojenik bakterilerin büyümesinin engellediği için gastrointestinal sistemdeki bakteriyel dengesizliğin yanı sıra bununla ilişkili semptomları giderdiği belirlenmiştir^[120, 121]. Biyotiklerin mikrobiyota modülasyonu ve restorasyonundaki rollerine ilişkin bu kitap bölümünde verilenden çok daha fazla miktarda literatürde kanıt olduğu unutulmamalıdır.

Sonuç

Bağırsak mikrobiyotasının iyi sağlık durumu ve çeşitli hastalıkların patogenezindeki rollerinin daha iyi anlaşılması üzerine; mikrobiyota restorasyonu teröpatik bir yol olarak düşünölmeye başlanmıştır. Çeşitli çevresel faktörden etkilenen mikrobiyota için en etkili modölatör şüphesiz beslenmedir. Öbiyozis ve disbiyozis durumları özellikle beslenme modellerine, besinlere ve besin ögelerine büyük ölçüde bağlıdır. Farklı mikroorganizma komüniteleri farklı diyet bileşenlerini kullanmakta ve böylece dominant türleri, oranları ve metabolizmaları şekillenebilmektedir. Mikrobiyota restorasyonu söz konusu olduğunda ön plana çıkan Akdeniz Diyeti'nin sağlıklı ilişkilendirilen faydalı mikroorganizmaların bolluğunu arttırdığı ve *Firmicutes:Bacteroidetes* oranını azalttığını göstermektedir. Yine bazı hastalıklarda uygulanan tıbbi beslenme tedavilerinin mikrobiyotanın disbiyozis durumunu azalttığı ve mikrobiyotanın öbiyozis durumuna geçişini hızlandırdığı bildirilmektedir. Diğer bir yandan yeni bir yaklaşım olarak görölen; bir veya daha fazla besin ögesini içeren ağızdan alınmak üzere tablet, kapsül ve sıvı formda hazırlanmış ürünler olan gıda takviyelerinin mikrobiyota restorasyonundaki olası etkileri de henüz netlik kazanmamıştır. Olası etkiler; gıda takviyesinin türüne, dozuna, kullanım şekline ve kullanan bireyin özelliklerine ve sağlık durumuna göre değişkenlik gösterebilmektedir. Bu noktada gıda takviyelerinin doz aşımaları ile ilgili de güvenlik endişelerinin olduğu ve kullanımlarına ilişkin fayda/zarar oranlarının göz önünde bulundurulması gerektiği unutulmamalıdır.

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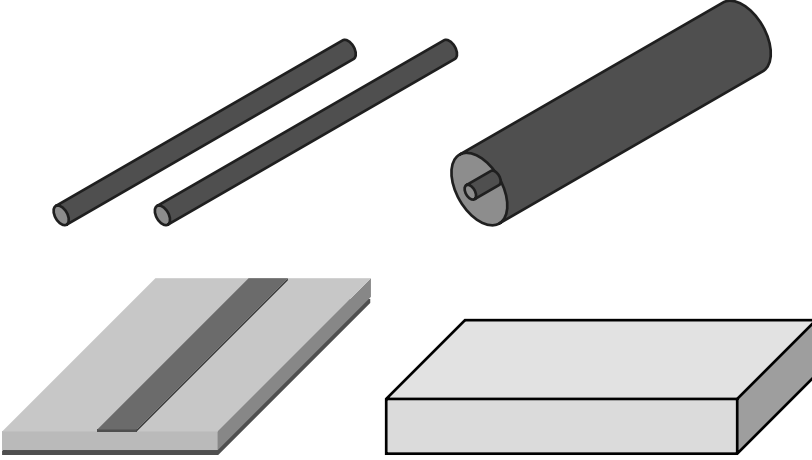
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Prof. Dr. Adnan Görür



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İçindekiler

ÖN SÖZ	ix	
BÖLÜM I	MİKRODALGA TEKNİĞİNE GİRİŞ..... 1	
1.1. Giriş	1	
1.2. Elektromanyetik Spektrum ve Frekans Bantları	3	
1.3. Mikrodalga Uygulamaları	8	
1.4. Mikrodalgaların İnsan Sağlığına Etkileri	11	
BÖLÜM II	ELEKTROMANYETİK TEORİNİN TEMEL DENKLEMLERİ 17	
2.1. Giriş	17	
2.2. Maxwell Denklemleri	17	
2.3. Harmonik (Sinüzoidal) Elektromanyetik Alanlar.....	21	
2.4. Harmonik Maxwell Denklemleri	22	
2.5. Elektromanyetik Sınır Şartları.....	23	
2.5.1. İki Kayıpsız Dielektrik Ortam Arasındaki Sınır Yüzeyi	26	
2.5.2. Kayıpsız Dielektrik ile Mükemmel İletken Arasındaki Sınır Yüzeyi	26	
2.6. Poynting Teoremi	27	
2.7. Düzlemsel Dalgalar	28	
2.7.1. Kayıpsız Ortamda Düzlemsel Dalgalar.....	29	
2.7.2. Az Kayıplı Dielektrik Ortamda Düzlemsel Dalgalar.....	35	
2.7.3. İyi İletken Ortamda Düzlemsel Dalgalar.....	36	
Çözümlü Örnekler	38	
BÖLÜM III	İLETİM HATLARI	57
3.1. Giriş	57	
3.2. İletim Hatlarının Eşdeğer Devresi ve Analizi.....	58	
3.3. İletim Hatlarında Dalga Karakteristikleri.....	62	
3.3.1. Kayıpsız İletim Hattı.....	63	
3.3.2. Az Kayıplı İletim Hattı	64	
3.3.3. Faz ve Grup Hızı.....	65	
3.3.4. Distorsiyonsuz İletim Hattı	66	
3.4. İletim Hattı Parametreleri İçin Alan Analizi.....	67	
3.5. Sonlandırılmış İletim Hatları.....	68	
3.6. Duran Dalga Oranı (DDO)	72	
3.7. Yük Empedansının Hesabı	76	

3.8. İletim Hatlarında Özel Durumlar.....	76
3.8.1. Kısa Devre İletim Hattı	77
3.8.2. Açık Devre İletim Hattı	79
3.8.3. Uyumlu İletim Hattı.....	82
3.8.4. Saf Reaktansla Sonlandırılmış İletim Hattı	82
3.8.5. Yarım Dalgaboyu İletim Hattı	84
3.8.6. Çeyrek Dalgaboyu İletim Hattı	85
3.9. Güç İletimi	85
3.9.1. Uyumlu Yük	88
3.9.2. Uyumlu Kaynak	88
3.9.3. Maximum Güç Transferi.....	89
3.9.4. Az Kayıplı İletim Hattında Güç İletimi.....	90
3.9.5. Kayıplı İletim Hattında Güç İletimi	91
3.9.6. Desibel ve Neper	92
3.9.7. Mutlak Güç Seviyeleri (dBm ve dBW)	93
3.9.8. Geriye Dönme Kaybı.....	94
3.9.9. Araya Girme Kaybı.....	95
3.10.Paralel Plakalı İletim Hatları	96
3.11.Planar İletim Hatları	98
3.11.1.Mikroşerit Hat	98
3.11.2.Şerit Hat	100
Çözümlü Örnekler	102
BÖLÜM IV	EMPEDANS DÖNÜŞÜMÜ VE
EMPEDANS UYUMLAMA	123
4.1. Empedans Dönüşümü	123
4.2. Empedans Dönüştürücüler	124
4.3. Empedans Uyumlama için Analitik Yöntem	126
4.3.1. Çeyrek Dalgaboyu Dönüştürücüyle Empedans Uyumlama	126
4.3.2. Paralel Yan Hat Kullanarak Empedans Uyumlama	128
4.3.3. Seri Yan Hat Kullanarak Empedans Uyumlama	131
Çözümlü Örnekler	134
BÖLÜM V	SMITH DİYAGRAMI
5.1. Smith Diyagramının Oluşumu.....	141
5.2. Smith Diyagramında Hesaplamalar.....	146
5.3. Empedans Uyumlama	157
5.3.1. Paralel Tek Yan Hat Uyumlama Yöntemi.....	157
5.3.2. Paralel Çift Yan Hat Uyumlama Yöntemi.....	161
Çözümlü Örnekler	167

BÖLÜM VI	DALGA KILAVUZLARI	191
	6.1. Giriş	191
	6.2. Uniform Dalga Kılavuzlarında TEM, TM ve TE Dalgaları.....	192
	6.2.1. TEM Dalgaları	195
	6.2.2. TM Dalgaları	196
	6.2.3. TE Dalgaları	197
	6.3. Paralel Plakalı Dalga Kılavuzu	198
	6.3.1. TM Modları	199
	6.3.2. TE Modları	203
	6.4. Dikdörtgen Kesitli Dalga Kılavuzları	205
	6.4.1. TM Modları	205
	6.4.2. TE Modları	211
	6.5. Dairesel Kesitli Dalga Kılavuzları	214
	6.5.1. TM Modları	215
	6.5.2. TE Modları	219
	6.6. Dalga Kılavuzlarında Zayıflama.....	221
	6.6.1. TE_{10} Dominant Modunda Zayıflama	223
	6.7. Dalga Kılavuzu Bağlantı Elemanları.....	225
	6.7.1. E-Düzlem T	225
	6.7.2. H-Düzlem T.....	226
	6.7.3. Hibrit (sihirli) T	227
	6.7.4. Hibrit Ring	228
	6.7.5. Yönlü Kuplör.....	229
	6.7.6. Dalga Kılavuzu Dönüş Elemanları	231
	6.7.6.1. Dönüş Elemanları	231
	6.7.6.2. Kıvrılmış Dalga Kılavuzu Elemanı.....	233
	6.8. Dalga Kılavuzlarının Uyarılması	233
	6.8.1. Koaksiyel Sonda Anten Yoluyla Kuplaj	234
	6.8.2. Koaksiyel Halka Anten Yoluyla Kuplaj	236
	6.8.3. Açıklık Yoluyla Kuplaj.....	237
	Çözümlü Örnekler	238
BÖLÜM VII	MİKRODALGA REZONATÖRLERİ.....	263
	7.1. Giriş	263
	7.2. Dikdörtgen Mikrodalga Rezonatörleri	264
	7.2.1. TM Modları	264
	7.2.2. TE Modları	267
	7.3. Dairesel Silindirik Mikrodalga Rezonatörleri	271
	7.3.1. TM Modları	271

	7.3.2. TE Modları	274
	7.4. Kalite Faktörü	276
	7.5. Rezonatörlerin Uyarılması.....	278
	Çözümlü Örnekler	280
BÖLÜM VIII	İKİ KAPILI MİKRODALGA DEVRE ANALİZİ.....	291
	8.1. Giriş	291
	8.2. Devre Değişkenleri.....	291
	8.3. Açık Devre Empedans Parametreleri	293
	8.4. Kısa Devre Admitans Parametreleri.....	294
	8.5. ABCD Parametreleri	295
	8.6. Saçılma Parametreleri.....	296
	8.6.1. Saçılma Parametrelerinin Özellikleri	299
	8.6.1.1. Simetri Özelliği	299
	8.6.1.2. Birim Özdeşlik	300
	8.6.1.3. Sıfır Özdeşliği.....	301
	8.6.1.4. Faz Kayması.....	302
	8.7. Devre Parametrelerinin Dönüşümü	303
	8.8. Çok Kapılı Devreler.....	304
	Çözümlü Örnekler	307
KAYNAKLAR	.....	329
EKLER		
EK A	SEMBOL VE BİRİM LİSTESİ	333
EK B	BİRİM SİSTEMİ VE FİZİKSEL SABİTLER	345
EK C	KOMPLEKS MATEMATİK	349
EK D	TRİGONOMETRİK VE HİPERBOLİK FONKSİYONLAR ...	351
EK E	FAYDALI SERİLER VE DENKLEMLER	353
EK F	FAYDALI İNTEGRALLER.....	357
EK G	VEKTÖR ANALİZ	359
EK H	İKİNCİ MERTEBEDEN SABİT KATSAYILI, LİNEER VE HOMOJEN DİFERANSİYEL DENKLEMİN ÇÖZÜMÜ	361
EK I	DALGA KILAVUZLARINA İLİŞKİN DENKLEMLER.....	363

Kaynaklar

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İÇİNDEKİLER

YAZARLAR LİSTESİ.....	iii
ÖN SÖZ	xiii
TEŞEKKÜR	xv
BÖLÜM 1 NANOTEKNOLOJİYE GİRİŞ.....	1
1. MAKRO'DAN NANO'YA: BOYUT NEYİ DEĞİŞTİRİR?	1
2. NANOTEKNOLOJİNİN TARİHSEL GELİŞİMİ.....	6
3. SİLİKON ÇAĞI: MOORE YASASI VE DAHA FAZLASI.....	11
4. NANOÜRETİM YÖNTEMLERİ.....	16
4.1. Yukarıdan aşağıya yaklaşımı.....	17
4.2. Aşağıdan yukarıya yaklaşımı.....	18
5. NANOTEKNOLOJİ VE NANOÜRETİMDE GELECEĞİN TRENDLERİ	19
5.1. Mikroeletromekanik (MEMS) ve nanoeletromekanik sistemler (NEMS).....	20
5.2. Kuantum hesaplama ve kuantum bilgisayarlar	23
5.3. Çip-Üstü-Laboratuvar teknolojileri: nanokanal ve nanogözenekler.....	24
5.4. Nanorobotik	27
5.5. Esnek elektronik.....	29
6. GENEL DEĞERLENDİRME	30
KAYNAKÇA.....	32
BÖLÜM 2 NANOMALZEMELERE GİRİŞ.....	35
1. NANOMALZEMELERE GİRİŞ	35
2. KAYNAĞINA GÖRE NANOMALZEMELER	35
2.1. Doğal nanomalzemeler.....	36
2.2. Yapay nanomalzemeler	37
3. BOYUTLARINA GÖRE NANOMALZEMELER.....	37
3.1. Sıfır boyutlu	38
3.2. Tek boyutlu.....	39

3.3. İki boyutlu	39
3.4. Üç boyutlu	40
4. YAPISAL KONFIGÜRASYONLARINA GÖRE NANOMALZEMELER	41
4.1. Karbon bazlı nanomalzemeler	42
4.2. Metal bazlı nanomalzemeler	53
4.3. Metal oksit bazlı nanomalzemeler	55
4.4. Moleküler bazlı nanomalzemeler	56
4.5. Kompozit bazlı nanomalzemeler	57
4.6. Yarı iletken kuantum noktaları	58
5. NANOMALZEMELERDE KUANTUM ETKİSİ	58
6. GENEL DEĞERLENDİRME	60
KAYNAKÇA	61

BÖLÜM 3 SIVI TEMELLİ YAKLAŞIMLAR İLE NANOYAPILARIN ÜRETİMİ.....67

1. GİRİŞ	67
2. TEMEL KAVRAMLAR	68
2.1. NP'lerin sentezi	68
3. SIVI ORTAMDA NANOYAPILARIN SENTEZ YÖNTEMLERİ	70
3.1. Çöktürme ve ikili-çöktürme	70
3.2. Sol-jel yöntemi	72
3.3. Sıvı-faz lazer ablasyon tekniği	73
3.4. Ultrasonik sentez yöntemleri	74
3.5. Mikrodalga-destekli sentez yöntemleri	75
3.6. Hidrotermal ve solvotermal yöntem	76
3.7. Sıcak-enjeksiyon sentez yöntemleri	78
3.8. Kolloidal sentez yöntemi	79
3.9. Elektrobiriktirme yöntemi	80
3.10. Kimyasal aşındırma yöntemi	81
4. SIVI ORTAMDA ÜRETİLEN NANOYAPILARIN UYGULAMA ALANLARI	82
4.1. Biyolojik ve medikal uygulamalar	82
4.2. Katalitik uygulamalar	87
4.3. Enerji ve çevre uygulamaları	88
4.4. Sensör uygulamaları	89
5. GENEL DEĞERLENDİRME	90
KAYNAKÇA	91

BÖLÜM 4 MOLEKÜLER KENDİLİĞİNDEN DÜZENLENME97

1. GİRİŞ	97
2. MOLEKÜLER KENDİLİĞİNDEN DÜZENLENME	100
2.1. Kendiliğinden düzenlenen tek tabakalar	100
2.2. Lipozomlar	104
2.3. Dendrimerler	107

2.4. Konak-Konuk Birlikteliği.....	110
2.5. Makrodöngüler.....	111
2.6. Katenanlar.....	113
2.7. Rotaksanlar.....	114
3. GENEL DEĞERLENDİRME	116
KAYNAKÇA.....	117

BÖLÜM 5 NANOMALZEMELERİN MEKANİK SÜREÇLER İLE ÜRETİMİ.....121

1. MEKANİK ÖĞÜTME	121
2. MEKANİK ALAŞIMLAMA	125
3. MEKANOKİMYASAL SÜREÇ.....	129
4. MEKANİK SÜREÇLERDE KULLANILAN DEĞİRMEN TÜRLERİ	135
4.1. Gezegenel bilyeli değirmen	136
4.2. SPEX (Çalkalayıcı) değirmen	137
4.3. Atritör (<i>Attritor</i> , Karıştırırmalı) değirmen	137
5. MEKANİK SÜREÇ PARAMETRELERİ	138
5.1. Öğütme ortamının malzemeleri.....	139
5.2. Bilye:toz oranı	139
5.3. Süreç kontrol kimyasalları	140
5.4. Atmosfer	140
5.5. Öğütme hızı	140
5.6. Öğütme süresi	140
5.7. Haznenin doluluk oranı	141
5.8. Sıcaklık.....	141
5.9. Kriyojenik çevre.....	141
6. GENEL DEĞERLENDİRME	141
KAYNAKÇA.....	142

BÖLÜM 6 LİTOGRAFİ.....145

1. GİRİŞ	145
2. FOTOLİTOGRAFİ	146
2.1. Fotomaske tasarımı ve imalatı	146
2.2. Fotorezistler ve fotorezist kaplama.....	149
2.3. Pozlama.....	152
2.4. Fotorezist geliştirme.....	154
3. DİĞER LİTOGRAFİ TEKNİKLERİ.....	154
3.1. Daldırma litografi (<i>Immersion lithography</i>).....	155
3.2. Faz Kaydırma Litografisi (<i>Phase shift lithography</i>)	156
3.3. Elektron ışını litografisi	156
3.4. Nano-baskı litografisi	157
3.5. Yumuşak litografi.....	158

4. LİTOGRAFI UYGULAMA ÖRNEKLERİ.....	159
4.1. Mikroakışkan sistemlerin üretimi.....	159
4.2. Düzlemsel elektrot üretimi	160
5. LİTOGRAFİDE ZORLUKLAR VE İYİLEŞTİRMELER	162
6. GENEL DEĞERLENDİRME	166
KAYNAKÇA.....	167

BÖLÜM 7 TARAMA PROBLU LİTOGRAFI TEKNİKLERİ 169

1. GİRİŞ	169
2. TARAMALI TÜNEL MİKROSKOBU.....	174
3. ATOMİK KUVVET MİKROSKOBU	179
4. SPM UYGULAMALI LİTOGRAFI TEKNİKLERİ.....	181
4.1. Lokalize oksit nanolitografi	181
4.2. Temas modu litografisi.....	183
4.3. Aralıklı temas modu litografisi	183
4.4. Temassız mod litografisi.....	184
4.5. Daldırma kalem litografisi	185
4.6. Çok tipli prob litografisi	186
5. GENEL DEĞERLENDİRME	187
KAYNAKÇA.....	188

BÖLÜM 8 NANOTEKNOLOJİDE İNCE FİLM BİRİKTİRME YÖNTEMLERİ 191

1. GİRİŞ	191
1.1. İnce filmler ve eğik açılı biriktirme.....	191
1.2. Yapı Bölge Modeli (<i>Structure Zone Mode, SZM</i>).....	194
2. İnce Film Biriktirme Yöntemleri.....	196
2.1. Fiziksel buhar biriktirme (<i>Physical vapor deposition, PVD</i>)	197
2.2. Taşıma.....	204
2.3. Yoğunlaşma	204
2.4. Diğer fiziksel buhar biriktirme yöntemleri	205
3. KİMYASAL BİRİKTİRME	208
3.1. Kimyasal buhar biriktirme (<i>Chemical vapor deposition, CVD</i>).....	208
3.2. CVD Temel özellikler	209
3.3. CVD ticari uygulamaları ve ürünleri	212
3.4. Termal oksidasyon.....	220
3.5. Atomik tabaka biriktirme (<i>Atomic layer deposition, ALD</i>)	220
3.6. Elektrokimyasal kaplama	223
3.7. Sol-jel (<i>Sol-gel</i>).....	228
3.8. Dönel kaplama (<i>Spin coating</i>).....	229
3.9. Sprey piroliz (<i>Sprey pyrolysis</i>).....	230
4. GENEL DEĞERLENDİRME	231
KAYNAKÇA.....	234

BÖLÜM 9 İNCE FİLM DAĞLAMA/AŞINDIRMA TEKNİKLERİ	237
1. GİRİŞ	237
2. DAĞLAMA/AŞINDIRMA	237
2.1. Dağlama süreci	238
2.2. Dağlama değişkenleri	239
2.3. Dağlama çeşitleri	245
3. DAĞLAMA UYGULAMALARI	281
4. GENEL DEĞERLENDİRME	290
KAYNAKÇA.....	291
BÖLÜM 10 BAĞLAMA TEKNİKLERİ	297
1. GENEL BİLGİ ve TARİHÇE	297
2. DİREKT BAĞLAMA TEKNİKLERİ	300
2.1. Hidrofilik Si için direkt bağlama	301
2.2. Hidrofobik Si için direkt bağlama	302
2.3. Düşük sıcaklıkta direkt bağlama	303
2.4. Kimyasal aktivasyon ile direkt bağlama	303
2.5. Plazma aktivasyon ile direkt bağlama.....	304
2.6. Anodik bağlama	304
3. ARA MALZEME KULLANILAN BAĞLAMA TEKNİKLERİ	306
3.1. Ötektik bağlama	307
3.2. Cam hamuru levha bağlama	309
3.3. Metal termokompresyon bağlama.....	310
4. GENEL DEĞERLENDİRME	311
KAYNAKÇA.....	311
EK 1 - Sİ PUL ÜRETİMİ.....	313
EK 2 - ÇÖZÜNÜRLÜK.....	315

1. MAKRO'DAN NANO'YA: BOYUT NEYİ DEĞİŞTİRİR?

“Nano” ön eki Yunanca cüce kelimesinden gelmektedir ve önüne geldiği parametrenin milyarda bir azalmasını ifade eder. Yani 1 metre (m), 1 nanometre (nm)'nin 10^9 katıdır. Atomların çaplarının genellikle 1-5 angstrom (Å , 10^{-10} m) olduğu düşünüldüğünde nanometrenin birkaç tane atomun yanyana dizilmesiyle oluşan küçük bir uzunluk olduğunu daha iyi gözümüzde canlandırabiliriz. Yahut insan saç telinin çapının 60-120 μm arasında değiştiği düşünülürse, nano dünyanın aslında bizim görebildiğimiz boyutlarla kıyaslandığında ne kadar büyük bir alanı kapladığını hayal edebiliriz. Şekil 1.1, bu kıyaslamanın daha iyi anlaşılması için doğal ve insan yapımı milimetre, mikrometre ve nanometre boyutundaki bazı nesnelere göstermektedir.

Nanoteknoloji (veya nanobilim) temel olarak bazı spesifik özelliklere sahip madde ve sistemleri ele almaktadır ve bunlar (i) 100 nm'den küçük en az bir boyuta sahip olmak, (ii) moleküler ölçekteki yapıların ve/veya süreçlerin fiziksel ve kimyasal özelliklerini ortaya koyan metodolojilerden yararlanmak ve (iii) yapıtaşlarını kullanarak daha büyük yapıların üretimine olanak sağlamak olarak sıralanabilir (1). Nanoboyuttaki malzemelerin (nanomalzemelerin) ve dolayısıyla nanoteknolojinin bu kadar ilgiyle karşılanmasının altında yatan temel sebep kütle (*bulk*) hâlinde nanoboyutlara inildiğinde malzemelerin kimyasal, fiziksel veya biyolojik özelliklerinde ortaya çıkması beklenen değişimlerdir. 100 nm'den küçük boyutlarda, özellikle 10 nm altında, ciddi farklılaşmalar olduğu daha önce gösterilmiştir (2). Bu değişimlerin ana nedeni, kuantum mekaniği tarafından ortaya konan şekliyle, nanometre boyutlarına inildiğinde maddelerin artık parçacık-benzeri (*particle-like*) değil de dalga-benzeri (*wave-like*) davranmaya başlamasıdır. Buna bağlı olarak maddelerin içeriği sabit kalmasına rağmen elektriksel ve termal iletkenlik, erime sıcaklığı, manyetik karakteristik, floresans, yüzey enerjileri gibi birtakım özellikleri değişebilmektedir (3). Kuantum düzeyindeki küçük maddelerin klasik mekanikteki parçacık ya da dalga konseptleriyle ayrı ayrı açıklanamaması sebebiyle ortaya çıkan dalga-parçacık ikiliği (*wave-particle duality*),

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1. NANOMALZEMELERE GİRİŞ

Bugüne kadar, "nanomalzeme" terimi ile ilgili tek tip kabul edilmiş bir tanımı yoktur ve bu yüzden farklı tanımlar ve açıklamalar çeşitli birimler tarafından sunulmuştur. Örneğin, bu terim Paul Ehrlich tarafından "Sihirli Mermiler" olarak adlandırılmış ve nanoteknoloji olarak bilinen yeni bir bilim dalını doğuran yüzyılın en çok çalışılan materyallerinden biri olarak belirtilmiştir [1]. 2008 ve 2010 yıllarında Uluslararası Standardizasyon Örgütü (*International Organization for Standardization*, ISO), nanoteknoloji ile ilgili terimler için kapsayıcı teknik tanımlar sağlamıştır. ISO tarafından 'Nanomalzeme', nano ölçekte herhangi bir dış boyutu olan veya nano ölçekte iç veya yüzey yapısına sahip olan malzemeler olarak tanımlanmıştır [2, 3]. Avrupa Komisyonu ise bağlanmamış hâlde veya bütün olarak partiküller içeren doğal, tesadüfi veya üretilmiş bir malzeme anlamına gelen "nanomalzeme" olarak tanımlamıştır. Burada iç veya dış boyut dağılımındaki parçacıkların %50 veya daha fazlası 1-100 nm boyut aralığındadır [4, 5]. Bu malzemeler, küçük ölçekte üretilen veya kullanılan kimyasal maddeler veya malzemelerdir. Aslında malzeme terimi, toplu olarak ortalama bir istatistiksel davranış sergileyen neredeyse sonsuz sayıda bileşene atıfta bulunur. Bu nedenle bu tür malzemelerin davranışına belirli arayüz, tane boyutu, boyut dağılımı, tane sınırları, sınırlar arasındaki etkiler hâkimdir. Nanomalzemelerin ilgi çekici olma nedeni benzersiz optik, manyetik, elektriksel ve benzeri diğer özelliklere sahip olmasıdır [6].

Bu bölümde doğal ve yapay nanomalzemeler ve bu malzemelerin boyutları, yapısal konfigürasyonları, ve özellikle nanoboyutlu malzemelerin yarı iletkenler ile ilişkileri hakkında detaylı bilgi verilecektir. Ayrıca, karbon, metal, moleküler kompozit bazlı nanomalzemelerin türleri, gelişimi, sentezlenmesi ve uygulamaları ele alınmıştır.

2. KAYNAĞINA GÖRE NANOMALZEMELER

Nanomalzemeler, kaynaklarına göre doğal ve yapay olarak sınıflandırılır. Bu bölümde bu iki grup ile ilgili bilgi verilmiştir.

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1. GİRİŞ

Yıllar içinde çevre, enerji, tıp, endüstri, havacılık ve uzay alanında yaşanan gelişmeler insanlığın hayatını önemli ölçüde kolaylaştırmıştır (1). Bu gelişmelerin en önemlilerinden biri olarak nanoteknoloji dikkat çekmekte ve her geçen gün hızla gelişip, farklı alanlardaki teknolojilere kayda değer yenilikler sunmaktadır. Nanoteknolojik çalışmalar kapsamında genellikle 1 ile 100 nm arasındaki çok küçük boyutta nano yapılar üretilmektedir (2). Teknolojik araçlara nanoyapılı malzemeler eklendikçe kullanılan bu araçların boyutlarında küçülmeler sağlanabilmektedir. Makroyapılı sistemlerin boyutları nanoboyutlara düşürüldükçe bu parçacıkların fiziksel, kimyasal ve optik özelliklerinde önemli değişimler görülmektedir (3). Bu değişimler, nanopartiküllere (NP) bambaşka yeni özellikler katmakta ve kullanım alanlarını genişletmektedir. Bu parçacıklar farklı biçimlerde düzenlenip kullanılarak, farklı çalışmalarda ve birçok alanda yeni uygulamalarda değerlendirilmektedir. Hâlihazırda gelişim sürecinde olan nanoteknoloji gelecek yıllarda insanlığa önemli imkânlar sunacaktır. Bundan dolayı devletler ve şirketler nanoteknoloji alanında araştırma ve geliştirme kapsamında büyük yatırımlar yapmaktadır. Örneğin; son yıllarda günümüzün en büyük problemlerinden biri olan kanserin tedavi ve erken teşhisi için nanoteknolojik yaklaşımlar yoğun bir şekilde çalışılmaktadır. Üretilen bir NP'ye kanserli hücreyi özelde tanıması için anti-kor, kanserli hücreyi ortadan kaldırmak için ilaç molekülü ve görüntüleme için floresans etiket ekleme gibi farklı stratejiler uygulanmaktadır (4).

Nanoyapılı malzemeler birçok farklı yöntemle üretilmekte ve buna bağlı olarak farklı morfolojilerde elde edilmektedir (5). Bu bölümde sıvı ortamda üretilen nanoyapılı sistemler ele alınacaktır. Bu kapsamda sıvı ortamda NP sentez yöntemleri özet şekliyle tanımlanacaktır. Burada literatürde verilen tüm yöntem ve malzeme türlerinin bu bölüm kapsamında verilmesi mümkün değildir. Bu noktanın okuyucu tarafından anlaşılması büyük önem arz etmektedir. Ayrıca üretilen NP'ler aynı atomlardan meydana gelmiş olsalar bile farklı özellikler gösterebilirler. Bu bağlamda elde edilen her

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1. GİRİŞ

Fonksiyonel malzemeler insanlık için hemen her alanda büyük öneme sahiptir. Çok eski zamanlardan beri uygulanan dene-yanıl yaklaşımı ile başlayan fonksiyonel malzeme üretim serüveni günümüzde bilimsel yöntem kullanılarak hâlâ önemini korumaktadır. Bu hususta en önemli çıkış noktası doğadan esinlenme yolu ile gerçekleştirilebilmektedir. Doğa zorlayıcı koşullar ile minimum kaynak maksimum performans noktasına ulaşabilmiştir. Bu mükemmel özelliklere ve performansa sahip yapılardan ve canlılardan dersler çıkarmak ve onları taklit etmek günümüz teknolojisinde karşılaşılan sorunların çözümünde önemli bir role sahiptir. Biyo-esinlenme temelli (*bio-inspired based*) en önemli yaklaşımların başında kendiliğinden düzenlenen yapılar gelmektedir. Yıllar boyunca bilim adamları tarafından yeni moleküllerin sentezi atomlar arasında kovalent bağ olarak adlandırılan güçlü çekim kuvvetlerine dayalı olarak gerçekleştirilmiştir [1]. 1960'lı yıllarda yeni moleküllerin sentezi için kovalent bağların haricinde yapı içerisinde bulunan diğer zayıf etkileşimler ile yeni moleküllerin elde edilmesinin mümkün olacağı anlaşılmıştır. Bunun sonucunda moleküler kendiliğinden düzenlenme (*Molecular Self Assembly, MSA*) adı verilen ve herhangi bir dış müdahaleye gerek kalmadan bir veya birden fazla molekülün birbirine kovalent olmayan etkileşimler ile bağlanması ve yeni düzenli yapıların oluşması fikri ortaya çıkmıştır [2]. MSA olgusu moleküler seviyeden makroskopik düzeye kadar gerçekleşebilmektedir [1]. MSA olayında moleküllerin bağlanması kovalent olmayan zayıf etkileşimler örneğin dipol-dipol, iyon-dipol, hidrojen bağı, π - π etkileşimler, van der Waals kuvvetleri ve hidrofobik etkiler vb. ile gerçekleşebilmektedir [3, 4]. MSA doğada, biyolojik sistemlerde ve birçok moleküler yapıda sıkça rastlanan bir olgu olarak karşımıza çıkmaktadır. Biyolojik sistemlerde MSA çerçevesinde yeni moleküllerin bir araya gelerek daha karmaşık bir yapı oluşturduğu bilinmektedir [5]. Hücre zarının oluşması için iki tabakalı lipid yapısının birleşmesi, polipeptitlerin katlanarak protein hâline gelmesi, nükleotit zincirlerinin birleşerek işlevleştirilmesi veya reseptör-ligand etkileşimleri

sürdürmesine sebep olmuştur. Bununla birlikte transistörler daha küçük boyutlara küçüldükçe mevcut durumun ulaştığı limitler, yasanın artık sonunun geldiğini düşündürmektedir. Bununla birlikte, yeni malzemelerin ve 3 boyutlu karmaşık yapıların hayatımıza girmesiyle, yukarıdan aşağıya yöntemlerde ciddi zorluklar ortaya çıkmıştır. Bu nedenle, aşağıdan yukarıya tekniklerin, yukarıdan aşağıya prosesleri ile birleştirilmesinin gerekli olduğuna inanılmaktadır. Bu doğrultuda, heterojen ve monolitik 3B entegrasyonu sunan kimyasal ve biyolojik yöntemlerin, yüksek yoğunluklu ve çok işlevli olarak genişletmesi beklenmektedir.

MSA sahip olduğu eşsiz özellikler nedeni ile mikroelektronik, optik, manyetizma, akustik ve biyoteknoloji, vb. nanoüretimde vazgeçilmez bir yaklaşım olarak karşımıza çıkmaktadır. İleri teknolojik ürünler ve aynı zamanda tıp alanında birçok uygulamaya sahiplerdir. Elektronik endüstrisinde birkaç nm ölçeğinde transistörlerin fabrikasyonunda kullanılan malzemeler SAMs sayesinde gerçekleştirilmektedir. Bu küçülme çevre ve enerji açısından son derece önemli olmakla birlikte, SAMs fenomeninin dolaylı bir şekilde çevre ve enerji açısından büyük katkılarda bulunduğunu da göstermektedir. Biyosensörlerin gelişimi, bu yaklaşımların gelişimi ile birlikte ivmelenmiştir. Kanser tedavisinde ise hedefli bir şekilde paketlenmiş ilaçların hedef hücrelere ulaştırılması ise bu olgu sayesinde gerçekleştirilmiştir. Günümüzde bu kategoride sınıflandırılabilen moleküllerin tasarımı, sentezi ve kullanımı büyük bir çaba ile birlikte Türkiye dâhil olmak üzere dünya çapında birçok grup tarafından devam etmektedir. Bu çalışmalar sayesinde ortaya çıkacak yeni ve işlevsel yapıların nanoteknoloji çalışmalarına da büyük katkılarda bulunacağı beklenmektedir.

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Nanomalzemelerin üretiminde ya kütleli malzeme ile başlayıp, daha sonra mekanik, kimyasal veya diğer enerji biçimlerini kullanarak (yukarıdan-aşağıya) daha küçük parçalara bölüdüğü ya da öncü parçacıkların büyümesine izin veren (aşağıdan-yukarıya) kimyasal reaksiyonlarla atomik veya moleküler türlerden sentezin gerçekleştiği iki farklı yaklaşım bulunmaktadır.

19. yy'ın başından bu yana uygulanan mekanik üretim süreçleri, mikro partikülleri ezmek için öğütmeyi kullanır. Ticari uygulanabilirliği sayesinde bu yaklaşım günümüzde metalik ve seramik nanoyapılı malzemelerin üretiminde başarılı bir şekilde uygulanmaktadır. Bu bölümde, mekanik etki temelli öğütme, mekanik alaşımlama ve mekanokimyasal sentez hakkında temel bilgiler ve söz konusu yöntemlerle ilgili yapılmış çalışmalara değinilmiştir.

1. MEKANİK ÖĞÜTME

Bu yöntem ilk keşfedildiğinde sadece kayaçları kırmak veya oksitli tozları karıştırmak için kullanılmıştır. Öğütme sırasında toz partiküllerinde aşırı plastik deformasyon ve partiküller arası soğuk kaynaklaşma oluşmamıştır. Dolayısıyla; işlem sırasında belirgin ve göze çarpan ilginç mikroyapısal değişime sebep olmayan bir süreç olarak bilinmiştir [1]. Bu alandaki ilk yayın 1892 yılında, M. Carey Lea isimli bilim adamı tarafından yapılan çalışmalar ile başlamıştır. Carey Lea, yapmış olduğu çalışmalarda altın, gümüş, platin ve cıva halojenürlerin, ince öğütme işlemi sırasında halojen ve metal olarak ayrıştırılabilir olduğunu göstermiştir. Bu çalışma, kimyasal değişikliklerin yalnızca ısıtılarak değil aynı zamanda bir mekanik müdahale ile de sağlanabileceğini göstermiştir [2].

Mekanik öğütme, toz metalurjisi ve maden işleme endüstrileri başta olmak üzere geniş bir uygulama alanına sahip; ısı veya kimyasal süreçlerden bağımsız gerçekleştirilen ekonomik bir yöntemdir. Diğer bir deyişle mekanik öğütme, başlangıç tozlarının

yöntem de mekaniksel kuvvetlerin etkisi altında öğütme, alaşımlama ve kimyasal reaksiyonlar gerçekleştirilir. Makro ölçekteki bir malzemenin nano ölçeğe (en az bir boyutu < 100 nm) dönüştürülmesi öğütme, elementel toz karışımlarının mekaniksel kuvvetler ile etkileştirilerek alaşımların elde edilmesi mekaniksel alaşımlama ve mekaniksel kuvvetlerin tetiklediği kimyasal reaksiyonlar ile ısı veya kimyasal işlemlere gerek olmadan katı hâl reaksiyonlarının gerçekleşmesi mekanokimyasal süreç olarak tanımlanmıştır. Bu yöntem nanoseviyede oksit/oksit dışı seramiklerin, nanoalaşımların ve birçok nanokompozit malzemenin üretilmesinde kullanılabilir. Bu yöntemler, nanomalzemelerin yeni ve inovatif bir sınıfı olan karbon ve iki boyutlu (MXene, MBenes, kalkojenitler vb.) malzemelerin ve kompozitlerinin elde edilmesinde yeni fırsatlar sunmaktadır. Süreç değişkenlerinin optimize edilmesi ve farklı öncül kimyasalların kullanılması ile elde edilen ürünlerin endüstriyel konuma gelmesi mümkün olacaktır. Özellikle de oda sıcaklığına yakın sıcaklıklarda kristal/kristal, kristal/amorf ve amorf/amorf yapıların oluşturulmasına izin vermesi avantajı ile gelecekteki yenilikçi nanomalzemelerin üretilmesinde ve endüstriyellesmesinde umut verici bir yaklaşım sunmaktadır.

KAYNAKÇA

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1. GİRİŞ

1796'da Alman yazar ve aktör, Alois Senefelder, tiyatro eserlerinin yayınlanmasında ucuz bir yöntem olarak bir taştan veya metal bir plaka üzerinde kimyasal yöntemlerle oluşturulan desenlerin pürüzsüz bir yüzeye aktarılması yöntemini icat etmiştir (1) (Şekil 6.1.a). Yunanca'da taş ve yazma anlamına gelen *lithos* ve *graphein* kelimelerinin birleşiminden oluşturulan litografi terimiyle anlatılan bu yöntem, temel olarak bir desenin bir yüzeye aktarılması işlemi ifade etmektedir. Litografi yöntemi zaman içerisinde 1960'lardan itibaren Mikro Elektromekanik Sistemlerin (MEMS) ve yarı iletken endüstrisinde entegre devrelerin (*integrated circuit, IC*) üretilmesinde, mikro veya nano ölçekli desenlerin, üretimde kullanılan altta üzerine aktarılmasında kullanılan temel yöntem olmuştur (Şekil 6.1.b).



(a)

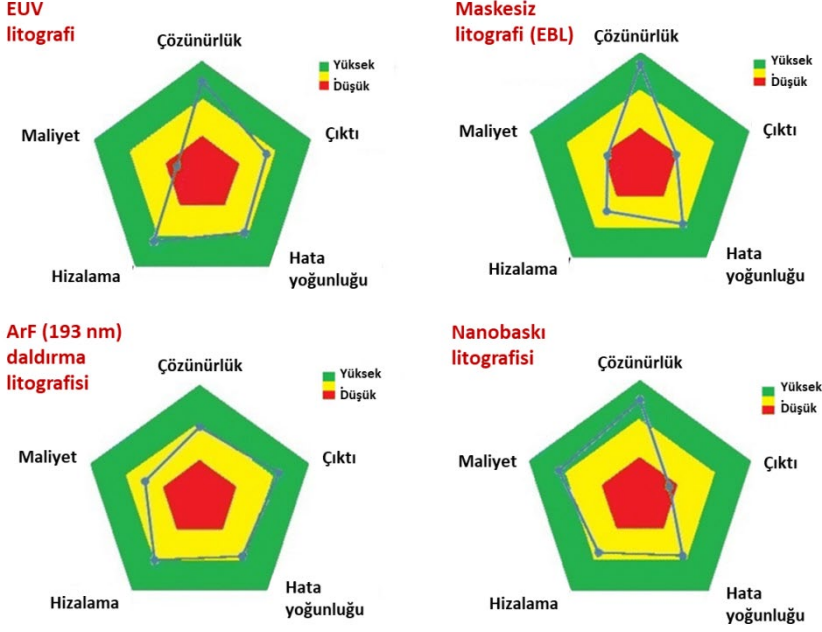


(b)

Şekil 6.1. (a) Taş üzerinde yer alan deseni bir yüzeye aktarmak için kullanılan litografik baskı presini gösteren gravür (2). (b) MEMS üretiminde litografi.

Mikro ve nano ölçekli desenlerin aktarılması işleminde kullanılan geleneksel litografi işlemi fotolitografidir. Fotolitografi işleminde, altlık üzerine kaplanan ışığa duyarlı bir

dezavantajları bulunmaktadır. Şekil 6.22, litografi tekniklerini çözünürlük, maliyet, katman hizalama, hata yoğunluğu, çıktı gibi farklı açılardan değerlendirmesini sunmaktadır. Avantaj ve dezavantajları göz önüne alınarak, uygulamaya özel uygun litografi tekniği seçilmelidir.



Şekil 6.22. Farklı litografi yöntemlerinin çözünürlük, maliyet, hizalama, hata yoğunluğu ve çıktı açısından değerlendirilmesi. Springer Nature tarafından yayınlanan Kaynak (6)'dan uyarlanarak tekrar yayınlanmıştır.

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1. GİRİŞ

20. yüzyılın sonlarında nanoteknolojideki olağanüstü gelişmeler, malzemeleri atomik boyutlarda görüntüleyebilen cihazların ortaya çıkmasına yol açtı. 1980'lerden önce nano ölçekli görselleştirme işlemleri elektron demeti görüntüleme yöntemleriyle yapılıyordu. IBM laboratuvarlarından Binnig, Rohrer ve Quate'in çabaları, taramalı tünelleme mikroskobu (*Scanning Tunneling microscope*, STM) ve atomik kuvvet mikroskobu (*Atomic Force Microscope*, AFM) dâhil olmak üzere taramalı prob mikroskobu (*Scanning Probe Microscope*, SPM) kavramlarını ortaya çıkardı (1-5). İlk tasarlanan STM'in çalışma ilkesi, vakum altında numuneye oldukça yakın sivri bir uç üzerine gerilim uygulanmasına dayanıyordu. STM'in çalışma ilkesinde, numune ile uç arasındaki mesafe tünel akımının (*tunnelling current*) büyüklüğünü belirler. Bu akımın büyüklüğü, belirtilen mesafe ile ters orantılıdır. Ucun çalışılan malzemenin yüzeyini taraması ile görüntüleme ya da işleme yapılabilir. STM, vakum altında ve 5-1000 K sıcaklık aralığında, yüksek hassasiyetli görüntüler elde edilmesine olanak sağlamasına rağmen sadece iletken numuneleri görüntüleyebilir ya da işleyebilir olması bu yöntemin bir handikabıdır (1, 2).

SPM, daha yüksek çözünürlükle, çalışılan malzemelerin yüzey özellikleri hakkında fiziksel, elektriksel veya kimyasal bilgiler elde etmek için sivri bir uç ve numune yüzeyi arasındaki yerel etkileşimi izleyen bir cihazdır. Günümüzde, birçok bilimsel alanda, çeşitli uygulamalar için kullanılan farklı SPM türleri mevcuttur. Tablo 7.1'de farklı SPM türleri, bunların özellikleri, çözünürlükleri ve uygulandıkları materyal türleri sıralanmıştır.

AFM'nin çalışma ilkesi, küçük atomik ölçekli kuvvetleri tespit edebilen, esnek bir konsol aracılığıyla yüzeye etkileşime giren belirli bir alanda sınırlandırılmış bir probun kullanılmasına dayanmaktadır. Bu hassasiyet, bir lazer ışınının uç üzerinden yansıtılmasıyla ve ışındaki kaymaların hassas bir fotodedektör yardımıyla tespit edilmesiyle elde edilir. Yüzey topografyası, uç ve yüzey arasındaki kuvveti korumak için geri

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1. GİRİŞ

İnce film biriktirme (*thin film deposition*) yöntemleri tarih boyunca insanlığın başvurduğu teknolojilerden biri olmuştur. İnce film biriktirme yöntemlerinin neredeyse 5000 yıllık bir geçmişi bulunmaktadır. İnce film biriktirme yöntemleri ilk yıllarında malzemelerin yüzeyinin estetik açıdan daha etkileyici olması için dekoratif amaçlı kullanılmıştır. Daha sonraki yıllarda ise ince filmler malzemelerin çevresel koşullara karşı dayanımının artırılması için korozyon direnci yüksek ve mekanik özellikleri geliştirilmiş kaplamalar oluşturmak için kullanılmıştır. Günümüzde ince film biriktirme yöntemleri teknolojide yapılan çalışmalarla özellikle vakum teknolojilerinin gelişmesi ve elektronik alanında meydana gelen bilimsel devrimlerle ileri teknolojinin vazgeçilmesi olmuştur.

Kitabın bu bölümünde günümüzde en çok kullanılan ince film biriktirme yöntemlerine yer verilmiştir. İlk olarak ince film biriktirme yöntemlerinin temelleri anlatılmış daha sonra da ince film biriktirme yöntemlerinin sınıflandırması yapılarak yöntemler detaylandırılmıştır. İnce film biriktirme yöntemlerini çeşitli şekillerde sınıflandırmak mümkündür. Bu kitapta ince film biriktirme yöntemleri kimyasal ve fiziksel biriktirme yöntemleri olarak ikiye ayrılmıştır. Kimyasal biriktirme yöntemlerinde kimyasal buhar biriktirme, elektrokaplama, sıvı faz biriktirme yöntemleri ve gaz faz biriktirme yöntemleri incelenirken, fiziksel biriktirme yöntemlerinde buharlaştırma, püskürtme ve elektrosprey biriktirme yöntemleri incelenmiştir.

1.1. İnce filmler ve eğik açılı biriktirme

1.1.1. Klasik ince film büyütme

İnce filmler, kimyasal buhar biriktirme (*chemical vapor deposition*, CVD) ve fiziksel buhar biriktirme (*physical vapor deposition*, PVD) olmak üzere iki farklı yöntemle biriktirilmektedir [1, 2] PVD yönteminde temel prensip, kaynak malzemesinin fiziksel bir yöntem kullanılarak (püskürtme, laser ablasyonu, elektron demeti) buharlaştırılması ve alttaş üzerine biriktirilmesidir. CVD yönteminde ise

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1. GİRİŞ

Yarı iletken teknolojisinin 19. yüzyılın ikinci yarısından itibaren hızlıca gelişiminin en büyük göstergesinden biri üretilen çip miktarının ortalama her iki senede bir iki katına çıkmasıdır. Elbette ki bu gelişim, litografi tekniklerde kullanılan yöntemlerin her birinin gelişimi ile doğrudan orantılıdır. Üretimin genel anlamda gelişmesi için dađlama/aşındırma (*etching*) sürecinde kullanılan vakum ve plazma teknolojileri gibi alanlarda yeniliklerin ve kullanıcı kolaylıklarının artırılmasına yönelik çalışmaların kaçınılmaz olduđu anlaşılmaktadır.

Bu bölümde, ince filmlerde kullanılan dađlama/aşındırma mekanizma ve yöntemleri ile birlikte dađlama kimyasından kısaca bahsedilmiştir. Dađlama yöntemleri ve dađlamaya etki eden unsurlar, dađlama cihazları, plazma sistemleri, seçicilik için kullanılan dielektrik malzemeler, silisitler ve Al gibi malzemelerin nasıl dađlanacağı ile ilgili açıklamalara da yer verilmiştir.

2. DAĐLAMA/AŞINDIRMA

Dađlama/aşındırma, kimyasal veya fiziksel yöntemlerle önceden belirlenen malzeme yüzeyini belli amaçlar için temizlemek, damgalamak veya fotolitografi işleminin sonu istenmeyen malzemenin yüzeyden kaldırılması için kullanılan yöntemlerin genel adıdır. Her iki terim de literatürümüzde kullanılmakta olup bu bölüm içerisinde genel olarak '*etching*' için dađlama terimi kullanılacaktır.

Nanoüretim tekniklerinde sıkça kullanılmasına ek olarak, dađlama metalurjide yüzey parlatma işleminin sonu kuvvetli asit çözeltisi kullanılarak malzeme yüzey mikro yapılarının açığa çıkarılıp, gözlenebilmesine de yardımcı olmaktadır. Dađlama, kuru ve yaş dađlama olarak ikiye ayrılmaktadır. Dađlayıcı (*etchant*) malzeme olarak genelde sıvı kimyasalların kullanılmasının yanı sıra plazma hâline geçen seçilmiş iyonize gazlar gibi kinetik çarpışmayı artırıcı elementlerin de kullanımı yaygındır. Dađlama çeşit-

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1. GENEL BİLGİ ve TARİHÇE

Bağlama işlemi herhangi bir deformasyon ve sızdırma olmadan en az iki adet aynı ya da farklı diskin, levhanın, kablunun ya da çipin geçici veya kalıcı olarak birleştirilmesi işlemidir. Mikroteknolojide levha (*wafer*, pul), tel (*wire*) ve çip (*chip*) gibi farklı yapıda malzemeler farklı bağlama teknikleri ile bir araya getirilmektedir. Bunlardan tel ve çip bağlama daha çok entegre devrelerin paketlenerek dış ortam ve korozyondan korunması ile baskı devre kartlarının kurulumunda sıklıkla kullanılmaktadır. Bu bölüm kapsamında pratik uygulamalarda çoğunlukla kullanılan levha bağlama teknikleri ele alınacak ve bu konu üzerinde ayrıntılı değerlendirmeler yapılacaktır.

Levha bağlama ile son derece karmaşık yapılar oluşturulabilmektedir (1). Ayrıca farklı cihaz ya da levha parçalarının damgalanması ve kapsüllenmesi yapılabilmektedir. Bunun yanında bu teknikle bir malzemedeki tabakaların farklı bir malzemeye aktarılması sağlanmakta ya da bir cihazın üretiminde destek malzemesi olarak levhalar doğrudan kullanılabilir. Günümüzde belirtilen yöntemler kullanılarak mikroeletromekanik sistemler (*microelectromechanic systems*, MEMS), nanoeletromekanik sistemler (*nanoelectromechanic systems*, NEMS), ışık saçan diyot sistemler (*light-emitting diode*, LED), bütüncü metal oksit yarı iletken sistemler (*complementary metal oxide semiconductor*, CMOS), radyofrekans (*radiofrequency*, RF) cihazları, mikroakışkan sistemler gibi çok farklı sistemler üretilmekte ve farklı alanlarda kullanılmaktadır. Bağlama işlemi termal, kimyasal veya yapışkan (*adhesive*) olabilir. Ayrıca seçilen bağlama tekniğine göre yüksek sıcaklık ve yüksek elektrik alanı gerekebilir. Bundan dolayı bağlama işlemi sırasındaki koşulların düzgün seçilmemesi cihazdaki elektronik parçalara zarar verebilir. Kullanılan malzemeye, malzemenin kalitesine ya da bağlama tekniğine bağlı olarak çeşitli bağlama dayanımları elde edilebilir.

Levha bağlama teknikleri, farklı kaynaklarda farklı şekillerde sınıflandırılmaktadır. Burada birçok kaynaktan verildiği üzere bu teknik iki temel sınıfa ayrılmıştır: Direkt

4. GENEL DEĞERLENDİRME

Bu kısımda anlatılan temel levha bağlama teknikleri entegre devrelerin paketlenerek dış ortam ve korozyondan korunması ile baskı devre kartlarının kurulumunda sıklıkla kullanılmaktadır. Sunduğu fırsatlar ile bağlama teknikleri 3D entegre devrelerin üretilmesinde önemli katkılar sunacaktır. Fakat burada temel sorun 3D entegre devrelerini oluşturmak için gereken altyapı harcamalarının oldukça yüksek olmasıdır. Gerekli altyapı oluşturulduktan sonra bu konuda önemli ilerlemelerin olacağı görülmektedir. 3D entegre devreler, ileri sistemlerin kısa sürelerde üretiminin sağlanması, klasik yaklaşımlarla üretimi mümkün olmayan sistemlerin eldesi ve farklı kullanım alanlarının ortaya çıkarılması gibi artı değerler sunmaktadır. Ayrıca farklı 3D sistemlere ek olarak, MEMS ve mikroakışkan sistemler bu kapsamda üretilebilecek başlıca yapılarıdır. Bu durum boyut küçültme ile bağlama tekniklerinin mikro ve nanoteknolojide farklı kullanım alanlarında önünü açmaktadır. Bu kapsamda sistemlerin geliştirilmesine yönelik olarak farklı şirketler tarafından önemli araştırma ve geliştirme çalışmaları yapılmaktadır. Bu çalışmalar sonucunda önümüzdeki yıllarda bu yapıdaki ürünlerin kullanıcıların arzına sunulacağı düşünülmektedir.

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Prof. Dr. Satılmış Tekindal



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İÇİNDEKİLER

ÖNSÖZ	V
ŞEKİLLER LİSTESİ	XV
TABLolar LİSTESİ	xvii
KUTULAR LİSTESİ	xix
1. BÖLÜM: ARAŞTIRMAYA GİRİŞ	1
EĞİTİMDE VE PSİKOLOJİDE ARAŞTIRMANIN ÖNEMİ	3
BİLGİYİ EDİNMENİN YOLLARI	6
Tümdengelim	10
Tümevarım	10
Tümdengelim – Tümevarım Bileşimi.....	11
ÖRNEK ARAŞTIRMA DURUMU	17
BİLİM YOLU İLE BİLGİ EDİNME	19
BİLİM OLARAK EĞİTİM	22
BİLİM OLARAK PSİKOLOJİ	23
BİLİMİN AMAÇLARI	23
BİLİM VE ARAŞTIRMA	25
ARAŞTIRMA TÜRLERİ	27
Deneysel Araştırma	28
Korelasyonel Araştırmalar	28
Nedensel Karşılaştırma Araştırmaları	30
Etnografik Araştırma.....	32
Tarihi Araştırma	33
Durum Araştırması (Durum Çalışması)	34
Olgubilim (Fenomenoloji) Araştırması.....	34
Kuram Oluşturma Araştırması	35

Karma Yöntem Araştırması.....	36
ETİK	39
2. BÖLÜM: ARAŞTIRMA PROBLEMİ	45
ARAŞTIRMA PROBLEMİ	46
İYİ BİR ARAŞTIRMA PROBLEMİNDE BULUNMASI GEREKEN NİTELİKLER.....	49
Problem Durumu	53
3. BÖLÜM: HİPOTEZLER VE DEĞİŞKENLER.....	55
HİPOTEZ.....	56
DEĞİŞKENLER	61
ARAŞTIRMA DEĞİŞKENLERİNİ TANIMLAMA VE AYARLAMA.....	61
ALAN YAZINI İNCELEME.....	68
AMAÇ	80
ÖNEM	81
SAYILTI.....	82
SINIRLILIKLAR.....	83
TANIMLAR	84
ARACIN UYGULANMASI.....	84
4. BÖLÜM: DEĞİŞKENLERİ ÖLÇME	85
DEĞİŞKENLERİ ÖLÇME	86
Ölçmenin Seviyeleri veya Ölçekler.....	90
VERİ TOPLAMA ARAÇLARI	94
VERİLERİN NİTELİKLERİ: GÜVENİRLİK VE GEÇERLİK	100
Güvenirlilik.....	100
Güvenirlilik Bulma Yöntemleri.....	101
Geçerlik.....	117
GEÇERLİĞİ ETKİLEYEN FAKTÖRLER	131
TEST GÜVENİRLİĞİ VE GEÇERLİK	133
İÇ GEÇERLİK.....	134
İç Geçerliliği Tehdit Eden Etmenler	135
DIŞ GEÇERLİK	147
5. BÖLÜM: EVREN VE ÖRNEKLEM.....	149
ARAŞTIRMA EVRENİ	150
HEDEF EVREN, ULAŞILABİLİR EVREN VE ÖRNEKLEM	151
Örnekleme Hataları	155
ÖRNEKLEME YÖNTEMLERİ.....	156

TESADÜFİ ÖRNEKLEME YÖNTEMLERİ.....	160
Tesadüfi (Seçkisiz) Örneklem Seçme Yöntemleri.....	160
Basit Tesadüfi (Seçkisiz) Örnekleme	163
Tabakalı Tesadüfi (Seçkisiz) Örnekleme.....	163
Kümeleme Tesadüfi (Seçkisiz) Örnekleme.....	165
İki Aşamalı Tesadüfi Örnekleme	166
OLASILIK DIŞI ÖRNEKLEME YÖNTEMLERİ	168
ÖRNEKLEM BÜYÜKLÜĞÜNÜN HESAPLANMASI	171
6. BÖLÜM: NİCEL ARAŞTIRMA YÖNTEMLERİ	175
TARAMA ARAŞTIRMALARI.....	177
Tarama Araştırmalarının Türleri	182
Bir Tarama Araştırması Yapmanın Basamakları.....	185
Tarama Araştırmalarında Verilerin Analizi.....	195
NEDENSEL KARŞILAŞTIRMA ARAŞTIRMASI.....	199
Nedensel Karşılaştırma Araştırması Tasarlama	203
Nedensel Karşılaştırma Araştırması Oluşturmanın Aşamaları	207
KORELASYONEL ARAŞTIRMALAR	213
DENEYSEL DESENİN MANTIĞI VE DENEYSEL DESENLER.....	224
Deneysel Desenin Mantığı.....	225
Deneysel Desenler	231
Gerçek Deneysel Desenler	243
Yarı Deneysel Desenler	251
TEK DENEKLİ ARAŞTIRMA	252
Tek Denekli Desenlerin Çeşitleri	257
7. BÖLÜM: İNTERNET TABANLI ARAŞTIRMA.....	269
İNTERNET TABANLI DENEYLERİ SINIFLANDIRMA	270
WEBDE BİR DENEY PLANLAMA	271
BİR WEB DENEYİ OLUŞTURMA.....	273
İNTERNET TABANLI DENEYSEL ARAŞTIRMA ÖRNEĞİ.....	275
İNTERNET TABANLI ANKET UYGULAMA	277
İNTERNET TABANLI ARAŞTIRMALARDA ÖRNEKLEME	285
İNTERNETTE ARAŞTIRMA MATERYALLERİ İÇİN ARAMA	288
WEB SİTELERİNİ DEĞERLENDİRME	290
BİLGİSAYAR SİMÜLASYONLARI	291
COĞRAFİK BİLGİ SİSTEMLERİ.....	292

8. BÖLÜM: NİCEL VERİLERİN ANALİZİ	295
VERİLERİN ANALİZİNDE HANGİ İSTATİSTİKSEL TEKNİĞİN KULLANILACAĞINI	
BELİRLEME KOŞULLARI	296
Verileri Analiz Etmek İçin Uygun İstatistiksel Tekniği Seçme	297
VERİLERİN DÜZENLENMESİ VE BETİMLEYİCİ İSTATİSTİKLER	302
Temel Kavramlar	303
Verilerin Düzenlenmesi.....	305
Tanımlayıcı İstatistikler	312
Puanlar Arasındaki İlişkileri Belirleme	333
Regresyon	337
Olasılık Ve Hipotez Test Etme	350
Olasılık Hesaplama Kuralları	354
Olasılık Dağılımları	356
Normal Dağılım	358
Bernoulli Dağılımı	361
Binom Dağılımı	362
t Dağılımı	363
Kay Kare Dağılımı	367
F Dağılımı.....	371
HİPOTEZ TEST ETME	373
ANLAM ÇIKARTICI İSTATİSTİKLER	390
Parametrik Olmayan Anlam Çıkartıcı İstatistik Testler	392
Kay Kare (χ^2) Uyum Testi	392
Kay Kare (x^2) Bağımsızlık Testi.....	394
Wilcoxon Sıra Toplamı Testi	397
Cochran Q Testi	399
Parametrik Anlam Çıkartıcı İstatistik Testler.....	402
Z Testi	402
t testi	406
9. BÖLÜM: GÖZLEM, ANKET VE GÖRÜŞME	421
GÖZLEM.....	423
Yapıldığı Ortama Göre Gözlem Türleri.....	424
Gözlemci Rolüne Göre Gözlem Türleri	425
Yapılandırma Koşullarına Göre Gözlem Türleri.....	428
Yapılandırılmış Gözlemin Yapılış Aşamaları	429

ANKET	439
Anket Geliştirme Süreci	441
Anketin Tasarlanmasında Göz Önüne Alınması Gereken Bazı Hususlar.....	459
Ankette Güvenirlik ve Geçerlik.....	462
GÖRÜŞME	469
Görüşme Türleri.....	471
Görüşmede Kullanılabilecek Yaygın Soru Formları	475
Verilerin Analizi.....	485
Görüşme Planı Örneği.....	493
GÖRÜŞMEDE GÜVENİRLİK VE GEÇERLİK	494
10. BÖLÜM: NİTEL ARAŞTIRMALAR	497
Nitel Araştırmaların Özellikleri.....	501
Nitel Araştırmanın Basamakları	502
DURUM ÇALIŞMASI	506
EYLEM ARAŞTIRMASI	510
Eylem Araştırmasının Anlamı.....	511
Eylem Araştırması Sürecinin Aşamaları	513
ETNOGRAFİK ARAŞTIRMA	517
Temel Kavramlar	519
Etnografik Araştırma Sürecinin Basamakları	522
İÇERİK ANALİZİ	527
Bir Araştırma Yöntemi Olarak İçerik Analizi.....	528
İçerik Analizi Araştırması Sürecinin Adımları	531
İçerik Analizinde Bilgisayar Kullanma	540
NİTEL VERİLERİN ANALİZİ	541
Nitel Veri Analizi Çeşitleri	543
NİTEL ARAŞTIRMALARDA GÜVENİRLİK VE GEÇERLİK	551
11. BÖLÜM: KARMA YÖNTEM ARAŞTIRMALARI	559
Karma Yönteme Duyulan İhtiyaç	562
KARMA YÖNTEM ARAŞTIRMA DESENLERİ	564
KARMA YÖNTEM ARAŞTIRMALARININ AŞAMALARI	570
Giriş Bölümü (Problem Durumu)	575
Karma Yöntem Araştırmalarında Verilerin Toplanması (Araştırmanın Yöntemi)	584
Örnekleme Yöntemleri	585

KARMA YÖNTEM ARAŞTIRMA VERİLERİNİ TOPLAMAYA	
HAZIRLIK ÇALIŞMALARI	592
KARMA YÖNTEM ARAŞTIRMA VERİLERİNİN ANALİZİ.....	608
12. BÖLÜM: ARAŞTIRMA ÖNERİSİ YAZMA VE	
ARAŞTIRMANIN RAPORUNU YAZMA	617
ARAŞTIRMA ÖNERİSİ YAZMA.....	617
KAYNAKÇA	657
EKLER.....	665

KAYNAKÇA

ÖNERİNİN KAYNAKÇASI

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EKLER

Tablo 1. Ki kare (χ^2) dağılımı kritik derleri tablosu

Tablo 2. Wilcoxon sıra toplamı testi kritik değerler tablosu (Bağımsız durum)

Tablo 3. Standart normal dağılımı (z dağılımı) tablosu

Tablo 4. Z değerlerine göre normal dağılımı üzerindeki ordinat (Y) yüksekliği

Tablo 5. t dağılımı kritik değerler tablosu

Tablo 6. Spearman korelasyon katsayısı kritik değerleri

Tablo 7. Fisher'in z dönüşümü tablosu

NORMAL GEBELİK



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3. Bölüm	KADIN ÜREME SİSTEMİNİN ANATOMİSİ Doç. Dr. Selda İldan Çahm <i>Manisa Celal Bayar Üniversitesi</i> Arş. Gör. Pelin Başkurt <i>Manisa Celal Bayar Üniversitesi</i>19
4. Bölüm	ERKEK ÜREME SİSTEMİNİN ANATOMİSİ Dr. Öğr. Üyesi Esra Çevik <i>Balıkesir Üniversitesi</i> .....35
5. Bölüm	ÜREME SİSTEMLERİNİN FİZYOLOJİSİ Doç. Dr. Ayten Dinç <i>Çanakkale Onsekiz Mart Üniversitesi</i> Arş. Gör. Remziye Gültepe <i>Çanakkale Onsekiz Mart Üniversitesi</i> .....43
6. Bölüm	GEBELİĞİN FİZYOLOJİSİ Doç. Dr. Nursen Bolsoy <i>Manisa Celal Bayar Üniversitesi</i> Arş. Gör. Dr. Esra Bozhan Tayhan <i>Manisa Celal Bayar Üniversitesi</i> .....59

7. Bölüm	EMBRİYO/FETÜSÜN BÜYÜME VE GELİŞMESİ, FETÜSÜN FİZYOLOJİSİ Öğr. Gör. Dr. Nurcan Çelik Odabaşı <i>Manisa Celal Bayar Üniversitesi</i> .....73
8. Bölüm	GEBELİKTE FETÜSÜN SAĞLIĞINI DEĞERLENDİRME Doç. Dr. Hülya Türkmen <i>Balıkesir Üniversitesi</i> .....83
9. Bölüm	GEBELİKTE SİSTEMİK DEĞİŞİKLİKLER Dr. Öğr. Üyesi Esra Karataş Okyay <i>Kahramanmaraş Sütçü İmam Üniversitesi</i>.....109
10. Bölüm	GEBELİKTE METABOLİK DEĞİŞİKLİKLER Öğr. Gör. Esra Bayram <i>Balıkesir Üniversitesi</i> Doç. Dr. Pelin Palas Karaca <i>Balıkesir Üniversitesi</i> .....129
11. Bölüm	GEBELİKTE PSİKOLOJİK DEĞİŞİKLİKLER Dr. Öğr. Üyesi Hülya Demirci <i>Manisa Celal Bayar Üniversitesi</i> .....141
12. Bölüm	GEBELİK TANISI VE GESTASYONEL YAŞ TAYİNİ Dr. Öğr. Üyesi Yeliz Çakır Koçak <i>Bartın Üniversitesi</i> Arş. Gör. Güleser Ada <i>Bartın Üniversitesi</i> .....147
13. Bölüm	GEBENİN SAĞLIĞINI DEĞERLENDİRME Doç. Dr. Ayla Kanbur <i>Atatürk Üniversitesi</i> Uzm. Ebe Merve Çakıl <i>Van Muradiye Devlet Hastanesi</i> .....169
14. Bölüm	GEBENİN SAĞLIĞININ GELİŞTİRİLMESİ Dr. Öğr. Üyesi Yeliz Çakır Koçak <i>Bartın Üniversitesi</i> Dr. Öğr. Üyesi Hanifi Dülger <i>Bartın Üniversitesi</i> .....183

15. Bölüm	DOĞUM ÖNCESİ BAKIM Dr. Öğr. Üyesi Seval Cambaz Ulaş <i>Manisa Celal Bayar Üniversitesi</i> Arş. Gör. Dr. Seçil Köken Durgun <i>Manisa Celal Bayar Üniversitesi</i> .....207
16. Bölüm	DOĞUM ÖNCESİ EĞİTİM Dr. Öğr. Üyesi Hanife Nurseven Şimşek <i>Manisa Celal Bayar Üniversitesi</i> .....221
17. Bölüm	GEBELİKTE BESLENME Dr. Öğr. Üyesi Hatice Gürgen Şimşek <i>Manisa Celal Bayar Üniversitesi</i> .....237
18. Bölüm	GEBELİKTE CİNSELLİK Prof. Dr. Şule Gökyıldız Sürücü <i>Çukurova Ünivesitesi</i> .....273
19. Bölüm	GEBELİKTE SIK RASTLANAN YAKINMALAR VE BELİRTİLERİ Arş. Gör. Dr. Yonca Çiçek Okuyan <i>Manisa Celal Bayar Üniversitesi</i> .....279

1. Bölüm

ANNE SAĞLIĞI VE EBENİN ROLÜ

Selma Şen

Öğrenim hedefleri

- Anne sağlığını kavrayabilmek.
- Güvenli annelik tanımlamasını yapabilmek.
- Güvenli anneliğin önemini açıklayabilmek.
- Anne sağlığında ebenin rolünü kavrayabilmek.

Gebelik ve doğum, riskli durumlardır. Gebelik ve doğuma bağlı yaşamı tehdit eden komplikasyonlar genellikle tahmin edilememekte ve acil obstetrik bakımın verilememesi ya da bu bakımı verecek kurumlara geç ulaşma nedeniyle önlenememektedir. Maternal mortalite önlenebilir bir durum olmakla birlikte anneliği güvenli hâle getirmek için girişimler bilinip kaynaklar sağlanmalıdır.

İnsan gelişmişliğini gösteren ölçütler bakımından gelişmiş olan ülkeler arasındaki en büyük farklılık, gebeliğe bağlı nedenlerle oluşan ölümlerdir. Gelişmekte olan bir ülkede yaşayan gebe, gelişmiş bir ülkede yaşayan gebeye göre 200 defa daha fazla ölüm riskiyle karşı karşıyadır. Daha düzenli ve daha güvenilir bilimsel yöntemlerle toplanan bilgiler nedeniyle 90'lı yıllarda, geçmiş yıllara göre gebelik, doğum ve güvensiz düşük gibi nedenlerle daha fazla kadının ölmüş olduğu görülmektedir. Bu olgu; sadece kadınların hayatlarını ilgilendirmekle kalmaz, çocukların hayatta kalma şansını, ailelerin ve toplumların sağlıklı olmalarını da etkiler.

Toplumların iyiliği, anne ve çocukların sağlığının iyi olmasıyla doğrudan ilişkilidir. Her yıl milyonlarca anne ve bebek, gebelik, doğum ve doğum sonrası erken dönemde yetersiz sağlık bakımı, beslenme yetersizliği ve hastalıklardan etkilenmekte ve ölmektedir.

Dünya Sağlık Örgütü, anne ölümünü gebeliğin başlangıcından doğumdan sonraki 42. güne kadar geçen süre içinde gebelik süresi ve durumuna bakılmaksızın doğrudan gebelikle ilgili veya gebeliğin şiddetlendirdiği dolaylı nedenler sonucu meydana gelen ölümler

- ✓ Gebe ve lohusalara bireysel ya da gruplar hâlinde eğitim verilmesi,
- ✓ Yüksek riskli gebeliklerin izlenmesi,
- ✓ Doğum eyleminin yönetimi,
- ✓ Doğum sonrası bakım verilmesi,
- ✓ Kadın sağlığını etkileyecek olası risk ve komplikasyonların erken tanısı,
- ✓ Temel ve acil obstetrik bakım hizmetlerinin verilmesi,
- ✓ Yenidoğanın bakımı ve emzirmenin desteklenmesi,
- ✓ Yenidoğan ve çocuğa yönelik bağışıklama ve sağlık hizmetlerinin yürütülmesinde anahtar rol oynamaktadır.

Sonuç olarak ebelerin; güvenli annelik hizmetlerinin yürütülmesi, anne ve çocuk sağlığının en üst seviyeye çıkarılmasında önemli sağlık çalışanları oldukları unutulmamalıdır.

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2. Bölüm

GEBELİKTE SIK KULLANILAN TERİMLER

Benay Oğuz

Öğrenim hedefleri

- Gebelik döneminde kullanılan terimleri kavrayabilmek.
- Gebelik döneminde kullanılan terimleri açıklayabilmek.
- Gebelik dönemlerinin standart tanımlamasını yapabilmek.

Gebelik, kadın yaşamının en önemli dönemlerinden biri olup biyolojik ve psikososyal değişimlerin yaşandığı fizyolojik bir olaydır. Normal şartlar altında gebelik döneminin süresi 280 gün/10 lunar ay/40 hafta olarak tanımlanmaktadır. Bu dönemde kullanılan terimler uluslararası standartlar tarafından belirlenmiştir. Sağlık profesyonelleri arasında ortak bir dil oluşturmak için kullanılması önerilmektedir.

Abortus: Fetüsün uterus dışında yaşama yeteneğine sahip olmadan önce (<20. Gebelik haftası) herhangi bir nedenle gebeliğin sonlanması.

Adölesan Gebe: 10-19 yaş arası genç gebe kişi.

Amniyotik Kese: Bebeği ve amniyotik sıvıyı içeren uterus içindeki zar.

Amniyotik Sıvı: Gebelik boyunca amniyotik kese içinde bebeği çevreleyen ve koruyan sıvı.

Antenatal Dönem: Doğum öncesi dönem. Gebeliğin ilk gününden doğuma kadar geçen süre.

Doğum: 20. gebelik haftasından sonra gebelik ürününün anneden çıkması ya da çıkarılması.

Embriyo: İntrauterin yaşamın ilk 8. haftasındaki gebelik ürünü.

Fertilizasyon: Ovumun sperm hücresi tarafından döllenesi.

Arteria uterina: Hipogastrik arterden ayrılarak uterusun istmus yönünden girer, serviks, fundus, tubalar, overler ve vajinanın üst kısımlarına doğru dallanır.

Arteria overika: Abdominal aorttan ayrılır, overler ve tubalara doğru uzanır.

Arteria vajinalis: İnternal iliak arterden ayrılarak dallanır, vajinayı besler. Vestibüler bulbuslar, mesane ve retuma doğru dallara ayrılır.

Arteria perinealis: İnternal iliak arterden dallanır; labiaları, klitorisi, ön perineal bölgeyi besler (Resim 12).

Kadın Üreme Organlarının Sinirleri

Pelvik sinir uyarıları spinal kord ile beyne iletir. Bu impulslar, merkezî ve periferik sinir sistemlerinde çeşitli seviyelerde modüle edilir. Pelviste, vücudun diğer yerlerinde olduğu gibi somatik ve otonom (sempatik ve parasempatik sistem) sinir sistemleri yer alır. Somatik sinirler lomber ve sakral omurilikten çıkar, dış üretral ve anal sfinkter, alt karın duvarı ve organları dâhil olmak üzere pelvik taban kaslarına dallanır. Lomber ve sakral sempatik sinirler ise pelvis ve alt ekstremitelere yayılır. Alt mezenterik pleksus, üst hipogastrik pleksus, hipogastrik sinirler ve alt hipogastrik pleksus uterus ve vajinanın sempatik sinir sisteminin ana kaynaklarıdır. Parasempatik sinirler sakral medulla spinalisten çıkarak uterus, vajina, mesane ve rektuma ulaşır. Vagus siniri, diğer iç organların ve gonadların parasempatik beslenme kaynağıdır (Resim 10).

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4. Bölüm

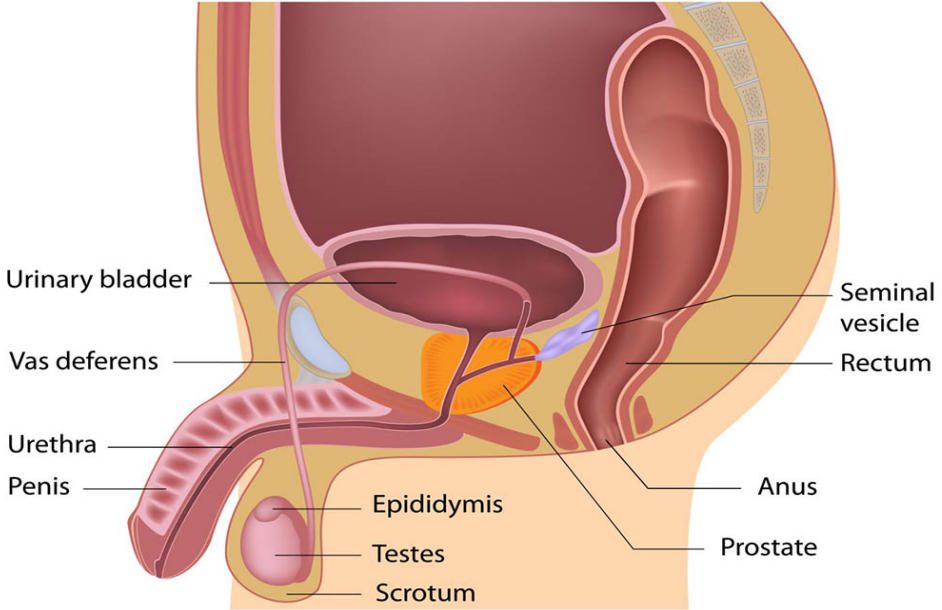
ERKEK ÜREME SİSTEMİNİN ANATOMİSİ

Esra Çevik

Öğrenim Hedefleri

- Erkek iç üreme organlarının yapısını ve özelliklerini bilmek.
- Erkek dış üreme organlarının yapısını ve özelliklerini bilmek.

Erkek üreme sistemi iç ve dış üreme organları olarak iki grupta incelenmektedir. Erkek üreme organlarının temel işlevi, sperm üretimini sağlayarak transportunu sağlamak ve erkeğe özgü cinsiyet hormonlarını salgılamaktır.



Resim 1. Erkek üreme organları-sagittal kesit

Kaynak: <https://www.healthdirect.gov.au/male-reproductive-system>

landinlerin en büyük konsantrasyonu ejakülattadır. Ejakülataın kokusunu testislerde üretilen aminler (amonyak türevleri) vermektedir.

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5. Bölüm

ÜREME SİSTEMLERİNİN FİZYOLOJİSİ

Ayten Dinç, Remziye Gültepe

Öğrenim Hedefleri

- Kadın ve erkek üreme sistemleri fizyolojisini farklarıyla kavrayabilmek.
- Hipotalamus-hipofiz ve over ilişkisini açıklayabilmek.
- Üreme sürecinde endometriyal ve ovarial değişiklikleri kavrayabilmek.
- Hipotalamus-hipofiz ve testis ilişkisini açıklayabilmek.
- Oogenezis ve spermatogenezis süreçlerini kavrayabilmek.

KADIN ÜREME SİSTEMİ FİZYOLOJİSİ

Kadın bedeninde üreme işlevinin devam edebilmesi için özellikle genital organlarda, ilk âdet görme olarak tanımlanan “menarş”tan itibaren başlayıp âdetten kesilme olarak tanımlanan “menopoz”a kadar süren ve her ay düzenli olarak tekrarlanan değişiklikler görülmektedir. Görülen bu değişiklikler, “siklus” olarak adlandırılmaktadır. Her bir siklus, menstruasyonun (âdet kanaması) görüldüğü ilk günden başlayarak sonraki menstruasyonun başlangıcına kadar geçen dönemi kapsamaktadır. Yaşanan her siklusta bir primer oosit gelişerek kadın üreme hücresi olan ovuma dönüşerek fertilize olabilecek düzeye erişmektedir. Ancak fertilizasyon olayı gerçekleşmez ise endometriyum, menstruasyon kanamasıyla dışarı atılır ve yeni bir siklus hazırlığı başlar.

Sağlıklı kadınlarda normal bir siklus, ortalama olarak 28 ± 7 gündür. Menstrual siklus bazı durumlarda fizyolojik ve psikolojik faktörler nedeniyle değişebilmektedir. Ancak bu sürenin 21 günden daha az veya 35 günden daha fazla olması patolojik bir duruma işaret edebilir. Her bir siklusta menstruasyon 3 ile 7 gün arasında devam eder. Menstrual siklus süresi her kadında ve kadının doğurganlık çağının değişik dönemlerinde farklılık gösterebilir. Kanamanın 2 günden daha az, 7 günden daha fazla devam etmesi yine sağlıklı olmayan bir duruma işaret etmektedir. Her siklusta kaybedilen kan miktarı 30-180 ml arasında

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6. Bölüm

GEBELİĞİN FIZYOLOJİSİ

Nursen Bolsoy, Esra Bozhan Tayhan

Öğrenim Hedefleri

- Fertilizasyon, fertilizasyon sonrası süreçleri ve implantasyonu açıklayabilmek.
- Hücresel değişimleri açıklayabilmek.
- Embriyonik/fetal membranların oluşumunu anlatabilmek.
- Plasentanın oluşumu ve işlevini söyleyebilmek.

Gebeliğin Fizyolojisi

Gebelik, ovumun sperm ile döllenmesiyle (fertilizasyon) başlayan ve yaklaşık kırk hafta sonra doğumun başlamasıyla sona eren bir süreçtir. Oosit ve spermin birleşmesiyle oluşan zigot bölünerek hücre bölünmesi, göçü, büyümesi ve farklılaşması ile çok hücreli bir yapıya yani insana dönüşür.

Fertilizasyon

Fertilizasyon, ovum ve sperm hücrelerinin tubaların ampulla kısmında birleşme sürecidir.

Ovumun etrafını saran iki zar mevcuttur (Resim 1). Dışta korona radiata, iç kısımda ise zona pellucida mevcuttur. Korona radiata hücreleri, hyaluronik asitle birbirine tutunmuştur. Zona pellucida ise oosit tarafından salgılanan glikoproteinlerden oluşan oosit ve gelişimini sürdüren embriyonun çevresini saran koruyucu bir tabakadır. Ovülasyon döneminde oositin matürasyonu devam etmektedir. Bu süreçte LH miktarındaki ani artış ile I. mayoz tamamlanır ve II. mayoz başlar. II. mayoz metafaz dönemine kadar devam eder. Ovülasyonla atılan sekonder oosit (oosit II). Ovülasyon sırasında oositi çevreleyen granuloza hücreleri ve oosit, folikül duvarından ayrılırlar. Ovülasyon sırasında kandaki yüksek östrojen düzeyi, fallop tüplerinin peristaltizmini artırarak hareketsiz olan oositin fimbriyal tarafından tuba içine çekilmesini ve siliaların ritmik hareketiyle 2-3 dakika sonra fallop tüpünün ampulla kısmına ulaşmasını sağlar. Ayrıca yüksek östrojen düzeyi sayesinde ser-

estriol düzeyinin yaklaşık 12 mg/l olması gerekirken 4 mg/l altına düşmesi fetal sağlığın tehlikede olduğunu göstergesidir.

Progesteron: Progesteron sentezi için gerekli olan kolesterol ya da pregnenolone an-neden alınır. Gebeliğin 7. haftasına kadar progesteron korpus luteum tarafından salgılanır-ken 7-10. haftalarda plasenta ve korpus luteum birlikte işlev görürler. Gebeliğin 10. hafta-sından sonra ise plasenta tek kaynaktır. Progesteron başta uterusu miyometriyum olmak üzere anne vücudundaki düz kasların tonusunu azaltır. Bazal vücut ısısını yükseltir. Ayrıca memelerde östrojenle birlikte alveolar gelişimi sağlayarak memeleri laktasyona hazırlar. Diğer yandan solunum merkezini uyararak solunumu artırır, karbondioksit düzeyini azaltarak dokuların oksijenasyonunu sağlar.

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7. Bölüm

EMBRYO/FETÜSÜN BÜYÜME VE GELİŞMESİ, FETÜSÜN FİZYOLOJİSİ

Nurcan Çelik Odabaşı

Öğrenim hedefleri

- Embriyonel/fetal dönemi tanımlayabilmek.
- Embriyo/fetüsün gelişim sürecini açıklayabilmek.
- Gebelik haftasına uygun embriyonel/fetal dönemi ayırt edebilmek.

Gebeliğin ortalama süresi, fertilizasyondan itibaren doğuma kadar yaklaşık 266-280 gün veya 38-40 gebelik haftasıdır. Fertilizasyon sonrası implantasyonun gerçekleşmesiyle birlikte intrauterin yaşam, embriyonel ve fetal dönem olarak ikiye ayrılır.

Embriyonel dönem: Fertilizasyonun ardından geçen iki haftalık evreye preembriyonik dönem denir. İmplantasyon sonrası sekiz haftalık evre ise embriyonik dönem olarak adlandırılır. Bu dönemde hücre sayısında hızlı şekilde artış meydana gelir. Hücreler farklı tipte dokuları oluşturur. Organ ve sistemlerin taslaklarının oluştuğu **bu evre, organogenezis dönemi olarak** bilinir.

Fetal dönem: Embriyonel evrenin bitiminden doğuma kadar geçen süredir. Bu dönemde organ ve sistemler gelişimini tamamlayarak doğum sonrası dış dünyaya uyumu sağlamak için gelişimlerini devam ettirirler. Gebeliğin 36. haftasından sonra yenidoğanlarda dış dünyaya uyum ile ilgili sorunlara daha az rastlanır.

Embriyonel Gelişim

Erkek ve dişi pronükleusunun bir araya gelmesiyle oluşan diploid kromozomlu tek bir hücreye zigot adı verilir. Zigot, insan vücudunda yer alan en büyük hücredir (0,15 mm). Fertilizasyondan 30 saat kadar sonra mitoz bölünme başlar. Zigot bölünerek hücre sayısı 2-4-8-16 gibi katlanarak çoğalır. Her bir hücreye blastomer adı verilir. Blastomer sayısı 16 ve üzeri olan hücre kümesine morulla denir. Fertilizasyonun 3. gününde 128-256 blastomerden oluşan blastokist adı verilen hücre kümesi uterin kaviteye ulaşır. Bu evrede hücre kümesinin ortasında yer alan embriyoyu geliştirecek iç hücreler embriyoblastlara, plasen-

28. gebelik haftası

Baş-popo uzunluğu, yaklaşık 25 cm ve ağırlık 1100 g'dır. Cilt ince, vernik kazeoza ile kaplı ve kırmızıdır. Göz kırpm hareketleri başlamıştır. Akciğerler gaz değişimi yapabilecek düzeye gelmiştir. Vücut sıcaklığı kontrol edilebilecek durumdadır. Doğum gerçekleştiği takdirde yenidoğan hayatta kalma şansına sahiptir.

32. gebelik haftası

Fetüsün baş-popo mesafesi yaklaşık 28 cm, ağırlığı 1800 g'dır. Bu dönemin sonunda cilt pembe, pürüzsüz ve yoğun verniks caseosa ile kaplıdır. 32 hafta ve üzeri doğan yenidoğanların uygun bakımla hayatta kalma oranı yüksektir.

36. gebelik haftası

Baş-popo mesafesi yaklaşık 32 cm, ağırlığı 2500 g'dır. Cilt altında yağ dokusu depolanır. Bu nedenle gövde, daha dolgunudur. Kas tonusu gelişir. Baş ve karın çevresi ölçümleri birbirine yakındır.

38 ve 40. gebelik haftaları

Son âdet tarihinin başlangıcından itibaren 40. haftayı dolduran fetüs, term olarak kabul edilir. Fetüs tam olarak gelişmiştir. Yaklaşık 50 cm uzunluğunda ve 3400 g ağırlığındadır. Gebeliğin son haftasında ağırlığına günlük 14 gram yağ eklenir. Göğüs çıkık, memeler her iki cinsten de hafif çıkıntı oluşturacak şekildedir. Miyadında erkek fetüste testisler genellikle skrotuma inmiştir (Resim 5).

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GEBELİKTE FETÜSÜN SAĞLIĞINI DEĞERLENDİRME

*Hülya Türkmen***Öğrenim Hedefleri**

- Hangi gebelere tarama testi yapılabileceğini açıklayabilmek.
- Fetal sağlığın değerlendirilmesinde kullanılan invaziv ve non-invaziv testleri sayabilmek.
- Birinci trimesterda hangi testlerin yapılabileceğini ve nasıl yapılacağını söyleyebilmek.
- İkinci trimesterda hangi testlerin yapılabileceğini ve nasıl yapılacağını açıklayabilmek.
- Üçüncü trimesterda hangi testlerin yapılabileceğini ve nasıl yapılacağını anlatabilmek.

Giriş

Antenatal dönemde fetal iyilik durumunun belirlenmesi için gebelerin taranması gerekmektedir. Böylece fetüsün büyüme ve gelişmesi açısından risk değerlendirilmesi yapılmış ve gerekli müdahalelerin zamanında uygulanması sağlanmış olur. Yenidoğanların %3'ünde doğumsal defektler görülebilmektedir. Konjenital anomalili bebekler, aile ve toplumda çeşitli problemlerin yaşanmasına yol açabilmektedir. Son yıllardaki bilimsel ilerlemeler, intrauterin dönemdeyken fetüs hakkında ayrıntılı bilgi edinmeyi ve gerektiğinde de intrauterin tedaviyi sağlamaktadır. Fetal iyilik hâli invaziv ve non-invaziv yöntemler ile belirlenebilir (Tablo 1). Tarama testi olarak uygulanan non-invaziv testlerin riski yüksek olan ya da olmayan tüm gebelere yapılması önerilmektedir. Tarama testi sonucunun pozitif çıkması sadece taranan durum konusunda riskin yüksek olduğunu göstermektedir. Kesin sonuç alınabilmesi için tanı testlerinin uygulanması gerekir. Tanı testi amacıyla genellikle invaziv testler uygulanmaktadır. Ancak invaziv testlerin bazı sakıncaları bulunmaktadır. Bu nedenle invaziv testlerin sadece tarama testlerinde riski yüksek bulunan gebelere uygulanması önerilmektedir. Tarama testlerinin basit, çabuk ve duyarlılığı özgünlü-

tus, gebelik hipertansiyonu, membranların erken rüptürü, plasental yetmezlik, tekrarlayan sezaryen gibi pek çok durum, gebeliğin erken sonlandırılması için endikasyon yaratabilmektedir. Birçok olguda akciğerler olgunlaşmaya kadar fetüsün doğumu ertelenir. Surfaktan maddesi fetal akciğerlerde yeterli miktarda oluşmadan önce doğum gerçekleşirse yenidoğanın alveollerinde kollaps gelişmesi sonucunda respiratuvar distress sendromu ortaya çıkmaktadır. Fetal akciğer olgunluğu Lesitin/Sfingomyelin (L/S) oranı ve Fosfatil Gliserol (PG) ile değerlendirilebilmektedir. Lesitin ve sfingomyelin, surfaktanı oluşturmaktadır. Gebeliğin erken dönemlerinde amniyotik mayideki lesitin konsantrasyonu, sfingomyelinden azdır. Komplikasyonsuz gebelerde 30-32. gebelik haftasından önce L/S oranı 1,0'dan küçüktür. Gebeliğin 35-36. haftalarında L/S oranı 2/1 olmalıdır. Bu oran, fetal akciğer olgunluğunu göstermektedir. PG ise surfaktanda bulunan bir fosfolipittir. PG gebeliğin 36. haftasında ortaya çıkmakta ve terme kadar artmaktadır. Amniyotik mayide PG varsa fetal akciğerler olgun durumdadır.

Mekonyum tanılanması

Mekonyumlu amniyotik mayinin rengi, amniyosentez sırasında ya da membran rüptüründen sonra vajinal drenajda görülebilir. Normalde amniyotik mayi berraktır fakat mekonyum, mayinin rengini yeşilimsi yapar. İntrapartum dönemde mekonyum, fetal olgunlaşma ile görülebilen normal bir olaydır. Ancak hipoksi sonucunda oluşan peristaltizm ve sfinkter gevşemesiyle ve umbilikal kord kompresyonuna bağlı vagal uyarı sonucunda da görülebilmektedir.

Kordosentez (perkutan umbilikal kan örneği)

Kordosentez, intrauterin olarak abdomenden girilerek umbilikal korddan fetal kan örneği alınması işlemidir. Bu işlem gebeliğin 14. haftasından terme kadar uygulanabilmektedir. Fetal sağlığın belirlenmesi, fetal karyotip, fetal kan grubu, fetal metabolik hastalıklar, trombosit hastalıkları, fetal enfeksiyon ve isoimmünizasyonun tanı ve tedavisi bu işlem ile yapılabilmektedir. İşlem sırasında abdomen antiseptik bir solüsyonla silinmeli, USG eşliğinde kordun plasentaya tutunduğu yerin 1-2 cm yukarisından 25-guage spinal iğne ile umbilikal vene girilmeli ve 2-3 ml fetal kan içinde antikuagülan olan enjektöre aspire edilmelidir. Kordosentez işleminde fetal kayıp, kanama, kordon hematomları, tromboembolizm, prematür membran rüptürü, prematür eylem, koriyoamniyonitis, fetal bradikardi ve fetomaternal transfüzyon gibi komplikasyonlar gelişebilmektedir.

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Öğrenim Hedefleri

- Gebelik döneminde üreme sisteminde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde memelerde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde kas/iskelet sisteminde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde deride görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde solunum sisteminde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde üriner sistemde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde gastrointestinal sistemde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde endokrin sistemde görülen değişiklikleri açıklayabilmek.
- Gebelik döneminde kardiyovasküler sistemde görülen değişiklikleri açıklayabilmek.

Gebelik, ovum (kadın üreme hücresi) ve sperm (erkek üreme) hücrelerinin birleşmesi sonucu başlayan bir olay olup gebelik süresi son menstruasyonun ilk gününden itibaren 9 ay 10 gün veya 10 lunar ay veya 40 hafta veya 280 gündür. Gebelik sürecinde kadının vücudunda önemli anatomik, sistemik, metabolik, psikolojik ve biyokimyasal değişiklikler görülmektedir. Çoğu değişiklik, fertilizasyon sonrası kısa sürede başlar ve gebelik süresince devam eder. Herhangi bir sağlık problemi olmayan bir kadın, meydana gelen bu değişikliklere kolaylıkla adapte olabilir.

Gebelikte Üreme Sistemindeki Değişiklikler

Gebelik sürecinde üreme sisteminde meydana gelen değişiklikler çoğunlukla damarlaşmada ve hormon yapımındaki artıştan kaynaklanır. Gebelik esnasında en belirgin değişiklik üreme sisteminde görülmekte olup en fazla değişikliğe uğrayan üreme organı uterusur.

Gebelikte plazma fibronejen (faktör I) düzeyi yaklaşık %50 artar ve pıhtı oluşumu eğilimini artırır. Gebelikte pıhtılaşma zamanlarında gebe olmayan kadınlara göre önemli bir farklılık olmamasına rağmen faktör VII, VIII, IX ve X miktarında artış, faktör XII ve XIII miktarında azalma görülür. Ayrıca protrombin zamanı (PT) ve pariyel tromboplastin (aPPT) zamanı hafifçe azalır. Bu durum, doğum esnasında kanamayı önlemede etkin rol oynamamakta fakat bacaklarda tromboflebit ve tromboz oluşma riskini artırmaktadır.

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10. Bölüm

GEBELİKTE METABOLİK DEĞİŞİKLİKLER

Esra Bayram, Pelin Palas Karaca

Öğrenim Hedefleri

- Gebelikte olan metabolik değişiklikleri kavrayabilmek.
- Gebelikte olan kilo değişimlerini açıklayabilmek.
- Gebelikte karbonhidrat metabolizması değişikliklerini açıklayabilmek.
- Gebelikte insülin hassasiyetini açıklayabilmek.
- Gebelikte protein metabolizmasını açıklayabilmek.
- Gebeliğin fizyolojik anemisini açıklayabilmek.
- Gebelikte sıvı ve elektrolit dengesinin korunmasının önemini kavrayabilmek.
- Gebelikte lipit metabolizmasında olan değişiklikleri açıklayabilmek.

Gebelik, kadının yaşamında en özel deneyimlerden biridir ve her gebelik kendine özgü değişikliklerle karakterizedir. Bu dönemde görülen fiziksel, hormonal, psikolojik ve maternal metabolik değişiklikler ile fetüsün gelişimi desteklenmekte, fetüse gerekli besin maddeleri sağlanmakta, kadının vücudu doğum ve emzirme için hazırlanmaktadır.

Fetal büyümeyi sağlamak için maternal metabolik değişiklikler Şekil 1’de yer almaktadır.

Gebelikteki metabolik değişiklikler gebeliğin ilk yarısında ve ikinci yarısındaki fetal büyümeyi sürdürmek için yağ depolarında artış sağlamaya yöneliktir. Fetal büyüme, anne, plasenta, fetüs ve çevresel birçok etmenden etkilenmektedir.

Bu nedenle anne, bu dönemde büyüyen fetüsün gereksinimlerini karşılamak, daha sonrasında yenidoğanın gereksinimleri ve laktasyon dönemine hazırlanmak için majör fizyolojik ve metabolik adaptasyonlardan geçmektedir. Bu sürece adaptasyon, komplikasyonların önlenmesi açısından oldukça önemlidir.

- ✓ Artan aldosteron ve deoksikortikosteron,
- ✓ Atriyal natriüretik peptit.

Gebelikte kan sodyum konsantrasyonu ve ozmolalitesi daha düşüktür. Bu nedenle gebe kadınlarda sodyum 130 - 140 mmol/L arası normal olarak kabul edilirken gebe olmayan kadınlarda normal değer aralığı 135 - 145 olarak alınmaktadır. Gebelikte kalsiyum düzeyi ise gebelik boyunca azalma eğilimindedir.

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11. Bölüm

GEBELİKTE PSİKOLOJİK DEĞİŞİKLİKLER

Hülya Demirci

Öğrenim Hedefleri

- Gebelikte görülen psikolojik değişiklikleri trimesterlere göre açıklayabilmek.
- Gebelikte görülen psikolojik değişikliklere uyumda ebeğin rolünü söyleyebilmek.

Gebelik, kadının yaşamındaki en kritik ve benzersiz olaylardan biri olmakla birlikte kadının dış görünüşünde, sosyal ilişkilerinde ve aile içi rollerinde değişikliklerle sonuçlanan bir durumdur. Bu nedenle stresli bir yaşam olayı veya uyum sağlanması gereken gelişimsel bir kriz olarak da nitelendirilebilir. Bu süreçte, fetüsün büyümesini desteklemek için belirli fizyolojik değişiklikler meydana gelirken gebeliğin başından sonuna kadar değişen psikolojik dalgalanmalar da görülür. Komplike olmayan gebeliklerde bile bu değişiklikler hem anne hem de bebek sağlığını etkileyebilir (gebelik kontrolleri, gebelik sonuçları, annenin doğum sonrası sağlığı ve bebeğin psikomotor gelişimi vb.).

Gebe, benlik kavramını etkileyen biyolojik kadınlığıyla karşı karşıyadır ve buna ek olarak gebeliğin seyri ve sonucuyla ilgili birtakım özel endişeler yaşar. Bu durum; kişilik özelliği, yaşam tarzı ve sosyal statüsü tarafından şartlandırıldığı için onu savunmasız hâle getirir. Bir kadının doğmamış çocuğuna karşı tutumu; gurur, heyecan, kabul veya reddetme olabilir. Normal gebeliklerin çoğunda kadınlar, heyecan ve umut gibi olumlu duyguların yanı sıra kaygı ve depresyon gibi olumsuz duygular da yaşayabilirler. Gebeliğin normal fiziksel değişiklikleri gebe için stres kaynağı olabilir. Bu değişiklikler mide bulantısı, yorgunluk, hazımsızlık veya sırt ağrılarını içerir. Değişen hormon seviyeleri uykusuzluk, ruh hâli değişimleri ve sinirlilik ile sonuçlanabilir. Ek olarak gebelik süresince kadın; doğum deneyimi, bebeğin sağlıklı olup olmayacağı ve kendi sağlığı hakkında tekrarlayan endişe ve korkulara sahiptir. Kadının gebeliğini kabullenme süreci, kendi inanç ve tutumları, geçmiş yaşam deneyimleri, çocuk sayısı, gebeliğin planlı olup olmadığı, gebelikten beklentileri, eş ve yakın çevrenin desteği, gebelikte yaşanan sorunlar, toplumsal bakış ve kadının statüsü, rol ve sorumluluk anlayışı gibi birçok faktörden etkilenebilir.

Bu süreçte ebeğin en önemli bağımsız rollerinden biri de duygusal destek sağlamaktır. Gebelik sürecinin gelişimsel bir kriz olmakla birlikte fiziksel, ruhsal ve sosyal uyumu gerektiren ve her kadının yaşayabileceği fizyolojik ve doğal bir olay olduğu anlatılmalıdır. Kadına gebelikte yaşanabilecek psikolojik tepkilerin neler olduğu açıklanmalı ve kadın, bu konuda duygularını ifade etmesi için cesaretlendirilmelidir. Yaşadığı duygusal dalgalanmaların sadece kendinde olmadığını bilmek gebeyi rahatlatacak ve sorunlarını çözmeye yöneltecektir.

Gebe kadın; kendini psikolojik olarak savunmasız hisseder ve daha fazla sosyal desteğe, özellikle eş desteğine ihtiyaç duyar. Eşinden ve ailesinden sürekli bakım ve destek alan gebeler stres, depresyon ve anksiyete bozuklukları gibi sorunlardan daha az etkilenir. Gebelikte sosyal destek, kadının gebeliğe uyumunu sağlar, çevresiyle olan ilişkilerini ve gebelikte yaşanan sorunlarla baş etmesini kolaylaştırır. Antenatal izlemlerde gebelerin sosyal destek sistemleri değerlendirilmeli, sosyal destek sistemlerini harekete geçirme konusunda gebeye yardımcı olunmalıdır. Gebenin eşi ve aile üyelerine, kadının yaşayabileceği duygusal dalgalanmalar ve desteğe ihtiyaç duyabileceği alanlar konusunda bilgi verilmeli, bu süreçte desteğin önemi vurgulanmalıdır. Yeterli sosyal destek alan kadınlar, gebeliklerinin sağlıklı geçmesi için çevresinden yardım talep edebilmekte ve yararlı sağlık davranışlarını arttırarak oluşabilecek gebelik komplikasyonlarını azaltabilmektedir.

Gebeler eşleriyle birlikte doğuma hazırlık sınıflarına katılmaları konusunda desteklenmelidir. Doğuma hazırlık eğitimleri kadınların gebeliğe uyum sürecini kolaylaştıracak, kendisinin ve bebeğinin bakımını sağlıklı olarak sürdürmesine, sosyal destek sistemlerinin artırılmasına katkıda bulunacaktır. Ayrıca doğuma hazırlık sınıflarının yaygınlaştırılması, gebe ve eşlerinin bu sınıflara katılmalarının desteklenmesi ile daha olumlu bir gebelik ve doğum deneyimi yaşamaları sağlanabilir.

Sonuç olarak gebelikte yaşanan psikolojik değişikliklere ilişkin farkındalık sağlanmış, doğuma ilişkin gerçekçi planlar yapılmış ve ebeveynler bebeğin yaşamlarını değiştireceği gerçeğini kabullenmişse başarılı bir ebelik yaklaşımından söz edilebilir. Sağlık profesyonelleri için gebelikte ortaya çıkan fiziksel ve psikolojik sorunlar bazen tedavi edilmesi gerekmeyen küçük durumlar olarak algılanabilir. Ancak önemli olan bu sorunların gebe ve ailesi tarafından nasıl algılandığıdır. Gebelik sürecinde sağlık ve hastalık çizgisinin birbirine yaklaştığı, sağlıklı olmak ile hasta olmak arasındaki farkı daraldığı da unutulmamalıdır.

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Yeliz Çakır Koçak, Güleser Ada

Öğrenim Hedefleri

- Gebelik tanı yöntemlerini açıklayabilmek.
- Bireysel, olası ve kesin gebelik belirtilerini sayabilmek.
- Gebelik yaşını belirlemek için sonografik olan yöntemleri açıklayabilmek.
- Gebelik yaşını belirlemek için sonografik olmayan yöntemleri açıklayabilmek.
- Gebelik tanılanması ve gestasyonel yaş tayininin ebelik mesleğine katkısını açıklayabilmek.

Gebeliğin tanılanması bazı kadınlar için hoş bazıları içinse kötü bir durum olarak algılanabilmekte ve çoğu kadın gebeliğini öğrenmesiyle birlikte ambivalan duygular yaşayabilmektedir. Kadınların gebelik döneminde tecrübe edindikleri değişikliklerin birçoğu gebeliğin tanılanmasında kullanılmaktadır.

Gebelik tanısındaki belirtiler üç grup altında incelenmektedir. Bunlar, kadının kendi hissettiği bireysel/subjektif belirtiler, olası/objektif belirtiler ve sağlık profesyoneli tarafından saptanan bulgulara dayanan kesin gebelik belirtileridir (Şekil 1). Gebelik tanısının yanında gestasyonel yaş tayini de antenatal izlemler için son derece önemlidir. Gebelik yaşının doğru tayin edilmesi, gebelik süresince fetüs ve annenin çeşitli tarama testlerinin ve değerlendirmelerinin zamanlaması için önemli bir veri kaynağıdır. Gebelik yaşı; son adet tarihine (SAT) göre hesaplama, sonografik değerlendirme ve doğum eyleminden sonra yenidoğanın değerlendirilmesi yöntemleri ile belirlenebilmektedir.

lunun karşı koluna doğru çekilerek değerlendirilmesi ve kol germe testleridir. Skor sonucunda elde edilen nörolojik ve fiziksel bulguların toplam puanları gestasyonel yaşa denk gelmektedir. Ballard Skorum sistemi hem sağlıklı hem hasta yenidoğanlarda kolaylıkla uygulanabilmektedir. Bu skorum sisteminin çok düşük doğum ağırlıklı yenidoğanların gestasyonel yaşının hesaplanmasının yetersiz kalmasından dolayı Ballard ve arkadaşları skorum sistemlerini güncelleştirmişlerdir. Bu skorum sistemi Yeni Ballard Skorum sistemi olarak adlandırılmaktadır. Yeni Ballard Skorum sistemi ülkemizin en uç bölgelerinde görev yapan ebeler tarafından kolaylıkla uygulanabilmektedir. Mutlu ve arkadaşları (2010) çalışmalarında yardımcı üreme teknolojisi ile doğan bebeklerin gestasyonel yaşını Yeni Ballard Skorum sistemi ile belirlemişlerdir. Yeni Ballard Skorum sistemi ile hesaplanan gestasyonel yaş ile gerçekte olan gestasyonel yaşın birbiriyle aynı sonucu verdiği saptanmıştır.

Gebelik, kadın ve ailesi için özel bir dönemdir. Bu dönemde gebeliğin tanınması ve gestasyonel yaşın doğru tahmin edilmesi gebeliklerin yönetiminde ve fetal gelişimin değerlendirilmesinde büyük önem taşımaktadır. Bu noktada ebe ve diğer sağlık profesyonelleri anahtar bir role sahiptir.

Bölüm Sonu Not:
Cevap 1: (TDT) 25.01.2023
Cevap 2: (TDT) 05.12.2022

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13. Bölüm

GEBENİN SAĞLIĞINI DEĞERLENDİRME

Ayla Kanbur, Merve Çakıl

Öğrenim Hedefleri

- Gebenin sağlığını değerlendirebilmek.
- Gebeden ayrıntılı öykü alabilmek.
- Gebenin fizik muayenesini yapabilmek.
- Trimesterlere uygun gebe değerlendirmesi yapabilmek.

Sağlıklı bir gebelik dönemi için prekonsepsiyonel bakımın başlatılmış olmasıyla birlikte prenatal bakım ve psikososyal desteğin olması gereklidir. Gebelik döneminde ebe tarafından sunulan bakım hizmeti, temelde koruyucu bir sağlık hizmetidir. Gebelik ve doğum ile ilgili önlenabilir nedenlerden kaynaklı anne ölümleri nitelikli ebelik bakımının önemini göstermektedir.

Gebelik dönemi boyunca ebe nitelikli bir öykü alma ile birlikte, baştan ayağa bir fizik muayene ve gerekli testleri yaparak gebe hakkında tüm verileri toplar ve bu doğrultuda bakım, izlem ve danışmanlık hizmetlerini planlar. Gebelik dönemindeki ebelik bakımının amacı kadının sağlık durumunu yükseltmek, gebeliğe adaptasyonunu sağlamak, var olan ya da olabilecek sağlık problemlerini erken dönemde tespit etmek ve gerekli işlemleri yaparak kadın ve aileye destek olmaktır. Ebelik bakımı ile gebenin ve fetüsün sağlığını korumanın yanı sıra kadın ve ailesine kapsamlı danışmanlığın sağlanması, gebenin yanlış alışkanlıklarının düzeltilmesi, yeni bilgilerin kazandırılması, sağlığın geliştirilmesi ve ailenin bebeğin getireceği sorumluluklara hazırlanması amaçlanmaktadır.

Gebelik döneminde sunulan bakım hizmeti ile ebe hem kadını hem de ailesini gebelik, doğum ve doğum sonu döneme hazırlar.

Gebenin Sağlığını Değerlendirme

Gebenin değerlendirilmesi çok yönlü bir yaklaşımı gerektirir. Özellikle gebe ile ilk karşılaşmada kapsamlı bir değerlendirmeye ihtiyaç vardır. Genetik hastalık değerlendir-

Gebenin Sağlığını Değerlendirmede Ebenin Rolü

Ebeler, gebelik döneminde kadınları genetik hastalıklar, teratojen maddeler, aşılama, kronik hastalıklar ve beslenme gibi konularda bilgilendirmeli ve bu konuların önemini vurgulamalıdır. Gebelikte tehlike işaretleri, beslenme dâhil sağlık açısından dikkat edilmesi gereken durumlar, gebelikte bağışıklama, kötü alışkanlıklar (sigara, alkol, madde), ilaç kullanımı ve radyasyona maruz kalma hakkında danışmanlık verilmelidir. Ebelerin sağlığı iyileştirmek için olumlu yaşam tarzı davranışlarını teşvik etmedeki rolü anne, çocuk ve gelecek nesiller için giderek daha önemli hâle gelmektedir. Böylece geliştirilen ulusal sağlık programları ve ebelerin verdiği nitelikli bakım ve danışmanlık ile olası risklerin erken dönemde tespiti sağlanarak gebelik, doğum ve doğum sonu dönem maternal ve fetal sağlığın yükseltilmesine katkıda bulunulacaktır.

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Öğrenim Hedefleri

- Sağlığın geliştirilmesi kavramını tanımlamak.
- Gebe sağlığının önemini açıklayabilmek.
- Gebelerin sağlığının geliştirilmesinin önemini açıklayabilmek.
- Gebelerin sağlığının geliştirilmesinde etkili olan sağlıklı yaşam biçimi davranışlarını açıklayabilmek.

Sağlığın geliştirilmesi

Tibbin ve teknolojinin gelişmesi, ticaretin artışı, küreselleşme ve seyahat kolaylığı gibi faktörler sağlığı pozitif yönde etkilerken, özellikle hareketsiz yaşam tarzı, sağlıksız beslenme alışkanlığı ve stresin artması gibi faktörler başta olmak üzere yaşam tarzında görülen olumsuz yöndeki değişiklikler sağlığı negatif yönde etkilemektedir. Ekonomik krizler, doğal afetlerin artması, çeşitli güvenlik tehditleri gibi faktörler diğer olumsuz etkileri ile sağlığı da olumsuz yönde etkilemektedir.

Geçmişte sağlık açısından en büyük risk olarak gösterilen bulaşıcı hastalıklar, günümüzde aşılanma ve diğer koruyucu önlemlerin varlığı nedeniyle eski etkisini gösteremese de göç gibi kitlesel nüfus hareketlerinin de etkisiyle yeniden yüksek risk faktörü olarak yaşantımızda yer almaya başlamıştır. Bunun yanında hastalık yükü de bulaşıcı olmayan kronik hastalıkların artması ve doğuştan beklenen yaşam süresinin uzamasıyla birlikte fazlasıyla artmıştır. Bu durum tedavi edici ve koruyucu sağlık hizmetleri sunanlar ve paydaşları içeren kapsamlı ve bütüncül yeni bir anlayışı doğurmuştur. Bu anlayış “Sağlığın Geliştirilmesi” olarak adlandırılmaktadır. Sağlığın geliştirilmesi insanların sağlık durumuna ulaşmaları için yaşam alanlarının olumlu hâle getirilmesi ve yaşam tarzlarını değiştirmeleri için yapılan bilimsel bir yaklaşımdır. Sağlığın geliştirilmesi toplumun sağlıklı olma, sağlıklı yaşam ve sağlığı destekleyen toplumsal aktiviteler konusunda daha duyarlı olmasını, kişilerin sağlıklı ve iyi olma hâlini sağlayan politikalar, sistemler, çevreyi geliştirme ve

minde anne adayına yeterli düzeyde destek vererek gebelik sürecini daha güçlü ve sağlıklı geçirmesi, stres düzeylerinin azaltılması konusunda destek verilmelidir. Bunu yapabilmek için sağlık profesyonelinin empatik anlayışa dayalı iletişim kurabilmesi önemlidir. Uluslararası Ebeler Konfederasyonu; bir ebeğin mesleki yetkinlik kriterleri arasında en temel kriterin empatik anlayışa dayalı iletişim olduğunu belirtmektedir. Ebeğin empatik iletişim becerisinin iyi düzeyde olması doğum eylemi ve doğum sonu döneme yönelik olumlu etki / katkıları sağlar. Etkili iletişim süreci, bütüncül bakım vermeyi, kadının duygularının, ihtiyaçlarının ve bakış açısının anlaşılmasını, empatik yaklaşım ile bireysel farklılıklarının (kültür, etnik köken, maneviyat vb.) değer kazanmasını, özel iletişim ihtiyaçları olan kadınlar ile uygun iletişim kurulmasını sağlar. Literatürde, kadınların ebelerden en büyük beklentilerinin empatik iletişim becerileri olduğu, bu becerinin hiçbir alet ya da girişimle yerinin doldurulamayacağı vurgulanmaktadır. Kadınların empatik iletişim becerileri yönündeki beklentilerin başlıcaları saygı, güler yüzlü olma, etkin dinleyici olma, samimi ve içten olma, yol gösterici ve cesaret verici olma, mahcup edici ve yargılayıcı kelimeleri kullanmama, kadını kendisi ve bebeğini ilgilendiren süreçlerde kararlara dâhil etme, geri bildirimde bulunma ve rahatlatmadır.

Doğal bir süreç olan gebelik döneminde maternal ve fetal iyilik durumu için sağlıklı yaşam davranışları kaçınılmazdır. Anne adayının bu süreçte sağlığını koruması ve gelişebilmesi için bu bölümde ele alınan önerilerin, yaşamın ve sağlık hizmetlerinin içinde yer alması, gebelik sürecinde olumsuz sağlık davranışlarının saptanabilmesi için farkındalık oluşturulması, saptanan olumsuz sağlık davranışlarının gebe ile birlikte değerlendirilmesi ve değiştirilmesi yönünde destek sağlanması gebelik sürecinin anne adayı ve bebek merkezinde aile ve toplum açısından sağlıklı, rahatlık ve mutluluk içinde tamamlanmasında önemli bir role sahiptir. Bireylere verilecek sağlık eğitimleri, sosyoekonomik durumlarının iyileştirilmesi, ekonomik maliyetlerin azaltılması ve sağlık hizmetlerine ulaşımın kolaylaştırılması gibi birçok girişim bireyin sağlıklı davranışlarını artıracaktır. Ülkemiz sağlık sisteminde ebeler ve hemşireler gebe kadınlara yararlı sağlık davranışları kazandırma konusunda kilit sağlık profesyonelleridir.

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15. Bölüm

DOĞUM ÖNCESİ BAKIM

Seval Cambaz Ulaş, Seçil Köken Durgun

Öğrenim hedefleri

- Doğum öncesi bakımın tanımını yapabilmek.
- Doğum öncesi bakımın önemini kavrayabilmek.
- Doğum öncesi bakımın amacını öğrenebilmek.
- Yeterli doğum öncesi bakımı anlayabilmek.
- Doğum öncesi bakımın izlem basamaklarını öğrenebilmek.
- Doğum öncesi bakımında risk değerlendirme kriterlerini öğrenebilmek.

Doğum öncesi bakım (DÖB), gebeliğin, anne ve bebek yönünden en iyi biçimde yaşanması için gebenin izlenmesi, sorunların erken dönemde saptanması, tetanoz bağışıklamasının sağlanması, sağlık eğitimi verilmesi, gebenin doğuma ve lohusalık sürecine hazırlanması için eğitilmiş bir sağlık personeli tarafından verilen sağlık bakım hizmetidir.

Doğum öncesi bakımın önemi

Temelde koruyucu bir sağlık hizmeti olan DÖB, hem kadın sağlığı hem de çocuk sağlığı açısından gerekli müdahaleleri uygulamayı sağlayan önemli bir fırsattır. Mevcut kanıtlar DÖB almayan ya da yetersiz DÖB alan kadınların bebeklerinin erken doğma, düşük doğum ağırlıklı doğma ve yenidoğan yoğun bakım ünitesinde yatma oranlarının yüksek olduğu, aynı zamanda bu ülkelerde anne ölüm oranının ve perinatal ölüm hızının yüksek olduğu bildirilmektedir. Anne ölüm oranı ve perinatal ölüm hızı bir ülkedeki kadın sağlığı ve obstetrik hizmetlerin göstergesidir. Aynı zamanda bir kadının gebelik ve doğum sırasında aldığı yeterli sağlık hizmetlerinin kanıtıdır. Dünya Sağlık Örgütü'nün (DSÖ) 2019 yılında yayınladığı raporda; anne ölüm oranı yüz binde dünya ortalaması 211, Sahra altı Afrika'da 542, Güney Asya'da 157, gelişmiş ülkelerde ise 12'dir. Dünyadaki perinatal ölüm hızı ise gelişmiş ülkelerde binde 8 ile 10 arasında, gelişmekte olan ülkelerde binde 40 ve üzerinde olduğu bilinmektedir. Dünyadaki gebe kadınların %86'sı en az bir kez

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16. Bölüm

DOĞUM ÖNCESİ EĞİTİM

Hanife Nurseven Şimşek

Öğrenim Hedefleri

- Doğum öncesi eğitim felsefelerinin çeşitlerini tanımlayabilmek.
- Doğum öncesi eğitimde kullanılan teknikleri tanımlayabilmek.
- Doğum öncesi eğitimleri kolaylaştırmak için ebelerin güvenini ve becerilerini geliştirmek.

Doğurganlık çağı, kadınlar, çocuklar ve aileler üzerinde derin ve uzun süreli etkileri olan deneyimleri kapsamaktadır. Bu nedenle sağlık profesyonelleri, eğitim ve hazırlığın başarılı gebelik ve doğum deneyimi için temel bileşenler olduğunu belirtmektedir. Doğum öncesi eğitim programlarının amaçları; sağlık davranışlarını etkilemek, kadınların doğum yapabileceğine dair güvenini arttırmak, kadınları ve eşlerini doğuma ve ebeveynliğe hazırlamak, sosyal destek ağlarını geliştirmek, ebeveynlerin kendilerine olan güvenini arttırmak ve perinatal morbidite ve mortaliteyi azaltmaktır. Bu nedenle doğum öncesi eğitim, ebeveynlerin ve ebeveyn adaylarının gebelik, doğum eylemi ve ebeveynlik sırasında kendi sosyal, duygusal, psikolojik ve fiziksel ihtiyaçlarını anlamalarına yardımcı olan bir dizi eğitici ve destekleyici yollardan oluşur.

1930'lu yılların sonlarına kadar doğumların çoğu evde gerçekleşmiştir. Doğum, kadınların yaşamında normal bir olay olarak görülmekteyken kadınların çoğunluğu gebelik ve doğumda anneleri, büyükanneleri veya kız kardeşleri tarafından desteklenmekteydi. Ancak doğumların hastane ortamına taşınmasıyla birlikte kadınların doğum ve doğuma katılanlarla ilişkisi değişmiş, sosyal desteği azalmış ve yalnızlaşmışlardır. Kadınlar savunmasız oldukları bu dönemde, hastane rutinleri ve prosedürlerine hazırlıksız oldukları için doğum süreci hakkında korku ve endişe yaşamaya başlamışlardır. Böylece geleneksel bilgi paylaşım yöntemlerinin azalmasıyla, doğum ve ebeveynliğe hazırlık eğitimleri ortaya çıkmıştır. Ancak bu programlar, katılımcıların ifade edilen ihtiyaçlarına değil, eğitimcilerin vermele-ri gerektiğine inandıkları mesaja dayanmaktadır.

Bireysel eğitimlerin uzunluğu, mekânın müsaitliğine göre belirlenebilir. Daha kısa eğitimler, ağır gebe kadınlar ve yorgun babalar için daha tolere edilebilir ancak eğitimlerin uzunluğu ne olursa olsun, yetişkin öğreniminin bazı temel özelliklerini tanımak önemlidir. Bir yetişkinin ortalama dikkat süresi yaklaşık 10 dakikadır. Beynin işlevini yerine getirebilmesi için suya, glikoza ve proteine ihtiyacı vardır. Eğitimlerin ortasında verilen bir mola, ebeveynlerin sosyalleşmesi, bir şeyler içmesi ve bir şeyler yemesi için zaman tanır ve böylece gruba döndüklerinde dikkatlerini ve öğrenme güçlerini artırır.

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17. Bölüm

GEBELİKTE BESLENME

Hatice Gürgen Şimşek

Öğrenim Hedefleri

- Gebelikte beslenmenin anne ve çocuk sağlığına etkilerini tanımlayabilmek.
- Gebelikte artan kalori gereksinimini fark edebilmek.
- Gebelik öncesi vücut ağırlığına göre gebelikte önerilen kilo alım düzeylerini sayabilmek.
- Besin ögesi gruplarının işlevlerini ve gebelik üzerindeki etkilerini fark edebilmek.
- Gebelikte yeterli ve dengeli beslenmenin önemini fark edebilmek.
- Gebelikte yeterli ve dengeli beslenmek için öneriler sunabilmek.
- Gebelikte gıda güvenliğinin önemini ve dikkat edilmesi gereken durumları sayabilmek.

“Beslenme” kavramı, Beden Kitle İndeksi’ni (BKİ), vücut yapısını, tüketilen gıdayı ve bireyin tıbbi durumunu içerir ve vücut ihtiyaçlarının gerekli besinlerle karşılanıp karşılanmadığını yansıtır.

Gebelik dönemi hem anne sağlığı hem de fetüsün ileriki dönemde sağlığı için önemli bir belirleyicidir. Gebelik, maternal ve fetal ihtiyaçları karşılamak için yeterli enerji, protein, vitamin ve mineral alımını içeren sağlıklı bir diyet gerektirir. Sağlıklı ve dengeli beslenmek, gebelik sırasında yapılabilecek en iyi şeylerden biridir. Bu şekilde beslenmek, gebelik ilerledikçe vücudun ekstra taleplerini karşılamaya yardımcı olur. Buradaki amaç, fetüsün büyümesini desteklemek için yeterli besin almayı ve sağlıklı bir kiloyu korumayı dengelemektir. Gebelikte gereksinim duyulan enerji ve besin öğelerinin alınması, uygun vitamin/mineral desteğinin sağlanması, gebelikte risk oluşturabilecek gıdalardan kaçınılması, güvenilir gıdaların seçilmesi temel yaklaşımdır.

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18. Bölüm

GEBELİKTE CİNSELLİK

Şule Gökyıldız Sürücü

Öğrenim Hedefleri

- Gebelikte cinsel işlev siklüsünde görülen değişiklikleri açıklayabilmek.
- Gebelikte cinsel aktivite değişikliklerinin nedenlerini açıklayabilmek.
- Gebelikte cinsel sağlık danışmanlığının önemini kavrayabilmek.

Biyolojik, sosyal, kişiler arası ve kültürel yönleri olan cinsellik; insan yaşamının önemli bir parçasıdır. Çok boyutlu ve komplekstir. Kültürel farklılıklar görülmekte birlikte aynı kültürde ve her bireyin yaşam dönemi içinde değişir.

Gebelik, genellikle bir cinsel ilişkinin sonucu oluşmasına karşın kadının cinsel yaşamı bundan sonra çoğunlukla unutulmaktadır. Gebelik, ebeveynlerin büyük uyumunu kapsayan fizyolojik bir olaydır. Her iki eş için birçok değişikliğin olduğu ve farklı hislerin yaşandığı bir dönemdir. Gebelik döneminde anatomik, fizyolojik ve ruhsal değişimlerin bir sonucu olarak cinsel yaşam etkilenmektedir.

Gebelikte Cinsel İşlev Siklüsü Değişiklikleri

Gebelikte cinsel yaşamda ortaya çıkan değişiklikler, cinsel işlev siklüsünün fazlarına göre aşağıda incelenmiştir.

İstek fazı

Gebeliğin farklı dönemlerinde cinsel istek azalır veya artar. Bireysel farklılıklar olmakla beraber genellikle gebelikte kadının cinsel isteği I. trimesterde azalır, II. trimesterde geri döner veya artar ve III. trimesterde tekrar azalır.

Uyarılma fazı

Gebelikte cinsel uyarı olmaksızın artmış vazokonjesyon mukoid akıntıyı artırır. Genel olarak cinsel uyarı sonucu vajinal lubrikasyon gebelikte daha çabuk ve daha çok miktarda olur.

Cinsel konforu artırma için gebenin kegel, pelvik sallama, çömelerek oturma egzersizleri yapması önerilir.

Cinselliğin sadece cinsel birleşme ile sınırlanamayacağı, özellikle vajinal ilişkinin yasaklandığı çiftlere öpüşme, karşılıklı erotik masaj ve mastürbasyon, oral seksle çiftlerin haz alabileceği cinsel aktiviteler önerilir.

Hekim tarafından cinsel ilişki kısıtlaması yapılan gebelere gebelikte yaşanan soruna göre danışmanlık ve bilgilendirme yapılmalıdır. Cinsel ilişkinin kısıtlanma nedenleri açıklanmalı ve gebenin/çiftin endişeleri giderilmelidir.

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GEBELİKTE SIK RASTLANAN YAKINMALAR VE BELİRTİLERİ

Yonca Çiçek Okuyan

Öğrenim Hedefleri

- Gebelikte sık rastlanan yakınmaları kavrayabilmek.
- Gebelikte sık rastlanan erken dönem yakınmaları belirleyebilmek.
- Gebelikte sık rastlanan geç dönem yakınmaları belirleyebilmek.
- Gebelikte sık rastlanan yakınmaların nedenlerini sıralayabilmek.
- Gebelikte sık rastlanan yakınmalar için öneriler verebilmek.

Gebelik, normal bir fizyolojik olaydır. Gebelik sürecinde fizyolojik ve anatomik değişiklikler ortaya çıkmaktadır. Bu değişiklikler sonucunda oluşan, tedavi gerektirmeyen hafif rahatsızlıklar ve yakınmalar gebe kadın tarafından önemli olarak algılanabilmektedir. Gebeliğin birinci trimesterında olan yakınmalar erken dönem yakınmaları, ikinci ve üçüncü trimesterında olan yakınmalar ise geç dönem yakınmaları olarak adlandırılmaktadır. Bu yakınmaların fizyolojik, psikolojik, anatomik nedenlerinin bilinmesi; bunlara yönelik önerilerin anlaşılmasında, bakım planı yapılmasında kolaylık sağlamaktadır. Bu yakınmalara yönelik öneriler ülkemizde Sağlık Bakanlığının eğitim kitapçıklarında, Dünya Sağlık Örgütünün Antenatal Bakım Rehberi'nde bulunmaktadır. Günümüzde yapılan çalışmalarda bu önerilerin düzeyleri A,B,C,D,I olarak sınıflandırılmaktadır. Önerilere yönelik kanıtların kalitesi ise iyi, orta, zayıf olarak sınıflandırılmaktadır.

Birinci Trimesterde Sık Görülen Yakınmalar (Erken Dönem)

Bulantı / kusma (ilk üç ay)

Nedeni kesin olarak bilinmemektedir. Gebelikte HCG (Human Chorionic Gonadotropin) hormonu düzeyinin yükselmesinin, gastrointestinal sistemde peristaltik hareketlerin yavaşlamasının, annenin gebeliğe ve gebeliğin getireceği durumlarda gösterdiği psikolojik tepkinin, karbonhidrat metabolizmasındaki değişikliğin gebelikte bulantı ve kusmanın nedenlerinden olabileceği düşünülmektedir. Sabah erken saatlerde bulantı ve kusma daha

Öneriler

Kontraksiyon hissedildiğinde sol lateral pozisyonda dinlenmesi, gevşeme egzersizleri uygulaması önerilebilir.

Round ligament ağrısı

Büyüyen uterusun basısı, round ligamentlerde gerilmeye ve hipertofiyeye neden olur. Ani hareket durumunda alt abdomenin sağında ve solunda keskin ve ani ağrı hissedilmesine “round ligament ağrısı” adı verilir. Ektopik gebelikte de aynı bölgede ağrı hissedildiği için gebe ektopik gebelik açısından değerlendirilmelidir.

Öneriler

Round ligament ağrısının ani hareketlerde olabileceği, abdomenin altında inguinal alanda tutulma hissi yaşanabileceği, ağrı olmaması için oturur pozisyondan ya da yatar pozisyondan ayağa kalkma pozisyonuna hızlı geçmemesi, ani hareketlerden kaçınması, ağrı geliştiğinde abdomene sıcak uygulama yapması dizlerini abdomene çekerek dinlenmesi önerilir. Gebenin endişelenmemesi için üçüncü trimesterden önce gebeye bilgilendirme yapılabilir.

Terleme

İlk trimesterden sonra cilde kan akımının artması ve metabolizmanın artması terleme nedenlerindedir.

Öneriler

Gebeye bol su içmesi, bol ve pamuklu giysiler giymesi, sık sık banyo yapması, cildi nemli bırakmaması, iyi kurulanması, cilt bakım losyonları kullanması önerilebilir.

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Dr. Ferda Öztürk Kömleksiz - Dr. Gül Kahveci



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İÇİNDEKİLER

ÖN SÖZ	V
BÖLÜM 1 OKUL ÖNCESİ ÖZEL EĞİTİMDE MÜZİK ETKİNLİKLERİ.....	1
GİRİŞ	1
MÜZİĞİN BEYİN FONKSİYONLARI ÜZERİNDEKİ ETKİSİ.....	4
KULAKTAN BEYNE.....	10
MÜZİK VE BEYİN İLİŞKİSİ	12
MÜZİĞİN BİLİŞSEL GELİŞİM ÜZERİNDEKİ ETKİSİ	13
MÜZİK EĞİTİMİNİN ÇOCUĞUN YÜRÜTÜCÜ İŞLEVLERİ	
ÜZERİNDEKİ ETKİSİ	16
BÖLÜM 2 ÇOCUĞUN GELİŞİMİNDE MÜZİK ETKİNLİKLERİ	19
FİZİKSEL GELİŞİM	21
ÇOCUKLARDA MÜZİKSEL İLETİŞİM.....	22
ÇOCUKLARDA AİDİYET VE SINIRLAR	24
MÜZİKTE ARACILIK	26
BÖLÜM 3 ÖZEL GEREKSİNİMİ OLAN ÇOCUKLARDA MÜZİK ÖĞRETİMİ....	33
DAVRANIŞ SORUNU OLAN ÇOCUKLARDA MÜZİK ÖĞRETİMİ.....	33
DUYGUSAL ZORLUKLARI OLAN ÇOCUKLARDA MÜZİK ÖĞRETİMİ	36
DUYUSAL ZORLUKLARI OLAN ÇOCUKLARDA MÜZİK ÖĞRETİMİ	38
FİZİKSEL YETERSİZLİĞİ OLAN ÇOCUKLARDA MÜZİK ÖĞRETİMİ	40
DOWN SENDROMU OLAN ÇOCUKLARDA MÜZİK ÖĞRETİMİ	41
Down Sendromunda Müzikle İletişim ve	
Sosyal-Duyuşsal Gelişim Alanı.....	42
OTİZM SPEKTRUM BOZUKLUĞU (OSB) OLAN ÇOCUKLARDA	
MÜZİK ÖĞRETİMİ	44
OSB Olan Çocuklarda Müzikle İletişim	47
OSB Olan Çocuklarda Müzik ve Sözlü İletişim	48

	Ötizm Spektrumundaki Çocuklar için Şarkı Söyleme Deneyimleri	49
	Taklit ve Doğaçlamalar	53
	Basit Tekrarlı Heceleri Olan Şarkılar	54
	Şarkılar ve Dil Gelişimi.....	54
	MÜZİK ETKİNLİKLERİNİ PLANLARKEN DİKKAT EDİLECEK NOKTALAR	55
	Şarkı Söylemede Öğretmenin Model Olması	55
	Şarkı Dağarcığı Oluşturulurken Yararlanılabilecek Müziksel Öneriler	56
	Küçük Çocuklarda Ses Aralıkları	59
	Çocuklarda Şarkı Öğretimi (Basamaklı Öğretim).....	61
BÖLÜM 4	PROGRAMIN TANITIMI VE MÜZİK ETKİNLİKLERİ	63
	1. ETKİNLİK ADI: ÜÇ RENK (KIRMIZI- SARI- MAVİ)	69
	2. ETKİNLİK ADI: ÜÇGEN, KARE, DAİRE (GEOMETRİK ŞEKİLLER)	74
	3. ETKİNLİK ADI: ÜÇ KÜPLE KÖPRÜ YAPARIM	77
	4. ETKİNLİK ADI: ALTI PARÇALI YAPBOZ.....	79
	5. ETKİNLİK ADI: YAŞAM ALANLARI	81
	6. ETKİNLİK ADI: AY, GÜNEŞ, BULUT, YILDIZ	83
	7. ETKİNLİK ADI: SAYI SAYALIM	86
	8. ETKİNLİK ADI: UZUN-KISA	89
	9. ETKİNLİK ADI: AZ-ÇOK.....	91
	10. ETKİNLİK ADI: AİLEM VE HAYVANLARIMIZ.....	93
	11. ETKİNLİK ADI: BİRLİKTE ÖĞRENİRİZ.....	96
	12. ETKİNLİK ADI: BÜYÜK-KÜÇÜK (KARINCA LEYLEK)	99
	13. ETKİNLİK ADI: İNSAN ÇİZERİM	104
	14. ETKİNLİK ADI: KANADIM VAR BENİM	107
	15. ETKİNLİK ADI: MASALLAR VE GERÇEKLER (HAYALÎ KARAKTERLER)	110
	16. ETKİNLİK ADI: MERHABA.....	112
	17. ETKİNLİK ADI: MUTLULUK (DUYGULAR).....	115
	18. ETKİNLİK ADI: DÜN BUGÜN YARIN	119
	19. ETKİNLİK ADI: DENGE	123
	20. ETKİNLİK ADI: GÜNAYDIN ARKADAŞIM.....	126
	21. ETKİNLİK ADI: HEDEFLERİME ULAŞACAĞIM	128
	22. ETKİNLİK ADI: KAŞIK ÇATAL BIÇAK KULLANIRIM	132
	23. ETKİNLİK ADI: KURBAĞA BULMACASI	135
	24. ETKİNLİK ADI: KÜÇÜK ÇOCUĞUN HİKÂYESİ	138
	25. ETKİNLİK ADI: KÜÇÜK KARDEŞ.....	140
	26. ETKİNLİK ADI: NEFES ALIRIM	142
	27. ETKİNLİK ADI: OYNAYALIM BİRLİKTE	145

28. ETKİNLİK ADI: PAYLAŞIRIM HEPSİNİ.....	148
29. ETKİNLİK ADI: TEMİZ ÇOCUK	151
30. ETKİNLİK ADI: ZIPLA ZIPLA.....	152
EKLER	155
EK 1. MEYVE RİTİM KARTLARI	155
EK 2. HAYVAN RİTİM KARTLARI	156
EK 3. ÇİÇEK RİTİM KARTLARI	157
KAYNAKLAR	161
YAZARLARIN ÖZ GEÇMİŞLERİ	173
Dr. Ferda Öztürk Kömleksiz	173
Dr. Gül Kahveci	174
SON SÖZ	175
ŞARKILAR	177

KAYNAKLAR

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3. Basım

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İÇİNDEKİLER

ÖN SÖZ.....	XV
KISIM I: KAVRAMSAL ÇERÇEVE VE BOYUTLAR.....	1
BÖLÜM 1: EĞİTİMDE KÜLTÜREL MODEL.....	3
BÖLÜM 2: KÜLTÜREL EĞİTİM MODELİNİN BOYUTLARI	7
1. EĞİTİM.....	7
1.1 Etkinlik Planlama	9
1.2 Eğitim Uygulamaları	11
1.3 Eğitim Çıktıları	16
2. EĞİTİM ORTAMI	19
2.1 Destekleyici.....	20
2.2 Güçlendirici (Öz Denetim)	22
2.3 Çevresel	25
3. AİLE EĞİTİMİ VE KATILIMI.....	27
3.1 Rehberlik	28
3.2 Projeler	28
3.3 Okul Aile İşbirliği.....	31
4. YÖNETİM	34
4.1 Personel Yapılanması.....	34
4.2 Motivasyon.....	35
4.3 Strateji.....	36
Sonuç Yerine	37

KISIM II: ETKİNLİKLER VE PLANLAR.....	39
BÖLÜM 3: MİLLÎ DİL ETKİNLİĞİMİZ	41
3.1. ATASÖZÜ	41
3.2. BİLMECELER.....	44
3.3. MANİLER	46
3.4. MASAL (KELOĞLAN)	48
3.5. FIKRA (NASRETTİN HOCA).....	52
3.6. HACİVAT İLE KARAGÖZ.....	54
3.7. NİNNİ.....	56
3.8. BOZKURT DESTANI	59
3.9. OĞUZ KAĞAN DESTANI.....	62
3.10. MANAS DESTANI.....	65
3.11. DEDE KORKUT	68
3.12. DEDE KORKUT	70
3.13. KÖROĞLU.....	73
3.14. BATTALGAZİ	76
3.15. DİVANI LÜGATİ’T TÜRK	78
3.16. KUTADGU BİLİG	80
3.17. EFSANELER (FERHAT İLE ŞİRİN)	82
3.18. GENÇ OSMAN.....	85
3.19. EFSANELER (KARACAOĞLAN)	87
3.20. EFSANELER (KIZ KULESİ)	90
3.21. EFSANELER (SARI KIZ).....	93
3.22. EFSANELER (FERHAT İLE ŞİRİN)	95
BÖLÜM 4: MİLLÎ SANAT ETKİNLİĞİMİZ.....	97
4.1. PATİK	97
4.2. PATİK	100
4.3. OYA.....	102
4.4. TAKI	104

4.5. AHŞAP OYMACILIĞI.....	106
4.6. CAM SANATLARI.....	108
4.7. CAM SANATLARI.....	110
4.8. KİLİM DOKUMA	113
4.9. KİLİM DOKUMA	115
4.10. EBRU SANATI	117
4.11. HAT SANATI.....	120
4.12. HAT SANATI.....	122
4.13. KALAYCILIK.....	125
4.14. KEÇECİLİK.....	127
4.15. BAKIRCILIK	129
4.16. DEMİRCİLİK.....	131
4.17. DEĞİRMENCİLİK	133
4.18. ÇÖMLEKÇİLİK.....	135
4.19. KEMAN.....	138
4.20. KEMENÇE	140
4.21. ZURNA.....	142
4.22. KOPUZ.....	144
4.23. BAĞLAMA	146
4.24. DAVUL-TAHTA KAŞIK.....	148
4.25. DAVUL-TAHTA KAŞIK.....	150
4.26. DOMBRA	153
4.27. NEY	155
4.28. LÜLE TAŞI.....	157
4.29. MİNYATÜR.....	159
4.30. NAZARLIK	161
4.31. NAZARLIK	163
BÖLÜM 5: MİLLÎ YEMEK ETKİNLİKLERİ	165
5.1. ANALIKIZLI ÇORBASI.....	165
5.2. AŞURE YAPIYORUZ	168

5.3.	AYRAN.....	170
5.4.	AYRAN.....	172
5.5.	BAMYA ÇORBASI.....	175
5.6.	BOZA-ŞIRA	178
5.7.	CANTIK	181
5.8.	CEVİZLİ SUCUK.....	183
5.9.	ÇİĞ BÖREK	186
5.10.	DOLMA.....	189
5.11.	DÜĞÜN PİLAVI	192
5.12.	EZOGELİN ÇORBASI.....	195
5.13.	GÖBETE	198
5.14.	GÖZLEME.....	201
5.15.	GÖZLEME.....	204
5.16.	GÜLLAÇ.....	206
5.17.	HAMSİ TAVA	208
5.18.	HELVA	211
5.19.	HELVA	213
5.20.	HÖŞMERİM	215
5.21.	KABAK TATLISI	218
5.22.	KAZANDIBİ	221
5.23.	KEŞKEK.....	223
5.24.	KISIR YAPIYORUZ.....	225
5.25.	KURU FASULYE.....	227
5.26.	KURU FASULYE.....	229
5.27.	LOKUM.....	231
5.28.	MANTI.....	233
5.29.	MERCİMEK ÇORBASI.....	236
5.30.	MERCİMEK ÇORBASI.....	238
5.31.	MERCİMEKLİ BULGUR PİLAVI.....	240
5.32.	SİMİT	242

5.33. SİMİT	245
5.34. ŞEKERPARE	247
5.35. YOĞURT MAYALİYORUZ.....	251
5.36. TARHANA YOĞURUYORUZ.....	254
5.37. TARHANA HAMURUNU SERİYORUZ.....	256
5.38. TÜRK KAHVESİ	258
5.39. TÜRK KAHVESİ	260
5.40. YAPRAK SARIYORUZ.....	262
5.41. YAYLA ÇORBASI	265
BÖLÜM 6: MİLLÎ TARİH ETKİNLİĞİMİZ.....	267
6.1. ESKİ TÜRKLER	267
6.2. ESKİ TÜRKLER	270
6.3. KARAHANLILAR VE SELÇUKLULAR.....	273
6.4. KKTC	276
6.5. OSMANLI DEVLETİ.....	278
6.6. OSMANLI DEVLETİ (MİMARİ ÖZELLİKLER)	282
6.7. SALTUK BUĞRA HAN	284
6.8. TÜRK DEVLETLERİ (DAĞISTAN, KARADEY-BALKAR, KARAÇAY-ÇERKEZ).....	286
6.9. TÜRK DEVLETLERİ (GAGAVUZ ÖZERK CUMHURİYETİ, ROMANYA (KÖSTENCE))	288
6.10. TÜRK DEVLETLERİ (GAGAVUZ ÖZERK CUMHURİYETİ- ROMANYA (KÖSTENCE))	290
6.11. TÜRK DEVLETLERİ (KAZAKİSTAN, KIRGIZİSTAN, ÖZBEKİSTAN, TÜRKMENİSTAN, AZERBAYCAN, DOĞU TÜRKİSTAN)	292
6.12. TÜRK DEVLETLERİ (KAZAKİSTAN, KIRGIZİSTAN, ÖZBEKİSTAN, TÜRKMENİSTAN, AZERBAYCAN, DOĞU TÜRKİSTAN)	294
6.13. TÜRK DEVLETLERİ (TUVA-ALTAY-HAKASYA-YAKUTİSTAN).....	297
6.14. TÜRKİYE CUMHURİYETİ	300
6.15. TÜRKİYE CUMHURİYETİ	303

BÖLÜM 7: HAYVANLARIMIZ	305
7.1. ATÇILIK	305
7.2. KARTALLAR	307
7.3. ARICILIK.....	310
7.4. ARICILIK.....	313
7.5. GÖKBÖRÜ	316
BÖLÜM 8: GELENEKSEL KIYAFETLER VE FOLKLOR	319
8.1. ANKARA SEĞMENLERİ.....	319
8.2. TRAKYA YÖRESİ	321
8.3. KARADENİZ BÖLGESİ	323
8.4. EGE EFELERİ	326
8.5. İÇ ANADOLU BÖLGESİ	329
8.6. DOĞU VE GÜNEYDOĞU ANADOLU BÖLGELERİ	331
BÖLÜM 9: GELENEK GÖRENEK ETKİNLİKLERİ	333
9.1. NEVRUZ.....	333
9.2. BAYRAM.....	336
9.3. MİSAFİRPERVERLİK.....	339
9.4. SELAMLAŞMA.....	341
9.5. SÜNNET	344
9.6. ASKER UĞURLAMA	347
9.7. HIDRELLEZ	349
9.8. KÖY ODASI	352
9.9. TÜRK ÇADIRI	354
9.10. DÜĞÜN (KIZ İSTEME-SÖZ KESME-NİŞAN).....	356
9.11. DÜĞÜN (KINA-DÜĞÜN-ÇEYİZ)	358
9.12. BEBEK BAKIMI (AD KOYMA, KUNDAKLAMA VE TUZLAMA)	361
9.13. BEBEK BAKIMI (KIRKLAMA, KIRK UÇURMA, DIŞ BUĞDAYI).....	364
BÖLÜM 10: MİLLÎ OYUN ETKİNLİKLERİ	367
10.1. AĞZINI YUM.....	367

10.2. AŞIK.....	369
10.3. AT YARIŞI	372
10.4. BEŞ TAŞ	374
10.5. BEZİRGÂN BAŞI	377
10.6. BİLEK GÜREŞİ.....	379
10.7. BİRDİRBİR.....	381
10.8. BOYA OYUNU	384
10.9. ÇELİK ÇOMAK.....	387
10.10. ÇUVAL YARIŞI.....	391
10.11. EVSİZ TAVŞAN.....	393
10.12. FIRILDAK.....	395
10.13. HALAT ÇEKME	397
10.14. İP OYUNU.....	400
10.15. İSTOP	402
10.16. KAZLAR KAZLAR.....	405
10.17. KEDİ SIÇAN (FARE).....	408
10.18. KİM GEREK	411
10.19. KİM GEREK	414
10.20. KIZLAR KIZLAR ÇIK	417
10.21. KÖPRÜ.....	420
10.22. KÖREBE.....	424
10.23. KÖŞE KAPMACA	426
10.24. KULAKTAN KULAĞA	428
10.25. KUYRUK YAKALAMA.....	431
10.26. LASTİK ATLAMA	433
10.27. MENDİL KAPMACA	435
10.28. MİSKET	438
10.29. PARMAK TUTMA.....	440
10.30. SAKLAMBAÇ.....	442
10.31. SAPAN	444

10.32. SEK SEK.....	447
10.33. SEMAVER.....	449
10.34. ŞAPKA	452
10.35. TOPAÇ	454
10.36. UÇTU UÇTU.....	457
10.37. ÜÇ TAŞ	459
10.38. ÜÇ TAŞ	462
10.39. YAĞ SATARIM BAL SATARIM	464
10.40. YAKAN TOP.....	466
10.41. YERDEN YÜKSEK	469
10.42. YUMURTA TAŞIMA.....	471
10.43. YUMURTA TAŞIMA.....	474
10.44. YÜZÜK SAKLAMA.....	477
10.45. OKÇULUK.....	480
KAYNAKLAR.....	483
EKLER	487
Ek 1: Model Geliştirme Sürecinde Anaokulunda Görev Alan Çalışanlar	487
Ek 2: Kültürel Etkinlik Konuları	489
Ek 3: Anaokulu İç Mekânında Kullanılan İsimler	491
Ek 4: Anaokulu Genel Kural Listeleri	492
Ek 5: Personel Görev Tanımları.....	493
Ek 6: Ayın Personeli Anketi.....	499
Ek 7: Öğretmen Adayı Değerlendirme Gözlem Formu.....	500
Ek 8: Ağız ve Diş Sağlığı Etkinlik Örnekleri.....	502

KAYNAKLAR

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İÇİNDEKİLER

BİRİNCİ BÖLÜM

<i>OPTİMİZASYONA GİRİŞ</i>	1
1.1 GİRİŞ.....	1
1.2 TEMEL TANIMLAR.....	2
1.3 YÖNTEMLER	3
1.3.1 Türeve Tabanlı Yöntemler.....	4
1.3.2 Doğrudan Yöntemler	4
1.3.3 Yapay Zekâ Optimizasyon Yöntemleri	4
1.4 ALGORİTMALAR	5
1.4.1 Sayısal Optimizasyon Algoritmaları	5
1.4.2 Yapay Zekâ Temelli Optimizasyon Algoritmaları	5
1.5 MATEMATİKSEL TANIM	8
1.5.1 Maksimum ve Minimum Arasındaki İlişki	8
1.6 OPTİMİZASYONUN SINIFLANDIRILMASI	9
1.7 YAPAY ZEKÂ TEMELLİ OPTİMİZASYON YÖNTEMLERİNİN SINIFLANDIRILMASI	13
1.8 MATLAB'DA OPTİMİZASYON.....	15

İKİNCİ BÖLÜM

<i>OPTİMİZASYONDA TEMEL KAVRAMLAR</i>	17
2.1 GİRİŞ.....	17
2.2 MİNİMUMUN VARLIĞI.....	17
2.2.1 Weierstrass Teoremi	17
2.3 KUADRATİK FORMLAR	18
2.3.1 Hessian Matris ve Fonksiyon Arasındaki İlişki.....	19
2.4 KONVEKS VE KONKAV FONKSİYONLAR	21
2.4.1 Bölgesel Minimum ve Maksimum Noktalar	23
2.4.2 Konveks Fonksiyon	26
2.4.3 Konkav Fonksiyon.....	30
2.4.4 Konvekslik ve Konkavlığın Değerlendirilmesi	32

2.5	EŞYÜKSELTİ EĞRİLERİ İLE OPTİMİZASYON ARASINDAKİ İLİŞKİ.....	36
2.6	ÖZDEĞERLERLE OPTİMİZASYON ARASINDAKİ İLİŞKİ.....	39
2.7	KÖK İLE OPTİMİZASYON ARASINDAKİ İLİŞKİ.....	46
2.8	SAYISAL OPTİMİZASYONDA YAKINSAKLIK.....	50
2.9	KISITSIZ FONKSİYONLARDA OPTİMALLIK KOŞULLARI.....	51
2.9.1	Tek Değişkenli Optimizasyon	51
2.9.1.1	<i>N</i> . Türev Testi.....	54
2.9.2	Çok Değişkenli Optimizasyon.....	56
2.9.2.1	İki Değişkenli Fonksiyonlar için Gerek ve Yeter Koşullar	57
2.9.2.2	Üç ve Daha Fazla Değişken Olması Durumunda Gerek ve Yeter Koşullar	63

ÜÇÜNCÜ BÖLÜM

<i>MATLAB İLE OPTİMİZASYON</i>	67
3.1 GİRİŞ.....	67
3.2 HAZIR FONKSİYONLARLA OPTİMİZASYON	67
3.2.1 Tek Değişkenli Doğrusal Olmayan Kısıtsız Fonksiyonlar	69
3.2.2 Eşitlik veya Eşitsizlik Kısıtlı Doğrusal Olmayan Fonksiyonlar	73
3.2.3 Çok Değişkenli, Çok Fonksiyonlu Eşitlik veya Eşitsizlik Kısıtlı Sistemler.....	78
3.2.4 Çok Değişkenli Doğrusal Programlama Problemlerinin Çözümü	80
3.2.5 Kısıtsız Çok Değişkenli Problemlerinin Çözümü	81
3.2.6 Doğrusal Olmayan Tek Değişkenli Problemlerin İstenen Aralıkta Çözümü ...	82
3.2.7 Kuadratik Fonksiyonun Çözümü.....	83
3.3 GEREK ve YETER KOŞULLARLA OPTİMİZASYON	85

DÖRDÜNCÜ BÖLÜM

<i>KISITSIZ TEK DEĞİŞKENLİ FONKSİYONLARDA OPTİMİZASYON</i>	91
4.1 GİRİŞ.....	91
4.2 SAYISAL OPTİMİZASYON YÖNTEMLERİ	97
4.2.1 Grafik Yöntemle Optimizasyon.....	100
4.2.2 Bölgesel Eleme Yöntemleri.....	102
4.2.2.1 Eşit Aralık Arama Yöntemi.....	103
4.2.2.2 İkiye Bölme Yöntemi	111
4.2.2.3 Altın Oran Arama Yöntemi	117
4.2.2.4 Fibonacci Arama Yöntemi	128
4.2.2.5 Swann Yöntemi	135
4.2.3 Birleştirilmiş Yöntemlerle Optimizasyon.....	143
4.2.3.1 Dekker Yöntemi ile Optimizasyon.....	143
4.2.3.2 Brent Yöntemi ile Optimizasyon.....	151
4.2.4 Türeve Dayalı Yöntemlerle Optimizasyon.....	161
4.2.4.1 İkiye Bölme Yöntemi	161
4.2.4.2 Newton-Raphson Yöntemi	167

4.2.4.3	Kiriş Yöntemi	178
4.2.5	Model Tabanlı Optimizasyon Yöntemleri.....	185
4.2.5.1	Weierstress'in Polinom Yaklaşımı	186
4.2.5.2	Kuadratik Polinomla Optimizasyon	194
4.2.5.3	Kübik Polinomla Optimizasyon	209

BEŞİNCİ BÖLÜM

KISITSIZ ÇOK DEĞİŞKENLİ FONKSİYONLARDA OPTİMİZASYON.....223

5.1	GİRİŞ.....	223
5.2	SAYISAL OPTİMİZASYON YÖNTEMLERİ	224
5.2.1	Doğrudan Arama Yöntemleri	227
5.2.1.1	Rastgele Arama Yöntemi	236
5.2.1.2	Tek Değişkenli Yöntem.....	241
5.2.1.3	Powell'in Eşlenik Yönler Yöntemi	251
5.2.1.4	Nelder-Mead Yöntemi.....	258
5.2.2	İniş Yöntemleriyle Optimizasyon.....	265
5.2.2.1	En Dik İniş Yöntemi.....	266
5.2.2.2	Newton Yöntemi	276
5.2.2.3	Marquardt Yöntemi	280
5.2.2.4	Yarı-Newton Yöntemleri.....	285
5.2.2.5	Davidon–Fletcher–Powell Yöntemi	290
5.2.2.6	Broyden–Fletcher–Goldfarb–Shanno Yöntemi.....	295

ALTINCI BÖLÜM

DOĞRUSAL PROGRAMLAMA YÖNTEMLERİ.....301

6.1	GİRİŞ.....	301
6.1.1	Optimizasyon Probleminin Doğrusal Programlama Modeline Dönüşümü	302
6.1.2	Doğrusal Programlamanın Matematik Modeli	303
6.1.3	Doğrusal Programlama Modelinin Çözümünde Kullanılan Terimler	304
6.1.4	Doğrusal Programlama Modelinin Çözümü.....	305
6.2	KÖŞE NOKTASI YÖNTEMİ.....	305
6.2.1	Doğrusal Programlama Model Türleri	328
6.2.1.1	Primal Form.....	328
6.2.1.2	Kanonik Form.....	329
6.2.1.3	Standart Form	330
6.2.1.4	Dual Form.....	331
6.2.1.5	Dual Form.....	331
	Normal Maksimum/Minimum Problemlerin Dualinin Alınması	332
	Asimetrik DP Probleminin Dualinin Alınması.....	334
	Zayıf Duallik Özelliği.....	335
	Güçlü Duallik Özelliği.....	335
6.3	SİMPLKS YÖNTEMİ	339
6.3.1	Simpleks Tablosu ve Kullanılan Değişkenler	343

6.3.2	Aylaklığın Tamamlayıcı Özelliği	346
6.3.3	Simpleks Yönteminde Özel Durumlar	347
6.4	DUAL SİMPLEKS YÖNTEMİ	358
6.5	BÜYÜK M YÖNTEMİ	366
6.6	İKİ FAZLI YÖNTEM	374
6.7	DUYARLILIK ANALİZLERİ	379
6.7.1	Amaç Fonksiyonu Katsayılarındaki Değişiklikler	381
6.7.2	Sağ Taraf Sabitlerindeki Değişiklikler	388
6.7.3	Kısıt Fonksiyonlarındaki Değişiklikler	397
6.7.4	Amaç ve Kısıt Fonksiyonlarındaki Değişiklikler	399

YEDİNCİ BÖLÜM

<i>KISITLI FONKSİYONLARDA OPTİMİZASYON.....</i>		403
7.1	GİRİŞ	403
7.2	EŞİTLİK KISITLI FONKSİYONLARDA OPTİMİZASYON	403
7.2.1	Jacobi Yöntemi	404
7.2.2	Lagrange Çarpanları Yöntemi	413
7.2.2.1	Amaç Fonksiyonunun Kuadratik ve Tüm Kısıtların Doğrusal Olduğu Durumlarda Optimallik Şartları	414
7.2.2.2	Kısıtlı Optimizasyon için Yeter Koşul	416
7.2.2.3	Yeter Şart için Farklı Yöntem	417
7.3	EŞİTSİZLİK KISITLI FONKSİYONLARDA OPTİMİZASYON	430
7.3.1	Genişletilmiş Lagrange Yöntemi	431
7.4	KUHN-TUCKER KOŞULLARI	434
7.4.1	Maksimizasyon Problemleri	434
7.4.2	Minimizasyon Problemleri	436
7.4.2.1	Kuhn-Tucker Kuşullarının Yeterliliği	436

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Doç. Dr. Hasan Bulut



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İÇİNDEKİLER

ÖN SÖZ	iii
İKİNCİ BASKIYA ÖN SÖZ	V
BÖLÜM 1 R'YE GİRİŞ	1
1.1. R Programını Hazırlama	1
1.2. Döngüler (for, while)	3
1.3. Koşul (If/ If-Else) Yapıları	5
1.4. Fonksiyon Oluşturma	7
1.5. R'de Bulunan Kullanışlı Fonksiyonlar	11
BÖLÜM 2 MATRİS CEBİRİ	15
2.1. Matris, Vektör ve Skaler	15
2.2. Bir Matrisin Transpozu (Devriği).....	22
2.3. İki Matrisin Eşitliği	23
2.4. Matris Türleri.....	23
2.5. Matrisin İz'i	25
2.6. Matrislerde Dört İşlem	26
2.6.1. Matrislerde toplama ve çıkarma	26
2.6.2. Matrislerin çarpılması.....	27
2.7. Matrisin Determinantı.....	30
2.8. Matrisin Tersi	32
2.9. Matrisin Rankı	39
2.10. Özdeğer ve Özvektör	41
2.11. Spektral Ayrışım	45
2.12. Pozitif Tanımlı Matris ve Cholesky Parçalanması	47

BÖLÜM 3	ÇOK DEĞİŞKENLİ VERİ VE İSTATİSTİKLER.....	51
3.1.	Çok Değişkenli Veri Yapısı ve Veri Matrisi	51
3.2.	Klasik Çok Değişkenli İstatistikler	52
3.3.	Dayanıklı (Robust) Tahmin Ediciler.....	65
BÖLÜM 4	ÇOK DEĞİŞKENLİ VERİ İÇİN GRAFİKLER.....	75
4.1.	Saçılım Grafiği.....	75
4.2.	Köpük Grafiği.....	80
4.3.	3 Boyutlu Grafikler	81
4.4.	Saçılım Grafikleri Matrisi	85
4.5.	Korelasyon Matrisleri için Grafikler	89
4.6.	Chernoff'un Yüz Grafiği ve Yıldız Grafikleri.....	95
4.7.	Çok Değişkenli Veriyi Haritalama	100
BÖLÜM 5	ÇOK DEĞİŞKENLİ DAĞILIMLAR.....	107
5.1.	Çok Değişkenli Normal Dağılım	107
5.1.1.	Normal Dağılım (Tek değişkenli).....	107
5.1.2.	Çok Değişkenli Normal Dağılımın Özellikleri.....	110
5.1.3.	Çok Değişkenli Normal Dağılımda Parametre Tahmini	114
5.1.4.	Çok Değişkenli Normal Dağılıma Uyum	118
5.1.5.	Çok Değişkenli Normal Dağılım için R Uygulamaları.....	119
5.2.	Çok Değişkenli t ve Cauchy Dağılımları.....	123
5.3.	Wishart Dağılımı	126
5.4.	X ve S İstatistiklerinin Dağılımı	128
5.5.	Kovaryans Matrislerinin Rastgele Üretilmesi	129
BÖLÜM 6	ORTALAMA VEKTÖRLERİ İÇİN HİPOTEZ TESTLERİ	131
6.1.	Tek Grup Ortalaması İçin Hipotez Testleri.....	136
6.1.1.	Tek değişkenli durumda tek grup ortalaması için hipotez testi.....	137
6.1.2.	Çok değişkenli durumda tek grup ortalaması için hipotez testi.....	142
6.2.	İki Bağımsız Grup Ortalaması İçin Hipotez Testleri.....	150
6.2.1.	Tek değişkenli durumda iki bağımsız grup ortalaması için hipotez testi	151
6.2.2.	Çok değişkenli durumda iki bağımsız grup ortalaması için hipotez testi	158

6.3. İkidenden Fazla Bağımsız Grup Ortalaması İçin Hipotez Testleri.....	171
6.3.1. Tek Yönlü Varyans Analizi (One Way ANOVA).....	172
6.3.2. Tek Yönlü Çok Değişkenli Varyans Analizi (One Way MANOVA)	177

BÖLÜM 7 KOVARYANS MATRİSLERİ İÇİN HİPOTEZ TESTLERİ205

7.1. Tek Grup Kovaryans Matrisi İçin Hipotez Testi.....	205
7.2. İki ve Daha Fazla Grup Kovaryans Matrisi İçin Hipotez Testleri..	208
7.3. Alt Vektörlerin Bağımsızlığı İçin Hipotez Testi	212

BÖLÜM 8 REGRESYON ANALİZİ.....217

8.1. Doğrusal Regresyon Analizi	220
8.1.1. Basit Doğrusal Regresyon Analizi	220
8.1.2. Çoklu Regresyon Analizi	234
8.1.3. Kategorik-Nitel Açıklayıcı Değişken Durumu: Kukla Değişken	240
8.1.4. Doğrusal Regresyonda Model Seçimi	244
8.2. Polinomiyal Regresyon Analizi.....	251
8.3. Robust Regresyon Analizi	255
8.3.1. En Küçük Mutlak Sapmalar Yöntemi (Lad, L1).....	257
8.3.2. En Küçük Medyan Kareler Yöntemi (LMS).....	258
8.3.3. Budanmış En Küçük Kareler Tekniği (LTS)	259
8.3.4. M- Tahmin Edicileri	260
8.4. Düzenlenmiş (Regularization) Regresyon Analizi	263
8.4.1. Ridge Regresyon.....	264
8.4.2. Lasso Regresyon	270
8.4.3. Elastic-Net	273
8.5. Lojistik Regresyon Analizi	276
8.6. Çok Değişkenli Regresyon Analizi	289

BÖLÜM 9 TEMEL BİLEŞENLER ANALİZİ.....297

9.1. Temel Bileşenler Analizinin Gerekliliği	297
9.2. Klasik Temel Bileşenler Analizi	298
9.2.1. Temel bileşenlerin elde edilmesi.....	298
9.2.2. Önemli temel bileşen sayısının belirlenmesi.....	302
9.3. Dayanıklı (Robust) Temel bileşenler Analizi Algoritması: ROBPCA	303
9.4. Temel Bileşenler Analizi için R Uygulamaları.....	303

BÖLÜM 10 FAKTÖR ANALİZİ	329
10.1. Dik (Ortogonal) Faktör Analizi Modeli	330
10.2. Faktör Çıkarım Yöntemleri	331
10.2.1. Temel Bileşenler Faktör Analizi	331
10.2.2. En Çok Olabilirlik Faktör Analizi	333
10.3. Faktör Döndürme	333
10.4. Faktör Analizi İçin R Uygulamaları	334
BÖLÜM 11 AYIRMA (DISKRİMİNANT) ANALİZİ	355
11.1. Doğrusal (Linear) Diskriminant Analizi	355
11.2. Karesel (Quadratic) Diskriminant Analizi	364
BÖLÜM 12 KÜMELEME ANALİZİ	369
12.1. Uzaklık Ölçüleri	369
12.2. Aşamalı (Hiyerarşik) Kümeleme Algoritmaları	378
12.2.1. Algoritmalar	379
12.2.2. Aşamalı Kümeleme Algoritmaları için R Uygulamaları	381
12.3. Aşamalı Olmayan (Bölünmeli) Kümeleme Algoritmaları	391
12.3.1. k-Ortalamalar Yöntemi	391
12.3.2. Medoid Ayırma Kümeleme Yöntemi (PAM)	395
12.4. Modele Dayalı Kümeleme-EM Kümeleme Algoritması	396
12.5. Robust Kümeleme Algoritmaları	402
12.5.1. Budanmış k-Ortalamalar Yöntemi	402
12.5.2. TCLUST Algoritması	407
12.6. Bulanık (Fuzzy) Kümeleme Analizi	412
12.7. Yoğunluğa Dayalı Kümeleme (DBSCAN)	414
12.8. Küme Geçerlilik İndeksleri ve Küme Sayısının Belirlenmesi	416
12.8.1. Yaygın Kullanılan Küme Geçerlilik İndeksleri	417
12.8.2. Küme Sayısının Belirlenmesi	419
BÖLÜM 13 KANONİK KORELASYON ANALİZİ.....	429
13.1. Klasik Kanonik Korelasyon Analizi	430
13.2. Düzenlenmiş (Regularized) Kanonik Korelasyon Analizi	448
13.3. Dayanıklı (Robust) Kanonik Korelasyon Analizi	450
BÖLÜM 14 ÇOK BOYUTLU ÖLÇEKLEME	455
14.1. Metrik Çok Boyutlu Ölçekleme	455
14.2. Metrik Olmayan Çok Boyutlu Ölçekleme	468

BÖLÜM 15 UYUM (CORRESPONDENCE) ANALİZİ	475
15.1. Basit Uyum Analizi.....	475
15.2. Çoklu Uyum Analizi.....	487
BÖLÜM 16 BAZI DAĞILIMLARA AİT TABLOLAR VE R	
PROGRAMINDA ELDE EDİLMELERİ	493
16.1. Standart Normal Dağılım Tablosu	493
16.2. Student t Dağılım Tablosu	495
16.3. χ^2 Dağılımı Tablosu	497
16.4. F Dağılımı Tablosu	499
16.5. Roy'un θ İstatistiği için Kritik Değerler Tablosu	503
EK-1 PAKET İNDEKSİ	507
EK-2 KİTABI OKUMADAN ÖNCE	
BİLİNMESİ GEREKENLER.....	511
KAYNAKLAR.....	517

KAYNAKLAR

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İÇİNDEKİLER

ÖN SÖZ	iii
YAZAR LİSTESİ	v
BÖLÜM 1 SAĞLIK BİLGİ SİSTEMLERİ VE AMAÇLARI	1
1. GİRİŞ	1
2. VERİ VE BİLGİ	2
3. BİLGİ SİSTEMLERİ	3
4. SAĞLIK BİLGİ SİSTEMLERİ	4
5. SAĞLIK BİLGİ SİSTEMLERİNİN AMAÇLARI	6
6. SAĞLIK BİLGİ SİSTEMLERİNİN BİLEŞENLERİ VE FAALİYET ALANLARI	8
7. SAĞLIK BİLGİ SİSTEMLERİNİN SUNDUĞU FAYDALAR	9
SONUÇ	10
KAYNAKÇA	11
BÖLÜM 2 SAĞLIK BİLGİ SİSTEMLERİ İLE İLGİLİ STANDARTLAR	13
1. GİRİŞ	13
2. SAĞLIK BİLGİ SİSTEMLERİ STANDARTLARI	14
2.1. Ulusal Sağlık Bilgi Sistemleri Standartları	14
2.2. Uluslararası Sağlık Bilgi Sistemleri Standartları	19
SONUÇ	29
KAYNAKÇA	30
BÖLÜM 3 STRATEJİK BAKIŞ AÇISIYLA SAĞLIK BİLİŞİM POLİTİKALARI	33
1. GİRİŞ	33
2. STRATEJİK AÇIDAN YÖNETİMİN ÖNEMİ	34
2.1. Bilgi Yönetimi	34
2.2. Değişim Yönetimi	35
2.3. Entelektüel Sermaye	35
2.4. Sosyal Sermaye	36
3. E-SAĞLIK KAVRAMI	36
3.1. E-Sağlık Faydaları	37
3.2. E-Sağlık Politikaları	37

	3.3. Avrupa Birliği'ne Entegrasyon	40
	3.4. Türkiye'de Sağlık Bakanlığı Uygulamaları.....	42
	KAYNAKÇA.....	45
BÖLÜM 4	ULUSAL SAĞLIK BİLGİ SİSTEMLERİ.....	49
	1. GİRİŞ	49
	2. SAĞLIK BİLGİ SİSTEMLERİ	49
	3. ULUSAL SAĞLIK BİLGİ SİSTEMLERİ	51
	3.1. Sağlık Net	52
	3.2. Aile Hekimliği Bilgi Sistemi (AHBS)	53
	3.3. Merkezi Hastane Randevu Sistemi (MHRS).....	53
	3.4. Ulusal Sağlık Veri Sözlüğü (USVS).....	53
	3.5. Minimum Sağlık Veri Sözlüğü (MSVS)	54
	3.6. Sağlık Kodlama ve Referans Sunucusu (SKRS).....	54
	3.7. Elektronik Nabız (E-NABİZ).....	54
	3.8. Engelsiz Sağlık İletişim Merkezi (ESİM)	54
	3.9. Evde Sağlık Hizmetleri Modülü	55
	3.10. Halk Sağlığı Yönetim Sistemi (HSYS).....	55
	3.11. Halk Sağlığı Yönetim Sistemi (HSYS) Bağışıklama Uygulama Modülü.....	55
	3.12. Hasta Başvuru Bildirim Sistemi (HBBS).....	55
	3.13. İlaç Takip Sistemi (İTS).....	55
	3.14. KKKA (Kırım Kongo Kanamalı Ateşi) Hastalığı Bilgi Sistemi	55
	3.15. SABİM (Alo 184)	56
	3.16. Yabancı Hasta Veri Takip Sistemi (YHTS).....	56
	3.17. Ölüm Bildirim Sistemi (ÖBS).....	56
	3.18. Sağlıkta İstatistik ve Nedensel Analizler (SİNA).....	56
	3.19. Hayat Eve Sığar (HES)	56
	3.20. Filyasyon ve İzolasyon Takip Sistemi (FİTAS).....	56
	3.21. Çekirdek Kaynak Yönetim Sistemi (ÇKYS).....	56
	SONUÇ	57
	KAYNAKÇA.....	57
BÖLÜM 5	HASTANE BİLGİ YÖNETİM SİSTEMLERİ	59
	1. GİRİŞ	59
	2. HASTANE BİLGİ YÖNETİM SİSTEMLERİ	60
	2.1. Hastane Bilgi Yönetim Sistemlerinde Kalite	61
	2.2. Hastane Bilgi Yönetim Sistemlerinin Faydaları.....	62
	2.3. Hastane Bilgi Yönetim Sistemlerinin Oluşturulması.....	63
	3. HASTANE BİLGİ YÖNETİM SİSTEMLERİNDE MODÜLLER VE İŞLEVLERİ	66
	3.1. Tıbbi/Klinik Modüller	66
	3.2. Laboratuvar Bilgi Yönetim Sistemi	73
	3.3. İdari ve Mali Bilgi Sistemi	74
	SONUÇ	76

KAYNAKÇA.....	76
BÖLÜM 6 HALK SAĞLIĞI BİLGİ YÖNETİM SİSTEMLERİ	79
1. GİRİŞ	79
2. HALK SAĞLIĞI BİLGİ YÖNETİM SİSTEMLERİ	80
3. HALK SAĞLIĞI BİLGİ YÖNETİM SİSTEMİNDE YER ALAN WEB TABANLI SİSTEMLER.....	81
3.1. Sina Uygulaması (SİNA)	81
3.2. Aşı Antiserum Soğuk Zincir ve Stok Yönetim Sistemi	81
3.3. Coğrafi Bilgi Sistemi (CBS):	82
3.4. İş Sağlığı ve Güvenliği Eğitim Sistemi.....	83
3.5. Laboratuvar Bilgi Yönetim Sistemi (LBYS)	84
3.6. Maliyet Analizi Programı	84
3.7. Muayene Bilgi Yönetim Sistemi (MBYS).....	84
3.8. Olay Yönetim Sistemi (OYS).....	85
3.9. Ölüm Bildirim Sistemi (ÖBS).....	86
3.10. Ulusal Neonatal Tarama Programı (NTP)	86
3.11. Ulusal İşitme Tarama Programı (İTP).....	87
3.12. E-Nabız Kişisel Sağlık Kaydı Sistemi	87
4. HALK SAĞLIĞI YÖNETİM SİSTEMİNDE YER ALAN UYGULAMA MODÜLLERİ	88
4.1. Bağışıklama Uygulamaları Modülü.....	88
4.2. Beslenme ve Fiziksel Aktivite Modülü.....	88
4.3. Çocuk, Ergen, Kadın ve Üreme Sağlığı (ÇEKÜS) Modülü.....	88
4.4. Dış Muayene Takip Modülü	88
4.5. Dönemsel Menenjit Aşılama Takip Modülü	89
4.6. Evde Sağlık Hizmetleri Modülü	89
4.7. HSYS Hekim İletişim Modülü	89
4.8. Influenza Takip Modülü	89
4.9. Kan Bağışı Beyanı Modülü.....	89
4.10. Kanser Tarama ve Takip Modülü.....	89
4.11. Kuduz ve Riskli Temas Takip Modülü	90
4.12. Misafir Anne Takip Modülü.....	90
4.13. Riskli Gebelik Takip Modülü	90
4.14. Sosyal Yardım Modülü	90
4.15. Suriyeli Hekim Atama Modülü	91
4.16. Tularemi Hastalığı Bilgi Sistemi Modülü.....	91
4.17. Ulusal Enterik Patojenler Laboratuvar Sürveyans Ağı (UEPLA) Modülü.....	91
4.18. HIV/AIDS Bilgi Sistemi (HABS)	91
4.19. Hızlı Veri Toplama Sistemi (HTS)	91
4.20. Ulusal Tüberküloz Sistemi (UTS).....	92
KAYNAKÇA.....	92

BÖLÜM 7	DİJİTAL HASTANE	95
	1. GİRİŞ	95
	2. DİJİTAL HASTANE NEDİR?	95
	3. DİJİTAL HASTANENİN AVANTAJLARI VE DEZAVANTAJLARI	96
	4. DİJİTAL HASTANELERDE KULLANILAN SİSTEMLER.....	98
	4.1. Klinik Karar Destek Sistemleri (KKDS).....	99
	4.2. Hastane Bilgi Yönetim Sistemi (HBYS).....	99
	4.3. Görüntü Arşivleme ve İletişim Sistemleri (PACS-Picture Archiving Communication System)	99
	4.4. Radyoloji Bilgi Sistemleri (RBS).....	100
	4.5. Elektronik İstem (e-Order) Sistemi.....	100
	4.6. Eczane Bilgi Sistemleri.....	100
	4.7. Laboratuvar Bilgi Yönetim Sistemi (LBYS)	100
	4.8. Radyo Frekansı ile Tanımlama (Radio Frequency Identification-RFID).....	101
	5. DİJİTAL HASTANELERİN SINIFLANDIRILMASI	101
	5.1. HIMSS (Sağlık Bilgi ve Yönetim Sistemleri Topluluğu- Healthcare Information and Management Systems Society)	101
	SONUÇ	108
	KAYNAKÇA.....	108
BÖLÜM 8	HASTA MERKEZLİ TEKNOLOJİLERDE BİLGİ GÜVENLİĞİ, GİZLİLİĞİ VE MAHREMİYETİ	111
	1. GİRİŞ	111
	2. HASTA MERKEZLİ TEKNOLOJİLER	112
	3. BİLGİ GÜVENLİĞİ, GİZLİLİK VE MAHREMİYET	113
	4. HASTA MERKEZLİ TEKNOLOJİLERDE BİLGİ GÜVENLİĞİ	116
	5. HASTA MERKEZLİ TEKNOLOJİLERDE BİLGİ GİZLİLİĞİ.....	118
	6. HASTA MERKEZLİ TEKNOLOJİLERDE BİLGİ MAHREMİYETİ.....	120
	7. HASTA MERKEZLİ TEKNOLOJİLERDE GİZLİLİK, GÜVENLİK VE MAHREMİYETİN SAĞLANMASI	121
	SONUÇ	123
	KAYNAKÇA.....	125
BÖLÜM 9	SAĞLIKTA KALİTE YÖNETİMİ VE BİLGİ SİSTEMLERİ	129
	1. GİRİŞ	129
	2. SAĞLIK HİZMETLERİNDE KALİTE KAVRAMI.....	130
	3. SAĞLIK SEKTÖRÜNDE BİLGİ SİSTEMLERİ	131
	4. BİLGİ SİSTEMLERİNİN KLİNİK KALİTEYE KATKISI	132
	5. BİLGİ SİSTEMLERİNİN KANITA DAYALI YÖNETİM SİSTEMİ İÇERİSİNDEKİ YERİ.....	139
	6. SAĞLIK BİLİŞİMİ İLE İLİŞKİLİ GÜVENLİK RİSKLERİ	140

7. SAĞLIK KURUMLARININ AKREDİTASYONU SÜRECİNDE BİLGİ SİSTEMLERİNİN ÖNEMİ	141
SONUÇ	143
KAYNAKÇA.....	144
BÖLÜM 10 SAĞLIK SEKTÖRÜ TEKNOLOJİ UYGULAMALARI	145
1. GİRİŞ.....	145
2. SAĞLIK SEKTÖRÜ TEKNOLOJİ UYGULAMALARI	145
2.1. Sağlık Sektöründe Yapay Zekâ.....	146
2.2. Sağlık Sektöründe Büyük Veri	148
2.3. Nesnelerin İnterneti (Internet of Things-IoT).....	149
2.4. Sağlıkta Sanal ve Artırılmış Gerçeklik	151
2.5. Sağlık Sektöründe Kullanılan Robotlar	152
2.6. E-Sağlık	153
2.7. Mobil Sağlık (m-sağlık)	154
2.8. Teletıp	155
2.9. Dijital Hastane	156
2.10. Kişiselleştirilmiş Sağlık	157
2.11. Giyilebilir Teknolojiler	157
2.12. Siber Güvenlik	158
SONUÇ	159
KAYNAKÇA.....	160
BÖLÜM 11 SAĞLIK BİLGİ SİSTEMLERİNDE TELETIP VE TELETIP UYGULAMALARI.....	163
1. TELETIP NEDİR?	164
2. TELETIP TÜRLERİ.....	166
2.1. Gerçek zamanlı etkileşimli tıp	167
2.2. Sakla ve ilet	168
2.3. Uzaktan hasta izleme (Remote patient monitoring).....	168
2.4. Mobil sağlık	169
3. TELETIP KULLANIMININ SAĞLADIĞI FAYDALAR.....	170
3.1. Bakıma Erişilebilirlik	170
3.2. Maliyet etkililik.....	171
3.3. Daha güvenli ve daha sağlıklı	171
3.4. Daha Yüksek Hizmet Kalitesi	172
4. TELETIP ENGELLERİ VE SINIRLAMALARI	173
5. TELETIP UYGULAMALARI	173
5.1. Teledermatoloji.....	174
5.2. Telekardiyoloji.....	174
5.3. Teleoftalmoloji	176
5.4. Teleradyoloji	177
5.5. Telecerrahi	179

5.6. Telepatoloji	181
5.7. Telenöropsikoloji.....	182
5.8. Telehemşirelik	182
5.9. Teleeczacılık	183
5.10. Telerehabilitasyon.....	183
5.11. Teledişhekimliği	184
5.12. Telesikiyatri	185
6. TELETIP VE SAĞLIK TURİZMİ	185
KAYNAKÇA.....	187
BÖLÜM 12 SAĞLIK BİLGİ SİSTEMLERİNDE ULUSLARARASI HASTALIK SINIFLANDIRMA SİSTEMLERİNİN ÖNEMİ	189
1. HASTALIKLARIN SINIFLANDIRILMASININ (ICD’NİN) TARİHÇESİ	190
2. ICD-10 SINIFLANDIRMASINA GENEL BAKIŞ	191
3. ICD’NİN TEMEL KAVRAMI	197
4. ICD SINIFLANDIRMASININ AVANTAJLARI	197
5. ICD SINIFLANDIRMASININ DEZAVANTAJLARI	198
6. SAĞLIK BİLGİ SİSTEMİNDE HASTALIK KODLAMA SİSTEMİNİN KULLANIMI	199
7. ICD-BÜYÜK VERİ	200
8. ICD-11.....	202
9. HASTALIK EĞİLİMLERİ	203
10. HASTANE BİLGİ SİSTEMLERİ VE SAĞLIK VERİLERİ	205
11. HASTALIKLARIN VE ÖLÜM NEDENLERİNİN SINIFLANDIRILMASI	206
KAYNAKÇA.....	207
BÖLÜM 13 SAĞLIK HİZMETLERİ FATURALANDIRMA SÜREÇLERİNDE SAĞLIK BİLGİ SİSTEMLERİNİN ÖNEMİ.....	209
1. GİRİŞ	209
2. SAĞLIK HİZMETLERİNDE GERİ ÖDEME VE TÜRKİYE UYGULAMASI.....	209
2.1. Kişi Başı Ödeme	212
2.2. Hizmet Başı Ödeme.....	213
2.3. Vaka Başı Ödeme	213
2.4. Teşhis ilişkili Gruplara Dayalı Ödeme	213
2.5. Gün Başına Ödeme.....	214
2.6. Harcama Kalemleri Bütçesi ve Global Bütçe	214
2.7. Değer Bazlı Ödeme.....	215
3. SAĞLIK HİZMETLERİNDE FATURALANDIRMA VE BİLGİ SİSTEMLERİ	215
3.1. MEDULA Sistemi.....	217
SONUÇ ve ÖNERİLER.....	223
KAYNAKÇA.....	223
BÖLÜM 14 SAĞLIK BİLGİ SİSTEMLERİNDE E-KEŞİF	225
1. GİRİŞ	225

2. E-KEŞİF NEDİR?	226
2.1. E-Keşfin Ortaya Çıkışı	226
2.2. E-Keşfin Çok Disiplinli Doğası	228
2.3. E-Keşfin Diğer Keşif Uygulamalarından Farkı	229
2.4. E-Keşif Uygulamasının Olumlu ve Olumsuz Yanları.....	229
2.5. E-Keşif Süreci.....	230
3. SAĞLIKTA E-KEŞİF	232
3.1. Sağlıkta E-Keşif Süreci	233
3.2. Sağlıkta E-Keşif ile İlgili Zorluklar	234
SONUÇ	237
KAYNAKÇA.....	237

BÖLÜM 15 SAĞLIK BİLGİ SİSTEMLERİNİN HUKUKİ YÖNÜ

1. MAHREMİYET SORUNLARI	239
1.1. Sağlık Çalışanlarının Verilere Erişimi	239
1.2. Bakanlık Birimlerinin Verilere Erişimi ve E-Nabız	241
1.3. Bilişim Sistemine Erişimden Kaynaklanan Problemler	245
2. E-AYDINLATMA.....	245
2.1. E-Aydınlatma Formlarının Geçerliliği	245
3. DİJİTAL KAYITLAR.....	246
4. TELETIP	247
4.1. Genel Olarak	247
4.2. Mevzuatımızda Tele-Tıbbı Müsaade Edilen Hâller	251
KAYNAKÇA.....	255

BÖLÜM 16 SAĞLIK BİLGİ SİSTEMLERİNDE İNSAN KAYNAKLARININ ÖNEMİ....

1. SAĞLIK BİLGİ SİSTEMLERİ TASARIMINDA İNSAN KAYNAKLARININ ÖNEMİ	259
2. SAĞLIK BİLGİ SİSTEMİNDE YÖNETİCİLERİN ÖNEMİ	260
2.1. Bilgi Sisteminde Üst Yöneticilerin Rolü	262
2.2. Bilgi Sistemi Yöneticisinin Sorumlulukları (CIO-The Chief Information Officer).....	264
2.3. Sağlık Bilgi Teknolojisi Yöneticisinin Sorumlulukları (The Chief Technology Officer-CTO).....	267
2.4. Bilgi Güvenliği Yöneticisinin Sorumlulukları (The Chief Information Security Officer-CISO)	267
2.5. Klinik Bilişim Sorumlusu (The Chief Clinical Informatics Office -CCIO).....	268
3. BİLGİ SİSTEMLERİ DEPARTMANI ÇALIŞANLARININ SORUMLULUKLARI....	269
3.1. Proje Yöneticisi/Lideri	269
3.2. Sistem Analisti (The Systems Analyst).....	270
3.3. Programcı	271
3.4. Veri tabanı Yöneticileri.....	271

	3.5. Ağ Yöneticisi (The Network Administrator)	271
	3.6. Bilgi Teknolojisi Uzmanları	272
	3.7. Geliştirme Ekipleri	272
	3.8. Kullanıcı Destek Personeli	272
	4. KULLANICI SORUMLULUKLARI VE ÖNEMİ (USER RESPONSİBİLİTİES)	273
	5. BİLGİ TEKNOLOJİLERİNDE GÖREV YAPAN TEKNİK PERSONELİN ÖZELLİKLERİ	275
	6. BİLGİ SİSTEMİNİN ÇALIŞANLARA ETKİLERİ	276
	SONUÇ	277
	KAYNAKÇA	277
BÖLÜM 17	SAĞLIK BİLGİ SİSTEMLERİNDE HASTA GÜVENLİĞİ	279
	1. HASTA GÜVENLİĞİ	279
	2. SAĞLIK BİLGİ SİSTEMLERİ	280
	3. HASTA GÜVENLİĞİNDE SAĞLIK BİLGİ SİSTEMLERİ	282
	3.1. Sağlık Bilgi Sistemlerinin Hasta Güvenliğine Etkisi	284
	3.2. Elektronik Olay Raporlama Sistemleri ve Hasta Güvenliğinde Rolü	293
	3.3. Tıbbi Hataları Önlemede Sağlık Bilgi Sisteminin Etkisi	296
	KAYNAKÇA	298
BÖLÜM 18	SAĞLIK BİLGİ SİSTEMLERİNDE ETİK	301
	1. GİRİŞ	301
	2. ETİK VE MESLEK ETİĞİ KAVRAMI	302
	3. SAĞLIK ETİĞİ VE İLKELERİ	303
	3.1. Yarar Sağlama-Zarar Vermeme İlkesi	304
	3.2. Adalet İlkesi	305
	3.3. Hasta Özerkliğine Saygı İlkesi	305
	3.4. Aydınlatılmış Onam İlkesi	306
	4. SAĞLIK HİZMETLERİNDE KARŞILAŞILAN ETİK SORUNLAR	306
	4.1. Sağlık Bilgi Sistemleri ve Etik	307
	SONUÇ	312
	KAYNAKÇA	314
BÖLÜM 19	SAĞLIK BİLGİ SİSTEMLERİNDE KRİTİK BAŞARI FAKTÖRLERİ	317
	1. GİRİŞ	317
	2. BİLGİ SİSTEMİ KAVRAMI	318
	2.1. Bilgi Kavramı	318
	2.2. Bilgi Sistemleri Kavramı	319
	2.3. Sağlık Bilgi Sistemlerinin Kullanım Amaçları	320
	2.4. Sağlık Bilgi Sistemlerinin Kullanım Alanları	321
	3. SAĞLIK BİLGİ SİSTEMLERİNDE KRİTİK BAŞARI FAKTÖRLERİ	323
	3.1. Kritik Başarı Faktörleri Kavramı	323
	3.2. Sağlık Bilgi Sistemlerinde Kritik Başarı Faktörleri Kavramı	324

3.3. Sağlık Kurumlarında Sağlık Bilgi Sistemleri İçin	
Kritik Başarı Faktörleri.....	326
SONUÇ	330
KAYNAKÇA.....	331
BÖLÜM 20 SAĞLIK BİLGİ SİSTEMLERİNİN GELECEĞİ VE ENDÜSTRİ 4.0	335
1. GİRİŞ.....	335
2. SAĞLIK BİLGİ SİSTEMLERİ GELECEĞİ.....	336
3. ENDÜSTRİ 4.0	339
3.1. Sağlık 4.0	340
SONUÇ	343
KAYNAKÇA.....	346

Bölüm 1

SAĞLIK BİLGİ SİSTEMLERİ VE AMAÇLARI

Elif Dikmetaş Yardan

Hasan Fehmi Demirci

1. GİRİŞ

Dijital çağ evriminin geçmişi yıllar öncesine dayanmaktadır. Bu evrim, her geçen gün gelişerek ilerlemeye devam etmektedir. Bu evrim, bilgisayarlar, ağlar, platformlar, bulutlar, algoritmalar ve makine öğrenimi gibi dijital teknolojinin, toplum özelinde ve iş dünyasının her alanında kullanılmasıyla karakterize edilen küresel ekosistemler ortaya çıkarmıştır (Ruotsalainen & Blobel, 2020). Dijital çağın getirmiş olduğu yeniliklerin en önemlilerinden biri, bilgi ve iletişim teknolojilerinin tüm sektörlerde hızlı şekilde benimsenmesidir.

Birleşmiş Milletlerin Sürdürülebilir Kalkınma Hedefleri'nde bilgi ve iletişim teknolojilerinin yaygın kullanımının, bilimsel ve teknolojik yeniliklerin yanında insanlığın ilerlemesini hızlandırmak, dijital uçurumu kapatmak ve bilgi toplumlarını geliştirmek için büyük potansiyele sahip olduğu belirtilir (United Nations, 2015). Günümüzde bilgi ve iletişim teknolojileri, sağlık sektöründe en hızlı büyüyen alanlardan biri olarak dikkat çekmektedir (WHO, 2005).

Son yıllarda, sağlık verilerinin üretim hızı katlanarak artmaya devam etmektedir (Friedman ve ark., 2017). Veri artış hızının artması, sağlık sektöründe elde edilen verilerin etkili şekilde kullanımını sağlamak ve bu verileri bilgiye dönüştürmek için yeni sistemlere ihtiyacı ortaya çıkarmıştır. Sağlık bilgi sistemleri, bu ihtiyacı gidermek için kullanılan, veri zenginliğinin daha iyi kullanılmasına, yeni teşhis ve tedavi yöntemlerinin uygunluğunun doğrulanmasına ve bakımın iyileştirilmesine katkıda bulunan sistemlerdir (Winter ve ark., 2018). Sağlık bilgi sistemleri, sağlık kurumlarında verilerin toplanmasını, depolanmasını ve kullanılmasını sağlayan sistemler olarak adlandırılmaktadır. Bu yönüyle sağlık bilgi sistemleri, dijital çağda etkili hizmet sunumunun vazgeçilmez aktörleri arasında yerini almaktadır.

Bu bölümde, dijital çağın sağlık sektörüne getirmiş olduğu yeniliklerden biri olan sağlık bilgi sistemleri, amaçları, bileşenleri, faaliyet alanları ve faydaları ile ilgili bilgilere değinilmiştir.

Sağlık hizmetlerinde kalitenin temel bileşenlerinden biri olarak bilgi teknoloji ve sistemlerinin kullanımı, istenmeyen durumların yaşanmasını önlemenin yanında, daha güvenli bir sağlık sistemi kurmak için birçok potansiyel taşımaktadır. Ancak sağlık bilgi sistemlerinin faydalarının yanı sıra gizlilik, güvenlik ve mahremiyet ile ilgili sorunlar da ortaya çıkabilir. Bu nedenle, sağlık bilgi sistemlerinde gizliliği ve güvenliği sağlayacak çalışmalara da ihtiyaç bulunmaktadır.

Bilgi teknolojisi alanında yaşanan gelişmeler toplumu ve sağlık sektörünü güçlü şekilde etkilemektedir. Artan yaşam süresi, kronik hastalıkların çoğalması, salgın hastalıkların görülme sıklığında yaşanan artış, küreselleşme, kaliteli hizmet sunumu beklentisi ve bireylerin sağlıklı yaşam biçimi davranışlarına yönelik artan yönelimi sağlık bilgi sistemlerinin geliştirilmesini zorunlu kılmaktadır.

Sağlık bilgi sistemlerinin sürekli olarak hasta bakımı ve hizmet sunum kalitesini iyileştirmesi ve artırması beklenmektedir. Bu nedenle, sağlık bilgi sistemleri ve bu sistemlerin ortaya çıkardığı değerin araştırılması ve gerekli iyileştirmelerin yapılması gerekmektedir.

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Bölüm 2

SAĞLIK BİLGİ SİSTEMLERİ İLE İLGİLİ STANDARTLAR

Elif Dikmetaş Yardan

Gizem Zevde Aydın

1. GİRİŞ

Çağımızda diğer sektörlerle birlikte sağlık sektöründe de bilgiye dayalı yönetim artarak önem kazanmaktadır. Gelişen bilgi ve iletişim teknolojilerinin hızlı şekilde sağlığa yansımaları, her geçen gün artan ve değişen hasta beklentileri ve yaşlanan nüfus sağlık hizmetlerine yeni bir bakış açısıyla yaklaşılması gerektiğini ortaya koymuştur (T.C. Sağlık Bakanlığı, 2004). Günümüzde bilgi teknolojilerinin kullanımının sağlık alanında giderek yaygınlaşması ve sağlık bakımının giderek teknolojiyle ilişkili hâle gelmesi (Işık & Akbolat, 2010) sağlık bilgi teknolojileri kavramını ön plana çıkarmaktadır. Sağlık hizmetlerinde ve teknolojiye yaşanan gelişmeler, tıbbi ilerlemelere katkı sunmaktadır. Tıp alanında yaşanan teknolojik gelişmelerle beraber hekimlerin işleri kolaylaşmakta, hastalıkların tanı sürecinin daha hızlı gerçekleştirilmesi fırsatı doğmaktadır (Ekiyor & Çimen, 2019). Sağlık bilgi teknolojilerinin kullanımı, sağlık hizmetlerinin etkinliğini ve verimliliğini de artırmaktadır (Işık & Akbolat, 2010). Bilginin öneminin giderek artmasıyla, bilginin doğru yöntemle elde edilmesi konusundaki ihtiyaç da artmıştır. Artan bu ihtiyacı karşılamak amacıyla çalışmalar gerçekleştirilmeye başlanmıştır (T.C. Sağlık Bakanlığı, 2022a). Bu doğrultuda farklı ortamlardaki yüksek düzeyde yapılandırılmış ve zengin anlamsallığa sahip klinik bilgileri dijital sistemler aracılığıyla kullanabilmek ve paylaşabilmek bilgi teknolojileriyle ilişkili sağlık alanındaki çalışmaların odağı hâline gelmiştir (Can ve ark., 2016).

Kurumların yoğun rekabetle baş edebilmeleri ve rekabet avantajı yakalayabilmeleri için bilgi sistemlerinin kullanımı gereklidir. Bilgi sistemleri, yöneticilere karar verme ve kontrol aşamalarında destek sağlamakta ve personelin işlemleri daha hızlı ve kolay gerçekleştirmelerini mümkün kılmaktadır (İleri, 2018). Sağlık bilgi sistemleri ise sağlık alanındaki gelişmelerle birlikte bilgi ve verilerin oluşturulması, düzenlenmesi, paylaşılması ve hastaların tanı ve tedavilerinin belirlenmesi ve geliştirilmesi gibi faaliyetlerin tamamını kapsamaktadır (Işık & Akbolat, 2010). Sağlık bilgi sistemleri; verilerin işlendiği, bilgi akışının sağlandığı, yönetsel açıdan karar vericilere ihtiyaç duydukları bilgilerin sağlandığı

sağlık bilgi sistemlerine uyarlanarak güçlendirilmesi önerilmektedir (WHO, 2008). Sağlık bilgi sistemleri standartları, diğer sağlık bilgi sistemleriyle birlikte çalışabilirliği ve veri alışverişinde bulunabilirliği sağlamaktadır. Sağlık bilgi sistemlerinin geleceğinde, birlikte çalışabilir elektronik sağlık kayıtları ve diğer sağlık bilgi sistemlerine uyum sağlamanın olduğu ifade edilebilir. Birlikte çalışabilirliğin de standartlarla sağlanabildiği görülmektedir. Bu kapsamda, sağlık bilişimi alanındaki ilerlemenin sürdürülebilmesi için gelişmelerin yakından takip edilmesi ve geliştirilen standartların tam anlamıyla benimsenmesi gerektiğine vurgu yapılabilir.

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Bölüm 3

STRATEJİK BAKIŞ AÇISIYLA SAĞLIK BİLİŞİM POLİTİKALARI

Merve Tarım

Mehveş Tarım

1. GİRİŞ

Hızlı değişen bir dış çevre karşısında her örgüt ve sistem varlığını devam ettirebilmek adına sürekli olarak değişim sürecine tabi tutulmaktadır. Değişime adapte olamayan sistemler ve örgütler rekabet ortamından uzaklaşmakta ve gerek ürün gerek hizmet bazında üretim gerçekleştirememektedirler. Değişimin başarılı bir şekilde gerçekleştirilmesi bilgi yönetiminin doğru bir biçimde yapılmasını gerektirmektedir. Hem iç hem de dış çevreye ait bilgi akışının doğru olmasına, gelen bilginin doğru analizinin yapılmasına ve doğru sonuca ulaşılmasına ihtiyaç duyulmaktadır. Bu akışın istenilen biçimde sağlanabilmesi için yönetimin fonksiyonlarının doğru uygulanması ve bilgi yönetiminin doğru biçimde yapılması söz konusudur. Bilgiye doğru biçimde ulaşabilmek teknolojinin güncel olmasıyla ve gerek iç gerek dış çevrede bulunan paydaşlarla güçlü iletişim kanallarının oluşturulması ile sağlanmaktadır. Bu bağlamda bilginin dışarıdan doğruya en yakın hâliyle elde edilmesi için sosyal sermayeye ve gelen bilginin örgüt içindeki analizinin doğru yapılabilmesi için entelektüel sermayeye yatırım yapılmak zorundadır. Sürdürülebilir Kalkınma için 2030 Gündemi, bilgi ve iletişim teknolojisinin insani ilerlemeyi hızlandırma, dijital uçurumu kapatma ve toplumların bilgi kapasitesini artırma konusunda büyük bir potansiyele sahip olduğunu vurgulamaktadır.

Bilgi ve iletişim teknolojilerini sağlık alanında geniş çaplı kullanabilme becerisinin hem gelişmiş hem de gelişmekte olan ülkelerde önemi gittikçe artmaktadır. Sağlıklı bir toplum oluşturma ancak bilgiye dayalı bir örgütlenme ile mümkündür. Bilgi ve iletişim teknolojilerinin geniş çapta yayılımı, tümüyle ekonomik ve sosyal faaliyetlerde hizmetin rolü ile ilgili algıyı değiştirmiştir. Bu teknolojiler, hemen hemen her yerde, zamanında kaliteli sağlık hizmetlerine adil erişimi destekler; kaliteli, uygun maliyetli ve adil bakım sunulmasında sağlık sistemlerinin sürdürülebilirliğini sağlar; ve hasta mahremiyetine ve güvenliğine özen gösteren bir sistemde, sağlığın teşviki ve geliştirilmesi, hastalık önleme,

yenilikçiliğinde, toplumsal ve ekonomik zorluklara çözümler sunmasında ve istihdam piyasasının büyümesini teşvik etme yeteneğinde yatmaktadır.

Veri toplamada kullanılan yazılımlar birbirleriyle uyumlu olmalıdır, böylece veri değişimi kolaylıkla sağlanabilir. Klinik hizmetlerin kalitesi artar, tekrarlı işlemler azalır, maliyetler düşer. Farklı kaynaklardan elde edilen veri sağlık sisteminin farklı düzeylerinde çeşitli amaçlar için kullanılır.

- Klinik karar mekanizmalarında hasta profili, ihtiyaçları, tedavisi gibi bireysel düzeyde veri kullanılır.
- Sağlık tesisi düzeyinde veri, sağlık yöneticilerine kaynak ihtiyacını belirleme, satın almada rehberlik etme ve toplumun sosyal gelişimini sağlamada kullanılır.
- Nüfus düzeyinde veri, özellikle kamu sağlık karar vericileri için önemlidir.
- Halk sağlığı izlemeleri, problemleri tanımlama ve zamanında faaliyet sunmaya odaklanarak tesislerin ve toplulukların bilgilerini bir araya getirir.

Toplanan verinin güvenliğinin sağlanmalıdır. Hasta güvenliği açısından son derece yararlı olan sistem veri güvenliği açısından da güçlendirilmelidir. Hasta mahremiyetini ve etik açıdan sakıncaların ortadan kaldırılması gerekir. Bunun için elektronik sağlık kayıtları ile ilgili etik ve yasal düzenlemeler yapılmalıdır.

Toplanan veriler bilgiye dönüştürülmeli, bilgi paydaşlarla paylaşılmalıdır. Şu anda Sağlık Bakanlığı tarafından toplanan veri, dünyanın pek çok gelişmiş ülkesinde dahi bulunmamaktadır. Sağlık sektörünün her bir alanından ve paydaş grubundan veri havuzuna veri girişi olmaktadır. Önemli olan bu verilerin bilgiye dönüştürülmesi ve bilgidan bilgi üretebilmektir. Bu ise bilgi ve iletişim teknolojileri konusunda yetkin insan gücü ile gerçekleştirilir. Nitelikli insan kaynakları ile sistem etkili ve verimli olacaktır.

Sağlık sektörünün kalitesini arttırmak ve sağlığı geliştirmek için teknolojiye yenilik ve gelişme kadar önemli olan husus, insan kaynaklarının güçlendirilmesi ve kültürün bu yön- de değiştirilmesidir.

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Bölüm 4

ULUSAL SAĞLIK BİLGİ SİSTEMLERİ

Elif Dikmetaş Yardan

Pelinsu Buket Doğanyığıt

Ebru Şahin

1. GİRİŞ

Bilgi sistemleri, veriyi bilgiye dönüştürmek amacıyla kaynakları kullanan ve girdi, süreç ile çıktı faaliyetlerini kapsayan sistemler olarak tanımlanmaktadır (Kavuncubaşı, 2000). Bilgi teknolojilerinde yaşanan hızlı değişimler, sağlık sektörünü de büyük oranda etkilemektedir (Haux ve ark., 2004). Sağlık sektöründe yoğun rekabetin yaşanması, beklentilerin artması, teknolojinin gelişmesi, yeniliklerin yaşanması ve sürekli yapılan yasal düzenlemeler sağlık bilgi sistemlerinin kullanımını zorunlu kılmıştır. *Sağlık bilgi sistemleri*; sağlık kurum ve kuruluşların sahip oldukları bilgileri işleyen, saklayan ve erişimi sağlayan bilgisayar yazılımı ile donanımdır (Tarcan ve Çelik, 2016). Sağlık hizmetleri sunumunda kullanılan bilgi sistemleri, bölgeler arası farklılıkları en aza düşürmeyi ve bireylere ihtiyaçlarına uygun, erişilebilir, etkili, hakkaniyet ve eşitlik ilkelerini gözeterek hizmet sunmayı amaçlamaktadır.

Bu bölümde sağlık bilgi sistemlerinin tanımı, amacı, tarihçesi ve Türkiye’de kullanılan ulusal sağlık bilgi sistemlerine değinilecektir.

2. SAĞLIK BİLGİ SİSTEMLERİ

Sağlık bilgi sistemlerinin kullanımı, 1960 tarihinden itibaren çevresel etkilerin ve teknolojik gelişmelerin etkisiyle önemli derecede değişmiştir. 1960’lı yıllarda az sayıda sağlık kurumunun bazı idari ve mali işlemlerinin otomatikleştirilmesiyle başlamıştır. Bu işlemler; analistler tarafından pahalı ve büyük merkezli ana bilgisayarların kullanımıyla gerçekleştirilmiştir. 1980’li yıllara gelindiğinde klinik ve idari uygulamalara yönelik veri tabanlarına ihtiyaç duyulmuştur. Bu nedenle hızlı şekilde çalışmalar yapılmaya başlanmıştır. 1980’li yılların ortalarında depolama kapasitesi bulunan ve bilgisayar gücüne sahip mikrobilgisayarlar (masaüstü) ortaya çıkmıştır. Daha sonra 1990’lı tarihlerde ücretsiz kullanılan internet ağ tarayıcıları oluşturulmuş ve www (the world wide web) ile e-posta araçları kullanılmıştır.

nin yapıldığı Yatırım Takip Sistemi ve ülke çapındaki sağlık istatistiklerini toplamak amacıyla kullanılan Temel Sağlık İstatistikleri Modülü bulunmaktadır. Türkiye’de faaliyette bulunan özel sağlık kurumlarının yaptığı işlemlerin takip edildiği sisteme, Özel Sağlık Kuruluşları Yönetim Sistemi adı verilmektedir (<https://dijitalhastane.saglik.gov.tr>, 25.06.2022).

SONUÇ

Son yıllarda, bilgi sistemleri sağlık bakım kalitesini, verimliliği ve hasta ile çalışan memnuniyetini arttırmak için daha fazla kullanılmaktadır. Türkiye’de sağlık bilgi sistemlerinin gelişimi 2003 yılında Sağlıkta Dönüşüm Programı ile hız kazanmıştır. Sağlıkta Dönüşüm Programı’nın sekiz bileşeninden biri olan Ulusal Sağlık Bilgi Sistemi, ulusal standartlara erişimde ve etkin bilgi ağının oluşmasını sağlamıştır. Sağlık kurumlarının sahip olduğu tüm bilgilerin korunmasını, transferini, standardizasyonunu ve kaydedilmesini mümkün kılmıştır.

Sağlık bilgi sistemlerini geliştirmek için sağlık hizmet sunumunun takip edilmesi, değerlendirilmesi ve kanıta dayalı uygulamaların geliştirilmesi önem taşımaktadır. Sağlık bilgi sistemlerine bireylerin kolay erişiminin olması, kolay kullanılması, veri güvenliğinin sağlanması ve kullanıcı memnuniyetinin ön planda tutulması önem arz etmektedir. Sağlık bilgi sistemleri hakkında kullanıcılarının bilgilendirilmesi, geri dönüşlerinin alınması ve ortaya çıkan sorunların çözülmesi gerekmektedir.

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Bölüm 5

HASTANE BİLGİ YÖNETİM SİSTEMLERİ

Türker Yardan

Ferdane Betül Bölükbaşı

1. GİRİŞ

Teknolojinin, hasta bakım hizmetlerinin iyileştirilmesinde önemli rol oynadığı ile ilgili ortak görüşlerin artışı ile birlikte bilgi teknolojileri ve bilgi sistemleri, son yıllarda sağlık sektöründe hayati hâle gelmiştir (Ismail ve ark., 2015). Bununla birlikte, sağlık sektöründe bilgi sistemleri ihtiyacı geçmiş yıllardan beri küresel sağlık gündeminde yer almaktadır. Dünya Sağlık Örgütü (WHO), sağlık sistemlerinin güçlendirilmesi ile ilgili gerçekleştirdiği toplantıda sağlık sistemlerinin iyi yönetilmesi ve herkes için sağlık hedefine ulaşılabilmesi için sağlık bilgi sistemlerinin kritik önem taşıdığını belirtmiş ve iyi tasarlanmış bilgi sistemlerine olan ihtiyacı vurgulamıştır (WHO, 1987; WHO, 2000). Sağlık kurumlarının hizmet sunum süreçlerinde çeşitli birimlerinde gerçekleşen tüm işlemleri kapsayan Hastane Bilgi Yönetim Sistemleri de bilgi teknolojileri araçlarından biri ve bilgi sistemlerinin önemli bir parçasıdır (Rahimi ve ark., 2019).

En yalın hâli ile bilgi sistemleri, belirli sonuçları etkilemek için insanların, verilerin, süreçlerin ve teknolojinin entegrasyonudur (Smith, 2013). Hastane bilgi sistemleri, etkin hasta bakımı, hasta ve personel memnuniyeti gibi stratejik hedeflere katkıda bulunan, sistematik bilgi işleme ve bilgi depolama alt sistemi olarak ifade edilebilir. İyi yönetilen bilgi sistemleri, içinde bulunduğumuz yüzyılda sağlık kurumlarının başarısı için her zamankinden daha kritik rol oynamaktadır (Haux ve ark., 2004). Öyle ki sağlık teknolojilerinin gelişmesi ile birlikte yüksek kaliteli ve verimli hizmet sunumu için sağlık kurumunda çalışan profesyonellerin bilgi ihtiyacı olabilmektedir. Bunun yanı sıra hastane yönetimi, her zaman hastanenin maliyetleri ve hizmetleri hakkında güncel bilgilere ihtiyaç duymaktadır. İhtiyaç duyulan bilgilerin elde edilmesinin yanı sıra bilgi işlemenin kalitesi de bir hastanenin rekabet gücü için önemlidir (Haux ve ark., 2004).

Küresel düzeydeki araştırmalar, hastane bilgi yönetim sistemlerinin kullanılmasının bir yandan kaliteli, müşteri odaklı ve uygun maliyetli hizmet sunumunu sağlarken diğer yan-

SONUÇ

Bilgi ve bilgi yönetim süreçleri, sağlık sektörünün temel konusunun insan olması ve hata tolere edemeyecek yapısı nedeniyle kritik öneme sahiptir. Sağlık hizmetlerinin büyük kısmının sunulduğu hastanelerde hemen hemen tüm gruplarda ve tüm alanlarda hizmet kalitesi, bilgi işleme süreçlerinin kalitesi ile orantılıdır. Sağlık kurumlarının emek ve teknoloji yoğun kurumlar olması, uzmanlaşmanın fazla olması ve özellikle kamu hastanelerinde hasta sayısının fazlalığı bilgi işleme süreçlerini karmaşık hâle getirmektedir. Bu noktada ihtiyaç duyulan bilgilerin doğruluğu ve standardizasyonu için hastane bilgi yönetim sistemlerine ihtiyaç duyulmaktadır.

Hastane bilgi yönetim sistemleri ile tıbbi, idari ve mali süreçlerin hatasız yürütülmesi mümkün olmakta, hasta güvenliği uygulamaları desteklenmekte, zaman ve maliyet yönünden önemli ölçüde tasarruf sağlanabilmektedir. Bununla birlikte hastane bilgi yönetim sistemlerinden maksimum faydanın elde edilebilmesi için her hastanenin ihtiyacı olan hizmetlerin belirlenmesi ve tasarımın kurum içi ve kurum dışı süreçlere entegrasyon sağlanacak şekilde yapılması ve uzman personel ile desteklenmesi gerekmektedir. Bu noktada bilgi yönetim sistemlerinden sorumlu ekibin ve kurumdaki ilgili sağlık yöneticisinin güncel gelişmeleri ve Sağlık Bakanlığı tarafından belirlenen standartları takibi oldukça önemlidir.

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HALK SAĞLIĞI BİLGİ YÖNETİM SİSTEMLERİ

Muhammet Ali Oruç

1. GİRİŞ

Teknolojik gelişmeler birçok sektörde olduğu gibi sağlık alanında da iyi yönde önemli etki sağlamıştır. Sağlık bilgi sistemlerinin sağlık hizmet sunucularında kullanılması hem hasta memnuniyetinde artış hem de yönetsel faaliyetlerde büyük kolaylıklar sağlamaktadır. Sağlık hizmeti sunum sistemleri, hizmet odaklı, maliyet etkin, hasta merkezli, kaliteli bakım sağlayıp optimal sağlık sonuçlarını teşvik etmelidir.

Geçmişten günümüze ülkemiz sağlık sektöründe yaşanan sorunlar teknoloji kullanımı ile en aza indirgenmeye çalışılmıştır. Sağlık sektörünün vazgeçilmez parçası olan halk sağlığı hizmet sunucuları sağlık bilişim sistemlerine çok önemli yatırımlar yapmak durumundadır. Türkiye bu konuda dünyanın birçok ülkesine nazaran oldukça iyi bir durumdadır. Ülkemizin, halk sağlığı hizmetleri ve vatandaş bütünleşmesinde hemen hemen her ihtiyaca yanıt verebilecek dijital uygulamaları bulunmakta, bu teknolojiler bulut ağ yapısında hasta mahremiyeti ve bilgilerinin gizliliği ve güvenliği konusunda oldukça özenli bir biçimde yürütülmektedir.

Sağlık bilişim sistemlerini yararlı bir şekilde kullanmak hem sağlık hizmetlerinin akmasını engellemekte hem de hastalara teşhis ve tedavi sürecinde büyük kolaylıklar sağlamaktadır. Bu sistemler sağlık hizmetlerinde ki maliyetleri azaltmakta, hizmetlerin kalitesini artırmakta ve klinik hataların daha az yapılmasına olanak sağlamaktadır. Sağlık bilgi teknolojileri, sağlık hizmeti sunumunun kalitesini iyileştirilmesi, hasta güvenliğinin artırılması, tıbbi hataların azaltılması ve hastalar ile sağlık hizmeti sağlayıcıları arasındaki etkileşimin güçlendirilmesinde büyük öneme sahiptir. Diğer taraftan sağlık bilgi sistemleri, nüfus sağlığının yönetilmesine ve sağlık bakım maliyetlerinin azaltılmasına yardımcı olmak için sağlık verilerinin toplanmasına, derlenmesine ve analiz edilmesine yardımcı olmaktadır.

kullanılmaktadır. Sistemin geliştirilme çalışmaları devam etmektedir (<https://hts.saglik.gov.tr/>, 101.09.2022).

4.20. Ulusal Tüberküloz Sistemi (UTS)

Tüm TB hastalarının kayıtları ve bildirimleri bu sistem üzerinden yürütülür. Tanıyı ko-yan kurumun bildirim görevlisi tarafından, hastanın TC kimlik nosu, ICD 10 kodu, sağ/ö-lü ve yatan/ayaktan hasta bilgileri girilerek bildirim yapılır.

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Bölüm 7

DİJİTAL HASTANE

Elif Dikmetaş Yardan

Pelinsu Buket Doğanyığıt

1. GİRİŞ

Günümüzde bilim ve teknolojide yaşanan hızlı gelişmeler sağlık sektörünü etkilemiştir. Sağlık sektörü dijital bir dönüşüm yaşamış ve dijital hastane kavramı ortaya çıkmıştır. Dijital hastaneye kâğıtsız hastane de denilmektedir. Dijital hastane/kâğıtsız hastane, sağlık kurumlarında yapılan tüm işlemlerin geleneksel ve manuel yöntemler kullanılmayarak elektronik ortamda yapılmasına imkân vermektedir. Teknoloji ile bilgiyi birleştiren, uzun mesafelerde bulunan bireylerin entegrasyonunu sağlayan yüksek kaliteli sağlık hizmet sistemidir. Örneğin; hastanın sahip olduğu dijital kart sayesinde, hasta sağlık kurumuna girer girmez bütün sağlık bilgileri karta aktarılmaktadır. Tekrar test yaptırma ve yanlış tedavi olma olasılığı engellenmektedir. Dijital hastaneye diğer örnek ise hastanın röntgen, ultrason ve MR (manyetik görüntüleme rezonans) gibi görüntülemeye ait bilgileri veya test sonuçları bilgisayar ortamında saklanmakta ve izlenmektedir. Hekim, hastane dışında olsa bile bu verilere erişebilmektedir. Hatta farklı bir yerde yaşayan hastalar da kendilerine ait verilere internet ağı sayesinde ulaşabilmektedir. Dijital teknolojilerin kullanılması, hasta memnuniyetini ve çalışan memnuniyetini arttırmaktadır. Dijital hastaneler; tıbbi süreçlerin iyileştirilmesinde, hizmet alanlarının genişlemesinde ve maliyetlerin düşmesinde önemli rol oynamaktadır. Sağlık kurumlarının dijitalleşme sürecinde rekabeti sağlamak ve yeniliklere uyum göstermek amacıyla HIMMS (Healthcare Information and Management Systems Society-Sağlık Bilgi ve Yönetim Sistemleri Topluluğu) yol gösterici olmuştur. HIMSS, dijitalleşme sürecini yürütmekte ve bu çerçevede birtakım kriterler oluşturup sağlık kurumlarını değerlendirmektedir.

Bu bölümde, dijital hastane ve dijital hastanenin sağladığı avantajlar ve dezavantajlar anlatılacaktır. Daha sonra dijital hastanelerde kullanılan sistemler, dijital hastane sınıflandırılması ile dünyada ve Türkiye’de bulunan dijital hastaneler hakkında bilgi verilecektir.

2. DİJİTAL HASTANE NEDİR?

Dijital Hastane, sağlık kurum ve kuruluşlarında kullanılan bilgi sistemlerinin medikal ve medikal olmayan her türlü teknolojilerle tam entegre olduğu, güvenilir veri akışı standartla-

SONUÇ

Globalleşen ve dijitalleşen dünyada sağlık teknolojileri alanında önemli gelişmeler yaşanmıştır. Bu noktada sağlığın ve sağlık hizmetlerinin geliştirilmesi sürecinde dijital hastane uygulamaları, çağdaş bilgi ve iletişim teknolojilerinde dönüştürücü güç olarak ele alınmaktadır. Kâr amacı gütmeyen ve merkezi Chicago’da bulunan HIMSS (Healthcare Information and Management Systems Society-Sağlık Bilgi ve Yönetim Sistemleri Topluluğu) kuruluşu, dijital hastane standartlarını belirlemektedir. Dünya çapında kabul gören standartlara göre kuruluş; bir sağlık kurumunun dijital olup olmadığının kontrolünü yapmakta ve sertifikalamaktadır. Bu çerçevede farklı sağlık kurumları için farklı modeller oluşturulmuştur. Örneğin; yataklı sağlık kurumlarındaki dijitalleşme sürecinde “EMRAM” (Elektronik Tıbbi Kayıt Kabul Modeli), ayakta tedavi hizmeti sunan tesislerde “O-EMRAM” (Ayakta Elektronik Tıbbi Kayıt Kabul Modeli), dijital görüntüleme için “DIAM” (Dijital Görüntüleme Adaptasyon Modeli), bakımın sürekliliğinde “CCMM” (Bakım Olgunluğu Süreklilik Modeli), sağlık kuruluşunun teknolojik ve analiz yeteneklerinde “AMAM” (Analitik Olgunluk Benimseme Modeli), tedarik zinciri yönetiminde “CISOM” (Klinik Olarak Entegre Tedarik Sonuçları Modeli) ile teknolojik altyapılarını incelemeye “INFRAM” (Teknolojik Altyapı Benimseme Modeli) olmak üzere çeşitli modeller bulunmaktadır. Sağlık kurumları pazarda rekabet edebilmek, yeniliklere ayak uydurabilmek ve stratejik kararlar almak için dijitalleşme sürecini önem vermektedir. Bu nedenle hem Dünya’da hem de Türkiye’de dijital hastane sayıları günden güne artmaktadır. Türkiye, dijital hastane konusunda dünyada önde gelen ülkeler arasındadır. Dijital hastane; sağlık kurumuna, hastalara ve sağlık çalışanlarına avantajlar sağlamaktadır. Ek olarak sıfır hata, hasta güvenliğini sağlama, kâğıt israfını önleme, maliyetlerin en aza inmesi, sağlık çalışanı ve hasta memnuniyetini artırma ile daha etkili verimli, ve güvenilir hizmet sunumunu sağlama gibi faydaları da bulunmaktadır. Mahremiyet ihlali, siber saldırı ve suistimal risklerine yönelik etkili stratejiler geliştirilmelidir. Bu bağlamda etkili olacak stratejiler ve politikalar geliştirilmelidir. Hastane verilerinin teknolojik ortamda güvenliği sağlanmalı, veri paylaşımı ve gizliliği arasındaki dengenin oluşturulması önerilmektedir. Sağlık hizmetinden yararlanan kişilerin bilgilerinin saklanabilmesi için güçlü koruma yazılımları geliştirilmelidir. Elektronik kayıt sisteminde, veri şifreleme yöntemi kullanılarak kayıtlara erişimi bulunmayan kişilerin ulaşması engellenmelidir. Siber saldırılara karşı sistem yazılım ve donanım alt yapısının da güçlendirilmesine ve yeni yöntemlerin geliştirilmesine ihtiyaç duyulmaktadır.

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Bölüm 8

HASTA MERKEZLİ TEKNOLOJİLERDE BİLGİ GÜVENLİĞİ, GİZLİLİĞİ VE MAHREMİYETİ

Türker Yardan

Hasan Fehmi Demirci

1. GİRİŞ

Teknolojik ilerlemeler ve bu alanda yaşanan değişim, teknolojinin sunmuş olduğu hız ve esneklik tüm sektörler tarafından göz ardı edilemeyecek boyuta ulaşmıştır. Her sektörde olduğu gibi sağlık sektörü de teknolojik gelişmeleri özümsemiş ve kendi yapısına dâhil etmiştir. Özellikle bilişim teknolojileri sağlık alanında yoğun şekilde kullanılmaktadır (İleri & Uludağ, 2017). Sağlık sistemleri içerisinde teknoloji gelişmeden önce teşhislerin kâğıt üzerinde okunaksız şekilde yazılması, hekimlerin hasta bilgilerine kolayca erişememesi ve hastaları izlemek için zaman, yer ve personel kısıtlamaları gibi sorunlar var olmuştur (Meingast ve ark., 2006). Teknolojinin gelişmesi ile birlikte bu sorunlar en aza indirilmiş ve sağlık hizmetlerinin sunumunda büyük değişiklikler yaşanmıştır. Bilgi çağına getirmiş olduğu teknolojik değişimler, her alanda çeşitli fırsatlar ortaya çıkarmıştır.

Son on yıldan fazla süredir, sağlık bilgi teknolojisi, sağlık hizmetlerinde güvenliği artırmanın ve kalitenin iyileştirilmesini sağlamanın yolu olarak tanıtılmaktadır (Furukawa ve ark., 2017). Sağlık bilgi yönetimi, tarihsel olarak tıbbi kayıtların yönetimine odaklanan disiplindir. Tıbbi kayıtların elektronik hâle gelmesiyle bu alan geçiş sürecine girmiş ve giderek bilişimle örtüşür hâle gelmiştir (Hersh, 2009). Sağlık hizmetlerinde bilgi sistemleri, sağlık hizmetlerinin daha iyi sunulmasını sağlamaktadır (Young & Klein, 2021). Sağlık hizmetlerinde bilgi sistemleri ile bilgi ve iletişim teknolojilerinin birleşiminden ortaya çıkan sağlık bilgi teknolojileri alanı, sağlık hizmetlerinin sunum şekillerinde birçok değişim meydana getirmiştir.

Sağlık bilgi teknolojileri, sağlık hizmetlerinin iyileştirilmesi ve dönüştürülmesi için insan hatalarının ortadan kaldırılmasını, klinik sonuçların iyileştirilmesini, bakım koordinasyonunun kolaylaştırılmasını, uygulama verimliliğinin artırılmasını ve zaman içinde verilerin izlenmesini içeren sayısız fırsat sunmaktadır (Dönmez ve ark., 2020). Bu teknolojiler hastayı merkeze alan teknolojilerdir. Dolayısıyla hastaya daha iyi hizmet sunmak için

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SAĞLIKTA KALİTE YÖNETİMİ VE BİLGİ SİSTEMLERİ

Tunçay Palteki

1. GİRİŞ

Etkili ve verimli bir sağlık hizmeti sunumu, ekip çalışmasını, etkili bilgi paylaşımını, başarılı bir iletişimi ve işbirliğini zorunlu kılmaktadır. Bununla birlikte hizmetin standardizasyonu da önem arz etmektedir. Bu bağlamda sağlık hizmeti sunumunda bilgi teknolojilerinin ve enformasyon sistemlerinin kullanımı büyük önem taşımaktadır (Birinci, 2013).

Milenyumla birlikte sağlık hizmetlerinin yüksek kalitede ve uygun maliyette sunulması ile ilişkili hesap verebilirliğin ön plana çıktığı görülmektedir. Bunu sağlayabilmek için de sağlık politika yapıcısı konumundaki tüm tarafların bilgiye ve bilgiye dayalı karar verme araçlarına sahip olması gerekliliği ortaya çıkmıştır. Günümüzde anlamlı sağlık sonuçlarına ve verimli hedeflerine ulaşabilmek için hem nicelik hem de nitelik olarak uygun sağlık bilgi sistemlerinin varlığına ihtiyaç duyulmaktadır.

Sağlık hizmetlerinde kalite yönetimi yaklaşımının ortaya çıkışı ile bilgi sistemlerinin sağlık alanında kullanılmaya başlanması yirminci yüzyılın son yirmi yılına karşılık gelmektedir. Kalite yönetiminin başarı koşulları arasında işin yapılandırılması, karar süreçleri ve problem çözümlerinde nicel yöntem ve tekniklerinden faydalanma gerekliliği yer almaktadır. Bu bağlamda ölçüm, gözlem ve kontrollerin etkin yapılabilmesi için veri dizileri ve bu verilerin yorumlanmasına ihtiyaç vardır (Çetin & Arslan, 2017). Bunları gerçekleştirebilmenin en önemli yollarından biri de hiç kuşkusuz bilgi sistemlerinin uygun kullanılmasıdır.

Sağlık bilgi teknolojilerinin sağlık hizmet sunumunda giderek yaygınlaşması gerek klinik düzeyde gerekse yönetim düzeyinde kalite ve performans artışına neden olmuştur.

Bilgi sistemlerinin sağlık hizmetlerinin sunumundaki rolü ve vazgeçilmezliği herkes tarafından bilinen bir gerçektir. Zamanında, eksiksiz, doğru ve okunaklı bilgilere erişim sağlık hizmeti içerisinde yer alan tüm paydaşlar için kritik öneme sahiptir. İster yoğun bakımdaki bir hastaya ilaç veren bir hemşire, isterse herhangi bir diyabet tedavisi için hastaya en son araştırma bulguları hakkında tavsiyede bulunan bir hekim ya da geri ödeme kuruluşuna elektronik fatura kesen bir memur veya kurumunun maliyet etkinliğini izleyen

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SAĞLIK SEKTÖRÜ TEKNOLOJİ UYGULAMALARI

Elif Dikmetaş Yardan

Birgül Yabana Kiremit

1. GİRİŞ

Günümüzde internet kullanımının artması ve teknolojiye meydana gelen önemli değişim ve gelişmelerle birlikte bireylerin ve toplumun mobil ve dijital beklentileri ve istekleri artmıştır. Özellikle sağlık hizmetleri bu gelişmelerden çok fazla etkilenmiş ve birçok hizmet dijital ve akıllı platformlara taşınmıştır. İnternet ve mobil iletişim teknolojileri, yapay zekâ, giyilebilir cihazlar, robotlar, nesnelerin interneti vb. sayesinde sağlıkta büyük dönüşüm yaşanmıştır.

Bu bölümde sağlık hizmetlerinde teknoloji kavramına değinilecek ve sağlık sektörü teknoloji uygulamalarından sağlık sektöründe yapay zekâ, sağlık sektöründe büyük veri, nesnelerin interneti, sağlıkta sanal ve artırılmış gerçeklik, sağlık sektöründe kullanılan robotlar, e-sağlık, mobil sağlık, teletıp, dijital hastane, kişiselleştirilmiş sağlık, giyilebilir teknoloji ve siber güvenlik konuları ele alınacaktır.

2. SAĞLIK SEKTÖRÜ TEKNOLOJİ UYGULAMALARI

Bilgi, ağ teknolojileri ve telekomünikasyonda yaşanan gelişmeler ve değişimler sağlık sektöründe önemli rol oynamakta ve medikal bilgi sistemlerinin gelişmesine katkı sağlamaktadır. Bilgi teknolojileri ve tıbbın bir araya gelmesiyle sağlık hizmetleri dönüşüm sürecine girmiştir. Bu durum, maliyet ve verimsizliği azaltmış ve bireylerin beklenen yaşam süresinin artmasını sağlamıştır (Dimitrov, 2016).

Teknolojik ve bilimsel alanlarda meydana gelen gelişmeler, insan yaşamının önemli derecede değişmesine sebep olmuştur. Sağlık hizmetlerinde teknoloji, profesyonellerin ihtiyaçlarıyla birlikte hastaların da ihtiyaçlarına çözümler sunan; yaşam kalitesini iyileştirmek için yöntem, sistem, ilaç, cihaz, aşı ve düzenli bilgilerin uygulanması şeklinde tanımlanmıştır (Arslan ve ark., 2020; WHO, 2011).

Sağlık personeli bu teknolojilerin nasıl kullanılacağına yönelik bilgi sahibi olması gerekir. Sunulan teknoloji tabanlı hizmetlerin hasta dostu, kullanımı kolay, uygun, verimli ve kolayca erişilebilir olması hastaların bu yeni tanıtilan teknolojik değişiklikleri reddetmelerini azaltacak ve teknolojilere aktif olarak katılımını sağlayacaktır (Yoon & Lee, 2019). Önemli olan başka bir konu da sağlık personelinin, kullanılacak olan teknolojileri ve uygulamalarının sağlık personeli tarafından kabul edilmesi ve uyumluluğudur. Aksi takdirde kullanılacak teknolojinin başarısı azalacaktır. Sağlık teknolojilerinin, hastalar, sağlık kurumları ve çalışanları için faydası her geçen gün artmaktadır.

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Bölüm 11

SAĞLIK BİLGİ SİSTEMLERİNDE TELETIP VE TELETIP UYGULAMALARI

Dilaver Tengilimođlu

Alper Güzel

Son yirmi yılda, teknolojideki yaşanan hızlı gelişmeler, dijital olarak sunulan bakımın erişilebilirliğini ve kalitesini önemli ölçüde artırmıştır. Teletıp sağlık profesyonelleri için yardımcı araçlar ve zamanında hasta bilgisi, bir arşive veya veri tabanına anında erişim ve sağlık alanındaki uzmanlarla daha kolay etkileşim sağlayarak hasta bakımını kolaylaştıran, hızlandıran ve iyileştiren bir teknoloji olarak görülmektedir. Pandemi döneminde, teletıp, hasta bakımına erişimi artıran, tedavide gecikmeleri önleyen, hastaların ve sağlık hizmeti sunucularının SARS-CoV-2 enfeksiyonuna maruz kalma riskini azaltan uygulanabilir ve güvenli bir alternatif hâline gelerek aynı zamanda, pandeminin başında sınırlı olan kişisel koruyucu ekipman talebini de azaltmıştır (Montenegro, ve diğerleri, 2021).

Başlangıçta travma ve felç gibi acil durumların zamanında yönetimi ile uzak kırsal veya dezavantajlı nüfuslarla iletişim kurmak için kullanılan teletıp, hızla genişleyerek birden fazla tıbbi alanda kapsamlı bakım sağlama aracı hâline gelmiştir. Akuttan kroniğe ve ayrıca birincil bakımdan özel bakıma kadar uzanan teletıp, kalp yetmezliği, diyabet ve hatta hamilelik gibi çok çeşitli tıbbi durumlarda başarıyla uygulanmaktadır. Teletıbbın nihai amacı, uzaktan, zamanında ve kaliteli tıbbi bakım sağlamaktır. Ek olarak teletıp, özel bakıma daha iyi erişim ve işten daha az zaman kaybı nedeniyle yüksek hasta memnuniyeti sağlayabilir. Taşınabilir cihaz teknolojisindeki yenilikler ve artan geniş bant kullanılabilirliği ile teletıp, bu amaca ulaşmak için kullanılan yöntemlerde büyük ilerlemeler kaydetmiştir. Akıllı telefonlar, video konferans ve mobil kablosuz sensörlerin kullanımı sayesinde hastalar genellikle kendi evlerinin rahatlığında tıbbi bakım alabilmekte, bu da zamandan ve gereksiz maliyetlerden tasarruf sağlamaktadır. Klinik etkileşimlerin sınırlarının ötesine geçen bu araçlar, hastalığın ilerlemesi ve iyileşmesi hakkında daha iyi bilgi edinmek ve optimal tıbbi tedaviye ulaşmaya yardımcı olmak için kullanılmaktadır. Teletıp sağlık hizmeti sunumunun yeni ve yenilikçi araçlarını sağlamaya devam etmektedir (Barbosa, Zhou, Waddell, Myers, & Dorsey, 2021; Hoyt, 2009).

Sağlık turizmi sektörünün ayırt edici özellikleri, düşük maliyetle yüksek kaliteli sağlık hizmetleri sunma yeteneği ve sağlık ihtiyaçları açısından hastalara daha fazla seçeneğe sunma potansiyelidir. Teletıp hizmetlerinin kullanımı, bunları sağlama potansiyeline sahip olmakla birlikte, hastanın kendi sağlık hizmeti için bir sorumluluk üstlenmesi açısından güçlendirme potansiyeline de sahiptir. Bu tür hizmetler, hastalara uzun mesafeler katetmelerine gerek kalmadan sağlayıcılara ve tıbbi hizmetlere erişim sağlar. Sağlık turizmi sektörü ile teletıpın uygulanması, daha kişiselleştirilmiş bir hizmet sunma çabası içinde, mesafeler arasında köprü oluşturma konusunda önemli bir taahhüttür (Arnaert, tarih yok).

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Bölüm 12

SAĞLIK BİLGİ SİSTEMLERİNDE ULUSLARARASI HASTALIK SINIFLANDIRMA SİSTEMLERİNİN ÖNEMİ

Aslan Kaplan

Aysel Köksal

Hastalıkların uluslararası sınıflandırılması sistemi sağlık bilgi sistemleri içerisinde kalite ve verimliliğin artırılmasında önemli bir role sahiptir. Hastalıkların uluslararası sınıflandırılması sistemi dünyada 1960'lı yıllardan beri kullanılmakta olan sağlık istatistiklerinin temeli olan ve epidemiyolojik değerlendirmeler için önemli olan bir sınıflandırma sistemidir. Sağlık hizmetlerinde hastalıkların ve işlemlerin tutarlı bir şekilde kodlanması, yalnızca muhasebe için değil, sağlık sisteminin her alanında büyük öneme sahiptir. Sağlık sisteminde güvenilir karşılaştırmalı analizler yapabilmek için standartlaştırılmış terminolojiye, uluslararası sınıflandırma sistemlerini kullanmaya ihtiyaç vardır. Sağlık sektöründe kodlama ve sınıflandırma sistemleri dünya çapında kullanılmaktadır. Birçok ülke Dünya Sağlık Örgütü'nün Uluslararası Hastalık Sınıflandırmasını kabul etmiş ve 10. Revizyonunu (WHO ICD-10) kullanmaktadır. 2022 yılı itibarıyla da ICD-11 kullanılmaya başlayacaktır.

ICD (International Statistical Classification of Diseases and Related Health Problems) Hastalıkların Uluslararası İstatistiksel Sınıflandırmasına ve İlgili Sağlık Sorunlarına dayalı elektronik sağlık kaydı (EHR) sistemleri, hastalıkların Onuncu Revizyon (ICD-10) kodlaması, analiz için büyük veri setleri oluşturmak için giderek daha fazla kullanılmaktadır. ICD-10 nun ülkemizde sağlık kuruluşlarında kullanımı 2005 yılından beri zorunlu hâle gelmiştir. Klinik kodlanmış veriler, kalite ve güvenlik, izleme ve finansman modellerinden sağlık hizmeti planlamasına ve altyapı geliştirmeye kadar sağlık sistemlerini çeşitli yönlerini etkilemektedir.

ICD, hastalıkları ve ölüm nedenlerini sınıflandırmak için kurulmuş küresel bir veri sistemidir. Son on yılda, Sağlık Bilgi Yönetimi (HIM) alanına entegrasyonuna paralel olarak ICD'nin kullanımında çarpıcı bir artış görülmüştür. Dünya Sağlık Örgütü (WHO) tarafından 1984'ten beri yayınlanan ICD, ICLD-5'in (Uluslararası Ölüm Nedenleri Listesi) yerine kullanılır ve her sağlık teşhisine kodlar atar. DSÖ Uluslararası Hastalık İstatistiksel Sınıflandırması ve İlgili Sağlık Sorunlarının 10. Revizyonu (ICD-10-CM) en son sürümdür ve 11. sürüm geliştirilme aşamasını tamamlamak üzeredir.

ICD kullanımı tedavinin seçimi, ölüm nedeninin raporlanması, uygunluk seçimi, sağlık sigortası taleplerinin kolaylaştırılması, verinin depolanması, sağlık hizmetinin değerlendirilmesi, sağlık politikalarının belirlenmesi, epidemiyolojik hastalıkların yönetimi, kaynak

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Bölüm 13

SAĞLIK HİZMETLERİ FATURALANDIRMA SÜREÇLERİNDE SAĞLIK BİLGİ SİSTEMLERİNİN ÖNEMİ

Ayşe Keleş

Elif İşlek

Umut Beylik

1. GİRİŞ

Zamanımızda bilgi sistemleri sağlık kurumlarında gittikçe genişleyen bir kullanım yelpazesinde yaygınlaşmakta ve âdeta bilgi sistemleri vazgeçilmez bir konuma hızla ulaşmaktadır. Bununla birlikte insan ve bilgi teknolojileri arasındaki iletişim ve koordinasyon nispeten daha geriden gelmektedir. Sağlık kurumlarında kullanılan bilgi sistemleri sunulan hizmetin kalitesini, maliyetini ve zamanını doğrudan etkilemektedir. Bu çerçevede sağlık bilgi sistemlerinin etkililiği ile sağlık sonuçlarının arzulan düzeyde olması arasında önemli bir ilişki olduğu söylenebilir. Sağlık hizmetleri ile ilgili veri ve bilgi akışının ileriye ve geriye yönelik sağlanması yönetim, tıbbi, idari ve mali süreçlerin yürütülmesini doğrudan etkilemektedir. Bu kapsamda; sunulan sağlık hizmetlerinin geri ödemesi kapsamında kanıtlayıcı temel muhasebe belgesi olarak kısaca tanımlanan faturaların oluşumu süreçleri “Faturalama” olarak adlandırılmaktadır. Günümüzde sağlık kurumları faturalama süreçlerini sağlık bilgi sistemleri üzerinden gerçekleştirmekte, hatta sosyal veya özel sağlık sigorta kurumlarına entegre sistemler aracılığı ile faturalar gönderilebilmektedir. Bu bölümde öncelikle sağlık hizmetlerinde faturalama süreçlerinin alt yapısını oluşturan bireysel ve kurumsal hizmet sunucularına yapılan geri ödeme yöntemleri anlatılmış akabinde ülkemizde sağlık bilgi sistemleri üzerinden yürütülen faturalama süreçleri ele alınmıştır.

2. SAĞLIK HİZMETLERİNDE GERİ ÖDEME VE TÜRKİYE UYGULAMASI

Sağlık sisteminin nihai hedefleri toplumun sağlık düzeyini yükseltmek ve sağlık hizmetlerinden memnuniyeti sağlarken aynı zamanda vatandaşları sağlık hizmetlerinin yıkıcı harcamalarından korumaktır. Bu nedenle sağlık hizmetlerinin ihtiyaca uygun olarak herkese eşit sağlanabilmesi için sağlık sistemleri içinde o topluma en uygun finansman, sigorta ve geri ödeme mekanizmalarının tanımlanması gerekir.

düler paketler hâlinde tasarlamaları gerekmektedir. Bu paketler veri aktarımı için gerekli üç temel işlemi; aktarım işlem sırası(örneğin veriyi kaynaktan çıkar-dönüştür-hedef sisteme yükle), akış senaryosu (sürekli, grup hâlinde) ve veriyi gönderme-alma metodlarını içermesi gerekir. Modüler paketler sayesinde ödeyici kurumların yaptığı servis güncellemelerine yeniden komut dosyaları oluşturmaya gerek kalmadan entegre olmayı sağlayacaktır.

SONUÇ ve ÖNERİLER

Sağlık hizmet sunucuları tarafından sundukları hizmetin karşılığı ücretin hukuki olarak kanıtı olan faturalar ile ilgili faaliyetler olan faturalama süreçleri, sağlık bilgi teknolojilerinde yaşanan gelişim ve değişimle tamamen otomasyon sistemleri aracılığıyla yürütülmeye doğru hızla yol almaktadır. Sağlık sistemlerinde genel olarak hasta adına ödeme yapan sigorta kuruluşları ile sağlık hizmet sunucuları entegre sistemler aracılığıyla bu süreçleri hızlı ve etkili bir şekilde yönetmeye çalışmaktadır. Artan hizmet sunum çeşitliliği, geri ödeme kurumları, sigorta şartları ve yazılım platformları arasında tutarlı ve zamanında veri değişimi gerçekleştirmek için özellikle sağlık hizmet sunucuları arasında yoğun fatura kesen hastanelere ait HBYS'lerin entegrasyon modüllerini standartlaştırmaları ve otomatikleştirmeleri gerekir. Ödeyici kurumların ise hizmet sunucuların faturalama süreçlerini daha etkili izleyebilecek otomasyon sistemleri oluşturması konusu ise hâlen çözülmesi gereken bilgi sistemleri entegrasyonlarında görülen en önemli eksiklik olarak ön plana çıkmaktadır. Bu durum hâlihazırda örneklem üzerinden fatura kontrolleri çerçevesindeki fiziki incelemeler ile yönetilmektedir. Bu kapsamda faturalama süreçlerinin onamı veya izlemine doğrudan hizmet alanlarında katılabileceği sağlık bilgi sistemleri (HBYS ve/veya MEDULA tarafında) tasarlanması bir alternatif olarak önerilmektedir. Bununla birlikte böyle bir bilgi sisteminin gereksiz veya aşırı sağlık hizmetini azaltabileceği, sağlık hizmetlerinin arzulanacak sağlık sonuçlarına odaklı sunulmasını teşvik edeceği, sağlık hizmetlinin performans ve kalitesini azaltabileceği, sağlık kurumlarında israfın düşürülebileceği ve sağlık harcamalarını doğrudan azaltıcı yönde etkileyebileceği öngörülmektedir.

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Okan Özkan

Özlem Özer

1. GİRİŞ

Bilgisayar, akıllı telefon gibi dijital cihazların yaygınlaşması ve çeşitli bilişim teknolojilerindeki hızlı gelişmeler nedeniyle internet, günlük hayatın ayrılmaz bir parçası hâline gelmiş, bilgi sistemleri giderek daha fazla kullanılmaya başlanmış ve elektronik belgeler hızla yaygınlaşmıştır. Bu gelişmeler, yargı sistemlerini de etkilemiş ve büyük değişimleri beraberinde getirmiştir (Lee ve ark., 2013).

Dijital çağın büyümesiyle birlikte keşif formatı, elektronik olarak saklanan bilgileri içerecek şekilde önemli ölçüde değişikliğe uğramıştır. Artık oluşturulan ve saklanan bilgilerin yüzde doksandan fazlasının elektronik olarak yapıldığı tahmin edilmektedir (Ward ve ark., 2012). Bu nedenle de elektronik olarak saklanan bilgilerin yönetimi, günümüzde çoğu işletmeler için büyük bir öneme sahip olmuştur. Elektronik olarak saklanan bilgiler şeklinde bilinen ve elektronik biçimde saklanan bilgilerin keşfedilmesi anlamına gelen e-keşif (Yuan ve ark., 2015), yeni yerlerden ve yeni kaynaklardan yeni biçimlerde yeni bilgiler elde etmeyi ve yeni bir şekilde kullanmayı gerektirmektedir (Smetana, 2009). E-keşif, sağlık kurumlarının günlük işlemlerini büyük ölçüde etkileyebilmesi nedeniyle üzerinde önemle durulması gereken bir kavram olarak değerlendirilmektedir (Vasudevan & Rao, 2011). Sağlık kurumları artık tüm hasta verilerini elektronik biçimde bilgisayar sunucularında depolamaktadır. Verilerin elektronik olarak depolanması ise sağlık kurumlarında davalar için keşfedilebilir yeni bir bilgi kaynağının ortaya çıkmasına neden olmuştur (Adams, 2014). Bu bölümde e-keşfin ne olduğu, e-keşfin olumlu ve olumsuz yanları, e-keşif süreci, sağlıkta e-keşfin tanımı ve sağlıkta e-keşif konusunda yaşanan zorluklar hakkında bilgiler sunulmaktadır.

SONUÇ

Sağlık hizmetleri, dava potansiyeli oldukça yüksek bir alandır. Bu nedenle riskleri ve oluşabilecek maliyetleri savunabilecek şekilde yönetme kabiliyeti giderek daha da önemli bir konu hâline gelmektedir (Proofpoint, 2011). Ayrıca sağlık kurumlarının e-keşfi başlatma ve uygulama konusunda kendisini eğitmesi, e-keşfi başlatmaya ve uygulamaya hazırlıklı olması da önemli bir gerekliliktir (Newton, 2016). Sağlık sektöründe yeni teknolojilerin ortaya çıkması, yeni veri kaynakları ve verileri uzun süreli saklama politikaları ve gereksinimleri nedeniyle sağlık hizmeti sunucuları oldukça yoğun veri istilasına ile baş etmek durumundadır (KPMG, 2019). Bu yüzden e-keşfin önümüzdeki yıllarda sağlık kurumlarında çok daha fazla kullanılacağı düşüncesinden hareketle verilerin uygun bir şekilde saklanması/depolanması ve davalara hazırlıklı olunması e-keşif sürecini daha iyi yönetebilmek adına oldukça önemlidir.

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SAĞLIK BİLGİ SİSTEMLERİNİN HUKUKİ YÖNÜ

h.c. Hakan Hakeri

Dijital sağlık “bilgisayar bilimi, mühendislik, bilişim bilimi, gazetecilik, ekonomi, klinik tıp, halk sağlığı, epidemiyoloji gibi pek çok disiplini kapsamaktadır”.

Dijitalleşme ile beraber bilgi sistemleri artık sağlık alanında da ana unsurlardan biri hâline gelmiştir. Bu husus tıp hukuku açısından da konunun değerlendirilmesini gerekli kılmaktadır. Bu çalışmada, sağlık bilgi sistemlerinin uygulamada hangi yönlerden sorunlara yol açabileceği ve ne tür hukuki değerlendirme yapılması gerektiği tartışılacaktır.³

1. MAHREMİYET SORUNLARI

1.1. Sağlık Çalışanlarının Verilere Erişimi

Kişisel Sağlık Verileri Hakkında Yönetmelik’e göre, “sağlık hizmeti sunumunda görevli kişiler; ilgili kişinin sağlık verilerine ancak, verilecek olan sağlık hizmetinin gereği ile sınırlı olmak kaydıyla erişebilir” (md. 6/1).

E-Nabız hesabı bulunan kişilerin sağlık verilerine, kendi gizlilik tercihleri çerçevesinde erişim sağlanır. İlgili kişiler, gizlilik tercihleri ve sonuçları konusunda ayrıntılı şekilde bilgilendirilir. Gizlilik tercihi ve geçmiş sağlık verilerinin görüntülenememesi nedeniyle sağlık hizmeti sunumunda meydana gelebilecek aksaklık ve zararlardan Bakanlık sorumludur (md. 6/2).

E-Nabız hesabı bulunmayan kişilerin sağlık verilerine ise Kanunun 6’ncı maddesinin üçüncü fıkrasında yer alan istisnai amaçlarla sınırlı olmak üzere ancak;

a) Kişinin kayıtlı olduğu aile hekimi tarafından herhangi bir süre sınırı olmaksızın,

b) Kişinin sağlık hizmeti almak üzere randevu aldığı hekim tarafından, randevunun alındığı gün ile sınırlı olmak kaydıyla ve alınan sağlık hizmeti ile doğrudan bağlantılı işlemler sonlanana kadar,

³ Prof. Dr., Konu ile ilgili ayrıntılar, kaynakça ve atıflar için bkz, Hakeri, Hakan, Tıp Hukuku, 25. Baskı, Ankara 2022.

- ç) Sağlık riski artan veya ileri yaşlı kişilerin çok yönlü değerlendirmesi ve takibi yapılabilir.
- d) Teknolojik imkânların elvermesi ve Bakanlıktan gerekli izinlerin alınması koşuluyla kişilere, Bakanlıkça belirlenen girişimsel veya cerrahi operasyon hizmetleri sunulabilir.
- e) Endemik veya epidemik salgınlarda ulusal nitelikteki kılavuzlar doğrultusunda kişilerin sağlığının korunmasına yönelik gerekli tıbbi işlemler yürütülebilir.
- f) Giyilebilir teknolojiler ve diğer tıbbi cihazlar ile sağlık hizmeti talep eden kişinin sağlık verileri ölçülebilir ve takip edilebilir.
- g) Hekim tarafından değerlendirilen kişiye, hekimince e-reçete ve e-rapor tanzim edilebilir.

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Bölüm 16

SAĞLIK BİLGİ SİSTEMLERİNDE İNSAN KAYNAKLARININ ÖNEMİ

Saffet Ocak

Sağlık hizmetlerinde verilerin doğru, güvenilir, kullanıma uygun, zamanında, yeterli biçimde kayıt altına alınması çok önem arz etmektedir. Eğer veriler doğru, eksiksiz ve gerektiğinde kullanılamıyorsa sağlık hizmeti sunumunda, hasta bakımında esasen işe yaramazlar. Dolayısıyla sağlık bilgi verilerini elektronik ortamda kayıt altına alacak olan personelin bu alanda yeterli eğitim almış olması, bilgi, beceri ve donanıma haiz olması sağlık bilgi sistemlerinin başarısında ön koşuldur. Ayrıca sağlık bilgi sisteminin önemini ve gerekliliğini kavramış personelin varlığı sistemin gelişimine katkılar sağlayacaktır. Diğer bir ifade ile sağlık bilgi sistemi kullanıcıları (sağlık çalışanları, yöneticiler vs.) bilgi teknolojilerini benimsemeleri, iş ve işlemlerinde kullanarak karar vermede yardımcı olan değerli bir varlık olarak görmeleri bu sistemin gelişimini daha da destekleyecektir. Sağlık bilgi sistemlerinde hem veriyi kayıt altına alan hem de veriyi kullanan personel çok önemlidir. Bu önemin gerekçeleri bu bölümün ana konusunu oluşturmaktadır.

Geleneksel sağlık hizmeti döneminden e-sağlık dönemine başarılı bir şekilde geçişle bile sağlık sektörünün veri yoğun özelliği değişmeyecektir (Tan, 2005). Tıp Enstitüsü (1999, 2001) araştırmaları, yüksek kaliteli hasta bakımının her hastanın tıbbi geçmişinin, sağlık durumunun, mevcut tıbbi durumlarının ve tedavi planlarının dikkatli bir şekilde belgelenmesine dayandığını ileri sürmektedir (Glandon ve ark., 2008). Sağlık hizmetlerindeki anahtar bilgiler arasında sistem hasta kayıdır. Hasta kaydı, genel sağlık bakım hizmetlerini planlama, organize etme, sağlama, yönlendirme, alma ve geri ödeme ile ilgili hemen hemen herkesin çalışmalarının merkezinde yer alır (Tan, 2005). Yalnızca hasta kayıtlarının elektronik ortamda kayıt altına alınması sağlık hizmetlerinin etkin ve verimli biçimde sunulması için yeterli değildir. Bilgi teknolojisi tek başına yönetim sorunlarının çözümü içinde yeterli değildir.

Sağlık hizmetlerinde yaşanan değişimi bakım maliyetleri, kanıta dayalı yönetim ve örgütsel değişim olmak üzere üç önemli faktör etkilemektedir (Glandon ve ark., 2008): Sağlık bakım maliyetleri, sağlık harcamaları hız kesmeden büyümeye devam ediyor. Tüm bunları bir perspektife oturtmak için, sağlık harcamalarındaki bu genel değişikliğin gerçek büyüklüğünü belirlemeye ve çözüm aramaya yardımcı olmak doğru, yeterli zamanında

SONUÇ

Sağlık hizmetleri sektöründe, maliyet düşürme, klinik sonuçlar, performansa göre ödeme, rekabet avantajı ve en iyi uygulama için iş modelleri, gelişmiş teknolojinin ve genişletilmiş veri varlıklarının sonucudur. Bilgi ve teknoloji daha zengin ve daha karmaşık hâle geldikçe, sağlık kuruluşlarında veri ve bilgiyi stratejik değer için bilgiye dönüştürmek için sistematik bir yaklaşım ihtiyacı duyacaktır (Cassidy, 2011). Bilgi sistemi insan kaynakları, sağlık sisteminin yüksek kaliteli sağlık verileri ve bilgi kaynaklarına yönelik artan ihtiyacını desteklemek için sürekli olarak iyileştirmeleri, değişiklikler yapmaları ve önemli katkılarda bulunmaları açısından önemlidir. Bilgi sisteminin amacı, doğru bilgiye doğru zamanda erişmeyi ve kullanmayı sağlamak, böylece kurumun doğru kararların doğru düzeyde alınmasına olanak sağlayacaktır. Bilgi sistemi insan kaynakları, bu ihtiyacı karşılamaya en uygun insan kaynaklarıdır.

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SAĞLIK BİLGİ SİSTEMLERİNDE HASTA GÜVENLİĞİ

Saffet Ocak

Cansu Güler

1. HASTA GÜVENLİĞİ

Sağlık bakım endüstrisindeki değişiklikler, yeni düzenlemeler, artan rekabet, sigorta kurumlarının ve sağlık hizmet tüketicilerinin baskısı sağlık kurumlarını daha maliyet etkili daha yüksek kaliteli hizmet sunmaya zorlamaktadır. Sağlık kurumlarının hem kaliteli hem de en düşük maliyetle hizmet sunabilmesindeki kritik önem sahip uygulamalardan biri hasta güvenliğidir. Hasta güvenliği, sağlık hizmetlerinde kalitenin en önemli konusu, aynı zamanda nitelikli ve kaliteli hizmetin en önemli göstergelerinden birisi olarak kabul edilmektedir.

Günümüzde, teşhis ve tedavi yöntemlerindeki modern gelişmeler, yeni tıbbi teknolojilerin kullanımının artması ve sağlık hizmetlerinin karmaşıklığı, bakım kalitesi ve hasta güvenliği konusunda ciddi eksikliklere neden olmuştur. Klinik risklerin ve güvenlik olaylarının yüksek prevalansı, sağlık hizmetleri sistemleri için endişeleri ve zorlukları arttırmıştır (Farokhzadian ve ark., 2018). Sağlık hizmetinin karmaşıklığı ve riskleri arttıkça hasta güvenliğini sağlayacak iyi tasarlanmış sistemlere olan ihtiyaç artmaktadır. Bakım hizmetleri sisteminin merkezinde hasta güvenliği sağlanamadığında, sağlık hizmetlerinin başka özelliklerinin değeri kalmayabilir.

Sağlık bakımı komplekstir ve çıktıları pek çok faktörden etkilenmektedir. Her sağlık sistemi içerisinde hastaların zarar görmesi kaçınılmazdır ve hastaların sağlık kuruluşuna her başvurusunda zarar görme olasılığı vardır (Sandars, 2009). Her ne kadar ciddi zararlar önemli maliyetler, morbidite ve mortalite ile sık sık ortaya çıksa da kanıta dayalı hasta güvenliğinin uygulamaya dönüştürülmesi yetersiz kalmaktadır (Rutberg ve ark., 2014). Hastaya zarar veren olumsuz olaylarla sağlık kurumlarında sıklıkla karşılaşılmaktadır (Zadvinskis ve ark., 2018). Sağlık hizmeti sunumunun her aşamasında ve her alanında güvenli olmayan uygulamalar (Albrecht, 2015), tıbbi hatalar, riskler ve tehlikeler söz konusudur. Bu tür olumsuzlukların ortadan kaldırılması ya da azaltılması sağlık kurumları

dukça güçtür (Akalin, 2005; Manav & Karademirler, 2018). Güvenli hasta bakımının artık bilgisayarlı karar desteği olmadan mümkün olamayacağını ileri sürülmektedir (Bates & Gawande, 2003). Örneğin bilgi sistemi aracılığı ile bir hastanın ilaçları arasındaki etkileşim anında belirlenebilmektedir. Artık çok sayıda çalışma, bilgisayar tabanlı karar desteğinin doktorların performansı ve bazı durumlarda hasta sonuçlarının iyileştirilebileceğini gösteriyor (Chertow ve ark., 2001; Johnston ve ark., 1994; Bates ve ark., 2003). Barkodlu hasta kimlik bileklikleri, yanlış hastaya yönelik tıbbi müdahale ya da işlemin gerçekleştirilmesi gibi olumsuz durumları önleyebilmektedir (Chassin & Becher, 2002; Bates ve ark., 2003). Örneğin hastada dekompanasyon meydana geldiğini hemşire gözlemleyerek fark edemeyebilir. Akıllı monitörlerin verdiği sinyaller ile bu durum görülüp hemen müdahale edilir. Hekimlere önemli tetkik sonuçları için uyarı mesajlarının bilgi sistemi aracılığı ile yapılması tıbbi hata oranlarını azaltmaktadır. Hastane bilgi sisteminin tedavinin klinik yollar ile uyum sağlayıp sağlamadığını kontrol etme olanağı sağlaması, hastanın tıbbi bakımını planlamada yardım eden alarm ve uyarı sistemlerinin kullanılması (Ceylan, 2015) tıbbi hata oranlarında düşüşlere yol açmaktadır.

5. Diğer: Hastane enfeksiyonları, yanlış kan tranfüzyonu gibi hayati konular ise diğer tıbbi hataların kapsamındadır. Bilgisayar destekli hekim istemleri ve bilgisayarlı hekim karar destek sistemleri, hekimlerin el yazısını okuyamama başta olmak üzere birçok tıbbi hata kaynağını ortadan kaldırmakta böylece tıbbi hata oranlarında azalmalar görülmektedir (İntepeler & Dursun, 2012). Hekimin teşhis koymadaki en büyük hatalarından birisi laboratuvar kaynaklı hatalardır. Laboratuvar yapılan testlerin kimlik doğrulamasının uygun bir şekilde yapılmaması ve numunelere yanlış hasta barkodu yapıştirilmesi nedeniyle hastaların tetkik sonuçlarının karışması gibi sonuçlar ortaya çıkmaktadır (Grabau, 2011). Hastaların kimlik doğrulamasının bilgi sistemi yardımı ile yapılması da transfüzyon hatalarının önüne geçmede etkili olabilmektedir (Er, 2019). Chaudhry ve arkadaşları (2006), sağlık bilgi sistem ve teknolojilerinin; klinik rehber ve protokollere bağlılığı artırarak ve hastalık süreyanslarını geliştirerek tıbbi hataları azalttıklarını tespit etmişlerdir.

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Bölüm 18

SAĞLIK BİLGİ SİSTEMLERİNDE ETİK

Demet Ünalın

Tuğba Baynal Doğan

1. GİRİŞ

Kökeni insanın var oluşuna kadar dayanan, toplumlarda doğru ve yanlış konusunda yol gösterici nitelik taşıyan etik kavramı iş kollarının artması ve kompleks hâle gelmesi ile çalışma ortamlarında oluşan ikilemlerin giderilmesi konusunda önem arz etmektedir. Sağlık hizmetleri; bünyesinde tıbbi, idari ve teknik olmak üzere pek çok meslek kolunu barındırması, acil ve ertelenemez olma özelliği, çalışma alanının insan hayatı oluşu ve ihlaller durumunda telafisi mümkün olmayan sonuçlara sebebiyet vermesi nedeniyle etik ilkelerin önemliliği açıktır. Bu önemlilik gereği meslek gruplarına ait etik ilkeler içerisinde öncü nitelik taşıyan sağlık etiği kavramı kapsamında sağlık hizmet sunumu esnasında uyulması gereken standartlar belirtilmekte ve bu süreçlerde sağlık profesyonellerinin yapması ve yapmaması gereken eylemleri içermektedir.

İçerisinde; yarar sağlama-zarar vermeme, adalet, aydınlatılmış onam ve hasta özerkliğine saygı ilkelerini de içersin sağlık etiği ilkeleri çerçevesinde şekillenen meslek uygulamaları Hipokrat'ın kökenine dayanmakta ve gün geçtikçe ihtiyaçlar dâhilinde revize edilmektedir. Dünya çapında bilgi iletişim teknolojisinde yaşanan hızlı dönüşüm de etik ilkelerin revize edilmesine yönelik yeni bir gerekçeyi de beraberinde getirmiştir. Bilgi iletişim teknolojisinde yaşanan bu gelişme ile birlikte, sağlık hizmetleri de farklı bir dönüşüm sürecine girmiştir. İlk olarak elektronik sağlık kayıtları ile başlayan dijitalleşme süreci, uzaktan sağlık hizmeti sağlayan teletıp teknolojisi, sağlık takibi yapan cihazlar, insan vücuduna yönelik gömülü teknoloji ile hızlı bir şekilde kâğıtsız dijital hastaneler doğmuştur.

Bu dönüşüm ile geçmişte tıbbi, idari ve teknik süreçlerde yaşanan rüşvet, yolsuzluk, çıkar çatışması, nepotizm, mahremiyet ve meslek sırrının ifşası gibi etik ihlallere ilaveten farklı ihlaller de ortaya çıkmıştır. Özellikle sağlık hizmet alıcılarının tüm verilerini depolayan sağlık bilgi sistemlerinde yaşanan etik ihlallerin tüm hastaneyi, hastayı ve tüm top-

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Bölüm 19

SAĞLIK BİLGİ SİSTEMLERİNDE KRİTİK BAŞARI FAKTÖRLERİ

Demet Ünalın

Sermed Doğan

Bülent Çizmeci

1. GİRİŞ

Sağlık arzını gerçekleştiren tüm sağlık kurum ve kuruluşları için, hizmet sunumunda teknolojinin kullanımı her geçen gün daha fazla önem kazanmaktadır. Günümüzde bilgi teknolojisi, tıp ve sağlık bakımında gittikçe yaygınlık kazanmakta ve sağlık bakım hizmetleri giderek teknolojiye bağımlı hâle gelmektedir (Işık & Akbolat, 2010). Hastanelerin uluslararası standartlarda kabul edilebilir dijital hastane sınıflandırma sürecine girebilme, aynı zamanda kâğıtsız hastane ya da yeşil hastane gibi kavramlar ile ön plana çıkabilme, klinik ya da yönetsel tüm işlemlerde modern bilgi teknoloji ile destekli alt yapı imkânlarına daha fazla gereksinim duyulması söz konusu olmaya başlanmıştır.

Sağlık problemleri; sadece bir ili, bölgeyi ya da ülkeyi ilgilendiren olumsuzluklardan ibaret değildir. Herhangi bir sağlık sorunu söz konusu olduğunda; tüm ülke etkilenebileceği gibi diğer ülkeler hatta kıtaları aşarak dünyayı etkisi altına alabilecek bir boyuta erişebilir. Bu duruma; çevresel bir sağlık sorunu veya bir salgın örnek olarak gösterilebilir. İnsanlar üzerinde etki yaratacak bu gibi sağlık sorunlarında ülkelerin birlikte mücadele etmesi en etkili yöntemler arasında yer almaktadır. Bu durum ise, sağlık hizmetlerinin küresel bir boyuta sahip olduğunu gösterir. Çevresel sağlık problemleri ya da salgına neden olan hastalıklar, olumsuz küresel sağlık sorunları arasında yer alırken, teknolojiye yaşanan gelişmeler ise küresel sağlık hizmetlerini olumlu yönde etkilemektedir. Nasıl ki; çevresel etmenler ya da salgınlar tüm insanları etkisi altına alabilme potansiyeline sahipse, bilgi teknolojisinde yaşanan gelişmelerden de insanların yararlanması söz konusudur. İnsanlığın faydasına yönelik gerçekleştirilen sağlık alanındaki tüm gelişmeler toplum yararına kullanılacaktır. Sağlığın küresel bir boyuta sahip olması, insanların en son bilgi teknolojisinden yararlanma istekliliğini artırmasının yanı sıra, bilgiye hızlı bir şekilde erişimin sağlanması ile insanların tüm gelişmeleri yakından takip edebilmesine de olanak tanımaktadır. Bilgiye; istenilen ortamda, belirlenmiş yetkiler çerçevesinde hızlı bir şekilde erişim sağlamak,

Bilgi teknolojisi; sağlık hizmet sunumunda, etkili, verimli, güvenilir, doğru ve organize edilmiş bilgilerden yararlanma imkânı sağlamaktadır. Çıktısı insan sağlığı olan sağlık hizmetlerinde bu tür bilgiye ulaşmak hayati önem taşımaktadır.

Teknolojinin yaygınlığı tıp biliminde hızlı bir şekilde gelişim göstermektedir. Sağlık kurumlarında karmaşık ve değişkenlik gösteren hizmetlerin sunulması ayrıca tüm kademelerden edinilen bilgiye ihtiyaç duyulması bakımından bilgi teknoloji yoğun bir şekilde kullanım alanı bulmaktadır. Birimler arası etkili iletişim sağlamada, hizmetin devamlılık esasını göstermesinde, tıbbi hataların engellenmesinde ve bilgiye bütüncül bakılabilmesi gibi birçok alanda bilgi sistemlerinden yararlanılmaktadır. Bu bağlamda; sağlık teknolojisinde yaşanan gelişmelerle birlikte bireylerin, kaliteli sağlık hizmeti alması, yaşam süresinin uzatılması, sağlık düzeyinin daha üst seviyeye çıkarılması için sağlık bilgi sistemlerine yönelik yatırımlar gün geçtikçe artış gösterecektir.

Sağlık sistemlerinin kurulumunun bir ihtiyaç durumundan daha çok zorunluluk hâline gelmesi ile bu sistemlerden en yüksek düzeyde verimin sağlanması temel kriteri oluşturmaktadır. Hem hizmet üretimini gerçekleştiren hem de hizmetten yararlanan kişilerin bu sistemden yüksek düzeyde verim elde edebilmesinde ise sistemi oluşturan tüm parçaların uyum içerisinde işlerlik kazanması gerekmektedir. Bu bağlamda, bilgi sistemlerinin birçok unsurun katılımı ile bir araya gelen yapıyı temsil ettiği söylenebilir. Sağlık bilgi sistemlerinin başarısında ise her bir unsur farklı düzeylerde etki etmektedir. Bunlar sağlık bilgi sistemleri için kritik başarı faktörlerini ifade etmektedir. Sağlık kurumlarında, sağlık bilgi sistemlerinin başarısını etkileyen faktörler genel olarak; bilgi sistemlerinin özünü oluşturan yazılım ve donanım, bunları destekleyecek alt yapı imkanları, karar alımını kolaylaştıracak klinik ve yönetsel karar destek sistemleri, hastaya ait bilgilerin muhafaza edilmesinde güvenlik önlemleri, e-sağlık uygulamaları ile entegrasyon, güncellemeye uygunluk, sistemin kullanımının tüm çalışan tabanına yayılması, sistem kullanıcılarının sürekli eğitimi, bekleme süresini kısaltacak hıza sahip olması, kolay erişime imkan tanınması, bilgileri saklayacak yeterli düzeyde depolama alanının bulunması şeklinde özetlenebilir.

İnsanın en önemli varlığı sağlığıdır. Sağlıklı olmak ve yüksek kalitede bir yaşam sürmek tüm insanların en doğal hakkıdır. Sağlık hizmetlerinden en ücra noktada bulunan bireylerin dahi eşit bir şekilde yararlanması ise ancak sağlık bilgi sistemleri ile mümkün olabilmektedir. Bu durumun sağlanması ise sağlık bilgi sistemlerinin başarısını etkileyecek uygulamaların önceden tespit edilerek sisteme adapte edilmesinden geçmektedir. Bu bağlamda, sağlık hizmetleri sunumunun neredeyse her alanında sağlık bilgi sistemlerinden gün geçtikçe daha fazla yararlanılması beklenilmektedir.

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Bölüm 20

SAĞLIK BİLGİ SİSTEMLERİNİN GELECEĞİ VE ENDÜSTRİ 4.0

Abdurrahman Yunus Sarıyıldız

1. GİRİŞ

Dünya nüfusunun artmasıyla birlikte, genel olarak daha iyi bir yaşam kalitesine ve etkili tedavilere ulaşmak için yükselen beklentiler, sağlık hizmetleri üzerinde artan bir baskı oluşturmaktadır. Bu nedenle sağlık hizmetleri; bilim, teknolojiye yeni ve daha gelişmiş çözümler talep ederek dünya çapında en önemli sosyal ve ekonomik zorluklardan biri olmaya devam etmektedir (Aceto ve ark., 2020).

Geleneksel sağlık hizmetleri, büyük nüfusu nedeniyle herkesin ihtiyaçlarını karşılayamaz. Mükemmel altyapıya, ileri teknolojilere rağmen, tıbbi hizmetler herkes için uygun fiyatlı veya erişilebilir değildir. Öte yandan sağlık hizmetleri operasyonları karmaşıktır ve büyük sistem görünürlüğü gerektirir. Sağlık personeli artan iş yükü ile hem sayıca yetersizdir hem de çalışma koşulları itibarıyla zor bir ortamda hizmet sunmaktadır. Ayrıca sağlık hizmetinin doğası gereği yüksek düzeyde bir belirsizlik vardır ve insan yaşamı söz konusu olduğundan riskler yüksektir (Yazıcı, 2014). Tüm bu zor koşullarda akıllı sağlık hizmetleri devreye girmektedir. Ayrıca akıllı sağlık hizmeti hedeflerinden birisi de insanların tıbbi durumları hakkında eğitmek ve sağlıkları hakkında bilgilendirmektir (Aghdam ve ark., 2021). Böylece insanların sağlık okuryazarlığı seviyesi yükseltilerek, sağlık sisteminin üzerindeki yükün bir nebze de olsa azaltılması hedeflenmektedir.

İnsanların yükselen yaşam beklentisi, hem sağlık hizmetleri maliyetlerini hem de sağlık hizmeti ihtiyaçlarını da farklılaştırarak artırmaktadır. Böylece sağlık hizmetleri, yüksek kaliteli hasta bakımı sunma baskısı, tıbbi personel eksikliği, tıbbi hatalar, verimsizlik gibi bir dizi sorunla da mücadele etmek durumundadır. Ayrıca sağlık hizmetlerinin doğası gereği 7 gün 24 saat esasına göre sürdürülen kesintisiz hizmet de sağlık hizmet sunumundaki zorlukları fazlalattırılmaktadır (Yazıcı, 2014).

Aslında sağlık, herhangi bir ulusun genel büyümesi için ana hedeflerden birisidir. Bu hedefe ulaşmak ve vatandaşlarını sağlıklı hâle getirmek gündemi olan bir ülke, vatandaşlarının gerçek zamanlı sağlık izlemesini sağlamayı amaçlamaktadır (Hathaliya ve ark.,

Sağlık bilgi sistemlerinin geleceği konusunu özetlemek gerekirse, özellikle, sağlık hizmetlerini destekleyen endüstriler, Endüstri 4.0'ı benimsemiş ve şimdi Endüstri 5.0'a doğru ilerlemektedir. Böyle bir devrim, modern dijital yüksek teknoloji şirketlerinin iş operasyonlarını nasıl iyileştirdiğini ve değer zinciri boyunca verimliliği nasıl artırdığını yeniden tanımlamaya devam etmektedir. Üretim sistemleri gibi, sağlık hizmeti sunumu da Sağlık 5.0'ın yeni çağına ulaşmak için bir paradigma değişikliğinin şafağındadır. Ortaya çıkan dijital teknolojiler, nanoteknoloji, 5G teknolojileri, drone teknolojisi, blok zinciri, robotik, büyük veri, nesnelerin interneti, yapay zeka ve bulut bilişim dâhil tüm bu gelişmeler Sağlık 5.0'da da kullanılacaktır. Günümüzde kullanımına başlanmış olan ve gelecekte sağlık teknolojilerinde kullanılacak dijital teknolojileri de şu şekilde belirtilmektedir:

- Nanoteknoloji
- Nesnelerin İnterneti
- Yapay Zekâ
- 5 G Teknolojisi
- Drone Teknolojisi
- Büyük Veri
- Bulut Bilişim
- Robotik
- Blok Zinciri (Mbunge ve ark., 2021).

Son olarak, geliştirilen her teknoloji insanlık yararına olduğu zaman belki de en çok faydayı sağlayacaktır. Sağlıklı olmak ve sağlıklı yaşamak, insanlığın vazgeçilmez bir amacı ve hedefidir. Bu çerçevede bilgi teknolojileri ve uygulamaları sağlık hizmetlerinde etkin, verimli ve amacına uygun olarak kullanılmalıdır. Yaşadığımız ya da gelecekte muhtemel yaşayacağımız pandemiler için de yardımcı birer araç olabilecek bu uygulamaların geliştirilmesi ve yaygınlaştırılması önemlidir.

Sağlık bilgi sistemlerinde uygulanan teknolojik yenilikler hayatımızı kolaylaştırırken aynı zamanda hem kurumsal hem de bireysel sorunları da beraberinde getirecektir. Bu teknolojinin getirdiği sorunları da bertaraf edebilecek politikalar geliştirilmelidir. Sağlık için teknolojiyi üretip, sağlıklı günlerde kullanmak hedefiyle bu alandaki yatırımlar teşvik edilmeli ve artırılmalıdır.

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Dr. Arzu Cebe



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İÇİNDEKİLER

ÖN SÖZ	V
GİRİŞ	1
1. İbrani Alfabeti	2
1.1. Ünsüzlerin Özellikleri.....	3
1.1.1. BeGeD-KeFeT Ünsüzleri	6
1.1.2. Sofit Ünsüzler	10
1.1.3. Boğaz Ünsüzleri	10
1.1.4. Labial (Dudaksıl) Ünsüzler	11
1.1.5. Sibilant (Dil ve Diş) Ünsüzler	11
1.1.6. Alef ve Ayn Harflerinin Özellikleri	11
1.1.7. Ses Benzerliği Olan Ünsüzler	12
1.1.8. Yazı Benzerliği Olan Ünsüzler	12
1.1.9. İbrani Alfabetinde Bulunmayan Harflerin İfadesi	14
1.2. Ünlüler	14
1.2.1. Tam Ünlüler.....	14
1.2.2. Yarım Ünlüler	15
1.3. Harekeler.....	16
1.3.1. Dageş.....	16
1.3.2. Şeva/Şva.....	17
1.3.3. Meteg.....	19
1.3.4. Mappik	20
1.3.5. Makkef	20
2. İbranice Belirtilik: Artikel.....	20
2.1. Artikelin Fonetik Değişim Kuralları.....	22
2.2. Artikelin Kullanım Yerleri.....	24
3. İsim Kategorisi	26
3.1. İsimlerin Cinsi	26
3.1.1. Dişil İsimler	26
3.1.2. Eril İsimler	31

3.2. İsmiñ Çoğul Durumu.....	36
3.2.1. Dışıl İsimlerin Çoğul Durumu.....	36
3.2.2. Eril Kelimelerin Çoğul Durumu.....	38
3.2.3. İsmiñ Çift Durumu.....	39
4. Vav Bağlacı	40
5. İbranice İyelik Kategorisi	43
5.1. İyeliliğın İfade Şekilleri	44
5.2. İyelik Zamir Sonlukları ve İsimlerle Birlikte Kullanımı.....	46
5.3. İyeliliğın Smihutla İfadesi	49
6. Segolat İsimler	52
7. Sıfatlar.....	69
7.1. Sıfat Kalıpları	71
7.2. Fiillerin Şimdiki Zaman Çatılarının Sıfat Olarak Kullanılması	74
7.3. Sıfatları Oluşturan Son Ekler	76
7.4. Sıfatın Dereceleri.....	77
8. Zamirler	80
8.1. Kişi /Şahıs Zamirleri	81
8.2. İşaret Zamirleri.....	81
8.3. Cümlede İsim, Sıfat, Zamir Uyumu.....	84
8.4. Soru Zamirleri.....	86
9. Edatlar.....	88
9.1. Birleşik Yazılan Edatlar	88
9.1.1. ך Edatının Fonetik Özellikleri.....	88
9.1.2. ך Edatının Fonetik Özellikleri.....	92
9.1.3. ך Edatının Fonetik Özellikleri.....	96
9.1.4. ך/ך Edatının Fonetik Özellikleri	99
9.2. Ayrı Yazılan Edatlar.....	102
9.2.1. ך Edatı	103
9.2.2. ך Edatı	104
9.2.3. ך Edatı	105
9.2.4. ך Edatı.....	106
9.2.5. ך Edatı.....	106
9.2.6. ך Edatı	107
9.2.7. ך Edatı.....	108
9.2.8. ך Edatı	109
9.2.9. ך Edatı.....	109
9.2.10. ך Edatı	110
9.2.11. ך Edatı	111
9.2.12. ך Edatı	112
9.2.13. ך Edatı	112

9.2.14. בגלל Edatı.....	113
9.2.15. בלי Edatı.....	114
9.2.16. ל Edatı	115
9.2.17. ליד Edatı.....	115
9.2.18. בעד Edatı	116
9.2.19. מול Edatı	117
10. Zarf (Belirteç).....	118
10.1. Soru Zarfları.....	118
10.2. Zaman Zarfları	119
10.3. Sıklık Zarfları.....	120
10.4. Mekân Zarfları.....	122
10.5. Niteleme/Durum/Hâl Zarfları.....	122
10.6. Derece Zarfları.....	123
10.7. Zarfların Oluşum Şekilleri	124
11. Sayılar	126
11.1. Onlar Basamağındaki Sayıların İfadesi	129
11.2. Yüzler Basamağındaki Sayıların İfadesi	132
11.3. Binler Basamağındaki Sayıların İfadesi.....	133
12. İbranice Cümle Yapısı: İsim ve Fiil Cümlesi	134
12.1. Fiil Cümleleri.....	134
12.2. İsim Cümleleri	135
12.3. Olumsuz Cümleler: אל Kullanımı	136
12.4. Cümlede ו ve וי Kullanımı	137
12.5. Soru Cümleleri.....	148
12.5.1. Soru Sözcükleriyle Oluşan Soru Cümleleri	148
12.5.2. וה - “Meğer”, “Acaba” Sözcükleri Kullanılarak Oluşturulan Soru Cümleleri.....	151
12.5.3. Tonlama Yardımıyla Soru Cümlelerinin Oluşumu	153
TERİMLER LİSTESİ.....	155
KAYNAKLAR.....	159

Kaynaklar

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İÇİNDEKİLER

ÖN SÖZ	İX
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Bölüm 1 MÜHENDİSLİKTE MALZEME BİLGİSİNİN ÖNEMİ VE KULLANILAN MALZEMELER

1.1. Giriş	1
1.2. Mühendislik Malzemelerinin Sınıflandırılması	2

Bölüm 2 MALZEMELERİN TEMEL YAPISI

2.1. Atomik Yapı	5
2.2. Atomlar Arası Bağlar ve Bağ Yapıları	8
2.2.1. Metalik Bağ	9
2.2.2. Kovalent Bağ	11
2.2.3. İyonik Bağ	12
2.2.4. Zayıf Bağlar	13
2.2.5. Birincil (Kuvvetli) Bağların Karşılaştırılması	13

Bölüm 3 KATI MALZEMELERİN TEMEL YAPISI

3.1. Giriş	15
3.2. Kristalik Yapının Oluşumu ve Birim Hücre	18
3.3. Atomik Doluluk Faktörü ve Koordinasyon Sayısı	23
3.4. Metalik Malzemelerin Teorik Yoğunluk Değerlerinin Hesaplanması	27
3.5. Kristalik Kafes Sistemlerinde Nokta, Düzlem ve Doğrultuların Gösterilmesi	29
3.6. İzotropi, Anizotropi, Polimorfizm	32
3.7. Katı Malzemelerde Bulunan Hatalar	33
3.7.1. Noktasal Hatalar	34
3.7.2. Çizgisel Hatalar	36

3.7.3. Yüzeysel Hatalar	38
3.7.4. Hacimsel Hatalar	39

Bölüm 4 **MALZEMELERİN TEMEL ÖZELLİKLERİ**

4.1. Giriş	41
4.2. Elektriksel Özellikler.....	42
4.3. Isıl Özellikler	43
4.4. Manyetik Özellikler	51
4.5. Optik Özellikler	52
4.6. Yoğunluk ve Özgül Özellikler.....	52

Bölüm 5 **MALZEMELERDE ŞEKİL DEĞİŞTİRME VE** **MEKANİK ÖZELLİKLER**

5.1. Elastik Şekil Değiştirme	64
5.2. Plastik Şekil Değiştirme	70
5.3. Mekanik Özellikler ve Mekanik Deneyler	74
5.3.1. Çekme Deneyi.....	74
5.3.2. Çekme Deneyinden Elde Edilen Sonuçlar ve Bunların	
Değerlendirilmesi	77
5.4. Sıcaklığın Mekanik Özelliklere Etkisi.....	92
5.5. Gerçek Gerilme-Gerçek Birim Şekil Değiştirme	94
5.6. Hiperelastik Rezilyans (Geri Yaylanma).....	102
5.7. Basma Deneyi.....	107
5.8. Eğme Deneyi.....	110
5.9. Burulma Deneyi.....	113
5.10. Sertlik Ölçme Yöntemleri	115
5.10.1. Statik Sertlik Ölçme Yöntemleri	116
5.10.2. Dinamik Sertlik Ölçme Yöntemleri.....	128
5.10.3. Diğer Sertlik Ölçme Yöntemleri	130
5.11. Dinamik Özellikler ve Dinamik Deneyler	131
5.11.1. Darbe Deneyleri	133
5.11.2. Yorulma Deneyi	141

Bölüm 6 **FAZ (DENGE) DİYAGRAMLARI**

6.1. Temel Kavramlar ve Giriş	153
6.2. Birbiri İçinde Sıvı ve Katı Hâlde Tamamen Eriyebilen	
İkili Denge Diyagramları	155

6.2.1. Birbirini Tamamen Eriten İkili Alaşımların Mekanik ve Fiziksel Özellikleri	161
6.3. Katı Hâlde Birbiri İçinde Kısmen Eriyen Sistemlerin İkili Faz Diyagramları.....	162
6.3.1. Katı Hâlde Birbiri İçinde Kısmen Eriyen İkili Alaşımların Mekanik ve Fiziksel Özellikleri	164
6.4. İzotermal Reaksiyonlar	165
6.5 Gibbs Faz Kuralı	166
6.6. Demir-Karbon İkili Faz Diyagramı	167
6.6.1. Demir Sementit İkili Faz Diyagramında Fazların Oluşumu, Mikroyapılar ve Özellikleri	170
6.6.2. Fe-C Sisteminde Çelikler Kısmında Mevcut Fazlar, Fazların Oranları ve Kimyasal Kompozisyonlarının Bulunması.....	174

Bölüm 7

ÇELİK MALZEMELERE UYGULANAN ISIL İŞLEMLER

7.1. Giriş ve Genel Kavramlar	179
7.2. Tavlama Isıl İşlemleri.....	181
7.2.1. Çeliklere Uygulanan Tavlama İşlemleri.....	181
7.2.2. Tüm Metalik Malzemelere Uygulanan Tavlama İşlemleri.....	185
7.3. Sertleştirme Isıl İşlemi.....	190
7.3.1. Kademeli Sertleştirme İşlemleri	195
7.3.2. Temperleme Isıl İşlemi.....	198
7.3.3. Islah İşlemi	199
7.4. Yüzey Sertleştirme İşlemleri.....	199
7.4.1. Alevle ve İndüksiyonla Yüzey Sertleştirme	200
7.4.2. Sementasyon İşlemi.....	202
7.4.3. Sıvı ve Gaz Ortamda Karbürizasyon	203
7.4.4. Nitrürleme İşlemi	203
7.5. Çeliklerde Sertleştirilebilirlik Kapasitesinin Belirlenmesi	205

Bölüm 8

METALİK MALZEMELER

8.1. Giriş	211
8.2. Demir Esaslı Mühendislik Malzemeleri.....	211
8.2.1. Sade Karbonlu Çelikler	212
8.2.2. Alaşımli Çelikler	215
8.2.3. Kullanım Yerine ve Özelliklerine Göre Alaşımli Çeliklerin Sınıflandırılması	218
8.2.4. Dökme Demirler.....	223
8.3. Demir Dışı Metalik Malzemeler	229
8.3.1. Alüminyum Alaşımları.....	231
8.3.2. Alüminyum Alaşımlarının Kısa Gösterimleri	236

8.4. Bakır ve Alaşımları.....	241
8.4.1. Bakır Alaşımları	241
8.4.2. Bakır Alaşımlarının Kısa Gösterimleri.....	243
8.5. Magnezyum Alaşımları	244
8.5.1. Magnezyum Alaşımlarının Sınıflandırılması ve Kısa Gösterimleri	245
8.6. Titanyum ve Titanyum Alaşımları.....	246

Bölüm 9 POLİMERLER

9.1. Giriş	249
9.2. Polimerlerin Yapısı.....	252
9.3. Plastik Malzemelerin Sınıflandırılması	257
9.3.1. Termoplastikler	257
9.3.2. Termoset Plastikler.....	260
9.4. Plastiklere İlave Edilen Katkı Maddeleri.....	262
9.5. Plastiklerin Şekillendirilme Yöntemleri	263
9.6. Plastiklerin Mekanik Özellikleri	266
9.7. Elastomerler	270

Bölüm 10 KOMPOZİT MALZEMELER

10.1. Giriş	273
10.2. Polimer Matrisli Kompozitler	276
10.2.1. Güçlendirici Olarak Kullanılan Fiber Malzemeleri ve Özellikleri	277
10.2.2. Fiberlerin Boyutları ve Kullanım Şekilleri.....	280
10.2.3. Kompozit Malzemelerin Özellikleri.....	282
10.2.4. Fiber Takviyeli Kompozitlerin Hasar Şartları	287
10.2.5. Kompozitlerin Kullanım Alanları.....	290
KAYNAKÇA	291
DİZİN.....	293

KAYNAKÇA

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İÇİNDEKİLER

YAZARLAR LİSTESİ	iii
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BÖLÜM 1

TİCARİ GEMİLERİN SINIFLANDIRILMASI

Özet	1
1. Giriş	3
2. Veri ve Yöntem	4
2.1. Ticari Literatürde Varolan Gemiler ve Özellikleri	4
2.1.1. Yük Taşıyan Gemiler	4
2.1.3. Kombine Yük ve Yolcu Taşıyan Gemiler.....	38
2.1.4. Açık Deniz Gemileri	43
2.1.5. Balıkçılık Gemileri	50
2.1.6. Özel Hizmet/Servis Gemileri.....	54
2.1.7. Römorkör Gemiler	70
2.2. Yöntem	72
2.2.1. Ticari gemilerin yapısal ve fonksiyonel niteliklerinin karşılaştırılması.....	72
2.2.2. Ticari gemilerin nicelik olarak karşılaştırılması	73
3. Bulgular	73
3.1. Ticari gemilerin Sınıflandırılması ve Birbirleriyle Olan İlişkileri	73
3.2. Ticari Gemilerin Yapılan Sınıflandırmaya Göre Toplam Sayıları	75
4. Sonuç	81
Kaynakça.....	81

BÖLÜM 2

GEMİ MAKİNELERİ İŞLETME MÜHENDİSLİĞİNDE ETİK

Özet	85
1. Giriş	86
2. Etik Nedir?	89

3. Mühendislikte Etik	91
4. Gemi Makineleri İşletme Mühendisliğinde Etik	93
5. Sonuç.....	97
Kaynakça.....	99

BÖLÜM 3

GEMİ MAKİNELERİNİN TARİHÇESİ

Özet	101
Abstract	102
1. Giriş.....	102
2. Tahrik Sistemleri	104
2.1. Kürek	107
2.2. Rüzgâr ve Yelkenli	107
2.3. Buhar Motoru.....	110
2.4. Buhar Türbinleri	115
2.5. Gaz Türbinleri	118
2.6. İçten Yanmalı Motorlar	125
2.7. Gemi Dizel Motorları.....	128
2.8. Dizel-Elektrik Tahrik Sistemi	137
2.9. Turbo Elektrik.....	138
2.10. Gaz Yakıtlı, Çift Yakıtlı veya Üç Yakıtlı Tahrik.....	138
2.11. Hibrit Deniz Tahrik Sistemleri.....	139
2.11.1. Kombine Dizel veya Gaz (Combined Diesel or Gas-CODOG)	140
2.11.2. Kombine Dizel ve Gaz (Combined Diesel and Gas-CODAG).....	140
2.11.3. Kombine Dizel-Elektrik ve Dizel (Combined Diesel-Electric and Diesel- CODLAD)	142
2.11.4. Kombine Dizel-Elektrik ve Gaz (Combined Diesel-Electric and Gas- CODLAG)	142
2.11.5. Kombine Dizel ve Dizel (Combined Diesel and Diesel-CODAD) ..	143
2.11.6. Kombine Buhar ve Gaz (Combined Steam and Gas-COSAG).....	144
2.11.7. Kombine Gaz veya Gaz (Combined Gas or Gas – COGOG)	144
2.11.8. Kombine Gaz ve Gaz (Combined Gas and Gas-COGAG)	145
2.11.9. Kombine Gaz ve Buhar (Combined Gas and Steam-COGAS).....	146
2.11.10. Kombine Nükleer ve Buhar Tahrik Sistemi (Combined Nuclear and Steam Propulsion-CONAS)	147
2.12. Entegre Elektrikli Tahrik Sistemi.....	147
2.13. Yeşil Gemiler: Güneş Enerjisi.....	150
2.14. Hidrojen.....	151
2.15. Nükleer Tahrik	152
2.16. Yakıt Hücreleri	153

2.17. Stirling Motoru	154
2.18. Su Jeti Tahrik	154
2.19. Alternatif Yakıtlar	154
2.19.1. LNG	154
2.19.2. LPG	156
2.19.3. Biyodizel	156
2.19.4. Metanol	156
2.19.5. Amonyak	156
3. Tahrik Araçları.....	157
3.1. Kürekler	157
3.2. Yelken	157
3.3. Kanatlı çark	157
3.4. Caterpillar/Tırtıl	158
3.5. Pervane	158
3.6. Jet Pompa.....	159
3.7. Azipodlar	159
3.8. Dinamik Konumlandırma Sistemi (DPS)	160
3.9. Çok Yönlü Tahrik - Voith-Schneider Siklorotor	160
3.10. Salınan Kanatçıklar	161
4. Deniz Tahrikindeki Son Gelişmeler.....	161
4.1. Yakıt Tasarruflu Pervane	161
4.2. İnsansız Gemiler	161
4.3. SkySails-Modern Yelkenli	161
4.4. Motor, Gövde ve Pervane Tasarımları	162
4.5. Verimli Tahrik-Triple-E İki Pervaneli Sistem	162
4.6. Deniz Taşımacılığında Yeni Eğilimler	164
5. Sonuç.....	164
Kaynakça.....	165

BÖLÜM 4

GEMİ MAKİNELERİ TERMODİNAMIĞI

Özet	173
1. Giriş.....	174
2. Gemi Makinelerinin Çevrimleri.....	175
2.1. Buhar türbinlerinin termodinamik çevrimi	176
2.2. Gaz Türbinlerinin Termodinamik Çevrimi	178
2.3. Dizel Makinelerin Termodinamik Çevrimi	180
3. Termodinamik Yöntem.....	182

4. Çevrimlerin Termodinamik Analizleri	185
4.1. Buhar Türbinlerinin Termodinamik Analizi	185
4.2. Gaz Türbinlerinin Termodinamik Analizi	186
4.3. Dizel makinelerin termodinamik analizi	189
5. Bulgular ve Tartışma	192
5.1. Buhar türbinleri	193
5.2. Gaz Türbinleri	196
5.3. Dizel Makineler	198
6. Sonuç	204
Kaynakça	205

BÖLÜM 5

GEMİLERDE ENERJİ EKONOMİSİ VE VERİMLİLİĞİ

Özet	207
1. Giriş	208
2. Yöntem	216
3. Gemi Ana Makine Sistemi	218
3.1. Sistem Analizi	220
3.2. Sonuçlar ve Tartışma	221
4. Atık Isı Geri Kazanımı Sistemi	223
4.1. Sistem Analizi	225
4.2. Sonuçlar ve Tartışma	226
5. Sonuç	229
Kaynakça	231

BÖLÜM 6

GEMİ MAKİNE ARIZALARININ DENİZ KAZALARINDAKİ ROLÜ

Özet	235
1. Giriş	236
2. Gemi Ana Makine Arızaları	237
2.1. Arızaların Boyutları ve Arıza Tespitinin Önemi	237
2.2. Dizel Motorlarda Arıza Tür ve Sebepleri	241
3. Deniz Kazası Raporlarında Geçen Gemi Makine Arızaları	245
4. Sonuç	252
Kaynakça	252

BÖLÜM 7

GEMİ MAKİNELERİNDE OPERASYONEL BAKIM

Özet	257
Abstract	258
1. Giriş	258
2. BAKIM STRATEJİLERİ	259
3. GEMİLERDE BAKIM VE ONARIM	261
3.1. Gemi Bakım-Onarımında Konvansiyonel Yöntemler	262
3.1.1. Gemi Bakımında Havuzlama ve İmal Usulleri	263
3.2. Gemi Bakım-Onarımında Kestirimci Bakım Teknikleri.....	263
3.2.1. Kestirimci Bakım	264
3.2.2. Titreşim Analizi	270
3.2.3. Sinyal (İşaret) Görüntüleme Teknikleri.....	273
3.3. Örnek Mekanik Kusur Tipleri.....	275
3.3.1. Balanssızlık	275
3.3.2. Yağsızlık ve Rulman Etkileri	276
3.3.3. Eksen Kaçıklığı	277
3.3.4. Mekanik Gevşeklik.....	280
4. Sonuç	282
Kaynakça	283

BÖLÜM 8

GEMİ KÖKENLİ HAVA VE DENİZ KİRLİLİĞİ

Özet	287
1. Giriş	288
2. Hava Kirliliği	288
2.1. Hava Emisyon Türleri ve Etkileri.....	289
2.1.1. Karbonmonoksit (CO)	290
2.1.2. Karbondioksit (CO ₂)	290
2.1.3. Hidrokarbonlar (HC)	290
2.1.4. Azot oksitler (NO _x)	291
2.1.5. Kükürt Oksitler (SO _x)	292
2.1.6. İs ve Partiküller	292
3. Emisyon Azaltıcı Tedbirler	293
3.1. EGR (Egzoz Gazı Resirkülasyonu).....	293
3.2. Seçici Katalitik İndirgeme (SCR-) Sistemi	293
3.3. Scrubber (Yıkayıcı).....	294
3.3.1. Scrubber (Yıkayıcı) Sisteminin Çalışma Prensibi	294
3.3.2. Deniz Yıkayıcılarının Sınıflandırılması	294

4. Deniz Kirliliği	295
4.1. Gemilerden Kaynaklanan Deniz Kirliliği Kaynakları	296
4.1.1. Balast Suyu	297
4.1.2. Petrol Sızıntıları	297
4.1.3. Atık Su	297
4.1.4. Katı Atık	298
4.1.5. Sintine Suyu	299
4.1.6. Zehirli Boya	300
4.1.7. Gemi Kazaları	300
4.1.8. Terminal Yükleme Sırasında Kazayla Dökülme	300
5. Deniz Kirliliğinin Etkileri	301
5.1. Kirliliğin Deniz Ekosistemi Üzerindeki Etkisi	301
5.2. Balıkçılık Endüstrisi	303
5.3. Turizm Sektörü	304
5.4. Deniz Kirliliğinin Halk Sağlığına Etkisi	304
6. Uluslararası Anlaşmalar ve Düzenlemeler	305
7. Sonuç	309
Kaynakça	310

BÖLÜM 9

GEMİLERDE EMİSYON AZALTMA YÖNTEM VE TEKNOLOJİLERİ

Özet	313
1. Giriş	314
2. Emisyon Çeşitleri	314
2.1. Azot Oksit (NO _x)	315
2.2. Kükürt Oksit (SO _x)	315
2.3. Karbondioksit (CO ₂)	316
2.4. Karbonmonoksit (CO)	318
2.5. Partikül Madde (PM)	319
2.6. Hidrokarbonlar (HC)	319
2.7. Uçucu Organik Bileşikler (VOC)	320
3. Gemi Kaynaklı Emisyon Miktarı	320
4. Gemi Kaynaklı Hava Kirliliği ile İlgili Regülasyonlar	323
5. Gemi Kaynaklı Emisyon Azaltma Yöntem ve Teknolojileri	325
5.1. Enerji Verimliliği Sağlayan Yöntemler	326
5.1.1. Balb Optimizasyonu	326
5.1.2. Tekne Boyaları	327
5.1.3. Havayla Yağlama	327

5.1.4.	Hava Durumuna Göre Rota Belirleme	328
5.1.5.	Pervane Optimizasyonu	328
5.1.6.	Rüzgâr Gücü	329
5.1.7.	Atık Isı Geri Kazanımı	329
5.1.8.	Hız Düşürme	330
5.1.9.	Güçlendirme (Retrofit)	331
5.1.10.	Hız Kontrollü Pompalar ve Fanlar	331
5.1.11.	Güneş Enerjisi	332
5.1.12.	Ortak Hat Yöntemi	333
5.2.	SO _x İndirgeme Yöntemleri	333
5.2.1.	Scrubber	333
5.2.2.	Düşük Sülfürlü Yakıt	333
5.3.	NO _x İndirgeme Yöntemleri	334
5.3.1.	Seçici Katalitik Redüksiyon (SCR)	334
Kaynakça		336

BÖLÜM 10

GEMİ DİZEL MOTORLARINDA KULLANILAN YAKITLAR VE YAĞLAR

Özet	339
1. Deniz Taşımacılığında Kullanılan Yakıtlar	340
1.1. Gemi Dizel Motorlarının Yakıt Parametreleri	342
1.2. Dizel Motorlarda Yanma Süreci	344
1.3. Alternatif Yakıtlar	345
1.3.1. Sıvılaştırılmış doğal gaz (LNG)	346
1.3.2. Amonyak	347
1.3.3. Biyoyakıt	347
1.3.4. Metanol	348
1.3.5. Alternatif Yakıtların Karşılaştırması	349
2. Gemi Dizel Motorlarında Kullanılan Yağlar	350
2.1. Yağlama Yağının Özellikleri.....	353
2.2. Madeni Yağlarda Kullanılan Katkı Maddeleri	354
2.3. Yağların Bozulma Sebepleri	355
3. Sonuç	356
Kaynakça	356

BÖLÜM 11

DÜŞÜK SÜLFÜRLÜ DENİZ YAKITLARININ İKİ ZAMANLI GEMİ ANA MAKİNELERİ ÜZERİNDEKİ TRİBOLOJİK VE KORUZİF ETKİLERİ

Özet	361
1. Giriş	362
2. Tipik Rafineri Süreçleri ve Yakıttaki Sülfür Oranı	365
3. Yeni Deniz Yakıtları ve Gemilerde Yakıt Sistemleri	368
4. Düşük Sülfürlü Yakıtların İki Zamanlı Gemi Ana Makineleri Üzerindeki Tribolojik ve Koruzif Etkileri.....	370
4.1. Yağlama	370
4.2. Aşınma.....	373
4.3. Korozyon	378
4.4. Makine Aşınmasının İzlenmesi ve Değerlendirilmesi	381
5. Sonuç.....	384
Kaynakça.....	385

BÖLÜM 12

DENİZ ARAÇLARINDA GÜÇ SİSTEM MİMARİLERİ, GÜÇ KALİTESİ VE YÖNETMELİKLER

Özet	387
1. Giriş	389
2. Deniz Araçlarının Sınıflandırılması	392
2.1. Yolcu Gemileri	392
2.1.1. Yolcu Feribotları	392
2.1.2. Seyahat Gemileri	393
2.2. Ticari Gemi	394
2.2.1. Açık Deniz Gemileri	394
2.2.2. Kargo Gemileri.....	396
2.2.3. Tanker Gemileri	397
2.2.4. Özel Gemiler	397
2.3. Askerî Gemiler	399
2.3.1. Donanma Gemisi	399
2.3.2. Sahil Güvenlik Gemisi	399
3. AC Güç Şebekeleri: Üretim, Dağıtım ve Yükler.....	401
3.1. Enerji Üretimi	401
3.2. Güç Dağıtımı	402
3.2.1. Elektrik Dağıtım Panosu	402
3.2.2. Transformatör	405

3.3.	Yükler	405
4.	Gemilerde Kullanılan Güç Dönüştürücü Teknolojileri	405
4.1.	Tristörlü Doğrultucu (SKD) İçeren DC Motor Sürücüleri.....	406
4.2.	Akım Kaynaklı Evirici (AKE)	408
4.3.	Doğrudan Frekans Dönüştürücü ve Matris Dönüştürücü.....	409
4.4.	Gerilim Kaynaklı Evirici (GKE)	411
4.5.	Aktif Ön Uç (AÖU) Dönüştürücü.....	412
4.6.	Diğer Dönüştürücü Topolojileri	412
4.7.	Tek Fazlı Sistemler	413
5.	Güç Elektroniği Sistemlerinin Kontrol Mimarileri	414
6.	Koruma Sistemi.....	415
6.1.	Koruma Gereksinimleri	416
6.2.	Koruma İlkesi.....	416
7.	Gemi Şebekelerinde Güç Kalitesi ve Standartlar.....	418
7.1.	Gemi Şebekelerinde Güç Kalitesi Sorunları	418
7.2.	Gemi Şebekesinin Güç Kalitesi Analizi.....	418
7.3.	Güç Kalitesi Düzenlemeleri ve Standartları	420
7.3.1.	IEEE 1662-2008, Tasarım Kılavuzu ve Güç Elektroniğinin Gemilerdeki Güç Sistemlerinde Uygulanması	420
7.3.2.	IEEE 1826-2012 Standardı: Anma değeri 100 kW'ın Üzerinde Olan Bölgesel Elektrik Dağıtım Sistemlerinde Güç elektroniği Standartları.....	421
7.3.3.	IEEE 1709-2010, Gemilerde 1 kV-35 kV arasında DC Orta Gerilim Güç Sistemleri için Önerilen Uygulama	422
7.3.4.	IEC/ISO/IEEE 80005-1&2, Yüksek Gerilim Kıyı Bağlantısı (HVSC) Sistemleri – Genel Gereksinimler, İzleme ve Kontrol için Veri İletişimi	423
7.3.5.	IEEE 45-2002, Gemilerde Elektrik Tesisatları için Önerilen Uygulama	424
7.3.6.	Amerikan Denizcilik Bürosu (ABS), Elektrik Güç Sistemlerinde Harmoniklerin Kontrolü Üzerine Kılavuz Notlar ..	425
7.3.7.	Diğer Bazı Önemli Belgeler	427
7.4.	Diğer Konular	428
7.4.1.	Yüksek Frekanslı (2-150 kHz) Harmonikler	428
7.4.2.	Ara Harmonikler (Interharmonics)	430
7.4.3.	Gemilerde DC Şebeke Kullanımı	430
8.	Sonuç.....	432
	Kaynakça.....	433

BÖLÜM 13

GEMİ MAKİNELERİ İŞLETME MÜHENDİSLİĞİ (GMİM) EĞİTİMİ VE OTOMATİK KONTROL SİSTEMLERİ

Özet	437
1. Giriş	439
2. Tarihsel Gelişim.....	442
2.1. İlk Kontrol Sistemi Örnekleri	442
2.2. Analog-Dijital Kontrol	443
2.3. Bilgi İşlemeye Dayalı Kontrol ve Endüstri 4.0	444
2.4. Otonom Sistemler	446
3. GMİM Eğitim Hedefleri ve Otomatik Kontrol Sistemleri	448
4. Otomatik Kontrol Yöntemleri	450
4.1. Açık ve Kapalı Çevrim Kontrol Sistemleri.....	450
4.2. Dijital veya Sayısal Kontrol	452
4.3. Oransal (Proportional, “P”) Kontrol Yöntemi	454
4.4. İntegral (Integrative, “I”) Kontrol Yöntemi	455
4.5. Türevsel (Derivative, “D”) Kontrol Yöntemi	457
4.6. PID (“P” + “I” + “D”) Kontrol Yöntemi	460
4.7. Bulanık Mantık Kontrol Yöntemi	462
4.8. Makine Öğrenmesi	465
5. Otomatik Kontrol Elemanları.....	467
5.1. Dönüştürücüler (Transducers)	467
5.2. Aktüatörler (Actuators)	467
5.3. Algılayıcılar (Sensors)	468
5.4. Kontrol Ediciler	471
6. Gemi Makine Dairesi Kontrol Sistemi Örnekleri	472
6.1. Düşük Sıcaklık Soğutma Suyu Sıcaklık Kontrol Sistemi	472
6.2. Ana Makine Viskozite Kontrol Sistemi.....	474
7. Sonuç.....	475
8. Bilgilendirme.....	476
Kaynakça.....	476

BÖLÜM 14

MAKİNE DAİRESİ SİMÜLATÖRÜ İLE DENİZCİLİK EĞİTİMLERİ

Özet	479
1. Giriş.....	481
1.1. Hızlı Değişen Teknoloji ve MDS ile Eğitimlere İlgili.....	483
1.2. MDS ile Eğitim Zorunluluğu.....	483

1.3.	MDS Eğitimlerine Talep: Sektördeki Büyüme.....	484
1.4.	MDS Eğitimlerine Talep: Deniz Kazalarının Azaltılması	486
2.	Makine Sistemlerinin Modellemesi, Simülasyon ve Simülatör.....	487
2.1.	Modelleme	487
2.1.1.	Animasyon.....	488
2.1.2.	Simülasyon	489
2.1.3.	Simülatör ve Eğitim	490
3.	Makine Dairesi Simülatörü (MDS).....	491
3.1.	Genel Giriş: MDS ve Eğitim.....	491
3.2.	MDS ve IMO Regülasyonları.....	492
3.3.	MDS Çeşitleri ve Sınıflandırma	494
3.3.1.	Kategori 1 - Tam Kapsamlı.....	494
3.3.2.	Kategori 2 - Çoklu Görev.....	494
3.3.3.	Kategori 3 - Sınırlı	494
3.3.4.	Kategori 4 - Özel	496
3.3.5.	Kategori 5 veya "F" - Ortama Aşinalık ve 3-Boyutlu Ortam Simülasyonu	496
3.4.	MDS ile Eğitim Konfigürasyonları	497
3.4.1.	Sınıf Ortamı	497
3.4.2.	Öğrenci Laboratuvarı.....	497
3.4.3.	Dağıtılmış Sistem ile Tam Kapsamlı Eğitim (Konfigürasyon C)....	498
3.5.	Sertifikasyon.....	501
4.	MDS ile Denizcilik Eğitimleri	502
4.1.	STCW 2010: MDS ile Sağlanabilen Eğitim Yetkinlikleri	502
4.2.	İşletim ve Yönetim Seviyesi Eğitimleri.....	504
4.3.	IMO Model Kursu 2.07 (2017 Versiyonu).....	505
4.4.	Makine Dairesi Kaynak Yönetimi Eğitimi.....	508
4.5.	Yüksek Voltaj İşletim Eğitimi	510
5.	MDS ile Senaryo Çalışmaları	512
5.1.	Rutin Operasyon Senaryosu: Jeneratörün Devreye Alınması.....	513
5.2.	Ana Makine Performans Senaryo: Kötü Hava Şartlarında Seyir	515
5.3.	Arıza veya Hata Tespiti Senaryoları	517
6.	MDS ile Değerlendirme	518
7.	Eğitimcilerin Eğitimi: IMO Model Kurs 6.10.....	520
8.	Sonuç.....	521
9.	Bilgilendirme.....	522
	Kaynakça.....	522

BÖLÜM 15

GEMİ MAKİNELERİNDE YENİ ÇEVRE DOSTU VE EKONOMİK TEKNOLOJİLER

Özet	527
1 Giriş	528
2. Veri ve Yöntem	528
2.1. Enerji Verimliliği Tasarım İndeksi	528
2.2. Yöntem	530
3.1.1 Hâlen kullanımda olan motorların EEDI performansını arttırıcı teknolojiler	531
3.1.2 Temiz yanma ve yüksek ekonomi sağlayan motorlar	531
3.1.3 Egzost enerjisinden yararlanma	535
3.1.4 Alternatif Yakıtlar	537
3.1.5 Elektrikli, yakıt hücreli, hibrit sevk sistemli ve bataryalı gemiler	544
3.1.6 Nükleer enerjinin gemilere uygulanması	546
3.1.7 Yenilenebilir enerji kaynakları	546
4. Sonuç	547
Kaynakça	547

Bölüm 1

TİCARİ GEMİLERİN SINIFLANDIRILMASI

Volkan Varışlı¹

Özet

Dünya gemi taşımacılığı endüstrisi, anakaralar arasında taşımacılığın en eski örneği olarak doğmuştur. Taşınan ürün miktarını saklayan unsur olarak gemiler, nicelikleriyle daima bu endüstride en büyük değişkeni temsil etmektedir. Gemi taşımacılığı ve gemi üretimi, global kriz dönemlerinde bile durağan kalamayan, sadece yavaşlayabilen ya da küçülebilen fakat daima işlevsel, ani ivmelenebilen dinamik bir yapıya sahiptir. Yeni kaynaklar ya da sermaye-meta ilişkilerinin konumlanış biçimine göre, yeniden şekillenebilen gemi üretimi ve alt sanayi dalları da düşünüldüğünde, bu alan maddi anlamda da dünyanın en zengin endüstrisi konumundadır. Bu düzeyde büyük bir endüstri, elbette harcanan enerji/yakıt ya da atmosfere salınan karbon endeksi dışında, dünyanın gerek sermaye akışı, gerekse ticari mal akışı üzerinden, her türlü ölçümleme, araştırma-geliştirme, simülasyon ve değerlendirme imkânını da büyük ölçeklerle ortaya koyabilen bir deneysel alandır. Diğer yandan, üretilen her gemi, bir öncekinin güçlü ve zayıf yönlerine bağlı olarak bir yeni gemi ihtiyacının doğumuna da neden olmaktadır. Bu nedenle bazı gemi türlerinin sayıları, global arz-talep ölçüğünde, dengeli bir artış gösteriyor olsa da yeni türlerin ortaya çıkışı ve sayısal yükselişi şaşırtıcı düzeyde hızlı gerçekleşebilmektedir. Bunun sonucu olarak varolan evrilme hızı, ekonomik değerlendirmelerin ötesinde, her türlü teknik, hukuki, eğitsel literatür değişimi açısından geri kalmaktadır. Bazı malzemelerin, uygulama ve üretim süreçleri açısından, klas ve bayrak kurallarının yeniden düzenlenmesine gerek doğurmakla birlikte, ortaya çıkan imkânsızlıklardan doğan kabullerle, bazı gemilerin ticari alan ve kapsamlarının dışına taşıdığı bilin-

¹ Girne Üniversitesi Gemi Makineleri İşletme Mühendisliği Deniz Ulaştırma İşletme Mühendisliği

4. Sonuç

Gemi türleri açısından, literatürün tanımladığı sınıflandırmaların, gerek işlev gerekse yeni yakıt, makine ve işletim teknolojilerine bağlı olarak geçmiş bileşenler dışına taşıdığı görülmektedir. En yakın zamanda literatüre eklenmesi gereken LNG mavnaları gibi gemilerin sayıca çoğalma olasılığı ya da literatürü en başından ikiye ayırabilecek olan otonom gemilerin varlığı düşünüldüğünde, bu çalışmada var olan yeni tür sınıflandırmasının şimdilik ihtiyacı karşılayabilecek nitelikte olduğu görülmekle birlikte, literatüre önerilen “canlı yolcu gemileri” ana sınıfı ve “açık deniz hizmet gemisi” alt sınıfları söz konusudur. Diğer yandan, sayısal verilerin incelenmesiyle, gemi türlerinde; bütün gezi teknelerinin, ticaret yapan süperyatlar ya da charter tekneleri dâhil hesap dışı tutulması hâlinde ve kayıtdışı balıkçılık teknelerinin sayısı bilinemediği bir durumda dahi, yapılmakta olan hesaplamayla güncel gemi sayısının, 179.228 adet olarak hesaplanabilmesi mümkün olmuştur. Bu durum, dünya üzerinde 2020 rakamlarına göre kaynaklarda görülen 119.999 adetlik gemi sayısının çok üzerinde bir rakama işaret etmektedir ve geçen iki yıllık sürede böyle bir üretimin gerçekleşmiş olması mümkün değildir (Equasis, 2020). Buna bağlı olarak gelişmiş ülkelerin ve Uluslararası Denizcilik Örgütü’nün (IMO) olası düşük karbon endeksi hedeflerinin beklenen sonuçları doğurmaması riski söz konusudur. Öte yandan RO-RO gemilerinin, konteyner gemileriyle benzer makinelere sahip olup sayıca 2,63 kat daha fazla olmalarına karşın, konteyner gemilerinin en yüksek karbon endeksine sahip gemiler olarak ifade ediliyor olması, yeniden değerlendirmeye açık görünmektedir. Yine aynı biçimde konteyner ve okyanus linerlerinin yüksek yakıt harcamına bağlı olarak en yüksek karbon endeksinde ifade ediliyor olmaları, rafineri görevi yapan 449 adet FPSO ve FPO’ların gemi sınıfında sayılmamasının çelişkinsini ortaya koymaktadır. Ticari gemi sayılarının daha doğru anlaşılabilmesi için, başta bayrak devletleri nezdinde kayıt dışılığın önlenmesi ve sayısal değerlendirmelerin, planlamalarla birlikte düzenli yapılmasına ihtiyaç olduğu anlaşılmaktadır.

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Bölüm 2

GEMİ MAKİNELERİ İŞLETME MÜHENDİSLİĞİNDE ETİK

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Özet

Deniz yolu taşımacılığının emniyetli ve sürdürülebilir bir taşımacılık türü olmasını sağlayacak en önemli faktörlerden birisi nitelikli insan gücü eğitimi ve istihdamıdır. Öyle ki deniz yolu taşımacılığı gibi ticari ve operasyonel faaliyetleri uluslararası denizcilik kuralları ile düzenlenen, teknolojik gelişmelerden önemli derecede etkilenen, çok uluslu ve çok kültürlü çalışma ortamına sahip bir taşımacılık türünde istihdam edilecek insan gücünün sahip olması beklenen becerileri geniş bir yelpazede değerlendirebilmek gün geçtikçe zorunlu hâle gelmektedir. İlgili beceriler içerisinde *meslek etiği bilgi ve becerisine sahip olmak* günümüzde önemi daha da arttan bir beceri olarak karşımıza çıkmaktadır. İnsan faktörünün oldukça önemli bir yere sahip olduğu deniz yolu taşımacılığında istihdam edilen insan gücünün sahip olacakları mesleki etik bilgi ve becerisi yürütülen faaliyetlerin denizcilik organizasyonu paydaşlarının önceden belirlenmiş olan hedeflerine ulaşmasına katkı sağlayacak en önemli etkenlerden birisidir. Öyle ki farklı kültürel değerlere sahip insanların davranışlarını çok uluslu ve kültürlü çalışma ortamlarında da uygulamak istemesi herkes için çok ciddi sorunlar yaratmaktadır. Yerel olarak oluşturulmuş hedeflerin tüm denizcilik eko sisteminde yararlı olabilmesi için deniz insanlarının kapsamlı bir değerler bütününe sahip olmaları gerekmektedir. Bu çerçevede, bu bölüm içerisinde Gemi Makineleri İşletme Mühendisliği açısından mühendislik etiği kavramı kapsamlı bir şekilde ele alınmıştır.

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- Sorumluluk verme mazereti altında kendi sorumluluk ve görevlerini başkalarına aktarması: önemli ekipmanların bakımları veya planlanması sırasında yetkili mühendislerin iş bölgesinde olmaması ve ciddi arıza ve kazalarda şahsen olaya dâhil olmamaları.
- İş planlamasında ve performans değerlendirilmelerinde adil olmaması ve bu sebeple hakkaniyet olmadığı duygusunun personel üzerinde oluşmasına neden olmaları.
- Gemide olan eksiklik ve olayları şirkete doğru aktarmamaları.
- Arıza ve eksikliklerin “uygunsuzluk” olarak yazılmasından çekinmeleri.
- Olayları kişiselleştirilerek sonuçları üzerinden hesaplar yapıp eksik ya da farklı raporlamaları.
- Emniyet tedbirlerine kendisi uygulamadığı için, personele de uygulatamaması.

Sonuç olarak mesleki etik değerlere sahip olmayan bir gemi makineleri işletme mühendisinin sorumluluklarını yerine getirirken yaratabileceği sorunlar dikkate alındığında meslek etiği bilgi ve becerinin mühendisler açısından ne kadar önemli olduğu net bir şekilde görülmektedir. Buna bağlı olarak denizcilik eğitimi veren kurumların etik prensiplerin en üst seviyede kazanımı sağlayacak bir eğitim müfredatına ve uygulama çerçevesine sahip olmaları beklenmektedir. Ayrıca gemi armatörleri ve gemi işletmeciliği firmalarında ise istihdam etmiş oldukları nitelikli iş gücünün sahip olduğu mesleki etik bilgi ve becerilerini geliştirebilecek aksiyonları geliştirerek uygulamalarının yukarı da ifade edilen sorunların önüne geçilebilmesi için katkı sağlayacağı değerlendirilmektedir.

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Bölüm 3

GEMİ MAKİNELERİNİN TARİHÇESİ

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Özet

Deniz tahrik gücünün ilk formu küreklerdi. Daha sonra yelkenler ortaya çıktı ve devamında kürekler ana kullanımda rol alamadılar. Bununla birlikte hem yelkenli hem de kürekli kadirgalar erken dönem denizciliğinde ve savaşlarında etkin bir rol oynadı. Deniz tahrikinde endüstriyel anlamda kullanılacak ilk mekanik sistem ise 19. yüzyılın başlarında tasarlanan deniz buhar motoruydu. 20. yüzyılda şimdiye kadar denizcilik sektörünü domine edecek olan iki zamanlı veya dört zamanlı dizel motorlar, dıştan takma motorlar ve daha hızlı gemilerde gaz türbini motorları buluşları ortaya konuldu. Bunlara ek olarak 1950'lerde denenilen ve ticari olarak başarısız olan deniz nükleer reaktörleri (savaş gemilerini ve buz kırıcıları itmek için buhar ürettiyordu), pil sistemlerine sahip elektrik motorları, alternatif yakıt türlerini kullanan motorlar (sıvılaştırılmış doğal gaz, biyodizel, amonyak gibi), daha sessiz çalışan Stirling motorları gibi birçok deniz tahrik türü kullanıldı. İçten yanmalı motorlardan veya güç türbinlerinden daha düşük toplam verimlilik nedeniyle birçok mühendislik tasarımı sivil deniz uygulamalarında kullanılmadı. Dahası, günümüzde güneş enerjisi, rüzgâr enerjisi, yakıt hücreleri, elektrikli sistemler, kombine sistemler gibi yenilikçi ve çevreci sistemler de geliştirilmekte ve kullanılmaktadır. Bu çalışmada geçmişten günümüze kullanılan deniz tahrik sistemleri ve bunların hangi aşamalardan geçtiği, ilk uygulamaları, mucitleri ve yeniliklerinden bahsedilmektedir.

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Bölüm 4

GEMİ MAKİNELERİ TERMODİNAMIĞI

Turgay Köroğlu¹

Özet

Gemilerin buldukları ortamda kendi kendini idame ettirebilen yüzer yapılar olmasından dolayı hareketinin sağlanması adına geminin direncini kırıp harekete geçebilmesi için bir güç ihtiyacı duyduğu bilinmektedir. Bu gücün sağlanması ise gemi ana makineleri sayesinde gerçekleştirilir. Geçmişten günümüze, gemi makinesi olarak kullanılan birçok sistem üretilmiştir. Sanayi devriminin getirmiş olduğu buhar makineleri ile başlayan hareketlilik daha sonra buhar türbinleri, gaz türbinleri ve dizel makineler ile devam ettirilmiştir. Günümüzde ticaret gemilerinin %85'inin ana makine olarak dizel makineleri kullandığı gözlemlenmektedir. Gemi makinelerinin önemini bu verilerden çıkarmak mümkündür. Ancak gemi makinelerinin tasarımı, üretimi, işletilmesi, bakım ve onarımlarının yapılabilmesi bu makinelerin temelleri bilinmeden gerçekleştirilemez. Bu sebeple, gemi makinelerinin temelini oluşturan temel termodinamik çevrimleri, günümüzdeki uygulamalarına ve bahsi geçen süreçlere ışık tutacağından bu bölümde termodinamik açıdan gemi makinelerinin incelenmesi gerçekleştirilecektir.

Anahtar Kelimeler: Termodinamik, Dizel, Buhar Türbini, Gaz Türbini, Verim.

Abstract

It is known that since ships are self-sustaining floating structures in their environment, they need a power to overcome the resistance of the hull in order to ensure its movement. This power is provided by the ship's main engines. From

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leştirilmiştir. Bunun neticesinde tüm sistemler için yapılan analizlerde tersinmezliklerin verimi düşürdüğü buna karşılık iş çıkışından sonra atılan ısıların arttığı tespit edilmiştir. Bununla birlikte gaz akışkan kullanan sistemlerin daha yüksek sıcaklıklarda çalışabildiği ve bu sayede verimlerinin daha yüksek olabileceği söylenebilir. Her sistemin geliştirmeye açık yönlerinin bulunduğu ve yakıtı daha verimli kullanmak için hem sistem içi hem de sistem dışı eklemeler yapılarak verimlerin daha da artabileceği yorumlanmıştır. Özellikle gaz akışkanlı sistemlerin egzoz sıcaklıklarının yüksekliği, buradan çıkan egzoz gazlarının çeşitli yöntemlerle daha fazla iş üretmek için kullanılabilmesi şeklinde bir sonuç çıkarılmasını sağlamıştır. Bu sebeple gaz türbini sisteminin arkasından bir buhar türbini sistemi yerleştirilmesinin uygun olabileceği, dizel makinenin ise arkasına eklenecek bir turboşarj sisteminin enerjinin daha verimli kullanılabilmesi ortaya çıkmıştır. Hatta bu sistemler eklendiğinde bile yeniden yapılacak analizler neticesinde sistemlere örneğin organik akışkanlı Rankine çevrimleri gibi farklı yaklaşımlarla daha da fazla güç elde edilebileceği söylenebilir.

Enerji analizleri gemi makinelerinde her ne kadar değerli bilgiler sunsa da sistemdeki tersinmezliklerin boyutları ve konumları hakkında çok bilgi veremediği göz önünde bulundurulmalıdır. Daha detaylı sistem incelemesi için termodinamiğin birinci ve ikinci kanununun birlikte kullanılarak oluşturulan ekserji analizlerinin gerçekleştirilmesi sistem hakkında işletme sorumlusuna veya tasarım ve yenileme aşamasında tasarımcıya çok daha değerli bilgiler sunacağı bilinmelidir.

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Bölüm 5

GEMİLERDE ENERJİ EKONOMİSİ VE VERİMLİLİĞİ

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Özet

Gemilerin direncinin kırılıp sevk edilebilmesi için gerekli enerji ihtiyacını karşılamak adına enerji sistemleri kullanılmaktadır. Enerji sistemlerinin etkin kullanılmaması yakıt sarfiyatının yüksek olmasına ve bu nedenle işletme maliyetlerinin artmasına ve yaydığı emisyonlar neticesinde çevreye karşı zarara sebep olur. Enerjinin ekonomik kullanılması verimi artırırken bahsi geçen sorunların da azalmasını sağlar. Bu bölüme, enerji ekonomisi adına alınan bir dizi yöntemler ve bunların verimi nasıl etkilediğinin gösterilmesinin ardından hem inşa edilmiş hem de yeni inşa edilecek gemiler için uygun olan yaklaşımlar incelenecektir. Enerjinin daha verimli kullanılması adına gerekli olan önlemlerin değerlendirmeleri gerçekleştirilecektir. Değerlendirme sonucunda sistemlerdeki uygulama potansiyelleri tespit edilecek, bunların nasıl iyileştirileceği üzerine yorumlar verilecektir. Özellikle hem yeni inşa hem de üretilmiş gemilerde, atık ısı geri kazanımı sistemleri üzerine daha detaylı çalışmaların gösterilecektir. Enerjiyi inceleyen bilim dalı olan termodinamikten faydalanılarak bir enerjinin iş yapabilme potansiyeli olan ekserji üzerinde durulacaktır. Ekserji analizlerinin ne olduğu, nasıl uygulandığı ve uygulanma alanları üzerine bilgiler verildikten sonra, ekserji analizi sonucunda elde edilen ekserji yıkımının anlamı ve ekserji analizlerinin bir sistemi geliştirmede nasıl kullanılabileceği de gösterilecektir.

Anahtar Kelimeler: Gemi Güç Sistemleri, Enerji Verimi, Yakıt Tüketimi, Emisyon Azaltma, Ekserji.

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ve verimin artırılmasına değil, aynı zamanda bu yöntemlerin uygulanabilir olmasına da önem veren yapıdadır. Bu yüzden ekserji analizleri uygulanarak sistemin veriminin artırılması için nerelere odaklanılması gerektiği tespit edilirken bunu için gerekli olabilecek yatırımların da hesabının tutulması fizibilite açısından çok büyük önem arz eder.

Son olarak belirtmek gerekir ki sistemler artık tek bir nokta üzerinden değil yaşam döngüleri üzerinden değerlendirildiklerinde, parça imalatından sökülümünün sonuna kadar çevreye olan tüm etkileri analiz edildiği gibi enerji analizlerinin yapıp ona göre yöntemlerin uygulanması daha iyi sonuçlar doğurabilir.

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Bölüm 6

GEMİ MAKİNE ARIZALARININ DENİZ KAZALARINDAKİ ROLÜ

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Özet

Ticari denizcilikte yük ve yolcu taşımacılığında kullanılan gemiler günümüzde ana ve yardımcı makinelerle donatılarak işlevlerini gerçekleştirmektedir. Gemilerin ana makinelerin görevi geminin hareketini sağlayan pervaneyi çevirmek iken gemideki diğer tüm yardımcı makineler başta ana makine olmak üzere yük, yolcu ve mürettebatın çok çeşitli ihtiyaçlarını karşılamak amacıyla gemilere donatılmaktadır. Büyük miktarda yük ve yolcu taşıma kapasitesine sahip gemiler çeşitli faktörler sebebiyle zaman zaman deniz kazalarına konu olmaktadır. Dünyanın farklı coğrafyalarında devletlerin yetki sahalarında gerçekleşen deniz kazaları teknik olarak soruşturulmakta ve kaza raporları paylaşılmaktadır. Bu çalışmada çok sayıdaki kaza raporu içerisinde gemi makineleri arızalarıyla ilişkili kazalar arızalarla incelenerek gemi makinelerinin deniz kazaları üzerindeki etkisi araştırılmıştır.

Anahtar Kelimeler: Gemi Makineleri, Deniz Kazaları, Makine Arızaları, Operasyonel Kusurlar.

The Role of Marine Engine Failures in Marine Accidents

Abstract

Ships used in freight and passenger transportation in commercial maritime sector are equipped with main and auxiliary engines and machinery and perform

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Taşınan yük ve geminin türü, geminin boyutu ve yaşı, geminin standart altı bulunması gibi değişkenler ile gemilerin gövde ve makine arızaları arasında ilişki mevcuttur (Kilic ve Akdamar, 2020).

Gemi dizel motorları operasyonları en yaygın arızaların enjeksiyon sistemi, enjektörler, enjeksiyon pompaları, yakıt sistemi, hız kontrol cihazları, yağlama sistemi, zamanlama mekanizması ve ayrıca soğutma sistemi arızaları olduğunu göstermektedir (Krakowski, 2014).

4. Sonuç

Dünyada denizcilik sektörünün gelişmiş olduğu tüm bölge ve ülkelerde meydana gelen deniz kazaları ile ilgili kapsamlı ve detaylı kaza raporları tutulmakta ve yayınlanmaktadır. Bu kazaların sebep ve sonuçlarına bakıldığında deniz kazalarının oluşumunda gemi makineleri arızalarının önemli bir kaza faktörü olduğu görülmektedir.

Deniz kazaları ile ilgili gerçekleştirilen kaza raporları incelendiğinde, gemi makineleri ile ilişkili kazaların başta yangın ve makine dairesinin su alması olmak üzere, personel yaralanması, makine arızası, başka bir gemi ile çatışma, herhangi bir kıyı yapısıyla gerçekleşen çatma, geminin alabora olması, geminin karaya oturması ve/veya batması gibi çok çeşitli deniz kazalarıyla ilişkili olduğu anlaşılmaktadır.

Gemi makineleri teknolojisinin gün geçtikçe ilerlemesine rağmen deniz kazalarında gemi makineleri kaynaklı kaza oranlarının ve bu kazaların zarar boyutlarının ciddiyetini korumaktadır. Her ne kadar kaza türleri arasında makine arızaları ana bir bileşen olarak ele alınmakta ise de malzeme ve tasarım faktörü dışındaki diğer tüm arızaların sebebinin makinelerin uygun olmayan işletim, bakım, tutum ve onarım süreçleriyle ilişkilendirilebilecek insan hataları kaynaklı olduğu değerlendirilmektedir.

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Bölüm 7

GEMİ MAKİNELERİNDE OPERASYONEL BAKIM

S. Seçkin Erol¹

Özet

Yüzer taşıtların uçsuz bucaksız okyanuslar üzerinde seyir ettiği düşünülürken, okyanusun ortasında arızalanıp plansız duruşa maruz kalması elbette ki hiç de istenecek bir durum değildir. Tıpkı bir uçağın motoru arızalandığında havada kalma şansı olmadığı gibi; bir geminin de okyanusun ortasında arızalanıp durma gibi bir lüksü bulunmamaktadır. Hele ki onarılamayan bir arızayla karşı karşıya kalındığında okyanusun ortasında yetkili servis ya da yedek parça temin etmek hiç de kolay olmayacaktır. Bu gibi istenmeyen durumların önüne geçebilmek için konvansiyonel bir yöntem olan periyodik bakım teknikleri uygulanmaktadır. Periyodik bakım; belirli zaman aralıkları ile tekrar edilen ve gerekli olup olmadığına bakılmaksızın yapılan kalıplaşmış uygulamalar olduğundan; genellikle zaman, işçilik ve ilgili maddi kayıplarla sonuçlanmaktadır. Modernist bir yaklaşımla öngörü yöntemi olan kestirimci bakım ise sadece bakım gereksinimi doğduğunda bunu tespit edip gerekli önlemlerin alınmasını ve düzeltici uygulamaların yapılmasını sağlayarak makine sağlığının nominal fonksiyonlarını sürdürülebilir hâle getirilmesini sağlar ve birçok yönden ciddi tasarruflar sağlar. Nominal fonksiyonlarını koruyan makine veya mekanik ekipman çalışmak için daha az enerji harcar ve daha uzun ömürlü olur. Bu çalışmada; gemilerde makine sağlığı yönetimi ve teşhis, tedavi teknikleri üzerinde durulmuştur. Konvansiyonel bakımın yanında modern kestirimci bakım uygulamalarının yaygınlaştırılması için önemi vurgulanmıştır.

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analiz gibi farklı kestirimci bakım tekniklerinin beraber kullanılması da özellikle eş zamanlı oluşabilecek arızaların önüne geçilmesinde bu tekniğin verimliliğini arttıracaktır.

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Bölüm 8

GEMİ KÖKENLİ HAVA VE DENİZ KİRLİLİĞİ

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Özet

Gemiler, büyük taşıma kapasiteleriyle dünya ticaretinin vazgeçilmez unsurlarıdır. Öte yandan, bu büyük faydalarına rağmen hem hava hem de deniz kirliliği konularında üzerinde ciddiyle durulması gereken etkiler üretirler. Gemi kökenli hava ve deniz kirliliği, çok çeşitli kökenlere sahip olmakla birlikte çoğunlukla gemi yakıtları ve gemilerde üretilen atıklarla ilişkilidir. Bu kirleticilerin miktar ve etki tespiti, çevresel sorunların aşılması için son derece önemlidir. Bu çalışmada, gemi kökenli kirleticilerin tanıtımı yapılarak bu kirleticilerin veya bunların etkilerinin azaltılması için yapılması gereken işlemler hakkında bilgi verilerek bu bağlamda gelecekte yapılması uygun görülen eylemlerden bahsedilmiştir.

Anahtar Kelimeler: Deniz Kirliliği, Hava Kirliliği, MARPOL, IMO.

Abstract

Ships are indispensable elements of world trade with their large carrying capacities. On the other hand, despite their great benefits, ships cause serious effects on both air and sea pollution. Ship-source air pollution and marine pollution has a wide variety of origins, but is mostly associated with ship fuels and ship waste. Determination of the amount and effect of these pollutants is extremely important for overcoming environmental problems. In this study, ship-source pollutants are introduced and information is given about the actions to be taken to reduce these pollutants or their effects, and in this context, the actions that are deemed appropriate to be taken in the future are mentioned.

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Bölüm 9

GEMİLERDE EMİSYON AZALTMA YÖNTEM VE TEKNOLOJİLERİ

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Özet

Deniz taşımacılığı, ölçek ekonomisi kapsamında taşınan birim yükte en düşük karbondioksit salımına sebep olan, en yeşil taşımacılık türü olmasına rağmen, küresel (CO₂) karbondioksit salımının %3,3'üne, azot oksit (NO_x) salımının %2'sine, sülfür oksit (SO_x) salımının %11'ine ve küresel sera gazı salımlarının %4'üne sebep olmaktadır (Tokuş ve Burak, 2021). Uluslararası deniz taşımacılığı gemi kaynaklı emisyonları ise dünyadaki toplam emisyon miktarının %2,5'ini oluşturmaktadır. Gemi baca gazı kaynaklı emisyonların her yıl özellikle Avrupa, Doğu Asya ve Güney Asya kıyılarında yaşayan (Corbett vd., 2007), yaklaşık 60.000 kişinin akciğer kanseri gibi hastalıklar sebebiyle erken ölümüne sebep olduğu (Anenberg vd., 2019) literatürde ifade edilmektedir. Bu sebeple gemi kaynaklı emisyon miktarlarının azaltılması hayati önem taşımaktadır. Bu çalışmada gemi kaynaklı emisyon çeşitleri ve azaltma yöntem/teknolojileri incelenmektedir.

Anahtar Kelimeler: Emisyon, Enerji Verimliliği, Deniz Taşımacılığı, Gemi Makine Teknolojileri.

Abstract

Despite being the most environmentally friendly form of transportation, due to economies of scale, maritime transportation nonetheless contributes 3.3% to

¹ Dokuz Eylül Üniversitesi Denizcilik Fakültesi Gemi Makineleri İşletme Mühendisliği Bölümü Gemi Makineleri İşletme Mühendisliği Anabilim Dalı

² Dokuz Eylül Üniversitesi Denizcilik Fakültesi Denizcilik İşletmeleri Yönetimi Bölümü Deniz Ulaştırma İşletme Yönetimi Anabilim Dalı

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Bölüm 10

GEMİ DİZEL MOTORLARINDA KULLANILAN YAKITLAR VE YAĞLAR

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Özet

Gemilerin gereksinim duyduğu büyük miktarlardaki güç ihtiyacı gemi dizel motorları ile sağlanmaktadır. Gemi dizel motorlarında yakıtın kimyasal olarak yanmasıyla güç elde edilmektedir. Motor silindirlerinde yakıtın uygun şekilde yanması hem güç üretimi hem de çevre ve meydana gelebilecek arıza ve bakım onarım hususları açısından önem arz etmektedir. Yanma süreci motorun tasarım ve parametrelerinin yanında yakıt parametrelerine de bağlıdır. Gemilerde kullanılan farklı tür yakıtların parametreleri standartlar ile belirlenmektedir. Bunun yanı sıra dizel motorlarda kullanılan yağlama yağları da hayati bir öneme sahiptir. Değişen teknoloji ve beraberinde zorunlu kılınan çevresel kurallar çerçevesinde gemi dizel motorlarında kullanılan yakıt ve yağların standart ve özellikleri de güncellenmektedir. Fosil yakıt rezervlerindeki azalma ve çevre kurallarına uyum sağlanması amacıyla geleneksel yakıtlara alternatif olarak farklı yakıt türleri önerilmektedir. Bu çalışmada günümüz koşullarında gemi dizel motorlarında kullanılan yakıt ve yağlama yağı özellikleri ve sistemlerinin yanı sıra bu alanlarda yapılan güncel çalışmalar ve gelişmeler tespit edilmiştir.

Anahtar Kelimeler: Gemi Dizel Motorları, Deniz Yakıtları, Yağlama Yağı.

Abstract

The large amount of power required by ships is provided by marine diesel engines. In marine diesel engines, power is obtained by chemical combustion of

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bozulmasına sebep olur. Yağ filtresi, yağın içindeki parçacıkların bir kısmını temizlese bile zaman içinde yeterli olamaz. Bu nedenle araç kataloğunda tavsiye edilen sürelerde motor yağının yenilenmesi gerekir.

3. Sonuç

Gemi dizel motorlarının sorunsuz çalışabilmeleri ancak uygun standartlarda ve motora özgü yağ ve yakıt kullanımıyla mümkündür. Bir gemi dizel motorunun ekonomik açıdan en önemli harcama kalemlerini yağ ve yakıt oluşturmaktadır.

Yapmış olduğumuz araştırma neticesinde, gemi dizel motorları yakıtlarına ilişkin yapılan çalışmaların motor yağını konu alan çalışmalara nazaran çok daha fazla olduğu görülmüştür. Bunun nedeni gemilerin yakıt harcamasının yağlama yağlarına oranla çok daha fazla olması ve ekonomik yönünün ağır basmasıdır. Gemi kaynaklı egzoz emisyonlarına getirilen sınırlamalar, gemilerde enerji verimliliği anlamında yakıt tüketiminin azaltılması ve düşük emisyonlu yakıtların alternatif olarak sunulmasını beraberinde getirmektedir.

Özellikle çevre konusunda yeni getirilen kuralların yakıt standartlarıyla paralel şekilde ilerlemesi kaçınılmazdır. Ancak mevcut ticari gemi filosu göz önüne alındığında, alternatif yakıtlara yönelimin yakıt maliyetleri ve uygulanabilirlik anlamında sınırlı kaldığı, düşük kükürtlü yakıt kullanımı dışında önemli bir gelişme mevcut olmadığı sonucuna varılmıştır.

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Bölüm 11

DÜŞÜK SÜLFÜRLÜ DENİZ YAKITLARININ İKİ ZAMANLI GEMİ ANA MAKİNELERİ ÜZERİNDEKİ TRİBOLOJİK VE KORUZİF ETKİLERİ

Sabri Alkan¹

Özet

Deniz taşımacılığı, Uluslararası Denizcilik Örgütü'nün (IMO) deniz yakıtlarındaki sülfür içeriğini sınırlayan Sülfür Üst Sınırı 2020 (Sulphur Cap 2020) yönetmeliğini yürürlüğe koymasıyla birlikte önemli bir zorlukla karşı karşıya kalmıştır. IMO, bu yönetmelikle ağır yakıttaki sülfür içeriğini sınırlandırarak gemilerin ana ve yardımcı makinelerinden ortaya çıkan egzoz gazındaki sülfür emisyonunu azaltmayı amaçlamıştır. Ancak, gerek gemilerde düşük sülfür içerikli yeni ağır yakıtların kullanılması, gerekse de bu yakıtların kullanımına bağlı olarak fiziksel ve kimyasal özellikleri değişen yeni yağlayıcıların devreye girmesi, motor tribolojisini, ekipman gereksinimlerini, nakliye ekonomisini ve gemi ana ve yardımcı makinelerinin işletme prosedürlerini etkilemiştir. Denizcilik endüstrisini etkileyen altı önemli emisyon (NO_x, CO₂, CO, HC, PM ve SO_x) olmasına rağmen, bu bölüm düşük sülfür içerikli deniz yakıtlarının iki zamanlı gemi ana makineleri üzerindeki tribolojik ve koruzif etkileri üzerine odaklanmıştır.

Anahtar Kelimeler: Gemi Dizel Makineleri, Düşük Sülfürlü Ağır Yakıt, Katalitik Partikül, Aşınma, Korozyon.

Abstract

Shipping has faced a significant challenge as International Maritime Organization (IMO) enacted the Sulfur Cap 2020 regulation, which limits the sulfur

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her makinenin kendine özgü tasarım ve işletme koşulları olduğunu unutmadan makine üreticilerinin prosedürlerini ve gerçek işletme tecrübelerini göz önünde bulundurmaları gerekmektedir.

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Bölüm 12

DENİZ ARAÇLARINDA GÜÇ SİSTEM MİMARİLERİ, GÜÇ KALİTESİ VE YÖNETMELİKLER

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Özet

Denizcilik endüstrisinin, enerji verimliliğine, daha yüksek hıza, daha düşük işletme maliyetine, daha düşük çevresel etkiye, daha fazla manevra kabiliyetine, güvenilirliğe ve emniyete sahip, daha büyük her türlü gemiye yönelik talebi hızla artmaktadır. Bu nedenlerden dolayı deniz tahrik sistemleri, elektrikli tahrik kullanımına ve sevk gücü sistemlerinin entegrasyonuna yönelik önemli ve hızlı bir gelişimden geçmektedir. Her çeşit deniz aracı için çok esnek, sağlam ve kompakt güç sistemlerine olan ihtiyaç her geçen gün artmaktadır. Bu ihtiyaç, güç elektroniği teknolojisinde meydana gelen son gelişmeler ile karşılanmaktadır. Bununla birlikte, IGBT, Mosfet gibi anahtarlama elemanları, dönüştürücü topolojileri ve kontrolünde sürmekte olan gelişmeler, deniz elektrik güç sistemlerinde devam etmekte olan gelişmeler için temel teşkil etmektedir. Güç elektroniği malzeme ve cihaz fiyatlarının 1990'lerden bu yana önemli ölçüde azalması bu donanımların enerji endüstrisi uygulamalarında hızlı büyümeyi körüklemiştir. Güç elektroniği teknolojisi, gemilerdeki veya karadaki elektrik enerjisi endüstrisinde çok büyük değişimlere neden olmuştur ve hâlâ gelecekte iyileştirmeler sağlama potansiyeline sahiptir. Günümüzde birçok deniz taşıtı, güç elektroniği teknolojilerini fazlaca kullanan elektrikli tahrik sistemlerine sahiptir. Dünyanın önde gelen donanmaları, sunduğu sayısız faydalar nedeniyle güç elektroniği esaslı elektrikli tahrik sistemlerine yönelmiştir. Bahsi geçen sistemlerle ilgili olarak bu kitap bölümünde şu konulara değinilmektedir;

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elektrik şebekesinin bir parçası olacaktır, bu durum yeni zorlukları beraberinde getirecektir.

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Bölüm 13

GEMİ MAKİNELERİ İŞLETME MÜHENDİSLİĞİ (GMIM) EĞİTİMİ VE OTOMATİK KONTROL SİSTEMLERİ

Ismail Cicek¹

Özet

Gemi Makineleri İşletme Mühendisliği (GMIM) lisans eğitimlerinde Otomatik Kontrol Sistemleri IMO STCW sözleşmesi kapsamında zorunlu derslerdendir. Aynı zamanda yeni nesil gemi sistemlerindeki teknoloji uygulamalarının neredeyse tamamı, performans artırımı veya daha iyi bir verim sağlama, insan hatalarının ve kazaların minimize edilmesi, işletim maliyetlerinin azaltılması ve benzeri amaçlarla otomatik kontrol sistemleri, hatta ileri seviye bilgiye dayalı kontrol sistemleri içermektedir. İnsansız makine dairesi örnekleri görülmeye başlanmış, otonom sistemlerin uygulanacağı, bununla ilgili tasarım ve işletim kurallarının yayınlanacağı tarihler çok uzak görülmemelidir.

Bu gelişmelere ayak uydurabilecek eğitim sistemi otomatik kontrol sistemi odaklı eğitim ve öğretimlerin müfredat programlarındaki adaptasyon ile mümkündür. Ancak, otomatik kontrol sistemlerinde kullanılan metot ve yöntemlerin modern sistemlerin tasarım ve işletim bakımından anlaşılması için hâlen büyük oranda geçerli olduğu söylenebilir. Dersin amacı otomatik kontrol sistemleri ile ve bu sistemleri oluşturan birimler ile ilgili temel bilgi edinilmesini sağlamak, gemilerdeki otomatik kontrol uygulamaları hakkında bilgi ve deneyim kazandırmak ve bu bilgiler ile öğrencinin kontrol sistemlerine bağlı oluşabilecek problemler hakkında doğru tespit edebilme yetkisini kazandırmak olarak özetlenebilir. Bunun yanında otomatik kontrol sistemleri temel prensiplerine bağlı kalınsa da özellikle bilgi teknolojilerini kullanabilen yeni yöntem ve metot uygulamaları da Endüstri 4.0 çağı ve getirdikleri ile beraber, yenilikçi, akıllı ve

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8. Bilgilendirme

Yazıda, GDS Mühendislik ARGE firması tarafından geliştirilen Ship Engine Room Simulator (SERS™) ürününe ait görseller, tanımlar ve diğer materyaller, firmanın yayın müsadresi ile örnek olarak kullanılmıştır. Diğer görseller ve materyaller ise referans verilerek metin içerisinde anlatılmıştır. Yazar, bu bölümün oluşturulmasında katkı sağlayan GDS Mühendislik ARGE San. Tic Ltd. Şti firması mühendis personeli Çağrı Berk Güler, Burak Çavuşoğlu ve Nisanur Güldoğan'a özellikle çok teşekkür etmektedir.

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Bölüm 14

MAKİNE DAİRESİ SİMÜLATÖRÜ İLE DENİZCİLİK EĞİTİMLERİ

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Özet

Makine Dairesi Simülatörü (MDS) ile eğitim ve öğretimin, Uluslararası Denizcilik Teşkilatı komitelerinde görüşülüp tüm dünya ülkeleri tarafından imzalanan sözleşmeler ile denizcilik eğitimlerinde bir zorunluluk olması üzerinden 30 yıldan fazla zaman geçmiştir. Bu süre içinde denizcilik eğitim kurumlarında simülatör ile eğitim verilmesi bir klasik eğitim yöntemi olarak standartlaşmıştır. Son yıllarda, hızla gelişen teknoloji sonuçları ile hızlı uygulamalar gelişmesi ve sistemlerin daha kompleks hâle gelmesi ile eğitim içerikleri ile uygulamada farklılıklar ortaya çıktığı daha fazla görülmeye başlanmıştır. Bu süreçte, yeni kurallara göre hızla değişen teknolojileri de içermesinden dolayı, makine dairesi simülatörleri ile eğitim hem lisans öğrencilerinin eğitimlerinde hem de vardiya zabitlerinin, hatta baş mühendislerin, sürekli eğitimlerinde doğru bir eğitim aracı ve yöntemi olarak görülmeye başlanmıştır. Klasik eğitimler yerine uygulamadaki teknolojiyi ve mesleği daha zor hâle getiren yeni kurallar, lisans ve sonrası sürekli eğitimlere de ilgiyi arttırmış; denizcilik eğitimlerinde MDS kullanılması kaçınılmaz hâle gelmiştir. Son yıllarda kazaların da artmasıyla özellikle sektörün de eğitime ilgisi önceki zamanlardan çok daha fazla olmaya başlamıştır.

Bu çalışmada, gemi makine dairesi simülatörü ile gemi makineleri işletme mühendislerinin lisans seviyesi eğitim ve öğretimi konu edilmiştir. Bu çalışma, geniş bir literatür taraması, yazarın 20 yıldan fazla eğitim tecrübesi, ders içi

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yapılması ve bunların simülator uygulamalarında standartlaştırılması doğru olacaktır.

- 2) Makine dairesi kaynak yönetimi eğitiminin tek bir model kursa bağlı olmaması eğitim yönteminin standart olmamasına yol açmaktadır. MDS ile kaynak yönetimi eğitimi, akademik çalışmalara ve gelişime açık bir alandır.
- 3) Klas sertifikasyonunun içerik çeşidi ile birlikte eğitim konfigürasyonunu da içerecek bir sınıflandırma önermesi yazar tarafından önerilmiştir.

9. Bilgilendirme

Yazıda, GDS Mühendislik ARGE firması tarafından geliştirilen Ship Engine Room Simulator (SERSTM) ürününe ait görseller, tanımlar ve diğer materyaller firmanın yayın müsaadesi ile, örnek olarak kullanılmıştır. Diğer görseller ve materyaller ise referans verilerek metin içerisinde anlatılmıştır.

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Bölüm 15

GEMİ MAKİNELERİNDE YENİ ÇEVRE DOSTU VE EKONOMİK TEKNOLOJİLER

Deniz Unsalan¹ Volkan Varışlı²

Özet

Gemi sevk sistemleri, bir yandan yakıt tüketiminin düşürülmesi, diğer yandan çoğu kez ekonomik taleplerle ters düşen atmosfere zararlı gaz salınımının sınırlandırılması, diğer taraftan yeni ve akıllı teknolojilerin yaygınlaşması nedenleri ile hızlı bir değişim içine girmiştir. Son yıllarda yakıtların yanma proseslerinin daha iyi anlaşılması, malzeme bilimi, triboloji, yakıt hücresi, yenilenebilir ve nükleer enerji teknolojileri, akıllı teknolojiler ve nanoteknoloji gibi alanlarda kaydedilen hızlı gelişmeler ve Uluslararası Denizcilik Örgütü (IMO) tarafından önerilen sınırlayıcı kurallar, gemi makineleri mühendisliği alanında hızlı gelişimlere yol açmıştır. Bu çalışmanın amacı, bu gelişmelere sınırlı da olsa bir bakış getirmektir.

Anahtar kelimeler: Gemi Makineleri, EEDI İndeksi, Miller, Kalina, Stirling, Otto Çevrimleri, Sıvı Pistonlu Motor, Yakıt Hücresi, Erimiş Tuz Reaktörü, LNG, Amonyak, Methanol, Biyodizel Yakıtı, Sıvı Hidrojen EEXI

Abstract

Marine propulsion systems have recently undergone into a phase of rapid and substantial developments due to the quest for reduced fuel consumption, often contradicting with the demand for a cleaner exhaust emissions with lesser amounts of obnoxious exhaust gas contents and developments in the field of digital (smart) technologies. Recent advances in the understanding of combustion phenomenon, materials science, tribology, developments in the fields of fuel cells, renewable and nuclear energy technologies, smart systems and nano-

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enerjisinin bataryalarda depolanması ile kısa süreli yolculuklarda kullanılması düşünülebilir.

4. Sonuç

Günümüzün gittikçe artan ekonomik ve çevresel kısıtlamaları, denizcilik sektörü ve gemi makinelerinde de kendini göstermektedir. Az veya sıfır karbon salımlı, azot ve kükürt oksit salınımı ortadan kaldırılmış motor sistemleri ile direkt elektrik enerjisi sağlayan güç sistemleri yaygınlaşmakta ve hemen her gün yeni bir teknoloji bu alanda uygulanmaya konulmaktadır. Hemen her gün literatürde yeni teknolojilerden veya mevcut teknolojilerdeki iyileştirmelerden söz edilmektedir. Her biri ayrı olarak en az bir makale kapsamında olan bu konularda erişebildiğimiz ve bildiğimiz dâhilinde olan yeniliklere ana başlıklar hâlinde değinmeye çalıştık. Sözü edilen teknolojilerden hangilerinin yaygınlaşacağı veya hangi yönde değişim göstereceğini ise öncelikle maliyet-etkinlik faktörleri belirleyecektir.

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İÇİNDEKİLER

ÖNSÖZ	V
1. BÖLÜM	MATERYALLERE GİRİŞ.....	1
2. BÖLÜM	DOLGU OYUNCAKLAR	7
3. BÖLÜM	KUKLALAR.....	39
4. BÖLÜM	MOBİLLER.....	57
5. BÖLÜM	MÜZİK ARAÇLARI.....	67
6. BÖLÜM	MASKE, KOSTÜM VE BAŞLIK.....	81
7. BÖLÜM	EĞİTİCİ OYUNCAKLAR.....	91
8. BÖLÜM	ARTIK MATERYALLER.....	185
KAYNAKÇA	205

KAYNAKÇA

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ÖN SÖZ	iii
TOPRAK-SU KORUMA	1
1. Giriş.....	1
2. Dünyada ve Türkiye’de Erozyon Sorunu	3
3. Toprak Kalitesi.....	5
3.1. Görsel Belirteçler	6
3.2. Fiziksel Belirteçler.....	8
3.3. Kimyasal Belirteçler	8
3.4. Biyolojik Belirteçler.....	8
4. Toprak-Su Koruma Stratejileri.....	12
5. Türkiye’nin Su Kaynakları Potansiyeli.....	15
6. Arazi Kullanımı ve Uygunluk Durumu	19
6.1. Türkiye’nin Arazi Varlığının Genel Durumu	19
6.2. Tarım Arazilerinin Sınıflandırılması.....	21
6.2.1. Mutlak Tarım Arazileri.....	22
6.2.2. Özel Ürün Arazileri	22
6.2.3. Dikili Tarım Arazileri	23
6.2.4. Marjinal Tarım Arazileri.....	24
6.2.5. Örtü Altı Tarım Arazileri veya Seralar	25
6.2.6. Diğer Araziler	25
6.3. Arazi Kullanma Kabiliyet (Yetenek) Sınıflaması	25
6.4. Kabiliyet sınıfları	27
7. Toprak Erozyonu.....	41
7.1. Doğal (Jeolojik) Erozyon	42
7.2. Hızlandırılmış Erozyon	43
7.3. Su Erozyonu	44
7.3.1. Su Erozyonuna Etki Eden Faktörler	45
7.3.2. Su Erozyonu Tipleri.....	59
7.3.3. Su Erozyonunun Şiddet Derecesine Göre Sınıflandırılması	68

7.4. Rüzgâr Erozyonu	70
7.4.1. Rüzgâr Erozyonuna Etki Eden Faktörler	70
7.4.2. Rüzgâr Erozyonunun Aşamaları.....	72
7.4.3. Toprak Taşınmasında Hareket Tipleri.....	72
7.4.4. Rüzgâr Erozyonunun Şiddet Derecesine Göre Sınıflandırılması	74
8. Toprak Kayıplarının Belirlenmesi.....	75
8.1. Gözlemsel İlişkiler ve Deneysel Çalışmalar	75
8.2. Toprak Erozyonunu Tahmin Modelleri	77
8.3. Su Erozyonuna İlişkin Modeller	78
8.3.1. Yüzeysel Akış Miktarının Saptanması	78
8.3.2. Toprak Kayıplarının Modellerle Saptanması	87
8.4. Rüzgâr Erozyonuna İlişkin Modeller	101
9. Toprak Erozyonunu Kontrol Yöntemleri	105
9.1. Su Erozyonuna Karşı Alınacak Önlemler	105
9.1.1. Bitkisel/Kültürel Önlemler.....	106
9.1.1.1. Ekim Nöbeti.....	106
9.1.1.2. Anız Örtülü Tarım	108
9.1.1.3. Düzeç Eğrili Tarım.....	111
9.1.1.4. Şeritsel (Şeritvari) Ekim	113
9.1.2. Mekanik Önlemler.....	115
9.1.2.1. Kontür (Yatay) Bentleri.....	115
9.1.2.2. Kontrol Bendi (Barajı).....	117
9.1.2.3. Çevirme Kanalları	119
9.1.2.4. Otlandırılmış Su Yolları	120
9.1.2.5. Teraslama ve Teras Sistemlerinin Planlanması	122
9.1.2.5.1. Terasların Sınıflandırılması	123
9.1.2.5.2. Teras Sistemlerinin Planlanması.....	130
9.1.2.5.3. Tarla Teraslarının Boyutlandırılması.....	130
9.1.2.5.4. Teras Çıkış Ağızlarının Seçimi.....	133
9.1.2.5.5. Toprak Seki Terasların Boyutlandırılması	135
9.1.2.5.6. Taş Seki Terasların Boyutlandırılması	138
9.2. Rüzgâr Erozyonuna Karşı Alınacak Önlemler	140
9.2.1. Bitkisel ve kültürel önlemler.....	140
9.2.2. Fiziksel önlemler.....	143
9.2.3. Kumul (Barkan) Stabilizasyonu.....	143
10. İklim Değişikliği ve Arazi Degradasyonu (Bozulması).....	144
10.1. İklim Değişikliği Projeksiyonları	144
10.2. Toprak Degradasyonunun Önlenmesi	145
KAYNAKLAR.....	147

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Editör: Dr. Erkan Denk



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İÇİNDEKİLER

YAZAR LİSTESİ	iii	
ÖN SÖZ	Vii	
1. BÖLÜM	GASTRONOMİ KAVRAMI VE GASTRONOMİ TURİZMİ	1
	Giriş	1
	1. GASTRONOMİ KAVRAMI VE GELİŞİMİ	1
	2. YEMEK KÜLTÜRÜ	7
	3. GASTRONOMİ TURİZMİ	9
	4. GASTRONOMİ TURİZMİNİN DESTİNASYONA KATKILARI	13
	SONUÇ	17
	KAYNAKÇA	18
2. BÖLÜM	PEYNİRİN TARİHÇESİ VE PEYNİR TURİZMİ	23
	Giriş	23
	1. PEYNİR TARİHİ	23
	2. DÜNYADAN PEYNİR TÜRLERİNE ÖRNEKLER	29
	3. TÜRK MUTFAK KÜLTÜRÜNDE PEYNİR	36
	4. PEYNİR TURİZMİ	42
	KAYNAKÇA	45
3. BÖLÜM	EGE BÖLGESİ-1 (İZMİR, MANİSA VE MUĞLA)	49
	Giriş	49
	1. İZMİR	53
	2. MANİSA	64
	3. MUĞLA	66
	KAYNAKÇA	68
4. BÖLÜM	EGE BÖLGESİ-2 (AYDIN, DENİZLİ, UŞAK, KÜTAHYA VE AFYONKARAHİSAR)	71
	1. AYDIN	71
	2. DENİZLİ	76
	3. UŞAK	77

	4. KÜTAHYA	78
	5. AFYONKARAHİSAR	80
	EGE BÖLGESİ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ	82
	KAYNAKÇA	83
5. BÖLÜM	AKDENİZ BÖLGESİ-1 (ADANA, ANTALYA, BURDUR VE ISPARTA)	85
	Giriş	85
	1. ADANA	86
	2. ANTALYA	90
	3. BURDUR	93
	4. ISPARTA	97
	KAYNAKÇA	101
6. BÖLÜM	AKDENİZ BÖLGESİ-2 (KAHRAMANMARAŞ, MERSİN, OSMANİYE VE HATAY)	103
	1. KAHRAMANMARAŞ	103
	2. MERSİN	106
	3. OSMANİYE	111
	4. HATAY	112
	AKDENİZ BÖLGESİ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ	122
	KAYNAKÇA	123
7. BÖLÜM	İÇANADOLU BÖLGESİ-1 (ESKİŞEHİR, ANKARA, ÇANKIRI, KIRIKKALE, KAYSERİ VE KIRŞEHİR)	127
	Giriş	127
	1. ESKİŞEHİR	128
	2. ANKARA	130
	3. ÇANKIRI	135
	4. KIRIKKALE	137
	5. KAYSERİ	139
	6. KIRŞEHİR	141
	KAYNAKÇA	142
8. BÖLÜM	İÇ ANADOLU BÖLGESİ-2 (NİĞDE, AKSARAY, KARAMAN, KONYA, SİVAS, NEVŞEHİR VE YOZGAT)	145
	1. NİĞDE	145
	2. AKSARAY	150
	3. KARAMAN	151
	4. KONYA	154
	5. SİVAS	158
	6. NEVŞEHİR	159
	7. YOZGAT	162

	İÇ ANADOLU BÖLGESİ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ	164
	KAYNAKÇA.....	165
9. BÖLÜM	GÜNEYDOĞU ANADOLU BÖLGESİ (ADİYAMAN, BATMAN, DİYARBAKIR, GAZİANTEP, KİLİS, MARDİN, SİİRT, ŞANLIURFA VE ŞIRNAK).....	169
	Giriş	169
	1. ADİYAMAN	170
	2. BATMAN	173
	3. DİYARBAKIR	173
	4. GAZİANTEP	176
	5. KİLİS	179
	6. MARDİN	180
	7. SİİRT.....	182
	8. ŞANLIURFA.....	183
	9. ŞIRNAK.....	187
	GÜNEYDOĞU ANADOLU BÖLGESİ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ.....	189
	KAYNAKÇA.....	190
10. BÖLÜM	DOĞU ANADOLU BÖLGESİ-1 (ERZİNCAN VE BİNGÖL)	193
	Giriş	193
	1. ERZİNCAN	194
	2. BİNGÖL	202
	KAYNAKÇA.....	207
11. BÖLÜM	DOĞU ANADOLU BÖLGESİ-2 (BİTLİS, HAKKÂRİ, MUŞ VE VAN) ..	211
	1. BİTLİS	211
	2. HAKKÂRİ	213
	3. MUŞ.....	215
	4. VAN.....	217
	KAYNAKÇA.....	220
12. BÖLÜM	DOĞU ANADOLU BÖLGESİ-3 (AĞRI, İĞDIR, KARS VE ARDAHAN)	223
	1. AĞRI.....	223
	2. İĞDIR.....	227
	3. KARS	227
	4. ARDAHAN	236
	KAYNAKÇA.....	241

13. BÖLÜM	DOĞU ANADOLU BÖLGESİ-4 (MALATYA, ELAZIĞ, TUNCELİ VE ERZURUM)	243
	1. MALATYA.....	243
	2. ELAZIĞ	247
	3. TUNCELİ.....	249
	4. ERZURUM	254
	DOĞU ANADOLU BÖLGESİ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ.....	262
	KAYNAKÇA.....	263
14. BÖLÜM	KARADENİZ BÖLGESİ - BATI KARADENİZ BÖLÜMÜ (BOLU, DÜZCE, SİNOP, KARABÜK, KASTAMONU, ZONGULDAK VE BARTIN)	267
	Giriş	267
	1. BOLU.....	269
	2. DÜZCE.....	274
	3. SİNOP.....	276
	4. KARABÜK.....	277
	5. KASTAMONU	279
	6. ZONGULDAK	280
	7. BARTIN.....	280
	KARADENİZ BÖLGESİ-BATI KARADENİZ BÖLÜMÜ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ	281
	KAYNAKÇA.....	282
15. BÖLÜM	KARADENİZ BÖLGESİ-ORTA KARADENİZ BÖLÜMÜ (ORDU, SAMSUN, AMASYA, ÇORUM VE TOKAT)	285
	Giriş	285
	1. ORDU	286
	2. SAMSUN	291
	3. AMASYA.....	293
	4. ÇORUM.....	294
	5. TOKAT	297
	KARADENİZ BÖLGESİ-ORTA KARADENİZ BÖLÜMÜ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ	298
	KAYNAKÇA.....	299
16. BÖLÜM	KARADENİZ BÖLGESİ-DOĞU KARADENİZ BÖLÜMÜ (ARTVİN, RİZE, GİRESUN, TRABZON, GÜMÜŞHANE VE BAYBURT)	301
	Giriş	301
	1. ARTVİN.....	304

2. RİZE.....	312
3. GİRESUN	315
4. TRABZON	316
5. GÜMÜŞHANE.....	324
6. BAYBURT.....	326
KARADENİZ BÖLGESİ-DOĞU KARADENİZ BÖLÜMÜ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ	327
KAYNAKÇA.....	329
17. BÖLÜM	MARMARA BÖLGESİ-1 (BALIKESİR VE BİLECİK)..... 333
Giriş	333
1. BALIKESİR.....	335
2. BİLECİK.....	367
KAYNAKÇA.....	372
18. BÖLÜM	MARMARA BÖLGESİ-2 (İSTANBUL, YALOVA VE SAKARYA) 377
1. İSTANBUL.....	377
2. YALOVA.....	380
3. SAKARYA.....	384
KAYNAKÇA.....	389
19. BÖLÜM	MARMARA BÖLGESİ-3 (EDİRNE-KIRKLARELİ-TEKİRDAĞ- KOCAELİ)..... 393
Giriş	393
TRAKYA İLLERİ VE KOCAELİ İLİ ÖZELİNDE MARMARA BÖLGESİ'NİN PEYNİR İLE İLİŞKİSİ	394
1. EDİRNE İLİ VE GELENEKSEL PEYNİRLERİ.....	396
2. KIRKLARELİ İLİ VE GELENEKSEL PEYNİRLERİ.....	410
3. TEKİRDAĞ İLİ-MALKARA İLÇESİ VE GELENEKSEL PEYNİRLERİ.....	419
4. KOCAELİ İLİ VE KOCAELİ GELENEKSEL PEYNİRLERİ.....	427
SONUÇ YERİNE	438
KAYNAKÇA.....	439
20. BÖLÜM	MARMARA BÖLGESİ-4 (BURSA VE ÇANAKKALE)..... 445
1. BURSA.....	446
2. ÇANAKKALE	450
MARMARA BÖLGESİ PEYNİRLERİ GENEL DEĞERLENDİRME ve SONUÇ.....	458
KAYNAKÇA.....	459
GENEL DEĞERLENDİRME VE SONUÇ	461

1. BÖLÜM

GASTRONOMİ KAVRAMI ve GASTRONOMİ TURİZMİ

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Giriş

Bireyler yaşamlarını devam ettirebilmek için beslenmeye ihtiyaç duymaktadır. Beslenme insan yaşamının sürdürülebilmesi adına gereksinim duyulan en önemli noktalardan birini oluşturmaktadır. Kişilerin gelir düzeyleri yükseldikçe ve teknolojinin gelişmesiyle birlikte ise beslenme ihtiyaç halinden çıkıp bir zevk halini almıştır ve gastronomi kavramı ortaya çıkmıştır (Cömert ve Çavuş, 2016:119). Toplumlar da yaşamış oldukları bölgelerdeki coğrafi ve kültürel özelliklere uygun olarak bir takım kurallar ile birlikte kendine has beslenme tarzları ve mutfak kültürlerini oluşturmuşlardır (Beşirli, 2010:160). Her toplum kendi geleneksel ürünlerini, mutfak kültürlerini son yıllarda beklenti ve ihtiyaçların çeşitlenmesiyle birlikte gastronomi turizmi aracılığıyla küreselleştirmektedir. Turistleri destinasyonlara çekmek için önemli bir bileşen olan gastronomi turizminin gelişebilmesi adına bölgelere çeşitli gastronomi rotaları ve turları düzenlemektedir.

Bu bölümde gastronomi kavramının ilk çağlardan günümüze kadar olan yolculuğu, bu süreçte kavramı açıklayabilmek adına yapılan çeşitli tanımlamalar, literatürde kullanıldığı eserler ve insanoğlunun en temel gereksinimlerinden olan beslenme ile başlayıp bir sanata dönüşen gastronomiyi tarih içerisinde etkileyen önemli olaylar yer almaktadır. Gastronomi bilimiyle ilgili temel kavramlar betimlenerek gastronomi kavramı üretim ve tüketim boyutuyla incelenmiştir. Toplumların yemek kültürleri, gastronomi turizmi, gastronomi turizminin gelişim gösterdiği bölgeye katkıları örnekler verilerek açıklanmıştır.

1. Gastronomi Kavramı ve Gelişimi

Gastronomi kavramının kökenine inmek için yazılı kaynaklar incelendiğinde bu terimin geçmişinin günümüzden yaklaşık 2000 yıl öncesine kadar dayandığı görülmektedir. Günümüzde Mısır toprakları içerisinde yer alan Naucratis şehrinde yaşamış olan Athenaus tarafından kullanılan bu terim mide anlamına gelen *gaster* ve yasa anlamına gelen *nomos* kelimelerinin bir araya gelmesinden oluşmuştur. M.S. 2. yy. ve 3. yy. arasında yazıldığı

re birçok bilim dalı ile etkileşim içerisinde olmasından dolayı disiplinler arası bir bilim dalı olarak kabul görmektedir.

Kimya, fizik, antropoloji, sosyoloji pazarlama vb. gibi bilimlerle etkileşim içinde bulunması ve bu vesileyle multidisipliner bir alan olmasından dolayı akademik bir disiplin olarak görülme süreci yavaş ilerlemiştir. Ancak 1900'lü yılların ortalarına doğru Avrupa'daki bazı üniversitelerde aşçılık eğitimlerinin ve diplomalarının verilmesi, 1990'lı yıllarda ise ABD'de yüksek lisans ve doktora programlarının açılması bu süreci hızlandıran gelişmeler arasında yer almaktadır. Ülkemizde ise 1980'li yıllarda ön lisans düzeyinde başlayan bu eğitimler 21.yy. da lisans eğitimi ile üniversitelerde yer almaya başlamıştır.

Günümüzde tüketicilerin beklentilerinin değişmesi, turizm endüstrisinde talep ve arz bakımından farklılıklarının olması ve turistlerin yenilik arayışları, gastronomi turizminin gelişmesine olanak sağlamıştır. Son yıllarda turistler tatil seçimlerini yaparken, bu seçimlerde bölgeye ait yiyecek ve içecek kültürüne önem göstermektedir. Bu nedenle destinasyon gastronomi kültüründeki farklılaşma ve ülkeler için imaj yaratması konusunda bölgeler için dikkat çeken noktalardandır. Bölgeye gelen yerli ve yabancı ziyaretçiler, bölgenin sahip olduğu mutfak kültürünü, yöresel yiyecek ve içecekleri deneyimleyebilmenin yanında çeşitli gastronomik etkinliklere de katılabilmektedirler. Bu durum da yerel kimliğin ve kültürün güçlenmesine yardımcı olmaktadır. Bölgelerin gastronomi turizmini bir çekicilik unsuru olarak kullanması, gastronomi alanındaki gelişmeleri yakından takip etmesi, coğrafi işaretleme sistemi ile gastronomik miraslarını koruma altına alması bölge mutfak kültürünün korunmasına ve gelişmesine katkıda bulunacaktır.

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2. BÖLÜM

PEYNİRİN TARİHÇESİ ve PEYNİR TURİZMİ

Erkan Denk

Giriş

Türkiye'nin tarih boyunca birçok medeniyete ev sahipliği yapmış olması mutfağına kültürel zenginlik ve geleneksel ürün çeşitliliği olarak yansımaya sebep olmuştur. Yerleşik hayata geçtikten sonra insanoğlu yaşamını sürdürürebilmek adına temel yiyecek ve içeceklerini belirlemeye çalışmış, devamında ise belirlediği bu ürünleri nasıl koruyabileceğini araştırmaya başlamıştır. Günümüzde de temel gıda maddesi olarak adlandırılan ürünlerden birisi saklanması ve taşınması zor olan süttür. Sütten daha fazla yararlanabilmek ve onu daha dayanıklı yapabilmek için insanoğlu zamanla süt ürünlerine yönelmiştir. Bu ürünlerden birisi de peynirdir. Dolayısıyla bu bölümde öncelikle peynirin tarihi hakkında bilgiler verilecek, peynir türleri sınıflandırılacak, Dünyadan peynir türleri örneklerine değinilecek, Türk mutfak kültüründe peynirin önemi ortaya konularak gastronomi turizminin önemli niş pazarı ve turizm türü olarak peynir turizmi hakkında literatürde yer alan çalışmalar ile birlikte bilgiler verilecektir.

1. PEYNİR TARİHİ

Gastronomi turizmi, destinasyon ile kuvvetli bağı olan ve kültürel kimliği temsil eden özgün, otantik ve eşsiz yerel ürünlere dayalı gerçekleştirilen seyahatler ile etkinlikleri kapsayan bir turizm türüdür. Aynı zamanda yöresel lezzetler, gastronomi turizmi destinasyonlarının önemli bir simgesi ve o yörenin özüne dayanan güçlü bir çekim unsurudur (Fusté-Forné, 2020).

Turistik destinasyonların rekabet gücünü artırmak ve turizmin olumlu etkilerini en üst düzeye çıkarmak, olumsuz olanları en aza indirmek, turizm talebinin ihtiyaç ve zevklerindeki değişiklikleri öngörmek, destinasyondaki eksiklikleri azaltmak ve mevsimsellikle mücadele etmek için uygun planlama yapmaktan geçmektedir. Bu planlamada ise yörenin gastronomik ürünleri ve unsurları yardımcı olabilmektedir (UNWTO, 2019). Peynir ise, gastronomi turizminin bir bileşeni olarak köklü geçmişe sahip, üretildiği yörenin kültürel

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3. BÖLÜM

EGE BÖLGESİ-1

(İzmir, Manisa ve Muğla)

Yıldız Ünlü, Kansu Gençer

Giriş

Kültür, toplumun tarihsel süreçleri içinde şekillenen ve nesiller boyunca aktarılan maddi manevi değerlerini gösteren bir bütündür (Karakaya ve Tiske, 2009). Kùltürler yaşanan toplumun bir benliğidir. Kùltürlerin oluşmasında da birçok unsur yer almaktadır. Bu unsurların başında ise toplumların mutfak kùltürleri gelmektedir (Şanlıer vd., 2010). Mutfak kùltürü, bir ülkenin bir bölgenin zenginliklerini ortaya çıkaran paha biçilmez bir unsurdur (Köten vd., 2014). Bölgesel mutfak ürünleri ile toplumların kùltürleri çeşitlenmekte ve her geçen gün geleneksel gıdalar ile birlikte de kùltürlerin yaşatılması sağlanmaktadır. Geleneksel gıdalar saklı kalmış lezzetlerin gün yüzüne çıkarılmasına, geçmişten gelen alışkanlıkların günümüzde de devam ettirilmesine aynı zamanda gıdaların üretiminde kullanılan metotların kalıcı hale gelmesine olanak sağlamaktadır. Her medeniyetinde farklı geleneksel ürünlere sahip bir kùltürü vardır. Türk toplumunda ise geleneksel gıdalar mutfaklarda oldukça fazla yer almaktadır (Çoşkun, 2010).

Zengin kùltüre sahip, medeniyetlerin karması olan Türk toplumu mutfaklarında çeşitli ürünlere rastlamak mümkündür. Her bölgenin hatta her il ve ilçelerinin kendine özgü yiyecekleri bulunmaktadır. Bu sayede mutfaklarda geleneksel gıdaların tüketimi devam etmekte ve gelişen gastronomi dünyası ile birlikte ürünlerin devamlılığı sağlanmaktadır. Fakat bu devamlılığın sağlanması için daha fazla çalışmaların yürütülmesi gerekmektedir. Çünkü geleneksel gıdaların varlığının devam ettirilmesi son derece önemlidir. Böylesine zengin bir kùltüre sahip, çok çeşitli mutfağı olan bu toplumun gün yüzüne çıkarılmamış birçok geleneksel gıdaları da mevcuttur. Bu yüzden her yörenin ürünleri daha özenli bir şekilde araştırılarak gün yüzüne çıkartılmalı ve mutfaklarda gelecek nesillere aktarılacak şekilde öğretilmelidir (Albayrak ve Güneş, 2010).

Geleneksel gıdalar denilince akla bölgede yetişen ot türlerinden tutun mutfaklarda bir yemeğin pişirilme şekline kadar olan tüm süreçler gelmektedir. Oldukça geniş bir yelpazesi olan geleneksel gıdaların değeri de gün geçtikçe anlaşılmaktadır. Çalışma hayatındaki

3.3. Geyve Yörük Peyniri

Muğla'nın Fethiye ilçesinde Yörükler tarafından üretilen bir peynirdir. Peynir yapımında keçi ve koyun sütü kullanılır. Sağılan sütler süzülerek el yakmayacak kadar ısıtılır. Süt miktarına göre peynir mayası eklenerek sütün pıhtı oluşturması beklenir. Oluşan pıhtı koyu yoğurt kıvamındadır. Daha sonra pıhtı temiz bir beze alınır. Üzerine baskı yapması için ağırlık konularak suyunun süzülmesi sağlanır. Ağırlıkla 1 gün bekleyen peynir, parçalara ayrılarak içerisine isteğe göre yörenin otları ilave edilir. Peynir tuzlanıp bidonlara basılır ya da otlar ilave edilmeyip salamura içerisine konularak peynirin olgunlaşması beklenir (K6, K7, K8).



Resim 14: Geyve Yörük Peyniri

Kaynak: Pinterest.com, 2023.

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- K3:** D, H. 1976 İzmir/Tire
- K4:** K, N. 1968 Manisa/Soma
- K5:** E, M. 1997 Manisa/Akhisar
- K6:** T, H. 1975 Muğla/Fethiye
- K7:** T, M. 1972 Muğla/Fethiye
- K8:** U, C. 1994 Muğla/ Menteşe

4. BÖLÜM

EGE BÖLGESİ-2

(Aydın, Denizli, Uşak, Kütahya ve Afyonkarahisar)

Yıldız Ünlü, Kansu Gençer

Bu bölümde Ege Bölgesinde yer alan Aydın, Denizli, Uşak, Kütahya ve Afyonkarahisar yörelerine ait geleneksel peynirlerden bahsedilecek olup üretim yöntemleri hakkında bilgi verilecektir.

1. AYDIN

Aydın, Ege Bölgesi'nin hem yoğun turizm faaliyetlerinin hem de tarım ve ticaretin gerçekleştiği bir diğer güzel şehridir. İnciri ve efeleriyle ün kazanmış il, bölgenin konum olarak her yere yakınlığıyla avantajlı durumdadır. Zeytinyağı, keşkeği, kestanesi, börülcesi gibi birçok lezzeti bulunan şehrin peynir çeşitliliği de dikkat çeken diğer lezzet zenginliklerindedir. Bölgede İzmir'den sonra peynir çeşidi en fazla olan il sıralamasında Aydın ikinci sırada yer almaktadır.

1.1. Çörek Otlı Peynir

Aydın ve çevresinde üretimi gerçekleşen çörek otlı peynir, lor peynirinin içerisine yöre halkı tarafından "karacaotu" olarak adlandırılan çörek otunun ilave edilip bidonlara basılarak olgunlaştırılması ile elde edilmektedir. Beyaz peynir ve kaşar peyniri yapımı sonrasında oluşan peynir altı suyuna isteğe bağlı olarak taze süt ilave edilerek pıhtı oluşturulur. Oluşan pıhtı süzdürülerek parçalara ayrılır. Elde edilen lorun içerisine çörek otu ilave edilir ve karıştırılır. Uzun süre muhafaza etmek için peynire %2-3 oranında tuz eklenmektedir. Devamında bidon veya küplere hava almayacak şekilde peynir sıkıştırılarak doldurulur. Serin yerde saklanarak olgunlaşmaya bırakılır. Üzerine zeytinyağı dökülerek kahvaltılarda, ara öğünlerde tüketilir (Dere,2006).

leri vardır. Ancak peynirleri tanıtmak konusunda eksik bir tarafın olduğu da bir gerçektir. Ege Bölgesi de geleneksel peynirler açısından zengin çeşitliliği olan bölgelerden biridir. Bölgede tulum peyniri, çökelek, lor gibi keçi ve koyun sütünden yapılan peynirlere ağırlık verilirken inek sütü ile yapılan peynirler de mevcuttur. Yörede her şehrin kendisine özgü en az bir peynir çeşidi bulunmaktadır. Bazı illerde peynir çeşitliliği oldukça fazlayken bazı illerde birkaç tane ile sınırlıdır. Fakat bunlardan yalnızca birkaçı bilinmekte ve ekonomik değer oluşturmaktadır. Oysa bu çeşitliliğin sürdürülebilir olması başta bölgenin olmak üzere ülkenin ekonomisi için oldukça değerlidir. Ege Bölgesi tarihi ve doğası ile ön plana çıkan, yüksek sayılarda kendisine turist çeken bir bölgedir. Bunlara ek olarak geleneksel gıdaları bakımından da oldukça zengindir. Bu zenginliğin ön plana çıkarılırken diğer çekiciliklerin yanında yöresel çeşitliliğin de dahil edilmesi önemli görülmelidir. Tüm bu fikirler ışığında yapılan çalışmada Ege Bölgesi'nde yapımı gerçekleşen geleneksel peynirlere değinilmiştir. Bölgede meşhur olan peynirlerin yanı sıra unutulmaya yüz tutmuş ya da sadece yöre halkı tarafından evlerde üretimi süren peynirler de ele alınmıştır. Geleneksel peynirlerin yapım aşamalarından bahsedilerek sürdürülebilirlik açısından kayıt altına alınmış ve standart bir reçetenin oluşumu sağlanmıştır. Son zamanlarda bu tür çalışmalara da daha çok önem vermeye başlanmış hem turizm endüstrisi hem de akademik camia bu alanda tanınırlığın artması için büyük uğraşlar vermeye başlamıştır. Ülkenin her bir olgusu değerlidir ve bu değerlerin sahip çıkılıp, korunmaya ihtiyacı vardır. Bu da yöresel mutfaklara, geleneksel gıdalara ve kültürel mirasa öncelik vererek, gastronomi turizmini iyileştirip aynı zamanda halkı teşvik ederek sağlanmalıdır.

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K3: A, G. 1972, Aydın/Koçarlı

K4: N, F. 1964, Aydın/İncirliova

K5: S, E. 1964, Denizli/Acıpayam

K6: İ, C. 1971, Uşak/Banaz

K7: Ç, F. 1982, Kütahya/Pazarlar

K8: A, G. 1970, Kütahya/Pazarlar

K9: D, E. 1956, Afyonkarahisar/Merkez

K10: D, N. 1957, Afyonkarahisar/Merkez

5. BÖLÜM

AKDENİZ BÖLGESİ-1

(Adana, Antalya, Burdur ve Isparta)

Rıfat Pir

Giriş

Akdeniz bölgesi Anadolu'nun güneyinde Antalya'dan Kahramanmaraş'a kadar olan il ve ilçeleri kapsamaktadır (Web_1a). Tarih boyunca birçok kültür ve medeniyete ev sahipliği yapmış olan bölge günümüzde uluslararası boyutta turistik destinasyonları ve gastronomik unsurları ile ön plana çıkmaktadır. Bölgenin mutfak kültürü ve beslenme alışkanlıkları doğu ve batı kuşaklarında farklılık göstermektedir. Batı Akdeniz'de yer alan Isparta, Burdur ve Antalya illerinde İç Anadolu mutfağı; Doğu Akdeniz'de yer alan Mersin, Adana, Osmaniye, Hatay ve Kahramanmaraş illerinde ise Güneydoğu Anadolu ve Arap mutfağı kültürlerinin etkileri görülmektedir (Şengül ve Türkay, 2016). Ayrıca Toros dağlarında yer alan yaylalarda geçmişten günümüze yaşatılan Yörük kültürünün de geleneksel mutfağı destekleyici konumda olduğu söylenebilir. Bölgede yaylacılığın Yörük kültürünün etkisi ile yoğun yaşanıyor olmasından dolayı süt ve süt ürünleri üreticiliği de gelişmiş düzeydedir. Bölgede başta keçi olmak üzere koyun ve inek yetiştiriciliği yapılmaktadır. Bu çeşitlilik içerisinde keçi sütünden elde edilen ürünler ise oldukça önemli bir yere sahiptir. Bölge mevcut turizm faaliyetleri dışında gastronomi turizmi kapsamında Hatay ve Adana illeri başta olmak üzere son yıllarda adından oldukça fazla söz ettirmektedir. Günümüzde geleneksel turizm faaliyetlerinin belirleyici unsur olduğu; kum, deniz, güneş üçlüsü artık popülaritesini yitirmeye başlamıştır. Bunun yerine gastronomi turizmine eğilimin arttığı bu kapsamda gastro turist kavramının ortaya çıktığı bununla birlikte gastronomi destinasyonlarının oldukça yaygın hale geldiği ve bölgeler için çekicilik unsuru oluşturduğu yapılan birçok çalışmada ortaya konulmuştur (Aslan vd., 2014). Akdeniz bölgesi tüm şehirleri ile ele alındığında gastro turist kapsamında mevcut turizm faaliyetlerine dâhil edilebilecek bölgeyi ziyarete gelen yerli ve yabancı turistlere sunabileceği oldukça önemli gastronomik argümanlara sahip olduğu açıkça ifade edilebilir. Bu gastronomik argümanlar içerisinde bölgenin zengin peynir çeşitliliği oldukça önemli bir yere sahiptir. Bölgede gastronomik ürüne dönüştürülebilecek geçmişten günümüze geleneksel teknik ve yöntemler kullanılarak elde edilen farklı aroma ve dokuları sahip peynir çeşitliliği oldukça fazladır. Bu çeşitli-

Isparta ili genelinde farklı teknik ve yöntemlerle yapılan oldukça değerli peynir çeşitleri bulunduğu görülmektedir. İl genelinde geleneksel yöntemler kullanılarak üretimi gerçekleştirilen bu peynirlerin kültürel miras kapsamında değerlendirilebilecek potansiyele sahip olduğu açıkça ifade edilebilir. Yalvaç Küp Peyniri üretim ve olgunlaştırma teknikleri açısından diğer ürünlerden ayrılmaktadır. Bu üretim sürecinin gastro tur kapsamında ele alınarak bölgede oluşturulabilecek peynir rotalarına dâhil edilebileceği ve bölgeye ziyarete gelen yerli ve yabancı turistler için çekicilik unsuru oluşturabileceği öngörülmektedir.

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6. BÖLÜM

AKDENİZ BÖLGESİ-2

(Kahramanmaraş, Mersin, Osmaniye ve Hatay)

Rıfat Pir

Bu bölümde Akdeniz Bölgesinde yer alan Kahramanmaraş, Mersin, Osmaniye ve Hatay yörelerine ait geleneksel peynirlerden bahsedilecek olup üretim yöntemleri hakkında bilgi verilecektir.

1. KAHRAMANMARAŞ

Kahramanmaraş ili doğal, tarihi ve kültürel unsurları ile bölgenin öne çıkan şehirleri arasında yer almaktadır (Web_1). Zengin bir geleneksel mutfağa sahip olan ilde süt ve süt ürünleri içerisinde peynir önemli bir yere sahiptir. İlin sahip olduğu endemik bitki çeşitliliği ve bu çeşitlilikten yararlanılarak yapılan hayvancılık bu süreci destekleyici en önemli unsurların başında gelmektedir. Doğu Anadolu'ya geçiş konumunda yer alan il genelinde geleneksel kültürü yansıtan, tat ve aroması ile ön plana çıkan ve geleneksel mutfakın karakteristik özelliklerini yansıtan peynirleri şu şekilde sıralayabiliriz.

Tablo 1. Kahramanmaraş İli Geleneksel Peynirleri

No	Geleneksel Adı	Hammadde	Ambalaj Tipi	Kullanım Yeri
1	Elbistan Kelle Peyniri	Koyun Sütü	Plastik Bidon	Genel Kullanım
2	Maraş Parmak Sıkma Peyniri	Keçi, Koyun Sütü	Plastik Bidon	Genel Kullanım
3	Maraş Tulum Peyniri	Keçi, İnek Sütü	Tulum	Genel Kullanım

1.1. Elbistan Kelle Peyniri

Kelle peyniri Kahramanmaraş'ın Elbistan ilçesi ve çevre köylerinde geçmişten günümüze geleneksel yöntemlerle yapılan bir peynir çeşidi olarak bilinmektedir. Genellikle son görünümü yumruk büyüklüğünde ya da örgü şeklindedir. Geleneksel kelle peyniri koyun

gastro turist kavramının ortaya çıkartmıştır. Bu kapsamında ortaya çıkan gastro turist iyi gıdaya ulaşabilmek adına deniz aşırı ülkelere seyahatler gerçekleştirmekte ve ziyaret ettiği bölge kültürlerini daha yakından tanımak için o kültüre ait gıda ürünlerini deneyimlemektedir (Hatipoğlu, 2010). Son yıllarda İtalya ve Fransa gibi ülkeler sahip oldukları zengin peynir çeşitliliğini gastronomi turizmi kapsamında turizm ürününe dönüştürmeyi ve bölgeleri ziyarete giden yerli ve yabancı turistlerin beğenisine sunmayı başarmışlardır (Kesici, 2012).

Araştırmaya konu olan Akdeniz Bölgesi turizm alanında Antalya, gastronomi turizmi alanında ise Hatay ve Adana illeri başta olmak üzere birçok marka şehri içerisinde barındırmaktadır. Bu şehirlerin sahip oldukları gastronomik kültürel birikimler bölgede zengin bir peynir profilinin oluşmasına önemli ölçüde katkı sunmuştur. Hatay ili bu profil içerisinde diğer illere nazaran ön plana çıkmaktadır. Bölgede yer alan illerin çoğunda geleneksel yöntemler kullanılarak hazırlanan ulusal ve uluslararası manada bilinirliği oldukça yüksek, turistik ürün kapsamında gastro turistin beğenisine sunulabilecek 5 adet coğrafi işaretle olmak üzere toplamda **48** adet peynir çeşidi bulunmaktadır. Turizm potansiyeli oldukça yüksek bir bölge için mevcut peynir çeşitliliğinin gastronomi turizmi kapsamında değerlendirilebilmesi, yapılacak bir takım çalışmalarla mümkün görülmektedir. Bu çalışmaları; Özgün özelliklere sahip başta Cimi Peyniri ve Girdev Yaylası Yörük Peyniri gibi obruklarda fermentasyon süreci gerçekleştirilen ürünlerin coğrafi işaretli ürünler kapsamına dahil edilmesi, yaylalarında dahil edildiği peynir rotalarının belirlenmesi, pilot illerde peynircilik müzelerinin kurulması, geleneksel peynir üretim atölyelerinin faaliyete geçirilmesi ve peynir tadım etkinliklerinin yanı sıra festivallerin düzenlenmesi şeklinde açıklayabiliriz. Hayata geçirilmesi muhtemel bu çalışmalar bölgenin peynircilik konusundaki potansiyelinin ortaya çıkmasına büyük ölçüde katkı sunacaktır. Aynı zamanda yapılacak olan bu çalışmalar bölgede gastronomi turizmi bileşeni olarak geleneksel peynirciliğin değerlendirmeye alınarak ulusal ve uluslararası manada bilinirliği yüksek turizm ve gastronomi alanında olduğu gibi peynircilik konusunda ihtisaslaşmış yeni marka şehirlerin ortaya çıkmasına olanak tanıyacaktır.

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K 1: Kişisi, Osmaniye İli Peynirleri: B., Ç. Yaş/ 50, Meslek/ Ev hanımı, Görüşme süresi /18:40sn: 13.05.2023 tarihinde görüşme gerçekleştirildi.

7. BÖLÜM

İÇ ANADOLU BÖLGESİ-1

(Eskişehir, Ankara, Çankırı, Kırıkkale, Kayseri ve Kırşehir)

Münevver Kaya, Hilal Keskin

Giriş

Peynir geçmişi çok eskiye dayanan ve insan beslenmesinde önemli yer tutan bir gıda maddesidir. Peynirin ortaya çıkışı ile ilgili çeşitli kaynaklarda farklı hikayeler yer almaktadır. Herodot, ilk peynirin İskit Türkleri tarafından kısırak sütünden yapıldığını öne sürmüştür. Kosikowski'ye göre peynir, Türklerin ve Moğolların ataları tarafından üretilmiştir. Türkler Anadolu'ya göç etmeden önce de peynir yapmaktadır (Kamber, 2007). Peynir anlamına gelen saf Türkçe kelimelere ilk defa Uygur Türkleri arasında rastlanmaktadır. Bereketli Hilal'den başlayan tarım ve hayvancılık, Türkiye'nin güneyinden Akdeniz kıyısı boyunca uzanan bölgede 8000 yıl önce peynir üretimi geliştirmiş ve çeşitlendirmiştir (Fox ve McSweeney, 2017; Karaca, 2016). Peynir, dünya çapında çok çeşitli tatlarda ve formlarda üretilen bir grup fermente süt bazlı gıda ürününe verilen genel adı tanımlamaktadır. Peynir yapımının temel amacı, sütün temel bileşenlerini koruyarak ek gıda ürününü çeşitlendirerek tüketmek ve nispeten dayanıksız olan sütün yıl boyunca tüketimini sağlamaktır. Sandine ve Elliker (1970), 1000'den fazla peynir çeşidi olduğunu öne sürmüştür. Walter ve Hargrove (1972) ise 400'den fazla peynir çeşidi tanımlamıştır.

Gastronomi turizminin ön plana çıkmasıyla birlikte rekabetçi turizm ortamında destinasyonlar, bölgelerini farklılaştıracak turistik ürün arayışına girmektedir. Yöresel gıdalar, gastronomi turizminin lokomotifini oluşturmakta; yöresel peynirler de bu kategoride ele alınmaktadır. Peynir üretimi açısından zengin olan Türkiye'de, "peynir turizmi" kavramı oldukça yeni bir kavramdır. Fransa, İtalya, İsviçre ve Hollanda gibi ülkelerde çizilen peynir rotaları ve apelyasyon uygulamalarının bölge ekonomisine sağladıkları katkılar da göz önünde bulundurulduğunda, yöresel peynirlerin turistik ürün olarak ele alınması ve gastronomi turizmine dahil edilmesi büyük önem arz etmektedir.

Türkiye'nin İç Anadolu bölgesinde, yoğun olarak; çömlük, küp ve testi peynirleri üretilmektedir. Yapısal olarak tulum peynirine benzeyen bu peynirler, içine basılan materyal ile birlikte mağara, depo veya toprak altı gibi 6-10°C'deki alanlarda olgunlaştırıldıkları

pılmaktadır. Çeşni maddesi olarak çörekotu kullanılmakta ve çömlek içinde olgunlaştırılmaktadır (Durlu-Özkaya ve Gün, 2007).

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Kaynak Kişiler

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8. BÖLÜM

İÇ ANADOLU BÖLGESİ-2

(Niğde, Aksaray, Karaman, Konya, Sivas, Nevşehir ve Yozgat)

Münevver Kaya, Hilal Keskin

Bu bölümde İç Anadolu bölgesinde yer alan; Niğde, Aksaray, Karaman, Konya, Sivas, Nevşehir ve Yozgat illerine ait yöresel peynirlere değinilmiş olup; bu peynirlerin yapıları ve özellikleri hakkında bilgiler verilmiştir.

1. NİĞDE

Anadolu'nun dört bir yanında, binlerce yıllık gelenekler ve ritüellere sahip yüzlerce peynir türü bulunmaktadır. İç Anadolu bölgesinin güneydoğusunda yer alan Niğde ilinde, en çok bilinen ve tüketilen dört adet peynir türü bulunmaktadır. Niğde'nin bu meşhur peynirlerinin özellikleri ve yapıları aşağıda anlatılmaktadır.

1.1. Niğde Mavisi

Niğde mavisi olarak adlandırılan bu peynir, mavi rengini henüz tulumdayken hava alarak oluşan bakterilerden almaktadır. Oldukça ender bulunan bu peynir, koyun sütünden yapılıyor olmasına rağmen mavi renkte olan ilk peynir olma özelliğini taşımaktadır. Kendine has lezzeti ile Niğde rokfor peyniri olarak da anılmaktadır (Karaaslan ve Demircan, 2001; Durlu-Özkaya ve Gün, 2007).

Yapılışı ise aşağıdaki gibidir:

- Pastörize edilen süt mayalanarak teleme halini alır.
- Çavdar veya buğday unundan yapılan ekmeğe mağarada bekletilip küflenmesi sağlanır.
- Tuzlama işlemi yapılan peynir telemesine, küflendirilen ekmekten starter kültür olarak bir miktar eklenir.
- Özel diktirilen keçi veya koyun derisinin içine bu karışım sıkıca basılır.
- Basım işleminden sonra deri, çelik sivri şişler ile delinir.

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9. BÖLÜM

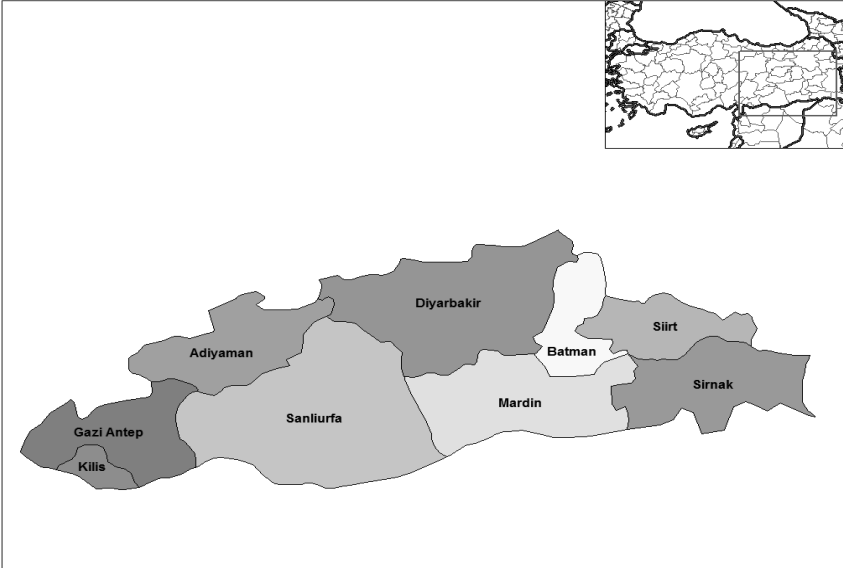
GÜNEYDOĞU ANADOLU BÖLGESİ

(Adıyaman, Batman, Diyarbakır, Gaziantep, Kilis, Mardin, Siirt, Şanlıurfa ve Şırnak)

Aslı Çelikel Güngör

Giriş

Güneydoğu Anadolu Bölgesi Gaziantep, Diyarbakır, Şanlıurfa, Batman, Adıyaman, Siirt, Mardin, Kilis, Şırnak illerinden oluşan ve ülkemizin güneydoğusunda yer alan bölgedir (Şekil 1). Bölgenin kuzeyinde ve doğusundan Doğu Anadolu Bölgesi, batısında Akdeniz Bölgesi ve güneyinde Irak (küçük bir bölümünde) ve Suriye'nin bir bölümü yer almaktadır (Anonim 2023a).



Şekil 1: Güneydoğu Anadolu Bölgesi

Kaynak: Anonim 2023a.

Ülkemiz tam bir peynir cenneti olarak nitelendirilebilirken Güneydoğu Anadolu bölgesinin de bu cennetin eşsiz lezzetlerine sahip olduğu unutulmamalıdır. Ancak bölgedeki her peynir çeşidi ya yeterince bilinirliğe sahip değil ya da komşu illerle benzerlik göstermesi nedeniyle gereken değeri görememiştir. Oysaki peynir üretiminde üretim şeklinin dışındaki önemi bir unsur olan hammadde yöreden yöreye, hatta köyden köye bile farklılık gösterebilmektedir. Üretimde kullanılan sütün temin edildiği hayvanın cinsi, ırkı, beslenmesi, laktasyon dönemi gibi birçok unsur sütün bileşimini etkilemektedir. Ayrıca üretimde kullanılan çeşitli otlar peynirinin bileşim, tat ve aromasını etkilemektedir.

Genel olarak Güneydoğu Anadolu bölgesinde üretilen yöresel peynirler incelendiğinde her ilde peynir üretimi yapıldığı görülmektedir. Bölümde 9 farklı yöresel peynire değinilmiştir. Fakat bölgede coğrafi işaretle tescillenmiş peynir sayısı son derece azdır. Tescil almış Diyarbakır örgü peyniri, Antep peyniri ve Urfa peyniri turistik açıdan tanınmış peynirlerdir. Adıyaman peyniri ve Siirt otlu peynirinin son yıllarda bilinirliği artmış fakat coğrafi işaret tescilli almamışlardır. Şırnak ilinde üretilen otlu peynir üzerine yapılan araştırmalar son yıllarda artış göstermiştir. Bu durum bu peynir çeşidine olan ilginin arttığının göstergesi olarak değerlendirilebilir. Ancak Mardin, Batman ve Kilis illerine ait peynir çeşitleri üzerine yapılan çalışmalar yok denecek kadar az sayıdadır. Bu nedenle yerel yönetimlerin, üreticilerin ve akademisyenlerin bu peynir çeşitleri üzerine yapacakları çalışmalar hem ürünün standardize edilmesi hem de bilinirliğinin artmasına katkıda bulunacaktır.

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10. BÖLÜM

DOĞU ANADOLU BÖLGESİ-1 (Erzincan ve Bingöl)

Tülay Polat Üzümcü, Necibe Şen

Giriş

Peynir, ülkemizin doğal ve kültürel zenginliğini gösteren ürünlerden biri olup, özellikle hayvancılığın ve süt ürünlerinin üretiminin en yoğun yapıldığı Doğu Anadolu Bölgesinde geleneksel 50 tür peynir üretimi yapılmaktadır. Bu peynirlerin üretiminde genellikle inek sütü kullanılmakla birlikte keçi ve koyun sütü de yaygın olarak kullanılmaktadır. Ülkemizdeki peynir türlerinden ilk coğrafi işaret tescil belgesini alan Erzincan tulum peyniridir (Güzeler ve Koboyeva, 2020). Bingöl ilinde üretilen köy peyniri ve Tomas peynirine ilişkin coğrafi işaret tescili ise henüz bulunmamaktadır (Web_1).

“*Türkiye'nin Geleneksel Peynirleri ve Peynir Turizmi Potansiyeli*” isimli bu kitapta, Doğu Anadolu bölgesinde yer alan Erzincan ve Bingöl illeri peynirlerine ilişkin bilgi verilecektir. Özellikle ülkemizde ilk coğrafi işaret alan Erzincan tulum peyniri ile Doğu Anadolu bölgesinde Tunceli, Bingöl, Elazığ, Erzurum, Kars, Sivas ve Muş illerinde yapılan Tomas peyniri ile Bingöl köy peyniri öne çıkmaktadır. Erzincan ve Bingöl peynirleri ve bu peynirlerin bölge ekonomisine katkıları ile bölge gastronomisi ve gastronomi turizmine etkilerine de değinilecektir.

malzeme olarak da kullanılmaktadır. Peynir; börek, çörek, poğaç, tost, meze, pizza, omlet vb. yapımında, çorbaların tatlandırılmasında, salatalara güzel görünüm ve lezzet kazandırılmasında, peynir helvası, künefe ve Kemalpaşa, cheescake gibi tatlılarda kullanılmaktadır (Badem, 2021:323).

Günümüzde gastronomi turizmi kavramı yanında, yeme-içme ile ilgili turistik deneyimleri tanımlamak için mutfak turizmi ve yemek turizmi gibi farklı kavramlar kullanılmaktadır. Hatta giderek büyüyen ve çeşitlenen gastronomi deneyimleri; şarap, bira, çikolata; zeytin, peynir gibi daha özel ilgi alanlarına ayrılmakta ve şarap turizmi, bira turizmi, çikolata turizmi, peynir turizmi olarak adlandırılmaktadır. Dünyada bu konuda yani peynir turizminde; Fransa, İsviçre, İtalya ve Hollanda öne çıkan ülkeler arasındadır (Şahin, 2015: 82). Peynir turizmi, peynir yapımı ve süt üretimi alanlarının ziyaret edilmesini, bu ürünlerin müze vb. alanlarda sergilenmesi, peynir ve peynirden yapılmış ürünlerin satışı ve tadımını içermektedir. Bu tipoloji kırsal dağlık bölgelerde uygulanmaktadır (Forne, 2015). Bu kapsamda Bingöl kırsal ve dağlık b.r bölge olup, hayvansal ürünlerin üretimi yaygındır. Pestigen peyniri, Bingöl köy peyniri gibi yöresel ve geleneksel peynirlerin Bingöl ili gastronomisine kazandırılması önemlidir. Gastronomi turizmi kapsamında, bu peynirlere coğrafi işaret alınarak, peynirlerin turistik ürün olarak alınabileceği, tadılabileceği satış yerleri ve restoranların oluşturulması gerekmektedir.

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Kaynak Kişiler

K1: A., B. Yaş:26, Fotoğrafçı-Tulum Peyniri üreticisi, Caferli/Erzinca

K2: A., F. Yaş:46, Tulum Peyniri üreticisi, Caferli/Erzincan

K3: A., İ., Yaş:52, Tulum Peyniri üreticisi, Caferli/Erzincan

11. BÖLÜM

DOĞU ANADOLU BÖLGESİ-2 (Bitlis, Hakkari, Muş ve Van)

Özkan Demir

Bu bölümde Bitlis, Hakkari, Muş ve Van illerinde yer alan yöresel peynirler ve bu peynirlerin üretim metodu ile bilgilere yer verilecektir.

1. BİTLİS

Van gölü havzasında yer alan Bitlis bulunduğu coğrafi konumun dağlık ve engebeli olması hayvancılığın yapılmasına olanak sağlamıştır. Bitlis'te hayvancılığın yaygın olması ise yemeklerde koyun, sığır, kuzu ve teke gibi hayvanların etlerinin kullanılmasına imkan sağlamıştır (Yıldız ve Dalagan, 2021a, s. 132). Bitlis'in gastronomik zenginliğinin kökeni büyük ölçüde doğanın sunduğu çeşitlilik ve tarihi nedenlerle ilgili olup (Arıncı, 2017, s. 97) bu çeşitlilikte süt ve süt ürünleri de önemli bir yer tutmaktadır.

1.1. Bitlis Tulum Peyniri

Bitlis tulum peyniri üretiminde daha çok koyun sütü ve keçi sütü kullanılmakta fakat tüketici tercihlerine göre inek sütünden de faydalanılmaktadır. Bazen bu söz konusu üç çeşit sütün karıştırılması ile de üretim yapılabilmektedir (Sancak, vd., 2018, s. 383). Coğrafi İşaret tescil sürecinde bulunan Bitlis tulum peyniri Bitlis dağlarının zengin bitki örtüsünde otlatılan hayvanların sütünden elde edilmektedir. Aroması çok hafif olan Bitlis tulum peynirinin yağ ve kuru madde oranı da yüksektir. Tamamen iç piyasaya satılan bu peynirin 1 kilogramı için ortalama 10 kilogram süttten kullanılmaktadır (Yöresel Ürün Envanteri Raporu, 2016, s. 26).

Üretim Yöntemi: Bitlis tulum peynirinin üretiminde sağım sonrasında süzülen süt genellikle herhangi bir pastörizasyon işlemi uygulanmadan sağım sıcaklığı ile veya 30-40 derece civarına kadar ısıtılıp ticari maya kullanılarak mayalanır. Mayalama işleminden 2-3 saat sonra oluşan pıhtı parçalanır ve serin bir yerde önce süzme bezinde yaklaşık bir gün daha sonra da altı delinmiş şeffaf poşetlerde yaklaşık olarak 3-4 gün suyunu tamamen salması amacı ile bekletilir. Bu sürenin sonunda el veya tahta sopalar yardımı ile ufalanan peynir %3-4 oranında kaya tuzu ile karıştırılarak bez çuvalara basılıp ağız kısmı sıkı bir

üretim metotları ve fiziksel özellikleri ile ilgili bilgi vermeyi amaçlamıştır. Hastaoğlu ve arkadaşları (2021), çalışmalarında bölgelere göre farklılık gösteren peynir çeşitlerinin özelliklerini belirlemeyi ve iç turizmde yeni destinasyonların belirlenmesinde etkili olacağı düşünülen peynir rotalarının oluşmasını amaçlamıştır. Elde edilen sonuçlara göre gastronomi faaliyetlerine katılan turistler için rotalar belirlenmiştir. Saygılı ve arkadaşları (2019), çalışmalarında Türkiye’de bulunan coğrafi işaretli peynirleri tanıtmışlardır.

Albayrak (2020), kitabında Türkiye’nin geleneksel peynirlerinin piyasa yapısını incelemiş ve üretimde kullanılan malzeme ve süt çeşidine göre kategorize ederek coğrafi işaretli peynirleri de ayrıca incelemiştir. Croxford (2010) ise Türkiye’nin Peynirleri isimli kitabında peynirin kısa tarihine değinerek bölgelere göre peynirleri ayrı ayrı incelemiş ve bu peynirlerin üretim aşamaları ile ilgili bilgiler vermiştir.

Ulusal alanyazın incelendiğinde Türkiye’de üretilen peynir çeşitleri ile ilgili çok sayıda çalışmanın bulunduğu görülmektedir. Fakat yapılan çalışmaların birçoğunun tek şehirde üretilen peynirlere veya tek bir peynir çeşidine odaklandığı görülmektedir. Türkiye’nin tamamında veya bir coğrafi bölgesinde üretilen peynir çeşitleri ve üretim metotları ile ilgili çalışmaların ise sınırlı olduğu söylenebilir. Özellikle gastronomi turistlerinin ilgisini çekmesi muhtemel olan peynir turizmi ile ilgili çalışmaların sayısının da çok sınırlı olduğu söylenebilir. Bu anlamda bu araştırmanın hem geleneksel peynirlerin üretim metotlarının kayıt altına alınıp tanıtımının yapılması hem de gastronomi turizmi ve peynir turizmi açısından alanyazına katkı sağlayacağı düşünülmektedir.

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12. BÖLÜM

DOĞU ANADOLU BÖLGESİ-3 (Ağrı, Iğdır, Kars ve Ardahan)

Leyla Eren Karahan, Seher Arslan

Bu bölümde Doğu Anadolu bölgesi illeri arasında yer alan Ağrı, Iğdır, Kars ve Ardahan yörelerine ait yöresel peynirlere değinilmiş olup; bu peynirlerin yapıları ve özellikleri hakkında bilgiler verilmiştir.

1. AĞRI

Türkiye peynir çeşitliliği açısından zengin bir ülkedir. Doğu Anadolu bölgesi endemik bitki örtüsü ve yüksek rakıma sahip olmasıyla kıymetli sütlerden çeşitli peynirlerin üretildiği bir bölgedir. Bu bölgenin en önemli peynirleri Erzurum Civil peyniri, Kars Gravyeri, Van Otlu peyniri, Saçak peyniri, Şavak Tulum peyniri, Erzincan Tulum peyniridir.

Ağrı ilinde bitkisel ürün çeşitliliği hayvansal üretime bağlı olarak şekillenmiştir. Buna göre buğday, arpa, şekerpancarı, yonca ve korunga yetiştirilmektedir (Kaya, 2013; Temelli, 2018). İlin fiziki coğrafyası, ova köylerinde bitkisel üretimi ve dağ köylerinde de hayvansal üretimi, dağ eteklerinde ise hem bitkisel hem de hayvansal üretimi olanaklı kılmıştır (Kaya, 2013). Hayvansal üretim açısından il genelinde yonca, korunga, fiğ ve burçak ekimi 1960'lardan sonra önem kazanmıştır (Anonim, 1982). Yörede “kes” adıyla bilinen yonca hayvanlarda süt verimini arttırmaktadır (Ceylan, 2021). Bölgede yaygın olarak koyun, keçi, inek ve manda sütü üretimi ve işlenmesi gerçekleştirilmektedir (Ceylan, 2021). Ağrı'da her ne kadar hayvansal üretim yapılırsa da 1960'lı yılların ortalarına kadar hayvansal üretimden katma değer yapabilecek ve marka üretebilecek bir işletme yoktur. 1965 yılında Doğubayazıt'a bağlı Üçgöze köyünde Aladağ'ın Kandilli yaylalarında geliştirilen tam yağlı Edirne tipi Ağrı beyaz peyniri Erzurum Et Balık Kombinası çatısı altında rağbet görmüştür (Ceylan, 2021).

1.1. Ağrı Küp Peyniri

Ağrı ilinin Yüzüncüyıl mahallesinde yaşayan sakinler sadece kendi tüketim ihtiyaçlarını karşılamak için peynir ve lor karışımından ürettikleri Ağrı küp peyniri olarak adlandırdıkları peynir çeşidini kendi yetiştirdikleri ineklerin sütlerinden elde etmektedirler. Peynir,

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13. BÖLÜM

DOĞU ANADOLU BÖLGESİ-4 (Malatya, Elazığ, Tunceli ve Erzurum)

Mevlûde Daşbaşı, Erkan Denk

Bu bölümde başta Malatya ilinde üretilen geleneksel peynirlere yer verilecek olup devamında Elazığ, Tunceli ve Erzurum illerine ait peynir çeşitleri hakkında bilgiler verilecektir.

1. MALATYA

Malatya mutfağı için geçmişten elde ettiği kültürel zenginliğini yöreye ait otantik ürün çeşitliliği ve bu çeşitliliğin tam kapasiteyle kullanılıp değerlendirilebilme açısından bölgede öncülük ettiği söylenebilir. Diğer bir deyişle fazla ve farklı malzeme kullanmadan da yani aynı malzemelerle birbirinden lezzetli yemeklerin hazırlanabildiği söylenebilir (Kılıç vd., 2013). Çoğu yörede olduğu gibi Malatya yöresinde de özel peynir türlerine rastlamak mümkündür. Ön plana çıkan yöresel peynirlerden Malatya peyniri, Malatya karışık deri peyniri, Malatya çökeleği peynirlerine değinilecektir.

1.1. Malatya Peyniri

Coğrafi işaret tescili bulunan Malatya peyniri salamura özelliğindeki peynirlerden birisidir. Kahvaltının yanı sıra böreklerde ve yemeklerde kullanılan Malatya peyniri, her mevsim bulunabildiği gibi akşam yemeklerinde dahi pide ile birlikte sofralarda aranan bir lezzettir. Salamura yöntemi ile saklanan bu peynir, ekonomik olduğu gibi sağlık açısından da faydalı olarak değerlendirilmektedir (Kılıç vd., 2013).

Malatya peynirinin tescili 06.07.2022 tarihinde Malatya Ticaret Odası tarafından mahreç işaretli olarak alınmıştır. Geçmişi 100 yıldan daha fazla bir süreye dayanan peynirin yöre mutfak kültürü ile ün bağı bulunmaktadır. İnek veya koyun sütü ya da bu sütlerin karışımından yapılabilen Malatya peynirinin özelliklerine bakıldığında 10-15 cm çapında, 2-3 cm kalınlığında silindirik şekilli, üst kısmı oluklu olup ağızda çiğnenirken ses çıkaran, yarı sert yapıda, hafif sarıya bakan renkte olan bir peynirdir (Resim 1). 85°C üzerindeki su veya peynir altı suyunda haşlanarak üretildiği için ağızda çiğneme sırasında ağızda ses

var olan peynir potansiyelini ortaya çıkarmıştır. Bundan sonraki aşama peynir ve peynir turizmi üzerine planlamalar yaparak yerel halkı da içine alan politikalar geliştirmektir. Bu bölgeye sadece peynir çeşitliliği ve yüksek peynir potansiyeli olarak da bakmamak gerekir. Her şehrin kendisine özgü peynirlerinin dışında ayrı gastronomik lezzetleri, tatları ve yemekleri de bulunmaktadır. Genel anlamda gastronomi turizmine ilgi gösterilip önem verilmesiyle bölgede ön planda olan turizm türleri desteklenebileceği gibi yeni turizm türleri de keşfedilebilir ve bunda belirleyici olacak olan da peynirdir. Peynir türlerine verilen Türkiye'deki tesciller değerlendirildiğinde bu bölgede mutlaka peynir rotaları oluşturulmalı, butik peynir atölyeleri açılabilceği gibi festivaller ile peynir turizmi potansiyeli ekonomik kazanca dönüştürülmelidir.

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14. BÖLÜM

KARADENİZ BÖLGESİ - Batı Karadeniz Bölümü (Bolu, Düzce, Sinop, Karabük, Kastamonu, Zonguldak ve Bartın)

Semra Gürbüz

Giriş

Karadeniz Bölgesi, kuzeyinde bulunan ve ismini aldığı Karadeniz boyunca uzanan, doğuda Gürcistan sınırından Sakarya ovasının doğusuna kadar devam eden, 1400 km uzunluk ile kuzey ve güney sınırlarında 100-200 km arasında değişen genişlikte bir yapıya sahiptir. Sınırları içerisinde 18 şehir bulunduran ve 122.121 km² yüzölçümüne sahip bölge, alan büyüklüğü açısından Türkiye'nin 3'üncü büyük bölgesidir (TOB, 2021; Anonim, 2023a).

Karadeniz Bölgesi; coğrafi özellikleri, konumu, iklimi ve ekonomik yapısı açısından birbirinden farklılık gösteren Batı, Orta ve Doğu Karadeniz olmak üzere üç bölüme ayrılır.



Şekil 1: Karadeniz Bölgesi Coğrafi Haritası

Kaynak: Web_1.

Kızılırmak deltasının batısından Adapazarı ve Bilecik ilinin doğusuna kadar olan alan Batı Karadeniz bölümüdür. Karadeniz Bölgesinin bu bölümünde Düzce, Karabük, Kastamonu, Bolu, Zonguldak, Sinop ve Bartın illeri bulunur. Engebeli bir arazi yapısının varlığı nedeniyle farklı iklim özelliklerinin görüldüğü bölge tarımsal ürün çeşitliliği açısından zengindir. En fazla yetiştirilen ürün sırasıyla mısır ve buğdaydır. Meyve üretiminde fındık,

Günümüzde; turizm endüstrisi içerisinde önemli bir itici gücü olan gastronomi turizmi, turizm faaliyetleri içerisinde giderek daha da ağırlıklı bir öneme sahip olmaya başlamıştır (Ermolov, Yashalova ve Ruban 2019). Gastronomi turizmi genel olarak, bir destinasyonun kültürel mirasları aracılığıyla kültürünün ve doğasının kendine özgü özelliklerini keşfetmek için yapılan ziyaret olarak tanımlanmaktadır (UNWTO, 2019). Gastronomi turizminin içerisinde bireysel bir turizm alanı olarak peynir turizmi; peynir yapımı ve süt üretim alanlarını ziyaret etmeyi içerir, bu nedenle de genellikle kırsal, dağlık ve doğal alanlarda uygulanmaktadır (Fusté-Forné, 2020). Peynir rotalarının oluşturulması; yeni destinasyonların oluşmasına, ya da mevcut destinasyonların gelişmesine katkı sağlayacaktır. Peynir turizmi aktiviteleri kapsamında; üretim işletmelerine yapılacak geziler yanında, düzenlenecek festivaller, fuarlar, kurulacak müzelerin ziyareti gibi etkinlikler turizmin geliştirilmesine katkı sağlayacak faaliyetlerdir. Aynı zamanda üretilen peynirlerin dükkânlarda, çiftçi pazarlarında, yerel üretici tarafından direkt satılması; otellerin, restoranların bu peyniri bulundurması ekonomik gelirin artmasına katkı sağlayacaktır. Bu nedenle de bu yöndeki faaliyetler ebetteki yerel ekonomik kalkınmaya katkıda bulunularak kırsal yaşamın gelişmesine vesile olacak ve kırsaldaki geleneklerin, kültürel mirasın korunmasını destekleyecektir.

Yerel ekonomik kalkınmayı sağlamak isteyen destinasyonlar potansiyellerini değerlendirmek için planlı çabalar göstererek hedeflerine ulaşabilirler. Batı Karadeniz Bölgesindeki Bolu ve Düzce illeri, takiben Sinop ile Karabük illerinde bu konudaki çabalar daha da yoğunlaştırılabilir. Bolu'da yiyecek içecek sektörü çalışanlarının katılımı ile yapılan bir çalışmada; çalışanların, yerel peynirleri kullanma konusunda istekli olmakla birlikte, peynirler hakkında yeterli bilginin bulunmadığını belirttikleri ifade edilmektedir (Kayış, 2017). Bu kapsamda festivaller, fuarlar, medya haberleri, akademik çalışmalar gibi enstrümanları kullanarak tanıtım çalışmalarının yapılması, üretimde standardizasyonun sağlanması, tedarik zincirinin güçlendirilmesi, gıda güvenliğinin sağlanmasına yönelik tüm ilgili paydaşların katılımı ile gerçekleştirilecek ortak çabalarla bu ürünlerin turizme kazandırılması sağlanabilir.

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Kaynak Kişiler:

K1: K., K. Yerel üretici, Yalakuz Sofular Köyü/Eskipazar/ Karabük, 25.07.2023.

15. BÖLÜM

KARADENİZ BÖLGESİ-Orta Karadeniz Bölümü (Ordu, Samsun, Amasya, Çorum ve Tokat)

Semra Gürbüz, Erkan Denk, Emine Yazan

Giriş

Coğrafi olarak Batı, Orta ve Doğu Karadeniz olmak üzere üç bölüme ayrılan Karadeniz Bölgesinin Amasya, Samsun, Çorum, Tokat ve Ordu illerinin bulunduğu kısmı Orta Karadeniz bölümüdür. Bu bölümde dağlar sahilden daha içtedir ve yüksek değildir, kıyı ve iç kısımlarda iklim özellikleri benzerdir. Bölge ağırlıklı olarak tarım alanında ülke ekonomisine katkı sağlamaktadır. Bölgenin iklim koşullarının uygun olması ve zengin bitki örtüsü hayvancılık için uygun ortam oluşturmaktadır. Bölgede hayvancılık küçük ölçekli, aile işletmesi şeklinde bitkisel üretimle birlikte yapılmaktadır. Türkiye mada yetiştiriciliğinin yaklaşık % 25'i bu bölgede gerçekleştirilmekte, aynı zamanda önemli ölçüde sığır yetiştiriciliği de yapılmaktadır (OKA, 2011).



Şekil 1: Orta Karadeniz Bölgesi Coğrafi Haritası

Kaynak: Web_1.

Orta Karadeniz Bölgesi illeri; geçmişten günümüze çok sayıda medeniyete ev sahipliği yapmaları dolayısıyla tarihi ve kültürel zenginliğe sahip oldukları gibi, coğrafi yapıları ve iklimin de etkisi ile eşsiz doğal güzelliklere sahiptirler. Tarihi dokusunun yanı sıra, sarp kayalıkların arasından akan Yeşilirmak Nehri'nin oluşturduğu manzara ile Amasya, ilk medeniyetin doğduğu Hattuşa Antik Kenti'ne ev sahipliği yapan Çorum, mavi ve yeşilin tonlarıyla oluşan doğal güzellikleri ile birlikte Amazonlara uzanan tarihi ve Kurtuluş Sa-

değerleri ile özel turistik çekiciliğe sahiptir. Tokat'ta üretilen peynirler özellikle Tokat küp peyniri ve Tokat tulum peyniri, turistik bir ürün olarak ele alınmasında fayda olan özelliklere sahip yerel peynirlerimizdir. Bu bölgede üretilen peynirin turistik çekicilik olarak bir motivasyon faktörüne dönüşmesine en yakın peynir çeşidi Çorum Kargı tulum peyniri olarak ön plana çıkmaktadır. Bu değerlendirmede; coğrafi işaret olarak üretim yönteminin belirlenmiş olması, peynir hakkında internet ortamında rahatlıkla bilgi bulunabilmesi, yerel kurumların peynire ilişkin bilgileri paylaşması, sahiplenmesi gibi hususlar etkili olmaktadır.

Öncelikle yerel kültürü yansıtan ürünlerin reçetelerinin araştırılması, üretim standardizasyonu ve üretimdeki farklı tekniklerin ortaya konulması, festivaller, şenlikler, tanıtım günleri, sosyal medya ve web sitelerinde bilgi paylaşımı gibi faaliyet ve etkinliklerle tanıtımın yapılması ve bu ürünlere yönelik hedef ve stratejilerin yerel paydaşların katılımı ile belirlenmesi çok önem taşımaktadır. Konuya ilişkin bilimsel çalışma sayısının da artırılmasına, ürünlerin her yönüyle analiz edilmesine, tedarik edilebilirliğinin, peynirin turizm kapsamında nasıl değerlendirilebileceğinin araştırılmasına da ihtiyaç vardır.

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K2: A. N. Aybastı /ORDU. 03.08.2023, Kişisel Görüşme

K3: A., O. S. Mesudiye Belediyesi çalışanı. Mesudiye/ORDU. 08.08.2023, Kişisel görüşme.

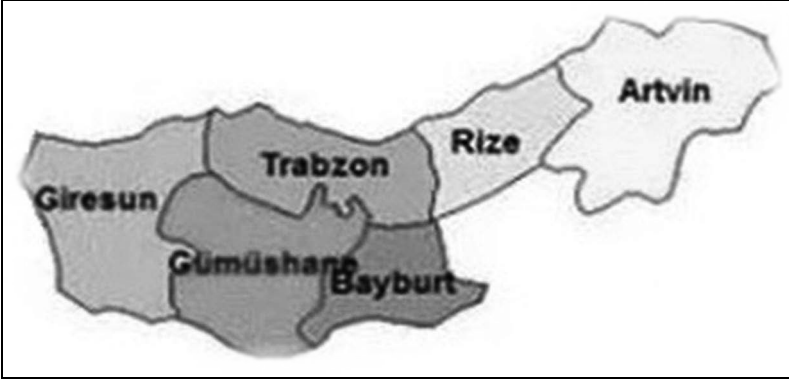
16. BÖLÜM

KARADENİZ BÖLGESİ-Doğu Karadeniz Bölümü (Artvin, Rize, Giresun, Trabzon, Gümüşhane ve Bayburt)

Semra Gürbüz, Erkan Denk

Giriş

Karadeniz Bölgesinde Artvin, Rize, Giresun, Trabzon, Gümüşhane ve Bayburt illerinin bulunduğu bölge Doğu Karadeniz bölümüdür. Bu bölüm, Karadeniz Bölgesinin en dağlık ve en yağışlı kısmıdır, çay, fındık ve mısırın en fazla yetiştirildiği (TOB, 2021) ve Karadeniz'in diğer bölgelerine göre büyükbaş hayvancılığın daha fazla yapıldığı bölgedir (Anonim, 2012).



Şekil 1:Doğu Karadeniz Bölgesi Coğrafi Haritası

Kaynak: Web_1.

Türkiye ekonomisi için önemli bir faaliyet olan hayvancılık, kültürel yaratım ve aktarım süreçlerinin de önemli bir parçasını oluşturmaktadır. Doğu Karadeniz Bölgesinde düzenli hayvancılık faaliyetlerinin Çepni Türklerinin bu bölgeye gelmesi ile başladığı kabul edilmektedir. Bölgenin Türk hâkimiyetine girmesinden itibaren önceki kültürel birikimlerini yeni yurtlarına taşımaları ile bölgenin en önemli geçim kaynaklarından biri hal-

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17. BÖLÜM

MARMARA BÖLGESİ-1

(Balıkesir ve Bilecik)

Aybuke Ceyhan Sezgin, Emel Memiş Kocaman

Giriş

Coğrafi konum itibarıyla orta kuşakta yer alan ve yılda dört mevsimi yaşayan Türkiye, mevcut fauna ve bitki örtüsü çeşitliliği gibi doğal güzelliklerinin yanı sıra tarihi ve kültürel mirasıyla turistlerin çekim alanı bir ülke konumundadır. Yedi bölgeye ayrılan topraklar üzerinde her bölgenin kendine özgü birbirinden lezzetli ürün çeşitliliği bulunmaktadır. Bir bölge ya da yöreyi yerel yiyecek ve içecekleri deneyimleme amacıyla ziyaret gerçekleştiren turistler açısından alışılmıştın dışında olan bu lezzetleri deneyimleme gastronomi turizmi açısından önemlidir. Ülkemiz mutfak kültüründe çeşitlilik açısından zengin bir yapıya sahip olduğundan gastronomi turizmi bakımından ön plana çıkmaktadır.

Bu lezzetlerden biri olan peynir çok eski dönemlerden bu yana ülke mutfaklarında kendine yer edinerek önemli bir değere sahip olmuştur. Hem insan beslenmesindeki önemi hem de halk kültüründeki yeri ile vazgeçilemeyen peynir, gastronomi turizmi açısından da önemli bir üründür. Özellikle gastronomi amaçlı seyahat eden kişilerin geleneksel peynirleri deneyimleme isteği yöre ve ülke tanıtımlarında etkili olduğu gibi geleneksel ürünlerin pazarlanmasına da katkı sağlamaktadır.

Türkiye'nin geleneksel peynirlerinin hem tanıtımı hem de gastronomik yönünü konu alan **kitabın bu bölümünde**; hayvansal, bitkisel ve sanayi ürünleriyle ön plana çıkan Balıkesir ve Bilecik yöreleri ele alınmıştır. Peynirin mutfak kültürü ve beslenmedeki önemine değinilirken Dünya ve Türkiye özelinde ünlenen peynirler, Balıkesir ve Bilecik yörelerinin coğrafi konumu, tarihi özellikleri, mutfak kültürleri ile coğrafi işaret tescilli peynirler hakkında bilgiler verilmiştir.

Ayrıca Balıkesir yöresinde geleneksel yollarla peynir üretimi ve/veya yöreye özgü geleneksel peynirlerin satışını yapan D.V., M., Ö.Y. ve S.M. adlı işletmelerin yetkilileri ile görüşerek yöreye özgü peynirler hakkında bilgi alınmıştır. 2020 yılında Balıkesir Valiliği öncülüğünde gerçekleştirilen ve Güney Marmara Kalkınma Ajansı (GMKA) tarafından desteklenen “Gastronomi Şehri Balıkesir” projesinin en önemli çıktısı olan “Balıkesir

ilinin inanç turizm potansiyelini ortaya koyarak yöre halkının turizm konusundaki bilinç ve farkındalığını araştırmıştır. Vatan (2015) ise çalışmasında Bilecik'te var olan turizm paydaşlarının bakış açısıyla Bilecik'in bir turizm destinasyonu olarak daha etkin nasıl pazarlanabileceğini araştırmıştır.

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KAYNAK KİŞİLER

K1: G.K. Yenipazar/BİLEÇİK. Bilecik Kahvaltılık Peyniri (Üfürük Peynir) Üreticisi.

18. BÖLÜM

MARMARA BÖLGESİ-2 (İstanbul, Yalova ve Sakarya)

Büşra Meltem Türkmen

Bu bölümde Marmara bölgesinde yer alan İstanbul, Yalova ve Sakarya yörelerine ait geleneksel peynirlerden bahsedilecek olup üretim yöntemleri hakkında bilgi verilecektir.

1. İSTANBUL

Türkiye'nin en önde gelen şehirleri arasında yer alan İstanbul, coğrafi konumu sebebiyle de oldukça önemli bir metropoldür. Dünyanın en eski şehirlerinden biri olan İstanbul, Asya ve Avrupa kıtasını birleştirmesi, Roma, Bizans ve Osmanlı İmparatorluğuna başkent olma etkisini barındırması ve hemen hemen dünyanın metropol şehirleri arasında ilk sıralarda yer alması yer küre üzerindeki konumu itibarıyla de dünyanın en önemli noktalarından biridir. İstanbul, kuzeyinde Karadeniz, doğusunda Kocaeli sıradağlarının yüksek tepeleri, batıda Ergene havzası ve güneyinde Marmara denizi ile sınırlandırılmaktadır. İstanbul'un iklim koşulları ise coğrafi konumu sebebiyle Karadeniz ve Akdeniz iklim tipleri arasında geçiş ikliminin görülmesinin yanı sıra güneyinde ve kuzeyinde farklı sıcaklık ve yağış eğilimleri görülmektedir. Yaz aylarının sıcak ve kurak, kış aylarının ise soğuk ve yağışlı olarak seyretmektedir (Türkeş, 2020; Çeler ve Serengil, 2021; Altınok, 2022).

Peynir turizmi, son yıllarda giderek popüler hale gelen bir turizm türüdür. Bu turizm türü, peynir üretimi ve tüketimiyle ilgili kültürel deneyimler sunar ve turistlere peynirin üretim sürecini, farklı peynir çeşitlerini ve lezzetlerini tanıtmayı amaçlar. Peynir turizmi, dünya genelinde birçok ülkede uygulanmaktadır ve giderek daha fazla insan tarafından tercih edilmektedir. İstanbul, Türkiye'nin en büyük şehirlerinden biridir ve hayvancılık açısından oldukça zengin bir tarihe sahiptir. Ancak, son yıllarda kentleşme ve sanayileşme nedeniyle hayvancılık faaliyetleri azalmıştır. İstanbul'da halen süt, et ve kümes hayvancılığı yapılmaktadır (Swan, 2005; Saygılı, Demirci ve Samav, 2020; Cihangir ve Demirhan, 2020).

İstanbul'da süt hayvancılığı, özellikle Büyükçekmece, Çatalca ve Silivri ilçelerinde yapılmaktadır. Burada genellikle sığır ve manda sütü üretilir. Süt, hem iç piyasada hem de dış piyasada satılmak üzere işlenir. Yoğun kentleşme sebebiyle de süt ve süt ürünleri üre-

3.5. Ferizli Kaşarı

Sakarya'nın Ferizli ilçesindeki yöre halkı tarafında üretilen bu peynir, inek sütünden yapılı ve tuzlu bir tatlılığı vardır. Evlerde ve küçük işletmelerde yöre hayvanlarının sütünden yapılan bu peynir sulu haşlama yöntemiyle üretilmektedir. Peynirin yapısı orta sertliktedir (Bolat ve Erbay, 2022, Sözlü Anlatıcı 5).

3.6. Hendek Peyniri

Sakarya'nın Hendek ilçesinde üretilen peynir, inek sütünden yapılmaktadır. Hendek ilçesinin köylerinde yapılan bir köy peyniri çeşididir. Hendek peyniri, yumuşak bir dokuya sahiptir. Klasik peynir yapım süreci işlenmektedir. Hayvandan sağılan süt kaynatılarak mayalanır ve fazla suyu süzdürülür. Genellikle taze olarak tüketilir ancak uzun süre tüketmek için tuzda da bekletilmektedir (Hastaoğlu, Erdoğan ve Işkın, 2021; Sözlü Anlatıcı 2).

3.7. Taraklı Peyniri

Sakarya'nın Taraklı ilçesinde üretilen bu peynir, inek, keçi ve koyun sütünden yapılmaktadır. Taraklı yaylalarında taze kekiklerle beslenen hayvanların yedikleri kekiklerin de aromasının süte geçer ve tadını etkiler. Klasik yöntemlerle üretilen tuzlu bir peynir çeşididir. Sert bir dokusu vardır ve uzun süre dayanıklıdır (Keskin ve Dağ, 2020; Sözlü Anlatıcı 3).

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19. BÖLÜM

MARMARA BÖLGESİ-3 (Edirne-Kırklareli-Tekirdağ-Kocaeli)

Ömür Alyakut

Giriş

Türkiye; köklü tarihi, coğrafi yapısı, kültürel ve doğal varlıkları ile zengin turizm potansiyeline sahip bir ülkedir. Bu nedenle turizm gelirinden payını arttırmak ve küresel pazarda rekabet avantajı sağlamak adına sahip olduğu bu potansiyeli en iyi şekilde geliştirmesi ve kullanması gerekmektedir. Günümüzde değişen turist davranışları ile kitle turizmine olan ilgi alternatif turizm çeşitlerine yönelmektedir. Gastronomi turizmi, son yıllarda yükselen bir trend olarak turizm pazarlaması ve tanıtımında önemli bir yere sahip alternatif turizm çeşitlerinden biridir. Bu kapsamda Türkiye’de her bölge yerel lezzetleri ile öne çıkmakta ve turistlere farklı tat, lezzet ve ritüelleri ile çeşitli deneyimler sunmaktadır (Hacıbebekoğlu vd., 2018:16). Özellikle Türklerin, Orta Asya’dan gelen birikimi ile Anadolu ve Mezopotamya beslenme alışkanlığının birleşiminden ortaya çıkan zengin peynir çeşitliliği ve kültürü bulunmaktadır. Bu zengin peynir çeşitliliğine “peynir medeniyeti” de denilebilmektedir. Yurdumuzda üretilen peynirin tipi, üretim yöntemi, kullanılan sütün niteliği, işletme koşulları, sütün bakteri içeriği, nem ve sıcaklık düzeyine göre değişen yağ, protein bileşenleri ile farklı özelliklerde çeşitli peynirler üretilmektedir (Tattersall, 2021). Bu peynir çeşitliliği gastronomi turizmi kapsamında ayırt edici özellik olarak kullanılmalı ve rekabet avantajında stratejik bir fark olarak görülmelidir.

Peynir üretimi denilince akla ilk gelen yer Trakya Bölgesi özelinde Marmara Bölgesi’dir. Özellikle Trakya illeri; Edirne, Kırklareli, Tekirdağ ile Marmara Bölgesi’nin doğusunda yer alan Kocaeli ili peynir üretimi çeşitliliği açısından zengindir. Peki bu iller özelinde üretilen peynir çeşitleri, kullanılan peynirlerin üretim ve tüketim pratikleri nelerdir, yerel ekonomiye katkısı ve gastronomi turizmine etkisi gibi konuları merak uyandırmaktadır. Buradan hareketle yapılan bu çalışma; bir saha çalışmasıdır. Çalışmada öncelikle literatür taraması yapılmış, ardından peynir üretimi yapan tanınmış bir yerel tesis ile Edirne, Kırklareli, Tekirdağ ve Kocaeli illerinde yaşayan dokuz yöre insanına ulaşılarak yarı yapılandırılmış görüşmeler eşliğinde sorular sorulmuştur. Elde edilen tüm veriler; betimsel analiz kullanılarak her yörenin peynir çeşidi için temalara ayrılarak açıklanmıştır. Çalış-

lanmalı ve turistlerin yörenin kültürü ile bağ kurmasına aracılık etmelidir. Çünkü günümüzde değişen turizm paradigması ile deniz-kum-güneş üçlüsü yerini kültür turizm çeşitlerine, değişen turist profili de yerini post modern turistlere bırakmıştır. Özellikle turistler, tüm duyularına hitap eden, deneyimlemeye dönük seyahat tercihleri yapmaya başlamıştır.

Kültür turizmi çeşitlerinden biri olan gastronomi turizmi son yıllarda bu tercihler nedeniyle rağbet görmeye başlayan turizm çeşitlerinden biri olmuştur. Bu nedenle turistik turlara destinasyonların geleneksel lezzetleri, lezzetlerin üretildiği ve sunulduğu mekanlar, yerel pazarlar, gastronomi festivalleri gibi unsurları da ilave edilmiş hatta sadece gastro turistlerin olduğu gastronomi turları oluşturulmaya başlanmıştır. Bu durum yöre mutfaklarının ve destinasyonların güçlenmesinde, tanınmasında ve öne çıkarılmasında önem arz etmektedir (Dağ, 2020).

Her ülke veya bölge mutfağının geleneksel gıdaları içinde geleneksel peynirleri vardır. Türkiye, kültürel mozaigine uygun olarak farklı tat ve lezzetteki peynir çeşitleriyle zengin bir peynir kültürüne sahiptir. Peynir kültürü somut olmayan kültürel miras olarak korunmalı, yaşatılmalı ve aktarılmalıdır. Özellikle Marmara Bölgesi'nde yer alan Trakya illeri (Edirne, Kırklareli, Tekirdağ) ile bölgenin doğusunda yer alan Kocaeli ili yöreye özgü peynir çeşitleriyle öne çıkmaktadır. Bu illerin her birinin coğrafi yapısı, bitki örtüsü, yöre hayvanlarının sütleri, kullanılan maya, üretim teknikleri, olgunlaştırma, haşlama, kaynatma, tuzlama, fümeleme gibi farklı teknikler, yöre halklarının kimlikleriyle ve kültürleriyle özdeşir başka bir ifadeyle o yörelerin gastronomik kimliğinin bir göstergesidir. Bu nedenle geleneksel gıda olan peynirler özelinde, destinasyonlarda gastronomi turizminin öncelenerek, turizmin 12 aya yayılması, Edirne beyaz peyniri, Kırklareli beyaz peyniri, Malkara eski kaşar peyniri ile Abhaz ve Çerkez peynirlerinin turistik ürün olarak öne çıkarılması önemlidir. Böylece turistler kültürel miras olan bu özel peynirleri deneyimlemek ve tatmak isteyecekler ve seyahat tercihlerini gastronomi destinasyonlarına yönlendireceklerdir. Bu durumda destinasyon rekabet avantajı sağlayacak, yerel kalkınmanın önü açılacak, çarpan etkisiyle ülke ekonomisine katma değer sağlanacak ve hem gastronomi turizminin hem de peynir kültürünün sürdürülebilirliğine katkı sağlanacaktır. Buradan hareketle şu öneriler getirilebilir: Edirne, Kırklareli, Tekirdağ ve Kocaeli gastronomi destinasyonlarında; peynir rotaları oluşturulmalı, peynir festivalleri yapılarak ulusal ve uluslararası alanda peynirlerin ve destinasyonların daha fazla tanınır ve bilinir olması sağlanmalı, reklam ve tanıtım çalışmaları yapılmalı ve yörelerin geleneksel peynirleri turistik ürün olarak gastronomi turizminde kullanılmalıdır.

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20. BÖLÜM

MARMARA BÖLGESİ-4

(BURSA ve ÇANAKKALE)

Ecem İnce Karaçeper

Bu bölümde Marmara bölgesinin iki önemli şehri olan Bursa ve Çanakkale’de üretilen geleneksel peynirler hakkında bilgiler verilecektir.

Toplumların yemek kültürlerinin gelişebilmesi ve beslenme alışkanlıklarının sürdürülebilir bir şekilde sağlanabilmesinde geleneksel gıdalar büyük role sahiptir. Geleneksel gıdalar aynı zamanda kültürel mirasın devamlılığı açısından da önemlidir (Köten ve Ünsal, 2014; Demirci vd., 2014). Özellikle, Türkiye sahip olduğu coğrafi konum ayrıcalığı ile dört mevsimi yaşayabilen nadir ülkelerden birisidir. Zengin tarihi geçmişi, kültürel mirası ve iklimsel avantajı ile elde ettiği gıda çeşitliliği ülke olarak Türkiye’yi bir adım daha ön plana çıkarmaktadır (Cumhur, 2017). Son dönemlerde gastronomi turizmi kapsamında düzenlenen birçok etkinlik destinasyonların kültürel farklılıklarını vurgulamakta ve turistlerin davranış eğilimlerini daha yöresel olan gıdaları tatma ve deneyimleme olarak açıklamaktadır. Turistlerin seyahat etme niyetlerinde ise gıdasal çeşitliliğin önemli bir itici güç olduğu vurgulanmaktadır (Deveci vd., 2013).

Ülkelerin geleneksel gıdaları arasında yer alan peynirlerin bölge, yöre görünürlüğü ve bilinirliği açısından önemi büyüktür (Karaca, 2016). İnsanoğlunun uygarlığa geçişinin ilk simgelerinden biri olarak kabul edilmektedir. Bununla birlikte toplumda yer alan kültürel zenginlik ile kültürel mirası temsil etmektedir. Kuşaktan kuşağa aktarılan ve yaşamsal deneyimler sonucu tesadüfi bir şekilde öğrenilen geleneksel bir üründür. Türkiye’nin yedi bölgesinde çeşitli tat ve lezzette üretilen ve toplum tarafından da sevilerek tüketilen birçok geleneksel peynir çeşidi bulunmaktadır. Özellikle, Marmara bölgesi iklim ve coğrafi avantajları nedeniyle peynir çeşitliliğinin fazla olduğu coğrafi bölgelerin başında gelmektedir. Bölgede yer alan her yörede de kendine özgü bilgi, görgü, gelenek ve göreneklerine göre birçok farklı peynir üretilmektedir. Türkiye’nin sahip olduğu geleneksel peynir varlığı kültürel zenginliğinin en önemli göstergesidir (Türkoğlu vd., 2003; Demirbaş vd., 2006).

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İÇİNDEKİLER

ÖN SÖZ	iii
GİRİŞ	vii
BÖLÜM 1	AHP TEKNİĞİ VE ÇALIŞAN PERFORMANSI DEĞERLENDİRME UYGULAMASI.....	1
	<i>Prof. Dr. Latif Öztürk</i> <i>Dr. Öğr. Üyesi Tayfun Arar</i>	
BÖLÜM 2	TÜRK MEVDUAT BANKALARININ 2021 YILI FİNANSAL PERFORMANSLARININ ENTROPİ TEMELLİ ARAS TEKNİĞİYLE DEĞERLENDİRİLMESİ.....	9
	<i>Dr. Öğr. Üyesi Mehmet Öksüzkaya</i>	
BÖLÜM 3	BIST TEKNOLOJİ SEKTÖRÜNDEKİ FİRMALARIN COCOSO TEKNİĞİ İLE FİNANSAL PERFORMANS ANALİZİ.....	23
	<i>Dr. Öğr. Üyesi Bahadır Fatih Yıldırım</i>	
BÖLÜM 4	CRITIC TEKNİĞİYLE ROBOT SÜPÜRGE İÇİN KRİTER AĞIRLIKLANDIRMA.....	39
	<i>Doç. Dr. Muhammet Burak Kılıç</i> <i>Öğr. Gör. Behiç Çetin</i>	
BÖLÜM 5	ENTROPİ TEKNİĞİ: PAZARLAMA ALANINA İLİŞKİN BİR ÇKKV KRİTER AĞIRLIKLANDIRMASI.....	53
	<i>Dr. Öğr. Üyesi İsa Gürkan Meral</i>	

BÖLÜM 6	GRİ İLİŞKİSEL ANALİZ TEKNİĞİYLE TAŞIMACILIK FİRMASI İÇİN TREYLER ÇEKİCİ ARAÇ SEÇİMİ	65
	<i>Doç. Dr. Yusuf Şahin</i>	
	<i>Doç. Dr. Kenan Karagül</i>	
BÖLÜM 7	MOORA TEKNİĞİ VE LOJİSTİK MERKEZ SEÇİMİ PROBLEMİNE UYGULANMASI	81
	<i>Doç. Dr. Gülşah Sezen Akar</i>	
	<i>Dr. Öğr. Üyesi Veli Rıza Kalfa</i>	
BÖLÜM 8	PROMETHEE TEKNİĞİ VE PERSONEL SEÇİMİ UYGULAMASI.....	97
	<i>Dr. Öğr. Üyesi Tayfun Arar</i>	
BÖLÜM 9	SWARA TEKNİĞİ VE BİR ÜRETİM İŞLETMESİ UYGULAMASI.....	111
	<i>Doç. Dr. Engin Çakır</i>	
BÖLÜM 10	TOPSIS TEKNİĞİ VE PAZARLAMA ALANINDA BİR UYGULAMA	125
	<i>Dr. Öğr. Üyesi Serhat Karaoğlan</i>	
BÖLÜM 11	VIKOR TEKNİĞİ VE FİNANSAL PERFORMANS ÜZERİNE RSTUDIO UYGULAMASI	133
	<i>Dr. Öğr. Üyesi Özgür Engeloğlu</i>	
YAZAR ÖZ GEÇMİŞLERİ.....		151

Giriş

Serhat Karaođlan & Tayfun Arar

Türk Dil Kurumu'na göre “Bir iş veya sorun hakkında düşünülerek verilen kesin yargı” olarak tanımlanan karar, alternatifler arasından bir tanesini seçmektir [1]. Karar problemindeki seçenekleri gösteren alternatifler arasından en iyisinin nasıl seçileceğinin sorgulanması ise karar verme problemidir [2]. Bir karar alabilmek için karar vericiye, amaca, karar kriter(ler)ine, alternatife, olaya ve sonuca ihtiyaç bulunmaktadır [3]. Herhangi bir konuda karar verebilmek için karar üzerinde etkileri olan çeşitli bilgi, birikim ve teknik karar vermenin gerekli olduğu problem hakkında detaylar, karar aşamasında yer alan insan veya aktörler, bu kişilerin amaçları ve ilkeleri, çıktıları değiştiren etkiler ile zaman tercihi, tasarılar ve kısıtlardan oluşan veriye ihtiyaç vardır [4].

Karar verme süreci aşamaları araştırmacılar tarafından çeşitli şekillerde tanımlanmıştır. En genel kabul görenlerinden bir tanesi ise

- Problemin tanımlanması
- Gerekli bilginin toplanması
- Mümkün çözümlerin üretilmesi
- Çözümlerin değerlendirilmesi
- Performans için stratejinin seçilmesi ve kararın uygulanması
- Öğrenme ve revize etme

Şeklinde sıralanmaktadır [5]. Karar verme teknikleri problemlerin çözümüne sezgisel ve öznel yanıtlar yerine analitik ve nesnel sonuçlar getirmektedir. İşletmeler fayda ve maliyet hesabı yaparak zaman çerçevesinde Tablo 1'de görüldüğü şekilde analitik kararlarını stratejik, taktik veya operasyonel olarak

Bir ÇKKV problemi, matris düzeninde Eşitlik 1'deki gibi gösterilmektedir. D matrisinde;

A_1, A_2, \dots, A_n ; karar aşamasında yer alan alternatifleri,

C_1, C_2, \dots, C_n ; alternatifleri değerlendirmek üzere kullanılan kriterleri

X_{ij} ; alternatif A_i 'nin C_j kriterine göre değerini

belirtmektedir [9,10,11].

$$D = \begin{matrix} & C_1 & C_2 & \dots & C_n \\ A_1 & X_{11} & X_{12} & \dots & X_{1n} \\ A_2 & X_{21} & X_{22} & \dots & X_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ A_n & X_{n1} & X_{n2} & \dots & X_{nn} \end{matrix} \quad (1)$$

Kriterlerin ağırlıklandırılması durumunda ise kriterlerin önem derecesini gösteren matris yani ağırlıklar matrisi $W = [W_1 \ W_2 \ \dots \ W_N]$ şeklinde gösterilmektedir.

Çok Kriterli Karar Verme yönteminden sosyal bilimler, fen bilimleri ve mühendislik gibi pek çok alanda yararlanılmaktadır. Çünkü tüm bu disiplinler içinde farklı sayıdaki alternatifler arasında farklı önem derecelerine sahip kriterlere göre bir seçim yapılması ve karar alınması gerekmektedir. Sosyal bilimler kapsamındaki işletme disiplini içindeki alt konulardan olan insan kaynakları yönetimi, pazarlama, üretim ve finansa da karar verme adına yapılan uygulamalarda ÇKKV tekniklerine rastlanılmaktadır.

Bu eserde de belli başlı çok kriterli karar verme teknikleri yönetim, pazarlama ve finans alanındaki uygulamalar yer almaktadır. Her bir bölümde öncelikle ilgili teknik ve uygulama adımları detaylıca anlatılmıştır. Ardından da gerçek veriler ile uygulamalara yer verilmiştir.

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Bölüm 1

AHP Tekniđi ve alıřan Performansı Deđerlendirme Uygulaması

Tayfun Arar & Latif Öztürk

GİRİŐ

İŐletmelerin faaliyetlerini başarılı bir şekilde sürdürebilmeleri için yönetici konumundaki kiŐilerin çeŐitli konularda sıklıkla karar verme durumları bulunmaktadır. Bu kararlar iŐletmenin stratejik faaliyetleri ile ilgili olabileceđi gibi taktiksel operasyonları hakkında da olabilmektedir. Alınacak kararların kapsamı ve bu kararları hayata geçirecek olanlar ise genellikle iŐletmenin iŐgücünü oluŐturan personeli olmaktadır. Bir iŐletmenin personelinin niteliđi ise o iŐletmenin başarısında büyük rol oynamaktadır. Dolayısıyla personelin gösterdiđi performans, kümülatif bir şekilde iŐletmenin performansını oluŐturmaktadır. Hâliyle alıŐan personelin iŐyerinde göstereceđi performans ve bu performansın nasıl deđerlendirildiđi önem arz etmektedir. Bu sebeple iŐletmeler, alıŐanlarının performanslarını deđerlendirme için çeŐitli sistemler geliŐtirmiŐtir. Literatür incelendiđinde alıŐan performansının deđerlendirilmesi için 360 derece performans deđerlendirme, kritik olay yöntemi ve amalara göre deđerlendirme yöntemi gibi uygulamalar yer almaktadır [1]. Bununla birlikte iŐletmelerin bazı spesifik pozisyondaki alıŐanlarının performanslarını ölçme/deđerlendirme için çeŐitli kriterler geliŐtirdiđi görülmekte ve bu kriterler temelinde puanlandırarak ölçüm yaptıđı görülmektedir. Buradaki önemli nokta ise ilgili kriterlerin eŐit önem derecesine sahip olup olmama durumudur. Farklı önemdeki kriterlerin ađırlıklarının belirlenmesi için farklı yöntemler bulunmaktadır. Literatür incelendiđinde alıŐanların performanslarının ađırlıklandırılmasında AHP tekniđinin kullanıldıđı görülmektedir. Bu alıŐmalar Tablo 1’de özetlenmiŐtir. Bununla beraber ađrı merkezlerinde performans deđerlendirme alıŐmalarının sayısının oldukça az olduđu görülmektedir. Örneđin KiŐi (2016) [2] alıŐmasında ađrı merkezi müŐteri temsilcisi yetkinliklerini AHP tekniđi ile önceliklendirmiŐ ve alıŐma bulgularına göre en

Tartıřma ve Sonu

alıřanların performanslarının dođru řekilde lümü, alıřanı dođru řekilde deđerlendirmeye, iřletmenin misyonunu ve amalarını en etkin řekilde gerekleřtirmesini sađlamaya ve diđer İK uygulamalarındaki verimliliđi elde etmeye zemin hazırladıđı iin iřletmeler iin olduđa nemli bir konudur [1]. Bununla birlikte bir iřletmenin ncelikleri amaları arasında yer alan müşteri tatmini, iřletmenin sürdürülebilirliđinin belirleyicilerindedir. Dolayısıyla müşterilerle dođrudan iletiřim kuran alıřanların gösterecekleri performansın iřletmenin sürdürülebilirliđi ve itibarı üzerinde daha ok etkisi bulunmaktadır. Bu sebeple bu alıřmada Ankara ilinde faaliyet gsteren ve biliřim sektründe bulunan bir iřletmenin ađrı merkezindeki alıřanlarının performans deđerlendirmesinde kullanılacak kriterler iřletmedeki yneticiler tarafından belirlenmiř ve ikili karřılařtırılmıřtır. AHP tekniđi ile nem dereceleri belirlenen kriterler iinde performans deđerlendirmede en nemli kriter iletiřim becerileri ve akabinde zmlenme becerisi olarak bulunmuřtur.

alıřmanın iki temel kısıtı bulunmaktadır. Bunlardan ilki alıřmanın bir vaka alıřması niteliđinde olması dolayısıyla sonularının genellenebilirliđinde dikkat edilmesi durumudur. İkinisi ise AHP tekniđinin temel varsayımı olan bađımsızlıktan dolayı kriterlerin birbirini etkilemediđi varsayımıdır. Bundan sonraki alıřmalarda, kriterlerin birbirlerini etkileme durumu da gz nnde bulundularak Analitik Ađ Prosesi (ANP) uygulanabilir.

Kaynaka

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Bölüm 2

Türk Mevduat Bankalarının 2021 Yılı Finansal Performanslarının Entropi Temelli Aras Tekniğiyle Değerlendirilmesi

Mehmet Öksüzakaya

GİRİŞ

Küresel finans piyasalarında oldukça önemli bir yere sahip olan bankalar gelişmiş ve gelişmekte olan ülke ekonomileri için bir fon aktarımı mekanizması görevini üstlenmektedir [1]. Finansal sistem içerisinde ekonomik birimler arasında birçok finansal araç yardımıyla tasarrufları yatırımlara yönlendirmesi, reel sektördeki firmaların büyümesi, ülke ekonomilerinde büyümeyi ve kalkınmayı desteklenmesi açısından son derece önemli bir rol üstlenmektedir [2,3]. Bankalar bir taraftan tasarruf sahiplerinden fon toplayarak bu fonlara ihtiyaç duyan yatırımcı ve tüketicilere kredi olarak aktararak karlı bir şekilde faaliyetlerini sürdürürken diğer taraftan finansal piyasaların gelişimi ve ülke ekonomilerinin istikrar tesis edilmesine önemli bir katkı sağlamaktadırlar [4,5]. Ülke ekonomilerinin uzun vadede sürdürülebilir bir büyüme ve kalkınmanın ön şartlarından biri bankacılık sisteminin kaynaklarını etkili ve verimli bir şekilde kullanmasıdır [1,6]. Küreselleşme ve giderek artan rekabet ortamı altında finansal sistemin merkezinde olan bankalar başta kendi ülke ekonomileri olmak üzere yabancı ülke ekonomilerini etkileyebilecek bir unsur hâline gelmiştir [1]. Bu sebeple bankaların sergilemiş olduğu finansal performanslarının denetleyici ve düzenleyici otoriteler tarafından düzenli olarak takip edilerek herhangi bir olumsuz bir durum veya kriz durumundan etkilenmeden bankacılık işlemlerini sürdürebilmesi için gerekli olan düzenleme ve iyileştirmelerin yapılması oldukça önem arz etmektedir [1,2,7].

Bu çalışma 2021 yılında Türk Bankacılık sisteminde faaliyet gösteren ve aktif büyüklük açısından en yüksek paya sahip 10 mevduat bankasının finansal performansının değerlendirilmesi amaçlanmıştır [4]. Bu çalışmanın literatüre iki önemli açıdan katkı sağlayacağı düşünülmektedir. Bunlardan ilki çalışmada

birbirlerine oldukça benzer olduğu görülmüştür. Kamu sermayeli bankalar içinde Vakıflar Bankası finansal açıdan en başarılı bankadır.

Özel sermayeli bankalar finansal skorları birbirine benzer olduğu görülmüştür. Özel sermayeli bankalar içinde Yapı Kredi Bankası finansal performans bakımından en başarılı bankadır. Yabancı sermayeli bankalar finansal skorları birbirinden oldukça farklı olduğu tespit edilmiştir. Garanti Bankası yalnızca yabancı sermayeli değil aynı zamanda tüm mevduat bankalarının arasında en yüksek finansal performansa sahip bankadır.

Bu tür çalışmaların sonuçlarını yorumlanırken oldukça dikkat edilmesi gerekmektedir. Çünkü çalışmanın sonuçları belirlenen kriterlere, yöntemlere, kriterlerin ağırlıklarına ve son olarak alternatiflere bağlı olarak değişebilmektedir. Bu tür çalışmalarda yalnızca tekniği veya kriterleri değiştirerek tamamen farklı sonuçları ulaşılabilmektedir.

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Bölüm 3

BIST Teknoloji Sektöründeki Firmaların CoCoSo Tekniđi ile Finansal Performans Analizi

Bahadır Fatih Yıldırım

GİRİŞ

İşletmelerin finansal performanslarının değerdendirilmesi ve izlenmesi, yoğun rekabet ortamında işletmelerin varlığını sürdürebilmesi için kritik öneme sahip bir süreçtir[1]. Finansal performans analizi, işletmenin finansal raporlar ve tabloları ile muhasebe kayıtlarından elde edilen veriler kullanılarak işletmenin yönetim performansı, verimliliđi, faaliyet ve finansal yapı özelliklerinin belirlenmesi olarak tanımlanabilir[2,3]. Finansal performans, işletmenin belirlediđi hedefler doğrudusunda mevcut kaynakları ne kadar etkin ve ne kadar verimli kullanabildiđinin bir göstergesidir[4].

Finansal performans ölçümünde literatürde kullanılan birçok farklı yaklaşım bulunmaktadır. Bu yaklaşımlardan en çok kullanılanlarında biri finansal oranları esas alan oran analizi yaklaşımıdır. Oran analizi yaklaşımının temelini işletmenin finansal tablolarında yer alan unsurlar arasındaki ilişkiler dikkate alınarak oluşturulan finansal oranlar yardımıyla işletmenin likidite, faaliyet ve finansal yapısının analiz edilmesi oluşturmaktadır[5].

Finansal oranların kullanılması yoluyla işletmenin finansal performansının analizi, işletme yöneticilerinin yanı sıra işletmenin paydaşı konumundaki ortaklar, yatırımcılar ve çeşitli finansman kurumları tarafından da kullanılmakta ve işletmenin finansal performanslarını değerdendirmenin yanında işletmenin değeri belirlenmesi ve yatırım politikalarının oluşturulmasında bir referans oluşturması için kullanılmaktadır. Finansal performans analizinde işletmenin faaliyet koluna göre belirlenen finansal oranlar ve bu oranlara ait sektörel ağırlıklandırılmalar kullanılarak oran analizine dayalı bir değerdendirme yapılabilmektedir. İşletmelerin finansal performanslarının değerdendirilmesinde işletmenin kendi

belirlenmiştir. Tablo 12’de alternatif sıralamasında kullanılan $\lambda=0,5$ değerinin yanı sıra farklı λ değerleri (0,25 ve 0,75) içinde k skorları hesaplanmış ve sıralamalar elde edilmiştir.

Tablo 12. Farklı λ Değerlerine Göre Alternatif Sıralamaları

	$\lambda = 0,75$		$\lambda = 0,50$		$\lambda = 0,25$	
	k	Sıralama	k	Sıralama	k	Sıralama
A1	2,03	3	2,04	3	2,05	3
A2	1,35	6	1,35	6	1,35	6
A3	1,95	5	1,95	5	1,95	5
A4	2,24	2	2,24	2	2,24	2
A5	2,59	1	2,59	1	2,59	1
A6	1,97	4	1,97	4	1,97	4

İncelenen karar probleminin farklı λ değerlerine duyarlılığının raporlandığı Tablo 12’de yer alan alternatif sıralamalarının sırasıyla 0,75, 0,50 ve 0,25 λ değerlerine göre farklılık oluşturmadığı ve elde edilen sıralamaların bu bağlamda tutarlı olduğu görülmektedir.

CoCoSo tekniği literatüre yeni kazandırılmış bir teknik olmasına rağmen, işlem adımlarının kolaylığı, her türden karar problemine uyarlanabilmesi ve paket program gereksinimi bulunmadan kolaylıkla uygulanabilmesi gibi avantajlarından ötürü kısa sürede literatürde kabul görmüş ve birçok çalışmada başarı ile kullanılmıştır. Bu çalışmada CoCoSo tekniği kesin sayılardan oluşturulmuş bir karar matrisi üzerinde uygulanmıştır. CoCoSo tekniği kesin sayıların yanı sıra Bulanık Sistem Teorisi, Nötrosofik Teori ve Gri Sistem Teorisi gibi sistem teorileri ile genişletilerek ve diğer ÇKKV yöntemleri ile bütünleşik ve karşılaştırmalı kullanılabilir.

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Bölüm 4

CRITIC Tekniđiyle Robot Süpürge İin Kriter Ađırlıklandırma

Muhammet Burak Kılı & Behi etin

GİRİŐ

ok kriterli karar verme yöntemleri uygulanırken, kriterlerin ađırlıklarının belirlenmesi önemli bir problemdir. Kriter ađırlıklandırılmasında objektif veya sübjektif yöntemler kullanılabilir. Objektif veya nesnel yaklaşımlar olarak da adlandırılan yöntemlerde karar vericilerinin görüşleri yerine karar matrisindeki bilgiler matematiksel modellerle birlikte kullanılarak, kriterlerin ađırlıkları belirlenir. Sübjektif yaklaşımlarda ise işletmelerin karar verme süreçlerinde yer alan uzman kişiler veya ilgili sektörde çalışan kişilerden alınan görüşlerden elde edilen bilgilere dayanarak kriter ađırlıkları belirlenir [1].

Kriter ađırlıklandırılmasında nesnel bir yaklaşım sunan ve yaygın kullanıma sahip olan CRITIC (The CRiteria Importance Through Intercriteria Correlation) tekniđi Diakoulaki vd. [2] tarafından önerilmiştir. Teknik, kriterler arasındaki zıt yoğunluğu ve uyumsuzluğu inceleyerek kriterlerin ađırlığını belirlemek için kullanılan bir yaklaşımdır. CRITIC tekniđi, karar vericilerin karar verme sürecinde kriterlerin önemini veya ađırlıklarını belirlemelerine yardımcı olmak için tasarlanmıştır. Bu teknik, kriter ađırlıklarının belirlenmesi amacıyla, blok-zincir değerlendirme [3], deniz yatırımı kararlarında risk seviyesinin belirlenmesi [4], mobil telefon seçimi [5], sađlık alanında, hasta bakımı için uygun yöntemlerin seçimi [6], finansal riskin belirlenmesi [7], endüstriyel robot seçimi [8] vb. problemlerde uygulama alanı olarak kullanılmıştır. CRITIC tekniđi tabanlı, korelasyon katsayısının hesaplama adımında önerilen KAPULA-CRITIC ve D-CRITIC teknikleri de literatürde yer almaktadır [9,10].

$> C_8 > C_1 > C_6 > C_3 > C_9 > C_5$ olarak, Spearman korelasyon katsayıları kullanılarak elde edilen ağırlık sıralamaları $C_2 > C_4 > C_7 > C_8 > C_3 > C_1 > C_6 > C_9 > C_5$ bulunmuştur. Kriterlerin ağırlıkları Şekil 7’de gösterilmektedir. Her iki korelasyon katsayısı yöntemi kullanılarak elde edilen CRITIC hesaplamalarında, en fazla ağırlığa sahip olan ilk dört kriter sırasıyla C_2 (Şarj süresi), C_4 (Emiş gücü), C_7 (Çöp kutusu boyutu) ve C_8 (Tırmanma yüksekliği) olduğu gözlenmiştir.

Bu bölümde, robot süpürge seçiminde kullanılan kriterlerin ağırlıklandırılmaları nesnel yaklaşım olan CRITIC tekniği ile hesaplanmıştır. Burada kriter ağırlıklandırma probleminde diğer nesnel yaklaşımlar uygulanabileceği gibi karar vericinin görüşlerini dikkate alan öznel yaklaşımlarda tercih edilebilir. Bu çalışmada ayrıca Pearson ve Spearman sıra korelasyon katsayıları hesaplanarak kriterlerin ağırlıklandırılması yapılmıştır. Spearman sıra korelasyon katsayısı sıralama ölçme düzeyine sahip kriterler için korelasyon katsayısının hesaplanmasında kullanılacağı gibi, ölçme düzeyi eşit aralıklı veya oranlama ölçme düzeylerine sahip kriterlerin korelasyon hesaplanmasında da kullanılabilir [17]. Kriterler için korelasyon katsayısı hesaplanırken, kriterlerin ölçme düzeylerine göre uygun olan korelasyon katsayıları da kullanılabilir.

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Bölüm 5

Entropi Tekniđi: Pazarlama Alanına İlişkin Bir ÇKKV Kriter Ağırlıklandırması

İsa Gürkan Meral

GİRİŞ

Karar alma, bulunduđumuz dönem göz önüne alındığında, geçmişe kıyasla daha karmaşık ve zor bir durumdadır. Geçmişte, daha az seçenek arasından daha az kriter hesaba katılarak karar alıcılar kararlarını verirken, günümüzde hem seçenek hem de kriter sayısı fazlalaşmıştır. Bu durum sonucunda geçmişe oranla günümüzde karar problemlerinde karar alıcılar çok daha fazla bilimsel yöntemleri tercih etmektedirler. Karar alma süreçlerinde bilimsel teknik olarak, 1990'lı yıllara kadar fayda maliyet analizi, balık kılçığı diyagramı, çoklu oylama, 5N 1K gibi teknikler kullanılırken, 1990'lı yıllar ve sonrasında bu tekniklere ek olarak kriter ağırlıklandırma yöntemleri ve çok kriterli karar verme yöntemlerinin (ÇKKV) kullanımı giderek daha yaygın hâle gelmiştir.

ÇKKV, bir yönetim seviyesi ve bir mühendislik seviyesi içeren karmaşık ve dinamik bir süreç olarak tanımlanabilmektedir [1]. Yönetim seviyesi, karar problemini belirlemede ve optimal olan alternatifi seçmektedir. Ancak alternatiflerin optimalinin belirlenmesi sürecinde yönetim seviyesi herhangi bir işlem yapamakta ve burada mühendislik seviyesi devreye girerek en optimal olan alternatifi belirlemektedir. ÇKKV sürecinin mühendislik seviyesi, alternatifleri tanımlamakta ve bunlardan herhangi birini seçmenin sonuçlarına ilişkin bilgiler vermektedir.

ÇKKV adımları,

1. Karar alıcı tarafından karar probleminin tanımlanması,
2. Karar verme problemine ilişkin kriterlerin oluşturulması,
3. Karar verme problemine ilişkin alternatiflerin oluşturulması,

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Bölüm 6

Gri İlişkisel Analiz Tekniğiyle Taşımacılık Firması İçin Treyler Çekici Araç Seçimi

Yusuf Şahin & Kenan Karagül

GİRİŞ

Karar verme, farklı seçenekler veya eylem biçimleri arasında seçim yapma sürecidir. Bu süreç, farklı seçenekleri belirlemeyi ve değerlendirmeyi ve ardından en uygun olanı seçmeyi içerir. Karar verme, özellikle dikkate alınması gereken birçok faktör olduğunda ve farklı kararların potansiyel sonuçları belirsiz hâle geldiğinde karmaşık ve zorlu bir süreç olabilir. Bazı yaygın karar verme stratejileri arasında, farklı seçeneklerin artılarını ve eksilerini karşılaştırmak, her seçimin olası sonuçlarını göz önünde bulundurmak ve ilgili bilgi veya uzmanlığa sahip olabilecek başkalarından veri elde etmek yer alır. Bir başka deyişle, karar vermenin amacı, mevcut bilgi ve kaynaklar göz önüne alındığında mümkün olan en iyi seçeneği bulmaktır.

Karar verme sürecindeki zorlukların aşılabilmesi ve bu türde problemlerin daha hızlı ve etkili bir şekilde çözülebilmesi için yıllardır araştırmalar yapılmaktadır. Yapılan bu araştırmaların sonucunda ise eldeki verilere ve problemin türüne bağlı olarak birçok yöntem ve yaklaşım geliştirilmiştir. Rasyonel karar verme, sezgisel karar verme, grup karar verme, beyin fırtınası ve yanal düşünme, çok kriterli karar analizi, maliyet-fayda analizi ve karar ağacı analizi gibi yöntem ve yaklaşımlar karar verme süreçlerinde sıklıkla kullanılır. Belirli bir problem için kullanılacak en uygun yöntem, mevcut durum ve eldeki bilgiler ile karar vericinin amaç ve hedeflerine bağlı olarak değişiklik gösterecektir. Bu yöntemlerden, seçim, sınıflandırma ve sıralama problemlerinde kullanılabilen çok kriterli karar analizi yöntemlerinin temel mantığı, birden fazla kritere göre değerlendirilmesi istenen alternatifler için tek bir referans noktası oluşturmaktır [1].

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EK – GİA Tekniği İçin Hazırlanan Programın Julia Kodları

```
# X: Karar matrisi
# nA: Alternatiflerin sayısı
# nC: Kriterlerin sayısı
# funDir: Kriterlerin yönünü gösteren vektör
# RefSer: Kriterlerin yönüne göre en iyi alternatif değerlerini gösteren vektör
# w : Kriterlerin ağırlıklarını tanımlayan vektör
#Adım 1. Normalize edilmiş karar matrisinin elde edilmesi (nX)
nX=zeros(Float64,nA,nC);
for j=1:nC
    for i=1:nA
        if funDir[j]=="Max"
            maxj=maximum(X[:,j]);
            minj=minimum(X[:,j]);
            range=maxj-minj;
            nX[i,j]=(X[i,j]-minj)/range;
        elseif funDir[j]=="Min"
            maxj=maximum(X[:,j]);
            minj=minimum(X[:,j]);
            range=maxj-minj;
```

Bölüm 7

MOORA Tekniđi ve Lojistik Merkez Seçimi Problemine Uygulanması

Gülşah Sezen Akar & Veli Rıza Kalfa

GİRİŞ

Karar verme, belirlenen amaçları en etkin şekilde yerine getiren birçok alternatif arasından seçim yapma süreci olarak tanımlanabilir. Çođu durumda, en iyi seçeneđin bulunması veya kesin olarak belirlenmesi, çođunlukla birbiriyle çelişen birden çok kriterin etkilerine dayanır ve bu nedenle bu karar verme türüne Çok Kriterli Karar Verme (ÇKKV) adı verilir. 20. yüzyılın ikinci yarısında ÇKKV, yöneylem araştırmasının en hızlı büyüyen alanlarından biri olmuş ve bunun sonucunda birçok ÇKKV yöntemi önerilmiştir [1].

Çok kriterli karar verme teknikleri, karar alternatif setinin önceden belirlendiđi, sınırlı alternatifle çalışılan Çok Nitelikli Karar Verme (ÇNKV) ve sınırsız alternatifle çalışılan Çok Amaçlı Karar Verme (ÇAKV) teknikleri olmak üzere ikiye ayrılmıştır [2]. ÇAKV Teknikleri, birden çok, bazen birbiriyle çelişen hedeflere dayalı olarak mevcut seçenekler kümesinden bir veya daha fazla alternatifini sıralamak veya seçmek için uygun bir araç gibi görünmektedir. Çok az bilgi gerektiren basit yaklaşımlardan, her hedef ve paydaşların tercihleri hakkında kapsamlı bilgi gerektiren matematiksel programlama tekniklerine dayalı yöntemlere kadar çeşitlilik göstermektedir [3]. Sınırlı sayıda alternatifini değerlendirmesine rağmen literatürde “Çok Amaçlı” karar verme modeli olarak değerlendirilen MOORA (Multi - Objective Optimization By Ratio Analysis) metodu da bunlardan birisidir [4].

Bu bölümde MOORA tekniđi, türleri ve çözüm adımları detaylı olarak ele alınmıştır. Teknik, lojistik merkez yer seçim problemine uygulanmıştır.

uygulanmıştır. Her bir MOORA tekniği değerlendirildiğinde Alternatif 2'nin uygun lojistik merkez olduğu sonucuna ulaşılmıştır. Karar verme süreçlerinde, MOORA tekniği diğer çok kriterli yöntemlerle karşılaştırıldığında kolay uygulanabilir ve güvenilir olma gibi üstünlükleri nedeniyle birçok alanda kullanılabilir. Kriterlerin farklı değerlendirilmesi gereken durumlar için ağırlıklanma yöntemleri de dâhil edilerek daha güçlü hâle getirebilir.

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Bölüm 8

PROMETHEE Tekniđi ve Personel Seçimi Uygulaması

Tayfun Arar

GİRİŞ

Karar verme hayatın her alanında karşımıza çıkan bir sorunsaldır. Kararın yapılacağı alternatiflerin sayısı arttıkça bu durum daha karmaşık bir hâl almaktadır. Seçim yapılacak alternatifler arasından birine karar vermek için ise kararımızı etkileyecek çeşitli faktörler bulunmaktadır ve bu faktörlerin önem dereceleri kişiden kişiye farklılık gösterebilmektedir. Bu gibi farklı ya da aynı ağırlıktaki faktörlerin/kriterin rol oynadığı ve birden fazla alternatif içinden bir tanesine karar vermemiz gerektiği durumlarda bu kararımızı daha rasyonel kılacak matematiksel tekniklere Çok Kriterli Karar Verme (ÇKKV) teknikleri denilmektedir.

Bireysel olduğu gibi işletmelerin de sürdürülebilirliklerini koruma ve başarıya ulaşma adına kısa ve uzun dönemli kararlar almak durumunda olduğu zamanlar bulunmaktadır. Kısa dönemli kararlar daha çok taktiksel ve operasyonel kararlar iken; uzun dönemli başarının sağlanması için alınan kararlar ise stratejik kararlar olarak nitelendirilmektedir. Eğitim ve geliştirme gibi çeşitli maliyetlerinden dolayı, bu uzun dönemli kararlardan biri de işletmenin amaçlarına ulaşabilmesi için gerekli ve en önemli kaynaklardan biri olan, işgücünün seçimidir.

Personel seçimi işletmeler için sürdürülebilirlik adına hayati önem taşımaktadır [1]. Farklı türdeki işlerin ifa edilebilmesi için ise çeşitli kriterler ile ölçülebilecek farklı becerilere sahip işgücüne ihtiyaç duyulmaktadır [2]. Literatür incelendiğinde personel seçimi için çeşitli ÇKKV tekniklerinin kullanıldığı görülmekle birlikte (bknz. Tablo 1) bu teknikler arasında PROMETHEE'nin de kullanıldığı çalışmalara rastlanmaktadır. Bu çalışmalar içinde dış pazarlama yöneticisi seçimi [2, 3], bilişim sektörü çalışanı seçimi [1], tekstil sektöründe çalışacak makine operatörü seçimi [4], proje yöneticisi seçimi [5], satış danışmanı seçimi [6],

durumuna göre Analitik Hiyerarşi Prosesi (AHP) ya da Analitik Ağ Prosesi (AAP/ANP) kullanılarak daha sistematik bir istihdam süreci sağlanabilir. Ayrıca diğer ÇKKV teknikleri ile karşılaştırma yapılarak farklı sonuçlar çıkması hâlinde ilgili işletmenin İK yöneticiler ile durum tartışılabilir.

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Bölüm 9

SWARA Tekniği ve Bir Üretim İşletmesi Uygulaması

Engin Çakır

GİRİŞ

Çok kriterli karar verme yöntemleri arasında yer alan SWARA tekniği, “Adım Adım Ağırlık Değerlendirme Oran Analizi” olarak birçok çalışmada Türkçe karşılık bulmuştur. İlk kez Keršulienė, Zavadskas ve Turskis (2010) [1] tarafından geliştirilen teknik, karar vericilere çevresel ve ekonomik durumları da dikkate alarak, kendi önceliklerini seçme konusunda fırsatlar sunmaktadır.

SWARA tekniği ile ilgili literatür incelendiğinde, birçok problemin çözümünde kullanıldığını görmek mümkündür. Tablo 1’de SWARA tekniğinin uygulandığı bazı çalışmalara yer verilmiştir.

Tablo 20. SWARA Yöntemi Literatür İncelemesi

Kaynak	SWARA ile Çözüm
[1] Keršulienė ve diğerleri, 2010	Uyuşmazlık çözümü
[2] Keršulienė ve Turskis, 2011	Mimar seçimi
[3] Hashemkhani Zolfani, Esfahani, Bitarafan, Zavadskas ve Arefi, 2013	Optimal mekanik havalandırma alternatifinin seçimi
[4] Alimardani, Hashemkhani Zolfani, Aghdaie ve Tamošaitienė, 2013	Tedarikçi seçimi
[5] Hashemkhani Zolfani, Zavadskas ve Turskis, 2013	Ürün dizaynı
[6] Aghdaie, Hashemkhani Zolfani ve Zavadskas, 2013	Makine parçası seçimi
[7] Hashemkhani Zolfani ve Saparauskas, 2013	Enerjide sürdürülebilirliği değerlendirme göstergeleri

Tablo 7’de yer alan kriter ağırlıkları iki karar verici için ayrı ayrı hesaplanmıştır. İki karar vericinin kriterler düzeyindeki ağırlıklarının ağırlıklandırılmış aritmetik ortalaması alınarak grup kararı alınabilmektedir. Bu çalışmada iki karar vericinin eşit önemde olduğu kabul edildiğinden kriter ağırlıklarının aritmetik ortalaması alınmıştır. Hesaplanan grup kararı sonucu nihai kriter ağırlıklarına Tablo 8 ‘de yer verilmiştir.

Tablo 27. Grup Kararı ile Elde Edilen Kriter Ağırlıkları

Kriterler	KV1	KV2	Grup Kararı	
	w_{1j}	w_{2j}	w_j	
C1	$w_{11} = 0,2613$	$w_{21} = 0,1735$	$w_1 = \frac{w_{11} + w_{21}}{2} = \frac{0,2613 + 0,1735}{2}$	$= 0,2174$
C2	$w_{12} = 0,1490$	$w_{22} = 0,2516$	$w_2 = \frac{w_{12} + w_{22}}{2} = \frac{0,1490 + 0,2516}{2}$	$= 0,2003$
C3	$w_{13} = 0,0636$	$w_{23} = 0,1055$	$w_3 = \frac{w_{13} + w_{23}}{2} = \frac{0,0606 + 0,1055}{2}$	$= 0,0846$
C4	$w_{14} = 0,1241$	$w_{24} = 0,0844$	$w_4 = \frac{w_{14} + w_{24}}{2} = \frac{0,1241 + 0,0844}{2}$	$= 0,1043$
C5	$w_{15} = 0,0955$	$w_{25} = 0,1510$	$w_5 = \frac{w_{15} + w_{25}}{2} = \frac{0,0955 + 0,1510}{2}$	$= 0,1233$
C6	$w_{16} = 0,0606$	$w_{26} = 0,0365$	$w_6 = \frac{w_{16} + w_{26}}{2} = \frac{0,0606 + 0,0365}{2}$	$= 0,0486$
C7	$w_{17} = 0,0449$	$w_{27} = 0,0603$	$w_7 = \frac{w_{17} + w_{27}}{2} = \frac{0,0449 + 0,0603}{2}$	$= 0,0526$
C8	$w_{18} = 0,2010$	$w_{28} = 0,1372$	$w_8 = \frac{w_{18} + w_{28}}{2} = \frac{0,2010 + 0,1372}{2}$	$= 0,1691$
Toplam			$\sum_{j=1}^n w_j = 1,0000$	

Grup kararı ile elde edilen nihai kriter ağırlıklarına göre en önemli kriterin %21,74 ağırlık değeriyle “C1 - Aflatoksin Varlığı” kriteri olduğu; diğerlerine göre önemsiz görülen kriterin %4,86 ağırlık değeriyle “C5 - Kontinü Sistem ile Çalışılmaması” kriteri olduğu sonucuna ulaşılmıştır.

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Bölüm 10

TOPSIS Tekniđi ve Pazarlama Alanında Bir Uygulama

Serhat Karaođlan

GİRİŞ

TOPSIS tekniđi (Technique for Order Preference by Similarity to an Ideal Solution) seçilmesi gereken alternatifin Pozitif İdeal Çözümüne (PIS - Positive Ideal Solution) en yakın ve Negatif İdeal Çözümüne (NIS - Negative Ideal Solution) en uzak mesafe temeline dayanarak Yoon ve Hwang tarafından 1980 yılında geliştirilmiştir [1]. Bu teknik kullanılırken alternatifler en iyi çözüme en yakın ve en kötü çözüme en uzak öklidyen mesafede bulunması temelinde sıralanmaktadır [2]. TOPSIS, ideal çözüme görelî yakınlığı dikkate alarak hem ideal hem de negatif ideal çözümlere olan mesafeleri aynı anda değerlendiren pratik ve kullanışlı bir tekniktir [3,4]. Tekniđin üstün yanları ölçülebilir olması gereken alternatiflerin birbirlerinden bağımsız olmasının gerekmeyişi, performans ölçütlerinin çift yönlü olarak ele alınabilmesi, pozitif ve negatif değerlerin hesaba katılabilmesi ve mantığı temsil edebilmesi ile yapılan hesaplamaların kolay olmasıdır [3,5,6]. İlk olarak alternatifler arasından en iyisini seçebilmek amacıyla kullanılmasına karşılık [7] sayılan sebeplerle geniş kullanım alanı bulmuş ve en sık kullanılan çok kriterli karar verme tekniklerinden birisi hâline gelmiştir [8]. Şekil 1’de TOPSIS tekniđinin çalışma prensibi verilmektedir [6].

TOPSIS tekniđinin kullanım alanı bulduđu disiplinlerden birisi de pazarlamadır. Yükseköğretim [9] ve bankacılık [10] gibi sektörlerde hizmet kalitesinin ölçümü ve boyutlarının değerlendirilmesi, pazarlama yönetimine destek olması amacıyla reklam stratejilerinin belirlenmesi [11] ve kampanya performansının değerlendirilmesi [12], dijital pazarlama kapsamında otel web sitelerinin [13] ve dijital içerik bileşenlerinin değerlendirilmesi [14], tüketici istek ve ihtiyaçlarına göre ürün tasarımı yapılması [15] ve yeni geliştirilecek olan ürünün risklerinin

Böylelikle de pazarlama uygulamalarının etkisini ölçmek için karşılaştırmalı analizler yapılabilir.

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Bölüm 11

VIKOR Tekniđi ve Finansal Performans Üzerine RStudio Uygulaması

Özgür Engelođlu

GİRİŞ

Çok kriterli karar verme (ÇKKV), hem nicel hem de nitel faktörleri içeren karmaşık bir karar verme aracı olarak kabul edilmektedir. Yıllar içerisinde optimal alternatifleri seçmek için çeşitli ÇKKV teknikleri ve yaklaşımları önerilmiştir [1]. Bu tekniklerin en önemlilerinden bir tanesi, aynı zamanda bu çalışmanın odaklandığı VIKOR tekniđidir.

Tüm ÇKKV teknikleri gibi belirli kriterler ışığında en iyi alternatifleri belirlemeye çalışan VIKOR tekniđi, kendisini diğer tekniklerden farklılaştıran çeşitli özelliklere sahiptir. Dolayısıyla VIKOR, ÇKKV teknikleri aracılığıyla çalışma yapmak isteyenler için dikkate alınması gereken başlıca tekniklerden bir tanesidir. Opricovic (1998) [2] ve Opricovic & Tzeng (2004) [3] çalışmalarıyla temelleri atılan teknik, günümüzde çok sayıda çalışmada ve birbirinden farklı alanlardaki karar alma süreçlerinde tercih edilmektedir. Birbirinden farklı, çok sayıda ÇKKV tekniđini inceleyen bu kitapta, doğal olarak incelenen tekniklerden bir tanesi de VIKOR tekniđidir. Bu bölümde VIKOR tekniđi ve süreci hem teorik olarak ele alınmış hem de finans üzerine bir uygulama yapılmıştır.

Çalışmada ilk olarak VIKOR tekniđinin prensipleri üzerinde durulmuş ve aşama aşama VIKOR skoru hesaplama süreçleri anlatılmıştır. Takip eden kısımda, incelenecek konudan bahsedilmiş ve ele alınan alternatifler ile kriterler listelenmiştir. Burada ayrıca incelenen konu üzerine daha önce yapılmış çalışmalara da değinilmiş ve bu çalışmalarda kullanılan teknikler ile elde edilen sonuçlar özetlenmiştir. Sonraki kısımda uygulama gerçekleştirilmiş olup, RStudio programı kullanılarak yapılan uygulamanın aşamaları detaylı olarak gösterilmiş ve

Bilişim sektöründeki firmaların finansal performansına yönelik yapılan ve ÇKKV tekniđinin kullanıldığı çok sayıda çalışma mevcuttur. Yapılan literatür taramasında bu çalışmalar içerisinde VIKOR tekniđini kullanan bir çalışmaya rastlanılmamıştır. Genelde, başta TOPSIS olmak üzere PROMETHEE ve Gri İlişkiyel Analiz tekniklerinin tercih edildiđi gözlenmiştir. Burada unutulmaması gereken önemli bir durum, tüm çalışmalarda elde edilen sıralamaların, belirlenen kriterler ışığında gerçekleştiđidir. Farklı kriterlerin tercihi ile farklı şekilde sonuçların gerçekleşmesi mümkündür. Bununla birlikte bu çalışmada kriterler yani finansal oranlar, sektörün yapısı dikkate alınarak belirlenmiştir. Hizmet ağırlıklı bir sektör olan ve genellikle yazılım üzerine faaliyet gösteren firmaların yer aldığı bilişim sektöründe işler, genel olarak kamu ve kamu dışı kurumlarla yapılan sözleşmeler aracılığıyla yürütülmektedir. Dolayısıyla alacakların tahsil performansının, bu firmalar için önemli olduđu düşünölmüştür. İşletmelerin temel amacının kâr elde etmek olduđu gerçeğinden hareketle, birden fazla kâr oranı yine kriter olarak belirlenmiştir. Yine firmaların likidite ve borçluluk durumları da kriter olarak dikkate alınmıştır.

2021 yıl sonu verileri kullanılarak yapılan analiz sonucunda, VIKOR tekniđine göre uzlaşık çözüm grubunu MIATK, PAPIL ve LINK firmaları oluşturmuştur. Bu sonuç, diđer tekniklerle aynı sektör üzerine ölçüm yapan ve yakın dönemi inceleyen çalışmalarda benzerlik arz etmektedir. VIKOR tekniđinin önemli bir özelliđi de sıralamayı belirleyen VIKOR skorlarına göre en iyi çözümün hangisi olduđunu ilan etmeden önce, bazı koşulları test etmeyi zorunlu kılmasıdır. Bu koşullara göre uzlaşık çözümün tek bir alternatif olması yerine birden fazla alternatiften oluşan bir grup şeklinde olması mümkündür. Nitekim çalışmada bu koşullar test edildiğinde, uzlaşık çözümün tek bir firma açısından gerçekleşmediđi ve üç firmanın birlikte uzlaşık çözüm grubunu oluşturduđu tespit edilmiştir.

Alternatifleri sıralarken, alternatifler arasındaki skor farklılıklarının da dikkate alınması ve fayda-maliyet özelliklerine göre ölçeklendirme yapılabilmesinin yanı sıra uygulama kolaylıđı da düşünöldüğünde, VIKOR tekniđinin, ÇKKV uygulamalarında kullanmak için ideal bir teknik olduđu söylenebilir.

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Ek 1. Karar Matrisi, Biliřim Firmalarının 2021 Yıl sonu Finansal Oranları

Firma	CO	HBK	PD/DD	NS	ROA	ROE	ADH	KO
ALCTL	3.59	1.34	1.16	14.55	3.68	6.53	2.11	43.58
ARDYZ	5.53	0.89	3.84	122.21	41.87	46.58	2.40	10.11
ARENA	1.26	0.67	1.60	18.97	1.69	8.24	2.71	79.47
ARMDA	1.71	-0.61	2.36	47.73	-0.46	-2.39	1.80	80.20
DGATE	1.64	1.75	2.03	11.37	8.70	31.15	4.92	60.29
DESPC	1.53	1.81	1.50	17.63	10.44	29.84	2.75	65.01
ESCOM	2.86	2.03	1.56	-46.78	51.43	52.21	0.18	1.49
FONET	2.72	0.94	3.91	31.67	19.67	28.42	2.01	30.80
INDES	1.17	1.95	1.57	27.66	6.29	46.09	3.68	84.28
KFEIN	1.50	0.86	2.24	54.14	5.63	10.09	2.74	40.09
KAREL	1.54	0.33	4.16	60.68	3.41	11.66	2.56	70.73
LINK	7.64	2.40	4.49	13.85	32.54	38.53	3.30	15.55
LOGO	1.07	2.77	5.48	40.68	15.34	36.53	2.30	53.89
MTRKS	1.46	0.97	10.79	45.56	31.61	51.16	19.43	38.45
NETAS	0.84	-10.34	29.69	32.49	-18.28	-1815.71	1.70	99.03
PAPIL	12.64	0.72	4.57	9.88	19.78	21.56	2.61	8.25
PENTA	1.55	-0.44	17.85	34.54	-0.73	-1.98	3.85	63.26
PKART	2.06	0.82	5.34	30.88	12.71	22.22	12.52	42.81
SMART	1.38	0.12	2.58	33.68	4.09	5.53	1.80	26.14
ATATP	2.71	1.79	7.85	17.94	14.59	23.37	1.24	34.53
EDATA	3.82	1.16	5.27	20.59	23.52	31.19	2.54	24.58
KRONT	1.44	2.46	6.65	58.27	22.18	43.74	1.30	49.30
MANAS	2.60	0.21	2.78	78.52	2.61	3.54	2.00	26.34
MIATK	2.67	1.43	5.34	89.87	18.01	22.06	2.97	18.35
MOBTL	1.06	0.62	0.90	33.38	18.87	34.74	3.20	43.88
VBTYZ	1.49	1.31	3.93	52.68	9.97	24.50	10.59	59.31

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İÇİNDEKİLER

Mizahı Üretmek.....	1
Matematikçiler Büyük Komedi Yazarları mıdır?	15
Komiği Yaratmak İçin Kişisel Acınıza Gidin.....	21
Mizah Ağlatır	41
Tüm Başarılı Komediler Karakterleri İle Hatırlanır	49
Komedi-Zaman ve Kültür.....	57
Komedi mi? Mizah mı? Peki ya Gülme?	69
Mizahın İşlevleri.....	89
Mizah ve Sağlık.....	103
Komedide Dil.....	115
Komiğin Matematiği.....	145
Kim Bu Komedi Yazarları?	163
Komik Etki Yaratmak	171
Mizahın Kurulumu ve Yaratıcılık	179
Komedi Bir Oyundur	187
Mizah Teorileri	197
Üstünlük Teorisi	199
Uyuumsuzluk Teorisi.....	211
Rahatlama Kuramı	225
Zararsız İhlal Kuramı.....	227
Duygu Karmaşası Kuramı	228
Sosyal Kuram	229
Yoldan Çıkarıcı Mizah Kuramı	230

Kavrama Kuramı.....	231
Derleyici Motivasyon Kuramı.....	231
Dil Bilimsel Kuram	231
Tek Yönlü Mizah Kuramı.....	231
Anlam Bilimsel (Semantik) Kuram	232
Derleyici Motivasyon Kuramı.....	232
Sözel Mizah Kuramı.....	233
İzleyiciye Dayalı Sözel Mizah Kuramı	233
Offensive (Savumacı Mizah).....	233
Kuantum Mizah Kuramı.....	234
Kavramsal Sanat ve Mizah	239
Komedinin Tarihi mi? İnsanlığın Tarihi mi?	255
Bu Kadar Komik Olan Şey Nedir?	285
Kaynaklar.....	289

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İÇİNDEKİLER

ÖN SÖZ	xiii
BİRİNCİ BÖLÜM - ANADOLU'NUN FELSEFE MİRASI	1
1. DÜŞÜNCEDE DÖNÜŞÜM	2
Kozmolojiden Ontolojiye Dönüşüm	2
Suyun Canlılığı	4
Sınırsızlığın Belirlenimi	4
Havanın Dönüşümleri	5
Aristoteles'te <i>Arkhe</i>	5
Bilgi ve Sanatta Dönüşüm	7
Bilginin Birikimi	8
2. ANADOLU'DA FELSEFİ BİLGELİĞİN KÖKENLERİ	9
Thales: Milet'te Başlayan Bilgelik	9
Hellen Bilgeliğinin Öne Çıkarılışı	12
Yunan Felsefesinden Önce Anadolu'da Doğan Bilgelik	14
3. MAVİ ANADOLU, FELSEFİ MİRAS VE ÖNEMİ	22
Anadolu'da İyon Uygarlığı ve Etkileri	22
Anadolu'da Felsefe	25
4. <i>PARRHESİA</i> KAVRAMI VE ANADOLU'DAKİ KÖKENLERİ	34
Anaksagoras'ın Euripides Üzerindeki Etkisi	37

5. ANAKSİMANDROS DÜŞÜNCESİNDE <i>ÁPEIRON</i> VE TANRISAL OLAN İLİŞKİSİ	41
Miletos Filozofları ve Düşüncede Yeni Bir Yol	41
Anaksimandros'un <i>Ápeiron</i> 'u Belirlemesi	42
<i>Ápeiron</i> 'un Özellikleri	44
<i>Ápeiron</i> ve Tanrısallık İlişkisi	45
6. FELSEFEDE, SANATTA VE POLİTİKADA ANAKSAGORAS	49
Felsefede Anaksagoras	49
Sanatta Anaksagoras	51
Politikada Anaksagoras	53
7. ANADOLU'NUN FELSEFE MİRASI	55
Kolofonlu Ksenophanes	56
Hierapolisli Epiktetos	58
Sinoplu Diogenes	60
Samsatlı Lukianos	60
Tarsuslu Khryssippos	61
8. MACİT GÖKBERK DÜŞÜNCESİNDE BATI ANADOLU FELSEFESİNİN DEĞERİ	63
Batı Anadolu Felsefe Geleneği ve Önemi	63
Batı Anadolu'daki Filozoflar	66
İKİNCİ BÖLÜM - ORTA ASYA TÜRK DÜŞÜNCESİNDE FELSEFE MİRASI	71
9. HOCA AHMED YESEVİ İLE DÜNYA PROBLEMLERİ ÜZERİNE DÜŞÜNMEK.....	72
Sahip Olmak ve Olmak	72
Hoca Ahmed Yesevi, <i>Fakr-Name</i> ve <i>Divan-ı Hikmet</i>	74
10. <i>KUTADGU BİLİĞİ</i> FELSEFİ AÇIDAN YENİDEN ANLAMAK	80
<i>Kutadgu Bilig</i> 'de Felsefi Tartışmalar	82
Adalet ve Doğru Yasa	83
Bilgi ve Akıl	85
Diğer Felsefi Konular	86
11. 21. YÜZYILDA <i>KUTADGU BİLİĞİ</i> YENİDEN ANLAMAK	90
İnsan, Mutluluk ve Adalet	92

12. KUTADGU BİLİG'DE İNSAN VE DEĞERLER	97
<i>Kutadgu Bilig</i> 'de İnsanın Değeri	100
<i>Kutadgu Bilig</i> 'de İnsanın Değerleri	102
13. TÜRK FELSEFESİNİN DOĞUŞU	105
<i>Kutadgu Bilig</i> : İnsanın Kendini Tanımalarının Bilgisi	105
<i>Kutadgu Bilig</i> 'de Dört Karakter ve Dört Değer	107
<i>Kutadgu Bilig</i> 'de İnsan Gerçekliği	107
14. BİR UYGARLIK ESERİ OLARAK <i>KUTADGU BİLİG</i>	110
Avrupa Merkezci Uygarlık Anlayışı ve Eleştirisi	110
Bilgelik Yapıtı Olarak <i>Kutadgu Bilig</i>	112
ÜÇÜNCÜ BÖLÜM - CUMHURİYET DÖNEMİNDE FELSEFE MİRASI	117
15. ATATÜRK VE CUMHURİYETİN FELSEFESİ	118
Çağdaşlaşmanın Ön Koşulu: Laiklik	119
Eğitim ve Kültür Devrimi Olarak Cumhuriyet	122
Çağdaş Türk Düşünürlerinde Dönüm Noktası Olarak Cumhuriyet	123
16. ZİYA GÖKALP'İ YENİDEN ANLAMAK	126
Üç Felsefi Vasiyet	126
"Yeni Hayat" İdeali	129
17. DÖNÜŞÜMDE HASAN-ÂLİ YÜCEL MİRASI	132
18. HASAN-ÂLİ YÜCEL VE İÇTEN-DIŞTAN	138
"Özü olanın izi olur"	138
"En güç ilim, şüphe edebilmesini öğrenmektir"	140
19. EĞİTİM DÜŞÜNÜRÜ: HASAN-ÂLİ YÜCEL	143
Canan Yücel'in Anlatımıyla Hasan-Âli Yücel	143
Kendi Kaleminden Hasan-Âli Yücel	147
Eğitim ve Kültür Alanında Dönüşümler	151
20. HİLMİ ZİYA ÜLKEN'DE MİLLÎ BİRLİK DÜŞÜNCESİNİN TEMELİ OLARAK VATAN	158
Hilmi Ziya Ülken Kimdir?	159

Millet ve Vatan Kavramları.....	163
İnsani Vatandaşlık.....	165
21. GEZGİN BİR FİLOZOF: ULUĞ NUTKU.....	169
Felsefe ve Dünya Görüşü Kavramları	169
Felsefe Tarihine Bakış.....	171
İnsan Üzerine.....	174
22. VEHBİ HACIKADİROĞLU DÜŞÜNÇESİNDE EĞİTİM.....	176
Eğitim ve İş Birliği	177
Atatürk ve <i>Üniversite Reformu</i>	180
23. VICTOR HUGO'NUN SEFİLLER ROMANI VE TAKİYETTİN MENGÜŞOĞLU'NUN FELSEFİ ANTROPOLOJİSİ	184
<i>Sefiller</i> Romanında İnsan Doğası Tartışması.....	186
Ontolojik Temelli İnsan Felsefesi Açısından <i>Sefiller</i>	191
24. GEÇMİŞİNİ BEKLEYEN İNSANLIK DURUMU.....	198
Geçmişin Tekrarı ve Mengüşoğlu.....	202
25. BİR EĞİTİM FİLOZOFU: TAKİYETTİN MENGÜŞOĞLU	204
Esas baktığı yer insan varlığıdır	205
“Eğitim öğütlerle sağlanamaz”.....	206
26. TÜRK DÜŞÜNÇESİNDE HÜMANİZM TARTIŞMASINA KISA BİR GİRİŞ	208
<i>Hümanizm</i> Düşüncesinde Tercümenin Rolü.....	208
Ahmet Mithat Efendi ve Klasiklere Dönüş	209
Türk Düşüncesinde <i>Nev-Yunanilik</i>	211
<i>Yücel</i> Dergisi	213
Hilmi Ziya Ülken ve <i>Hümanizm</i>	215
Hasan-Âli Yücel ve <i>Hümanizm</i> Düşüncesinin Yükselişi	217
GENEL KAYNAKÇA.....	221
DİZİN	237

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İçindekiler

Ön Söz	iii
Giriş.....	1
19. Yüzyıl Osmanlı Demokratikleşme Hareketleri.....	7
Abdülhamid İktidarına Karşı Tepkiler	21
Meşrutiyet'ten Beklentiler	43
İttihad ve Terakki Cemiyeti Üyelerinin Faaliyetleri ve Siyasi İlişkileri	63
İttihad ve Terakki Cemiyetinin Etki Alanı	79
31 Mart İsyanı ve İsyana İlgili Nazariyeler	101
31 Mart İsyanında Taraflar	109
II. Meşrutiyet'in İlanı ve 31 Mart Sürecinde Balkan Etkisi ..	119
Hareket Ordusunun Mahiyeti.....	141
Cemiyete Muhalefet ve İsyanı Tetikleyen Vakalar	153
İsyana Süreci ve Sonrası.....	173
31 Mart Sürecine Tesiri Olan Basın-Yayın Organları ve Propaganda.....	187
Sonuç.....	213
Kaynakça	217
Ekler	231
İndeks	239



Kaynakça

Devlet Arşivleri Osmanlı Arşiv Vesikaları (BOA)

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TÜRKİYE'NİN BİRİNCİ VE İKİNCİ 500 BÜYÜK
SANAYİ KURULUŐU ÖRNEĐİ

Dr. Őerife Kuzgun



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İÇİNDEKİLER

ÖN SÖZ	iii
ŞEKİL LİSTESİ	ix
TABLO LİSTESİ	xi
1. GİRİŞ.....	1
2. ÖRGÜTSEL DAYANIKLILIK KAPASİTESİ, YEŞİL YENİLİK, ALGILANAN YEŞİL ÖRGÜTSEL DAVRANIŞ, ÇEVRESEL BELİRSİZLİK ve SÜRDÜRÜLEBİLİRLİK PERFORMANSI KAVRAMSAL YAKLAŞIM.....	5
2.1. Dayanıklılık Kavramı.....	5
2.1.2. Örgütsel Dayanıklılık Kapasitesi Kavramı	7
2.1.3. Örgütsel Dayanıklılığın Özellikleri	11
2.1.4. Örgütsel Dayanıklılığın Boyutları	18
2.1.4.1. Bilişsel Dayanıklılık	18
2.1.4.2. Davranışsal Dayanıklılık	20
2.1.4.3. Bağlamsal Dayanıklılık.....	21
2.1.5. Örgütsel Dayanıklılık Yaklaşımları.....	23
2.1.5.1. Davranışsal Yaklaşım.....	23
2.1.5.2. Anlamlandırma Yaklaşımı.....	23
2.1.5.3. Yenilenme Süreci Yaklaşımı	24
2.1.5.4. Risk Yönetimi Yaklaşımı.....	24
2.1.5.5. Sistem Yaklaşımı	24
2.1.6. Dayanıklılık İle İlişkili Kavramlar.....	25
2.1.6.1. Esneklik.....	25
2.1.6.2. Adaptasyon	26
2.1.6.3. Çeviklik	27
2.2. Yenilik Kavramı ve Önemi.....	28
2.2.1. Yeşil Yenilik.....	31
2.2.2. Yeşil Yenilik Kapsamı ve Boyutları	40

2.2.2.1. Yeşil Süreç Yeniliği	41
2.2.2.2. Yeşil Ürün Yeniliği	43
2.3. Algılanan Yeşil Örgütsel Davranış ve Önemi.....	44
2.3.1. Algılanan Yeşil Örgütsel Davranışın Özellikleri	48
2.3.2. Algılanan Yeşil Örgütsel Davranışın Boyutları	54
2.4. Sürdürülebilirlik Kavramı.....	57
2.4.1. Sürdürülebilir Kalkınma	59
2.4.2. Kurumsal Sürdürülebilirlik.....	63
2.4.2.1. Kurumsal Sürdürülebilirliğin Ana Bileşenleri	67
2.4.2.1.1. Çevresel Sürdürülebilirlik.....	67
2.4.2.1.2. Sosyal Sürdürülebilirlik	69
2.4.2.1.3. Ekonomik Sürdürülebilirlik	69
2.4.3. Kurumsal Sürdürülebilirlik Performansı Göstergeleri.....	70
2.4.3.1. Küresel Raporlama Girişimi (GRI).....	71
2.4.3.2. Dow Jones Sürdürülebilirlik Endeksi (DJSI).....	72
2.4.3.3. ISO 14000 Çevre Yönetim Sistemi.....	74
2.4.3.4. SA 8000 Sosyal Sorumluluk Standardı	74
3. HİPOTEZ GELİŞTİRME.....	77
3.1. Örgütsel Dayanıklılık Kapasitesi ve Yeşil Yenilik İlişkisi	77
3.2. Algılanan Yeşil Örgütsel Davranış ve Yeşil Yenilik İlişkisi	80
3.3. Yeşil Yenilik ve Sürdürülebilirlik Performansı İlişkisi.....	82
3.4. Örgütsel Dayanıklılık Kapasitesi ve Sürdürülebilirlik Performansı İlişkisi.....	84
3.5. Algılanan Yeşil Örgütsel Davranış ve Sürdürülebilirlik Performansı İlişkisi	87
3.6. Çevresel Belirsizliğin Moderatör (Düzenleyici) Etkisi.....	90
3.6.1. Çevresel Belirsizliğin Yeşil Yenilik İle Sürdürülebilirlik Performansı Arasındaki Moderatör Etkisi.....	91
3.6.2. Çevresel Belirsizliğin Örgütsel Dayanıklılık Kapasitesi İle Yeşil Yenilik Arasındaki Moderatör Etkisi	93
4. ÖRGÜTSEL DAYANIKLILIK KAPASİTESİ, YEŞİL YENİLİK, ALGILANAN YEŞİL ÖRGÜTSEL DAVRANIŞ, ÇEVRESEL BELİRSİZLİK ve SÜRDÜRÜLEBİLİRLİK PERFORMANSI ARASINDAKİ İLİŞKİLER.....	97
4.1. Araştırmanın Amacı ve Kapsamı	97
4.2. Araştırmanın Metodolojisi	98
4.2.1. Araştırmada Kullanılan Ölçekler	98

4.2.2. Ölçeklerin Ön Testi	99
4.2.3. Araştırmanın Evreni ve Örnekleme.....	100
4.2.4. Araştırmanın Kısıtları.....	101
4.3. Analiz ve Bulgular.....	102
4.3.1. Demografik Özellikler	102
4.3.2. Korelasyon Analizi.....	104
4.3.3. Ölçeklerin Açıklayıcı ve Doğrulayıcı Faktör Analizleri, Güvenilirlik ve Geçerlilik Analizleri	105
4.3.4. Araştırma Hipotezlerinin Testi.....	110
4.3.5. Moderatör Değişken Etkisinin İncelenmesi	112
4.3.6. Araştırma Bulgularının Tartışılması	116
5. SONUÇ VE ÖNERİLER.....	123
6. KAYNAKÇA.....	133
7. EKLER.....	167

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DİJİTAL MEDYA EKSENİNDE NOSTALJİ VE TOPLUMSAL BELLEK

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İÇİNDEKİLER

ÖN SÖZ iii

**YOUTUBE'DA ERKEKLİK NOSTALJİSİ: SÜPER BABA
(1993-1997) DİZİSİ ÖRNEĞİ..... 1**

Özlem Akkaya

**TOPLUMSAL BELLEK VE YENİ MEDYA: DİJİTALLEŞEN
HAFIZA MEKÂNLARI 37**

Fatma Esra Öztürk

**YENİ MEDYA TEKNOLOJİLERİ BAĞLAMINDA DEĞİŞEN
MÜZECİLİK, KÜLTÜREL BELLEK İNŞASI: KATAR İSLAM
SANATLARI MÜZESİ ÖRNEĞİ 75**

Oytun Doğan

**KÜLTÜREL HAFIZA VE NOSTALJİ BAĞLAMINDA TÜRK
YAHUDİ TOPLULUĞUNUN DİJİTAL BASINDA TEMSİLİ ..127**

Çağla Coşar

**KÜLTÜREL MİRASIN DİJİTALLEŞTİRİLMESİ VE
KARİKATÜRLE KÜLTÜREL BELLEĞİN AKTARIMI: GOBAU
DİJİTAL ARŞİVİ ÖRNEĞİ..... 167**

Türkay Türkan Ünlü

YOUTUBE'DA ERKEKLİK NOSTALJİSİ: SÜPER BABA (1993-1997) DİZİSİ ÖRNEĞİ

Özlem Akkaya¹

GİRİŞ: Nostaljinin “İki Yüzlü” Doğası

Yunanca *nostos* (ev) ve *algia* (özlem) sözcüklerinden türeyen nostalji, sözlük anlamıyla yitirilmiş, geride bırakılmış eve duyulan özlemi ifade eder. Ancak bu anlam zamanla genişlemiş ve nostalji bugün “geri getirilemeyeceği bilindiği hâlde aranan bir şeyi özleme durumu”nu (Cook, 2005, s. 2) anlatır hâlde gelmiştir. Bu yönüyle nostalji, bireyin değişen dünyayla kendi hafızası arasında kurduğu rabıtayı açıkça gözlemleyebileceğimiz duygusal ve düşünsel bir tutumdur.

Barney'e (2009, s. 137) göre nostalji genellikle büyük krizleri ve radikal toplumsal dönüşümleri takip eden huzursuzluk ve kayıp hissine gösterilen bir tepkidir. Hewison (1987, s. 47) da nostaljinin bir krizle baş etme mekanizması olduğunu söyler, başka bir deyişle nostalji, birliktelik bilincini tam da dağılmaya yüz tuttuğu koşullar altında güçlendirerek toplumsal

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TOPLUMSAL BELLEK VE YENİ MEDYA: DİJİTALLEŞEN HAFIZA MEKÂNLARI

Fatma Esra Öztürk¹

GİRİŞ

Toplumsal bellek kavramı, bir topluluğun ortak bir geçmiş anlatısını, hatıralarını ve deneyimlerini ifade eder. Geçmişle bir köprü kuran toplumsal belleğin, geleceğe yönelik kurucu bir niteliği de bulunur. Geçmişle ilişkili olan toplumsal belleğin oluşması noktasında geçmişini deneyimlemiş olma zorunluluğu bulunmamakta, geçmişin bilgisine sahip olma ve geçmişini hatırlama önem kazanmaktadır. Halbwachs'ın (2017) temel argümanına göre, kişisel hayatımız ve anılarımız bireysel belleğimizi oluştursa da hatırlama, toplumsal çerçevelerle şekillenmekte, dolayısıyla bellek toplumsal olarak tanımlanmaktadır.

Bireysel ve toplumsal olarak hatırlama/unutma biçimlerini inceleyen bununla birlikte, bugün geçmişin yeniden inşa edilme talebinin arka planında yer alan gerekçeleri ve ideolojik

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YENİ MEDYA TEKNOLOJİLERİ BAĞLAMINDA DEĞİŞEN MÜZECİLİK, KÜLTÜREL BELLEK İNŞASI: KATAR İSLAM SANATLARI MÜZESİ ÖRNEĞİ

Oytun Doğan¹

GİRİŞ

Müze, Aydınlanma Çağı ile birlikte Batı modernliğinin simge yapılarından biri olarak hafıza ve bellek inşa eden bir kurum olmuştur. Geçmiş gösteren ve gelecek tasavvurunun yapıldığı bir mekân olması, bunun temel nedenidir. Aydınlanma Çağı'nda müze, ülkeye bağlı vatandaşlığın oluşumunda etkili bir aygıt dönüşmüştür. Millî devlet inşasında ulusun ortak referanslara ihtiyaç duyması, müzenin de bu minvalde referans sağlayan bir mekân olmasını sağlamıştır. Bunda iktidarın müzeyi bir medya aygıtı olarak kullanması etkilidir. Bunun temel sebebi 19. ve 20. yüzyılda kamusal alanda gösterimi yapılan görsel kültürel üretimlerin ulus bilincini şekillendir-

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KÜLTÜREL HAFIZA VE NOSTALJİ BAĞLAMINDA TÜRK YAHUDİ TOPLULUĞUNUN DİJİTAL BASINDA TEMSİLİ

Çağla Coşar¹

GİRİŞ

Bachelard (2014: 38), hafızayı “geçmişin tiyatrosu” olarak nitelendirmektedir. Bu metaforik tiyatronun modern toplumsal yapı tarafından bir anlam bulması için, geçmişin bu görüntülerinin törensel pratiklerle birlikte, dil aracılığı ile aktarılıp korunması önemlidir. Diaspora toplumlar için hatıraların yazıya dökülmesi o hatıraları daha etkileyici kılmaktadır (Boym, 2001).

Özellikle diaspora toplumların hafıza temsilleri ile kendi kültürlerini koruma çabalarında gazeteler, bir hafıza deposu olarak büyük bir önem taşımaktadır.

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KÜLTÜREL MİRASIN DİJİTALLEŞTİRİLMESİ VE KARİKATÜRLE KÜLTÜREL BELLEĞİN AKTARIMI: GOBAU DİJİTAL ARŞİVİ ÖRNEĞİ

Türkay Türkan Ünlü¹

GİRİŞ

Dijitalleşme ile şekillenen iletişim teknolojileri, özellikle ağ teknolojilerinin gelişimiyle birey ve toplumlarda bilginin oluşumunu, saklanması ve hatırlanmasını etkilemiştir. Bu dönüşümlerle değişen ve şekillenen bellek hem inşa sürecinde hem de saklanma ve aktarım sürecinde dijital teknolojilerden faydalanmaktadır. Dolayısıyla bellekle etkileşim kurma biçimlerimiz değişmektedir.

Kavram olarak bellek, Güngör'e (2015, s.61) göre bilgilerin depolandığı sabit bir alan yerine, aktif ve etkin bir işleyiş olarak açıklanan, öğrenilen ya da tecrübe edilen bir şeyin in-

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MİSAFİR İŞÇİLER İLE ÖZDEŞLEŞMİŞ İMAJLAR VE TOPLUMSAL BELLEKTE VARLIKLARI: *SEKSENLER* DİZİSİNDEKİ “ŞAHİN” ÖRNEĞİ

Ebru Han Kundakçı¹

GİRİŞ

Diaspora iki uçlu bir kavramdır. Milliyetçilik, vatanseverlik ve bağlılık ile ilişkilendirilirken, aynı zamanda uyumsuzluk, gericilik ve tutuculuk gibi olumsuz çağrışımlarda bulunabilmektedir. Ben, bir göçmen torunu olarak yaşamım boyunca diasporik anlarla iç içe büyüdüğümü söyleyebilirim. 70’li yıllarda her iki dedemin Almanya’ya misafir işçi olarak göç etmeleri, yalnızca onların yaşamını değil her iki ailenin kaderini değiştirmiştir. Çocukluğumdan bu yana Türkiye’de “Almancı”, Almanya’da ise “sınıftaki Türk kıızı” olmak, olumlu ve olumsuz derin etkiler bırakmıştır. Bu etkiler yetişkin bir

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- <https://www.youtube.com/watch?v=rnujLF9YjcU> (Erişim Tarihi: Mart 2023)
- <https://www.youtube.com/watch?v=hCfYi8XujP8&t=5451s> (Erişim Tarihi: Mart 2023)
- https://www.youtube.com/watch?v=H0_1Ft1DH0g&t=2493s (Erişim Tarihi: Mart 2023).

MEDYA BELLEĞİ VE KADIN: KADIN ARŞİVLERİNDEN YANSIYANLAR SERGİSİ

Semay Buket Şahin¹

GİRİŞ

Şimdiye kadar yapılan çeşitli kapsamlı araştırmalarda fotoğrafın sanattan gelen taklit yoluyla yansıtma doğası, kültür, öz-kimlik, tarihsel bilinç gibi konulara ilişkin araştırma konusu olmuştur. Azınlık kültürüne yönelik fotoğrafçılık pratiği metropol öz kimliğinin oluşumunda önem taşıırken, çağdaş fotoğrafçılık pratikleri de bireyleri nötr olarak biçimlendirme ve tarihsel vaka incelemelerinde yardımcı bir rol üstlenmektedir. İnsanların kendileri için inşa ettikleri tarihsel ve biyografik oluşumlarda da fotoğraf kayıtları, geçmişe ışık tutma yönünden somut bir yapıya sahiptirler. Fotoğraf imgeleri ve pratikleri, bir dizi kültürel ve politik olguyu basit bir şekilde yansıtan bir hakikatin içinde hareketsiz bir şekilde inşa etme eğiliminde olmuştur. Bu anlamda, Alan Sekula, Susan Sontag ve Gilbert Simondon'un kavramsallaştırmaları çerçevesinde

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İÇİNDEKİLER

ÖN SÖZ..... iii

1. BÖLÜM:

GİRİŞ.....1

1. Kavramsal Çerçeve3
2. Tarımsal atık yönetimiyle ilgili yasal çerçeve4
3. Atık yönetiminin temel prensipleri.....5
4. Önceki araştırmaların değerlendirilmesi8
5. Çalışmanın Kapsamı..... 12

2. BÖLÜM:

TOPRAKSIZ TARIM İLE DOMATES ÜRETİMİNDE ATIKLARIN TİPİ, MİKTARI VE DEĞERLENDİRME BİÇİMLERİ 15

1. Sera tipleri itibariyle atıkların tipi ve miktarları ve değerlendirme biçimleri.....24
2. İşletmecilik tipleri itibariyle atıkların tipi, miktarları ve değerlendirme biçimleri 26
3. Bölgeler ve iller itibariyle atıkların tipi, miktarları ve değerlendirme biçimleri 28
4. Domates üretimi ile bitkisel atık miktarı ilişkisi37

3. BÖLÜM:

EN UYGUN ATIK DEĞERLENDİRME BİÇİMİ VE BUNA GEÇİŞİN EKONOMİK ANALİZİ..... 39

1. İşletme düzeyinde bitkisel atıklardan kompost yapımının, hayvan yemi elde etmenin ve toprak düzenleyici üretiminin ekonomik yapılabilirliği 42
2. İl, bölge ve ulusal düzeyde bitkisel atıklardan kompost yapımının, hayvan yemi elde etmenin ve toprak düzenleyici üretiminin ekonomik yapılabilirliği52

4. BÖLÜM:

ÇEVRESEL ETKİNLİK DÜZEYİ VE ÇEVRESEL ETKİNLİK BELİRLEYİCİLERİ 67

1. Çevresel etkinlik belirleyicileri78
2. Çevresel etkinliği sağlamanın ve atık yönetiminin getirisi.....80

5.BÖLÜM:

DEĞERLENDİRME.....81

KAYNAKLAR..... 87

KAYNAKLAR

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Dr. Ahmet Ekrem Kaya



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İÇİNDEKİLER

ÖNSÖZ	iii
SİMGELER VE KISALTMALAR DİZİNİ	vii
GRAFİKLER DİZİNİ	xi
TABLolar DİZİNİ	xiii
1. GİRİŞ.....	1
2. PARA POLİTİKASI VE DÖVİZ PİYASASI BASKISI	5
2.1. Döviz Piyasası Baskısının Hesaplanması.....	13
2.2. Para Politikası ve Döviz Piyasası Baskısı İlişkisi: VAR Yaklaşımı.....	16
3. KRİZ MODELLERİ VE DÖVİZ PİYASASI BASKISINA İLİŞKİN AMPİRİK LİTERATÜR	45
3.1. Kriz Modelleri.....	45
3.1.1. Birinci Nesil Kriz Modelleri	45
3.1.2. İkinci Nesil Kriz Modelleri	50
3.1.3. Üçüncü Nesil Kriz Modelleri	55
3.2. Döviz Piyasası Baskısına İlişkin Ampirik Literatür.....	58
3.2.1 Türkiye Üzerine Yapılan Ampirik Çalışmalar	58
3.2.2 Doğu Avrupa Ülkeleri Üzerine Yapılan Ampirik Çalışmalar.....	66
3.2.3 Diğer Ülkeler Üzerine Yapılan Ampirik Çalışmalar	73
4. TÜRKİYE VE DOĞU AVRUPA ÜLKELERİ EKONOMİLERİ.....	89
4.1. Türkiye Ekonomisi ve Finansal Liberalizasyon Tarihi	89
4.2. Doğu Avrupa Ülkeleri Ekonomileri	98
5. DÖVİZ PİYASASI BASKISININ BELİRLEYİCİLERİ	103
5.1. Ekonometrik Model	103
5.2. Veriler.....	105

5.3. Metodoloji.....	106
5.3.1. Gecikmesi Dağıtılmış Otoregresif Model (Autoregressive Distributed Lag-ARDL).....	106
5.3.2. Doğrusal Olmayan Gecikmesi Dağıtılmış Otoregresif Model (Nonlinear Autoregressive Distributed Lag- NARDL)	108
5.4. Ampirik Sonuçlar	112
5.4.1. Türkiye.....	113
5.4.1.1. Birim Kök Testleri	113
5.4.1.2. ARDL Sınır Testi Sonuçları	114
5.4.1.3. NARDL Modeli Tahmin Sonuçları ve Tanılayıcı İstatistikler....	115
5.4.1.4. Hatemi-J (2012) Asimetrik Nedensellik Testi Sonuçları	119
5.4.2. Doğu Avrupa Ülkeleri.....	121
5.4.2.1. Birim Kök Testleri	121
5.4.2.2. ARDL Sınır Testi Sonuçları	123
5.4.2.3. NARDL Modeli Tahmin Sonuçları ve Tanılayıcı İstatistikler..	125
5.4.2.4. Hatemi-J (2012) Asimetrik Nedensellik Testi Sonuçları	132
5.4.3. Türkiye ve Doğu Avrupa Ülkeleri Karşılaştırması.....	136
6. SONUÇ	141
KAYNAKLAR.....	143

KAYNAKLAR

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DÜNYADA VE TÜRKİYE'DE EVLİLİK YAŞININ ARTIŞI: NEDENLER, MUHTEMEL SONUÇLAR VE POLİTİKA ÖNERİLERİ

Dr. Bilal Coşan



**Dünyada ve Türkiye’de Evlilik Yaşının Artışı:
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Dr. Bilal Coşan

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İÇİNDEKİLER

SUNUŞ	v
ÖN SÖZ	vii
TABLolar LİSTESİ.....	xiii
GRAFİKLER LİSTESİ	xv
ŞEKİLLER LİSTESİ	xvii
KISALTMALAR LİSTESİ.....	xix
GİRİŞ.....	1

BİRİNCİ BÖLÜM

AİLE VE EVLİLİK: KAVRAMSAL VE TEORİK ÇERÇEVE.....	5
1.1. Aile Kurumunun Kavramsal Zemini ve Aile Türleri.....	5
1.1.1. Geleneksel Geniş Aile	7
1.1.2. (Modern) Çekirdek Aile	8
1.1.3. Diğer Aile Türleri.....	9
1.1.4. Aileyi Bekleyen Güncel Riskler ve Aileye Karşı Oluşumlar	11
1.2. Evlilik Olgusu ve Türleri	14
1.2.1. Grup İçi Evlenme (Endogami) ve Grup Dışı Evlenme (Egzogami).....	16
1.2.2. Eş Sayısına Göre Evlilik Çeşitleri	18
1.2.3. Oturulan Yere, Otorite İlişkilerine ve Şecere İlişkilerine Göre Evlilikler	20
1.3. Aileye Yönelik Yaklaşımlar	22
1.3.1. Fonksiyonalist (İşlevsel) Yaklaşım.....	22
1.3.2. Çatışmacı Yaklaşım.....	24
1.3.3. Sembolik Etkileşimcilik.....	26
1.3.4. Feminist Teori.....	27
1.3.5. Rasyonel Seçim ve Mübadele Teorisi	29
1.3.6. Ekolojik Perspektif	31
1.3.7. Diğer Aile Teorileri.....	31

1.4. Eş Seçiminde Temel Yaklaşımlar ve Eş Seçimini Etkileyen Faktörler ...	33
1.4.1. Eş Seçiminde Temel Yaklaşımlar	33
1.4.1.1. Sosyal Mübadele Yaklaşımı	33
1.4.1.2. Filtre(leme) Yaklaşımı	34
1.4.1.3. Sosyobiyolojik Yaklaşım	34
1.4.1.4. Ortak ve Zıt Özellikler Yaklaşımı.....	34
1.4.1.5. Birbirini Tamamlayan Gereksinimler Yaklaşımı ve Uyarın- Değer-Rol Yaklaşımı	35
1.4.2. Eş Seçimini Etkileyen Unsurlar	35
1.4.2.1. Sosyal, Kültürel, Dinî, Fiziksel, Coğrafi ve Ekonomik Nedenler	36
1.4.2.2. Yaş.....	36

İKİNCİ BÖLÜM

DÜNYADA İLK EVLİLİK YAŞININ ARTIŞINA NEDENLERİ VE SONUÇLARI BAĞLAMINDA PANORAMİK BİR BAKIŞ

2.1. Dünyada Evlilik Yaşının Artışının Genel Görünümü	40
2.1.1. Afrika Kıtası	43
2.1.2. Asya Kıtası.....	44
2.1.3. Avrupa Kıtası.....	47
2.1.4. Kuzey Amerika Kıtası.....	49
2.1.5. Güney Amerika Kıtası.....	53
2.1.6. Avustralya Kıtası	53
2.2. Dünyada Evlilik Yaşının Artışının Nedenleri ve Sonuçları	54
2.2.1. Ekonomik Temelli Açıklamalar	56
2.2.1.1. Gary Becker'in Evlilik Piyasası Görüşü	56
2.2.1.2. Kadının Çalışma Hayatına Katılması	58
2.2.1.3. İşsizlik	59
2.2.1.4. Evlilik Harcamalarının Etkisi	59
2.2.1.5. Ebeveynlerin Sosyoekonomik Statüsü.....	60
2.2.2. Sosyokültürel Temelli Açıklamalar	61
2.2.2.1. Eğitimin Etkisi	61
2.2.2.2. Evli Gibi Birlikte Yaşamının Etkisi	62
2.2.2.3. Lise Yılları Deneyimi	63
2.2.3. Diğer Değişkenler Üzerinden Yapılan Açıklamalar	63
2.2.3.1. Din, Irk ve Etnisitenin Etkisi	64

2.2.3.2. Coğrafi Konumun Etkisi.....	65
2.2.3.3. İdeal Ruh Eşi Beklentisi	65
2.2.3.4. Evlilik Sıkışıklığı.....	65
2.2.4. Evlilik Yaşının Artışının Muhtemel Sonuçları	66
2.2.4.1. Evlilik Yaşı Artışı-Doğurganlık İlişkisi.....	66
2.2.4.2. Evlilik Yaşı Artışı-Boşanma İhtimali İlişkisi.....	70
2.2.4.3. Evlilik Yaşı Artışı-Evlilik Uyumu/Doymu İlişkisi.....	72

ÜÇÜNCÜ BÖLÜM

NEDENLERİ VE SONUÇLARI BAĞLAMINDA TÜRKİYE'DE İLK EVLİLİK YAŞININ ARTIŞI..... 75

3.1. Türkiye'de Evlilik Yaşının Artışının Nedenleri ve Genel Görünümü.....	75
3.1.1. Türkiye'de Evlilik Yaşının Seyri.....	76
3.1.2. İllere Göre Ortalama İlk Evlilik Yaşının Değişimi (2021).....	80
3.1.3. Sosyoekonomik Nedenlerin Evlilik Yaşı Üzerindeki Etkisi.....	82
3.2. Demografik Geçiş Süreci Bağlamında Evlilik Yaşının Artışının Sonuçları: Doğurganlığın Azalması ve Kelebek Etkisi	86
3.2.1. Nüfus Artış Hızında Yaşanan Azalma ve Nüfusun Geleceği.....	88
3.2.2. Yaşlı Nüfusun Artışı ve Demografik Fırsat Penceresinin Sonu.....	91
3.2.3. Nüfus-Ekonomik Büyüme İlişkisi	93
3.2.4. İstihdamın Değişimi: Demografik Hediye Den Demografik Yüke.....	94
3.2.5. Nüfus Değişimi-Sağlık ve Sosyal Güvenlik İlişkisi.....	96
3.3. Evlilik Yaşının Artışının Sonuçları (Mikro Perspektif)	98

DÖRDÜNCÜ BÖLÜM

İLK EVLİLİK YAŞININ ARTIŞININ NEDENLERİ VE SONUÇLARI BAĞLAMINDA POLİTİKA ÖNERİLERİ..... 103

4.1. Politika Önerilerinde Tarihsel Tecrübeyi Dikkate Almak.....	103
4.2. Artan İlk Evlilik Yaşının Düşürülmesi ya da Sabit Tutulması İçin Politika Önerileri.....	108

SONUÇ..... 119

KAYNAKÇA..... 123

KAYNAKÇA

Abd El-Ati, Hammûde:	Nasıl Bir Aile? İslami Bakışın İmkânları , Çev.: Mesut Karaşahan, 1. Bs., İstanbul, Pınar Yayınları, 2000.
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İÇİNDEKİLER

ÖN SÖZ ix

TÜRKİYE'DE KUZNETS VE FİNANSAL KUZNETS EĞRİLERİ GEÇERLİ Mİ?
FMOLS, DOLS VE CCR YÖNTEMLERİNDEN KANITLAR1

Serhat Çamkaya

YATIRIMIN YENİ ŞEKLİ KİTLE FONLAMASI: TÜRKİYE VE ABD
KARŞILAŞTIRMASI..... 15

Alirıza Ağ

Kübra Elmalı

Zeynep Kocabaş

BORSA İSTANBUL'DA AŞIRI GÜVEN ÖN YARGISI: İŞLEM HACMİ
GÖSTERGELERİ İŞIĞINDA KARŞILAŞTIRMALI BİR İNCELEME 35

Cihan Yılmaz

BANKACILIK SEKTÖRÜNÜN PİYASA YAPISI VE FİNANSAL İSTİKRAR
İLİŞKİSİ ÜZERİNE TEORİK BİR İNCELEME 61

Yusuf Akan

Samet Topal

SÜRDÜRÜLEBİLİRLİK PERSPEKTİFİYLE YEŞİL FİNANS VE YEŞİL TAHVİL.... 77

Hakan Yılmaz

İHRACAT YAPAN FİRMALAR 2008 FİNANS KRİZİNDEN Mİ YOKSA COVID-19
PANDEMİ KRİZİNDEN Mİ DAHA ÇOK ETKİLENDİ? 97

Meltem Gül

Tuncer Yılmaz

**DÜNYADA VE TÜRKİYE'DE SİGORTACILIK SEKTÖRÜNDE FİNANSAL
TEKNOLOJİLERİN KULLANIMI ÜZERİNE BİR YAKLAŞIM 113**

Nurhan Talebi

Korkmaz Keskendir

Fatma Çakıcı

**İŞSİZLİK VE İŞ GÜCÜ ÜZERİNE BİR DEĞERLENDİRME: ARDAHAN İLİ
ÖRNEĞİ 129**

Aysun Hazel Özaydın

YEŞİL FİNANS VE YEŞİL BANKACILIK BAĞLAMINDA TÜRKİYE..... 153

Selçuk Bakan

BANKACILIKTA YENİ BİR YOL AYRIMI: AÇIK BANKACILIK UYGULAMASI ...171

Bahattin Erden

Melik Yolci

**CAMELS DERECELENDİRME MODELİ İLE KIRGIZ BANKALARININ
FİNANSAL PERFORMANS TAHMİNİ..... 189**

Mahmut Erdoğan

**FİNANSAL İNOVASYONUN BİR BOYUTU OLARAK DİJİTAL BANKACILIĞIN
GELİŞİMİ..... 209**

Eda Ayvacık

Selçuk Yalçın

**ASYA'DA YÜKSELEN İKİ GÜÇ: ÇİN VE HİNDİSTAN'IN KALKINMA
SÜREÇLERİNİN KARŞILAŞTIRILMASI.....231**

Atıla Er

Yakup Koray Duman

SON SÖZ 259

KAYNAKÇA

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YATIRIMIN YENİ ŞEKLİ KİTLE FONLAMASI: TÜRKİYE VE ABD KARŞILAŞTIRMASI

Alırıza Ağ

Kübra Elmalı

Zeynep Kocabaş

GİRİŞ

Kitle fonlaması, fırsat arayan girişimciler için yeni bir fırsat sunan ve destekçilerden yararlanarak işletmeler için kaynak sağlayan bir finansman aracıdır. Kitlesele fonlama platformu internet ortamında kolay erişim sunarak yeni teşviklerle ekonomik büyümeyi sağlamaktadır (Zengin, Yüksel ve Kartal, 2017: 22-32). Dünya da kitlesele fonlama sistemi hızlı bir şekilde ilerlemesine rağmen Türkiye’de beklenen düzeye gelmemiştir. Bu sorunun temelinde ise kitlesele fonlama tanıtımının iyi yapılmaması ve kitle fonlamasına gerekli desteğin verilmemesidir. Türkiye’de platformların tamamı ürün bazlıdır. Bunun sebebi, ürün bazlı platformlar karşılıklı finansal yükümlülük içermediğinden yasal engellerle karşılaşılmasındır (Sırma ve Sandalı, 2018).

Kitlesele fonlama sistemini geliştirmek adına hem Türkiye’de hem de dünyada çalışmalar devam etmektedir. Yeni bir finansman modeli olan kitle fonlaması sisteminin 2013-2016 yılları arasında dünyadaki yasal düzenlemeler ve fonlamalar incelenmiştir. Türkiye’de 2017 yılında kitle fonlaması ile ilgili düzenlemeler değerlendirilmiş ve önerilerde bulunulmuştur (Vural, 2019: 2). Başka bir çalışmada; Türkiye’deki kitlesele fonlama platformlarında hangi tür fonlama yapıldığı, hangi tür projelere destek verildiği, miktarları, fonlayan kişi sayısı ve süreleri araştırılmıştır. Türkiye’de faaliyet gösteren platformlarda ne tür kitlesele fonlama yapısı olduğu ve yurt dışındaki sitelerle benzerlikleri ve farklılıkları ortaya konulmuştur (Sakarya ve Bezirgân, 2018: 2). Sezgin ve Orçun’un çalışmasında Türk girişimcilerin kitle fonlaması uygulamasının neden başarısız olduğu yönünde incelleme-

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BORSA İSTANBUL'DA AŞIRI GÜVEN ÖN YARGISI: İŞLEM HACMİ GÖSTERGELERİ İŞIĞINDA KARŞILAŞTIRMALI BİR İNCELEME¹

Cihan Yılmaz

GİRİŞ

Psikolojik ön yargıların iktisadi karar alıcıların davranışları üzerindeki etkilerini gösteren yeni bulguların ortaya konmasının ve borsalarda gerçekleşen yüksek işlem hacimleri ile ortalama üstü getirilerin varlığının tespit edilmesinin ardından standart teorilerin bahsi geçen normalden sapmaları açıklamada yetersiz kaldığı görülmüştür. Ardından klasik iktisat ve standart finans teorilerinin temel varsayımları güçlü biçimde eleştirilmeye ve buna karşılık yeni teoriler ve modeller ortaya konmaya çalışılmıştır. Özellikle Tversky ve Kahneman'ın (1974; 1979) çalışmalarının ardından, bireylerin belirsizlik altındaki kararlarını etkileyen davranışsal yönler ele alınmaya başlanmıştır.

Bireysel yatırımcılar; risk, getiri, likidite, işlem hacmi ve diğer birtakım finansal olmayan kriterler açısından, finansal piyasalarda şüphesiz önemli rollere sahiptir. İşlem hacmi de piyasa katılımcılarının borsadaki faaliyetlerine ilişkin karar verme süreçlerinde dikkate aldıkları önemli faktörlerden birisidir. Spekülatif piyasalardaki işlem hacminin rasyonel gerekçelerle gerekçelendirilemeyecek ve standart teorilerin izah edilemeyecek kadar büyük olduğu ortadadır. Gözlenen aşırı işlem hacminin bir açıklaması olarak aşırı güven ön yargısı ileri sürülmüştür. Pozitif yanılısamanın bir türü olan aşırı güven davranışı, birçok krizin ana nedeni olarak görülmesinin de etkisiyle tarih boyunca büyük ilgi gören bir olgu olmuştur

1 Bu çalışma, 19-20 Ocak 2023 tarihleri arasında Bingöl Üniversitesi ev sahipliğinde gerçekleştirilen II. Uluslararası İktisadi ve İdari Bilimler Kongresi'nde sunulan "Aşırı Güven Önyargısı: İşlem Hacmi ile Borsa Devir Hızı Işığında Borsa İstanbul Özelinde Bir Değerlendirme" başlıklı bildirinin, genişletilmiş, geliştirilmiş ve yeniden düzenlenmiş biçimidir.

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BANKACILIK SEKTÖRÜNÜN PİYASA YAPISI VE FİNANSAL İSTİKRAR İLİŞKİSİ ÜZERİNE TEORİK BİR İNCELEME⁴

Yusuf Akan

Samet Topal

GİRİŞ

Finans sektörü, ülke ekonomileri ve dünya ekonomisi açısından hayati bir rol oynamaktadır. Finansal sistemde ortaya çıkabilecek olası bir sorun tüm ekonomiye yayılarak büyük bir maliyet oluşturur. Ayrıca, ekonomik serbestleşme ile finansal piyasaların entegre olması ve artan teknoloji kullanımı ile birlikte bir ülkenin finansal sisteminde yaşanan sorun diğer ülkelerin finans sektörlerini ve dolayısıyla ekonomilerini etkilemektedir. Bu nedenle, finansal sistemin sağlıklı işleyişi, gerek ulusal gerekse küresel ölçekte üzerinde durulması gereken bir öneme sahiptir. Özellikle tasarrufların yatırıma yönlendirilmesinde aracılık yapan bankaların işleyişinde görülen bir aksaklık, finansal sistemin ve tüm ekonominin sorun yaşamasına neden olmaktadır. Finansal sisteminin büyük bir kısmını bankaların oluşturduğu bir finansal yapıya sahip olan ülkelerde, bu durum daha da önem kazanmakta ve bankaların sağlıklı bir şekilde işleyişinin sağlanmasının gerekliliği genel kabul görmektedir.

Günümüzde çoğu banka, klasik bankacılık işlemlerinin yanı sıra müşterilerine çok çeşitli finansal ürünü ve hizmeti sağlamaktadır. Bu da ülkeler için bankaların denetlenmesi ve finansal göstergelerinin kontrol edilmesinin daha geniş bir alana yayılmasına neden olmaktadır. Banka temelli piyasa yapısına sahip olan ülkelerde finansal istikrarın sağlanması, büyük oranda bankaların sağlamlığına, yapı-

4 Bu çalışma, Prof. Dr. Yusuf Akan danışmanlığında hazırlanan “*Türk Bankacılık Sektörünün Piyasa Yapısı ve Rekabet-İstikrar Analizi*” adlı doktora tezinden hareketle üretilmiştir.

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SÜRDÜRÜLEBİLİRLİK PERSPEKTİFİYLE YEŞİL FİNANS VE YEŞİL TAHVİL

Hakan Yılmaz

GİRİŞ

Doğal kaynakların kontrolsüz olarak kullanılması sonucunda doğaya salınan karbondioksit miktarının artması, birçok olumsuz durum meydana getirmektedir. Küresel ısınma, deniz suyu sıcaklıklarında yaşanan artış ve buzul erimeleri bu olumsuzluklardan bazılarıdır. Ayrıca işletmeler tarafından doğaya bırakılarak akarsulara karışan fabrika atıkları, deniz ve toprak yapısının bozulmasına yol açmaktadır. Kişisel yaşamdan, işletmelere kadar, doğayı koruma kaygısı bulunmayan insan odaklı tüm faaliyetler, sürekli olarak çevreyi kirletmekte ve insan yaşamını tehdit eden boyutlara ulaşmaktadır (Yılmaz, 2019: 140).

Dünya’da küresel sıcaklık değişimleri incelendiğinde, geçmiş son 170 yıl içerisinde küresel ısınmanın 1,1 derece civarında arttığı belirlenmiştir. Ancak gerçekleştirilen araştırmalar ışığında, doğaya olan tahribatın önüne geçilmediği takdirde, 22. yüzyıla kadar küresel sıcaklık artışının 4 dereceden daha fazla olacağı belirtilmektedir. Sanayileşmenin başlangıcı olarak kabul edilen sanayi devriminden günümüze kadar, dünya nüfusunda meydana gelen artışlar ve çevreye zarar veren yatırımlar sonucunda ortaya çıkan iklim değişikliklerinin ve çevresel anomalilerin, dünyanın ve yaşamın geleceğini tehlikeye sokacağı ifade edilmektedir (Sachs, 2015: 404; Yiğit ve Canöz, 2021: 38).

Sanayi devriminden günümüze kadar, dünya genelinde gerçekleşen sanayileşmenin artması sonucu, çevrenin aşırı kirlenmesi ve doğanın dengesinde meydana gelen bozulmalar, çevreyle ilgili duyarlılığın artmasına ve yaşamın sürdürülebilirliğinin üzerinde durulmasına neden olmuştur. Bu doğrultuda düzenlenen, 21. Birleşmiş Milletler İklim Değişikliği Taraflar Konferansı neticesinde 196 ülke katılımıyla imzalanan Paris Anlaşması kapsamında, dünya sıcaklığında meydana

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İHRACAT YAPAN FİRMALAR 2008 FİNANS KRİZİNDEN Mİ YOKSA COVID-19 PANDEMİ KRİZİNDEN Mİ DAHA ÇOK ETKİLENDİ?⁵

Meltem Gül

Tuncer Yılmaz

GİRİŞ

Ekonomik krizler özellikle son yıllarda tüm dünya genelinde karşılaşılan bir kavram olarak gündemi meşgul etmektedir. Genel olarak bakıldığında ülkelerin ekonomik değişkenlerinin krizlerden negatif yönde etkilendiği söylenebilir (Aslantaş ve Korlu, 2020: 113). Son yirmi yılda, dünya finans piyasaları iki küresel krize tanık olmuştur. Birincisi 2008'deki Küresel Finans Krizi, ikincisi ise Covid-19 Pandemisi'nin neden olduğu küresel salgın krizidir. Dünyada yaşanan bu iki kriz sadece insanların günlük yaşamını etkilemekle kalmamış, aynı zamanda finansal piyasaları ve dünya ekonomisinin neredeyse her sektörünü de etkilemiştir. 2008 Finans Krizi ilk önce Amerika Birleşik Devletleri'nde başlamış daha sonra tüm dünyaya yayılmıştır. Küresel ölçekli bir kriz olan 2008 Finans Krizi, 1929 Büyük Buhranından sonra yaşanan en büyük kriz olarak tanımlanmıştır. Bu kriz, 2009'da dünyanın toplam Gayri Safi Yurtiçi Hasıla'sında (GSYİH) %0,6'lık bir düşüğe neden olmuştur. 2009'da dünya çapında GSYİH büyümesi 2007'ye kıyasla %5,8 düşmüştür (Fernandes, 2020).

2020 yılında ortaya çıkan Covid-19 Pandemi Krizi, 2008 Finans Krizi'nden bu yana dünyada ikinci küresel bir krize yol açmıştır. Bu durum tüm OECD (Organisation for Economic Co-operation and Development) ülkelerinde ve çoğu gelişmekte olan ekonomide bir resesyona neden olmuştur. Yeni koronavirüsün

5 Bu çalışma 29 Eylül–1 Ekim 2022 tarihleri arasında Tokat Gaziosmanpaşa Üniversitesi'nde düzenlenen 9. Uluslararası Muhasebe ve Finans Araştırmaları Kongresinde sunulan bildiriden türetilmiştir.

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DÜNYADA VE TÜRKİYE'DE SİGORTACILIK SEKTÖRÜNDE FİNANSAL TEKNOLOJİLERİN KULLANIMI ÜZERİNE BİR YAKLAŞIM

Nurhan Talebi

Korkmaz Keskendir

Fatma Çakıcı

GİRİŞ

Ülkemizde sigorta sektörünün son yıllarda ekonomideki gelişmelere paralel olarak değişimler geçirdiği gözlenmektedir. Aslında ekonomik kalkınma olmadan ve ekonomiyi yabancılarla rekabete sokmadan sigorta sektörünün kendi kendine gelişmesi teorik olarak mümkün görülmemektedir. Ülkemizde ve diğer gelişmekte olan ülkeler ile birlikte henüz gelişmemiş ülkelerde sigortacılık sektörü istenilen noktaya gelememiştir. Sigortacılık sektöründe her bireye ve bütçeye göre birçok yeni ürünler geliştirilmesine karşın, prim tahsilâtlarında yaşanan problem, nitelikli eleman sorunları, organizasyon sorunları, üretim kanalları ile birlikte sigorta şirketleri arasındaki sorunlar, sigortalılar arasında sigorta hizmeti bilincinin olmaması, yasal mevzuattaki eksiklikler ve boşluklar sigortacılık sektörünün gelişmemesinin en büyük nedenleridir.

Günümüz teknolojisinde hem gelişmiş hemde gelişmekte olan ülkelerde sigortacılık sektörünün önemli bir ekonomik paya sahip olduğu bilinmektedir. Sigortacılık sektörünün günümüzde finansal teknolojilerin artmasıyla ve ekonomik dengelerin değişmesiyle birlikte sürekli kendini güncellediği görülmektedir. Bu çalışma ile finansal teknolojilerin sigortacılık sektöründeki etkileri anlatılmış ve sektörün gelecekteki yıllarda pazar paylarının nasıl olacağı tartışılmıştır.

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İŞSİZLİK VE İŞ GÜCÜ ÜZERİNE BİR DEĞERLENDİRME: ARDAHAN İLİ ÖRNEĞİ

Aysun Hazel Özaydın

GİRİŞ

Çalışmak insanlığın var olduğundan beri günümüze kadar ki sürede yaşamını devam ettirmek için vazgeçilmez bir durumdur. Bu çağda yaşayan insanlar da teknolojik gelişmelere ayak uydurarak çalışmalarını sürdürmüşlerdir. Günümüzde iş sektörlerinin çeşitlenmesine ve çoğalmasına rağmen, emek arzının fazlalığı gibi nedenlerden ötürü işsizlik sorunu yaşanmaktadır. Bu sorun bireyde ve ailesinde geçim sıkıntısı ve psikolojik sıkıntılara neden olmaktadır. İstihdam sıkıntısı ülkemizde ve bölgesel anlamda da varlığını sürdürmektedir. Emek arzı fazlalığını etkileyen etmenler; toplam nüfus, çalışma çağındaki nüfus, istihdamın dağılımından kaynaklı oluşan göçler, nüfusun yaş ve cinsiyet özellikleri gibi faktörler etken durumdayken, iş gücü niteliği ve verimi gibi iş gücünü geliştirecek eğitim sistemleri de etkili olmaktadır.

Bu çalışmada işsizlik kavramı ile türleri genel olarak açıklanmış ve Ardahan ili kapsamında açık işsizlik verileri kullanılarak inceleme yapılmıştır. Yapılan inceleme kapsamında Ardahan ili işsizlik oranı, işsiz bireylerin yaş grubu, cinsiyetleri ve eğitim seviyeleri şeklinde ayrımlarla incelemeler yapıp bu işsizlerin yüzde kaçının işsizlik yardımı aldığı yıl bazında tespit edilmiştir. Bu bağlamda işsizlik sorununun çözümüne ilişkin olarak öneriler sunulmuştur.

1. İŞSİZLİK KAVRAMI

Günümüzde yüzlerce insan, çalışma istek ve arzusunda olsa da işsiz kalabilmektedir. Bir ülke nüfusunun çalışma istek ve arzusunda olan çalışmaya hazır olan kişiler ile işe girip çalışan kesim anlamına gelen istihdam seviyesi arasındaki fark, işsizlik şeklinde tanımlanmaktadır.

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YEŞİL FİNANS VE YEŞİL BANKACILIK BAĞLAMINDA TÜRKİYE

Selçuk Bakan

GİRİŞ

Günümüzde insanlığın en büyük sorunlarının çözümü, teknolojik, sosyopolitik, kültürel, finansal girişim ve mekanizmaların bir arada geliştirilmesi, benimsenmesi ve uygulanmasında yatmaktadır.

Çevre kirliliği ve yenilenemeyen kaynakların tükenmesi, biyolojik çeşitliliği, insan sağlığını ve ekonominin daha da gelişmesini tehlikeye atan uluslararası, ulusal, bölgesel ve yerel düzeylerde önemli sorunlardır. İklim değişikliğinin ekonomik ve mali etkileri bankaları ve finans kurumlarını gelecekte önemli kayıplarla karşılaştırabilir. Çevresel bozulma küresel olarak önemli bir ikilem hâline gelmektedir. İklim değişikliği sürdürülebilir kalkınma için bir tehdit hâline gelmiştir. Şirketlerin yoğun ekonomik faaliyetleri nedeniyle doğal kaynakların aşırı tüketim eğiliminin artması, sera gazı emisyonlarında önemli bir artışa yol açarak küresel ısınmaya ve nihayetinde küresel iklim değişikliğine neden olmuştur. Bu sorunlar, bilim camiasını ekonomik kalkınma ile bu kalkınmanın iklim değişikliği üzerindeki etkisi arasında bir uzlaşma bulma ikilemiyle karşı karşıya bırakmaktadır (Ciobu ve Sajin, 2022).

Sanayi devriminin başlangıcından bu yana, finans sektörü insani büyümenin güçlü bir dayanağı olmuştur. Küresel finans sektörünün birincil rolü, küresel tasarrufların verimli bir şekilde kullanılmasıdır. Yatırımların doğru kullanımı insanların yaşam kalitesinin artmasını sağlamaktadır. Ancak, finansal sistemin çökmesi nedeniyle insanlar tasarruflarını gayrimenkul balonlarına ve insan kaynaklı iklim değişikliğinin şiddetlenmesine sebep olanlar da dâhil olmak üzere çevreye zarar veren projelere yatırmışlardır (Meo ve Karim, 2022). Finans, antropojenik (insanın çevre üzerindeki etkisi) konusunda çok önemli bir rol oynamış ancak çevresel

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BANKACILIKTA YENİ BİR YOL AYRIMI: AÇIK BANKACILIK UYGULAMASI

Bahattin Erden

Melik Yolci

GİRİŞ

Finans sektöründe yaşanan dijital dönüşümle birlikte bankalar, müşterilerin değişen ve yenilenen ihtiyaçları ile karşı karşıya kalmaktadır. Bankalar, müşterilerinin bu değişken ve yenilikçi ihtiyaçlarına en hızlı ve en uygun teklifi yapmak zorundadır. Değişen teknolojik gelişmelerle (blokzincir, büyük veri, nesnelerin interneti, yapay zekâ, makine öğrenmesi vb.) beraber kullanıcılara birçok alternatif arasından seçim yapma şansı doğmuştur. Teknolojik gelişmelere bağlı olarak ortaya çıkan dijital finansal hizmet sağlayıcılar, müşterilerine daha iyi bir ödeme deneyimi, daha geniş bir hizmet alımı ve daha fazla seçenek arasından en iyi seçeneğe ulaşma imkânı sağlamaya çalışmaktadır.

Bankacılık alanındaki finansal teknolojik gelişmelerin en önde gelen araçlarından biri de açık bankacılıktır. Açık bankacılıkla beraber müşteriler, hesaplarına banka dışından ulaşma olanağı bulmalarının yanısıra birçok bankada yer alan farklı banka hesaplarına tek bir arayüzle tek bir noktadan erişim hakkına sahip olurlar.

Geleneksel bankacılıkta müşteriler, bankadaki danışmanları ile yüz yüze görüşerek para transferlerini, kredi işlemlerini ve diğer tüm bankacılık faaliyetlerini gerçekleştirirler. Bankacılıkta dijital kanalları kullanmak istemeyen müşteriler için hâlâ daha yüz yüze bankacılık hizmeti verilmekle beraber günümüzde müşteriler gitgide daha az fiziksel bankacılık hizmetinden yararlanmayı tercih etmektedirler. Finansal gelişmelere bağlı olarak tüm bankacılık hizmetleri çevrim içi olarak verilebilmektedir. Bankalar bir uygulama arayüz (API) aracılığıyla müşteri bilgilerini, bankacılık ürün ve hizmetlerini müşterilerine ulaştırırlar. Bu arayüzler genellikle fintekler gibi hizmet sağlayıcılarından elde edilirler (Schneider, 2023).

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CAMELS DERECELENDİRME MODELİ İLE KIRGIZ BANKALARININ FİNANSAL PERFORMANS TAHMİNİ

Mahmut Erdoğan

GİRİŞ

Finansal sektör kompozisyonu küresel olarak ele alındığında, Anglo-Saxon ülkelerde finansal varlıkların büyük oranda sermaye piyasalarında bulunduğu, yükselen piyasalarda ise bankacılık sektörünün dominant bir yapıda olduğu görülmektedir. Finansal istikrarın sürdürülebilirliği için güçlü bir bankacılık yapısı sistem içerisinde başrole sahiptir. Banka endüstrisi, finans sektörünün önemli bir bileşenidir ve etkin şekilde çalışması tüm ekonomi açısından büyük önem taşımaktadır. Ayrıca, tasarruf hareketliliği, risk çeşitlendirme, kaynak tahsisi, yöneticilerin izlenmesi ve kurumsal yönetim bu endüstrinin ana fonksiyonları olarak sayılabilir.

Finansal sistemin en önemli aktörlerinden biri olan bankacılık sektörü, finansal liberalizasyonun ardından ortaya çıkan finansal yenilikler sebebiyle daha da karmaşık bir hâl almış ve bazı dönemlerde büyük krizler yaşamıştır. Finans ve reel sektörlerin her ikisinin de ciddi maliyetlere katlandığı bu krizlerin ve banka iflaslarının önlenmesi amacıyla gözetim ve denetim sistemleri geliştirilmiştir. Bankacılık sektöründeki ters seçim ve ahlaki riskin azaltılması için, bankaları kimlerin ve nasıl yönettiğine yönelik incelemeleri kapsayan banka denetimi önemli bir yöntemdir. Bankacılık sektörünün güçlü bir yapıya sahip ve denetlenebilir olması ekonomide sermaye birikiminin olumlu yönde etkilenmesine zemin oluşturmaktadır.

Ülkeler arasında banka sektörünün denetim ve gözetim yapıları farklılıklara sahip olsa da uygulamada yerinde denetim ve uzaktan gözetim biçiminde iki sistemin varlığı bilinmektedir. Banka üst yönetiminin yetkilendirdiği denet-

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FINANSAL İNOVASYONUN BİR BOYUTU OLARAK DİJİTAL BANKACILIĞIN GELİŞİMİ

Eda Ayvacık

Selçuk Yalçın

GİRİŞ

Bilgi çağı olarak adlandırılan yaşadığımız dönemde dijitalleşmenin hem bireyleri hem de kurumları etkisi altına aldığı kuşku götürmez bir gerçektir. Bu durum bireysel olarak her yaş gurubundaki bireyleri farklı şekilde etkilediği gibi kurumları ve sektörleri de bireylere benzer şekilde etkisi altına almıştır. Meydana gelen değişiklikler bazı sektörleri öncelikli ve hızla etkisi altına alsada zamanla genele yayılmıştır. Dijital dönüşüm sektörlerin özellikle iş yapış süreçlerini etkilemiştir. Otomasyon ve yapay zekâya dayalı sistemler gerçek hayatta yapılmakta olan işlemlerin sanal ortamlara taşınmasını sağlamıştır. Bu hızlı değişim ve dönüşümden etkilenen sektörlerin başında ise hiç şüphesiz bankacılık gelmektedir. Finansal teknolojilerin inovatif biçimde ilerlemesi bu etkilenmenin derecesini artırmış dijital bankacılık veya e-bankacılık diye adlandırılan yepyeni kavramların literatüre girmesini sağlamıştır. Bankacılık sektörü, özellikle teknolojik inovasyonları iş süreçlerine hızlıca adapte etme açısından diğer sektörlerle nazaran ön sıralardadır. Ayrıca mevcut gelişmelerden ötürü sektörde rekabet artmış hatta bu rekabete sektörde hizmet veren diğer finansal kurumlarda dâhil olmuştur. Bu gelişmelerden dolayı bankalar geleneksel bankacılık anlayışında yeniliğe gitmek zorunda kalmış, dijital teknolojilerin sağladığı imkânlar doğrultusunda hizmet şartlarında müşterilerin lehine değişikliklere gitmişlerdir. Yapılan bu değişiklikler ise müşteriler nezdinde olumlu karşılınıp müspet geri dönüşler alınmasını sağlamıştır. Bu ise hem bankaları hem de diğer finansal kuruluşları dijital bankacılık hizmetlerini daha da çok geliştirmeye sevk etmiştir. Bu yenilikler her iki tarafında lehine dönüşümler yaratmaktadır. Bankalar yeni teknolojileri bünyelerine adapte etmek için birtakım maliyetlere katlanmak zorunda kalsalar da en nihayetinde

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ASYA'DA YÜKSELEN İKİ GÜÇ: ÇİN VE HİNDİSTAN'IN KALKINMA SÜREÇLERİNİN KARŞILAŞTIRILMASI⁶

Atila Er

Yakup Koray Duman

GİRİŞ

Kalkınma süreci basit tanımı ile mevcut durumdan daha ileri bir duruma gelinmesidir. Her ülkenin kalkınma süreci birbirinden farklılık göstermektedir. Bir kalkınma modeli bir devletin gelişmesine fayda sağlarken, aynı model başka bir devletin gelişmesine olumlu bir katkı sağlamayabilir.

Günümüzde kalkınma konusunda yakaladıkları ivme ve geldikleri süreçte uyguladıkları kalkınma modelleri ile dikkatleri üzerlerine toplayan ülkelerin başında Çin ve Hindistan gelmektedir. Öyle ki pek çok kaynakta bu iki ülkeden “yükselen güçler” şeklinde sıklıkla bahsedilmektedir. Yapılan araştırmalara bakıldığında bu iki ülkenin birbirlerinden farklı kalkınma yaklaşımlarına sahip oldukları fakat ekonomik kalkınma açısından ciddi bir seviyeye geldikleri görülmektedir. Kısaca iki devletin temel olarak kalkınma yaklaşımlarına bakıldığında Hindistan'ın ekonomik kalkınmasında devletin belirleyici rolünün daha kısıtlı olduğu ve Hindistan'da özel sektör yatırımlarına daha fazla ağırlık verildiği görülmektedir. Çin'de ise devletin denetiminde bir piyasa ekonomisi hâkim olmakla beraber, devletin bilinçli yol göstericiliği, tasarruf politikaları ve teşvik politikaları sayesinde teknolojik alandaki yatırımlara ağırlık verilerek gelişme kaydedilmiştir denilebilir.

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E-TİCARETTE İLETİŞİM KANALLARININ TÜKETİCİ DAVRANIŞLARINA ETKİLERİ

Dr. Fahrettin Kayan



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Dr. Fahrettin Kayan

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İÇİNDEKİLER

ÖN SÖZ	iii
TABLolar DİZİNİ	ix
ŞEKİLLER DİZİNİ.....	xi
GRAFİKLER DİZİNİ	xiii
KISALTMALAR DİZİNİ.....	xv
GİRİŞ.....	1

1. BÖLÜM

İLETİŞİM KANALLARI VE GELİŞEN YENİ İLETİŞİM KANALLARI KAPSAMINDA ELEKTRONİK TİCARET	3
1.1. İletişim ve İletişim Kanalları	3
1.1.1. İletişim Kavramı ve Süreci	4
1.1.2. İletişim Kanalları.....	5
1.1.2.1. Geleneksel İletişim Kanalları.....	6
1.1.2.1.1. Televizyon.....	6
1.1.2.1.2. Radyo.....	7
1.1.2.1.3. Basılı Medya.....	8
1.1.2.1.4. Açık Hava Panoları/Reklamcılığı.....	9
1.1.2.2. Yeni Nesil İletişim Kanalları	10
1.1.2.2.1. İnternet.....	10
1.1.2.2.2. Sosyal Ağlar.....	11
1.1.2.2.3. Dijital Pazarlama Stratejileri	12
1.1.2.2.4. Etkileyici (Influencer) Bireyler Pazarlaması.....	15
1.2. İletişim Kanallarının Kullanımının İşletmeler İçin Önemi	16
1.3. Teknolojik Gelişmelerin E-Ticaret İşletmelerinin Yönetimine Etkileri	17
1.3.1. Elektronik Ticaret Kavramı.....	18
1.3.2. E-Ticaretin Gelişimi.....	19

1.3.2.1. E-Ticaretin Dünyadaki Gelişimi.....	20
1.3.2.2. E-Ticaretin Türkiye'deki Gelişimi	21
1.3.3. E-Ticaretin Özellikleri	24
1.3.4. E-Ticaretin İşletmeler Açısından Avantaj ve Dezavantajları	26
1.3.4.1. E-Ticaretin İşletmeler Açısından Avantajları	26
1.3.4.2. E-Ticaretin İşletmeler Açısından Dezavantajları.....	26
1.3.5. E-Ticaret Türleri	28
1.3.5.1. İşletmeden İşletmeye E-Ticaret (Business to Business/B2B). 28	
1.3.5.2. İşletmeden Müşteriye E-Ticaret (Business to Consumer/B2C). 28	
1.3.5.3. Tüketiciden Tüketicie E-Ticaret (Consumer to Consumer/ C2C)	28
1.3.5.4. Tüketiciden İşletmeye E-Ticaret (Consumer to Business/C2B). 29	
1.3.5.5. İşletmeden Devlet Sektörüne E-Ticaret (Business to Government/B2G).....	29
1.3.5.6. Dijitalleşmenin Pazarlama Anlayışına Etkileri.....	29

2. BÖLÜM

GELENEKSEL İLETİŞİM VE YENİ İLETİŞİM KANALLARI AÇISINDAN TÜKETİCİ DAVRANIŞLARI	31
2.1. Tüketim ve Tüketici Kavramları	31
2.2. Tüketici Davranışları	32
2.3. İletişim Kanalları Açısından Tüketici Davranış Modelleri.....	32
2.3.1. Klasik Davranış Modelleri	33
2.3.1.1. Marshall'ın Ekonomik Modeli.....	33
2.3.1.2. Pavlov Modeli.....	34
2.3.1.3. Veblen Modeli	35
2.3.2. Modern Davranış Modelleri.....	36
2.3.2.1. Engel–Kollat–Blackweel Modeli.....	36
2.3.2.2. Howard–Sheth Modeli	38
2.3.2.3. Nicosia Modeli.....	39
2.4. Tüketici Davranışlarını Etkileyen Faktörler	41
2.4.1. Kişisel Faktörler.....	41
2.4.2. Sosyokültürel Faktörler.....	41

2.4.3. Psikolojik Faktörler.....	43
2.5. Çevrim İçi Tüketici Satın Alma Karar Süreci	44
2.5.1. İhtiyacın Belirlenmesi	45
2.5.2. Bilginin Aranması.....	45
2.5.3. Seçeneklerin Değerlendirilmesi.....	46
2.5.4. Satın Alma Kararının Verilmesi ve Satın Alma.....	46
2.5.6. Satın Alma Sonrası Davranışlar	46
2.6. Çocukların Alışveriş Desteği	47

3. BÖLÜM

E-TİCARET İŞLETMELERİNDE İLETİŞİM KANALLARI KULLANIMI VE BİR ARAŞTIRMA.....	49
3.1. Araştırmanın Amacı ve Önemi	49
3.2. Araştırma Yöntemi.....	50
3.3. Araştırmanın Modeli ve Hipotezleri	51
3.4. Veri Toplama Araçları	53
3.5. Araştırmanın Evreni ve Örneklemi	55
3.6. Veri Toplama ve Değerlendirme Süreci.....	55
3.7. Demografik Bilgiler	56
3.8. Ölçeklere Yönelik Açıklayıcı Faktör Analizleri (AFA).....	57
3.8.1. Çevrim İçi Alışveriş Davranışı (CAD) Ölçeği'ne Yönelik AFA Analizi	57
3.8.2. Tüketici Güveni Ölçeği (GUV) Ölçeği'ne Yönelik AFA Analizi	58
3.8.3. Geleneksel İletişim Kanalları (GİK) Ölçeği'ne Yönelik AFA Analizi	59
3.8.4. Yeni Nesil İletişim Kanalları (YİK) Ölçeği'ne Yönelik AFA Analizi ..	60
3.8.5. Risk Ölçeği'ne Yönelik AFA Analizi	62
3.9. Ölçeklere Yönelik Doğrulamalı Faktör Analizleri (DFA).....	66
3.9.1. CAD Ölçeği'ne Yönelik DFA Analizi	67
3.9.2. GUV Ölçeği'ne Yönelik DFA Analizi.....	68
3.9.3. GİK Ölçeği'ne Yönelik DFA Analizi.....	68
3.9.4. YİK Ölçeği'ne Yönelik DFA Analizi	70
3.9.5. Risk Ölçeği'ne Yönelik DFA Analizi	71
3.10. Ölçeklere ve Alt Boyutlarına Yönelik Güvenirlilik Analizi.....	72
3.11. Ölçeklere ve Alt Boyutlarına Yönelik Normallik Analizi	73
3.12. Hipotezlere Yönelik Aracılık ve Etki Analizleri	74

3.12.1. GİK→GUV→CAD Modeline Yönelik Aracılık Analizi.....	74
3.12.2. YİK→GUV→CAD Modeline Yönelik Aracılık Analizi.....	75
3.12.3. RİSK→GUV→CAD Modeline Yönelik Aracılık Analizi.....	77
3.13. Hipotezlere Yönelik Fark Analizleri	78
3.13.1. Cinsiyet Değişkeni İle İlgili Fark Analizi.....	78
3.13.2. Yaş Değişkeni İle İlgili Fark Analizi.....	79
3.13.3. Eğitim Değişkeni İle İlgili Fark Analizi.....	81
3.13.4. Gelir Değişkeni İle İlgili Fark Analizi	83
SONUÇ VE ÖNERİLER.....	87
KAYNAKÇA.....	93
EKLER	105
Ek 1.	105
Ek 2.	105
Ek 3.	106
Ek 4.	106
Ek 5.	107
Ek 6.	107
Ek 7.	108
Ek 8.	108
Ek 9.	109

KAYNAKÇA

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FİNANSAL İÇERME: KAVRAM VE POLİTİKA

Dr. Fergül Özgün



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İÇİNDEKİLER

Ön Söz.....	iii
Giriş	1
BİRİNCİ BÖLÜM.....	3
1. FİNANSAL İÇERME KAVRAMI.....	3
1.1. Finansal İçermenin Tanımı.....	3
1.2. Finansal İçermenin Önemi.....	9
1.2.1. Sürdürülebilir Kalkınma ve Finansal İçerme.....	10
1.2.2. Kapsayıcı Büyüme ve Finansal İçerme	14
1.2.3. Finansal İstikrar ve Finansal İçerme	15
1.2.4. Yoksulluk ve Finansal İçerme	17
1.2.5. Finansal Dışlama ve Finansal İçerme	19
1.2.6. İstihdam ve Finansal İçerme	22
1.2.7. Kayıt Dışı Ekonomi ve Finansal İçerme.....	23
1.3. Finansal İçerme Türleri	25
1.3.1. Bireyler İçin Finansal İçerme.....	31
1.3.2. Firmalar İçin Finansal İçerme.....	32
1.4. Finansal İçermenin Temel Bileşenleri.....	34
1.4.1. Hizmetlere Erişim	34
1.4.2. Finansal Okuryazarlık.....	36
1.4.3. Tüketicinin Korunması	39
1.4.4. Mikro Finans	41
1.4.5. Altyapı Yatırımları	44
1.5. Finansal İçermenin Ölçümü	45
1.5.1. Arz Yanlı-Talep Yanlı Değişkenlere Göre Ölçüm	46
1.5.1.1. Arz Yanlı Değişkenler	47
1.5.1.2. Talep Yanlı Değişkenler	48

1.5.2. Dünya Bankası Yaklaşımına Göre Ölçüm.....	49
1.5.2.1. Finansal Hizmetlere Erişim	50
1.5.2.2. Finansal Hizmetlerin Kullanımı.....	53
1.5.2.3. Kalite.....	57
1.6. Finansal İçermenin Önündeki Engeller	60
1.6.1. Arz Yanlı Engeller.....	61
1.6.2. Talep Yanlı Engeller	63
İKİNCİ BÖLÜM	65
2. FİNANSAL İÇERMEYİ ARTIRMAYA YÖNELİK POLİTİKALAR	65
2.1. Finansal İçermeyi Artırma Politikaları	65
2.1.1. Finansal Okuryazarlığın Artırılması.....	66
2.1.2. Finansal Engellerin Azaltılması	70
2.1.3. Dijital Teknolojilerdeki Yenilikler	74
2.1.4. Para Politikası Uygulamaları.....	80
2.1.5. Yasal Düzenlemeler	83
2.2. Ulusal Strateji Politikaları	87
2.2.1. Hindistan	88
2.2.2. Nijerya	96
2.2.3. Avrupa Birliği	102
2.2.4. Türkiye	108
KAYNAKÇA.....	127

KAYNAKÇA

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Erol Demir
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İÇİNDEKİLER

ÖN SÖZ	iii
KISALTMALAR DİZİNİ.....	ix
ŞEKİLLER DİZİNİ.....	xi
ÇİZELGELER DİZİNİ	xv
1. GİRİŞ.....	1
2. GAYRİMENKUL PİYASASI VE GAYRİMENKUL PAZAR ANALİZİ	15
2.1. Gayrimenkul Piyasasının Etkinliği	16
2.2. Gayrimenkul Pazar Analizi	17
2.3. Pazar Analizinin Yapılma Sebepleri	19
2.4. Pazar Analizine İhtiyaç Duyan Taraflar.....	21
2.5. Arz ve Talep Analizleri	23
2.6. Konut Piyasası ve Analizi	25
3. SİSTEM DÜŞÜNCESİ VE SİSTEM DİNAMIĞI.....	27
3.1. Sistem Düşüncesi.....	27
3.1.1. Sistem düşüncesinin kuramsal altyapısı	27
3.1.2. Sistem ve sistemin unsurları.....	28
3.1.3. Sistemlerin sınıflandırılması	29
3.2. Sistem Dinamiği	31
3.3. Dinamik Sistemlerde Modelleme	33
3.4. Sistem Dinamiğinin Ögeleri.....	35
3.4.1. Stok akış diyagramları	36
3.4.2. Geri besleme (nedensel) döngü diyagramları.....	38
3.4.3. Davranışın zamana bağlı değişimleri.....	41
3.4.4. Bilgisayar benzetimi (simülasyon).....	42

4. ANKARA KONUT PİYASASI VERİLERİNİN İNCELENMESİ	45
4.1. Nitel Araştırma Yaklaşımıyla Sağlanan Bilgiler	46
4.2. Nicel Araştırma Yaklaşımıyla Sağlanan Bilgiler	47
4.2.1. Nüfus ve hane sayıları	47
4.2.2. Yapı ruhsatı ve yapı kullanma izin belgesi	48
4.2.3. Satılan birinci el konutlar	49
4.2.4. İnşaat maliyet endeksi	50
4.2.5. Konut fiyat endeksi	51
4.2.6. Konut kredisi faiz oranı	52
4.2.7. Yurt içi üretici fiyat endeksi	53
5. ANKARA KONUT PİYASASI SİSTEM DİNAMİĞİ MODELİ	55
5.1. Modelin Tasarlanması	55
5.1.1. Modelin kapsamı	55
5.1.2. İncelenen zaman periyodu	56
5.1.3. Simülasyon modeli döngüleri	56
5.1.4. Simülasyon modeli	57
5.2. Modelin Test Edilmesi	72
5.2.1. Yapısal testler	73
5.2.2. Davranışsal testler	75
5.3. Model Çıktılarının İncelenmesi	80
5.3.1. Modelin temel durumda çalıştırılması	81
5.3.2. Duyarlılık analizi	84
5.3.3. Senaryo analizi	89
5.4. Model Çıktılarının Kullanımı ve Politika Önerileri	104
6. SONUÇ VE ÖNERİLER	109
KAYNAKLAR	117
YAZAR BİLGİSİ	123

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İÇİNDEKİLER

ÖN SÖZ	iii
KISALTMALAR	ix
GİRİŞ	1
1. Araştırmanın Önemi	1
2. Araştırmanın Amacı	4
3. Araştırmanın Kapsamı	5
4. Araştırmanın Yöntemi	7
5. Mâturîdî Kelamının Temel Dinamikleri ve Hikmet Felsefesi.....	9

BİRİNCİ BÖLÜM

MÂTURÎDÎ'DE HİKMET ANLAYIŞI	17
1.1. Hikmetin Tanımı ve Mahiyeti	17
1.1.1. Lügat ve İstılah Manası	17
1.1.2. Kaynağı ve Çeşitleri	22
1.2. Kur'an'da ve Hadislerde Hikmet.....	27
1.2.1. Kur'an'da Allah'ın Hâkim Olması	31
1.2.2. Hikmetin İnsana Verilmesinin Anlamı	32
1.3. İslami İlimlerde Hikmet.....	38
1.3.1. Kelam İlminde Hikmet	38
1.3.2. Fıkıh İlminde Hikmet.....	49
1.3.3. İslam Felsefesinde Hikmet	56
1.3.4. Tasavvufta Hikmet.....	65

1.4. Hikmetle İlişkili Bazı Kavramlar.....	72
1.4.1. İllet	72
1.4.2. Gaye	77
1.4.3. Hayır	79
1.4.4. Fıkıh	81
1.4.5. Hak	84
1.4.6. Adalet	87
1.4.7. Kaza-Kader	89
1.5. Hikmetle Zıt Anlamlı Kavramlar	93
1.5.1. Sefeh	93
1.5.2. Zulüm	95
1.5.3. Cehalet.....	98
1.5.4. Batıl	101

İKİNCİ BÖLÜM

MÂTURÎDÎ'YE GÖRE AHLAK VE SORUMLULUK AÇISINDAN İNSAN FİİLLERİ.....	103
2.1. Ahlakın Tanımı	103
2.1.1. Lügatte Ahlak	103
2.1.2. Terim Olarak Ahlak.....	106
2.2. Ahlakın Konusu ve Amacı	107
2.3. Ahlakın Kısımları.....	111
2.3.1. Ferdi Ahlak.....	114
2.3.2. Sosyal Ahlak.....	117
2.3.3. Siyaset Ahlakı	125
2.4. Ahlakın Kaynağı.....	140
2.4.1. Vahiyle Temellendirilen Ahlak Anlayışı.....	141
2.4.2. Vahiy Dışı Temellendirilen Ahlak Anlayışı.....	145
2.5. Ahlakla İlgili Bazı Kavramlar	151
2.5.1. İhsan.....	151

2.5.2. İstikamet.....	153
2.5.3. Birr/Berr	154
2.5.4. Hasene ve Seyyie.....	156
2.5.5. Sabır	157
2.5.6. İhlas	160
2.5.7. Halife	161
2.5.8. İman/Emanet	162
2.5.9. Takva	165
2.5.10. Ma'ruf ve Münker	168

ÜÇÜNCÜ BÖLÜM

MÂTURÎDÎ'DE İLAHÎ HİKMET ANLAYIŞININ TEMELLENİRİLMESİ	171
3.1. Hikmet Düşüncesinin Temellendirilmesi.....	171
3.2. Hikmetin Tanrı Merkezli Boyutları.....	176
3.2.1. Âlemin Yaratılmışlığı/Hudus.....	176
3.2.2. Tanrı'nın Varlığı/Marifetullah.....	183
3.2.3. Ahiretin Varlığı/Mead.....	189
3.3. Hikmetin İnsan Merkezli Boyutları.....	193
3.3.1. İyi ve Kötünün Tabiatı /Hüsün ve Kubuh.....	193
3.3.2. Kader-Kaza ve Hikmet İlişkisi	200
3.3.2.1. Salah-Aslah.....	215
3.3.2.2. Hidayet ve Dalalet.....	222
3.3.3. Tercih Yapma Hakkı/Cüz'i İrade.....	226
3.3.4. İstitaat (Kudret), Kesb ve İnsanın Sorumluluğu.....	232
3.4. Ahlak ve Sorumluluk Açısından Hikmetle Bağlantılı Konular	246
3.4.1. Va'd-Va'id ve Tanrı'nın Ahlakiliği.....	246
3.4.2. Peygamberlerin Gönderilmesi.....	257
3.4.3. Emir ve Yasakların Hikmeti	262

3.4.4. Nimete Karşı Şükürün Gerekliliği	268
3.4.5. Akıl-Hikmet İlişkisi.....	276
3.5. Hikmet Anlayışının İnsan Davranışlarına Etkisi	283
3.5.1. İnsan-Allah İlişkisi	283
3.5.2. İnsanın Nefsi ile İlişkisi.....	290
3.5.3. İnsan-Çevre/Doğa İlişkisi	298
SONUÇ.....	313
KAYNAKÇA.....	321

KAYNAKÇA

A. Kitaplar:

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ISO 9001: 2015 ve IATF 16949: 2016 KALİTE YÖNETİM SİSTEMİ STANDARTLARI BELGELENDİRMESİ VE PERFORMANS

Dr. Buşra Kesici
Prof. Dr. Mehmet Selami Yıldız



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İÇİNDEKİLER

ÖN SÖZ	vii
YAZARLAR HAKKINDA	ix
SİMGELER	xi
GİRİŞ	1
1. KALİTE YÖNETİM SİSTEMLERİ	5
1.1. Kalite, Prensipleri ve Yönetim Sistemlerinin Temeli	7
1.2. ISO 9001: 2015 ve IATF 16949: 2016 Kalite Yönetim Sistemi Standartları	11
2. KALİTE STANDARTLARI BELGELENDİRME SÜRECİ	23
2.1. Geçiş Süreci Zaman Planı.....	24
2.2. GAP (Boşluk) Analizi	25
2.3. SWOT Analizi	27
2.3.1. İç ve Dış Bağlamlar.....	30
2.3.2. PESTLE Analizi.....	31
2.3.3. PRIMO-F Analizi.....	32
2.4. Risk Analizi	33
2.4.1. Risk Kavramı.....	33
2.4.2. Belirsizlik	34
2.4.3. Risk Yönetimi	34
2.4.4. Risk Yönetim Süreci.....	35
2.4.5. Risklerin Belirlenmesi	38
2.4.6. Risk Analizi ve Değerlendirilmesi.....	39
2.4.7. Risk Tepkileri Planlaması	42
2.4.8. Risklerin İzlenmesi ve Kontrolü.....	44
2.5. İç Denetim (Tetkik).....	46

2.5.1. İç Denetim (Tetik) Programı	50
2.5.2. İç Denetçi Yeterliliği	50
2.5.3. İç Denetim Sonuçları	51
2.6. Yönetim Gözden Geçirmesi	54
2.6.1. Yönetim Gözden Geçirme Girdileri	54
2.6.2. Yönetim Gözden Geçirme Çıktıları	55
3. BALANCED SCORECARD İLE PERFORMANS ANALİZİ.....	57
3.1. Performans Kavramı	57
3.2. Balanced Scorecard (BSC)	59
3.2.1. Finansal Boyut.....	63
3.2.2. Müşteri Boyutu	65
3.2.3. İçsel Süreç Boyutu.....	66
3.2.4. Öğrenme ve Gelişme Boyutu	67
3.2.5. BSC ve Performans Göstergesi İlişkisi	69
4. YÖNTEM.....	75
4.1. Araştırmanın Modeli.....	78
4.1.1. Araştırma Modelinin Teorik Tartışması.....	78
4.1.2. Araştırmanın Kavramsal Modeli	80
4.2. Evren ve Örneklem	81
4.3. Veri Toplama Araçları	83
4.4. Verilerin Toplanması	85
4.4.1. Doküman İnceleme.....	85
4.4.2. Görüşme	88
4.4.3. Araştırmanın Geçerliliği ve Güvenilirliği	89
4.5. Verilerin Analizi.....	90
5. BULGULAR VE YORUMLAR.....	93
5.1. Geçiş Süreci Zaman Planı Uygulaması.....	93
5.2. GAP (Boşluk) Analizi Uygulaması	96
5.3. SWOT Analizi (İç ve Dış Bağlımlar, PESTLE ve PRIMO-F dâhil edilerek) Uygulaması.....	99
5.4. Risk Analizi Uygulaması	102
5.4.1. Risklerin Tanımlanması.....	103

5.4.2. Risklerin Analizi.....	103
5.4.3. Risk ile Fırsatların Aksiyon ve Faaliyetlerin Belirlenmesi	105
5.4.4. Risk ve Fırsat Aksiyonlarının Analizi.....	106
5.5. Doküman İncelemesi.....	109
5.6. İç Denetim Uygulaması.....	110
5.7. Yönetim Gözden Geçirmesi Uygulaması.....	113
5.8. Geçiş Süreci İncelemesi Sonrasında İşletmenin Performans Değerlendirmesi	115
5.9. Geçiş Süreci İncelenen İşletme ve Henüz Geçiş Yapmamış Diğer Firmanın Performans Değerlendirmesi.....	141
5.10. Öneri Hipotezleri.....	168
6. SONUÇ VE ÖNERİLER.....	181
6.1. Sonuçlar	181
6.2. Öneriler	188
6.2.1. Literatüre Yönelik Öneriler	188
6.2.2. Uygulamaya Yönelik Öneriler	189
KAYNAKÇA.....	191
EKLER.....	217

KAYNAKÇA

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İŞ KAZALARINDA VERİ ANALİZİ

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Dr. Öğr. Üyesi Tufan Öztürk

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İÇİNDEKİLER

ÖN SÖZ	v
KISALTMALAR	ix
GİRİŞ.....	1
1. BÖLÜM	3
Lojistik Regresyon Analizi	3
Lojit Model.....	5
Model Uyum İyiliği	8
Olasılık Oran Testi (Likelihood-Ratio Test)	8
Wald Testi.....	9
Hosmer ve Lemeshow Testi (RL).....	10
β Katsayıları	11
2. BÖLÜM	13
Araştırma Yapılacak Saha ve Problemin Belirlenmesi	14
Araştırma İzni ve Veri Temini.....	15
SGK'dan Araştırma İzninin Alınması ve Verilerin Temini	15
İstanbul Meteoroloji Genel Müdürlüğünden Araştırma İzninin Alınması ve Verilerin Temini.....	16

Kaynak Bilgilerin İncelenerek Kıymetlendirilmesi	16
Kaynak Bilgilerin Elektronik Ortama İşlenmesi.....	18
Ek Verilerin Türetilmesi.....	18
Verilerin Sınıflandırılması.....	19
SPSS'e Veri Girişi	33
Değişkenlerin Uygun Analiz Yöntemi Bakımından İncelenmesi	33
Bağımlı ve Bağımsız Değişkenlerin Belirlenmesi	34
Sıklık Analizleri.....	34
Zaman Değişkeni Sıklık Analizleri	38
Kaza Zamanının Çalışma Aralığındaki Yeri	38
Kazazede Değişkenleri Sıklık Analizler	40
Kazazedenin Son İşyerindeki Deneyimi	40
Kazazedenin Esas İş.....	41
Proje Değişkenleri Sıklık Analizler	43
Projede Çalışan Sigortalı Sayısı	43
Kaza Değişkenlerinin Sıklık Analizler.....	44
Kaza Cinsi	44
Kaza Anında Zarar Veren Nesne	46
Yaralanma Değişkenlerinin Sıklık Analizler	47
Kazalarda Oluşan Yaranın Vücuttaki Yeri.....	47
Kazalarda Oluşan Yaranın Türü	49
Düşme Değişkeni Sıklık ve Ön Analizi	50
Düşme Türü	50
Kazazedenin Düşey Düşme Yüksekliği	52
İklim Değişkenleri	53
Günlük Ortalama Sıcaklık	53
Günlük Ortalama Nem	54

3. BÖLÜM	57
Model Oluşturulması	57
Sıralı (Ordinal) Lojistik Regresyonu Analizi İle Esas Modelin Oluşturulması.....	57
İkili (Binominal) Lojistik Regresyon Analizleri.....	81
İkili (binominal) Lojistik Regresyonu Analizi İle Birinci Açıklayıcı Modelin Oluşturulması	81
İkili (Binominal) Lojistik Regresyonu Analizi İle İkinci Açıklayıcı Modelin Oluşturulması	92
 KAYNAKLAR	 101
EKLER	105

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İÇİNDEKİLER

SUNUŞ	iii
ÖN SÖZ	v
İKLİM DEĞİŞİKLİĞİ İLE MÜCADELEDE KARBON NÖTR POLİTİKALAR	1
Esra Çelebi Zengin	
İKLİMSSEL VE ÇEVRESEL NEDENLERLE GÖÇE ZORLANANLAR: İKLİM GÖÇMENLERİ.....	35
Hayriye Sağır	
Süleyman Koç	
YENİ KENTSEL KİMLİKLER: MARKA KENT, AKILLI KENT, YAVAŞ KENT VE SÜNGER KENT	63
Emrah Atar	
TOPLUMSAL HAREKETLER VE SİYASET: BİR TEZAHÜR ALANI OLARAK KENT.....	85
Melih Coşgun	
NEOLİBERAL KENTLEŞME SÜRECİNDE TÜRKİYE'DE KENTSEL PARADOKSLAR	101
Handan Yıldırım	
TARIM VE GIDA GÜVENLİĞİ KAPSAMINDA TÜRK TARIM POLİTİKALARININ DEĞERLENDİRİLMESİ.....	133
Hayriye Sağır	
Gizem Altay	
TÜRKİYE'DE KENTSEL YOKSULLUKLA MÜCADELE STRATEJİSİ OLARAK SOSYAL BELEDİYECİLİK	163
Ersin Eraslan	
Kamil Hakan Derin	

YEREL YÖNETİMLERİN SOSYAL POLİTİKA UYGULAMALARI	197
Bilal Çilkaya	
Bahadır Metin	
YEREL YÖNETİMLERDE E-DÖNÜŞÜM.....	227
Seyida Erkek	
YEREL YÖNETİMLERDE STRATEJİK YÖNETİM.....	243
Ali Davut Alkan	
YEREL YÖNETİMLERDE TOPLAM KALİTE YÖNETİMİ KÜLTÜRÜNÜN YERLEŞMESİNDE HİZMET TALEP EDENLERİN ROLÜ	261
Hava Tahtaloğlu	
NİĞDE KENT KÜLTÜRÜNÜ İNŞA EDEN UNSURLAR	289
Şükrü Türköz	
YAZARLAR HAKKINDA.....	317

gazlar içinde karbon dioksit ve metan özel bir yer tutmaktadır. Karbon dioksitin sera gazlarının yaklaşık %80ini oluşturduğu gerçeğinden hareketle ise hava kirliliğinin, yol açtığı küresel ısınma ve iklim değişikliğinin yıkıcı etkilerinin azaltılması için karbon dioksit başta olmak üzere sera gazı emisyonlarını azaltmak birincil strateji olarak karşımıza çıkmaktadır. Bu gazların ve özellikle karbon dioksitin en çok kömür, petrol gibi fosil yakıtların üretimi/tüketimi noktasında açığa çıktığı bilindiği için de başta bu yakıt türlerinin kullanımının durdurulması ve atmosferdeki karbon dioksit miktarını azaltacak tedbirler alınması gündeme gelmektedir.

Karbon ayak izi, karbon nötr ve net sıfır emisyon gibi kavramlarla hayatımıza giren bu tedbirler uluslararası sözleşme, protokol ve belgeler aracılığıyla küresel bir stratejiye dönüşmektedir. Bireylerin, kurum/kuruluşların ve ülkelerin karbon dioksit emisyon oranlarının düşürülmesini hedefleyen bu tedbirlerin temelinde ise rüzgâr ve güneş gibi yenilenebilir ve temiz enerji kaynaklarının kullanılması, yeşil alanların yani karbon yutaklarının artırılması, araç kullanımının azaltılması gibi pek çok husus yer almaktadır. Birçok ülkenin de uzun vadede karbon nötr hâle gelebilmek ve net sıfır emisyon hedefine ulaşabilmek için stratejiler geliştirdikleri bilinmekte, top yekün bir mücadeleyi gerektiren bu süreçte en çok karbon salınımının gerçekleştiği alanlar olan kentlere ve kent yönetimlerine de büyük görevler düşmektedir.

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İKLİMSEL VE ÇEVRESEL NEDENLERLE GÖÇE ZORLANANLAR: İKLİM GÖÇMENLERİ

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GİRİŞ

İnsan-çevre dengesinin bozulmasının küresel yansıması olarak iklim değişikliği sorunsalı, tüm dünyayı etkisi altına almaya başlamıştır. Farklı coğrafyalarda değişik etkilerle ortaya çıkan sorunların nihai aşaması ise insanların yaşam ortamlarını kaybetmeleridir. Buzulların erimesi sonucu sular altında kalmaya başlayan ve ilerleyen dönemlerde kalması muhtemel yerleşimlerde yaşayanlar için göç kaçınılmaz olacaktır. Bununla birlikte yaşam alanlarındaki istihdam imkânları kaybolan ve iklim değişikliğinden zarar gören insanlar için göçün zorunluluk hâline gelmesiyle, küresel toplum ilerleyen yıllarda ciddi bir göç dalgası ile karşı karşıya kalacaktır.

İklim göçmenleri kavramı, iklimsel ve çevresel nedenlerle buldukları yerleşim alanından ayrılan insan topluluklarını ifade etmektedir. Göçü ortaya çıkaran sebeplerin başında ise daha iyi yaşam standardına ulaşma arzusu gelmektedir. Göçmenlerin yaşam alanları ya yok olmakta ya da yaşamlarını devam ettirme olasılıkları buldukları mekânda zorlaşmaktadır. Böyle bir durum ise göçü kaçınılmaz kılacaktır. Hâlihazırda iklim değişikliğinin nedenleri ve doğal çevre üzerindeki etkileri hakkında küresel aktörlerin çekimsel bir anlayışa sahip olması ve sonucunda net politikalar üretilememesi nedeniyle, artan sayıdaki ik-

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SONUÇ

Göç hareketinin iklimsel nedenlerden kaynaklanması iklim mültecileri olgusunu gündeme getirmiştir. Özellikle yaşam alanının yok olması, yaşanan mekândaki düşük, yetersiz yaşam standartları, geçim imkânlarının ortadan kalkması gibi nedenler zorunlu bir göç süreci ortaya çıkarmaktadır. Uluslararası hukuk antropojenik ve çevresel faktörlerden kaynaklanan sorunlara yönelik düzenlemelere yer vermemektedir. Bununla birlikte iklim değişikliğinin etkileri sadece zorunlu göçe maruz kalanlar açısından değil, bu kişilere ev sahipliği yapacak ülkelerdeki insanlara da yansımaktadır.

Doğal ve iklim değişikliklerine bağlı felaketlerin artarak devam ettiği günümüzde iklim göçmenlerinin sayısının da artması beklenmektedir. Uluslararası alanda kavramsal çerçeve oluşturulamadığı için, iklim mültecileri noktasında ülkelerin kendi bünyelerinde buldukları çözüm önerileri sürece fazla katkı sağlamamaktadır. Bu nedenle ilerleyen yıllarda iklim göçmenlerine yönelik sorun alanları daha da karmaşıklaşmadan, uluslararası toplum iklim göçmenlerinin statülerine ilişkin gerekli düzenlemeleri yapmalıdır. Mülteciler, 1951 tarihli Mültecilerin Statüsüne İlişkin Cenevre Sözleşmesi kapsamında statü hakkı elde etmektedir. Oysaki sözleşme şartlarının hazırlandığı yıllarda ve 1967 Protokolü ile revize edildiği dönemde iklim değişikliği henüz uluslararası hukuk kapsamında gündeme gelen bir sorun alanı değildi. Bu nedenle günümüz şartları doğrultusunda sözleşmede bir düzenleme yapılması, önemli bir gereklilik olarak ortaya çıkmaktadır. İklimsel nedenlere bağlı zorunlu göç eden bireylere yönelik mülteci hukuku kapsamında kavramsal çerçevenin çizilmesi tanım kapsamına alınması, sorunun çözümü noktasındaki en önemli adım olacaktır, çünkü göçmenler günümüzde sadece buzdağının görünen yüzünü yansıtmaktadırlar.

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YENİ KENTSEL KİMLİKLER: MARKA KENT, AKILLI KENT, YAVAŞ KENT VE SÜNGER KENT

Emrah Atar¹

Birlikte yaşama duygusu, insanın var olduğu günden beri, insanın temel iç güdülerinden birisi olmuştur. Bu doğrultuda tarihin her evresinde insanların bazen benzer hedefler bazen ise farklı amaçlar doğrultusunda oluşturdukları ve tarihin her evresinde kültürel farklılıklar ile belirli bir değişim ve dönüşüm geçiren kentler oluşturulmuştur. Kent, tüm vatandaşları için sosyal, politik, idari ve ekonomik alanı olan bir yaşam alanıdır (Akkoyunlu, 2007:23). Sanayi devrimi ile beraber artan endüstrileşme hareketi de kentleşme hareketinin daha farklı boyutlara ulaşmasına zemin hazırlamıştır. Aynı şekilde, 1. ve 2. Dünya Savaşlarından sonra artan göç olayları endüstrileşmeyle paralel farklı hareketlerin oluşmasına neden olmuştur. Bütün bunların neticesinde, ekonomik, politik, demografik, sosyal ve kültürel önemlerine göre farklı kentler karşımıza çıkmıştır. Bundan dolayı kent tanımlaması yapılırken farklı ölçütler kullanılmakla beraber farklı bilim alanları tarafından da çeşitli boyutları ile ele alınmaktadır. Günümüzde kentler genel olarak; nüfus ölçütüne göre, toplumbilimi ölçütü açısından ve ekonomik faaliyet ölçütüne göre sınıflandırılabilir.

Nüfus ölçütüne göre bir değerlendirme yapacak olursak; En az 50.000 nüfuslu yüksek yoğunluklu şehirlerde yaşayan nüfus, özellikle son yarım asırda iki katından fazla artarak 1975'te 1,5 milyardan 2015'te 3,5 milyara ulaşmıştır. Böylece dünya nüfusunun neredeyse yarısı (%48) şehirlerde, dörtte biri kırsal alanlarda (%24) ve geri kalan insanlar kasabalarda veya yarı yoğun alanlarda (%28) yaşamlarını devam ettirmektedirler (OECD, 2020). Küresel olarak incelendiği zaman ise kentleşmenin yaygınlaştığını, kasabaların zaman içerisinde şehirlere dönüştüğünü ve banliyölerin genişleyen şehirler tarafından emildiğini

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TOPLUMSAL HAREKETLER VE SİYASET: BİR TEZAHÜR ALANI OLARAK KENT

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GİRİŞ

Toplumsal hareketler kavramı ismiyle müsemma bir biçimde sahip olduğu dinamizm ve anlamlandırma çabaları esnasında merkeze yerleştirilen olgunun farklılaşması nedeniyle üzerinde mutabakata varılmış, herkes tarafından kabul gören tek bir tanımı bulunmamaktadır. Kavramın en önemli düşünürleri arasında yer alan Tilly (2008) toplumsal hareketleri, yalın bir ifadeyle, halkın organize bir biçimde siyasi manada harekete geçişi olarak tanımlamaktadır. Özellikle 19. yüzyıla kadar cemaat gruplarının yönlendirdiği görece geleneksel zeminde ilerleyen toplumsal hareketler sonraları kalıcı kazanımları ve yeni hakları beraberinde getiren modern toplumsal hareketlere dönüşmüştür. Geleneksel toplumsal yapıda kendisine uygun genişleme alanını yeteri kadar bulamayan toplumsal hareketler bu imkânı kentlerle birlikte elde etmiştir. Modern zamanlarla birlikte kentler daha önceleri sahip olmadığı birtakım özelliklere haiz olmuştur. Modern kentler; tarım ve sanayi ürünlerinin dağıtıldığı bir ekonomik bir merkez, uzmanlaşmanın hızlandığı, toplumsal açıdan dikey/yatay geçişlerin kolaylaştığı, geleneksel aile yapısının değiştiği, hukuk kurallarının ve kurumlarının belirginleştiği ve heterojenleşmiş bir toplumsal yapı hâli almıştır (Kaya, 2003). Kentin sahip olduğu bu nitelikler eski ve yeni toplumsal hareketlerin de merkezinde yer alan ayrışmayı derinleştirmiştir. Bu ayrışma toplumsal hareketlerin eskiliğine veya yeniliğine dair farklı yaklaşımları da beraberinde getirmiştir. Bu yaklaşımlardan ilki toplumsal hareketlerin geleneksel ve modern zamanlarda pek de farklı olmadığını iddia etmektedir. Özü itibarıyla toplumsal hareketler iki temel benzerlik içermektedir. Bunlardan ilki tek tipleştirmeye karşı tavrının olması ve diğeri önceleri işçi sınıfı

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dönemlerde kullanılan yeni toplumsal hareketler bahsi geçen yüzyıla ait temel yöntemler olmakla birlikte aralarındaki ilişki hasebiyle net biçimde birbirinden ayırıştırılamamaktadır. Yeni toplumsal hareketlerin sahip olduğu merkezlessiz, çoğulcu, iktidar talep etmeyen ve demokrasinin demokratikleşmesine yönelik tavır onun, kendine münhasır değerleri olarak görülmektedir. Bu bağlam aynı zamanda çalışmanın temel iddiası olan yeni toplumsal hareketlerin küçük partilerin ortaya çıkışının zemini olduğu düşüncesini argümanıdır. Benzer bir biçimde küçük partiler de iktidarı ele geçirme arzusu olmadan, katı ve hiyerarşik parti örgütlenmesini reddeden, tek bir ideolojik tavra karşı çıkan ve seçimlerden seçimlere değil siyasal karar alma süreçlerine sık sık katılım talep etmektedirler.

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NEOLİBERAL KENTLEŞME SÜRECİNDE TÜRKİYE'DE KENTSEL PARADOKSLAR

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GİRİŞ

Neoliberalizmin yönetim pratiklerindeki hegemonyası göz önüne alındığında kentlerin yaşadığı önemli bir zorluk, kentin küresel odaklı ekonomik işlevlerinin yerel olarak kök salmış toplum ve kültürle eklemelenmesidir (Castells, 1993; Parnell ve Robinson, 2012). Neoliberalizm, sermayenin çıkarlarına üstünlük veren politika gündemlerini teşvik ederken; siyasi iktidarın kalkınma sürecindeki etkisini azaltmaz (Davies, 2014). Bu çerçevede yönetim anlayışı, girişimciliğe kaymakta ve kentsel gelişme büyük ölçüde kamu ve özel sektör arasındaki ortaklıklara ve sermaye birikimi için kentsel metalaştırmaya odaklanmaktadır (Harvey, 1989).

Bu kalkınma ideolojisi, politika yapıcılar tarafından, özellikle kentsel bağlamda, yeniden geliştirme projelerinin sembolik temsili olarak uygulanmaktadır (Mosciaro ve Pereira, 2019). Birçok paradoksuna rağmen neoliberalizm, Türkiye'de 1980'li yıllardan itibaren hükümetler tarafından bir kalkınma yaklaşımı olarak benimsenmekte ve varsayılan faydaları, yeni kentsel kalkınma projelerini teşvik etmek ve uygulamak için kullanılmaktadır. Bu tür projeler, görünüşte, sosyoekonomik zorlukları çok boyutlu olarak ele almayı amaçlamaktadır. Projelerin savunucuları, ilgili projelerin kentsel refah için gerekli olduğu ve damlama² yo-

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2 Damlama Teorisi (The Trickle-Down Theory), vergi indirimlerinden, sermaye kazançlarından, temettülerden ve hatta şirketler ve varlıklı bireyler üzerindeki daha gevşek düzenlemelerden elde edilen faydaların, sonunda orta ve düşük gelirli bireylere fayda sağlamak için aşağıya akacağını varsayar. Kesintilerden elde edilen ekstra servet, zenginleri ekonomik büyümeyi artıran işletmelere yatırım yapmaya veya genişletmeye yönlendirir. Ancak, çoğu zaman durum böyle

kaynaklarından sistematik olarak mahrum bırakıldığı yapısal ve kurumsal itme veya engelleme süreçleri biçimindeki sosyal dışlanma (Fischer, 2008) yaşanmaktadır. İstanbul'da bu, şehir genelinde mevcut yaygın sosyo-mekânsal eşitsizliği, yoksunluğu derinleştirmekte ve böylece kent yoksullarının zaten güvencesiz yaşam koşullarını daha da kötüleştirmektedir.

Devletin kentsel modernite amaçları arzu edilirken, süreçlere ve istenmeyen sonuçlara çok dikkat etmek esastır. Bu çalışmada tartışılan neoliberalizmin birçok paradoksuna dikkat etmek, normalde kalkınmadan faydalanması gereken, zaten marjinalleşmiş düşük gelirli toplulukları daha fazla yoksullaştırmayacak şekilde kentsel dönüşümü sağlama yollarını teşvik etmek için daha iyi bir fırsat sağlayabilir. Bu aynı zamanda bir yanda siyasi iktidarın ekonomik büyüme ve kentsel modernite özlemleri ile diğer yanda toplulukların sosyoekonomik özlemleri arasındaki çelişkileri azaltmaya da yardımcı olabilir. İstanbul örneğinde, kalkınmanın sosyal yönlerinin ekonomik hususlar kadar kritik olduğunu anlamak önemlidir.

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TARIM VE GIDA GÜVENLİĞİ KAPSAMINDA TÜRK TARIM POLİTİKALARININ DEĞERLENDİRİLMESİ

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Gizem Altay²

GİRİŞ

Gıda ve tarım güvenliği, küresel seviyede yaşanan birçok neden ve sorunun bir araya gelmesi nedeni ile risk altındadır. Temel ihtiyaçlar hiyerarşisinde en önde gelen beslenme ihtiyacı ancak gıda güvenliği esasının tesis edilebilmesiyle mümkün hâle gelecektir. Gıda güvenliği tesis edilemediğinde salgın hastalık, felaket, kıtlık, kuraklık ve doğal afetlerin insan yaşamını normalden fazla etkilediği görülmektedir. Buna ek, olarak gıda güvenliğinin sağlanamaması nedeni ortaya çıkan olumsuz ve yıkıcı sonuçlar, pozitif ayrımcılık görmesi gereken kırılgan grupları (kadın, çocuk ve yaşlıları) daha fazla etkilemektedir.

Maslow'un ihtiyaçlar hiyerarşisinde ilk sırada yer alan beslenme ihtiyacının karşılanması insan yaşamının temel vazgeçilmezleri arasındadır. Gıdaların, insanların yaşamındaki vazgeçilmezliğine ve ekonomik açıdan önemine bakıldığında gıda ve tarım güvenliği konusu, kamu otoriteleri ve prosedürleri bakımından ilk sırada yer almaktadır. Gıda ve tarım güvenliğinin ilk sıralarda yer almasının en önemli nedeni ise gıda yoksunluğunun ulusal ve küresel çapta çatışmaya yol açma potansiyelidir. Dolayısıyla gıda ve tarım güvenliği; mevcut beslenme problemlerine çözüm getirmek ve olağanüstü durumlarda meydana gelen yıkıcı

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gulanmaya başlanmıştır. İlerleme Raporları, Katılım Ortaklık Belgesi ve Ulusal Programlar vasıtasıyla da gıda güvenliği konusu gündeme taşınarak ortak bir eğilim ortaya çıkartılmaktadır. Tarım güvenliği açısından, gıda mevzuatında çeşitli değişiklik ve düzenlemeler yapılarak gıda güvenliği alanı hukuki bir altyapıya kavuşturulmaya çalışılmaktadır. Gıda ve tarım güvenliğine ilişkin küresel aktörlerle de aktif bir şekilde çalışmalarda bulunmaktadır.

İncelenen literatür sonucunda, Türkiye’de tesis edilmesi amaçlanan gıda güvenliğinin; temelindeki amaçları, hedefleri, politika ve strateji çerçevelerini ortaya çıkartmaktadır. Temellerinde benzer konular etrafında şekillenen bu çalışmaların, birçok noktada da birbirini tekrarladıkları görülmektedir. Dolayısıyla bu açıdan Türkiye’nin gıda güvenliği konusu bakımından geçmişten günümüze gelen altyapısının yetersizliği ve yapılan düzenlemelerin AB eksenli olmasında yattığı düşünülmektedir. Ancak Türkiye, gelişmekte olan ülkeler arasında olup küresel sahada kendisini kanıtlamaya çalışmaktadır. Gelecek zaman içerisinde gıda güvenliği alanında yaşanan aksaklık ve eksikliklerin giderilmesi için tedbirler alınarak, sürdürülebilir bir temelde, gıda güvenliğinin temelden tesis edilmesine ilişkin düzenlemelerin yapılması gerekmektedir. Her ne kadar yetersizlikten bahsedilse de iyileştirme ve ilerleme çalışmalarıyla olumlu yönde bir çaba gösterildiği göz ardı edilmemelidir. Gösterilen çabaların karşılığının alınması ve hedeflerin amaçlanan doğrultuda şekillenmesi isteniyor ise bunun için gerekli olan idari ve yasal düzenlemelerin aksatılmadan yapılarak hukuki altyapısının oturtulması büyük önem arz etmektedir. Bilhassa önemi oldukça aşikar olan gıda ve tarım güvenliğiyle ilgili Türk Gıda Mevzuatı’ndaki düzenlemelerin, demografik şartlar ve mevcut sisteminin temel dinamikleri ışığında yeniden incelenmesi gerekmektedir.

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TÜRKİYE'DE KENTSEL YOKSULLUKLA MÜCADELE STRATEJİSİ OLARAK SOSYAL BELEDİYECİLİK

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GİRİŞ

Tarihsel süreç içerisinde kentlerin kontrolsüz bir şekilde aşırı derecede büyümesi kente özgü değişik sorun alanlarının ortaya çıkmasına neden olmuştur. Başlıca sorun alanlarından bir tanesi de kentsel yoksulluk meselesidir. Yoksulluğun mekânsal bir kimliğe büründüğü kentsel yoksulluk meselesi esasen çok boyutlu yoksulluk türlerinden bir tanesi oluşturmakta ve karmaşık bir olguyu ifade etmektedir.

Kentsel yoksulluk; kentsel bölgede yaşayan nüfusun bir kısmının eğitim, sağlık ve ulaşım gibi temel kamusal hizmetlerden mahrum kalmasının yanı sıra insan onuruna yakışır ve yaşarır bir asgari yaşam standartından da geride kalanların durumunu ifade etmek için kullanılan sosyal dışlanmışlık ve eşitsizlikler temelinde oldukça grift bir yapı sergileyen yoksulluk türlerinden bir tanesidir. Diğer kentlilerle aralarında ciddi kopukluklar ve eşitsizlikler olan kent yoksulları sosyal, siyasi, ekonomik ve hukuki açıdan güvencesiz bir ortamda yaşamalarını devam ettirmektedir. Bu durum onları sosyal ve ekonomik hayatın dışına itmekte ve marjinalleşmelerine neden olmaktadır.

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yılı kanunların revize edilmesi gerekmektedir. Söz konusu değişiklik dâhilinde sosyal yardımların etkin denetim temellinde yardımseverlik ve (istisnai olarak) kayırmacılık tabanından hak temelli yaklaşım anlayışına geçişinin sağlanması hayati bir önem taşımaktadır. Bununla birlikte uygulanacak olan sosyal yardımların sosyal doku çalışmalarının nihayetinde ortaya çıkacak veriler ışığında planlı bir şekilde yürütülmesi kritik niteliktedir. Öte yandan sürdürülebilirlik açısından sosyal yardımlar yerine gelir dağılımındaki adaletsizliği azaltıcı uygulamalara yer verilmesi gerekmektedir. Bu çerçevede Türkiye’de bölgelerarası eşitsizliğin keskinliği dikkate alınarak ilçe bazında bir ayırım dâhilinde yatırım teşviklerinin kademeli bir biçimde verilmesi, beşeri sermayenin temel bileşenleri olan eğitim ve sağlık hizmetlerinde geri planda kalmış bölgelere önceliklerin tanınması gerekmektedir. Son olarak kentsel yoksullukla sebep sonuç ilişkisi içerisinde olan kırsal kalkınmanın desteklenmesi kentsel yoksullukla mücadelede önemli bir alan kazanımı sağlayacaktır.

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YEREL YÖNETİMLERİN SOSYAL POLİTİKA UYGULAMALARI

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Bahadır Metin²

GİRİŞ

Devlet, kamu hizmetlerinin sürdürülmesi ve yönetilmesi açısından siyasal ve toplumsal olduğu kadar ekonomik özelliği ile de var olan örgütlenme biçimidir. Kamu yönetimi, bu özelliği ile de devlet içerisinde önemli bir rol oynamaktadır. Kamusal gereksinimlerin de karşılanmasında üstlenmiş olduğu roller kapsamında bir örgütlenme biçimi olarak devlet, merkezî ve yerel yönetimlerden oluşmaktadır. Bununla beraber özellikle küreselleşme ile yerel yönetimin rolü daha da artmaktadır. Sanayileşme süreci sonucu kırsal kesimden kentlere doğru oluşan yoğun göç hareketleri, kent nüfusunu arttırmış, bu sayede yerel yönetimler daha da önem kazanmıştır. Sanayi devrimi beraberinde getirmiş olduğu yoğun göç hareketleri, kentlerin sadece demografik olarak ele alınmaması gerektiğini ortaya çıkarmış; işsizlik, yoksulluk, sağlık, barınma, beslenme, ulaşım gibi sorunlarla mücadele etmeyi ve bu yönde politikaların oluşmasını da gerekli kılmıştır. İşçi sınıfını ortaya çıkaran bu göç hareketi ile işçiler, sanayi merkezlerine geldiklerinde ilk etapta sorun yaşamasalar bile emek arzının emek talebinden fazla olması nedeniyle “işsizlik” ile karşı karşıya kalmışlardır (Koca,2020:4535). Türkiye’de işsizlik, sanayileşmenin yetersiz kalması kırsal kesimlerden kentlere göçün artması gibi yapısal sorunlardan kaynaklanabilmektedir (Ay, 2012:326). Yerel yönetimlerin Merkezî yönetimin yükünü hafifleterek kamu hizmetlerinin

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çözümünde etkin rol oynama açısından yerel paydaşların etkinliğinin ne denli büyük olduğunu gösterecektir.

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YEREL YÖNETİMLERDE E-DÖNÜŞÜM

Seyida Erkek¹

GİRİŞ

Emek ve sermayenin ulus sınırlarının ötesine geçmesi ile bilgi teknolojilerinin gelişimine yol açan küreselleşme kentleri kaçınılmaz bir değişim sürecine sokmuştur. Dünya genelinde tüm kentler, geleceğe hazırlanmak ve kentlilerin yaşam kalitesini yükseltmek amacıyla dijitalleşmektedir.

Küreselleşmenin etkisiyle artan teknolojik ilerlemeler bilginin tıpkı ürünler gibi hızlı bir şekilde dolaşıma ve paylaşımına girmesine yol açmıştır. Bu durum gelenekselden farklı yeni yapı, fonksiyon ve süreçlerin varlığına yönelik bir değişimi kaçınılmaz kılmıştır. Kamu sektöründe başlangıçta iletişim teknolojilerindeki değişim ile başlayan bu dönüşüm süreci, ardından pek çok hizmetin elektronik ortamda sunumuyla devam etmiştir.

Büyük bir kısmı kentlerde yaşayan nüfusun yaş dinamiği de dikkate alındığında artan ve farklılaşan hizmet taleplerinin nasıl karşılanacağı hususu önemli bir hâl almıştır. Günümüz kentlileri internet ve internet teknolojisinin sunduğu diğer araçları aktif kullanan bireyler olarak yerel hizmetlerin hem tüketicisi hem de üretim biçiminin belirleyicisi hâline gelmişlerdir. Bu süreçte yerel yönetimler artan talep ve beklentilere göre yönetim ile örgüt yapılarını uyarlamak zorunda kalmıştır. Öte yandan teknolojideki son gelişmelerin takip edilmesi kadar nüfusun katılımı, yönetim ilkelerinin yerleşmesinin önemi artmıştır.

Günümüzde yerel yönetimlerin pek çoğu elektronik dönüşüm sürecini hızlandırmıştır. Özellikle Covid-19 pandemisi bilgi teknolojilerinin kullanılabilirliği konusunda pek çok kurum gibi yerel yönetimleri de yöreklendirmiş, acil durumlar için dijital çözümlere yatırım yapma girişimleri artmıştır. Dijital dönüşüm sü-

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YEREL YÖNETİMLERDE STRATEJİK YÖNETİM

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GİRİŞ

Yerel yönetimler, Türkiye’de yerleşik halkın yerel ortak ihtiyaçlarını karşılamak üzere tesis edilmiş kuruluşlarken zaman içinde merkeziyetçi yönetim yaklaşımının tesiriyle bir hizmet birimi olarak görülmeye başlanmış ve merkezî yönetimin bölgelerdeki bir unsuru olarak değerlendirilmiştir. Bilhassa 2000 yılından itibaren hayata geçirilen hukuki uygulamalar öncesinde ağır bir denetim ve vesayet altında kontrol edilmiş ve kendince bir yönetim mimarisi oluşturmaya, karar ve kaynaklarla ilgili müstakil kararlar almasına müsaade edilmemiştir (Ünal, 2012: 277-278). Yerel yönetimler; altyapı, zabıta, cenaze, itfaiye ve genel temizlik gibi hizmetler sunarken iletişim ve ulaşım olanaklarının artması ve bu olanaklara erişimin kolaylaşmasıyla birlikte dünya genelinde kardeş şehir uygulamaları başta olmak üzere çeşitli iş birlikleri geliştirmektedir. Bu yolla, yerel meselelerden bazılarının uluslararası ortaklıkların katkısıyla çözümü öngörülmektedir (Çelebi Zengin & Alkan, 2022: 459).

Mecek ve Atmaca (2020: 2068), Türkiye’de yerel yönetimlerin uygulamaları ile mevzuat arasında pek çok noktada uyumsuzluklar yaşandığını, hatta bazı hatalı kanun değişiklikleri sebebiyle anayasanın bazı maddeleri ile uyumsuzluklar görüldüğünü belirtmektedir. Ancak Türkiye’deki yerel yönetimlerle ilgili temel hususlar, Türkiye Cumhuriyeti Anayasası kapsamında düzenlenmiştir. Bu temel düzenleme dışında, yerel yönetimlerle ilgili farklı ihtiyaçlar ve gelişen durumlara göre yasal düzenlemeler de zaman zaman yapılmakta ve uygulanmaktadır.

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cine katkı yapabilecek adımların eksikliğine işaret etmektedir. Merkezî yönetimin, yerel yönetimlerin stratejik planlama sürecine katkı sağlayacak daha etkin bir katılım ve denetim mekanizması tesis etmesinin olumlu sonuçlar sunacağı öngörülmektedir.

Zaei vd. (2013: 743), yerel yönetimlerin stratejik yönetim yaklaşımını hakıyla uygulaması için mevcut koşullar altında verimliliği en üst düzeye çıkaracak ve maliyetleri asgari düzeye indirecek yapısal değişiklikleri gerçekleştirmesi gerektiğinin altını çizmektedir. Tekin (2018: 478), yerel yönetimlerin stratejik yönetim yaklaşımını başarıyla uygulaması için personelin eğitim ve yeterlilikleri doğrultusunda bir görevlendirme ve yapı kurmasının önemini belirtmektedir. Güngör (2011: 114), yerel yönetimlerde stratejik planlama başarısının tek seferlik ve durağan yasal düzenleme ve uygulamalarla sağlanamayacağını, deneyim ve değerlendirmeler doğrultusunda sürekli iyileştirme, değişiklik ve düzenlemelerle sağlanabileceğini ifade etmektedir. Yerel yönetimlerin stratejik plan hazırlama dönemlerinden önce, ilgili bakanlıklar tarafından iç ve dış çevre koşullarında meydana gelen ve önemli olarak değerlendirilen hususların bir rapor hâlinde yerel yönetimlerle paylaşılması ve geçmiş dönemde yapılan hataların isim verilmeden sunulması faydalı olabilir.

Son tahlilde, özel sektördeki uygulamaları incelendiğinde doğru uygulandığı ve kararlı olunduğu takdirde başarıya ulaştığı görülen stratejik yönetim yaklaşımının yerel yönetimlerde de başarı ve verimliliği sağlayacağı değerlendirilmektedir. Ancak Türkiye'deki siyasi iklimde, yerel yönetimlerin iyi niyetli ve gerçekçi olarak belirlenmiş hedeflerine ulaşmasına zaman zaman farklı gerekçelerle bilinçli ya da bilinçsiz olarak izin verilmediği görülmektedir. Yerel yönetimlerin, görüş farklılıklarına rağmen personeline stratejik bilinç kazandırmakla işe başlaması, hedeflerine giden yolda sabırlı ve kararlı davranarak stratejik yönetim yaklaşımını takip etmesinin faydalı olacağı beklenmektedir.

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YEREL YÖNETİMLERDE TOPLAM KALİTE YÖNETİMİ KÜLTÜRÜNÜN YERLEŞMESİNDE HİZMET TALEP EDENLERİN ROLÜ

Hava Tahtalıoğlu¹

GİRİŞ

Toplam Kalite Yönetimi (TKY) 1980’li yıllardan itibaren yaşanan küresel değişimler sonucunda kamu yönetimi kültüründe önem kazanan çağdaş anlayışlardan biridir. 20. yüzyılın başlarında TKY özel sektör için oluşturulan bir yönetim modeli olmasından dolayı kamu yönetiminde benimsenmesi ve uygulanması zaman almıştır.

TKY’nin amacı, merkezden ve yerelden hizmet talep edenlerin beklentilerinin en üst düzeyde karşılanmasını, başka bir ifadeyle müşteri/yurttaş memnuniyetinin veya tatminin sağlanmasını hedefleyen yönetim kültürünün oluşturulmasıdır. Yönetişim ve diğer çağdaş yönetim anlayışlarıyla TKY arasında sıkı ilişkiler bulunmaktadır. Ancak kalite konusunun çok boyutlu ve aktörlü yapısı diğer yaklaşımlara oranla TKY’nin daha fazla dikkat çekmesine sebep olmaktadır. TKY anlayışı iş kalitesinin yanı sıra hem iç müşteriye hem de dış müşteriye odaklanarak, kalite ölçütlerini ve çıktılarını belirlemektedir. Böylece kaliteyi dar bakış açısıyla değerlendiren yönetim yaklaşımlarından farklı olarak TKY’de, işin kalitesinden söz edilebilmesi için ne istediğini ve beklediğini bilen müşteriler/yurttaşlar ile alanında uzmanlaşmış kaliteli çalışanlara ihtiyaç duyulmaktadır. TKY’de bahsi geçen bu ihtiyaçlar, sürece dâhil olan aktörleri de çeşitlendirmektedir. Bu aktörler temelde iki şekilde irdelenmektedir. İlki üst yönetim/liderler, ikincisi müşterilerdir. Müşteriler ise kendi içinde iç müşteri ve dış müşteri olarak ikiye ayrılmaktadır. İç müşteriler çalışanlar iken dış müşteriler yurttaşlardır.

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mesinde önemli kriterlerden biri olan yönetim anlayışlarında yaşanan değişimlere paralel yurttaşın beklentisindeki değişimleri tetikleyen eğitimleri çeşitlendirmesi, yaygınlaştırması ve teşvik etmesidir. Ancak yönetimin, yurttaşın gönüllü katılımı ve beklentilerini gelenekselden moderne dönüştürebilecekleri eğitimlere yönelik teşvik edici girişimlere yeteri kadar ağırlık vermediği/veremediği görülmektedir.

TKY'nin yerel yönetimlerde etkilerinin hissedilmesi; yurttaşların bilgileri, deneyimleri ve duyduklarıyla ilişkilendirilen beklentilerini geliştirmeyi amaçlayan mekanizmaların kurulmasıyla sağlanabilir. Bu mekanizmaların kurulmasında eğitim kurumlarına, yerel yönetim birimlerine ve medyaya önemli görevler düşmektedir. Öncelikle yerel yönetimlerin görev ve sorumluluk alanları hakkında yurttaşların bilgilendirilmesi, yönetime katılım mekanizmalarına dâhil edilmenin özendirilmesi ile yönetim deneyimlerinin artırılması gerekmektedir. Yerinden yönetim birimlerine yörede faaliyet sergileyen eğitim kurumları, gönüllü olan yurttaşlara yönetimin ödev ve sorumlulukları hakkında bilgilendirici eğitimler verme yönünde destek olmalıdır. Medya kuruluşları ise hem merkezî yönetim hem de yerel yönetimler tarafından sunulan hizmetlerin kalitesini artırabilmek adına bilinçli bir yurttaş kitlesinin oluşması için özellikle gündüz kuşağında eğitici programlara yer vermelidir. Böylece bilinçlenen yurttaşın kamu hizmetleri sonucunda beklentilerinin karşılanma oranıyla ortaya çıkan tatmin düzeyi TKY kültürünün yerleşmesine ve süreklilik arz etmesine vesile olacaktır.

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NİĞDE KENT KÜLTÜRÜNÜ İNŞA EDEN UNSURLAR

Şükrü Türköz¹

GİRİŞ

Sosyal bilimlerde çokça çalışılan bir konu olan kent olgusu üzerine oldukça geniş bir literatür birikmiştir. Bununla birlikte kent olgusuna yönelik farklı yaklaşımlar nedeniyle kent kavramının tanımlanmasında dahi ortak bir yönelimden bahsetmek mümkün değildir. Özellikle küreselleşme süreciyle birlikte kent çalışmalarına olan ilgi artmış, bu bağlamda akademik yazında küreselleşmenin kent üzerindeki olumsuz etkileri çokça tartışılmıştır (Ritzer, 2011; Kayan, 2015; Özcan ve Sümer, 2015). Modernleşme sürecinin bir aşaması olarak ele alınan küreselleşmenin, birçok alanda olduğu gibi kentlerde de yerel ve bölgesel farklılıkları ortadan kaldırarak kültürel çeşitliliği yok ettiği, kentleri özgünlükten uzak, renksiz ve kimliksiz yerlere dönüştürdüğü iddia edilmektedir (Oktay, 2011: 9; Bilgin, 2011: 24). Bu açıdan günümüzün modern kentleri geçmişten farklı olarak tek tip meydanları, ağaçsız caddeleri, tek tip okul binaları ve çatısız apartmanlarıyla birbirine benzemektedir (Bumin, 1990: 11). Ancak, fiziksel görünüm olarak gittikçe benzeşen kentler aslında bünyelerinde barındırdıkları farklı kültürler nedeniyle kendi içlerinde dahi farklılaşmaktadır. Bu bakımdan aynı kent içerisindeki semtler, hatta mahalleler arasında bile belirgin kültürel farklılıklar ortaya çıkabilmektedir. Bu anlamda kent kültürü kavramı herhangi bir kent için homojen bir toplumsal kimliği veya kültürü ifade etmemektedir. Kent kültürü kavramıyla daha çok, bir kenti diğerlerinden ayıran ve söz konusu kentte baskın olan kültürel değerlerin izahı söz konusudur. Kent kültürü bu bakımdan maddi ve manevi olarak bir kentin bütününe ait değerleri içerir. Kente ait kültür, kent kimliğini belirginleştirir ve bu kimliğin sonraki kuşaklara aktarılmasında başat

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dir. Niğde'nin üzerine yapışıp kalan bu “arada/kenarda kalmış küçük taşra kenti” imajı, kent potansiyelinin her bakımdan değerlendirilmesini engelleyen en büyük faktördür. Bu anlamda kentin sahip olduğu doğal güzelliklerin ve kültürel mirasın bulunduğu alanlar turizm amaçlı yeniden düzenlenerek bunların tanıtımı ciddi bir planlama çerçevesinde ve profesyonelce yapılabilirse, kentin turizm noktasında yaşadığı dezavantajlı durum tersine çevrilebilir.

Son dönemde kentin tarihî/kültürel zenginliğini korumak, bunları geliştirmek ve kenti dünyaya tanıtmak amacıyla planlanan projeler dikkat çekicidir. Özellikle “Kale Çevresi Yenileme ve Koruma Projesi” ile “Niğde Kültür Yolu Projesi” planlandığı şekliyle tamamlanabilirse Niğde kent kültürünün korunması ve gelecek kuşaklara miras bırakılması mümkün olacaktır. Bu projeler ayrıca, kentin turizm potansiyelinin Türkiye’de ve dünyada daha geniş biçimde tanıtılmasına da imkân sağlayacaktır. Bununla beraber anılan projeler kent kültürünün statik (durağan) unsurlarının korunması ve tanıtılmasına yöneliktir. Oysa kent kültürü sadece durağan unsurlardan oluşmaz. Kent kültürü, zaman içerisinde değişebilen ve gelişebilen, dinamik bir karaktere sahiptir. Niğde kent kültürünün dinamik unsurlarını ise kentin sosyoekonomik ve kültürel yapısındaki hareketlilikler oluşturmaktadır. Bu bakımdan 1992 yılında kentte kurulan üniversite, son otuz yılda giderek artan öğrenci sayısı ile Niğde'nin sosyal, ekonomik ve kültürel hayatında bir dinamizm unsuru hâline gelmiştir. Yakın gelecekte de Niğde kent kültürünü etkileyecek en önemli değişkenin üniversite olacağı öngörülmektedir. Bu nedenle, üniversite kapasitesinin yeni birimler ve öğrenci sayısı bağlamında artması kadar ülke ve dünya genelinden nitelikli öğrencileri kente çekebilecek bir yapıya kavuşması da önem taşımaktadır. Bu açıdan üniversitedeki eğitimin kalitesinin (nicelik ve nitelik) yükselmesi kentin sosyal, ekonomik ve kültürel anlamda gelişmesine de katkı sağlayacaktır.

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MALİ TABLOLAR İLE SEKTÖREL RİSK ANALİZİ İMALAT SANAYİ ÜZERİNDE UYGULAMA (1999-2016)

Taner Biçer



Mali Tablolar ile Sektörel Risk Analizi İmalat Sanayi Üzerinde Uygulama (1999-2016)

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İÇİNDEKİLER

ÖN SÖZ	iii
TABLolar LİSTESİ.....	xiii
GRAFİKLER LİSTESİ	xix
KISALTMALAR LİSTESİ.....	xxv
GİRİŞ.....	1

BİRİNCİ BÖLÜM

MALİ TABLolar ANALİZİNİN TEORİK ESASLARI	5
1. Mali Tablolar Analizi	5
1.1- Genel Açıklamalar/Tanımlar ve Kavramlar	5
1.1.1- Mali Tablolar Analizinin Tanımı ve Kapsamı	5
1.1.2- Mali/Finansal Tabloların Tanımı ve Türleri.....	6
1.1.2.1- Mali Tabloların Tanımı.....	6
1.1.2.2- Mali Tabloların Türleri.....	7
1.1.2.2.1- Temel Mali/Finansal Tablolar	7
1.1.2.2.1.1- Bilanço	7
1.1.2.2.1.2- Gelir Tablosu	8
1.1.2.2.2- Ek Mali Tablolar	8
1.2 - Mali Tabloların İlkeleri	8
1.2.1- Bilanço İlkeleri.....	9
1.2.2- Gelir Tablosu İlkeleri	9
1.3- Temel Mali Tabloların Hesapları ve Hesap Açıklamaları	9
1.3.1- Bilanço ve Gelir Tablosu Hesapları.....	9
1.3.2- Bilanço ve Gelir Tablosu Hesaplarının Açıklamaları	13
1.3.2.1- Bilanço Hesap Açıklamaları.....	13
1.3.2.2- Gelir Tablosu Hesap Açıklamaları.....	24
1.4- Mali Tablolar Analizi	30

1.4.1- Genel Açıklamalar	30
1.4.2- Mali Tablolar Analizinde Kullanılan Yöntemler.....	31
1.4.2.1- Karşılaştırmalı Mali Tablolar Analizi.....	31
1.4.2.2- Dikey Yüzde Yöntemi ile Mali Tablolar Analizi.....	32
1.4.2.3- Eğilim Yüzdeleri Yöntemi ile Mali Tablolar Analizi	33
1.4.2.4- Oran/Rasyo Yöntemiyle Mali Tablolar Analizi	33
1.4.2.4.1- Seçilmiş Oranlar/Rasyolar	34
1.4.2.4.1.1- Kârlılık Oranları	35
1.4.2.4.1.1.1- Faaliyet Kârı/Net Satışlar Oranı (%).....	35
1.4.2.4.1.1.2- Ciro Kârlılığı (Net Kâr/Net Satışlar)(%).....	36
1.4.2.4.1.1.3- Net Kârın Öz Kaynaklara Oranı (%)	37
1.4.2.4.1.1.4- Faiz Karşılama Oranı (%)	38
1.4.2.4.1.2- Likidite Oranları.....	38
1.4.2.4.1.2.1- Cari Oran (%).....	40
1.4.2.4.1.2.2- Asit Test Oranı (Likidite Oranı).....	42
1.4.2.4.1.2.3- ADH-Alacak Devir Hızı	43
1.4.2.4.1.2.4- SDH-Stok Devir Hızı	44
1.4.2.4.1.2.5- Ticari Alacakların Ortalama Tahsil Süresi	45
1.4.2.4.1.2.6- Ticari Borçların Ortalama Geri Ödeme Süresi ..	46
1.4.2.4.1.2.7- (Net) İşletme Sermayesi	46
1.4.2.4.1.3- Finansal Yapı Oranları	46
1.4.2.4.1.3.1- Finansman Oranı (%)/(Kat).....	47
1.4.2.4.1.3.2- Öz Kaynaklar/Toplam Pasif (%)	48
1.4.2.4.1.3.3- Kaldıraç Oranı (%)	49
1.4.2.4.1.3.4- Top.Banka Kredilerinin Top.Yab.Kaynaklara Oranı (%).....	50
1.4.2.4.1.3.5- Top.Banka Kredilerinin Aktif=Pasif Top. Oranı (%).....	50
1.4.2.4.1.3.6- Net Maddi Durak Varlıkların Öz Kaynaklara Oranı (%).....	51
1.4.2.4.1.3.7- K.V. Yabancı Kaynakların Toplam Pasife Oranları (%).....	52
1.4.2.4.1.3.8- U.V. Yabancı Kaynakların Toplam Pasife Oranları (%).....	52

İKİNCİ BÖLÜM

TÜRKİYE İMALAT SANAYİ MALİ BÜNYE ANALİZİ (1999-2016)	55
2- Mali Bünye Analizi	58
2.1- İmalat Sanayi Ciro (Satış) ve Kârlılık Analizi	59
2.1.1- Ciro (Satışların) Analizi	59
2.1.1.1- Genel İmalat Sanayi Ciro (Satış) Analizi	59
2.1.1.1.1- Brüt Satışların Analizi.....	59
2.1.1.1.1.1- Brüt Satışların Yurt İçi ve Yurt Dışı Dağılımı.....	59
2.1.1.1.1.2- Yurt İçi ve Yurt Dışı Brüt Satışların Artış Hızları/ Büyüme Oranları	61
2.1.1.1.2- Net Satışların Analizi	62
2.1.1.1.2.1- Brüt ve Net Satış Tutarları	63
2.1.1.1.2.2- Brüt ve Net Satışların Artış Hızları/Büyüme Oranları.....	64
2.1.1.1.2.3- Toplam Net Satışlar ve Firma Başına Net Satışlar.....	65
2.1.1.1.2.4- Net satışlar ve istihdam Artış Hızları	66
2.1.1.1.2.5- Çalışan Sayıları	68
2.1.1.2- Ölçeğe Göre İmalat Sanayi Ciro (Satış) Analizi.....	69
2.1.1.2.1- Ölçeğe Göre Brüt Satışların Analizi	69
2.1.1.2.2- Ölçeğe Göre Net Satışların Analizi	71
2.1.1.2.2.1- Ölçeğe Göre Net Satışların Dağılımı.....	72
2.1.1.2.2.2- Ölçeğe Göre Firma Sayıları ile Net Satışların Mukayesesi	73
2.1.1.2.2.3- Ölçeğe Göre Çalışan Sayıları ile Net Satışların Mukayesesi	75
2.1.1.2.2.4- Ölçeğe Göre Net satışların Artış Hızları.....	76
2.1.2- Kârlılık Analizi	78
2.1.2.1- Genel İmalat Sanayi Kârlılık Analizi	78
2.1.2.1.1- Kâr ve Zarar Eden Firma Sayıları	78
2.1.2.1.2- Brüt Kâr Marjı	79
2.1.2.1.3- Faaliyet Kârlılığı.....	81
2.1.2.1.4- Dönem Kârı ve Dönem Net Kârı =Ciro Kârlılığı	82
2.1.2.1.5- Öz Kaynak ve Aktif Kârlılığı.....	86
2.1.2.1.6- Faiz Karşılama Oranları (Faiz ve Vergi Öncesi Kâr/ Faiz Giderleri-Net Kâr+ Faiz Giderleri/Faiz Giderleri	87

2.1.2.1.7- Fon Akım-Faaliyetlerden Yaratılan Fonlar	88
2.1.2.2- Ölçeğe Göre İmalat Sanayi Kârlılık Analizi	90
2.1.2.2.1- Ölçeğe Göre Faaliyet Kârlılığı.....	90
2.1.2.2.2- Ölçeğe Göre Dönem Net Kârlılığı =Ciro Kârlılığı =Net Satış Kârlılığı	91
2.1.2.2.3- Ölçeğe Göre Öz Kaynak Kârlılığı	93
2.1.2.2.4- Ölçeğe Göre Aktif Kârlılığı	95
2.1.2.2.5- Ölçeğe Göre Faiz Karşılama Oranı	96
2.1.2.2.6- Ölçeğe Göre Fon Akım-Faaliyetlerden Yaratılan Fonlar	97
2.1.3- Likidite Analizi.....	99
2.1.3.1- Genel İmalat Sanayi Likidite Analizi	99
2.1.3.1.1- Cari ve Asit Test Oranları	99
2.1.3.1.2- Alacak Devir ve Stok Devir Hızları	100
2.1.3.1.3- Ortalama Alacak Tahsil ve Ortalama Borç Ödeme Süreleri	102
2.1.3.1.4- Net İşletme Sermayesi (NIS).....	104
2.1.3.1.5- Fon Akım-Kısa Vadeli Fon Kaynakları ve Kullanımları -Kısa Vadeli Yabancı Kaynaklardaki Artışlar-Dönen Varlıklardaki Artışlar.....	105
2.1.3.2- Ölçeğe Göre İmalat Sanayi Likidite Analizi.....	107
2.1.3.2.1- Ölçeğe Göre Cari Oran	107
2.2.2.2.2- Asit Test Oranları	107
2.1.3.2.3- Ölçeğe Göre Alacak ve Stok Devir Hızları	109
2.1.3.2.4- Ölçeğe Göre Ortalama Alacak Tahsil ve Borç Ödeme Süreleri	110
2.1.3.2.5- Ölçeğe Göre Net İşletme Sermayesi	112
2.1.3.2.6- Ölçeğe Göre Fon Akım-Kısa Vadeli Fon Kaynakları ve Kullanımları-Kısa Vadeli Yabancı Kaynaklardaki Artışlar ve Dönen Varlıklardaki Artışlar	114
2.1.4- Finansal Yapı Analizi	115
2.1.4.1- Genel İmalat Sanayi Finansal Yapı Analizi.....	115
2.1.4.1.1- Finansman Oranı (Borç/Öz Kaynak Oranı).....	115
2.1.4.1.2- Aktiflerin Finansmanı	117
2.1.4.1.3- Kısa ve Uzun Vadeli Yabancı Kaynakların Pasif Toplamına Oranı	118

2.1.4.1.4- Net Maddi Duran Varlıkların Öz Kaynaklara Oranı	119
2.1.4.1.5- Kısa Vadeli Mali ve Ticari Borçların Toplam Kısa Vadeli Borçlara Oranı	120
2.1.4.1.6- Aktiflerin Finansmanında Banka Kredileri ile Satıcı Kredilerinin (Borçlarının) Payları	121
2.1.4.1.7- Yabancı Para Krediler	123
2.1.4.1.8- Öz Kaynakların Oluşumu	124
2.1.4.1.9- Mali Borçların ve Net Satışların Artış Hızları	127
2.1.4.1.10- Fon Akım-Uzun Vadeli Borç-Öz Kaynak ve Duran Varlık Yapısı	128
2.1.4.2- Ölçeğe Göre İmalat Sanayi Finansal Yapı Analizi	130
2.1.4.2.1- Ölçeğe Göre Finansman (Borç/Öz Kaynak) Oranı ...	130
2.1.4.2.2- Ölçeğe Göre Öz Kaynaklar ve Yabancı Kaynakların Aktif Finansmanındaki Payları	131
2.1.4.2.3- Ölçeğe Göre Yabancı Kaynakların Vade Yapısı	133
2.1.4.2.3.1- Kısa vadeli Yabancı Kaynakların Pasif Toplamına Oranı	133
2.1.4.2.3.2- Uzun Vadeli Yabancı Kaynakların Pasif Toplamına Oranı	135
2.1.4.2.4- Ölçeklerin Ortalama Kaynak Yapısı (Ölçeklerin Pasif Toplamına Oranlarının Ortalamaları)	136
2.1.4.2.5- Net Maddi Duran Varlıkların Öz Kaynaklarla Finansmanı	136
2.1.4.2.6- Toplam Banka Kredilerinin Toplam Yabancı Kaynaklara Oranı	137
2.1.4.2.7- Toplam Ticari Borçların Toplam Yabancı Kaynaklara Oranı	139
2.1.4.2.8- Toplam Banka Kredilerinin Toplam Yabancı Kaynaklara Oranı=Kısa Vadeli Mali Borçlar ile Satıcı Borçlarının Kısa Vadeli Yabancı Kaynaklar İçindeki Payları .	139
2.1.4.2.9- Ölçeğe Göre Fon Akım- Uzun Vadeli Kaynak (Borç+ Öz Kaynak) Artışı-Duran Varlık Artışı	141

ÜÇÜNCÜ BÖLÜM

KRİZLER VE TÜRKİYE EKONOMİSİ (1999-2016)	145
3- Krizler ve Türkiye Ekonomisi	145
3.1- Nominal Büyüme Oranları	145

3.1.1- Nominal GSYİH Artış Hızları	147
3.1.2- Nominal Tüketim Harcamaları Artış Hızları	147
3.1.3- Nominal Yatırım Harcamaları Artış Hızları	148
3.1.4- Nominal Kamu Harcamalarının Artış Hızları	148
3.1.5- İhracat Artış Hızları	149
3.1.6- İthalat Artış Hızları	149
3.1.7- Para Arzlarında Büyüme Oranları	151
3.1.7.1- Nominal Para Arzında Büyüme Oranları	151
3.1.7.2- Reel Para Arzlarında Büyüme Oranları	151
3.1.8- Ortalama Nominal TL/Dolar Kuru ve Reel Efektif Döviz Kuru (REDK)	152
3.1.9- İç Borçların Artış Oranları.....	154
3.1.10- Dış Borçların Artış Oranları	155
3.1.11- Genel Enflasyon	155
3.1.12- Kapasite Kullanım Oranları.....	156
3.1.13- Mevsimsellikten Arındırılmış İşsizlik.....	157
3.2- Krizlerde Reel Büyüme Oranları	158
3.2.1- Krizlerde Reel GSYİH Büyüme Oranları.....	158
3.2.2- Krizlerde Reel Tüketim Harcamaları Büyüme Oranları	161
3.2.3- Krizlerde Reel Yatırım Harcamaları Büyüme Oranları	163
3.2.4- Krizlerde Reel Kamu Harcamaları Büyüme Oranları	165
3.2.5- Stok Değişiklikleri (IENV).....	166
3.2.6- Reel İhracat Büyüme Oranları (X).....	166
3.2.7- Reel İthalat Büyüme Oranları (Z).....	166
3.2.8- Krizlerde Reel Yatırımların, İhracatın ve İthalatın GSYİH 'ya Oranları	169
3.2.8.1- Krizlerde Reel Yatırımların Gayri Safi Yurt İçi Hasılaya Oranı... 169	
3.2.8.2- Krizlerde Reel İhracatın ve Net İhracatın GSYİ Hasılaya Oranı	171
3.2.8.3- Krizlerde Reel İthalatın Gayri Safi Yurt İçi Hasılaya Oranı .. 174	
3.2.8.4- Krizlerde Cari Hesabın Gayri Safi Yurt İçi Hasılaya Oranı ... 175	
3.9- Krizlerde Reel Para Arzının (M2Y) Büyüme Oranları	176
3.10- Krizlerde Reel Efektif Döviz Kuru (REDK)	178
3.11- Krizlerde İç Borçlarda Büyüme Oranları.....	180
3.12- Krizlerde Dış Borçlarda Büyüme Oranları.....	182

3.13- Krizlerde Enflasyon	183
3.14- Krizlerde Kapasite Kullanım Oranları (KKO).....	184
3.15- Krizlerde Mevsimsellikten Arındırılmış İşsizlik	186

DÖRDÜNCÜ BÖLÜM

KRİZLERDE İMALAT SANAYİ RASYO ANALİZİ (1999-2016)..... 189

4- İmalat Sanayi Rasyo Analizi.....	189
4.1- Temel Makroekonomik Göstergelerin Rasyolara Potansiyel Etkileri...190	
4.1.1- Büyüme Oranlarının (+/-) Rasyolara Etkisi	191
4.1.2- İç ve Dış Borçların Rasyolara Etkisi	195
4.1.2.1- Kamunun İç Borç Artışının Rasyolara Etkisi	195
4.1.2.2- Kamu Dış Borç Artışının Rasyolara Etkisi	196
4.1.2.3- Reel Sektör Dış Borç Artışının Rasyolara Etkisi	197
4.1.3- Dış Ticaret/CIB Açıklarının Rasyolara Etkisi	197
4.1.3.1- İhracatın Rasyolara Etkisi	197
4.1.3.2- İthalatın Rasyolara Etkisi.....	198
4.1.4- Kur Artışlarının Rasyolara Etkileri	198
4.1.5- Kredi Faiz Oranlarındaki Artışın Rasyolara Etkisi	199
4.1.6- Banka Ticari Kredi Hacminin Rasyolara Etkisi	199
4.1.7- Enflasyon Oranlarının Rasyolara Etkisi	200
4.2- Krizlerde Genel İmalat Sanayi Rasyo Analizi	200
4.2.1- Krizlerde Genel İmalat Sanayi Kârlılık Oranları	200
4.2.1.1- Faaliyet Kârlılığı.....	200
4.2.1.2- Ciro Kârlılığı	202
4.2.1.3- Öz Kaynak Kârlılığı	204
4.2.1.4- Faiz Karşılama Oranı.....	205
4.2.2- Krizlerde Ölçeğe Göre İmalat Sanayi Kârlılık Oranları	207
4.2.2.1- Krizlerde Ölçeğe Göre Faaliyet Kârlılıkları (Faaliyet Kârı/ Net Satışlar).....	207
4.2.2.2- Krizlerde Ölçeğe Göre Ciro Kârlılığı (Net Kâr/Net Satışlar).....	208
4.2.2.3- Krizlerde Ölçeğe Göre Öz Kaynak Kârlılığı.....	209
4.2.2.4- Krizlerde Ölçeğe Göre Faiz Karşılama Oranı.....	210
4.2.3- Krizlerde Genel İmalat Sanayi Likidite Oranları	211
4.2.3.1- Cari Oran-Asit Test Oranı	211

4.2.3.2- Stok Devir Hızı-Alacak Devir Hızı	213
4.2.3.3- Ortalama Ticari Alacakların Tahsil Süresi ile Ortalama Ticari Borçların Geri Ödeme Süreleri ve Aralarındaki Gün Farkları.....	216
4.2.3.4- Net İşletme Sermayesinin Döner Değerlere Oranı	219
4.2.4- Krizlerde Ölçeğe Göre Likidite Rasyoları.....	220
4.2.4.1- Krizlerde Ölçeğe Göre Cari Oran ve Asit-Tast Oranı	220
4.2.4.2- Krizlerde Ölçeğe Göre Stok ve Alacak Devir Hızları	222
4.2.4.3- Krizlerde Ölçeğe Göre Ortalama Alacak Tahsil Süresi ve Ortalama Borç Ödeme Süresi.....	225
4.2.4.4- Krizlerde Ölçeğe Göre Net İşletme Sermayesinin Döner Değerlere Oranı.....	228
4.2.5- Genel İmalat Sanayi Finansal Yapı Rasyoları	229
4.2.5.1- Finansman Oranı	229
4.2.5.2- Yabancı Kaynakların ve Öz kaynakların Toplam Aktiflere Oranı	231
4.2.5.3- Net Maddi Duran Varlıkların Öz Kaynaklara Oranı.....	233
4.2.5.4- Banka Kredilerinin Toplam Yabancı Kaynaklara ve Toplam Aktiflere Oranı	234
4.2.5.5- Kısa Vadeli Yabancı Kaynakların Toplam Yabancı Kaynaklara Oranı.....	236
4.2.5.6- Kısa ve Uzun Vadeli Yabancı Kaynakların Toplam Pasiflere =Aktiflere Oranları	238
4.2.6- Krizlerde Ölçeğe Göre İmalat Sanayi Finansal Yapı Rasyoları ...	240
4.2.6.1- Krizlerde Ölçeğe Göre Finansman Oranı	240
4.2.6.2- Krizlerde Toplam Yabancı Kaynakların Toplam Aktiflere Oranı.....	242
4.2.6.3- Krizlerde Öz Kaynakların Toplam Aktiflere Oranı.....	243
4.2.6.4- Krizlerde Net Maddi Duran Varlıkların Öz kaynaklara Oranı	245
4.2.6.5- Krizlerde Ölçeğe Göre Banka Kredilerinin Toplam Yabancı Kaynaklara ve Toplam Aktiflere Oranı.....	246
4.2.6.6- Kısa Vadeli Yabancı Kaynakların Toplam Yabancı Kaynaklara Oranı	248
4.2.6.7- Kısa ve Uzun Vadeli Yabancı Kaynakların Toplam Pasiflere Oranı.....	250

SONUÇ-ARAŞTIRMA SORULARI VE CEVAPLARI.....	253
KAYNAKÇA.....	265

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(SAP2000 UYGULAMALI)

DR. HAKAN ULUTAŞ



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İÇİNDEKİLER

1. Giriş	1
2. Bina Genel Bilgileri	2
2.1. Bina Deprem Tasarım Parametrelerinin Belirlenmesi	3
2.2. Bina Kullanım Sınıfı ve Bina Önem Katsayısının Belirlenmesi	3
2.3. Deprem Tasarım Sınıfının Belirlenmesi	4
2.4. Bina Yükseklik Sınıfının Belirlenmesi	5
2.5. Taşıyıcı Sistem Davranış Katsayısı, Dayanım Fazlalığı Katsayısı ve İzin Verilen Bina Yükseklik Sınıflarının Belirlenmesi	7
3. Zayıf Kat Düzensizliği (B1) Kontrolü.....	8
4. Bina SAP2000 Modelinin Oluşturulması	17
5. Hakim Titreşim Periyodların Belirlenmesi.....	55
6. Doğrusal Hesap Yönteminin Belirlenmesi	58
6.1. Eşdeğer Deprem Yükünün Tanımlanması	59
7. Görelî Öteleme Değeri Hesaplanacak Düşey Taşıyıcı Bilgilerinin Tanımlanması	62
8. Burulma ve Yumuşak Kat Düzensizliği için Azaltılmış Görelî Kat Ötelemelerinin Belirlenmesi	68
8.1. Burulma Düzensizliği Kontrolü (A1).....	71
8.2. Yumuşak Kat Düzensizliği (B2) Kontrolü	76
9. Mod Birleştirme Yöntemi ile Deprem Yükü Tanımlanması	79
10. Ek Dışmerkezliliklerin Büyütülmesi.....	91
11. Azaltılmış İç Kuvvetlerin ve Yerdeğıştirmelerin Eşdeğer Taban Kesme Kuvvetine Göre Büyütülmesi Kontrolü	93
12. Perde Devrilme Momenti Kontrolü.....	98
12.1. TBDY 4.3.2.4 Maddesinin Kontrolü	98
12.2. TBDY 4.3.4.5, 4.3.4.6 ve 4.3.4.7 Maddelerinin Kontrolü	109
13. Etkin Görelî Kat Ötelemeleri Kontrolü	111
14. İkinci Mertebe Etkilerinin İncelenmesi.....	117

Kaynaklar

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OECD ÜLKELERİNDE SAĞLIK SİSTEMLERİ VE SAĞLIK EKONOMİSİ

Dr. Hülya Diđer



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Dr. Hülya Diğler

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İÇİNDEKİLER

TABLolar LİSTESİ	xi
ŞEKİLLER LİSTESİ	xv
DENKLEMLER LİSTESİ	xvii
GİRİŞ	1
1. SAĞLIK HİZMETLERİ VE SAĞLIK EKONOMİSİ	3
1.1. Sağlık Kavramı.....	3
1.1.1. Sağlık Hizmetleri	3
1.1.1.1. Koruyucu Sağlık Hizmetleri	3
1.1.1.1.1. Kişiyeye Yönelik Koruyucu Sağlık Hizmetleri	4
1.1.1.1.2. Çevreyeye Yönelik Koruyucu Sağlık Hizmetleri	5
1.1.1.2. Tedavi Edici Sağlık Hizmetleri	5
1.1.1.2.1. Birinci Basamak Tedavi Edici Sağlık Hizmetleri	6
1.1.1.2.2. İkinci Basamak Tedavi Edici Sağlık Hizmetleri	6
1.1.1.2.3. Üçüncü Basamak Tedavi Edici Sağlık Hizmetleri	6
1.1.1.3. Rehabilitasyon Hizmetleri	6
1.1.1.3.1. Tıbbi Rehabilitasyon	7
1.1.1.3.2. Sosyal Rehabilitasyon	7
1.1.2. Birinci Basamak Sağlık Hizmetleri	7
1.1.2.1. Avustralya Birinci Basamak Sağlık Hizmetleri	7
1.1.2.2. Danimarka Birinci Basamak Sağlık Hizmetleri	10
1.1.2.3. Almanya Birinci Basamak Sağlık Hizmetleri	11
1.1.2.4. İzlanda Birinci Basamak Sağlık Hizmetleri.....	12
1.1.2.5. İsrail Birinci Basamak Sağlık Hizmetleri	12
1.1.2.6. Lüksemburg Birinci Basamak Sağlık Hizmetleri.....	13
1.1.2.7. Yeni Zelanda Birinci Basamak Sağlık Hizmetleri.....	13
1.1.2.8. Norveç Birinci Basamak Sağlık Hizmetleri.....	14

1.1.2.9. Polonya Birinci Basamak Sağlık Hizmetleri	15
1.1.2.10. Slovenya Birinci Basamak Sağlık Hizmetleri.....	16
1.1.2.11. İsveç Birinci Basamak Sağlık Hizmetleri	16
1.1.2.12. Türkiye Birinci Basamak Sağlık Hizmetleri	17
1.1.3. Sağlık Ekonomisi	19
1.1.3.1. Sağlık Ekonomisinin Önemi	22
1.1.3.2. Sağlık Ekonomisinin Kapsamı.....	23
1.1.3.3. Sağlık Ekonomisinin Gelişimi	25
2. SAĞLIK POLİTİKASI VE SİSTEMLERİ	27
2.1. Politika ve Sağlık Politikası.....	27
2.1.1. Sağlık Politikalarında Önceliklerin Belirlenmesi	27
2.2. Sağlık Sistemi.....	30
2.2.1. Sağlık Sistemlerinin Sınıflandırılması.....	31
2.2.1.1. Girişimci ve Serbest Sağlık Sistemi	32
2.2.1.2. Refah Yönelimli Sağlık Sistemi.....	32
2.2.1.3. Kapsayıcı Evrensel Sağlık Sistemi.....	33
2.2.1.4. Sosyalist Sağlık Sistemi	33
2.2.2. Ülkelerin Sağlık Sistemleri.....	33
2.2.2.1. Avustralya Sağlık Sistemi.....	33
2.2.2.1.1. Avustralya Hakkında.....	34
2.2.2.1.2. Sağlık Hizmetleri	34
2.2.2.1.3. Sağlık Sistemi Finansmanı.....	38
2.2.2.2. Danimarka Sağlık Sistemi	39
2.2.2.2.1. Danimarka Hakkında.....	40
2.2.2.2.2. Sağlık Hizmetleri	40
2.2.2.2.3. Sağlık Sistemi Finansmanı.....	43
2.2.2.3. Almanya Sağlık Sistemi	43
2.2.2.3.1. Almanya Hakkında	44
2.2.2.3.2. Sağlık Hizmetleri	44
2.2.2.3.3. Sağlık Sistemi Finansmanı.....	46
2.2.2.4. İzlanda Sağlık Sistemi.....	51
2.2.2.4.1. İzlanda Hakkında	51
2.2.2.4.2. Sağlık Hizmetleri	51
2.2.2.4.3. Sağlık Sistemi Finansmanı.....	55
2.2.2.5. İsrail Sağlık Sistemi	55

2.2.2.5.1. İsrail Hakkında.....	55
2.2.2.5.2. Sağlık Hizmetleri.....	56
2.2.2.5.3. Sağlık Sistemi Finansmanı.....	62
2.2.2.6. Lüksemburg Sağlık Sistemi.....	63
2.2.2.6.1. Lüksemburg Hakkında	64
2.2.2.6.2. Sağlık Hizmetleri	64
2.2.2.6.3. Sağlık Sistemi Finansmanı.....	65
2.2.2.7. Yeni Zelanda Sağlık Sistemi.....	66
2.2.2.7.1. Yeni Zelanda Hakkında	67
2.2.2.7.2. Sağlık Hizmetleri.....	67
2.2.2.7.3. Sağlık Sistemi Finansmanı	70
2.2.2.8. Norveç Sağlık Sistemi	71
2.2.2.8.1. Norveç Hakkında	71
2.2.2.8.2. Sağlık Hizmetleri.....	71
2.2.2.8.3. Sağlık Sistemi Finansmanı	72
2.2.2.9. Polonya Sağlık Sistemi	73
2.2.2.9.1. Polonya Hakkında	73
2.2.2.9.2. Sağlık Hizmetleri	73
2.2.2.9.3. Sağlık Sistemi Finansmanı	76
2.2.2.10. Slovenya Sağlık Sistemi.....	77
2.2.2.10.1. Slovenya Hakkında.....	77
2.2.2.10.2. Sağlık Hizmetleri	77
2.2.2.10.3. Sağlık Sistemi Finansmanı.....	80
2.2.2.11. İsveç Sağlık Sistemi	80
2.2.2.11.1. İsveç Hakkında	81
2.2.2.11.2. Sağlık Hizmetleri	81
2.2.2.11.3. Sağlık Sistemi Finansmanı.....	82
2.2.2.12. Türkiye Sağlık Sistemi	83
2.2.2.12.1. Türkiye Hakkında	83
2.2.2.12.2. Sağlık Hizmetleri.....	84
2.2.2.12.3. Sağlık Sistemi Finansmanı	85
2.2.3. Sağlık Sistemleri ile Diğer Sistemler Arasındaki İlişki.....	89
2.3. Sağlık Finansmanı	89
2.3.1. Sağlık Hizmetlerinde Finansmanın Piyasa Ekonomisi ile Sağlanması	90

2.3.1.1. Cepten Ödemeler	90
2.3.1.2. Özel Sağlık Sigortası	91
2.3.2. Sağlık Finansman Modelleri	91
2.3.2.1. Beveridge Modeli	92
2.3.2.2. Bismarck Modeli	92
2.3.2.3. Ulusal Sağlık Sigortası Modeli	93
2.3.2.4. Cepten Ödeme Modeli	93
2.3.2.5. ABD Modeli	94
2.3.2.6. Türkiye Modeli (Genel Sağlık Sigortası).....	94

3. LİTERATÜR TARAMASI.....95

4. ARAŞTIRMA HAKKINDA99

4.1. Araştırma Hakkında	99
4.1.1. Araştırmanın Konusu ve Önemi	99
4.1.2. Araştırmanın Amacı.....	100
4.1.3. Araştırmanın Sağlayacağı Katkıları	100
4.1.3.1. Bilimsel Çalışmalara Katkıları	100
4.1.3.2. Toplumsal Yaşama ve Refaha Katkıları	101
4.1.3.3. Araştırmacıya Sağlayacağı Katkıları	101
4.1.4. Araştırmanın Sınırlılıkları.....	101
4.1.5. Araştırmanın Varsayımları.....	101
4.1.6. Araştırmanın Yöntemi	102
4.1.6.1. Evren ve Örneklem.....	102
4.1.6.1.1. Ülkelerin Sosyo-Demografik Bilgileri	103
4.1.6.1.1.1. Nüfus	103
4.1.6.1.1.2. Sağlık Harcamaları	105
4.1.6.1.1.3. Sigorta	109
4.1.6.1.1.3.1. Devlet/Sosyal Sağlık Sigortası	109
4.1.6.1.1.3.2. Özel Sağlık Sigortası	111
4.1.6.1.1.4. Hastane Sayısı	113
4.1.6.1.1.5. Anne Ölüm Oranı.....	115
4.1.6.1.1.6. Bebek Ölüm Oranı	118

5.UYGULAMA.....	121
5.1. Veri Seti.....	121
5.2. Model.....	121
5.3. Yöntem.....	122
5.4. Veri ve Değişkenlerin Tanımlanması.....	122
5.4.1. Anne Modeli.....	123
5.4.2. Bebek Modeli.....	125
6.KESİTLER ARASI YATAY KESİT İLİŞKİSİNİ ARAŞTIRAN; BREUSCH VE PAGAN (1980) VE PESARAN (2004) YATAY KESİT BAĞIMLILIĞI TESTLERİ.....	127
6.1. Kesitler Arası Yatay Kesit İlişkisini Araştıran; Breusch ve Pagan (1980) ve Pesaran (2004) Yatay Kesit Bağımlılığı Testleri.....	127
6.1.1. Anne Modeli için Değişkenler Arasındaki Yatay Kesit Bağımlılığının Analizi.....	129
6.1.2. Bebek Modeli için Değişkenler Arasındaki Yatay Kesit Bağımlılığının Analizi.....	131
7. YAPISAL KIRILMALARI İÇERMİYEN PANEL PESARAN (2007) CADF BİRİM KÖK TESTİ.....	133
7.1. Yapısal Kırılmaları İçermeyen Panel Pesaran (2007) CADF Birim Kök Testi.....	133
7.1.1. Anne Modeli için Yapısal Kırılmaları İçermeyen Panel Birim Kök Analizi.....	134
7.1.2. Bebek Modeli için Yapısal Kırılmaları İçermeyen Panel Birim Kök Analizi.....	139
8. YAPISAL KIRILMALARI İÇERMİYEN WESTERLUND VE EDGERTON (2007) LM BOOTSTRAP EŞBÜTÜNLEŞME TESTİ.....	141
8.1. Yapısal Kırılmaları İçermeyen Westerlund ve Edgerton (2007) LM Bootstrap Eşbütünleşme Testi.....	141
8.1.1. Anne Modeli için Yapısal Kırılmaları İçermeyen Panel Eşbütünleşme Analizi.....	142
8.1.2. Bebek Modeli için Yapısal Kırılmaları İçermeyen Panel Eşbütünleşme Analizi.....	143

9. YAPISAL KIRILMASIZ UZUN DÖNEM EŞBÜTÜNLEŞME KATSAYILARI TAHMİNİ PESARAN (2006) COMMON CORRELATED EFFECT (CCE) VE EBERHARDT VE TEAL (2010) AUGMENTED MEAN GROUP ESTIMATOR (AMG) TESTLERİ.....	145
9.1. Yapısal Kırılmasız Uzun Dönem Eşbütünleşme Katsayıları Tahmini Pesaran (2006) Common Correlated Effect (CCE) ve Eberhardt ve Teal (2010) Augmented Mean Group Estimator (AMG) Testleri.....	145
9.1.1. Anne Modeli için Yapısal Kırılmasız Uzun Dönem Eşbütünleşme Katsayıları Tahmini Pesaran (2006) CCE ve Eberhardt ve Teal (2010) AMG Analizi	147
9.1.2. Bebek Modeli için Yapısal Kırılmasız Uzun Dönem Eşbütünleşme Katsayıları Tahmini Pesaran (2006) CCE ve Eberhardt ve Teal (2010) AMG Analizi	153
10. EMİRMAMHUTOĞLU VE KÖSE (2011) PANEL NEDENSELLİK TESTİ	161
10.1. Emirmahmutoğlu ve Köse (2011) Panel Nedensellik Testi.....	161
10.1.1. Anne Modeli için Emirmahmutoğlu ve Köse (2011) Panel Nedensellik Analizi.....	162
10.1.2. Bebek Modeli için Emirmahmutoğlu ve Köse (2011) Panel Nedensellik Analizi.....	169
10.1.3. Anne ve Bebek Modeli Bağımsız Değişkenleri Arası Emirmahmutoğlu ve Köse (2011) Panel Nedensellik Analizi	177
10.1.4. Anne ile Bebek Ölüm Oranları Arasındaki Nedensellik Durumu için Emirmahmutoğlu ve Köse (2011) Panel Nedensellik Analizi	189
SONUÇ	195
ÖNERİLER.....	201
ARAŞTIRMA SONUÇLARININ SAĞLIK YÖNETİMİ AÇISINDAN DEĞERLENDİRİLMESİ	203
SÖZLÜKÇE.....	219
KAYNAKLAR.....	221

KAYNAKLAR

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İÇİNDEKİLER

ÖN SÖZ	iii
1. GİRİŞ.....	1
2. GENEL BİLGİLER.....	5
2.1. Sağlık Hizmetleri Finansmanı	5
2.1.1. Vergiler	7
2.1.2. Sosyal Sağlık Sigortası	7
2.1.3. Özel Sağlık Sigortası.....	8
2.1.4. Cepten Ödemeler	11
2.2. Sağlık Sektöründe Eksik Sigortanın Kavramsal Çerçevesi.....	13
2.2.1. Ekonomik Faktörler	15
2.2.2. Deneysel Faktörler.....	17
2.2.3. Yapısal Faktörler.....	17
2.2.4. Tutuma İlişkin Faktörler.....	18
2.3. Eksik Sigortanın Ortaya Çıkardığı Sorunlar	20
2.3.1. Sağlık Hizmetine Erişim, Kullanım ve Hizmet Kalitesi İle İlgili Sorunlar	20
2.3.2. Finansal Sorunlar	23
2.4. Eksik Sigorta İle İlişkili Faktörler	24
2.4.1. Gelir Düzeyi	24
2.4.2. Sağlık Sigortası Türü	26
2.4.3. Sağlık Statüsü	27
2.4.4. Yaş.....	28
2.4.5. Medeni Durum.....	29
2.4.6. Cinsiyet.....	29
2.4.7. Eğitim Düzeyi	29
2.4.8. İstihdam Durumu	29

2.4.9. Aile Yapısı	30
2.4.10. Alınan Hizmetin Türü.....	30
2.4.11. Hanehalkı Büyüklüğü.....	30
2.4.12. Yerleşim Yeri	30
2.5. Türkiye’de Sağlık Hizmetleri Finansmanı ve Eksik Sigorta Sorunu.....	31
2.5.1. Sağlık Hizmetleri Finansmanı	31
2.5.1.1. Genel Sağlık Sigortası (GSS)	31
2.5.1.2. Özel Sağlık Sigortası	33
2.5.1.3. Cepten Ödemeler	33
2.5.2. Türkiye’de Sağlık Harcaması.....	36
2.5.3 Eksik Sigorta	45
3. GEREÇ VE YÖNTEM	53
3.1. Araştırmanın Tipi / Tasarımı	53
3.2. Araştırmanın Modeli	53
3.3. Veri Kaynağı ve Veri Toplama Aracı.....	59
3.4. Araştırma Evreni ve Örneklemi.....	61
3.5. Analiz Yöntemi	64
3.5.1. Tanımlayıcı Yöntemler.....	64
3.5.2. Analitik Yöntemler	65
4. BULGULAR	67
4.1. Tanımlayıcı Bulgular	67
4.1.1. Hanelerin Genel Özelliklerine İlişkin Tanımlayıcı Bulgular	67
4.1.2. Hanelerin Yaptıkları Cepten Sağlık Harcamasına İlişkin Tanımlayıcı Bulgular	75
4.1.3. Cepten Sağlık Harcamasının Alt Kalemlerine İlişkin Tanımlayıcı Bulgular	98
4.1.4. Cepten Sağlık Harcamasının Tüketim Harcaması İçindeki Payına İlişkin Tanımlayıcı Bulgular	122
4.1.5. Eksik Sigortalı Hane Prevalansı İle İlgili Tanımlayıcı Bulgular	124
4.2. Analitik Bulgular.....	154
5. TARTIŞMA	169
5.1. Hanehalkı Reisinin Sağlık Sigortası Türü.....	170

5.2. Hanenin Gelir Düzeyi.....	172
5.3. Hanede Yatarak Sağlık Hizmeti İçin Cepten Yapılan Harcama Miktarı	172
5.4. Hanede Ayakta Sağlık Hizmeti ve İlaç İçin Cepten Yapılan Harcama Miktarı.....	173
5.5. Hanede Günlük Faaliyete Engel Fiziksel ya da Zihinsel Problemi Olan Bireylerin Sayısı	173
5.6. Hanede 65 Yaş ve Üzeri Birey Sayısı	174
5.7. Hanede 5 Yaş Altı Çocuk Sayısı	174
5.8. Hanehalkı Büyüklüğü.....	175
5.9. Hanehalkı Reisinin Eğitim Düzeyi.....	175
5.1.0 Hanehalkı Yapısı	176
6. SONUÇ VE ÖNERİLER.....	177
KAYNAKÇA.....	183
EKLER	189

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1. Xu K, Evans DB, Kawabata K, Zeramdini R, Klavus R, Murray CJL. “Household catastrophic health expenditure: a multicountry analysis”, *Lancet*, 2003, 362: 111–117.
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YENİ BİR TANIM VE ÖLÇEK ÖNERİSİ

Onur Ünlü



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Onur Ünlü

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İÇİNDEKİLER

KISALTMALAR LİSTESİ.....	ix
ŞEKİLLER LİSTESİ	xi
TABLolar LİSTESİ.....	xiii
GİRİŞ.....	1

BİRİNCİ BÖLÜM

Sapma - Norm İlişkisi ve Sapma Teorileri	5
1.1. Sapma ve Norm İlişkisi	5
1.1.1. Norm Kavramı	6
1.1.2. Mikro Perspektiften Norm ve Birey Davranışı Arasındaki İlişkiler	8
1.1.3. Gruplarda Normların Düzenleyiciliği	12
1.1.4. Makro Düzeyde Normların İşleyişi	14
1.1.4. Yönetim Literatüründe Normlar	17
1.1.5. Araştırmanın Sosyal Bağlamı ve Norm İlişkisi	18
1.2. Sapma Teorileri.....	26
1.2.1. Caydırıcılık ve Rasyonel Tercih Teorileri.....	27
1.2.2. Suçlu Doğanlar Teorisi	29
1.2.3. Psikanalitik Teori ve Kişilik Araştırmaları.....	31
1.2.4. Sosyal Öğrenme Teorileri	33
1.2.4.1. Sutherland'ın Diferansiyel İlişkiler Teorisi	33
1.2.4.2. Akers'in Sosyal Öğrenme Teorisi	34
1.2.5. Sosyal Bağ ve Denetim Teorileri	38
1.2.5.1. Reiss's ve Nye'nin Dahili ve Harici Denetim Teorisi	39
1.2.5.2. Reckless'in Denetim Altında Tutma Teorisi	39
1.2.5.3. Sykes ve Matza'nın Nötralize Etme ve Sürüklenme Teknikleri Teorisi.....	40
1.2.5.4. Hirschi'nin Sosyal Bağ Teorisi	40

1.2.5.5. Gottfredson ve Hirschi'nin Benlik Denetimi Teorisi	42
1.2.6. Etiketleme Teorisi	42
1.2.7. Tekrar Bütünleştirici Ayıplama Teorisi.....	43
1.2.8. Sosyal Düzensizlik ve Anomi Teorileri	43
1.2.8.1. Kolektif Yeterlilik	44
1.2.8.2. Merton'un Sosyal Yapı ve Anomi Teorisi.....	44
1.2.8.3. Cohen'in Statü Yoksunluğu ve Suçlu Altkültürü Teorisi	48
1.2.8.4. Suçun Diferansiyel Fırsat Teorisi.....	48
1.2.8.5. Messner ve Rosenfeld'in Kurumsal Anomi Teorisi	49
1.2.8.6. Agnew'in Suç ve Suçluluğun Genel Gerilim Teorisi:	50
1.2.9. Çatışma Teorisi	50

İKİNCİ BÖLÜM

Sapma Kavramlarının Çeşitliliği Negatif ve Pozitif Özellikli Sapma Tanımları.....	55
2.1. Sapmanın Çok Katmanlı Yapısı	55
2.2. Negatif Sapma Kavramı	62
2.3. Pozitif Karakteristikli Sapma Tanımları	65
2.4. Sapma Tipolojileri	75

ÜÇÜNCÜ BÖLÜM

Yeni Bir Tanım ve Ölçek	87
3.1. Farklı Bir Kavramsallaştırma Temelinde Pozitif Sapma	87
3.2. Ölçek Geliştirme Çalışmaları.....	100
3.2.1. İfade Geliştirme Çalışmaları	100
3.2.1.1. İfade Havuzunun Oluşturulması	101
3.2.1.1.1. Denetim Temelli Teoriler ile İlişkili İfadeler.....	102
3.2.1.1.2. Sosyal Öğrenme ile İlişkili İfadeler	102
3.2.1.1.3. Sosyal Kimlik ile İlişkili İfadeler	104
3.2.1.1.4. Merton'un Sosyal Yapı ve Anomi Teorisi ile İlişkili İfadeler.....	105
3.2.1.1.5. Örgüte Fayda / Yaratıcılık / Pro-Sosyal Kural Yıkıcılık ile ilgili İfadeler	106
3.2.1.1.6. Bireysel Özellikler ile İlişkili İfadeler	107
3.2.1.2. İfade Havuzunun İçerik Geçerliliğinin Sağlanması	108

3.2.2. Ölçek Yapısının Oluşturulması.....	110
3.2.2.1. Veri Toplama Yöntemi	110
3.2.2.2. Bulgular - Ölçek Geliştirme	112
3.2.2.2.1. Örneklem Yönelik Bulgular	112
3.2.2.2.2. Keşfedici Faktör Analizi Sonuçları	114
3.2.2.2.2.1. Birincil Keşfedici Faktör Analizi Sonuçları	114
3.2.2.2.2.2. Nihai Faktör Yapısının Oluşturulması	116
3.2.2.2.2.3. Nihai Faktör Yapılarının Güvenilirlik ve Geçerlilik Analizleri	119
3.2.2.2.2.4. Nihai Faktör Yapılarının Adlandırılması	120
3.2.3. Ölçeğin Test Edilmesi	123
3.2.3.1. Birincil Araştırma: Ölçeğin Bir Araştırma Modelinde Test Edilmesi	123
3.2.3.1.1. Araştırmanın Metodolojisi	124
3.2.3.1.2. Araştırma Evreni ve Örneklem	124
3.2.3.1.3. Araştırma Değişkenleri	125
3.2.3.1.4. Araştırma Modeli ve Hipotezleri.....	125
3.2.3.1.5. Veri Toplama Araçları.....	130
3.2.3.1.6. Bulgular	131
3.2.3.1.7. Birinci Araştırmanın Sonuçlarının Değerlendirilmesi	137
3.2.3.1. İkincil Araştırma: Ölçeğin Devamlılığının Test Edilmesi	145
3.2.3.2.1. İkinci Araştırmanın Sonuçlarının Değerlendirilmesi	146
SONUÇ VE ÖNERİLER.....	149
KAYNAKÇA	157
EKLER	179

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Merve Özdemir



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Merve Özdemir

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İÇİNDEKİLER

ÖN SÖZ	iii
GİRİŞ.....	1

BİRİNCİ BÖLÜM İRADE

1.1. İrade Kavramı	5
1.2. Özgür İrade	8
1.3. Filozoflara Göre İrade ve Özgürlük Kavramları.....	14
1.3.1. Platon'da İrade Kavramı	15
1.3.2. Aristoteles'te İrade ve Özgürlük İlişkisi	18
1.3.3. Ebu Bekir Razi'ye Göre İnsan İradesi	20
1.3.4. Farabi'de Özgür İrade	21
1.3.5. İbn Rüşd'de İrade ve Fil İlişkisi.....	23
1.3.6. Leibniz'de İrade Problemi	25
1.3.7. Schopenhauer'da İrade ve Var Oluş.....	26

İKİNCİ BÖLÜM

SİYASAL KARAR ALMA TERCİHLERİNDE İRADE VE DAVRANIŞ İLİŞKİSİ

2.1. Seçmen Davranışına Etki Eden Faktörler.....	29
2.1.1. Biyolojik Faktörler.....	30
2.1.2. Psikolojik Faktörler.....	34
2.1.2.1. Siyasal Davranışın Bir Yönlendiricisi Olarak Motivasyon.....	35
2.1.2.2. Siyasal Tutum ve Davranışlar	37
2.1.3. Sosyolojik Faktörler	39
2.2. Siyasal Toplumsallaşmanın Bireysel İrade ve Karar Verme Süreci İle İlişkisi	42
2.3. Kitle Psikolojisi ve Özgür İrade Bağlamında Seçmen Davranışı.....	45

2.3.1. Grup Zihni Yaklaşımı	48
2.3.2. Kimliksizleşme	49
2.3.3. Beliren Norm Kuramı.....	50
2.3.4. Sosyal Kimlik Kuramı.....	52
2.4. Siyasi İrade ve Kitle Psikolojisi Bağlamında Seçmen Davranışı	53

ÜÇÜNCÜ BÖLÜM

MEDYA VE SİYASAL ÇERÇEVELEMAYA GENEL BİR BAKIŞ

3.1. Çerçevelemenin Karar Verme ve İrade Üzerindeki Etkisi.....	57
3.2. Siyasal Çerçeveleme Açısından İletişimin Psikolojik ve Bilişsel Temelleri	59
3.3. Medyada Çerçeveleme Açısından Siyasal Söylem	63

DÖRDÜNCÜ BÖLÜM

SEÇMEN KARARLARI VE İRADESİ ÜZERİNE BİR ARAŞTIRMA

4.1. Araştırmanın Metodolojisi	69
4.2. Araştırmanın Amacı	70
4.3. Araştırmanın Örneklemi	70
4.4. Araştırmanın Katılımcıları	70
4.5. Bulgular ve Yorum	73
4.5.1. Ak Parti Seçmenin Görüşleri	73
4.5.1.1. Ak Parti.....	73
4.5.1.2. Özgür İrade	77
4.5.1.3. Oy Verilen Parti İle İlgili Bilgi Edinme Kaynakları	79
4.5.1.4. Karar Sürecine Etki Eden Faktörler	82
4.5.1.5. Kanaat Önderlerinin Etkisi.....	85
4.5.1.6. Medyanın Objektifliği	86
4.5.1.7. Parti ve İletişim.....	88
4.5.1.8. Oy ve Baskı.....	89
4.5.1.9. Parti Lideri Etkisi.....	91
4.5.1.10. Diğer Parti Seçmenlerine Yönelik Görüşler	93
4.5.1.11. Partiye Yönelik Çelişkiler	98
4.5.1.12. Oy ve Sorumluluk Duygusu.....	100
4.5.2. Cumhuriyet Halk Partisi Seçmenin Görüşleri	107
4.5.2.1. Cumhuriyet Halk Partisi	107

4.5.2.2. Özgür İrade	108
4.5.2.3. Oy Verilen Parti İle İlgili Bilgi Edinme Kaynakları	110
4.5.2.4. Karar Sürecine Etki Eden Faktörler	115
4.5.2.5. Kanaat Önderlerinin Etkisi	119
4.5.2.6. Medyanın Objektifliği	122
4.5.2.7. Parti ve İletişim.....	127
4.5.2.8. Oy ve Baskı.....	132
4.5.2.9. Parti Lideri Etkisi	133
4.5.2.10. Diğer Parti Seçmenlerine Yönelik Görüşler	137
4.5.2.11. Partiye Yönelik Çelişkiler	139
4.5.2.12. Oy ve Sorumluluk Duygusu.....	141
TARTIŞMA VE SONUÇ.....	147
KAYNAKÇA.....	155
ÖZ GEÇMİŞ.....	167

KAYNAKÇA

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SEÇMENLER, ADAYLAR, PARTİLER NASIL DÜŞÜNÜR? NASIL DAVRANIR?

Dr. Murat İnan



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Dr. Murat İnan

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İÇİNDEKİLER

Ön Söz.....	iii
A. Seçim Sistemi, Siyasi Partiler ve Adaylar	1
1. Seçim sistemi nedir?	1
2. Siyasi partilerin ve adayların işlevleri nelerdir ve siyasi partiler ve adaylar nasıl kategorize edilir?	7
3. Niş parti kavramı nedir?	12
4. Partilerin devlet tarafından finansmanının sonuçları nelerdir?	15
B. Siyasi Temsil	17
5. Temsilî demokrasi nedir?	17
6. Siyasette seçen-seçilen uyumu nedir?.....	18
7. Demokratik memnuniyet nedir?	24
C. Parti Rekabetinin Uzamsal Modelleri	27
8. Parti rekabetinin uzamsal modelleri nelerdir?	27
9. Uzamsal modellerin iki alternatif türü, yakınlık ve yön yaklaşımları nelerdir?.....	33
10. Siyasette mutabakat meseleleri konusu nedir?	41
D. Siyasette Yeni Konular	47
11. Siyasetin yeni fay hatları nelerdir?	47

12. Toplumsal deęişime neden olan yaş, dönem ve kuşak etkileri nelerdir?	54
13. Siyasette jenerasyon olgusu ne anlama gelir?.....	56
14. Siyasi partilerin interneti kampanya aracı olarak kullanmalarını etkileyen faktörler nelerdir?	60
15. Siyaset bilimi alanında sayısal yöntemler ile araştırma yaparken kullanılabilir başlıca veri setleri hangileridir?	61
Kaynaklar	79

Kaynaklar

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SİYASAL RIZA BAĞLAMINDA OY VERME DAVRANIŞLARI

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İÇİNDEKİLER

GİRİŞ.....	1
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BİRİNCİ BÖLÜM

SİYASAL RIZA GÖSTERME VE OY VERME DAVRANIŞLARI ARASINDAKİ İLİŞKİNİN KURAMSAL ÇERÇEVESİ

1.1. RIZA KAVRAMI	7
1.1.1. Rızanın Unsurları ve Bu Unsurların Oy Verme Davranışlarıyla İlişkisi	9
1.1.1.1. Yetkinlik	9
1.1.1.2. Sorumluluk	11
1.1.1.3. Özgür İrade	12
1.1.1.4. Bilgilendirme	14
1.1.1.5. Gönüllülük	16
1.1.1.6. İyi Niyet	18
1.1.1.7. Doğruluk.....	20
1.2. SİYASAL RIZA VE TARİHSEL SÜREÇTE SİYASAL RIZAYLA İLGİLİ TEMEL YAKLAŞIMLAR.....	21
1.2.1. Siyasal Rıza	21
1.2.2. Tarihsel Süreçte Siyasal Rızayla İlgili Temel Yaklaşımlar	23
1.2.2.1. Antik Çağ'da Siyasal Rızanın Görünüşleri.....	24
1.2.2.1.1. Antik Yunan Dönemi ve Aristoteles	25
1.2.2.1.2. Roma Dönemi ve Cicero	32
1.2.2.2. Orta Çağ ve Mutlak Monarşi Dönemlerinde Siyasal Rıza.....	35
1.2.2.2.1. Orta Çağ'da Siyasal Rıza: Meşruiyetin Kaynağı Olarak Tanrı	35
1.2.2.2.2. Mutlak Monarşilerde Siyasal Rıza: Meşruiyetin Kaynağı Olarak İktidar (Tanrıdan Krala)	36
1.2.2.2.2.1. Niccolo Machiavelli (1469-1527)	36
1.2.2.2.2.2. Jean Bodin (1529-1596)	38
1.2.2.2.2.3. Thomas Hobbes (1588-1679)	39
1.2.2.3. Modern Dönemde Siyasal Rızanın Tekrar ve Güçlü Bir Şekilde Gündeme Gelmesi: Meşruiyetin Kaynağı Olarak Halk (Kraldan Halka) ..	42
1.2.2.3.1. Demokrasi Bağlamında Siyasal Rızanın Gündeme Gelişi.....	42
1.2.2.3.1.1. John Locke (1632-1704)	43

1.2.2.3.1.2. Charles-Louis de Secondat Baron de Montesquieu (1689-1755)	47
1.2.2.3.1.3. Jean Jacques Rousseau (1712-1778)	53
1.2.2.3.2. Siyasal İktidar Bağlamında Siyasal Rızanın Gündeme Gelişi.....	58
1.2.2.3.2.1. Antony Gramsci (1891-1937)	58
1.2.2.3.2.2. Louis Althusser (1918-1990).....	65

İKİNCİ BÖLÜM

SEÇMENİN OY VERME DAVRANIŞLARI VE SİYASAL RIZA

2.1. SEÇMEN DAVRANIŞI VE OY VERME KARARI.....	69
2.2. OY VERME MODELLERİNİN KURAMSAL ZEMİNİ VE SİYASAL RIZA İLE İLİŞKİSİ.....	74
2.2.1. Temel Oy Verme Modelleri	74
2.2.1.1. Psikolojik Oy Verme Modeli	74
2.2.1.2. Sosyolojik Oy Verme Modeli.....	77
2.2.1.3. Ekonomik/Rasyonel Oy Verme Modeli.....	80
2.2.2. Temel Oy Verme Modellerinden Türetilen Diğer Oy Verme Modelleri.....	87
2.2.2.1. İdeolojik Oy Verme Modeli	87
2.2.2.2. Konuya Oy Verme Modeli.....	89
2.2.2.3. Sezgisel Oy Verme Modeli	92
2.2.3. Normatif Modeller	96
2.2.3.1. Benzeşmeci Model.....	97
2.2.3.2. Delege Modeli.....	99
2.2.3.3. Vekâlet Modeli	101
2.2.3.4. Müteveli Modeli.....	104

ÜÇÜNCÜ BÖLÜM

SEÇMENİN OY VERME DAVRANIŞLARININ SİYASAL RIZA BAĞLAMINDA İNCELENMESİNE İLİŞKİN BİR UYGULAMA

3.1. ARAŞTIRMANIN METODOLOJİSİ	107
3.1.1. Araştırma Modeli.....	107
3.1.2. Araştırmanın Özgünlüğü ve Önemi	107
3.1.3. Araştırmanın Amacı	108
3.1.4. Araştırmanın Problemi ve Araştırma Soruları	108

3.1.5. Veri Toplama Aracının Geliştirilmesi	109
3.1.6. Araştırmanın Evreni ve Örneklemi	115
3.1.7. Örneklem Grubu.....	117
3.1.8. Verilerin Analizi	117
3.1.9. Sayıltılar	117
3.2. BULGULAR VE TARTIŞMA	118
3.2.1. Örneklem Grubunun Sosyodemografik Özellikleri ve Betimleyici İstatistikler.....	118
3.2.1.1. Örneklem Grubunun Cinsiyeti	118
3.2.1.2. Örneklem Grubunun Medeni Durumu.....	118
3.2.1.3. Örneklem Grubunun Yaşı.....	118
3.2.1.4. Örneklem Grubunun Eğitim Düzeyi	119
3.2.1.5. Örneklem Grubunun Gelir Düzeyi	119
3.2.1.6. Betimleyici İstatistikler	119
3.2.2. Seçmenin Demografik Özelliklerine Göre Siyasal Rızası	120
3.2.2.1. Seçmenin Cinsiyetine Göre Siyasal Rızası	120
3.2.2.2. Seçmenin Medeni Durumuna Göre Siyasal Rızası	124
3.2.2.3. Seçmenin Yaşına Göre Siyasal Rızası	126
3.2.2.4. Seçmenin Eğitim Düzeyine Göre Siyasal Rızası	130
3.2.2.5. Seçmenin Gelir Düzeyine Göre Siyasal Rızası	134
3.2.3. Diğer Siyasal Değişkenlere Göre Seçmenin Siyasal Rızası	138
3.2.3.1. Seçmenin Siyasete Karşı İlgi Düzeyine Göre Siyasal Rızası	138
3.2.3.2. Seçmenin Oy Verdiği Partiye Bağlılık Düzeyine Göre Siyasal Rızası.....	141
3.2.3.3. Seçmenin Siyasal Kampanyalara Karşı İlgi Düzeyine Göre Siyasal Rızası	143
3.2.3.4. Seçmenin Siyasi Olaylara Karşı Tutumuna Göre Siyasal Rızası ...	146
3.2.3.5. Seçmenin Bir Siyasi Partiye Oy Verme Karar Zamanına Göre Siyasal Rızası	149
3.2.4. Seçmenin Algıladığı Oy Verme Modellerine Göre Siyasal Rızası.....	155
3.2.4.1. Seçmenin Algıladığı Psikolojik Oy Verme Modeli Düzeyine Göre Siyasal Rızası	155
3.2.4.2. Seçmenin Algıladığı Sosyolojik Oy Verme Modeli Düzeyine Göre Siyasal Rızası	158
3.2.4.3. Seçmenin Algıladığı Egotropik Ekonomik Oy Verme Modeli Düzeyine Göre Siyasal Rızası.....	161

3.2.4.4. Seçmenin Algıladığı Sosyotropik Ekonomik Oy Verme Modeli Düzeyine Göre Siyasal Rızası.....	163
3.2.4.5. Seçmenin Algıladığı İdeolojik Oy Verme Modeli Düzeyine Göre Siyasal Rızası	166
3.2.4.6. Seçmenin Algıladığı Konuya Oy Verme Modeli Düzeyine Göre Siyasal Rızası	169
3.2.4.7. Seçmenin Algıladığı Sezgisel Oy Verme Modeli Düzeyine Göre Siyasal Rızası	172
3.2.4.8. Seçmenin Algıladığı Benzeşmeci Oy Verme Modeli Düzeyine Göre Siyasal Rızası	175
SONUÇ.....	179
ÖNERİLER.....	181
KAYNAKÇA	185

KAYNAKÇA

- Abadan, N. ve A. Yücekök. (1966). “1961–1965 Seçimlerinde Büyük Şehirlerde Gelir Durumuna Göre Oy Verme Davranışları”. *Ankara Üniversitesi Siyasal Bilgiler Fakültesi Dergisi*, 21(4), 103-117.
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Dr. Binnur Güröl



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İÇİNDEKİLER

ÖN SÖZ	iii
KISALTMALAR LİSTESİ.....	ix
TABLolar LİSTESİ.....	xiii
ŞEKİLLER LİSTESİ	xv
GİRİŞ.....	1

BİRİNCİ BÖLÜM

SÜRDÜRÜLEBİLİR ÜRETİM.....	3
1.1. SÜRDÜRÜLEBİLİR ÜRETİM KAVRAMI, TANIMI, YAKLAŞIMI, SÜRECİ, ÖĞELERİ, ÖZELLİKLERİ VE İLKELERİ	3
1.1.1. Sürdürülebilir Üretim Kavramı ve Tanımı	3
1.1.2. Sürdürülebilir Üretim Yaklaşımı ve Üretim Yönetimi Yaklaşımlarında Yaşanan Tarihsel Değişimler.....	8
1.1.2.1. Sürdürülebilir Üretim Yaklaşımı.....	8
1.1.2.2. Sürdürülebilir Tüketim ve Üretim Yaklaşımı	13
1.1.2.3. Üretim Yönetimi Yaklaşımlarında Yaşanan Tarihsel Değişimler.....	18
1.1.3. Sürdürülebilir Üretim Süreci.....	27
1.1.4. Sürdürülebilir Üretimin Öğeleri ve Özellikleri.....	41
1.1.5. Sürdürülebilir Üretim İlkeleri	48
1.2. SÜRDÜRÜLEBİLİR ÜRETİM GÖSTERGELERİ, ÜRETİM STRATEJİLERİ, İŞLETMELERE SAĞLADIĞI FAYDALAR, YÖNLENDİRİCİ VE ENGELLEYİCİ FAKTÖRLER	55
1.2.1. Sürdürülebilir Üretim Göstergeleri	55
1.2.1.1. Lowell Sürdürülebilir Üretim Merkezi Göstergeleri	63
1.2.1.2. Dow Jones Sürdürülebilirlik İndeksi	68
1.2.1.3. IMKB Sürdürülebilirlik İndeksi.....	71
1.2.2. Sürdürülebilir Üretim Stratejileri.....	74
1.2.3. Sürdürülebilir Üretimin Sağladığı Faydalar	99

1.2.4. Sürdürülebilir Üretimi Yönlendirici ve Engelleyici Faktörler.....	105
1.3. TÜRKİYE VE DÜNYADA SÜRDÜRÜLEBİLİR ÜRETİM UYGULAMALARI ...	114
1.3.1. Türkiye’de Sürdürülebilir Üretim Uygulamaları	117
1.3.2. Dünyada Sürdürülebilir Üretim Uygulamaları	128

İKİNCİ BÖLÜM

KURUMSAL SÜRDÜRÜLEBİLİRLİK	131
2.1. SÜRDÜRÜLEBİLİRLİK, KURUMSAL SÜRDÜRÜLEBİLİRLİK KAVRAMI, TANIMI, ÖNEMİ, AMACI, HEDEFLERİ, BOYUTLARI VE GÖSTERGELERİ	131
2.1.1. Sürdürülebilirlik Kavramı ve Tanımı.....	131
2.1.2. Kurumsal Sürdürülebilirlik Kavramı ve Tanımı.....	147
2.1.3. Kurumsal Sürdürülebilirliğin İşletmeler Açısından Önemi	151
2.1.4. Kurumsal Sürdürülebilirliğin Ülke Ekonomisi Açısından Önemi	157
2.1.5. Kurumsal Sürdürülebilirliğin Amacı ve Hedefleri.....	159
2.1.6. Kurumsal Sürdürülebilirliğin Boyutları.....	163
2.1.7. Kurumsal Sürdürülebilirliğin Göstergeleri.....	171
2.2. KURUMSAL SÜRDÜRÜLEBİLİRLİKLE İLİŞKİLİ TEMEL KAVRAMLAR VE MODELLER.....	178
2.2.1. Kurumsal Sürdürülebilirlikle İlişkili Temel Kavramlar.....	178
2.2.1.1. Sürdürülebilir Kalkınma	179
2.2.1.2. Kurumsal Sosyal Sorumluluk.....	192
2.2.1.3. Paydaş Yönetimi.....	203
2.2.1.4. Kurumsal Hesap Verebilirlik	211
2.2.1.5. Üçlü Kâr Hanesi	214
2.2.1.6. Kurumsal Yönetişim	222
2.2.2. Kurumsal Sürdürülebilirlik Konusunda İleri Sürülen Modeller	229
2.2.2.1. Van Someran Modeli	229
2.2.2.2. Callens ve Tyteca Modeli.....	230
2.2.2.3. Stead ve Stead Modeli.....	230
2.2.2.4. Gladwin ve Arkadaşları Modeli	231
2.2.2.5. Welford Modeli	231
2.2.2.6. Shrivastava ve Hart Modeli.....	233
2.3. İŞLETMELERİN KURUMSAL SÜRDÜRÜLEBİLİRLİK KONUSUNDA İZLEDİKLERİ STRATEJİLER, UYGULAMALAR, KURUMSAL SÜRDÜRÜLEBİLİRLİK ÖLÇÜMLERİ VE KURUMSAL SÜRDÜRÜLEBİLİRLİK PERFORMANSI	236

2.3.1. İşletmelerin Kurumsal Sürdürülebilirlik Konusunda İzledikleri Stratejiler	236
2.3.1.1. Ekonomik Stratejiler	236
2.3.1.2. Çevresel Stratejiler	238
2.3.1.3. Sosyal Stratejiler	240
2.3.2. İşletmelerin Kurumsal Sürdürülebilirlik Uygulamaları/Çalışmaları	245
2.3.2.1. Kurumsal Sürdürülebilirlikle İlişkili Standartlar ve Belgelendirme Çalışmaları	248
2.3.2.1.1. OECD Standartları.....	248
2.3.2.1.2. ISO 14001 Çevre Yönetim Sistemi	251
2.3.2.1.3. AA1000 Standardı.....	257
2.3.2.1.4. ISO 26000 Sosyal Sorumluluk Rehberi Standardı	258
2.3.2.1.5. SA8000 Sosyal Sorumluluk Standardı.....	259
2.3.2.1.6. Birleşmiş Milletler Küresel İlkeler Sözleşmesi	261
2.3.2.2. Raporlama Çalışmaları	264
2.3.2.2.1. Küresel Raporlama Girişimi (GRI).....	269
2.3.2.2.2. Entegre (Bütünleşik) Raporlama	272
2.3.3. Kurumsal Sürdürülebilirlik Değerlendirmesi ve Ölçümleri.....	277
2.3.4. Kurumsal Sürdürülebilirlik Ölçümü İçin Çok Kriterli Karar Verme Yöntemleri	283
2.3.4.1. AHP (Analitik Hiyerarşi Prosesi).....	286
2.3.4.2. TOPSİS Yöntemi.....	295
2.3.4.3. ELECTRE Yöntemi.....	299
2.3.4.4. Entropi Yöntemi	306
2.3.5. Kurumsal Sürdürülebilirlik Performansı	308
KAYNAKÇA.....	329

KAYNAKÇA

KİTAPLAR

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Murat Kurnu

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İÇİNDEKİLER

SİMGELER VE KISALTMALAR DİZİNİ	ix
GİRİŞ.....	1

BİRİNCİ BÖLÜM

TEDARİK ZİNCİRİ VE TEDARİK ZİNCİRİ YÖNETİMİ.....	5
1.1. TEDARİK ZİNCİRİ YÖNETİMİNİN AMACI VE ÖNEMİ.....	11
1.2. TEDARİK ZİNCİRİ YÖNETİM SÜREÇLERİ.....	12
1.2.1. Müşteri İlişkileri Yönetimi (Customer Relations Management).....	14
1.2.2. Müşteri Hizmet Yönetimi (Customer Service Management).....	14
1.2.3. Talep Yönetimi (Demand Management)	14
1.2.4. Sipariş Karşılama (Order Fulfillment)	15
1.2.5. İmalat Akış Yönetimi (Manufacturing Flow Management).....	15
1.2.6. Satın Alma (Purchasing)	16
1.2.7. Ürün Geliştirme ve Ticarileştirme (Product Development and Commercialization).....	17
1.2.8. İadelerin Yönetimi (Management of Returns).....	17
1.3. TEDARİK ZİNCİRİ ÜYELERİ.....	18
1.3.1. Üreticiler	18
1.3.2. Dağıtımçılar	19
1.3.3. Perakendeciler	20
1.3.4. Müşteriler	20
1.3.5. Hizmet Sağlayıcılar	21
1.4. TEDARİK ZİNCİRİ YÖNETİMİNİN HEDEFLERİ	21
1.4.1. Nihai Müşteri İçin Fayda Artışı	21
1.4.2. Maliyet Hedefleri	22
1.4.3. Zaman Hedefleri	22
1.4.4. Kalite Hedefleri	23

1.5. TEDARİK ZİNCİRİ YÖNETİMİNİ ETKİLEYEN FAKTÖRLER.....	23
1.5.1. Müşteri Beklentileri.....	23
1.5.2. Küreselleşme.....	24
1.5.3. Rekabet.....	24
1.5.4. Bilgi ve İletişim	25
1.5.5. Yasal Düzenlemeler	25
1.5.6. Çevresel Faktörler	26
1.6. TEDARİK ZİNCİRİ YÖNETİMİ STRATEJİLERİ	26
1.7. YALIN TEDARİK ZİNCİRİ.....	29
1.8. ÇEVİK TEDARİK ZİNCİRİ	33

İKİNCİ BÖLÜM

BİLGİ PAYLAŞIMI, REKABET AVANTAJI VE TEDARİK ZİNCİRİ PERFORMANSI.....

PERFORMANSI.....	41
2.1. BİLGİNİN TANIMI, ÇEŞİTLERİ VE YÖNETİMİ	41
2.2. BİLGİ PAYLAŞIMI, ÖNEMİ VE BOYUTLARI.....	43
2.2.1. Bireysel Faktörler	46
2.2.2. Örgütsel Faktörler	47
2.2.3. Teknolojik Faktörler.....	48
2.3. BİLGİ PAYLAŞIM İLKELERİ VE TEKNOLOJİLERİ	49
2.4. TEDARİK ZİNCİRİNDE BİLGİ PAYLAŞIMI	52
2.4.1. Tedarikçilerle Bilgi Paylaşımı	52
2.4.2. Müşterilerle Bilgi Paylaşımı.....	54
2.5. REKABETİN TANIMI, ÖNEMİ VE İŞLEVLERİ.....	55
2.6. REKABET AVANTAJI KAVRAMI VE GELİŞİMİ.....	58
2.7. REKABET AVANTAJININ BİLEŞENLERİ	61
2.7.1. Temel Bileşenleri.....	61
2.7.2. Tamamlayıcı Bileşenler	62
2.7.3. Kuşatıcı Bileşenler	64
2.8. TEDARİK ZİNCİRİ PERFORMANSI	65
2.8.1. Maliyet (Kaynak) Performansı	67
2.8.2. Çıktı (Üretim) Performansı	69
2.8.3. Esneklik Performansı	69

ÜÇÜNCÜ BÖLÜM

TEDARİK ZİNCİRİ STRATEJİLERİNİN TEDARİK ZİNCİRİ PERFORMANSI ÜZERİNDEKİ ETKİSİNDE BİLGİ PAYLAŞIMI VE REKABET AVANTAJININ ARACI ROLÜ..... 71

3.1. ARAŞTIRMA KONUSUNUN ÖNEMİ	71
3.2. ARAŞTIRMANIN AMACI.....	72
3.3. ARAŞTIRMANIN MODELİ VE KULLANILAN ÖLÇEKLER.....	73
3.4. ARAŞTIRMA KAPSAMINDA GELİŞTİRİLEN HİPOTEZLER	74
3.5. ARAŞTIRMANIN METODOLOJİSİ.....	81
3.5.1. Araştırmanın Evreni ve Örneklem Seçimi.....	81
3.5.2. Ön Çalışma	82
3.5.3. Veri Toplama Araçlarının Geliştirilmesi.....	82
3.6. VERİLERİN ANALİZİ VE YORUMU	83
3.6.1. Araştırma Kapsamındaki İşletmelerin Özellikleri.....	83
3.6.2. Araştırma Modelinde Yer Alan Değişkenlere Yönelik Algılar.....	85
3.6.2.1. Tedarik Zinciri Stratejilerine Yönelik Cevaplayıcıların Algıları.....	85
3.6.2.2. Bilgi Paylaşımına Yönelik Cevaplayıcıların Algıları	86
3.6.2.3. Rekabet Avantajına Yönelik Cevaplayıcıların Algıları.....	88
3.6.2.4. Tedarik Zinciri Performansına Yönelik Cevaplayıcıların Algıları.....	89
3.6.2.5. Model Değişkenlerine Yönelik Cevaplayıcıların Genel Algıları .	90
3.6.3. Araştırma Modelinde Yer Alan Değişkenlere Yönelik Cevaplayıcı Algılarının İşletme Özellikleri Açısından Analizi	91
3.6.3.1. İşletmedeki Görev Açısından Algı Farklılıklarının Analizi.....	91
3.6.3.2. İşletmenin Yer Aldığı Bölge Açısından Algı Farklılıklarının Analizi	93
3.6.3.3. İşletmenin Hukuki Türü Açısından Algı Farklılıklarının Analizi.....	95
3.6.3.4. Faaliyet Sınırı Açısından Algı Farklılıklarının Analizi.....	97
3.6.4. Ölçeklere Yönelik Yapılan Güvenilirlik Testi Sonuçları.....	98
3.6.5. Ölçeklere Yönelik Yapılan Doğrulayıcı Faktör Analizi (DFA) Sonuçları	99
3.6.5.1. Tedarik Zinciri Stratejilerine Yönelik Doğrulayıcı Faktör Analizi Sonuçları.....	100
3.6.5.2. Bilgi Paylaşımına Yönelik Doğrulayıcı Faktör Analizi Sonuçları.....	103
3.6.5.3. Rekabet Avantajına Yönelik Doğrulayıcı Faktör Analizi Sonuçları.....	106

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TİCARİ HAVA YOLLARINDA REKABETÇİ TARİFE SİSTEMLERİ ÜZERİNE FİLO YÖNETİMİ ARAŞTIRMASI

Dr. Ahmet Selim Süzer



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İÇİNDEKİLER

TABLolar LİSTESİ.....	ix
ŞEKİLLER LİSTESİ	xi
GİRİŞ.....	1

1. BÖLÜM

HAVA YOLUNDA İŞLETMELERİN ÖZELLİKLERİ	3
GİRİŞ.....	3
1.1. Hava Yolu Taşımacılığı.....	3
1.2. Hava Taşımacılığı Unsurları	4
1.3. Hava Yolu İş Birliği Konsepti	5
1.4. Hava Taşımacılığı Özellikleri	7
1.5. Havacılık Yönetimi	8
1.6. Hava Yolu Kapasitesini Yönetme Zorluğu.....	8
1.7. Hava Yolu İşletmelerinin Sınıflandırılması.....	9
1.8. Havacılık Taşımacılığının Son Durumu ve Beklentiler.....	12
1.8.1. Dünyadaki Havacılık Sektörün Hâlihazır Durum ve Beklentiler.....	12

2. BÖLÜM

FİLO PLANLAMA.....	15
GİRİŞ.....	15
2.1. Filo Planlama Konsepti.....	15
2.1.1. Uçuş Planlaması.....	16
2.1.2. Uçak Planlaması.....	17
2.2. Filo Planı.....	17
2.2.1. Uçak Rotalama (Yönlendirme).....	19
2.2.2. Uçak Bakım Yükümlülüğü.....	20
2.3. Filo Planının Amacı.....	21

2.3.1. Filo Yapısı ve Boyutu	24
2.4. Filo Planlama ve Pazarlama Arasındaki İlişki.....	24
2.5. Filo Planlamasını Etkileyen Değişiklikler.....	25
2.6. Uçak Değerlendirme ve Uçak Değerlendirme Süreci	27
2.6.1. Tasarım Özellikleri.....	27
2.6.2. Fiziksel Özellikler	27
2.6.3. Bakım Gereksinimleri	28
2.6.4.Elde Etme Değeri	28
2.6.5. Fonksiyonel Ekonomisi	28
2.7. Hava Yolu İşletmelerinde Uçak Seçimi	28
2.7.1. Yolcu Uçaklarının Değerlendirilmesi.....	29
2.7.2. Filo Benzerlik Durumu	30
2.7.3. Kullanılmış Uçakların Değerlendirilmesi	31
2.8. Karar Verme Sürecinde Yer Alacak Filo Tipleri	31
2.8.1. Airbus 330s.....	31
2.8.2. Airbus 321s	32
2.8.3. Boeing 737s.....	33
2.9. Hava Yolu Uçak Filosu Seçimi	34
2.10. Uçak Performansının ve Özelliklerinin Değerlendirilmesi	35
2.11. Uçak Seçiminde Çok Kriterli Karar Verme Yöntemi	36
2.11.1. Çift Karşılaştırma.....	38
2.11.2. Seçimlerinizi Nasıl Sıralarsınız?	38
2.11.3. Normalleştirme Yöntemi	40
2.11.4. Ağırlık ve Tercih Etkililiği	41
2.12. Hava Yollarında Uçak Kullanımı	44
2.12.1. Sunulan Pazar Özellikleri.....	44

3. BÖLÜM

TARİFE PLANLAMA	47
GİRİŞ.....	47
3.1. Tarife Planlamanın Tanımı ve Bileşenleri	47
3.1.1. Ağ Yapısı ve Uçuş Planı Özellikleri	48
3.2. Ticari Havacılıkta Tarife Planına Genel Bakış.....	49
3.3. Hava Yolu Tarife Planlamasının Önemi	51
3.3.1. Hava Yolu Şirketlerinde Tarife Planlama Aşamaları	51

3.4. Tarife Planlama Departmanı	56
3.5. Tarife Geliştirme Süreci.....	57
3.6. Yeni Bir Hat için Tarife Hazırlanırken Toplanması Gereken Bilgiler.....	58
3.7. Tarife Hazırlanırken Göz Önünde Bulundurulması Gereken Faktörler ...	58
3.7.1. Tarife-Pazarlama İlişkisi	59
3.7.1.1. Yolcu Pazarında	59
3.7.1.2. Kargo Pazarı	61
3.7.2. Tarife-Operasyon Kontrol Merkezi (OCC) İlişkisi.....	61
3.7.3. Tarife-Uçak Tahsis ilişkisi	62
3.7.4. Ekip Planlama ve Tahsis.....	63
3.7.4.1. Ekip Planlama Süreci	64
3.7.4.2. Ekip Planlamasıyla İlgili Terminoloji.....	64
3.7.4.3. Ekip Planlaması.....	66
3.7.4.3.1. Uçuş Sırasını Bulma	66
3.7.4.3.2. Ekip Atama	68
3.7.4.3.3. Düzensiz Olayları Yönetme.....	68
3.7.4.3.4. Uçak ve Uçuşların Yeniden Planlaması	69
3.7.4.3.5. Uçuş Ekibinin Yeniden Planlaması	70
3.7.5. Tarife-Tahsis Süreci İlişkisi	70
3.8. Tarife Planlamasını Etkileyen Faktörler	71
3.8.1. İç Faktörler.....	71
3.8.2. Dış Faktör	72
3.8.3. Slot Tahsisi	73
3.8.3.1. Slot Koordinasyon Ofisi, Yapısı, Görevleri ve Koordinatör Görev ve Sorumlulukları	75
3.9. IATA Tarife Konferansları	76
3.10. Havaalanı Çalışma Saatleri(Curfew)	81
3.11. Bağlantılı Uçuşlar	81
3.12. İstasyon Personeli Kısıtlamaları	83
3.13. Çevresel ve Diğer Operasyonel Faktörler	83
3.14. Talep ve Tarife Arasındaki İlişki	84
3.15. Hazırlanan Tarifenin Zamanında Gerçekleştirilmesi (on-time performans).....	87
3.16. Havayolları Tarafından Kullanılan Tarife Türleri	89
3.17. Tarife Planlama-Gecikme İlişkileri	92

3.17.1. Gecikmeler	92
3.17.2. Gecikme Analizleri	94
3.17.3. Rötaların Maliyeti	98
3.18. Tarifeli ve Tarifesiz Uçuşlar Arasındaki Fark	100
3.19. Tarifelerin-Filo Planlama İlişkisi	103

4. BÖLÜM

TÜRKİYE'DE HAVA YOLU İŞLETMELERİNDE UYGULAMA107

4.1. Araştırma Nedenleri, Önemi, Kapsamı, Varsayımları, Sınırlamaları ve Yöntemi, Verilerin Toplanması, Verilerin Analizi.....	107
4.1.1. Araştırma Nedenleri.....	107
4.1.2. Araştırmanın Önemi	107
4.1.3. Araştırma Kapsamı	108
4.1.4. Araştırma Varsayımları	108
4.1.5. Araştırmanın Sınırlamaları.....	108
4.1.6. Araştırma Yöntemi	108
4.1.7. Verilerin Toplanması	109
4.1.8. Verilerin Analizi.....	109
4.2. BULGULAR VE YORUM	110

SONUÇ VE ÖNERİLER.....121

EKLER125

Ek-1 Rötâ Kodları	125
Ek-2 Soru Formu	126
Ek-3 Hava Yolu İşletmeleri	128

KAYNAKÇA..... 129

YAZAR HAKKINDA..... 134

Kaynakça

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Dr. Özlem Akgüç Çetinkaya



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Dr. Özlem Akgüç Çetinkaya

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İÇİNDEKİLER

ÖN SÖZ	iii
GİRİŞ.....	1

1. BÖLÜM

TÜKETİM KÜLTÜRÜ, YÖNLENDİRME VE ÖZGÜRLÜK	9
A- TÜKETİM KÜLTÜRÜ	9
B- TÜKETİM TEORİLERİ	16
C- ÖZGÜRLÜK	23
D- AKILCILASTIRARAK YÖNLENDİRME	31
1. Verimlilik	34
2. Hesaplanabilirlik	36
3. Öngörülebilirlik	37
4. Denetim.....	39
E- GÖZETİM YOLUYLA YÖNLENDİRME.....	42
F- ZAMANIN YÖNLENDİRİLMESİ	50
1. Boş Zamanın Tüketim Odaklı Kurulumu	52
2. Boş Zaman Pazarı	56
G- MEKÂNSAL DÜZENLEME YOLUYLA YÖNLENDİRME	58

2. BÖLÜM

ALIŞVERİŞ MERKEZLERİ (AVM) VE YÖNLENDİRME	65
A- TÜKETİMİN MEKÂNSAL ORGANİZASYONU.....	65
1. "Mekân"ın Altyapısal Dönüşümü.....	65
2. Mekânda Gerçeklik ve Yapaylaşma Sorunu	69
3. Tüketimin Mekânsal Organizasyonunun Günümüzde Geldiği Son Nokta Olarak Alışveriş Merkezleri	72

B- ALIŞVERİŞ MERKEZLERİNİN OLUŞUMU	74
1. Kent Simülasyonu ile Yaratılan İç Kamusal Alan.....	76
2. "Kapalı Kutu" Olarak Alışveriş Merkezleri.....	79
C- ALIŞVERİŞ MERKEZLERİNDE YÖNLENDİRME ARAÇLARI.....	82
1. Elektronik Gözetim Sistemleri	83
2. İzleme ve Veri Bankası Oluşturma	86
3. Zamansal ve Mekânsal Düzenleme	88
3. BÖLÜM	
ALIŞVERİŞ MERKEZLERİNDE YÖNLENDİRMENİN ÇÖZÜMLENMESİ.....	93
A- Araştırmanın Amacı, Yöntemi, Kapsamı ve Sınırlılıklar	93
1. Alışveriş Merkezi Mekânsal Çözümlemesi	98
2. Alışveriş Merkezi Deneyimi Çözümlemesi	108
a) Anket Bulguları.....	111
b) Anket Bulgularının Değerlendirilmesi.....	132
GENEL DEĞERLENDİRME VE SONUÇ	141
KAYNAKÇA.....	149

KAYNAKÇA

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İÇİNDEKİLER

SUNUŞ	iii
ÖN SÖZ	v
BÖLÜM YAZARLARI	xi
HELAL GIDA	1
GİRİŞ.....	1
1. HELAL GIDA VE HARAM GIDANIN TANIMI.....	3
1.1. Helal ve Haram Gıda ve Helal Tüketim İle İlgili Ayet ve Hadisler.....	4
1.2. Helal Gıdanın Tanımı.....	7
1.3. Haram Gıdanın Tanımı.....	8
2. HELAL VE HARAM OLAN GIDALARIN SINIFLANDIRILMASI.....	9
2.1. Helal Hayvanlar.....	9
2.2. Helal Olmayan Hayvanlar.....	10
2.3. Su Hayvanları.....	10
2.4. Amfibi Hayvanlar.....	10
2.5. Bitkisel Kökenli Gıdalar.....	11
2.6. İnsan veya Hayvan Kökenli Kan ve Diğer Maddeler.....	11
2.7. Şüpheli Gıda.....	11
3. HELAL KESİM.....	11
3.1. Kesilecek Hayvanlarda Aranacak Özellikler.....	11
3.2. Kasaplarda Aranacak Özellikler.....	12
3.3. Kesilecek Hayvanların Bayıltılması.....	12
3.4. Kesilen Hayvanlarda Ölümün Tespiti.....	14
3.5. Küçükbaş ve Büyükbaş Hayvanların Kesim Kuralları.....	14
3.5.1. Küçükbaş ve Büyükbaş Hayvanların Kesiminde Helal Kontrol Noktaları.....	16
3.6. Kanatlı Hayvanların Kesim Kuralları.....	19

3.6.1. Mekanik Kesim	19
3.6.2. Otomasyonlu Kanatlı Hayvan İşleme Tesislerinde Elle Kesim	20
3.6.3. Tüy Yolma	22
3.6.4. Kanatlı Hayvan Kesiminde Helal Kontrol Noktaları	22
3.7. Diğer Hayvanların Kesimi	25
3.8. İşlenmiş Et Ürünlerinde Helal Kontrol Noktaları	26
4. HELAL GIDA ÜRÜNLERİ İÇİN HELAL OLMA GEREKLİLİKLERİ	27
4.1. Et ve Et Ürünleri	27
4.2. Süt ve Süt Ürünleri	30
4.3. Yumurta ve Yumurta Ürünleri	34
4.4. Bal ve Diğer Arıcılık Ürünleri	35
4.5. Bitkisel Gıdalar	35
4.6. Unlu Mamuller	36
4.6.1. Kavram ve Kapsam	36
4.6.2. Helal Olma Gereklilikleri	38
4.7. Yağlar	40
4.7.1. Kavram ve Kapsam	40
4.7.2. Helal Olma Gereklilikleri	41
4.8. Meşrubatlar	43
4.8.1. Kavram ve Kapsam	44
4.8.2. Helal Olma Gereklilikleri	45
4.9. Gıda Katkı Maddeleri, İşleme Yardımcıları ve Besin Takviyeleri	48
4.10. Enzimler	49
4.11. Mikroorganizmalar	50
4.12. Genetiği Değiştirilmiş Organizmalar (GDO'lu Gıdalar)	50
5. HELAL GIDAYA YÖNELİK YAPILMIŞ ÇALIŞMALAR	50
6. KONUYLA İLGİLİ KULLANILAN ÖLÇEKLER	54
SONUÇ	57
KAYNAKÇA	59

HELAL LOJİSTİK VE KÜRESEL TEDARİK ZİNCİRİNDEKİ YERİ	69
GİRİŞ	69
1. KAVRAM VE KAPSAM	70
2. HELAL OLMA GEREKLİLİKLERİ	72
3. LİTERATÜR TARAMASI	78

4. GELİŞTİRİLEN ÖLÇEKLER	82
SONUÇ	86
KAYNAKÇA	87

HELAL TURİZM..... 91

GİRİŞ	91
1. DİN (İSLAMİYET-İSLAM DİNİ) VE TURİZM İLİŞKİSİ	92
2. HELAL TURİZM NEDİR?	94
3. HELAL TURİZM ve İSLAMİ TURİZM ARASINDAKİ FARKLAR	97
4. HELAL TURİZMİN GEREKLİLİKLERİ.....	100
5. HELAL TURİZMİN GELİŞİMİ	102
6. HELAL TURİST KİMDİR VE MOTİVASYONLARI NELERDİR?	103
7. HELAL TURİZM PAZARLAMASI.....	106
8. HELAL TURİZM DESTİNASYONLARI	108
8.1. Endonezya.....	109
8.2. Malezya	109
8.3. Singapur.....	110
8.4. Türkiye	111
9. HELAL TURİZM İŞLETMELERİ	113
9.1. Helal Konaklama.....	114
9.2. Helal Hava Yolları	116
9.3. Helal Gemi Turları/Yolculuğu	117
9.4. Helal Seyahat Acentaları.....	118
9.5. Helal Seyahat Web Siteleri	118
10. HELAL TURİZM İLE İLGİLİ ÖLÇEKLER	119
10.1. Helal Dostu Destinasyon Performans Ölçeği.....	119
SONUÇ	121
KAYNAKÇA	122

HELAL KOZMETİK VE KİŞİSEL BAKIM ÜRÜNLERİ..... 127

GİRİŞ	127
1. HELAL KOZMETİK KAVRAMI.....	130
2. KOZMETİK ÜRÜNLERİN HELAL OLMA GEREKLİLİKLERİ	132
3. HELAL KOZMETİK ÜRÜNLERİNİN SERTİFİKALANDIRILMASI.....	134
4. KÜRESEL HELAL KOZMETİK PAZARI VE HELAL KOZMETİK MARKALARI....	135

5. HELAL KOZMETİK KONUSUNDA GELİŞTİRİLMİŞ ÖLÇEKLER	139
SONUÇ.....	140
KAYNAKÇA	143
HELAL İLAÇ VE TAKVİYE EDİCİ GIDALAR.....	149
GİRİŞ.....	149
1. KAVRAM VE KAPSAM	150
1.1. İlaç ve Takviye Edici Gıda.....	150
1.2. Helal İlaç ve Takviye Edici Gıda.....	153
1.3. Helal İlaç Sertifikası	157
2. İLAÇ VE TAKVİYE EDİCİ GIDALARIN HELAL OLMA GEREKLİLİKLERİ	158
3. LİTERATÜR TARAMASI	161
4. GELİŞTİRİLMİŞ ÖLÇEKLER	163
SONUÇ.....	165
KAYNAKÇA	167
İSLAMİYET’TE GİYSİ MODASI–HELAL MODA.....	171
GİRİŞ.....	171
1. İSLAM DÜNYASINDA GİYSİ MODASININ YERİ VE ÖNEMİ	172
1.1. İslamiyet’te Giysi Modası–Helal Modada Kavram ve Kapsam	172
2. LİTERATÜR TARAMASI.....	176
2.1. Giyimde Helal Olma Gereklilikleri	176
2.2. İslamiyet’te Helal Giyinme Şekli	179
2.3. İslami Giyimin Modadaki Yeri	181
2.4. Türkiye’de İslami Giysi Modası	181
3. İSLAMİ GİYİMDE İSRAF.....	182
4. İSLAMİ GİYİM MODASINDA DİJİTALLEŞME	185
SONUÇ.....	187
KAYNAKÇA	189
HELALLİK AÇISINDAN GIDA KATKI MADDELERİ	193
GİRİŞ.....	193
1. GIDA KATKI MADDESİ NEDİR?.....	194
2. GIDA KATKI MADDELERİNİN FONKSİYONLARI	194
3. GIDA KATKI MADDELERİ İLE İLGİLİ YASAL DÜZENLEMELER	196

4. GIDA KATKI MADDELERİNİN SINIFLANDIRILMASI	198
5. GIDA KATKI MADDELERİNİN HELAL OLMA GEREKLİLİKLERİ.....	200
6. HELALLİK AÇISINDAN ŞÜPHELİ GÖRÜLEN GIDA KATKI MADDELERİ ...	203
6.1. Karotenler (E 160a)	204
6.2. Paprika Ekstraktı, Kapsantin, Kapsorubin (E 160c).....	205
6.3. Likopen (E 160d)	205
6.4. Lutein (E 161b).....	205
6.5. Kantaksantin (E 161g)	206
6.6. Antosiyaninler (E 163).....	206
6.7. Biberiye Ekstraktları (E 392)	207
6.8. Karminik Asit, Karminler (E 120).....	207
6.9. L-Sistein (E 920).....	208
6.10. Lesitin (E 322).....	208
6.11. Amonyum Fosfatitler (E 442).....	209
6.12. Gliserol	209
6.13. Yağ Asitleri	210
SONUÇ.....	214
KAYNAKÇA	216

HELALLİK AÇISINDAN JELATİN221

GİRİŞ.....	221
1. JELATİN KAVRAM VE KAPSAMI.....	222
1.1. Jelatin Nedir?	222
1.2. Jelatinin Özellikleri	223
2. JELATİN KAYNAĞI: KOLAJEN	225
3. JELATİNİN EKSTRAKSİYONU.....	225
4. JELATİN KULLANIMI.....	229
5. HELAL JELATİN ÜRETİMİNİN KONTROL NOKTALARI.....	231
5.1. Üretilen Jelatinin Kaynağı.....	231
5.2. Kolajenden Yağın Uzaklaştırılma Aşaması.....	232
5.3. Asit İle Muamele.....	232
5.4. Alkali İle Muamele.....	232
5.5. Ekstraksiyon, Evaporasyon, Kurutma	232
5.6. Öğütme.....	233
5.7. Ambalajlama ve Etiketleme.....	233

6. JELATİN ÜRETİMİNDE ALTERNATİF KAYNAKLAR	233
6.1. Jelatin Kaynağı Olarak Balık ve Yan Ürünleri	233
6.2. Jelatin Kaynağı Olarak Deve ve Yan Ürünleri	234
6.3. Jelatin Kaynağı Olarak Kanatlılar ve Yan Ürünleri	235
7. JELATİN İÇİN BİTKİSEL VE MİKROBİYAL İKAMELER	236
7.1. Agar	236
7.2. Karragenan	237
7.3. Pektin	237
7.4. Ksantan Gam	238
7.5. Konjak Glukomannan	238
8. JELATİN HELALLİĞİNİN BELİRLENMESİ İÇİN KULLANILAN YÖNTEMLER	239
8.1. Protein Bazlı Yöntemler	239
8.2. DNA Bazlı Yöntemler	240
8.3. Sensor Bazlı Yöntemler.....	240
8.4. Diğer Yöntemler	241
SONUÇ.....	241
KAYNAKÇA	242

HELAL GIDA SERTİFİKASI.....251

GİRİŞ.....	251
1. KAVRAM VE KAPSAM.....	252
1.1. Belgelendirme ve Sertifikasyon	253
1.2. Akreditasyon.....	253
1.3. Standart ve Standardizasyon	254
1.4. Helal Gıda Sertifikası ve Kapsamı.....	254
2. SÜREÇ VE UYGULAMALAR	256
3. HELAL VE KOŞER SERTİFİKALARI	259
4. TÜRKİYE VE DÜNYADA HELAL GIDA SERTİFİKASI VEREN KURULUŞLAR	261
4.1. Türkiye’de Helal Sertifikası Veren Kuruluşlar	262
4.1.1. Gıda ve İhtiyaç Maddeleri Denetleme ve Sertifikalandırma Araştırmaları Derneği (GİMDES).....	262
4.1.2. Türk Standardları Enstitüsü (TSE).....	263
4.1.3. Türkiye’de Sertifika Sağlayan Diğer Kuruluşlar ve Helal Gıda Sertifikası Açısından Önemli Kuruluşlar	263
4.1.3.1. İslam Ülkeleri Standartlar ve Metroloji Enstitüsü (SMIIC)..	264

4.1.3.2. Helal Akreditasyon Kurumu (HAK)	265
4.1.3.3. Dünya Helal Birliđi	265
4.2. Dünyada Helal Sertifikası Veren Kuruluşlar	266
4.2.1. Müslüman Yargı Konseyi (MJCHT)	267
4.2.2. Kuzey Amerika İslam Cemiyeti (ISNA).....	267
4.2.3. Malezya İslami Kalkınma Ajansı (JAKIM).....	268
4.2.4. Endonezya Ulema Konseyi (MUI).....	269
5. HELAL GIDA SERTİFİKASINA YÖNELİK LİTERATÜRDE YAPILAN ÇALIŞMALAR.....	270
6. KONUYLA İLGİLİ GELİŞTİRİLMİŞ ÖLÇEKLER.....	274
6.1. Helal Sertifikasına, Sertifika Veren Kurum/Kuruluşa Yönelik Ölçekler.....	277
SONUÇ.....	280
KAYNAKÇA	283
HELAL AMBALAJLAMA VE ETİKETLEME.....	291
GİRİŞ.....	291
1. AMBALAJ VE ETİKET KAVRAMLARI.....	292
2. HELAL AMBALAJLAMA.....	297
2.1. Helallik Açısından Ambalajlarda Kullanılan Zararlı Maddeler	304
3. HELAL ETİKETLEME.....	307
4. KONU İLE İLGİLİ LİTERATÜRDE YAPILAN ÇALIŞMALAR.....	310
SONUÇ.....	312
KAYNAKÇA	313
HELAL TÜKETİM PAZARI	317
GİRİŞ.....	317
1. HELAL PAZAR KAVRAMI VE KAPSAMI	319
1.1. Artan Müslüman Nüfusu ve Helal Pazar	321
1.2. Büyüyen Ekonomi	324
2. KÜRESEL İSLAM EKONOMİSİNDEKİ SEKTÖRLERİN İTHALAT VE İHRACAT ORANLARI	326
2.1. Helal Gıda Pazarı.....	326
2.2. Helal Turizm Pazarı	329
2.3. Helal Moda Pazarı	332
2.4. Helal İlaç Pazarı.....	334

2.5. Helal Kozmetik Pazarı.....	337
2.6. İslami Finans	339
SONUÇ.....	341
KAYNAKÇA	343
HELAL PAZARLAMA VE MARKALAMA.....	347
GİRİŞ.....	347
1. HELAL PAZARLAMA	348
1.1. Helal Pazarlama Karması	350
1.1.1. Ürün.....	350
1.1.2. Fiyat	351
1.1.3. Tutundurma.....	352
1.1.4. Dağıtım.....	353
2. HELAL MARKALAMA	354
3. HELAL PAZARLAMA VE MARKALAMA İLE İLGİLİ LİTERATÜRDE YAPILAN ÇALIŞMALAR.....	359
SONUÇ.....	362
KAYNAKÇA	364
TÜKETİCİ DAVRANIŞLARI AÇISINDAN HELAL TÜKETİM	369
GİRİŞ.....	369
1. HELAL SATIN ALMA DAVRANIŞI	370
1.1. Helal Satın Alma Davranışını Açıklayan Teoriler.....	370
1.1.1. Genel Tüketici Davranış Modeli	370
1.1.2. Tüketim Değeri Teorisi	371
1.1.3. Nedensel Eylem Teorisi ve Planlanmış Davranış Teorisi.....	372
1.1.4. Helal Ürün Kabul Modeli	374
1.2. Helal Satın Alma Davranışını Etkileyen Önemi Değişkenler.....	375
1.2.1. Dindarlık	376
1.2.2. Helal Farkındalık	377
1.2.3. Güven	378
1.2.4. Öz Kimlik	379
2. HELAL TÜKETİCİ	379
2.1. Helal Tüketici Çeşitliliği	380
2.2. Helal Tüketici İle İlgili Diğer Konular.....	380

2.2.1. Müslüman ve Müslüman Olmayan Ülkelerde Helal Tüketici.....	381
2.2.2. Helal Tüketimde Demografik Özelliklerin Etkisi	382
SONUÇ.....	384
KAYNAKÇA	386

İSLAMİ FİNANS 391

GİRİŞ.....	391
1. İSLAMİ FİNANS KAVRAMI.....	391
2. İSLAMİ FİNANS İLKELERİ	393
2.1. Faiz Yasağı.....	393
2.2. Belirsizlik ve Risk Yasağı.....	395
2.3. Haram ve Yasa Dışı Mallara Yatırım Yasağı.....	395
2.4. Kâr-Zarar Paylaşımı Prensibi	395
2.5. Yapılan Tüm Ticari İşlemlerin Gerçek Bir Ekonomik İşleme ve Somut Bir Ticari Varlığa Dayanması Gereği.....	396
3. İSLAMİ FİNANSTA FİNANSAL ENSTRÜMANLAR.....	396
3.1. İşlem Sözleşmeleri.....	398
3.1.1. Selem.....	398
3.1.2. İstisna (Üretim Ortaklığı)	399
3.1.3. İcare	399
3.2. Finansman Sözleşmeleri.....	400
3.2.1. Murabaha	400
3.2.2. Müşareke.....	401
3.3. Aracılık Sözleşmeleri.....	402
3.3.1. Ortaklık Sözleşmeleri	402
3.3.2. Ücrete Dayalı Hizmetler	403
3.3.3. Tekaful	404
3.4. Sosyal Refah Sözleşmeleri	405
3.5. Sukuk.....	405
4. LİTERATÜR İNCELEMESİ	405
4.1. Uluslararası Çalışmalar	406
4.2. Ulusal Çalışmalar	407
SONUÇ.....	408
KAYNAKÇA	410

miz ve kaliteli olduğunu düşünerek helal gıda ürünlerine daha fazla rağbet göstermeye başlamaları, gıda üretim ve işleme teknolojilerinde yaşanan gelişmeler vb. birçok sebepten dolayı helal gıda konusunun gelecekte de önemini koruyacağı değerlendirilmektedir. Bu sebeple gelecekte bu konuda, farklı disiplinlerden araştırmacıların gerek teorik anlamda gerekse de uygulamalı olarak farklı çalışmalar yapmaları gerektiği ifade edilebilir.

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HELAL LOJİSTİK VE KÜRESEL TEDARİK ZİNCİRİNDEKİ YERİ

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GİRİŞ

Helal, Müslümanların yaşam tarzını oluşturan kavramların başında gelmektedir. Dolayısıyla başta beslenme olmak üzere pek çok sektörü Müslümanlar açısından etkilemektedir. Bu kitabın daha önceki bölümünde bahsedildiği gibi helal ürün kullanım gerekliliği Müslümanlar açısından seçiciliği beraberinde getirmektedir. Özellikle helal ürünlerin haram ürünlerle temas etmesi hâlinde haram olduğu varsayımı Müslüman toplumların hayatını daha derinden şekillendirmektedir. Ayrıca Müslüman toplumların dünya nüfusu içerisindeki oranı ve nüfus artış hızı göz önüne alındığında dinî isteklerine yönelik artan bir talepten söz edebilmek mümkündür. Müslüman toplumların istek ve arzularına diledikleri şekilde ulaşmaları önemli bir mesele hâline gelmektedir.

Zaman ve mekân faydası yaratmak suretiyle arz ve talebin koordinasyonunu sağlayan ve ürünlerin hareketini kolaylaştıran tüm faaliyetler lojistik olarak ifade edilebilir. Ayrıca müşteri gereksinimlerine uyum sağlamak amacıyla malların, hizmetlerin ve bilginin çıkış noktasından tüketim noktasına kadar etkili ve verimli bir şekilde akışına katkı sağlayan tüm depolama, planlama, uygulama ve kontrol etme süreçleri de lojistiğin alanına girmektedir. Helal lojistik kavramı tam olarak bu noktada gündeme gelmekte ve Müslüman toplumların ihtiyaçları ile lojistik faaliyetlerini birleştirmektedir.

Müslüman toplumlar, tükettikleri ürünlerin İslami ilkeler çerçevesinde kendilerine sunulduğundan emin olmak ve söz konusu ürünlerin sağlıklı ve iyi anlamına gelen tayyib olmasına yönelik güvenceler istemektedir. Ürünün helal olup olmaması tedarik zincirindeki çeşitli faaliyetlerin bir sonucu hâline geleceğinden, helalliği güvence altına almak açısından tedarik zinciri ve lojistik yaklaşım da büyük önem taşımaktadır. Özellikle kitlesel üretim ve tüketimin son derece hız kazandığı günümüzde ürünlerin ham madde tedariki, üretilmesi, paketlen-

Malezya’da üretilen bir helal ürünün İngiltere’de yaşayan bir Müslümana İslami koşullarda ulaştırılması için küresel tedarik zincirinde faaliyet gösteren lojistik hizmet sağlayıcıların adım atması gerekmektedir. Bu bağlamda özellikle İslami açıdan standartları belirleyen kurumların ajandaları ve rehberleri takip edilerek lojistik işletmecilerin helal lojistiğe kendilerini hazırlamaları, lojistik faaliyetlerin her aşamasında bu hassasiyetleri gözetmeleri önerilmektedir. Çünkü bu konu sadece Müslüman toplumların beklentisinin karşılanmasına ilave olarak işletmelerin karlılığını artıracak yeni bir iş alanı olarak benimsenmelidir. Ayrıca literatür taramasında görüldüğü üzere, gayrimüslimlerin de helal lojistik ve helal ürünler noktasında beklentileri olabilmektedir. Yani helal lojistiği sadece bir kesimin tercihi olarak sınıflandırmak da doğru bir yaklaşım olmayacaktır. Çünkü helal olma gereksinimlerine bakıldığında aslında tüm insanlığa fayda sağlayabilecek ve zararlı kontaminasyonların önüne geçilebilecek adımları içerdiği görülmektedir. Dolayısıyla küresel çapta faaliyet gösteren lojistik hizmet sağlayıcıların helal lojistik noktasında farklı bakış açıları geliştirmelerinin yararlı olacağına inanılmaktadır.

Gelecekte yapılacak bilimsel araştırmalar açısından bakıldığında ise büyük potansiyelli bir araştırma alanı ve farklı bağlamlarda kullanılacak ölçeklerin varlığı ile helal lojistik konusu değerli bir araştırma fırsatı olarak görülmektedir. Özellikle Türkiye gibi medeniyetler arasında köprü görevi üstlenen ülkelerde, lojistik hizmet sağlayıcıların helal lojistiğe olan bakış açılarının keşfedilmesi, helal lojistik sertifikası olan işletmelerin geçtiği aşamaların anlaşılması ve bu konularda ampirik araştırmalar yapılması araştırmacılara yönelik öneriler olarak değerlendirilebilir.

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HELAL TURİZM

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GİRİŞ

Turizm, oluşturduğu istihdam kapasitesinin genişliği, bölgeler arası kalkınma farklılıklarını azaltılmasına sağladığı katkı ve gelir yaratıcı etkisi gibi nedenlerden dolayı pek çok ülke ekonomisi için önemli bir rol oynamaktadır. Turizm, tarım başta olmak üzere diğer pek çok sektörle olan yakın ekonomik ilişkisi nedeniyle ülke gelirini artırırken yerel nüfus için sürdürülebilir istihdam olanakları oluşturulmasına katkı sağlamaktadır. Söz konusu katkılar turizmin pek çok ülke için ayrıcalıklı ve önemli bir yere sahip olmasına neden olmaktadır (Ratnasari vd., 2020: 865). Mohsin vd. (2016: 137); turizm sektörünün ne kadar benzersiz bir sektör olduğunun Körfez Savaşı, terör saldırıları, grip korkuları vb. gibi olumsuz olaylara rağmen sektörün büyüme kaydetmeye devam ettiğini gösteren verilerden çok açık bir şekilde görüldüğünü belirtmektedirler. Turizm, oldukça geniş bir sektör olup konaklama, yiyecek-içecek, ulaşım-seyahat, eğlence gibi çok sayıda alt sektöre sahiptir. Sektör aynı zamanda kendi içerisinde de farklı sınıflandırmalara göre pek çok farklı turizm türünü bünyesinde barındırmaktadır. Örneğin yalnızca alternatif turizm başlığı altında yaklaşık elliye yakın farklı turizm türü bulunmaktadır.

Daha fazla turizm geliri elde etme konusunda oldukça yoğun bir rekabet ortamına sahip olan turizm sektöründe, dünya genelinde pek çok destinasyon (varış yeri) bir biri ile yarış hâlinindedir. Her geçen yıl bir önceki yıldan daha fazla sayıda turist çekmek ve turizm geliri elde etmek isteyen turizm destinasyonları, turistlerin istek ve ihtiyaçlarını yakından takip etmektedirler. Söz konusu rekabet ortamı, turizm pazarında meydana gelen her bir değişikliğin destinasyonlar ve turizm işletmeleri tarafından dikkatle incelenmesini zorunlu kılmaktadır. Bu kapsamda turizm sektöründe son dönemlerde yaşanan önemli bir değişim Müslüman ülkelerden gelen turist sayısında yaşanan artıştır. Müslüman nüfus, diğer dünya dinlerinden daha hızlı büyümekte olup 2010'da 1,5 milyarı aşan küresel Müslüman nüfusun 2030'da 2,3 milyara çıkacağı ve dünya nüfusunun yaklaşık olarak %27'sini oluşturacağı tah-

lilikleri zorunlu hâle getirmektedir. Tuna'ya (2016: 261) göre, İslam dini sadece bir din olmanın da ötesinde bir yaşam biçimi olup Müslümanların hayatının her aşamasında olduğu gibi destinasyon seçimlerinin yönünü de etkilemekte ve destinasyondaki sergilenen davranış ve faaliyetlerde de uyulması önerilen bazı gereklilikler getirmektedir. Bu kapsamda özellikle 2000'li yıllardan sonra turizm pazarında Müslümanlara yönelik yeni bir ürün olarak ortaya çıkan "helal turizm" olgusu, turizm pazarlamacılarının, araştırmacıların ve destinasyonların gittikçe daha fazla ilgisini çekmektedir. Destinasyonların çoğu büyüyen helal turizm pazarından daha fazla pay alabilmek için Müslüman turistlere yönelik turizm ürünleri tasarlamakta ya da kendilerini helal turizm gerekliliklerine uygun hâle getirmek için dönüştürmektedirler. Bu kapsamda Müslüman olmayan destinasyonların da helal turizm pazarından pay alma yarışına girdikleri görülmektedir. Dünya Müslüman nüfusu ve bu nüfusun gelir dağılımı ile ilgili gelecek tahminlerinin sonuçları, helal turizm pazarının ilerleyen yıllarda turizm pazarı içerisinde en hızlı büyüyen alan olacağına işaret etmektedir. Dolayısıyla Müslüman ya da Müslüman olmayan turizm destinasyonlarının helal turizm pazarından pay alabilmeleri için Müslüman turistlere yönelik mal ve hizmet geliştirmelerinin faydalı olacağı değerlendirilmektedir.

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HELAL KOZMETİK VE KİŞİSEL BAKIM ÜRÜNLERİ

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GİRİŞ

Helal ürün kavramı genel olarak gıda ile ilişkilendirilse de bu kavram aslında gıda dışında daha geniş bir alanı kapsamaktadır (Majid vd., 2015: 48). Helal kavramı sadece yiyecek ve içeceklerle sınırlı olmayıp kozmetik, kişisel bakım ve temizlik ürünleri, ilaçlar gibi tüm sarf malzemelerini, finans ve turizm gibi diğer mal veya hizmetleri de kapsamaktadır (Lada vd., 2009: 66; İslam ve Chandrasekaran, 2013: 3938; Abd Rahman vd., 2015: 149; Suparno, 2021: 1665). Bu doğrultuda, helal ürün sektörü de son yıllarda gıda sektörünün ötesine geçerek helal bir yaşam tarzını da kapsayacak şekilde genişlemeye başlamıştır. Giderek tüm dünyaya yayılan bu helal yaşam tarzı, bugün yalnızca tüketicilerin ürünleri satın alma şeklini değil aynı zamanda bazı işletmelerin çalışma şeklini de değiştirmiştir (Wilson, 2014: 255; Divianjella vd., 2020: 71).

Helal ürün endüstrisi, son yirmi yılda pazarlamacılar için çekici sektörlerden biri hâline gelmiştir. Müslüman ülkelerin artan ekonomik gücü, onları güzellik ve kişisel bakıma daha fazla harcama yapma konusunda etkilemiştir (Swidi vd, 2010: 1). Khalek ve İsmail'e (2015: 608) göre büyüme açısından dünya çapında en hızlı büyüyen pazarlardan biri olarak kabul edilen helal ürün pazarındaki ürünlere yönelik küresel harcama, 2021 yılında 2 trilyon ABD dolarına ulaşmış 2023 yılına kadar 3 trilyon ABD dolarına ulaşması beklenmektedir. Küresel helal pazarının 2024 yılına kadar ise yıllık %6,8 bileşik büyüme oranıyla genişlemesi beklenmektedir (Thomson Reuters, 2018; Küresel İslam Ekonomileri Durum Raporu, 2022).

Helal endüstrisine yönelik talebi yönlendiren şey, Müslüman nüfusa artık genç ve dinamik profesyonellerden oluşan bir demografinin hâkim olduğu gerçeğidir. Bu genç Müslümanlar İslami yaşam tarzlarını benimseyen ve günlük yaşamın bir parçası olarak helal tüketim konusunda genel olarak bilinçli yeni bir nesildir

daha bilimsel yöntemlerin kullanılması gerekmektedir (Sugiyabashi vd., 2019: 10). Kadınların helal kozmetiğe olan ilgisi artmaya devam ederken endüstriyi daha yüksek bir konuma getirmek için teknoloji etkili bir şekilde kullanılmalıdır.

Nitekim helal kozmetik ürünleri sadece Müslümanların değil Müslüman olmayan tüketicilerin de ilgisini çekmekte ve daha sağlıklı ve güvenli ürünler olarak algılanmaktadır (Mohezar vd., 2016: 54; Amalia vd., 2020: 1186; Shahid vd., 2018: 486). Helal kozmetikler, helal yönergelere uymanın yanında yüksek kaliteli ürünler sağladıkları için kozmetik sektöründe bir atılım ve devrim niteliğinde kabul edilmektedir (Handriana vd., 2021: 1309; Khan vd., 2021: 1462). Müslüman olmayanlar da helal olmayan ürünlerden daha güvenli oldukları algısı nedeniyle helal ürünler satın almaktadırlar (Alam ve Sayuti, 2011: 8). Müslüman olmayan tüketiciler helal logosunu ürün hakkında tanınırlık ve güvenlik sağlayan bir sembol olarak algılamaktadır (Abdul Aziz ve Chok, 2013: 19). Helal sertifikalı ürünler aynı zamanda daha doğal, etik, çevre dostu, organik, sömürücü olmayan ve insani bir yaklaşımla üretilen ürünlerdir (Aoun ve Tournois, 2015: 121; Ali vd., 2016: 53; Bhatia ve Jain, 2013: 1). Aoun ve Tournois (2015: 121), helal belgelendirme ile çevre kirliliğine karşı mücadele eden ve yeşil pazarlama uygulayan markaların sayısının giderek arttığını belirtmiştir.

Bu nedenle helal ürün üreticilerinin organik ve hayvan deneyleri içermeyen “doğal” ürünler arayan tüketicileri de hedeflemesi gerekmektedir. Helal ve vegan ürünler aynı amaca hizmet ettiği için pazarlamacılar onların tüketimlerinden de fayda sağlayabilirler (Shahid vd., 2022). Özellikle son yıllarda doğal, organik ve vegan kozmetiklere olan talepteki artışla birlikte, helal markalar pazar payını korumak ve artırmak için daha fazla zorlukla karşı karşıya kalmaktadır. Dolayısıyla helal markalar ürünlerini satmalarına yardımcı olmak için başka sertifikasyon etiketleri de almakta; organik, doğal ve vegan markalar da daha fazla pazar çekiciliğine sahip olmak için helal sertifikası almaktadır.

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HELAL İLAÇ VE TAKVİYE EDİCİ GIDALAR

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GİRİŞ

Dünya nüfusunun %24,4'ünü Müslümanlar oluşturmaktadır. Bu da helal pazara olan ilgiyi artırmaktadır. Sadece Müslüman olanlar için değil farklı dinî inanışlarda olanlar için de helal temelli iş sektörleri bir yaşam tarzı hâline gelmiştir (Vizano vd., 2020: 59). Helal ürünler günlük tükettiğimiz her şeyin güvenlik, hijyen ve kalite güvencesi için bir ölçüt olarak kabul edilmesi, bu ürünlerin hem Müslümanlar hem de diğer dinlere mensup kişiler için kolaylıkla kabul edilebilir olmasını sağlamaktadır (Ambali ve Bakar, 2014: 11). Nitekim Aziz ve Chok (2013), Müslüman olmayanların helal ürünleri temizlik, güvenlik ve yüksek kalite sembolü olarak gördüklerini, helal sertifikalı yiyecekleri daha lezzetli, hijyenik ve güvenli hissettiklerini belirtmiştir.

Bazı işletmeler helal kavramını, pazar payını artırmaya yardımcı olacak bir marka bileşeni olarak görmesine rağmen bu kavram Müslümanlar için bir marka unsurundan çok günlük yaşamın, inanç sisteminin ve ahlaki davranış kurallarının bir parçasıdır (Wilson ve Liu, 2010: 108). Ayrıca helal kelimesi “iyi”, “lezzetli”, “güvenli” ilkelerini kapsamakta ve bunlar helal ürünlerin pazarlanmasında yeni bir trend ve değer katan bir faktör olarak kullanılmaktadır (Kasri vd., 2021: 4). Helal marka olmak, marka özellikleri bakımından dinî özellikleri temsil ettiği için benzersizdir ve helal markanın bu boyutu helal markalara İslami açıdan bakıldığını göstermekte, bu da bu kavramın ürünlere tüketiciler için üreticiler tarafından manevi bir özellik kattığını düşündürmektedir (Farah, 2021: 283).

Helal ürünler; gıda, içecek, ilaç, kozmetik, kimyasal ürünler, biyolojik ürünler, genetiği değiştirilmiş ürünler gibi tüketilebilir ürünler veya İslami ilkelere uygun olarak insanlar tarafından kullanılacak ve uygulanabilecek her türlü maldır (Rahmah ve Barizah, 2020: 2012). Helal kavramı sadece yiyecek ve içecek için değil yaşam tarzı olarak düşünüldüğünde ilaç ve takviye edici gıda tüketimi, sağlık hizmeti alımı gibi birçok davranışı etkilemektedir. Helal ilaçların or-

durum helal ilaç ve takviye edici gıda konusunun önemini artırmakta ve gelecekte konu ile ilgili daha fazla çalışma yapılması gerektiği sonucunu doğurmaktadır.

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İSLAMİYET’TE GİYSİ MODASI–HELAL MODA

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GİRİŞ

Dünyada Müslüman nüfusun son zamanlardaki hızlı büyümesi, tesettür modasına yönelik talebin artmasına neden olmuştur. “Tesettür”ün gerçek anlamı örtünmek veya perdelemektir. İngilizcede “scarf” ve Arapçada “Hijab” olarak ifade edilmektedir. İslam hukukunun (şeriat) izin verdiği sınırlarda hem erkeklerin hem de kadınların; mütevazı, vücuda oturmeyen, teni göstermeyen ve karşı cinsle benzemeyen kıyafetler giymesi gerekmektedir. Aynı zamanda kadınların yüz ve eller hariç tüm vücutlarını başlarına kadar örtmeleri belirtilirken erkek kıyafetlerinin ve aksesuarlarının ipek ve altın içermemesi gerektiği de vurgulanmıştır. Tesettür sadece giyimle ilgili olmayıp kişinin salih amellerini, davranışlarını, tutumlarını, ahlaki davranışlarını ve niyetlerini içeren bir yaşam biçimidir. Bu nedenle yapılan her işte olduğu gibi giyimde de İslamiyet’in izin verdiği, helal kabul edilen sınırlar içinde tercihler yapılması gerekmektedir. İslami giysi modası; tesettür ya da helal giyim modası şeklinde yorumlanan geniş kapsamlı bir olgudur.

Giyimde tevazu, güvenlik, temizlik ve rahatlık konularında İslami ilkelere uygun yeşil ve sürdürülebilir bir moda olan tesettür modasının tedarik zinciri, helal ham maddelerin hazırlanması ve biraraya getirilmesi, nihai ürünlerin müşteriye teslimine kadar tüm süreci kapsamaktadır. Bu tedarik zincirinin en önemli halkaları olan üreticinin ve tüketicinin tesettür ile ilgili bilgileri çok kısıtlıdır. Ürün bilgisi, ürünlerin satılması ve alınması konusunda önemli bir etkiye sahiptir. Bu nedenle ürünlerin ne olduğu, nasıl üretildiği, lojistiği ve dağıtımı gibi bilgiler tesettür modasının gerçek amacına hizmet etmesi bakımından önemlidir (Erdem, 2015: 260-265; Hassan ve Harun, 2016: 483; Sumarliah vd. 2020: 83-91).

İslam dininin doğaya ve canlıya verdiği önem pek çok ayet ve hadis içinde yer almaktadır. Dolayısıyla dininin bu hassasiyetine sahip olan tüketiciler çevreyi önemsemekte, giysi alışverişlerinde tercihlerini doğadaki kaynakların israf olma-

re farketirmeye çalışmaktadır. Dindar tüketiciler çevreyi önemseyen ve çevreye olan pozitif eğilimleri nedeniyle ihtiyaç dışı giyim alışverişi yaparak doğadaki kaynakların israf olmasını istememektedirler.

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HELALLİK AÇISINDAN GIDA KATKI MADDELERİ

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GİRİŞ

Yaşadığımız yüzyılda gıda bilimi ve teknolojileri alanındaki gelişmeler sonucunda farklı işlevlere sahip birçok yeni gıda maddesi ortaya konulmuştur. Modern dünyada, tüketiciler birçok alanda olduğu gibi gıda sektöründe de daha fazla seçeneğe daha kolay ulaşma isteği duymakta ve ulaştığı gıdanın da güvenilir olması yönünde talepte bulunmaktadır. Günümüz karmaşık gıda zincir sistemi düşünüldüğünde gıdaların tarladan sofraya uzanan zorlu yolculuklarında arzu edilen hâllerinin dışına çıkarak bozulmalarına sebep birçok etkene maruz kaldığı bilinmektedir. Bunların başında sıcaklık değişimleri, mikroorganizmalar, oksidasyon gibi faktörler gelmektedir. Tüm bu bozulmaların önüne geçebilmek, gıdanın cezbediciliğini de kaybetmeden, besin değerini koruyarak ve sağlık üzerinde olumsuz bir etki göstermeksizin tüketiciye ulaşmasını sağlamak adına bazı gıda ürünlerinde gıda katkı maddelerinin kullanımı gerekli hâle gelmektedir.

Gıda katkı maddelerinin kullanımı dünyada oldukça uzun bir geçmişe sahiptir. Gıda katkı maddeleri ile ilgili kayıtlar MÖ 1500 yıllarına kadar uzanmaktadır. Bu konudaki ilk kayıtların Eski Mısır'da şekerlemelere rengini iyileştirmek amacıyla doğal ekstraktların ilave edilmesi ile ilgili olduğu belirtilmektedir (Sun ve Wang, 2017: 189). MÖ 300-400 yıllarında şarapların yapay olarak renklendirildiği bilinmektedir. 19. yüzyıl öncesi gıda katkı maddelerinin yalnızca doğal kaynaklardan elde edildiği görülmektedir. 19. yüzyılın ortalarında ise bazı gıdalara görsel amaçlı safran eklendiği veya lezzet amaçlı farklı bitkilerin eklendiği görülmektedir. Gıda katkı maddelerinin sentetik yolla eldesine dair ilk kayıt, 1856 yılında İngiliz bir kimyager olan W. H. Perkins'in kömür katranından elde ettiği mor renkli bir renklendiriciye aittir (Sun ve Wang, 2017: 189). 19. yüzyılın sonlarında kimya alanındaki gelişmelerin de bir sonucu olarak çok sayıda sentetik gıda katkı maddesi üretilmeye başlamıştır.

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HELALLİK AÇISINDAN JELATİN

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GİRİŞ

Jelatin, hayvanların kemiklerinde ve/veya derilerinde bulunan, kolajen adı verilen bağ dokusundan, saflaştırılarak elde edilen renksiz bir proteindir (Liu vd., 2015: 528). Jelatin, kolajenin lifli yapısının asidik veya alkali ön muamelesi ile parçalanmasının ardından çeşitli polipeptit zincirleri arasında çapraz bağların oluşmasıyla üretilmektedir (Ali vd., 2018: 1495). Jelatin, kolajen hidrolizi yoluyla elde edildiğinden jelatinin kalitesi öncelikle kolajen kaynağına bağlıdır (Yuswan vd., 2021: 1). Eşsiz yapısal stabiliteye, beslenme özelliğine ve diğer fizyokimyasal özelliklere sahip olan protein bazlı bir hidrokolloiddir (Hassan vd., 2018: 2903; Liu vd., 2015: 528; Zhang vd., 2009 :2001). Bu özelliklerinden dolayı endüstride kalınlaştırıcı, emülgatör, plastikleştirici ve ayrıca jelleştirici, köpük oluşturucu, doku geliştirici, nem tutucu ve bağlayıcı olarak çeşitli gıda, ilaç ve kişisel bakım ürünlerinde yaygın olarak kullanılmaktadır (Rakhmanova vd., 2018: 477). Gıda endüstrisinde kek, yoğurt, çikolata, yumuşak şeker, dondurma, jöle, jöleli tatlılar, peynir, şekerleme ve sakız gibi çeşitli ürünlerde kullanım alanı vardır. Öte yandan, ilaç endüstrisinde, ilaçları ışık, nem ve oksijenin zararlı etkilerinden korumak için yumuşak ve sert kapsül üretiminde etken maddelerin enkapsülasyonunda önemli bir rol oynamaktadır. Ayrıca tabletlerin, hapların şekerle kaplanması ve vitamin kapsüllemesinde de faydalıdır (Karim ve Bhat, 2008: 644; Zhang vd., 2009: 2001). Bu endüstrilerde jelatin hidrokolloidine alternatif olarak agar, karragenan, pektin, ksantan gam ve konjak glukomannan gibi bitkisel ve mikrobiyal kaynaklar kullanılmasına rağmen jelatinin sağladığı avantajlar, ekonomik olması, kaynaklarının bol ve üretim veriminin yüksek olması nedeniyle hâlâ vazgeçilemezdir (Uddin vd., 2021: 1).

Jelatin, hayatımızın çeşitli alanlarında birden fazla kullanıma sahip olsa da modern helal gıda endüstrisinde en tartışmalı maddelerden biri olarak kabul edilmektedir. Bu nedenle jelatinin tür orijininin tespitinin belirlenmesi son derece

ürünlere helallik yönünden yaklaşımı sınırlandırmaktadır. Ayrıca jelatin yerine kullanılabilir ve jelatinin sağlayabileceği besinsel ve fonksiyonel özellikleri sergileyebilen bitkisel bir ikamenin olmaması, birçok sektörde jelatin kullanımını gerekli kılmaktadır. Bu yönleriyle düşünüldüğünde helal jelatin üretimi için jelatinin üretilmesi hayvansal kaynağın domuz ve tüketimi yasak olmayan hayvan türlerinden sağlanması ve bu nedenle alternatif hayvansal kaynaklardan (kanatlı, balık, deve vb.) jelatin üretimine yatırımların artırılması gerekmektedir. Jelatin yerine bitkisel kaynaklardan veya mikrobiyolojik yollarla üretilen agar, karagenan, pektin, ksantan gam, konjuk gukomannan vb. gibi alternatifler üzerine araştırmalar devam etse de bu alternatiflerin jelatinin yerini alması oldukça zor görünmektedir.

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HELAL GIDA SERTİFİKASI

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GİRİŞ

Helal gıda, başta inanç olmak üzere değerler, kültür, yaşam biçimleri, beslenme alışkanlıkları gibi çeşitli değişkenlere bağlı olabilecek bir tüketici tercihidir. Helal gıda ürününün tüketicilere bu gibi değişkenler kapsamında değer sunması için ürünün üretiminde kullanılacak ham maddelerden başlayarak tüm pazarlama aşamalarını kapsayacak şekilde son tüketiciye ulaşana dek süreç hassas ve güvenilir bir sürecin yürütülmesi gerekmektedir. Böyle bir çaba ancak helal gıda konusunda standartların geliştirilmesi, güvenilir bir belgelendirme mekanizması oluşturulması ve bu sürecin sertifikalar ile denetim ve güvence altına alınması vasıtasıyla gerçekleştirilebilir. Bu kapsamda, özel olarak bu amaca odaklanmış kuruluşlar tarafından farklı din, inanç veya değerleri temsil edecek şekilde standartlar geliştirilmektedir. Helal gıda sertifikası özelinde ise çeşitli İslami kuruluşlar tarafından farklı standartlar geliştirilmekte, müteşebbisler amaçlarına ve hedef pazarlarının ihtiyaçlarına bağlı olarak kendilerine uygun olan standartların gereksinimlerini karşılamakta ve helal gıda sertifikaları temin etmektedir.

Tüketicilerin talepleri, müteşebbislerin helal sertifikalarına olan ilgisini artırmakta, şirketlerin artan ilgisi ise her geçen gün daha fazla helal standardının ve helal kuruluşunun ortaya çıkmasına neden olmaktadır. Bu şekilde büyüyen küresel helal pazarı mevcut markaların, firmaların rekabet alanı hâline gelirken pazara yeni girecek birçok marka için satışlarını ve kârlılıklarını artırmak için fırsat anlamına gelmektedir. McDonald's, Starbucks, KFC, Burger King, Nestle gibi onlarca küresel dev markanın helal gıda sertifikaları temin etmesi (Fischer, 2012) ve artan talep sonucunda son yıllarda ivmelenmeye başlayan helal gıda pazarının, sertifikalar açısından görece kısa bir tarihe sahip olduğu ve henüz emekleme aşamasında olduğu söylenebilir. Helal gıdaların piyasa değeri 2022 yılı için 2,4 trilyon dolar olarak hesaplanırken (Shahbandeh, 2018) bazı kaynaklarda ise küresel helal pazar büyüklüğünün 7 trilyon doları aştığı ifade edilmektedir (Adroit Mar-

Çin, Avustralya, Brezilya gibi birçok gayrimüslim ülke Malezya'yı küresel helal endüstrisinin öncüsü olarak görmektedir (Fındık, 2019). Helal endüstrisinde dünya lideri kabul edilen Malezya'nın (Melewar ve Alwi, 2017) sadece helal gıda sertifikalarında değil aynı zamanda helal gıda sertifikaları ile ilgili bilimsel yayınlarda da öncü konumda olduğu söylenebilir. Sıklıkla atıf yapılan ve literatüre yön veren kaynakların Malezya'da yapılan çalışmalar oldukları görülmüştür. Bu açıdan Malezya'nın gerek standartları gerek helal konusundaki gelişim süreci gerekse hükümet destekli yapısı helal sertifikaları konusunda pazarda söz sahibi olmak isteyen her ülke ve kuruluş açısından örnek teşkil etmektedir. Bu doğrultuda yapılacak çalışmalarda, ISO, HACCP, GMP, GHP gibi uluslararası kriterlere uygun, her açıdan güven ve kalite simgesi olan, mümkün olduğunca hükümet desteği alan sertifikalar hedeflenmelidir.

Son olarak çalışma için uygulanan literatür taraması sonucunda güvenilir kaynak sorunu olduğu görülmüş, özellikle Türkçe literatür olmak üzere çalışmanın konusunu oluşturan literatürde yanlış yapılan atıflara veya atıf yapılmadan kullanılan ifadelerle sıkça rastlanılmıştır. Bu sorunun temel nedenleri olarak sertifika sağlayan kuruluşların internet sayfası kaynaklarının sıkça kullanılmak zorunda kalınması, 2015 ve öncesindeki çevrim içi sayfa kaynaklarının birçoğunun hâlihazırda aktif olmaması, ulaşılabilen çevrim içi sayfalarının özensiz düzenlenmiş, konunun uzmanları tarafından hazırlanmadığı anlaşılan, yazım hataları içeren kaynaklar olması ve yabancı kaynaklardan yapılan özensiz çeviriler gibi maddeler sayılabilir. Ulaşılan birçok çevrim içi sayfanın hâlihazırda güvenli sayfa niteliği taşıyor olması, eski çevrim içi altyapılar kullanmaları, sayfalara tarih bilgileri girilmemesi, sayfalarda genellikle güncel bilgiler bulunmaması ve sayfalar içerisinde yer alan bilgilerin zaman zaman çelişmesi veya aynı bilgilerin farklı kapsamlarla verilmesi gibi durumlara da sıklıkla rastlanılmıştır. Ayrıca sertifika kuruluşlarının çevrim içi sayfalarında referanssız olarak başka kaynaklardan alınan ifadelerle de rastlamak mümkündür. Günümüz şartlarında birçok helal gıda sertifika başvurusu çevrim içi olarak yapılmakta, süreçler çevrim içi olarak yürütülmektedir. Dolayısıyla söz konusu sertifika kuruluşlarının çevrim içi sayfalarına özen göstermeleri, nitelikli ve uzman personel vasıtasıyla doğru, şeffaf ve anlaşılır bilgiyi tüketicilere ve müteşebbislere aktarabilmeleri önem arz etmektedir. Bu konu üzerinde gerek sertifika kuruluşlarının gerekse alanda çalışmalar yapan araştırmacıların özen göstermeleri gerektiği düşünülmektedir.

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HELAL AMBALAJLAMA VE ETİKETLEME

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GİRİŞ

Dođada bulunan diđer canlılar gibi insanlar da yařadığı sürece sürekli olarak tüketim yapmaktadır. Ancak insanın tüketim davranışlarını diđer canlılardan ayıran en temel nokta, tüketimin sadece fiziksel ihtiyaçların giderilmesi güdüsüyle yapılmamasıdır. İnsan, ihtiyaçlarını giderirken psikolojik ve sosyolojik gereksinimlerini tatmin etmeyi de tüketim faaliyetlerine yansıtmaktadır. İnsanlarda tüketim maddi ihtiyaçların yanında manevi boşlukların doldurulmasını da kapsamaktadır (Bakır ve Çelik, 2013: 47). Tüketiciler herhangi bir ürüne satın alma arzusu ile yöneldiğinde kendi ihtiyaçları ile çevresel ve sosyolojik koşulların dengeli bir uyumu ile kendi tatminini sağlamak durumundadırlar. Tüketim davranışının dış faktörlerden etkilenme özelliđi taşıması, deđişimlere uyum sağlayabilen bir yapıya sahip olduğunu göstermektedir. İnsanların tüketim amacıyla yaptıkları satın alma davranışını etkileyen birçok faktör vardır. Tüketim kalıpları üzerinde bazı dış faktörlerin etkisi kısa süreli iken bazılarının ise uzun dönemlidir. Kişisel ve sosyal deđerlerimiz genel anlamda davranışlarımızı yönlendirmektedir. Bu durumda tüketim ve satın alma davranışlarımızın da deđerlerimizden etkilendiđi söylenebilmektedir (Odabaşı ve Barış, 2013: 35-216). Bu çerçevede düşünülüdüğünde bireyin tüketim davranışı ile din arasında, ihtiyaçların tatmin edilmesi noktasında akılcı ve karşılıklı bir ilişki vardır (Demirezen, 2015). Dinî inançlar, pazarlama literatüründe kültürel faktörlerin anahtarı sayılmakta ve tüketici davranışlarını, dolayısıyla da satın alma davranışlarını büyük ölçüde etkilemektedir. Çünkü dinî deđerlere bađlılık ile yaşam biçimi arasında dođrusal bir ilişki vardır. Bu durum da bireyin neleri tüketeyeceđi konusundaki tercihlerini etkilemektedir (Öztürk vd., 2015: 143). Dinî deđerlere bađlılık ve tüketim arasındaki bu ilişki ürünlerin dinî deđerlere uygunluđu konusunda daha derinlemesine ve titiz düşünülmesi gerekliliđini ortaya çıkarmaktadır. Dünyadaki en yaygın dinlerden biri olan İslam dininin kurallarına uygun olarak üretilen ürünler helal ürünler ola-

özellikle enzimler, katkı maddeleri gibi içeriklerin helallik özellikleri açısından yeterli bilinç seviyesinde olmadığı söylenebilir.

Çalışmadan ulaşılabilecek bir başka sonuç ise kalite algısı ile ilgilidir. Helal etiketli ürünlerin aktarmak istediği bilgi içeriği ve pazarlama mesajı ile ilgili tüketici bilinç seviyesi yüksek olmasa da helal etiketinin Müslüman olan tüketicilerin yanı sıra Müslüman olmayan tüketiciler tarafından da bir kalite göstergesi olarak benimsendiği görülmektedir. Bu durum, helal ürün pazarının genişlemesini sağlamaktadır.

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HELAL TÜKETİM PAZARI

Dr. Öğr. Üyesi Melda Aslan

GİRİŞ

Günümüzde helal pazar artık sadece gıda sektörüyle sınırlı kalmayıp moda, kozmetik, ilaç ve tıbbi cihazların yanı sıra lojistik, turizm, finansman, pazarlama, basılı ve elektronik medya, paketlenme ve markalaşma gibi hizmet sektörü bileşenlerini de kapsayacak şekilde genişlemiştir. Buna göre, küresel helal endüstrinin ekonomik değerinin bir bütün olarak şu anda yaklaşık 2 trilyon dolar (İslami finans hariç) olduğunu tahmin edilmektedir (DinarStandard, 2022: 3). Ekonomik anlamda böylesine büyük bir yapıyı ifade eden helal pazar, son zamanların en hızlı büyüyen pazarı olarak ifade edilmektedir (Shah vd., 2022: 1264; Abu-Daibes, 2018: 329). Helal temelli pazarda yaşanan bu hızlı büyüme, helal/İslami pazarlama ile birlikte akademik alanda da ilgiyi artırmıştır. Sandıkçı ve Ger (2011: 487), Müslüman tüketicilere olan ilginin çeşitli ekonomik, sosyal, kültürel ve politik nedenlerden kaynaklandığını belirtmişlerdir. Bu anlamda, İslam'ın dönüştürücü rolünü araştıran ve günlük yaşam üzerindeki etik, ekonomik, siyasi, kültürel ve sosyal etkilerini tartışan çeşitli çalışmalar da ortaya çıkmaya başlamıştır (Dekmejian, 1995; Esposito, 1998; Tibi, 2001).

Helal pazarın çekici bir pazar konumuna gelmesinde pek çok etken bulunmaktadır (Aniqoh ve Hanastiana, 2020: 44; Azam ve Abdullah, 2020: 50-54). Örneğin; helal kavramı, aynı zamanda Tayyib kavramı ile ilişkilendirilmektedir. Dolayısıyla helalin anlamı, İslam'da izin verilen ve insan için en iyi olabilecek her şey olarak tanımlanmaktadır (Azam ve Abdullah, 2020: 47). Etik değerlerin dinî değerlerle bütünleşmesi, helal endüstrinin sınırlarını dünya genelinde Müslüman tüketicilerle birlikte gayrimüslim tüketicilere de genişleterek pazarın çekici bir konuma gelmesini sağlamıştır. Bunun en önemli nedeni, helal endüstrisi tarafından benimsenen hayvan iyilik hâli, sosyal sorumluluk, çevre dostu, yeryüzünün korunması, ekonomik, sosyal adalet ve etik gibi değerlerin günümüz gayrimüslim tüketiciler tarafından da bir yaşam tarzı olarak kabul edilmesidir (Nasr, 2009: 123; Billah vd., 2020: 326).

temelli yeni sektörlerin varlığına işaret etmektedir. Bu amaçla mevcut literatür ve ortaya koyulan raporlar aracılığıyla sektörün mevcut durumunun değerlendirilmesi; uzun vadede, sektördeki gerçek koşulları anlamak için ampirik çalışmaların yapılması gerekmektedir.

Son olarak pazardaki fırsatlara yönelik farkındalığın sadece tüketici, akademisyen, ticari girişimcilerle değil aynı zamanda kurum ve kuruluşlar, yerel yönetimler ve hükümet olmak üzere tüm birimlerle eşgüdümlü olarak özverili bir şekilde yürütülmesi gerekmektedir.

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HELAL PAZARLAMA VE MARKALAMA

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GİRİŞ

Pazarlama anlayışının yıllar içerisinde değiştiği ve geliştiği yoğun rekabet ortamında işletmelerin varlıklarını devam ettirebilmesi için farklı pazarlama stratejileri kullanmaları bir zorunluluk hâline gelmiştir. Müşteri odaklı bir pazarlama anlayışının hâkim olduğu günümüz dünyasında, işletmeler tüketici ihtiyaçlarını karşılamak için ellerinden gelen bütün çabayı göstermek durumundadırlar. Helal ürünlerin pazarlanması da işletmelerin rekabet gücü elde edebilmeleri için uygulayabileceği pazarlama stratejileri arasında yer almaktadır. Helal ürünlerin satış ve pazarlaması sadece dinî ihtiyaçların karşılanması için değil ticari bir avantaj elde etmek düşüncesiyle de işletmeler tarafından kullanılmaktadır.

Günümüz dünyasında pazarlamacılar, tüketicilerin karar verme süreçlerini şekillendiren faktörlere bağlı olarak müşterilere hitap etmek ve onları çekebilme için çeşitli yollara başvurmaktadırlar (Shah vd., 2020: 1641). Bu yollardan bir tanesi de bireylerin dinî hassasiyetlerine göre ürünler üretmek ve bu yöndeki ihtiyaçlarını karşılamaktır. Bu durum farklı dinler için söz konusu olabileceği gibi özellikle Müslüman nüfusun fazla olduğu yerlerde Müslüman tüketiciler için helal ürünlerin üretilmesi ve pazarlanması şeklinde karşımıza çıkmaktadır. Dinî hassasiyeti olan kişilerin tüketim alışkanlıklarına dikkat ettiği, başka bir deyişle dinin tüketim üzerinde etkili olduğu (Delener, 1994: 46; Assadi, 2003: 11; Esso ve Dibb, 2004: 706; Mokhlis, 2009: 81; Kızılgın ve Özkan, 2014: 35) ve Müslüman tüketicilerin gıda alışverişlerinde helal konusuna öncelik verdikleri (Soesilowati, 2010: 156) düşünüldüğünde helal ürünlerin pazarlanması daha büyük bir öneme sahip olmaktadır.

Marka olgusu geçmişten günümüze mal ve hizmetlerin yanı sıra işletmelerin, kişilerin, destinasyonların vb. unsurların ayırt edilmesinde de kullanılmaktadır. İşletmeleri ve ürünlerini rakiplerinkinden ayırt etmeye yarayan en önemli unsurlardan biri markadır. Birçok ürün için olduğu gibi helal ürünlerin pazarlanmasın-

Sonuç olarak, helal ürünlere yönelik yapılan pazarlama ve markalama faaliyetleri bir bütün olarak ele alınabilir. Yani söz konusu alanda faaliyet gösteren şirketler pazarlama ve markalamaya yönelik stratejiler geliştirirken bu iki olguyu birbirinden bağımsız olarak düşünmemelidir. Geliştirilecek olan bu stratejiler gıda, kozmetik, ilaç, turizm, lojistik vs. gibi helalin söz konusu olduğu bütün alanlarda kendi içerisinde farklılık gösterebilir.

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TÜKETİCİ DAVRANIŞLARI AÇISINDAN HELAL TÜKETİM

Doç. Dr. Fatih Koç

GİRİŞ

Bireylerin davranışlarını şekillendiren faktörlerden bir tanesi de dindir. Din bireylerin ibadetlerini şekillendirdiği gibi sosyal hayatlarını da düzenlenmektedir. Bununla birlikte, birçok birey satın aldığı ürünleri, benimsemiş oldukları dinin getirdiği kurallara uygun olarak seçmektedir. Bu noktada, dinin tüketici tutum ve davranışlarına yön veren önemli bir öge olduğunu söylemek gerekir.

Helal tüketim kavramı, İslam dinin getirdiği helal ve haram kavramları ile ilişkilidir ve bireyin İslam dininin izin verdiği ürünleri tüketmesi ve izin vermediği ürünlerden kaçınmasını ifade etmektedir. Helal tüketim kavramı günümüzde gıda, finans, kozmetik, giyim, konaklama ve bankacılık gibi birçok alanda kendini göstermektedir (Tuhin vd., 2022: 672).

Dünya genelinde, yaklaşık 2 milyar Müslüman yaşamaktadır (World Population Review, 2022). Bu nüfusun büyük bir çoğunluğu İslami kuralları dikkate alarak tüketim yapmaktadır. Ayrıca Müslüman ve Müslüman olmayan kişiler dinî inançlarının dışında sağlık, temizlik ve lezzet gibi nedenlerle helal diye ifade edilen mal ve hizmetleri tüketmeyi tercih etmektedir (Burgmann, 2007). Helal tüketim birçok alt sektörden oluşan büyük bir endüstri hâline gelmiştir (Tieman, 2021:10). Her geçen gün yeni sektörlerin helal tüketim alanına dâhil olması, dünyada Müslüman nüfusun artması ve diğer dinlere mensup kişilerin çeşitli nedenlerle daha fazla oranda helal ürünlerini tercih etmeye başlaması bu alanın daha da büyüyeceğini göstermektedir.

Tüm bu açıklamalar, helal tüketim kavramının ne kadar önemli olduğunu ortaya koymaktadır. Bu nedenle bu çalışmada, helal tüketim kavramı detaylı bir şekilde açıklanmaya çalışılacaktır. Buradan hareketle aşağıdaki bölümlerde, helal satın alma davranışı ve helal tüketici kavramları detaylı bir şekilde incelenmiştir.

ma durumu tüketiciler için sorun teşkil etmektedir. Ayrıca ülkedeki işletmelerin kar vb. güdülerle hareket etmesi sonucu, bazı helal kriterleri göz ardı etmelerine neden olmaktadır. Bu noktada, Müslüman nüfusun çoğunlukta olduğu ülkelerde de helal sertifikası önem kazanmaktadır. Hatta Müslüman nüfusun çoğunlukta olduğu birçok ülkede yabancı işletmeler ürünleri için helal sertifikası almaktadır. Müslüman nüfusun azınlıkta olduğu ülkelerde tüketiciler helal ürünü elde etmek için özel bir çaba içerisinde. Bu gruptaki tüketicilerin helal tüketim farkındalık düzeyi daha yüksektir. Helal farkındalık düzeyi yüksek olan bir diğer grup da seyahat eden Müslüman tüketicilerdir. Bu tüketiciler, Müslüman olmayan veya azınlıkta olan ülkelere seyahat ettiklerinde helal tüketim konusunda (özellikle gıda) hassasiyet göstermektedir. Son yıllarda helal tüketici sınıfına giren yeni bir kitle daha vardır. Bu kitle İslam dinine mensup olmayıp sağlık, hijyen ve lezzet gibi nedenlerle helal ürünleri tercih eden kişilerdir.

Helal tüketici başlığı altında incelenen başka bir konu da tüketicilerin demografik özellikleridir. Aslında helal tüketim davranışının demografik özelliklere göre farklılık göstermesi beklenmemektedir. Çünkü bu davranış dinî gerekçelerle yapılıdır. Dinine uygun yaşayan bireylerin hiçbir özelliğe göre farklılık göstermesi gerekir. Literatürdeki çalışmalar incelendiğinde demografik özelliklere göre bazı farklılıkların olduğu ortaya çıkmıştır. Burada ön plana çıkan ilk değişken eğitimidir. Dinî eğitim alan kişilerin helal farkındalık, bilgi ve helal kurallarına uygun davranma eğilimi oldukça yüksektir. Ancak dinî eğitim dışındaki gruplarda çok ciddi bir farklılık yoktur. Cinsiyet açısından bu konu ele alındığında birçok ülkede ve birçok üründe farklılık olmadığı söylenebilir. Ancak kişisel bakım ürünleri konusunda kadınların erkeklere oranla daha fazla helal ürün tüketim niyetinde olduğu söylenebilir. Demografi açısından ele alınan bir diğer konu yaştır. Yaş ile ilgili olarak kuşak farklılıkları ve genç nesil üzerine yapılan çalışmalar daha fazladır. Genç tüketicilerin helal tüketim konusunda olumlu tutuma sahip oldukları söylenebilir. Ancak göçmen olan genç nesiller, içinde buldukları ülkenin yaşam tarzına daha kolay uyum sağlamaktadır ve tüketim konusundan daha serbest hareket etmektedirler.

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İSLAMİ FİNANS

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GİRİŞ

Geleneksel finans, dünyada yüzyıllar boyunca kullanılan klasik borç sözleşmelerine dayanan bir sistemdir. Finansal işlemlerin temel kurumu banka olarak kabul edildiğinde modern anlamda ilk bankacılık temellerinin 12. yüzyılda İtalya'ya dayandığı, dolayısıyla geleneksel finansın bu tarihte başladığı söylenebilir. Buna karşılık faizsiz finans veya İslami finans kavramı ise İslamiyet'in doğuşuyla bazı yatırım ve finansman sözleşmelerinin kullanılması sonucu ortaya çıkmış ve 1975 yılına kadar ise banka formunu almamıştır (Al-Jarhi, 2017: 117; Chachi, 2005: 3).

İslami finans en genel tabiriyle İslam hukukuna uygun olarak yürütülen finansal sistem olarak tanımlanabilir. İslam hukuku şeriat olarak adlandırıldığı için İslami finans, şeriat hükümlerine göre uygulanan finansal işlemlerin yürütüldüğü bir sistem olarak da ifade edilebilir.

İslami finans yalnızca İslam ülkelerinde değil Müslüman olmayan ülkelerde de önemini artırmış, özellikle kriz dönemlerinde kendilerine has prensipleri ile krize karşı daha güçlü ve başarılı bir sistem olabileceği düşünülmüştür. Sadece ticaret yolu ile para kazanması ve aşırı riskli işlemlerin yasak olması hem ekonomiyi canlandırma bakımından hem de olası kriz durumlarında İslami bankaları avantajlı hâle getirmektedir. Bu avantajlar ve İslami finanstaki gelişim potansiyeli İslami finansı çalışma alanı olarak daha popüler hâle getirmiştir.

1. İSLAMİ FİNANS KAVRAMI

Modern İslami finansın temelleri, 1940'lı yılların ortalarında tartışılmaya başlanmıştır. 1940'lı yılların sonlarından itibaren genellikle Pakistanlı bilim insanları tarafından şeriata uygun finansal sisteme yönelik teorik çalışmalar yapılmıştır. 1970'li yıllarda ortaya çıkan petrol krizi ve petrol fiyatlarının 4 katına çıkması, Körfez ülkelerinde önemli ölçüde sermaye birikimine sebep olmuştur. Suudi Arabistan Kralı'nın ümmetçilik politikası, petrol krizi ile oluşan sermaye

yaşanmış, kamu desteğiyle Vakıf Katılım, Ziraat Katılım, Emlak Katılım gibi yeni katılım bankaları sisteme dâhil olmuş ve tekaful şirketleri kurulmuştur. Ancak diğer ülkelerin İslami finans gelişim skorları ve İslami finansal varlığa sahip olma oranları incelendiğinde Türkiye'deki gelişimin diğer ülkeler ile rekabet edebilir boyutta olmadığı görülmektedir. Bununla beraber, kamu katılım bankalarının sektöre giriş yapması ve varlıklardaki hızlı büyüme Türkiye'de de İslami finansın gelecek vadettiğini göstermektedir.

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TÜRKİYE'DE BÜYÜKŞEHİR BELEDİYE
MODELİNDE HİZMET VE GELİR
PAYLAŞIMI ANALİZİ:
ORDU VE TRABZON ÖRNEĞİ

Dr. Gamze Çürüksulu Usta



Türkiye’de Büyükşehir Belediye Modelinde Hizmet ve Gelir Paylaşımı Analizi: Ordu ve Trabzon Örneği

Dr. Gamze Çürüksulu Usta

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İÇİNDEKİLER

TABLO LİSTESİ	ix
ŞEKİLLER LİSTESİ	xiii
KISALTMALAR	xv
GİRİŞ	1
1. METROPOLİTEN ALAN	9
1.1. Kent ve Kentleşme Kavramları	10
1.1.1. Kent Kavramı	10
1.1.2. Kentleşme Kavramı	13
1.2. Kentlerin Ortaya Çıkışı ve Gelişimi	15
1.2.1. Sanayileşme Öncesi Dönemde Kentlerin Gelişimi	16
1.2.2. Türk ve İslam Medeniyetlerinde Kentlerin Gelişimi	18
1.2.3. Sanayileşme Sonrası Dönemde Kentlerin Gelişimi	19
1.3. Dünyada Kentleşmenin Seyri ve Nüfus Hareketleri.....	21
1.4. Metropoliten Alan Kavramı ve Gelişimi	29
1.4.1. Metropoliten Kentlerin Tanımlanmasında Kullanılan Kriterler	31
1.5. Metropoliten Alanların Ortaya Çıkışı ve Metropolleşme Süreci	34
2. METROPOLİTEN YÖNETİM	39
2.1. Yerel Yönetim Kavramı ve Özellikleri	39
2.2. Metropoliten Yönetim Kavramı ve Özellikleri.....	46
2.3. Metropoliten Yönetim Yaklaşımları.....	47
2.3.1. Metropoliten Reform Geleneği Yaklaşımı.....	48
2.3.2. Kamu Tercihi Yaklaşımı	49
2.3.3. Yeni Bölgecilik Yaklaşımı	52
2.3.4. Kent Bölge Yaklaşımı.....	53

2.4. Metropoliten Yönetim Modelleri	55
2.4.1. Metropoliten Yönetim Kriterleri.....	55
2.4.2. Metropoliten Yönetim Dörtlü Ayırım	61
2.4.3. Metropoliten Yönetim Kademe ve Koordinasyon Esaslı Altılı Ayırım.....	63
3. İDARELER ARASI HİZMET VE GELİR PAYLAŞIMI	69
3.1. Hizmet Paylaşımı	72
3.1.1. Hizmet Paylaşımı Kriterleri	73
3.1.1.1. İktisadi Kriter.....	73
3.1.1.2. İdari Kriter.....	76
3.1.1.3. Subsidiarite	79
3.2. Optimum Hizmet Alanı ve Ölçek Ekonomisi Tartışmaları	81
3.3. Gelir Paylaşımı	85
3.3.1. Gelir Paylaşım Kriterleri	87
3.3.2. Gelir Paylaşım Sistemleri.....	88
3.3.3. Gelir Paylaşımı Yöntemleri.....	89
3.3.3.1. Öz Gelirler.....	89
3.3.3.2. İdareler Arası Transferler	91
3.3.3.3. Borçlanmalar	93
4. TÜRKİYE’DE BÜYÜKŞEHİR BELEDİYE YÖNETİMİ.....	95
4.1. Türkiye’de Büyükşehir Belediye Yönetiminin Gelişimi.....	96
4.1.1. 1984 Yılı Öncesi Dönemde Büyükşehir Belediye Yönetimi.....	96
4.1.2. 1984-2004 Döneminde Büyükşehir Belediye Yönetimi.....	101
4.1.3. 2004-2012 Döneminde Büyükşehir Belediye Yönetimi.....	104
4.2. 2012 Yılında Getirilen Büyükşehir Belediye Modelinin Özellikleri.....	106
4.2.1. 6360 Sayılı Kanun İle Getirilen İdari ve Siyasi Kapsamlı Değişiklikler	107
4.2.2. 6360 Sayılı Kanun İle Getirilen Hizmet ve Gelir Kapsamlı Değişiklikler	112
4.3. Büyükşehir Belediyesi ile Büyükşehir İlçe Belediyesi Arasındaki Paylaşım	114
4.3.1. Büyükşehir Belediyesi ile Büyükşehir İlçe Belediyesi Arasındaki Hizmet Paylaşımı	114

4.3.2. Büyükşehir Belediyesi ile Büyükşehir İlçe Belediyesi Arasındaki Gelir Paylaşımı.....	121
4.4. 6360 Sayılı Kanun Değişikliğinin Büyükşehir Belediyeleri ile Büyükşehir İlçe Belediyelerinin Mali Yapısına Etkisi	133

5. BÜYÜKŞEHİR BELEDİYELERİ İLE BÜYÜKŞEHİR İLÇE BELEDİYELERİ ARASINDAKİ HİZMET VE GELİR PAYLAŞIMI ANALİZİ: ORDU VE TRABZON ÜZERİNE ALAN ARAŞTIRMASI..... 141

5.1. Araştırma Hakkında Bilgiler.....	141
5.1.1. Araştırmanın Amacı.....	142
5.1.2. Araştırmanın Kapsamı.....	143
5.1.3. Araştırmanın Önemi	144
5.1.4. Araştırma Sorusu ve Varsayımları.....	145
5.1.5. Araştırmanın Sınırlılıkları.....	146
5.1.6. Araştırmanın Evreni ve Örneklemi.....	147
5.1.6.1. Büyükşehir Belediye Örneklemi	147
5.1.6.2. Büyükşehir İlçe Belediye Örneklemi.....	148
5.1.6.3. Hizmet Alanları Örneklemi.....	152
5.1.7. Araştırmanın Yöntemi	154
5.2. İller Hakkında Bilgiler	158
5.2.1. Ordu İli	158
5.2.1.1. Konum ve Coğrafi Yapı	158
5.2.1.2. Demografik Yapı.....	159
5.2.2. Trabzon İli	161
5.2.2.1. Konum ve Coğrafi Yapı	161
5.2.2.2. Demografik Yapı	162
5.2.3. İlçeler Hakkında Bilgiler	163
5.2.4. Ordu ve Trabzon İlleri ve İlçelerine Ait Gelişmişlik Düzeyi Verileri	171
5.3. İdari Yapıdaki Değişiklikler.....	173
5.4. Mali Yapıdaki Değişiklikler	176
5.5. Araştırma Bulguları ve Analiz	181
5.5.1. Katı Atık Yönetimi ve Temizlik Hizmeti Analizi	182
5.5.1.1. Katı Atık Yönetimi ve Temizlik Hizmeti Analiz Bulguları.....	184
5.5.1.2. Katı Atık Yönetimi ve Temizlik Hizmeti Analiz Sonuçları.....	193
5.5.2. Su ve Kanalizasyon Hizmeti Analizi.....	197

5.5.2.1. Su ve Kanalizasyon Hizmeti Analiz Bulguları.....	200
5.5.2.2. Su ve Kanalizasyon Hizmeti Analiz Sonuçları	207
5.5.3. İmar ve Planlama Hizmeti Analizi	210
5.5.3.1. İmar ve Planlama Hizmeti Analiz Bulguları	212
5.5.3.2. İmar ve Planlama Hizmeti Analiz Sonuçları	221
5.5.4. Ulaşım Hizmeti Analizi.....	225
5.5.4.1. Ulaşım Hizmeti Analiz Bulguları.....	227
5.5.4.2. Ulaşım Hizmeti Analiz Sonuçları	235
5.5.5. Zabıta Hizmeti Analizi	239
5.5.5.1. Zabıta Hizmeti Analiz Bulguları.....	240
5.5.5.2. Zabıta Hizmeti Analiz Sonuçları	247
5.5.6. Mezarlık ve Defin Hizmeti Analizi	250
5.5.6.1. Mezarlık ve Defin Hizmeti Analiz Bulguları.....	251
5.5.6.2. Mezarlık ve Defin Hizmeti Analiz Sonuçları.....	256
5.5.7. Otopark Hizmeti Analizi	258
5.5.7.1. Otopark Hizmeti Analiz Bulguları.....	260
5.5.7.2. Otopark Hizmeti Analiz Sonuçları.....	262
5.5.8. Toptancı Hal Hizmeti Analizi	262
5.5.8.1. Toptancı Hal Hizmeti Analiz Bulguları.....	264
5.5.8.2. Toptancı Hal Hizmeti Analiz Sonuçları.....	265
5.5.9. Gelir Paylaşımı Analizi	266
5.5.9.1. Gelir Paylaşımı Analiz Bulguları.....	267
5.5.9.2. Gelir Paylaşımı Analiz Sonuçları	275

6. SONUÇ VE ÖNERİLER.....281

7. KAYNAKÇA 301

7. KAYNAKÇA

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Dr. Numan Sait Eren



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Dr. Numan Sait Eren

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İÇİNDEKİLER

ÖN SÖZ	v
TABLolar LİSTESİ.....	xi
ŞEKİLLER LİSTESİ	xiii
GRAFİKLER LİSTESİ	xv
KISALTMALAR LİSTESİ.....	xvii
GİRİŞ.....	1

BİRİNCİ BÖLÜM

REKABET VE REKABET GÜCÜ: KAVRAMSAL VE TEORİK KAPSAM.....	5
1.1. REKABET KAVRAMI VE TEORİLERİ	5
1.1.1. Rekabet Kavramı	5
1.1.1.1. Rekabet Kavramının Tanımı	5
1.1.1.2. Rekabetin Özellikleri	7
1.1.2. Rekabet Piyasaları ve Koşulları	7
1.1.2.1. Tam Rekabet Piyasa Koşulları	7
1.1.2.2. Eksik Rekabet Piyasa Koşulları.....	8
1.1.2.3. Rekabetsiz Piyasa Koşulları	10
1.1.2.4. Korumacılık Kavramı Piyasa Koşulları	11
1.1.3. Rekabet Teorileri	11
1.2. REKABET GÜCÜ KAVRAMI, TEORİLERİ VE ÖLÇÜLMESİ.....	17
1.2.1. Rekabet Gücü Kavramı	17
1.2.1.1. Rekabet Gücü Tanımı.....	17
1.2.1.2. Rekabet Gücü Faktörleri	19
1.2.1.2.1. Ürün	19
1.2.1.2.2. Fiyat	20
1.2.1.2.3. Pazarlama Bileşenleri	20
1.2.1.2.4. Globalleşmenin Etkisi	21

1.2.1.3. Rekabet Gücü Düzeyleri	22
1.2.1.3.1. Firma Düzeyinde Rekabet	22
1.2.1.3.2. Sektörel Düzeyde Rekabet	23
1.2.1.3.3. Ulusal Düzeyde Rekabet.....	23
1.2.1.3.4. Uluslararası Düzeyde Rekabet	24
1.2.2. Rekabet Gücü Teorileri ve Ölçülmesi.....	25
1.2.2.1. Mutlak Üstünlükler Yaklaşımı.....	25
1.2.2.2. Karşılaştırmalı Üstünlükler Yaklaşımı	26
1.2.2.3. Açıklanmış Karşılaştırmalı Üstünlükler Yaklaşımı.....	26
1.2.2.3.1. Liesner Ölçümü.....	27
1.2.2.3.2. Balassa Ölçümü	28
1.2.2.3.3. Vollrath Ölçümü.....	28
1.2.2.4. Porter ve Elmas Modeli	29
1.2.2.5. Dunning Yöntemi.....	32
1.2.2.6. Krugman Yöntemi	32
1.2.2.7. IMD (Uluslararası Yönetim Geliştirme Enstitüsü) Rekabet Ölçümü	33
1.2.2.8. WEF (Dünya Ekonomik Forumu) Rekabet Ölçümü.....	35
1.2.2.9. WIPO (Dünya Fikri Mülkiyet Örgütü) Rekabet Ölçümü.....	38
1.2.2.9.1. Dünya İnovasyon Endeksi Rekabet Ölçümü.....	39
1.2.2.9.2. Dünya Patent Başvuru Sayıları.....	40
1.2.2.10. Diğer Uluslararası Kurumsal Yaklaşımlar	42
1.2.2.10.1. UNIDO (Birleşmiş Milletler Sınai Kalkınma Teşkilatı).....	42
1.2.2.10.2. WTO (Dünya Ticaret Örgütü)	43
1.2.2.10.3. OECD (Ekonomik İşbirliği ve Kalkınma Örgütü).....	44
1.2.2.10.3.1. AR-GE harcamaları	45
1.2.2.11. Avrupa Birliği.....	46
1.2.2.12. Standart & Poor's, Moody's ve Fitch Group Uluslararası Kredibilite Notları ve Rekabet İlişkisi.....	47

İKİNCİ BÖLÜM

DÜNYA EKONOMİK GÖRÜNÜMÜ VE DIŞ TİCARETİ.....	51
2.1. DÜNYA EKONOMİK GÖRÜNÜMÜ	51
2.1.1. Dünyanın Ekonomik Gelişimi.....	51
2.1.2. Bölgesel Ekonomik Birlikler.....	54

2.1.2.1. Avrupa Birliđi'nin Tarihsel Oluşumu.....	56
2.1.2.2. Avrupa Birliđi ve Türkiye İlişkileri	58
2.1.2.2.1. Avrupa Birliđi ve Türkiye İlişkilerinin Tarihi Gelişimi	58
2.1.2.2.2. Avrupa Birliđi ile Türkiye Arasındaki Ekonomik İlişkiler ..	61
2.2. DÜNYA DIŞ TİCARETİNİN GELİŞİMİ.....	66
2.2.1. AB Dış Ticareti.....	66
2.2.2. Türkiye Dış Ticareti	68
2.2.2.1. 1923 Sonrası Ekonomik Gelişme	69
2.2.2.2. Dış Ticaretin Gelişimi ve Verileri.....	71
2.2.2.3. Sektörel Gelişim ve Verileri.....	78

ÜÇÜNCÜ BÖLÜM

TÜRKİYE'NİN AB'YE İHRACATINDA OTOMOTİV ANA VE YAN SANAYİ..... 83

3.1. OTOMOTİV ANA VE YAN SANAYİNİN GELİŞİMİ	83
3.1.1. Dünya Otomotiv Ana Sanayi ve Yan Sanayi.....	83
3.1.2. AB Otomotiv Ana Sanayi ve Yan Sanayi	88
3.1.3. Türkiye Otomotiv Sanayi ve Yan Sanayi	90
3.1.3.1. Üretim	92
3.1.3.1.1. Otomotiv Ana Sanayinde Üretim.....	92
3.1.3.1.2. Otomotiv Yan Sanayinde Üretim	100
3.1.3.2. Dış Ticaret.....	101
3.1.3.2.1. Otomotiv Ana Sanayi Dış Ticareti	101
3.1.3.2.2. Otomotiv Yan Sanayi Dış Ticareti	103
3.2. İSTANBUL SANAYİ ODASI 500 İÇERİSİNDE OTOMOTİV ANA VE YAN SANAYİ.....	108
3.2.1. İstanbul Sanayi Odası Birinci 500 İçinde Otomotiv Ana Firmalarının Gelişimi	109
3.2.2. İstanbul Sanayi Odası Birinci 500 İçinde Otomotiv Yan Sanayi Firmalarının Gelişimi	114
3.2.3. İstanbul Sanayi Odası İkinci 500 İçinde Otomotiv Ana ve Yan Sanayi Firmalarının Gelişimi	115
3.3. TÜRKİYE İHRACATÇILAR MECLİSİ İLK 1000 İHRACATÇI İÇERİSİNDE OTOMOTİV ANA VE YAN SANAYİ.....	115
3.3.1. Türkiye İhracatçılar Meclisi ilk 1000 İhracatçı İçinde Otomotiv Ana ve Yan Sanayi Firmalarının Gelişimi	116

DÖRDÜNCÜ BÖLÜM

TÜRKİYE’NİN AVRUPA BİRLİĞİ’NE OTOMOTİV YAN SANAYİ İHRACATINDA REKABET GÜCÜ ANALİZİ	119
4.1. TÜRKİYE’DE OTOMOTİV SEKTÖRÜNDE REKABET GÜCÜ.....	119
4.1.1. Otomotiv Sektöründe Rekabet ve Rekabet Stratejileri	119
4.1.2. Türkiyede Rekabet Gücüne Katkıda Bulunması Amacıyla Hazırlanan Eylem Planları.....	120
4.1.3. Türkiyede Otomotiv Sektörünün Rekabet Gücü Kazanması Açısından Önemli Faktörler	122
4.2. AÇIKLANMIŞ KARŞILAŞTIRMALI ÜSTÜNLÜKLER ARAŞTIRMASI	123
4.2.1. Türkiye Otomotiv Ana ve Yan Sanayisinin 2016-2020 Yılları GTIP 87 ve 8708 için Açıklanmış Karşılaştırmalı Üstünlükler (AKÜ) Araştırması	123
4.2.1.1. Yöntem.....	124
4.2.1.2. AKÜ Değerleri ve Yorumları.....	125
4.3. SEÇİLİ OTOMOTİV YAN SANAYİ FİRMALARININ REKABET GÜCÜNÜN İNCELENMESİ	140
4.3.1. Yöntem	140
4.3.2. Cevap Değerleri ve Yorumları.....	141
4.4. ÖNERİLER VE DEĞERLENDİRME	154
4.4.1. Otomotiv Sektöründe Yurt Dışında ve Avrupa Birliği’nde Yeni Yapılanma	157
4.4.2. Otomotiv Sektöründe Sanal 5.0 Organize Sanayi Bölgesi Kurulumu	159
4.4.3. Otomotiv Sektöründe Tedarik Zinciri Serbest Bölge Yapılanması	162
4.4.3.1. Tedarik Zinciri ve İthalat Yapılanması	163
4.4.3.2. Tedarik Zinciri ve İhracat Yapılanması.....	164
4.4.4. Değerlendirme.....	164
SONUÇ.....	187
KAYNAKÇA.....	191
EKLER	201
ÖZ GEÇMİŞ	251

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SOSYAL KORUMA HARCAMALARI İLE GELİR DAĞILIMI

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Dr. Öğr. Üyesi Gonca Bıyık



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(Türkiye'de Sosyal Koruma Harcamaları ile Gelir Dağılımı Arasındaki İlişkinin Analizi)
Dr. Öğr. Üyesi Gonca Bıyık

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İÇİNDEKİLER

ÇİZELGELER LİSTESİ	vii
ŞEKİLLER LİSTESİ	ix
SİMGELER VE KISALTMALAR.....	xi
GİRİŞ.....	1

1. BÖLÜM

REFAH DEVLETİ, GELİR DAĞILIMI, SOSYAL POLİTİKA VE SOSYAL KORUMA	5
1.1. Refah Devleti	5
1.1.1. Refah Devleti Kavramı.....	8
1.1.2. Refah Devletinin Nitelikleri	11
1.1.3. Refah Devletinin Politikaları.....	22
1.1.4. Refah Devleti Yaklaşımları.....	26
1.2. Gelir Dağılımı.....	28
1.2.1. Gelir Dağılımı Kavramı	29
1.2.2. Gelir Eşitsizliği Kavramı.....	31
1.2.3. Gelir Dağılımı Türleri	32
1.2.4. Gelir Dağılımı ve Gelir Eşitsizliği Ölçüm Yöntemleri	33
1.2.4.1. Gelir dağılımı ölçüm yöntemleri.....	33
1.2.4.2. Gelir eşitsizliği ölçüm yöntemleri	34
1.2.5. Gelir Dağılımının Nitelikleri	35
1.3. Sosyal Politika ve Sosyal Koruma.....	39
1.3.1. Sosyal Politika Kavramı.....	39
1.3.2. Sosyal Politikanın Nitelikleri.....	41
1.3.3. Sosyal Koruma Kavramı	44
1.3.4. Sosyal Koruma Tabanı	45
1.3.5. Sosyal Koruma Yaklaşımları.....	48

1.3.6. Sosyal Koruma Harcamalarının Hesaplanmasına İlişkin Yaklaşımlar.....	51
1.3.6.1. Avrupa bütünleştirilmiş sosyal koruma istatistikleri sistemi (ESSPROS).....	51
1.3.6.2. OECD sosyal harcamalar veri tabanı (SOCX).....	53
1.3.6.3. ILO sosyal güvenlik ve sosyal koruma yaklaşımı.....	54
1.3.7. Sosyal Koruma Araçları.....	58

2. BÖLÜM

TÜRKİYE'DE DEVLET YAPISI, GELİR DAĞILIMI VE SOSYAL KORUMA.....	61
2.1. Türkiye'de Devlet Yapısı.....	61
2.1.1. 1923 – 1960 Dönemi.....	63
2.1.2. 1960 – 1980 Dönemi.....	65
2.1.3. 1980 – 2000 Dönemi.....	68
2.1.4. 2000 – 2019 Dönemi.....	71
2.2. Türkiye'de Gelir Dağılımı.....	74
2.3. Türkiye'de Sosyal Koruma.....	78
2.3.1. Türkiye'de Sosyal Koruma Harcamalarının Kamu Harcamaları İçindeki Yeri.....	78
2.3.2. Türkiye'de Sosyal Koruma Gelirleri ve Harcamaları.....	81
2.3.3. Türkiye'de Sosyal Koruma Gelirleri.....	82
2.3.4. Türkiye'de Sosyal Koruma Harcamaları.....	85
2.3.4.1. Türkiye'de sosyal koruma yardımlarının kapsamı.....	87
2.3.4.2. Türkiye'de sosyal koruma yardımlarının sınıflandırılması.....	90
2.3.4.3. Türkiye'de sosyal koruma yardımlarının yararlananları.....	94
2.4. Türkiye'de Sosyal Koruma Üzerine Yapılan Çalışmalar.....	95
2.5. Türkiye'de Gelir Dağılımı Üzerine Yapılan Çalışmalar.....	97

3. BÖLÜM

SOSYAL KORUMA HARCAMALARI VE GELİR DAĞILIMI İLİŞKİSİNİN ÖNGÖRÜSÜ.....	101
3.1. Amaç ve Kapsam.....	101
3.2. Literatür.....	102
3.2.1. Sosyal Koruma Üzerine Yapılan Çalışmalar.....	102
3.2.2. Gelir Dağılımı Üzerine Yapılan Çalışmalar.....	107

3.2.3. Sosyal Koruma ve Gelir Dağılımı Üzerine Yapılan Çalışmalar	112
3.3. Metodoloji.....	116
3.3.1. Veri Seti.....	116
3.3.2. Simülasyon Temelli Öngörü	119
3.3.3. Doğrusallık.....	121
3.3.4. Durağanlık.....	123
3.3.4.1. ADF testi.....	124
3.3.4.2. PP testi.....	125
3.3.4.3. KPSS testi.....	126
3.4. Bulgular	126
3.4.1. Doğrusallık.....	126
3.4.2. Birim Kök ve Durağanlık	128
3.4.3. Model	141
3.5. Öngörü Senaryoları.....	159
3.5.1. Senaryo-1.....	160
3.5.2. Senaryo-2	166
3.6. Bulguların Değerlendirilmesi	172
SONUÇ.....	177
KAYNAKÇA.....	183

KAYNAKÇA

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**TÜRKİYE'DE ULUSLARARASI
GÖÇE YÖNELİK TUTUMLAR VE
EKONOMİK KRİZ
KAMUOYU ARAŞTIRMALARININ İLERİ ANALİZİ**

Ali Berker



Türkiye’de Uluslararası Göçe Yönelik Tutumlar ve Ekonomik Kriz: Kamuoyu Araştırmalarının İleri Analizi

Ali Berker

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İÇİNDEKİLER

ÖN SÖZ	iii
TABLolar VE ŞEKİLLER LİSTESİ	vii
TAKDİM YAZISI	ix
BÖLÜM 1 GİRİŞ ÇALIŞMANIN GENEL YAPISI.....	1
BÖLÜM 2 TÜRKİYE’DE ULUSLARARASI GÖÇMEN SEÇİMİNDE HALKIN TERCİHLERİNİN ANALİZİ	7
2.1 Giriş.....	7
2.2 Arka Plan Bilgileri	9
2.3 Araştırma Yöntemi.....	13
2.4 Bulgular	15
2.5 Sonuç.....	24
2.6 Kaynaklar	27
2.7 Ek Tablolar.....	29
BÖLÜM 3 TÜRKİYE’DE SURİYELİ GÖÇMENLERE YARDIM ETMENİN BELİRLEYİCİLERİ	31
3.1 Giriş	31
3.2 Arka Plan Bilgileri	32
3.3 Araştırma Yöntemi.....	41
3.4 Bulgular	44
3.5 Sonuç.....	49
3.6 Kaynaklar	52
BÖLÜM 4 TÜRKİYE’DE EKONOMİK KRİZ VE SURİYELİ MÜLTECİLERİN SOSYAL KABULÜ: DEĞİŞİM ANALİZİNDEN BULGULAR.....	55
4.1 Giriş.....	55
4.2 Arka Plan Bilgileri	58

4.3 Araştırma Yöntemi.....	67
4.4 Bulgular	74
4.5 Sonuç.....	83
4.6 Kaynaklar	86

**BÖLÜM 5 EKONOMİK KRİZ GENÇ YETİŞKİNLERİN SURİYELİ GÖÇÜNE
YÖNELİK EKONOMİK TEHDİT ALGISINI FARKLI ETKİLEDİ Mİ?
TÜRKİYE'DEN BULGULAR89**

5.1 Giriş	89
5.2 Arka Plan Bilgileri	91
5.3 Araştırma Yöntemi.....	99
5.4 Bulgular	103
5.5 Sonuç.....	109
5.6 Kaynaklar	111
5.7 Ek Tablo.....	114

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yapılan yardımlar ve yardımın yapılmasına aracılık eden kurumsal ve kurumsal olmayan yapıların özellikleri. Gelecek çalışmalar göçmenlere yardım etme davranışını çok boyutlu yapısını dikkate alacak şekilde ölçmeli ve incelemelidir.

Son olarak yatay kesitli veriye dayanan regresyon analizinin bulguları birlikte değişim analizi (korelasyon analizi) kapsamında değerlendirilmelidir. Demografik özellikler dışarıda bırakıldığında bireylerin sosyoekonomik ve aidiyet özelliklerin tahmin edilen etkileri bazı sorunlar yüzünden neden-sonuç ilişkisini yansıtmayabilir. Mesela bireylerin gözlenmesi mümkün olmayan bazı özellikleri hem sosyoekonomik veya aidiyet özelliklerini hem de yardım etme davranışını etkileyerek tahmin edilen ilişkilerin yanlı olmasına yol açabilir. Bireylerin gözlenemeyen özellikleri için diğerkâmlık, şefkatli ve adaletli olma yatkınlıkları örnek olarak verilebilir. İleride yapılacak çalışmalarda gerekli verileri toplayarak ve neden-sonuç analizinin yöntemlerini uygulayarak yardım davranışını biçimlendiren etkenler açığa çıkarılmalıdır.

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BÖLÜM 4

TÜRKİYE'DE EKONOMİK KRİZ VE SURİYELİ MÜLTECİLERİN SOSYAL KABULÜ: DEĞİŞİM ANALİZİNDEN BULGULAR

4.1 Giriş

Küresel veya ulusal ölçekteki ekonomik ve siyasi krizler, iklim değişikliği ve salgınlar gibi çok boyutlu krizler toplumları değişik açılardan olumsuz etkiliyor. Türkiye gibi tarihsel ve güncel sorunlarla boğuşan gelişmekte olan ülkeler söz konusu krizlerin etkilerini daha fazla hissediyor. Bu durum özellikle ekonomik kriz için geçerlidir. Nitekim ekonomik kriz bir yandan bireylerin işgücü piyasasındaki konumunu, gelirini, fiziksel ve psikolojik sağlığını olumsuz etkilerken (Fallon ve Lucas, 2002; Margerison-Zilko, 2016) öte yandan çocukların eğitim ve sağlık çıktılarını azaltıyor (Paxson ve Shaday, 2005; Duryea vd., 2007). Ekonomik kriz ayrıca bireylerin siyasi tutumlarını ve davranışlarını değiştiriyor (Margalit, 2019). Örneğin, kriz bireylerin oy verip vermeme davranışına ile siyasi parti tercihine tesir ediyor (Hall vd., 2017). İlaveten, kriz yeniden dağıtım politikası ve kamu sektörünün rolü gibi kamu politikalarıyla ilgili tercihler ile siyasi kurumlara olan güveni etkiliyor (Kroknes vd., 2016; Fishman vd, 2018)

Ekonomik krizin etkisinin görüldüğü başka bir alan gruplar arası ilişkilerdir. İlgili yazın, özellikle ekonomik kriz sonucunda yerlilerin (iç grubun) göçmenlere (dış gruba) karşı tutumlarındaki değişimi mercek altına almıştır (Hatton, 2016; Valentove ve Callens, 2019). Bu bağlamda 2010'lu yıllarda Türkiye'de gerçekleşen iki olay, ekonomik kriz ile yerlilerin göçmenlerle ilgili tutumları arasındaki bağı irdelemek için emsalsiz bir imkân sağlamaktadır. Birincisi, 2011'den beri süren Suriye iç savaşı nedeniyle yaklaşık 3.5-4 milyon Suriyelinin -2019 yılının sonu itibarıyla- Türkiye'ye yerleşmesidir. İkincisi, küresel ekonomideki eğilim-

ve ekonomik dışı alanlarda bu grupların ortak menfaatler ile iş birliği geliştirmesini teşvik etmelidir. Ayrıca kamu kurumları, özel sektör ve sivil toplum örgütlerinin aktif şekilde rol alacağı ve gruplar arası bağı güçlendiren olumlu temasların gerçekleşebileceği ekosistem inşa edilmelidir. Burada özellikle hem gerçekteki hem de algı düzeyindeki sıfır-toplamlı toplum anlayışının, yani “biz” ve “onlar” yaklaşımının ortadan kaldırılması gerekmektedir. Dolayısıyla gerekli kamu politikaları Türkiye-Suriye göç sistemindeki tüm aktörler, Küresel Kuzey'deki ülkeler ve diğer tüm uluslararası aktörlerin aktif katılımıyla hayata geçebilir. Bu da ancak çok aktörlü, çok yönlü ve çok katmanlı ortak çalışma perspektifiyle olur.

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BÖLÜM 5

EKONOMİK KRİZ GENÇ YETİŞKİMLERİN SURIYELİ GÖÇÜNE YÖNELİK EKONOMİK TEHDİT ALGISINI FARKLI ETKİLEDİ Mİ? TÜRKİYE'DEN BULGULAR

5.1 Giriş

Genç yetişkinlik dönemindeki ekonomik koşullar bireyin yaşam döngüsü evrelerindeki ekonomik ve siyasi çıktılarına etkilemektedir (Margalit, 2019; Wachter, 2020). Bu dönemin görece öneminin bir nedeni, bireyin genç yetişkinliğinde üniversite eğitimi, çalışma hayatı ile aileden ayrılma, evlenme ve çocuk yapma gibi kritik alanlarda ilk deneyimlerinin ortaya çıkması ile bu deneyimlerin kısa ve uzun dönem tesirlerinin olmasıdır (Long, 2015; Kondo, 2016, Matsudaria, 2016; Hannes ve Wachter, 2019). Ayrıca birey pek çok konuyla ilgili tutumlarının ve davranışlarının belirlenmesinde önemli rol oynayan dünya görüşünü büyük ölçüde genç yetişkinlik yıllarında inşa etmektedir (Krosnik ve Alwin, 1989; Alwin ve Krosnick, 1991; Sears ve Brown, 2013). Öyleyse bireyin kendisini pek çok açıdan inşa ettiği yılları kapsadığı dikkate alındığında genç yetişkinlik döneminde değişik ekonomik ortama maruz kalmak, uluslararası göç gibi kritik ekonomik ve siyasi olaylarla ilgili kuşaklar arasında farklı bakış açılarının benimsenmesine yol açabilir (Inglehart, 1971, 1981; Inglehart ve Abramson, 1994; Giuliano ve Spilembergo, 2014; O'Grady, 2017; Roth ve Wohlfart, 2018; Laaker, 2020; Cotofan vd., 2021).

Bu bağlamda çalışma, Türkiye'de 2018-2019 ekonomik kriz sonucunda Suriyeli göçün ekonomik etkisine yönelik algının genç yetişkinler ile yaşlı yetişkinler arasındaki değişimini incelemektedir. Bu incelemede, KONDA Araştırma'nın Şubat 2016 ve Ocak 2019'da gerçekleştirdiği barometre anketlerinden faydala-

Bu bağlamda, Covid-19 pandemisine genç yetişkinliğinde maruz kalanlar ile kalmayan arasında Suriyeli göçüne yönelik tutumların nasıl değişeceği önemli bir toplumsal mesele olarak karşımıza çıkmaktadır. Bu çalışmanın bulguları, tesir ettiği alanlar ile tesirlerinin büyüklüğünün sınırlı olmasına rağmen 2018-2019 ekonomik krizinin genç yetişkinlerin Suriyeli göç algısını yaşlı yetişkinlerinkinden daha olumsuz yönde değiştirdiğini işaret etmektedir. Bu bulgulara dayanarak, Covid-19 pandemisinin Suriyeli göçüne yönelik ekonomik tehdit algılarını katmerleştirerek genç yetişkinlerin bu göçe ait görüşlerini daha olumsuz yönde etkileyeceği ileri sürülebilir. Bu olumsuz öngörünün gerçekleşmesini önlemek gayesiyle genç yetişkinlerin ekonomik ve sosyal konumunu güçlendiren kamu politikaları ile okul, işyeri ve diğer kamusal alanlarda genç yetişkinler ile göçmenlerin çift-yönlü entegrasyonunu destekleyen uygulamalar hayata geçirilmiştir. Böylece bir yandan genç yetişkinlerin çeşitli yaşam alanlarındaki Covid-19 pandemisi kaynaklı sorunlar bertaraf edilirken diğer yandan göçe yönelik dışlayıcı yaklaşım benimseme ihtimali ortadan kaldırılabilir.

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UYGULAMALARLA KLASİK VE GÜNCEL KARAR VERME YÖNTEMLERİ

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İÇİNDEKİLER

ÖN SÖZ	iii
1. KARAR VE KARAR VERME	1
1.1. Karar Verme Süreci.....	2
1.2. Karar Türleri	2
1.3. Çok Kriterli Karar Verme.....	3
1.4. Çok Kriterli Karar Verme Yöntemleri	4
Kaynaklar.....	5
2. KRİTER AĞIRLIĞI BELİRLEME YÖNTEMLERİ	7
2.1. Subjektif Yöntemler	7
2.1.1. AHP Yöntemi	8
2.1.2. BMW Yöntemi.....	10
2.1.3. DEMATEL Yöntemi	13
2.1.4. FUCOM Yöntemi.....	15
2.1.5. SWARA Yöntemi.....	18
2.1.6. MAX 100 Yöntemi	20
2.2. Objektif Yöntemler	21
2.2.1. Entropi Yöntemi	22
2.2.2. CILOS Yöntemi	26
2.2.3. CRITIC Yöntemi	32
2.2.4. LOPCOW Yöntemi.....	37
2.2.5. MEREC Yöntemi.....	42
2.2.6. Standart Sapma Yöntemi	48
2.2.7. IDOCRIW Yöntemi	51
Kaynaklar.....	52

3. ALTERNATİFLERİ SIRALAMA YÖNTEMLERİ.....	57
3.1. ARAS Yöntemi	57
3.2. CoCoSo Yöntemi	61
3.3. CODAS Yöntemi	65
3.4. COPRAS Yöntemi	70
3.5. EDAS Yöntemi	74
3.6. ELECTRE Yöntemi.....	78
3.7. Gri İlişkisel Analiz Yöntemi	85
3.8. MABAC Yöntemi	89
3.9. MAIRCA Yöntemi	93
3.10. MARCOS Yöntemi.....	97
3.11. MOORA Yöntemi.....	102
3.12. OCRA Yöntemi	106
3.13. PIV Yöntemi.....	110
3.14. PROMETHEE Yöntemi	113
3.15. PSI Yöntemi.....	118
3.16. ROV Yöntemi.....	122
3.17. WSM, WPM ve WASPAS Yöntemleri	124
3.18. TOPSIS Yöntemi.....	129
3.19. VIKOR Yöntemi.....	132
Kaynaklar.....	137
4. BÜTÜNLEŞTİRME VE NORMALİZASYON TEKNİKLERİ.....	147
4.1. Bütünleştirme Teknikleri.....	147
4.1.1. Borda Tekniği	147
4.1.2. Condorcet Tekniği.....	149
4.1.3. Copeland Tekniği.....	151
4.1.4. Dodgson Tekniği.....	154
4.1.5. Kemeny Tekniği.....	155
4.1.6. Nanson Tekniği	156
4.1.7. Ortalama Tekniği.....	158
4.2. Normalizasyon Teknikleri	159
4.2.1. Doğrusal Ölçek Normalizasyonu	159
4.2.2. Z Skor Normalizasyonu	159
4.2.3. Vektör Normalizasyonu	160

4.2.4. Referans Noktasına Göre Normalizasyon	160
4.2.5. Doğrusal Normalizasyon	160
4.2.6. Doğrusal Olmayan Normalizasyon.....	161
4.2.7. Jüttler-Körth Normalizasyon.....	161
4.2.8. Logaritmik Normalizasyon.....	161
4.2.9. Doğruluğu Artırılmış Normalizasyon.....	161
Kaynaklar.....	162

sıralaması veya gruplandırması için kullanılmakla birlikte birden fazla kriter ve seçeneğin olduğu durumlarda seçeneklerin tercih edilmesi, seçeneklerin tercih sıralaması veya gruplandırması amacıyla oldukça yaygın olarak kullanılır (Pekkaya ve Dökmen, 2019:931).

ÇKKV yöntemleri özellikle II. Dünya Savaşından sonra önem kazanmaya başlamış ve günümüze kadar birden çok farklı yöntem literatüre tanıtılmıştır. Bu yöntemlerden bazıları zorlukları veya kullanımının uygun bulunmaması sebebiyle sıkça kullanılmamışsa da birçoğu oldukça kabul görmüş ve birçok uygulamada yer bulmuştur. Genel olarak karar verme yöntemlerini kriterlerin ağırlıklarının belirlendiği ve alternatiflerin sıralandığı yöntemler olarak ikiye ayırmak mümkündür. Kriter ağırlıklarının belirlendiği yöntemler ise objektif ve sübjektif yöntemler olarak ikiye ayrılmaktadır. Bu çalışmada kriter ağırlığı belirleme ve sıralama yöntemlerinin ayrı ayrı açıklaması yapılmıştır.

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2. KRİTER AĞIRLIĞI BELİRLEME YÖNTEMLERİ

Bilimsel arařtırmalarla topluma ışık tutmak, toplumdan bir adım önde olmak ve ortaya çıkan bir problemin varlığında güncel arařtırmalarla karar vericiye yardımcı olmak bilim insanlarının en önemli görevidir. Karar vericinin karşılařtığı karar problemleri bilimsel olarak çeřitli kriterlere ve alternatiflere göre çözölür. Kriterlere karar vericinin görüşlerine göre veya alternatiflerin yapısına göre ağırlık deęerleri atamak bilimsel arařtırmalarda önemli bir yer etmiştir. Hatta denebilir ki karar problemlerinin yarısını çözmek kriterlere uygun kriter ağırlığı deęerleri atamakla gerçekleştirilebilir. Problemleri en iyi şekilde çözebilmek için literatürde günümüze kadar birden çok kriter ağırlığı belirleme yöntemi tanıtılmıştır. Bu çalışmada kriter ağırlığı belirleme yöntemleri sübjektif ve objektif yöntemler olarak ikiye ayrılarak incelenmiştir.

Sübjektif yöntemler karar vericinin bilgi, deneyim ve kişisel görüşlerini kullanır. Karar verici belirlenen kriterlere uygun ağırlıklar atfetmekte, ardından çeřitli matematiksel işlemler sonucunda kriter ağırlıkları belirlenmektedir. Objektif yöntemlerde ise karar vericinin kriter ağırlığı belirlemede kişisel yargılarına, yanlı tutumlarına, özne deęerlendirmelerine ihtiyaç duymadan kriterlerin alternatiflere göre aldıkları deęerler kullanılmaktadır. Uygun matematiksel işlemler yapılarak kriter ağırlıkları belirlenmektedir. Bu çalışmada kriter ağırlığı belirlemede önemli yeri olan klasik yöntemlerle birlikte son zamanlarda literatüre tanıtılan güncel yöntemler bu alanda çalışma yapacak uygulayıcılara, akademisyenlere ve konunun paydařlarına bilgi sunması açısından incelenmiş, yöntemlerin tanıtılmasından sonra çözüm aşamaları açıklanmış ve ardından çeřitli uygulamalar gerçekleştirilmiştir.

2.1. Sübjektif Yöntemler

Sübjektif yöntemler kriter ağırlıklarını uzman ya da karar vericinin kişisel/öznel bilgisi, tecrübesi ve yargılarına göre belirlemektedir. Uzmanın/yanıtlayıcının karar problemindeki bilgisi ve görgüsüne göre kararlarını probleme dâhil etmesi kriter ağırlığı belirlemeye kişisel ve önemli bir deęer katmaktadır. Sübjektif ya da özne yöntemlerde kimi zaman kriterler tek yönlü/iki yönlü karşılařtırılmakta,

si için kullanılan Entropi yöntemindeki kriterlerin değişkenliğini ve kriterlerin etki kaybını ölçen CILOS yönteminin zayıflıklarını tek bir yöntemle karşılamak amaçlanmıştır.

IDOCRIW yöntemi literatürde çeşitli çalışmalarda kullanılmıştır. Bunlardan bazıları; Trinkūnienė vd. (2017) kalite güvencesinin değerlendirilmesinde, Čereška vd. (2018) çelik halat teşhis verilerinin analizinde, Alao vd. (2020) enerji teknolojisinin seçiminde, Pala (2021) ulaştırma işletmelerinin finansal performans analizinde IDOCRIW yöntemini kullanmıştır. IDOCRIW yöntemi basit bir hesaba dayanır. Trinkūnienė vd. (2017:1165) bu hesabı aşağıdaki gibi açıklamıştır.

$$w_j = \frac{q_j w_{e_j}}{\sum_{j=1}^m q_j w_{e_j}} \quad (1)$$

IDOCRIW yöntemini örnek üzerinde incelemek gerekirse Trinkūnienė vd. (2017:1165)'nin çalışmasında 7 kriterin bütünleştirilmesinde başarılı bir şekilde kullanıldığı söylenilebilir. Alternatiflerin kriterlere göre aldıkları değerler karar matrisinde gösterilir ve yöntemlere göre ağırlıklar elde edilir.

IDOCRIW											
	A	B	C	D	E	F	G	H	I	J	K
1	IDOCRIW		A1	A2	A3	A4	A5	A6	Entropy	CILOS	IDOCRIW
2	C1	min	8.00	9.33	7.00	7.00	8.00	9.67	0.0264	0.1166	0.0238
3	C2	max	5.00	6.67	6.67	6.00	3.00	3.33	0.1489	0.1707	0.1970
4	C3	min	7.33	8.67	6.67	9.00	6.00	7.00	0.0338	0.2433	0.0638
5	C4	max	2.67	6.67	7.67	6.00	4.67	7.67	0.1682	0.1208	0.1575
6	C5	min	3.33	7.67	6.67	7.00	4.00	2.67	0.2408	0.0905	0.1690
7	C6	max	4.00	6.67	6.00	8.00	4.33	3.00	0.1728	0.1055	0.1413
8	C7	max	4.00	7.00	7.00	6.00	3.33	2.67	0.2090	0.1527	0.2474

Karar matrisine göre Entropy ve CILOS yöntemlerinin ağırlıklarının hesaplanması sonucunda IDOCRIW yöntemiyle nihai kriter ağırlıkları bulunmuştur. C7 kriteri %24,74 ağırlıkla ilk sırada, C3 kriteri %6,38 ağırlıkla son sıradadır.

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3. ALTERNATİFLERİ SIRALAMA YÖNTEMLERİ

Karar probleminin önemli bir aşaması olan alternatiflerin değerlendirilmesi aşamasında kriterlere göre belirlenen alternatif seçeneklerin en uygun olanının saptanması gerçekleştirilir. Bunun için öncelikle kriterler belirlenir, kriterlerin ağırlıkları belirlenerek veya eşit ağırlık verilerek sonrasında alternatifler sıralanır.

Yöneylem araştırması literatüründe geçmişi çok fazla eskilere dayanmayan, ikinci dünya savaşı sırasında ve sonrasında bu alana önem verilmesiyle birlikte karar bilimcileri tarafından çeşitli yöntemler tanıtılmıştır. Alternatiflerin belirlenmesi için kullanılan yöntemler aşamalarıyla birlikte uygulamalı olarak bu bölümde açıklanmıştır.

3.1. ARAS Yöntemi

ARAS (Additive Ratio Assessment) yönteminde bir alternatifin karmaşık nispi etkinliğini veya verimliliğini belirleyen bir fayda fonksiyonu değeri, bir uygulamada göz önünde bulundurulmuş ana kriter değerlerinin ve ağırlıklarının nispi etkisi ile doğru orantılıdır (Zavadskas ve Turskis, 2010:163). ARAS yöntemi Zavadskas ve Turskis (2010) tarafından 2010 yılında geliştirilmiş ve ofis odalarında mikro iklimin değerlendirilmesi için uygulanmıştır (Goswami ve Behera, 2021:953). Alternatiflerin belirlenen ideal alternatifle kıyaslanmasına ve ideal alternatife oransal benzerliğe dayanır (Ateş ve Topal, 2021:1106). ARAS yönteminin matematiksel hesaplamaları için kullanılan prosedürler, TOPSIS, VIKOR ve PROMETHEE gibi önde gelen ÇKKV yöntemlerinden daha basittir (Toygar vd., 2022:6). ARAS yöntemi literatürde birçok alanda çeşitli çalışmalarda kullanılmıştır. Güneş enerjisi santrali kuruluş yeri seçiminde (Ateş ve Topal, 2021), malzeme taşıma ekipmanı seçiminde (Goswami ve Behera, 2021), bilişim işletmeleri için teknopark bölgesinin belirlenmesinde (Arslan vd., 2021), boş konteyner kıtlığının araştırılmasında (Toygar vd., 2022) ARAS yöntemi kullanılmıştır. ARAS yönteminin çözüm aşamaları 4 adımda açıklanabilir (Zavadskas ve Turskis, 2010; Arslan vd., 2021).

Adım 1: Karar probleminde alternatiflere ve kriterlere göre karar matrisi oluşturulur. Kriterlerin optimal değerleri belirlenir. Bunun için kriterlerin fayda veya maliyet özellikleri dikkate alınır. Fayda özelliğine sahip kriterlerde maksimum

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4. BÜTÜNLEŞTİRME VE NORMALİZASYON TEKNİKLERİ

Farklı yöntemlere göre seçim ve sıralama çalışmalarında alternatiflerin tek bir sırada toplulaştırılmış/bütünleştirilmiş şekilde bir arada gösterilebilmesini sağlayan çeşitli teknikler geliştirilmiştir. Ayrıca farklı yöntemlere göre alternatifleri standart bir tabloda göstermek ve birbirleriyle aynı düzlemde işlem yapabilmek için çeşitli normalizasyon teknikleri bulunmaktadır. Bu bölümde bütünleştirme ve normalizasyon teknikleri açıklanmıştır.

4.1. Bütünleştirme Teknikleri

Çeşitli alternatiflerin bulunduğu karar problemlerinde alternatiflerden en uygun olanını seçmek için bazen tek bir karar verme yöntemi kullanılmakta, bazen de birden fazla yöntem kullanılmaktadır. Birden fazla ÇKVV yöntemi kullanıldığında bu yöntemlerin nasıl değerlendirileceği ayrı bir problem olarak ortaya çıkar. Kullanılan yöntemlerin tek bir sonuçta birleştirilmesini sağlayarak uygulayıcı veya karar vericilere bilgi sağlayan çeşitli bütünleştirme teknikleri bulunmaktadır. Seçim sonuçlarını sıralamak için 1781’de Borda, 1785’de Condorcet, 1876’da Dodgson, 1907’de Nanson, 1959’da Kemeny olmak üzere çeşitli yazarlar tarafından geliştirilmiş oylama teknikleri bulunmaktadır.

4.1.1. Borda Tekniği

Borda tekniğinin geçmişi oldukça eskilere dayanmaktadır. Borda tekniği 1781 yılında Fransız ‘de Borda’ tarafından seçim süreçlerindeki sıralama sorunlarıyla başa çıkmak için önerilmiştir (Costa, 2017:282). Borda tekniği yapılan bir oylama sonucunda ortak bir kararla en çok tercih edilen adayın belirlenmesini sağlar. Borda tekniği alternatiflerin sıra numaralarına dayanır. Bir grup alternatife verilen puan sayısı ‘n’ ise birinci tercih edilen alternatife ‘n’ puan, ikinci tercih edilen alternatife ‘n-1’ puan, üçüncü tercih edilen alternatife ‘n-2’ ve devam edecek şekilde puanlar verilir. Son sıradaki alternatif 1 puan alır. Uzlaşma için alternatifler verilen puanlarına göre toplanır ve alternatifler aldıkları puanlara göre azalan

$$r_{ij} = 1 - \frac{x_{ij} - x_j^{\min}}{\sum_{i=1}^m (x_{ij} - x_j^{\min})} \quad (20)$$

Farklı karar verme yöntemlerine göre farklı normalizasyon modelleri kullanılabilir. Karar verme yöntemlerinde belirlenen normalizasyon yöntemi yerine veri setine uygunluğuna göre diğerleri de kullanılabilir. Örneğin veri setinde uç değerlerin fazla olması durumunda bu değerlerin etkisini azaltmak için z-skor yöntemi kullanılabilir veya kriter değerlerinin maksimum ve minimum farkı değerlerini birlikte işin içine katarak değerlendirme yapmak istendiğinde doğrusal normalizasyon sıkça kullanılabilir.

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İÇİNDEKİLER

ÖN SÖZ	v
ÇİZELGELERİN LİSTESİ.....	xi
ŞEKİLLERİN LİSTESİ	xv
KISALTMALAR	xvii
1. GİRİŞ.....	1
2. DEĞER VE FİRMA DEĞERLEMESİ	5
2.1. Değer Kavramı	5
2.1.1. Nominal Değer	6
2.1.2. Defter Değeri	7
2.1.3. Piyasa Değeri	8
2.1.4. Tasfiye Değeri.....	8
2.1.5. İşleyen Teşebbüs Değeri	9
2.1.6. Gerçek Değer	10
2.2. Firma Değerlemesi.....	10
2.2.1. Firma Değerini Etkileyen Faktörler.....	11
2.2.2. Değerleme Yaklaşımları.....	12
2.2.2.1. Aktif bazlı değerlendirme yaklaşımı.....	14
2.2.2.2. Piyasa esaslı değerlendirme yaklaşımları.....	15
2.2.2.3. Nakit akış esaslı değerlendirme yaklaşımları	17
2.2.2.3.1. İndirgenmiş nakit akımları yöntemi.....	19
2.2.2.4. Diğer değerlendirme yöntemleri	23
2.2.2.4.1. Ekonomik katma değer (EVA).....	23
2.2.2.4.2. Reel opsiyon değerlendirme yaklaşımı	25
2.2.2.4.3. Yatırımın nakit akım kârlılığı (CFROI) yöntemi.....	29
3. DEĞERLEME STANDARTLARI.....	35
3.1. Uluslararası Değerleme Standartları Konseyi ve Uluslararası Değerleme Standartları.....	36

3.1.1. Uluslararası Değerleme Standartları Konseyi	36
3.1.2. Uluslararası Değerleme Standartları	38
3.2. Türkiye’de Değerleme Standartlarının Kurumsal Yapısı ve Mevzuatı....	43
3.2.1. Gayrimenkullerin Sermaye Piyasası Mevzuatı Açısından Değerlemesi.....	43
3.2.2. Gayrimenkul Dışındaki Varlıkların Sermaye Piyasası Mevzuatı Kapsamındaki Değerlemeleri.....	45
4. VERİ ZARFLAMA ANALİZİ	47
4.1. Veri Zarflama Analizinin Amaçları ve Kullanımındaki Avantajlar	51
4.2. VZA’nın Dezavantajları	52
4.3. Etkinlik Türlerinin Gösterimi	54
4.4. VZA Modelinin Matematiksel Yapısı	57
4.5. VZA’nın Uygulama Süreci	60
4.5.1. Karar Verici Birimlerin Seçilmesi	61
4.5.2. VZA’ya Dâhil Edilecek Girdi ve Çıktıların Seçimi	62
4.5.3. Model Seçimi	66
5. VZA İLE FİRMA DEĞERLEMESİ UYGULAMASI	69
5.1. VZA ile Firma Değerlemesine İlişkin Literatür	69
5.2. VZA ile Firma Değerlemesi Metodolojisi	72
5.3. Uygulama.....	76
5.3.1. Karar Verici Birimlerin Seçilmesi	76
5.3.2. VZA’ya Dâhil Edilecek Girdi ve Çıktıların Seçimi.....	77
5.3.3. Model Seçimi	78
5.3.4. Bulgular	79
5.3.4.1. Bankacılık sektörü	80
5.3.4.1.1. İş Bankası, Vakıf Bankası ve Yapı ve Kredi Bankası değer analizi	81
5.3.4.1.2. Albaraka Türk, Halkbank ve Şekerbank maksimum değer analizi	86
5.3.4.1.3. Bankacılık sektörü sonuçları özeti.....	87
5.3.4.2. Gıda ve İçecek Sektörü.....	88
5.3.4.2.1. Kent Gıda, Konfrut Gıda, Pınar Entegre, Pınar Süt ve Tat Gıda değer analizi.....	90
5.3.4.2.2. Merko Gıda, Penguen Gıda, Pınar Su ve Tukaş Gıda değer analizi.....	98
5.3.4.2.3. Avod ve Oylum Gıda değer analizi	103

5.3.4.2.4. Frigo Pak, Kerevitaş, Kristal Kola ve Selçuk Gıda maksimum değer analizi	106
5.3.4.2.5. Gıda ve içecek sektörü sonuçları özeti.....	108
5.3.4.3. Çimento sektörü.....	109
5.3.4.3.1. Baştaş, Batıçim, Batısöke, Çimentaş ve Çimsa değer analizi	110
5.3.4.3.2. Göлтаş ve Konya Çimento için maksimum değer analizi..	117
5.3.4.3.3. Çimento sektörü sonuçları özeti	118
5.3.4.4. Gayrimenkul Yatırım Ortaklığı (GYO) sektörü	119
5.3.4.4.1. Deniz ve Yeşil GYO Şirketleri için değer analizi.....	121
5.3.4.4.2. Servet ve TSKB GYO Şirketleri için değer analizi	124
5.3.4.4.3. Akiş, Atakule, Avrasya, Dođuş, Halk, Koray, Martı, Nuroł, Özak, Özderici, Peker, Pera, Vakıf, Yeni Gimat GYO firmaları için maksimum değer analizi.....	127
6. SONUÇ	131
KAYNAKLAR.....	137

KAYNAKLAR

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Dr. Filiz Yılmaz



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Sürdürülebilir Gelişme ve Yeşil Ekonomi**
Dr. Filiz Yılmaz

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İÇİNDEKİLER

İKİNCİ BASIMA ÖN SÖZ	iii
ÖN SÖZ.....	v
TABLolar LİSTESİ.....	xi
ŞEKİLLER LİSTESİ.....	xiii
GRAFİKLER LİSTESİ.....	xv
KISALTMALAR LİSTESİ.....	xvii
GİRİŞ.....	1

BİRİNCİ BÖLÜM

SÜRDÜRÜLEBİLİR GELİŞME VE YEŞİL EKONOMİ

1.1. Sürdürülebilir Gelişme Yaklaşımı	5
1.1.1. Sürdürülebilir Gelişme Yaklaşımının Tanımsal Çerçevesi	6
1.1.2. Sürdürülebilir Gelişme Yaklaşımının Tarihsel Gelişimi	8
1.1.2.1. Sürdürülebilir Gelişmeye Doğru	8
1.1.2.2. Sürdürülebilir Gelişme Yaklaşımının Dönüm Noktaları ..	12
1.1.3. Sürdürülebilir Gelişmenin Boyutları	31
1.1.3.1. Ekolojik Boyut.....	32
1.1.3.2. Ekonomik Boyut.....	33
1.1.3.3. Sosyal Boyut.....	34
1.1.3.4. Kültürel Boyut	35
1.1.3.5. Politik Boyut.....	36
1.1.4. Sürdürülebilir Gelişme Aktörleri	36
1.1.4.1. Uluslararası Kuruluşlar.....	37
1.1.4.2. Merkezi Yönetimler.....	39

1.1.4.3. Yerel Yönetimler.....	40
1.1.4.4. Özel Sektör Kuruluşları.....	41
1.1.4.5. Sivil Toplum Kuruluşları	42
1.2. İklim Değişikliği	43
1.2.1. İklim Değişikliğinin Kavramsal Çerçevesi.....	43
1.2.2. İklim Değişikliğinin Nedenleri	44
1.2.3. İklim Değişikliğinin Sonuçları	46
1.2.3.1. Ekolojik Sonuçlar	46
1.2.3.2. Ekonomik Sonuçlar	48
1.2.3.3. Sosyal Sonuçlar	49
1.2.3.4. Kültürel Sonuçlar.....	50
1.2.3.5. Politik Sonuçlar	51
1.3. Yeşil Ekonomi.....	52
1.3.1. Yeşil Ekonominin Tanımı ve Kapsamı	52
1.3.2. Yeşil Ekonomi Prensipleri	56
1.3.3. Yeşil Ekonomi Göstergeleri	58
1.3.3.1. Ekolojik Ayak İzi	59
1.3.3.2. Yeşil Ekonomi Endeksleri	62
1.3.4. Yeşil Ekonomi Stratejileri.....	68
1.3.4.1. Eko–Girişimcilik	70
1.3.4.2. Çevreci Yatırımlar.....	71
1.3.4.3. Yeşil Teknolojiler.....	72
1.3.4.4. Yeşil İnovasyon.....	74
1.3.4.5. Biyomimikri’den Yeşil İşler’e	75

İKİNCİ BÖLÜM

YEŞİL İŞLER

2.1. Yeşil İşlerin Kavramsal Çerçevesi	79
2.1.1. Yeşil İşlerin Tanımı	81
2.1.2. Yeşil İşlerin Özellikleri	88
2.1.3. Yeşil İşlerin Ekonomik Kalkınmadaki Rolü	90
2.2. Uluslararası Örgütlenmelerde Yeşil İşler	92
2.2.1. Birleşmiş Milletler	92
2.2.2. Uluslararası Çalışma Örgütü (ILO)	97
2.2.2.1. Yeşil İşler Girişimi (Green Jobs Initiative).....	98
2.2.2.2. Yeşil İşler Programı (Green Jobs Programme)	98
2.2.3. Avrupa Birliği Çevre Politikaları	101
2.3. Yeşil İşlerin Yer Aldığı Sektörler ve Dünyadaki Gelişmeler	104
2.3.1. Enerji (Renewable Energy).....	108
2.3.2. İnşaat (Buildings)	118
2.3.3. Ulaşım (Transportation).....	120
2.3.4. Temel Sanayi/Geri Dönüşüm (Basic Industry).....	122
2.3.5. Tarım (Agriculture).....	124
2.3.6. Ormancılık (Forestry)	126
2.3.7. Dünyadaki Gelişmeler	127
2.4. Yeşil Yakalı Çalışanlar	135
2.4.1. Yeşil Yakalı Çalışanların Tanımı ve Özellikleri.....	135
2.4.2. Yeşil Yakalı Çalışanların Yeşil İş Stratejisindeki Önemi	139

ÜÇÜNCÜ BÖLÜM
TÜRKİYE’DE YEŞİL İŞLER’E DOĞRU

3.1. Tarihsel Gelişim Süreci.....	147
3.2. Yeşil İş Sektörleri	159
3.2.1. Enerji	159
3.2.2. İnşaat.....	165
3.2.3. Ulaşım.....	167
3.2.4. Temel Sanayi/Geri Dönüşüm.....	168
3.2.5. Tarım.....	169
3.2.6. Ormancılık	171
3.3. Yeşil Yatırım Aktörlerinin Yeşil İş Sektörlerindeki Rolü	174
3.3.1. Merkezi Yönetimin Rolü	175
3.3.2. Yerel Yönetimlerin Rolü	180
3.3.3. Özel Sektör Kuruluşlarının Rolü	182
3.3.4. Sivil Toplum Kuruluşlarının Rolü	186
3.4. Ulusal Yenilenebilir Enerji Kaynakları Atlası.....	188
3.4.1. Mevcut Durum.....	189
3.4.2. Potansiyel Durum	205
3.4.3. Yeşil İşgücünün Geleceği (İşgücü İstatistikleri-İstihdamın Özellikleri)	208
SONUÇ.....	211
KAYNAKÇA.....	215
ÖZGEÇMİŞ.....	231

KAYNAKÇA

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