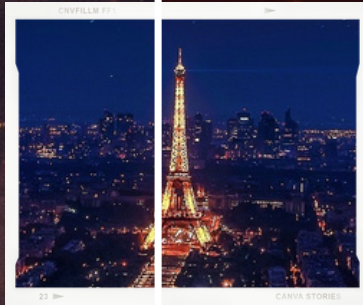
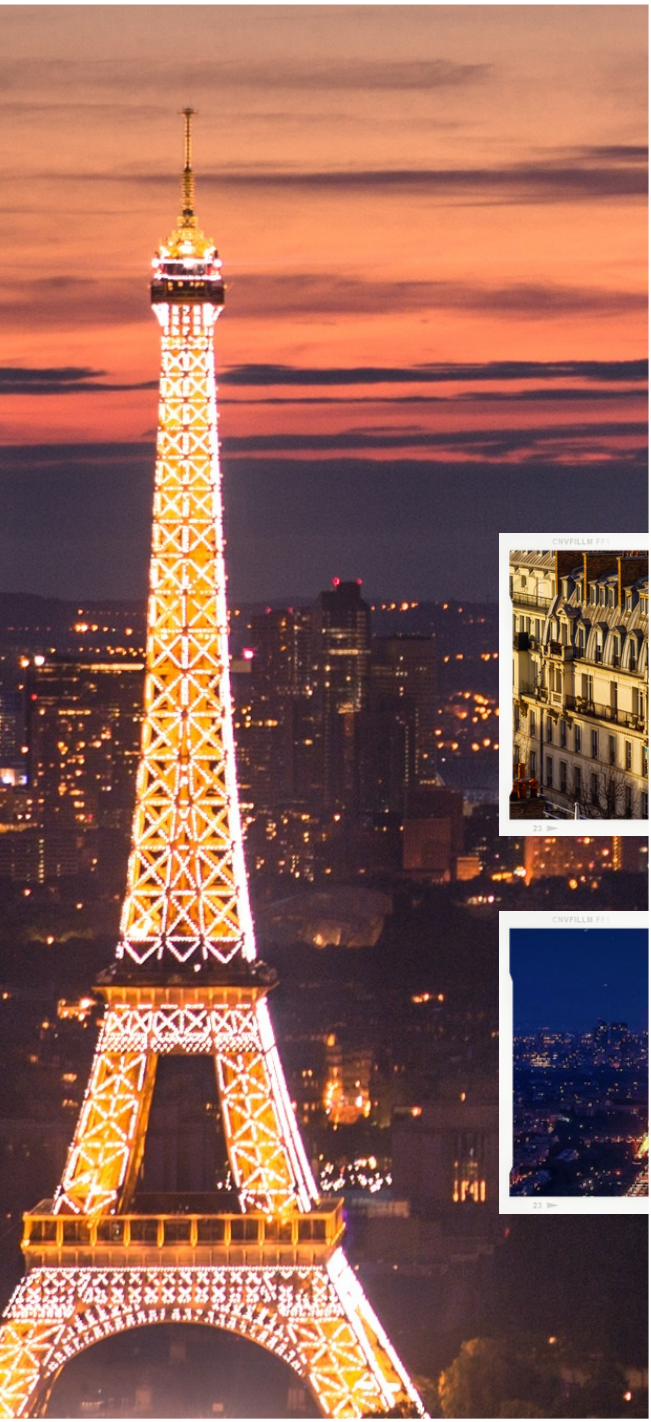


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3. INTERNATIONAL PARIS CONGRESS ON APPLIED SCIENCES

FEBRUARY 17-19, 2024

PARIS - FRANCE



EDITORS

Prof. Dr. Saša Salapura
Dr. Ethem İlhan ŞAHİN

X X X X X

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3rd INTERNATIONAL PARIS CONGRESS ON APPLIED SCIENCES

February 17-19, 2024

Paris - France

EDITORS

Prof. Dr. Saša SALAPURA

Dr. Ethem İlhan ŞAHİN

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CONGRESS TITLE

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DATE AND PLACE

February 17-19, 2024

Paris – France

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IKSAD INSTITUTE

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16.02.2024

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İlgi yazınıza istinaden Müdürlüğünüzde görev yapmakta olan Öğr. Gör. Dr. Ethem İlhan ŞAHİN'in 2547 sayılı Yükseköğretim Kanununun 39. maddesi uyarınca, 17-19 Şubat 2024 tarihleri arasında Fransa'nın Paris şehrinde düzenlenecek olan, 3. Uluslararası Paris Uygulamalı Bilimler Kongresinin organizasyon komitesinde çevrimiçi olarak yolluksuz ve yevmiyesiz olarak görevlendirilmesi Rektörlüğümüzce uygun görülmüştür. Bilgilerini rica ederim.

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ON APPLIED SCIENCES

Etkinlik Tarihi ve Yeri: 17-19 Şubat 2024, Paris

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3rd INTERNATIONAL PARIS CONGRESS ON APPLIED SCIENCES

February 17-19, 2024 / Paris



15.03.2024

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The screenshot shows a Zoom meeting window with a PowerPoint presentation. The slide is titled "3'd INTERNATIONAL PARIS CONGRESS ON APPLIED SCIENCES" and "February 17-19, 2024". The main topic is "The Impact of Low Energy Availability on Skeletal Health in Physical Active Young Women" by Prof. Dr. Dhurata BOZO and MD. Suela Xhufi. The slide features a diagram of bone structure with labels: Compact bone, Trabeculae, Osteoblast, Osteoclast, and Osteocyte. A flowchart on the right shows "Energy Deficiency" leading to "Impaired Bone Health" and "Menstrual Dysfunction". The Zoom interface includes a top bar with participant names (observer h6, Patrycja Widlak, H 4 - Mariam S..., hall- 6/Joanna...), a right sidebar with a participant list (6 participants), and a bottom taskbar with various application icons.

The screenshot shows a Zoom meeting gallery view with 9 participants. The participants are arranged in a grid with their names and profile pictures. The names visible are: observer h6, Patrycja Widlak, H 4 - Mariam S..., Lia Gumbaridze, hall- 6/Joanna..., H6- Soufiane EL..., and H-6, Dr. Iqra Parvez. The Zoom interface includes a top bar with "Giriş yapın" and "Kalarç: 08:55:51", a right sidebar with a participant list (9 participants), and a bottom taskbar with various application icons.

PHOTO GALLERY

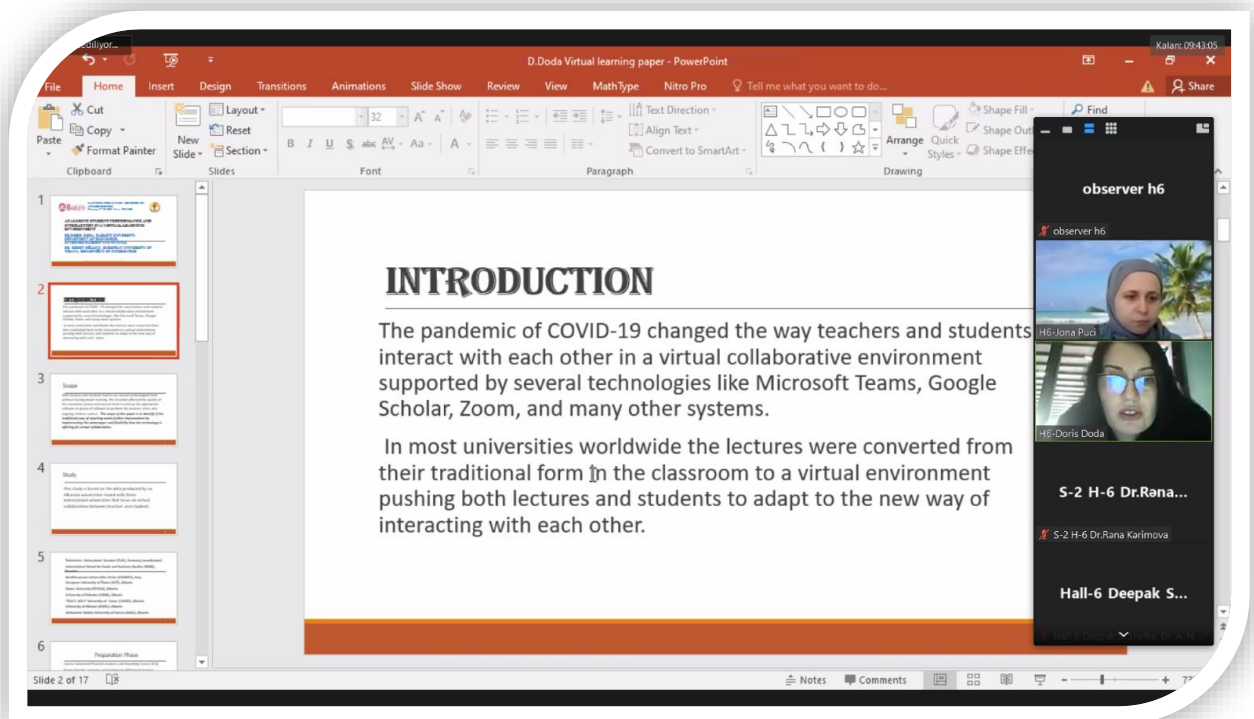
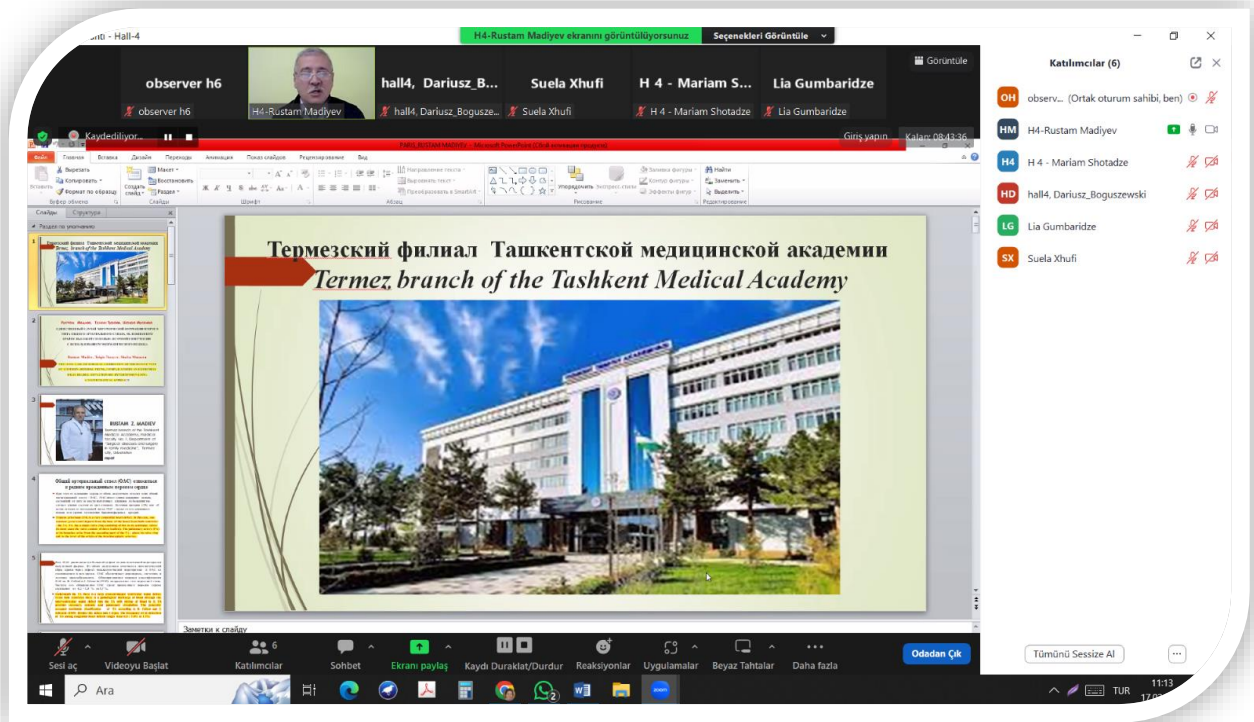


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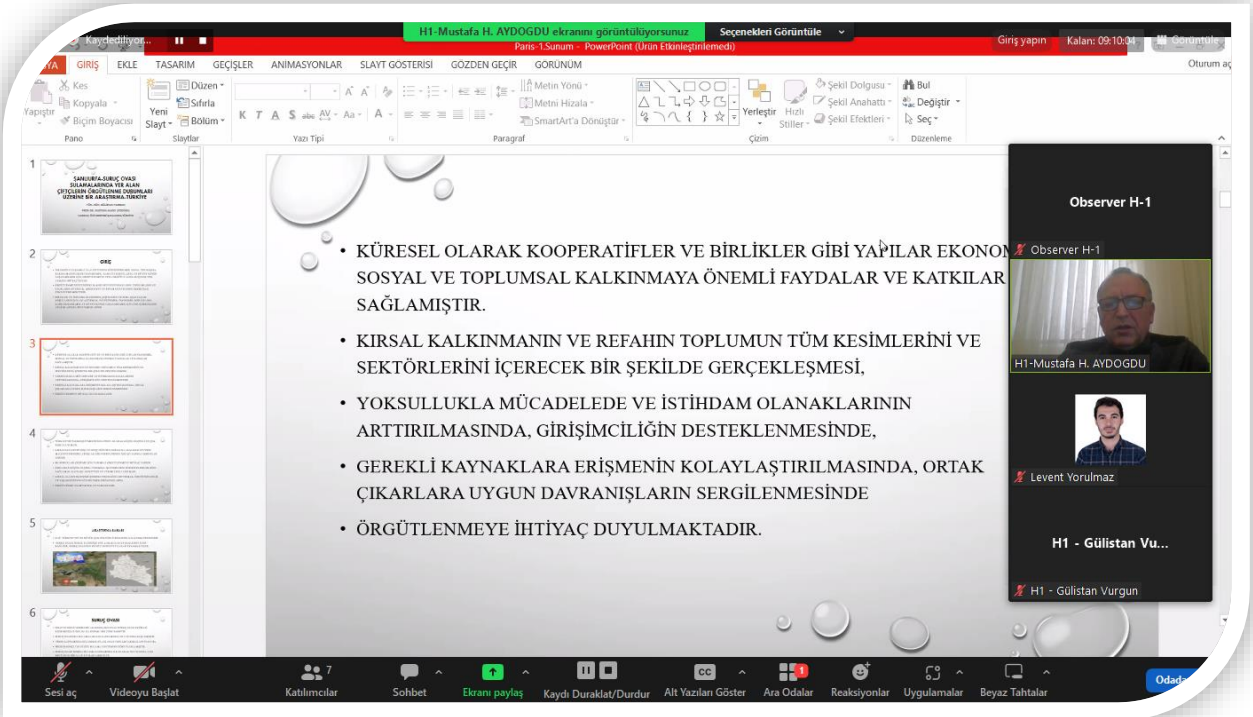
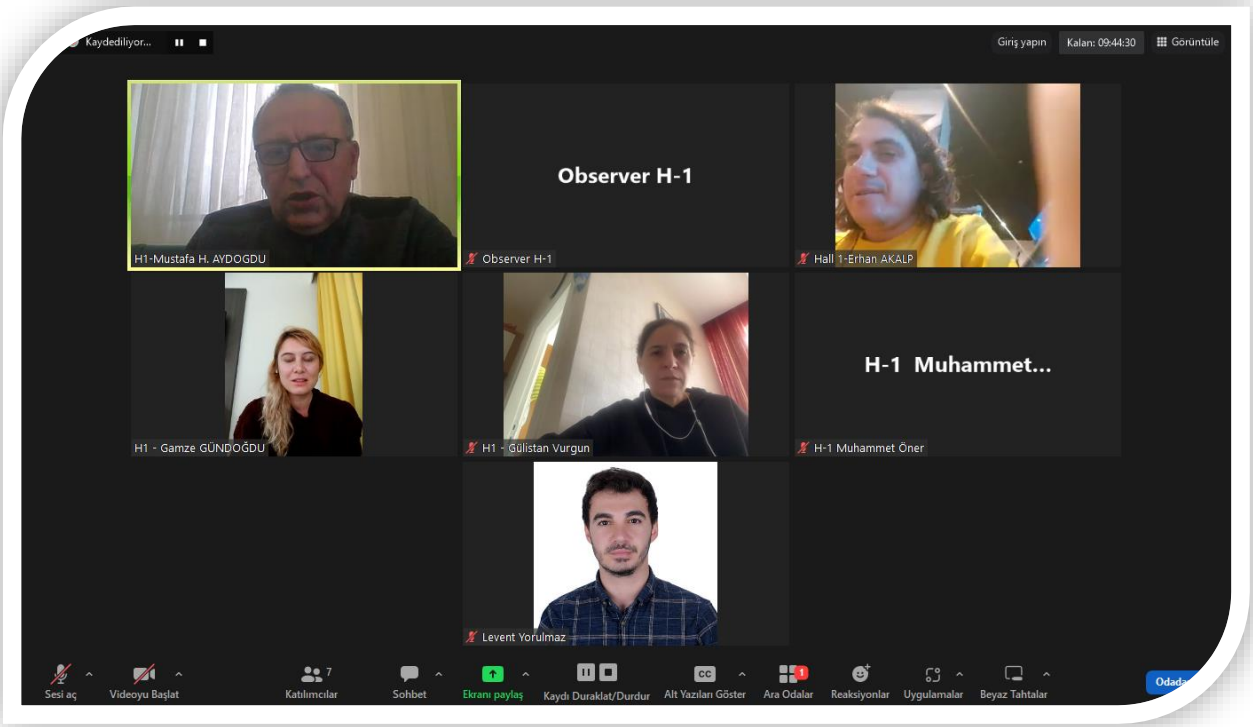


PHOTO GALLERY

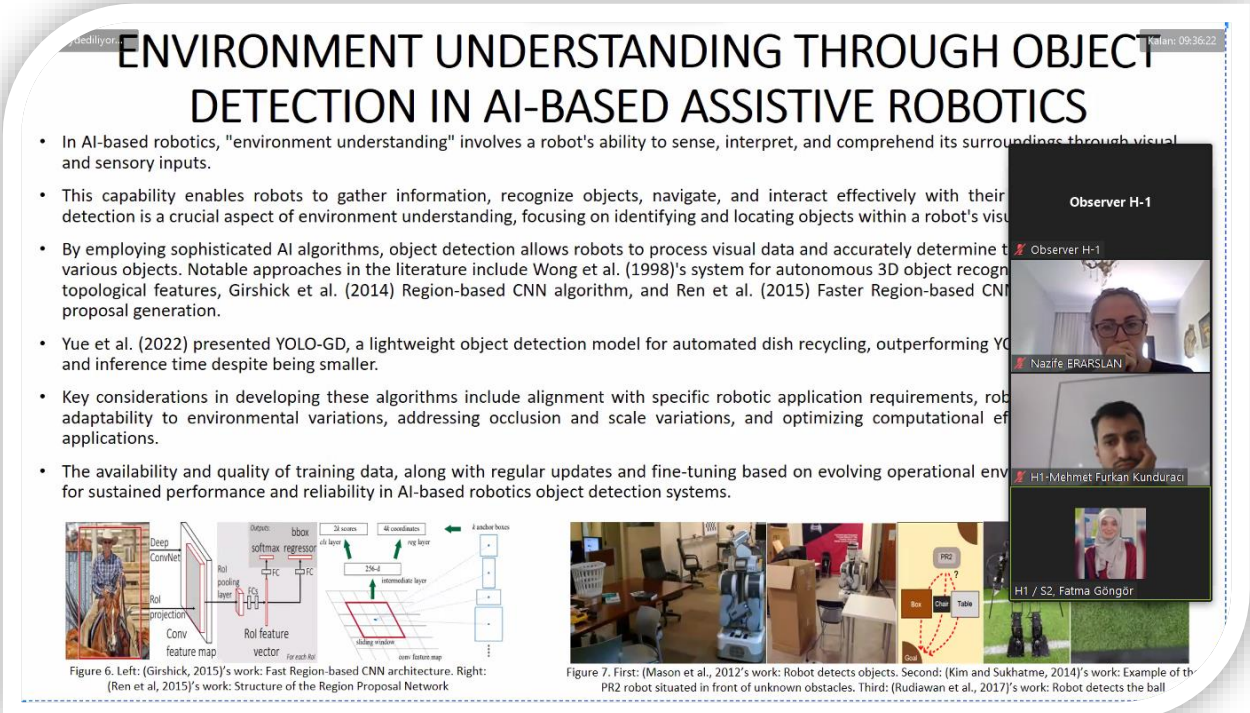
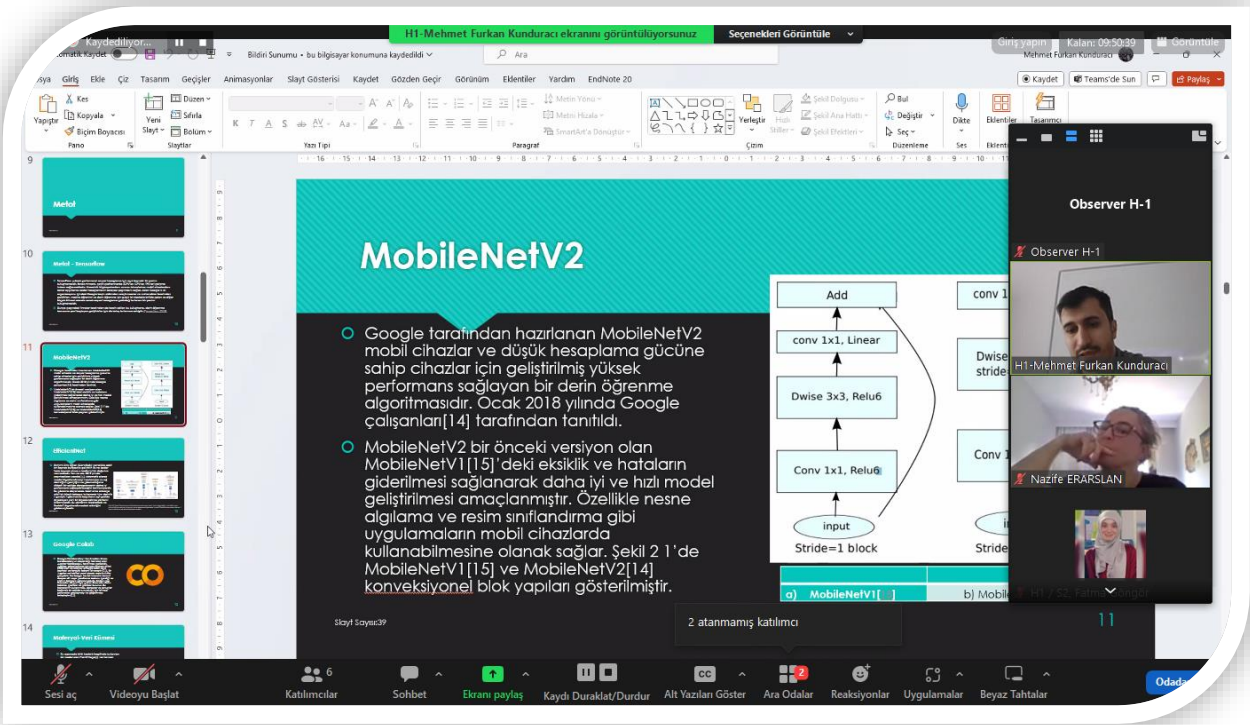
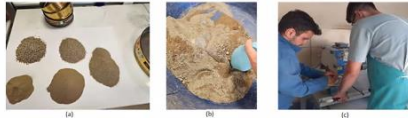


PHOTO GALLERY

2. Research methodology

- The well-graded gravel-sand-clay mixture (GSC) and sandy clay (SC) specimens were stabilized with 2% and 10% blast furnace slag cement in this study to investigate the fracture toughness and cohesive fracturing properties of the semicircular bend (SCB) specimens under static loading.

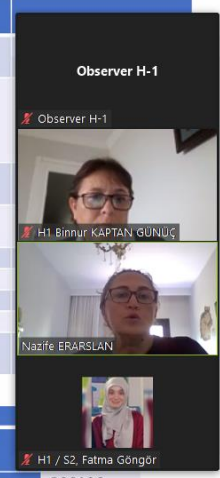


	Specimen constitution	Soil B
Soil A	GW-GC-sand mixture	
Sieve analysis	45% passing #4 sieve	
	12% passing #200 sieve	
	12% passing #200 sieve	
Stabilizer content	%2, %10	
Liquid limit	%	
Plastic limit	%	
Plasticity index	%	
Dry unit weight	18.5 kN/m ³	
Opt. moisture content	17%	

Mixes

Well-graded gravel-sand-clay mixture +2% cement

Well-graded gravel-sand-clay mixture +10% cement

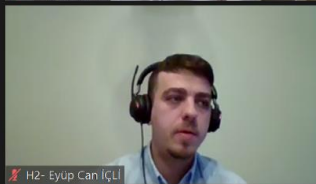


Kaydediliyor...

Giriş yapın Kalan: 09:57:58



Observer h-2



Gökhan GELEN

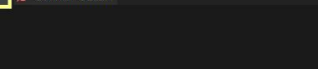
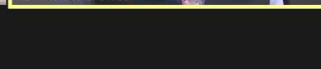
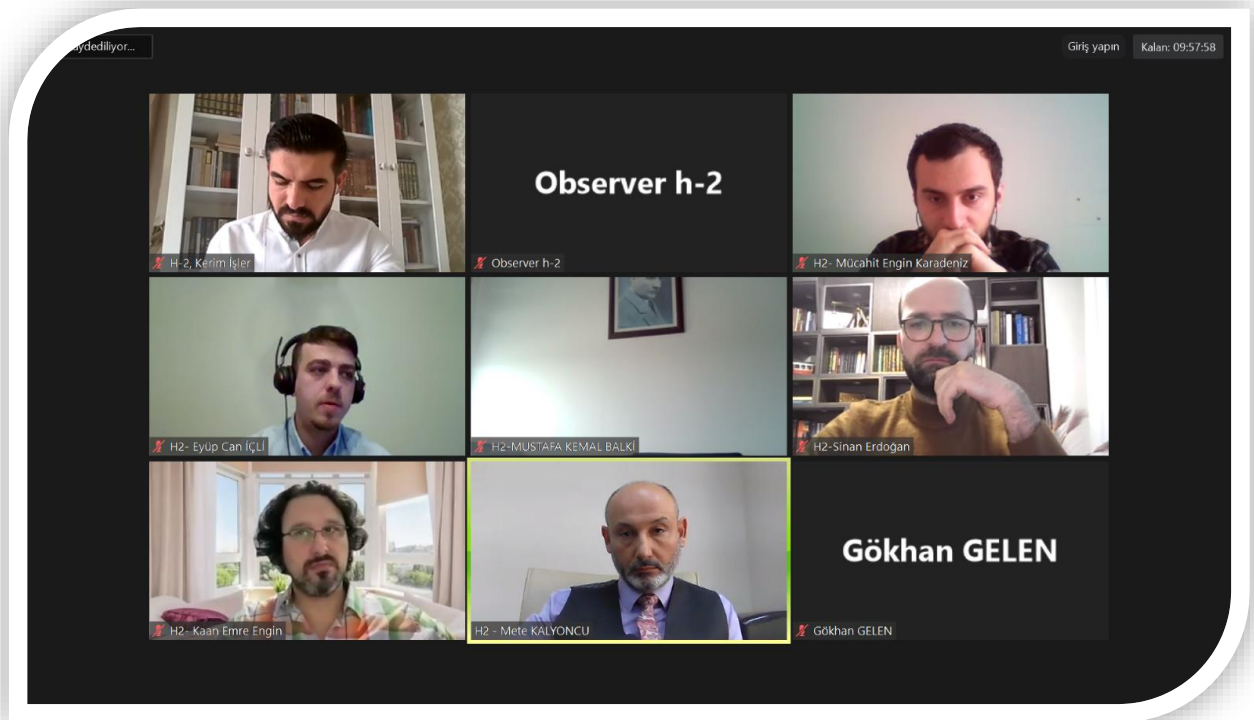


PHOTO GALLERY



Brake specific nitrogen oxide (BSNO_x)

- A decreasing trend was observed in BSNO_x with increasing load.
- Generally, the use of biodiesel and its blends has raised BSNO_x.
- **The lowest BSNO_x: 4.22 g/kWh (B0, 20 Nm)**

Fuel Type	Load 1 (g/kWh)	Load 2 (g/kWh)	Load 3 (g/kWh)
B0	9.5	5.5	4.22
B100	10.2	7.0	6.0
B80	9.5	6.5	5.5
B80M20	1.5	1.5	1.5

Observer h-2

Observer h-2

H2-MUSTAFA KEMAL BALKI

H2-Sinan Erdoğan

H2- Mücahit Engin Karadeniz

Kalan: 09:19:18

14

PHOTO GALLERY

Observer h-2

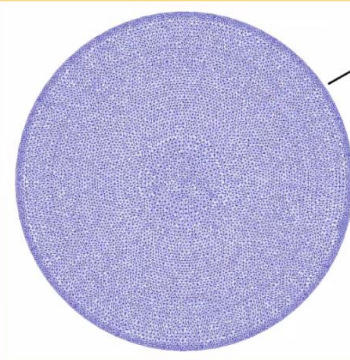
H2- Kaan Emre Engin ekranını görüntüleyorsunuz Seçenekleri Görüntüle

Kalan: 09:08:46

Simulation Parameters

Mesh Element Number: 250.000
Mesh Type: Tetrahedral
Workpiece Diameter: 150 mm
Workpiece Thickness: 0.5 mm
Remesh Criteria: Every 2 mm of punch penetration
Punch Speeds: 1 mm/s, 10 mm/s and 100 mm/s
Blankholder Force: 0.5 kN

Workpiece



Observer h-2

Observer h-2

H2-MUSTAFA KEMAL BALKI

H2-Sinan Erdogan

H2- Kaan Emre Engin

Observer h-2

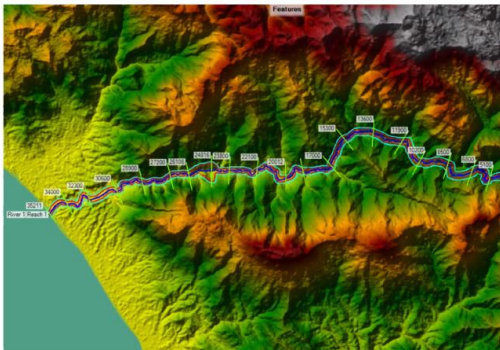
H2-Pinar ÇAVDAR ekranını görüntüleyorsunuz Seçenekleri Görüntüle

Kalan: 09:37:48

DEVELOPMENT OF DIM STREAM FLOOD HAZARD MAPS WITH HEC-RAS 2D MODEL

Materials and Methods

The HEC-RAS program, a Hydrologic Engineering Center- River Analysis System, was used in this study to predict and analyze to calculate water surface profiles in order to determine the water level during a flood event. The HEC-RAS program was used in this study to determine the potential flood sections and to perform a cross-section analysis using the data observed from water surface levels with the HEC-RAS program.

$$V = \frac{1}{n} R^{2/3} J^{1/2}$$
$$R = \frac{A}{P}$$


Observer h-2

Observer h-2

H2-Pinar ÇAVDAR

H2- Meltem COŞANER TONYALI

H2 - ECE TOPAL...

H2 - ECE TOPALOĞLU

4

Dim Stream River, Bank Lines, Flow Path and Cross Section Representation on Elevation Map

PHOTO GALLERY

Yeddiyor... H2- Meltem COŞANER TONYALI ekranını görüntülüyorsunuz Seçenekleri Görüntüle Kalan: 09:26:49

KAMUSAL ALAN TASARIM VE PLANLAMASI



<https://universaldesignaustralia.net.au/great-public-spaces-toolkit/>

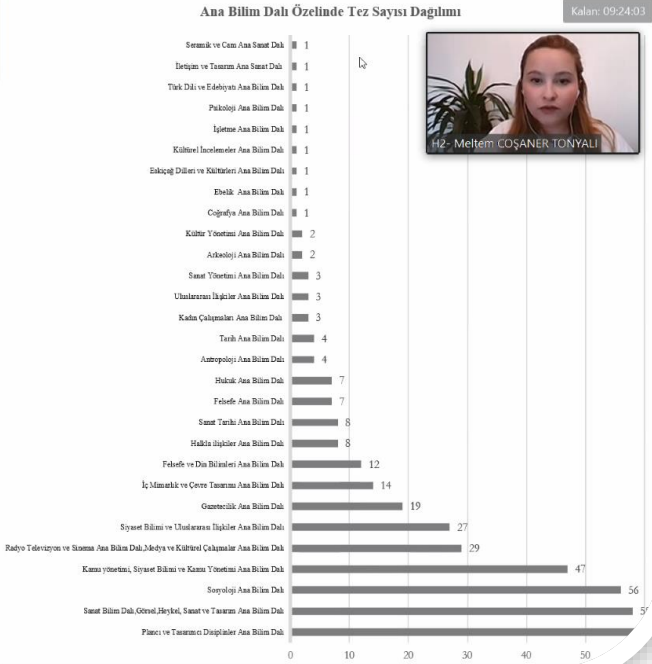
Kamusal alan oluşumlarında en önemli ilke **insanların konforuna yönelik evrensel tasarım kriterleri** temelinde planlanmasıdır. Kamusal alanların mekansal konforu önceleyen tasarımları insanların yaşamını kolaylaştırarak ve konforunu artmasını sağlamaktadır (Deniz, 2005). Kullanım konforu dışında mekansal alanların tasarımı bir yaklaşım ile **estetik ve psikolojik açılarından çözümlenmelerle** planlanması gerekmektedir (Carmona, 2019; Karayılmazlar ve Çelikyay, 2018).

Observer h-2
Observer h-2
H2- Meltem COŞANER TONYALI
H2-Pinar ÇAVD...
H2-Pinar ÇAVDAR
Tuğba KİPER Sa...
Tuğba KİPER Salon2

Yeddiyor... H2- Meltem COŞANER TONYALI ekranını görüntülüyorsunuz Seçenekleri Görüntüle Kalan: 09:24:03

BULGULAR

YÖK Tez Merkezi veri tabanı son yirmi üç yılda **“kamusal alan”** konulu hazırlanan tezlerin, anabilim dalı özelinde **29 farklı kategoride** derlenmiştir. Değerlendirme çerçevesinde yazarlar tarafından ilgili konu özelinde en çok araştırması yapılan ana bilim dalını **Plancı ve Tasarımcı Disiplinler** oluşturmuştur. Bunun üzerine plancı ve tasarımcı disiplinler hazırlanan **60 teze yönelik niceliksel analiz** gerçekleştirilmiştir.



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Değin ve Tasarım Ana Bilim Dalı	1
Türk Dil ve Edebiyatı Ana Bilim Dalı	1
Psikoloji Ana Bilim Dalı	1
İşletme Ana Bilim Dalı	1
Kültürel İncelenmeler Ana Bilim Dalı	1
Ekoçözüm Dili ve Kültürleri Ana Bilim Dalı	1
Etnik Ana Bilim Dalı	1
Coğrafya Ana Bilim Dalı	1
Kültür Yönetimi Ana Bilim Dalı	2
Arkeoloji Ana Bilim Dalı	2
Sanat Yönetimi Ana Bilim Dalı	3
Uluslararası İlişkiler Ana Bilim Dalı	3
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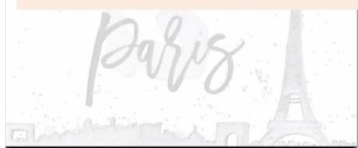


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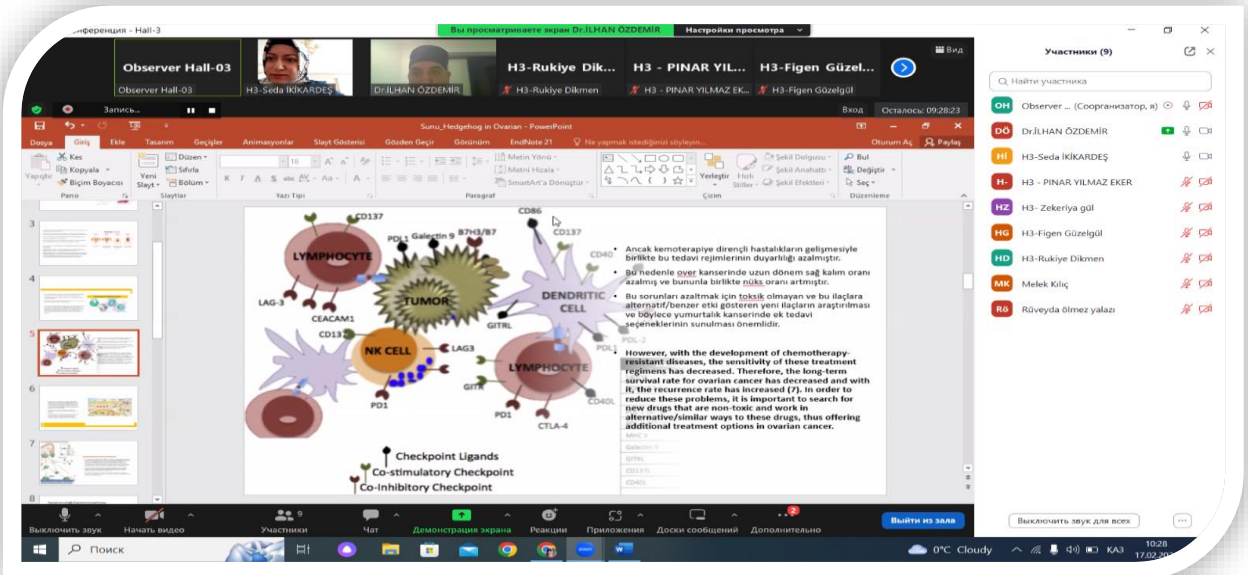
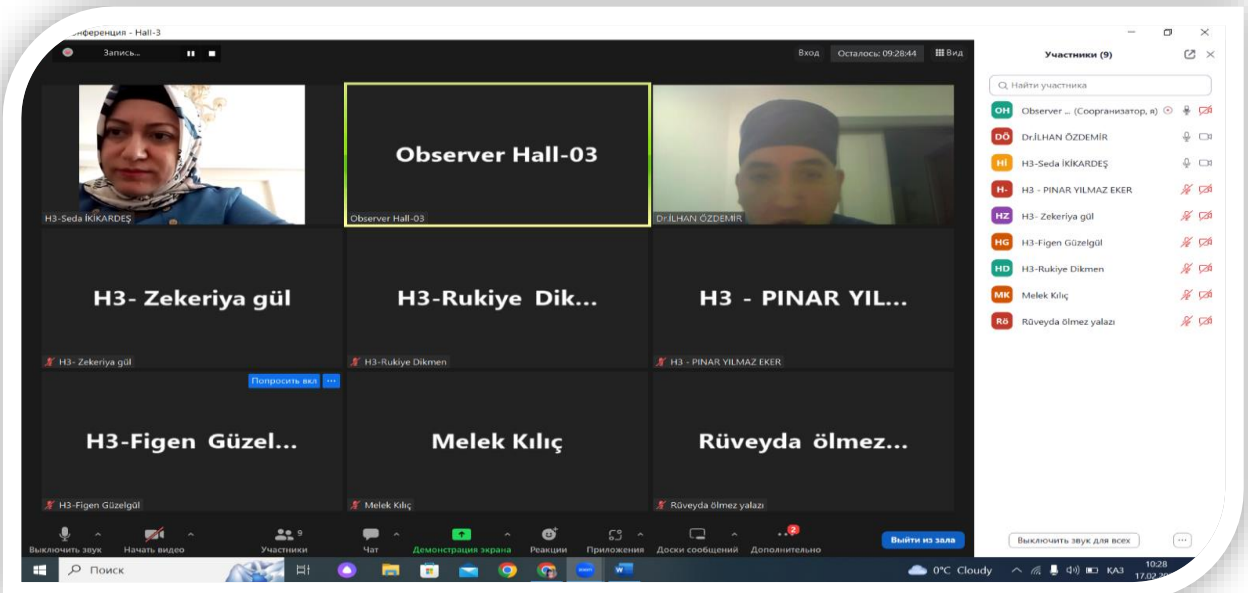


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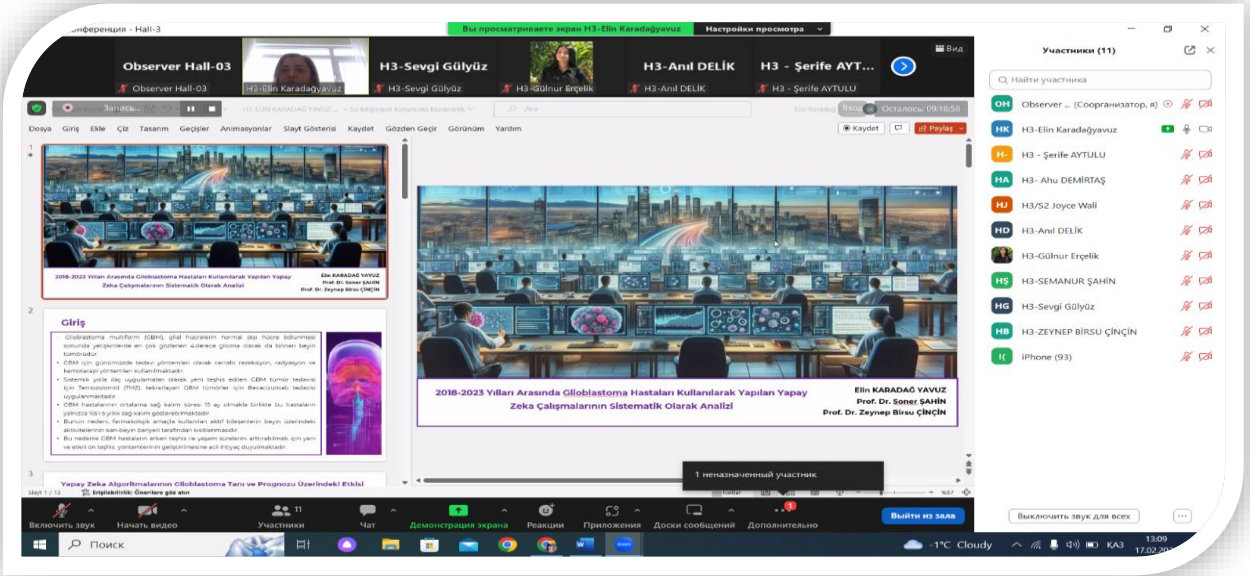


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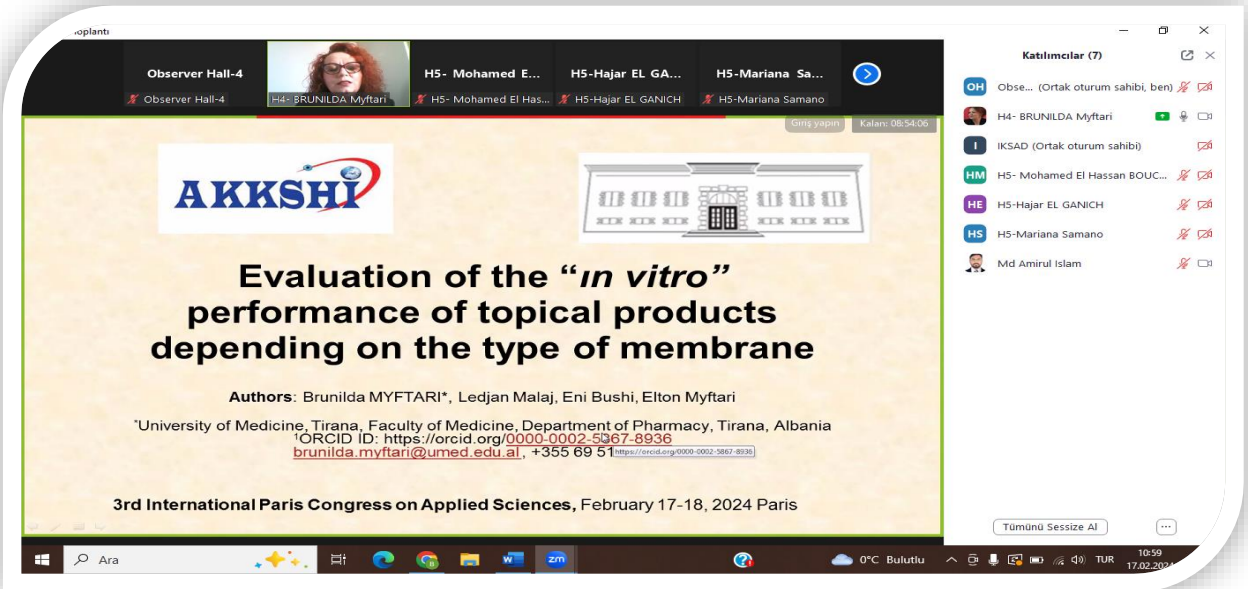


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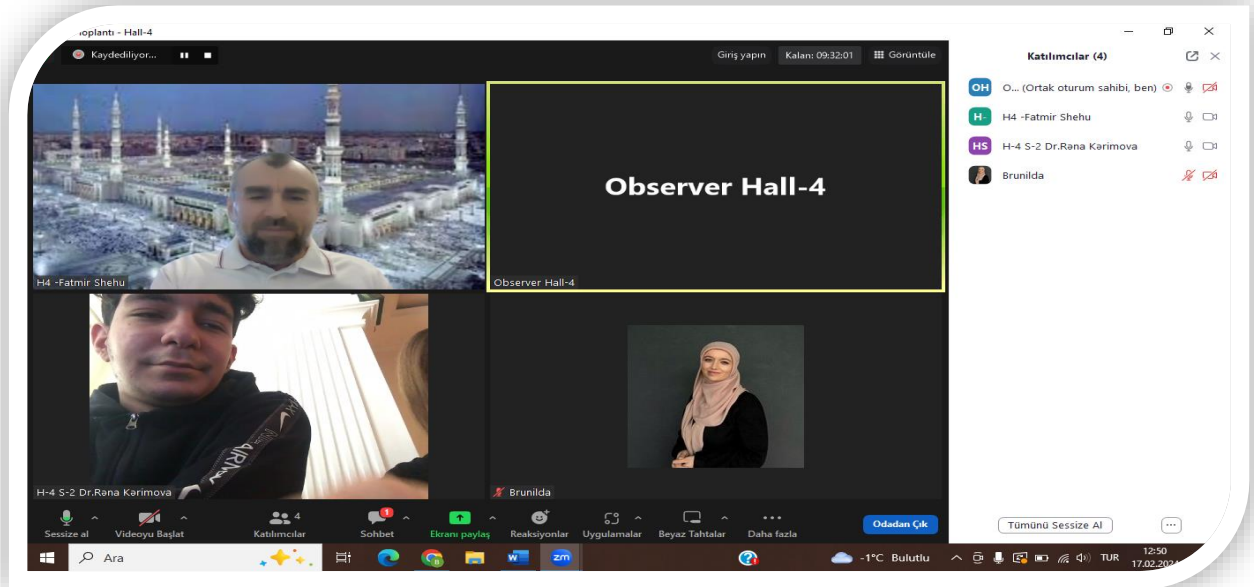
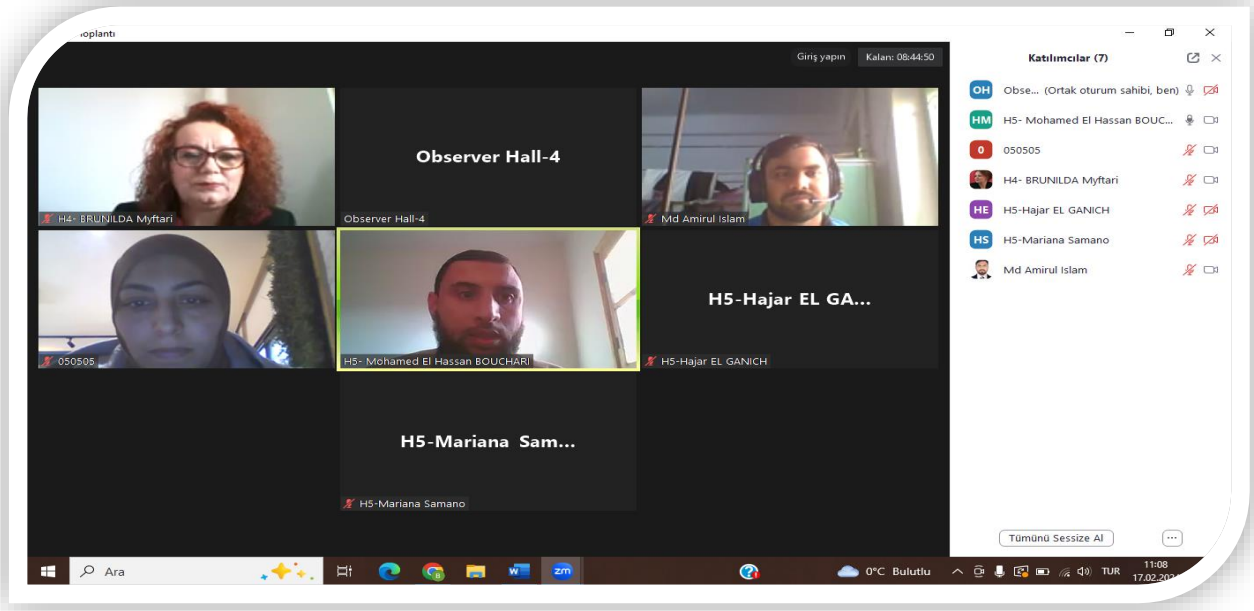


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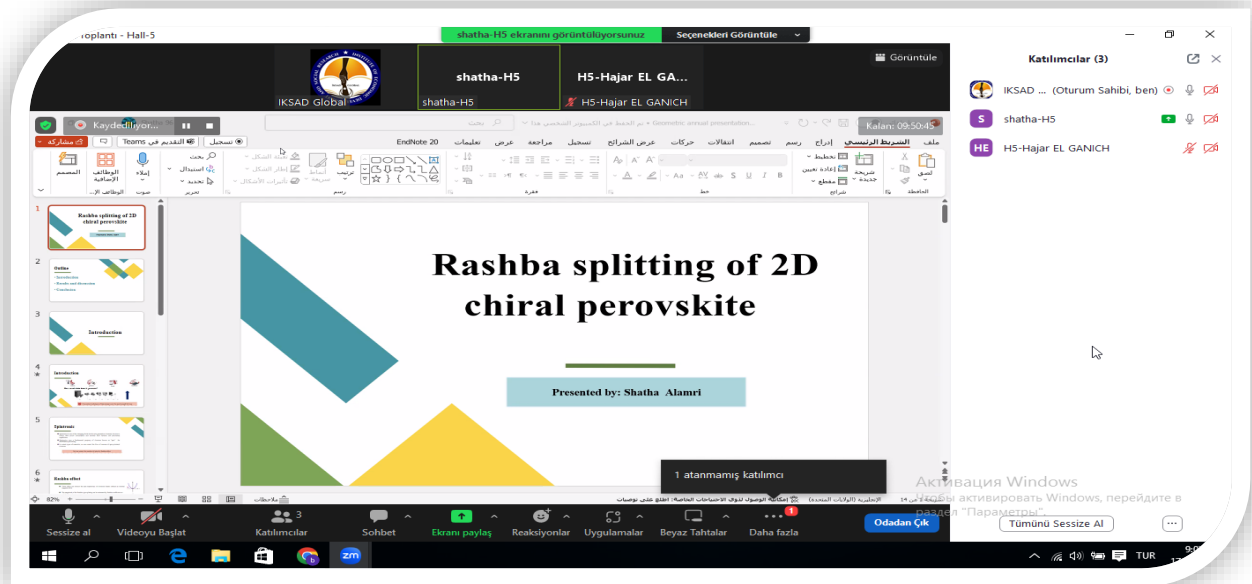
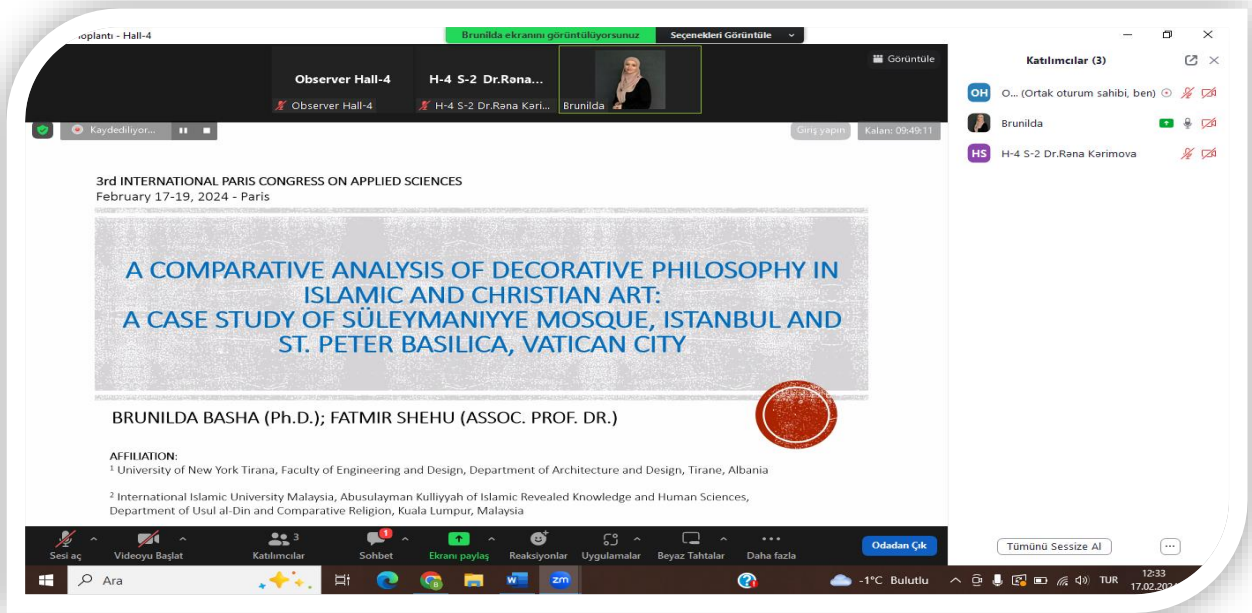


PHOTO GALLERY

opłanti - Hall-6

Seçenekleri Görüntüle

Katılımcılar (10)

Q Katılımcı bul

- IKSAD ... (Oturum Sahibi, ben)
- H6 hall 6/Joanna Cieplińska
- H6 H6- Soufiane EL MEGDAR
- H-6, Dr. Iqra Parvez
- HR H6, RETEM CHAHIRA
- H HALL -6/ session 1, Arieta
- HD Hall-6 Deepak S. Shelke, Dr. A. N...
- PW Patrycja Widlak
- R Rida Fatima
- SE Sehrish eman

Kalan: 08:38:56

JOSEF PILSUDSKI UNIVERSITY OF PHYSICAL EDUCATION IN WARSAW

3rd INTERNATIONAL PARIS CONGRESS ON APPLIED SCIENCES February 17-19, 2024 - Paris

EFFECT OF LIFESTYLE ON BONE MINERAL DENSITY IN EUROPEAN MEN: THE RESULTS OF CROSS-SECTIONAL OBSERVATIONAL STUDY

Prof. (Assoc.) PhD. Anna KOPICZKO¹, PhD. Joanna CIEPLIŃSKA¹
PhD. Natalia BIENKO², Prof. (Assoc.) PhD. Monika ŁOPUSZAŃSKA-DAWID¹

¹Józef Pilsudski University of Physical Education in Warsaw, Faculty of Physical Education

of Public Health NIH - National Research Institute, Warsaw, Poland

Windows

Windows

Sesimi Aç (Alt+A). Veya sesi geçici olarak açmak için boşluk tuşunu basılı tutabilirsiniz.

Sesi Aç Videocu Başlat Katılımcılar Sohbet Ekranı paylaş Reaksiyonlar Uygulamalar Beyaz Tahtalar Daha fazla Odadan Çık

opłanti - Hall-6

Seçenekleri Görüntüle

Katılımcılar (9)

Q Katılımcı bul

- IKSAD ... (Oturum Sahibi, ben)
- HR H6, RETEM CHAHIRA
- HM H5- Mohamed El Hassan BOUC...
- HS H6- Soufiane EL MEGDAR
- H-6, Dr. Iqra Parvez
- HD H-6-Doris Doda
- H HALL -6/ session 1, Arieta
- H6 hall 6/Joanna Cieplińska
- PW Patrycja Widlak

Kalan: 07:50:21

part 1 - Microsoft PowerPoint

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Laboratoire de NeuroEndocrinologie Appliquée, Département de Biologie, Faculté des Sciences, Université Badji Mokhtar, ANNABA, ALGERIE.

* E-mail: retem.chahira@univ-bba.dz

EFFET D'UN ORGANOPHOSPHORÉE ET D'UN ANTIOXYDANT SUR LES PARAMÈTRES BIOCHIMIQUES DANS UN ENVIRONNEMENT NOCICEPTIF CHEZ LE RAT MÂLE WISTAR

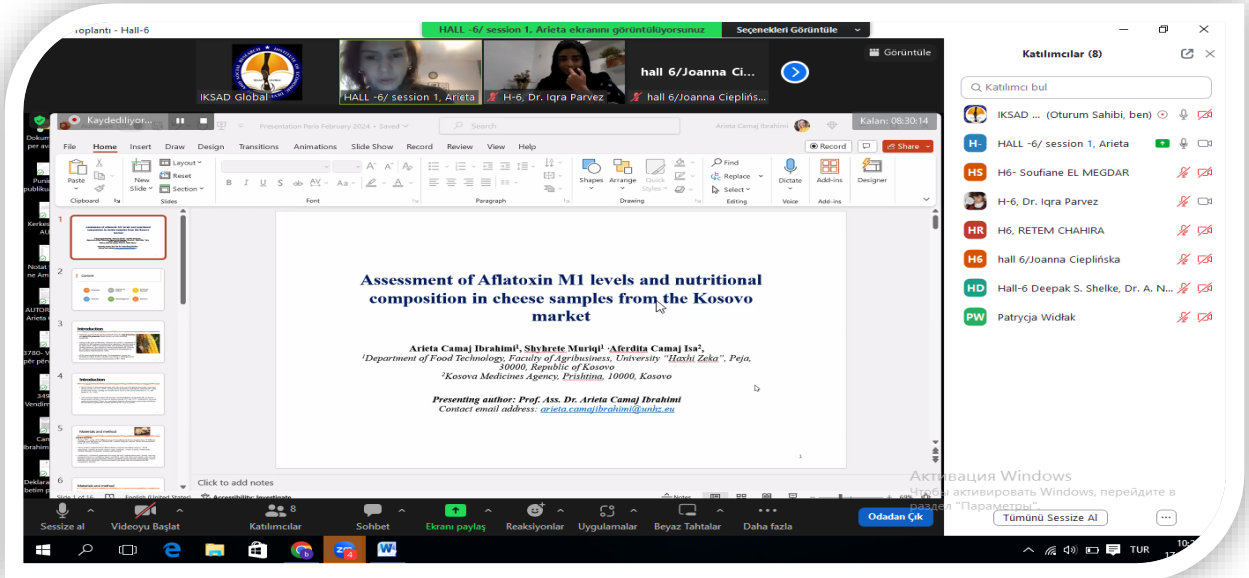
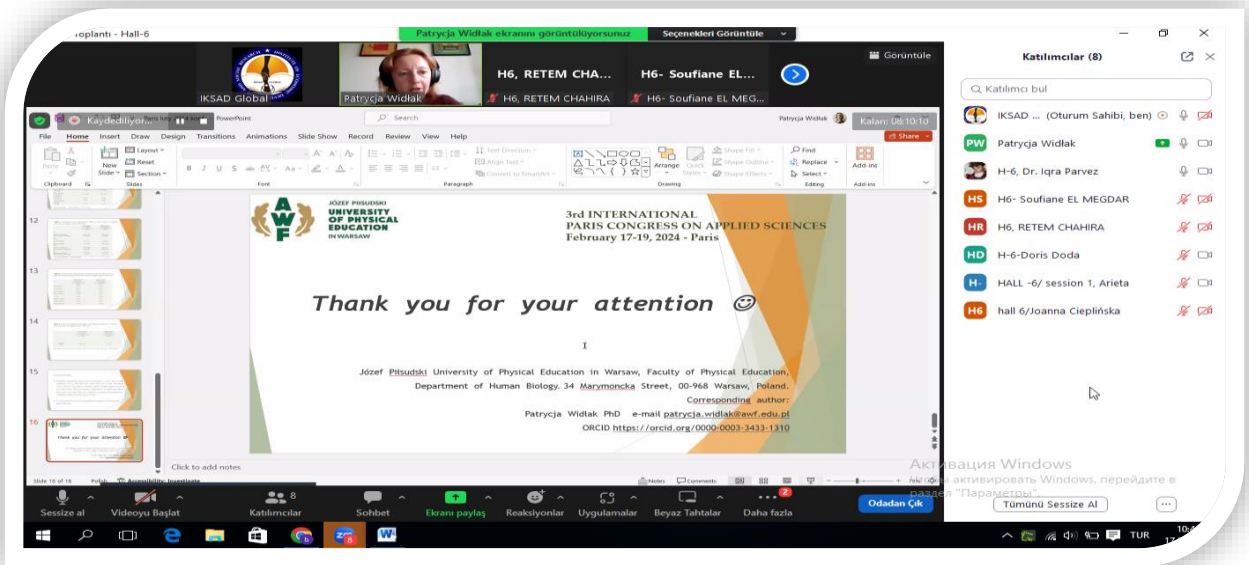
Dr. Retem chahira

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PHOTO GALLERY



3rd INTERNATIONAL PARIS CONGRESS ON APPLIED SCIENCES

February 17-19, 2024 / Paris, FRANCE



CONGRESS PROGRAM



zoom

Meeting ID: 833 4101 6484
Passcode: 050505

Participant Countries (21)

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TUNUSIA, BOSNIA AND HERZEGOVINA, POLAND, GEORGIA, ROMANIA, SERBIA,
MEXICO, SAUDI ARABIA, INDIA, ALGERIA, SLOVAKIA, MALAYSIA, BANGLADESH,
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- Moderatör – oturumdaki sunum ve bilimsel tartışma (soru-cevap) kısmından sorumludur.

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- All congress participants can connect live and listen to all sessions.
- Moderator is responsible for the presentation and scientific discussion (question-answer) section of the session.

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ONLINE PRESENTATIONS

17.02.2024 / HALL-1 / SESSION-1



PARIS LOCAL TIME



08 00 : 10 00



ANKARA LOCAL TIME



10 00 : 12 00

HEAD OF SESSION: **Assoc. Prof. Dr. Mustafa Hakkı AYDOĞDU**

AUTHORS	AFFILIATION	TOPIC TITLE
Res. Assist. Gamze GÜNDOĞDU	<i>Bursa Uludağ University TÜRKİYE</i>	THE EFFECTS OF DIFFERENT WAVELENGTH LED LAMPS EARLINESS AND GROWTH OF TULIP (<i>Tulipa gesneriana L.</i>)
Assist. Prof. Dr. Vedat PİRİNÇ Res. Assist. Erhan AKALP Res. Assist. Levent YORULMAZ Lect. Muhammet ÖNER Sibel IPEKESEN	<i>Dicle University TÜRKİYE</i>	EFFECT OF POTASSIUM NITRATE APPLICATION ON QUALITY OF GARLIC CLOVES
Res. Assist. Levent YORULMAZ Res. Assist. Erhan AKALP Lect. Muhammet ÖNER Sibel IPEKESEN Prof. Dr. B. Tuba BİÇER	<i>Dicle University TÜRKİYE</i>	IMPACTS OF ORGANIC MANURE AND CHEMICAL MANURE ON DIFFERENT DEVELOPMENTAL STAGES OF CHICKPEA UNDER SEMI-CONTROLLED GREENHOUSE CONDITIONS
M. Sc. Gülistan VURGUN Assoc. Prof. Dr. Mustafa Hakkı AYDOĞDU	<i>Harran University TÜRKİYE</i>	A RESEARCH ON THE ORGANIZATIONAL SITUATION OF FARMERS IN ŞANLIURFA-SURUÇ PLAIN IRRIGATIONS – TÜRKİYE
M. Sc. Gülistan VURGUN Assoc. Prof. Dr. Mustafa Hakkı AYDOĞDU	<i>Harran University TÜRKİYE</i>	A RESEARCH ON FARMERS' AGRICULTURAL CREDIT USAGE: SURUÇ PLAIN IRRIGATIONS, ŞANLIURFA-TÜRKİYE
Elshad GURBANOV Humira HUSEYNOVA Afag RZAYEVA	<i>Baku State University AZERBAIJAN Baku Engineering University AZERBAIJAN</i>	DISTRIBUTION OF THE JUNIPER (<i>JUNIPERUS L.</i>) GENUS ON THE ABSHERON PENINSULA
Luca QUARANTA Piera DI MARZIO Paola FORTINI	<i>University of Molise ITALY</i>	WHAT FUTURE FOR URBAN TREE COMMUNITIES DUE TO CLIMATE CHANGE? HEALTH STATUS ANALYSIS USING PLANT FUNCTIONAL TRAITS - NATIONAL BIODIVERSITY FUTURE CENTER (NBFC)

Paris





ONLINE PRESENTATIONS

17.02.2024 / HALL-2 / SESSION-1



PARIS LOCAL TIME



08 00 : 10 00



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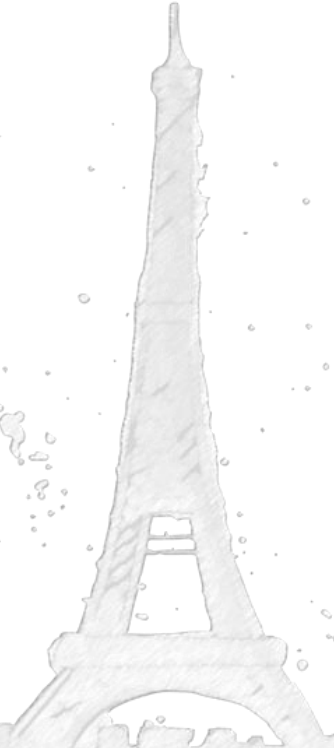


10 00 : 12 00

HEAD OF SESSION: **Assist. Prof. Dr. Sinan ERDOĞAN**

AUTHORS	AFFILIATION	TOPIC TITLE
Ömer KARAKUŞ Prof. Dr. Mete KALYONCU	<i>Akko Machinery Industry and Trade Inc., Konya TÜRKİYE Konya Technical University TÜRKİYE</i>	MODELLING OF CUTTING FORCE IN TURNING PROCESS BASED ON ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM
Eyüp Can İÇLİ	<i>Oyak Renault Automobile Factory TÜRKİYE</i>	MICROSTRUCTURAL ANALYSIS OF STAINLESS STEEL VARIETIES ACROSS DIFFERING THICKNESSES
Hüseyin ERGİN Mücahit Engin KARADENİZ Gökhan GELEN	<i>Makine Otomasyon Proses San. ve Tic. A.Ş. TÜRKİYE Bursa Technical University TÜRKİYE</i>	SERVO CONTROL DESIGN AND APPLICATION FOR AYRAN PACKAGING LINE CAPPING UNIT
Assist. Prof. Dr. Mustafa Kemal BALKİ	<i>Sinop University TÜRKİYE</i>	INVESTIGATION OF PERFORMANCE AND SPECIFIC EMISSIONS IN A LOW-POWER COMPRESSION IGNITION ENGINE USING BIODIESEL/METHANOL MIXTURE
Assist. Prof. Dr. Kaan Emre ENGIN	<i>Adıyaman University TÜRKİYE</i>	A STUDY ON THE IMPACT OF DIE SPEED ON DRAWING LOAD IN MULTI- POINT DEEP DRAWING PROCESS OF AISI 1010 STEEL USING NUMERICAL ANALYSIS
Assist. Prof. Dr. Sinan ERDOĞAN	<i>Sakarya University TÜRKİYE</i>	THE ROLE OF NIOBIUM IN SOLID-STATE BATTERY TECHNOLOGY AND ITS WORLD RESERVES
Kerim İŞLER Prof. Dr. Mete KALYONCU	<i>Buzçelik Thermal Devices Industry Joint Stock Company TÜRKİYE Konya Technical University TÜRKİYE</i>	INVESTIGATION OF THE EFFECTS OF REFRIGERANTS AND EVAPORATING/CONDENSING TEMPERATURES ON THE CAPACITY OF A FINNED TUBE EVAPORATOR

Paris





ONLINE PRESENTATIONS

17.02.2024 / HALL-3 / SESSION-1



PARIS LOCAL TIME



08 00 : 10 00



ANKARA LOCAL TIME



10 00 : 12 00

HEAD OF SESSION: **Prof. Dr. Ergul Belge KURUTAŞ**

AUTHORS	AFFILIATION	TOPIC TITLE
Assist. Prof. Dr. Fırat Aşır Exp. İlhan Özdemir	<i>Dicle University TÜRKİYE Private Buhara Hospital, Erzurum TÜRKİYE</i>	THE SIGNALING PATHWAYS IN THE TREATMENT OF OVARIAN CANCER
Assoc. Prof. Dr. Aslı Eryılmaz Exp. Dr. Dilek Doğanbaş Exp. İlhan Özdemir Assoc. Prof. Dr. Şamil Öztürk	<i>Kahramanmaraş Sütçü İmam University TÜRKİYE Women's Health and Clinic, Bursa TÜRKİYE Private Buhara Hospital, Erzurum TÜRKİYE Çanakkale Onsekiz Mart University TÜRKİYE</i>	SIRT-2 IMMUNOREACTIVITY IN PLACENTAS OF PREGNANT WOMEN WITH GESTATIONAL DIABETES
Seda İKİKARDEŞ Prof. Dr. Ergul Belge KURUTAŞ Assist. Prof. Dr. Figen GÜZELGÜL	<i>Kahramanmaraş Sütçü İmam University TÜRKİYE Tokat University TÜRKİYE</i>	EVALUATION OF RAFTLIN AND 8- ISOPROSTAGLANDIN LEVELS ON THE CLINICAL SEVERITY OF CASES WITH COVID-19
Prof. Dr. Ergul Belge KURUTAŞ Seda İkikardeş	<i>Kahramanmaraş Sütçü İmam University TÜRKİYE</i>	THE ASSOCIATION OF RAFTLIN AND DISEASE ACTIVITY IN SEBORRHEIC DERMATITIS
Lect. Melek KILIÇ Res. Assist. Rüveyda ÖLMEZ YALAZI	<i>Fenerbahçe University TÜRKİYE Çanakkale Onsekiz Mart University TÜRKİYE</i>	GENDER INEQUALITY AND ABORTION: A REVIEW STUDY
Res. Assist. Rüveyda ÖLMEZ YALAZI Lect. Melek KILIÇ	<i>Çanakkale Onsekiz Mart University TÜRKİYE Fenerbahçe University TÜRKİYE</i>	INTERVENTIONS FOR PERINEAL TRAUMA: A REVIEW STUDY
Assist. Prof. Dr. Pınar YILMAZ EKER Zekeriya GÜL	<i>Sivas Cumhuriyet University TÜRKİYE</i>	THE EFFECT OF NASALE CONGESTION ON ANXIETY AND QUALITY OF LIFE IN SEPTORHINOPLASTY PATIENTS
Lect. Rukiye DİKMEN Lect. Emine İLKİN AYDIN	<i>Yozgat Bozok University TÜRKİYE</i>	RESUSITATION AND NURSING DURING PREGNANCY
Lect. Rukiye DİKMEN Lect. Emine İLKİN AYDIN	<i>Yozgat Bozok University TÜRKİYE</i>	SMOKING AND INFERTILITY

Paris





ONLINE PRESENTATIONS

17.02.2024 / HALL-4 / SESSION-1



PARIS LOCAL TIME



08⁰⁰ : 10⁰⁰



ANKARA LOCAL TIME



10⁰⁰ : 12⁰⁰

HEAD OF SESSION: **Dariusz BOGUSZEWSKI**

AUTHORS	AFFILIATION	TOPIC TITLE
Dariusz BOGUSZEWSKI	<i>Jozef Pilsudski University of Physical Education in Warsaw POLAND</i>	EFFECTIVENESS OF ONE-TIME SELF-MASSAGE USING A FOAM ROLLER IN REDUCING FUNCTIONAL LIMITATIONS OF THE MUSCULOSKELETAL SYSTEM
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	NOVEL RESISTIVE BUTANOL SENSOR
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	NOVEL RESISTIVE N- PROPANOL SENSOR
Rustam Madiev Tulqin Turayev Shaira Musaeva	<i>Tashkent Medical Academy UZBEKISTAN</i>	THE ONLY CASE OF SURGICAL CORRECTION OF THE SECOND TYPE OF COMMON ARTERIAL TRUNK, COMPLICATED BY AN EXTREMELY HIGH DEGREE OF PULMONARY HYPERTENSION USING A MATHEMATICAL APPROACH
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	OXIDIZED CARBON NANOHORNS - BASED NANOHYBRID AS SENSING LAYER FOR NOVEL RELATIVE HUMIDITY SENSOR
Rzayev Zaur Asad Museyibov Farid Musa Akhundov İmran Adil Cafarova Qumru Kamil Babayeva Milada Xanbala	<i>Azerbaijan State Advanced Training Institute for Doctors named after A. Aliyev AZERBAIJAN Azerbaijan Medical University AZERBAIJAN Odlar Yurdu University AZERBAIJAN</i>	STUDY OF THE EFFECT OF OSTEOPLASTIC MATERIALS ON THE REGENERATION ABILITY OF JAW BONES UNDER EXPERIMENTAL CONDITIONS
Brunilda MYFTARI Ledjan MALAJ Eni BUSHI Elton MYFTARI	<i>University of Medicine ALBANIA</i>	EVALUATION OF THE IN VITRO PERFORMANCE OF TOPICAL PRODUCTS DEPENDING ON THE TYPE OF MEMBRANE
Prof. Levan Baramidze Assist. Prof. Lia Gumbaridze Mariam Shotadze	<i>Tbilisi State Medical University GEORGIA</i>	STUDY AWARENESS OF PASSIVE SMOKING AS A RISK FACTOR AMONG THE STUDENTS OF TBILISI STATE MEDICAL UNIVERSITY



ONLINE PRESENTATIONS

17.02.2024 / HALL-5 / SESSION-1



PARIS LOCAL TIME



08⁰⁰ : 10⁰⁰



ANKARA LOCAL TIME

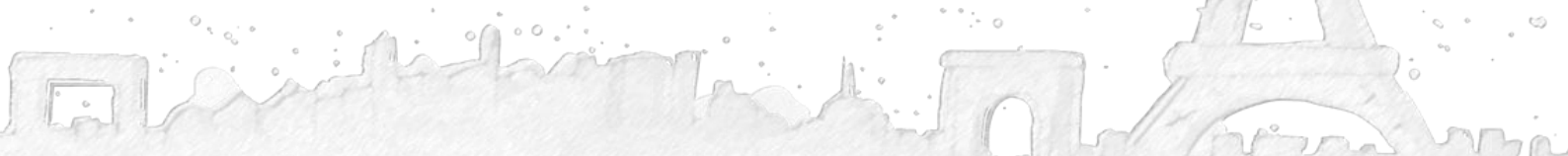
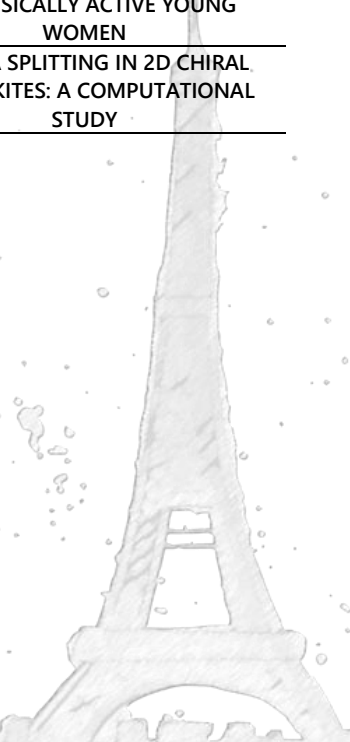


10⁰⁰ : 12⁰⁰

HEAD OF SESSION: **Prof. Dr. Ivan PAVLOVIC**

AUTHORS	AFFILIATION	TOPIC TITLE
Hajar EL GANICH Omar EL RHAZOUANI Elmadani SAAD	<i>Hassan First University of Settat MOROCCO</i>	COMPUTATION OF THE EXCHANGE INTERACTIONS IN CaCu ₃ Fe ₂ Os ₂ O ₁₂ QUADRUPLE PEROVSKITE: MONTE CARLO SIMULATION
Hela GUESMI	<i>National School of Engineering, Monastir TUNUSIA</i>	HEAT TRANSFER IN STRATIFIED POROUS ENVIRONMENTS
Prof. Dr. Ivan PAVLOVIC	<i>Scientific Institute of Veterinary Medicine SERBIA</i>	COCCIDIOSIS OF DOMESTIC PIGEONS (COLUMBA LIVIA DOMESTICA) BREED IN SPREAD BELGRADE AREA
Mariana Lopez Samano Kalpana Nanjareddy Miguel Lara Manoj-Kumar Arthikala	<i>National Autonomous University MEXICO</i>	<i>PvNLP5</i> PROMOTER ACTIVITY DURING NODULE FORMATION AND DEVELOPMENT IN PHASEOLUS VULGARIS
Mohamed El Hassan BOUCHARI Abdelilah MEDDICH Abderrahim BOUTASKNIT Abdelmajid HADDIOUI	<i>Sultan Moulay Slimane University MOROCCO Cadi Ayyad University MOROCCO University Mohammed Premier MOROCCO</i>	CONTRIBUTION TO THE STUDY OF WATER STRESS TOLERANCE IN THYMUS SATUREJOIDES UNDER NATURAL CONDITIONS IN THE HIGH ATLAS OF MOROCCO
Amirul Islam Murshida Khatun Ashraful Amin	<i>University of Rajshahi BANGLADESH Institute of Natural Resources Research and Development BANGLADESH</i>	IMPORTANCE AND SETTING IN GIS-BASED SPATIAL ARCHAEOLOGY: A CASE STUDY FROM NORTHWESTERN BANGLADESH
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	RISK OF FISH AND SEAFOOD CONSUMPTION AS A SOCIAL PROBLEM: WHAT YOU NEED TO KNOW?
Bozo DHURATA Xhufi SUELA	<i>Sport University ALBANIA</i>	THE IMPACT OF LOW ENERGY AVAILABILITY ON SKELETAL HEALTH IN PHYSICALLY ACTIVE YOUNG WOMEN
Shatha Alamri	<i>King Abdulaziz University SAUDI ARABIA</i>	RASHBA SPLITTING IN 2D CHIRAL PEROVSKITES: A COMPUTATIONAL STUDY

Paris





ONLINE PRESENTATIONS

17.02.2024 / HALL-6 / SESSION-1



PARIS LOCAL TIME



08⁰⁰ : 10⁰⁰



ANKARA LOCAL TIME



10⁰⁰ : 12⁰⁰

HEAD OF SESSION: **Bogdan-Catalin SERBAN**

AUTHORS	AFFILIATION	TOPIC TITLE
Dr. Iqra Parvez Ms. Ayesha Asif Ms. Sehrish Eman Ms. Rida Fatima	<i>Superior College, Campus for University Programs, Mandi Bahauddin PAKISTAN</i>	PLASTICITY IN MORPHOANATOMICAL ATTRIBUTE OF EUISETUM RAMOSISSIMUM IN MANDI BHAUDDIN DISTRICT, PAKISTAN
Anna KOPICZKO Joanna CIEPLIŃSKA Natalia BIENKO Monika ŁOPUSZAŃSKA-DAWID	<i>Józef Piłsudski University of Physical Education in Warsaw POLAND National Institute of Public Health NIH - National Research Institute POLAND</i>	EFFECT OF LIFESTYLE ON BONE MINERAL DENSITY IN EUROPEAN MEN: THE RESULTS OF CROSS- SECTIONAL OBSERVATIONAL STUDY
Arieta CAMAJ IBRAHIMI Shyhrete MURIQI Aferdita CAMAJ ISA	<i>University Haxhi Zeka KOSOVO Ministry of Health, Kosova Medicines Agency, Prishtinë KOSOVO</i>	ASSESSMENT OF AFLATOXIN M1 LEVELS AND NUTRITIONAL COMPOSITION IN CHEESE SAMPLES FROM THE KOSOVO MARKET
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	ACIDS AND BASES IN ORGANIC CHEMISTRY: EDUCATORS' PERSPECTIVES ON ERRORS AND MISCONCEPTIONS
Soufiane EL MEGDAR Raja ELKHELOUI Fouad MSANDA Mohammed HASSI Fatima HAMADI	<i>Ibn Zohr University MOROCCO</i>	GREEN SYNTHESIS OF LAVANDULA MAIREI-MEDIATED SILVER NANOPARTICLES: ANTIBACTERIAL EFFICACY AGAINST KLEBSIELLA PNEUMONIAE STRAINS
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	ASPARTAME AND SUCRALOSE IN 2024, PROS AND CONS: QUO VADIS?
Chahira RETEM Dounia Amani FERTAS Chaima SMILI	<i>Université Badji Mokhtar ALGERIA</i>	EFFET D'UN ORGANOPHOSPHOREE ET D'UN ANTIOXYDANT SUR LES PARAMETRES BIOCHIMIQUES DANS UN ENVIRONNEMENT NOCICEPTIF CHEZ LE RAT MALE WISTAR
Chahira RETEM Dounia Amani FERTAS Fella CHEBBAH	<i>Université Badji Mokhtar ALGERIA</i>	EVALUATION COMPORTEMENTALES ET ADAPTATIVES D'UN STRESS DE CONTENTION CHEZ LES RATTES WISTAR
Patrycja WIDŁAK Marzena MALARA	<i>Józef Piłsudski University of Physical Education in Warsaw POLAND</i>	BODY FAT, LIPID PROFILE AND SELECTED HORMONES IN ACTIVE POLISH STUDENTS CHARACTERIZED BY LOWER AND HIGHER NORMAL TSH LEVELS



ONLINE PRESENTATIONS

17.02.2024 / HALL-1 / SESSION-2



PARIS LOCAL TIME



10 30 : 12 30



ANKARA LOCAL TIME



12 30 : 14 30

HEAD OF SESSION: **Assoc. Prof. Dr. Nazife ERARSLAN**

AUTHORS	AFFILIATION	TOPIC TITLE
Mehmet Furkan KUNDURACI Prof. Dr. Fatih BAŞÇİFTÇİ	<i>Selçuk University TÜRKİYE</i>	MOBILE APPLICATION THAT DETECTS DISEASES FROM FRESH FRUITS AND VEGETABLES, PLANTS AND LEAVE IMAGES
Fatma GÖNGÖR Prof. Dr. Önder TUTSOY	<i>Adana Alparslan Turkes Science and Technology University TÜRKİYE</i>	A REVIEW OF RECENT ADVANCEMENTS IN DEEP MACHINE LEARNING, ARTIFICIAL INTELLIGENCE, OBJECT DETECTION, AND HUMAN-ROBOT INTERACTIONS APPROACHES FOR ASSISTIVE ROBOTICS
Fatma GÖNGÖR Prof. Dr. Önder TUTSOY	<i>Adana Alparslan Turkes Science and Technology University TÜRKİYE</i>	PHYSICAL EXERCISE OF GERIATRIC PATIENTS WITH ASSISTIVE HEALTH-CARE HUMANOID ROBOTS UTILIZING SOCIAL DIALOGUE AND MACHINE LEARNING ALGORITHMS
Dr. Binnur KAPTAN GÜNÜÇ	<i>Tekirdağ Namık Kemal University TÜRKİYE</i>	NANOTECHNOLOGICAL APPLICATIONS IN DAIRY INDUSTRY
Assoc. Prof. Dr. Nazife ERARSLAN	<i>İzmir Demokrasi University TÜRKİYE</i>	PLASTIC STRAIN ACCUMULATION IN CEMENT STABILIZED SOIL SPECIMENS UNDER CYCLIC LOADING
Assoc. Prof. Dr. Nazife ERARSLAN	<i>İzmir Demokrasi University TÜRKİYE</i>	COHESIVE FRACTURE CHARACTERISTICS OF SOILS STABILIZED BY BLAST FURNACE SLAG CEMENT
Merve KARTAL Assoc. Prof. Dr. Nazife ERARSLAN	<i>İzmir Demokrasi University TÜRKİYE</i>	NUMERIAL ANALYSIS OF MIXED MODE (I-II) COHESIVE FRACTURING IN CEMENT STABILIZED SOILS
Gizem Elif KORKMAZ Prof. Dr. Mine YAMAN	<i>Fırat University TÜRKİYE</i>	EFFECT OF VITAMIN-D ON THE EXPRESSION OF SOME ADIPOKINES IN RAT OVARY IN AN EXPERIMENTAL POLYCYSTIC OVARY SYNDROME (PCOS) MODEL

Paris





ONLINE PRESENTATIONS

17.02.2024 / HALL-2 / SESSION-2



PARIS LOCAL TIME



10 30 : 12 30



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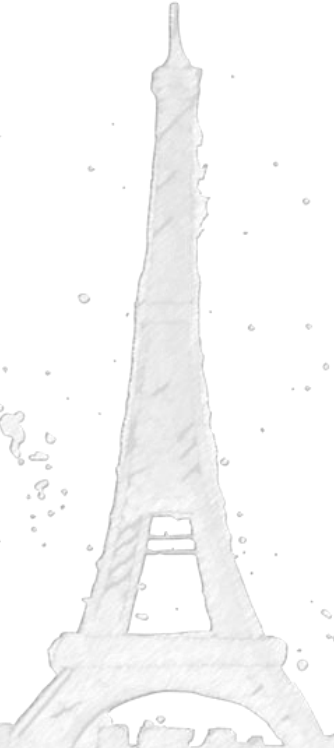


12 30 : 14 30

HEAD OF SESSION: **Dr. Meltem COŞANER TONYALI**

AUTHORS	AFFILIATION	TOPIC TITLE
Pınar ÇAVDAR Merve GÜÇ	<i>İzmir Demokrasi University TÜRKİYE</i>	THE DEFORMATION AND DESIGN ANALYSIS OF CYLINDRICAL UNDERGROUND WATER TANKS DEPENDING ON SOIL TYPE
Pınar ÇAVDAR	<i>İzmir Demokrasi University TÜRKİYE</i>	DEVELOPMENT OF DIM STREAM FLOOD HAZARD MAPS WITH HEC-RAS 2D MODEL
Dr. Meltem COŞANER TONYALI Prof. Dr. Tuğba KİPER	<i>Istanbul Metropolitan Municipality TÜRKİYE Tekirdağ Namık Kemal University TÜRKİYE</i>	QUANTITATIVE ANALYSIS OF POSTGRADUATE THESES ON PUBLIC SPACES WRITTEN IN THE FIELD OF PLANNING AND DESIGN
Dr. Meltem COŞANER TONYALI Prof. Dr. Tuğba KİPER	<i>Istanbul Metropolitan Municipality TÜRKİYE Tekirdağ Namık Kemal University TÜRKİYE</i>	BIBLIOMETRIC ANALYSIS OF STUDIES ON URBAN IDENTITY IN THE TRANSFORMATION OF PUBLIC SPACES
Ece TOPALOĞLU Prof. Dr. Emel AŞICI	<i>Bursa Technical University TÜRKİYE</i>	METHODS TO CONSTRUCT T-NORMS (T-CONORMS) ON APPROPRIATE BOUNDED LATTICES
Hakan OKYAY Assoc. Prof. Dr. Nesrin AKCA	<i>Kırkkale University TÜRKİYE</i>	DETERMINATION OF ENTREPRENEURSHIP LEVELS OF HEALTH MANAGEMENT DEPARTMENT STUDENTS: THE CASE OF TÜRKİYE
Ercan KESKİN Deniz ULUIŞIK Semiha KANAÇ	<i>Selçuk University TÜRKİYE</i>	NEUROTROPHIN FAMILY

Paris





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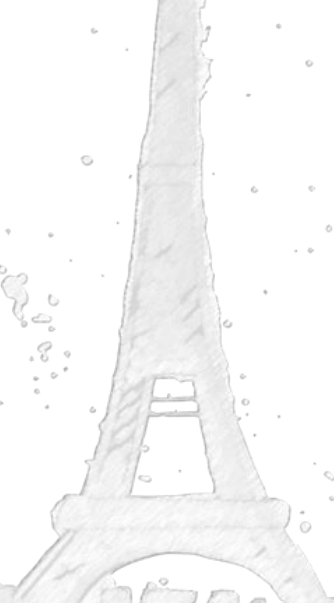


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Şerife AYTULU Lect. Beyza MENDEŞ	<i>Bezmialem Vakıf University TÜRKİYE</i>	MEDICAL NUTRITION THERAPY OF CYSTIC FIBROSIS – ASSOCIATED DIABETES
Anıl DELİK Yakup ÜLGER	<i>Çukurova University TÜRKİYE</i>	EFFECT OF ETIOLOGICAL FACTORS ON ALPHA FETO PROTEIN LEVELS: A COMPARATIVE ANALYSIS IN HEPATOCELLULAR CARCINOMA PATIENTS
Gülnur ERÇELİK Ahu DEMİRTAŞ	<i>Burdur Mehmet Akif Ersoy University TÜRKİYE</i>	THE ROLE OF PROBIOTICS IN THE TREATMENT OF DISEASES ASSOCIATED WITH GUT MICROBIOTA DYSBIOSIS
Dr. Sevgi GÜLYÜZ	<i>Marmara Research Center, TUBITAK, Gebze, Kocaeli, TÜRKİYE</i>	SYNTHESIS AND SELF-ASSEMBLY OF COUMARIN-PEPTIDE HYDROGELATOR FOR BIOMEDICAL APPLICATIONS
Elin KARADAG YAVUZ Prof. Dr. Soner ŞAHİN Prof. Dr. Zeynep Birsu ÇİNÇİN	<i>Nişantaşı University TÜRKİYE</i>	SYSTEMATIC ANALYZING OF ARTIFICIAL INTELLIGENCE STUDIES CARRIED OUT ON PEOPLE WITH GLIOBLASTOMA BETWEEN THE YEARS 2018 AND 2023
Semanur ŞAHİN Prof. Dr. Soner ŞAHİN Prof. Dr. Zeynep Birsu ÇİNÇİN	<i>Nişantaşı University TÜRKİYE</i>	THE DEVELOPMENT OF A NANOTECHNOLOGY – BASED PROBIOTIC FOOD SUPPLEMENT FOR THE INDIVIDUAL TREATMENT OF NEUROLOGICALLY EFFECTIVE GASTROINTESTINAL DISEASES: SYSTEMATIC ANALYSIS
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Saffet KILIÇER	<i>Artvin Çoruh University TÜRKİYE</i>	STRUCTURAL LOAD EXAMPLE FOR MARS STRUCTURES: ICE LOAD

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12³⁰ : 14³⁰

HEAD OF SESSION: **Bogdan-Catalin SERBAN**

AUTHORS	AFFILIATION	TOPIC TITLE
Kutliyeva G.J. Turaeva B.I. Kamalova H.F. Kuziev B.U.	<i>Institute of Microbiology of the Academy of Sciences of the Republic of UZBEKISTAN</i>	OPTIMIZATION OF CULTIVATION CONDITIONS FOR BACTERIA OF THE GENUS BACILLUS SUBTILIS TO INCREASE CELLULASE ACTIVITY
Dr. Kərimova Rəna Cabbar Assoc. Prof. Dr. Hüseynova Gülbəniz Asif Assoc. Prof. Dr. İradə Əliyeva Cəmiyyəvna Prof. Abiyev Hüseyn Əzizulla Abaszadə Zümrüd Əmirqulu Dr. İsmaylova Fatma Zakir	<i>Azerbaijan Medical University AZERBAIJAN</i>	CONGENITAL ADRENOGENITAL DISORDERS, PHYSIOLOGICAL CHARACTERISTICS, DIAGNOSTIC METHODS
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	HOLEY CARBON NANOHORNS- BASED SENSING LAYER FOR NOVEL RESISTIVE ETHANOL SENSOR
Dr. Kərimova Rəna Cabbar Assoc. Prof. Dr. İradə Əliyeva Cəmiyyəvna Assoc. Prof. Dr. Hüseynova Gülbəniz Asif Prof. Abiyev Hüseyn Əzizulla Dr. Əliyeva Günel Məhərrəm Abaszadə Zümrüd Əmirqulu	<i>Azerbaijan Medical University AZERBAIJAN</i>	PHYSIOLOGICAL STUDY, TREATMENT AND DIAGNOSTIC DETECTION OF DRUG-INDUCED HYPOGLYCEMIA OBSERVED WITHOUT COMA
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	NATURAL AND SYNTHETIC COMPOUNDS: WHAT DO WE KNOW ABOUT THEM?
BRUNILDA BASHA FATMIR SHEHU	<i>University of New York Tirana ALBANIA International Islamic University MALAYSIA</i>	A COMPARATIVE ANALYSIS OF DECORATIVE PHILOSOPHY IN ISLAMIC AND CHRISTIAN ART: CASE STUDY OF SULEYMANIYYE MOSQUE, ISTANBUL AND ST. PETER BASILICA, VATICAN CITY
Bertina HOXHA LAMI Entela NEZIRI	<i>Sports University ALBANIA</i>	URINARY TRACT INFECTIONS IN TIRANA, ALBANIA
Prof. Axundov Ramiz Atalla Prof. Abiyev Hüseyn Əzizulla Dr. Kərimova Rəna Cabbar Assoc. Prof. Xanım Aydın Assoc. Prof. Dr. Abdulkərimova Fatimə Dursun Axundova Xumra Ramiz	<i>Azerbaijan Medical University AZERBAIJAN</i>	OXIDATIVE STRESS, MECHANISMS OF OCCURRENCE, WAYS OF CORRECTION IN PATHOLOGICAL CONDITIONS



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HEAD OF SESSION: Prof. Dr. Saša SALAPURA

AUTHORS	AFFILIATION	TOPIC TITLE
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Dr. Gandhimathi AMIRTHALINGAM Midun THANGAVEL	<i>King Khalid University SAUDI ARABIA Dr. Mahalingam College of Engineering and Technology INDIA</i>	OBJECT DETECTION WITH INCEPTION BASED FEATURE EXTRACTOR ON UAV VIDEOS USING CNN
B. Derrar Y. Bakhti A. Boubaa	<i>University of Science and Technology of Oran Mohamed Boudiaf ALGERIA University of Oran 2 Mohamed Ben Ahmed ALGERIA</i>	A DIGITAL APPROACH TO THE BEHAVIOR OF A WIND TURBINE INSTALLATION
Muneeb HASSAN	<i>Pakistan Institute of Engineering and Technology PAKISTAN</i>	GLOBAL APPLICATION OF AASHTO STANDARD METHODOLOGY FOR BITUMEN GRADE DETERMINATION BASED ON SOFTENING POINT USING PYTHON PROGRAMMING LANGUAGE
Kinga GALEWSKA	<i>The John Paul II Catholic University POLAND</i>	PERCEPTION OF GREEN TRANSITION IN THE INTERNATIONAL ENVIRONMENT
Saadia EL OMARI Amar HABSAOUI Soumia BELOUFA	<i>Ibn Tofail University MOROCCO Hassan II University MOROCCO</i>	ANALYTICAL VALIDATION OF A METHOD FOR THE DETERMINATION OF TADALAFIL AND ITS IMPURITIES BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY IN THE DRUG (ACTIVE INGREDIENT, TADALAFIL 5 MG) FILM-COATED TABLETS
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Khadija OUTALB Hassan CHAIR Soumia BELOUFA	<i>University Hassan II MOROCCO</i>	ULTRASONIC EXTRACTION OF SUGAR JUICE FROM CAROB PULP: EFFECTS OF EXTRACTION FACTORS
Norah Alotaibi	<i>King Abdulaziz University SAUDI ARABIA</i>	DFT ANALYSIS OF THE CATALYTIC ACTIVITY OF CU55 AND CU13@NI42 NANOPARTICLES AS CATALYSTS FOR THE HYDROGENATION OF CO2 TO FORMIC ACID
Eris NEPRAVISHTA Prof. Dr. Skender TOPI Dr. Armela KAPAJ	<i>Aleksander Moisiu University ALBANIA Aleksander Xhuvani University ALBANIA</i>	SURGICAL SITE INFECTIONS INCIDENCE AND ASSOCIATED RISK FACTORS AMONG ELECTIVE AND EXPEDITED SURGERY IN TIRANA, ALBANIA: A CROSS SECTIONAL STUDY



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HEAD OF SESSION: **Dr. Jona PUCI**

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Dr. Kərimova Rəna Cabbar Assoc. Prof. Dr. İradə Əliyeva Cəmiyyəvna Prof. Abiyev Hüseyn Əzizulla Bədəlova Aytac Tahir Dr. Babayeva Mənsurə Yaşar Məmmədov Şahmar Əjdər	<i>Azerbaijan Medical University AZERBAIJAN</i>	PATHOPHYSIOLOGICAL REFUTATION OF THE PATHOGENESIS OF STRESS-INDUCED DISRUPTION OF ADRENAL HORMONES AND INFERTILITY
Dr. Kərimova Rəna Cabbar Assoc. Prof. Dr.İradə Əliyeva Cəmiyyəvna Prof. Abiyev Hüseyn Əzizulla Dr. Babayeva Mənsurə Yaşar Məmmədov Şahmar Əjdər Bədəlova Aytac Tahir	<i>Azerbaijan Medical University AZERBAIJAN</i>	PATHOLOGICAL AND PHYSIOLOGICAL ROLE OF ADRENAL HORMONES IN THE PATHOGENESIS OF INFERTILITY CAUSED BY PSYCHOLOGICAL STRESS
Bogdan-Catalin SERBAN Octavian BUIU Marius BUMBAC Cristina-Mihaela NICOLESCU Vlad DIACONESCU	<i>National Institute for Research and Development in Microtechnologies- IMT ROMANIA Valahia University ROMANIA University of Medicine and Pharmacy 'Carol Davila' ROMANIA</i>	FAKE NEWS IN CHEMISTRY: A SOCIAL PROBLEM WITH HUGE IMPACT
Dr. Doris DODA Dr. Erdet KELLICI	<i>Barleti University ALBANIA European University ALBANIA</i>	ANALIZING STUDENT PERFORMANCE AND INTERACTION IN A VIRTUAL LEARNING ENVIRONMENT
Dr. Ashok Bhavale Deepak Shelke	<i>Modern College of Arts INDIA</i>	p - LABELING OF POSETS
Dr. Jona PUCI	<i>University of New York Tirana ALBANIA</i>	A COMPREHENSIVE STUDY OF BUSINESS PERFORMANCE INDICATORS IN THE ALBANIAN CONSTRUCTION SECTOR
Dr. Mimoza Kotollaku MSc. Rejsi Kotollaku Msc Ansi Kotollaku	<i>Aleksander Xhuvani University ALBANIA</i>	STANDARDIZATION FOR TOURISM AND RELATED SERVICES – ALBANIA
Csaba VÖRÖS	<i>J. Selye University SLOVAKIA</i>	RESEARCH ON MANAGERIAL TECHNOSTRESS KNOWLEDGE AND ATTITUDES

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ENERGY EFFICIENT SOLAR TRACKING SYSTEM USING IOT

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ABSTRACT

In this paper, the process of increasing the efficiency of the existing solar installation is described by introducing the functionality of automated tracking of the Sun's movement in two axes. The task of the positioning module is to ensure that the solar platform is always perpendicular to the Sun, i.e., that the angle of incidence (the angle between the perpendicular line to the surface of the solar panel and the sun's rays) is as close to 0° as possible at all times.

Two different approaches to tracking the movement of the Sun are described: the first approach involves a numerical model where the values of angles to be assumed are calculated using astronomy formulas for known input values of date and time (along with knowledge of the position of the solar installation: geographical latitude and longitude of installed solar panels). The values of horizontal and vertical angles can be precalculated and read from internal memory or obtained from the internet using a web service that calculates the required angle values. The second approach is based on measuring the current values of solar radiation and determining the direction and magnitude of the necessary movement on each axis to achieve maximum radiation on the surface of the solar platform.

Key Words: dual-axis tracking system, Sun position, numerical model, measuring model, memory cached table, web service, LDR photoresistor, servo, IoT

INTRODUCTION

Fixed solar system loses energy every day. Depending on the conditions during the day, these losses can reach an amount that is the same as the energy obtained.

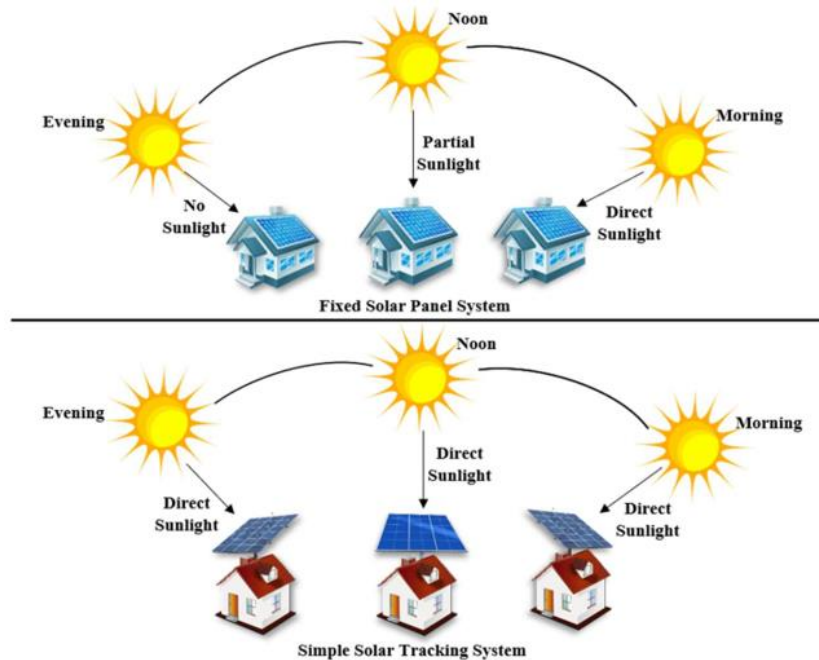


Figure 1 Comparison between Fixed and Simple Solar Tracking Systems [1]

The Earth completes one full rotation on its axis in approximately 24 hours. This means that the Earth turns 360 degrees in 24 hours, so it turns 15 degrees in one hour. It takes 4 minutes for the Sun to move 1 degree, i.e. Sun will travel 3 degrees in a 12 minutes.

That is why the solar tracker system is being used more and more often.

A sun tracking system is a device that directs solar panels, reflectors, lenses or other optical devices directly towards the sun's radiation. Some of these solar panels used a sun tracking technique, so that the solar zenith angle is kept equal to zero, to increase the amount energy production during a day.

The effective collection area of a flat-panel solar collector varies with the cosine of the angle of misalignment (i.e. angle of incidence) of the panel with the Sun.

Power lost due to misalignment:

$$\text{Loss} = 1 - \cos(i) \quad (1)$$

Power loss is less than 1% at 8° and less than 10% at 25° [2].

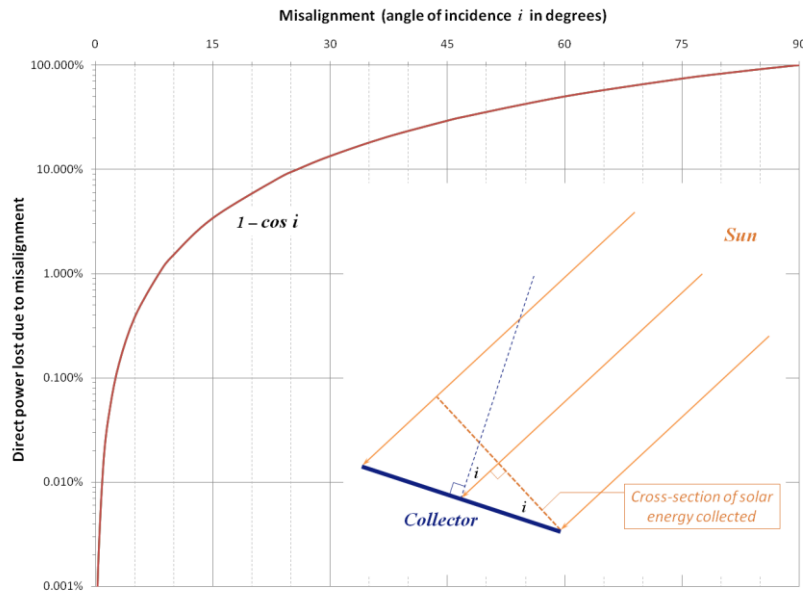


Figure 2 Power loss [2]

Power collected drops off rapidly beyond misalignment angles of around 30°, with 30% power loss at 45°, 50% loss at 60° and 75% direct power loss at 75°.

Table 1 Direct power loss (%) due to misalignment: Loss = 1 – cos(i) [2]

Angle i	Hours	Loss
0°		0%
1°	4 min	0.015%
3°	12 min	0.14%
8°	32 min	1%
15°	1	3.4%
23.4°		8.3%
30°	2	13.4%
45°	3	30%
60°	4	>50%
75°	5	>75%

The main goal of solar tracking systems is to point the solar platform perpendicular to the sun. This means that the angle is equal to 0° (direct sunlight):

$$i = 0^\circ \Rightarrow \cos(0) = 1 \Rightarrow \text{Loss} = 1 - \cos(i) = 0 \quad (2)$$

Analysis of the research problem

The task of the positioning module is to ensure that the solar platform is always perpendicular to the Sun, i.e., that the angle of incidence (the angle between the perpendicular line to the surface of the solar panel and the sun's rays) is as close to 0° as possible at all times.

Two different approaches to tracking the movement of the Sun are described: calculate or measure!

This paper describes first of two different approaches to tracking the movement of the Sun:

1. the first approach involves a numerical model where the values of angles to be assumed are calculated using astronomy formulas for known input values of date and time (along with knowledge of the position of the solar installation: geographical latitude and longitude of installed solar panels). The values of horizontal and vertical angles can be precalculated and read from internal memory or obtained from the internet using a web service that calculates the required angle values.
2. The second approach is based on measuring the current values of solar radiation and determining the direction and magnitude of the necessary movement on each axis to achieve maximum radiation on the surface of the solar platform.

Numerical model

We can calculate position of Sun using astronomy formulas for known input values of date and time and position of installed solar panels (geographical latitude and longitude.). During the year declination angle δ^1 oscillates from -23.45 to +23.45 [4]

$$\delta = 23.45 * \sin \left[\frac{360}{365} * (n - 81) \right] \quad (3)$$

or (Spencer's formula) [4]

$$\begin{aligned} \delta = & 0,006918 - 0,39912 * \cos(\Gamma) + 0,070257 * \sin(\Gamma) \\ & - 0,006758 * \cos(2\Gamma) + 0,000907 * \sin(2\Gamma) \\ & - 0,002697 * \cos(3\Gamma) + 0,00148 * \sin(3\Gamma) \end{aligned} \quad (4)$$

where

$$\Gamma = \frac{2\pi(n-1)}{365} \quad (5)$$

In order to calculate the required angles, it is necessary to know the day of the year, the time and the position of the solar panel beforehand

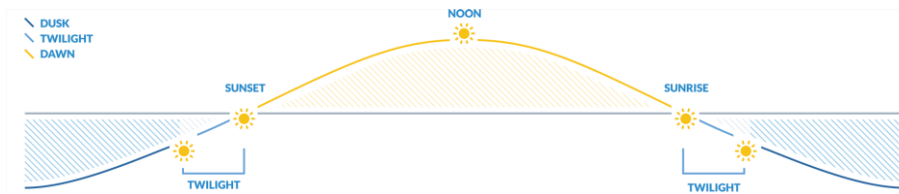


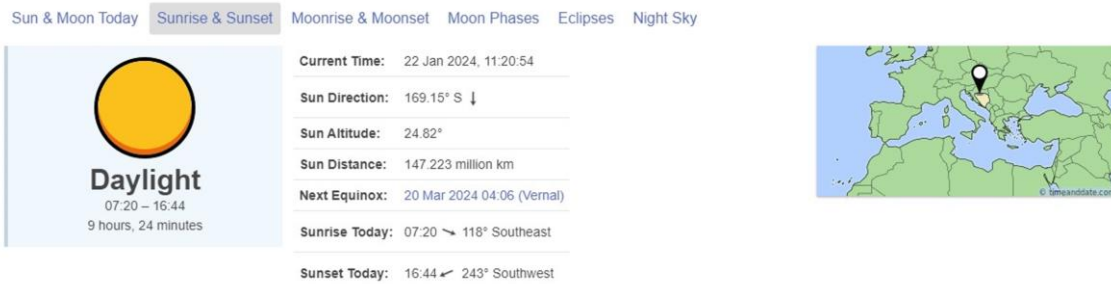
Figure 3 Sunrise, sunset, daylength [5]

¹ equal to the angle between the solar position and the celestial equator measured along the great circle containing the sun and the celestial poles

Let's look at an example for the city of Banja Luka on January 22:

City of Banja Luka (44°46'32.7"N 17°11'30.3"E), 22.jan 2024.

2024	Sunrise/Sunset		Daylength		Astronomical Twilight		Nautical Twilight		Civil Twilight		Solar Noon	
Jan	Sunrise	Sunset	Length	Diff.	Start	End	Start	End	Start	End	Time	Mil. km
22	07:20 ↑ (118°)	16:44 ↓ (243°)	09:23:58	+2:06	05:38	18:27	06:13	17:52	06:48	17:16	12:02 (25.5°)	147.223



<https://www.timeanddate.com/sun/bosnia-herzegovina/banja-luka>

Figure 4 Sunrise, sunset, daylength <https://www.timeanddate.com/sun/bosnia-herzegovina/banja-luka> [6]

If we look data for city of Banja Luka at 22.january, we can see [6]:

- sunrise at 07:20
- Sunset at 16:44
- At specific moment, 11:20, azimuth was 170 degrees, Altitude was 25 degrees

As expected, the Azymuth is 180 degrees at noon, and highest value of altitude is 26 degree:



Figure 5 Azymuth at noon, highest value of altitude

During the day the azimuth value changes from 118 to 243 (-118) degrees and the altitude from 0 to 26 degrees [8].

440	450	465	480	495	510	525	540	555	570	585	600	615	630	645	660	675	690	705	720
07:20	07:30	07:45	08:00	08:15	08:30	08:45	09:00	09:15	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00
116,97	118,74	121,42	124,17	126,98	129,87	132,82	135,90	139,05	142,39	145,62	149,04	152,56	156,17	159,86	163,62	167,45	171,32	175,23	179,16
-0,25	1,23	3,38	5,55	7,68	9,75	11,73	13,62	15,42	17,10	18,67	20,10	21,40	22,55	23,55	24,38	25,05	25,54	25,86	25,99
735	750	765	780	795	810	825	840	855	870	885	900	915	930	945	960	975	990	1005	1020
12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30	14:45	15:00	15:15	15:30	15:45	16:00	16:15	16:30	16:45	17:00
183,10	187,02	190,91	194,76	198,56	202,28	205,93	209,49	212,96	216,33	219,61	222,80	225,90	228,91	231,84	234,69	237,47	240,19	242,85	245,46
25,94	25,71	25,29	24,71	23,95	23,02	21,94	20,71	19,33	17,82	16,19	14,45	12,90	10,66	8,63	6,52	4,37	2,20	0,12	-2,70

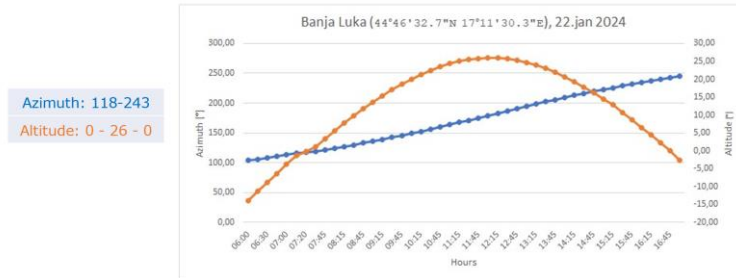


Figure 6 values calculated using astronomical formulas

We can get these values (angles) by always calculating using astronomical formulas, or, if we calculate these values in advance and put them in a table, we can read them from the table in a much easier way.

The values may be available from cloud located somewhere on the internet in form of a web service or they can be found in the tables of the processor that manages the platform.

```

{"results":
{"sunrise":"6:19:00 AM"
,"sunset":"3:46:18 PM"
,"solar_noon":"11:02:39 AM"
,"day_length":"09:27:18"
,"civil_twilight_begin":"5:48:40 AM"
,"civil_twilight_end":"4:16:38 PM"
,"nautical_twilight_begin":"5:12:54 AM"
,"nautical_twilight_end":"4:52:24 PM"
,"astronomical_twilight_begin":"4:38:11 AM"
,"astronomical_twilight_end":"5:27:07 PM"}
,"status":"OK","tzid":"UTC"}

```

Figure 7 web service (api.sunrise-sunset.org/json?lat=44.7722&lng=17.191&date=2024-01-22) [5]

We can calculate these values in advance and put them in a table, so we can read them from the table in a much easier way. In case we do not have data for a certain time, we will use interpolation²:

² In mathematical field of numerical analysis, interpolation is a type of estimation, a method of constructing new data points based on the range of a known data points:

For example, if we need to calculate Azimuth and Altitude at 08:05 (and don't have that value in table), but we already have values for 08:00 and 08:15, so it is possible calculate values for 08:05 using linear interpolation.

First we need to convert to minutes all time values and use Interpolation equation:

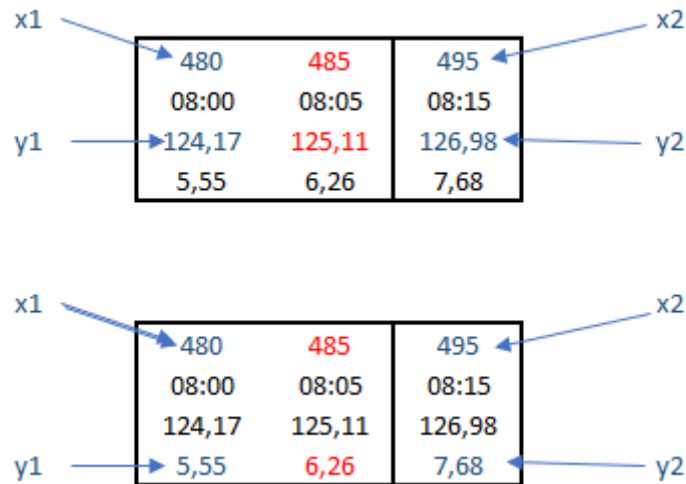


Figure 8 Using interpolation formula

Just remember that power loss is less than 0.142% if we miss 3° (if we are late for 1 minute)!

CONCLUSION

The task of the positioning module is to ensure that the solar platform is always perpendicular to the Sun. Two different approaches to tracking the movement of the Sun is possible: calculate values using astronomy formulas, or measure values of solar radiation and determine the direction and angles for each axis to achieve maximum radiation on the surface of the solar platform.

Two different approaches to tracking the movement of the Sun is possible: the first approach involves a numerical model where the values of angles to be assumed are calculated using astronomy formulas for known input values of date and time (along with knowledge of the position of the solar installation: geographical latitude and longitude of installed solar panels). The values of horizontal and vertical angles can be precalculated and read from internal memory or obtained from the internet using a web service that calculates the required angle values.

$$y = y_1 + (x - x_1) \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

y = linear interpolation value

x = independent variable

x_1, y_1 = values of the function at one point

x_2, y_2 = values of the function at another point

The second approach is based on measuring the current values of solar radiation and determining the direction and magnitude of the necessary movement on each axis to achieve maximum radiation on the surface of the solar platform.

This paper in details described first approach.

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ACIDS AND BASES IN ORGANIC CHEMISTRY: EDUCATORS' PERSPECTIVES ON ERRORS AND MISCONCEPTIONS

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ABSTRACT

Knowledge of acids and bases is one of the most important tools to predict and understand organic chemical reactions and subtle details about their mechanism. Unfortunately, many students had considerable difficulty understanding the most important concepts and notions about organic acids and bases.

This paper aims to emphasize some of the most common errors and misconceptions about the acid-base properties of organic molecules.

Understanding these nuances has implications for teachers and students involved in this educational project.

Common misconceptions about organic acids and bases include (1) "all organic acid and bases are weak," (2) "aliphatic amines are always more basic than aromatic amines," (3) "electron donating groups decrease the acidity of all carboxylic acid," (4) "electron donating groups always increases the basicity of all aromatic amines" (5) "usual order of basicity of amines are the same for all types of acid" will be explained in details based on fundamental concepts, often ignored, such as solvation, steric effects (face strain), ortho effect, hydrogen bonding, polarizability.

Changing the solvent, the effect of the temperature, and hybridization are other important parameters in evaluating the pK_a and pK_b of organic acids and bases, which are briefly discussed in chemistry classes.

Generally, even though the Brønsted-Lowry theory is stressed, the Lewis theory of acids/bases is more broadly applicable in organic chemistry, with a direct correlation in mechanistic prediction. The paper explained how understanding this theory has a cardinal role in elucidating many fundamental ideas of organic chemistry.

The present study discussed the confusion between nucleophilicity and basicity, although often there are parallels between the two.

Finally, the paper points out the most common mistakes on synthesis questions where people want to use a strong base in the presence of an acidic proton.

Keywords: organic acids and bases, solvation, Lewis theory

RISK OF FISH AND SEAFOOD CONSUMPTION AS A SOCIAL PROBLEM: WHAT YOU NEED TO KNOW?

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ABSTRACT

The vast majority of people know that fish consumption is usually recommended as part of a balanced healthy, balanced diet and has several benefits. The American Heart Association (AHA) advises eating fish at least two times a week, particularly fatty fish like sardines, salmon, and albacore tuna. Unfortunately, some fish and several types of seafood may contain harmful chemicals, increasing the risk of health problems.

This paper aims to review the most important contaminants found in fish and seafood, their origin, and their health risks.

These contaminants include a plethora of chemicals, such as:

- naturally occurring allergens, toxins produced from shellfish and algae (ciguatoxin, maitotoxin, brevetoxin, saxitoxin, kainic, okadaic and domoic acids), histamine due to inappropriate storage or processing, puffer fish poison;
- unintentionally or incidentally added chemicals such as pesticides (endosulfan, aldrin, dieldrin), fungicides, fertilizers, toxic metals (cadmium, chromium, mercury, nickel), microplastics and their additives such as bisphenol A, polybrominated diphenyl ethers, nonylphenol, octylphenol, dioxin, per- and polyfluoroalkyl compounds;
- intentionally added chemicals and food additives - food preservatives (such as nitrites), food additives, antibiotics used in aquaculture, sulfites, and coloring agents (zeaxanthin).

It is essential to mention that most of these toxins are heat-stable and cannot be removed upon cooking and processing. Moreover, several contaminants are tasteless and odorless, so it is challenging to discriminate between contaminated and non-contaminated fish and seafood.

The paper emphasizes several simple rules to diminish risk contamination, which could be helpful for consumers. After reviewing published scientific literature, public health guidelines, and advisories related to fish consumption, we conclude that the paradigm “benefits versus risks of fish and seafood consumption” is much more complex than it seems at first glance.

Keywords: ciguatoxin, domoic acids, histamine, puffer fish, mercury, microplastic

OXIDATIVE STRESS, MECHANISMS OF OCCURRENCE, WAYS OF CORRECTION IN PATHOLOGICAL CONDITIONS

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ABSTRACT

The article presents information about the importance of oxidative stress in the life of the body, its characteristics in various pathological processes, assessment methods, the most reliable of which is the determination of the levels of malondialdehyde and reduced glutathione in the blood plasma. Detection of oxidative stress in the body is important already in the early, sometimes preclinical stages of various diseases, both to assess the severity of the pathological process and to monitor the effectiveness of preventive, therapeutic and rehabilitation measures.

Keywords: Oxidative stress, Peroxidation syndrome, Lipid peroxidation, Antioxidants

The existence of people in the conditions of modern technogenic civilization, the disruption of centuries-old relationships between man and nature inevitably lead to the constant emergence of stressful situations, their accumulation and, ultimately, to the development of pathological changes in various organs and systems [0]. The negative influence of environmental factors (tobacco smoke, air pollution from transport and industrial emissions, radiation and ultraviolet radiation, xenobiotics, including drugs, pesticides, industrial solvents, etc.), excessive physical activity, stress, overwork are accompanied by an increase in the formation of free radicals . The latter are formed in cells, which, by changing its structure, damage cell membranes, sometimes incompatible with the life of the cell. In the context of this, the variety of functions of cell membranes, which are a cooperative system that provides the most important regulatory mechanisms of cell life, determines increased interest in the processes occurring in the cell membrane and makes it the object of close attention of researchers. The membrane, according to modern concepts, is most often considered in the form of a mosaic model, which is a structure consisting of proteins, the space between which is filled with lipid molecules (Игнатова Г.Л., Антонов В.Н., Шекланова Е.В.,2021).

In order for a cell to function normally, the lipids that make up its membrane must retain certain physicochemical properties. Violation of the composition and physicochemical properties of biomembrane lipids changes microviscosity, lipid-protein interactions in membranes and creates conditions for structural transitions in the biomembrane. (E.B. Burlakova, 2002), which is a trigger mechanism in switching a cell from one metabolic state to another (Ахундов Р.А.,Эйвазов Т.А.,Ханум Айдын кызы,Гусейнова Ф.Д.,2014).

The process of free radical oxidation is important for the functioning of the membrane and the cell itself. Under physiological conditions, free radical oxidation is involved in the processes of prostacyclin synthesis and microsomal oxidation. It has been proven that the lipid bilayer of cell membranes is damaged when this oxidation increases (Ахундов Р.А.,2010),

Changes that occur when lipid peroxidation is activated in the body are characterized as peroxidation syndrome. The appearance of peroxide polar groups in lipids leads to changes in hydrophobic interactions and disruption of lipid-protein bonds in the membrane, while at the same time free valency in the lipid components of membranes changes the strength of the complex of enzymes and other macromolecules with the membrane, inactivation of the catalytic center of lipid-dependent enzymes. The structure of the membrane, its physicochemical properties, conformational and phase transitions in lipids and proteins change, and cell division is suppressed (Игнатова Г.Л., Антонов В.Н., Шекланова Е.В.,2021).

In this context, metabolic and energy disorders, the accumulation of active damaging agents (free radicals and pro-oxidants), initiating cell damage and leading to the development of various pathological conditions, are called oxidative stress (Aimo A, Castiglione V, Borrelli C, et al.,2022).

It is based on free radical oxidation of fatty acids, or so-called lipid peroxidation (LPO). In this case, ultrastructural and biochemical changes occur in the most sensitive cell membranes to lipid peroxidation processes, membrane microsomes, mitochondria, sarcoplasmic reticulum, lysosomes, which ultimately leads to membrane destruction and cell death. Thus, the activation of LPO and the damaging effect of its products is a key link in many pathological conditions. When assessing the damaging effects of LPO on biomembranes, it should be borne in mind that in any cell where aerobic metabolism occurs, there are conditions necessary for LPO to occur. However, activation of LPO in a healthy body does not occur due to a constantly operating and fairly reliable system of antioxidants. A decrease in antioxidant activity leads to increased lipid peroxidation processes under various pathological conditions, including hypoxia. (N.K.Zenkov

et al., 2001). The following are observed in the mechanism of oxidative stress (Aimo A, Castiglione V, Borrelli C, et al.,2022).

More than 95% of the oxygen entering the body is reduced to water in the mitochondria through the process of oxidative phosphorylation. The rest, less than 5%, as a result of various (usually enzymatic) reactions are converted into its active forms, which are highly toxic to cells. Reactive oxygen species (ROS) - free radicals, pro-oxidants - are molecular particles that have an unpaired electron in the outer orbit and possessing high reactivity, which consists in damaging proteins, nucleic acids and lipids of biological cell membranes. Normally, in a healthy body, the formation of ROS occurs continuously. It has been proven that ROS and other pro-oxidants are involved in the mechanisms of bactericidal activity, in the synthesis of biologically active substances, in collagen metabolism, regulation of membrane permeability, etc. The formation of free radicals is an important protective mechanism underlying nonspecific immunity: phagocytosis leads to a multiple increase in the content of free radicals in phagocytic cells with a simultaneous increase in oxygen consumption by 20 or more times (the so-called "respiratory explosion"). At the same time, ROS are the basis for the pathogenesis of many pathological processes, have antigenic properties, trigger autoimmune processes of tissue damage, cause bronchoconstriction, etc. It has also been proven that the LPO process begins with a chain initiation reaction, which results in the formation of superoxide and hydroxyl radicals. If such a radical is formed near the cell membrane, it tends to react with the polyunsaturated fatty acids of lipid side chains to form a carbon free radical in the membrane. The latter, reacting with molecular oxygen, forms a peroxy radical. In the absence of an appropriate antioxidant, the lipid peroxide "extracts" hydrogen from another nearby polyunsaturated fatty acid to form hydroperoxide and a new carbon radical. This reaction begins a new stage of the free radical chain process where hydroperoxides decompose, initiating new chains. Not all radicals continue the chain; some of them interact with each other, inactive products are formed, which leads to chain termination. In addition to spontaneous chain termination, interruption is possible when interacting with Fe²⁺, as well as when interacting with antioxidants (Ахундов Р.А., Эйвазов Т.А., Ханум Айдын кызы, Гусейнова Ф.Д.,2014).

As a result of the self-accelerating reaction of free radical oxidation, many lipid peroxidation products are formed, which include: (Даренская М.А., Колесникова Л.И.,2020).

lipid hydroperoxides (primary products of LPO) are unstable substances that easily undergo further transformations with the formation of a number of more stable secondary oxidation products: aldehydes, ketones, a number of low molecular weight acids (formic, acetic, butyric). These substances are toxic to cells and lead to disruption of membrane functions and metabolism in general;Diene conjugates - are formed by abstracting a hydrogen atom from an acid molecule, most often arachidonic acid (lipid peroxide with conjugated double bonds); Peroxide radicals - H*, *OH, HO 2 *; Malondialdehyde - is formed during the oxidative destruction of lipids, is part of the secondary products of lipid peroxidation; Schiff bases - conjugated compounds formed from polyunsaturated fatty acids, dialdehydes and other secondary lipid peroxidation products (Керимова Р.Дж., Рзаева С.Дж.,2017).

To assess the intensity of lipid peroxidation, the quantitative determination of malondialdehyde (MDA) is most often used. Its increase is a method for early detection of metabolic disorders in the body, even at the preclinical stage of the disease (Bellavite P, Donzelli A.,2021).

In contrast to free radical processes in the body, there is an antioxidant system, which is a set of protective mechanisms of cells, tissues, organs and systems aimed at preserving and maintaining homeostasis in the body. The balance between these two opposite components in a state of physiological optimum keeps peroxidation at a certain low level, preventing the development of a chain oxidative process and characterizes the antioxidant status of the body.

Without its universal endogenous protection system, the normal existence of organisms in the Earth's biosphere under conditions of a polluted atmosphere, natural background radiation and ultraviolet radiation from the sun would be impossible (Ахундов Р.А.,2010),

There are enzymatic and non-enzymatic components of the antioxidant system; the enzymatic link is represented by glutathione peroxidase, superoxide dismutase and catalase. They have a certain specialization in relation to specific types of radicals and peroxides. According to available data, the activity of glutathione peroxidase already in the early stages of vascular pathology of the brain is reduced by almost half compared to healthy people and tends to further decrease as the disease progresses. Non-enzymatic link of the antioxidant system, consists of compounds of low molecular weight and protein nature (Керимова Р.Дж., Рзаева С.Дж.,2017).

Attention to the problems of cell damage in various diseases, including cardiovascular diseases, in domestic cardiology and therapy has been significant since the 20–30s. XX century thanks to the works of G.F. Langa. However, until recently, biologists did not imagine that free radicals could arise and die during biochemical processes in the human and animal body. When Joe M. McCord and Irwin Fridovich announced in 1969 that superoxide anion, a dangerous free radical, forms in living organisms and that an enzyme called superoxide dismutase can neutralize it, their colleagues at research institutes around the world agreed with these findings with undisguised skepticism. The famous biochemist researcher Richard Passwater made a huge contribution to the understanding of free radical oxidation processes. His pioneering work on the possibility of slowing down the aging process appeared in print in 1971, when the terms “free radical” and “antioxidant therapy” were familiar only to a very narrow circle of professionals. 2 years later, R. Passwater published data from his subsequent studies, from the results of which it became known for the first time about the existence of a connection between free radicals and cancer pathology. In 1977, he published a fundamental work on free radicals (Даренская М.А., Колесникова Л.И.,2020).

In Western countries, interest in oxidative stress has increased significantly in connection with the results of the work of E. Braunwald (1982) on “myocardial hibernation” (hibernatio - hibernation). The term was borrowed from zoology and used to reflect a state of dysfunction and hypoperfusion of the myocardium, potentially capable of recovery when perfusion is improved. It has been proven that a decrease in the patient's body temperature by just 1 °C reduced the metabolic rate in him by 5–6%. It followed from this that by lowering the patient's body temperature by 20 °C, it was possible to achieve a 100-fold reduction in metabolism. Since that time, the number of studies on the state of energy-producing processes in a living organism has increased (Шаварова Е.К., Казахмедов Э.Р., Алексеева М.В.,2021).

To date, a large amount of data has accumulated indicating the participation of free radical processes in the pathogenesis of a number of infectious diseases. Increased lipid peroxidation processes in ischemic myocardium, atherosclerosis, arterial hypertension, cerebral hypoperfusion, etc. have been proven (Durand M., Coué M., Croyal M., Moyon T.,2021

It is also known that the intensity of lipid peroxidation processes depends on the severity of the inflammatory process; therefore, the effectiveness of treatment is largely determined by the degree of protection of cell membranes. That is why, for almost any pathology, the inclusion of antioxidant drugs in complex therapy is justified. However, we should not forget that some foods themselves are sources of natural antioxidants, and therefore have the above effects (Ramiz Akhundov, Vidadi Khalilov.,2023).

In this aspect, researchers, having accumulated sufficient information about the mechanism of oxidative stress, free radical oxidation, and the destructive role of the process of lipid peroxidation, in order to correct and treat this condition that is dangerous for the body, have put

forward a number of ideas for influencing many parts of this multifactor process. Among the main ones, natural regulators were proposed, among which the leading place was given to tocopherols and other natural compounds (Шаварова Е.К., Казахмедов Э.Р., Алексеева М.В.,2021).

Vitamin E (tocopherol) plays a critical role among fat-soluble antioxidant membrane protectors, having the ability to increase the level of natural lipid antioxidants. It interacts with the hydroxyl radical, has a “quenching” effect on singlet oxygen, inactivates the superoxide radical and inhibits lipid radicals, protects against the toxic effects of ozone, blocking the radical reactions generated by it (Даренская М.А., Колесникова Л.И.,2020).

The only lipid-soluble antioxidant that is synthesized in cells and is constantly regenerated from its oxidized form is ubiquinone. Its role as the most important electron carrier in the respiratory chain determines an improved prognosis for various pathologies (Adameova A, Anureet S, Adameova ND. A.,2020).

Cardiovascular system (coronary heart disease, atherosclerosis and its complications, arterial hypertension); (Rabbania N., Thornalley P.J.,2021).

For anemia (stimulates the process of hematopoiesis);In hypoimmune conditions, increasing the phagocytic activity of macrophages, the number of granulocytes in the bone marrow and blood plasma, increasing the amount of immunoglobulins, supporting the function of the thymus gland; In the prevention and treatment of asthenic syndrome and chronic fatigue syndrome; (Tossetta G., Fantone S., Licini C.,2022).

For chronic intoxication (removes free radicals and radionuclides from the body); Used in complex programs for the treatment of hypoxic conditions of any origin.The antioxidant function of vitamin A is to protect any biological membranes from damage by reactive oxygen species. Ascorbic acid (vitamin C) is the most important antioxidant of intercellular fluid; it is not synthesized and has no storage in the human body; binds and inactivates ROS organic peroxides; protects low-density lipoproteins and other lipids from oxidative damage by scavenging free radicals before they reach the membrane; restores the oxidized form of vitamin Eplays a leading role in antioxidant protection of the brain (Ramiz Akhundov,Vidadi Khalilov.,2023).

Glutathione functions as a hydrogen donor and cofactor for a number of antioxidant enzyme systems. A decrease in the intracellular content of reduced glutathione, caused by a genetic deficiency of the enzymes of its synthesis or the introduction of antagonists, significantly reduces the resistance of cells and the body to radiation damage or intoxication. Glutathione is found inside cells. Glutathione accounts for 90–95% of all non-protein thiol compounds. The liver and brain tissues are richest in glutathione. The functions of glutathione in the body are diverse: protection against reactive oxygen species, restoration of disulfide bonds, influence on the activity of numerous enzymes, maintaining the optimal state of biomembranes, implementation of coenzyme functions, participation in the metabolism of eicosanoids, functioning as a cysteine reserve, participation in the biosynthesis of nucleic acids, participation in metabolism of xenobiotics, increasing cellular resistance to toxicants and other harmful effects, stimulating proliferation (Rabbania N., Thornalley P.J.,2021).

Another group of antioxidants deserves attention: bioflavonoids. They reduce blood pressure, the propulsive activity of the intestinal muscles, eliminate bronchospasm, and have a strengthening effect on the capillaries. One of the most famous representatives of this group is vitamin P (rutin) (Кәрімова Р.С., Вәлиева З.Ү., Байрамов А. А.,2022).

The sulfur-containing amino acid taurine, urea, uric acid, bilirubin, and polyamines also play an important role in the antioxidant protection of body fluids. Urea is found in body fluids and

prevents the formation of methemoglobin. Effectively protects the central nervous system, lungs and blood from oxidative stress. Uric acid also inhibits lipid peroxidation and reduces methemoglobin to form the low-active urate radical. Protects blood cells, partially binds to proteins and is released in stressful situations (Adameova A, Anureet S, Adameova ND. A.,2020).

Ceruloplasmin is a multifunctional copper-containing protein of blood serum (α_2 -globulin fraction) and is a glycoprotein. It is synthesized in hepatocytes and, being the main extracellular antioxidant in the blood, inhibits lipid peroxidation by up to 50% due to the interception and inactivation of the superoxide radical (O_2^*). Acting as an antioxidant, it has a powerful anti-inflammatory effect. It transports copper, delivering it to tissues for the synthesis of cytochrome C oxidase and other enzymes, participates in the regulation of biogenic amines and the regulation of their functions, is a stimulator of hematopoiesis and a regulator of blood functions (Kerimova R.C., Vəliyeva Z.Y., Bayramov A. A.,2022).

Of particular importance are changes in the antioxidant status of children. This is due to the immaturity of the physiological and metabolic systems of the child's body and the disorders that easily arise as a result under the influence of various unfavorable environmental factors. In this context, diseases belonging to the class of free radical pathology are widespread, including in childhood, starting from the neonatal period (bronchopulmonary dysplasia, retinopathy of prematurity, necrotizing enterocolitis, etc.) (Aimo A, Castiglione V, Borrelli C, et al.,2022).

The weakening of antioxidant protection and the uncontrolled increase in the processes of lipid peroxidation in children is one of the important links in the pathogenesis of autonomic dysfunction, atopic dermatitis, dental pathology, diabetes mellitus, arthropathy, diseases of the gastrointestinal tract, urinary tract, etc. At the same time, they reach blood and tissues high concentrations of lipid peroxidation products, in particular malonaldehyde, which destabilizes cell membranes (Durand M., Coué M., Croyal M., Moyon T.,2021).

Thus, studying the indicators of oxidative stress, which develops as a result of an imbalance between the oxidative and antioxidant systems, helps to reveal the mechanism of pathogenesis of many pathological processes, assess the degree of risk of their occurrence, and predict the characteristics of the course of the disease. Elimination of oxidative stress helps to increase the effectiveness of preventive, therapeutic and rehabilitation measures (Durand M., Coué M., Croyal M., Moyon T.,2021)

The above materials convince us of the need for wider use of antioxidants in the complex therapy of acute and chronic diseases in neurotic, cardiovascular, metabolic and other conditions, along with other pathogenetic methods of treatment. Their choice should be determined by the nature of the pathological process and the degree of its activity (Tossetta G., Fantone S., Licini C.,2022).

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**POLYELECTROLYTE-OXIDIZED CARBON NANOHORNS–BASE MATRIX
NANOCOMPOSITE AS SENSING LAYER FOR NOVEL RELATIVE HUMIDITY
SENSOR**

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ABSTRACT

This paper presents the design and manufacturing processes for a novel resistive relative humidity (RH) sensor using a polyelectrolyte (poly (acrylamide-co-diallyl dimethylammonium chloride) - oxidized carbon nanohorns – based matrix nanocomposite as sensing layer. The RH sensor includes a Si/SiO₂ dielectric substrate, electrodes (made up of aluminum, copper, and chromium), and a sensing layer obtained via drop casting and/or spin coating methods. Electrodes can be linear, planar, or can have interdigitated configurations. The RH monitoring capability is investigated by applying a constant current between the two electrodes and measuring the voltage at different values of the ethanol concentration to which the sensing layer

is exposed. The decrease in conductivity is explained by the fact that water molecules donate electrons to the sensing film, reducing the concentration of holes. The oxidized carbon nanohorns can be synthesized by oxygen plasma treatment of pristine carbon nanohorns or by H₂O₂ treatment of pristine carbon nanohorns at 100 °C.

The use of polyelectrolyte and oxidized carbon nanohorns exhibits several significant advantages:

- improving the mechanical properties and processability of the sensitive layer;
- the presence of oxidized carbon nanohorns confers a high specific surface/volume ratio, affinity for water molecules, as well as a variation in the resistance of the sensitive layer upon contact with them;
- room temperature detection;
- the presence of the polyelectrolyte poly (acrylamide-co-diallyl dimethylammonium chloride) confers hydrophilicity and a small hysteresis.

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Keywords: poly (acrylamide-co-diallyl dimethylammonium chloride), oxidized carbon nanohorns, relative humidity, resistive sensors

NOVEL RESISTIVE N- PROPANOL SENSOR

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ABSTRACT

This paper presents the design and manufacturing processes for a novel resistive n-propanol sensor using an oxidized carbon nanohorns (CNHox) / Cu₂O-based binary nano hybrid as a sensing layer. The n-propanol sensor includes a Si/SiO₂ dielectric substrate, electrodes (made up of aluminum, copper, and chromium), and a sensing layer obtained via drop drop-casting method. Electrodes can be linear, planar, or can have interdigitated configuration. The n-propanol monitoring capability is investigated by applying a constant current between the two electrodes and measuring the voltage at different values of the n-propanol concentration to which the sensing layer is exposed. The decrease in conductivity is explained by the fact that n-propanol molecules donate electrons to the sensing film, reducing the concentration of holes.

Furthermore, low-cost synthesis of CNO_{ox} via water plasma treatment of the pristine CNHs is a simple and fast procedure. Last but not least, the functionalization of the CNHs in water plasma has the advantage (by varying the exposure time as well as its power) that it can provide an optimal C:O ratio for superior sensitivity towards n-propanol molecules.

The use of the oxidized carbon nanohorns (CNH_{ox}) / Cu₂O exhibits several significant advantages:

- oxidized carbon nanohorns give a high specific surface/volume ratio, affinity for n-propanol molecules as well as a variation in the resistance of the sensitive layer upon contact with them;
- Cu₂O nanopowder is a p-type semiconductor with a wide conduction band, large specific surface, and nontoxic, with good chemical and thermal stability. It presents a synergistic effect with oxidized carbon nanohorns, also p-type semiconductors;
- Cu₂O changes the distribution of pores at the interface with CNH_{ox}, increasing their specific surface area;
- detection at room temperature;
- chemical and thermal stability;
- superior mechanical properties.

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Keywords: oxidized carbon nano-onions, n-propanol, cuprous oxide (Cu₂O), resistive sensor

CONGENITAL ADRENOGENITAL DISORDERS, PHYSIOLOGICAL CHARACTERISTICS, DIAGNOSTIC METHODS

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ABSTRACT

Congenital adrenal hyperplasia (CAH) is a group of rare inherited autosomal recessive disorders characterized by a deficiency of one of the enzymes needed to make specific hormones. CAH affects the adrenal glands located at the top of each kidney. Normally, the adrenal glands are responsible for producing three different hormones: corticosteroids, which gauge the body's response to illness or injury; mineralocorticoids, which regulate salt and water levels; and androgens, which are male sex hormones. An enzyme deficiency will make the body unable to produce one or more of these hormones, which in turn will result in the overproduction of another type of hormone precursor in order to compensate for the loss. The most common cause of CAH is the absence of the enzyme 21-hydroxylase. Different variants in the gene responsible for 21-hydroxylase result in different levels of the enzyme, producing a spectrum of effects.

CAH due to 21-hydroxylase deficiency is responsible for 95% of all cases of CAH and is broken down further into two subcategories: classical CAH, which can be sub-divided into the salt-losing form or the simple-virilizing form, and non-classical CAH

Keywords: Congenital adrenogenital, Disorders, Physiological characteristics, Diagnosis

Congenital adrenal hyperplasia (CAH) is a group of rare inherited autosomal recessive disorders characterized by a deficiency of one of the enzymes needed to make specific hormones. CAH affects the adrenal glands located at the top of each kidney (Tamhane S, Rodriguez-Gutierrez R., 2018). Normally, the adrenal glands are responsible for producing three different hormones: corticosteroids, which gauge the body's response to illness or injury; mineralocorticoids, which regulate salt and water levels; and androgens, which are male sex hormones. An enzyme deficiency will make the body unable to produce one or more of these hormones, which in turn will result in the overproduction of another type of hormone precursor in order to compensate for the loss. The most common cause of CAH is the absence of the enzyme 21-hydroxylase. Different variants in the gene responsible for 21-hydroxylase result in different levels of the enzyme, producing a spectrum of effects. CAH due to 21-hydroxylase deficiency is responsible for 95% of all cases of CAH and is broken down further into two subcategories: classical CAH, which can be sub-divided into the salt-losing form or the simple-virilizing form, and non-classical CAH (Jayakrishnan R, Lao Q, Adams SD, Ward WW., 2019).

Classical CAH is by far the more severe form and can result in adrenal crisis and death if not detected and treated. Non-classical CAH is milder and may or may not present symptoms. Since the absence of 21-hydroxylase makes these individuals unable to make the hormone cortisol and, in the case of salt-losing CAH, aldosterone, the body produces more androgens which cause a variety of symptoms such as atypical genital development in infant girls. There are other much rarer forms of CAH as well, including 11-Beta hydroxylase deficiency, 17 α -hydroxylase deficiency, 3-Beta-hydroxysteroid dehydrogenase deficiency, congenital lipoid adrenal hyperplasia and p450 oxidoreductase deficiency which all present different symptoms. Although CAH is not curable, patients can go on to lead normal lives if they receive adequate care and treatment (Kerimova R.C., Huseynova G.A., Nəcəfova T.M., Abiyev H.Ə., Məmmədov Ş.Ə., 2023).

Many individuals with CAH present with abnormally enlarged adrenal glands (hyperplastic adrenomegaly) that produce excessive amounts of androgens (male steroid hormones) leading to abnormal sexual development in females affected with the disease. Females with severe or classic virilizing CAH due to 21-hydroxylase deficiency will most likely have ambiguous or atypical external genitalia (masculinization or virilization), although they are genetically female and will have normal internal reproductive organs. Males with this type of CAH will not have ambiguous genitalia. Both genders can experience other symptoms such as early onset of puberty, fast body growth and premature completion of growth leading to short stature, if they are not diagnosed and treated in early life. About 75% of people with classical CAH due to 21-hydroxylase deficiency also have a deficiency of the hormone aldosterone, leading to the inability to retain salt and water (salt wasting). This results in excessive loss of water (dehydration), low circulating blood volume (hypovolemia) and abnormally low blood pressure (hypotension and shock). Without treatment, this severe form of CAH can lead to profound weakness, vomiting, diarrhea and circulatory collapse due to adrenal crisis. The remaining 25% are referred to as simple-virilizers and do not have a problem regulating salt and water levels. Fortunately, in the United States, and in many other developed countries, there is universal newborn screening for CAH due to 21-hydroxylase deficiency, and the vast majority of children

are diagnosed and treated early to avoid these complications. The mild form of 21-hydroxylase deficiency (non-classical CAH) is not life-threatening and is due to a more common genetic variant. This mild form is not usually detected in our newborn screening programs, and it seldom requires early treatment. Symptoms in later childhood may include premature body hair or acne development. In adolescent females, the most common problems include excessive facial or body hair, menstrual irregularities, and pustular acne. Both genders have normal genitals. A small proportion of the non-classical CAH population has sub-fertility. Patients with CAH may or may not require treatment to improve their quality of life (Kərimova R.C., Huseynova G.A., Nəcəfova T.M., Abıyev H.Ə., Məmmədov Ş.Ə., 2023).

Rare forms of CAH: Patients affected with 11-Beta hydroxylase deficiency are protected from the symptoms associated with adrenal crisis, although they are subject to others such as hypertension due to salt retention and ambiguous genitalia in females. Steroid 17 α -hydroxylase deficiency results in ambiguous external genitalia in males and lack of pubertal development or menstrual cycles (amenorrhea) in females. Steroid 3-Beta-hydroxysteroid dehydrogenase deficiency leads to ambiguous genitalia in males and females. In both genders it can lead to salt-wasting. Congenital lipoid adrenal hyperplasia may cause early death due to adrenal crisis. Males have ambiguous genitalia. Both males and females, if they survive, would likely be infertile. PORD (P450 oxidoreductase deficiency) presents with signs and symptoms that may resemble 21-hydroxylase deficiency, 17-hydroxylase deficiency, or a combination of the two enzyme deficiencies. Some cases have been associated with a skeletal disorder known as Antley-Bixler syndrome (Bulsari K, Falhammar H., 2017).

Causes: Deletions and changes (mutations or variants) in the CYP21A2 gene account for all cases of the 21-hydroxylase deficiency form of CAH (Tamhane S, Rodriguez-Gutierrez R., 2018).

Variants in the CYP11B1, CYP17A1, HSD3B2, CYP11A1, STAR and CYPOR genes are responsible, respectively, for 11-hydroxylase, 17-hydroxylase, 3-beta-hydroxysteroid dehydrogenase deficiencies, lipoid adrenal hyperplasia, and PORD, the other rarer forms of CAH (Nimkarn S, Gangishetti PK., 2020).

All forms of CAH are inherited in an autosomal recessive pattern. Recessive genetic disorders occur when an individual inherits an abnormal gene from each parent. If an individual receives one normal gene and one abnormal gene for the disease, the person will be a carrier for the disease, but usually will not show symptoms. The risk for two carrier parents to both pass the abnormal gene and, therefore, have an affected child is 25% with each pregnancy. The risk of having a child who is a carrier, like the parents, is 50% with each pregnancy. The chance for a child to receive normal genes from both parents is 25%. The risk is the same for males and females (Kərimova R.C., Ağayeva A.H., Abıyev H.Ə., 2023).

Disorders with similar symptoms: Symptoms of the following disorders can be similar to those of congenital adrenal hyperplasia. Comparisons may be useful for a differential diagnosis: Addison disease is a rare disorder characterized by inadequate production of cortisol, aldosterone, and/or androgens by the outer layer of cells of the adrenal glands (adrenal cortex). The symptoms of classic Addison disease, also known as primary adrenal insufficiency, result from the insufficient production of these hormones. Major symptoms include fatigue, hypotension, salt-craving, abdominal pain, nausea or vomiting, darkened skin color and absence of body hair. Depressive behavior and mood changes may also occur in some individuals with Addison disease. The symptoms of Addison usually develop slowly, but sometimes can develop rapidly into a serious condition called acute adrenal failure. In most cases, Addison disease most often occurs when the body's immune system mistakenly attacks the adrenal glands causing slowly progressive damage to the adrenal cortex (Nimkarn S, Gangishetti PK., 2020).

Since autoimmune disorders often cluster in families and individual patients, people who themselves suffer, or who have family members who suffer from such diseases (e.g., type 1 diabetes, Graves' disease, lupus) should be screened for Addison disease if they have suggestive symptoms. There are other non-immune forms of adrenal dysfunction, including iatrogenic (caused by medications), inherited, infectious, cancerous and toxic adrenal diseases. Addison disease is not associated with female or male genital ambiguity, as it typically occurs in adults and older children or adolescents. Ovotesticular disorder of sex development (ovotesticular DSD) is a very rare disorder in which an infant is born with the internal reproductive organs (gonads) of both sexes (female ovaries and male testes). The gonads can be any combination of ovary, testes or combined ovary and testes (ovotestes). The external genitalia are usually ambiguous but can range from normal male to normal female.

There are numerous other types of DSD. Virilization of female fetuses and children, or accelerated sexual maturity in males, may also result from androgen-producing tumors or exposure to androgenic substances. Genetic abnormalities affecting development of the placenta, pituitary, adrenal or gonads (testicles or ovaries) can also result in abnormal sexual development (Bulsari K, Falhammar H.,2017).

Diagnosis: All newborns in the United States are screened for classic 21-hydroxylase deficiency. Non-classic CAH is frequently not detected in the newborn test and therefore, may not be diagnosed until childhood or early adulthood when the patient first starts showing symptoms. Genetic testing for the gene variants associated with the various forms of CAH is available but is most often performed when pre-pregnancy genetic counseling is indicated, after an endocrinologist confirms the diagnosis through blood hormone tests, or if results of hormone tests are not definitive (Van de Grift TC, Cohen-Kettenis PT.,2018).

Prenatal diagnosis is available for couples at risk for having a child affected with CAH using first trimester chorionic villus sampling and testing the fetal DNA for a particular CAH gene variant known to occur in the family. Non-invasive determination of sex can be accomplished through testing fetal DNA in the mother's blood. Non-invasive prenatal testing for variants in CYP21A2 (the gene causing this disorder) is not generally available at present (Tamhane S, Rodriguez-Gutierrez R.,2018).

Clinical evaluation: If CAH is detected in a fetus, prenatal treatment is a possibility, although it should be regarded as experimental. The oral drug dexamethasone can be given to pregnant women in a subsequent pregnancy if she has given birth to child with severe classical CAH. Such treatment does not prevent or cure the disease but may lessen the virilization of affected female fetuses. There is limited knowledge about the long-term safety of this procedure, and this should be done only under the supervision of experienced clinicians who report to an ethical review board for human studies (Al-Mendalawi MD.,2018).

Monitoring hormone levels in individuals with CAH is crucial throughout their post-natal life. Height and weight are important aspects that need to be monitored in order to know if treatment should be adjusted, particularly in children. Monitoring bone age is an additional tool to determine if the child is undergoing proper physical maturation. A simple x-ray of the hand can show the growth centers and provide an estimate of predicted adult height. As individuals mature, the growth centers change and have characteristic appearances at different ages. Too much sex hormone secretion can cause bones to age more rapidly, and treatment can slow this progression, if caught early (Mokrysheva N.G., Melnichenko G.A.,2021).

Standard therapies: Treatment of CAH varies greatly depending on the type and severity. CAH cannot be cured, but it can be effectively treated. Treatment of classical CAH starts soon after birth and is needed throughout the patient's life. People with classical CAH should have a team of healthcare providers, including specialists in pediatric endocrinology, uro-

gynecologic surgery (for girls), psychology and genetics. People with classical CAH can have normal, fulfilling lives. Patients with non-classical CAH may not need any treatment, depending on their symptoms. Treatment must be individualized by doctors who have experience with this condition. The primary goal of treating classical CAH is to reduce the excess androgen production and replace the deficient hormones. Proper treatment with the correct dosage of these medications is crucial to preventing adrenal crisis and virilization (Al-Mendalawi MD.,2018). Daily tablets including glucocorticoids (usually as hydrocortisone to replace cortisol), mineralocorticoids (fludrocortisone to replace aldosterone) and salt supplements may be prescribed, the latter particularly in infancy. During times of high stress or illness adrenal glands are normally much more active. Therefore, when ill or after major surgery or stressful event, CAH patients must be closely monitored because their bodies will require more hormones to help the body recover and meet increased demands. Hormone levels need to be adjusted and monitored throughout the patient's life. The dose of glucocorticoids should be adjusted to avoid development of Cushing's syndrome, a disorder characterized by a variety of symptoms and physical abnormalities including weight gain; skin, muscle and bone changes. High dose mineralocorticoid supplements or salt should be avoided to prevent high blood pressure (Соболева Е.Л., Осиновская Н.С.,2018).

Surgery may be considered to correct the appearance of ambiguous genitalia and/or relieve urethra-vaginal outlet obstruction that may lead to infection. Usually, surgery is thought to be easier when performed at about 6-12 months after birth. The choice to have the surgery should be reserved for infants with severe genital ambiguity and is most often a joint decision of the parents and medical-surgical teams. Some parents choose to wait until their daughter is old enough to have a say in her surgery. Others feel uncomfortable with waiting and may request early surgical intervention. If this is the case, finding a highly skilled pediatric urologic surgeon is of the utmost importance. Surgical techniques have changed over the past few decades, and cosmetic appearance and functionality have improved. It is also highly recommended that families of girls who undergo this surgery have expert psychological counseling and care (Jayakrishnan R, Lao Q, Adams SD, Ward WW.,2019).

Non-classical CAH on the other hand, is not life-threatening and relatively mild. People who have no obvious symptoms of non-classical CAH do not require surgery or medical treatment. If a patient with non-classical CAH begins to enter puberty too early, has early maturation of bones, or is a female with excess facial or body hair or other masculine features, glucocorticoid treatment is often recommended. Fertility problems can also be corrected with glucocorticoids and/or fertility drugs. Women who do not wish to conceive may also be prescribed oral contraceptives. Unlike severe forms of CAH, non-classical CAH patients are free to taper and stop treatment when symptoms go away (Van de Grift TC, Cohen-Kettenis PT.,2018).

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OXIDIZED CARBON NANOHORNS -BASED NANOHYBRID AS SENSING LAYER FOR NOVEL RELATIVE HUMIDITY SENSOR

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ABSTRACT

In this study, a resistive humidity sensor for moisture detection at room temperature is presented. The thin film proposed as a key sensing element is a ternary nanohybrid based on oxidated carbon nanohorns (CNHox)/NiO/agarose.

The RH sensor includes a Kapton substrate, interdigitated electrodes, and a sensing layer obtained via drop drop-casting method. The electrodes were connected by successive deposition of Cr (10 nm) and Au (100 nm). They can be linear or have an interdigitated configuration. The morphology and composition of the sensing layers-based ternary nanohybrid were investigated through scanning electron microscopy (SEM), atomic force microscope, and Raman spectroscopy. The RH monitoring capability of the sensing layers was investigated by applying a current between the two electrodes, and measuring the resulting voltage while

exposing the assembly at different RH levels. Resistance of the thin film increased when the sensors were exposed to the atmosphere with relative humidity in the range of 0 to 100%. From the point of view of the detection principle, the resistance of the conductive layer varies with the level of relative humidity.

The use of CNHox/NiO/agarose ternary nanohybrid deposited as a sensitive layer by the drop-casting method on a dielectric substrate, has significant advantages, such as:

- CNHox confers a high specific surface/volume ratio, affinity for water molecules, as well as a variation in the resistance of the sensitive layer upon contact with them throughout the relative humidity (RH) range;
- NiO nanopowder is a p-type semiconductor with a wide conduction band and a large specific surface. It is non-toxic and has good chemical and thermal stability. It presents a synergistic effect with oxidized carbon nano-onions, which also has a p-type semiconductor behavior.
- detection at room temperature;
- agarose is a hydrophilic polymer that exhibits low hysteresis.

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Keywords: oxidated carbon nanohorns, resistive sensors, relative humidity, agarose

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ABSTRACT

This study presents a resistive n-butanol vapors sensor for detection at room temperature. The thin film proposed as a key sensing element is a ternary nanohybrid based on oxidated carbon nanohorns (CNHox) / oxidated carbon nanooxions (CNOox) / Cu₂O.

The n-butanol vapor sensor includes a Si/SiO₂ substrate, interdigitated electrodes, and a sensing layer obtained via drop-casting. The electrodes (with linear and interdigitated configuration) were connected by successive deposition of Cr (10 nm) and Au (100 nm). The morphology and composition of the sensing layers-based ternary nanohybrid were investigated through scanning electron microscopy (SEM), atomic force microscopy, and Raman spectroscopy. The n-butanol vapor monitoring capability of the sensing layers was investigated by applying a current between the two electrodes, and measuring the resulting voltage while exposing the assembly at different n-butanol levels. Resistance of the thin film increased when the sensors were

exposed to the atmosphere with n-butanol concentrations in the range of 0 to 100%. From the point of view of the detection principle, the resistance of the conductive layer varies with the n-butanol level.

The use of CNHox/CNOox/Cu₂O ternary nanohybrid deposited as a sensitive layer by the drop-casting method on a dielectric substrate, has significant advantages, such as:

- both CNHox and CNOox confer a high specific surface/volume ratio, affinity for n-butanol molecules, as well as a variation in the resistance of the sensitive layer upon contact with them;
- Cu₂O nanopowder is a p-type semiconductor with a wide conduction band and a large specific surface and has good chemical and thermal stability. It presents a synergistic effect with CNHox and CNOox, which also has a p-type semiconductor behavior.
- detection at room temperature.

Keywords: oxidated carbon nanohorns, resistive n-butanol sensors, Cu₂O

**PHYSIOLOGICAL STUDY, TREATMENT AND DIAGNOSTIC DETECTION OF
DRUG-INDUCED HYPOGLYCEMIA OBSERVED WITHOUT COMA**

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ABSTRACT

Hypoglycemia is an abnormally low level of sugar (glucose) in the blood. Hypoglycemia is most often caused by medications taken to control diabetes. Less common causes of hypoglycemia include other medications, serious illness or organ failure, a reaction to carbohydrates (in sensitive people), an insulin-secreting tumor in the pancreas, and some types of bariatric surgery (for weight loss). Low blood glucose causes symptoms such as hunger, sweating, tremors, fatigue, weakness, and inability to think clearly, while severe forms of hypoglycemia can cause symptoms such as confusion, seizures, and coma. Very low blood

glucose levels can affect the functioning of some organs. The brain is especially sensitive to low glucose levels because sugar is the brain's main source of energy. Responds by stimulating the brain to prevent blood glucose levels from falling below normal. Adrenal glands to produce adrenaline (adrenaline). Adrenal glands to produce cortisol. Pancreas to produce glucagon. Pituitary gland to produce growth hormone. All of these hormones cause the liver to make glucose and release it into the blood, but sometimes these hormones do not raise blood glucose levels enough to reverse hypoglycemia. If blood glucose levels remain too low, the brain will receive insufficient energy, leading to confusion, seizures, or loss of consciousness.

Keywords: Medicated hypoglycemia, Physiological characteristics, Treatment, Diagnosis

Hypoglycemia is an abnormally low level of sugar (glucose) in the blood. Hypoglycemia is most often caused by medications taken to control diabetes. Less common causes of hypoglycemia include other medications, serious illness or organ failure, a reaction to carbohydrates (in sensitive people), an insulin-secreting tumor in the pancreas, and some types of bariatric surgery (for weight loss). Low blood glucose causes symptoms such as hunger, sweating, tremors, fatigue, weakness, and inability to think clearly, while severe forms of hypoglycemia can cause symptoms such as confusion, seizures, and coma (Kerimova R.C., Abiyev H.Ə., Hüseynova G.A., 2023).

The diagnosis of a patient with diabetes is based on a low blood glucose level at the time of the development of symptoms. To eliminate the symptoms of hypoglycemia, you need to take sugar in any form. It may be necessary to reduce the dose of drugs that cause hypoglycemia. Typically, normal blood glucose levels are about 70 to 110 mg/deciliter (mg/dL), or 3.9 to 6.1 millimoles (mmol/L) per liter of blood. With hypoglycemia, the glucose level decreases significantly. Although diabetes mellitus, a disease affecting blood glucose levels, is characterized by high blood glucose levels, many patients experience periodic hypoglycemia due to the side effects of diabetes treatment. Hypoglycemia is rare in patients without diabetes (Kaewput W, Thongprayoon C, Varothai N, et al., 2019).

Very low blood glucose levels can affect the functioning of some organs. The brain is especially sensitive to low glucose levels because sugar is the brain's main source of energy. Responds by stimulating the brain to prevent blood glucose levels from falling below normal. Adrenal glands to produce adrenaline (adrenaline). Adrenal glands to produce cortisol. Pancreas to produce glucagon. Pituitary gland to produce growth hormone. All of these hormones cause the liver to make glucose and release it into the blood, but sometimes these hormones do not raise blood glucose levels enough to reverse hypoglycemia. If blood glucose levels remain too low, the brain will receive insufficient energy, leading to confusion, seizures, or loss of consciousness (Haroon NN, Austin PC, Shah B, et al., 2015).

Physiological disturbance due to the effect of drugs: Most episodes of hypoglycemia occur in people with diabetes and are caused by insulin or other medications they take to lower blood glucose levels. Hypoglycemia is more likely to occur when intensive efforts are made to keep blood glucose levels as close to normal as possible, or when people taking insulin check their blood glucose levels quite frequently. Hypoglycemia often occurs in diabetic patients with reduced food intake or chronic kidney disease. Elderly people are more susceptible to sulfonylurea-induced hypoglycemia than younger patients. If a person eats less than usual or exercises more than usual after taking diabetes medicine, the medicine can significantly lower blood glucose levels. In such situations, long-term diabetics are particularly vulnerable to hypoglycemia because they cannot produce enough glucagon or epinephrine to counteract low

blood glucose levels. Some medications other than those used to treat diabetes can sometimes cause hypoglycemia, especially pentamidine, used to treat pneumonia, the most common form of AIDS, and quinine, used to treat muscle cramps. A rare type of drug-induced hypoglycemia sometimes occurs in patients secretly taking insulin or other diabetes medications because they have a psychological disorder called false self-report disorder (formerly called Munchausen syndrome) (Kərimova R.C., Abiyev H.Ə., Hüseynova G.A., 2023).

Fasting hypoglycemia: In otherwise healthy people, prolonged fasting (sometimes for several days) and prolonged vigorous exercise (even after fasting) do not cause hypoglycemia. However, some diseases or disorders cause the body to be unable to maintain adequate blood glucose levels after fasting (fasting hypoglycemia). With heavy drinking on an empty stomach, alcohol can inhibit the production of glucose in the liver. In patients with advanced liver disease such as viral hepatitis, cirrhosis or cancer, the liver cannot store and produce enough glucose. Infants and young children with abnormalities in the enzyme systems that control glucose utilization (eg, glycogen storage disease) may also experience fasting hypoglycemia (Aggarwal N, Singla A, Mathieu C, et al., 2019).

A rare cause of fasting hypoglycemia is insulinoma, a tumor of the pancreas that produces insulin. Hypoglycemia can be caused by diseases that reduce hormone production by the pituitary and adrenal glands (Addison's disease). Other diseases such as chronic kidney disease, heart failure, cancer, and sepsis can also cause hypoglycemia, especially in critically ill patients. Hypoglycemia can occur if the body produces more insulin than it needs after eating foods high in carbohydrates (reactive hypoglycemia). However, such a reaction rarely occurs. In some cases, people with normal glucose levels experience symptoms that can be confused with hypoglycemia. After some bariatric surgeries, such as gastric bypass surgery, sugar is absorbed too quickly and causes an increase in insulin secretion, which can lead to hypoglycemia (Kaewput W, Thongprayoon C, Varothai N, et al., 2019).

Symptoms of hypoglycemia: Mild hypoglycemia: sweating, nervousness, tremors, weakness, rapid heartbeat, and hunger. Severe hypoglycemia: dizziness, fatigue, weakness, headaches, inability to concentrate, confusion, slurred speech, blurred vision, seizures, and coma. Symptoms of hypoglycemia rarely occur before blood glucose levels fall below 60 mg/dL (3.3 mmol/L). In some patients, when levels are slightly elevated, especially when glucose levels fall rapidly, symptoms do not appear until glucose levels drop significantly. The body's first response to a decrease in blood glucose levels is the release of epinephrine from the adrenal glands. Epinephrine is a hormone that stimulates the release of glucose from the body's stores, but also causes symptoms similar to those experienced during an anxiety attack: sweating, nervousness, tremors, fainting, palpitations, and hunger (Haroon NN, Austin PC, Shah B, et al., 2015).

More severe forms of hypoglycemia reduce the supply of glucose to the brain, causing dizziness, fatigue, weakness, headache, inability to concentrate, confusion, erratic behavior that can be mistaken for intoxication, slurred speech, blurred vision, seizures, and coma. Severe and prolonged hypoglycemia can cause irreversible brain damage. Symptoms can develop slowly or suddenly, progressing from mild discomfort to severe confusion or a panic attack within minutes. Sometimes, people who have had diabetes for many years (especially if they have had frequent episodes of hypoglycemia) no longer experience the initial symptoms of hypoglycemia and may suddenly pass out or fall into a coma without any warning signs (Quartuccio M, Buta B, Kalyani RR., 2017).

In patients with insulinoma, symptoms usually begin early in the morning after an overnight fast, especially if blood glucose stores are depleted by physical activity before breakfast. Initially, patients with tumors usually have infrequent episodes of hypoglycemia, but over

several months or years, the episodes become more frequent and severe. Patients with hypoglycemia are sometimes mistaken for drunkards (И.И. Дедова, М.В. Шестаковой, А.Ю. Майорова.,2019).

Diagnostics: Blood tests to measure glucose levels: When the patient describes the symptoms, the doctor may suspect hypoglycemia in a patient with diabetes. If the patient has a low glucose level at the time of symptoms, the diagnosis is confirmed (Mehta HB, Mehta V, Goodwin JS.,2017).

In a healthy person without diabetes, a doctor can usually diagnose hypoglycemia based on symptoms, history, physical examination, and simple tests (Kaewput W, Thongprayoon C, Varothai N, et al.,2019).

First, doctors measure the level of glucose in the blood. A low glucose level in the presence of typical hypoglycemic symptoms confirms the diagnosis in a person without diabetes, especially if an association between low glucose levels and symptoms has been repeatedly demonstrated. If the symptoms improve as the glucose level rises within a few minutes after taking sugar, the diagnosis is confirmed. If the relationship between glucose levels and symptoms remains unclear in a person without diabetes, additional tests may be needed. Often, the next step is to measure your fasting blood glucose at a hospital or other monitoring facility. More extensive testing may be needed.

If the cause of hypoglycemia is the use of drugs such as pentamidine or quinine, stop the drug and measure the blood glucose level to detect the increase. If the cause is unclear, other laboratory tests may be required (Mehta HB, Mehta V, Goodwin JS.,2017).

If insulinoma is suspected, fasting (sometimes within 72 hours) blood insulin levels may be required. If your insulin levels are high and you suspect a tumor, your doctor will try to detect it before starting treatment.

Treatment: Consuming sugar to raise blood glucose levels. Changing the dose of drugs. Eating small portions several times a day. Sometimes surgery to remove the tumor. Emergency treatment of hypoglycemia: Symptoms of hypoglycemia disappear within minutes of consuming any form of sugar, such as candy, glucose tablets, or a sugary drink such as a glass of fruit juice. Patients with recurrent episodes of hypoglycemia, especially those with diabetes, often prefer to carry glucose tablets with them because they act quickly and provide sufficient sugar. These people may benefit from eating sugar before eating longer-lasting carbohydrate foods (bread or crackers). For severe or prolonged hypoglycemia, when sugar cannot be ingested, doctors rapidly administer glucose intravenously to prevent brain damage (Zhang J, Chen C, Hua S, et al.,2017).

Patients at risk for severe hypoglycemic episodes may carry glucagon for emergency use. The use of glucagon stimulates the release of large amounts of glucose by the liver. It is given by injection or nasal inhalation and usually normalizes glucose levels to an acceptable level within 5 to 15 minutes. Glucagon kits are easy to use and the patient's loved ones or trusted representatives can learn how to administer this medication (Quartuccio M, Buta B, Kalyani RR.,2017).

Treatment of the cause of hypoglycemia: If the drug causes hypoglycemia, it is necessary to adjust the dose or change the drug. Insulinomas should be surgically removed. However, since these tumors are small and difficult to find, the operation must be performed by a specialist. Before surgery, the patient must take medication to control symptoms such as octreotide or diazoxide. Sometimes there are multiple tumors and if the surgeon doesn't find them all, a second operation may be needed (Zhang J, Chen C, Hua S, et al.,2017).

Non-diabetic patients prone to hypoglycemia can avoid attacks by having frequent snacks instead of three regular meals a day. To prevent postprandial hypoglycemia (called reactive hypoglycemia), it is sometimes recommended to limit the intake of carbohydrates, especially monosaccharides. Alpha-glucosidase inhibitors, such as acarbose, which slow the absorption of carbohydrates, have also been used successfully in people with reactive hypoglycemia and hypoglycemia after bariatric surgery (Kaewput W, Thongprayoon C, Varothai N, et al.,2019).

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NATURAL AND SYNTHETIC COMPOUNDS :WHAT DO WE KNOW ABOUT THEM?

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ABSTRACT

We firmly believe at the beginning of the third millenium that we have opportunity to revisited and discuss some old ideas, stereotypical wiews that have proven to be invalid or have little supportive evidence or are still debatable.

In this paper, we discuss five issues that involve toxicology, nutrition, public health, and government regulatory policy as follows:

a) Are the synthetic pesticides dangerorous? But the natural ones? The pesticide glyphosate is used all over the world. According to the International Agency for Research on

Cancer, glyphosate is probably carcinogenic. The US EPA considers glyphosate as “not likely to be carcinogenic to humans. Moreover, the EU extends the use of the herbicide for another 10 years. However, the amounts of synthetic pesticide residues in plant foods are insignificant compared to the amount of natural pesticides produced by plants.

b) Are antioxidants safe at any dose and cure any disease? Over an extended period, we have noticed about the antioxidant statements such as “are extremely toxic”, “natural antioxidants are best”, or ‘antioxidants cannot be effective.

c) Does drinking a glass of wine have health benefits? The last extensive studies suggests a robust conclusion: Drinking alcohol in any amount carries a health risk.

d) Are artificial colorings harmful? There’s no strong evidence that artificial colors in food are dangerous for our health. That doesn’t mean there is no risk, however. Total safety can’t be guaranteed. FDA uses a standard of “reasonable certainty of no harm”. Thus, removing them from foods could be a good choice.

e) Are parabens safe? According to the official position of FDA (Food and Drug Administration) parabens are safe and effective preservatives for the cosmetic industry.

Key words: pesticides, antioxidant, alcohol, food coloring, parabens,

HOLEY CARBON NANOHORNS- BASED SENSING LAYER FOR NOVEL RESISTIVE ETHANOL SENSOR

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ABSTRACT

This paper presents the design and manufacturing processes for a new chemiresistive ethanol sensor using a nanofiber composite material - $\text{TiO}_2/\text{La}_2\text{O}_3$ / holey carbon nanohorns - as a sensing layer. The ethanol sensor includes a dielectric substrate such as glass, electrodes (made up of aluminum, copper, and chromium), and a sensing layer obtained via drop casting and/or spin coating methods. Electrodes can be linear, planar, or can have interdigitated configurations. The ethanol monitoring capability is investigated by applying a constant current between the two electrodes and measuring the voltage at different values of the ethanol concentration to which the sensing layer is exposed. The decrease in conductivity is explained by the fact that ethanol molecules donate electrons to the sensing film, reducing the concentration of holes. The

oxidized carbon nanohorns can be synthesized by oxygen plasma treatment of pristine carbon nanohorns or by H_2O_2 treatment of pristine carbon nanohorns at 100°C . According to HSAB theory, ethanol is classified as a strong base. At the same time, TiO_2 (by Ti^{4+} ions), as well as La_2O_3 (by La^{3+} ions), are strong acids, so a "hard acid-hard base" interaction between the analyte and the sensitive layer is feasible. Moreover, TiO_2 and La_2O_3 change the distribution of pores at the interface with holey carbon nanohorns, increasing their specific surface area. The new synthesized sensing layer has several advantages: improved mechanical properties, large surface area, detection at room temperature, fast response, selectivity, and stability up to 400°C .

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Keywords: holey carbon nanohorns, HSAB, ethanol resistive sensor

PATHOPHYSIOLOGICAL REFUTATION OF THE PATHOGENESIS OF STRESS-INDUCED DISRUPTION OF ADRENAL HORMONES AND INFERTILITY

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ABSTRACT

The Hypothalamic-pituitary-adrenal (HPA) axis is comprised of the hypothalamus, pituitary gland, and adrenal glands. It regulates the body's adaptive response to stress. Adrenal fatigue, or HPA Axis dysfunction which is otherwise known, is when our adrenal glands function below normal levels, usually as a result of prolonged, chronic stress. The adrenal glands are situated on top of the kidneys and regulate our stress response by producing stress hormones such as cortisol and adrenaline in response to stress. Long term stress can lead to the depletion of the adrenal glands and can result in imbalances in the production of cortisol. When the body is in a long-term stress state, non-essential functions that are not important for immediate survival such as the digestive system, reproduction system, and thyroid start to slow down or switch off altogether.

Keywords: Stress, Adrenal hormones, Pathogenesis, Infertility

The Hypothalamic-pituitary-adrenal (HPA) axis is comprised of the hypothalamus, pituitary gland, and adrenal glands. It regulates the body's adaptive response to stress. Adrenal fatigue, or HPA Axis dysfunction which is otherwise known, is when our adrenal glands function below normal levels, usually as a result of prolonged, chronic stress. The adrenal glands are situated on top of the kidneys and regulate our stress response by producing stress hormones such as cortisol and adrenaline in response to stress. Long term stress can lead to the depletion of the adrenal glands and can result in imbalances in the production of cortisol. When the body is in a long-term stress state, non-essential functions that are not important for immediate survival such as the digestive system, reproduction system, and thyroid start to slow down or switch off altogether (Simic, D.; Nikolic Turnic, T.;2022).

The hypothalamic - pituitary - adrenal (HPA) axis, when activated by stress, exerts an inhibitory effect on the female reproductive system. Corticotrophin-releasing hormone (CRH) inhibits hypothalamic gonadotropin-releasing hormone (GnRH) and glucocorticoids inhibit pituitary luteinizing hormone and ovarian estrogen and progesterone secretion (Sidhom, K.; Panchendrabose, K.; Mann, U.;2022).

Stressful stimuli cause the activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic-adrenal-medullary (SAM) axis. The hormones secreted by these systems after stressful stimuli result in an abnormal, prolonged and/or excessive stress-induced body's set-up that can potentially produce long-term neuroendocrine changes, affecting female fertility . Biologically, neurons of the hypothalamic paraventricular nucleus of HPA axis release vasopressin and corticotropin-releasing hormone (CRH) to mediate the secretion of adrenocorticotrophic hormone (ACTH) from the anterior lobe of the pituitary gland . In turn, ACTH mediates the secretion of cortisol and glucocorticoid hormones by the adrenal cortex (Ostadmohammadi, V.; Jamilian, M.; Bahmani, F.;2019).

Differentially, the preganglionic sympathetic fibers of SAM axis, in response to environmental stressful stimuli, activate the adrenal medulla to release epinephrine and norepinephrine into the blood . Experimental data showed that statistically significant reductions in the probability of conception across the fertile window during the first cycle attempting pregnancy were observed for women whose salivary concentrations of α -amylase were in the upper quartiles in comparison with women in the lower quartiles. Even if the salivary α -amylase is considered only a surrogate marker of stress and SAM activity, these data seem to confirm the ability of stress to exert its effect on female fecundity through the SAM pathway (Sidhom, K.; Panchendrabose, K.; Mann, U.;2022).

All stress-induced hormones from the adrenal cortex and medulla are responsible for several physiological and mental consequences, which cause the individual to fight with or flight from the stressor. Differences in individual responses could be explained by findings from ewes showing that animals with divergent cortisol responses to ACTH exhibit functional differences in the HPA axis due to innate differences in the gene expression/function of HPA molecules. Further results from female cynomolgus monkeys, exposed to mild combined psychosocial and metabolic stress, show a selected and specific (rather than generalized) increased activity in the adrenal framework significantly related to stress-induced reproductive dysfunction (Simic, D.,Nikolic Turnic, T.;2022).

Increased glucocorticoid release/concentrations leads to profound dysfunction of the hypothalamic-pituitary-ovary (HPO) axis .Specifically, distress concentrations of

glucocorticoids in the bloodstream reach high levels acting directly on hypothalamus altering the physiologic release of gonadotropin releasing hormone (GnRH). The synthesis and release of gonadotropins from the pituitary are thus indirectly inhibited, even if a direct pituitary effect of glucocorticoid has been also demonstrated. Accordingly, evidences from animal models are available . In sheep model the infusion of cortisol at concentrations comparable to those produced in humans under stress generates a delay in follicular maturation and ovulation by attenuating or blocking the expected increase of estrogens and luteinizing hormone (LH) surge (Ostadmohammadi, V.; Jamilian, M.; Bahmani, F.;2019).

However, the signaling pathway by which this occurs remain unclear and is further complicated by the recent findings of kisspeptin (KISS1) and gonadotropin-inhibitory hormone (GnIH). These two neuropeptides induce opposite effects on hypothalamic GnRH release being sensitive to high levels of glucocorticoids . KISS1 exerts stimulatory effects on GnRH secretion. In mouse model, corticosterone administration reduced hypothalamic expression of KISS1 during the estradiol-induced LH surge and decreased the activation of KISS1 neurons. Differentially, GnIH neurons inhibit the activity mediated by either GnRH and KISS1 molecules. Experimental data in ewes demonstrated a direct relationship between both acute and chronic stress and inhibiting GnIH effects on hypothalamus up to inhibition of LH release from the pituitary (Kərimova R.C., Ağayeva A.H., Abiyev H.Ə.,2023).

Consequently, the stressful stimuli on the female adrenal and HPO axis impact more than one physiological event of fertility including ovulation, fertilization and the implantation rate , independently of stimulus origin. Anomalies in the LH pulses induce and inhibition of the ovulatory function directly or thought an effect on sex steroid synthesis/secretion in the ovary . This circumstance can be produced by job-induced stress that exerts its effect through increased LH-plasma concentrations in both the follicular and luteal phases of the ovarian cycle (Liu, Y.; Yu, Z.; Zhao, S.; Cheng, L.;2021).

Both in general and infertile population, distress was respectively associated with decreased conception rates and long menstrual cycles (≥ 35 days) and lower outcomes of reproductive medicine, including oocytes retrieved, fertilization, pregnancy and live birth rates . In addition, in infertile women chronic lifetime psychosocial stressors were also identified as detriments to ovarian reserve. Specifically, they were predictive of an enhanced likelihood for diminished ovarian reserve. To this regard, a low socioeconomic status aggravated by sources of stress such as undernutrition and financial hardships potentially plays a key role in affecting ovarian reserve (Liu, Y.; Yu, Z.; Zhao, S.; Cheng, L.;2021).

Of note, the distress can act on female fecundity acting on uterine receptivity also independently from ovarian function. Using a mouse implantation model, the distress induced a poorer endometrial receptivity even if the hormone supplementation was administrated (Sidhom, K.; Panchendrabose, K.; Mann, U.;2022).

Depression, high active coping, avoidance and expression of emotions may produce the same consequences on female fecundity. Depression is significantly correlated with the alternative manifestation of stress, i.e. anxiety, affecting cortisol release and symptoms are observed in approximately 37% of infertile women . Consistently, both emotions are prevalent in female partners of infertile couples and more common among females suffering from infertility compared to fertile females . The role of emotional distress and anxiety is not still understood, but a small body of evidence suggests that the induction of oxidative stress may be the mechanism by which psychosocial stressors affect oocyte quality through impairment of the overall female health (Kərimova R.C., Ağayeva A.H., Abiyev H.Ə.,2023).

Many women undergoing reproductive medicine report depressive symptoms prior to beginning their treatments, reflecting a prior history of mood/anxiety disorders independent of

infertility itself. Of interest, resilience, i.e. psychosocial stress-resistance, in infertile couples acts as a protective factor against infertility-specific distress and impaired QoL probably through its effect on freedom from anxiety. Moreover, data on psychological interventions or counseling interfering with depression and anxiety are reliable to speculate that the less women are physiologically reactive to distressing stimuli the more they potentially become capable of alleviating their negative consequences on reproductive system. Nonetheless, albeit these interventions are effective to optimize natural fertility and outcomes of reproductive medicine strong clinical evidences are still lacking (Zehravi, M.; Maqbool, M.; Ara, I.,2021).

Unsatisfied motherhood may have implications on female QoL for stress related to marital life too, hampering also couple's attitude towards successful infertility treatments . Consistently, partnered women who give up a strong intention to have children show more depressive symptoms when relinquished fertility intentions occur in the context of declining relationship quality and in the relational domain, female sexual function positively correlates with male partner sexual function . In addition, infertile women are more likely to underestimate the importance of sexual intimacy in marital life and this is consistent with the deleterious effect of the infertility on sexual dysfunction and poor QoL in women . This scenario can constitute a negative event in women's life with an impact on QoL because it may potentially trigger chronic distress and subsequently reduce the changes of successful infertility treatments . However, this pathway still needs further clarification (Liu, Y.; Yu, Z.; Zhao, S.; Cheng, L.;2021).

QoL can be impaired in case of reproductive illness at which women are faced to during fertile lifespan. For instance, the polycystic ovary syndrome (PCOS) may be a factor favoring the occurrence of mood disorders as there is evidence that infertile women with PCOS experience high psychological distress and difficulties with coping with their condition as well as poor QoL . These and other variables including body mass index, woman's job, menstrual cycle intervals and sexual satisfaction appear to define QoL in women with PCOS . The validated questionnaire for evaluating the impact of PCOS on health-related QoL in affected women revealed that how weight decrease is of relevance for the overall phenotypic spectrum improvement and a relative decrement in psychological distress. Co-morbidities (for example obesity) may impact many patient' characteristics, such as social and patient perspective reflected in well-being and QoL individual perception (Perera, G.;Casillas,F.;Betancourt, M.;2020).

In the current review, we discussed and summarized the literature published over the past years until nowadays concerning the relationship between stress, QoL and female fertility. Much of information stems from cross-sectional and interventional studies in which female population is recruited from clinics of reproductive medicine and kindred registries. Considering that 15% of couples are infertile among general population and a million of couples every year looks for time-consuming and expensive fertility treatment, the cohort here argued is not representative of the overall female population. This could reasonably explain some conflicting results cited (Sidhom, K.; Panchendrabose, K.; Mann, U.;2022).

Mood states are manifestations of well-being encompassing psychological condition and life satisfaction. In this perspective, depression and anxiety represent distress-mediated symptoms of infertility that affects more women than men in four aspects of their life: psychological well-being (depending on the presence or absence of distressing stimuli from any source), marital relationship including sexual intimacy, and QoL. Specifically, most women plan their fertility as meticulously as they do career, educational and lifestyle choices waiting for the right moment of motherhood. In the absence of difficulties, achieving motherhood allows women to reach adult status, social identity, to fulfill gender-role and to complete the marriage. On the other

hand, the inability to realize these social expectations can constitute a source of stress and strain resulting in QoL deterioration (Goto, T.; Hirabayashi, M.; Watanabe, Y.;2020).

Although the influence of stress and distress (measured as anxiety and depression) on ART outcomes was appeared somewhat limited up to 2011, four years later the European Society of Human Reproduction and Embryology (ESHRE) acknowledged the clinical weight of stress and QoL in female reproduction and prompted to incorporate psychosocial assistance into clinical practice of reproductive medicine . In fact, each specific step of ART treatment seems to be closely related to increased levels of distress. This picture seems to be gender-related. During an ART cycle, women show lower levels of QoL compared to men and the number of ART failures in becoming pregnant influences more women' QoL rather than men . Before knowing ART outcome, women undergoing a cognitive coping and relaxation in their first in vitro fertilization (IVF) cycle showed improved QoL as compared with patients undergoing routine care . From a different perspective, many ART women may report depressive symptoms prior to beginning their cycle, which likely reflects the impact of repeated, unsuccessful, less invasive forms of treatment, but may reflect also a prior history of mood/anxiety disorders independent of infertility . Interestingly, lower concentrations of norepinephrine and cortisol in serum and follicular fluid on the oocyte retrieval day were found in women whose treatments were successful suggesting that both stress-induced biomarkers may negatively influence the clinical pregnancy rate in IVF treatment . Similar findings whereby stress levels were measured in terms of circulating prolactin and cortisol levels suggest that infertile women have a different personality profile in terms of more suspicion, guilt and hostility as compared to the fertile controls . To this regard, the infertility status or its awareness could influence the hormonal release of prolactin/cortisol. On the other hand, the psychological stress may affect the outcome of IVF treatment since anxiety levels in patients who do not achieve pregnancy are higher than in those who become pregnant. Furthermore, women with successful treatment have lower concentrations of adrenaline at oocyte retrieval and lower concentrations of adrenaline and noradrenaline at embryo-transfer day, compared with unsuccessful women . That data emphasizes the positive relationship between adrenal stress-related biomarkers concentrations and pregnancy and depression (Kərimova R.C., Huseynova G.A., Nəcəfova T.M., Abiyev H.Ə., 2023).

On one side, stress from any source has more impact on the wives' live than husbands', more impact on satisfaction with self and general well-being than on satisfaction with the marriage or health, and affects QoL mostly indirectly through its impact on the marriage factors. Most results address the alteration of hormonal signaling between the HPA and HPO axis as the more likely mechanism by which stress-related molecules negatively modulate female fertility. Going beyond the emotional fences of depression and anxiety leads women to make the decision to reveal information about their infertility with a resulting positive impact in QoL. Accordingly, literature data show that when a direct disclosure of their infertility issues (i.e. face-to-face, clearly, verbally and with the opportunity for an immediate response) is adopted by women, the perceived support quality from social network members is also related to improved QoL supporting towards infertility treatments . Concisely, when the appropriate infertility patient-centered care is not offered, poor QoL is observed among women. On the other side, QoL and lifestyle choices are non-synonymous concepts, albeit some habits of modern life (classified as social lifestyle factors) can interfere with female health and account for reproductive problems. As consequence, the inability of becoming pregnant can be linked to social behaviors worsening female QoL indirectly (Goto, T.; Hirabayashi, M.; Watanabe, Y.;2020).

Thus, it is possible to speculate that information on lifestyle habits should be useful to encourage women by clinicians to improve the overall health because positively affects their

ability to reproduce. Moreover, handling the topic of stress with accidentally childless couples should be included in routinely cares to minimize the effects of modern life on infertility. In addition, managing the baseline stress (chronic distress) prior to infertility treatment appears to have even greater importance than managing the (acute) stress inherent to fertility treatment itself. This hypothesis is in line with the results of two pilot studies exploring the efficacy of integrative approaches demonstrating that ongoing emotional and instrumental supports are both pivotal to the well-being and QoL of infertile women (Perera, G.; Casillas, F.; Betancourt, M.;2020).

This is particularly true for ART population for which health-care providers should be aware of offering psychological support to patients, especially women, during all phases of the medical procedures, given the emotional and physical difficulties associated with this experience. The usefulness of this support has been also acknowledged somewhat of importance to contrast psychological discomfort that could lead to premature termination of ART and consequently to reduce pregnancy rate . For this purpose, it should be also considered that until the desire of motherhood does not become a priority in female life, the presence of an eventual baseline acute and/or chronic stress as low QoL determinants can be not a determinant of such a relevance. However, when the need for ART procedures occurs, it becomes difficult to establish whether ART-stress is related to ART cycle itself (acute or procedural stress, due to the timing and experience during which it arises) rather than QoL-stress, i.e. chronic distress accumulated during lifespan (Zehravi, M.; Maqbool, M.; Ara, I.,2021).

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FAKE NEWS IN CHEMISTRY: A SOCIAL PROBLEM WITH HUGE IMPACT

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ABSTRACT

Even though social media is, inter alia, a vast library, distinguishing between accurate scientific data and misinformation can be a challenge, even for a well-educated person.

Unfortunately, much fake news related to different molecules with significant impacts on our lives is disseminated online using pseudoscience as a primary tool to confuse people. After receiving a cancer diagnosis, the patients refuse the standard treatments approved by the medical community in favor of alternative therapies, leading to serious public health consequences. This study aims to review a few of the most encountered fake news and misinformation related to chemical compounds. Thus, the paper analyzes the popular cancer treatments that lack scientific and medical evidence of effectiveness. Miraculous molecules or

therapies such as dehydroepiandrosterone, dimethyl sulfoxide, hydrazine sulphate, amygdalin and laetril, pregnenolone, quercetin are analyzed in terms of medical evidence of effectiveness.

The paper reviews, also other fake news – related to chemical compounds, such as the benefits of drinking hexagonal water, the therapeutic properties of alkaline- water, and the use of raspberry ketone as a loss supplement due to a possible efficacy in the treatment of overweight/obesity, use of resveratrol in diabetes and hypertension, in treating and preventing retinal damage, use Himalayan salt for their health benefits.

The paper emphasizes contradictory messages and misinformation about the role of dietary supplements such as vitamin C, vitamin D, zinc, elderberry, and silver in treating and preventing coronavirus disease 2019 (COVID-19).

Last but not least, the paper highlights the importance of using reliable sources of information from reputable institutions such as the EFSA (European Food Safety Authority), EMA (European Medicine Agency), FDA (Food and Drug Administration), the EPA (Environmental Protection Agency), the IARC (International Agency for Research on Cancer).

Keywords: cancer, Laetril, vitamin C, Covid-19, FDA

ASPARTAME AND SUCRALOSE IN 2024, PROS AND CONS: QUO VADIS?

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ABSTRACT

Common sugar substitutes, such as aspartame and sucralose, are food additives used to sweeten and, in some cases, enhance the flavor of foods. These sweeteners are widely used in foods and beverages marketed as "sugar-free" or "diet," including baked goods, carbonated beverages, puddings, canned foods, dairy products, toothpaste, and medications such as cough drops and chewable vitamins. Despite a plethora of comprehensive reviews on the safety of artificial sweeteners, there is still a high level of controversy about their safety.

This paper aims to analyze the most discussed aspects related to unscientific, proven, unproven, and disproven side effects and safety issues of aspartame and sucralose, two of the most used artificial sweeteners.

Beyond anecdotal allegations such as “Aspartame metabolism yields to methanol intoxication (one of the most frequent statements related to aspartame toxicity found on the Internet), “Ingredients hard to pronounce such as sucralose should be avoided” or valid concern (patients suffering from phenylketonuria should avoid consumption of aspartame), the paper is focused on the most recent assessments released last year by the International Agency for Research on Cancer (IARC) According to these, aspartame is classified as possibly carcinogenic to humans (IARC Group 2B). Moreover, according to the last extensive research, sucralose-6-acetate, a sucralose impurity and metabolite, is suspected to be a genotoxin with induction of breaks in DNA.

Last but not least, the paper emphasizes the World Health Organization's warnings about the long-term use of artificial sweeteners.

The conclusion of this study is that we are still far from fully understanding the risks associated with prolonged sweetener consumption.

For this reason, to prevent safety issues, the authors propose and explain, with several examples, a new concept called “alternatively open and close the window towards different artificial sweeteners. ”

Keywords: aspartame, sucralose, carcinogenic genotoxin, sweeteners

PATHOLOGICAL AND PHYSIOLOGICAL ROLE OF ADRENAL HORMONES IN THE PATHOGENESIS OF INFERTILITY CAUSED BY PSYCHOLOGICAL STRESS

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ABSTRACT

Infertility has a remarkable global impact affecting approximately about 48 million couples worldwide. One of the most contended concerns in reproductive biology is the prospective influence of psychological stress on pregnancy rates. Individuals struggling to conceive face a stupendous amount of emotional turbulence and have a greater risk for psychological vulnerability. Both stress and infertility reinforce the impact of each other; hence, there exists a reciprocal relationship. Stress may be the major contributor to subsequent infertility. Infertility treatments may enhance stress levels as well as reduce treatment outcomes. The biological mechanisms that interlink stress and infertility are the outcome of the hormonal actions at the

brain level, where they stimulate or suppress the hypothalamic-pituitary-adrenal axis (HPA) and have a potential influence on the secretion of the respective hormone by the reproductive organs and the pregnancy outcomes. Sex hormones play an essential role in reproductive biology as well as in general physiology where they generate the cycle and provide a potential environment for pregnancy. This article reviews the impact of stress on reproductive rates and the implications of sex hormones on infertility. Additionally, it suggests strategies to overcome the stress conditions and the scenarios that may lead to stress.

Keywords: Psychological stress, Infertility, Adrenal hormones, Pathology, Physiology

Stress is an inevitable outcome of modern life which is expressed as an uncomfortable condition of mental and physiological arousal that people experience when they perceive a harmful or dangerous situation to their well-being . With continuously changing lifestyles and social systems, the ability to deal with stress and limit its consequences is essential for living a balanced and healthy life. The basis of the complexion, duration, and severity of stress responses can affect homeostasis and have various impacts on the body, including life-threatening effects and even death (Kerimova R.C., Ağayeva A.H., Əliyeva D.M.,2023).

Infertility is one of the global health problems and the most distressing condition affecting about 186 million people that may carry significant psychological trauma. Personal stress, pressure from marital relationships, and social networks for married couples' further family functioning and educational level are negatively correlated with infertility . Although not fatal, it has been described as a serious life-changing problem where one is unable to establish clinical pregnancy. Behind the workup of infertility, traditionally, the female factor is considered the major driving force, and the malefactor is predicted to be 50% of the cause, with a peculiar contribution in 20% of instances . In males and females, the influence of mental disorders is often considered the reason for idiopathic infertility including stress, depression, sleep, and eating disorders (Bisconti, M.; Simon, J.F.; Grassi, S.,2023).

The knowledge of the relationship between stress and infertility is still not broadly accepted. However, it has been reported that stress is a common factor in the development of unexplained reproductive disorders . The major drawback seems to be the hardship in administering the correlation between emotional factors and reproductive outcomes. The inability to reproduce naturally can cause feelings of shame, guilt, and low self-esteem, thus increasing their psychological vulnerability, and these negative feelings may lead to varying degrees of depression, anxiety, distress, and a poor quality of life. This review focuses on elucidating the knowledge of the impact of stress on infertility or reproductive outcomes and the role of hormones in causing stress as well as affecting the fertility rate, which also includes various stress-related ailments that lead to infertility (Bisconti, M.; Simon, J.F.; Grassi, S.,2023).

The Hypothalamic-pituitary-adrenal (HPA) axis is comprised of the hypothalamus, pituitary gland, and adrenal glands. It regulates the body's adaptive response to stress. Adrenal fatigue, or HPA Axis dysfunction which is otherwise known, is when our adrenal glands function below normal levels, usually as a result of prolonged, chronic stress. The adrenal glands are situated on top of the kidneys and regulate our stress response by producing stress hormones such as cortisol and adrenaline in response to stress. Long term stress can lead to the depletion of the adrenal glands and can result in imbalances in the production of cortisol. When the body is in a long-term stress state, non-essential functions that are not important for immediate survival such as the digestive system, reproduction system, and thyroid start to slow down or switch off altogether. The hypothalamic - pituitary - adrenal (HPA) axis, when activated by stress, exerts

an inhibitory effect on the female reproductive system. Corticotrophin-releasing hormone (CRH) inhibits hypothalamic gonadotropin-releasing hormone (GnRH) and glucocorticoids inhibit pituitary luteinizing hormone and ovarian estrogen and progesterone secretion (Bisconti, M.; Simon, J.F.; Grassi, S.,2023).

Stress is always manifested as a phenomenon that fails to attain the genetic potential and to cope with the environment of any individual. Indelible diagnosis and therapeutic methods may have a pessimistic impact on sexual lives and can also induce stress among infertile couples . Acute stress and chronic stress are two distinct kinds of stress. Acute stress is generally present in times of emergency, such as fighting. The changes that occur in the structure and function of specific chemicals in the brain trigger the emotional cognitive system, leading us to make stress-coping judgments. As a result, acute stress is frequently beneficial to the body, and it also enhances resistance to infection and minimizes the ability of an individual to produce a powerful immunological reflex along with the subsequent rise in ailments. However, chronic stress is extensively involved in the pathogenesis of various diseases, and it is now thought to include both professional stress and atypical adversity. It may cause sleeplessness, gastrointestinal issues, anxiety, and depression, as well as an increased risk of complications associated with cardiac, cancer, and mental illness in addition to adversely affecting fertility. It also hampers the process of immune cell migration to the site of inflammation or infection . The primary cause of infertility is psychological stress, and it is often preventable. The other mediators reported are metabolic stress and oxidative stress, which are interlinked with psychological stress (Kumar, M.; Zilate, S.; Gupta, C.,2022).

Psychological stress: Psychological stress is common among infertile women, and it is often manifested as chronic stress. Untreated stress can interfere with the pregnancy success rate or persistence with fertility treatment. The psychological stress that leads to a cytokine storm induces, in turn, oxidative stress which may trigger disruptions in the blood–testis barrier and lead to abnormal semen characteristics. It causes a delay in attempting fertility that has a negative impact on the couple’s fecundity. The disputing psychological stress is reported as the major reason for severe reductions in testicular function leading to infertility . Moreover, psychological stress is shown to be associated with high levels of female infertility that establish greater levels of undesirable pregnancy which includes repeated implantation failure and miscarriage. Psychological distress has a high probability of directly causing endometrial dysfunction by disrupting the secretion and regulation of endometrial hormones . Prolonged psychological distress leads to a higher rate of discontinuous medically assisted reproduction. The vital environmental factor which adversely influences fertility is psychological stress which is associated with multiple health consequences and is considered to be a chronic experience of stress causing infertility (Mate, A.; Reyes-Goya, C.; Santana-Garrido, Á.,2021).

In recent years, the assessment of metabolic risk factors is considered highly essential for understanding reproductive disorders, especially since it may contribute in figuring out the cause behind idiopathic infertility, which might help in enhancing fertility treatment outcomes. Metabolic stress is an underlying cause of various metabolic disorders including obesity, osteoporosis, amenorrhea, or athlete triad (an eating disorder that leads to being underweight) . The imbalance between reproduction and metabolism is mainly due to PCOS which often leads to ovarian dysfunction; further, it causes metabolic syndrome in females. Obesity can contribute to and cause permanent female infertility, and a higher BMI causes a potential reduction in serum adiponectin levels and elevation of insulin, which triggers hyperandrogenemia, inducing the risk of menstrual irregularity, PCOS, acne, and hirsutism. Women with greater BMI exhibit lower fecundity despite many ART treatment cycles. The female with athlete triad experiences menstrual dysfunction which is accompanied by the risk of infertility (Mate, A.; Reyes-Goya, C.; Santana-Garrido, Á.,2021).

Reproductive hormonal changes during stress and infertility conditions: Hormones administer and coordinate human sexual development, sexuality, reproduction, developmental plasticity, or phenotypic rearrangements that happen perpetually at the entire ontogeny including follicle formation and ovulation which involves hormones such as LH and Follicle-Stimulating Hormone (FSH), as their functions are illustrated in together in distinct locations of the body, namely the hypothalamus, pituitary gland, and reproductive organs. An endocrine imbalance accounts for about 10% of the major causes of infertility . During stress, hormone and acoustic tests revealed increased salivary cortisol levels and related alterations in voice pitch, vocal tract resonances (formants), and speech speed. The hormones that are generated in response to stressful conditions aid a depressed body setup that has the potential to cause long-term neuroendocrine changes that impact female fertility. During the normal estrogen cycle, at the follicular phase, the hypothalamus secretes the regular standard outcome of gonadotropin-releasing hormone (GnRH); this results in the pituitary gland's pulsatile secretion of luteinizing hormone (LH) release, and stress may induce abnormal hormonal production that may mislead the estrogen cycle and end up in failure in conception . Under stress conditions, the serum level of hormones alters to adapt an individual to the persisting circumstances; however, long-term exposure to stress may lead to deleterious endocrine disorders that may have a negative influence upon conception death (Kərimova R.C., Ağayeva A.H., Əliyeva D.M.,2023).

In stressed conditions, the gonadotrophin-secreting hormone, which is the primary driver of reproductive function, is found in a reduced amount . Neurons that are responsible for the synthesis of GnRH have a neural control point for modulating the reproductive function in vertebrates, and those neurons also highly represent the stress responses on reproduction since they are capable of monitoring the physiological status of the body . Stress normally triggers the activation of the hypothalamus-pituitary-adrenal (HPA) axis as well as inhibits the hypothalamus-pituitary-gonadal (HPG) axis which is dealing with the secretion of GnRH. The stress may also interfere at any level of the HPG axis and may influence the reproductive function. Impairment in gonadotropin production and its action results in a spectrum of changes such as relative or absolute LH and FSH deficit, which affects the gametogenesis process and steroid synthesis in gonads, lowering fertility and estradiol levels (Lin, X.; Dai, Y.; Tong, X.; Xu, W.; Huang, Q.,2020).

Testosterone:Testosterone is an androgen that performs an essential function in the growth, reproduction, and maintenance of a healthy body. Sperm formation (spermatogenesis) is regulated by both endocrine and paracrine systems. FSH and LH are both involved in the endocrine stimulation of spermatogenesis and then work through the intermediate testosterone generated by the Leydig cells of the testis. There are only a few reports which insist on the effect of stress on testosterone synthesis and male infertility. Psychological stress primarily reduces the serum testosterone level, followed by the secondary elicit of serum LH and FSH levels, which may have an impact on the semen quality by reducing the rate of motility, count, and normally functioning spermatozoa. In accordance with the guidelines of the Endocrine Society, T replacement therapy is the standard treatment for men who suffer from symptomatic hypogonadism. Intratesticular testosterone is also an important factor for the spermatogenesis process, virility, and male fertility. Testicular biopsy is the only way to measure intratesticular testosterone concentration, which is invasive and can lead to many complications .A transdermal testosterone pretreatment may develop ovarian sensitivity for FSH levels. As well, in low-responder in vitro fertilization (IVF) individuals, gonadotropin therapy had increased follicular response. This perspective leads to higher levels of gonadotropin and increased follicular response compared to the mini-dose GnRH agonist protocol. Few other research studies had reported that after 21 days of unintended chronic stress in adult male rats, reduced

body weight, serum testosterone levels, and genital index were observed (Kumar, M.; Zilate, S.; Gupta, C.,2022).

In both males and females, a dimeric glycoprotein gonadotropin hormone called FSH and its receptor play an essential function in the generation of follicles as well as in regulating the process of steroidogenesis in the ovary and spermatogenesis in the testis. It is generated by the anterior portion of the pituitary gland in various isoforms physiologically and targets the cells of gonads. It coordinates its function with LH through G protein-coupled receptors (GPCRs) and alters steroidogenesis and cellular metabolism to regulate reproduction . The interrupted secretion of these hormones by the pituitary glands will lead to infertility and testicular functional disruption. Furthermore, this gonadotropin deficiency stands as the major risk factor accounting for about 0.5% of men's infertility. FSH interacts with its receptor on the Sertoli cells, triggering those cells in adults to secrete regulatory nutrients that are essential for germ cell maturation . Furthermore, the circulating concentration of the germ cells directly depends on the volume of Sertoli cells . It has been extensively employed in assisted reproductive technologies (ART). This hormone establishes its functionality upon binding to the receptors located in granulosa and Sertoli cells. Any polymorphism in the Follicle Stimulating Hormone Receptor gene figures out infertility in women. It may also lead to ovarian failure and primary or secondary amenorrhea. The level of serum FSH has a significant correlation with stress. During psychologically stressful conditions, serum FSH was observed to lower, which may influence sperm motility and functioning .

Prolactin: Prolactin is a polypeptide hormone, an essential factor for male reproduction secreted by lactotrophs . Treating prolactin elevation causes an affirmative metabolic effect on the patient, namely controlling glycemic content and other metabolic parameters. Men experiencing long-term psychological stress have greater levels of prolactin which are not noticed in women .Infertile men with oligo- and azoospermia, impaired movement, and hypogonadotropic hypogonadism have an extensively increased volume of serum prolactin levels as well as levels of seminal plasma. High prolactin in serum exhibits a chronic impact on the process of spermatogenesis in infertile men (Kumar, M.; Zilate, S.; Gupta, C.,2022).

Estrogen: It has been debated for a long time that males also have the estrogen hormone. According to early studies, estrogen was harmful to male reproduction since the exogenous treatments led to abnormal developmental outcomes. Estrogen synthesis in the testis and elevated levels of 17-oestradiol in the testis fluid are recommended as an essential factor in healthy male reproduction, but they are still a controversy. Based on the species, the receptors of estrogen such as estrogen receptors (ERs), ESR1 (ER-alpha), and ESR2 (ER-beta) are expressed in certain cells of the testis and also in the epididymal epithelium. Through the enzyme named aromatase, the testis secretes a crucial amount of this hormone. In the human body, biologically active aromatase is expressed by Leydig cells, immature germ cells, and in spermatozoa. Additionally, ESR1 and ESR2 are found in spermatozoa and germ cells, and it is important to note that spermatozoa contain a truncated form of ESR1. These observations unmistakably imply that estrogens are probably involved at various stages of the development of male germ cells. Historically, testosterone and estrogen were thought to be male and female sex hormones, respectively. However, estradiol, the most common type of estrogen, is also important in male sexual function. It is required in males to regulate libido, erectile function, and spermatogenesis. Estrogen is crucial for different physiological functions, including controlling energy metabolism, mineral balance, stress responses, and sexual development. It is a powerful vasodilator that increases blood flow in several organs throughout the body, with reproductive tissues, particularly in the uterus, experiencing the greatest effects (Emokpae, M.A.; Brown, S.I.,2021).

Anti-mullerian hormone (AMH): The Anti-Mullerian hormone (AMH) is made of small developing follicles in the ovary produced by granulosa cells. It is a homodimer glycoprotein involved in transforming the growth factor-B (TGFB) super family and is an outcome marker of the ovarian reserve pool belonging to chromosome 19 short arm. It acts as momentum for the quantitative aspect of ovarian reserve constitutes by the quality and quantity of primordial follicles. The primordial follicles undergo atresia by FSH after puberty when the HPG endocrine axis is activated. It produces 140 kDa disulfide-linked homodimer covalently bonded as a monomer of 560 amino acids. AMH exists as an active form of C-terminal about 25 kDa dimer and N-terminal pro region about 110 kDa. It is known for its serum marker assessment of spectrum ovarian reserve and PCOS. AMH provides two distinct receptors, AMHRI and AMHRII, involved in signal transmission relating Suppressor of Mothers Against Decapentaplegic (SMAD) proteins. These receptors transduce intracellular signals effectively through nuclear and physiological binding to AMH, which exhibits an essential function of prenatal gonadal sex differentiation by developing mullerian ducts in males. During embryonic development by the eighth post-conception week, the AMH hormone is produced by immature Sertoli cells in the testes until the age of 2 years post-natal, which declines over pubertal years; then, ultimately, it becomes untraceable in adults due to high concentrations of testosterone. The lower devotion of AMH level in males leads to the growth of the male and female genitalia. In females, analyzing serum AMH levels with autoimmune disease associated with the possibility of infertility (Kərimova R,C.,Məşədiyeva Bayramova S,Ə.,2023).

Impact of stress on infertility treatment: Fortunately, major advancements in the medical and surgical treatment of infertility have lately been developed. The total increased risk associated with various fertility medicines, however, is just 1–2%. PCOS is the greatest prevalent condition of anovulatory infertility. It is treated with various medications; oral ovulation induction medications are the first-line pharmacological therapy for women with the condition who are unable to conceive. Clomiphene citrate is the most well-established therapy, while aromatase inhibitors have shown promise, although efficacy has yet to be verified in randomized controlled trials. Repeated clomiphene medication may be linked to an increased incidence of hypospadias and neural tube abnormality. Patients with PCOS who were clomiphene-resistant showed lower antioxidant levels than the people who were clomiphene sensitive but did not have PCOS. Myeloperoxidase levels followed the same pattern, which might be explained by a compensatory mechanism. Females with PCOS have increased levels of inflammatory markers as well as lower levels of antioxidants. N-acetylcysteine appears to be effective in restoring oxidative equilibrium and fostering high-quality oocytes with optimal follicular size. It also boosts ovulation and conception rates while having fewer negative effects including ovarian hyperstimulation syndrome, which is frequent with other drugs. Premature ovarian insufficiency (POI) affects at least 1% of all women and creates long-term health issues as well as psychological stress. POI-induced infertility was once thought to be absolute, with infertility therapy having little or no efficacy. In general, it has been assumed that medicine can only give little assistance to these individuals (Kərimova R,C.,Məşədiyeva Bayramova S,Ə.,2023).

In these modern days, infertility has become the most prevalent health issue, and it has been impacted by various risk elements including lifestyle habits, diet, environment, stress, and endocrine disruptors. The great attention to quality-of-life choices such as food habits, stress, drinking, smoking, and obesity affects the physiology of an individual and exerts long-term effects. Healthy lifestyle behaviors from preconception through postpartum are regarded as an important precaution for attaining healthy pregnancies and avoiding gestational disorders. Healthy diet control, BMI control, physical exercise, and physical, mental, and emotional health are among the World Health Organization's (WHO) preconception priorities. A healthy diet is

opulent in carbs, fiber, fruits, and vegetables, and folate is linked to enhanced sperm quality . Another possible benefit might be antioxidants, which are majorly essential for sperm capacitation and perform a crucial in ROS scavenging activity, where ROS overloading might cause sperm malfunction and affect its motility, damage DNA, and lower its membrane integrity. The antioxidants aid in the removal of excess ROS or convert ROS into molecules that are less harmful to cells. It is recommended to have a diet rich in antioxidants (Mate, A.;Reyes-Goya, C.; Santana-Garrido, Á.,2021).

Usage of tobacco causes exposure to about 4700 mutagenic substances such as hazardous chemicals and polycyclic aromatic hydrocarbons which lead to oxidative stress in the testes that affects spermatogenesis and steroidogenesis and results in poor chromatin condensation, DNA integrity, oocyte binding, and epigenetic alterations (Mintziori, G.;Duntas, L.H.; Veneti, S.,2022).

Obesity was related to the risk for erectile dysfunction (ED). Being overweight or obesity is observed in 79% of males reporting ED symptoms. In very obese males, BMI was related to higher avoidance of sexual contact and increased difficulty with sexual performance, resulting in decreased satisfaction with sexual life. This leading risk factor influences the metabolic processes; namely hypercaloric diet alters the low energy state which targets the HPG axis, thus creating a negative impact on female fecundity (Emokpae, M.A.; Brown, S.I.,2021).

Stress is referred to as the non-peculiar response of the body to danger or unexpected events as well as the ability to trigger various stimuli . Stress may be due to sexual attitude, marital life, quality of life, work life, motherhood, social tension, etc. Any of these may have a detrimental influence on sperm quality. The recent scenarios that may lead to stress are illustrated in . Stress may not have a great impact on sperm morphology, but it has a 39% reduction in sperm quantity and a 48% reduction in motility. Thus it is indicated that stress is negatively associated with semen quality (Mintziori, G.; Duntas, L.H.; Veneti, S.,2022).

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**QUANTITATIVE ANALYSIS OF POSTGRADUATE THESES ON PUBLIC SPACES
WRITTEN IN THE FIELD OF PLANNING AND DESIGN**

**PLANLAMA VE TASARIM ALANINDA KAMUSAL ALANLARLA İLGİLİ
YAZILAN LİSANSÜSTÜ TEZLERİN NİCELİKSEL ANALİZİ**

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ABSTRACT

Introduction and Purpose: Public spaces are one of the basic components of the city and are nodes that provide opportunities for social interaction, recreational activities, cultural activities and economic functions. Therefore, they have become an important tool in the development of a comfortable, social, attractive, sustainable and high quality of life city. This situation has constituted one of the main study subjects of public spaces, especially of planners and designers from past to present. A large number of applications, projects and various researches have been carried out on national and international scale. Some of the studies conducted in the academic field are thesis studies prepared at the national postgraduate level. In this framework, the main subject of the study is the quantitative analysis of the postgraduate theses on public spaces prepared in the field of planning-design. For this purpose, an answer was sought to the question of "how the postgraduate theses on public space in the field of planning-design are distributed numerically in terms of year, university, basic field and field of study?"

Materials and Methods: In this study, postgraduate theses on "public space" covering the period between 2000 and 2023 were quantitatively evaluated in terms of YÖK Thesis Centre database. In this framework, 58 postgraduate theses obtained in Landscape Architecture, Urban Design, Architecture, Urban Regional Planning were analysed numerically in terms of year, university, basic field and field of study. Numerical data are presented in charts and graphs.

Results: When the findings regarding the studies conducted in the last twenty-three years were analysed, it was found that there were differences within the year and the highest number of theses were written in 2011. It has been determined that the studies on the related subject are concentrated in the basic field of architecture and are frequently based on field research.

Discussion and Conclusion: The results of the study will provide important information on the main themes, publication trends, and periodical changes in the literature by presenting a framework for studies on the relationship between public space transformation and urban identity in the academic field.

Key Words: Public space; Urban Area, Urban Planning, Urban Design

ÖZET

Giriş ve Amaç: Kamusal alanlar, kentin temel bileşenlerinden biri olup, sosyal etkileşim, rekreasyonel faaliyetler, kültürel etkinlikler ve ekonomik işlevler için fırsat sağlayan düğüm noktalarıdır. Dolayısıyla da, konforlu, sosyal, çekici, sürdürülebilir ve yaşam kalitesi yüksek bir kentin gelişiminde önemli bir araç olmuşlardır. Bu durum, geçmişten günümüze kamusal alanların özellikle de planıcı ve tasarımcı disiplinlerin ana çalışma konularından birini oluşturmuştur. İlgili konu özelinde, ulusal ve uluslararası ölçekte çok sayıda; uygulama, proje ile çeşitli araştırmalar yapılmıştır. Akademik alanda yapılmış çalışmaların bir bölümünü ulusal düzeyde lisansüstü seviyede hazırlanmış tez çalışmaları oluşturmuştur. Bu çerçevede çalışma ana konusunu; planıcı ve tasarımcı disiplinler alanında hazırlanmış kamusal alanlar konulu lisansüstü tezlerin niceliksel analizi oluşturmuştur. Bu amaçla “planıcı ve tasarımcı disiplinler alanında kamusal alan konulu lisansüstü tezler sayısal olarak yıl, üniversite, temel alan, çalışma alanı açısından nasıl bir dağılım göstermiş?” sorusuna cevap aranmıştır.

Gereç ve Yöntem: Çalışmada, 2000-2023 yılları arasını içeren “kamusal alan” konulu lisansüstü tezler; YÖK Tez Merkezi veri tabanı özelinde niceliksel olarak değerlendirilmiştir. Bu çerçevede elde edilen 60 adet lisansüstü tez Peyzaj Mimarlığı, Kentsel Tasarım, Mimarlık, Şehir Bölge Planlama özelinde yıl, üniversite, temel alan, çalışma alanı açısından sayısal olarak değerlendirilerek analiz edilmiştir. Sayısal veriler, çizelge ve grafiklerle sunulmuştur.

Bulgular: Son yirmi üç yılda yapılan çalışmalara ilişkin bulgular incelendiğinde, yıl içerisinde farklılıklar gösterdiği ve en fazla tezin 2011 yılında yazılmış olduğu saptanmıştır. İlgili konuda yapılan çalışmaların; mimarlık temel alanında, yoğunlaştığı ve sıklıkla da alan araştırmasına dayandığı tespit edilmiştir.

Tartışma ve Sonuç: Çalışmanın sonuçları, kamusal alan konusunun planıcı-tasarımcı disiplinlerde Ulusal ölçekte yerel düzeyde lisansüstü tezler kapsamındaki yönelimini tespit ederek genel bir çerçeve sunmak açısından literature katkı sağlayacaktır.

Anahtar Kelimeler: Kamusal Alan; Kentsel Alan, Kentsel Planlama, Kentsel Tasarım

GİRİŞ ve AMAÇ

Kamusal alanlar, kentlerin fiziksel, sosyal, kültürel dokusunu şekillendiren önemli bir unsurdur. Öyle ki kamusal alanlar, insan-toplum etkileşiminin olduğu sosyal yaşamın (festival, konser, spor, ticari kullanım vb.) sürdürüldüğü dinamik mekanlardır. Erkal (2006) ile Özdemir (2006)'nın çalışmalarında ise; kamusal alan ile kent eşdeğer olarak ifade edilerek, kamusal alanların kentin bütününe oluşturduklarına vurgu yapılmıştır (Erkal, 2006; Özdemir, 2009).

Kamusal alanlar tarihsel bir geçmişe sahip olup, ilk oluşumları da 14. ve 15. yy. rönesans ile şekillenen kent planlamaları ile ortaya çıkmıştır. Kentlerin o dönemlerde belli bir simetri ve geometri ile tasarlanan sokakları, meydanları, pazar yerleri kamusal alanların oluşumlarına ilk örnek teşkil etmişlerdir (Gökgür, 2008). Geçmişten günümüze kadar da kamusal alanlara yönelik; planlama-tasarım süreç ve uygulama yaklaşımları geliştirilmiştir. Dolayısıyla kentlerde başat rol oynayan kamusal alanlar, pek çok araştırmanın konusu olurken, özellikle de planıcı ve tasarımcı disiplinler alanında çalışmaların temelini oluşturmuştur. Kamusal alanlar

konusunda akademik anlamda; kitaplar yazılmış, ülkemizde özellikle 2000’li yıllardan itibaren çeşitli bilimsel toplantılar düzenlenmiş ve çeşitli yarışmalar yapılmıştır. Örnek olarak, 1. Ankara Şehircilik Bienali kapsamında “Yeni Yaşam Biçimleri ve Kentsel Kamusal Alanın Yaratıcı Kullanımı” temasında öğrenci fikir proje yarışması yapılmıştır. Fikir proje yarışması, 18 farklı üniversiteden olmak üzere toplamda 22 grup (62) kişi katılımı ile gerçekleşmiş olup, üç proje ödüle layık görülmüştür. Kazanan projelerin değerlendirilmesinde; kamusal alan yaratımında tarihsel, özgün yönünü öne çıkaran, farklı aktivite olanakları sağlayan ve toplumsal ilişkileri güçlendiren fikirlerin yer aldığı projeler derecelendirilmiştir (Url 1, 2023). Öğrenci fikir proje yarışmasının yapılması kamusal alanların önemini desteklemektedir (Coşaner Tonyalı, 2024). Kitap, makale, bildiri gibi çeşitli akademik çalışmaların yanı sıra lisansüstü tezlerde kamusal alan konusu işlenmiştir. Bu kapsamda çalışmada, akademik anlamda lisansüstü tezler özelinde kamusal alanların yeri ve öneminin ortaya konulması amaçlanmıştır. Bu amaçla YÖK Tez Merkezi veri tabanı özelinde 2000-2023 yılları arasını içeren “kamusal alan” konulu lisansüstü tezlerin niceliksel olarak değerlendirilmesi hedeflenmiştir.

Çalışma amaç ve kapsamı doğrultusunda aşağıda maddelenen araştırma soruları oluşturulmuş ve araştırma soruları temelinde yöntem kurgusu geliştirilmiştir.

Kamusal alan konulu yazılmış tezlerin tür ve yazım dili özelinde eğilimi nasıldır?

Kamusal alan konulu yazılmış tezler daha çok hangi Ana Bilim Dalı temelinde araştırılmıştır?

Plancı ve tasarımcı disiplinler kamusal alan konulu yazılmış tezler sayısal olarak yıl, üniversite, temel alan, çalışma alanı açısından nasıl bir dağılım göstermiştir?

KAMUSAL ALAN

Kentler, farklı kültür ve sosyal yapıya mensup kişilerin bir araya geldikleri mekanlardır. Kentsel mekanların oluşumunda temelinde insanların eşit şekilde yararlanmasını önceleyen ve sağlayan kamusal alanların varlığı ise çok önemlidir (Carr, Francis, Rivlin ve Stone, 1992; Uysal Bilge, 2021).

Her kent bir kamusal alan oluşumdur (Kedik, 2011). “Kamu” olmadan “kamusal alanlar”dan söz edilemez (Stauskis ve Eckardt, 2011). Öyle ki “kamu” kelimesi genellikle “Devlet” anlamı ile kullanılmaktadır. Türk Dil Kurumu ise “Kamu” kelimesini ‘‘Halk hizmeti gören devlet organlarının tümü’’, ‘‘Bir ülkedeki halkın bütünü, halk, amme’’ ve ‘‘hep, bütün’’ olarak tanımlamıştır (TDK, 2023). Kamu kelimesinin kökü incelendiğinde Öztürkçe olan “kamag” ve “kamuğ” sözcüklerinden oluşmaktadır. Bu sözcükler “bütün, tüm, toplu, genel” anlamları taşımaktadır. Osmanlıcada ise ‘‘umum/umumi’’ günümüzde kamu sözcüğü ile aynı anlama gelmektedir. Umum kelimesinin sözlük anlamı “hep, bütün, cümle, herkes” ve “bütün insanlar, bütün halk”dır. Umumi kelimesinin sözlük anlamı ise “herkese ait, herkesle ilgili” olarak açıklanmaktadır (Gürallar, 2009). Özetle kamusal alanlar, tüm insanlara ait alanlardır (Karayıılmazlar ve Çelikyay, 2018).

Tarih boyunca kentler gelişim gösterirken kentlilerin kamusal alanlara da bakış açısı değişmiştir. Bu bağlamda kamusal alan kavramını tarihi süreç içerisinde değerlendirmek gereklidir. Kamusal alan kavramı ilk olarak 17.-18. yy'da üç filozofun yaklaşımı ile şekillenmiştir. İlk yaklaşımı geliştiren Habermas'a göre; 18. yy o dönemlerde üst sınıf olarak tanımlanan burjuvaların fikirlerini paylaştığı felsefe, şiir, edebiyat ya da politik konuların tartıştığı ve söylemde bulunduğu sivil toplum alanları olarak tanımlamıştır (Habermas, 1962; Özbek, 2004; Nalbant, 2016; Odabaş, 2018). Arendt, kamusal alanlara ilişkin herkes vurgusu yapmıştır (Arendt, 2012). İlgili konuda çalışmaları ile kavramı geliştiren diğer filozof ise Richard Sennett'tir. 'Kamusal İnsanın Çöküşü' kitabında kentlerin gelişmesi ile bozulan kamusal alan-toplum ilişkisinden söz etmiştir (Sennett, 2010). Lynch (1964) de çalışmasında benzer yaklaşımla kamusal alan-insan ilişkisini temel almıştır. Kamusal alan ile ilgili literatür incelendiğinde konu özelinde araştırmacıların farklı yaklaşımları bulunmaktadır. Carr, Francis, Rivlin, Stone (1992)'de kamusal açık alanları insanların biraraya geldikleri alan olduğunu ifade ederken, Mitchell (1995)'e göre sosyal politik aktivitelerin de gerçekleştiği mekanlar olduğu belirtmiştir. Bauman (1999) da çalışmasında farklı bir yaklaşımla kamusal alanlarda insanların planlı bir şekilde biraraya gelmesinin aksine tesadüfi karşılaşmalar ile sosyallik ilişkisinin güçlendiğini savunmuştur. Madanipour (2000) ve Arendt (2009) çalışmalarında kamusal alanların herkes için olduğunu belirtirken Bauman (2003) de din, dil, ırk ve sosyal sınıf ayrımı yapılmadan insanların sosyalleşme alanları olduğu tanımlamasını yapmıştır.

Kamusal açık alanlar genel olarak sokak, meydan, park gibi tüm insanları kapsayan açık alanlardır. İnsanların günlük işler, eğlenme, dinlenme farklı etkinliklerle kullanımına ve sosyalleşmesine fırsat sunan mekanlardır (Perinçek, 2003). Kamusal alanlar, insandan topluma doğru tümevarımda tarihsel süreçte dönemleri anlatan ve betimleyen niteliğe sahiptir (Karaibrahimoğlu, 2021). Tarihsel süreçte kamusal alan değişimlerinden dönemsel değişimleri anlamak ve fikir edinmek mümkündür. Bununla birlikte, Mehta (2014) çalışmasında; kentlerden mahalle ölçeğinde yaşayan kullanan insanların , alışveriş, oyun, toplantı ve diğer insanlarla etkileşim ve dinlenme gibi işlevsel, sosyal ve boş zaman etkinlikleri için kamusal alanları varlığına dikkat çekmiştir.

KAMUSAL ALAN TASARIM ve PLANLANMASI

Kamusal alan oluşumlarında en önemli ilke insanların konforuna yönelik olması ve evrensel tasarım kriterleri temelinde planlanmasıdır. Thomas (1991)'de kamusal alanı dört kapsamda ele almıştır. Bunlar; sosyal anlamda herkesin faydalanabileceği mekan özelliği olması, toplumsal açıdan birlikteliğin sağlanacağı yapıda olması, görsel olarak estetik,tarihi vb. anıt, sembol,heykellerin sergileneceği alanlar ile kenti ilişkilendiren temel işlevlerdir (Thomas, 1991). Kentlerde kamusal alan varlığı ile çevresel ve ekonomik açıdan gelişim sağlanmaktadır. Bu bağlamda kamusal alanların mekansal konforu önceleyen tasarımları insanların yaşam kalitelerinin de artmasını sağlamaktadır (Deniz, 2005). Ayrıca kamusal alanların kullanım konforu dışında mekansal açıdan bütüncül bir yaklaşım ile estetik ve psikolojik açılardan çözümlenmelerle planlanması gerekmektedir (Carmona, 2019; Karayılmazlar ve Çelikyay, 2018). Paumier, Dimond, Rich (1988)'in çalışmasında kamusal alan tasarımı kent sokaklar,

binolar, yeşil alanlar, caddeler ve meydanlar gibi yapılar arasında değerlendirilerek doğru kurgunun sağlanmasını dikkat çekmiştir. Bu bağlamda kamusal alanda birçok araştırmacılar tasarım ve planlama parametreleri geliştirmiştir. Whyte (2010)'ın araştırmasında 1970'li yıllarda New York'taki kamusal alanda incelemelerde bulunarak mekan kalitesi vurgulayan dört önemli kriter oluşturmuştur.

- Kamusal alanda erişilebilirlik,
- Kamusal alanda kullanım çeşitliliği
- Kamusal alanda insan ölçeği,
- Kamusal alanın tercih edilme kriterleri ile planlama yapılması savunmuştur (Whyte, 2010).

Kamusal alan Sennett (2010)'e göre; zaman içerisinde kent ve insan ihtiyacına göre şekillenen bir yapısı vardır. Kedik (2011) de araştırmasında aynı yaklaşım ile kent ve kamusal alan planlamasını ilişkisini ortaya koymuştur. Buchecker ve Frick (2020) ile Körmeçli ve Uslu (2021)'deki çalışmalarında kentleşme ile ortaya çıkan sorunların çözümünde açık kamusal alanların planlanması önüne geçilebileceğine dikkat çekmişlerdir. Bu bağlamda kentlerde kamusal alanların tasarım ve planlamaları önemlidir.

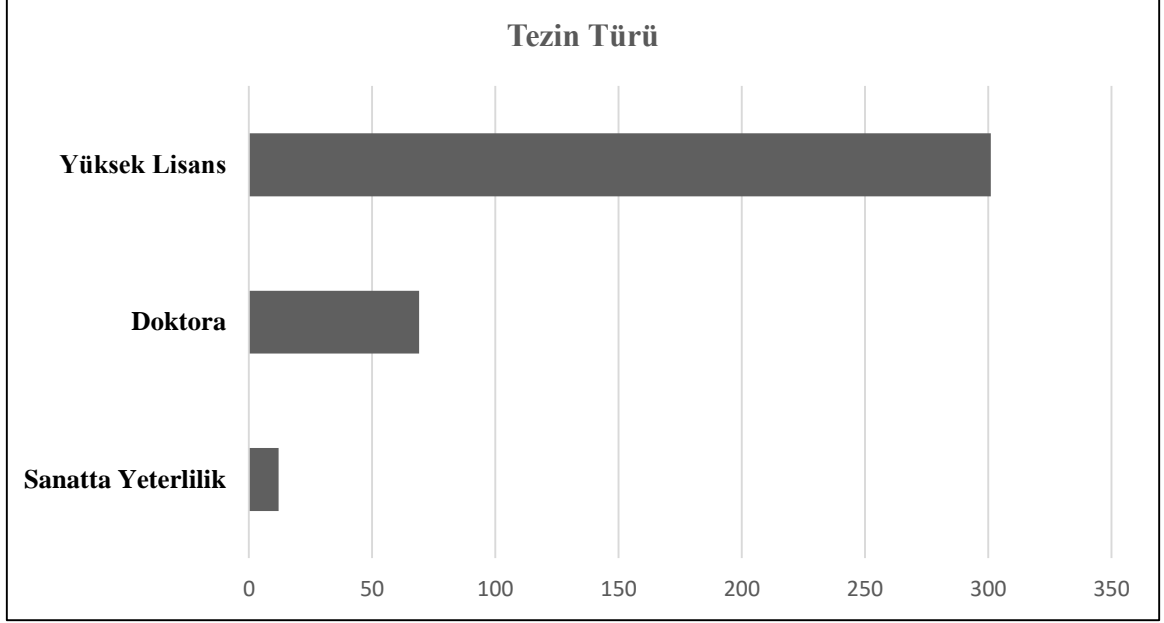
GEREÇ ve YÖNTEM

Kamusal alan pek çok farklı disiplinin çalışma alanına girdiğinden, farklı alanlarda yapılmış lisansüstü tezler literatürde mevcuttur. İçerik analizi çalışmaları ile literatürde farklı alanlarda ve konularda lisansüstü tezler konu, alan, yıl vb. üzerinde eğilimlerin ortaya konulması sağlanmaktadır. Bu amaçla “kamusal alan” konulu yazılmış lisansüstü tezlerin niceliksel analizi yapılmıştır. Temel nitel araştırma yaklaşımına göre desenlenen “Niceliksel Analiz” yönteminde verilerin oluşturulmasında doküman incelemesinden yararlanılmıştır. Döküman incelemesi, nitel araştırmada belirlenen amaç ve konu ilişkin yazılı materyallerin analizinin yapılmasıdır (Yıldırım ve Şimşek, 2008). Çalışma kapsamında araştırma dökümanını YÖK Tez Merkezi veri tabanı “plancı ve tasarımcı disiplinler alanında kamusal alan konulu lisansüstü tezler oluşturmaktadır. Bu çerçevede çalışma iki aşamada gerçekleştirilmiştir. Birinci aşamada, kamusal alanlar dizininde yazılan tezler tür ve yazım dillerine göre incelenmiştir. Son yirmi üç yılda yazılmış lisansüstü tezler ile “kamusal alanlar” konulu tezlerin YÖK Tez Merkezi veri tabanında oransal olarak temel alan ve yeri belirlenmiştir. İkinci aşamada, veri tabanı taramasında kamusal alan konulu plancı ve tasarımcı disiplinler alanında nasıl bir dağılım gerçekleştirildiği analiz edilmiştir. Bu çerçevede elde edilen 60 adet lisansüstü tez Peyzaj Mimarlığı, Kentsel Tasarım, Mimarlık, Şehir Bölge Planlama özelinde yıl, üniversite, temel alan, çalışma alanı açısından sayısal olarak değerlendirilerek analiz edilmiştir. Sayısal veriler, çizelge ve grafiklerle sunulmuştur.

YÖK Ulusal Tez Merkezi'nden elde edilen veriler ile gerçekleştirilen çalışmanın bulguları aşağıda yer almaktadır.

BULGULAR

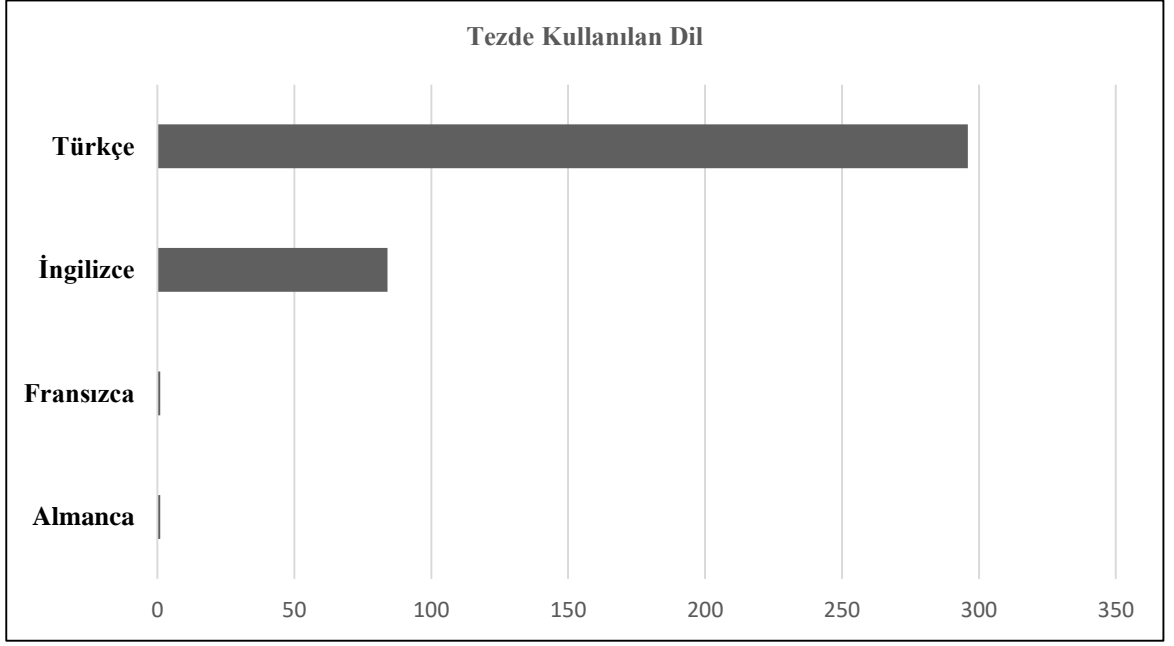
Araştırmanın ilk kısmında YÖK Tez Merkezi veri tabanı dizin taraması özelinde “kamusal alan” yazılmış lisansüstü tezlerin türlerine ve yazım dillerine göre dağılımı yapılmıştır (Şekil 1).



Şekil 1. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alanlar konulu tezlerin türlerine göre dağılımı (tez.yok.gov.tr, 2024)

Yapılan incelemede dizin taramasında “kamusal alan” yazılmış 382 adet lisansüstü tezin 301 adetinin çoğunlukla yüksek lisans, 69’sinin doktora ve 12 adeti Sanatta Yeterlilik derecelerinden oluştuğu görülmektedir (tez.yok.gov.tr, 2024), 10 Şubat 2024 itibariyle sistemde bulunan toplam yüksek lisans tez sayısı, toplam doktora tezlerinin yaklaşık 4 katıdır (tam oran 3.52’dir). Kamusal alanlar dizinde yazılan tezler de yakın oranda olup toplam yüksek lisans tez sayısı, toplam doktora tez sayısının yaklaşık 4 katı olduğu saptanmıştır (tam oran 4.36’dir). Bu durum, “kamusal alanlar” konusunun daha çok yüksek lisans düzeyinde çalışıldığını göstermektedir.

Kamusal alanlar dizinde yazılan tezlere ilişkin dil taramasında ise 296’sının Türkçe, 84’ü İngilizce, 1 adet Almanca ve 1 adet Fransızca dillerinde yazıldığı görülmektedir (Şekil 2).

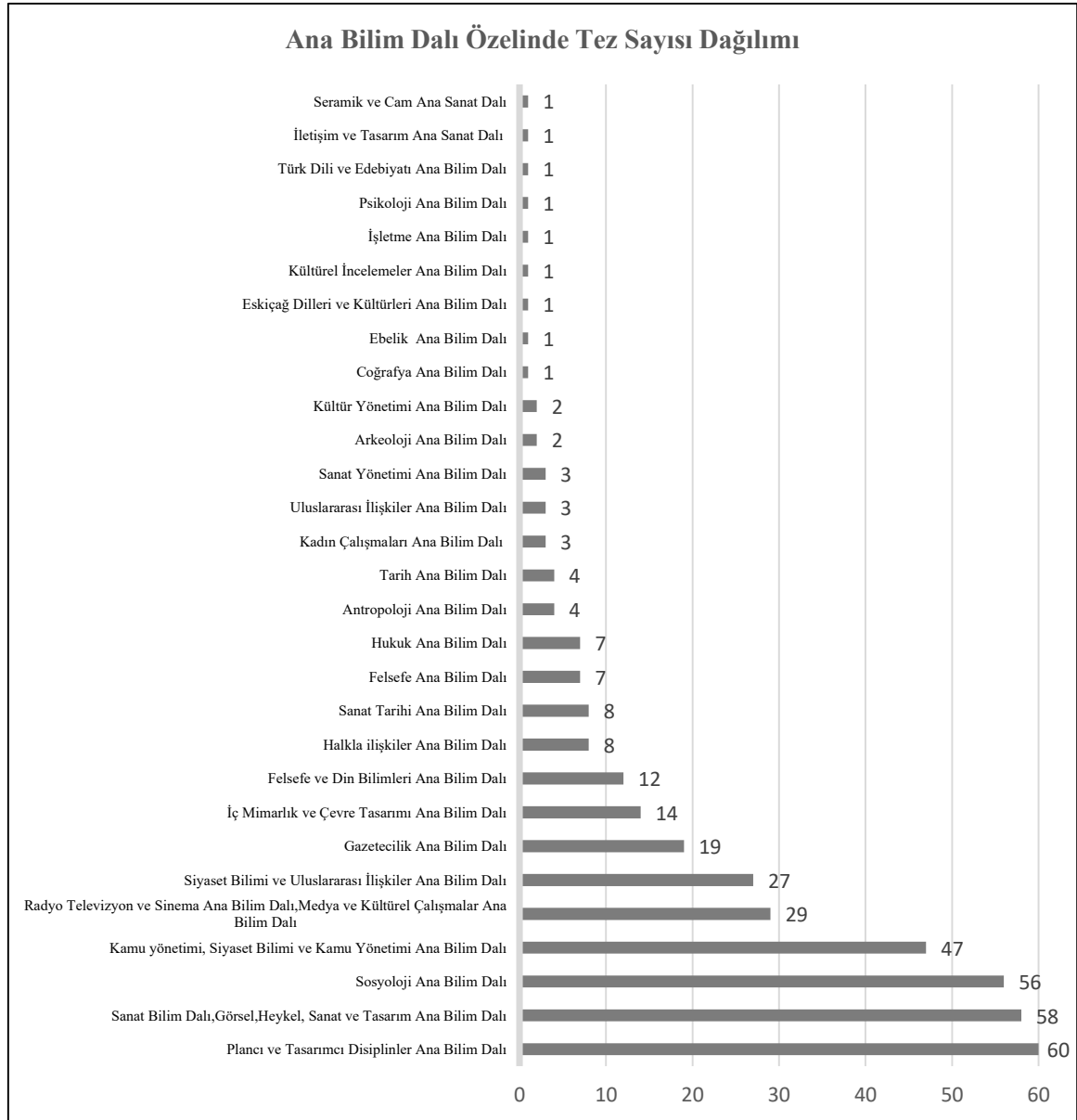


Şekil 2. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alanlar konulu tezlerin yazım dillerine göre dağılımı (tez.yok.gov.tr, 2024)

Şekil 2'ye göre; konu özelinde yazılan lisansüstü tezlerde, Türkçe dilinin %78 oranda daha çok tercih edildiği saptanmıştır.

Araştırma soruları temelinde ilk kısımda “Kamusal alan konulu yazılmış tezlerin tür ve yazım dili özelinde eğilimi nasıldır?” sorusuna cevap bulunmuştur.

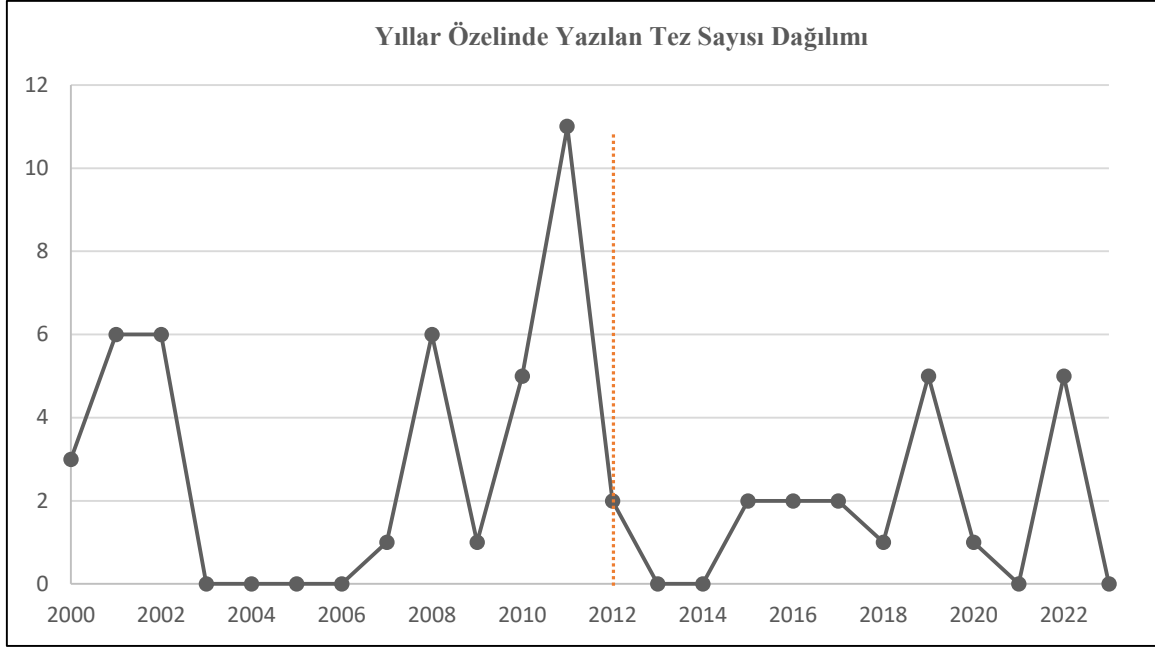
Araştırmanın ilk kısmında son olarak “Kamusal alan konulu yazılmış tezler daha çok hangi Ana Bilim Dalı temelinde araştırılmıştır?” sorusuna yönelik YÖK Tez Merkezi veri tabanı dizin taramasında “kamusal alan” konulu yazılmış lisansüstü tezlerin ana bilim dalları özelinde dağılımı sayısal olarak değerlendirilerek Şekil 3’de grafiksel olarak sunulmuştur.



Şekil 3. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alanlar konulu yazılan tezlerin ana bilim dalları özelinde dağılımı (tez.yok.gov.tr, 2024)

YÖK Tez Merkezi veri tabanı son yirmi üç yılda “kamusal alan” konulu hazırlanan tezlerin, anabilim dalı özelinde 29 farklı kategoride derlenmiştir. Değerlendirme çerçevesinde yazarlar tarafından ilgili konu özelinde en çok araştırması yapılan ana bilim dalını planlı ve tasarımcı disiplinler oluşturmuştur. Bunun üzerine bu çalışma kapsamında planlı ve tasarımcı disiplin temelinde hazırlanan 60 lisansüstü teze yönelik niceliksel analiz gerçekleştirilmiştir.

Araştırmanın ikinci kısmında YÖK Tez Merkezi veri tabanı üzerinden planlı ve tasarımcı disiplinler (Peyzaj Mimarlığı, Kentsel Tasarım, Mimarlık, Şehir Bölge Planlama Ana Bilim Dalı) temelinde hazırlanmış kamusal alanlar konulu 60 lisansüstü tezin sayısal olarak yıl, üniversite, temel alan, çalışma alanı açısından nasıl bir dağılım göstermiş? sorusuna cevap aranmıştır (Şekil 4).



Şekil 4. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu planıcı ve tasarımcı disiplinler özelinde yıllara bağlı yazılan tez dağılımı (tez.yok.gov.tr, 2024)

Son yirmi üç yıl içinde yazılan tez incelemesinde yıllar içinde kamusal alan konusunda çalışmaların farklı dağılımlarda olduğu ve eğilimin sürdüğü en çok tezin ise 2011 yılında yazıldığı görülmektedir. Bunun üzerine ilgili konuda yapılmış tezlerin üniversite ve tez sayısı verileri oluşturulmuştur (Tablo1).

Tablo 1. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu planıcı ve tasarımcı disiplinler alanında yazıldığı üniversite ve tez sayısı (tez.yok.gov.tr, 2024)

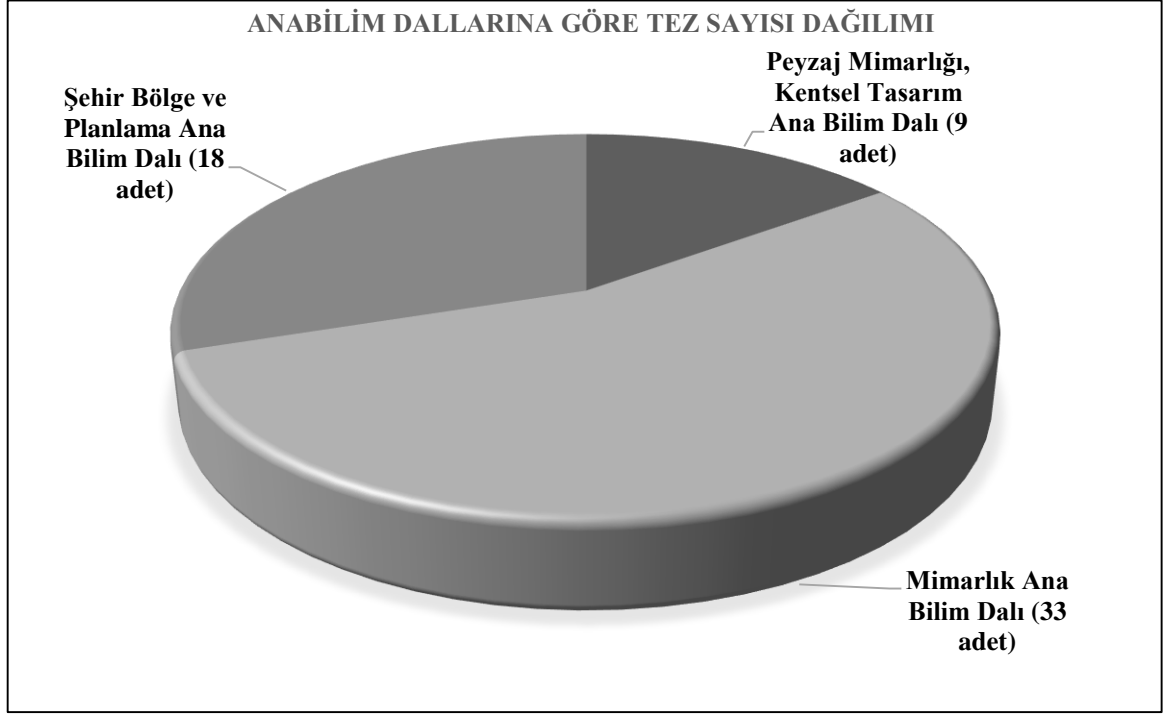
Sıra No	Üniversite Adı	Tez sayısı
1	Ankara Üniversitesi	3
2	Bartın Üniversitesi	2
3	Dokuz Eylül Üniversitesi	4
4	Ege Üniversitesi	1
5	Erciyes Üniversitesi	1
6	Gazi Üniversitesi	1

Tablo 1. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu planıcı ve tasarımcı disiplinler alanında yazıldığı üniversite ve tez sayısı (devamı) (tez.yok.gov.tr, 2024)

7	İnönü Üniversitesi	1
8	İstanbul Aydın Üniversitesi	1
9	İstanbul Teknik Üniversitesi	12
10	İzmir Ekonomi Üniversitesi	2
11	İzmir Yüksek Teknoloji Enstitüsü	3
12	Karadeniz Teknik Üniversitesi	1
13	Konya Teknik Üniversitesi	1
14	Mersin Üniversitesi	1
15	Mimar Sinan Güzel Sanatlar Üniversitesi	4
16	Orta Doğu Teknik Üniversitesi	12
17	Trakya Üniversitesi	1
18	Yaşar Üniversitesi	1
19	Yıldız Teknik Üniversitesi	8

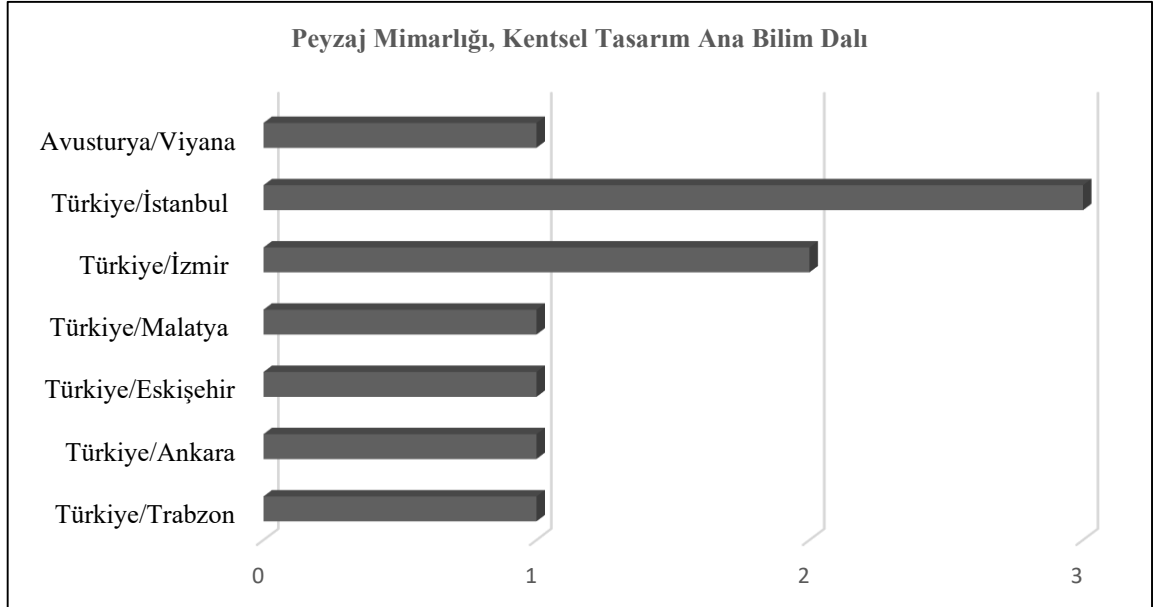
Tablo 1 dikkate alındığında; yapılan incelemede 19 farklı Üniversitede planıcı ve tasarımcı disiplinler alanında hazırlanmış kamusal alanlar konulu lisansüstü tezlerin yazıldığı görülmektedir. Planıcı ve tasarımcı disiplinler alanında (Peyzaj Mimarlığı, Kentsel Tasarım, Mimarlık, Şehir Bölge Planlama Ana Bilim Dalı) hazırlanmış kamusal alanlar konulu lisans üstü tezlerin %93 'ü devlet üniversiteleri %7'si vakıf üniversitelerinde yapılmıştır.

Üniversite bünyesinde bulunan planıcı ve tasarımcı disiplinler yazarlar tarafından hazırlanmış olan 60 adet lisansüstü tez Peyzaj Mimarlığı, Kentsel Tasarım, Mimarlık, Şehir Bölge Planlama temel alan özelinde dağılımı incelenmiştir (Şekil 5).



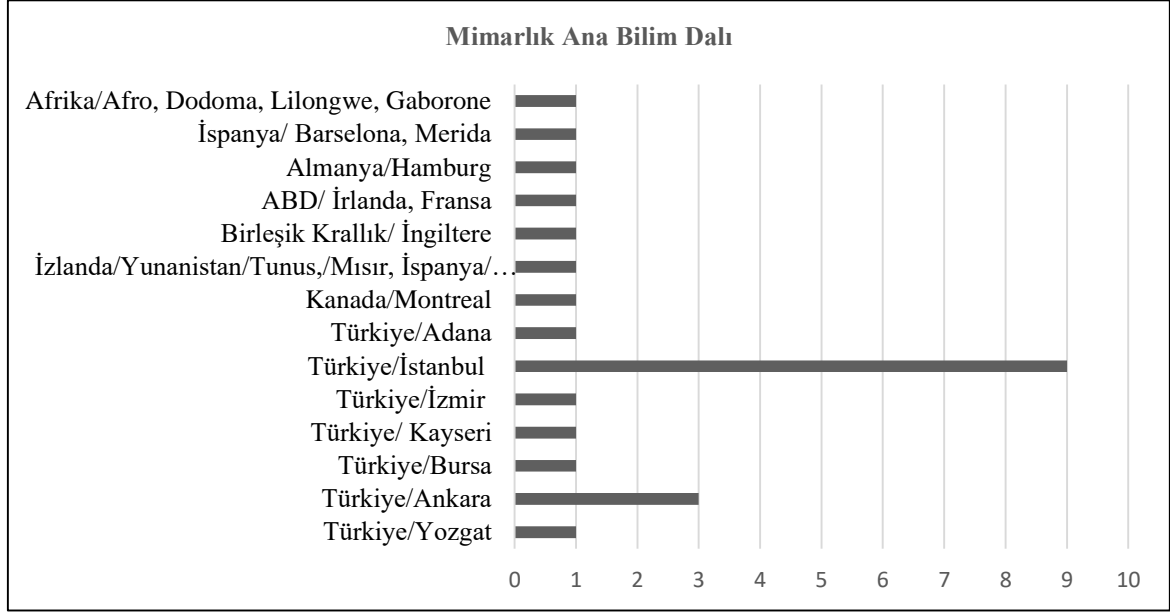
Şekil 5. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu planıcı ve tasarımcı disiplinler özelinde tez dağılımı (tez.yok.gov.tr, 2024)

İlgili temel bilim dalları özelinde kamusal alan konulu tezlerin %55 oranında Mimarlık Ana Bilim Dalında, %30'unun Şehir Bölge Planlama ve %15'inin Peyzaj Mimarlığı, Kentsel Tasarım Ana Bilim Dalında yapılmıştır. Her ana bilim dalı özelinde çalışma alanı ve tez çalışma alan sıklığı çerçevesinde veri incelemesi yapılmıştır (Şekil 6, Şekil 7, Şekil 8).



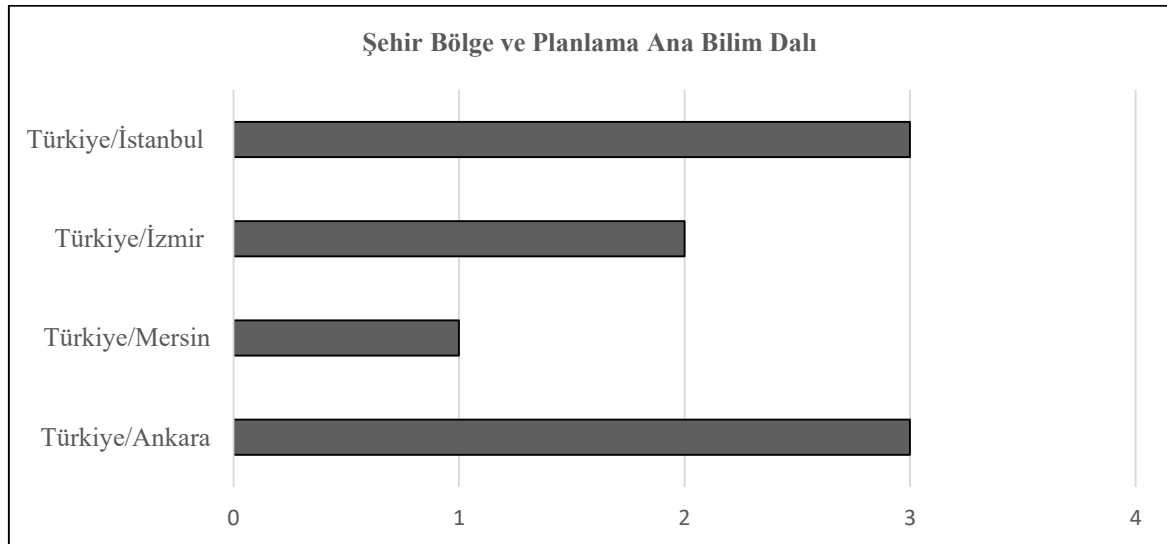
Şekil 6. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu Kentsel Tasarım Ana Bilim Dalı yazarlar tarafından yazılmış çalışma alanı özelinde tez dağılımı (tez.yok.gov.tr, 2024)

YÖK Tez Merkezi veri tabanı elde edilen kamusal alan konulu Peyzaj Mimarlığı, Kentsel Tasarım Ana Bilim Dalı yazılmış tezlerde en çok İstanbul ve İzmir çalışma alanı olarak ele alındığı saptanmıştır.



Şekil 7. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu Mimarlık Ana Bilim Dalı yazarlar tarafından yazılmış çalışma alanı özelinde tez dağılımı (tez.yok.gov.tr, 2024)

Şekil 7 incelendiğinde; kamusal alan konulu Mimarlık Ana Bilim Dalı yazılmış tezlerde çalışma alanlarının farklı ülkeler özelinde gerçekleştiği görülürken, en fazla oranı da Türkiye'den İstanbul'un seçildiği ortaya konulmuştur.



Şekil 8. YÖK Tez Merkezi veri tabanı 2000-2023 yılları arasında kamusal alan konulu Şehir Bölge ve Planlama Ana Bilim Dalı yazarlar tarafından yazılmış çalışma alanı özelinde tez dağılımı (tez.yok.gov.tr, 2024)

Şekil 8 incelendiğinde; kamusal alan konulu Şehir Bölge ve Planlama Ana Bilim Dalı yazılmış tezlerin Türkiye'nin üç metropol kentlerinden olan İstanbul, Ankara ve İzmir çalışma alanı olarak seçilmiştir.

TARTIŞMA ve SONUÇ

Planlama ve tasarım disiplinlerinde kamusal alan konulu hazırlanmış lisans üstü çalışmaları incelemek araştırmanın temel amacını oluşturmaktadır. Günümüzde kamusal alanlar tasarım ve planlamaları bu projekte kentlerin gelişiminde öne çıkmaktadır.

Bu çalışmada, YÖK Tez Merkezi veri tabanında 2000-2023 yılları arasında “kamusal alan” konusunda araştırma eğilimlerinin belirlenmesi ve planıcı ve tasarımcı disiplinler alanında yapılmış lisansüstü tezlerin yayınlandığı yıl, üniversite, temel alan, çalışma alanı açısından sayısal olarak değerlendirilmiştir.

Araştırma amacına bağlı olarak yapılan inceleme sonucunda;

- YÖK Tez Merkezi veri tabanında 2000-2023 yılları arasında “kamusal alan” konusunda lisansüstü çalışmalar incelendiğinde; en çok yüksek lisans düzeyinde tezlerin hazırlandığı saptanmıştır.
- Lisansüstü tezlerin en fazla Türkçe dilinde yazıldığı ve planıcı ve tasarımcı disiplinlerin ana çalışma alanını oluşturduğu tespit edilmiştir. Bu durum Türkiye’de lisansüstü düzeyinde planlamacı ve tasarımcıların kamusal alan konusuna ilgisinin olması ile ilişkilendirilmiştir.
- Son yirmi üç yıl içinde yazılan tezlerin incelemesinde yıllar içinde kamusal alan konusunda çalışmaların farklı dağılımlarda olduğu tespit edilmiştir. İlgili konu ve alan özelinde en çok tez (11 adet) 2011 yılında yazılmıştır.
- İlgili konu ve alan özelinde ilk sırayı 12 adet tez ile İstanbul Teknik Üniversitesi ve Orta Doğu Teknik Üniversitesi oluşturmuştur. Bu durum, İstanbul ve Ankara gibi iki büyükşehir özelinde çalışmaların yoğun olduğunu destekleyici niteliktedir.
- Planıcı ve tasarımcı disiplinlerde yazarlar tarafından hazırlanmış olan 60 adet lisansüstü tezdten Mimarlık Ana Bilim Dalı’nda en fazla sayıda (33 adet) yürütüldüğü ortaya konulmuştur. Diğer ana bilim dallarında da bu oranın artırılması önemli olacaktır.
- Planıcı ve tasarımcı disiplinlerde yazarlar tarafından hazırlanmış olan 60 adet lisansüstü tez içerisinde çalışma alanı seçimi dikkate alındığında Türkiye/İstanbul odaklı tezlerin yoğunlukta olduğu saptanmıştır.

Geçmişten günümüze kadar kentlerin oluşum, gelişim ve değişiminde başat rol oynayan kamusal alanlar konusunun; akademik alanda lisansüstü tezler kapsamında 23 yıllık süreçte toplam 382 tez içerisinden, planlama-tasarım disiplinleri en fazla sayıyı oluşturarak (60 tez) ilk sırada yer almıştır. Bu durum, kamusal alan konusunun plan ve tasarım süreçlerindeki etkisine dikkat çekildiğinin göstergesidir. Ancak yaklaşık %15,71’lik oranı oluşturan bu sayının, özellikle de doktora düzeyindeki çalışmaların artması kentlerin planlama ve tasarım süreçleri açısından yol gösterici olabilecektir. Çalışmadan elde edilen sonuçlar, kamusal alanlar

konusunda yazılmış ilgili lisansüstü tezlerin mevcut eğilimlerinin belirlenmesi ve gelecekte çalışma yapacak araştırmacılara fikir verilmesi açısından önemlidir.

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BIBLIOMETRIC ANALYSIS OF STUDIES ON URBAN IDENTITY IN THE TRANSFORMATION OF PUBLIC SPACES

KAMUSAL ALANLARIN DÖNÜŞÜMÜNDE KENTSEL KİMLİK KONULU ÇALIŞMALARIN BİBLİYOMETRİK ANALİZİ

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ABSTRACT

Introduction and Purpose: Public spaces, along with social, economic and technological developments in the historical process; service, entertainment, gathering, trade, culture-art etc. They have become places of different functions such as. This process has led to the transformation of public spaces in terms of spatial, socio-cultural, visual, and environmental dimensions. The transformed public spaces have become one of the important elements that shape and develop cities, and strengthen and reflect the identity of the city. This situation has strengthened the development of literature-based studies in the academic field. Therefore, the main aim of this study is to determine the main trends in the academic development of the relationship between the transformation of public spaces and urban identity. Specifically, the study aims to answer the question: 'How has the relationship between the transformation of public spaces and urban identity been distributed numerically over time?' Which authors, countries, keywords, publication types, and institutions stand out in the relevant field? What concepts have the studies focused on in the relevant field?

Materials and Methods: In this study, research on 'public space transformation and urban identity' was quantitatively evaluated using bibliometric analysis techniques in terms of article titles, abstracts, and keywords in the SCOPUS database. The article presents numerical data on the changes in the number of studies conducted between 1993 and 2023, the most common document types, fields of study, countries, publishing institutions, authors, and keyword distribution. Numerical data were presented in charts and graphs using software programs such as Excel and VOSviewer.

Results: Studies conducted in the last thirty years have generally increased, despite variations within each year. Research in the relevant field has been concentrated in social sciences, in the United States, in English, and at the article level. When evaluated in terms of specific keywords, the focus has been on concepts such as 'public space', 'urban planning', 'identity', and 'urban design'.

Discussion and Conclusion: The results of the study will provide important information on the main themes, publication trends, and periodical changes in the literature by presenting a framework for studies on the relationship between public space transformation and urban identity in the academic field.

Key Words: Public spaces; Transformation of Public Spaces, Urban Identity; Bibliometric Analysis.

ÖZET

Giriş ve Amaç: Kamusal alanlar, tarihsel süreç içerisinde toplumsal, ekonomik ve teknolojik gelişmelerle birlikte; hizmet, eğlence, toplanma, ticaret, kültür-sanat vb. gibi farklı işlevlerin mekanı olmuşlardır. Bu süreç, kamusal alanların; mekansal, sosyo-kültürel, görsel ve çevresel ölçekte dönüşümüne neden olmuştur. Dönüşüme uğrayan kamusal alanlar, kentlerin şekillenmesinde ve gelişiminde etkili olarak, kent kimliğini güçlendiren ve yansıtan önemli unsurlardan biri haline gelmiştir. Bu durum, akademik alanda literature dayalı çalışmaların gelişimini güçlendirmiştir. Bu amaçla çalışmada; kamusal alanların dönüşümü-kent kimliği ilişkisi konusunun akademik alandaki gelişimindeki ana eğilimlerinin belirlenmesi amaçlanmıştır. Bu amaçla “Zaman içerisinde; kamusal alanların dönüşümü-kent kimliği ilişkisi konusu sayısal olarak nasıl bir dağılım göstermiş?, İlgili konuda hangi yazarlar, ülkeler, anahtar kelimeler, yayın türleri ve kuruluşlar öne çıkmış? ve “ilgili konuda yapılan çalışmalar hangi kavramlar üzerinde yoğunlaşmıştır?” sorularına cevap aranmıştır.

Gereç ve Yöntem: Çalışmada, “kamusal alan dönüşümü ve kent kimliği” konulu çalışmalar; SCOPUS veri tabanı özelinde makale başlığı, özet ve anahtar kelimeler detayında bibliyometrik analiz tekniği ile niceliksel olarak değerlendirilmiştir. İlgili konu özelinde 1993-2023 yılları arasında yapılmış 247 adet çalışmanın yıllara göre değişimi, en çok yayın yapılan doküman tipi, temel alan, ülke, yayıncı kuruluş, yazar ve anahtar kelime dağılımına ilişkin sayısal veriler ortaya konmuştur. Sayısal veriler, Excel ve VOSviewer gibi yazılım programları kullanılarak çizelge ve grafiklerle sunulmuştur.

Bulgular: Son otuz yılda yapılan çalışmalar, yıl içerisinde farklılıklar gösterse de genel anlamda artmıştır. İlgili konuda yapılan çalışmaların; sosyal bilimler alanında, ABD’de, İngilizce dilinde ve makale düzeyinde yoğunlaştığı görülmüştür. Anahtar kelime özelinde değerlendirildiğinde; “kamusal alan, kentsel planlama, kimlik ve kentsel tasarım” kavramları üzerinde yoğunlaşmıştır.

Tartışma ve Sonuç: Çalışmanın sonuçları, akademik alanda kamusal alan dönüşümü-kent kimliği ilişkisine yönelik yapılmış çalışmalara yönelik bir çerçeve sunarak, literatürdeki ana temaları, yayın eğilimlerini ve dönemsel değişimleri belirlemeye yönelik önemli bilgiler sağlayacaktır.

Anahtar Kelimeler: Kamusal alanlar; Kamusal Alanların Dönüşümü, Kent Kimliği; Bibliyometrik Analiz.

GİRİŞ

Kamusal alanlar kentsel yapının tanınabilir ana unsurları olup, günlük etkileşimlerin, ve ekonomik alışverişlerin gerçekleştiği kentsel yaşam ortamları olarak tanımlanmıştır (Carmona, 2010; Makworo ve Mireri, 2011; Officha vd., 2012; Askari ve Soltani, 2019). Öyle ki; Mattson (1999) da çalışmasında; kamusal açık alanların, insanların şehirlerde sosyal yaşamlarını geliştirmek için birbirleriyle etkileşime girdikleri ve gündelik konularda farklı görüş alışverişinde buldukları alanlar olduğunu vurgulamıştır. Bununla birlikte; Carr vd. (1999) da; kamusal alanların herkesin kullanımına açık, anlamlı ve duyarlı yerler olduğunu belirtirken, Solarek ve Grochowska (2021) ise; kamusal alanların kentsel yaşamın sahnesi ve seyircisi

olarak önemli bir rol oynadıklarını vurgulamıştır. Weijs-Perrée vd. (2020) de çalışmalarında; kentsel kamusal alanların, toplumun sosyal, kültürel ve ekonomik faaliyetlerine katkıda buldukları için şehirlerin temel bileşenleri olduğunu ve bu alanların sosyal etkileşim için fırsat sağladığını, rekreasyon, kültürel etkinlikler ve ekonomik işlemlerin yanı sıra önemli düğüm noktaları olarak hizmet verdiklerini belirtmişlerdir. Gehl ve Gemzøe (1996) de; kamusal alanların; buluşma yeri, pazar yeri ve bağlantı alanı olarak üç önemli işleve sahip olduğunu vurgulamıştır. Bununla birlikte; Nasution ve Zahrah (2014) de; kamuya açık alanların; sosyal etkileşim, çevresel ve ekonomik değer açısından kentsel gelişimde önemli bir rol oynadığını belirtmiştir. Dolayısıyla kamusal alanlar, tarihsel süreç içerisinde toplumsal, ekonomik ve teknolojik gelişmelerle birlikte; hizmet, eğlence, toplanma, ticaret, kültür-sanat vb. gibi farklı işlevlerin mekanı olmuşlardır. Öyle ki Madanipour (1999) çalışmasında; kamusal alanların, tarihsel süreç içerisinde çeşitli toplumsal olaylarla değişim-dönüşüm gösterdiğini ve bunun sonucunda yeni anlamlar kazandığını belirtmiştir (Okumuş ve Ediz, 2022). Tekçe (2021) de; kamusal alanları, bireyin gündelik yaşamında önemli karşılaşma noktaları olarak nitelendirilmiş ve zaman içerisinde kullanıma bağlı olarak anlam ve yer değiştirdiğine vurgu yapmıştır. Öyle ki; kamusal alanlar; Antik Yunan döneminden itibaren; “akropol”, “agora”, “forum”, “bulvar”, “meydan”, “cadde”, “park” olarak farklı isimler alarak fiziksel, sosyal ve ekonomik açıdan önemli değişiklikler göstermişlerdir (Gökgür, 2008.). Bu süreç, kamusal alanların; mekansal, sosyo-kültürel, görsel ve çevresel ölçekte dönüşümüne neden olmuştur. Antik Yunan agorasından ve Ortaçağ pazar yerinden Rönesans bulvarlarına ve günümüzün yaya bölgelerine ve parklarına kadar değişim de bu durumun bir sonucudur (Madanipour, 2003; Andersson, 2016; Leveratto, Gotti ve Lanz Citation, 2022). Karaçor ve Ögçe (2023) de; kamusal alanın değiştiğini ve modern toplumun yaşam tarzının değişmesine bağlı olarak yeni kamusal alan biçimlerinin (fiziksel veya sanal) ortaya çıktığını vurgulamıştır.

Böylelikle dönüşüme uğrayan kamusal alanlar, kentlerin şekillenmesinde ve gelişiminde etkili olarak, kent kimliğini güçlendiren ve yansıtan önemli unsurlardan biri haline gelmiştir. Keza bir çok çalışmada; kamuya açık alanların başarı göstergeleri ile imaj ve estetik değerler ilişkilendirilmiştir (Carmona, 2010; Makworo ve Mireri, 2011; Officha vd., 2012; Askari ve Soltani, 2019). Aynı zamanda birçok çalışmada, kamusal alanın kentsel peyzajın bir parçası olduğu kimlik açısından çok önemli bir değer taşıdığı ortaya konulmuştur (Fornara, 2011; Galindo ve Rodriguez, 2000; Jaśkiewicz, 2015).

Bu çalışmada; kamusal alanların dönüşümü-kent kimliği ilişkisi konusunun akademik alandaki gelişimindeki ana eğilimlerinin belirlenmesi amaçlanmıştır. Bu çerçevede “Zaman içerisinde; kamusal alanların dönüşümü-kent kimliği ilişkisi konusu sayısal olarak nasıl bir dağılım göstermiş? İlgili konuda hangi yazarlar, ülkeler, anahtar kelimeler, yayın türleri ve kuruluşlar öne çıkmış? ve “İlgili konuda yapılan çalışmalar hangi kavramlar üzerinde yoğunlaşmıştır?” sorularına cevap aranmıştır. İlgili sorular çerçevesinde, çalışma kapsamında; “kamusal alan dönüşümü ve kent kimliği” konulu çalışmalar; SCOPUS veri tabanı özelinde makale başlığı, özet ve anahtar kelimeler detayında bibliyometrik analiz tekniği ile niceliksel olarak değerlendirilmiştir

MATERYAL VE YÖNTEM

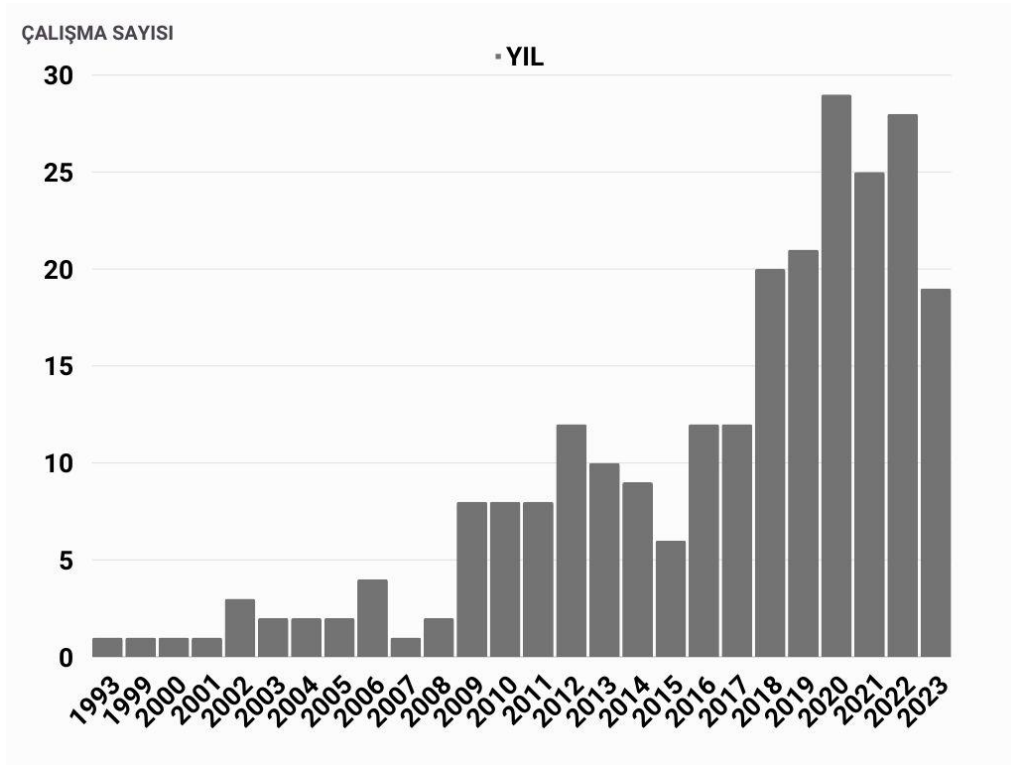
Bu çalışma, 1993-2023 yılları arasındaki sürede akademik alandaki “kamusal alan dönüşümü ve kent kimliği” konulu yapılan çalışmaların makale başlığı, özet ve anahtar kelimeler detayında bibliyometrik analiz tekniği ile niceliksel olarak değerlendirilmesini içermektedir. Bu amaçla çalışmada, bibliyometrik analiz tekniği kullanılmıştır. Ellegaard (2018) ile Moral vd. (2020) tarafından, bibliyometri; akademik literatürü tanımlamaya ve ölçmeye yardımcı olan nicel yöntemler kümesi olarak tanımlanmış olup, temel bir değerlendirme yöntemi olarak birçok çalışmada kullanılmıştır (Khan vd., 2018; Gómez ve Luna, 2022). Bibliyometri, sayısal veriler (örneğin yayın ve alıntı birimleri) üzerinde niceliksel tekniklerin uygulanmasını kapsamakta olup, belirli bir araştırma alanındaki yayınların karşılıklı ilişkilerini ve etkilerini ölçmek için matematiksel ve istatistiksel araçları kullanan niceliksel bir analiz yöntemidir (Broadus, 1987; Van Eck, 2010; Lee vd., 2020; Donthu vd., 2021). Bibliyometrik analiz tekniği; bir araştırma konusu veya alanının mevcut durumunu ve ortaya çıkan eğilimlerini sunmak için büyük miktardaki veriyi özetleyerek, alanındaki yayınların, yazarların, kurumların ve ülkelerin karşılıklı ilişkilerini ve etkilerini niceliksel açıdan değerlendirmektedir (Okagbue ve Teixeira da Silva, 2020; Donthu vd., 2021; Fu vd., 2023).

Çalışma kapsamında bibliyografik bilgi kaynağı olarak Scopus veri tabanı tercih edilmiştir. Dergi makaleleri ve konferans bildirimleri de dahil olmak üzere hakemli belgelerin özetleri ve alıntıları için en büyük havuzlardan biri olması, bibliyometrik analizlerin uygulamasını kolaylaştıran çok sayıda işletim fonksiyonunu içermesi ve bir çok çalışmada yaygın olarak kullanılması nedeniyle Scopus veri tabanı kullanılmıştır (Yao vd., 2018; Aazami vd., 2020; Magadán Díaz, Jesús ve Rivas García, 2022; Omotehinwa, 2022; Rejeb vd., 2023).

İlgili konu özelinde 1993-2023 yılları arasında yapılmış 247 adet çalışmanın yıllara göre değişimi, en çok yayın yapılan doküman tipi, temel alan, en fazla yayın yapan dergi, ülke, dil türü, en çok atıf alan yayınlar, yazarlar ve atıf sayıları ile anahtar kelime dağılımına ilişkin sayısal veriler ortaya konulmuştur. Sayısal veriler, Excel ve VOSviewer gibi yazılım programları kullanılarak çizelge ve grafiklerle sunulmuştur. VOSviewer yazılımı; ağ verilerine dayalı haritalar oluşturulması ve görselleştirilmesi esasına dayalı olarak kullanılmaktadır (van Eck ve Waltman, 2022)

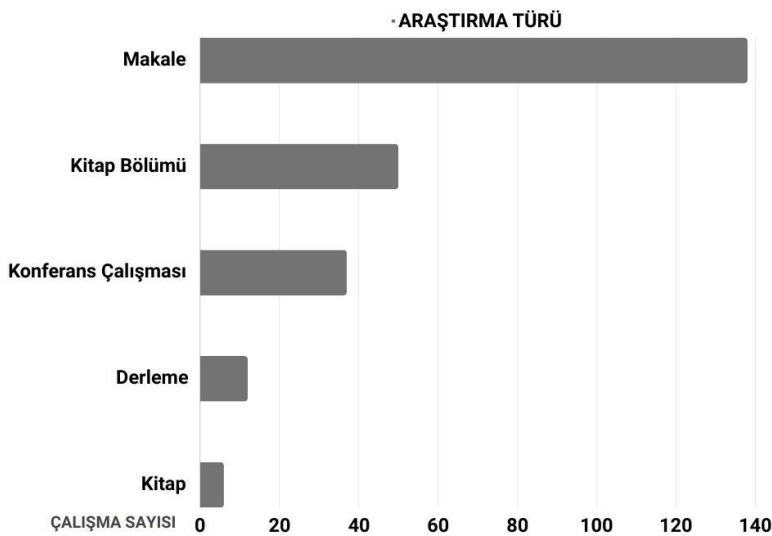
BULGULAR

Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanında 1993-2023 yılları arasındaki yapılan çalışmaların değişken bir süreç izlediği saptanırken genel bir artış olduğu görülmektedir. İlgili konu özelinde özellikle 2008’e kadar durağan bir süreç izlenirken, en fazla yayın 2020 (29 adet) ve 2022 (28 adet) yıllarında görülmüştür. Akademik literatürde, kamusal alan dönüşümü ve kent kimliğine olan ilginin özellikle 2018’den itibaren yoğunlaştığı görülmektedir (Şekil 1).



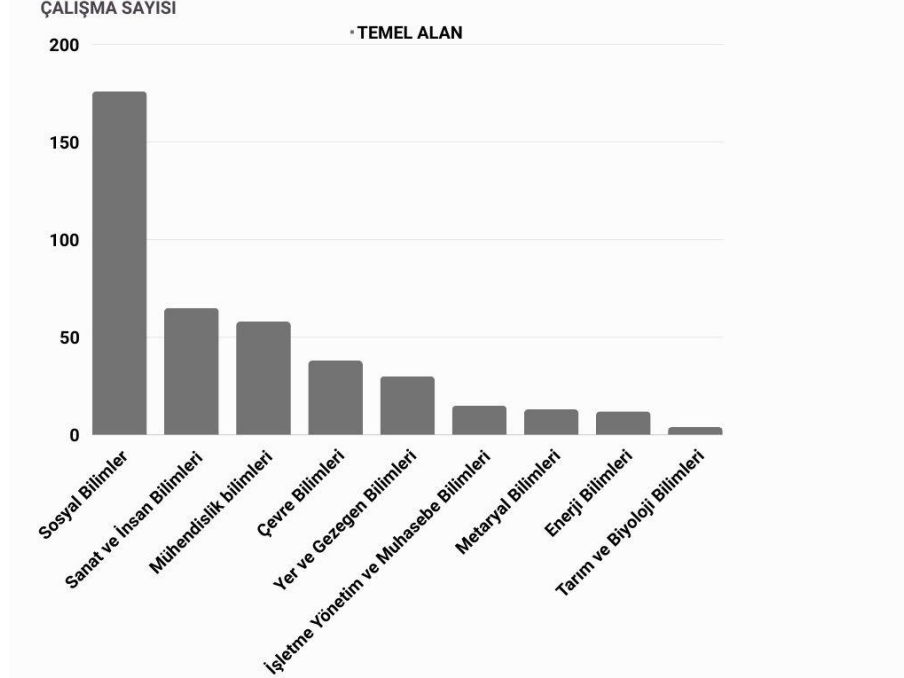
Şekil 1. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanında 1993-2023 yılları arasındaki yapılan çalışmaların yıllara göre değişim grafiği (<https://www.scopus.com/>, 2024)

İlgili konu özelinde 1993-2023 yılları arasında yapılmış 247 adet çalışmanın doküman tipi dağılımı incelendiğinde, birçok farklı türde yayın yapıldığı görülmekle birlikte, ilk sırayı % 59,92 ile (148 adet) araştırma makalesi almıştır (Şekil 2).



Şekil 2. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanında 1993-2023 yılları arasındaki yapılan çalışmaların araştırma türü dağılım grafiği (<https://www.scopus.com/>, 2024)

İlgili konu özelinde 1993-2023 yılları arasında yapılmış 247 adet çalışmanın temel alan dağılım oranları incelendiğinde, ilk sırayı % 71,26 ile (176 adet) sosyal bilimler almıştır (Şekil 3).



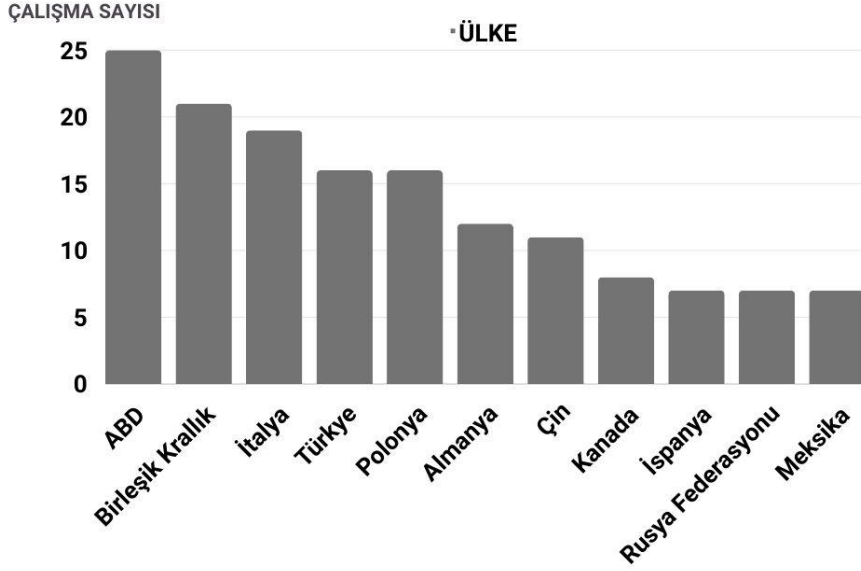
Şekil 3. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanında 1993-2023 yılları arasındaki yapılan çalışmaların temel bilim alanı dağılım oranları (<https://www.scopus.com/>, 2024)

Temel alanlara göre en fazla yayın yapan dergi sıralamasına ilişkin dağılım incelendiğinde farklı dergiler yer alırken, sosyal bilimler ile sanat ve insan bilimleri alanında ilk sırayı “On The W@terfront”, mühendislik alanında “Architecture, City and Environment” ile çevre bilimleri alanında “Sustainability” dergileri yer almıştır (Tablo 1).

Tablo 1. Temel alanlara göre en fazla yayın yapan dergi sıralamasına ilişkin dağılım (<https://www.scopus.com/>, 2024)

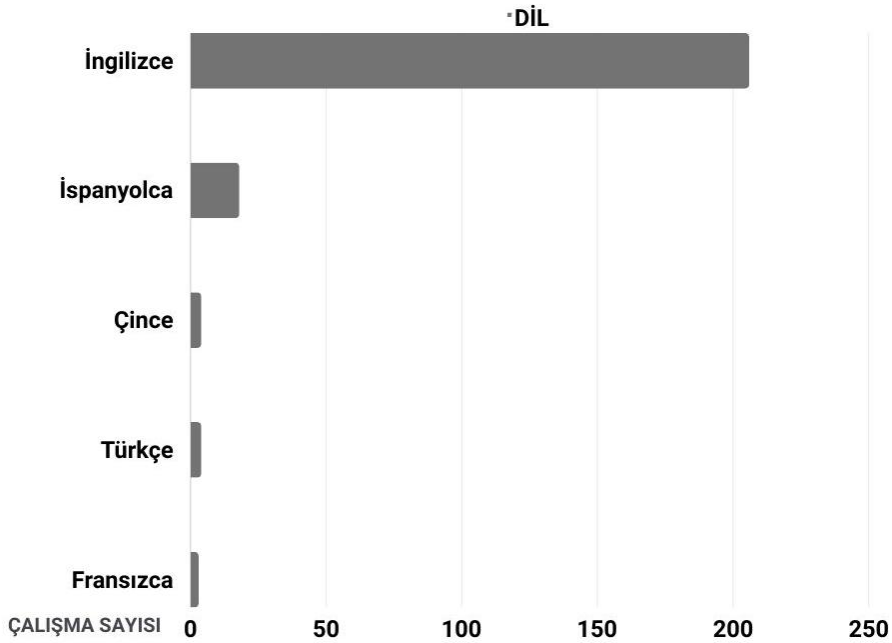
Temel Alan	Dergi Adı	Adet
Sosyal Bilimler	On The W@terfront	4
	Urban Studies	3
Sanat ve İnsan Bilimleri	On The W@terfront	4
Mühendislik Bilimleri	Architecture, City and Environment	2
Çevre Bilimleri	Sustainability	7
	International Journal of Sustainable Development and Planning	3
	Environment and Planning	3

Ele alınan konularda en çok yayın yapılan ülke incelendiğinde ilk sırayı 25 yayın ABD alırken, ise, 16 yayın ile Türkiye'nin ilk 5 içerisinde yer aldığı saptanmıştır (Şekil 4).



Şekil 4. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanında 1993-2023 yılları arasındaki yapılan çalışmaların ülkelere göre dağılım grafiği (<https://www.scopus.com/>, 2024)

İlgili konu özelinde 1993-2023 yılları arasında yapılmış 247 adet çalışmanın dil türü dağılımı incelendiğinde, ilk sırayı yüksek bir oranı oluşturan % 83.40 ile (206 adet) İngilizce almıştır (Şekil 5).



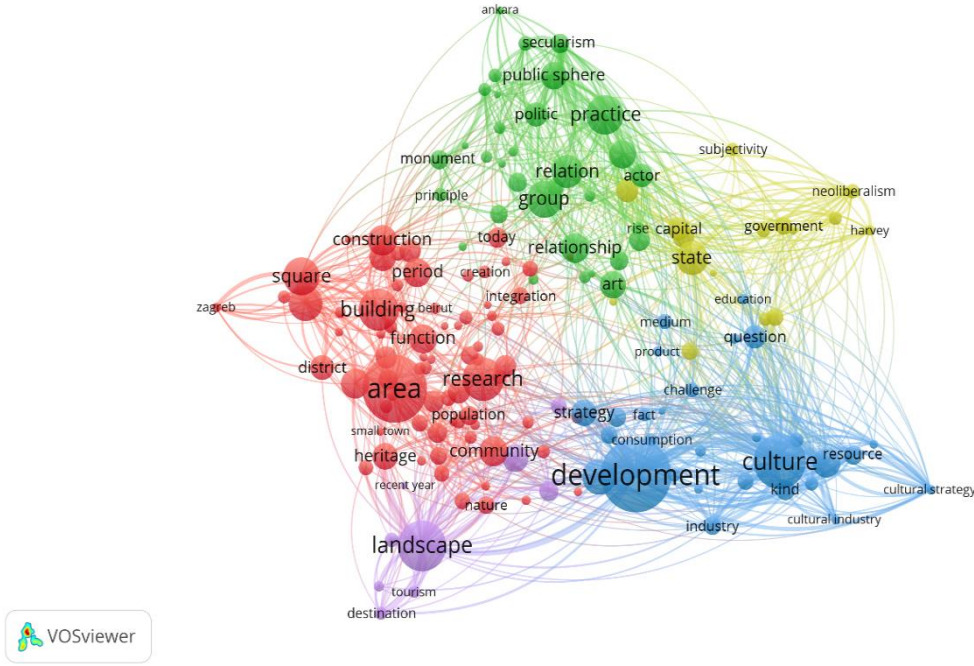
Şekil 5. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanında 1993-2023 yılları arasındaki yapılan çalışmanın dil türüne göre dağılım grafiği (<https://www.scopus.com/>, 2024)

Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanı özelinde 1993-2023 yılları arasında birçok yazarın çalışması olduğu saptanmıştır. Yapılan analizlerde en fazla atıf alan beş yazar ile yayın isimleri ve yayımlanma yılları Tablo 2. de belirtilmiştir. Buna göre; Schwenkel'in 2003'de yayımlanan çalışması 104 adet atıf olarak ilgili konuda en çok atıf alan makale olmuştur. Erkip tarafından hazırlanan, Türkiye'de alışveriş merkezlerinin kullanım şeklinin özellikleri ve bunların sosyal ve mekansal sonuçlarının Ankara özelinde incelendiği (Erkip, 2003) makale 86 adet atıf olarak en çok atıf alan üçüncü çalışmayı oluşturmuştur.

Tablo 2. 1993-2023 yılları arasında en çok atıf alan yayınlar, yazarlar ve atıf sayıları dağılımı (<https://www.scopus.com/>, 2024)

Yazar Adı	Yayın Adı	Yılı	Atıf Sayısı
Schwenkel, C.	Post/Socialist Affect: Ruination and Reconstruction of the Nation in Urban Vietnam	2013	104
Zimmerbauer, K.& Paasi, A.	When Old and New Regionalism Collide: Deinstitutionalization of Regions and Resistance Identity in Municipality Amalgamations	2013	92
Erkip, F.	The Shopping Mall As An Emergent Public Space in Turkey	2003	86
Oktay, D.	The Quest for Urban Identity in The Changing Context of The City Northern Cyprus	2002	68
Marino, S.	Making Space, Making Place: Digital Togetherness and the Redefinition of Migrant Identities Online	2015	60

Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanı özelinde 1993-2023 yılları arasında yayınlanan çalışmaların VOSviewer gibi yazılım programları kullanılarak anahtar kelime ağı incelenerek ve Şekil 6'da sunulmuştur. Buna göre anahtar kelimeler arasında beş farklı grupta kümeleşme oluşmuştur. Zeybek, Karabağ ve Yavuz (2022)nin de belirttiği gibi; dairelerin boyutu, anahtar kelimenin kullanım sıklığına bağlı olarak büyümektedir. Kamusal alan dönüşümü ve kent kimliği kırmızı kümede alan, araştırma, miras, gibi anahtar kelimelerle birliktedir. Yeşil kümede kamusal alan, politika anahtar sözcükleri bulunmaktadır. Mavi kümedekalkınma, strateji, açık mor kümede isepeyzaj, turizm gibi anahtar kelime ağı ortaya çıkmıştır. Turuncu kümede ise konut, nüfus, sarı kümede tüketim, kırsal çalışmalar ve karşılaştırmalı kentleşme bulunmaktadır. Sarı kümede eyalet, başkent gibi kelimeler yer almaktadır (Şekil 6).



Şekil 6. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanı özelinde 1993-2023 yılları arasında yayınlanan çalışmalara ilişkin yazarlar tarafından kullanılan anahtar kelimelere ilişkin ağ analizi (<https://www.scopus.com/>, 2024)

Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanı özelinde 1993-2023 yılları arasında yayınlanan çalışmalara ilişkin en fazla kullanılan anahtar kelime dağılımları incelendiğinde ilk sırayı 59 adet yayında yer alarak kamusal alan almıştır (Tablo 3).

Tablo 3. Kamusal alan dönüşümü ve kent kimliği alanında Scopus veri tabanı özelinde 1993-2023 yılları arasında yayınlanan çalışmalara ilişkin anahtar kelime dağılımı (<https://www.scopus.com/>, 2024)

Anahtar kelime	Adet	Yüzde	Anahtar kelime	Adet	Yüzde
kamusal alan	59	23.88	Mimarlık	12	%4.86
kentsel planlama	30	12.15	Kentsel gelişim	11	%4.45
kentsel kimlik	16	6.47	Kentsel büyüme	10	%4.05
kentsel tasarım		5.26	Kentsel alan		4.05

SONUÇ VE TARTIŞMA

Kamusal alanlar ve kent kimliği arasındaki ilişki, bir şehrin karakterini, kültürünü ve toplumsal dokusunu şekillendiren önemli unsurları içerir. Öyle ki Sarayılmazlar ve Çelikyay (2018) çalışmalarında kamusal alanların kent kimliğini oluşturduğu ve kent kültürünü yansıttığına dikkat çekilmiştir. Bununla birlikte, Karabağlar Belediyesi Kamusal Açık Mekan ve Kent

Meydanı Kentsel Tasarım Yarışmasında 2. Ödül alan proje raporunda da; açık kamusal kent mekanlarının, kentlerin oluşum ve toplumların gelişim sürecinde önemli bir rol oynadığı üzerine vurgu yapılarak, kamusal alan kent kimliği ilişkilendirilmiştir (<https://www.arkitera.com/proje/2-odul-karabaglar-belediyesi-kamusal-acik-mekan-ve-kent-meydani-kentsel-tasarim-yarismasi/>)

Çalışmada; kamusal alanların dönüşümü-kent kimliği ilişkisi konusunun akademik alandaki gelişimindeki ana eğilimlerinin belirlenmesi amacıyla Scopus veri tabanı özelinde 1993-2023 yılları arasında yayınlanan çalışmalara (247 adet) ilişkin bibliyometrik analiz gerçekleştirilmiştir. Bu amaçla çalışma çerçevesinde aşağıda maddeler şeklinde verilen sonuçlara ulaşılmıştır.

- Akademik alanda Scopus veri tabanı özelinde kamusal alanların dönüşümü-kent kimliği ilişkisi konusunu içeren çalışmaların 1993 yılında görülmeye başlandığı, 2008'e kadar durağan bir süreç izlenirken 2018 yılı sonrasında da yoğunlaştığı saptanmıştır. Öyle ki, 2018-2023 yılları arasında yapılan yayın sayısı 147 ile toplam yayının %57.48'ini oluşturmuştur. Akademik çalışmaların hızlandığı bu süreç özellikle pandemi sürecinin etkisi ile ilişkilendirilebilir.
- 247 adet çalışmanın doküman tipi dağılımında araştırma makaleleri ilk sırayı almıştır.
- İlgili konuda araştırma yapan ve en çok atıf alan yazarlar Schwenkel, C. ile Zimmerbauer, K.& Paasi, A. olmuştur. Bu durum, ilgili konuda öne çıkan kişileri ve çalışmaları takip etmek açısından önemli bir katkı sağlayacaktır.
- En fazla yayın yapılan ülkeler arasında ilk sırayı ABD oluşturmuş olup, devamında Birleşik Krallık ve İtalya yer almıştır.
- İlgili konu özelinde çalışmaların temel alan dağılımlarında farklı disiplinler yer alırken, ilk sırayı sosyal bilimler almıştır.
- En fazla yayın yapılan ülkeler arasında Türkiye dördüncü sırada yer almıştır.
- Kamusal alanların dönüşümü-kent kimliği ilişkisi ile ilgili çalışmalarda en etkili dergi yayın sayısı ile "Sustainability" olmuştur.
- Yazarlar tarafından en fazla kullanılan kelimeler sırasıyla kamusal alan, kentsel planlama, kimlik, kentsel tasarım ve mimarlık olmuştur. Araştırmalardaki anahtar kavramların belirlenmesi, literatürde ön plana çıkan ve konu ile ilişkilendirilen kelimelerin ve kavramların belirlenmesini sağlaması açısından önemlidir.
- Çalışmalar en çok İngilizce dilinde yayımlanmıştır.

Çalışmadan elde edilen sonuçlar, akademik alanda kamusal alan dönüşümü-kent kimliği ilişkisine yönelik yapılmış çalışmalara yönelik bir çerçeve sunarak, literatürdeki ana temaları, yayın eğilimlerini ve dönemsel değişimleri belirlemeye yönelik niceliksel açıdan önemli bilgiler sağlamaya katkıda bulunmuştur.

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A RESEARCH ON THE ORGANIZATIONAL SITUATION OF FARMERS IN ŞANLIURFA-SURUÇ PLAIN IRRIGATIONS – TÜRKİYE

ŞANLIURFA-SURUÇ OVASI SULAMALARINDA YER ALAN ÇİFTÇİLERİN ÖRGÜTLENME DURUMLARI ÜZERİNE BİR ARAŞTIRMA-TÜRKİYE

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ÖZET

Tarımsal üretim tüm ülkeler için vatandaşlarının beslenme ihtiyaçlarının karşılanması ile gıda güvenliği ve güvenliği için esastır. Tarımsal üretimde verimliliği etkileyen birçok faktör vardır. Bunlardan birisi de çiftçilerin üretim süreçlerinde içinde yer aldıkları örgütlü yapılardır. Bu yapılar çiftçilerin her türlü girdi temininde ve ürünlerinin pazarlanmasında çiftçinin gelirini olumlu ya da olumsuz yönde doğrudan etkileyebilmektedir. Bu çalışmanın amacı GAP kapsamında sulamaya açılan Şanlıurfa iline bağlı Suruç ovasında sulama alanlarında yer alan çiftçilerin örgütlenme durumlarının araştırılmasıdır. Araştırma birincil verilere dayalı olarak yapılmış olup, bu kapsamda yüz yüze görüşmeler yoluyla elde edilen anket verileri kullanılmıştır. Örneklem hacmi %95 güven sınırı ve %5 hata payı ile belirlenmiştir. Araştırmadaki karşılaştırmalarda frekans dağılımları kullanılmış ve sonuçlar yorumlanmıştır. Elde edilen sonuçlara göre katılımcıların %98,2'si herhangi bir çiftçi örgütüne üye olup, en fazla üyelik %37,3 ile ziraat odasıdır. Tarımsal faaliyetlerde kooperatiflerin gerekliliğine inananların oranı %90,3'dür. Bu gerekliliğe inananların %46,8'i üretiminde verimliliğin artırılması için bilgi ihtiyacının karşılanması amacıyla evet demiştir. Hayır, cevabı verenlerin %86,5'i ise kooperatiflerin gerçek amaçlarına uygun olarak faaliyetlerde bulunmamalarını gerekçe göstermiştir. Bu çalışmada, çiftçilerin örgütlü yapılara üyeliklerinin çok büyük oranda tarımsal desteklemelerden faydalanmak gibi zorunlu nedenlerden dolayı üye oldukları belirlenmiştir. Zorunlu olmayan üretici birliklerine üye olanların oranı ise %9,4'dür. Çiftçilerin örgütlenmenin sağlayacağı faydalar ve tarımsal üretim konularında etkili tarımsal yayım faaliyetlerine ihtiyaçları vardır.

Anahtar Kelimeler: Tarımsal Üretim; Örgütlenme; Çiftçi Tutumları; Suruç Ovası Sulamaları; GAP-Şanlıurfa; Türkiye.

ABSTRACT

Agricultural production is essential for all countries to meet the nutritional needs of their citizens and for food security and safety. There are many factors that affect productivity in agricultural production. One of these is the organized structures in which farmers take part in the production processes. These structures can directly affect the farmer's income, positively or negatively, in the supply of all kinds of inputs and the marketing of their products. The aim of this study is to investigate the organizational status of farmers in the irrigation areas in the Suruç plain of Şanlıurfa province, which was opened to irrigation within the scope of the GAP. The research was conducted based on primary data, and in this context, survey data obtained through face-to-face interviews were used. The sample size was determined with a 95% confidence limit and a 5% margin of error. Frequency distributions were used in the comparisons in the research and the results were interpreted. Results: The 98.2% of the participants were members of any farmer organization, and the highest membership was in the chamber of agriculture with 37.3%. The rate of those who believe in the necessity of cooperatives in agricultural activities was 90.3%. The 46.8% of those who believe in this necessity said yes in order to meet the need for information to increase efficiency in production. 86.5% of those who answered no cited the fact that cooperatives do not carry out activities in accordance with their real purposes. According to the results obtained from this research, it was determined that farmers' membership in organized structures is largely due to mandatory reasons such as benefiting from agricultural supports. The rate of members of non-compulsory producer associations was 9.4%. Farmers need effective agricultural extension activities regarding the benefits of organization and agricultural production.

Keywords: Agricultural Production; Organization; Farmer Attitudes; Suruç Plain Irrigations; GAP-Şanlıurfa; Türkiye.

GİRİŞ

İnsanoğlu yaşamsal faaliyetlerini sürdürebilmek adına, tek başına başaramadığı işleri yapabilmek, daha iyi koşullarda ve güven içinde yaşayabilmek için, örgütlenmeye veya örgütlü yapılar içinde yer almaya ihtiyaç duyar. Örgütlenme düzeyindeki başarı seviyesi insanların, toplumların ve ulusların güvenlik, medeniyet ve refah seviyelerini doğrudan etkileyebilmektedir. Değişim, gelişim ve kalkınma süreçlerinde bireyler ve toplumlar giderek çeşitlenen ve zorlaşan yaşam koşullarını kolaylaştırmak, iyileştirmek, ekonomik zorluklara karşı koyabilmek ve güven içinde yaşayabilmek için yine iş birlikleri arayışlarında bulunmuşlardır. Bunun içinde ortak çıkarlara uygun ve birlikte hareket edebilecekleri örgütler kurmuşlardır. Küresel olarak kooperatifler ve birlikler gibi yapılar ekonomik, sosyal ve toplumsal kalkınmaya önemli faydalar ve katkılar sağlamıştır. Kırsal kalkınmanın ve refahın toplumun tüm kesimlerini ve sektörlerini içerecek bir şekilde gerçekleşmesi, yoksullukla mücadelede ve istihdam olanaklarının artırılmasında, girişimciliğin desteklenmesinde, gerekli kaynaklara erişmenin kolaylaştırılmasında, ortak çıkarlara uygun davranışların sergilenmesinde örgütlenmeye ihtiyaç duyulmaktadır. Diğer taraftan refahın toplum tüm kesimlerine dengeli dağılması ve bireylerin yönetim süreçlerine katılım sağlayabilmesi de örgütlenme yoluyla daha kolay olabilmektedir (Tarım ve Orman Bakanlığı, 2020; Sevinç, 2021).

Tüm canlıların beslenme gereksinimlerini karşılamak tarım sektörünün en önemli görevlerindedir. Bireylerin yaşamlarını sürdürebilmeleri için tarımsal üretim yapmak bir

zorunluluktur (Vurgun & Aydođdu, 2023). Tüm sektörler arasında örgütlenmenin en çok ihtiyaç duyulduđu sektör tarımdır. Türkiye tarımsal üretim potansiyeli açısından çok önemli avantajlara sahiptir. Türkiye'de ortalama tarımsal işletme büyüklüğü Türkiye İstatistik Kurumunun (TÜİK) 2001 yılı Genel Tarım Sayımı sonuçlarına göre 61 dekar iken, 2014/2015 üretim sezonunu dikkate alan 2016 yılı Tarımsal İşletme Yapı Araştırması sonuçlarına göre 76 dekar çıkmıştır. Çiftçi Kayıt Sisteminin son verilerine göre ise 2017 yılı itibarıyla 70 dekadır (KKB, 2019). Türkiye'de tarım işletmelerinin genel olarak küçük ölçekli ve çok parçalı olması, kırsaldan kente göç ve genç nüfusun kırsalda azalması ve girdi maliyetlerindeki artışlar gibi nedenlerden dolayı yapısal sorunlar vardır. Bu sorunları çözümü için tarımsal örgütlenmeye ihtiyaç vardır. Özellikle küçük ölçekli tarımsal işletmelerin sürdürülebilirliğini sağlamak, kaynakların etkin ve verimli kullanılması, kırsal alanın ekonomi içindeki etkinliğini arttırmak, üreticinin gelir ve yaşam düzeyini yükseltmek gibi konularda örgütlenme anahtar rol oynamaktadır (Tarım ve Orman Bakanlığı, 2020; Sevinç, 2021).

Bu çalışmanın amacı Güneydođu Anadolu Projesi (GAP) kapsamında sulamaya açılan Şanlıurfa iline bađlı Suruç ovasında sulama alanlarında yer alan çiftçilerin örgütlenme durumlarının araştırılmasıdır.

MATERYAL VE YÖNTEM

Araştırma Sahası

GAP projesi Türkiye'nin en büyük çok sektörlü bölgesel kalkınma projesidir. GAP, Fırat ve Dicle nehirlerine dayalı olarak planlanmış içinde tarım, sanayi, enerji, eğitim, sađlık, turizm gibi birçok sektörü barındırmaktadır. Proje Güneydođu Anadolu Bölgesinde yer alan 9 ili içermekte olup, proje kapsamında 1.8 milyon hektar alanın sulamaya açılması hedeflenmiştir. Hâlihazırda 600 bin hektar civarında bir alanda sulu tarım yapılmaktadır (GAP İdaresi, 2024). Suruç ovası, Suruç ilçesinde yer almakta olup Şanlıurfa iline bađlıdır. Suruç Ovası'nın güneyi Suriye'ye kadar uzanmaktadır (Şahinalp, 2012). Suruç ovası verimli topraklara sahip olması ve ipek yolu üzerinde yer alması nedeniyle birçok medeniyete ev sahipliđi yapmış, kültürel açıdan zengin bir geçmişe sahiptir. Fırat ve Dicle nehirleri arasında bulunan Suruç Ovası cođrafi konumundan dolayı da önemli bir yere sahiptir (Dođantürk, 2015). Suruç Ovası doğuda Fatik Yaylası ile Harran Ovası'ndan ayrılır, batıda Birecik Yaylası ile komşudur. Ovanın kuzeyinde Şanlıurfa-Bozova Platosu'nun devamı yer almaktadır. Suruç Ovası'nın güneyi Suriye'ye kadar uzanmaktadır.

Suruç ovasında sulamalar GAP kapsamında 2015 yılında başlamıştır. Proje kapsamında sulanması planlanan toplam tarım alanı 94.814 hektardır (ha). Proje basınçlı ve yüzey sulama yöntemine göre planlamıştır (Sepetçiođlu ve ark., 2010). Suruç Ovası Pompaj sulama kapsamında ilk olarak 2015 yılında 5.445 hektarlık bir alan ile başlamış olup, 2022 yılı itibarıyla 56.295 ha alan sulamaya açılmıştır (DSİ, 2023).

Materyal ve Analiz Yöntemi

Araştırmada birincil veriler kullanılmıştır. Birincil veriler, üç yöntem ile toplanabilir; anket, gözlem ve mülakat (sözlü görüşme) yöntemlerinden bir veya bir kaçı kullanılarak veriler elde edilebilir (Lorcu, 2020). Araştırmada yüz yüze görüşmeler yoluyla daha önceden hazırlanmış olan sorulara dayalı anket kullanılmıştır. Suruç ovası sulamalarında yer alan çiftçilerin sayısı

Şanlıurfa Tarım ve Orman İl Müdürlüğünden, Çiftçi Kayıt Sistemine kayıtlarından öğrenilmiş olup, bu sayı 35.189'dir. Örneklem hacmi %95 güven sınırı, %5 hata payıyla hesaplanmıştır. Anket yapılacak çiftçi sayısı basit tesadüfi örnekleme yöntemi ile referansı verilen formül kullanılarak belirlenmiştir (Yazıcıoğlu & Erdoğan, 2014). Elde edilen verilen Excel'e işlenmiş ve daha sonra frekans dağılımları elde edilerek, yorumlanmıştır.

ARAŞTIRMA BULGULARI VE TARTIŞMA

Araştırmaya katılanların yaş ortalaması 45.5'dir. Katılımcıların yaklaşık %32'si 41 ile 50 yaşları arasındadır. Şanlıurfa Harran ovasında yapılan bir çalışmada çiftçilerin yaş ortalaması 46.7 olarak belirtilmiştir (Parlakçı Doğan, 2019). Konya ovasında yapılan başka bir çalışmada çiftçilerinin yaş ortalamalarının 46.23 olduğu belirtilmiştir (Dıyanah, 2021). Ankete katılan çiftçilerin %85,6'sı evli ve %14,4'ü bekârdır. Katılımcıların %60,4'ü ilköğretim ve altı (okur yazar) dır. Yüksek okul/üniversite eğitime sahip olanların oranı ise %4,4'dür. Trakya bölgesinde Edirne, Kırkkale ve Tekirdağ illerinde çiftçiler ile ilgili olarak yapılan bir çalışmada katılımcıların %63'ü ilköğretim, %27'si ortaokul, %7 lise ve %3'ü üniversite mezunudur (Yıldırım, 2020). Elde edilen sonuçlar, Türkiye'de farklı alanlarda yapılan çalışmalar ile örtüşmektedir.

Katılımcıların yaklaşık %70'nin temel gelir kaynağı tarımdır. Katılımcıların çiftçi örgütlerine üyelikleriyle ilgili veriler Tablo 1'de verilmiştir. Yapılan çalışmada katılımcıların büyük bir çoğunluğunun Ziraat odasına üye oldukları görülmektedir. Toplamda 376 katılımcının en az bir örgüte üye olduğu ve 7 katılımcının ise herhangi bir örgüte üyelik yapmadıkları tespit edilmiştir. Katılımcıların %37,33'ü Ziraat Odasına, %29,77'si Tarım Kredi Kooperatifine, %9,40'ı Üretici Birliğine, %4,70'i Sulama Birliğine ve %16,73'ü ise diğer birliklerden en az bir tanesine üye iken, %1,83 katılımcı ise herhangi bir birliğe üyelik yaptırmamıştır. Trakya Kalkınma Ajansının Trakya Bölgesinde çiftçi algısı analizi çalışmasında katılımcıların %63,6'sı Tarım Kredi Kooperatiflerine, %33,7'si yağlı tohumlar kooperatifine, %13,5'i Tarımsal Kalkınma Kooperatifine, %12,5'i süt kooperatifine, %5,1'i sulama kooperatifine, %1,7'si köy-koop, %1,4'ü Trakya Birlik, %1,3'ü damızlık birliğine ve %3,8'i diğer kooperatiflere üye oldukları belirtilmiştir (Trakya Kalkınma Ajansı, 2013).

Tablo 1. Anket katılımcıların örgütlenme durumları

Çiftçi Örgütleri	Frekans (n)		Yüzde (%)		Toplam	
	Evet	Hayır	Evet (%)	Hayır (%)	(n)	(%)
Ziraat Odası	143	240	37.3	62.7	383	100.0
Tarım Kredi Kooperatifleri	114	269	29.8	70.2	383	100.0
Üretici Birliği	36	347	9.4	90.6	383	100.0
Sulama Birliği	18	365	4.7	95.3	383	100.0
Diğer	65	318	17.0	83.0	383	100.0

Parlakçı Doğan'ın Harran Ovasında suyun ekonomik analizi çalışmasında katılımcıların %62,5' sulama birliğine üye olduklarını, %37,5'nin sulama birliğine üye olmadıkları belirtilmiştir (Parlakçı Doğan, 2019). Trakya bölgesinde Edirne, Kırkkale ve Tekirdağ illerinde yapılan başka bir çalışmada katılımcıların %98,8'i tarım kredi kooperatifine üye iken %1,2'si diğer

kooperatiflere üye olduklarını belirtmişlerdir (Yıldırım, 2020). Konya İli Altınekin ilçesinde bitkisel üretim yapan tarım işletmelerinin tarım sigortası yaptırma durumlarını etkileyen faktörlerin analizi çalışmasında katılımcıların %27.27'si Tarım Kredi Kooperatiflerine, %83.33'ü Panko Birlik üyesi, %21.21'i damızlık sığır yetiştiriciliği birliğine, %96.97'si ziraat odasına, %19.70'i süt üreticiliği birliğine ve %39.39'u sulama birliğine üye oldukları belirtilmiştir (Dıyanah, 2021). Konya'da tarımsal kuraklığın uzmanlaşmış tarla bitkileri yetiştiren işletmelerin ekonomik faaliyet sonuçlarına etkisi çalışmasında işletmelerin %44.34'ü tarım kredi kooperatiflerine, %18.87'si Panko Birliğe, %15.09'u sulama kooperatiflerine, %11.32'si süt üreticileri birliğine, %5.66'sı tarımsal kalkınma kooperatiflerine ve %4.72'si damızlık sığır yetiştiriciliği birliğine üye oldukları görülmüştür (Satırlı, 2023). Üreticiler yaptıkları üretim neticesinde farklı birliklere üyelik yapmaktadırlar.

Katılımcıların “Tarımsal faaliyetlerde kooperatif gerekli midir?” sorusuna verdiği cevaplar Tablo 2’de verilmiştir. Katılımcıların % 90.3’ü kooperatifin gerekli olduğunu düşünürken, % 9.7’si ise kooperatifin gerekli olmadığını düşünmektedir.

Tablo 2. Tarımsal Faaliyetlerde Kooperatif Gerekli midir?

Tarımsal faaliyetlerde Kooperatif gerekli midir?	Frekans (n)	Yüzde (%)
Hayır	37	9.7
Evet	346	90.3
TOPLAM	383	100.0

Katılımcıların “Tarımsal faaliyetlerde kooperatif gerekli midir?” sorusuna “evet” cevabını verme nedenleri Tablo 3’de verilmiştir. Katılımcıların %46.8’i kooperatifin bilgi almak için gerekli olduğunu düşünmektedir. Katılımcıların bilgi alma isteklerindeki asıl amaç tarımsal faaliyetlerde elde ettikleri geliri artırmaya yöneliktir. Katılımcıların %19.1’i işbirliği, %9.3’ü girdi temini, %17.9’u pazarlama, %46.8’i bilgi almak, %6.9’u alet makine temini gibi nedenlerden ötürü kooperatifin gerekli olduğunu düşünmektedirler.

Tablo 3. “Tarımsal faaliyetlerde kooperatif gerekli midir?” sorusuna Evet cevabını verme nedenleri

EVET	Frekans (n)	Yüzde (%)
İşbirliği	66	19.1
Girdi Temini	32	9.3
Pazarlama (Satış)	62	17.9
Bilgi Almak için	162	46.8
Alet Makina Temini	24	6.9
TOPLAM	346	100.0

Katılımcıların “Tarımsal faaliyetlerde kooperatif gerekli midir?” sorusuna “hayır” cevabını verme nedenleri Tablo 4’de verilmiştir.

Tablo 4. “Tarımsal faaliyetlerde kooperatif gerekli midir?” sorusuna Hayır cevabını verme nedenleri

HAYIR	Frekans (n)	Yüzde (%)
Faydalı değil	2	5.4
Yönetimi güven vermiyor	1	2.7
Ulaşılması zor / İşlemleri fazla	2	5.4
Diğerleri (Gerçek amaçlarına uygun olarak faaliyetlerde bulunmamaları nedeniyle)	32	86.5
TOPLAM	37	100.0

Hayır, cevabını veren (37 kişi) katılımcılar en fazla sırasıyla; kooperatifi faydalı görmemekte, kooperatiflere ulaşımın zor olduğunu ve işlemlerin fazla olduğunu düşünmekte, kooperatif yönetimini güvenli bulmamakta ve en büyük katılım ise diğer nedenlerden, gerçek amaçlarına uygun olarak faaliyetlerde bulunmamalarından dolayı, kooperatifin gerekli olmadığını düşündüklerini beyan etmişlerdir.

Diğer taraftan, DSİ ve Topçu Gündaş sulama birliği ile yapılan görüşmelerde Suruç Ovası Sulama Projesi yürürlüğe girdikten sonra ilk 3 yıl Yap-İşlet-Devret modelinin uygulandığı daha sonrasında sulamaların Topçu Gündaş sulama birliği tarafından gerçekleştirildiği ifade edilmiştir. Çiftçiler sulama birliğine ödeme yaptıklarında otomatikman üyeliklerinin yapıldığını sulama birliği üyeliği için ekstra bir işlem gerçekleştirmediklerini belirtmişlerdir. Üye olmadıklarını beyan eden çiftçilerinde bundan bihaber olduğunu ve bilmedikleri için Hayır cevabını verdiklerini beyan etmişlerdir. Sulama birliği ÇKS kayıtları ve CBS uydu sistemi üzerinden ekili alanı ve ürün desenini takip etmektedir. Çiftçi beyan etmese bile bu veriler baz alınarak borçlanma yapılmaktadır.

Karlı ve ark. (2018) tarafından yürütülen “Türkiye’de Tarımda Üretici Örgütlenmesinin Önemi ve Gelişimi” çalışmasında; Türkiye’de gerektiği kadar üretici örgütleri olmasına karşın, üreticilerin gerekli bilgi ve donanımına sahip olmamalarından, örgütlere olan güvensizlik, oluşan sorunların örgütler tarafından çözüme ulaştırılamaması, girdi temini, pazarlama, sosyal konularda örgütlerin pasif davranması ve örgüt yöneticilerinin başarı göstermemelerinden dolayı örgütlenme çalışmalarında başarı elde edilememiştir sonuca varmışlardır.

SONUÇ VE ÖNERİLER

Bu araştırmada, örgütlenmenin pek çok sebebe dayalı olarak çiftçiler arasında pek yaygın olmadığı tespit edilmiştir. Anketlerin doldurulması esnasında çiftçilerle yapılan sohbetlerden edilen bilgilere göre, bu sebepler arasında bölgenin aşiret yapısı, güven sorunu, adam kayırma, yetersiz şeffaflık ve eğitim yetersizliği gibi sorunlar örgütlenmenin önündeki en büyük engeller olarak anlatılmıştır. Çiftçilerin örgütlü yapılara üyeliklerinin çok büyük oranda tarımsal desteklemelerden faydalanmak gibi zorunlu nedenlerden dolayı üye oldukları belirlenmiştir. Zorunlu olmayan üretici birliklerine üye olanların oranı ise %9,4’dür.

Üretici örgütleri, tarımı yönlendirebilmek, yapısal sorunlara çözümler getirebilmek, tarımsal üretimde verimliliğin artırılması, üretimde ve pazarlamada planlamaların yapılabilmesi, piyasa koşullarında üreticiden tüketiciye kadar olan süreçte danışmanlıklar verebilmesi, kamusal teşvikler ve desteklemelerin etkin ve verimli bir şekilde üretim sürecine dâhil edilmesi gibi fonksiyonların yerine getirilmesinde önemli roller üstlenmektedirler. Çiftçiler, üyesi bulunduğu üretici örgütleri vasıtasıyla üretimlerini pazarın talebine göre planlanmak, ürünlerinin verimliliği ve değerini yükseltmek ve piyasada rekabet gücünü arttırmak gibi çeşitli avantajlara

sahip olabileceklerdir. Bu durum hem çiftçinin refahını ve hem de ulusal ekonomiyi olumlu yönde etkileyecektir. Tarımsal üretimde sürdürülebilirliğin ve kırsal refahın artırılması için örgütlenme bir tercih değil, zorunluluktur. Bundan dolayı, çiftçilerin örgütlenmenin sağlayacağı faydalar ve tarımsal üretim konularında etkili tarımsal yayım faaliyetlerine ihtiyaçları vardır. Diğer taraftan örgütlü yapıların verimli, etkin ve şeffaf bir şekilde faaliyetlerde bulunulması için de, kamusal tedbirlerin ve kontrollerin artırılması gereklidir.

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A RESEARCH ON FARMERS' AGRICULTURAL CREDIT USAGE: SURUÇ PLAIN IRRIGATIONS, ŞANLIURFA-TÜRKİYE

ÇİFTÇİLERİN TARIMSAL KREDİ KULLANIMLARI ÜZERİNE BİR ARAŞTIRMA: SURUÇ OVASI SULAMALARI, ŞANLIURFA-TÜRKİYE

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ÖZET

Türkiye’de son dönemlerde tarım alanları ve çiftçi sayıları birçok sebebe bağlı olarak azalmaktadır. En önemli nedenler arasında tarımsal üretimde bulunan çiftçilerin yetersiz öz sermaye, bir başka ifadeyle finansman eksikliği de yer almaktadır. Böyle bir durumda tarımsal kredi kullanımı gerekmektedir. Uygun koşullarda krediye ulaşamadığı durumlarda ise tarımsal üretimde sürdürülebilirlik sorunu ile beraber yetersiz gıda üretimine bağlı fiyat istikrarsızlığı problem ortaya çıkmaktadır. Bu çalışmanın amacı GAP kapsamında sulamaya açılan Şanlıurfa iline bağlı Suruç ovasında sulama alanlarında yer alan çiftçilerin tarımsal kredi kullanım durumlarının araştırılmasıdır. Araştırma birincil verilere dayalı olarak yapılmış olup, bu kapsamda yüz yüze görüşmeler yoluyla elde edilen anket verileri kullanılmıştır. Örneklem hacmi %95 güven sınırı ve %5 hata payı ile belirlenmiştir. Araştırmadaki karşılaştırmalarda frekans dağılımları kullanılmış ve sonuçlar yorumlanmıştır. Elde edilen sonuçlara göre; araştırmaya katılan çiftçilerin %80,7’si tarımsal kredi kullanmaktadır. Kullanılan tarımsal krediler en çok sırasıyla gübre, tohum ve zirai ilaç temini amaçlı olarak üretim aşamasında kullanılmaktadır. En sık kullanılan tarımsal kredi temin kaynakları ise %38,2 ile devlet bankaları, %20,3 ile tarımsal kooperatifler ve %24,7 ile tüccarlardan oluşmaktadır. Bu araştırmada, çalışma sahasında yer alan çiftçilerin öz sermaye yetersizliğine sahip olduğu ve bundan dolayı da tarımsal kredi kullanım zorunlulukları oldukları tespit edilmiştir. Kredi kullanan katılımcıların ¼’ünün şahıslardan-tüccarlardan yüksek maliyetli kredi temin ettikleri belirlenmiştir. Tarımsal üretimde sürdürülebilirliği sağlamanın ön koşullarından biri de uygun şartlarda girdi temininden kullanılacak olan kredilerdir. Bu durum çiftçinin elde edeceği geliri, dolayısıyla kırsal refahı doğrudan etkilemektedir. Bundan dolayı çiftçilerin uygun koşullarda tüzel kurum ve kuruluşlardan kredi temin etmesi yönünde kolaylıklar sağlanmalıdır.

Anahtar Kelimeler: Tarımsal Üretim; Tarımsal Kredi Kullanımı; Kredi Kaynakları; Suruç Ovası Sulamaları; GAP-Şanlıurfa; Türkiye.

ABSTRACT

Agricultural areas and the number of farmers have been decreasing recently due to many reasons in Türkiye. Among the most important reasons is the insufficient equity capital of farmers engaged in agricultural production, in other words, lack of financing. Therefore agricultural credit is required. In cases where credit cannot be accessed under suitable conditions, the problem of price instability due to insufficient food production along with the sustainability problem in agricultural production arises. The aim of this study is to investigate the agricultural credit usage status of farmers in the irrigation areas of the Suruç plain of Şanlıurfa province, which was opened to irrigation within the scope of GAP. The research was conducted based on primary data, and in this context, survey data obtained through face-to-face interviews were used. The sample size was determined with a 95% confidence limit and a 5% margin of error. Frequency distributions were used in the comparisons in the research and the results were interpreted. According to the results: The 80.7% of the farmers participating in the research use agricultural loans. The agricultural loans used are mostly used in the production phase for the purpose of supplying fertilizer, seeds and pesticides, respectively. The most frequently used sources of agricultural credit are state banks with 38.2%, agricultural cooperatives with 20.3% and merchants with 24.7%. In this research, it was determined that the farmers in the study area had insufficient equity capital and therefore were obliged to use agricultural loans. It was determined that ¼ of the participants using loans obtained high-cost loans from individuals and merchants. One of the prerequisites for ensuring sustainability in agricultural production is the loans to be used for input procurement under favourable conditions. This situation directly affects the income of the farmer and therefore rural welfare. Therefore, farmers should be provided with facilities to obtain loans from legal institutions and organizations under favourable conditions.

Keywords: Agricultural Production; Agricultural Credit Usage; Credit Sources; Suruç Plain Irrigations; GAP-Şanlıurfa; Türkiye.

GİRİŞ

Bireylerin besin ihtiyaçlarının karşılanması ve yaşamlarının sürdürülebilmesi için tarımsal üretim yapılması bir zorunluluktur (Vurgun & Aydoğdu, 2023). Tarımsal üretimde sürdürülebilirliğin sağlanması ülkeler açısından hayati öneme sahiptir. Küresel olarak kırsal alanlarda yaşayanların en temel gelir kaynağı tarımsal üretim faaliyetlerinden oluşmaktadır. Diğer üretim sektörlerinden farklı olarak, tarım sektörünün getirisi daha az, risk ve belirsizlikleri daha fazla, çoğunlukla doğal koşullarda yapılan, refah seviyesinin doğrudan tarımsal üretime ve gelire dayalı olması nedeniyle en fazla korunmaya ve desteklenmeye ihtiyaç duyan bir üretim sektörüdür (Semerci, 2021). Dünya'daki bütün ülkeler yurttaşlarının gıda ve tarımsal ihtiyaç güvenliğini karşılamak ve çiftçilerinin ihracatta rekabet üstünlüğünü arttırması için olanaklar sağlamak durumundadır. Dünyada gelişme düzeyi yüksek olan ülkeler tarım ve sanayiye aynı koşulları sağlayarak ilerlemişlerdir (Özyurt, 2020). Kara (2018) "Tarımda Temel Meseleler ve Çözüm Önerileri" çalışmasında; Türkiye'de uygulanan tarım politikaları, çiftçilerin satın alma gücü, tarım ürünleri fiyatları, döviz kurları vb. etkenlerden ötürü tarımdaki maliyetlerin yüksek seviyelerde olduğunu belirtmiştir.

Türkiye’de son dönemlerde tarım alanları ve çiftçi sayıları birçok sebebe bağlı olarak azalmaktadır (Sevinç et al., 2019). En önemli nedenler arasında tarımsal üretimde bulunan çiftçilerin yetersiz öz sermayeye sahip olmalarından dolayı, bir başka ifadeyle finansman eksikliği sorunu da yer almaktadır. Türkiye’deki tarımsal işletmelerin dış finansman ihtiyacı tarım arazilerinin küçük ölçekli ve çok parçalı olması, kırsalda tasarruf düzeylerinin düşük olması ve ayrıca sermaye devir oranı hızının az olmasından kaynaklanmaktadır (Semerci, 2021). Böyle bir durumda tarımsal kredi kullanımı gerekmektedir. Tarımsal krediler, çiftçilerin mali güçlerinin artırılması ve sermaye yapılarının güçlenmesi, işletmelerin etkin ve verimli faaliyetlerini sürdürmelerinin sağlamlasının yanı sıra, kırsalda gelir artışlarının gerçekleştirilmesi maksadıyla verilmektedir (İnan, 2016). Çiftçiler tarafından alınan tarımsal kredilerin amacına uygun olarak kullanılması durumunda, tarım işletmelerinde verimliliğin ve gelirin artmasına destek olmaktadır (Doll & Orazem, 2005). Diğer taraftan uygun koşullarda krediye ulaşılamadığı durumlarda ise tarımsal üretimde sürdürülebilirlik sorunu ile beraber yetersiz gıda üretimine bağlı fiyat istikrarsızlığı problemi ortaya çıkmaktadır.

Bu çalışmanın amacı GAP kapsamında sulamaya açılan Şanlıurfa iline bağlı Suruç ovasında sulama alanlarında yer alan çiftçilerin tarımsal kredi kullanım durumlarının araştırılmasıdır.

MATERYAL VE YÖNTEM

Araştırma Sahası

GAP projesi Türkiye’nin en büyük çok sektörlü bölgesel kalkınma projesidir. GAP, Fırat ve Dicle nehirlerine dayalı olarak planlanmış içinde tarım, sanayi, enerji, eğitim, sağlık, turizm gibi birçok sektörü barındırmaktadır. Proje Güneydoğu Anadolu Bölgesinde yer alan 9 ili içermekte olup, proje kapsamında 1.8 milyon hektar alanın sulamaya açılması hedeflenmiştir. Hâlihazırda 600 bin hektar civarında bir alanda sulu tarım yapılmaktadır (GAP İdaresi, 2024). Suruç ovası, Suruç ilçesinde yer almakta olup Şanlıurfa iline bağlıdır. Suruç Ovası'nın güneyi Suriye'ye kadar uzanmaktadır (Şahinalp, 2012). Suruç ovası verimli topraklara sahip olması ve ipek yolu üzerinde yer alması nedeniyle birçok medeniyete ev sahipliği yapmış, kültürel açıdan zengin bir geçmişe sahiptir. Fırat ve Dicle nehirleri arasında bulunan Suruç Ovası coğrafi konumu dolayısıyla da önemli bir yere sahiptir (Doğantürk, 2015). Suruç ilçesinin coğrafi konumu Şekil 1 de verilmiştir. (Anonim, 2024).

Suruç ovasında sulamalar GAP kapsamında 2015 yılında başlamıştır. Proje kapsamında sulanması planlanan toplam tarım alanı 94.814 hektardır (ha). Proje basınçlı ve yüzey sulama yöntemine göre planlanmıştır (Sepetçioğlu ve ark., 2010). Suruç Ovası Pompaj sulama kapsamında ilk olarak 2015 yılında 5.445 hektarlık bir alan ile başlamış olup, 2022 yılı itibarıyla 56.295 ha alan sulamaya açılmıştır (DSİ, 2023).



Şekil 1. Suruç İlçesi coğrafi konumu (Anonim, 2024).

Materyal ve Analiz Yöntemi

Araştırmada birincil veriler kullanılmıştır. Birincil veriler, üç yöntem ile toplanabilir; anket, gözlem ve mülakat (sözlü görüşme) yöntemlerinden bir veya bir kaç kullanılarak veriler elde edilebilir (Lorcu, 2020). Araştırmada yüz yüze görüşmeler yoluyla daha önceden hazırlanmış olan sorulara dayalı anket kullanılmıştır. Suruç ovası sulamalarında yer alan çiftçilerin sayısı Şanlıurfa Tarım ve Orman İl Müdürlüğünden, Çiftçi Kayıt Sistemine kayıtlarından öğrenilmiş olup, bu sayı 35.189'dir. Örneklem hacmi %95 güven sınırı, %5 hata payıyla hesaplanmıştır. Anket yapılacak çiftçi sayısı basit tesadüfi örnekleme yöntemi ile referansı verilen formül kullanılarak belirlenmiştir (Yazıcıoğlu & Erdoğan, 2014). Elde edilen veriler Excel'e işlenmiş ve daha sonra frekans dağılımları elde edilerek, yorumlanmıştır.

ARAŞTIRMA BULGULARI VE TARTIŞMA

Araştırmaya katılan çiftçilerin yaklaşık %86'sı evli olup, yaş ortalaması 45.5'dir. Suruç'ta bazı şifalı bitkilerin geleneksel kullanımları ile ilgili yapılan çalışmada katılımcıların yaş ortalaması 47 olarak tespit edilmiştir (Yalçın ve ark., 2021). Parlakçı Doğan'ın Harran Ovasında yapmış olduğu bir çalışmada katılımcıların yaş ortalaması 46.73 olarak tespit edilmiştir (Parlakçı Doğan, 2019). Katılımcıların ortalama hane halkı sayısı 6.42'dir. Ortalama olarak hane halkının 3.81'i tarımda, 1.86'sı ise tarım dışı işlerde çalışmaktadır. Parlakçı Doğan (2019) Harran Ovası'nda hane halkı ortalamasını 8.15 kişi olarak tespit etmiştir (Parlakçı Doğan, 2019). Adana İli Ceyhan İlçesindeki üreticilerin tarımsal bilgi kaynaklarının yayımdaki etkilerinin değerlendirilmesi çalışmasında katılımcıların hanelerindeki birey sayıları %47.1'i 2-4 kişi, %49.4'ü 5-7 kişi, %3.5'i 8 ve üzeri kişiden oluşmaktadır (İldeş, 2022). Konya'da uzun dönemde tarımsal ürün fiyatlarındaki değişmelerin incelenmesi ve etkilerinin tarım sektörü için sosyo-ekonomik açıdan değerlendirilmesi çalışmasında hanedeki birey sayısı ortalama nüfus 3.70 kişi olarak belirlenmiştir (Üstün, 2023).

Katılımcıların %60.4'ü ilköğretim ve altı (okur yazar) dır. Yüksek okul/üniversite eğitime sahip olanların oranı ise %4.4'dür. Trakya bölgesinde çiftçiler ile ilgili olarak yapılan bir çalışmada

katılımcıların %63'ü ilkokul ve %3'ü ise üniversite mezunudur (Yıldırım, 2020). Elde edilen sonuçlar, Türkiye'de farklı alanlarda yapılan çalışmalar ile örtüşmektedir.

Katılımcıların yaklaşık %70'nin temel gelir kaynağı tarımdır. Katılımcıların % 61.9'unun (237 kişi) sosyal güvencesi bulunmamaktadır. Sosyal güvencesi bulunmayan katılımcıların % 72.2'sinin (171 kişi) esas mesleği ve tek gelir kaynağı çiftçiliktir. Katılımcıların "Tarımsal kredi kullanıyor musunuz?" sorusuna verdikleri cevaplar Tablo 1'de verilmiştir. Katılımcıların % 80.7'si (309 kişi) tarımsal kredi kullandıklarını bildirirken, % 19.5'i (74 kişi) kredi kullanmadıklarını bildirmişlerdir. Tarımsal faaliyetlerde artan maliyetler sebebi ile üreticiler kredi alma ihtiyacı duymaktadırlar.

Tablo 1. Anket katılımcıların tarımsal kredi kullanma durumları

Tarımsal kredi kullanıyor musunuz?	Frekans (n)	Yüzde (%)
Hayır	74	19.3
Evet	309	80.7
TOPLAM	383	100.0

Parlakçı Doğan'ın Harran Ovasında suyun ekonomik analizi çalışmasında katılımcıların %27.4'ü evet cevabını verirken %48.50'si hayır ve %24.20'si bazen kullandıklarını belirtmişlerdir (Parlakçı Doğan, 2019). Araştırmaya katılan üreticileri kredi kullanım alanları Tablo 2'de verilmiştir.

Tablo 2. Araştırmaya Katılan Üreticilerin Kredi Kullanım Alanları

Üreticilerin Kredi Kullanım Alanları	Frekans (n)		Yüzde (%)		Toplam	
	Evet	Hayır	Evet (%)	Hayır(%)	(n)	(%)
Tohum	168	215	43.9	56.1	383	100.0
Sulama sistemi	115	268	30.0	70.0	383	100.0
Gübreleme	169	214	44.1	55.9	383	100.0
İlaç	155	288	40.5	59.5	383	100.0
Bakım ve Onarım	57	326	14.9	85.1	383	100.0
Makine, Alet ve Ekipman	98	285	25.6	74.4	383	100.0
İşletmeyi Büyütme (Ahır, Depo, Silo)	6	377	1.6	98.4	383	100.0

Katılımcıların %43.9'u tohum, %30.0'u sulama sistemleri, %44.1'i gübre kullanımı, %40.5'i ilaç, %14.9'u bakım ve onarım, %25.6'sı makine, alet ve ekipman, %1.6'sı işletmeyi büyütme gibi faaliyetler için bu kredi seçeneklerinden en az bir tanesini kullanmaktadırlar. Üreticiler kredi kullanımını daha çok üretim aşamasında gerçekleştirmektedirler.

Katılımcıların kullandıkları kredi kaynakları ile ilgili bilgiler Tablo 3'de verilmiştir. Kredi kullanan katılımcıların %38.2'si (139 kişi) kredilerini devlet bankalarından almaktadırlar. İkinci tercih ettikleri kredi kaynağı ise %24.7 oranında özel şahıslar (tüccarlar) olmaktadır. Özel şahıslardan (tüccarlardan) aldıkları kredileri çoğunlukla nakit olarak değil, üretimde kullanılan girdileri aynı olarak temin etmek amacıyla almaktadırlar.

Tablo 3. Katılımcıların Tarımsal Kredi Kaynağı Tablosu

Kredi kaynağınız nedir?	Frekans (n)	Yüzde (%)
Kooperatifler	74	20.3
Devlet Bankaları	139	38.2
Özel Sektör Bankaları	9	2.5
Özel Şahıslar (Tüccarlar)	90	24.7
Diğerleri(Yukardaki cevapların dışındaki nedenler)	52	14.3
TOPLAM	364	100.0

Karlı ve Çelik'in GAP bölgesinde yaptığı "GAP Alanındaki Tarım Kooperatifleri ve Diğer Çiftçi Örgütlerinin Bölge Kalkınmasındaki Etkinliği" çalışmasında katılımcıların % 62,9'u tarımsal amaçlı kooperatiflerden, % 20,4'ü T.C. Ziraat Bankası'ndan ve % 16,7'si şahıslardan kredi aldıkları tespit edilmiştir (Karlı & Çelik, 2003). Tarımsal üretimde kullanılan finansman (borçlanma) kaynakları genel olarak kurumsal olanlar ve kurumsal olmayanlar olmak üzere iki temel grupta değerlendirilebilmektedir. Kurumsal finans kaynakları genel olarak; kamusal kredi kuruluşları, tarım kredi kooperatifleri, özel finansman/kredi kuruluşları ve bankalar şeklinde gruplandırılmaktadır. Kurumsal olmayan finansman kaynakları ise tüccarlardan ve şahısların birbirlerinden aldıkları borçlar, ürün toplayıcıları veya borç karşılığı ürünün önceden satılması gibi işlemler olarak ifade edilebilmektedir (Çetin, 2014).

Türkiye'de tarımsal üretimde sürdürülebilirliğin sağlanması açısından işletmelerin finansman taleplerinin karşılanması için dönemsel olarak farklı politikalar uygulanabilmektedir (Semerci, 2021). Koç ve ark. (2019) tarafından yapılan bir araştırmada Türkiye'de uygulanmakta olan tarımsal kredilerdeki %1 oranındaki bir artışın, hektar başına tarımsal üretimde katma değer olarak ortalama %0.17 artış sağladığını, doğrudan etki ve yayılma etkilerinin ise %0.12 olduğunu belirlemiştir.

SONUÇ VE ÖNERİLER

Bu araştırmada, çalışma sahasında yer alan çiftçilerin öz sermaye yetersizliğine sahip olduğu ve bundan dolayı da tarımsal kredi kullanım zorunlulukları oldukları tespit edilmiştir. Kredi kullanan katılımcıların ¼'ünün şahıslardan-tüccarlardan yüksek maliyetli kredi temin ettikleri belirlenmiştir. Tarımsal üretimde sürdürülebilirliği sağlamanın ön koşullarından biri de uygun şartlarda girdi temininden kullanılacak olan kredilerdir. Bu durum çiftçinin elde edeceği geliri, dolayısıyla kırsal refahı doğrudan etkilemektedir. Bundan dolayı çiftçilerin uygun koşullarda tüzel kurum ve kuruluşlardan kredi temin etmesi yönünde daha fazla kolaylıklar sağlanmalıdır.

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HEAT TRANSFER IN STRATIFIED POROUS ENVIRONMENTS

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ABSTRACT

Introduction and Purpose: The research highlights the use of the Lattice Boltzmann method to address complex equations describing fluid dynamics in layered porous materials. It emphasizes the need for thermal energy storage and the impact of layering in porous environments, calling for more advanced problem-solving approaches. The article offers an overview of existing energy sources and their operational limitations, particularly exploring the challenges and constraints associated with petroleum as an energy source.

Materials and Methods: The equations used in this study are crucial for understanding fluid behavior and heat transfer in porous environments. They form the basis for mathematical modeling and analysis, including Maxwell's model for thermal conductivity, the parallel model for calculating the total effective conductivity of a two-phase medium, Slattery's theorem for the spatial derivative of a quantity, conservation of momentum and energy equations for porous media, Darcy's law equation for flow in porous media, Forchheimer's empirical model equation, and equations related to the Lattice Boltzmann method (LBM).

Results: The main findings underscore the importance of thermal energy storage and its practical applications. They present a detailed mathematical model of porous environments and the equations governing continuity, momentum, and energy conservation within a porous structure.

Discussion and Conclusion: The study confirms the effectiveness of the Lattice Boltzmann (LBM) method in solving the system of equations that describe fluid flow in layered porous environments. These findings significantly contribute to our understanding of thermal energy storage and fluid flow in porous environments, particularly within the context of layered porous materials.

Key Words: Heat Transfer; Porous Environments; Lattice Boltzmann Method LBM; Thermal Energy Storage; Fluid Dynamics

A REVIEW OF RECENT ADVANCEMENTS IN DEEP MACHINE LEARNING, ARTIFICIAL INTELLIGENCE, OBJECT DETECTION, AND HUMAN-ROBOT INTERACTIONS APPROACHES FOR ASSISTIVE ROBOTICS

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ABSTRACT

The emergence of Artificial Intelligence (AI) has become a major milestone in technological advancements of assistive robotics. By integrating AI into robotics, essentially the machines gain the capacity to autonomously perceive, engage in sophisticated reasoning, and execute actions within highly dynamic and complex environments. In AI-based assistive robotics, numerous sophisticated methods have been devised to emulate these cognitive functions akin to human intelligence. This paper briefly addresses this intricate landscape through four pivotal categories. Following a succinct historical overview showcasing the progression of AI for assistive robotics, the first prominent category examines the deep machine learning methods that facilitate the iterative learning process of robots, enabling continuous improvement of their performance through data assimilation. The second category delves into the understanding of the environment, enabling robots to interpret and comprehend the visual spectrum which is essential for complex tasks such as object detection, Simultaneous Localization, And Mapping (SLAM). The third category focuses on Human-Robot Interaction (HRI), where robots are equipped with the ability to understand humans, optimizing seamless and collaborative interaction through both verbal and non-verbal communication. Finally, the last category underlines the ethical issues that need to be considered in the development of AI-based robotics. The primary objective of this paper is to underscore not solely the intricate influence of AI within the field of robotics but also to furnish a foundational perspective to researchers, enabling them to cultivate cutting-edge applications that contribute to the beneficence of humanity.

Keywords: Artificial intelligence, Deep learning, Environment understanding, Human-robot interaction, Machine learning, Robotics.

INTRODUCTION

Throughout the centuries, humans have embarked on numerous endeavours aimed at enhancing their quality of life, fostering prosperity, and simplifying their daily tasks. Among these endeavours, the most significant undoubtedly involves the development of machines endowed with sophisticated intelligent mechanisms capable of autonomous operation and adaptation to dynamic environments. Considering intelligence as one of the most pivotal factors in this context, a number of theories have been posited dating back to the Greeks and other

Mediterranean coastal philosophers like Socrates, Plato, and Aristotle. They conceptualized intelligence as the capacity for thinking, reasoning, and knowledge acquisition, closely linked to wisdom and rational judgment. Aristotle's contributions to logic, particularly in categorical, hypothetical, and disjunctive syllogisms, laid the groundwork for formal reasoning. The categorical syllogism, with two premises and one conclusion, emerged as fundamental, facilitating structured reasoning and decision-making based on existing knowledge.

In the late 1800s, Alfred Binet contributed to the refinement of the conceptual framework surrounding intelligence by introducing a dichotomy between fluid intelligence, characterized by abstract thinking and problem-solving abilities, and crystallized intelligence, which pertains to the knowledge acquired through educational experiences. Neisser emphasized evaluating cognitive abilities in specific contexts, introducing the "intelligence of one" concept. This perspective suggests assessing an individual's cognitive performance relative to a normative group in a given context, challenging the reliance on standardized assessments. Honavar shares a similar view, defining intelligence as a collection of attributes like perception, reasoning, adaptation, autonomy, creativity, and organization.

The contemplation of these facets engendered a necessity for the adoption of a more nuanced terminology to characterize the rapid evolution of machines. In response to this exigency, Karel Capek, a Czechoslovakian writer, in 1920, introduced the term "Robot" to characterize these evolving mechanical entities. This term, derived from the Czech word "roba," signifying "forced labourer" or "servant," was unveiled within the context of his science fiction narrative, "Rossum's Universal Robots" (RUR). The narrative unfolds within a factory setting where a multitude of efficient and indefatigable synthetic humanoid machines were employed for laborious tasks. Capek's seminal contribution not only bestowed the contemporary nomenclature upon robots but also accentuated societal concerns regarding the potential displacement of human labour by these mechanical entities (Capek, 1971).

Following the widespread acceptance of "robot", a pivotal development occurred in 1941 with Isaac Asimov's introduction of "Robotics" in his short story "Runaround." Asimov conceptualized this term to denote the domain encompassing robots and their interactions with humans, presenting a more optimistic view compared to Karel Capek. Asimov envisioned robots as beneficial collaborators and established the "Three Laws of Robotics" to govern secure and efficient human-robot interactions (HRIs). These laws prohibit harm to humans, mandate obedience to human commands within ethical bounds, and prioritize a robot's self-preservation (Clarke, 2020). Adhering to Asimov's laws requires robots to possess autonomous action and the ability to discern human actions, necessitating a level of intelligence comparable to humans for autonomous operation in dynamic environments.

Subsequent to Asimov's elucidation of the "Three Laws of Robotics", researchers have focused their efforts on understanding and examining human behaviour. This is accomplished through the study of brain structure and its application in creating robots that can interact more effectively with humans. An illustrative exemplar of this scientific endeavour materialized in 1943 when Warren McCulloch and Walter Pitts formulated the concept of neural networks. Employing specifically delineated modelling frameworks, they systematically scrutinized the operational processes of the human brain, subsequently simulating intelligent behaviours through the utilization of simply connected circuits (Piccinini, 2004). Another notable milestone in this continuum transpired in 1950 when Alan Turing conducted an experimental inquiry aimed at discerning whether a robot could manifest independent thought and exhibit autonomous cognition (Muggleton, 2014).

In the early stages of artificial intelligence (AI), the evaluation of machine intelligence and its similarity to human intelligence was a significant milestone. In 1955, Allen Newell and Herbert

A. Simon developed the Logic Theorist, the first AI algorithm. It represented problems as logical statements and used rules to solve them. They further advanced their contributions in 1956 with the General Problem Solver, a versatile algorithm that used heuristics to solve various problems. Their collective contributions not only played a pivotal role in delineating AI as a distinct field of research but also stimulated interest in the development of intelligent machines. Postdating these seminal inventions, John McCarthy formally coined the term "AI" in 1956, encompassing the comprehensive domain dedicated to augmenting the intelligence of robots through scientific and engineering methodologies (Rajaraman, 2014).

Frank Rosenblatt's introduction of the perceptron in 1957 marked the birth of modern neural networks, improving upon the limitations of the McCulloch-Pitts neuron model. This breakthrough laid the groundwork for more advanced neural network models. In 1959, Arthur Samuel revolutionized AI with a machine learning algorithm that excelled at playing checkers. By analysing past games and extracting key features, the algorithm made informed decisions. Samuel's work paved the way for contemporary AI systems like deep learning. In the early 1970s, Terry Winograd created the SHRDLU algorithm, enabling robots to understand and interact with human language. This research paved the way for further advancements in natural language understanding for robotics.

In subsequent years, AI-based robotic entities have undergone development to incorporate the capacity to comprehend human emotions and actively engage in human interactions. One notable example is the emotionally intelligent robot called "Kismet," created by Cynthia Breazeal (2002). This robot was designed to engage in meaningful social interactions with humans. Another milestone was achieved in 2017 with the introduction of "Sophia," a social robot by Hanson Robotics, which obtained citizenship in Saudi Arabia, marking a historic moment for robotic advancements (Retto, 2017). Engineered Arts also unveiled its humanoid robot "Ameca" in 2022, which can understand multiple languages and replicate human facial expressions for natural interaction.

As evident from the succinct historical timeline depicted in Figure 9, the incorporation of AI into robotics endows machines with the capability to autonomously perceive, engage in advanced reasoning, and execute actions within highly dynamic and complex environments. This paper succinctly navigates this intricate landscape through four pivotal categories. The initial notable category explores machine learning and deep learning methods that facilitate the iterative learning process of robots, enabling the continuous enhancement of their performance through the assimilation of data. The second category delves into the understanding of the environment, empowering assistive robots to interpret and comprehend the visual spectrum essential for complex tasks such as object detection, simultaneous localization, and mapping (SLAM). The third category concentrates on Human-Robot Interaction (HRI), wherein robots acquire the capacity to comprehend human cues, optimizing seamless and collaborative interaction through both verbal and non-verbal communication. Lastly, the fourth category underlines the ethical issues that need to be considered in the development of AI-based assistive robotics. This paper seeks not only to elucidate the intricate influence of AI within the realm of robotics but also to provide a foundational perspective for researchers, enabling the cultivation of cutting-edge applications that contribute to the overall beneficence of humanity.



Figure 9. Historical timeline of the remarkable progress of AI for assistive robotics

In the subsequent sections of this paper, Section 2 and Section 3 expound upon machine learning and deep learning, two foundational approaches within the field of AI. Following this, Section 4 and 5 elucidate the environment understanding in AI-based assistive robotics, while Section 6 and 7 explicate HRI in AI-based assistive robotics. Then, Section 8 addresses ethical considerations, and ultimately, Section 9 offers a comprehensive summary of the paper.

MACHINE LEARNING

Machine learning stands as the fundamental core of AI, providing the essential framework for assistive robotic systems to learn from data, make informed decisions, and continuously evolve in their understanding capabilities. As depicted in Figure 10, the formulation of a specific learning objective initiates the collection of labelled or unlabelled datasets from diverse sources, subsequently partitioned into training and testing sets. The selection of an appropriate machine learning algorithm is determined by the knowledge base in accordance with organizational preferences. The machine learning algorithm assimilates knowledge from latent patterns within the training data, and this acquired knowledge is then applied to unfamiliar test data for predictive purposes. The resultant model's predictions are compared to the real desired values to determine the model's performance.

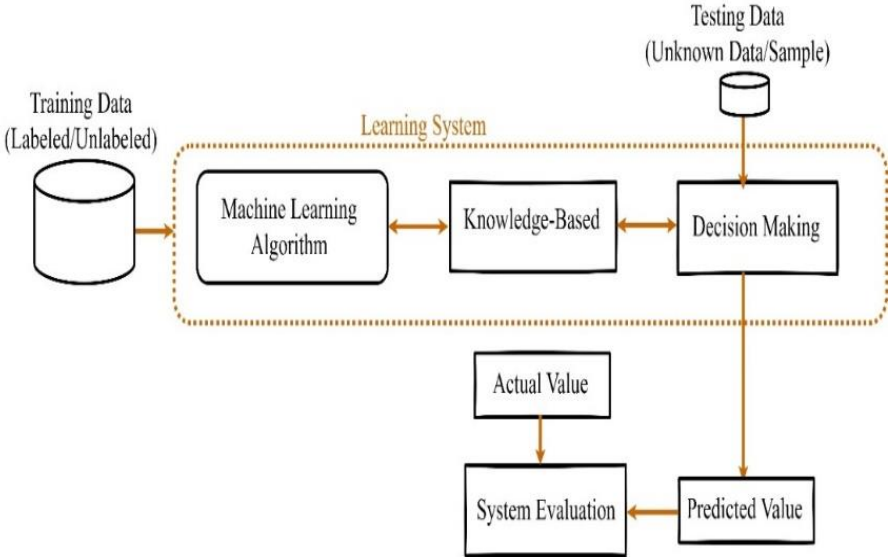


Figure 10. A basic machine learning system architecture

Notably, machine learning encompasses four fundamental categories: supervised learning, unsupervised learning, reinforcement learning, and deep learning. Each of these categories is briefly examined in the subsequent discussions.

Supervised Learning

As the first category within machine learning, supervised learning is a methodological approach that leverages labelled training data to instruct algorithms in achieving precise predictions or assessments. Therein, the term "supervised" originates from the notion that the algorithm undergoes guidance and correction during its training process through labelled examples. The labelled data assumes the role of a teacher, aiding the algorithm in adjusting parameters to minimize the difference between its predictions and the actual outputs.

As illustrated in Figure 11, supervised learning predominantly addresses two primary problem types: classification, where the algorithm assigns inputs to discrete categories, and regression, where the algorithm predicts a continuous output.

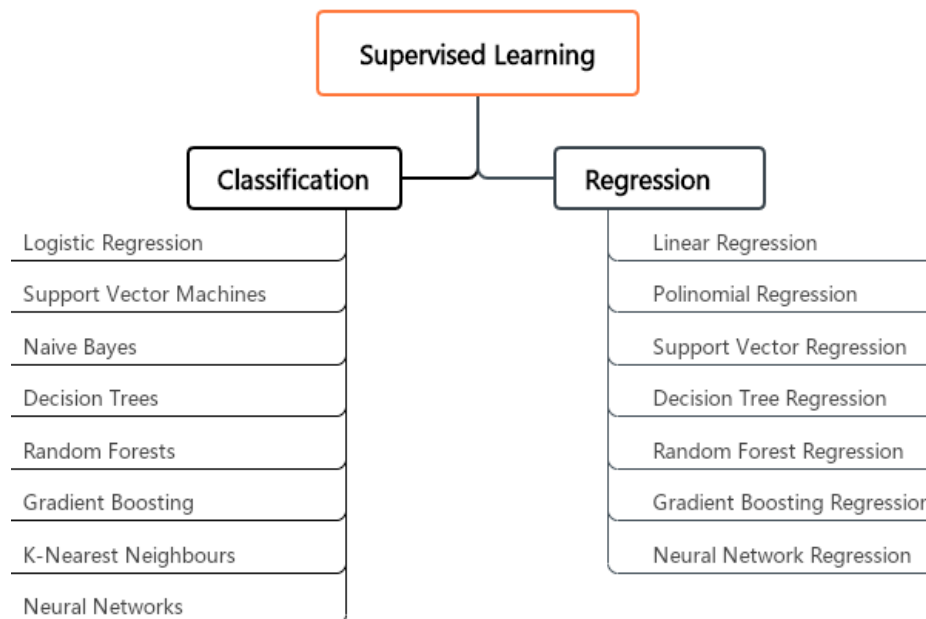


Figure 11. A basic taxonomy of supervised learning in the literature

In the realm of classification, the literature frequently delves into 8 prominent algorithms. Logistic regression, a prevalent method for binary classification, utilizes a logistic function to depict the relationship between input features and class membership probability. While it offers interpretability, its limitation lies in handling complex relationships. Support Vector Machines (SVMs) excel in high-dimensional spaces, identifying optimal hyperplanes to separate classes, but face challenges with kernel selection and scalability. Decision Trees provide simplicity and interpretability but are prone to overfitting, addressed by ensemble methods like Random Forests. Gradient Boosting enhances predictive performance by sequentially building trees but demands careful tuning. K-Nearest Neighbours (KNN) is versatile but requires careful selection of distance metrics and faces computational expenses. Naive Bayes is efficient for sentiment analysis but assumes feature independence. Neural networks, inspired by the human brain, excel in handling intricate relationships but require substantial resources and may suffer from overfitting. Each algorithm has specific strengths and weaknesses, influencing its suitability for different tasks, making informed learning a valuable tool for enhancing robotic capabilities.

Unsupervised Learning

Unsupervised learning is another sub-field of machine learning that focuses on analysing unlabelled data to distinguish inherent patterns, structures, and correlations without any specific output or target labels. Unlike supervised learning, it deals with unstructured data and aims to extract insights and information from the data itself. The primary objectives of unsupervised learning are to identify hidden structures and group data into meaningful representations. Clustering and dimensionality reduction are the two primary algorithms used in unsupervised learning for achieving these goals, as demonstrated in Figure 12.

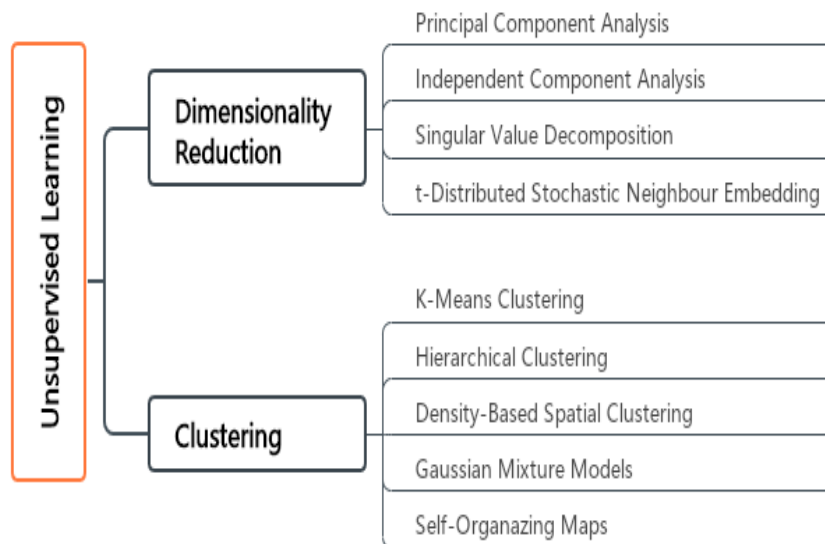


Figure 12. A basic taxonomy of unsupervised learning in the literature

In the context of clustering, the objective is to categorize entities into homogeneous groups based on intrinsic similarities. Clustering serves various purposes, including data exploration, simplification, hypothesis formulation, and prediction. Hierarchical and partitional methods are two broad categories. The k-means algorithm, a partitional technique, seeks to minimize an inequality function by iteratively updating centroids. However, k-means depends on initial centroid positions and lacks an optimal solution guarantee. Density-Based Spatial Clustering of Applications with Noise (DBSCAN) addresses this by categorizing data points based on density. Gaussian Mixture Models (GMM) offer a similar solution, synthesizing data points through Gaussian distributions. Self-Organizing Maps (SOMs), introduced by Kohonen, create feature maps using artificial neurons. In dimensionality reduction, Principal Component Analysis (PCA) prioritizes computational efficiency, but its linearity assumption may limit effectiveness. On the other hand, t-Distributed Stochastic Neighbour Embedding (t-SNE) effectively captures non-linear relationships but poses computational challenges and results variability. Unsupervised learning plays a vital role in exploring unlabelled datasets, but challenges such as effective evaluation metrics, sensitivity to hyper-parameters, and interpretability need further advancements in machine learning algorithms for enhanced efficacy in assistive robotics.

Reinforcement Learning

Reinforcement Learning (RL) is an advanced machine learning subfield focused on optimizing behavioural strategies through trial-and-error processes, mirroring human and animal intelligence. In RL, an agent selects actions, receives rewards, and transitions iteratively, aiming to execute actions that decrease penalties and increase rewards as depicted in Figure 5. Traditional RL involves methods like Markov decision processes (MDP) and Dynamic Programming (DP), while model-free techniques like Monte Carlo (MC) and Temporal Difference (TD) are used when a model is not available. RL algorithms can be categorized as on-policy or off-policy, with Q-learning being a notable off-policy algorithm. Actor-critic (AC) approaches, incorporating both policy and value functions, offer advantages such as handling large-scale actions and integrating domain-specific constraints. The challenge in RL lies in balancing exploration and exploitation for optimal policy acquisition (Shakya et al., 2023).

In the pursuit of optimal policies, RL faces the challenge of balancing exploration and exploitation, requiring a well-structured exploration strategy. Advanced RL methods focus on improving convergence, sample efficiency, and generalization capabilities. Experience-level

methods optimize learning from prior experiences, crucial for Batch RL techniques. Noteworthy developments include non-linear approximators like Neural Fitted Q Iteration (NFQI) and robust linear approximation techniques like Least-Squares Policy Iteration (LSPI). In contrast, Model-level strategies involve formulating environmental models, employing planning techniques like Monte Carlo Tree Search (MCTS). Task-level methodologies, such as Transfer RL, focus on transferring knowledge between tasks for enhanced learning performance. Recent RL investigations explore concise representations, like Factored MDPs, and tackle challenges in handling partially observable states in scenarios like Partially Observable MDPs (POMDPs) (Yu, Liu, Nemati, and Yin, 2021).

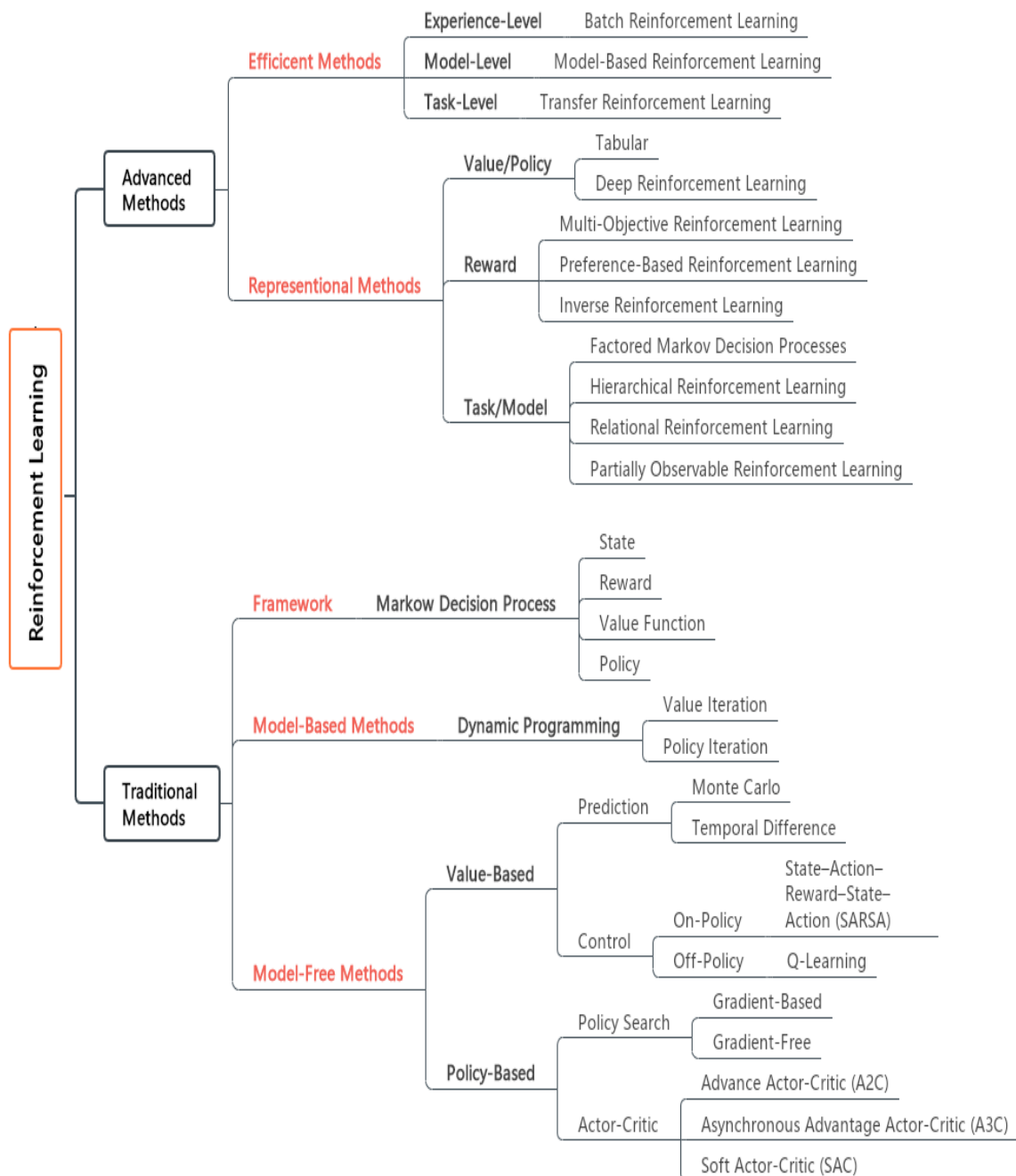


Figure 13. A basic taxonomy of reinforcement learning in the literature

To sum up, RL holds paramount importance in the realm of machine learning. This approach enables robots to learn optimal behaviours through interaction with their environment, akin to

how humans and animals acquire skills and make decisions. Its significance lies in its capacity to tackle complex problems that involve sequential decision-making, where traditional rule-based systems, supervised and unsupervised learning methods encounter limitations. By providing a dynamic framework for learning, adapting, and optimizing behaviours, reinforcement learning plays a fundamental role in shaping the trajectory of autonomous AI-based robotics, marking a pivotal milestone in the advancement of sophisticated AI algorithms.

Deep Learning

Within the context of recent progressions, deep learning emerges as the latest influential and transformative subfield within machine learning to reshape the landscape of data analysis and automated decision-making in the field of robotics.

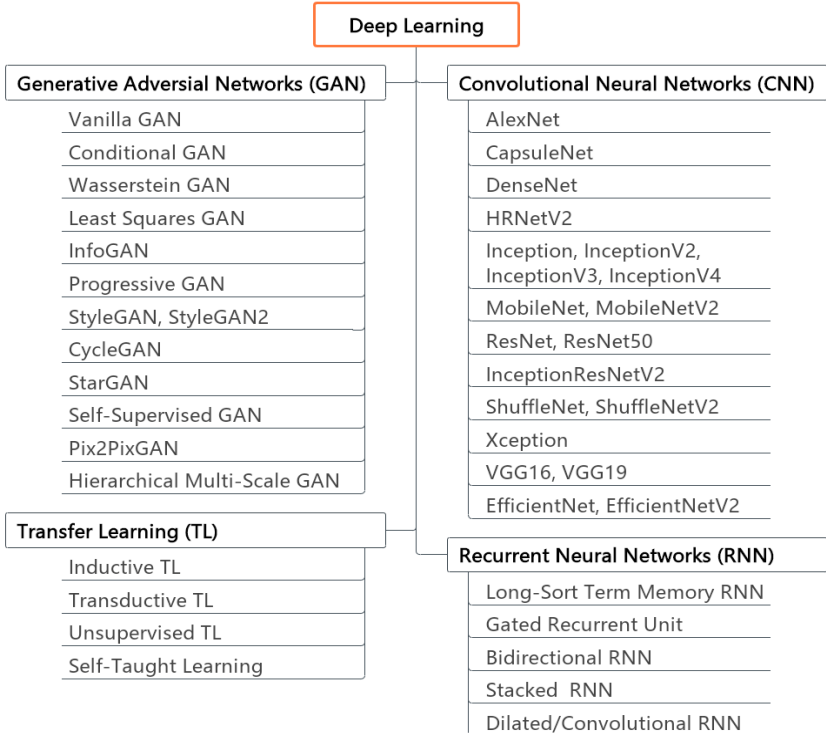


Figure 14. A basic taxonomy of deep learning in the literature

It revolves around the utilization of neural networks with multiple layers to enable robots to learn and make decisions autonomously. The distinctive feature of deep learning models is their ability to automatically learn hierarchical representations and intricate patterns from the raw data through the iterative processing of information across numerous layers. These neural networks consist of interconnected nodes, where each layer contributes to the extraction of increasingly abstract features. The training process involves adjusting the weights and biases of these connections using large datasets, allowing the model to generalize and construct accurate predictions on unseen data. As depicted in Figure 14, the three primarily employed architectures within the realm of deep learning encompass Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNNs), and Generative Adversarial Neural Networks (GANs). Each of these architectures is briefly examined in this section.

Convolutional Neural Networks (CNNs)

The Convolutional Neural Network (CNN) is a pivotal deep learning framework designed for processing visual and perceptual data. It comprises convolutional layers for feature extraction, pooling layers for dimensionality reduction, and fully connected layers for decision-making.

AlexNet, a seminal CNN architecture, demonstrated the effectiveness of deep learning with its depth, rectified linear units (ReLUs), and dropout for regularization (Han et al., 2017). Visual Geometry Group (VGG) followed a similar approach with increased depth, consistent use of 3x3 convolutional filters, and different configurations like VGG16 and VGG19 (Muhammad et al., 2018). GoogleNet introduced the Inception module for multi-scale feature extraction, global average pooling for efficiency, and substantial depth. ResNet innovated with skip connections, addressing the vanishing gradient problem and enabling the training of very deep networks (He et al., 2016).

Densely Connected Convolutional Networks (DenseNet), another significant CNN architecture, introduced densely connected blocks to enhance gradient propagation and achieve greater depth with fewer parameters than ResNet (Huang et al., 2017). CapsuleNet utilized capsules instead of neurons, incorporating dynamic routing for improved recognition and pose estimation (Van Quang et al., 2019). Lastly, HRNet leverages parallel multi-resolution pathways to process information at various spatial scales concurrently, preserving high-resolution representations and excelling in tasks demanding precise localization and detailed granularity (Yu et al., 2021). These CNN architectures, each with unique innovations, have significantly contributed to the advancement of deep learning, addressing challenges such as training convergence, gradient vanishing, and hierarchical relationship understanding in visual data processing. In summary, the effectiveness of the aforementioned CNN architectures lies in their capacity to autonomously acquire intricate features directly from data, facilitating the adept resolution of intricate and real-world visual challenges.

Recurrent Neural Networks (RNNs)

Among the aforementioned deep learning architectures, Recurrent Neural Networks (RNNs) are specialized for processing sequential data by maintaining an internal memory, allowing them to consider context from previous inputs. Therein, Long Short-Term Memory (LSTM) networks, a type of RNN, tackle long-term dependencies through dedicated memory cells and gates, enabling effective learning of dependencies over extended sequences (Hochreiter and Schmidhuber, 1997). Similarly, Bidirectional Recurrent Neural Networks (BRNN) enhance RNN capabilities by processing input sequences in both forward and reverse directions, providing a more thorough comprehension of sequential data (Schuster and Paliwal, 1997). Gated Recurrent Units (GRUs) offer a simplified alternative to LSTMs, utilizing update and reset gates to selectively retain or discard information from previous time steps (Rana, 2016).

On the other hand, Echo State Recurrent Neural Networks (ESN) harness the dynamics of a reservoir with randomly initialized connections for efficient processing of sequential data. The fixed random connections within the reservoir eliminate the need for extensive training, allowing ESNs to adeptly capture intricate temporal dependencies (Gallicchio et al., 2018). Dilated or Convolutional Recurrent Neural Networks (CNN-RNN) combine elements from both CNNs and RNNs, seamlessly incorporating dilated convolutions into the RNN framework (Tan and Wang, 2018). Dilated convolutions enable an exponentially growing receptive field, making CNN-RNNs well-suited for tasks requiring the capture of long-range dependencies in sequential data, such as action recognition and speech synthesis. These diverse architectures showcase innovations in handling sequential data and offer solutions to challenges associated with temporal dependencies.

Generative Adversarial Neural Networks (GANs)

Generative Adversarial Networks (GANs) introduced by Goodfellow (2014), consist of a generator and discriminator engaged in adversarial learning, where the generator produces realistic data, and the discriminator evaluates it. This competitive process refines the generator's

ability to create realistic samples, creating a dynamic equilibrium where generated samples become indistinguishable from real data. Numerous GAN methodologies include Conditional GANs (cGANs), designed for precise attribute control by endowing both the generator and discriminator with conditional information. Wasserstein GANs (WGANs) utilize the Wasserstein distance for a stable measure of distributional distance, addressing the challenges of vanishing gradients. Therein, WGANs incentivize the generator to produce samples aligned with the real data distribution, introducing Lipschitz continuity for a smooth mapping between input and output spaces.

In a similar vein, Least Squares GANs (LSGANs) adopt a least squares loss function for stability, aiming to minimize the squared difference between real and generated data distributions (Mao et al., 2017). Progressive GANs (PGANs) adopt a progressive training strategy for high-resolution image generation, incrementally refining images for stability and intricate detail (Wei et al., 2020). Self-supervised GANs strategically incorporate self-generated labels for feature extraction, eliminating the need for manually annotated datasets (Chen et al., 2019). As the last illustrative instance, Hierarchical Multi-Scale GANs introduce a multi-scale approach, generating images at different resolutions simultaneously, capturing intricate details with a global understanding of the image (Chen et al., 2023). These innovations empower GANs to revolutionize image generation, style transfer, and data synthesis tasks. More specifically, employing these sophisticated learning architectures ultimately enables robots to independently acquire conceptual attributes, rendering them indispensable in a myriad of contexts, particularly in understanding their surroundings and interacting with individuals within a shared workspace. The ensuing sections provide an exhaustive review of the literature on these contexts by scrutinizing their distinct components and noteworthy findings.

ENVIRONMENT UNDERSTANDING THROUGH OBJECT DETECTION IN AI-BASED ASSISTIVE ROBOTICS

In AI-based robotics, "environment understanding" refer to the ability of a robot to sense, understand, and interpret its environment through visual and other sensory inputs. This capability allows robots to gather information about their surroundings, recognize objects, navigate, and interact with the environment. Environment understanding in robotics commonly encompasses 2 key components, including but not limited to Object Detection and Simultaneous Localization and Mapping (SLAM). In this section, object detection will be specifically addressed.

Object detection in AI-based assistive robotics is a pivotal perception task focusing on the identification and localization of objects within a robot's visual field. This essential capability empowers robots to recognize and precisely locate distinct entities or elements in their surroundings, thereby enhancing their overall understanding of the environment. By employing the aforementioned sophisticated AI algorithms, object detection enables robots to process visual data from sensors and accurately delineate the spatial positions of various objects. Numerous investigations have been undertaken on this subject within the literature. For instance, Wong et al. (1998) developed a robotic system to autonomously recognize 3D objects. They used spatial and topological features and created a search tree with image and model features. The system compared unmatched image features with 3D features to generate a hypothesis for the matching process. Iterating through all features, the system identified the highest-scoring match as the desired one. However, this system did not account for images without corresponding models in the database.

Likewise, Anguelov et al. (2004) introduced a probabilistic framework for detecting and modelling doors using robot sensor data. Their algorithm optimized colour and shape properties of doors and walls by segmenting the environment into distinct door and wall objects. Therein,

the study focused on segment-based models of objects with minimal spatial displacement. Similarly, Gould et al. (2008) developed a multimodal object detection system for indoor robots. The system effectively detected and recognized small objects in real-time using sparse depth information. However, real-world scenarios posed challenges related to lighting, texture, and occlusion. In a further study, Jeong et al. (2005) proposed an algorithm for robot localization and spatial context recognition. They used the Harris detector and Hierarchical Lucas-Kanade (HLK) optical flow methods for robot localization and the Harris detector and scale-invariant feature transform (SIFT) descriptor for spatial context recognition. Similarly, Peña-Peña Cabrera et al. (2005) presented a system to improve the efficiency of industrial robots in unstructured environments. They employed an ANN algorithm for object recognition, using image histograms and image moments as inputs. The system achieved high identification rates in a manufacturing task within a short period.

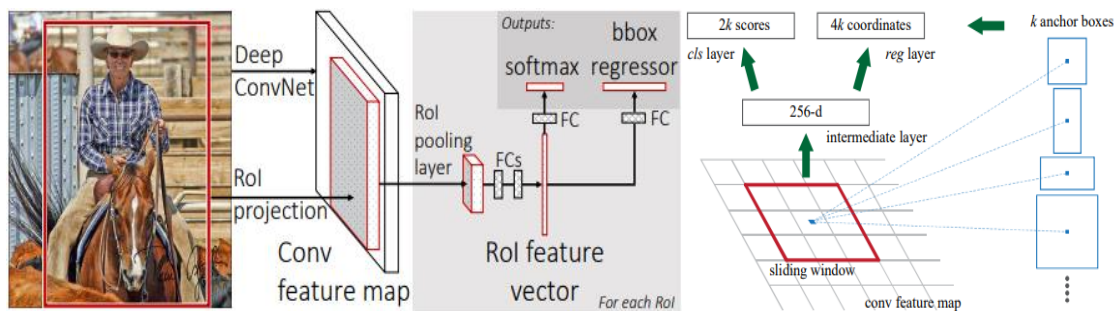


Figure 15. Left: (Girshick, 2015)’s work: Fast Region-based CNN architecture. Right: (Ren et al, 2015)’s work: Structure of the Region Proposal Network

In a separate publication, Girshick et al. (2014) introduced the Region-based CNN algorithm, which uses region proposal methods like selective search and edge boxes to generate bounding boxes for object detection. However, this algorithm is computationally inefficient due to the fixed input size requirement of CNNs. To address this, Girshick (2015) proposed the Fast Region-based CNN algorithm, which incorporates ROI pooling layers to reduce computational complexity while improving detection performance. To further improve efficiency, Ren et al. (2015) introduced the Faster Region-based CNN algorithm, replacing selective search with region proposal networks for faster and unified proposal generation and CNN-based classification. In an alternative study, Lu et al. (2017) presented a deep learning-based algorithm for object detection in robotics. They introduced a specialized proposal layer that incorporates features like multiscale feature extraction, multi-kernel convolution, data-driven kernel size selection, and multiple hyperplane optimization. This algorithm aims to achieve computational efficiency and reliability by using multiple hyperplane optimization and data-driven kernel size selection. They also developed a robust detection layer that combines a genetic algorithm-based CNN and a multi-frame fusion process, utilizing both temporal information and deep CNN performance.

Similarly, Bellver et al. (2016) proposed a hierarchical methodology for object detection using a Markov Decision Process (MDP) framework. Their approach involves identifying a region of interest and gradually narrowing it down to smaller sub-regions, creating a hierarchical structure. The agent is implemented using Deep Q-Networks (DQN) and trained with a reward function based on Intersection over Union change. Therein, they utilize two networks, Image-zooms and Pool45-crops, with a VGG-16 backbone to extract feature information. In a related study, Mason et al. (2012) developed a robotic system for object discovery using unsupervised segmentation and change detection mechanisms. Their approach was extended to include object class clustering and conducted on a Willow Garage PR2 robot with a Microsoft Kinect (Mason et al., 2014). The system achieved a high precision of 98.7% and recall of 71.8% in object class

discovery, demonstrating its scalability and effectiveness in long-term large-scale object discovery.

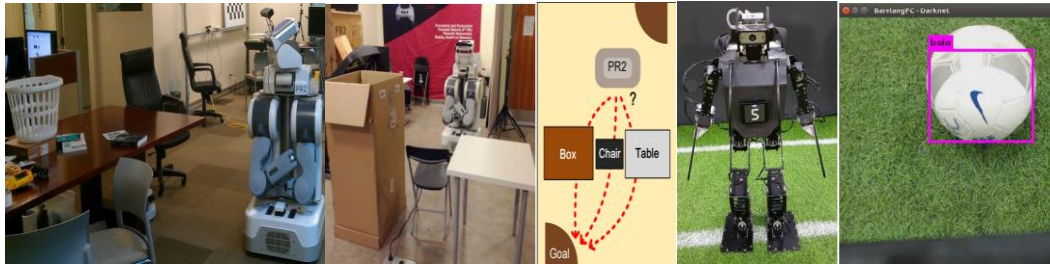


Figure 16. First: (Mason et al., 2012's work: Robot detects objects. Second: (Kim and Sukhatme, 2014)'s work: Example of the PR2 robot situated in front of unknown obstacles. Third: (Rudiawan et al., 2017)'s work: Robot detects the ball

In another work, Kim and Sukhatme (2014) improved object detection capabilities of assistive robotics entities by using 3D point clouds and affordance relations. They found that incorporating affordances enhanced the detection task compared to organizing objects into classes. In a subsequent investigation, Rudiawan et al. (2017) integrated a real-time object detection algorithm into a humanoid robot soccer system using the You Only Look Once (YOLO) method. The algorithm successfully detected and differentiated objects in diverse lighting conditions and from different angles. In a separate investigation, Zhang et al. (2017) proposed a deep CNN model for salient object detection. They incorporated a regularized dropout mechanism after a specific convolution layer to enhance training and reasoning. An effective hybrid up-sampling method was introduced to address artefacts in the decoder network. A distinctive feature of this method is its capacity to incorporate more uncertainty, especially when confronted with the necessity for meticulous reasoning about object boundaries.

Leveraging the Goodman model equations, Kuang et al. (2018) developed a utilitarian robot using stereo vision to detect and monitor objects in dynamic or static states. The robot showed high accuracy in object detection, especially when controlled by the bionic coordinated motion model algorithm. In another study, Han et al. (2019) addressed the challenge of active object detection using a DQN and a duelling architecture. The integration of these techniques improved the robot's ability to explore the action space, enhancing object detection efficiency. However, the issue of continuous exploration in active object detection remains unresolved. Furthermore, Chatterjee et al. (2020) introduced an innovative design enabling multiple robots to concurrently execute real-time object detection and localization. They modified the YOLOv3 model and developed a distributed architecture, improving inference time and enabling customized actions based on detected objects. In a study by Guo et al. (2021), advanced deep-learning algorithms were used to improve object detection. They implemented a real-time transmission framework between HoloLens and Ubuntu systems, utilizing YOLO models like YOLOv3 and YOLOv4. The results showed that YOLOv4 achieved faster speed and better object detection accuracy compared to YOLOv3.

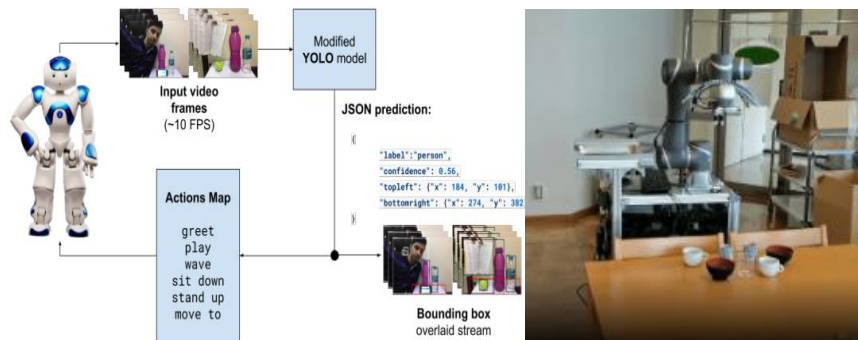


Figure 17. Left: (Chatterjee et al., 2020)‘s work: A complete overview of the system. Right: (Yue et al., 2022)‘s work: Empty-dish recycling robot detects objects

More recently, Liu et al. (2022) focused on active object detection using the DQN model. They developed a memory-based training algorithm and introduced an end-state generation technique. Comparison experiments with an active object detection dataset proved the superiority of their approach and the effectiveness of their training algorithm. As a conclusive example, Yue et al. (2022) presented YOLO-GD, a lightweight object detection model for automated dish recycling in restaurant and canteen environments. YOLO-GD achieved a 3.41% higher effectiveness than YOLOv4, despite being only 1/5th the size. The model also reduced inference time per image and showed slightly better performance after quantization.

When developing these object detection algorithms in AI-based robotics, several critical considerations must be taken into account. First and foremost, the choice of the algorithmic approach should align with the specific requirements of the robotic application. The selection of suitable features for object representation, robustness to variations in lighting conditions, and adaptability to diverse environmental settings are pivotal factors in ensuring the algorithm’s effectiveness. Additionally, addressing issues related to occlusion, scale variations, and real-time processing constraints is crucial for practical implementation. Furthermore, the availability and quality of training data play a vital role in training accurate and generalizable models. Additionally, the computational efficiency of the algorithm is essential for real-time applications, necessitating optimizations in terms of speed and resource utilization. Regular updates and fine-tuning of algorithms based on the evolving nature of the operational environment contribute to the sustained performance and reliability of object detection systems in AI-based robotics.

ENVIRONMENT UNDERSTANDING THROUGH SIMULTANEOUS LOCALIZATION AND MAPPING (SLAM) IN AI-BASED ASSISTIVE ROBOTICS

Simultaneous Localization and Mapping (SLAM) is extensively employed in the field of robotics for mapping and navigation purposes. It allows robots to create maps of their surroundings while simultaneously determining their own position within that environment. A substantial array of SLAM algorithms has been elucidated in the scholarly literature. One approach, introduced by Smith H. et al. (1986) involves using multiple sensors like cameras, LiDARs, and IMUs to simultaneously map the environment and determine the robot’s location. This SLAM system consists of five components: data reading, front-end odometry, back-end optimization, loop detection, and mapping (Pu et al., 2023). In an alternate study, Lu and Milios (1997) introduced Graph-SLAM, a foundational graph-based model for SLAM. It uses motion and observation data to determine the robot’s pose in an environment. The Front-End component constructs a graph using sensor outputs, while the Back-End component optimizes the graph nodes based on edge constraints. To improve optimization and recognize previously visited locations, a loop closure system identifies identical scenes. As another graph-based algorithm, Karto-SLAM employs sparse pose adjustment and non-iterative Cholesky matrix for

direct nonlinear optimization, making it suitable for creating 2D maps with sparse systems (Konolige et al., 2010).

In a study Kaess et al. (2008), i-SAM was introduced as an incremental SLAM method that uses rapid matrix factorization to handle estimation uncertainties. It incrementally updates the square root information using matrix factorization. Although further refinement is needed, i-SAM contributes to addressing estimation uncertainties. Another algorithm, HectorSLAM, introduced by Kohlbrecher et al. (2011), relies on LiDAR for robustness. It calculates rotation and translation using nearest-neighbour scan matching and does not require explicit loop closure detection. In a distinctive study, Clipp et al. (2009) introduced a SLAM technique using a stereo camera for environmental information retrieval. To address computational cost concerns, they proposed using Kanade-Lucas-Tomasi (KLT) feature tracking. A wide baseline feature was added to improve resilience to repetitive features and recognize previously visited areas. However, challenges arose in recognizing mapped areas due to object movement and low dynamic range. To overcome this, the authors suggested a 3D scene feature extraction approach that combines 3D geometry and sparse feature detection for re-localization. Successful implementation can address challenges in dynamic environments and illumination variations.

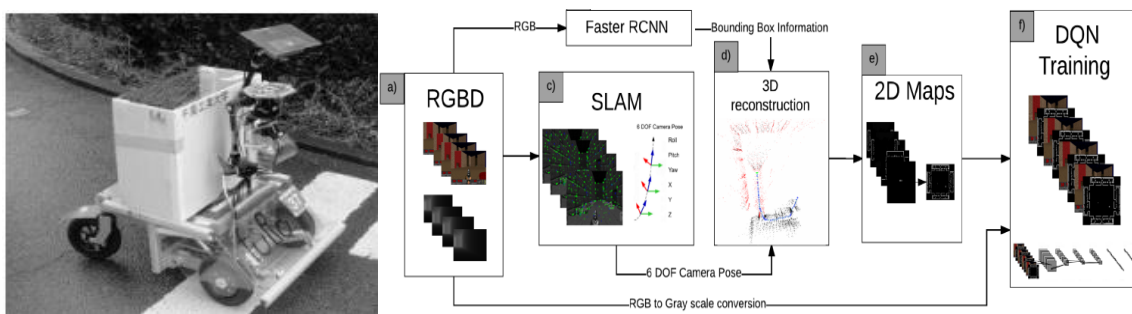


Figure 18. Left: (Irie et al., 2012)’s work: Robot analyses the environment. Right: (Bhatti et al., 2016)’s work: System overview

Likewise, Irie et al. (2012) proposed a vision-based SLAM system to improve robot navigation. They addressed challenges related to environmental noise by using 2D occupancy grid maps derived from 3D point clouds obtained through a stereo camera. Salient line segments from the ground were added to the grid map, and robot pose estimation was achieved using particle filters. This technique reduced the impact of shadows and lighting conditions on the grid maps, but struggled with severe illumination conditions and extracting salient line segments. In a separate study, Bhatti et al. (2016) used a SLAM algorithm to create a 3D map of the environment. They employed the Faster Region-based CNN algorithm to generate a semantic map, which was then incorporated into the DQN for better decision-making. Besides map construction, researchers are also training robots to interpret environmental maps.

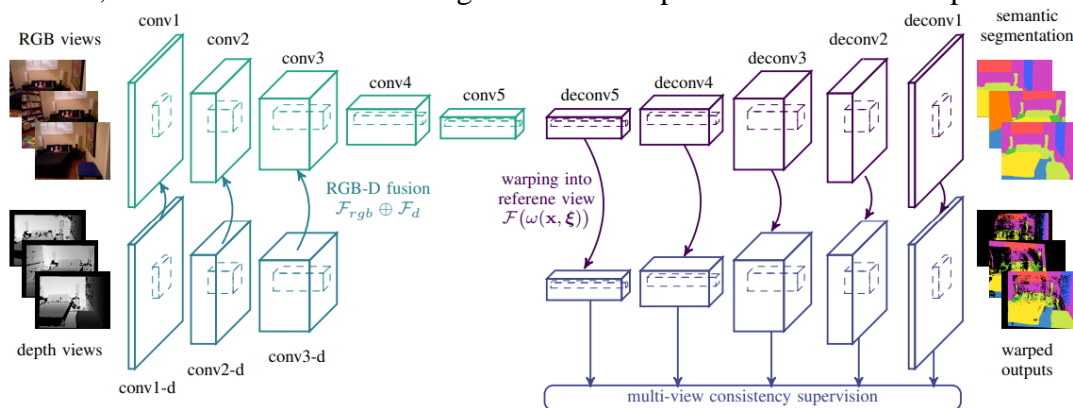


Figure 19. (Chaplot et al., 2018)’s work

In a particular study, another SLAM algorithm was employed by Bhatti et al. (2016) to create a 3D map of the environment. They utilized the Faster Region-based CNN algorithm to produce a semantic map, which was then incorporated into the DQN to provide the robots with more comprehensive information for decision-making. Similarly, Gupta et al. suggested the use of cognitive mapping through value iteration networks to store the environmental map in spatial memory. The cognitive mapping module was responsible for improving the planning ability of robots in environments where visibility was limited. In addition to constructing maps, researchers are also focusing on training robots to interpret environmental maps. In an extensive inquiry, Ma et al. (2017) employed Dense Visual Odometry (DVO) SLAM and FuseNet for semantic segmentation of RGB-D images. By registering image sequences with the global coordinate system, they achieved semantic segmentation of multi-frame images and created a cohesive semantic map. The integration of SLAM and deep learning-based semantic mapping improved accuracy and precision in robot navigation tasks. In a further work, He et al. (2018) proposed an EKF and particle filter-based SLAM algorithm for mobile robots. The algorithm accurately estimated robot poses and environmental maps. However, it had limitations in achieving global consistency in pose and map estimation. To overcome these obstacles, a graph-based SLAM approach can effectively enhance the robot's historical pose while achieving a globally consistent pose and map.

In an alternative study, Chaplot et al. (2018) proposed an active neural localization model with Bayesian algorithm and A3C to reduce steps for precise localization. A hierarchical likelihood estimation approach was introduced to handle non-deterministic transition functions. A2C was employed for successful localization in real robotic settings. In other work, Bai et al. (2018) presented SeqCNN SLAM, which combines CNN algorithm and sequence matching to improve loop detection in scenarios with conditional transformations. This technique enhances the algorithm's efficacy in managing large-scale data by leveraging sequential information and dynamically adjusting model parameters online. Additionally, Yang and Scherer (2019) integrated semantic object detection and geometric SLAM into CubeSLAM's framework. They used 2D images and the vanishing points method to construct a 3D cubic structure of objects. Object identification was achieved using the YOLO algorithm, and camera pose optimization was expanded to include dynamic objects' motion as constraints. This approach demonstrates the benefits of combining semantic information with geometric mapping in a SLAM system. Similarly, Sucar, et al. (2020) developed NodeSLAM, a lightweight framework for real-time 3D object reconstruction using semantic segmentation and Augmented Reality (AR). It optimizes real-world images using volumetric probabilistic rendering functions and a single self-coding neural network. By decoupling the link between real pose and tracking data through joint optimization with Gaussian noise, it achieves a 90% accurate segmentation rate for specific object classes in real time frames.

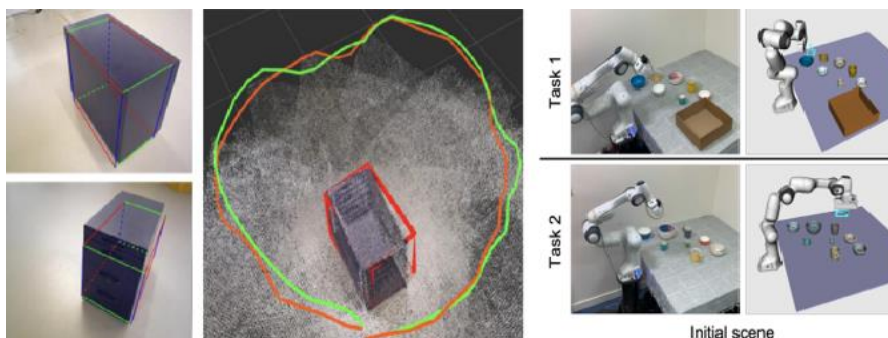


Figure 20. Left: (Yang and Scherer, 2019)'s work: Proposed object SLAM pipeline. Right: (Sucar, et al., 2020)'s work: Robotic representation of packing and sorting of objects using NodeSLAM

Another research by Wang et al. (2020) introduces DymSLAM, a 4D dynamic SLAM system that efficiently segments unknown mobile targets without relying on prior semantic information. Unlike other frameworks, DymSLAM acquires 6 Degrees of Freedom (DoFs) and 3D models for moving targets, contributing to the reconstruction of a dense static environment map. Although it performs well in real robot motion processes, real-time performance cannot be guaranteed. In their recent work, Bruno and Colombini (2021) presented LIFT-SLAM, a monocular Visual SLAM system that utilizes deep learning features. The framework reconstructs a sparse map to adjust the camera pose by linking keyframes and graphs. They employ transfer learning to optimize the neural network for each task, enhancing system performance across diverse datasets. Additionally, they propose a migration learning-based adaptive approach to eliminate fixed matching thresholds, improving system performance without the need for fine-tuning specific parameters on datasets.

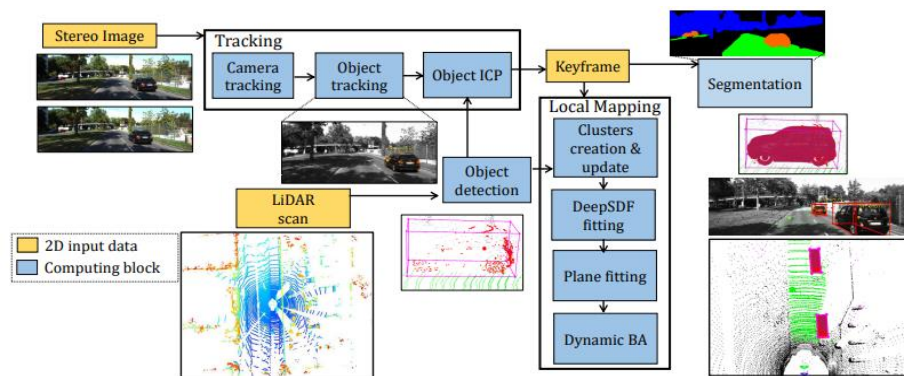


Figure 21. The proposed pipeline of (Gonzalez et al., 2022a and 2022b)' works

In a recent study, Gonzalez et al. (2022a) presented the TwistSLAM algorithm, employing the concept of "joints" to impose physical constraints on both stationary and moving objects. This concept is grounded in the observation that many real-world dynamic objects exhibit fewer than 6 Degrees of Freedom (DoFs). Incompatible constraints of DoFs are utilized to establish general dynamic clustering constraints. In a complementary study, Gonzalez et al. (2022b) expanded their approach by integrating LiDAR data for multimodal fusion. Their original 3D object detection network assessed the poses of potentially dynamic objects, and LiDAR data was incorporated for Iterative Closest Point (ICP) algorithms. This facilitated precise relative pose calculations, further constraining object motion and resulting in accurate 3D geometry for identified objects. Developing such SLAM algorithms for AI-based assistive robotics necessitates careful consideration of several key factors. First, the choice of sensor modalities, such as cameras, LiDAR, or inertial sensors, should be aligned with the specific application requirements and environmental conditions. Robust feature extraction and matching methods are crucial for accurate mapping and localization, especially in dynamic or cluttered environments. Regular testing, validation, and optimization based on real-world scenarios play a pivotal role in ensuring the reliability and practicality of SLAM algorithms in AI-based robotics.

NON-VERBAL HUMAN-ROBOT INTERACTION IN AI-BASED ASSISTIVE ROBOTICS

In AI-based assistive robotics, the purpose of HRI is to endow robots with the ability to understand humans, optimizing seamless and collaborative interaction through both verbal and non-verbal communication. In this section, non-verbal communication will be specifically addressed. In the realm of HRI, the incorporation of non-verbal communication is of paramount importance. Non-verbal cues, such as gestures, facial expressions, and body language, serve as

nuanced channels for conveying emotional states, intentions, and contextual information. The integration of these non-verbal elements enhances the overall quality of communication, fostering a more natural and intuitive interaction between humans and robots. Recognizing and appropriately responding to non-verbal cues enables robots to navigate social dynamics effectively, establish consistency, and engage in collaborative tasks. In this context, numerous investigations have been undertaken within the existing literature.

As an illustrative example, Nejat and Ficocelli (2008) developed a gesture recognition system to assess a person's accessibility level and affective state. The system utilized a Q-learning-based decision-making framework in a robot, which exhibited both driven and emotional states. Numerical values were assigned to state transition probabilities, Q-values, and rewards. The robot aimed to fulfil its drives by completing tasks and issued reminders to users about daily activities. User responses influenced the robot's drive satisfaction, with reminders related to bathroom use requiring more iterations due to user discomfort. In a distinct inquiry, Robins et al. (2008) developed a temporal behaviour-matching algorithm to investigate the adaptability of children during interactions with a robot. Using the KASPAR robot, the researchers conducted games involving "Drumming Call and Response" and "Gesture Imitation" with 18 children. By manipulating the robot's responses and gestures through a Wizard of Oz (WoZ) setup, the researchers examined the impact on the children's behaviour. The results demonstrated the effectiveness of the algorithm, as the children adjusted their behaviour based on the robot's actions in various experimental conditions, including timing delays and different non-verbal behaviours.

In a study by Allison et al. (2009), participants were presented with the Brian robot and tasked with identifying its emotional expressions. The robot utilized a muscle-based facial action coding system (FACS) to generate facial expressions. The study found that participants achieved a 100% recognition rate for happiness, sadness, surprise, and fear, and an 80% recognition rate for anger and disgust. In a similar context, Boccanfuso and O’Kane (2011) conducted research with the CHARLIE robot, which adapted to a child's non-verbal actions during gameplay. The study showed that the proposed hand detector achieved 86% accuracy, while the face detector averaged 92% accuracy. Likewise, Wainer et al. (2014) developed an autonomous KASPER robot endowed with the capability to engage in video game interactions. The evaluative study involved six children with autism spectrum disorder, comparing their enjoyment and collaboration during human-robot and human-human gameplay sessions. The results showed that while the children were willing to play with the robot, they preferred interactions with humans for increased enjoyment and collaboration, possibly due to the novelty factor of robotic interaction.

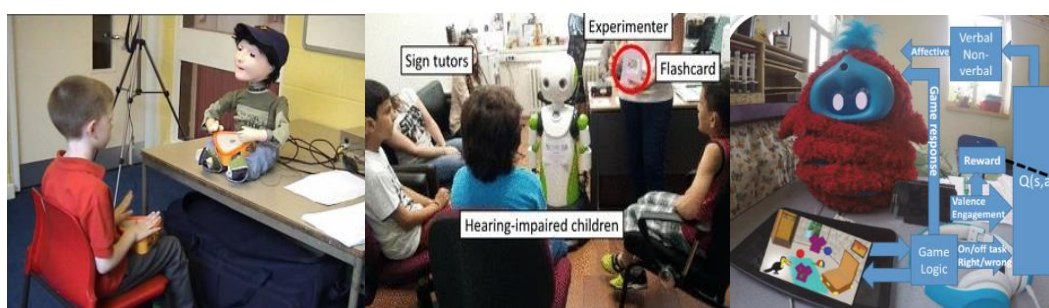


Figure 22. First: (Robins et al., 2008)’s work: KASPER interacts with a child. Second: (Uluer et al., 2015)’s work: Robot interacts with hearing-impaired children. Third: (Gordon et al., 2016)’s work: Robot and its system description

In a distinct investigation, Uluer et al. (2015) a semi-autonomous Robovie-3 tutor was used to teach Turkish sign language. Through the WoZ paradigm, the researchers assessed the robot's sign recognition capabilities and its impact on learning performance. The robot's sign recognition capabilities consistently exceeded 90% and positively influenced learning performance across different groups. In another study, Gordon et al. (2016) implemented a pedagogical facial emotion detection system using the Tega robot and an Android tablet with Affectiva software. Therein, they used the SARSA algorithm with a reward mechanism based on valence and engagement. Park et al. (2019) also used the Tega robot for language acquisition by cultivating a personalized policy through interactive sessions and a tabular Q-learning algorithm (Akalın and Loutfi, 2021).

Similarly, Peters et al. (2017) examined the impact of different gesture styles on perceptions of a robot's characteristics, such as warmth, competence, dominance, and affiliation. The study involved a NAO humanoid robot delivering a short lecture about robots to a group of children. The robot displayed four different gesture styles, varying in levels of warmth and competence. The results indicated that higher levels of competence led to increased perceptions of competence, while warmth was perceived as high in both high warmth-high competence and low warmth-low competence conditions. In an additional study, Chen et al. (2018) conducted a study on a multi-robot system that provides services in a social drinking scenario. They integrated the information-driven fuzzy Friend-Q (IDFFQ) learning algorithm with fuzzy inference to understand and adapt the robots' behaviour based on user emotions and intentions. The researchers used triangular and trapezoidal membership functions to fuzzify emotions on the pleasure-arousal plane. The IDFFQ algorithm outperformed their previous algorithm, Fuzzy Production Rule-based Friend-Q learning, as shown by higher rewards and faster response times of the robotic entities.

In a similar vein, Churamani et al. (2018) aimed to enhance the Nico robot's empathetic capabilities by incorporating visual and auditory data. Their model consisted of three modules: an emotion perception module, an intrinsic emotion module, and an emotion expression module. The perception module employed visual and auditory channels and utilized a Growing-When-Required Network for training. The emotion expression module, on the other hand, utilized a Gradient-based actor-critic architecture. Offline pre-training assessed the symmetry of facial features, while online training involved participants evaluating the appropriateness of facial expressions as the reward criterion. In a distinct work, (Chen et al., 2020) introduced a graph-based convolutional network algorithm for analysing human behaviour. The algorithm utilizes a structural graph pool scheme to aggregate human skeletal maps, reducing parameters and computational costs. Additionally, a joint channel attention module is incorporated to discern discriminative joints and assign varying degrees of attention to different channels. This attention mechanism enhances the model's ability to classify complex behaviours in the field of robotics.

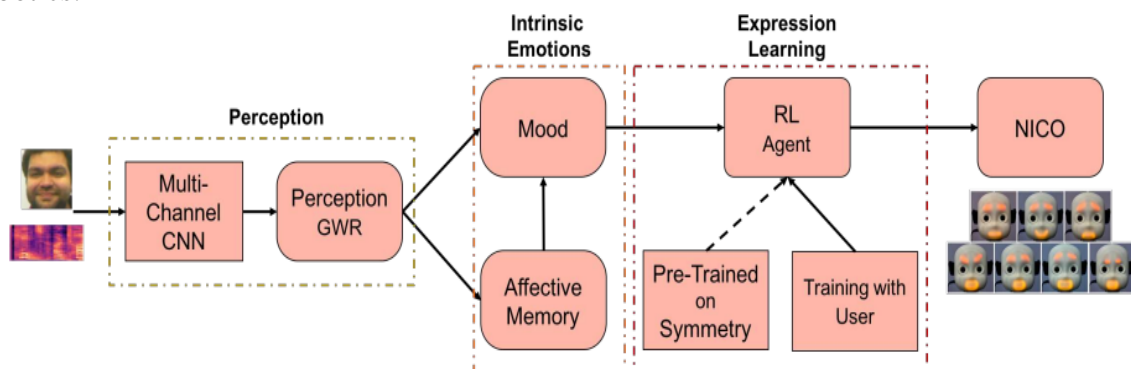


Figure 23. (Churamani et al., 2018)'s proposed model

As can be seen from the presented instances, developing Non-Verbal Communication algorithms in AI-based robotics requires careful consideration of several critical factors to enhance HRI and user experience. First, understanding cultural and contextual nuances in non-verbal communication cues is essential for creating algorithms that are universally applicable and socially intelligent. Algorithms should be designed to interpret and generate non-verbal signals, such as facial expressions, gestures, and body language, with high accuracy and sensitivity. Furthermore, customization options allowing users to define their preferences in non-verbal communication styles contribute to personalization and adaptability. Implementing real-time responsiveness and synchronization between the robot's actions and non-verbal cues is crucial for creating natural and intuitive interactions. Regular updates and refinements based on user feedback and evolving social norms are integral to maintaining the effectiveness and appropriateness of non-verbal communication algorithms in diverse and dynamic settings.

VERBAL HUMAN-ROBOT INTERACTION IN AI-BASED ASSISTIVE ROBOTICS

Verbal communication in AI-based robotics involves equipping robots with the capability to understand and interpret human language, enabling them to interact with humans through conversations, understand spoken commands, answer questions, and perform tasks based on language instructions. This is crucial for creating robots that can communicate with and assist humans in a more natural and intuitive manner. A number of studies have been proposed in the literature. Illustratively, Tapus (2009) developed an adaptive robotic system to assist individuals with Alzheimer's disease. The system optimized user task performance in cognitive activities by providing commendation and motivation based on performance metrics. Participants' ability to recognize songs improved, and attention training was enhanced during the experimental sessions.

In another study, Salem et al. (2011) investigated the impact of congruent robot gestures and speech using the ASIMO robot. The robot executed verbal requests accompanied by three types of gestures: iconic for illustrating object properties, deictic for indicating location, and pantomimic for depicting actions. Participants evaluated the robot as more sympathetic, lively, active, and engaged when it incorporated gestures.

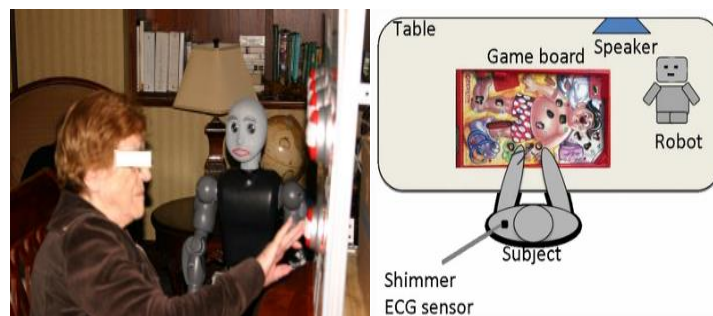


Figure 24. Left: (Tapus, 2009)'s work: Robot interact with an older adult. Right: (Dang and Tapus, 2015)'s experimental setup

In another work, Sekmen, and Challa (2013) present an autonomous mobile robot that can learn and adapt its behaviour and preferences based on user interactions. The robot utilizes a Bayesian learning mechanism to dynamically update itself with each user interaction, taking into account user states and preferences. By incorporating capabilities such as face detection, speech recognition and localization, natural language understanding, and navigation, the learning model enhances the robot's responsiveness. In their experimental study involving 25 recruited students, the robot serves as a tour-mate on a university campus. Therein, the participants evaluated the adaptive and non-adaptive conditions of the robotic tour-mate and expressed a

preference for the adaptive version. The results show a clear preference for the adaptive tour-mate among the participants.

In a subsequent investigation, Han and Tashev (2014) proposed a deep learning algorithm to establish probability distributions for different emotions in speech segments. They integrated these segment-level distributions with an extreme learning machine (ELM) for emotion classification. The authors compared their approach with traditional methods like HMM, SVM, DNN-HMM, and DNN-SVM, and their results showed significantly higher accuracy. Similarly, (Song et al., 2014) employed transfer learning for speech emotion recognition. They used dimension reduction techniques and Maximum Mean Discrepancy (MMD) embedding optimization. The study included two models with PCA and Local Preserving Projection for dimension reduction, followed by classification using the SVM algorithm. The results indicated that the recognition rate for the neutral emotion category was the highest, while happiness and fear had lower rates. Likewise, Dang and Tapus, (2015) conducted a study using a NAO robot in the "Operation Board game" to assess players' stress levels by monitoring heart rate and game performance. The study focused on NAO's personality adaptation through verbal reactions to motivate individuals and improve their performance. A within-subject experimental study with 17 participants was conducted in four different conditions. The results showed that players performed better when coached by the robot. Additionally, participants' personalities correlated with their preferences for the robot's personality. Higher heart rates were associated with false alarms, and introverted players displayed higher heart rates compared to extroverted players.

In a separate investigation, Oyamada et al., (2017) proposed an algorithm for pronunciation conversion, aiming to automatically rectify the pronunciation of non-native speakers through the use of GANs. The paper employs a consistency-aware recursive network to enable real-time conversion. The fundamental GAN operates at the MFCC level, which is subsequently transformed into speech using the WORLD vocoder. In a later study, Chen et al. (2018) introduced a GAN-based conversational model that improves impaired speech caused by missing articulators. The model includes a controller module that preserves linguistic content and speaker characteristics. The controller is trained on impaired speech, generating a specialized code for the generator. The generator, trained on normal speech, aims to produce normative speech reflecting the speaker's characteristics. This model is the first of its kind applied to impaired speech and surpasses existing techniques.

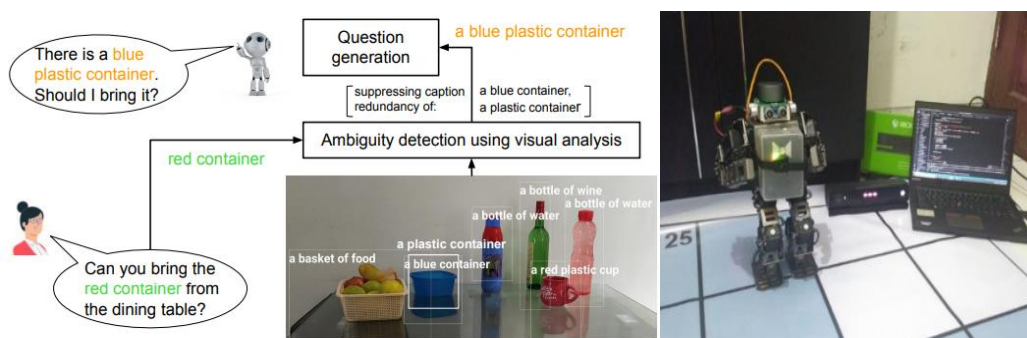


Figure 25. Right: (Pramanick et al., 2022)'s system architecture .Left: (Rofi'ah et al., 2021)'s work setup

In an additional study, Ho et al. (2020) proposed a multimodal approach for speech emotion recognition using multilevel multi-head fusion attention and a recursive neural network. The study utilized audio components to determine Cepstral Coefficients (MFCC) and embedded text information using a pre-trained bidirectional encoder representation. These features were input into an RNN with self-attention mechanisms to capture context. Experimental results on three databases demonstrated superior performance compared to a single model. In a

corresponding vein, Kumar et al., (2020) proposed a speech recognition model that adapts children's speech using linguistic information from interactions. They introduced two approaches: lexical repetition and semantic response generation. The latter involves a sequence-to-sequence model that predicts target sub-utterances based on adult utterances, maintaining long-term context. Subsequently, Pramanick et al. (2022) introduced the Talk-to-Resolve (TTR) system, enabling robots to resolve communication deadlocks by visually observing the scene. This enhances conversational accuracy by calculating the robot's next action based on the observed scene and provided instructions.

In their study, Rofi'ah et al. (2021) examined dialogues in Indonesian, focusing on entertainment, motivation, emergencies, and knowledge expansion. They used a knowledge-growing method and provided mp3 audio for various types of content, such as music, fairy tales, comedy, and motivational material. In emergency situations, the robot was capable of calling a nurse and recording patients' complaints. The robot also made efforts to understand the patient's conversation by seeking clarification. The use of the SARSA reinforcement learning method resulted in faster convergence to a steady state due to higher cumulative rewards. Both Q-learning and SARSA methods successfully achieved the desired dialogue goals in 200 episodes. This study concludes that reinforcement learning methods effectively address the limitations in the robot's knowledge, enabling it to accomplish new dialogue goals in patient assistance scenarios.

As discerned from the given literature, developing verbal communication algorithms in AI-based assistive robotics necessitates a multifaceted approach, encompassing linguistic, technological, and social considerations. Firstly, robust natural language processing techniques are essential for accurate speech recognition and understanding. These algorithms should be designed to handle diverse linguistic nuances, accents, and colloquialisms to ensure effective communication with users. Context awareness is crucial, as algorithms need to interpret and respond appropriately to changes in conversation topics or user instructions. Additionally, the incorporation of adaptive machine learning and deep learning mechanisms allows the algorithms to continuously improve their language understanding capabilities through user interactions. Lastly, Social aspects, such as politeness and tone, should be integrated to enhance the robot's conversational skills and user experience.

ETHICAL CONSIDERATIONS

This rapid integration of AI into the field of robotics brings with it a range of ethical considerations that must be carefully examined and addressed. One crucial ethical consideration revolves around transparency and accountability. As AI-powered robots gain autonomy, it becomes essential to comprehend their decision-making processes and ensure alignment with human values. Establishing trust in AI and robotic systems can be achieved by creating auditable and explainable algorithms. Another vital ethical consideration is the potential for bias and discrimination in AI systems. As AI algorithms learn from data, they can inadvertently perpetuate existing societal biases and discriminatory practices. To address this, it is imperative to actively develop fair and unbiased AI systems. This involves scrutinizing training data, identifying and mitigating biases, and continuously monitoring and evaluating AI algorithms to ensure equitable outcomes for all individuals.

Safety and security are also critical ethical concerns in the integration of AI and robotics. As these systems become more sophisticated and pervasive, the potential for accidents or malicious exploitation cannot be ignored. Implementing robust safety measures, ethical guidelines, and secure protocols are essential to minimize risks and protect against unintended consequences. It is crucial to prioritize the well-being and safety of both humans and AI-powered robots to ensure that they operate within ethical bounds. While AI-based robotics can bring about

increased efficiency and productivity, it also has the potential to disrupt job markets and result in job displacement. It is crucial to consider the ethical implications of these changes and work towards mitigating the negative impacts. Strategies such as re-skilling and retraining programs, creating new job opportunities, and ensuring a just transition for affected workers can help address these concerns and ensure a fair and equitable integration of AI and robotics into the workforce. Through responsible development and deployment of AI and robotics technologies, we can harness their potential while minimizing risks and ensuring a positive impact on society.

CONCLUSION

Through the integration of AI into assistive robotics, machines acquire the ability to autonomously perceive, engage in sophisticated reasoning, and perform actions within dynamic and intricate environments. Within the domain of AI-based robotics, numerous advanced methods have been developed to replicate cognitive functions analogous to human intelligence. This paper comprehensively addressed this intricate landscape through four key categories. Commencing with a concise historical overview that delineates the evolution of AI in robotics, the first notable category scrutinized machine learning and deep learning methods facilitating the iterative learning process in robots, enabling continual enhancement of their performance through data assimilation. The second category delved into environmental understanding, empowering robots to interpret and comprehend the visual spectrum, crucial for intricate tasks such as object recognition and SLAM. The third category focused on HRI, where robots are endowed with the capacity to comprehend humans, optimizing seamless and collaborative interaction through both verbal and non-verbal communication. Finally, the last category emphasized the ethical considerations imperative in the development of AI-based robotics. The primary objective of this paper is not only to highlight the intricate impact of AI in the field of robotics but also to provide a foundational perspective to researchers, enabling them to cultivate cutting-edge applications that contribute to the beneficence of humanity.

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A STUDY ON THE IMPACT OF DIE SPEED ON DRAWING LOAD IN MULTI-POINT DEEP DRAWING PROCESS OF AISI 1010 STEEL USING NUMERICAL ANALYSIS

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ABSTRACT

The deep drawing process plays a crucial role in the manufacturing of mechanical components and finds extensive applications. Deep drawing process is widely utilized in various industrial applications. Nevertheless, certain limitations can hinder the application of deep drawing when producing various shapes, thereby impeding the flexibility of the process. The cost of dies becomes an important drawback to profitability, particularly for small manufacturing quantities. Multi-Point deep drawing offers a solution to the inflexibility issue of traditional deep drawing systems by replacing the punch component of the deep drawing process with independently movable pins. The pins, which have the ability to move without restriction, may be adjusted to various heights, thus creating diverse forms. The required drawing load is a crucial determinant of both the press capacity and energy efficiency. The main aim of this study is to investigate the influence of die speed on the required drawing load in the multi-point deep drawing process of AISI 1010 low carbon steel by using numerical analysis. Deform-3D software is used to conduct numerical analysis. A customized die set has been developed for the purpose of performing multi-point deep drawing operations. In this configuration, the lower die operates as a traditional deep drawing die, including a circular die cavity of 100 mm in diameter. Instead of using a punch, circular pins with a diameter of 10 mm are employed. The multi-point deep drawing process simulations are carried out using three distinct drawing speeds: 1 mm/s, 10 mm/s, and 100 mm/s. The findings indicate that the speed at which the drawing takes place has an impact on the amount of load required to complete the drawing, as a consequence of the material's strain hardening ability.

Keywords: Multi-Point Forming; Multi-Point Deep Drawing; Deep Drawing Load; AISI 1010 Steel.

DISTRIBUTION OF THE JUNIPER (JUNIPERUS L.) GENUS ON THE ABSHERON PENINSULA

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ABSTRACT

On the Absheron Peninsula, the only place where juniper association was found is in the territory of Gobustan. The area's relief was formed due to the impact of wind and precipitation. The Gobustan region's terrain is inclined towards the south-east, and the soil is gray, brownish-brown in some areas. The climate here is primarily semi-desert. The summers are hot and dry, and the average annual temperature is 14-14.5°C, while the average air temperature in January ranges from 0-3°C. The region typically receives between 150 to 400 mm of precipitation annually. The soil in the region is sandy and has low nutrient content. A study was conducted in 2020-2022 to observe the species composition and structure of the associations that were dominated by *Juniperus polycarpus* K.Koch. It was found that *Juniperus polycarpus* K. Koch is the only dominant species in the tree layer, and its prevalence can be estimated as 1-2 on the Drude scale.

The second layer of shrubs mainly contains *Suaeda microphylla* Pall. and *Celtis caucasica* Willd., which can be evaluated with 1 point on the Drude scale. After conducting thorough research, it has been determined that the total project coverage of the association is 10%.

Key Words: Absheron peninsula, juniperus, plant association, plant group

PLASTICITY IN MORPHOANATOMICAL ATTRIBUTE OF EQUISETUM RAMOSISSIMUM IN MANDI BAHAUDDIN DISTRICT, PAKISTAN

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Abstract

Equisetum ramosissimum is perennial fern (Pteridophytes) and widely distributed across Mandi Bahauddin, Pakistan located mainly along streams and rivers. It is evergreen horsetail species belonging to the genus *Equisetum* and subgenus *Hippochaete*. It is mostly present in damp places like moist meadows, streams banks, path and watered edges. Present study is emphasized on morphoanatomical responses of *E. ramosissimum* subsp. *ramosissimum* present at three different ecozones (Adalabad, Rattokal and Rasool Beraj) of Mandi Bahauddin. These sites were selected on the basis of difference in altitude, latitude and soil heterogeneity. A huge variation in morpho-anatomical features have been observed in this species even in same ecozone. Better morphological parameters have observed at Rasool Beraj site due to more organic and potassium ions present in the soil. *E. ramosissimum* showed response to the environment through changing the anatomical feature such as as low stem radius with reduced xylem and phloem area indicate the heat stress condition like Adalabad site. Adalabad site showed maximum high temperature as well as less saturation percentage in the soil. Rattokal site showed better root anatomical parameters due to more potassium and phosphate ions in the soil. Maximum physiological like photosynthetic parameters were observed in all sites. This species has flexible morpho-anatomical features and that genes can be used in future research. There is no record found at present literature.

Key words: Fern, Horsetail, Heterogeneity, Morpho-anatomical features, Variation.

ASSESSMENT OF AFLATOXIN M1 LEVELS AND NUTRITIONAL COMPOSITION IN CHEESE SAMPLES FROM THE KOSOVO MARKET

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ABSTRACT

Introduction and Purpose: Aflatoxins, a group of mycotoxins, pose a significant threat to global food safety, particularly in the dairy sector. This research aimed to assess the presence and distribution of Aflatoxin M1 in various cheese types available in Kosovo's markets during 2022 and 2023. Additionally, the study sought to determine if there is a correlation between cheese types, processing conditions, and nutritional parameters with the aflatoxin M1 level in cheese.

Materials and Methods: During 2023, a total of 93 different types of manufactured cheese samples from 15 different countries were analyzed for Aflatoxin M1 content using the enzyme-linked immunosorbent assay (ELISA) technique.

Results and Discussion: The research findings indicate that several countries exceeded the concentration of 0.05 µg/kg for Aflatoxin M1, the maximum tolerable limit for milk and milk products in many countries. Notably, cheese samples from Albania exhibited substantially higher levels of Aflatoxin M1 compared to the samples of other countries ($p = 0.000$). Aflatoxin M1 concentration did not exhibit statistically significant variations based on regulated total fat content ($p = 0.902$), carbohydrate content ($p = 0.741$), protein concentration ($p = 0.298$), or salt content ($p = 0.122$) within the cheese. Similarly, Aflatoxin M1 levels were not significantly affected by cheese consistency ($p = 0.926$). While different starter cultures were associated with varying Aflatoxin M1 concentrations, these differences were not statistically significant ($p =$

0.472). Aging time did not exert a significant impact on Aflatoxin M1 levels ($p = 0.691$), as concentrations remained relatively consistent across different aging periods.

Conclusion: These findings provide valuable insights into the variations in Aflatoxin M1 levels in cheese samples among different countries, emphasizing the importance of regulatory measures and continuous monitoring to ensure food safety and adherence to maximum allowable limits.

Key Words: cheese; ELISA; aflatoxin M1; food contamination

A COMPARATIVE ANALYSIS OF DECORATIVE PHILOSOPHY IN ISLAMIC AND CHRISTIAN ART: CASE STUDY OF SULEYMANIYYE MOSQUE, ISTANBUL AND ST. PETER BASILICA, VATICAN CITY

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ABSTRACT

Introduction and Purpose: Art and architecture have always served as reminders of earlier civilizations. Religious art is one of the most studied and respected kinds of art, especially before the Industrial Revolution. Places of worship, such as Masajids and Churches have served as the highest institutions of Muslim and Christian civilizations through which the architectural religious-based art emerged. These two civilizations frequently encountered each other, building on one another and sharing ideals. The purpose of this research is to explore Islamic and Christian arts during a historical timeframe focusing on the case study of Süleymaniye Masjid in Istanbul and St. Peter's Basilica in the Vaticana analyzing comparatively the similarities and differences between Christian and Islamic art.

Materials and Methods: The ornamental principles found in Islamic and Christian art traditions of the Süleymaniye Mosque in Istanbul and St. Peter's Basilica in Vatican City, such as the design aspects, symbolic representations, and cultural implications incorporated in these art forms including their historical trajectories, creative processes, and cultural relevance within their various religious frameworks, are used as the main material sources for this study. The historical, descriptive, analytical, and comparative methods used in the entire research contribute to a greater understanding of cultural and inter-religious dynamics by identifying the prominent similarities and contrasts in these forms of religious art.

Results: The results reveal that there is a relationship between religious representation of ideas in the form of art, design, architecture, and creative expression related to both religious sites.

Discussion and Conclusion: This comparative study of the Süleymaniye Masjid and St. Peter's Basilica engages in a dialogue between the rules of religious teachings and the quest for artistic autonomy, offering a perspective on the symbiotic relationship between art and religion. In conclusion, the comparative narrative analyses of the similarities and differences in their design elements, symbolism, and overall aesthetic provide beneficial insights into the subject of study.

Key Words: Islamic Art, Christian Art, Süleymaniye Masjid, St. Peter's Basilica, Inter-Religious Dialogue.

**WHAT FUTURE FOR URBAN TREE COMMUNITIES DUE TO CLIMATE
CHANGE? HEALTH STATUS ANALYSIS USING PLANT FUNCTIONAL TRAITS -
NATIONAL BIODIVERSITY FUTURE CENTER (NBFC)**

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ABSTRACT

Introduction and Purpose: Urban forests are an irreplaceable heritage for capitals and metropolitan cities. By providing ecosystem services, forests are a fundamental resource in the fight against global warming and air pollution, which puts people's health at risk. Assessing of the health status of plant species becomes essential in order to preserve green areas within cities, identifying any causes of stress and possible remedies.

Materials and Methods: Three stands were sampled, selected by a different gradient of fragmentation green cover in the Campobasso municipality (Italy). All the measurements were taken in: June – July/August – September/October periods. The study involves the characterization of the sites through phytosociological surveys, which are also useful for defining the species to be analyzed. In each stand, 5 species are chosen that make up the tree and shrub layer of the forest. For each species, 10 leaves are collected from 7 individuals. For each leaf, the following traits are measured: Fresh Weight (FW), Leaf Area (LA), Dry Weight (DW), Chlorophyll content (SPAD, CCI, ATLEAF), Anthocyanin Content (AC), Flavonols Content (FC), Leaf thickness (Lth), Specific Leaf Area (SLA), Leaf Dry Matter Content (LDMC), Leaf Mass per Area (LMA), Leaf Water Content (LWC).

Results: The analysis of these Plant Functional Traits can provide useful data on the health status of the analyzed species but also data on the ecological adaptation of species in urban contest.

Discussion and Conclusion: This study can help to identify possible critical issues for their survival and identify possible interventions for the protection of urban forests provide a robust dataset for the implementation of machine-learning algorithms, useful for predicting and monitoring the species examined over time.

Key Words: Plant functional traits, urban forests, plant health assessment.

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CONTRIBUTION TO THE STUDY OF WATER STRESS TOLERANCE IN THYMUS SATUREJOIDES UNDER NATURAL CONDITIONS IN THE HIGH ATLAS OF MOROCCO

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Abstract

Introduction and Purpose: Thymus saturejoides is an important economic resource for Morocco's rural populations. This species is used in traditional medicine to treat a number of illnesses, particularly gastric and respiratory. However, drought stress is the principal environmental factors limiting development of this species in Morocco. In this study, we aimed to test the water stress tolerance of several populations of T. sturejoides from the High Atlas of Morocco based on two water stress markers: hydrogen peroxide (H₂O₂) and malondialdehyde (MDA).

Materials and Methods: Samples of 5 contrasting populations from different sites in the High Atlas of Morocco were collected between the end of April and the beginning of May 2023. Climatic data were taken from the "power.larc.nasa.gov" site. The concentrations of H₂O₂ and MDA were determined spectrophotometrically.

Results: Climatic parameters (precipitation, relative humidity and temperature) showed that 2023 was a very dry year. The population from "Ait Hani" site, which received the largest quantity of water, had the lowest concentrations of H₂O₂ and MDA. On the other hand, the population from "Ait Abbas" site was the least tolerant of water stress, with high concentrations of H₂O₂ and MDA.

Discussion and Conclusion: Despite the known resistance of this species of thyme to water stress. The succession of drought periods in Morocco is having a negative impact on its development. In addition, over-exploitation and over-grazing are threatening the future survival of this plant. Therefore, it is highly advisable to plan an emergency conservation project for this species in its natural habitat.

Key Words: Thymus sturejoides; Hydrogen peroxide; Malondialdehyde; Water stress.

STUDY AWARENESS OF PASSIVE SMOKING AS A RISK FACTOR AMONG THE STUDENTS OF TBILISI STATE MEDICAL UNIVERSITY

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The tobacco epidemic is a global public health problem. Every year more than 8 million people worldwide die from tobacco use, more than 7 million deaths are related to direct tobacco use, and 1.3 million nonsmoker deaths are caused by secondhand tobacco consumption. As of 2020, 22.3% of the world population consumes tobacco products, 7.8% women and 36.7% men. 80% of Tobacco users are living in middle- and low-income countries. (World Health Organization, 2023).

According to a 2019 prevalence study conducted by the National Center for Disease Control and Public Health, 30.7% of the Georgian population consumes tobacco, the percentage of women is 7.8% and men- 55.5%. The impact of secondary tobacco smoke was reported by 38.6% of the population at home and at work 11.1%. European School Survey Project on Alcohol and Other Drugs ESPAD 2019 results show that 36% of Georgian students smoke tobacco during their lifetime (National Center For Disease Control and Public Health, 2021).

Exposure to secondary smoke can increase the risk of cardiovascular disease by 25-30%, and the risk of developing lung cancer by 20-30%. Exposure to second-hand tobacco smoke affects reproductive health, pregnancy and increases the risk of health complications. (Centres For Disease Control and Prevention , 2022).

Aim of Research-Identify factors that influence the levels of student's awareness toward passive smoking as a risk factor.

Research methodology Target Group - Students enrolled in Tbilisi State Medical University's undergraduate and postgraduate programs in public health, medicine, dentistry, pharmacy, physical medicine and rehabilitation, nursing, and obstetrics.

Study Design: Cross-sectional study. The research method adopted was quantitative research.

Type of Sampling: Simple random sampling.

Tbilisi State Medical University has a student population of 6,000 Georgian students. The sample size, calculated with a confidence level of 90% and a margin of error of -5%, was determined to be 261 students. (N=261)

Closed-ended questions was developed for the study. Data analysis was conducted using the Statistical Package for the Social Sciences, specifically IBM SPSS version 28. A p-value <0.05 was established as the threshold for statistical significance.

Results of Research -Among the respondents, it was found that 49.1% of men and 29.7% of women use tobacco. The research analysis revealed that 100% of students possess information/knowledge about passive smoking.

Of the surveyed students, 31.4% stated that, in the last 7 days, they had been in the presence of someone smoking any tobacco product, while 9.6% had never been passive smokers during this period.

In public open spaces, 57% of smoking students and 59% of non-smoking students are exposed to second-hand smoke most frequently. Similarly, nearly equal percentages of smoking and non-smoking students (24% and 24.2%) experience second-hand smoke in public indoor spaces.

According to 13.8% of the interviewed students, passive smoking is most prevalent at home. Although 51.3% of students consider passive smoking a serious health risk, statistically reliable results were not observed regarding students' knowledge of diseases associated with passive smoking.

Regarding specific health risks, 62% of tobacco-using students and 69.6% of non-smokers believe that passive tobacco use is a risk factor for cancer, while 52% of smoking students and 49.1% of non-smokers believe it is related to cardiovascular diseases. Additionally, 20% of tobacco-using students and 20.5% of non-smokers believe that passive tobacco use can be associated with the risk of developing endocrine diseases. A significant majority, 71% of tobacco-using students and 77.6% of non-smokers, believe that passive tobacco consumption is related to the development of respiratory diseases.

It is noteworthy that smokers are aware of the risks, including the development of cancer, cardiovascular diseases, and respiratory diseases, yet they still use tobacco products. The study found that smokers (35%) and non-smokers (73.3%) are differently affected by exposure to second-hand tobacco smoke, leading to variations in their behavior (frequency of behavior) to avoid tobacco smoke. Notably, 28% of smokers and 3.1% of non-smokers never make an effort to avoid exposure to secondhand smoke. Both smoking and non-smoking students believe that studying at a medical university does not influence their attitudes and behavior.

On a positive note, a significant majority of surveyed students (87%) are informed about tobacco policies and regulations. However, only half of those surveyed believe that existing tobacco control policies and regulations are either completely effective or somewhat ineffective.

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COMPUTATION OF THE EXCHANGE INTERACTIONS IN $\text{CaCu}_3\text{Fe}_2\text{Os}_2\text{O}_{12}$ QUADRUPLE PEROVSKITE: MONTE CARLO SIMULATION

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ABSTRACT

This paper focuses to establish a method for estimating the exchange interactions in Quadruple Perovskite $\text{CaCu}_3\text{Fe}_2\text{Os}_2\text{O}_{12}$, based on a correlation between internal energy and magnetism at each site and Monte Carlo Simulations (MCS) according to the Ising model. We have computed the exchange interactions using the experimental temperature value of this material, identified under an external field $h = 0.1 \text{ T}$, using also a renormalization parameter α . The internal energy of each magnetic arrangement has been computed together with the magnetization at each site, the magnetic susceptibility, and the specific heat. Finally, a comparison of our simulation results with other has been performed. The Exchange interactions obtained are $J_{\text{Cu-Fe}} = 13.15 \text{ meV}$, $J_{\text{Cu-Os}} = 37.58 \text{ meV}$, $J_{\text{Fe-Os}} = 46.98 \text{ meV}$, $J_{\text{Cu-Cu}} = 0.13 \text{ meV}$, $J_{\text{Fe-Fe}} = 0.07 \text{ meV}$ and $J_{\text{Os-Os}} = 0.02 \text{ meV}$.

Key Words: Quadruple perovskite $\text{Ca}_2\text{Cu}_3\text{Fe}_2\text{Os}_2\text{O}_{12}$; Exchange interaction; Monte Carlo Simulation; Internal energy at each site; Magnetization at each site

ANALYTICAL VALIDATION OF A METHOD FOR THE DETERMINATION OF TADALAFIL AND ITS IMPURITIES BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY IN THE DRUG (ACTIVE INGREDIENT, TADALAFIL 5 MG) FILM-COATED TABLETS

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ABSTRACT

Validated analytical methods are developed to guarantee the quality of medicines. The aim of this study is to validate a chromatographic method for quantification of Tadalafil in the pharmaceutical speciality (5mg Tadalafil, active ingredient, 100 mg excipients) film-coated tablets according to ICH guidelines.

The Chromatographic system (HPLC) conditions of this study are as follows: method: UV detector for Tadalafil assay by HPLC, column INERTSIL ODS 3V 5 μm , size : 250x4.6 mm, mobile phase: 45% Acétonitrile-55% Tampon pH 6.6, flow rate = 1.0 ml/min, detection wavelength = 225 nm, column temperature = 40°C, and injection time = 15 min.

The Tadalafil assay by HPLC is specific; it shows the Tadalafil peak with the same retention time, linear in the range 0.0158 to 0.0473 mg.ml⁻¹ with a coefficient of determination ($R \geq 0.999$). It is accurate and reliable and does not cause any interference with the substances analyzed during the assay, as the percentage overlap varies between 99.86 and 100.94%.

The Tadalafil dissolution assay validated as specific, linear, accurate and reliable. The percentage of active ingredient released after 30 min remains within specifications. The target value is 85%.

The method for determining impurities (unknown impurities) is validated as specific, linear, accurate and reliable. The method for identifying titanium dioxide and iron oxide is specific.

In conclusion, the method performs well at the chosen concentration levels, making it suitable for routine quality control.

Keywords: TADALAFIL , impurities, analytical validation, HPLC, film-coated tablets

ANALIZING STUDENT PERFORMANCE AND INTERACTION IN A VIRTUAL LEARNING ENVIRONMENT

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ABSTRACT

The pandemic of COVID 19 changed the way teachers and students interact between each other in a virtual collaborative environment supported by several technologies like Microsoft Teams, Google Scholar, Zoom and many other systems. In most of the universities worldwide the lectures were converted from their traditional form in the classroom to a virtual environment pushing both lectures and students to adopt to the new way of interacting with each other. This change was implemented in a very short time and all stockholders including government agencies had to adapt to the new way of conducting lectures all over the world. Both lectures and students had to use several technological tools without having a proper training, this situation affected the quality in the education system and caused confusion to pick up the appropriate software or group of software to perform the lectures, tests and ongoing students control. Nowadays the situation allows the normal learning and interaction between student and teacher in a traditional environment in the classroom by teaching face to face to the students. The scope of this paper is to identify if the traditional way of teaching need further improvement by implementing the advantages and the flexibility that the technology is offering for virtual collaboration. This study is based on the data produced by six Albanian universities mixed with three international universities that focus on virtual collaboration between teacher and students.

Keywords: Virtual Collaboration, Virtual Learning, Collaboration Systems, Log Management, Learning Management Systems.

INTRODUCTION

During COVID 19 pandemic period the methodology of teaching in universities changed dramatically by immediately passing from teaching face to face in classroom to a virtual collaborative environment that was supported by several software. Each university tried to adopt as soon as possible to this change putting under pressure academic staff and students. Government bodies tried to facilitate the process by publishing regulations on performing the lectures and exams online during this period. Each university within the country adopted

different type of technologies to address the issue of online learning methodology. This paper focus on the piloting that was made by European University of Tirana in a master class by dividing the class in two groups with the purpose of making a detailed analyses regarding the performance of each group in the same class. In the first group there were 30 vountiring students that followed the classes and completed their assignments using VCL methodology and tools. The second group of 113 students continue to follow the classes and complete their assignment using traditional methods in the class and by meeting with the teacher. The process was facilitated by 4 eTutors that helped both teacher and VCL students during the piloting period. This pilot started at week 6 of the course in December 2021 until the end of semester mid-February 2022.

Literature Review

The dominant understanding in research on virtual collaboration has been that it requires physical presence (Dubé, L., & Robey, D. (2009)). This claim, however, has been also disputed by studies offering empirical evidence of productive virtual collaborations without any face-to-face interactions, (Vidolov Simeon P., (2022)). One such notable case, reported by (Malhotra, A., Majchrzak, A., Carman, R., & Lott, V. (2001)), (Yonkers V. (2020)), tells a story of a unique virtual project during which a small team completed the design of a rocket engine without any f2f communication (Metiu, A.(2006)), has also shown how in one instance a distributed collaboration might be very challenging, whereas in a similarly geographically distributed arrangement, the participating team members could develop closer relationships without any co-located interactions. Similar findings are reported by (Schinoff, B. S., Ashforth, B., & Corley, K. (2019)), suggesting that people can develop strong bonds and feelings of proximity in distributed work arrangements. (Walther, J., Van Der Heide, B., Ramirez, A., Burgoon, J., & Pena, J. (2015)), (Vidolov Simeon P., (2022)), Schinoff, B. S., Ashforth, B., & Corley, K. (2019), mostly relying on experimental findings, have also argued that people can develop a high level of intimacy through virtual communication, arguing that these capacities might even exceed the ones of co-located teams and individuals.

These findings introduce variance across studies and question the dominant claim for the inferiority of virtual collaboration that is commonly attributed to the reduced richness and missing bodily cues. Many of these authors, however, remain agnostic about the status of the human body and focus on particular aspects of virtual collaboration such as regularity of interaction (Schinoff, B. S., Ashforth, B., & Corley, K. (2019)), mutual attention (Metiu, A., & Rothbard, N. P. (2013)), (Vidolov Simeon P., (2022)), presence awareness (Espinosa, A., Slaughter, S., Kraut, R., & Herbsleb, J. (2007), Schultze, U., & Brooks, J. A. M. (2019)) and aligning commitments (Einola, K., & Alvesson, M. (2019)). Other studies have attempted to develop a more holistic conceptual perspective that can account for the divergent outcomes of virtual collaboration, (Vidolov Simeon P., (2022)). One such approach, for instance, suggests that the source of variance stems from different ways of using technology, where technology can afford better ways for developing situational awareness (Malhotra, A., & Majchrzak, A. (2014)), as well as, lead to more reflexive collaborative practices (Baralou, E., & Tsoukas, H. (2015)). Another approach pays little attention to the role of technology and instead focuses on the concept of distance (O'Leary, M. B., Wilson, J. M., & Metiu, A. (2014), Wilson, J., Crisp, B., & Mortensen, M. (2013), Wilson, J. M., O'Leary, M., Metiu, A., & Jett, Q. (2008)).

These authors criticize the conventional understanding of distance as objective and problematize the claim that it should be experienced equally by all members of teamwork, (Vidolov Simeon P., (2022)). Central to this argument is construal-level theory according to which physical distance is correlated to perceptions of proximity suggesting that the greater the

physical distance between interlocutors, the more likely it is for them to construe each other at a higher level and in general terms and features (Wilson, J. M., O'Leary, M., Metiu, A., & Jett, Q. (2008)). Similarly, (Wilson, J., Crisp, B., & Mortensen, M. (2013)), contend that frequent communication with distant others sustains "cognitive salience", which makes others more "top of mind", serving as an antidote to "the out-of-sight-out-of-mind" problem in virtual teams Kiesler, S., & Cummings, J. (2002).

Recent phenomenological accounts have directly addressed the issue of the human body by suggesting to fundamentally reconsider its connection to virtuality. Some, for instance, question the assumption that the sensation of the virtual "other" requires proximity similar to that in local space (Lindemann, G., & Schünemann, D. (2020)).

These authors re-work the notions of space and lived experience to argue that lived bodies are only "artificial" bodies in virtual settings (Schinoff, B. S., Ashforth, B., & Corley, K. (2019)). Other studies question the pre-requisite of full embodied interactions for achieving a feeling of togetherness pointing out that relational experiences in virtual settings can be also based on a habitual sense of togetherness (Osler, L. (2020)). Bologna Process Until 1999, not only in Albania but also in Europe and worldwide, traditional education was exclusively recognized, where the university system was unique and the students had to physically attend studies referring to the study programs of their respective universities, (Vidolov Simeon P., (2022)). Until graduation, the programs, curricula, assessments, etc. were discreet and determinative depending on the university. (Valeu-x, www.valeu-x.eu).

Until 2010, HEIs in Albania offered study programs of complete and unique university studies either in 4 or 5 years, inherited from the pre-90s education system of the country. The reform and changes in the education system came from the decision to implement the Bologna Charter. In 1999, at the University of Bologna, the Bologna Declaration was signed, legalized, and formalized, which then was voluntarily signed by 29 education ministers of European countries (the original signatories of the declaration). The initiator signers of the Bologna Charter envisioned for the first time the creation and establishment of a joint standardized and unified structure of the university system in Europe. This structure would include the evaluation system (ECTS), quality assurance, curricula, accreditation, mobility of students and academic staff, and administrations between the higher education institutions included in the agreement. Afterward, many other countries, including Albania, agreed to sign the recognition and implementation of the Bologna process in the unification of higher education studies. The Bologna Process over the years has brought new reforms and innovations to countries that have signed up and are following this educational process (Demaj E., Alushllari G.(2023)). In 2003, Albania signed the agreement for the recognition and acceptance of the Bologna system, while in 2007 the implementation started for the first time in the Albanian university system - where the bachelor studies cycle was applied and the first diplomas of the first cycle of 3-year studies were obtained in 2010. The implementation of the Bologna process in Albania has had its difficulties, criticisms, acceptances, and advantages and disadvantages that have accompanied and are accompanying the process as a whole. In the context of improving the quality and unification of university studies according to the Bologna process - recognition of diplomas, curricula, credits, etc.- recently the main focus has been on the modernization of teaching practices and internationalization of universities. (Demaj E., Alushllari G.(2023), Wilson, M. H.(2016)).

CONCEPTUAL FRAMEWORK

The aim of this paper is to respond to some questions showing in this topic, regarding the VCL collaboration, students performance in such environment including lecture performance and control of students involvement mainly in group projects. The main variables analysed by this paper are:

- Student performance in a virtual learning environment
- Lecture performance in a virtual learning environment using advanced technological tools
- Group work and transparency
- Adoption to the new methodology of teaching and learning

The first research question of this paper is “Did the students that were part of the Pilot VCL performed better than their mates in the same course following traditional way of teaching?”. This question was addressed by assigning to both groups of student the same assignment to fulfil during 6 week of the piloting period. The assignment was to identify at list 4 companies at the website of “Central Business Centre” that holds publicly financial data for each registered Albanian company. The students have to analyse this data containing companies financial statement and prepare an assignment paper up to 1000 words to compare the companies they identified by identifying some economic variables like:

- Gross Profit Margin
- Net Profit Margin
- Working Capital
- Current Ratio
- Quick Ratio
- Leverage
- Inventory Turnover
- Total Asset Turnover
- Return on Equity
- Return on Assets
- Operating Cash Flow
- Seasonality
- Etc.

The students that were volunteering for the VCL methodology has to collaborate with each other into the LMS platform of the UET University for completing their assignment. Furthermore, they had to perform scheduled and unscheduled meetings in MS Teams platform to discuss for the fulfilment of each task of their assignment. All meeting was recorded and all chat communications in MS Teams platform and in LMS system were saved for further analyses. All students participating to this course had to upload their assignment to the LMS platform of the university before the deadline.

METHODOLOGY

The focus of virtual collaboration project founded by European Union and implemented in six Albanian Universities focused on testing different type of collaboration between students and lectures or the collaboration of students between each other in a virtual environment. There involved several ICT Software to support data collection and data analysing for producing results to identify the efficiency of the virtual collaborative systems and accurate measurement of collaboration between students and lectures during group work in a specific project. Each Albanian university provided its own data gathered by the system used by them. This data was analysed in this paper for drawing general conclusions about the virtual collaboration in this environment.

The methodology used in the evaluation of the data is both qualitative and quantitative because it analyses unstructured data like conversations, emails or other no structured data and also it analyses the volume of interaction like the number of messages exchanged between students in a group, email exchange, LMS logs etc.

There were several indicators that were analysed during the project implementation including academic staff, students and tutors. The geographical location has given more strength for an accurate data analyses in a virtual learning collaboration environment that gathered students and academics from several locations into a single virtual working place.

European University of Tirana has implemented local VCL in the fall semester 2021-2021 in a master course of Advanced Financial Analyses and Reporting with lecturer Nevina Habili, aiming to identify the gap and similarities between students that volunteered to follow the VCL methodology on following the course and the students that were following the course using standard teaching methodology being present into the class.

During the implementation of local VCL at European University of Tirana there were some barrier to take in consideration for fully evaluating the outcome of VCL project during implementation. The government law doesn't allow the students to give exams remotely or follow lectures online. By doing so it was impossible to fully implement VCL and fully incentive the participant student to this new methodology of learning. The students were involved in the project and lecture participation by benefiting if they excel 30% of the evaluation for the given subject. This already motivated them to actively use the VCL tools and collaborate with each other in a virtual environment.

DATA ANALYSES

Due to regulations imposed by the Ministry of Education the VCL course was tailored in a such way to respect the regulation for high education institutions and to give the possibility to volunteering students to perform some of their activity in a virtual collaboration environment. The volunteering group of students that were involved in the piloting of local VCL at European University of Tirana had 50 members from a total of 127 students and they were evaluated with 20% of the total evaluation for the fulfilment of the assignment in a virtual learning collaboration environment. In the process 4 eTutors already trained facilitated the process and monitored the group of students participation into the VCL course. One teacher was involved for the second half of the semester to monitor, evaluate and prepare a report regarding VCL students performance and also compare the overall performance of VCL students and the students that followed the traditional way of collaborating between each other and the teacher.

The evaluation of the outcome of the VCL course and student performance was made using mix tools. The student activities and collaboration was made using technological tools as UET LMS System, Miro Board and MS Teams. The user expectations were analysed through surveys that also were produced using technological tools like Microsoft forms.

The results are as follow:

80% of the students were full time employed and found the online learning time saving and easier to adapt to their schedule

None of the them had prior experience with VCL course (except for the online classes during the Pandemic) that were forced to be followed due to lockdown situation

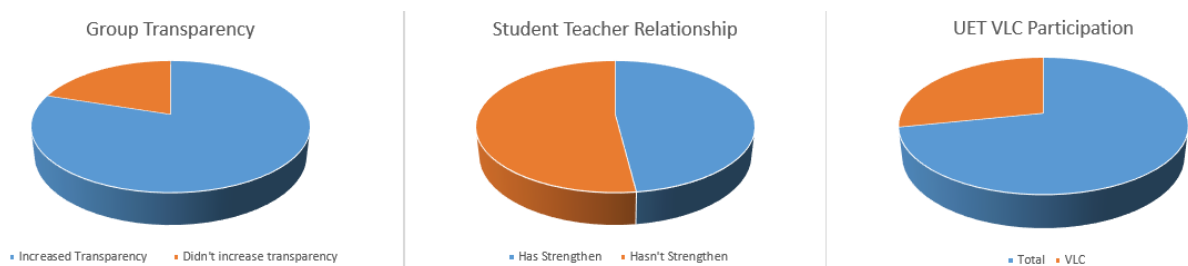
Students perceived the VCL course as a good methodology that will be helpful for them and will help in increasing their performance during courses and help them to better balance their personal live with studding especially for those student that already have a job.

Half of the students think that this way of collaboration strengthens the relation between teacher and students. This indicates that the students perceived the relationship between them and the teachers as a direct approach that can be strengthen in physical on class participation.

Almost 80% of the students participating in VCL course found this method of collaboration increase the group working task management and increase the overall workgroup transparency. The professors had the possibility to really evaluate each member of the group individually based on their real contribution.

One of the most important findings in the local VCL was the performance of the VCL students was in average better that the other part of the group that performed this task in a traditional learning environment in class. The average evaluation of VCL group wans 17 out of 20, where the evaluation of traditional class group was 14.5 out of 20.

The figures bellow show the above data in graphical view:



Source: UET Local VCL Implementation

CONCLUSION AND DISCUSSION

The local VCL project implemented by UET was part of the big project that was divided in two modules, the first module was the local VCL implementation and the second one was the International VCL implementation in an international environment. In local VCL was implemented in 7 Albanian university and each university implemented it independently by following the same framework that was designed by the project team. During the analyse of local VCL in UET we have noticed that most of participating students were more motivated and perceived this methodology as an advantage to balance physical presence in class and the virtual learning in a virtual environment with advanced technological collaboration tools. Most

of the participants had already a part time or afterschool job so somehow this result was also affected by this important fact.

During the evaluation of both groups it was noticed that the group of the students that had collaborated for the fulfilment of assignment through VCL methodology and tools showed a better performance than the group that was working using traditional collaboration in class and physically. A more thorough study has to be performed to really evaluate this result because only half of semester and 20% of course evaluation can't give the full picture of the results. More VCL classes in future are needed to really evaluate the performance of the students that participate to these courses.

Albanian law didn't give the full possibility to implement a full VCL course in a given subject during a full semester. This has decreased the possibility of incentivising the participating students to put all their efforts to this new methodology of learning and collaboration.

To have a better understanding of how VCL collaboration between students, teacher and other stockholders more VCL piloting are needed in an international environment. To fully evaluate the impact of this methodology of virtual collaboration in university changes in education law are needed in Albania to support this kind of learning as an official methodology.

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APPLICATION OF ISO 17025 TO ASSESS THE QUALITY MANAGEMENT SYSTEM OF A UNIVERSITY CHEMICAL RESEARCH LABORATORY

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ABSTRACT

Laboratories generally generate reliable results, and ensuring this reliability is not always easy for laboratories that are not subject to control and inspection.

This work is part of an approach to assessing the reliability and conformity of the activities of a university research laboratory whose mission is to provide results relevant to scientific research in the fields of chemistry, the environment and process engineering.

We assessed our laboratory's conformity using an analytical approach, against the requirements of the international standard ISO/CEI 17025 version 2017, which represents a tool for assessing the technical competence of laboratories and their ability to produce technically valid results.

An initial analysis of the laboratory's current situation was carried out using part of the ISO 17025 checklist.

We recorded an average level of satisfaction achieved with the laboratory's doctoral students.

This assessment enabled us to identify the points needed to draw up an action plan comprising a set of preventive and corrective actions.

Keywords: Evaluation, Quality system, ISO 17025, 2017 release, Checklist.

IMPORTANCE AND SETTING IN GIS-BASED SPATIAL ARCHAEOLOGY: A CASE STUDY FROM NORTHWESTERN BANGLADESH

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Abstract

The contemporary development of Northwestern Bangladesh is posing a growing threat to the region's archeological landscape. The need of using GIS to record and examine archeological sites is highlighted by this study, which will help us understand ancient civilizations more deeply and guide conservation efforts. Settlement trends in Northwestern Bangladesh are investigated, and the usefulness of GIS mapping and analysis is evaluated. The locations of archeological sites, topography, and patterns of land usage were all gathered, arranged, and analyzed using GIS techniques. Complementing the GIS analysis were field surveys and archival research. GIS made it easier to find archeological sites that had never been found before and revealed complex settlement patterns. The spatial study shed important light on how human occupancy in the area has evolved. The study emphasizes how important GIS is to spatial archaeology and how it can be used to manage and preserve archaeological legacy. The results provide a guide for future studies and conservation initiatives in areas where agriculture and urbanization are encroaching.

Keywords: Spatial Archaeology, Northwestern, Archaeological Heritage, Settlement Patterns, Heritage Management.

MOBILE APPLICATION THAT DETECTS DISEASES FROM FRESH FRUITS AND VEGETABLES, PLANTS AND LEAVE IMAGES

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ABSTRACT

Image processing and deep learning-based applications are used in almost every field today. Many applications have been developed that perform tasks such as classification, counting, measuring, and target tracking. The use of this technology in the agricultural sector increases productivity in various aspects. In this study, an application was developed that focuses on image-based detection of plant species and diseases and provides treatment recommendations for these diseases. A total of 50 different classes, 12 healthy and 38 diseased, were studied on 22 different plant species. 50,951 images were used in this study for training. The application is designed for mobile phones based on Android 6.0 (API 23) and above. Users can register and use the system. They can also benefit from limited features without becoming a member. The application allows users to make detections on the images they take and offers both cultural and chemical control recommendations for detected diseases. Apart from this, they also record the findings made by users who are members of the system. The developed mobile application can be used on approximately 70% of the smartphones used today. Although the accuracy rate of the developed data model is 95% with the test data at the end of the training, it achieves a correct determination of approximately 70% in real-life use.

Key Words: Artificial Intelligence, Phytopathology, Smart Agriculture Technologies, Machine Learning, Cloud Computing

1. INTRODUCTION

Agriculture is an important field in our country as well as all over the world. Continuation of life; Food sustainability and food quality are directly related to agriculture. The share of agriculture in GDP in our country; Although it had a downward trend in the period from 2011 to 2018, it remained at 6.4% in 2019, 6.7% in 2020, 6.5% in 2022, and 6.7% in 2023. Generally speaking, the share of agriculture in GDP has been increasing trend since 2011 (TOB, 2023) Considering the proportion of the population living in villages and towns, it decreased from 6.8% in 2021 to 6.6% in 2022 (TurkStats, 2023). Additionally, when the "Fresh Fruit and Vegetable Sector Report" is examined, 3,976,173 tons of products were exported in Product-Based Fresh Fruit and Vegetable Exports in 2019, while 4,882,748 tons of products were exported in 2022. While exports amounted to 2,192,805,000 dollars in the same years, this

increased to 2,855,347,000 in 2022. As can be seen from this report, exports of agricultural products have increased year by year (Fresh Fruit and Vegetable Sector Report, 2023).

One of the most important factors affecting agricultural productivity is the ability to produce healthy products; It is the absence of any disease element in the field, garden, or vineyard. Plant diseases significantly reduce agricultural productivity and cause both loss of time and financial losses. Some plant diseases spread throughout the crop when not diagnosed early; Maybe it causes the farmer to lose all his product. In an industry that is so affected by plant diseases, it is extremely important to produce correctly and diagnose the plant correctly. Although issues such as doing agriculture correctly and diagnosing plant diseases are the field of study of agricultural engineering, in this study we tried to develop software that will help people who have little knowledge in the field of agriculture and are not experts in plant diseases. The plant photographed in the study; It is aimed to develop a mobile application that diagnoses the type of disease and whether it is healthy or not.

2. RELATED WORK

One of the first studies on the detection of plant diseases through images was by Bravo C. et al. It was made in 2003 (Bravo et al., 2003). The aim of this study is to detect the difference in spectral reflectance between healthy and diseased wheat plants infected with *Puccinia striiformis* (yellow rust). Spectral images from the field were captured using a spectrograph mounted at the height of the spray boom. They determined that with this method, confusion rates decreased from 12% to 4% of error classification based on four different wavebands.

In a study conducted by Kumar and Kaur (Kumar & Kaur, 2015); The methods used to detect plant diseases were compared. These techniques are SVM, BPNN, SGDM, and K-Means clustering methods. They stated that the ideal data required for training in the SVM technique is difficult. They stated that the K-Means clustering algorithm also has a disadvantage in terms of time. They stated that such disadvantages make the BPNN technique stand out as the most suitable and easily applicable model for detecting plant diseases.

In a study published in 2018 by Konstantinos P. Ferentinos (Ferentinos, 2018), convolutional neural network models were developed to detect and diagnose plant diseases using simple leaf images of healthy and diseased plants with deep learning methodologies. Training of the models was performed using an open database of 87,848 images containing 25 different plants in 58 different class [plant, disease] combinations, including healthy plants. He stated that the model developed in the study reached a success rate of 99.53%.

Sharada P. Mohanty et al. In a study conducted by (Mohanty et al., 2016) in 2016, they used the deep learning method for image-based disease detection. Using a publicly available dataset of 54,306 images of diseased and healthy plant leaves collected under controlled conditions, they trained a deep convective neural network to identify 14 crop species and 26 diseases (or lack thereof). The trained model demonstrates the feasibility of this approach by achieving 99.35% accuracy on an extended test set. Overall, the approach of training deep learning models on growing and publicly available image datasets offers a clear path toward smartphone-assisted plant disease diagnosis on a large global scale.

M.S. Mustafa et al. In a study conducted by (Mustafa et al., 2020) in 2020, they focused on plants used in the medical and cosmetic industry; They mentioned the importance of early detection of diseases in these plants. This developed system also includes a fuzzy inference system, Naive Bayes (NB), probabilistic neural network (PNN), and support vector machine (SVM) classifier systems. In the study, 10 different plant species were studied. The three integrated machine learning approaches achieved a nearly 99% recognition and detection rate.

The study conducted by Tete and Kamlu in 2017 (Tete & Kamlu, 2017); it was both a comparison of the studies done until that year and a study that offered its own solutions through the K-Means algorithm. When looking at the rates of thresholding and K-Means algorithms in detecting plant diseases, they stated that the K-Means algorithm gave better results than thresholding.

P. Moghadam et al. In a study conducted by (Moghadam et al., 2017); They aimed to detect diseases in plants using Hyperspectral photography. This article proposes the use of hyperspectral imaging (VNIR and SWIR) and machine learning techniques for the detection of Tomato Spotted Wilt Virus (TSWV) in capsicum plants.

3. MATERIALS AND METHODS

In this section, the materials and methods used for the study will be mentioned. In this study, MobileNetV2 and EfficientNet models were worked, and Google Colab and Kotlin programming languages were used.

Tensorflow: TensorFlow is an open-source software library for high-performance numerical computing. Its flexible architecture enables operation on various platforms (CPUs, GPUs, TPUs). From desktop computers; to server clusters, from mobile devices; It allows easy calculation up to edge devices (Tensorflow, 2023).

MobileNetV2: Prepared by Google, MobileNetV2 is a high-performance deep learning algorithm developed for mobile devices and devices with low computing power (Sandler et al., 2018).

MobileNetV2 aims to develop a better and faster model by eliminating the deficiencies and errors in the previous version, MobileNetV1 (Howard et al., 2017). It especially enables applications such as object detection and image classification to be used on mobile devices. Figure 1 shows the convective block structures of MobileNetV1 (Howard et al., 2017) and MobileNetV2 (Sandler et al., 2018).

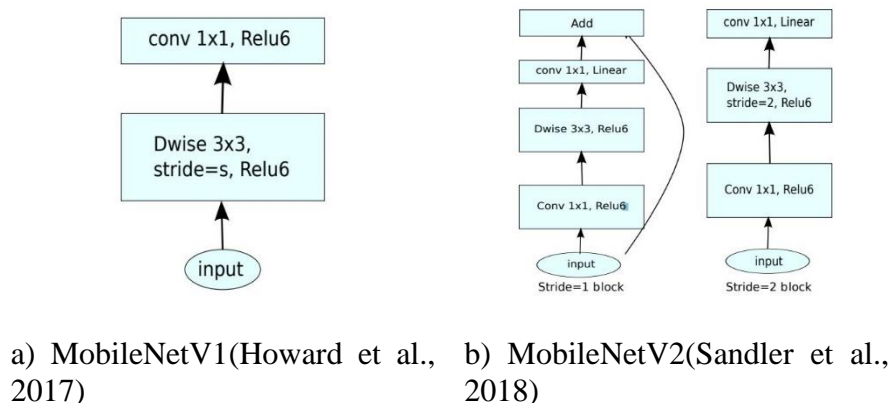


Figure 1. Comparison of convolutional blocks

As seen in Figure 1, MobileNetV1 (Howard et al., 2017) (a) has a 2-layer structure. The first layer is called depth convolution. This achieves light-weighted filtering by applying a single convective filter for the input channel. The second layer consists of a 1x1 convective network;

The task of this network is to create new features by converting the input channel into linear combinations. Relu6 activation function is used in both layers.

In MobileNetV2(Sandler et al., 2018) (b), there are two types of blocking. One of these is a 1-step block and the other is a 2-step block. There are 3 layers for both types of blocks. Unlike the MobileNetV1 (Howard et al., 2017) architecture, the convective network with a 1x1 Relu6 activation function is located in the first layer. In the second layer, there is deep convection. In the third layer, there is a convective network with a linear activation function.

EfficientNet: EfficientNet0 is a deep learning architecture developed by Google. It was introduced in 2019 in a paper titled “EfficientNet: Rethinking Model Scaling for Convolutional Neural Networks” (Tan & Le, 2019) This architecture aims to obtain more effective and lightweight models by optimizing the computational power and number of parameters.

EfficientNet0 achieves an optimal balance by adjusting depth, width, and resolution dimensions using scaling coefficients. This makes it possible for smaller models to achieve similar performance to larger models. Thus, more efficient models can be obtained for use in devices or applications with limited computational resources.

EfficientNet0 is specifically designed for use in mobile devices, edge devices, and other resource-limited environments. Its lightweight structure and high performance make it an attractive option, especially for application developers. In this way, it contributed to making deep learning models accessible to a wider range of users.

Google Colaboratory: Google Colaboratory provides a working environment based on the Jupyter Python Editor (Pérez & Granger, 2007) Users can create code sections by taking notes and adding cells between notes. In this way, the developer can write which code does what. Google Colab provides the opportunity to work with Jupyter editor in a cloud system-based working environment. Users connect to remote computers. They can use graphics cards of these computers with high processing power and develop artificial intelligence models using these graphics cards (Google, 2021).

PlantVillage Dataset: In order to detect plant diseases through images, a tensorflow model must be created. In order to create a model, a dataset containing the names and images of plants and their diseases is needed. At this stage, the PlantVillage (Mohanty et al., 2016) dataset, which is a model used in plant disease detection, was preferred. In addition to the PlantVillage (Mohanty et al., 2016) dataset, 12 diseases belonging to 9 fruits in the table of Fruit products, beverage, and spice plants production quantities in the Crop Production Statistics newsletter published by TUIK were added.

The PlantVillage (Mohanty et al., 2016) dataset consists of 54306 images of healthy and diseased plant leaves taken in a controlled environment. These images include 14 crop types (vegetables and fruits) and 26 diseases (or lack thereof).

When creating the data set, each plant species and its disease represents a different class. In this case, there are 38 different classes in the PlantVillage dataset. In addition to the classes in this dataset, 12 different classes were created for this study. Examples of images forming these 50 different classes are shown in Figure 2.



Figure 2. Sample images from each of the classes in the data set used in this study

There are 54305 images belonging to 38 classes in the PlantVillage dataset. Since the number of images in some classes was low, the already augmented version of this dataset was used. There are at least 1000 images from each class in the replicated dataset. However, in this study, since 12 classes were added in addition to 38 classes in the PlantVillage dataset, it was decided to use fewer images from some classes in the dataset. In this way, it is aimed to shorten the training period and ensure the balance between the number of class pictures. Since the original number of pictures was insufficient in the 12 added classes, data augmentation was performed for these 12 classes and the number of pictures was increased. Figure 3 shows the number of images in the classes for both versions and the reduced number of images in this new dataset.

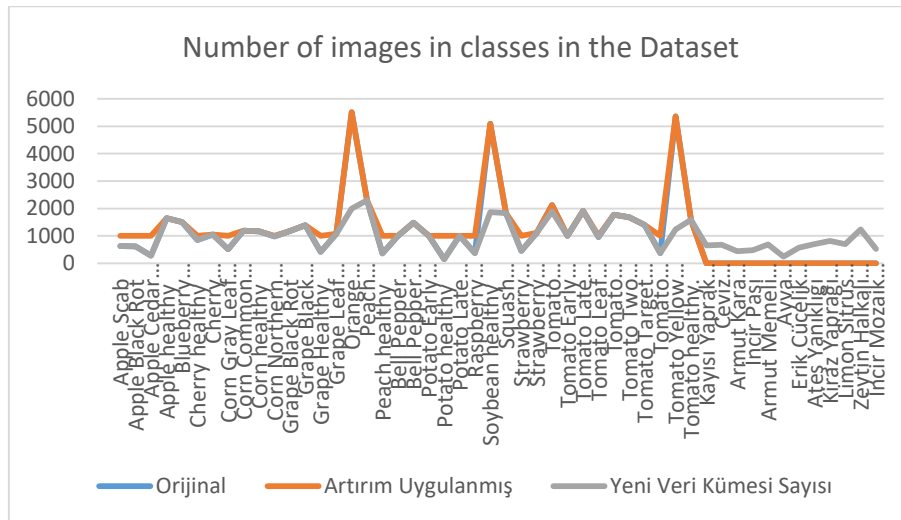


Figure 0. Number of images in classes in the Dataset

As seen in Figure 3, an incrementing process was applied to the images in some classes in order to balance the number of images in the dataset. The augmentation process was carried out by changing the directions of the selected images. Although the human eye can easily perceive this, these two images are completely different for the computer. For this reason, any number of reproductions can be made from the same image. Data augmentation can be done by

changing the orientation of the images, changing the brightness and contrast, and changing color filters.

The images in the dataset are 204x204, 256x256, or 350x350 in size, 72ppi resolution, 8-bit color depth, and are in JPEG format with RGB color mode.

4. APPLICATION

First, the data to be used in the study must be determined, and then the images in the determined data set must be classified and their class names determined. Then, the dataset needs to be trained as Image Classification. At this stage, the model file was obtained after training on Google Colab. The model file developed during the mobile application development phase is included in the application. After the development phase of the application, the testing and debugging phase began. After this stage, the final stage of reporting the results began. The results are reported. Figure 4 shows the development stages of the Plant Species and Disease Detection mobile application.

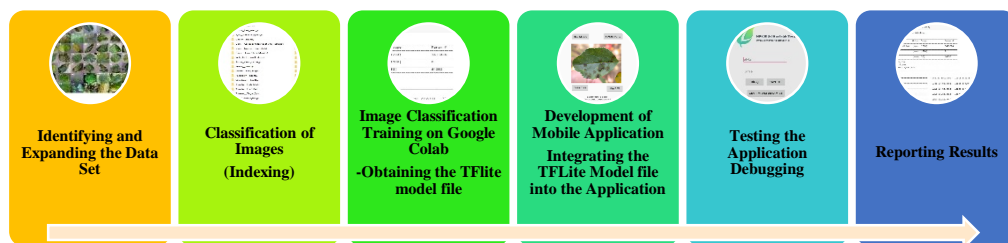


Figure 0. Development stages of the Plant Species and Disease detection mobile application

4.1. Pre-processing stage

PlantVillage dataset was preferred for this study. Because the PlantVillage data set contains images of 14 frequently produced and consumed vegetable-fruit species and 26 disease types frequently encountered in them. There are a total of 54305 images in the dataset. The high variety of leaves used in the dataset and the presence of many images from each class are also reasons for preference. However, the PlantVillage library was not deemed sufficient. For this reason, 12 disease types belonging to 8 different fruit species were added to this dataset. As a result, 38 disease types belonging to 22 plant species were included in the study, and studies were conducted on 50 different classes.

After the data set is determined, it must be classified into given folders. Pictures folders are named in the order “fruitandvegetable_diseasename”. These names will also be used during the training phase. Therefore, it is important to name it this way. Because in practice, the name of the fruit and vegetable and the name of the disease can be easily determined separately.

Since the training will be carried out on Google Colab, the training data, that is, the dataset, must be uploaded to this system. Therefore, it was preferred to upload data to Google Drive for this study. Data was uploaded to the Drive area with the same folder and directory structure on the local computer. After uploading the data to the Drive account, the data is integrated into Google Colab by entering the activation code. After the integration process, the data needs to be processed and trained.

After this process, the Python software libraries required for the model training phase on Google Colab must also be installed on the cloud. For this reason, the necessary libraries are installed

at this stage. Since Google Colab is a system running on the cloud, the necessary libraries must be reinstalled before each session. After the installations and necessary libraries are integrated into the system, the data must be separated into train and test. The data is divided into 90% train and 10% test in each class. After the data is separated, the data is transferred to the training. During the training phase, it was planned to train in sequential order by adopting the "EfficientNet-Lite0" (Tan & Le, 2019) model. The training phase was carried out with 1432 steps in 5 epochs. Figure 5 shows the realization of the training phase.

```

model = image_classifier.create(train_data)
... INFO:tensorflow:Retraining the models...
Model: "sequential"
Layer (type)                Output Shape                Param #
-----
hub_keras_layer_v1v2 (HubKer) (None, 1280)                3413024
dropout (Dropout)           (None, 1280)                0
dense (Dense)                (None, 50)                  64050
-----
Total params: 3,477,074
Trainable params: 64,050
Non-trainable params: 3,413,024
None
Epoch 1/5
3/1432 [.....] - ETA: 2:55:11 - loss: 4.1975 - accuracy: 0.0226

```

Figure 5. Training Phase

At the beginning of the training, the loss value of the trained model was 4.1975; The accuracy value is also 0.0226. As the model was trained, there was a decrease in the loss value and an increase in the accuracy value. At the end of the training, the loss value was 1.0071, while the accuracy value was 0.9535. Figure 6 shows the change in loss and accuracy values.

```

None
Epoch 1/5
1432/1432 [=====] - 14073s 10s/step - loss: 1.8188 - accuracy: 0.7004
Epoch 2/5
1432/1432 [=====] - 233s 157ms/step - loss: 1.0992 - accuracy: 0.9241
Epoch 3/5
1432/1432 [=====] - 225s 157ms/step - loss: 1.0507 - accuracy: 0.9398
Epoch 4/5
1432/1432 [=====] - 226s 158ms/step - loss: 1.0232 - accuracy: 0.9473
Epoch 5/5
1432/1432 [=====] - 223s 156ms/step - loss: 1.0071 - accuracy: 0.9535

```

Figure 6. Change of Loss and Accuracy values

As seen in Figure 6, the training was completed in 14980 seconds in total. This duration corresponds to approximately 250 minutes. After the training phase is completed, the evaluation phase of the model comes. Test data is used in the evaluation phase. At the end of the evaluation, the loss value increased to 0.9604 and the accuracy value increased to 0.9680. After the evaluation process, the model is ready for use. Our completed model was exported in tflite format.

After the model was obtained, the development phase of the application for Android-based mobile devices began. Since an Android-based application will be developed, the Android Studio tool was used as the development tool. Kotlin programming language was preferred as the development language.

Work and operations to be carried out during the application development phase; The user interfaces, user classes, and usage scenarios to be prepared need to be planned. The application is intended to offer different options for normal users (non-member users) and member users. The Use-Case model of the application, which explains the general use of the application, is shown in Figure 7.

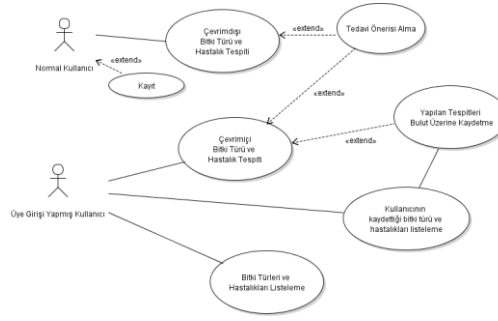


Figure 7. Use Case model of mobile application

Figure 8 shows the class diagram of the plant species and disease detection application.

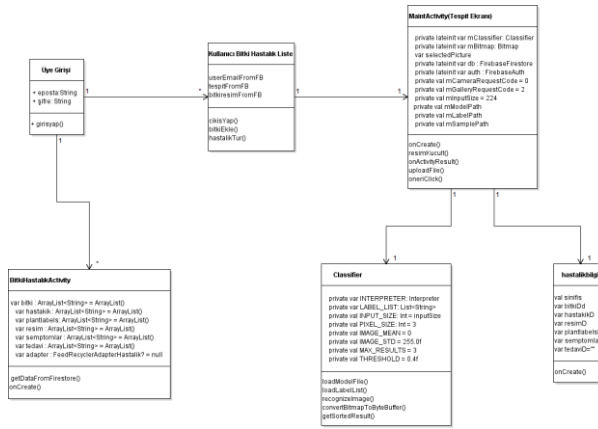


Figure 8. Bitki Türü ve Hastalık Tespit Mobil Uygulaması Class Diyagramı

In order for the user to use the program effectively, interfaces must be present. In Android application software, user interfaces are provided by activities. Each activity fulfills a function of the program.

The application welcomes the user with the “Login Activity”. In this activity, the user;

- You can register with your e-mail address and your own password.
- If registered, he can log in with his email and password.
- It can continue offline without any membership process.

The user's information is stored encrypted on the cloud. When you click on the login button, you will be directed to the "User History Detection Screen".

When the user clicks on the continue offline button, they are directed to the Detection Screen. The application login screen is shown in Figure 9.

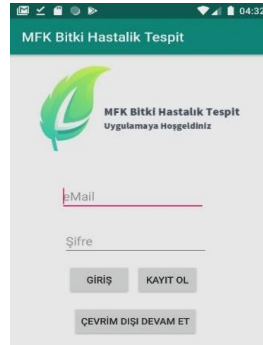


Figure 9. Login Activity

When the user logs in to the system, his/her previously saved records are listed. The user can view these records. When he wants to add a new plant, he clicks on the menu icon in the upper right corner and selects the "Add Plant" option from the menu that opens. This situation is shown in Figure 10.

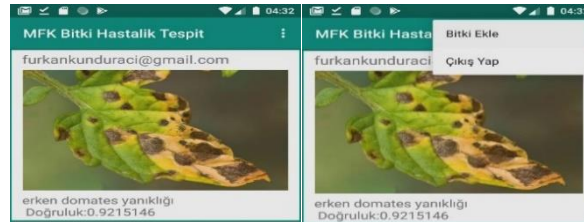


Figure 10. Add Plant Menu

On the Detection Screen, there are "Select Image" and "Open Camera" buttons and a "Detect" button. By default, a healthy soybean leaf is shown. This is shown in Figure 11.



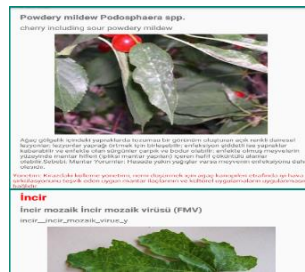
Figure 11. "Detection Activity (Screen)"

However, there is also a hidden "Save" button. When the user clicks on the "Select Image" button, he is directed to the device gallery, and when he clicks on the "Open Camera" button, he is directed to the device camera. The image that the user selects from the gallery or the camera is loaded into the "ImageView" object. When the user clicks on the "Detect" button, the type of leaf in the picture and the type of disease, if any, are shown with accuracy. This is shown in Figure 12. At this stage, the model trained on Google Colab is used. After detection, the "Save" button becomes active.



Figure 12. Image Classification by Mobile Application

When you click the save button, the information is saved in the Google Firebase system. After saving, the user is directed to the “History Detection” screen. This is shown in Figure 13.



Şekil 13. "Detection History" Screen

When the user clicks on the "Suggestion and Treatment" Button shown in Figure 12, he is directed to the Information Page regarding the detected disease. The “Recommendation and Treatment” screen is shown in Figure 14. The information here has been compiled from the Pest Control Technical Instructions (Aydemir, 2008) published by the Ministry of Food, Agriculture, and Livestock of the Republic of Turkey and from various sources.



Figure 14. Suggest and Treatment Screen

If the menu icon is clicked in the list view and the Log Out button is clicked, the account will be logged out. The logout process is performed on the Firebase system. The “Sign Out” menu is shown in Figure 15.



Figure 15. Sign Out Menu

5. CONCLUSIONS AND DISCUSSIONS

In order for the application to make detection, a model must first be created. There are two options for such operations in the literature; The first is the object detection option and the second is the image classification option. In this application, an image classification model was created. For image classification training, a model was created based on the EfficientNet-Lite0 model using the Google Colab tool. The training was carried out on Google Colab and was completed in 14980 seconds. The loss value, which was 4.1975 at the beginning of the training, decreased to 1.0071 at the end of the training.

At the beginning of the training, the accuracy value was 0.0226, i.e. 2.26%; At the end of the training, it increased up to 0.9535, that is, 95.35%. The trained model was included in the application with the Tensorflow library, which is required during the Android application development phase. After this stage, the interface design phase of the application started. After the interface design, the programming phase of the interface functions began. While the compilation SDK version of the application is 30 (Android 11), the minimum SDK version is 23 (Android 6.0). This covers approximately 98.2% of Android devices used today.

In the tests, it was observed that the application works smoothly on Android devices with different screen sizes and different API versions. When the accuracy value of the application is examined, a value of 95% is seen. Although the application is not that high when tested in real life with real plants, it generally performs the desired task. After the application detects plant diseases, there is an average delay of 3.5 seconds as it retrieves disease-related information and treatment recommendations from the cloud system. This delay decreases and increases depending on the internet speed. In addition, since the number of classes belonging to diseases found in tomatoes and tomato leaves is high in the data set, it has been observed that the program is more inclined to compare the leaves given as input to this plant. Many incorrect evaluations arise from this reason. In addition, the application's square image entries were detected more accurately at a higher rate.

In this study, a mobile application was designed to detect plant diseases via images and provide treatment recommendations. The application has been applied for mobile phones with the Android operating system. Mobile phones with the Android operating system constitute 70.16% of phones today. The application covers approximately 98.2% of devices with Android operating system. Therefore, the application is available on approximately 68.90% of today's phones. The application could not be developed for mobile devices with the iOS operating system due to the lack of technological infrastructure. The dataset used in the research consists of single-leaf images taken in an unnatural environment. Instead, it is thought that better results will be obtained if leaf images are taken in natural light in the field during the appropriate season.

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COCCIDIOSIS OF DOMESTIC PIGEONS (COLUMBA LIVIA DOMESTICA) BREED IN SPREAD BELGRADE AREA

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ABSTRACT

Introduction and Purpose: Coccidiosis caused by *Eimeria* spp. is highly infectious and quite a common illness that infects the intestines of birds. About nine species of the genus *Eimeria* were described in these birds, but only three species are of significant, *Eimeria columbae*, *Eimeria columbarium* and *Eimeria labbeana*. It usually exists to some degree in all pigeons, but most adult birds produce sufficient immunity to the disease to continue to be healthy.

Materials and Methods: Examinations were carried out on spread Belgrade area in free-living birds and flocks in controlled conditions. Two fecal analysis methods were used for examination - direct smear and flotation method. Detremination of oocys we performed by its morphological characteristic.

Results: During examination we established infection with *Eimeria columbae* and *E.columbarium*. Most abudant species was *Eimeria columbae* found in 12.32% of clinical manifested infection. In young pigeons disease is acute with mortality ranging from 5 to 47% and most deaths occurring in 3rd and 4th month.

Discussion and Conclusion: The coccidia attack the cells of the intestinal wall, proliferate inside them, then, once the cell is destroyed, the freed pathogens begin to target new cells. Intestinal inflammation occurs, and the mucosa and deeper layers of the intestinal wall are damaged, which can lead to worsening diarrhoea. The watery faeces will be greeny-brown; afterwards it can become distinctly sanguineous. Diarrhoea is accompanied by dispiritedness; the pigeons are lethargic, their plumage is ruffled. Their consumption of feed decreases dramatically, while their water intake increases. In all cases treatment generally lasts for three to five days and we use sulfonamides and in several cases toltrazuril.

Key Words: pigeons, coccidiosis, therapy

RESEARCH ON MANAGERIAL TECHNOSTRESS KNOWLEDGE AND ATTITUDES

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ABSTRACT

Managing technostress among office workers is an increasingly significant role of leaders, the proper knowledge, and attitude can result in effective actions, enabling organizations to tackle challenges in their day-to-day tasks.

The study has been part of my research area on the effects of technostress on organizations. It is proven that within office workers technostress is a growing problem, it can develop serious problems for the individual and the organization and may result in malfunction.

The research was based on an online questionnaire which was promoted on professional IT websites, X and Facebook. It was limited to Hungary and only the answers of leaders were used in the study. In total of 127 answers have been collected. The primary areas were the IT environment of the organisation, stress-related symptoms in the workplace and managerial attitude towards them.

The assumption was that management has limited knowledge about technostress and has challenges linking workforce problems with technology. Managing IT hardware, software and ergonomics. I found out that despite managing technostress in the organization being claimed to be a priority, the IT environment is not focused on the users. Management does notice the symptoms of users but doesn't link it to stress. An important finding was that most leaders reported mental and physical stress symptoms of their team members.

Keywords: Technostress, Management, Information technology, Mental health.

**SYSTEMATIC ANALYZING OF ARTIFICIAL INTELLIGENCE STUDIES
CARRIED OUT ON PEOPLE WITH GLIOBLASTOMA BETWEEN THE YEARS
2018 AND 2023**

**2018-2023 YILLARI ARASINDA GLİOBLASTOMA HASTALARI KULLANILARAK
YAPILAN YAPAY ZEKA ÇALIŞMALARININ SİSTEMATİK OLARAK ANALİZİ**

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ABSTRACT

Introduction and Purpose: Glioblastoma is a highly aggressive and lethal kind of brain cancer. An in-depth examination of AI research can greatly enhance our comprehension of the disease, potentially resulting in more efficacious therapies and enhanced patient outcomes. Through the examination of multiple studies, researchers may evaluate the efficacy and precision of artificial intelligence (AI) technologies in the diagnosis, prediction, and treatment of glioblastoma. This aids in assessing the dependability of AI techniques in therapeutic environments. Examining existing studies promotes innovation by pinpointing deficiencies in present research. It has the potential to facilitate the creation of novel AI models and methodologies, hence expanding the limits of present capabilities in glioblastoma therapy and research. AI also has the capacity to customize remedies for individual patients by utilizing their distinct clinical data. Systematically analyzing research can enhance personalized medicine in the treatment of glioblastoma, resulting in more efficient and focused therapy.

Materials and Methods: We opted for the SCOPUS database to conduct our literature investigation, employing specific keywords such as "artificial intelligence," "glioblastoma," "machine learning," "neural networks," and "artificial intelligence" within the time frame of 2018 to 2023. We established certain criteria for the selection or exclusion of studies, which included the following: peer-reviewed papers, English language, and special fields such as medicine, biochemistry, genetics, molecular biology, and computer science. To do data extraction, we initially obtained the following information: author, year, study type, sample

size, AI approach employed, and major findings. Subsequently, we arranged the extracted data into tables to facilitate comparison and analysis. We conducted a thorough examination to identify any potential bias in the research that could influence the results. In order to conduct data analysis, we examined patterns in the utilization of artificial intelligence techniques, success rates, and advancements in diagnosis or treatment and conducted a comparative analysis of findings from other studies to identify shared conclusions or contradictory outcomes.

Results: We identified 320 documents pertaining to the time period spanning from 2018 to 2023, which encompassed the specific keywords we had chosen. A total of 129 of them met our exclusion criteria for analysis. We observed a gradual rise in interest beginning in 2021. 41.7% of the 100 studies were documented in the field of medicine, while 22.1% of the 53 studies were documented in the fields of biochemistry, genetics, and molecular biology. Additionally, 12.5% of the research (30) was documented in the field of computer science.

Discussion and Conclusion: Our study's findings can illuminate the most efficient artificial intelligence methodologies and approaches, aiding in the establishment of optimal practices within the area. Standardizing treatment methods is essential for enhancing the quality of care provided to glioblastoma patients. The management of glioblastoma typically necessitates a comprehensive and interdisciplinary strategy. Additionally, our findings can expedite the incorporation of artificial intelligence into fields such as neurosurgery, cancer, and radiology, resulting in a comprehensive and all-encompassing approach to medical care.

Key Words: Glioblastoma, Artificial Intelligence, Machine Learning, Preventive Medicine

ÖZET

Giriş ve Amaç: Glioblastoma oldukça agresif ve ölümcül bir beyin kanseri türüdür. Yapay zeka araştırmalarının derinlemesine incelenmesi, hastalığa ilişkin anlayışımızı büyük ölçüde geliştirebilir ve potansiyel olarak daha etkili tedaviler ve gelişmiş hasta sonuçlarıyla sonuçlanabilir. Araştırmacılar, birden fazla çalışmayı inceleyerek yapay zeka (AI) teknolojilerinin glioblastomanın tanı, tahmin ve tedavisinde etkinliğini ve kesinliğini değerlendirebilir. Bu, terapötik ortamlarda yapay zeka tekniklerinin güvenilirliğinin değerlendirilmesine yardımcı olur. Mevcut çalışmaların incelenmesi, mevcut araştırmalardaki eksiklikleri tespit ederek yeniliği teşvik eder. Yeni AI modellerinin ve metodolojilerinin oluşturulmasını kolaylaştırma potansiyeline sahiptir ve dolayısıyla glioblastoma tedavisi ve araştırmasındaki mevcut yeteneklerin sınırlarını genişletmektedir. Yapay zeka aynı zamanda farklı klinik verilerini kullanarak bireysel hastalar için tedavileri özelleştirme kapasitesine de sahiptir. Araştırmaların sistemli olarak analiz edilmesi, glioblastoma tedavisinde kişiselleştirilmiş tıbbi geliştirebilir ve bu da daha etkili ve odaklanmış bir tedaviye yol açabilir.

Gereç ve Yöntem: Literatür araştırmamızı gerçekleştirmek için "yapay zeka", "glioblastoma", "makine öğrenimi", "sinir ağları" ve "yapay zeka" gibi spesifik anahtar kelimeleri kullanarak SCOPUS veritabanını seçilmiştir. 2018'den 2023'e. Çalışmaların seçilmesi veya hariç tutulması için belirli kriterler belirledik; bunlar arasında aşağıdakiler yer almaktadır: hakemli makaleler, İngilizce dili ve tıp, biyokimya, genetik, moleküler biyoloji ve bilgisayar bilimi gibi özel alanlar. Veri çıkarımı yapmak için öncelikle şu bilgileri elde ettik: yazar, yıl, çalışma türü, örneklem büyüklüğü, kullanılan yapay zeka yaklaşımı ve önemli bulgular. Daha sonra,

karşılaştırma ve analizi kolaylaştırmak için çıkarılan verileri tablolar halinde düzenlenmiştir. Araştırmada sonuçları etkileyebilecek olası önyargıları belirlemek için kapsamlı bir inceleme yapılmıştır. Veri analizini yürütmek için yapay zeka tekniklerinin kullanımındaki kalıpları, başarı oranlarını ve teşhis veya tedavideki ilerlemeleri inceledik ve ortak sonuçları veya çelişkili sonuçları belirlemek için diğer çalışmalardan elde edilen bulguların karşılaştırmalı bir analizini yapılmıştır.

Sonuçlar: 2018'den 2023'e kadar olan döneme ait, seçtiğimiz belirli anahtar kelimeleri kapsayan 320 belge belirlenmiştir. Toplam 129 tanesi analiz için hariç tutma kriterlerimizi karşıladı. 2021 yılından itibaren ilginin giderek arttığını gözlemlenmiştir. 100 çalışmanın %41,7'si tıp alanında, 53 çalışmanın ise %22,1'i biyokimya, genelmiştir ve moleküler biyoloji alanlarında belgelenmiştir. Ayrıca araştırmanın %12,5'i (30) bilgisayar bilimleri alanında belgelenmiştir.

Tartışma ve Sonuç: Çalışmamızın bulguları, alanda en uygun uygulamaların oluşturulmasına yardımcı olarak en etkili yapay zeka metodolojilerine ve yaklaşımlarına ışık tutabilir. Glioblastoma hastalarına sağlanan bakımın kalitesini artırmak için tedavi yöntemlerinin standartlaştırılması önemlidir. Glioblastomanın yönetimi tipik olarak kapsamlı ve disiplinler arası bir strateji gerektirir. Ek olarak bulgularımız, yapay zekanın beyin cerrahisi, kanser ve radyoloji gibi alanlara dahil edilmesini hızlandırabilir ve bu da tıbbi bakıma yönelik kapsamlı ve her şeyi kapsayan bir yaklaşımla sonuçlanabilir.

Anahtar Kelimeler: Glioblastoma, Yapay Zeka, Makine Öğrenme, Bireysel Tıp

SERVO CONTROL DESIGN AND APPLICATION FOR AYRAN PACKAGING LINE CAPPING UNIT

AYRAN PAKETLEME HATTI KAPAKLAMA ÜNİTESİ İÇİN SERVO KONTROL TASARIMI VE UYGULAMASI

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ÖZET

Süt ve ayran dolum hatlarında şişe kapaklarının sıkılması için geçirilen sürenin kısaltılması hattın hızını büyük ölçüde etkilemektedir. Bu nedenle, sunulan çalışmada ayran dolum hattında yer alan kapak sıkma ünitesinin tasarımı ve servo kontrolü araştırılmıştır. Kapak sıkma ünitesi için servo motor ve programlanabilir lojik denetleyici (PLC) kontrollü bir sistem tasarımı gerçekleştirilmiştir. Şişe kapaklarının tek tek sıkılması yerine 6'lı gruplar halinde sıkma işleminin gerçekleştirilmesi planlanmıştır. Böylelikle birim zamanda kapaklanacak şişe sayısı arttırılmıştır. Konveyör üzerinde ilerleyerek sıkma ünitesinin altına gelen şişeler üzerindeki kapaklar, z ekseninde hareket eden çoklu sıkma ünitesi tarafından yakalanmakta ve hassas bir biçimde sıkılmaktadır. Tasarlanan sistem ile çoklu kapağın aynı anda sıkılması ile hat hızı büyük oranda arttırılmıştır. Şişe üzerine bırakılan kapakların tam olarak oturmaması sonucu başarısız olunabilecek durumlar için kontrol algoritmasında değişiklik yapılarak çözüm üretilmiştir. Sıkma işlemlerinin tamamında tork değerleri kontrol edilerek gereken sıkma miktarına ulaşıncaya kadar görev tamamlanmıştır. Bu çalışma kapsamında gerçekleştirilen tasarım ve kontrol faaliyetleri ile ayran dolum makineleri için kapak sıkma görevi servo kontrol kullanılarak gerçekleştirilmiştir. Gerçekleştirilen kontrol algoritması ile çoklu sayıda kapak eş zamanlı olarak başarılı bir şekilde kapatılabilmektedir. Böylelikle dolum hattının hızının arttırılmasının yanı sıra eklenen yeni ünite ile hattının başarımı ve verimi de arttırılmıştır.

Anahtar Kelimeler: Proses kontrol ve otomasyonu, Sıvı dolum sistemleri, Şişe dolum, Servo kontrol, PLC.

ABSTRACT

The duration spent on the tightening of bottle caps in milk and ayran filling lines significantly affects the speed of the line. Therefore, this study investigates the design and servo control of the cap-tightening unit in the ayran filling line. A system design controlled by a servo motor and a programmable logic controller (PLC) has been implemented for the cap-tightening unit. Instead of tightening bottle caps individually, the plan is to perform the tightening process in groups of 6. This way, the number of bottles to have their caps tightened within a unit time is increased. As bottles progress on the conveyor and reach the cap-tightening unit, the caps on them are captured and precisely tightened by a multiple squeezing unit moving in the z-axis. With the designed system, the line speed is greatly increased by tightening multiple caps simultaneously. A solution has been found by changing the control algorithm for situations where failure may occur as a result of the caps placed on the bottle not fitting properly. Torque values are checked during all tightening processes and the task is completed when the required tightening amount is reached. Within the scope of this study, the cap-tightening task for ayran filling machines has been accomplished using servo control in the design and control activities conducted. The implemented control algorithm has successfully enabled the simultaneous closure of a large number of caps. Consequently, not only has the speed of the filling line increased, but the addition of the new unit has also enhanced the overall performance and efficiency of the line.

Keywords: Process control and automation, Liquid filling systems, Bottle filling, Servo control, PLC.

GİRİŞ

Üretim teknolojilerindeki hızlı ilerlemeler, günümüzdeki sıvı paketleme hatların birim zamanda doldurması gereken hacmin ve paketlenen ürün sayısının artmasını gerektirmektedir. Sıvı gıda üretim endüstrilerinden biri olan süt ve süt ürünleri endüstrisinde verimliliği artırmak, üretim süreçlerini optimize etmek ve ürün kalitesini artırmak için Ayran dolmuş hatları kullanılmaktadır. Bu otomasyon sistemleri ile ayran gibi sıvı gıdaların hassas bir şekilde dolmuş gerçekleştirilmektedir. Geleneksel bir Türk içeceği olan ayran ve sıvı yoğurt dolmuş makinelerinin otomasyonu konusunda literatürde çeşitli çalışmalar mevcuttur. PLC kullanılarak otomasyonu sağlanan ayran yapma ve dolmuş makinelerinin kontrolüne bir örnek (Ozkan & Çetinkaya, 2012)'de görülebilir. Bu çalışmada dolmuş sistemi için SCADA izleme görevleri de sağlanarak tam otomatik çalışma sağlanmıştır. Farklı ebatlardaki şişeler için PLC kontrollü bir başka dolmuş sistemi (Saleh et al.)'de önerilmiştir. Bu sistem, dolmuş işlemi izlemek ve kontrol etmek için gelişmiş teknolojiler kullanılmaktadır. (Chakraborty et al., 2015)'te şişe kapaklarının otomasyonu konusunda PLC tabanlı çözümlere bir örnek sunulmuştur. Endüstri 4.0 konseptini kullanarak otomatik ayran dolmuş sistemlerinde dolmuş noktasının artırılması ile dolmuş sürecinin optimize edilerek verimliliğin artırıldığı başta olmak üzere ileri otomasyon uygulamaları da gösterilmiştir (Salah, Khan, et al., 2021, Salah, Alsamhan, et al., 2021, Chen et al., 2022). Şişe kapaklarının otomatik kapatılmasının çalışıldığı bir diğer çalışma (Chikumbirike et al., 2021) de sunulmuştur. Bu çalışmada, üretim mühendisliği açısından kapaklama ünitesinin çalışması ve verimliliğinin artırılması detaylı olarak araştırılmıştır. Operasyonun mükemmelliğinin sağlanması için altı sigma kuralı tabanlı çözüm yaklaşımları önerilmiştir. Farklı PLC modelleri kullanılarak gerçekleştirilen benzer kontrol uygulamaları da gerçekleştirilmiştir (Mukherjee et al., 2022, Muralidharan et al., 2021). Factory IO programı kullanılarak yoğurt dolmuş sistemlerinin üç boyutlu simülasyonuna ait bir çalışma da gerçekleştirilmiştir (Salah et al., 2023). Yoğurt ve ayran dolmuş sistemlerinde diğer bir önemli

arařtırma konusu hijyenin saęlanmasına ynelik gerekleřtirilen yıkama ve sterilizasyon otomasyonlarıdır. Bu konuda gerekleřtirilen alıřmalar mevcuttur.

Sunulan alıřmanın ilk blmnde dolum hattının tanıtımı ve hatta yer alan kapaklama nitesi iin gereken iyileřtirme alıřmaları aıklanmıřtır. Oluřturulan servo kontrol algoritması tanıtılarak alıřmanın sonularına yer verilmiřtir.

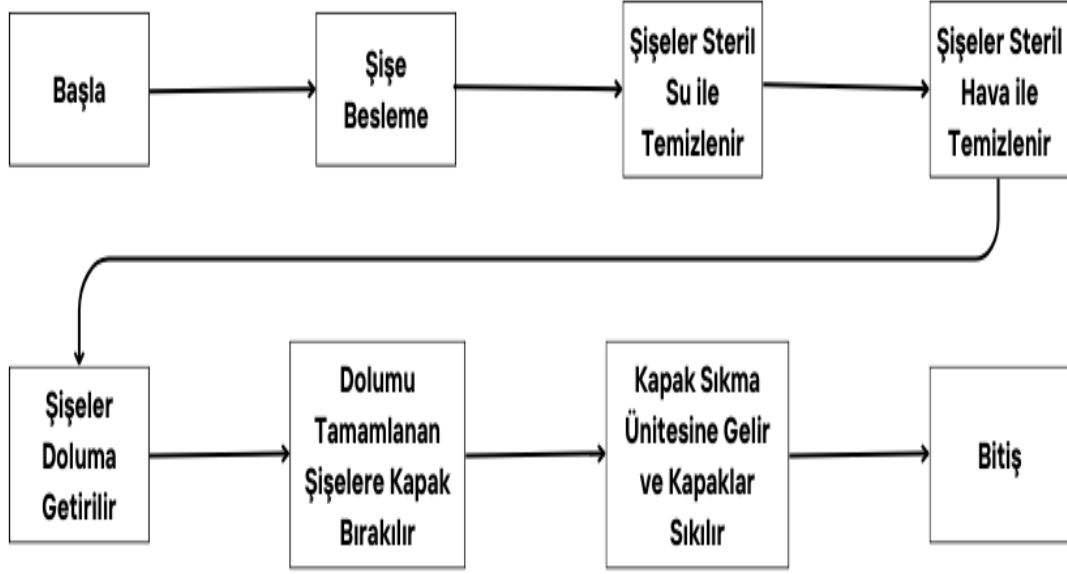
DOLUM HATTININ TANITIMI ve İYİLEŐTİRMELER

Bu alıřmada řiře ayran dolum makinelerinin kapak sıkma nitesinde karřılařılan problemlerin zmne ynelik servo kontrol uygulaması gerekleřtirilmiřtir. Ergin Makine Otomasyon Proses San. ve Tic. A.Ő. bnyesinde retimi gerekleřtirilen dolum hattının resmi Őekil 1’de sunulmuřtur. retimi gerekleřtirilen ayran dolum hattını genel alıřma senaryosu ise Őekil 1’de verilmiřtir.



Őekil 1. Dolum hattı

Őekil 2’de sunulan tipik alıřmasına gre beslenen boř řiřeler sterilizasyon ve kurutma iřlemlerinin ardından dolum nitesine ulařmaktadır. Dolumu gerekleřen řiřelerin zerin bırakılan kapaklar, kapak sıkma nitesine ulařır. Bu nite kapakları sıkır ve rn dolumu tamamlanarak hattı terk eder.



Şekil 2. Dolum hattı çalışma senaryosu

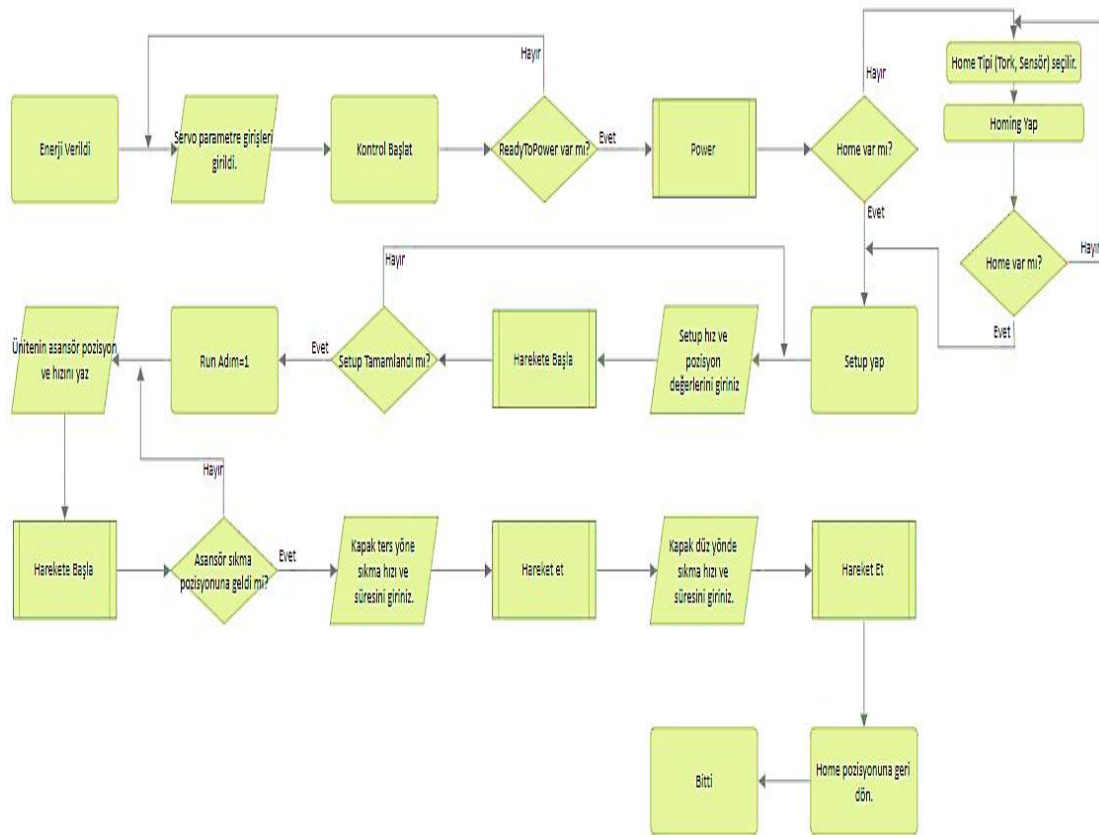
Kapak sıkma ünitesi iyileştirme çalışmaları kapsamında hat dolum hızının artırılabilmesi için çoklu dolum yapılması ve kapakların çoklu olarak sıkılması planlanmıştır. Bu kapsamda sıkma ünitesinin tek bir şişe kapağı sıkma yerine çoklu örneğin altışarlı gruplanmış şişelerin kapağını aynı anda sıkması planlanmıştır. Bu amaçla yeniden oluşturulan şişe sıkma ünitesinin tasarımı Şekil 3'te sunulmuştur.



Şekil 3. Çoklu kapak sıkma ünitesi

SERVO KONTROL UYGULAMASI

Dolum ünitesinde, kapakların sıkılması esnasında kapakların yerlerine tam oturmaması ve devamlı dönmesinden kaynaklanan kapak hasarları meydana geldiği belirlenmiştir. Bu sorunun çözülebilmesi için üniteye kullanılan asenkron motorlar servo motor ile değiştirilmiş ve kontrol algoritması geliştirilmiştir. Gerçekleştirilen uygulama ile kapakların tork algısı olmaksızın sıkılmasından kaynaklı zayıflığını en düşük seviyede tutma ve güvenli iş sahası oluşturabilme imkanı doğmuştur. Bundan önceki makinelerde bu bölümün asenkron motor ile devreye alınması yapılan hareketin takibinin yapılamamasını beraberinde getirmiştir. Bu motorun pozisyonlama hassasiyeti ve boyuta göre daha yüksek güç ve tork sağladığı için kullanılması tercih edilmiştir. Servo motorların kullanılmasının birden fazla amacı bulunmaktadır. Bu özelliklerden bir tanesi ise dönme esnasında ortaya çıkan anlık tork miktarı da ölçülmesi asıl önem arz eden kısımlardan birisidir. Anlık tork miktarının ölçülmesi bize, kapaklarda fazla döndürme ve sıkma eyleminin önüne geçerek oluşabilecek zayıflığı azaltması ve makine çalışma sahasında oluşabilecek herhangi bir el, kol veya parça sıkışması olasılığına karşı okunabilecek fazla tork ile makinenin durdurulması sayesinde güvenli iş sahası oluşturmak gibi avantajları bulunmaktadır. Bütün bunlara ek olarak şişe üzerine bırakılan kapakların zaman zaman tam oturmaması dolayısıyla kapama işleminin tam anlamıyla gerçekleşmemesinden kaynaklı bir çözüm olarak kapak sıkıma başlamadan önce yarım tur ters yöne çevirerek kapağın yerine tam oturması sağlanmıştır. Ardından kapama yönünde ilerletilerek kapağın sıkılması ve tork değerine göre kapama işlemini algılayıp durulması planlanarak kapakta çapaklanmanın önüne geçilmiştir. Servo motor için Şekil 4'te sunulan kontrol algoritması oluşturulmuş ve kodlanmıştır.



Şekil 4. Servo kontrol algoritması

SONUÇLAR

Bu çalışmada, süt ve süt ürünleri endüstrisinde kullanılan dolum hatlarındaki ayran şişe kapağı sıkma ünitelerindeki tespit edilen temel problemler için çözümler sunulmuştur. Hattın hızının arttırılabilmesi için bir anda tek şişe kapağının sıkılması yerine altışarlı gruplar halinde şişe kapakları sıkılarak hattın hızı büyük oranda arttırılmıştır. Diğer bir problem olan, kapakların deformasyonu tork kontrollü servo motor kullanımı ile çözülmüştür. Gerçekleştirilen çalışmalar ile hatta kullanılan ünitenin daha verimli ve daha etkin çalışması sağlanmış, üretimin hızlı ve güvenilirliğinde iyileşmeler sağlanmıştır.

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SURGICAL SITE INFECTIONS INCIDENCE AND ASSOCIATED RISK FACTORS AMONG ELECTIVE AND EXPEDITED SURGERY IN TIRANA, ALBANIA: A CROSS SECTIONAL STUDY

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ABSTRACT

Introduction: The surgical site infections institutional surveyance is considered inadequate in our health centers, and furthermore, previous studies and papers investigating surgical site infections are noticeably scarce. In this background it becomes nearly impossible to establish and evaluate any new preventive strategy or policy for surgical site infections, since we are lacking the data to prove its statistical significance. With this study we are aiming at setting a milestone by determining the incidence of SSI and associated risk factors in elective and expedited cases in our Trauma University Hospital.

Methods: This is a cross sectional study conceived to analyse all the collected data, from the hospital database and individual patient follow up questionnaires of all the elective and expedited surgery cases during two time periods March 1 to 31, and September 1 to 30, 2023 in our facility. Data analysis was organised to report both announced and missed SSI cases and investigate presence of associated risk factors.

Results: During both selected time periods we registered a total of 514 elective and expedited surgery cases from, general surgery, orthopaedics, neurosurgery and ENT departments. No SSI cases were reported during both time periods. The average age was 49.2 yrs and on overall, 9% were smokers (more than 5 cigarettes per day), DM was present in 14% of cases, other chronic conditions (including cardiac and other systems morbidities) in 10.7%. From the follow up questionnaire data we stated a 3.3 % overall SSI incidence rate with only 17 revealed cases with delayed wound healing and confirmed surgical site infection.

Conclusion: The reported incidence of SSI in this study is lower compared to other neighboring countries of similar demo and geographic characteristics, and/or better rated regional facilities with reported ongoing surveyances and established preventive strategies. Further studies are required to address low reporting tendencies and expose the unintentionally missed cases.

Keywords: Surgical site infections, elective surgery, expedited surgery, incidence, risk factors,

Introduction

Surgical site infections (SSI) are a major complication of surgery worldwide. Because of their preventability, they have always been considered a major public health threat, that increases drastically treatment costs, lengthens hospital stay, decreases patient's quality of life and increases significantly both postoperative morbidity and mortality.¹

They are the most common type of infection within the hospital acquired infections (HAI) in low- and middle-income countries, and the second most common in high-income countries²

The World Health Organization (WHO)'s 2011 estimates, reported the incidence of SSI to be 1.2 - 5.2% in high income countries and 10.8% in low income countries³.

In some very low income African countries, the prevalence of SSI is reported to be as high as 26%.⁴

Such high SSI prevalences clearly prioritised international support for low to middle income countries in order to optimize surgical outcomes. Such global initiatives contributed in developing WHO surgical safety checklist (supplementary materials Fig.1), applicable specifically to prevent SSI, in low income countries, in deficient settings or in absence of appropriate resources.⁵

Nevertheless, we are not using WHO surgical safety checklist in our center and its overall application showed no satisfactorily results in improving surgical outcomes. The results emphasized the importance of a more multisegmentary comprehensive approach and the employment of carefully built local preventive policies.⁶

Surgical site infections not only increase postoperative morbidity and mortality, but the irrational antibiotics usage during prophylaxis, and other postoperative infection control protocols, are clearly demonstrated to increase antibiotic resistance.⁷

In Europe the highest reported SSI incidence is 9.5% for colon surgery, followed by 3.5% for coronary artery bypass graft, 2.9% for caesarean section.^{8,9}

In Africa, 2 studies conducted in Sierra Leone recorded SSI prevalence rates ranging from 7.3 to 10.9% in caesarean section wounds^{10,11}.

Statistically in both low and high income countries, surgical site infections are accounted for being the primary death cause during the postoperative period, before and after discharge.¹²

Our institutional database, is lacking constructive data regarding antibiotic resistance, postoperative wound isolates, and unfortunately there is no continuous institutional surveyance regarding SSI cases, and under such circumstances, it becomes crucial to determine the incidence of SSI within a time period in order to assess the efficacy of the current SSI preventive policies and practices, and also to test new policies and evaluate their efficacy.

In this study, we aimed to establish the incidence and risk factors of SSIs in the Trauma University Hospital, to compare results with neighboring countries and other centers of similar rating and population characteristics.

Methods

This is a cross sectional study designed to collect data from expedited and elective surgery patients. The study was conducted at Trauma University Hospital, Tirana. This facility is the only tertiary medical center in our country, being of service to the two largest cities of Albania, where more than half of the population is currently living.

We included all hospitalized patient from two general surgery departments, three orthopedics, one neurosurgery and one ENT department. Every department admits expedited and elective surgery cases on a regular agenda and each department administers a separate operating theatre. The study participants were all the hospitalized expedited and elective surgery patients, who were admitted to the surgery departments during the selected time periods. We did not set age limits in the inclusion criteria.

We dropped the unreachable cases, patients who refused consent and excluded all patients with documented infection prior to current surgery, whose infections were not classified as SSIs by definition (abscesses, local puncture wounds, external trauma related wounds, infected burn wounds).

The cases were selected from two separate time periods. The time periods were set 6 months apart respectively from March 1 to 31, and September 1 to 30, 2023. We selected these time periods upon admission frequency for such surgeries in our facility. The hospitalization wards in our center lack centrally controlled air conditioning systems, therefore in our study sample selection, we favored the most neutral annual meteorological conditions. We avoided all the external environmental factors, such as very high or very low temperatures, marginal atmospheric pressure, lack of or increased exposure to sunlight and humidity etc. These factors are predominant in borderline seasons (summer and winter), and they might as well impact the rates of incidence of SSI.

The target data in the individual patient form (supplementary materials Fig.2), included all the patient and hospital related risk factors, and the follow up assessment of surgical site infections. A senior nurse collected the target data from the database of the patients' files and records, as recorded by admission nurses and ward doctors during hospitalization. The first three sections of the patient's form included patient generalities like age, sex, socio-demographic characteristics, chronic diseases, usage of drugs and other condition like immunodeficiencies either intrinsic or acquired that might alter the predisposition to develop SSI. Information regarding severity and duration of the procedure and the overall hospitalization duration, could easily be obtained from the files, but still certain topics like surgical procedure duration, and hospital room patient density, were included in follow up questionnaires to be recorded directly from the patients' interviews.

In the fourth section, we investigated preoperative preparation of the patient including subjective questions, about recommendations of preoperative bathing, chlorhexidine use, and surgical site hair removal, and also informed consent about the overall risks of the surgical procedure and specifically surgical site infection risks.

We organized the follow up section of each individual patient questionnaire form, based on similar constructs to investigate and detect unregistered and unreported cases of SSI.¹³ The follow up questionnaire was completed after at least 90 days' post discharge for all orthopedics department patients, and at least after 30 days' post discharge for all other departments patients.¹²

The information was gathered by phone, either directly from the patient or from the next of kin in pediatric or geriatric cases, or wherever cooperation was considered inappropriate due to objective reasons. All the forms were filled manually by the same health personnel at the admission desk, who completed the hospitalization procedure. All the patient's characteristics obtained from the hospital records, and all the data collected by the follow up questionnaire were inserted in the MS statistical software for further analysis.

The case was classified as SSI positive, if within 90 days for orthopaedic patients or within 30 days' post-surgery for other departments the patient reported positive, for at least a purulent discharge from the incision during these time periods and at least 2 of the following, late wound closure (more than 2 weeks), readmission to hospital, extra antibiotics, fever more than 38°C longer than 24 hrs, local swelling, redness, local heat, foul smell, pain or tenderness.¹⁴

Data management and analysis was performed exporting the data from individual patient form follow up questionnaire into Microsoft Excel, cleaned, coded and transferred ready for STATA analysis.

Frequencies and percentages of all variables, were used as description statistics to present socio demographic and clinical characteristics of the study population.

Factors associated with surgical site infections (SSIs) were identified by univariate and multivariable logistic regression, with findings presented as crude odds ratio and adjusted odds ratio after multivariable analysis. A p value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the Institutional Ethics Committee of Trauma University Hospital Tirana. A copy of the approval letter and the details of the study including the data collection, analysis and possible results and conclusions were sent to the administrations of the hospital and all the chiefs of the departments included in the study. The participants informed consent was taken by phone prior to the interview and all the reached participants who refused to consent were still offered comprehensive advice, and their details were not recorded. Any participants requesting withdrawal, was free to end the interview at any time.

Results

A total of 514 patients were hospitalized at Trauma University Hospital for expedited and elective surgery during the two time periods March 1-31 and September 1-30, 2023. Approximately 60.1 % of the participants were from general surgery department, 34.2 % were from orthopaedics and the remainder, 4.3% from neurosurgery and 1.4 % from ENT department. We were not able to reach 8 patients or 1.5% of the overall population and, 11 or 2.1% from the contacted patients refused the informed consent. These cases were excluded from the study since no follow up data could be provided and we could not evaluate the SSI status of these patients. The majority were females 292 (59%) and the average age was 49.2 yrs. of age. 69 patients (14%) admitted being under treatment for diabetes mellitus, using either insulin or oral antidiabetics. And, 10.7% of the cases (53 patients) reported suffering from a chronic condition involving major systems of the body, the most frequent being cardiac diseases present in 39 out of 53 patients. Smoking consumption was confirmed in 45 participants (9%) with male predominance (33 males and 12 females). The average BMI was 25.7, and regarding education the majority of 68% had only finished primary school, and only 8% owned a university degree.

We found no registered SSI infection case in the institutional database, or stated otherwise, no confirmed SSI infection was reported within the population of the study, during both time periods.

From all the contacted and interviewed cases, we revealed 17 cases that were classified as SSI infection positive. All these cases reported having purulent discharge from the surgical wound lasting more than 24 hours and also checked positive for more than 4 of the accompanying symptoms like swelling, redness, pain, heat etc., as mentioned above.

These cases distribution was, 11 cases from general surgery, 5 from orthopaedics and 1 from neurosurgery department, 11 were males and 6 were females.

The average age of the positive reports, was 58.6 years with the youngest patient aged 42 and the oldest aged 88 years old. 11 patients (64.7%) were males and 6 were females. The average BMI was 29, and none of the subjects was a regular consumer of alcohol (≤ 25 cc of alcohol per day). Only one owned a university degree, and 10 cases had finished only basic education. 6 of the positive cases were smoking addicts, and 7 participants were diabetes mellitus positive under oral antidiabetic treatment. 82% (14 patients) of the positive cases presented with other chronic diseases, and 41% (7 patients) having both diabetes mellitus and another chronic organ disease.

As per wound classification according to potential of infection and extend of involvement, all these cases, were considered, clean to clean contaminated wounds and the infections were considered superficial site infections (supplementary materials Fig.3). All surgical procedures were reported as deep surgeries with durations lasting more than 2 hours, and all of the

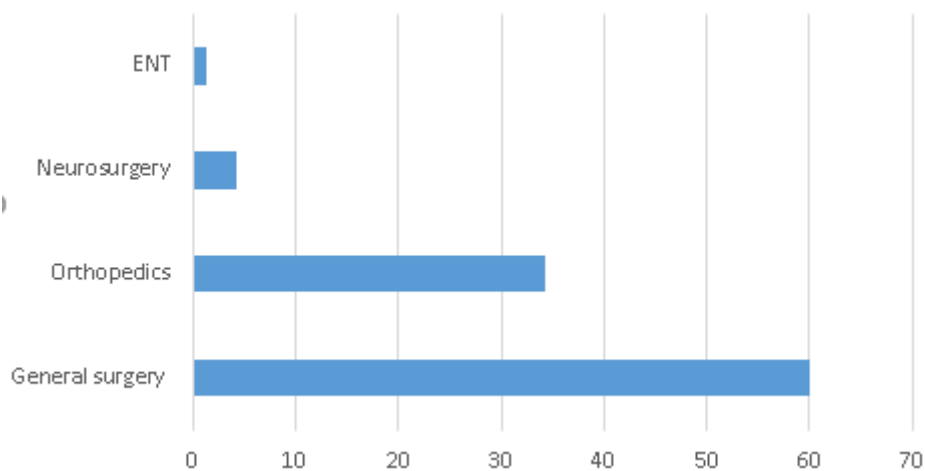
participants reported to have been adequately informed regarding the infection risk of the planned procedure.

Discussion

We have reported a 3.3 % SSI infection incidence rate and have provided comprehensive multidepartmental data regarding incidence and risk factors of SSI. This incidence is significantly lower incidence, compared to similar geo and demographically similar neighbouring centres of the same rating.^{15,16}

We were able to reach and to include in the study 96.3% of the targeted population. The distribution of positive SSI infection cases among departments, is a reflection of the contributions of each department to the study population, as a result we can report an equal risk for a patient to develop SSI in all departments of the centre of the study. (Fig.1)

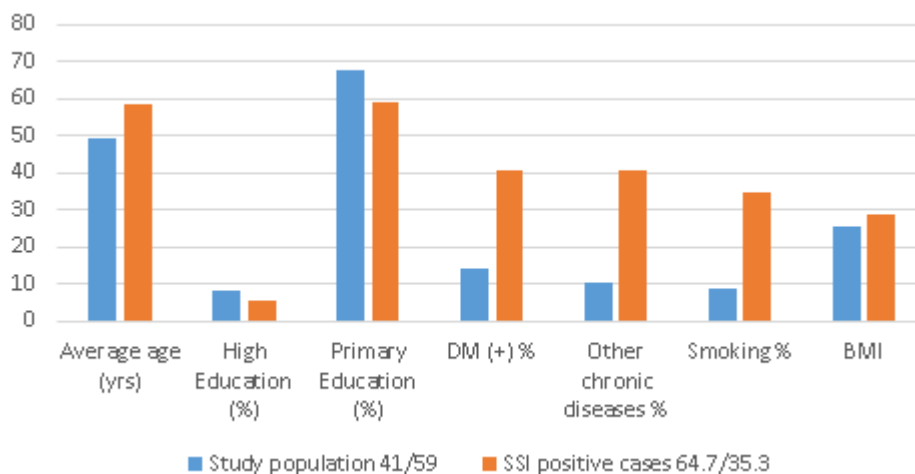
Figure 1



The average age of the positive group was significantly higher than that of the population of the study (58.6 yrs. vs 49.2yrs). (Fig.2)

We observed a higher percentage of male-to-female ratio in the positive group. The male population is 64.7% in the positive group vs 41% of the overall study population. There have been no papers that report the predisposition of a certain sex population, to develop SSI infection, and under such circumstances further data would be necessary for future considerations. Such results can be attributed to overall surrounding environmental factors that both sexes are more prone to be exposed to, and due to sex stereotypical routine hygienic practices and limitations.

Figure 2



Despite the higher rating of the calculated BMI values for the positive group (29 vs 25.9), we didn't find any significant statistical differences regarding the level of education between the positive group, and overall study population.

We observed that 82% of the positive cases reported to be suffering from either diabetes mellitus, or another chronic systemic disease, with 41% of the participants suffering from both of the nosologies simultaneously. The reliability of this study is consolidated, by exposing the confirmed risk factors like diabetes mellitus.

Similarly, to many previous confident reports, this study, despite the small sample number, compared to large number institutional surveyances, confirmed a nearly four times higher ratio of smoking cases in the positive group, in comparison to the overall patient population records. This study has limitation. The information input relied upon patients or next of kin's, personal collaboration, understanding and reporting. Despite the accurate questionnaire construct, to discount and avoid any personal misjudgement and misunderstanding, it did not take into account any individual bias toward the institution, doctor, or overall personal perception of the disease or investigated complication.

Conclusion

The reported SSI incidence is a landmark at Trauma University Hospital, Tirana. Our reported incidence is within the range reported in high income countries.³ The regional hospital centres incidence of surgical site infections is comparable to other middle-income countries.^{3,16,17} We re-evaluated the known risk factors and highlighted several predictors of SSI. Further research should be focused on the rationale for the reported lower incidence, compared to similar neighbouring centres of the same rating practicing on populations of same geo and demographical characteristics.

In the interest of the good clinical practice, and the improvement of health seeking behaviours in middle-income countries, we advocate the setting up of the institutional SSI surveyance. This is crucial to continuously asses and evaluate the existing and if deemed necessary upgrade to more efficient SSI preventive strategies.

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Supplementary materials

Figure 1

Surgical Safety Checklist			World Health Organization	Patient Safety <small>A World Alliance for Safer Health Care</small>
Before induction of anaesthesia	Before skin incision	Before patient leaves operating room		
<small>(with at least nurse and anaesthetist)</small>	<small>(with nurse, anaesthetist and surgeon)</small>	<small>(with nurse, anaesthetist and surgeon)</small>		
<p>Has the patient confirmed his/her identity, site, procedure, and consent?</p> <input type="checkbox"/> Yes	<p><input type="checkbox"/> Confirm all team members have introduced themselves by name and role.</p> <p><input type="checkbox"/> Confirm the patient's name, procedure, and where the incision will be made.</p> <p>Has an antibiotic prophylaxis been given within the last 60 minutes?</p> <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	<p>Nurse Verbally Confirms:</p> <input type="checkbox"/> The name of the procedure <input type="checkbox"/> Completion of instrument, sponge and needle counts <input type="checkbox"/> Specimen labelling (read specimen labels aloud, including patient name) <input type="checkbox"/> Whether there are any equipment problems to be addressed		
<p>Is the site marked?</p> <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	<p>Anticipated Critical Events</p> <p>To Surgeon:</p> <input type="checkbox"/> What are the critical or non-routine steps? <input type="checkbox"/> How long will the case take? <input type="checkbox"/> What is the anticipated blood loss? <p>To Anaesthetist:</p> <input type="checkbox"/> Are there any patient-specific concerns? <p>To Nursing Team:</p> <input type="checkbox"/> Has sterility (including indicator results) been confirmed? <input type="checkbox"/> Are there equipment issues or any concerns? <p>Is essential imaging displayed?</p> <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	<p>To Surgeon, Anaesthetist and Nurse:</p> <input type="checkbox"/> What are the key concerns for recovery and management of this patient?		
<p>Is the anaesthesia machine and medication check complete?</p> <input type="checkbox"/> Yes				
<p>Is the pulse oximeter on the patient and functioning?</p> <input type="checkbox"/> Yes				
<p>Does the patient have a:</p> <p>Known allergy?</p> <input type="checkbox"/> No <input type="checkbox"/> Yes				
<p>Difficult airway or aspiration risk?</p> <input type="checkbox"/> No <input type="checkbox"/> Yes, and equipment/assistance available				
<p>Risk of >500ml blood loss (7ml/kg in children)?</p> <input type="checkbox"/> No <input type="checkbox"/> Yes, and two IVs/central access and fluids planned				

Figure 2

Selsioni A Informacioni mbi personelin			
Spitali			
Departamenti			
Specialiteti			
Pervoja e punes	<10 vjet	10-20 vjet	>20 vjet
Selsioni B Periudha preoperatore			
1	A mendoni se i kemi informuar mjaftueshem pacientet tuaj ne lidhje me risikun e infeksionit te interventit	Po	Jo
2	A i rekomandoni pacienteve tuaj te bejne baze mbremjen para nderhyrjes?	Po	Jo
3	A i rekomandoni pacienteve tuaj te lajne trupin me solucione klorhexidine mbremjen para nderhyrjes?	Po	Jo
4	A i rekomandoni pacienteve tuaj te heqin qimet nga zona e interventit para operacionit?	Po	Jo
Nese PO specifikoni		Me brakte	Me makine
5	A i rekomandoni pacienteve tuaj te keqshqyerapo me BMI < 18.5 te marrin multivitaminat dhe suplemente ushqimore para interventit?	Po	Jo
6	A kryeni optimizim para interventit te vlerave te glicemis e per pacientet e risikuat?	Po	Jo
Selsioni C Periudha operatore			
1	A aplikoni profilaksi me ab me antibiotike para interventit?	Po	Jo
Nese po specifikoni		1 dite perpara	2 ore perpara
2	A mendoni se tretesirat per larjen e duarve dhe pergatitjen e fushes operatore jane ne standartin e duhur?	Po	Jo
3	Sa kohe shpenzoni per larjen e duarve para interventit?	<30 sekonda	30 - 60 sekonda
		>60 sekonda	
A besoni qe nderrimi i shpeshte i dorezave me shume se 5 here/ore gjate operacionit ndikon pozitivisht ne uljen e infeksioneve?			
4		Po	Jo
A mendoni se ngrohja e trupit te pacientit gjate operacionit ka efekt pozitiv ne uljen e infeksioneve?			
5		Po	Jo
A perdorni "drape" per izolimin e zones kirurgjikale?			
6		Po	Jo
A mendoni se perdorni i "drape" ul risikun e infeksionit te plages?			
7		Po	Jo
A mendoni se irrigacioni me solucione iodine para mbyljes se plages, ndikon ne risikun e infeksioneve te plages?			
8		Po	Jo
A mendoni se dentimi sekondar i indeve te buta ndikon ne risikun per infeksione te plages operatore?			
9		Po	Jo
A mendoni se oksigjenumi i pacientit me 80% O ₂ gjate operacionit ndikon ne risikun per infeksione?			
10		Po	Jo
Selsioni D Periudha postoperatore			
A e rekomandoni vazhdimine profilaksise me ab ne fazen postop?			
1		Po	Jo
Nese po sa kohe		72 ore	5 dite
		>5 dite	
A mendoni se vendosja e drentshiton risikun per infeksion dhe rrjedhimisht nevojten per ab profilaksi te zgjatur?			
2		Po	Jo
Nese po e mendoni se ka nevojte te zgjatet profilaksia me ab per shkak te vendosjes se drent			
		Po	Jo

Figure 3

<p>Wound classification based on the potential of infection ^{12,13}</p> <ul style="list-style-type: none">• Clean wound is an uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital or uninfected urinary tracts are not entered• Clean-contaminated wound is an operative wound in which the respiratory, alimentary, genital or urinary tracts are entered under controlled conditions and without unusual contamination.• Contaminated wound is an open, fresh, accidental wound.• Dirty wound is an old traumatic wound with retained devitalized tissue or wound involving existing clinical infection or perforated viscera.
<p>Wound classification based on the extent of involvement</p> <ul style="list-style-type: none">• Superficial surgical site infection confines to the skin and subcutaneous tissue and it is characterised by the presence of either purulent drainage with or without laboratory confirmation or microbial isolates from superficial incision or the presence of signs and symptoms of infection at the site, or diagnosis of SSI by clinician.• Deep surgical site infections is the presence of at least purulent drainage from the deep incision, spontaneous dehisces or a deliberately opened deep incision in a patient with at least one of the following signs or symptoms: fever ($> 38^{\circ}\text{C}$), localized pain, or tenderness, unless site is culture-negative, an abscess or other evidence of infection involving the deep incision soft tissues or diagnosis of a deep incisional SSI by the attending clinician.• Organ/space SSI is an infection which involves any part of the anatomy other than the incision, which was opened or manipulated during an operation and at least purulent drainage from a drain that is placed through a stab wound into the organ/space, isolate from an aseptically obtained culture of fluid or tissue in the organ/space, abscess or other evidence of infection involving the organ/space that is found on direct examination, during re-operation, or by histopathologic or radiologic examination, and diagnosis of an organ/space SSI by a surgeon or attending physician.

MICROSTRUCTURAL ANALYSIS OF STAINLESS STEEL VARIETIES ACROSS DIFFERING THICKNESSES

FARKLI KALINLIKLARDAKİ PASLANMAZ ÇELİK ÇEŞİTLERİNİN MİKROYAPISAL ANALİZİ

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ABSTRACT

Introduction and Purpose: This study examines the welding of stainless steels of varying thicknesses using the Tungsten Inert Gas (TIG) method. It focuses on the welding of 2 mm thick 304 austenitic, 3 mm thick 420 martensitic, and 3 mm thick 430 ferritic stainless steels. Microstructural changes in the weld region are particularly scrutinized. The widespread industrial usage and ease of shaping of 304 austenitic steels, as well as the high carbon content characteristic of 420 martensitic steels, constitute key aspects of this study. Pure argon gas is employed as the shielding gas, and welding is conducted using specific current and speed parameters. Microstructural examinations are conducted under an optical microscope, with no welding defects observed during experimental observations. Additionally, sample preparation is performed using laser cutting, revealing melting and mixing of different materials in the weld region due to high heat input. Although no flaws such as cracks or pores are detected in the weld zone, root flaws are identified. Particularly in the welded connection of 304 austenitic and 420 martensitic stainless steels, it is concluded that the lamellar martensite structure prevents micro-crack formation. This study aids in evaluating the quality and performance of welded joints by focusing on the microstructural changes before and after welding different thicknesses of stainless steels. Furthermore, rapid melting and solidification cycles lead to martensite formation in the welded connection of 430 ferritic and 420 martensitic stainless steels. Near the fusion zone in the ferritic side, martensite formation occurs, while within the Heat Affected Zone (HAZ), a coarse Widmanstatten structure is observed. These findings contribute to understanding the microstructural changes and interactions occurring during the welding of materials with different thicknesses.

Key Words: Stainless Steel; Micro Structure; Heat Affected Zone; TIG Welding

ÖZET

Giriş ve Amaç: Bu çalışma içerisinde, Tungsten Inert Gaz (TIG) yöntemiyle farklı kalınlıklardaki paslanmaz çeliklerin birleştirilmesini incelenmektedir. 2 mm kalınlığındaki 304 kalite östenitik, 3 mm kalınlığındaki 420 kalite martenzitik ve 3 mm kalınlığındaki 430 kalite ferritik paslanmaz çeliklerin kaynak yöntemiyle birleştirilmesi üzerinde odaklanılmıştır. Kaynak bölgesindeki mikro yapısal değişimler özellikle incelenmiştir. 304 kalite östenitik çeliklerin endüstride yaygın olarak kullanılması ve şekil verme kolaylığı, 420 kalite martenzitik çeliklerin yüksek karbon içeriği gibi özellikler bu çalışmanın temel çıkış noktalarından biridir. Kaynak işleminde saf argon gazı, koruyucu gaz olarak tercih edilmiş ve belirli akım ve hız parametreleriyle kaynaklı bir birleştirme işlemi gerçekleştirilmiştir. Mikro yapı incelemeleri optik mikroskop altında gerçekleştirilmiş ve deneysel gözlemlerde kaynaklı birleştirmelerde kaynak kusuru gözlenmemiştir. Ayrıca, lazer kesim yöntemiyle numune hazırlığı yapılmış ve kaynak bölgesinde yüksek ısı girdisiyle birlikte erime ve farklı malzemelerin karışımı tespit edilmiştir. Kaynak bölgesinde çatlak ve gözenek gibi kusurların olmamasına rağmen kök hatası tespit edilmiştir. Özellikle 304 kalite östenitik ve 420 kalite martenzitik paslanmaz çeliklerin kaynaklı bağlantısında, çıta martenzit yapısının mikro çatlak oluşumunu engellediği sonucuna varılmıştır. Bu çalışma, farklı kalınlıklardaki paslanmaz çeliklerin kaynağı ve kaynak sonrası mikro yapısal değişimlerine odaklanarak kaynaklı birleştirmelerin kalitesini ve performansını değerlendirmeye yardımcı olmaktadır. Diğer yandan, 430 kalite ferritik paslanmaz çelikler ve 420 kalite martenzitik paslanmaz çeliklerin kaynaklı bağlantısında termal döngüdeki hızlı erime ve soğuma nedeniyle martenzit oluşumu gözlenmiştir. Ferritik tarafta, erime bölgesi sınırına yakın bölgelerde martenzit oluşumu, Isı Tesiri Altındaki Bölgesi (ITAB) içerisinde ise iri taneli Widmanstatten yapısı gözlemlenmiştir. Bu bulgular, farklı kalınlıklardaki malzemelerin birbirleriyle alın kaynağı sırasında meydana gelen mikro yapısal değişimlerini ve etkileşimlerini anlamaya yardımcı olmaktadır.

Anahtar Kelimeler: Paslanmaz Çelik; Mikro Yapı; Isı Tesiri Altındaki Bölge; TIG kaynağı

EVALUATION OF THE IN VITRO PERFORMANCE OF TOPICAL PRODUCTS DEPENDING ON THE TYPE OF MEMBRANE

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ABSTRACT

Introduction In vitro evaluation of topical (dermatological) pharmacokinetics is a critical aspect of the drug development process for semi-solid products.

Purpose: Evaluation of penetration rate of a topical product through the skin of the piglet skin compared to that through a synthetic membrane.

Materials and Methods: hydrocortisone acetate ointment 1%, hydrocortisone acetate standard (Profarma), alcohol 99% (Aquila group), piglet skin (8 weeks old, farmer North Albania), synthetic membranes (STRAT-M, 9mm, Merck), Franz Diffusion Cell Apparatus (Model EMFDC06-O30, Orchid Scientific) with 6 stages and 9mm diameter, UV-VIS Instrument for Spectrophotometry (VARIAN), quartz cuvettes 10mm (ISOLAB, Laborgeräte GmbH, 3.5 ml-macro, I.09.01.001), ultrasonic stirrer, filter paper G₂, analytical digital balance (Model ISO 900, Denver Instrument, max 210 g, d=0.1mg), etc

Results: From 15' to 60', there is a slight increase in the penetration of hydrocortisone acetate from the ointment through the membrane and into the medium. A slight fluctuation of absorbance is distinguished only in the third week, where until the 60' interval there is not much of absorption. A factor that affects this case is the age of the piglet skin. With the passage of weeks, it is assumed that skin stored in the refrigerator does not fully retain the characteristics of fresh skin. This phenomenon is not observed in synthetic membranes, which have the advantage of having the same physic-chemical characteristics throughout the time of usage.

Conclusions: In conclusion, it can be said that the results obtained using the piglet skin are similar to those obtained using synthetic membranes. Through this study, a method of determining the rate of penetration of active substances through the skin using the Franz Diffusion Cell with piglet skin was stabilized. This is the first scientific research in this field in Albania, developed entirely in the Department of Pharmacy, and may serve to carry out further research in the future in terms of determining the penetration of semi-solid or liquid dermocosmetic preparations.

The results obtained using the piglet skin are similar to those with synthetic membranes. Altogether, the study of the use of Franz Diffusion Cell with piglet skin assisted into stabilizing a method to determine the penetration rate of active substances through the skin. This is the first scientific research in this field, which is developed entirely in the Department of Pharmacy, and it may be a good base for future researches regarding penetration and absorbance of semi-solid or liquid dermocosmetic preparations through the skin.

Keywords: Franz Diffusion Apparatus, natural membrane, synthetic membrane, topical products

1.1. References:

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STUDY OF THE EFFECT OF OSTEOPLASTIC MATERIALS ON THE REGENERATION ABILITY OF JAW BONES UNDER EXPERIMENTAL CONDITIONS

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Placement of dental implants bypassing the maxillary sinus (subantral), use of subperiosteal implants, segmental osteotomy, online and inline plastic methods with bone blocks, etc. is one of the widely used methods in modern stomatology (1,3,6,9,12,14,15). However, these methods also have a number of drawbacks. For example, attempts to bypass sinus lifting surgery have often resulted in unstable implants due to insufficient vertical bone volume, short implants, and too long bridge-like structures.

The main goal of sinus lifting surgery is to create optimal conditions for adequate fixation of implants in the bone tissue. At the same time, implants should not perforate the mucous membrane at the bottom of the maxillary sinus, as this can cause acute and chronic inflammation in the maxillary sinus. Also, when the implant perforates the maxillary sinus, a purulent oro-antal fistula may form between the oral cavity and the sinus cavity, which may necessitate the removal of the implant, radical operations in the maxillary sinus, and surgical intervention to completely remove the sinus microzone (5,8,10, 11,15).

Experiments show that the stability of implants depends significantly on the optimal height and width of the bone (2,4,7,13). As a result of the atrophy of the posterior bone tissue of the upper jaw, the reduction of the alveolar bone volume and the perforation of the mucous membrane of the maxillary sinus (Schneider's membrane) greatly reduce the possibilities of implantation (3,4,6,10,13). The solution to the problem can be overcome by more advanced methods. One of these methods is open and closed sinus lifting surgery.

In cases of atrophy of the alveolar ridge of the upper jaw due to various reasons, a number of natural and artificial materials are used to solve the problem of bone deficiency, which are

called osteoplastic materials. Stomatologists divide osteoplastic materials into 4 main groups according to their origin:

- 1) Autogenous materials - a person's own bone is used as a donor;
- 2) Allogeneic materials - another person's bone is used as a donor;
- 3) Xenogenic materials - animal bone is used as a donor;
- 4) Alloplastic materials – synthetic materials are used as donors (5,7,9).

Studies show that although auto and allotransplants are performed with minimal trauma for the patient, these methods have a number of disadvantages. Limited bone material, risk of various bacterial and viral infections, loss of sensation in the donor area, etc. (5,6,8,10). Therefore, the search for suitable alternative synthetic replacement materials for auto and allotransplants continues today.

Currently, a number of synthetic osteoplastic materials are widely used to solve the problem of bone deficiency in the field of traumatology, orthopedics and maxillary surgery. Bio-Oss is one of the giant companies producing osteoplastic materials used for bone plastic in dentistry and maxillofacial surgery. Geistlich Bio-Oss Collagen, a bone replacement material produced by this company, is mainly obtained from ox bone and is widely used in dentistry. The main advantage of this material is that the healing time is up to 3 months, it has a weak absorbency. The material is produced in the form of granules or membrane weight.

Another large company producing osteoplastic materials is Botiss. This company mainly produces biomaterials and alloplastic materials.

Due to the rapid development of dental implantation, the synthesis of composite osteoplastic materials continues in many advanced countries of the world. The effectiveness and efficiency of several of them are studied at the Department of Stomatology and Maxillofacial Surgery of the Azerbaijan State Physicians Improvement Institute.

At the Scientific Research Center of Azerbaijan Medical University, the effects of several osteoplastic materials on osteogenesis were studied under experimental conditions.

Material and method

The main materials of the study were osteoplast material of xenogenic origin Gen-oss Osteobiol (Italy), Max resorb synthetic granulated hydroxyapatite Bottis (Berlin), fibrin enriched with platelets obtained from the patient's blood (PRF) and antibiotic Metronidazole.

The main mass of PRF is fibrin. Its role in the process of osteogenesis is quite large. Thus, fibrin can connect with many tissues with the help of covalent and electrostatic bonds and even mechanically. Fibrin fibers also form a complex with collagen and fibronectin XIIIa with the help of covalent bonds in the body, as well as with platelets, megakaryocytes and fibroblasts with the help of GPHb/IIIa receptors. The products generated during fibrin breakdown under the action of proteolytic enzymes stimulate the migration of monocytes and help them transform into macrophages.

Stimulated fibroblasts migrate to the fibrin network and accumulate collagen, synthesize plasminogen activators, create conditions for fibrin lysing and revascularization of connective tissue.

Researches were conducted on 24 rabbits at the Scientific Research Center of Azerbaijan Medical University. The experimental animals were divided into 4 main groups: In the first group (Control group) - 6 rabbits underwent maxillary sinus lifting surgery, a lateral window

was opened on the side of the upper jaw, 0.15-0.20 mg of xenogenic osteoplastic material was injected into 1/3 of the sinus cavity - Gen- Os Osteobiol (Italy) granules are filled.

In the second group, 6 rabbits underwent a sinus lifting operation, a window was opened on the lateral surface of the upper jaw, and 0.5 ml of PRF and 0.15-0.20 mg of osteoplastic material - Max resorb granules (0.5-1.0 mm) filled.

In the third group, 6 rabbits underwent a sinus lifting operation and the sinus cavity was filled with 0.5 ml of PRF and 0.15-0.20 mg of synthetic osteoplastic material - Hydroxyapatite (Bottis) granules.

In the fourth group, 6 rabbits underwent sinus lifting surgery and 1/3 of the sinus cavity was filled with osteoplastic material Max resorb (Berlin) granules (0.5-1.0 mm) and antibiotic - Metronidazole powder.

In all cases, the wounds were closed with a flap. Then the rabbits were kept in a special room in the vivarium of ATU ETM, with free feeding and water intake.

On the 15th and 30th days of the experiments, the rabbits belonging to the control and experimental groups were partially decapitated, and the part of their maxillary bone where sinus lifting was performed was cut and fixed in 10% formalin solution for microscopic analysis. After two weeks, the fixed materials were washed in running water for 3-4 hours, then decalcified in 5% HCl solution for 5-7 days. Then the materials were washed again, dehydrated with the help of alcohol solutions of increasing concentration, and paraffin blocks were prepared according to the generally accepted methodology. A few days later, paraffin blocks were cut with the help of a microtome, prepared preparations were stained with Hemotoxylin-Eosin dye. Microscopic analyzes were carried out in the "SKOPE" (Netherlands) light microscope and pictures were taken with the help of a special camera.

Research results

The results of the morphological studies conducted within a month showed that infection and inflammatory process did not occur in the gums in the upper jaw region of rabbits that underwent sinus lifting surgery. The operation was performed under sterile conditions and was completed successfully.

The results of histological studies showed that the process of reparative osteogenesis began in the sinus cavity in experimental animals of all groups within 15 days after the operation. Connective tissue elements were formed around and inside the osteoplastic materials transferred to the sinus cavity, thin fibrin fibers began to form in an irregular manner. Osteogenic cells are found between fibrin fibers arranged irregularly.

The results of numerous studies show that the process of reparative osteogenesis is a complex process with the occurrence of general and local biological and biochemical changes. The successful completion of this process depends on the general condition of the body, age, the quality of the surgical operation, etc. depends and ends in several stages. In dentistry and maxillofacial surgery, immediately after surgery, blood and damaged tissue cells are collected in that area. Soon, the processes of alteration and carabalism intensify in this area, leukocyte cells accumulate here, thus reparative osteogenesis begins. A hematoma forms in the injured area.

The reproduction and proliferation of osteogenic cells intensifies, the damaged area is filled with an infiltrate rich in various cells. As a result of the activity of infiltrated cells, connective tissue is formed in the cavity. This process takes up to 6-10 days. At the next stage, the

differentiation of osteogenic cells begins, and as a result, irregularly located fibrin threads are formed in the cavity. Between these threads there are a large number of fibroblast cells.

In the first group of experimental animals, the xenogeneic osteoplastic material filled into the sinus cavity - Gen-Os Mix 0.5 g (Italy) became denser during the last 15 days, and cavities were formed in some places.

Newly formed very weak fibrin fibers are seen around and within the osteoplastic material. Fibroblast cells are found between the connective tissue fibers (Fig. 1a).

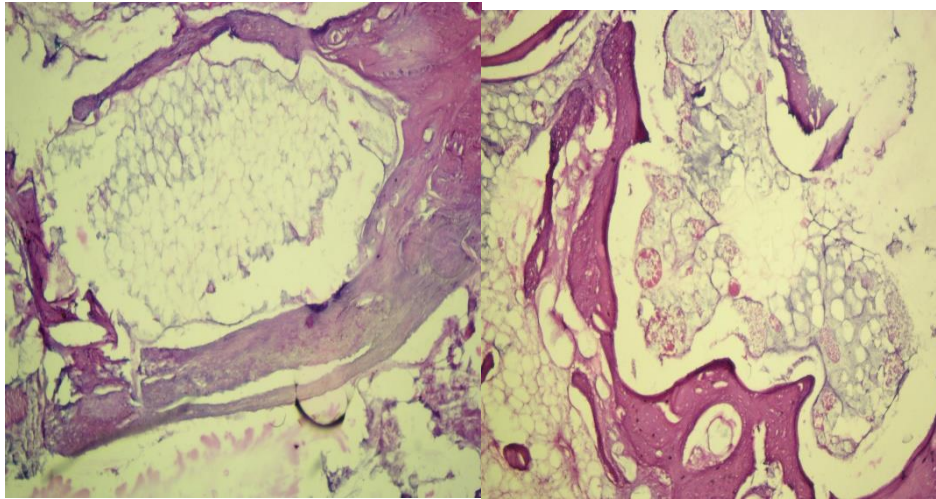


Fig. 1a

Fig. 1b

Figure 1 a) 15 days after the introduction of xenogenic osteoplastic material – Gen-oss Mix (Italy) into the sinus cavity of a rabbit, b) 30 days after the introduction of osteoplastic material into the sinus cavity

A part of the rabbits belonging to this group was decapitated on the 30th day of the experiments and the part of the jaw bone that was operated on was fixed in 10% formalin. Examination of the histological preparations made from those materials showed that the osteoplastic material (Gen-Os Mix 0.5 g) inserted into the sinus cavity during the past 30 days was completely resorbed, the material was completely surrounded by connective tissue. Within the newly formed connective tissue, weak blood capillaries and a small amount of young bone tissue elements are visible (Fig. 1b).

0.5 ml of PRF and 0.5 g of xenogeneic osteoplastic material - Gen-Os Mix were inserted into the sinus cavity immediately after surgery in 6 rabbits belonging to the second group. On the 15th day of experiments, the analysis of histological preparations prepared from the maxillary segment of decapitated rabbits showed that PRF was completely dissociated and absorbed in the sinus cavity of rabbits during the past days. Connective tissue elements have developed around and within the osteoplastic material inserted into the cavity. Very weak blood capillaries are visible between the irregularly arranged fibrin fibers. (figure 2a)

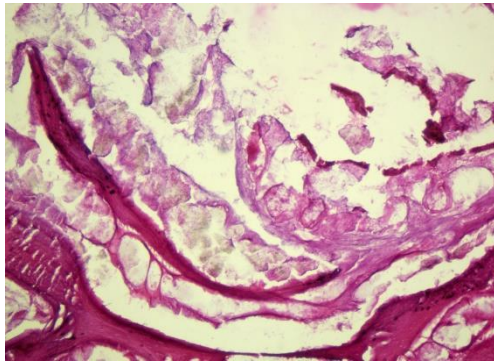


Fig. 2a

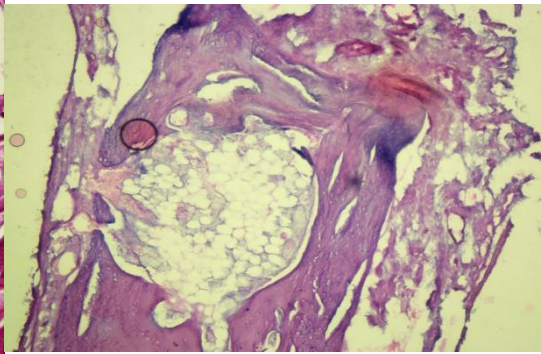


Fig. 2 b

Figure 2. a) 15 days after inserting 0.5 ml of PRF and 0.5 mg of osteoplastic material – Gen-Oss Mix into the sinus cavity of a rabbit, b) 30 days after inserting PRF and osteoplastic material into the sinus cavity

A part of the rabbits belonging to the second group (3 heads) was decapitated on the 30th day of the experiment and the part of the jaw bone that was operated on was fixed. The results of the histological examinations showed that the PRF inserted into the sinus cavity of the rabbits during the past 30 days was completely dissociated and absorbed. The osteoplastic material Gen-OS mix granules inserted into the cavity are completely resorbed and completely surrounded by connective tissue. Within the newly formed fibrous tissue, weak blood capillaries and young bone tissue cells are visible (Figure 2b).

After surgery, 5 ml of PRF and synthetic osteoplastic material - hydroxyapatite granules (0.15-0.20 mm) were inserted into the sinus cavity of 6 rabbits belonging to the third group. Examination of the histological preparations made from the maxillary bone of decapitated rabbits 15 days after the operation showed that the PRF inserted into the sinus cavity during the previous days was completely decomposed and absorbed. The hydroxyapatite granules inserted into the cavity have been sufficiently resorbed, and connective tissue elements have developed around and within the material. Among poorly developed fibrin fibers, fibroblasts are found (Fig. 3a).

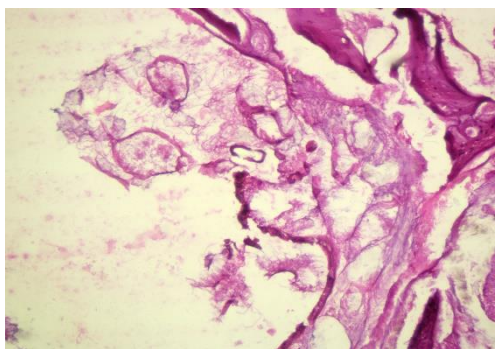


Fig. 3a

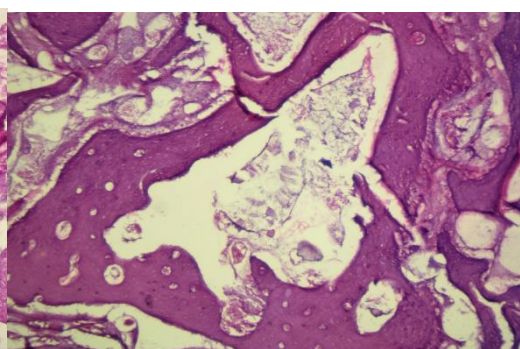


Fig. 3 b

Figure 3. A) osteoplastic material in the rabbit sinus cavity - 15 days after hydroxyapatite injection, b) 30 days after hydroxyapatite injection in the sinus cavity.

Part of the rabbits belonging to this group (3 heads) were decapitated on the 30th day of the research and the segment of the upper jaw bone was fixed. Analysis of histological preparations made from those materials showed that PRF inserted into the sinus cavity of rabbits during the past month was completely broken down and absorbed. At the same time, the osteoplastic

material - hydroxyapatite granules - inserted into the cavity was completely resorbed and replaced by connective tissue elements. Young bone tissue cells can be found between the regularly located fibers (Fig. 3b).

0.5 ml of PRF and 0.15-0.20 mg of osteoplastic material Bio-Oss were injected into the sinus cavity of 6 rabbits belonging to the fourth group after surgery. On the 15th day of the experiments, histological analysis of preparations prepared from the operated maxillary segment of decapitated rabbits showed that the PRF inserted into the sinus cavity during the previous 15 days was completely broken down and absorbed. The osteoplastic material inserted into the sinus cavity – Gen-Os Maxc resorb (Berlin) granules was sufficiently resorbed, connective tissue developed around and within the material. Among the weak fibrin fibers formed in the sinus cavity during the past days, fibroblast cells are found (Fig. 4a).

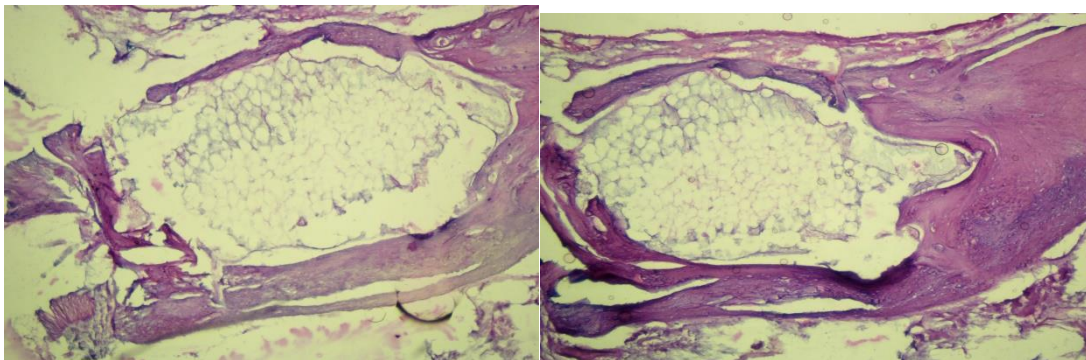


Fig. 4a

Fig. 4 b

Figure 4. a) 15 days after insertion of 0.5 ml of PRF and 0.15-0.20 ml of osteoplastic material – Bio-Oss into the sinus cavity of a rabbit, b) 30 days after insertion of PRF and osteoplastic material into the sinus cavity.

Part of the experimental animals belonging to this group (3 rabbits) were decapitated on the 30th day of the experiments and the operated part of the upper jaw was fixed in formalin solution. Microscopic analysis of histological preparations made from fixed materials showed that the PRF inserted into the sinus cavity during the past 30 days was completely broken down and resorbed, the osteoplastic material inserted into the cavity was completely resorbed and replaced by connective tissue. Faint blood capillaries are visible between the developed collagen fibers in the cavity (Fig. 4b).

Summarizing the results of the conducted histological studies, it is possible to conclude that the introduction of PRF into the sinus cavity of rabbits has a positive effect on the development of connective tissue elements in the cavity by having a stimulating effect on the osteogenesis process.

Osteoplastic materials inserted into the cavity do not prevent the development of connective tissue elements mainly due to their resorbability. Xenogenic material with higher resorption capacity - Gen-Os Mix resorb granules (0.5-1.0 mm) differ from others due to relatively high osteoconductive properties.

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STUDY OF THE EFFECT OF OSTEOPLASTIC MATERIALS ON THE REGENERATION ABILITY OF JAW BONES UNDER EXPERIMENTAL CONDITIONS

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Abstract

Although significant positive results have been achieved in the field of dentistry and maxillofacial surgery in recent years, the problem of lack of bone mass during dental implantation remains relevant. Historically, a number of methods have been developed to solve this problem.

Placement of dental implants bypassing the maxillary sinus (subantral), use of subperiosteal implants, segmental osteotomy, online and inline plastic methods with bone blocks, etc. is one of the widely used methods in modern stomatology. However, these methods also have a number of drawbacks. For example, attempts to bypass sinus lifting surgery have often resulted in unstable implants due to insufficient vertical bone volume, short implants, and too long bridge-like structures.

Key words: dental, operation, implant, bone

THE DEFORMATION AND DESIGN ANALYSIS OF CYLINDRICAL UNDERGROUND WATER TANKS DEPENDING ON SOIL TYPE

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ABSTRACT

The importance and sustainability of water storage and management for humans is a very important and detailed issue. This study covers the design of cylindrical underground water tanks in different ground conditions and the strength analysis of the underground floors, walls and foundations of these tanks. The design and analysis of cylindrical water tanks to be built in the ZE soil class, which is a problematic soil class classified according to the Turkish earthquake regulation (TBDY 2018), was made using the IdeCAD and ANSYS programs. Stress, moment and deformation analysis results showed that the cylindrical water tanks to be constructed in the ZE soil class have structural strength against the stresses du to the soil, water and earthquake loads without suffering significant deformation. It was observed that the design values obtained using stress, deformation and structure overturning moment analyzes were within the structural safety limits, confirming the reliability of the design parameters. Although the reliability of the parameters suggested in the designs was achieved, it was determined that the deformations in the tank structure were found high due to the loose, decomposed and low bearing strength of the ZE class soils. For this reason, the outcome of this study emphasizes the importance of using raft foundations under underground water tanks to be built on ZE class floors in order to increase safety and prevent deformations such as creep that increase over time.

Keywords: Cylindrical underground water tanks, interaction between soil class and underground water tanks, IdeCAD, ANSYS

INTRODUCTION

The importance and sustainability of water storage and management for humans is a very important and detailed issue. This study covers the design of cylindrical underground water tanks in different ground conditions and the strength analysis of the underground floors, walls and foundations of these tanks. Designing a water tank requires careful consideration of various factors, including the soil type in which it will be constructed. The soil type plays a crucial role in determining the stability and longevity of the tank structure.

When designing a water tank, engineers must assess the soil's properties to ensure that it can adequately support the weight of the tank and withstand external forces such as water pressure. Different types of soils have varying characteristics, such as cohesion, permeability, and bearing capacity, which directly impact the tank's design. For instance, cohesive soils like clay

have high strength but low permeability. This means that they can provide good support for the tank but may also cause issues with drainage and potential water infiltration. On the other hand, granular soils like sand offer better drainage capabilities but may require additional measures to enhance stability due to their lower cohesion. By understanding the soil type at the site where a water tank is planned to be built, engineers can adapt their design accordingly. They may need to incorporate measures such as reinforcement or foundation modifications to ensure optimal stability and prevent any potential issues in the future.

The importance and sustainability of water storage and management for humans is a very important and detailed issue. This study covers the numerical analysis and design of cylindrical underground water tanks in ZE class soil with liquefaction potential, classified according to TBDY2018, one of the earthquake building design regulations in Turkey, including strength analysis of the underground floors, walls and foundations of these tanks. Fig. 1 is shown some cylindrical water tanks construction.



Fig.1 Cylindric water tanks construction

In conclusion, considering soil type is substantial when designing a water tank. Engineers must carefully evaluate its properties to create a robust and long-lasting structure that can withstand both internal and external forces while ensuring proper functionality for years to come. The characteristics of these soil classes determined by TBDY 2018 are shown in Table 1.

Table 1. TBDY-2018 article 16.4.1. (Karasin et al., 2020)

Soil Class	Soil Type	Average in the upper 30 meters		
		(V _s) ₃₀ [m/s]	(N ₆₀) ₃₀ [blows/30 cm]	(C _u) ₃₀ [kPa]
ZA	Strong, hard rocks	>1500	-	-
ZB	Moderately weathered, relatively strong rocks	760-1500	-	-
ZC	Very dense layers of sand, gravel and hard clay or weathered, weak rocks with many cracks	360-760	>50	>250
ZD	Medium-tight sand, gravel or very solid clay layers	180-360	15-30	70-250
ZE	Profiles containing loose sand, gravel or soft-solid clay layers or a soft clay layer (c _u < 25 kPa) with a total thickness of more than 3 meters that meets the conditions of PI > 20 and w > 40%	< 180	< 15	< 70
ZF	Soils that require site-specific research and evaluation: 1) Soils with a risk of collapse and potential collapse under the influence of an earthquake (liquefiable soils, highly sensitive clays, collapsible weakly cemented soils, etc.) 2) Peat and/or clays with high organic content with a total thickness of more than 3 meters 3) High plasticity (PI > 50) clays with a total thickness of more than 8 meters 4) Very thick (> 35 m) soft or medium solid clays.			

Soil parameter calculations are made for the first 30 meters downwards from the base or pile cap of the soil profile. In profiles containing various soil and rock layers, these layers in the top 30 meters are subdivided and numbered from $i = 1$ to $i = N$. The average shear wave velocity (VS)₃₀, the average standard penetration test blow count (N60)₃₀, and the average undrained shear strength (CU)₃₀ are calculated as follows:

$$(VS)_{30} = \frac{30}{\sum_{i=1}^N \left(\frac{h_i}{VS_i} \right)}, \quad (N60)_{30} = \frac{30}{\sum_{i=1}^N \left(\frac{h_i}{N60_i} \right)}, \quad (CU)_{30} = \frac{30}{\sum_{i=1}^N \left(\frac{h_i}{CU} \right)} \quad E\text{ş.1}$$

Where, h_i is the thickness [m] of the i -th sublayer, VS_i , $N60_i$, and CU_i are the shear wave velocity [m/s], the number of blows from the standard penetration test [blows/30 cm], and the undrained shear strength [kPa] of the sublayer respectively (TBDY-2018, Article 16.4.2). The design will consider buried water tanks in ZA and ZE soil classes. (Songur and Dabanlı, 2006; Bingöl and Kavvas, 2011, Gorchev and Ozolins, 1984; Sönmez and Çizmecioğlu, 2007).

In this paper, it is studied that the design and performance analyses of a cylindrical water tank in the ZE. The effect of soil types on the seismic response of underground water tanks and durability is investigated under earthquake loading, as well as the impact of varying loadings on the walls and slab floor of a water tank depending on the ZE soil type. The ZE class, classified by TBDY 2018, and the water tank analysed with İDECAD and ANSYS programs.

ANALYSES AND RESEARCH METHODOLOGY OF THE STUDY

In this work, soil-structure interactions of a rectangular underground water tank built on ZE class soils were evaluated using the İdeCAD tool, along with geotechnical reports and field data. The İdeCAD tool is often used in civil engineering and architecture to analyze and design

concrete, reinforced concrete, and steel structures. It may analyze the systems utilizing semi-rigid diaphragm, completely rigid diaphragm, or no diaphragm techniques. The program enables the modeling of the combined usage of frame and shell parts using interdisciplinary building information modeling software for architecture, structural analysis, design, reinforcement, visualization, and drawings (Basov, 2017, Systems, 2011). ANSYS program is a modeling and simulation software program generally used in engineering fields. The main purpose of this program is to enable testing in a virtual environment, without the need for prototype production, after modeling the materials to be produced. Ansys is a general-purpose finite element computer program. It is used for engineering solutions such as structure, fluid and heat transfer (Jacob 2007, Karayer and Severcan 2018). It is feasible to calculate the vertical earthquake effect, which affects building behavior in proportion to the horizontal earthquake impact, based on the motions of underlying structures during earthquakes.

Cylindric water tank design for ZE class soil

The local soil class effect may vary during an earthquake based on the ground structure. The earthquake influence can travel faster via soft ground. Different soil types cause growth at different stages of the seismic reaction spectrum. If buildings' natural periods are near to this growth range, structural damage will rise dramatically. As a result, local ground conditions are critical in the process of analyzing ground motion and designing earthquake-resistant structures. The most common input parameter in dynamic structure analysis is the determination of an earthquake acceleration spectrum that is adequate for local ground conditions. This is a spectrum with the greatest peak acceleration value and period (PGA).

Short-period design spectral acceleration coefficient S_{DS} , and 1-second period design spectral acceleration coefficient S_{D1} values are calculated with Eş.2.

$$\begin{aligned} S_{DS} &= S_S F_S && \text{Eş.2} \\ S_{D1} &= S_1 F_1 \end{aligned}$$

Where S_S is the map spectral acceleration coefficient for the short period and S_1 is the map spectral acceleration coefficient for the 1.0-second period. F_S and F_1 are the ground effect coefficients for the short period, whereas F_1 is the local ground effect coefficient for a 1.0-second period. The coefficients were taken from the TDBY 2018 regulations.

In this study, Static and dynamic analyzes of this comprehensive, 5 meters water tank with a 200m³ water volume, 3.57m radius, cylindrical section structure and 5 meter length were made using İdeCAD software. The properties of the earthquake, soil and construction materials included in the analysis are given in Table 2, Table 3 and Table 4, respectively.

Table 2. Earthquake parameters in the analyses determined according to the TBDY2018 (Ozcebe et al., 2003)

Building Importance Coefficient (I):	1
Building Usage Class (BKS):	3
Carrier System Behavior Coefficient R (Entered) (X / Y):	6/6
Carrier System Behavior Coefficient R (Selected) (X / Y):	4.8. / 6
Strength Excess Coefficient (X / Y):	2.5. / 2.5
Eccentric Ratio:	0.05
Ductility Level:	High
Earthquake Ground Motion Level:	DD2
Earthquake Design Class (DTS):	1
Building Height Class (BYS):	8
Normal Performance Target:	Controlled Damage
Evaluation / Design Approach:	Design According to Strength

Table 3. Soil parameters used in the İdeCAD analyses

Soil Type	ZA
Spectrum Characteristic Periods:	Ta : 0.05, Tb : 0.24
Ground Bearing Strength	100.00 [tf/m ²] 15000.00
Bearing coefficient	[tf/m ³]
Short period map spectral acceleration coefficient (Ss):	1.111
Map spectral acceleration coefficient (S1) for a 1.0 second period:	0.262
Short period design spectral acceleration coefficient (SDs):	0.8888
Design spectral acceleration coefficient (SD1) for 1.0 second period:	0.2096
Maximum Ground Acceleration (g) (PGA):	0.453
Maximum Ground Velocity (PGV):	26.166

Table 4. Material characteristics used in the analyses

Curtains:	C25 B420C
Floors:	C25 B420C
Foundation	C25 B420C
Static Material Name:	C25 B420C
Characteristic Compressive Strength of Concrete:	25 Mpa
Characteristic Tensile Strength of Concrete:	178.45 tf/m ²
Concrete Safety Coefficient:	1.5
k ₁ Constant:	0.85
Flexural Reinforcement Yield Strength:	420 Mpa
Stirrup Reinforcement Yield Strength:	420 Mpa
Steel Safety Coefficient:	1.15
Elasticity Modulus:	3084641.544 tf/m ²
Slip Module:	1285267.31 tf/m ²
Poisson's Ratio:	0.2
Unit weight:	2.5 tf/m ³
Coefficient of Thermal Expansion:	1.00E-05

2.3 Cylindric water tank design for ZE soil class

This study used the İdeCAD application with a semi-rigid diaphragm model to examine a cylindrical water tank built in ZE class soil. Diaphragms that are semi-rigid and totally rigid. The Semi-Rigid Diaphragm is an acceptance in which in-plane loads and movements can happen when the slab floor is modeled using shell finite elements, taking into account the stiffness of the slab floor in the analytical model, and depending on the dimensions, thicknesses, and characteristics of the building materials. The Full Rigid Diaphragm model ignores in-plane movement and assumes that the slab floor has extremely high in-plane stiffness. In order to represent the most realistic behavior, the semi-rigid diaphragm model simulates in-plane and out-of-plane loads and deflections of the slab floor using shell finite elements. The loading configurations and relative notations in the loading and moment analysis are provided in Table 5.

Table 5. Loading symbols and notations

Symbol	Loading type	Loading combinations in the analyses
G	Constant Load	$1.6G+1.4Q+1.6H$
Q	Moving Load	$0.9G+1.6H$
G'	Dead load (Effective section stiffnesses were used)	$1.4G+1.6Q$ $G+Q$
Q'	Live load (Effective section stiffnesses were used)	$G'+Q'+Ex-0.3Ey+0.3Ez$ $G'+Q'+Ex+0.3Ey+0.3Ez$
Ez(G)	Vertical earthquake (4.4.3.2)	$G'+Q'-Ex-0.3Ey+0.3Ez$ $G'+Q'-Ex+0.3Ey+0.3Ez$
HX1	Earth thrust loading in X direction	$G'+Q'+Ey-0.3Ex+0.3Ez$
HY1	Earth thrust loading in Y direction	$G'+Q'+Ey+0.3Ex+0.3Ez$
S	FULL WATER LOAD	$G'+Q'-Ey-0.3Ex+0.3Ez$
H	SOIL LOAD	$G'+Q'-Ey+0.3Ex+0.3Ez$
Ex	Additional eccentric earthquake loading in X direction (Full rigid diaphragm solution)	$0.9G'+Ex-0.3Ey-0.3Ez$ $0.9G'+Ex+0.3Ey-0.3Ez$
Ey	Additional eccentric earthquake loading in Y direction (Full rigid diaphragm solution)	$0.9G'-Ey-0.3Ex-0.3Ez$ $0.9G'-Ey+0.3Ex-0.3Ez$

The design processes of a cylindrical water tank constructed to be in ZE soil class with a storage capacity of 200 m³ are analyzed in this study. The tank has been designed with dimensions of 3.57m radius, cylindrical section structure and 5 meter length. The design takes into account the coordinates and earthquake design parameters as per the TBDY 2018 guidelines. The soil parameters for the ZE class are given in Table 6.

Table 6. ZE class soil parameters used in the analysis

Soil Type	ZE
Spectrum Characteristic Periods:	Ta: 0.14, Tb : 0.70
Ground Bearing Strength	10.00 [tf/m ²]
Bearing coefficient	1000.00 [tf/m ³]
Short period map spectral acceleration coefficient (Ss):	1.111
Map spectral acceleration coefficient (S1) for a 1.0 second period:	0.262
Short period design spectral acceleration coefficient (SDs):	1.123.443
Design spectral acceleration coefficient (SD1) for 1.0 second period:	0.78338
Maximum Ground Acceleration (g) (PGA):	0.453
Maximum Ground Velocity (PGV):	26.166

The design of the rectangular water tank in soil class ZE was restructured following the existing soil properties and load-carrying capacity. In the initial design, under a full water load of 5 t/m², excessive stresses appeared in the raft foundation, which posed a risk of collapse. To solve this

problem, that need to be done to increase the storage and reliability of the water tank in the ZE soil class. Earthquake loads and other relevant parameters used in the design are given in Table 7.

Table 7. Earthquake loading and other relative parameters used in design

Total Mass of the structure	124.84 t
Live load coefficient =	0.3000
Total Earthquake Load (X)	$V_t = 38.38$ [tf] - (Dynamic Method)
Total Earthquake Load (Y)	$V_t = 34.17$ [tf] - (Dynamic Method)
Structure Natural Vibration Period (X - Modal E1)	$T_a = 0.14 \leq T_r = 0.17 \leq T_b = 0.70$ [s]
Structure Natural Vibration Period (X - Modal E2)	$T_a = 0.14 \leq T_r = 0.17 \leq T_b = 0.70$ [s]
Structure Natural Vibration Period (Y - Modal E3)	$T_a = 0.14 \leq T_r = 0.17 \leq T_b = 0.70$ [s]
Structure Natural Vibration Period (Y - Modal E4)	$T_a = 0.14 \leq T_r = 0.17 \leq T_b = 0.70$ [s]
Spectrum Coefficient	$S(T) = 1.17$

2.4 Stress distribution and deformation analyses of the cylindrical water tank designed ZE classes soils

The present work involved the design of cylindrical subterranean concrete water tanks and the performance of stress deformation analyses. These tanks were chosen for their numerous benefits, including their extensive global use, ease of manufacturing, efficient cost management, minimal area occupation, and structural efficiency. The moment and curvature values on the tank walls were calculated using the moment-curvature relationship, along with the structural bending moments on the slab floor and raft foundation of the designed tank and the locations requiring reinforcement. Figure 2 shows the solid model geometry of a cylindrical water tank in ZE class soil. The water tank has a water volume of 200m³, is designed with a cylindrical section with a radius of 3.57m, and its height is 5 meters. Following the deformation analyses, Von- Mises stresses occurring in reinforced concrete and soil for rectangular cross-section water tanks were determined separately for ZE soil classes with 1 tf/m² soil thrust applied to all walls for every 1 m² (Fig. 2).

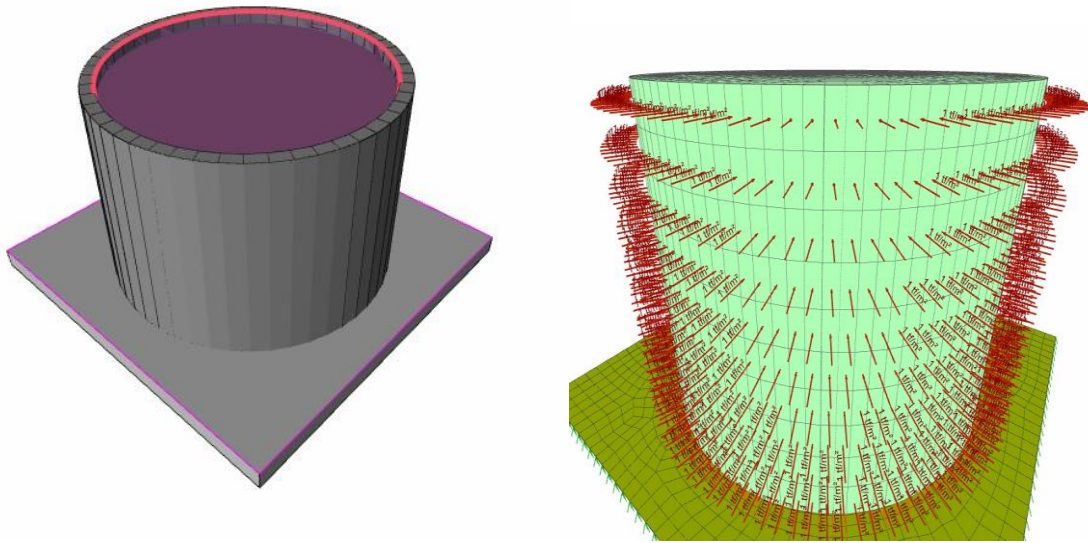


Figure 2. Water tank solid model,

In this section, the static analysis of a cylindrical cross-section water tank with a water volume of 200 m³, a height of $h = 5$ m and a radius of $r = 3.57$ was carried out with the İDECAD program. The earthquake parameters taken according to TBDY2018, the soil parameters used, material information and loading combinations and the reinforcement diameters used are the same as the rectangular section water tank designed in the ze soil class and are given above. The water tank is buried from +0 elevation to -500 cm elevation. The İdeCAD program has shown that in this solution, the foundation must be reinforced to spread the load over a larger area.

Numerical analyses were performed assuming the tank was filled with water up to a height of 5 m. The tank geometry is assumed to be in contact with the soil and the stresses on each geometry are determined separately. In the analyses ANSYS programe, hydrostatic pressure and gravitational acceleration due to water were defined on the system and the tank bottom was considered as a fixed support. (Fig. 3)

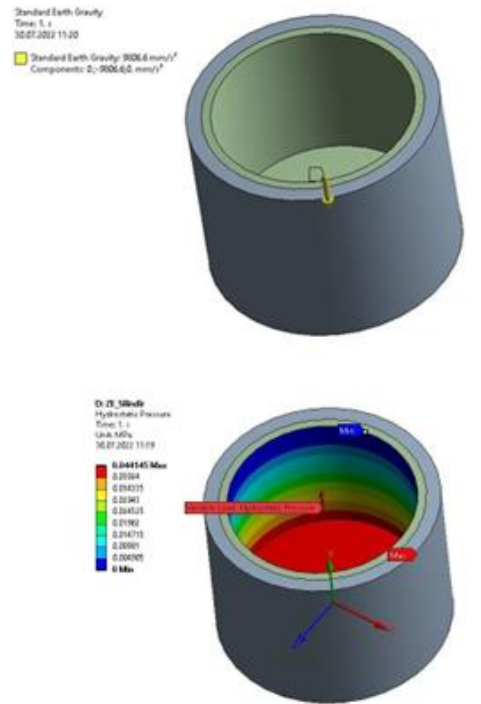


Fig.3 Stress distribution at the walls of the water tank in ZE class soil with ANSYS programe

According to TDBY 2018 in Turkey, if the underground structure is close to the surface, structure-soil interaction can be neglected in relatively soft soils exposed to earthquake loads. Fig 4 shown the maximum displacement of the cylindrical water tank walls modeled in soil class ZE was determined as 0.124 mm, which has a homogeneous stress distribution due to its circular geometry with the ANSYS programe.

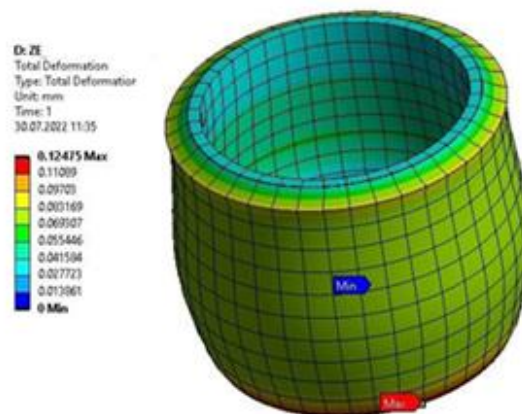


Fig 4. The deformation of the cylindrical water tank walls modeled in soil class ZE

In addition, the stress values calculated in the middle of the walls of a water tank to be designed for ZE class soil are almost 10 times higher than the stresses that occur on the base of the cyclindrcial water tank is shown in Fig. 5

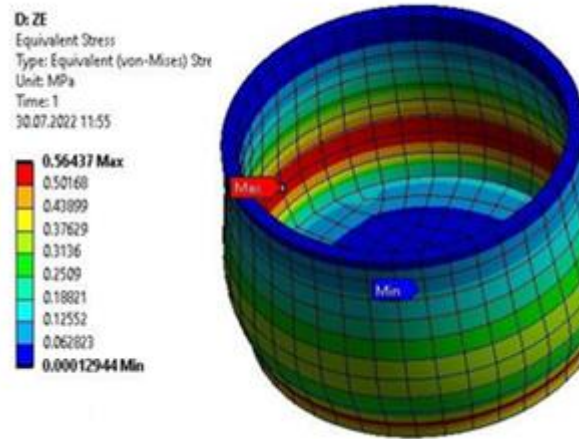


Fig 5. The stress values of the cylindrical water tank walls modeled in soil class ZE

Another stress analysis is the horizontal earthquake loads and earthquake rollover control analyses on the water tank designed in ZE soil classes during earthquakes with the İdeCAD programme. These evaluations are compulsory for the structural design, safety, and standard practices in earthquake engineering and structural analysis in Turkey. The designed and expected earthquake loads that affect the water tank in ZE soil classes are presented in Table 8 for X and Y directions. Here, 'h' represents the height, 'ex' and 'ey' represent the interaction points of the horizontal components of the earthquake loads with axial loads, 'Fx' and 'Fy' represent the magnitudes of the earthquake loads, and 'T' represents the earthquake moments. In Table 9, earthquake moments and vertical load moments are compared for both soil classes for overturn control. A "Structure Overturning Moment" is the moment generated at the base by horizontal loads. Overturning Structures Making sure that the ratio of the total moments preventing the structure from overturning to the sum of the moments that cause the structure to overturn is more than 0.5 is known as moment control. Overturning moments were controlled in both the X and Y directions in the overturning moment control study of the water tank structure. Naturally, a structure overturning moment analysis is not anticipated in the design of an underground water tank; however, since these loads will result in variations in the pressures on the tank walls, slab floors, and raft foundation, in particular, these overturning moment control analyses have been performed. The rollover risk is within acceptable bounds when the control ratios, which are for the rollover ZE soil classes' X and Y directions, are below 0.5 in both scenarios.

In this instance, rollover controls for ZE class soil are applied in the X and Y axes as follows:

$$X \text{ direction roll control } 123.36 / 1064.81 = 0.116 < 0.5$$

$$Y \text{ direction tilt control } 123.36 / 1069.74 = 0.115 < 0.5$$

For the tank geometry, the computed rollover analysis is less than 0.5.

It indicates that the design parameters that were found are quite safe.

Table 8. The designed and expected earthquake loads on the water Tank in ZA and ZE soil classes in X and Y directions

EARTHQ U.-X	Soil	ex	ey	Fx	Fy	T	ex	ey	Fx	Fy	T	
	clas s	h [m]	[cm]	[cm]	[tf]	[tf]	[cm]	[cm]	[tf]	[tf]	[tfm]	
	ZE	5.0	0	40	38.0	0	15.2	0	40	38.0	0	15.2
		0			9		3			9		3

EARTHQ .-Y	Soil	ex	ey	Fx	Fy	T	ex	ey	Fx	Fy	T	
	clas s	h [m]	[cm]	[cm]	[tf]	[tf]	[cm]	[cm]	[tf]	[tf]	[tfm]	
	ZE	5.0			33.9					33.9	8.47	
		0	25	0	0	1	8.47	25	0	0	1	8

Table 9. Earthquake horizontal load moments

Earthquake moments	Soil class	h (m)	Fx (tf)	Fy (tf)	Mx (tf)	My (tf)
	ZE	5.00	38.09	33.91	190.46	169.57

Earthquake vertical load moments

Vertical load moments	Soil class	Soil weight (tf)	Dx (m)	Dy (m)	Mx (tf/m)	My (tf/m)
	ZE	230.34	3.50	5.00	805.83	1151.44

RESULTS AND DISCUSSION

In this study, stress, moment, and deformation analyses were performed using the İdeCAD and ANSYS programs to determine the effects on the walls, and upper and lower slab floors of underground rectangular water tanks if they were constructed in ZE soil classes. The variations in soil classifications led to a range of design outcomes. TDBY 2018 in Turkey states that in relatively soft soils exposed to seismic stresses, structure-soil interaction can be disregarded if the subterranean structure is close to the surface (Korkmaz and Demir 2012, İnel and Tanık 2016, Eroglu and Ipek 2023). Table 10 displays the necessary quantities of reinforcement and concrete, as determined by the study of a cylindrical water tank intended for subterranean construction in ZE soil classifications.

Table 10. The required concrete and reinforcement quantities for an underground water tank to be constructed in ZE class soil

soil class	CONCRETE (m ³)				REINFORCEMENT			
	Floor	Raft Foundation	Walls	Total	Floor	Raft Foundation	Walls	Total
ZE					331 (Ø8)+	242(Ø12)+	891(Ø8)+	
	10.048	41.449	33.624	85.121	293(Ø12)	3599(Ø14)	2547(Ø14)	7903

The analysis's findings demonstrated that, while developing an underground tank in various soil classes, the requirements for reinforcing, the kind of material, and the design foundation's geometries varied significantly. The results of this analysis showed that a water tank that is going to be constructed on ZE class soils has to have its raft foundation base expanded. This shows that more concrete and reinforcement are needed, particularly for raft foundations. This emphasizes how different soil classifications affect structural needs and how important it is to take these factors into account throughout the design process. Few studies in the literature have examined the impact of variations in soil classes on underground water tank designs in a manner similar to this one (Anchor, 1992, Sani et al., 2014, Anirudha et al., 2016, Dubey, 2021).

The water-filled tanks were used in the study, and the SSI effect was disregarded while calculating stress, moment, and deformation at the sites where the tanks and the ground came into contact. The models featured hydrostatic pressure, gravitational acceleration, and a fixed supports model for the bottom of the water tank. Building on the ground was ensured for both classes since the highest stress values at the ground foundation stayed below the soil's bearing capability. One of the most significant findings of this study, however, is that an underground water tank of this size constructed in the ZE soil class is advised to have a raft foundation.

The cylindrical water tanks that are to be built in the ZE soil class have structural strength against the stresses due to the soil, water, and seismic loads without experiencing considerable deformation, according to the findings of stress, moment, and deformation analyses. The trustworthiness of the design parameters was confirmed when it was noted that the design values produced via the use of stress, deformation, and structure overturning moment evaluations were within the structural safety limitations.

CONCLUSIONS

2. This study was carried out to determine the design parameters obtained as a result of stress, moment and deformation analyses for a cylindrical geometry underground water reservoir to be constructed in Class ZE soils with liquefaction potential classified according to TBDY2018, one of the earthquake building design regulations in Turkey.

3. Subsequent stress and deformation analysis results obtained with the İdeCAD and ANSYS programs showed that the cylindrical water tank to be constructed in ZE soil class have structural resistance against soil, water and earthquake induced stresses without any significant problem. However, due to the fact that ZE class soils are loose, weathered and have low bearing capacity, the use of raft foundation is recommended, and its importance is emphasized in order to prevent deformations occurring in the tank structure in ZE class soils, to increase safety under underground water tanks and to prevent deformations that increase over time such as creep. As a result of all analyses, the recommended design parameters and the required concrete and reinforcement quantities for both tank geometries are given in the study

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DEVELOPMENT OF DIM STREAM FLOOD HAZARD MAPS WITH HEC-RAS 2D MODEL

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ABSTRACT

Although it is a common natural disaster, the effects of floods on human health, all kinds of structures and the economy, especially in Turkey, have not been evaluated in detail, and serious studies have not been carried out for precautions to be taken in advance. In this study, a flood and overflow analysis of a stream in a settlement was carried out in order to take some precautions before, during and after the flood in order to reduce such damages due to the flood and overflows. The HEC-RAS program, a Hydrologic Engineering Center- River Analysis System, was used in this study, to make predictions and analyzes to calculate water surface profiles in order to determine the water level during a flood. The Dim Stream in Turkey was decided to be used in this study to determine the potential flood sections and flood analysis using the data observed from water surface levels with the HEC-RAS program. The existing and potential flood sections in the DIM stream bed, which was flooded before, were determined by the analysis results. The HEC-RAS program analysis results also leads to conclusions that the damages that may occur would be minimized for all kinds of structure to take the drastic measures for the determined flood dissemination areas. It has been understood that a terrain model should be prepared and used in modeling studies, and river cross sections should be taken from points that will accurately represent the riverbed to carry out flood studies conducted with HEC-RAS more efficiently. It has been understood that the analyzes to be made by using hundred-year stream flow values in the HEC-RAS program will be quite sensitive and accurate in reducing the damages and human health risks caused by flood hazards.

Keywords: Dim Stream, Floods, Human Health, Planning, HEC-RAS, Flood Analysis

1.INTRODUCTION

Flood is caused by a water source that overflows due to the effect of continuous rain or melting snow in general. It is more common in areas that receive abundant rainfall throughout the year, are close to sea level, and have high slopes. It stands out as the most common natural disaster in Turkey. According to DSİ data, 695 flood events occurred between 1975 and 2010, 634 people lost their lives as a result of these floods and 810 000 hectares of agricultural land were exposed to flooding. Floods belong to the group of disasters that cause national economy, deaths and diseases (Albering et al. 1992, Altundal, 2010). Although these effects are tried to be eliminated with the flood reclamation structures built, these efforts are insufficient due to reasons such as rapidly changing climatic conditions and unplanned construction. Floods are seen as the biggest natural disaster after earthquakes worldwide, especially in countries located in tropical climate zones. Today, there are significant increases in the severity, frequency and affected areas of meteorological events such as global warming, weather events (severe storms, heavy rainfall and storm surges) as well as hydrological natural disasters such as floods and

overflows, and climatological natural disasters such as long-term drought events and desertification processes (Türkeş et al., 2000). Due to global climate change, not only the number and severity of storms in tropical regions have increased in recent years, but also the number and severity of flash floods in cities due to storms have increased in countries outside tropical regions such as Turkey (Baxter et al. 2001) . In rapidly increasing unplanned settlements, hazards such as earthquakes, floods, etc. can now turn into disasters more frequently (Kadioğlu, 2008)).

The size of stream beds do not cause flooding in normal rainwater accumulation situations and an extreme rainfall must fall in a short period of time for flood analysis to be performed. However, streams whose beds are narrowed or channelized as a result of subsequent engineering structures cause more flooding. The main reason for this problem is the narrowing of stream beds as a result of wrong zoning practices and land uses, channelization or reduction of the flow cross-section for slums and other uses (Filiz, 2001; Karakuyu, 2004). In the effects of riverbed landform on floods, the influence of rivers on landforming occurs mostly in temperate belts. For this reason, the land shaping of rivers is closely related to geomorphology, the development of landforms related to rivers (Dirik, 2009). The geological structure of the basin is effective in determining the morphology of the river. The river bed develops as allowed by geology. Similarly, soil type also affects the amount of infiltration and run off (Özbek, 2009).

Roughness Coefficient is another effective parameter on fllooding. For example, vegetation that may appear as a result of seasonal changes or garbage thrown into the channel from the immediate vicinity can significantly increase the value of the roughness coefficient. Therefore, taking into account the changes that may occur in the open channel bed in the near future while making the determination provides healthier results. Since the HEC-RAS program used in this study is implemented with the Manning Equation to determine the water surface profile, it is necessary to specify the roughness coefficient (n) when performing flood analysis. When determining the flow rate in flood structures, experimentally obtained values for certain structures are used in many sources for the roughness coefficient. Roughness coefficient depends on many parameters when sizing flood channels. These can be listed as the type of material in the bed, vegetation cover, the number and shape of transverse structures on the river, the shape of the channel cross-section, the irregularity of the channel and the meandering of the channel along its route. Among these parameters, the value of the roughness coefficient is calculated by Cowan method (Cowan 1956, Arcement et al. 1989):

$$n = (n_0 + n_1 + n_2 + n_3 + n_4)m$$

Where: n: Roughness coefficient, n0: Type of material in the river bed, n1: Degree of channel irregularity, n2: Variation in channel radius, n3: Similar effects of obstacles, n4: Vegetation, m: Represents the degree of channel meandering.

2. STUDY AREA

Dim Stream is located within the borders of Alanya district of Antalya. The stream, which originates from the Taurus Mountains 6 kilometers from the center, follows a path of approximately 60 kilometers. A dam is being constructed by DSİ for irrigation, drinking water and energy purposes. The source of Dim stream is Alacami Village of Alanya district. Since the source of the stream originates from here, Dim is known as Alacami Village. The route of the stream that feeds 12 villages in the region is; Yalçı, Bucak, Gümüş, Kavak, Başka village, Üzümlü, Uzunöz, Bıçakçı, Kuzyaka, Kızılca city and Kestel. The end of the stream flowing in this order flows into the sea from Tosmur Beach on the coast of Kestel. Figure 1 shows the

physical map of the research area and its immediate surroundings prepared by utilizing the General Directorate of Mapping, 1/100 000 scale map.

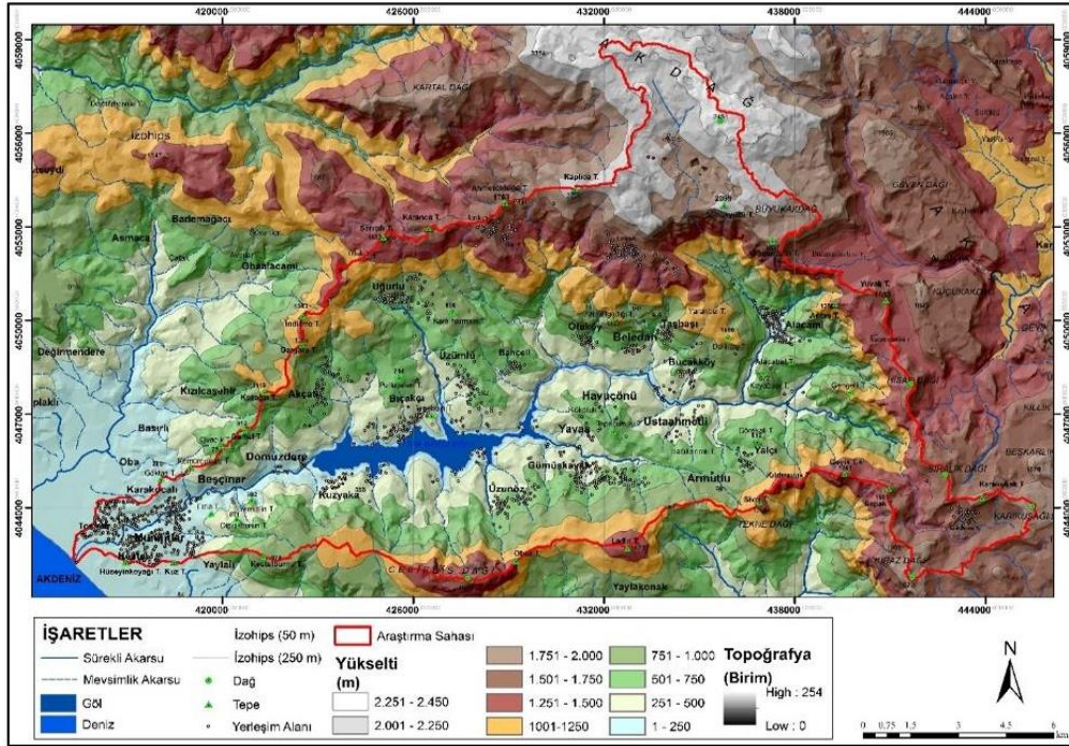


Figure 1.

Research field map (General Directorate of Mapping with 1/100 000 scale map).

Figure 2 shows 3D satellite view of Dim Stream obtained from Google Earth.

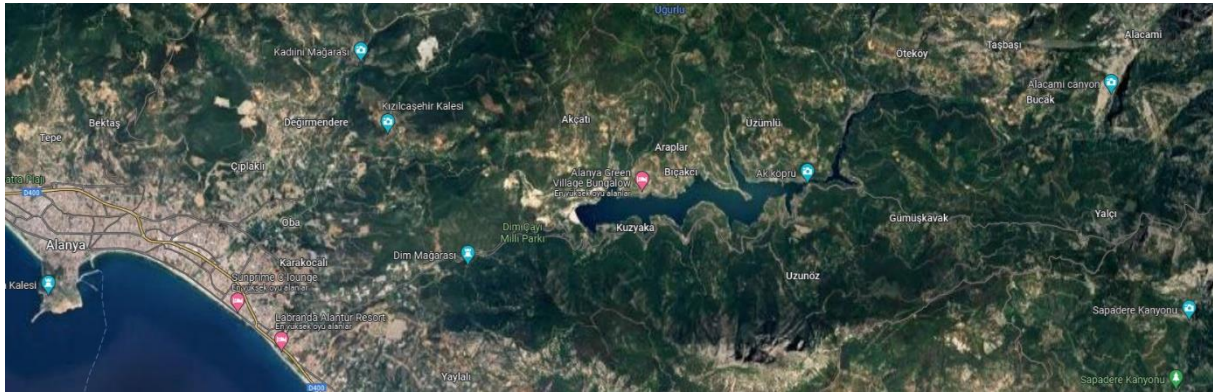


Figure 2. Dim Stream 3D Satellite View

2.1. HEC-RAS Program Analysis

The first version of the HEC-RAS program (1.0) was released in 1995. The latest version (4.1), which has been in use since January 2010, includes many innovations and enhancements. Developed by the Hydrologic Engineering Center (HEC), a branch of the Institute of Water Resources (IWR), Gary W. Brunner played a leading role in the development of the HEC-RAS software. The user interface and graphics were designed by Mark R. Jensen, the water surface profile analysis modules were designed by Steven S. Piper, the sediment transport module by Stanford Gibson, and the water quality module by Cindy Lowney and Mark R. Jensen.

There are pre-process parameters in HECRAS program to perform hydraulic analysis of channel geometry and flow (Brunner et al. 2010, Khallhalla et al 2018). These parameters are

applied to a series of cross sections along the stream. Each cross-section is divided into three sections along the stream bank: right, center and left. The reason for this division is the differences in hydraulic parameters. The frictional force between the flow and the channel bed significantly affects the flow resistance in the floodplain by reducing the Manning roughness coefficient. As a result, the velocity and transport of the flow are higher in the main channel than in the flood route. In HEC-RAS, shape, elevation and relative position parameters need to be defined at each cross section.

The parameters to be defined are;

- a) Cross section numbers and cross section geometries along the stream route
- b) Distance between cross sections
- c) Roughness coefficient
- d) Channel contraction and expansion coefficients
- e) Geometries of transverse structures forming obstacles along the route

In the HEC-RAS program, it is assumed that the energy line is constant along the cross sections and the velocity vector is perpendicular to the cross sections. After the flow geometry is defined, the hydraulic water values of the flow are defined as the first step data input. Figure 3 shows the Digital Elevation Map of approximately River, Bank Lines, Flow Path and Cross Section on Dim Stream Elevation Map.

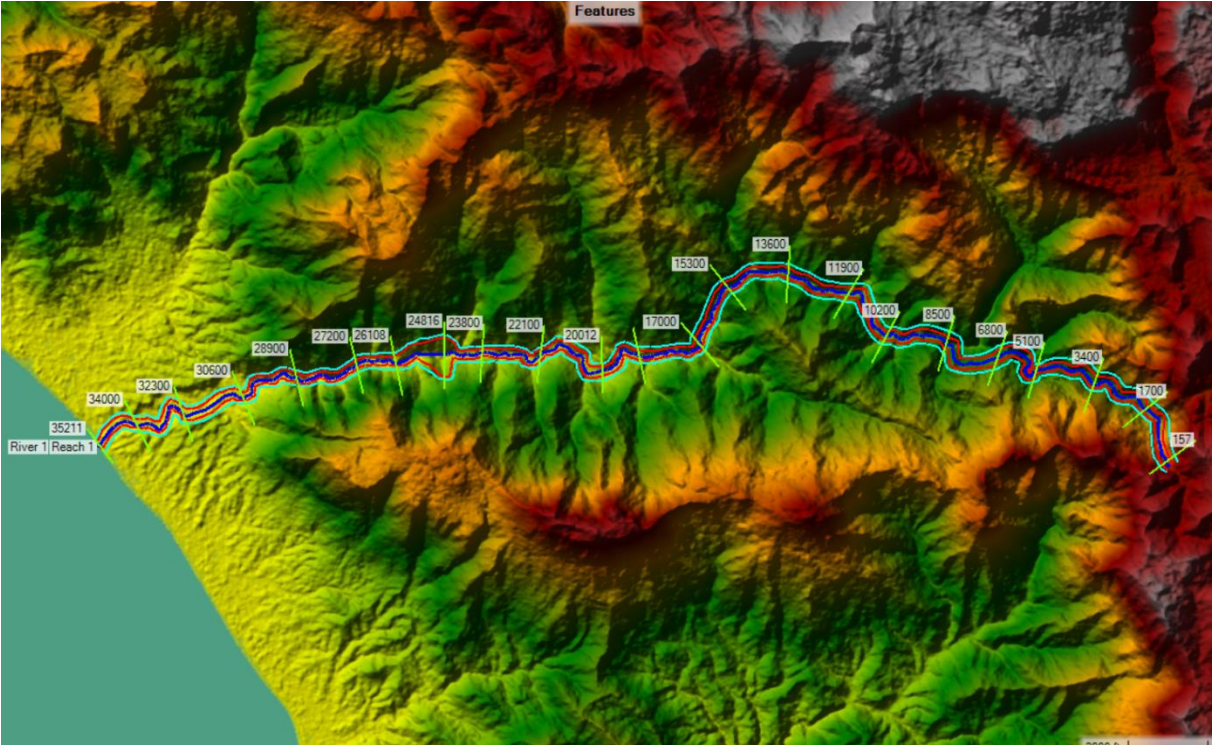


Figure 3. River, Bank Lines, Flow Path and Cross Section on Dim Stream Elevation Map.

Since there are different soil structures along the river bed, three different manning coefficients were determined by 'Cowan Method' are shown in Table 1 shows the parameters required for the determination of the manning coefficients.

Table 1. Determination of Manning Coefficients

First 5 sections

m	n_b	n_1	n_2	n_3	n_4	n
0.83	0.027	0.000	0.005	0.025	0.075	0.01460

Next 10 Sections

m	n_b	n_1	n_2	n_3	n_4	n
0.83	0.027	0.020	0.005	0.025	0.075	0.02041

Last 8 Sections

m	n_b	n_1	n_2	n_3	n_4	n
0.83	0.040	0.020	0.005	0.012	0.075	0.01690

In a mixed regime with different riverbeds, the HEC-RAS program provides very good results for identifying areas where flooding is likely to occur depending on the basin condition. Figure 4 shows the interface of the Hec-Ras program.

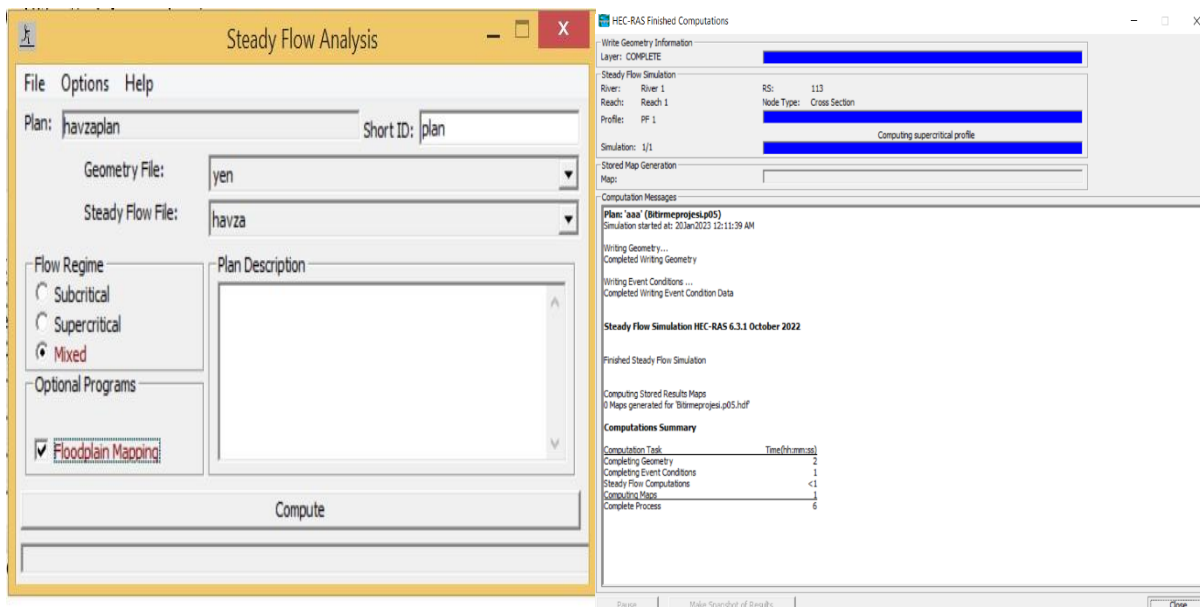
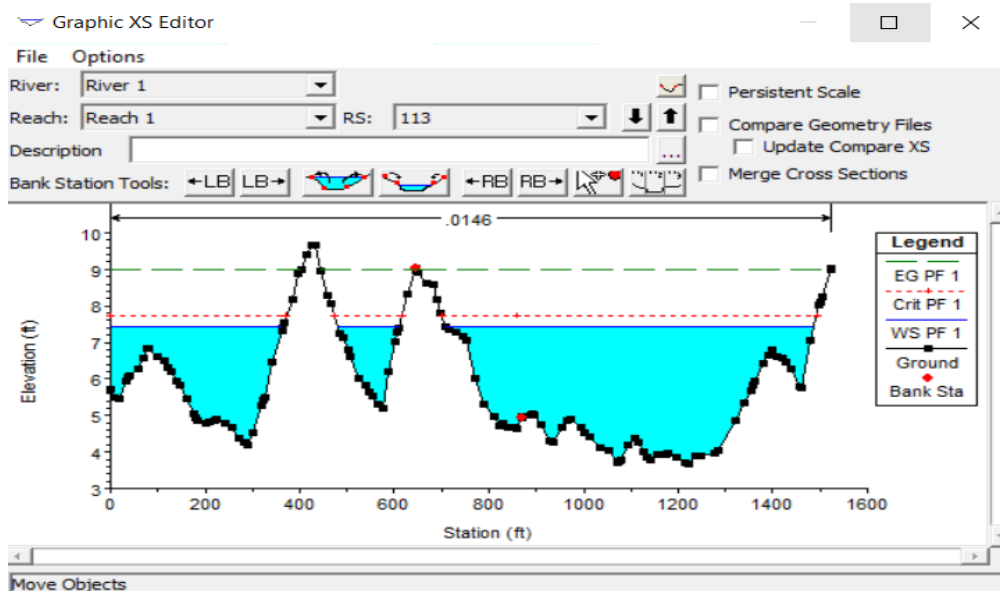


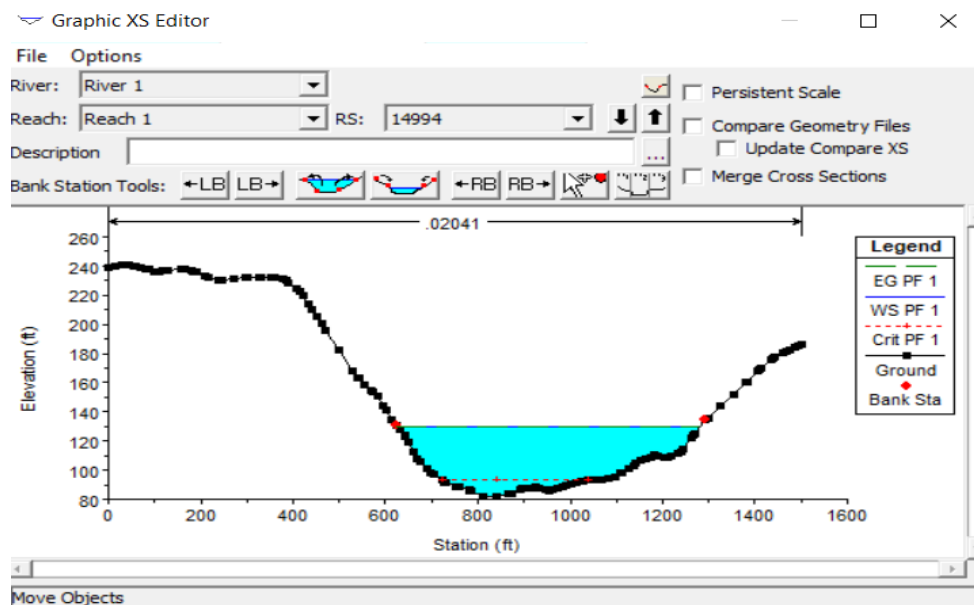
Figure 4. Analysis and Running the Program.

In general, the calculation steps for a river regime flow with the determination of boundary conditions are as follows: a) Estimate a value for the water surface profile at the first cross section. b) Find the area, hydraulic radius and velocity for this cross section. c) Calculate the convection and kinetic energy based on the area, hydraulic radius and velocity. d) Find the friction curve, energy loss and contraction/expansion losses. e) Calculate the water surface profile from the energy equation between two consecutive cross sections. f) The water surface

profile is compared with the predicted values and the process is continued until the permissible range of values is reached. Results With the HEC-RAS program, it is possible to obtain the water surface profile, velocity graph at channel bottom-side slopes, elevation-flow graph and perspective view of the route under repetitive flow rates of cross-sections taken at specified locations along the study area and the length profile of the route. Figures 5 show some cross-section-water level profile graphs. As seen from the variation analysis results, the water level and height varies with profile depth and width depending on the riverbed soil structure, soil profile and morphology.



(a)



(b)

Figure 5. (a) Figure 5. RS113 Cross Section View (b) RS14994 Cross Section View .

When the observation of the flow rate through the sections in Figure 8, the water depth takes shades between light blue tone and dark blue tone. As it is gone to the darker tone, it is seen that the depth of the water passing through the section increases and the water depth exceeds 2.5m^2 in certain sections.

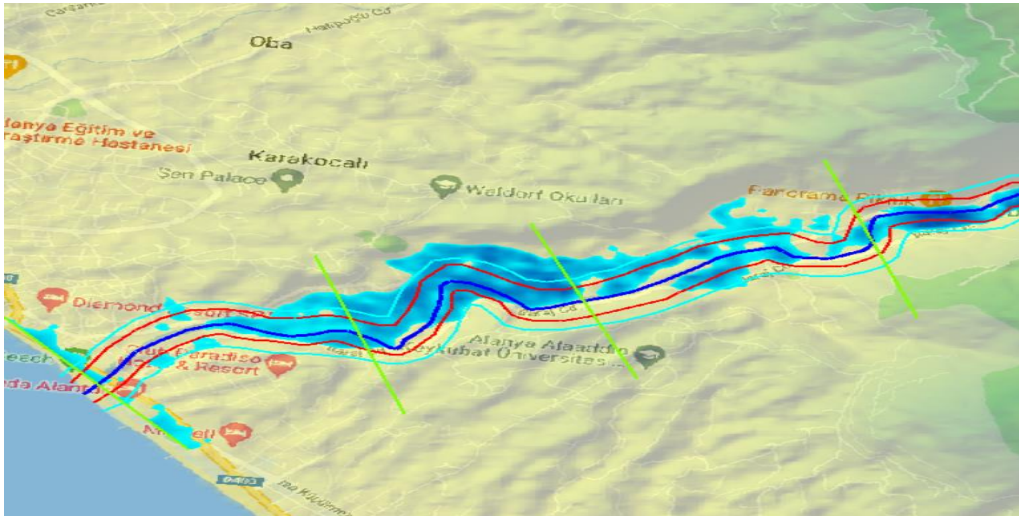


Figure 6. Water Depth in Sections

Figure 7 shows the results of the analysis of water velocity values passing through the sections with the Hec-Ras program. Light tones indicate that the velocity is slow in the cross-sections, while dark tones indicate that it is faster. As it can be seen in the figure, the water flows very fast in the residential areas and this is a very big problem because if the amount of water increases, the water velocity will increase at the same rate and the living beings in this area will suffer serious damages due to flooding. Figure 8 shows the water areas along the river due to flooding. In this case, in order to prevent possible flooding, barriers should be created close to settlements to reduce the speed of the water and reduce its kinetic energy.

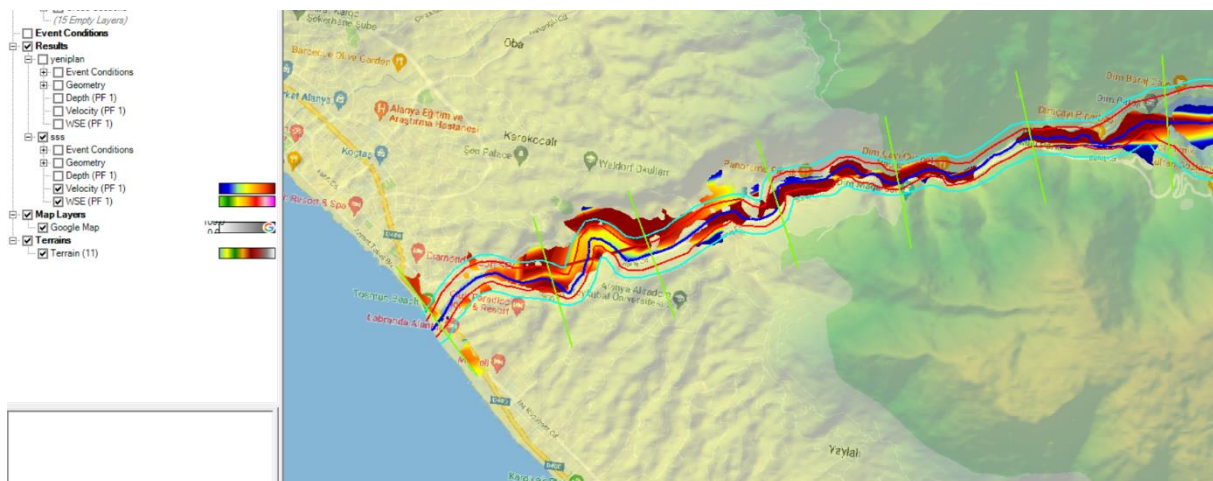


Figure 7. Flow velocity analysis with HEC-RAS

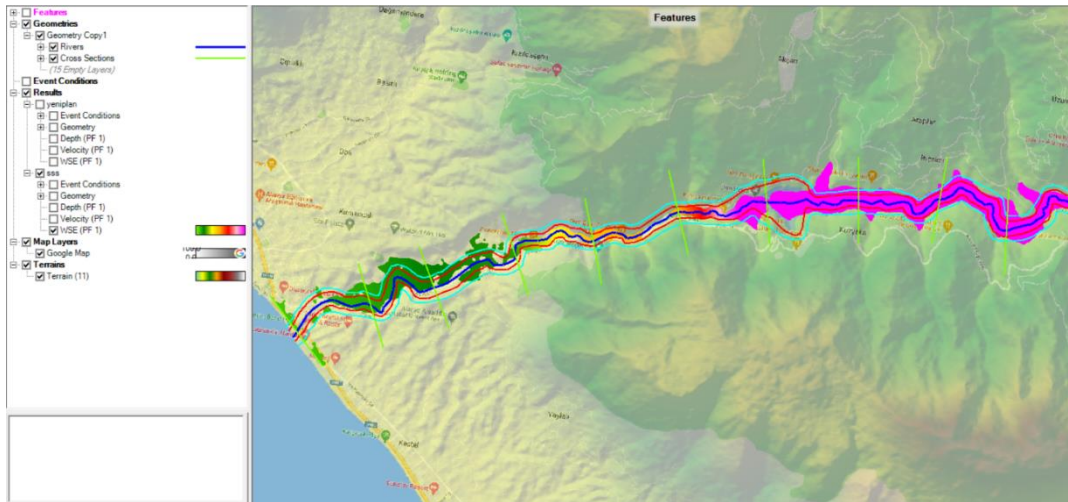


Figure 8. Possible flood area along the river profile

Table 2 shows the results of flow, velocity and possible flood areas in ft units with detailed calculations made in the sections examined.

Table 2. Detailed Calculations Made in Sections

Profile Output Table - Standard Table 1

File Options Std. Tables Locations Help

HEC-RAS Plan: sss River: Rive												
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	34986	PF 1	26637.80	1134.06	1150.59	1150.59	1155.57	0.002075	17.91	1487.09	151.92	1.01
Reach 1	33319.99	PF 1	26637.80	563.66	581.77	581.77	587.85	0.002016	19.78	1346.77	112.36	1.01
Reach 1	31654.00	PF 1	26637.80	448.27	454.40	464.04	566.38	0.161724	84.89	313.80	82.93	7.69
Reach 1	29988.00	PF 1	26637.80	385.84	353.81	337.02	353.97	0.000029		8207.57	451.34	0.00
Reach 1	28322	PF 1	26637.80	418.73	351.32		353.66	0.000708		2171.47	174.74	0.00
Reach 1	26656.00	PF 1	26637.80	329.89	346.79	346.79	351.50	0.002080	17.42	1529.14	162.92	1.00
Reach 1	24990.00	PF 1	26637.80	203.46	245.70	218.00	245.87	0.000015	3.38	8777.99	379.14	0.11
Reach 1	23324.00	PF 1	26637.80	196.31	245.69		245.83	0.000019	3.07	9006.40	358.39	0.10
Reach 1	21657.99	PF 1	26637.80	175.47	245.67		245.80	0.000013	2.87	9292.54	212.30	0.08
Reach 1	19992.00	PF 1	26637.80	220.11	238.95	238.95	245.12	0.002958	19.93	1336.79	109.91	1.01
Reach 1	18326.00	PF 1	26637.80	127.29	132.65	141.09	221.24	0.223738	75.50	352.80	107.91	7.36
Reach 1	16660	PF 1	26637.80	112.67	125.82	130.93	142.49	0.013268	32.75	813.36	101.37	2.04
Reach 1	14994	PF 1	26637.80	81.92	129.57	93.04	129.59	0.000003	1.36	21271.81	656.85	0.04
Reach 1	13328.00	PF 1	26637.80	77.74	129.51		129.58	0.000008	2.31	12929.84	445.33	0.06
Reach 1	11662	PF 1	26637.80	64.52	129.51		129.57	0.000004	2.07	14412.35	370.67	0.05
Reach 1	9996.000	PF 1	26637.80	109.92	125.28	125.28	129.16	0.003220	15.80	1685.98	219.05	1.00
Reach 1	8329.999	PF 1	26637.80	41.94	48.08	56.38	108.00	0.105173	62.09	429.00	99.34	5.27
Reach 1	6663.999	PF 1	26637.80	36.20	45.52	50.41	61.99	0.008067	32.55	818.25	119.13	2.19
Reach 1	4997.999	PF 1	26637.80	13.97	19.71	24.40	40.75	0.021808	36.80	723.91	188.42	3.31
Reach 1	3332	PF 1	26637.80	10.37	16.44	17.84	21.20	0.004644	14.81	1533.93	390.55	1.48
Reach 1	1665.999	PF 1	26637.80	6.22	11.43	12.14	14.52	0.003416	13.30	1896.88	524.83	1.28
Reach 1	113	PF 1	26637.80	4.65	7.43	7.72	8.98	0.003048	7.84	2746.71	1271.57	1.08

CONCLUSION AND EVALUATION

Possible flood areas were evaluated in the agricultural areas and touristic facilities located on the Dim Stream route within the borders of Alanya District of Antalya Province, which was selected as the study area. It was determined that a part of Karakoçanlı Neighborhood within the borders of Alanya District would be exposed to flooding due to the narrowness of the stream cross-section and low depth especially in the 0+113.1+667.3+332.4+998 km sections. When the literature was examined, it was determined that there have been floods in these regions before. In order to take precautions, it is necessary to expand the stream sections by looking at the condition of the basin and to prevent material and moral damages that will prevent human life in a possible flood risk by building flood control channels.

As a result of the direct and indirect effects of floods on economy, public health, significant material and moral damages occur almost every year. In order to reveal these damages in a healthy way and to carry out studies for mitigation, it is necessary to collect accurate data during and after the disaster. There are some practical difficulties in obtaining data for studies to be conducted after floods and floods. In order to reduce injuries, deaths and illnesses due to floods and floods, necessary measures should be taken by emergency teams, administrations and people at risk before, during and after floods and floods, not after the disaster as in this study. Especially the establishment of an observation network and early warning system that will cover the whole country is extremely important in terms of reducing the damages caused by these disasters. Scientific studies on this subject are needed in our country. In addition, it is necessary to establish healthy databases that will reveal the material and moral balance sheet of damages to be used in planning studies.

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A COMPREHENSIVE STUDY OF BUSINESS PERFORMANCE INDICATORS IN THE ALBANIAN CONSTRUCTION SECTOR

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ABSTRACT

Over the past decades, many studies have been focusing on the determinants of business performance, mainly their impact on certain sectors as they do affect the overall prosperity of a country. This research delves into the essential role of macro indicators in a crucial industry of the Albanian economy. Concentrating on major companies in Albania's construction sector the model looks at variables like GDP growth, credit to private sector, exchange rates fluctuations between ALL/EUR, population growth and unemployment rate. The dependent variable reflecting the performance of businesses is the Return on Equity (ROE). To achieve our purpose a balanced panel data model has been built, making 455 observations in total, investigating 35 companies from 2010 until 2022. Regression analysis is used to identify any potential relationship among the variables. Out of these, GDP growth, and population growth were found to be statistically significant, indicating a positive impact on financial performance for the period considered. Further, the results show that unemployment rate negatively and significantly affects the Return on Equity. Credit to private sector although with a positive impact was found to be statistically insignificant. Lastly, exchange rates fluctuations contrary to our hypothesis reveal a positive and insignificant effect on the dependent variable. This study addresses the importance of these indicators in developing economies like Albania, emphasizing their critical role in reaching economic prosperity and reducing differences relative to developed countries.

Key Words: Financial performance, Return on Equity, Credit, Population growth, and Construction sector.

INTRODUCTION

A company's financial success reflects how well its core operations performed in comparison to the market and rivals. Evaluating and assessing a company's financial performance appropriately and using the appropriate methods will always be a challenge and a top priority for economic entities. Analysing and comparing financial ratios across various businesses within the same industry across different reporting periods is a valuable approach for evaluating financial performance. This process can be facilitated by regularly accessing information from frequently published financial statements. Another innovative technique for evaluating the financial health of specific sectors within a country involves the ability to quantify, comprehend, and identify the interrelationships among these ratios. The construction industry stands out as the primary driver of economic growth in Albania, with its impact becoming increasingly pronounced in recent years. According to the Albanian Institute of Statistics, the construction sector is expanding at a faster pace than the GDP, underscoring its pivotal role in

the national economy. With its rapid growth and substantial contribution to the nation's GDP over the past decade, Albania's construction industry emerges as one of the most vibrant sectors. This industry's significant engagement with the workforce markedly enhances per capita income, particularly benefiting skilled, semi-skilled, and unskilled labours as a vital source of employment. Additionally, a thriving labour force and industrial sector are paramount for a robust economy, fostering a higher quality of life through the establishment and empowerment of businesses. Acknowledging the significant influence of businesses on the economy, researchers and policymakers have invested significant resources in developing and enforcing policies to support their prosperity and maintain long-term economic expansion (Olanipekun, Omotayo, & Saka 2021). If a company's performance is accurately and thoroughly assessed and examined, it can significantly contribute to the organization's success.

Regardless of the sector in which a company operates, its profitability, or the nature of its offerings, it remains subject to the influences of the external environment. All enterprises are affected by these external forces to varying degrees. Hence, macroeconomic policies play a crucial role in determining business returns. For instance, high tax rates can diminish returns, while inflation can create instability in returns. The enforcement of legal regulations can influence investors' decisions regarding the level and structure of their investments. The business environment primarily impacts the economy by influencing investment incentives. Enhancements in the business operating environment can increase returns in specific activities, thereby attracting more investments. It also influences the mindset of entrepreneurs, affecting their decision-making processes. Recognizing the substantial sway of businesses on the economy, researchers and policymakers have devoted considerable resources to crafting and enforcing policies aimed at bolstering their prosperity and sustaining prolonged economic growth.

Above said, this study aims to focus on the construction sector in Albania by analysing variables like GDP growth, credit to private sector, exchange rates fluctuations between ALL/EUR, population growth and unemployment rate. The dependent variable reflecting the performance of businesses is chosen the Return on Equity (ROE). To achieve our purpose a balanced panel data model has been built, making 455 observations in total, investigating 35 companies from 2010 until 2022.

LITERATURE REVIEW

Although macroeconomic factors can help explain corporate investment patterns to a great extent, they don't completely clarify the recent decrease. While we don't fully grasp the role of structural forces in this decline, analysing detailed panel data at the micro-level indicates that improving the business environment through cost reduction, infrastructure enhancement, prudent monetary and fiscal policies, and fortifying the financial system might encourage corporate investment. (Puci, Demi, & Kadiu, 2023). Tokuoka (2012) highlights the impact of the business environment on corporate investment in India.

Instability in macroeconomic variables poses significant risks, including business failures, financial crises, and economic downturns (Mara & Nicoleta, 2019). The macroeconomic policies of a country profoundly influence enterprises, impacting inflation, economic activity, unemployment, and income distribution (Vladimir, 2010). The ever-changing business landscape, encompassing economic, political, technological, and socio-cultural factors, profoundly impacts company survival and performance, necessitating regular environmental scanning (Alexander and Britton, 2000). Ogundele and Opeifa (2004) highlight the importance of external factors in understanding business performance and growth, emphasizing the need to

grasp how these factors interplay to shape the business's future. Other authors have highlighted also the same conclusion (Puci, Draci, Demi, & Merja, 2023).

Naceur (2003) analyzed the profitability of the banking sector in Tunisia from 1980 to 2000, revealing an insignificant effect of GDP growth on profitability. Ongore and Kusa (2013) found that GDP had no significant effect on banking sector profitability in Kenya from 2001 to 2011. This insignificant relationship has also been observed by other researchers (Hoffmann, 2011).

Baggs, Beaulieu, and Fung (2009) discovered a negative relationship between domestic currency appreciation and profit levels, particularly pronounced in larger companies serving broader markets and more susceptible to exchange rate fluctuations. Successful businesses are essential to a nation's development since they play a significant and evident role in people's lives as well (Singla & Samanta, 2019). Sayedi (2014), found a statistically significant negative coefficient for the effect of exchange rate fluctuations on ROE.

Bragoli, Burlina, Cortelezzi, and Marseguerra (2022), investigate the impact that credit has on the performance by revealing an increase of this variable on profitability. Nizaeva & Coskun (2019) emphasize the constraints on growth and profitability that firms face if they are subject to credit constraints. The study of Barth, Lin, and Yost (2011) focus on the financing capabilities of economies in transition and how this affects the economy through its positive effect on businesses and the obstacles faced. No significant relationship was found between firm growth and traditional finance (Beck & Yang, 2015)

Literature on the impact of population growth on the financial performance is very limited. Of the few studies, Peters and Walsh (2021) by highlighting the declining trend in population in almost all main economies, reveal the consequences of this decrease on the dynamics of the company and growth. Loecker and Eeckhout (2021) stress the importance of market power. They also emphasize the positive relation population growth has on the market power, affecting eventually business performance.

Dewi, Soei, and Surjoko (2019) have analysed the effect that non-specific factors have on financial performance of businesses operating in Indonesia. With their focus on GDP, inflation, unemployment and exchange rates, only GDP statistically influences the profitability of these companies. The decline in per capita income is influenced by rising unemployment. Consumer purchasing power is negatively impacted by a decline in GDP per capita. This may also result in a decline in product demand, which could ultimately hurt the company's profitability (Tandelilin, 2010)

METHODOLOGY

Data collection and sample

This research employs panel data analysis to explore the potential correlation between profitability in the construction sector and macroeconomic factors. The study focuses on major companies within the construction industry in Albania, as identified by the General Directorate of Taxation under the Law of Large Taxpayers. The list comprises 120 large construction companies in the country. The sample is drawn from businesses whose financial statements are accessible at the National Business Centre and are audited in accordance with Article 41 of Law No. 10.091 dated March 5, 2009. Consequently, the sample size is reduced to 35 companies operating in Albania between 2010 and 2022, resulting in a total of 455 observations. The data for these variables is taken from the statements of firms available on the National Business Center (QKB) webpage, whereas macroeconomic variables have been gathered from the World Bank database.

Model Specifications

To explore the long-term relationship between ROE and specific macroeconomic factors, multiple regression analysis is employed. The independent variables include GDP growth, credit to private sector as percentage of GDP, exchange rate fluctuation (EUR/ALL), population growth, and unemployment rate, while ROE is the dependent variable of the model. The regression is conducted using EVIEWS 10 software.

This study tests four hypotheses:

H1: GDP growth positively affects ROE

H2: Credit to private sector positively affects ROE

H3: Exchange rate fluctuations negatively affects ROE

H4: Population growth positively affects ROE.

H5: Unemployment rate negatively affects ROE

ROE is calculated as net income divided by total equity, while GDP growth reflects the percentage change in GDP relative to the previous year. Exchange rate fluctuations refers to the percentage change from one year to the other of the quotation between EUR and ALL. Population growth is percentage change of the Albanian population from one year to the other. Lastly, unemployment rate is expressed as percentage of total labour force.

The R-squared value indicates the proportion of variance in the dependent variable explained by the independent variables. The null hypothesis is tested against the alternative hypothesis; if the model's p-value is less than 0.05, the model is considered significant.

Multiple regression analysis requires adherence to several assumptions: normal distribution, tested using the Jarque-Bera test; homoscedasticity, assessed through p-values; multicollinearity, examined using the variance inflation factor (VIF); and absence of serial correlation, evaluated with the Durbin-Watson test.

ANALYSIS OF RESULTS

Regression Output

Our prior tests, presumptions, show no presence of autocorrelation as indicated by Durbin Watson test, but the data reveal presence of heteroscedasticity, hence we run the regression with corrected standard errors. Lastly normal distribution is met, and the model does not reveal any presence of multicollinearity.

The regression is performed using EVIEWS and the results are presented in the following table. The p-value of the model is lower than 0.05 which makes the model significant. Additionally, the R-squared is relatively high, at about 48%. The significance of each variables is reflected in the regression outcome. GDP growth, and population growth are statistically significant, indicating a positive impact on financial performance; whereas unemployment rate negatively and significantly affects ROE. Hence, H₁, H₄ and H₅ are accepted. Further, the results show that Credit to private sector although with a positive impact is statistically insignificant. Lastly, exchange rates fluctuations a positive and insignificant effect on the ROE. Therefore, H₂ and H₃ are rejected.

Dependent Variable: ROE
Method: Panel
Sample: 2010 2022
Periods included: 13
Cross-sections included: 35
Total panel (balanced) observations: 455

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.124606	0.061019	2.042095	0.0418
GDPGR	0.291887	0.098356	2.967648	0.0032
CREDIT	0.001758	0.002207	0.796286	0.4263
EXCHRATE	0.614805	0.042328	14.52479	0.0000
POPGROWTH	0.031807	0.008682	3.663713	0.0003
UNEMPL	-0.004920	0.002202	-2.234471	0.0260

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.526272	Mean dependent var	0.173593
Adjusted R-squared	0.481753	S.D. dependent var	0.172014
S.E. of regression	0.121611	Sum squared resid	6.137496
F-statistic	11.82127	Durbin-Watson stat	1.535233
Prob(F-statistic)	0.000000		

Discussion

In this study, we intended to determine the non-specific impacts on the construction industry in Albania. As shown from the table above, our model is valid for conclusions, recommendations and forecasting as indicated by the p-value of the model (0.000). As it can be observed, about 48% of the fluctuations in the Return on equity are explained by the variables that we have included in the model. Next, if each variable is analysed, the results of GDP growth are in line with most of literature suggestions, indicating that firm's performance will tend to follow the business cycle (Singla & Samanta, 2019). More specifically, results show that a 1% increase in GDP growth rate increases ROE by about 0.29%. The outcome for population growth aligns with the studies of Peters and Walsh (2021), revealing that a 1% increase in population growth increases ROE by about 0.032%. As expected, a higher rate of unemployment would affect the demand for goods and services offered in the society, by lowering business revenues, and eventually their Return on Equity (Dewi, Soei, and Surjoko 2019). Mainly, the outcome shows that a 1% increase in unemployment rate decreases ROE by about 0.005%. Lastly, as it is apparent from the table the other two variables exchange rate fluctuations and credit to private sector as percentage of GDP, suggest no impact on the Return on Equity of the companies considered.

CONCLUSION

In this paper, we have scrutinized the profitability of one of the most vital sectors in Albania. As suggested, performance assessment provides useful insights to supervise, pinpoint problems, and correct. Thus, the primary requirement for improving business performance is to formulate and execute the requisite measures for business performance. Through these metrics, multiple stakeholders can glean a rudimentary understanding of an exceedingly intricate reality.

In conclusion, this study delved into the crucial role of macroeconomic indicators in assessing the performance of large companies within the construction sector of Albania. Through the utilization of a balanced panel data model encompassing 455 observations across 35 companies from 2010 to 2022, this research examined the impact of GDP growth, credit to the private sector, exchange rate fluctuations between ALL/EUR, population growth, and unemployment rate on Return on Equity (ROE). The findings revealed that GDP growth and population growth positively and significantly influenced financial performance, while the unemployment rate had a negative and significant effect on ROE. However, credit to the private sector was statistically insignificant despite its positive impact. Surprisingly, exchange rate fluctuations exhibited a positive but insignificant effect on the dependent variable, contrary to initial expectations. This study underscores the significance of these indicators in the context of developing economies like Albania, underscoring their pivotal role in fostering economic prosperity and bridging the gap relative to more developed nations.

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COHESIVE FRACTURE CHARACTERISTICS OF SOILS STABILIZED BY BLAST FURNACE SLAG CEMENT

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ABSTRACT

In this study, coarse clayey sand (GSC) and sandy clay (SC) samples to be used to represent coarse-grained and fine-grained soils were stabilized with blast furnace slag cement at specified ratios and fracture toughness tests were performed. The stabilized soil samples were compacted into molds and semicircular bend (SCB) specimens were prepared after 28 days of curing. Fracture toughness test results and cohesive fracture analysis results under static load showed that GSC specimens stabilized with 10% cement (GSC10C) had higher strength values than SC specimens stabilized with 10% (SC10C) and 2% cement (SC2C). Numerical analyses were performed using FRANC2D crack analysis software to compare the experimental analysis results. The crack opening displacement (COD) and applied load graphs plotted showed that a high plastic deformation zone was formed before fracture, followed by a stable cohesive crack propagation. The results of nonlinear numerical analysis with FRANC2D showed that the unstable cohesive crack initiation occurred between the initial chevron notch crack and the final chevron notch crack.

Keywords: Cement stabilized soils, Fracture mechanics and stabilized soils

INTRODUCTION

The main purpose of soil improvement is to increase the basic bearing capacity of the soil and prepare for construction. Many methods are used to stabilize soil and mechanical stabilization, chemical stabilization, strengthening, etc. methods are generally preferred. The selection of the soil improvement method is made according to several factors and an in-depth ground survey of the soils is required to determine the soil properties. One of the most common methods of soil stabilization material is cement. A determined amount of cement is mixed with the soil in soil stabilization to increase the strength and resistance of the ground. The percentage of cement mixed into the soil varies depending on the engineering properties of the soil. The higher the plasticity of the soil, the more cement is generally added (Fondjo et al., 2021, Zada et al., 2023).

Cement stabilized soil behaves like elastoplastic materials under static loading (Xia et al. 2022; Zada et al. 2023; Xiushan 2023). In the ultimate strength calculations and projects of such materials, uniaxial compressive strength tests are quite common among the strength tests. However, the standards proposed to test the indirect tensile and shear strengths of such materials are not common and there is no international test method to analyse especially mixed mode I-II (tensile-shear) strengths and damage mechanisms. Cement-stabilized soils are elastoplastic and quasi-brittle materials; hence, research on deformations of brittle and quasi-brittle

materials using fracture mechanics has been widely carried out in this field (Crockford 1987; Sophan and Das 2007; Zhang et al. 2017; Takahashi et al. 2021).

The semicircular bending (SCB) test is one of the international fracture mechanics standard tests and is used commonly for asphalt, concrete, composites, and cement stabilized soils (Zhang et al. 2022, Zhang et al. 1017) (Fig.1).

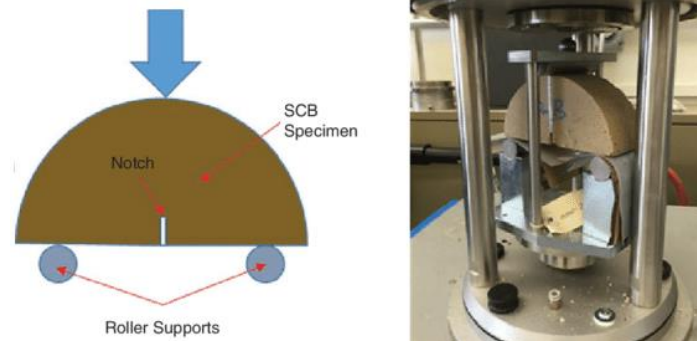


Fig.1 SCB specimen geometry and test configuration

Fracture toughness (KIC) is the critical value of stress intensity factor (KI) and shows the material's resistance to fracture and indicates the beginning of unstable crack propagation around the fracture process zone (FPZ) in front of the crack tip in strength of materials research. However, it is not easy to calculate the length of a crack when it becomes unstable in the FPZ. This is an important point for elastoplastic materials such as stabilized soil, where elastoplastic material properties do not change much if the stable cracks are not unstable. Considering a Mode I (tensile) type fracture, the crack begins to grow in a plane perpendicular to the direction of the greatest direct/indirect tensile stress. The stress state around the crack tip is calculated as a function of the notch crack length and the geometry of the sample.

METHODOLOGY

In this study, it was planned to use well-graded gravel-sand-clay mixture and sandy clay samples and mix them with 2% and 10% cement to create both a coarse and fine-grained soil mixture. The GSC (granular clayey sand) specimens stabilized with 10% cement is represented as GSC10C and SC (clayey sand) specimens stabilized with 10% (SC10C) and 2% cement (SC2C).

Before performing the fracture toughness tests, the determination of basic soil tests, such as natural water content, specific gravity, sieve analysis, Atterberg limits and compression (Proctor) tests, were performed. GSC and SC samples were mixed with Portland slag cement at 2% and 10% ratios of the soil sample weight. Some of the prepared samples are shown in Fig. 2. In order to prepare the samples removed from the mold after 28 days of curing period for fracture tests, 40 cm thick discs were cut and then these discs were divided into two to prepare the semicircular bending (SCB) samples. After the first series SCB samples were prepared, static loading experiments were performed with a loading rate of 0.025 mm/min.

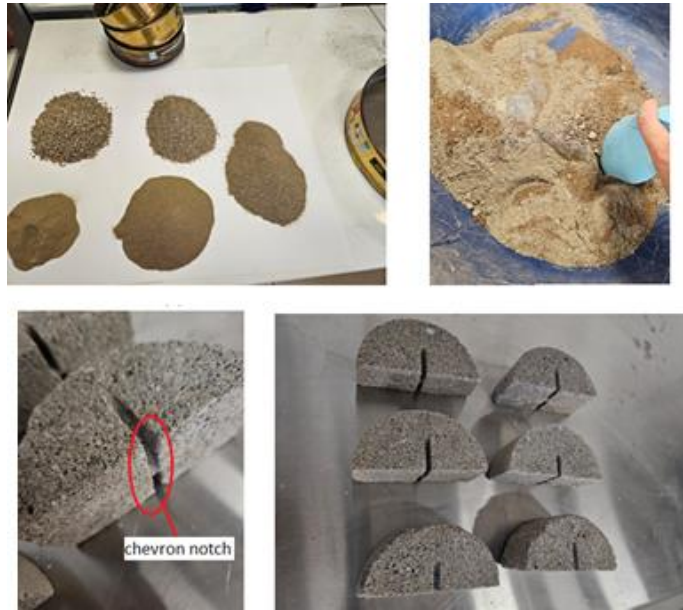


Fig.2 SCB specimen preparation (above) and some prepared specimens (below)

In this study, numerical analysis and modeling were performed using the Fracture Analysis Code (FRANC2D) program, which is embedded with the discrete crack method and LEM criteria. When conducting stress and crack propagation analyses in FRANC2D, the Maximum Tangential Stress Concentration Theory is predominantly utilized (Erdogan and Sih, 1963). Before conducting stress distribution analysis with the FRANC2D program, the sample geometry and mesh generation for numerical analysis were performed using the CASCA program, which is compatible with the FRANC2D program. The SCB geometry was modeled with a 103 mm diameter and a 20 mm notch crack length, consistent with the fracture toughness experiments conducted at $\beta=0^\circ$ crack inclination angles (Fig. 3).

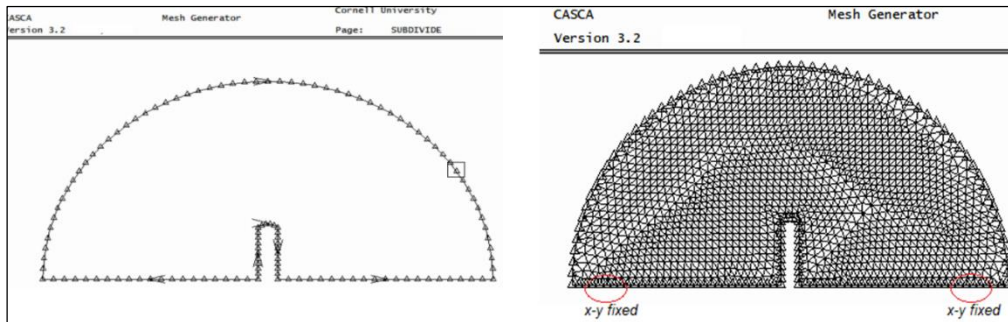


Fig. 3 SCB geometry and mesh generation with $\beta=0^\circ$

RESULTS AND DISCUSSION

It is stated in the literature that higher strength and fracture toughness values are obtained in well-graded granulated soils than in fine-grained sand-clay mixed soils (Das, 2006; Prasad and Redy, 2015; Rezaeian et al. 2019). The highest fracture toughness value was obtained with the GSC10C samples (Table 1). The strength and fracturing properties of stabilized soils under diametral compressive and indirect tensile stress were examined for the first time in the literature using SCB specimen geometry embedded with the 0° inclined notch cracks with this study.

Table 1. Fracture toughness test results

Notch crack inclination angle, β (Avrg. of three)	D (mm)	B (mm)	Failure load (P) (N)	K_{Ic} (MPa \sqrt{m})
GSC2C	102	41	774	0,30
GSC10C	103	41	887	0,36
SC2C	101	40	470	0,21
SC10C	103,5	40,5	593	0,24

In fracture mechanics, especially in brittle and elasto-plastic materials, when under load, stress-induced fracture first begins at the tip of a pre-existing crack. This propagating crack is actually a stable crack and propagates towards the loading axis. In this study, crack initiation in SCB samples started from the tip of the notch crack and progressed along the loading axis, resulting in final failure in accordance with the theory (Fig. 4).

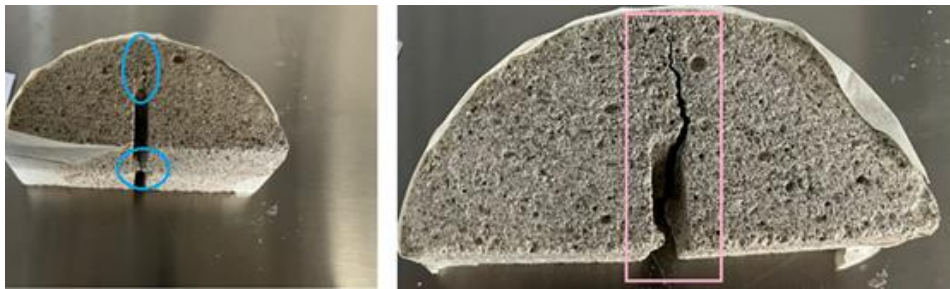


Fig. 4 Tested SCB specimens and macro crack propagation at the tip of notch crack

The first series of numerical analyses was carried out for stress distribution analysis around the notched cracks in SCB samples, and some of the analyses are shown in Fig. 5. The stress distribution in SCB samples with inclination angle $\beta = 0^\circ$ was simulated without any new crack initiation or propagation. According to the first results, it was found that the maximum tensile stress concentration region was at the center of the tip of the chevron-notched crack in the $\beta = 0^\circ$ inclined notch crack, (Figs. 5 a-b). This result is quite compatible with the maximum tangential stress criterion, which is one of the principles of fracture mechanics (Whittaker et al. 1992). On the other hand, very low shear stress concentration was determined at the $\beta = 0^\circ$ inclined notch crack tip due to the mode I (tensile) fracturing mode (Figs. 5b-d).

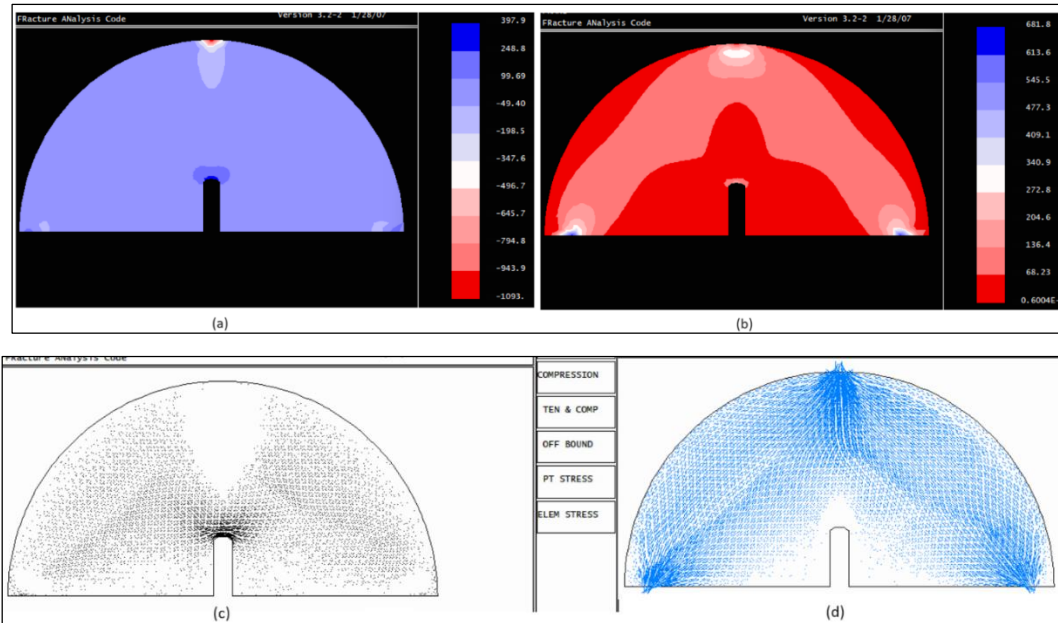


Fig.5. FRANC2D stress distribution analysis for $\beta = 0^\circ$ inclined notch crack (a) tensile stress distribution analyses for (b) shear stress distribution analysis (c) tensile stress concentration locations (d) shear stress concentration locations

Following the stress analyses performed with FRANC2D, fracture characteristic analyses were conducted. Since FRANC2D is a fracture analysis program, it is a program that can model the fracture analysis of elastoplastic and brittle materials successfully. Therefore, FRANC2D was able to successfully model the crack starting from the chevron notch tip and growing towards the loading axis in the failed SCB sample, and it is shown in Fig. 6 that the experimental results and numerical analysis modeling results are in good agreement.

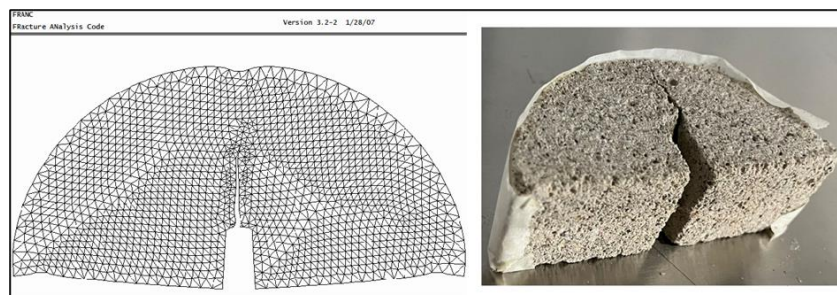


Fig.6. Fracture analysis with FRANC2D and comparison with the tested SCB specimen,

One important aspect to note is that both Linear Elastic Fracture Mechanics (LEFM) and Non-linear Elastic/plastic Fracture Mechanics (NEFM) analysis were performed in this study. The cohesive crack model (called Generalized Dugdale Model (GDM)) is a well-known fictitious or cohesive crack approach used to model cohesive fracturing in numerical analyses (Fig. 7) (Dugdale, 1960; Hillerborg, 1977; Behnam, 2021; Ma et al., 2022). In numerical cohesive crack modeling, cohesive zone elements are defined for fracture in mixed-mode loading where Mode I and Mode II loading are effective. The defined elements are surface elements located along the element boundaries, and crack propagation occurs between the cohesive zone elements.

Q/NL-INTRFC non-linear interface elements of FRANC2D were used to model the non-linear softening behavior due to the strain localization effect of the fictitious fracture zone.

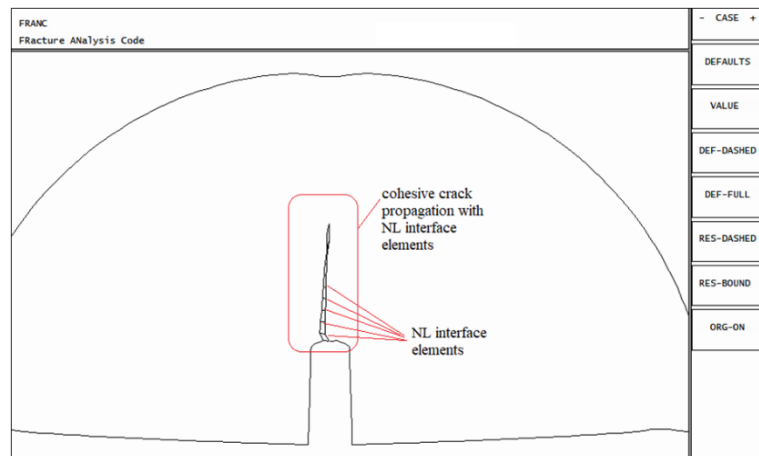


Fig. 7 Modelling of cohesive crack propagation using Q-NL interface elements

CONCLUSIONS

Consistent measurements of the fracture toughness of stabilized soil specimens with various cement ratios were obtained, and a relationship between the soil type, cement ratio, and KIC was established. The micromechanical and cohesive fracture behaviour of a cement-stabilized silty sand soil was investigated. Both the fracturing properties obtained from the experiments and the nonlinear cohesive fracture zone modelling showed that the GSC samples stabilized with 10% cement have much higher fracture resistance than the SC samples stabilized with 10% and 2% cement. The load-COD graphs obtained during static loading tests showed the high plastic deformation accumulation before the final fracture. It indicates that a fracture process zone occurs in front of the crack, followed by stable cohesive crack surfaces and cohesive separation before the final fracture. The non-linear numerical and cohesive fracture analysis results showed that the unstable cohesive crack initiation occurs between the initial chevron notch crack (a_0) and the final chevron notch crack length (a_1).

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PLASTIC STRAIN ACCUMULATION IN CEMENT STABILIZED SOIL SPECIMENS UNDER CYCLIC LOADING

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ABSTRACT

The main aim of this study is to investigate the fatigue and plastic strain accumulation properties of the cement-stabilized soil specimens tested under cyclic loading for the first time in literature. The experimental studies in this research were carried out using semi-circular bending disc specimens prepared by the well-graded gravel-sand-clay mixture (GSC) specimens stabilized with 2% blast furnace slag cement. The cement used in the experiments was CEM II/A-S 42.5 R and produced by OYAK Çimento A.Ş in Turkey. A significant decrease in fracture toughness values of the GCS and SC samples stabilized with 2% and 10% cement tested under cyclic loading was found to be up to 24% compared to the values obtained with the static tests. This result would be explained by the fatigue effect in composite materials such as stabilized soil due to the intergranular crack propagation between the grain and matrix rather than within the matrix. Well-graded granular soils were found to be quite suitable for cement stabilization, similar to the literature, and the highest fracture toughness values were obtained with GCS samples in this study. The most interesting result was obtained with the fracture toughness reductions of GSC specimens with 30° inclined cracks due to the fatigue and plastic strain accumulation in front of the notch crack.

Keywords: Cement stabilized soils, Fracture mechanics and stabilized soils

INTRODUCTION

The chemical stabilization materials are, in general, cement, lime, fly ash, bitumen, chlorite, lignin, molasses, and some special chemical compounds in soil stabilization. The percentage of cement mixed into the soil depends on the engineering properties of the soil and the project type (Fondjo et al., 2021, Zada et al., 2023). Since the cement-stabilized soils are heterogeneous and composite building materials, many parameters such as preparation, placement, mixing, compaction, and water content ratios affect the properties of these kinds of materials. It is almost impossible to keep all these parameters constant in field applications. The percentage of cement mixed into the soil depends on the engineering properties of the soil and the project type. The higher the plasticity of the soil, the more cement is generally added. The main purposes of soil improvement studies with cement are generally to reduce the plasticity, permeability, and compressibility of the soil to increase its bearing strength. It is known that lime additives increase or decrease the plasticity index depending on the liquid limit value of the soil; cement additives contribute to increasing the strength of the soil by filling the gaps between the coarse grains; and fly ash additives have a decreasing effect on the plasticity index and facilitates the

increase in strength depending on the properties of the soil (Savran, 1988; Fondjo et al., 2021; Zada et al., 2023).

Cement stabilized soil behaves like elastoplastic materials under static loading (Rezaeian et al. 2018, Xia et al. 2022; Zada et al. 2023; Xiushan 2023). In the ultimate strength calculations and projects of such materials, uniaxial compressive strength tests are quite common among the strength tests. Most engineering structures, such as roads, subway tunnels, railways, etc., are subjected to cyclic dynamic loads (Fig.1). For example, wheel loading and contact surface area are important in highway performance in terms of the number of wheel contacts and intervals. Fatigue occurs in materials under repeated loads and fatigue strength is generally up to 30% lower than the static strength of the materials (Fredrik et al. 2022; Erarslan and Williams 2012).

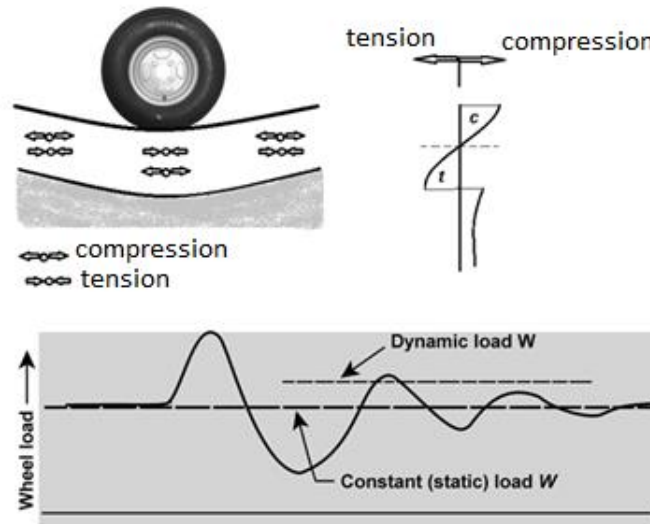


Fig.1 Load distribution in pavement and sublayers under a dynamic wheel loading

The basic methods used to increase the fatigue and permanent deformation resistance of soils exposed to dynamic loads are stabilization with bituminous foundation and/or cement and changing the surface layer gradation. In recent years, semi-circular bend (SCB) geometry including notch cracks has begun to be used to determine the fracture toughness of composite materials such as cement stabilized soils (Fig.2a). In addition, with the SCB sample geometry, it is possible to examine the FPZ (Fracture Process Zone: FPZ), which is the crack development area, to examine the elastoplastic deformations occurring at the tip of the notch crack (Fig. 2b). FPZ is generally examined in two regions: 1) Inner region: initial stress-induced crack development; and 2) Outer zone: unstable crack development. In the inner region, the stresses induced at the notch crack tip increase faster than the stress increases in crack propagation, and a crushed zone is formed in this area. It is important to note that many micro- and nanoscale cracks also form in this region, leading to strain hardening. This region continues to grow until the SIF value, which is the stress concentration, reaches a critical value, namely the fracture compactness value (KIC). In the outer region, the induced stress inside the sample begins to decrease further due to the development of unstable cracks and larger displacements.

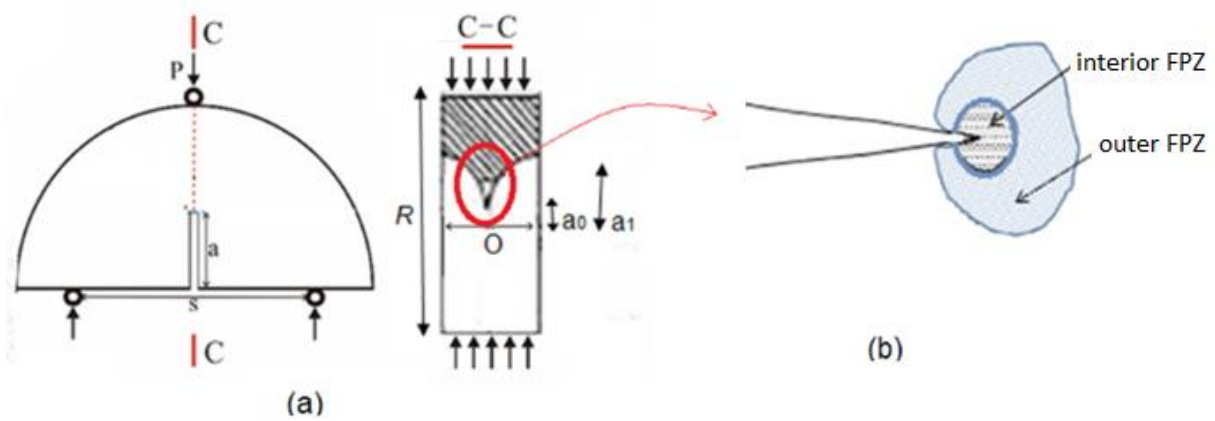


Fig.2 SCB sample geometry parameters and FPZ zones in front of the notch crack

METHODOLOGY

SCB samples were stabilized with 10% cement and soil classified as SC according to the United soil classification system (USCS) classification system. Optimum water content was found by performing standard proctor tests and consistency tests. Among the cylindrical core samples prepared in the molds, the semicircular SCB sample was prepared for fracture toughness tests and three repeat tests were performed. In fracture toughness tests, samples with $\beta = 0^\circ$ angle notch cracks were tested). Sample thickness B was 50 mm, sample diameter D was 103 mm, chevron crack thickness t was 2 mm, and outer notch crack length a_1 was 32 mm. Experiments were carried out at 18° laboratory temperature. Some prepared SCB samples are shown in Fig.3.



Fig.3 Prepared SCB specimens with notch cracks

In cyclic loading experiments, the frequency was set as 2 Hz and the amplitude was set as 70% of the static strength value. Crack opening displacement (COD) distance was measured directly using SHIMADZU P701805 model transducer.

RESULTS AND DISCUSSION

Some of the load-COD curves are given in Fig.4. Similar load-COD graphs showing ductile behavior were obtained in all tested samples. As seen in the load-COD curves, typical

elastoplastic deformation behavior seen in the literature was detected in stabilized samples. In these graphs, strain hardening before failure and strain softening after failure are observed. The reasons of this behaviour is cohesive fracturing and FPZ development.

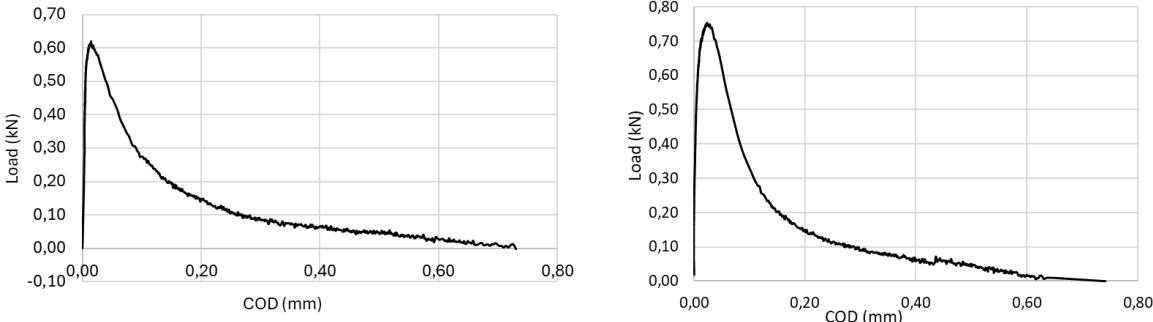


Fig.4 The load-COD plots of the tested specimens

Cyclic loading test results are given in Table 2 and COD-number of cycle plots are given in Fig.5. As seen from the graphs, plastic deformation accumulated at the chevron crack tip before the final failure occurred. This shows that FPZ is formed in front of the chevron crack. According to studies in the literature, the main causes of fatigue failure in the material are explained as the formation of intragranular cracks between the matrix and the grain (Hillborg et al. 1976, Cangiano et al. 1998, Sophan and Das 2017, Erarslan 2023, Deresse et al. 2023). Fatigue fracture occurs and grows through the formation of microcracks within the FPZ. While cracking within the FPZ exhibits a nonlinear behavior in the stress-strain graphs, the region outside the FPZ generally behaves as a linear elastic material. Therefore, defining this region is useful in measuring the fracture properties of the material and understanding its behavior (Gyltoft 1983, Deresse et al. 2023). Microcracks formed within the FPZ reduce the energy for the main crack growth and also increase the fracture surface (Wu et al. 2011, Erarslan 2023). Plastic strain localization occurring during fatigue loading is due to the increased presence of microcracks in fatigue loading compared to monotonic loading. The fatigue analysis for this reason, especially in composite materials, is performed by monitoring the development of FPZ.

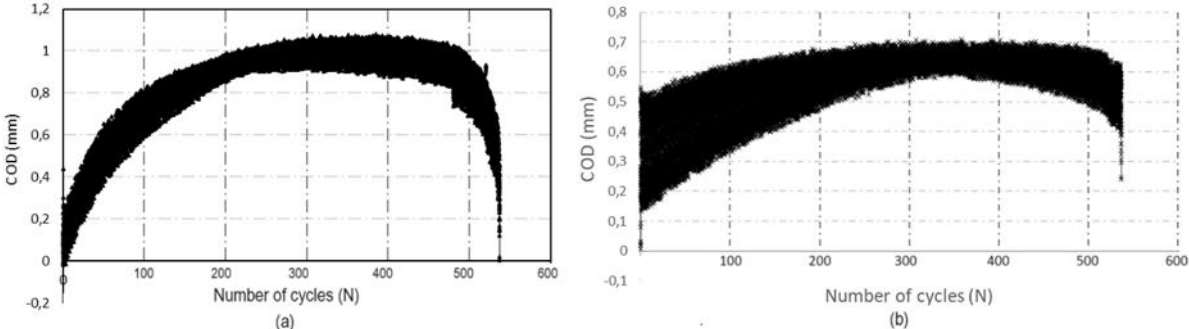


Fig.5 COD-number of cycle plots of fracture toughness tests on SCB specimens

CONCLUSIONS

The fracture toughness tests were carried out under both static and cyclic loading on sandy-clay (SC) SCB specimens stabilized with 2% cement under cyclic loading, and a significant decrease of up to 24% in fracture toughness was observed compared to the values obtained with the static tests. This result can be explained by the hypothesis of fatigue effect in composite materials due

to intergranular crack propagation between grain and matrix rather than matrix strength. The obtained load-COD graphs showed high plastic deformation accumulation before final fracture with cyclic loading tests. This indicates that an FPZ zone forms in front of the crack, followed by stable cohesive crack surfaces and cohesive separation before final fracture.

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NUMERICAL ANALYSIS OF MIXED MODE (I-II) COHESIVE FRACTURING IN CEMENT STABILIZED SOILS

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ABSTRACT

Soil stabilization with cement is the method of blending soil with cement to improve the certain strength properties of soil. The main purpose of this study is to examine the mixed mode (I-II) cohesive fracturing feature of cement stabilized soils, which is very rare in the literature, with numerical analysis. The numerical analysis and modelling were performed using the Fracture Analysis Code (FRANC2D) program, which is embedded with the discrete crack method, LEFM and Non-LEFM criteria. The semicircular bend (SCB) specimen geometry was used in the analysis. The sample is loaded by placing it on two lower cylindrical supports kept apart at a predetermined distance proportional to the size of the sample. The tensile and shear stress distribution analyses for $\beta = 0^\circ$ inclined notch crack and $\beta = 30^\circ$ inclined notch crack were obtained with the first series analysis. The nonlinear numerical analysis results showed that the unstable cohesive crack initiation occurs between the initial chevron notch crack (a_0) and the final chevron notch crack (a_1). The stress intensity factor (SIF)-crack length graphs obtained with the analysis showed a high plastic deformation zone developed at the tip of stable cracks before the final failure.

Keywords: Cement stabilized soils, Fracture mechanics and stabilized soils.

INTRODUCTION

Soil stabilization with cement is an effective technique for enhancing the specific strength properties of soil and widely used in some specific projects such as transportation infrastructure, water storage facilities, building foundations, and waste storage. Soil improvement studies focus on factors like soil type, plasticity, cement quantity, mixing methods, compaction, curing conditions, and grain diameter distribution. Also, the percentage of added cement varies based on soil engineering properties.

As fracture toughness represent the fracturing properties of materials, the significance of fracture toughness is emphasized, in this research. Cement-stabilized soils, treated as quasi-brittle materials, have been extensively studied in fracture mechanics. Indirect tensile and disc-shaped compact tension tests characterize fracture resistance, with fracture toughness and energy as crucial parameters (Cockford 1987, Pratheepan et al. 2010, Kardani et al. 2021, Zada et al. 2023).

There are three fracturing modes in fracture mechanics: Mode I (Opening), Mode II (Shear), and Mode III (Tearing) (Whittaker et al.1996). (Fig.1) Beside these modes there is also mixed mode I-II (tensile-shear) fracturing common in mechanics of materials.

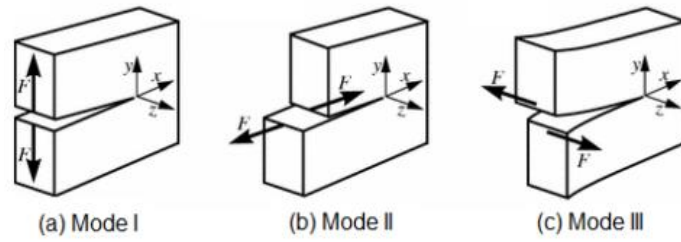


Fig. 1. Fracturing modes in fracture mechanics.

Cement stabilized soils behave like elastoplastic and more brittle materials. For this reason, the use of fracture mechanics in strength analyzes of cement-stabilized soils is very useful, and in recent years in the literature, many researchers have studied cement-stabilized soils with fracture mechanics (Davis, 1991, Harrison et al 1993, Sophan and Das 2007, Zhang et al. 2010, Im et al. 2014, Fang and Jui 2023,

MATERIALS AND METHODS

The semicircular bending (SCB) test is a globally accepted standard for asphalt, concrete, and other composites (Fig.2). It is used to find out the Mode I fractures of materials, where cracks extend perpendicular to the maximum tensile stress.

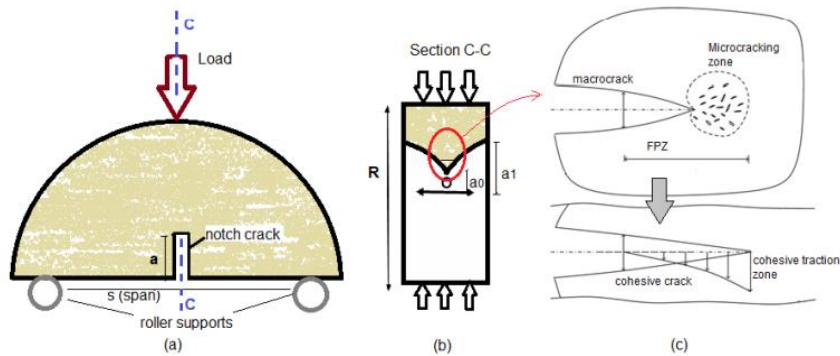


Fig. 2. SCB dimensional parameters (b) C-C section of SCB specimen and (c) the cohesive crack, microfracture and FPZ in front of notch crack in SCB specimen.

The loading configuration and the fracturing modes Mode I and mixed mode I-II are shown in Fig.3

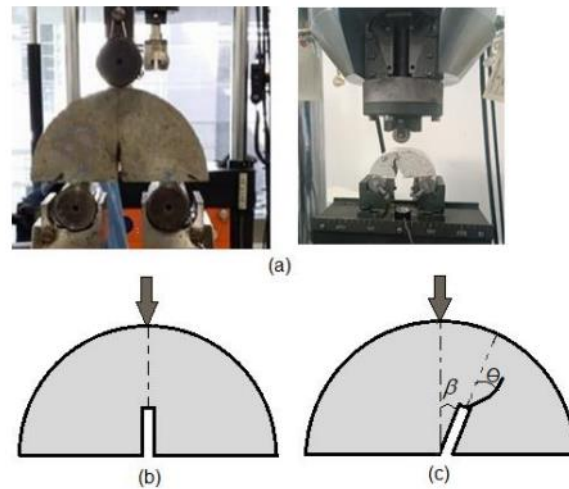


Fig. 3. Three-point loading test configuration of SCB specimens.

The sample geometry and mesh generation for numerical analysis were performed using the CASCA program, which is compatible with the FRANC2D program. The SCB geometry was modelled with a 103 mm diameter and a 20 mm notch crack length, consistent with the fracture toughness experiments conducted at $\beta=0^\circ$ and $\beta=30^\circ$ crack inclination angles (Fig. 4). When conducting numerical modelling with FRANC2D, the load applied to the SCB sample was uniformly distributed as diametric compressive loading.

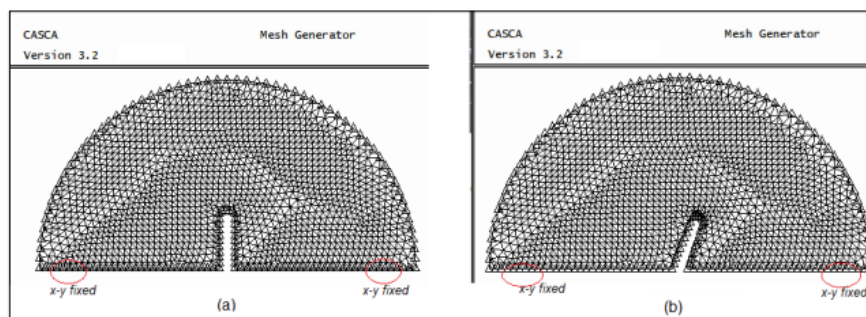


Fig. 4. SCB geometry and mesh generation (a) $\beta=0^\circ$ and (b) $\beta=30^\circ$.

Fig.5 shows the stress distribution analysis in SCB specimens under tensile and mixed mode loading conditions.

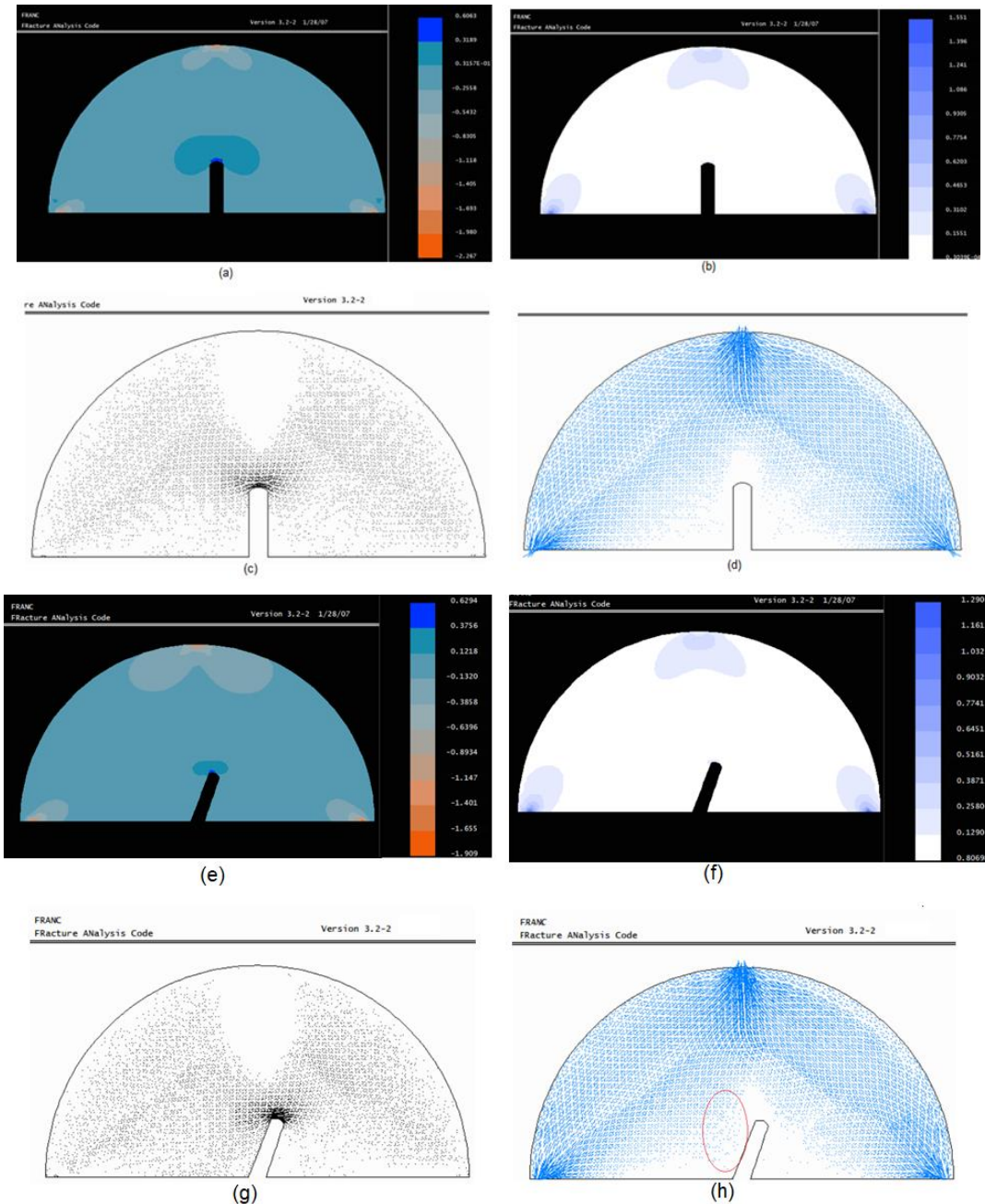


Fig.5. Stress distribution around modelled crack: (a), (e) are maximum principal stress (MPa) σ_1 (+: tension; -: compression); (b) and (f) are minimum principal stress (shear stress) for $\beta = 0^\circ$, $\beta = 30^\circ$ and $\beta = 45^\circ$ respectively; (c) and (g) are stress bars for tension (black bars) and blue bars represent compression for possible shear stress bars

The fracturing modeling of the SCB specimen under both mode I and mixed mode was successfully performed using FRANC2D. Fig. 6 shows that the experimental results and numerical analysis modeling results are in good agreement.

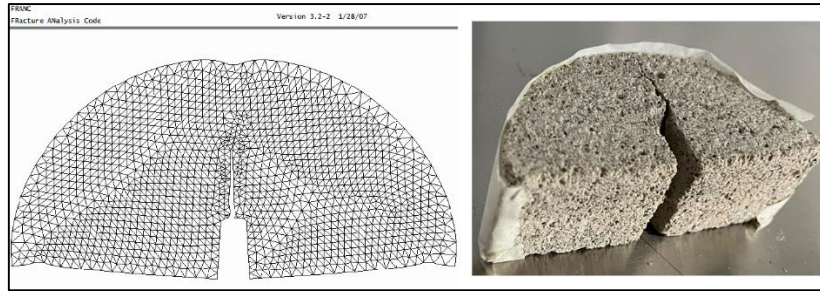


Fig. 6. Fracture analysis with FRANC2D and comparison with the tested SCB specimen.

In cohesive crack analyses, unstable crack length α (a/r) values are expected to be between the notch crack tip and the loading point (Dugdale 1960, Zhang et al. 2023, Im et al 2014). In cohesive crack analyses, the crack length at which the unstable crack began to propagate was found to be 13-14 mm for 10% C-coarse soil and 2% cement-fine soil samples, and 16-18 mm for 10% cement-fine and 2% cement-fine soil samples (Fig.7). Thus, it was found that the unstable crack initiation was at the notch crack tip and towards the loading axis, which was in accordance with the fracture mechanics criteria.

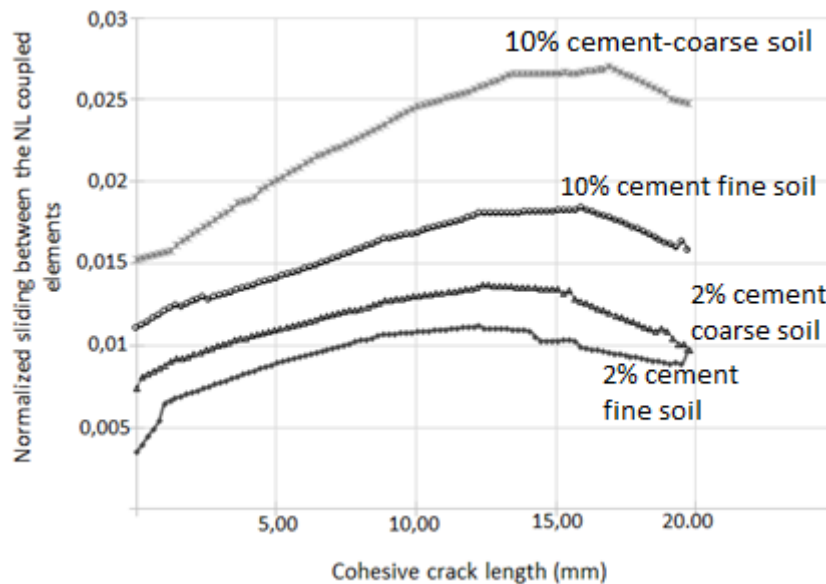


Fig.7 Cohesive crack analysis results

CONCLUSION AND DISCUSSION

This study investigates the impact of cement content on the mixed mode fracturing strength of granular and fine soil stabilized with cement under static loading using fracture mechanics principles first time in the literature. The three-point bending test were modelled and analysed on cement-stabilized semicircular bending (SCB) cemented soil specimens. The highest fracture toughness (the highest SIF) was found in coarse soil samples with 10% cement stabilization and 30° inclined notch cracks.

The high plastic deformation zone observed before the final fracture leads to the development of a fracture process zone. Numerical analysis results also showed the development of the FPZ zone in front of the macro crack by propagation of cohesive fracturing in cement-stabilized soils. It was found that the unstable crack initiation was at the notch crack tip and towards the loading axis, which was in accordance with the fracture mechanics criteria. In cohesive crack analyses, the crack length at which the unstable crack began to propagate was found to be 13-

14 mm for 10% C-coarse soil and 2% cement-fine soil samples, and 16-18 mm for 10% cement-fine and 2% cement-fine soil samples.

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STRUCTURAL LOAD EXAMPLE FOR MARS STRUCTURES: ICE LOAD

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ABSTRACT

It is seen as the most likely planet to contain liquid water and life in the planets in the solar system. So, in recent years, humankind's interest in the planet Mars continues to increase. With this increasing interest, efforts to create suitable living spaces will bring new problems. Mars structures are the first problem. The loads that will affect the Martian buildings required for colonization are a matter of curiosity. Structural loads occur on Earth from load combinations consisting of dead loads, live loads, earthquake loads, wind loads and snow loads. However, the planet Mars has its own unique weather and geographical conditions. For this reason, the aim of this study is to examine the effect of Ice rich deposits, which are unique to the planet Mars, on Martian structures to be built/established on Mars. The presence of ice on Mars gains a different dimension almost every day with the discoveries made by the unmanned aerial vehicles of the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). For this reason, the planet Mars was divided into 3 geographical groups, taking into account latitudes. Group 1: Examination of the presence of underground and surface ice in and around the Martian equator. Group 2: Evaluation of the presence of ice in low latitudes outside the pole and equator, taking into account recent discoveries. Long-term effects of surface ice in the north and south polar regions. In comparisons involving all groups, the variation in ice presence across the planet Mars and its possible effects on Martian structures were examined. While there is no ice on the ground around the equator, ice deposits have been found underground. A similar situation has been observed in low latitudes, but it has been found that the presence of underground ice is in volumes that have not been discovered so far, and this will be of great importance in the colonization of regions other than the polar regions. In low latitudes, in the light of ESA's data, it has been concluded that underground ice stores are constantly shifting seasonally. In this case, it has been concluded that during the anchoring of Martian structures, gaps will occur in the ground and, contrary to popular belief, the anchoring must be done much deeper. In the equator region, it has been concluded that the south polar region has a much greater permanent ice thickness than the northern polar circle and is almost negligibly affected by weather conditions. In the North Pole region, ice change is more than the south and sometimes over Mars dust depending on the weather conditions. This study revealed that when comparing all groups, the best regions for Martian structures are the equator, excluding craters and their surroundings, and that ice loads should be taken into account as underground lateral pressure, not vertical load. In addition, it was concluded that separate research should be carried out and mapped for other design loads and Mars structures.

Keywords: Structural Loads, Planet Mars, Ice Load, Martian Structures, Map.

INTRODUCTION

According to the International Astronomical Union (IAU), there are 8 planets in the Solar system. Exceeding from Earth, the planet Mars is the most suitable for life for humanity. For this reason, humanity's interest in the planet Mars has been increasing for more than half a century. This interest is based on scientific research conducted not only to colonize the planet Mars but also to gain knowledge about the structure, evolution and future state of the planets around the Earth. In this context, understanding the planet Mars, examining the geographical events and meteor impacts that occurred in the past, and observing both the underground and ground seasonal changes of the planet are of great importance for the construction and design loads of Mars structures that will be used in human travels in the coming years.

Studies on structures to be built or established on the planet Mars continue, although not intensively, for many years. Toklu and Akpınar (2022) conducted studies on the usability of lunar soil as construction material, similar to the planet Mars, and construction techniques suitable for these materials. Later, by improving their research, Toklu et al. (2023) tried to produce samples similar to Lunar soil using XRD and XRF mineral and chemical analyses, also using lunar soil (CE-5 Chinese lunar soil). Reches (2019) talked about the difficulties associated with in-situ concrete production on the red planet. He made recommendations on providing suitable conditions for concrete, water supply, aggregate, salt and other parameters (solar radiation, changing temperatures, etc.). Soureshjani et al. (2022) explained the design loads (dead load, live load, Marsquake load, wind load and snow load) that the Martian structures to be built on the planet Mars will be exposed to, based on the data of the exploration vehicles.

According to Soureshjani et al. (2023), Importing materials from Earth for Martian structures creates great costs, and it has been emphasized that deep excavations on the planet Mars will require energy. It has been suggested that cost and energy loss can be prevented with the materials found on Mars. Similar studies are being carried out on the planet Mars by the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). The structure of the planet Mars is being tried to be understood with the sent rover.

With the developing technology, the instruments carried by the rover sent to the planet Mars have begun to improve. With this development, in recent years, under the leadership of ESA and NASA, ice deposits have been found first in the poles of the planet Mars, and then in low latitudes and the equator underground. The effect of ice load, one of the design loads, on Martian structures has been a matter of curiosity. In this study, the presence of ice in different parts of the planet Mars and its effects on Martian structures were examined. Some formulations also used on Earth regarding the long-term effects of the presence of both above-ground and underground ice on Martian structures and the load that the presence of above-ground ice will create on the structures and in the anchorage area are mentioned.

MARTIAN BUILDINGS

Structural Loads

Before buildings are built, they are designed by taking into account various loads during the design phase. These loads are determined by international regulations and each country has its own codes. These structural loads generally consist of dead load, live load, seismic loads, wind load, snow load and other loads. Dead loads consist of the supporting elements that form the frame of the structure and all kinds of walls. Live loads consist of movable elements within the structure and items that can generally be changed, such as people and furniture. Earthquake

loads, wind loads or snow loads are related to the seismicity of the region where the structure will be built, the height of the structure or seasonal snow density.

The loads determined for the design are used in combinations regulated by the regulations. The load combinations of the ASCE 7-10 'Minimum design loads and associated criteria for buildings and other structures' regulation are as follows (ASCE 7-10, 2017).

1.4 D	(1)
1.2 D + 1.6 L + 0.5 S	(2)
1.2 D + 1.6 S + 0.5 W	(3)
1.2 D + 1.6 S + L	(4)
1.2 D + 1.0 W + 1.0 L + 0.5 S	(5)
1.2 D + 1.0 E + 1.0 L + 0.2 S	(6)
0.9 D + 1.0 W	(7)
0.9 D + 1.0 E	(8)

where D is the dead load, L is the live load, S is the snow load, W is the wind load and E is the earthquake load.

Buildings are designed using these load combinations taken into consideration around the world and they have been serving humanity for many years. Especially seismic loads have been added to the combinations after years of experience and experimental studies.

Ice Load

Ice load is not widely used in the world. It is used only in electrical transmission lines. However, recent discoveries on the planet Mars have shown that; Apart from the poles, there are also very large underground ice deposits in low latitudes. In Martian structures to be built in the coming years, the lateral effects of underground ice deposits depending on latitude and both underground and aboveground ice loads in the polar regions appear as a load that must be taken into consideration. With the observations and radar soundings made by NASA and ESA, more and more information is obtained about the existence of ice. With the latest discoveries, the depth of ice reservoirs covered with Martian dust around the equator and at low latitudes is being investigated.

METHODOLOGY

Mars Rovers

Spacecraft have been sent to the surface of the planet Mars by NASA, ESA and the Soviets since 1970. They place on them, these rovers are sometimes used to take samples of Mars dust from the surface of the Planet Mars and sometimes to photograph and observe with the technological instruments. These remotely controlled rovers are of great importance in getting the planet Mars. Rovers are still produced and designed for many special missions.

The rovers successfully produced by the American NASA Jet Propulsion Laboratory generally continue their work for many years by making successful landings at different points on the surface of the planet Mars. A list of some of the rovers performed is given in Table 1.

Table 1. Rover List

Rover	Launch Timeline	Landing Timeline
Viking 1&2	Viking 1: August 20, 1975 Viking 2: Sept. 1975	Viking 1: June, 1976. Viking 2: September, 1976
Sojourner	December, 1996	July 1997
Spirit & Opportunity	July, 2003	January 2004
Phoenix	August, 2007	May, 2008
Curiosity	November, 2011	August 2012
InSight	May, 2018	November, 2018
Perseverance	July, 2020	February 2021

Curiosity and Perseverance are still active. Sojourner and Spirit Opportunity are disabled. EU-Russian and Russian-Indian partnership Mars exploration rovers are being prepared within the scope of joint projects. The information obtained thanks to all these rovers formed the main topics of the study.

Mars Map

The first drawings of the planet Mars were created by William Herschel in 1783. NASA used these drawings in 1962 (The Planetary Society, 2024). A general map of the planet Mars was drawn in 1962 by American air force telescopic observations. The first detailed images of the planet Mars were obtained by combining 7000 photographs taken by Mariner 9 in 1971. Later, research was carried out for 30 years with higher resolution images obtained with the Viking rover. After 2000, in parallel with technological developments, better and more realistic images of the planet Mars began to be obtained (URL-1). The map of the planet Mars published by NASA was used in the study. In general terms, it is considered as three different parts. The topological map of the planet Mars is given in Figure 1 (NASA/JPL, 2024).

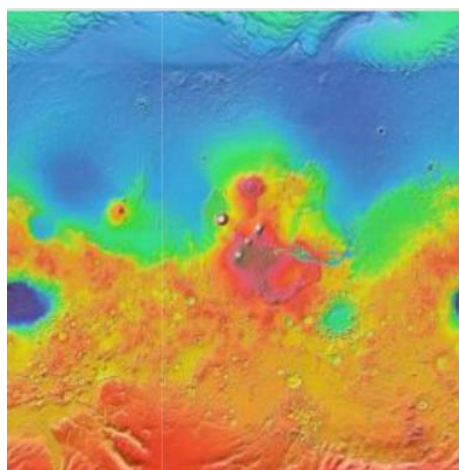


Figure 1. Mars Topological Map

Modern Mars maps, as shown in Figure 1, have been created and used in studies. Even the first Martian south pole map drawn by William Herschel shows the presence of ice, similar to today's maps. Ice deposits, which can only be observed in the polar regions, are not observed on the surface of other parts of the planet Mars.

Ice Deposits

It would be more accurate to divide ice reservoirs on the planet Mars into aboveground and underground. The existence of surface ice is only seen in the polar regions. Especially in the south polar region, the ice thickness is much greater than in the north polar region and is not affected by seasonal changes. The presence of surface ice is not observed in other parts of the planet Mars, except for craters. As for the existence of underground ice, according to the latest discoveries made by ESA, there are large ice deposits around the equator, including in low latitudes.

When considering the structures to be built, the ice load should be considered as zero since there is no ice on the ground in equatorial and low latitudes. However, due to the existence of underground ice deposits, the horizontal effect of the ice deposits should be taken into account for the structural elements to be anchored.

$$L_{\text{Ice-Equator}} \approx 0 \quad (9)$$

$$L_{\text{Ice-Low Latitude}} \approx 0 \quad (10)$$

Where L, ice load.

Polar regions have different thicknesses of ice load. In recent discoveries, an ice thickness of 8 meters at the south pole and 2 meters at the south pole was found. However, these numerical values may vary depending on the regions where radar sounding is carried out. Therefore, much more data and research is needed to calculate the ice load above ground in the polar regions. In order to understand the underground ice thickness in other regions, it is necessary to examine NASA missions such as MARSIS.

CONCLUSION AND DISCUSSION

Human population is increasing rapidly. Interest in Mars has been increasing for the last half century. In order to understand the geographical and topological structure of the planet in order to colonize the planet Mars, rovers are constantly sent to Mars orbit and to the planet Mars by the leading countries of the Earth.

In recent years, thanks to the information obtained from the planet Mars and sent to Earth via rovers, the unknown on the planet Mars is gradually becoming clear. Research continues on the design of Martian structures necessary for humankind to survive on Mars and the structural loads to be taken into account. In this study, the load that ice deposits and surface ice discovered on the planet Mars may impose on these structures while designing Martian structures was examined. The findings obtained are as follows;

- It was previously suggested that structures to be built on the planet Mars would generally be built at low latitudes or around the equator. Since there is no ice above ground (except craters), the ice load is negligible. However, with new discoveries, although there is no ice above ground, underground ice deposits have been discovered. The presence of ice deposit should be taken into account as a horizontal load during anchoring of structures or during excavations. However, the density, stability and seasonal movements of ice presence must be carefully observed.

- The presence of ice above ground in the polar regions is visible. No construction is expected in these areas. However, since there will be facilities to be established by research teams, it is necessary to conduct further research on the ice load.
- In the world, ice load is calculated only on electrical transmission lines based on cable diameters.
- Structural loads should not be applied uniformly in all regions of the planet Mars. Geographically, the planet consists of craters, depressions and elevations. This may affect some of the structural loads.
- For Mars buildings, along with all structural loads (dead load, live load, earthquake load, etc.), grading these structural loads according to Mars regions will be of great importance in terms of economy.
- More detailed investigation of the underground ice reservoirs of the planet Mars will be a pioneering data for future studies.
- Rovers that underground ice deposits are constantly shifting and moving according to seasonal air temperature changes have determined it.

Much more research and building design examples are needed in the coming years for humanity to colonize the planet Mars. Exciting new information is discovered on Mars every day. Many countries want to have a share in these important discoveries by actively or passively participating in the space race led by the planet Mars.

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THE IMPACT OF LOW ENERGY AVAILABILITY ON SKELETAL HEALTH IN PHYSICALLY ACTIVE YOUNG WOMAN

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ABSTRACT

Recent studies recognize that low energy availability and malnutrition are the main initiating factors for low bone mass density (BMD) in females in general, in those who are physically active and especially in athletes. The relationship between low energy availability and poor skeletal health is not exclusive to women engaging in sport endurance exercise. Females experience also endocrine dysfunction resulting from low energy availability and high exercise levels that degrades particularly the skeletal mass. Energy availability (EA) is defined the difference in energy intake and exercises energy expenditure. Reduction of EA often causes abnormalities and drastic bone loss. Low energy availability (LEA) underpins the female athlete triad and relative energy deficiency in sport (RED-S). The condition arises when insufficient calories are consumed to support exercise energy expenditure, resulting in compromised physiological processes, such as menstrual irregularities in active females. The health concerns associated with longstanding low EA include menstrual/libido, gastrointestinal and cardiovascular dysfunction and compromised bone health, all of which can contribute to impaired sporting performance. This review provides an update on the prevalence and risk of low EA, within-day energy deficiency, and the potential impact of low EA on performance. The methods to assess EA remain a challenge and contribute to the methodological difficulties in identifying “true” low EA. The Low Energy availability (LEA) is a major problem in women who exercise physically and/or sports, which seriously endangers not only their health but also negatively affects their physical and/or sports performance. The female athletes health may have major health problems: , osteoporosis and disorders and problems associated with problems in feeding. These problems have been evidenced since early, but in recent years have taken on a special importance, as studies show that they remain major health problems even in current conditions and are often overlooked or underestimated. These clinical manifestations have a very important impact on women's quality of life both physiologically, and on the impact of performance on physical activity, as well as on the creation of a pathological territory where chronic diseases that are difficult and severe to treat such as osteoporosis, osteopenia, nutritional disorders that lead to cascading pathology such as cardiac, tumoral, respiratory, gastrointestinal, endocrinology etc. The focus of our work will be to provide a brief overview of the physically active female health, provide a more comprehensive view in the overall thinking regarding energy availability and the relations with bone health. More recently,

low energy availability has been recognized as the initiating factor for low BMD in these women. Furthermore, the relationship between low energy availability and poor skeletal health is not exclusive to women engaging in endurance exercise. Rather, females commonly experience endocrine dysfunction resulting from low energy availability and high exercise levels that degrades skeletal health. Consequences to skeletal health can range from short-term changes in bone metabolism and increased risk of bone stress injuries to long-term consequences of low BMD, such as osteoporosis and related fragility fractures. The degree to which low energy availability degrades skeletal health may be dependent on the length and extent of the energy deficit.

Keywords: LEA, BMD, Skelethal Health, Osteoporosis

INTRODUCTION

The summary picture of studies in physical activity and sport promotes good health and are recommended for women of all ages (Loucks & Nattiv, 2005; Maya & Misra, 2022). Engaging in physical activity and sports has positive effects and many benefits, such as physical health, improved self-esteem, the way they look at their bodies and encourage them to do sports and people should stay active throughout their lives. However, one physical activity exceeded, and associated with an additional lack of adequate amount of food through diet, it will be accompanied by a lack of energy which, in the long term, will lead to decreased physical performance in that health (Mountjoy et al., 2014; Maya & Misra, 2022). Athletes may develop nutritional disorders (characterized by non-habitualities) normal eating, which in women is associated with menstrual disorders and which it eventually leads to decreased bone density (BMD), or osteoporosis. These conditions often they occur jointly or simultaneously and are otherwise referred to as the Feminine Triads or (FAT) (Nattiv et al., 2007). Women who engage in sports or sports activities and who have a small weight compared to normally, they have a higher chance of having an energy (EA-energy availability) to get food less than what you may need to meet your daily needs. Nowadays we have a significant increase in women dealing with sports activities as well as with various elite sports, where special sports such as football put a serious health challenge for women. Negative effects of insufficient energy in a deliberate or unintentional manner sports performance has been highlighted by many sports organizations. The main purpose of this study is to identify main health problems in women who are physically active and/or sports-related:

1. Anemia and insufficiency/low energy level often associated with Eating disorders
2. Decreased bone density levels to pathological manifestations of osteopenia and/or early osteoporosis
3. Reproductive cycle disorders for hormonal, nutritional, menstrual cycle causes, etc.
4. Avoid normal values of anthropometric, cardiac and respiratory parameters, such as physical activity or adverse health effects,

The most clinically significant symptoms of low energy availability in female athletes and exercising women are its effects on bone health. Although other symptoms are apparent, such as endothelial dysfunction, altered lipid profiles, and, in one case, poor sport performance, the physiological impact of low energy availability on the menstrual cycle and bone are most clinically significant since they both render negative health effects. In mammals, available oxidizable fuel is partitioned into compartments important for viable function and sustenance, including thermoregulation, cellular maintenance, locomotion, growth, immune function, and reproductive function. During times of limited fuel availability, energy is shunted or re-

partitioned away from growth and reproduction in order to prioritize the compartments vital for survival of the individual, such as thermoregulation, cellular maintenance, and locomotion. As such, available energy is shunted away from growth and reproduction, resulting in a cascade of metabolic and energetic alterations that conserve energy. Energy expenditure is thus conserved through suppression of resting metabolic rate, total triiodo thyronine (TT3), insulin-like growth factor-1 (IGF-1), leptin, and insulin, and counter regulatory upregulation of cortisol, and the development of an acquired growth hormone (GH) resistance. These metabolic and endocrine adaptations occur within normal physiological ranges and represent expected adjustments to low energy availability.

ACSM identified 3 specific reasons that led to energy deficiency in physically active women. The first factor is an obsessive eating disorder that is part of one of the shows clinical mental illness.

The second factor concerns the desire or effort that female athletes make to manage and rationalize body mass and decrease fat mass to qualify and enhance sporting performance in national events, competitions and international ones. Regarding Statuta (2020b), this lack of or deficit management may include eating disorders or not necessarily.

The third but no less important factor is the inadvisable decline of increased energy taken to compensate for the energy expended by physical activity (Maya et al.,2022; Statute et al., 2017b).

Many women athletes are not satisfied and do not consider their training regimen sufficient to have their ideal body in shape and composition especially in the case of lowering fat mass that would indicate the weakest postgrade (Statute et al., 2017b). This necessarily leads some of these women to embark on diets that include decreased caloric or total elimination from diets of products that have more calories and also they are subjected to harmful procedures or practices to reduce their weight to achieve the ultimate goal of a finer and lower weight posturing (Maya et. al.,2022).

These repeated actions in time will bring subjects in the study to a level of chronic undernourishment, also in menstrual cycle disorders, and continuation loss of bone density (Stellingerrff et al., 2021b). Most athletes do certain exercises and exercise regimens to increase their sports performance, but in most cases, the increase in performance in certain sports should be accompanied by decreased athlete weight, which is accompanied by drastic changes in the diet regimen in large part reducing the daily energy intake as a result of this diet (Stellingerrff et al., 2021b). According to Warrick et al. (2020), if persistent eating disorders can lead to a variety of changes and consequences to mental and physical health.

Nutrition Disorders in athletes and not only is energy availability (EA) (Nattiv et. al., 2007; De Souza & Williams, 2019) defined or defined as "energy induced from diet minus the energy expended by exercise" and where athletes who have weight loss and nutritional worries but do not have "mental psychopathology" and who do not necessarily meet the criteria for nutrition disorder. Eating disorder, which is thought to affect two-thirds of women athletes coincides with or consists of eating restriction behaviors and diets but not necessarily reaching such a level as we might call clinical nutrition disorder (Statute, 2020). Women athletes with nutrition disorder often limit their intake of calories or fats but maintain a high-quality training regimen that will in most cases cause chronic energy deficit. Nutrition disorder will occur if relapse continues eating and dieting, abnormal eating behavior continues, and eventually clinical disorder appears in nutrition (Sundgot-Borgen & Torstveit, 2010). Many athletes decrease their available energy intentionally to optimize body mass and composition to be more successful in competitions and sporting events (Robertson & Mountjoy, 2018). Some of the female athletes practice eating disorders, here we can include fasting at all levels up to 72 hours, skipping

meals, buying and using diet pills, laxatives, and various diuretics (Sundgot-Borgen & Torstveit, 2010). For some athletes, the available energy reduction represents an disorder in feeding at such a level, as it puts it before psychiatric pathologies that can endanger life and which must be treated with psychotropic therapy and prolonged psychotherapy. (Sundgot-Borgen & Torstveit, 2010). Elite athletes in most cases convey the image and concept of physical perfection. However, not all de facto athletes have a subjective feeling that their bodies are not adapted or adapted to the optimal percentile presented by specific sports (Sundgot-Borgen & Torstveit, 2010) . These athletes for the most part are under immense pressure to achieve the "ideal" body (Areta et al., 2021b). As a result, the demands for a perfect and ideal body that society demands and the standards set by it towards men and women not only in the field of sport, will necessarily lead to a very high pressure on elite athletes to increase their sporting performance and meet the standards and requirements according to the sport they exercise (Langan-Evans et al., 2022b). who have their own criteria for evaluation and the standards that athletes must meet. All these factors that we mentioned lead the subject to diet, dietary disorders, and later on to the development of severe eating disorders. Clinical experience and evidence or examples from scientific research have concluded that eating disorders and nutrition disorders such as mental anorexia, mental bulimia binge eating (eating three meals for a short time) usually starts with behaviors that are similar to diet. (Langan-Evans et al., 2022b). The primary picture or the beginning of a feeding disorder typically comes across in adolescence, when changes in physical and body directly affect the personal appearance of adolescents, often putting it in the dilemma of self-acceptance or not (Nose-Ogura et al., 2018). Mental anorexia cases were seen high in high school women (15–19 years old) (Hoek & Van Hoeken, 2003; Langan-Evans et al., 2022b).

METHODOLOGY

The study included and referenced over 28 articles that were selected on online platforms such as Web of Science, Pub Med using keywords of specific field of study (EA (energy availability), BMD (bone density reduction) , osteoporosis, LEA etc.) and filters regarding the level of citations and time of publication).Përzgjedhja ka përfshirë publikimet dhe artikujt nga revistat më prestigjioze si Lancet, British Journal of Sports Medicine, American College of Sport Medicine, International Journal of Eating Disorders, Medicine and science in sports and exercise, International journal of sport nutrition and exercise metabolism, the official journal of the American Society for Bone and Mineral Research, European Journal of Sport Science etj The selection has included publications and articles from the most prestigious journals such as the Lancet, British Journal of Sports Medicine, American College of Sport Medicine, International Journal of Eating Disorders, Medicine and science in sports and exercise, International journal of sports nutrition and exercise metabolism, the official journal of the American Society for Bone and Mineral Research, European Journal of Sport Science etc. Data collection and examination of ethical principles

Analysis of the research data regarding LEA and BMD

Energy Availability (EA) Energy through diet or nutrition is used to meet the needs of basic physiological processes such as cell maintenance, thermogenesis, immunity, growth, reproduction, and movement process (Coelho et al., 2021).Any energy used for these processes cannot be used for other processes in the organism.To understand exercise physiology, we need to define available energy EA as energy obtained through diet minus the energy expended by

EEA exercise. This remaining amount will serve for all basic physiological processes, since the fat free measure spends more energy than fat mass, so we need to normalize EA in female active woman to have this $EA=(EEE)$ equation. In young and healthy adults, the energy balance should vary around $EA- 45 \text{ kcal/kgFFM/d}$ (Langan-Evans et al., 2022) When available energy decreases EA below 30kcal/kg/FFM/d the body begins and supplants reproductive functions and bone formation (Langan-Evans et al., 2022). This is done to maintain energy balance and to continue survival, thus affecting reproductive and bone-forming health.

Bone Health

The third component of the trio of female athletes, is bone health (ISCD, 2004) describes a continuum that extends from optimal bone health to osteoporosis and focuses on bone strength, which consists of BMD (or mineral bone content) and the quality of the bones. The International Association for Clinical Density recommendation is to determine BMD using bone densitometry scanning (DXA) by comparing age and chronological gender using a scattering of Z-results. The association further recommends that the term osteopen not be used in the description of bone density and that the term osteoporosis be reserved for "low BMDs," with secondary clinical risk factors like "chronic malnutrition, eating disorders, hypogonadism, exposure to glucocorticoids and previous fractures (Javed et al., 2013). According to Jagielska et al. (2016) athletes with Z score two standard deviations below average should be called "low bone density below the expected age limit" if they are pre-menopausal women and "low bone density for chronological age" if they are children. The 2007 ACSM position further defined "low BMD" as - "a history of nutritional deficiencies, hypoestrogenism, stress fractures and/or other secondary clinical risk factors for fracture along with a BMD Z score between -1.0 and -2.0 standard deviations below average" and osteoporosis as - "secondary clinical risk factors for a fracture with a Zscore ≥ -2.0 standard deviations (Nattiv et al., 2007; Goolsby & Boniquit, 2017). In exercise women, bone formation rates and hormones that promote bone formation decrease within 5 days when energy availability is reduced from 45 to less than $30 \text{ kcal} \cdot \text{kg FFM}^{-1} \cdot \text{day}^{-1}$, and the rate of bone resorption increases when energy availability decreases sufficiently to decrease estradiol (Ihle & Loucks, 2004; Gross & Joy, 2020). In runners with amenorrhoea, both bone formation rates and bone mineral density (VanBaak & Olson, 2016b) are both low. Menstruating athletes gain approximately 2-4% of bone mass per year, while athletes with amenorrhoea tend to lose 2% of BMD per year (De Souza et al., 2019; Gross & Joy, 2020). Thus, it is easy to see why athletes who engage in high-impact sports may still be more susceptible to fractures than their non-athletic and menstrual counterparts. Often these fractures are due to the added stress carried by these bones during physical activity (De Souza et al., 2008; Brook et al., 2019). On the other hand, it is commonly accepted that weighted exercises offer an osteogenic stimulus to the bones. Often these fractures are due to the added stress carried by these bones during physical activity (De Souza et al., 2008; Brook et al., 2019; Heikura et al., 2021). Often these fractures are due to the added stress carried by these bones during physical activity (De Souza et al., 2008; Rassy et al., 2018). On the other hand, it is commonly accepted that weighted exercises offer an osteogenic stimulus to the bones, observations suggest that repeated stress applied to weight-bearing sites for long periods of time serves as an important strengthening agent for bones . The bone undergoes a continuous remodeling process throughout the life cycle. Remodeling is affected by factors such as; food intake and especially calcium that helps in bone formation, the individual's hormonal status and weighty physical activity having an effect on bone load. Bone development is negatively affected by LEA, with decreases in elements as diverse as estrogens (inhibition of osteoclasts and increased osteoblasts), IGF-1 (osteoblastogenesis stimulation and bone formation promotion), leptin (osteoblast propagation) and T3 (osteoblasts and promote bone formation). Decrease in bone cell formation and bone-destroying cell turnover are the main

consequences of changes in bone metabolism. (Coelho et al., 2021) With a compromised hormone status, BMD is negatively affected due to the hormone's protective role in bone remodeling. The bone is constantly degrading and replenishing. This remodeling requires different cycles of bone resorption and formation. Two different types of bone cells are responsible for cycles of bone formation and resorption. Osteoblasts are cells responsible for bone formation during the remodeling phase. Osteoclasts are responsible for bone resorption. When BMD is decreasing, the activity of osteoclasts is greater than osteoblasts resulting in decreased BMD (De Souza & Williams, 2019). Osteoclasts mediate bone resorption with proteolytic digestives, which is followed by a long process where osteoblasts establish new bone matrix. However, for the matrix to be fully mineralized, several stages must occur. The circulating bone markers in the blood are an indirect measure of bone formation and bone separation and are usually measured in blood serum and urine (Coelho et al., 2021). Studies have shown that reduction in bone formation is associated with low body mass index and lack of estrogen, and that osteoporosis in hypothalamic amenorrhea has a direct link to nutritional issues. Negative energy balance is associated with reduced bone marker turnover as demonstrated among a group of amenorrhoeal runners at a distance, thus highlighting the possible association between body mass index, energy deficit and hypothalamic dysfunction (Coelho et al., 2021). When normal women were put under dietary restrictions, changes in bone marker turnover were observed (Coelho et al., 2021) also demonstrated a direct link between energy availability and turnover of bone markers in healthy women with limited energy availability. In anorexic subjects, bone resorption did not decrease until menstruation resumed. Such findings show that both nutrient and estrogen-related compounds affect bone resorption (Coelho et al., 2021), therefore estrogen deficiency is not the only possible cause of dysfunction in bone formation. Women suffering from eating disorders have shown an increased risk of fractures compared to women in the general population, due to their chronic energy deficit. One study (Skarakis et al., 2021b) found that women with anorexia nervosa had a higher risk for all types of fractures compared to the general population. The study showed that women with bulimia nervosa were 1.4 times likely to suffer fractures, while those with eating disorders not otherwise specified were 1.8 times more likely to suffer. Women with anorexia nervosa showed an increased risk of fractures compared to the general population. Therefore, the study concluded that severely underweight women presenting with a fracture suffered from low-energy trauma and no accompanying medical condition raised suspicions of anorexia. This study aimed to determine whether there was any link between bone density and other variables of the Female Triad trio. A higher prevalence of disordered eating was reported among female non-athletes compared to athletes in a study of high school athletes (Bratland-Sanda & Sundgot-Borgen, 2013c). However, the results from these studies faced a major limitation in what are based on self-reporting. Other studies on adult athletes showed the use of a two-step approach (self-reporting via questionnaire followed by clinical interviews by experienced therapists) where it was seen that athletes tended to underestimate disorders of eating and eating disorders (Sundgot-Borgen & Torstveit, 2004), where it was seen that athletes tended to underestimate disorders of eating and eating disorders, low self-esteem and personality traits such as perfectionism, compulsion and high achievement (De Souza et al., 2019). Other studies show that sports coaches can reduce or increase the risk of eating disorders depending on their training style and the environment offered to the athlete.

According to ACSM, developmental inequities or increased inhibitions in adolescent athletes occur during prolonged periods of low energy intake, protein and micronutrients. The effects of the increased impact can be delaying the onset of puberty in child athletes. Also poor bone development will lead to increased sensitivity to fractures and bone problems in later life. Because ovarian steroid hormones, particularly estradiol, facilitate calcium uptake in bones and inhibit the resorption of bones, amenorrhea can predispose female athletes to osteoporosis, an

early loss of bone quality and quantity (Popp et al., 2022). This condition can occur despite the fact that physical activity with load causes greater bone-mineral density. There seems to be a threshold of calcium intake in the diet, below which physical activity can have minimal effect on increasing bone mass (Popp et al., 2022). Vitamin D intake is likely to be affected by calcium intake and vice versa. In terms of bone health, high calcium intake in the diet and high intake of vitamin D lead to reduced levels of bone resorption. This condition may occur despite the fact that physical activity with load causes decreased bone-mineral density (Manore et al., 2007). The mechanism underlying bone loss observed in amenorrhoeic athletes is twofold, including hormonal and nutrient components. (De Souza et al., 2008; Nose-Ogura et al., 2018). Bone is an active tissue that undergoes cycles of resorption and formation. When estrogen and energy are deficient, a break-off of bone circulation occurs, bone resorption increases while on the other hand bone formation decreases, ultimately resulting in bone loss (De Souza et al., 2008).

	High risk factors	Moderate risk
Eating disorders	History of diag ,E DIS,on DSM V criteria	His.of at least 6 month EA
weight	BMI< 17.5 kg/m ² Loss of 10%weight /month	BMI 17,5-18,5kg/m ² <90% expected weight, or weight loss of 5-10% /month
Menarchal age	16 years or older	15-16 years
Menstrual history	<6 menses/12 month	6-8 menses over 12 month
Reactions,fractures	Two prior stress fracture	One prior stress fracture
Prior DXA	Prior Z score<-2.0	Prior Z score -1.0 -2.0

Table .1 Indicating for obtaining a DXA scan

CONCLUSION AND DISCUSSION

Studies examining the long-term effects of energy deficiency on female athletes have demonstrated adverse effects on bone health, cognitive behavior and eating behaviors. These effects are particularly problematic during the critical teenage and young adult years of peak bone growth and brain maturation. Evidence points to these effects being secondary to hormonal changes that adapt to the state of low energy availability; Normalization of the latter is essential for improving bone, cognitive and eating outcomes. As shown by studies, it is assumed that with the reduction of energy availability, there is a decrease in estrogen corresponding to an increase in bone resorption markers, providing support for the role of estrogen in suppressing bone resorbing effects of osteoclasts. Athletes with eating disorders have been shown to have decreased vertebral bone mineral density of the spine than non-athletes with eating disorders, indicating the positive effect of physical exercise on reducing bone loss, but also the fact that exercise alone cannot protect the athlete from osteoporosis. Future research aims at new treatment options to improve bone outcomes in younger capacitors lags behind. According to studies energy intake and availability is below recommended daily intake for both athletes and not athletes. However, athletes reported lower energy availability than non-sportsmen. based on this result. Also, disordered eating occurs in both female athletes and non-athletes. It has been noted that in women athletes there is a delay in menarch/or they

develop irregular menstruations during exercise regimens. Although the prevalence of menstrual irregularities differs between different sports, rates are often quite high, affecting health -- in a recent study of high school female athletes, 1/4 of respondents had menstrual irregularities. The health problems of the female in sport are always present in these groups, despite the improvement of lifestyle, abundant information and increased awareness in these years. In conceptualizing these studies, based on the data so far, we assume that the conclusion and evaluation of these indicators in the three main areas remains a major priority for ensuring the health of first female persons who engage in physical activity and especially sports, elite. Our hypothesis is based on the fact that in physically active women, there is and is an ascescence of problems as above. Clinical experience and evidence or examples from scientific research have concluded that eating disorders and nutrition disorders such as mental anorexia, mental bulimia binge eating (eating three meals for a short time) usually starts from behaviors that resemble diet. More studies on RED-S prevalence in different populations should be conducted in order to take preventive measures in athletes who are at risk. Future research should focus on hormonal changes that arise due to long-term chronic LEA conditions and subsequent health outcomes , (egz., cardiovascular events, while there should also be studies that distinguish between hormonal changes during LEA in athletic populations and those occurring in nonathletes. New information obtained from such studies should be used to continue educating athletes, sports coaches and physically active individuals at RED-S that will encourage a more comprehensive approach to prevention, early detection and treatment of the disorder . Diagnosis and identification of LEA depends on the complete examination of athletes by their physicians during physical training prior to participation. Studies examining the long-term effects of energy deprivation in female athletes have demonstrated detrimental effects on bone health, cognitive behavior, and eating behaviors. Athletes with eating disorders have shown that AF reduces the risk of decreasing the mineral density of the vertebral bones of the spine than non-athletes with eating disorders, showing the positive effect of physical exercise in reducing bone loss, but also the fact exercise alone cannot protect the athlete from osteoporosis. The diagnosis and identification of the LEA depends on the complete examination of athletes by their doctors during physical training before participation. This screening should include a menstrual history, history of physical activity and current level of activity, history of diet and current dietary behaviors related to weight and sports expectations, assessment of EA, biochemical examination, including assessments of endocrine status and iron, Mg, Vit D and family history, especially that of the mother. age of menarche etc.

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THE ROLE OF NIOBIUM IN SOLID-STATE BATTERY TECHNOLOGY AND ITS WORLD RESERVES

KATI HAL PİL TEKNOLOJİSİNDE NİYOBYUM'UN ROLÜ VE DÜNYA REZERVLERİ

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ABSTRACT

Niobium (symbol Nb, atomic number 41) is a valuable metal utilized in high-strength superalloys, superconductors, and electronic components. In recent years, niobium has found significant applications not only in steel production but also in solid-state battery technology. Solid-state batteries, which use a solid electrolyte instead of the liquid or polymer gel electrolytes found in lithium-ion or lithium-polymer batteries, offer higher energy density, enhanced safety, longer lifespan, and lower cost compared to lithium-ion batteries. Consequently, they have become one of the most researched areas in recent times. In solid-state batteries, niobium-based compounds such as niobium oxide, niobium phosphate, and niobium sulfide can be utilized as solid electrolytes. These batteries are being used or are planned to be used in various applications, including electric vehicles, smartphones, laptops, wearable devices, pacemakers, and RFID devices. Niobium naturally occurs in minerals such as niobite, niobite-tantalite, and pyrochlore. Due to the chemical properties of niobium being very similar to those of tantalum, which is also found in these minerals, separating these two elements is challenging. The separation process of niobium typically involves methods such as alkaline solution, hydrofluoric acid, liquid-liquid extraction, and reduction with carbon or sodium. Approximately 85% of the world's niobium production is in Brazil, with 10% occurring in Canada. The countries with the largest reserves include Brazil, Canada, Australia, Nigeria, the Democratic Republic of Congo, Russia, China, India, Colombia, Argentina, Peru, Mexico, and the USA. Niobium has emerged as a significant player in the development of advanced anode-active materials in the form of metal niobates. These niobium-based anodes, belonging to the metal niobate family, are designed for high-demand and high-performance applications such as commercial heavy-duty vehicles, buses, e-ferries, and trucks. This class of material offers better charge rates and safety features compared to graphite, as well as a higher energy density compared to lithium titanate batteries (LTO). Due to its high energy density and fast charging capabilities, niobium is anticipated to become a very important element in the future.

Key Words: Niobium; Solid-state batteries; Niobium-based anodes

ÖZET

Niyobyum (sembol Nb, atom numarası 41), yüksek mukavemetli süper alaşımlarda, süper iletkenlerde ve elektronik bileşenlerde kullanılan değerli bir metaldir. Son yıllarda niyobyum sadece çelik üretiminde değil aynı zamanda katı hal pil teknolojisinde de önemli uygulama

alanları buldu. Katı hal pilleri, lityum iyon veya lityum polimer pillerde bulunan sıvı veya polimer jel elektrolitler yerine katı elektrolit kullanan bir pil teknolojisidir. Katı hal pilleri, lityum iyon pillere göre daha yüksek enerji yoğunluğu, daha fazla güvenlik, daha uzun ömür ve daha düşük maliyet sunabilir. Bu sebeple son yıllarda en çok araştırma yapılan alanların başında gelmektedir. Katı hal pillerinde, niyobyum oksit, niyobyum fosfat, niyobyum sülfür gibi niyobyum bazlı bileşikler, katı elektrolit olarak kullanılabilir. Katı hal pilleri, elektrikli araçlar, akıllı telefonlar, dizüstü bilgisayarlar, giyilebilir cihazlar, kalp pilleri, RFID gibi çeşitli uygulamalarda kullanılmaktadır veya kullanılması planlanmaktadır. Niyobyum, doğada genellikle niyobit, niyobit tantalit, piroklor gibi mineraller içinde bulunur. Niyobyumun kimyasal özellikleri, aynı zamanda minerallerinde bulunan tantalum ile çok benzer olduğu için, bu iki elementin ayrıştırılması zordur. Niyobyumun ayrıştırılması için, genellikle alkali çözelti, hidroflorik asit, sıvı-sıvı ekstraksiyonu, karbon veya sodyum indirgeme gibi yöntemler kullanılır. Dünya niyobyum üretiminin yaklaşık %85'i Brezilya'da, %10'u Kanada'da gerçekleşmektedir. En büyük rezervlere sahip ülkeler Brezilya, Kanada, Avustralya, Nijerya, Kongo Demokratik Cumhuriyeti, Rusya, Çin, Hindistan, Kolombiya, Arjantin, Peru, Meksika, ABD'dir. Niyobyum, metal niobatlar formunda gelişmiş anot aktif malzemelerinin geliştirilmesinde çok önemli bir oyuncu olarak ortaya çıkmıştır. Bu niyobyum bazlı anotlar, ticari ağır araçlar, otobüsler, e-feribotlar ve kamyonlar gibi yüksek talepkâr ve yüksek performanslı uygulamalar için tasarlanmış metal niobat ailesine aittir. Bu malzeme sınıfı, grafitte göre daha iyi şarj oranlarına ve güvenlik özelliklerine, ayrıca lityum titanat pillere (LTO) göre daha iyi enerji yoğunluğuna sahiptir. Yüksek enerji yoğunluğu ve hızlı şarj özellikleri sebebiyle gelecekte çok önemli bir element haline geleceği öngörülmektedir.

Anahtar Kelimeler: Niyobyum; Katı hal pilleri; Niyobyum esaslı anotlar

GİRİŞ

Son yıllarda enerji depolama teknolojilerindeki gelişmeler paralelinde elektrikli araçların yaygınlaşması ve taşınabilir elektronik cihazların performansının artırılması gibi birçok konuda enerji sistemlerinde gelişmesine sebep olmuştur. Enerji depolama teknolojilerinde yaşanan bu hızlı dönüşümün kaynağında ise malzeme teknolojilerinde yaşanan gelişmelerdir. Özellikle grafen, borafen, silisen gibi 2 boyutlu malzemelerin keşfi ile gelecekte daha fazla değişimin olacağı öngörülmektedir.

Bilindiği gibi Lityum-iyon Pil Teknolojisi taşınabilir elektroniklerden elektrikli araçlara ve enerji depolama sistemlerine kadar geniş bir uygulama yelpazesinde hâkim teknoloji haline gelmiştir. Lityum-iyon pil teknolojisi; enerji yoğunlukları, uzun ömürleri ve kendiliğinden deşarj oranlarının düşük olması nedeniyle tercih edilirler. Ayrıca, son yıllarda, malzeme bilimindeki ilerlemeler sayesinde bu pillerin enerji yoğunlukları artırılmış ve maliyetleri düşürülmüştür.

Pil teknolojisindeki daha hızlı şarj süreleri ve geliştirilmiş güvenlik özellikleri gibi yenilikler özellikle elektrikli araçların daha hızlı yaygınlaşmasına yardımcı olmuştur.

Ayrıca, büyük ölçekli enerji depolama sistemleri, yenilenebilir enerji kaynaklarının şebekeye entegrasyonunu kolaylaştırarak, güneş ve rüzgâr enerjisi gibi dalgalı enerji kaynaklarının daha etkin bir şekilde kullanılmasını sağlamıştır.

KATI HAL BATARYA TEKNOLOJİSİ

Geleceğin enerji depolama teknolojileri arasında özellikle katı hal piller önemli bir yere sahiptir. Bu piller, sıvı elektrolitler yerine katı elektrolitler kullanır, bu da onları potansiyel olarak daha güvenli ve daha uzun ömürlü hale getirir. Katı hal pillerde, lityum iyonlarının anot ve katot arasında hareket etmesini sağlayan ortam katı bir elektrolittir. Bu katı elektrolit, genellikle lityum tuzlarından oluşan inorganik veya polimer bazlı bir materyaldir. Katı elektrolit, aynı zamanda pilin içindeki elektrotları birbirinden ayıran ve iç kısa devreleri önleyen bir bariyer görevi görür.

Katı hal teknolojisi, avantajları aşağıdaki gibi sıralayabiliriz:

- 1. Güvenlik:** Katı hal elektrolitler, yanıcı olmayan malzemeler olduğundan, sıvı elektrolitli pillere kıyasla yangın ve patlama riskini azaltır. Kimyasal yan reaksiyonların engellenmesi de önemli bir avantajdır.
- 2. Enerji Yoğunluğu:** Katı hal piller, daha yüksek enerji yoğunluklarına ulaşabilir, bu da onları elektrikli araçlar ve taşınabilir elektronikler için daha çekici hale getirir.
- 3. Daha Uzun Ömür:** Katı elektrolitler, sıvı elektrolitli pillere göre daha az aşınma ve yıpranma gösterir, bu da pillerin daha uzun süre dayanmasını sağlar.
- 4. Geniş Sıcaklık Aralığı:** Katı hal piller, geniş bir sıcaklık aralığında stabil çalışabilir, bu da onları çeşitli uygulamalar için uygun hale getirir.

Bu avantajlarının yanında, katı hal pil teknolojisinin geliştirilmesi ve ticarileştirilmesinde hala bazı zorluklar bulunmaktadır. Özellikle yüksek üretim maliyetleri ve ölçeklendirme zorlukları bu alandaki önemli engeller arasındadır. Ancak, bu teknoloji, enerji depolama alanında devrim yapma potansiyeline sahiptir ve araştırma ve geliştirme çalışmaları yoğun bir şekilde devam etmektedir.

NİOBYUM'UN PİL TEKNOLOJİLERİNDEKİ ROLÜ

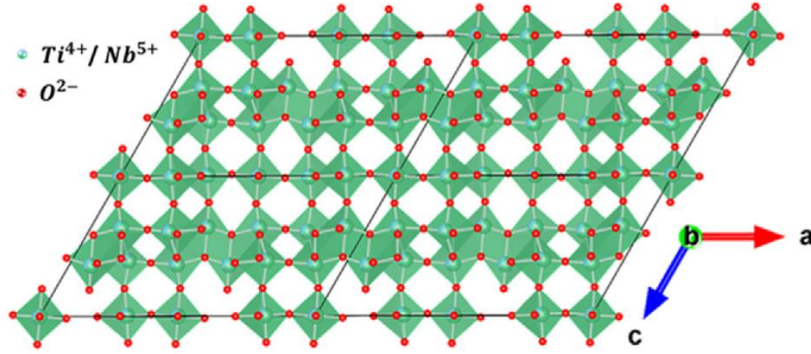
Niyobyum (Nb), periyodik tabloda 41 atom numarası ile yer alan bir elementtir ve d bloğu metalleri arasında sınıflandırılır. Yüksek erime (2477 °C) ve kaynama (4744 °C) noktası, olağanüstü korozyon direnci ve mükemmel fiziksel ve kimyasal özellikleri ile bilinir. Oda sıcaklığında, niyobyumun yoğunluğu yaklaşık 8.57 g/cm³'tür, bu da onu oldukça yoğun metallerden biri yapar. Oda sıcaklığında, niyobyum hava ve çoğu kimyasal maddelere karşı oldukça inerttir. Ancak yüksek sıcaklıklarda, özellikle halojenler ve bazı güçlü asitlerle reaksiyona girebilir. Bu metal, özellikle çelik alaşımlarında mikro alaşım elementi olarak, süper alaşımlarda ve diğer yüksek performanslı malzemelerde kullanılır. Özellikle pasif oksit tabakası formunda yüksek korozyon direncine sahip olduğu için kimyasal işleme endüstrisinde ve tıbbi cihazlarda kullanımını popüler hale getirir.

Niyobyum, katı hal pillerde hem anot-katot malzemelerinin geliştirilmesinde hem de katı elektrolitlerin performansını iyileştirmek amacıyla araştırmalarda kullanılmaktadır. Ancak, niyobyumun kullanımı genellikle katot tarafında daha fazla vurgulanmaktadır, özellikle katot malzemelerinin performansını artırma ve elektrolit ile olan arayüzün stabilitesini iyileştirme amacıyla çalışmalar yapılmaktadır. Niyobyum, katot malzemelerinde dopant olarak veya katot yüzeylerinde kaplama malzemesi olarak kullanılarak pilin kimyasal stabilitesini ve iletkenliğini artırmanın yanında daha iyi döngü (siklus) ömrü ve yüksek sıcaklık performansı da sağlamaktadır.

Bununla birlikte, niyobyumun anot malzemelerinde kullanımı hakkında da araştırmalar mevcuttur. Niyobyum, anot malzemelerine katkı maddesi olarak eklendiğinde, elektronik

iletkenliđi artırabilir ve anotun yapısal bütünlüğünü iyileştirebilir, bu da genel pil performansına olumlu katkıda bulunur.

Niyobyum bazlı bileşikler, yüksek iletkenlik ve kimyasal stabilite sunabilir. Özellikle, niyobyum oksit (Nb_2O_5) gibi niyobyum bazlı katı elektrolitler, yüksek iyon iletkenliđi ile dikkat çeker. Bu özellikler, pilin enerji yoğunluđunu ve güvenliđini artırırken, aynı zamanda uzun ömürlü olmasını sağlar.



Şekil 1. $TiNb_2O_7$ nanokristalin yapısı [1]

Niyobyumun katot malzemelerindeki oksit fazları ($LiNbO_3$, Li_3NbO_4 , Nb_2O_5 vb.) ve elemental dopant olarak kullanımı, pillerin termal ve kimyasal stabilitesini artırma, ilk döngü kaybını azaltma ve hız kapasitesini iyileştirme gibi faydalar sunmaktadır. Niyobyumun (Nb^{5+}) oksijenle yüksek afinite göstermesi ve kimyasal olarak stabil oksitler oluşturması, katmanlı geçiş metal oksitleri içindeki ortak metal türleriyle benzer iyonik yarıçapa (0,64 Å) sahip olmasına rağmen farklı valans karakteri sunması, niyobyumun bu alandaki potansiyelini göstermektedir. Niyobyumun kullanımı, lityum difüzyon kinetiğinde iyileşmelere ve bozulmanın azalmasına yol açmaktadır. Niobate ($LiNbO_3$) tabanlı kaplamaların, lityum iyon pil ve katı hal pil uygulamaları için etkili bir iyonik iletken kaplama malzemesi olarak kullanılabilmesi, özellikle amorf haliyle önemli ölçüde artırılmış iyonik iletkenliđi ile dikkat çekmektedir. Bu kaplamalar, katot malzemeleri üzerinde bir yüzey stabilizasyonu sağlayarak, pil performansında önemli iyileştirmeler sunmaktadır [2].

Sonuç olarak, niyobyumun katı hal pillerdeki tam rolü, spesifik uygulamaya ve pil tasarımına bađlı olsa da katot, anot ve elektrolit malzemelerindeki kullanımı, pilin enerji yoğunluđunu, güvenliđini, şarj hızını ve ömrünü optimize etmeye yönelik olumlu katkı yaptığı söylenebilir.

Bu çalışmada $TiNb_2O_7$ ve $TiNb_6O_{17}$ bileşiklerinin elektrot olarak katı hal pillerde kullanımı ve dünya rezervleri incelenmiştir.

Griffith ve ark. çalışmalarında niyobyum tungsten oksidin ($Nb_{16}W_5O_{55}$ ve $Nb_{18}W_{16}O_{93}$) yüksek miktarlarda lityumu birbirine ekleyebildiđini göstermiştir. Niyobyum tungsten oksit parçacıklarının boyutları mikrometre mertebesinde olsa bile oranlar yüksektir. Oda sıcaklığında yapılan ölçümlerde, her iki yapıdaki lityum-iyon difüzyon katsayılarının ölçümleri, $Li_4Ti_5O_{12}$ ve $LiMn_2O_4$ gibi tipik elektrot malzemelerindeki değerlerden birkaç kat daha yüksek olduđu vurgulanmıştır. Çok elektronlu redoks, tamponlu hacim genişlemesi, topolojik olarak engellenmiş niyobyum/tungsten çokyüzlü düzenlemeleri ve hızlı katı hal lityum taşınması, son derece yüksek hacimsel kapasitelere ve hız performansına yol açmaktadır. Mikrometre boyutundaki parçacıkların dakikalar içinde lityumlaştırılmasını mümkün kılan geleneksel olmayan malzeme ve mekanizmaların, yüksek güçlü uygulamalar, hızlı şarj cihazları, tamamen

katı hal enerji depolama sistemleri, elektrot tasarımı ve malzeme keşfi için etkileri olacağı belirtilmiştir [3].

Liang ve ark. polietilen oksit (PEO) bazlı katı polimer elektrolit (SPE) ve Ni açısından zengin lityum nikel manganez kobalt oksit $\text{LiNi}_{0,8}\text{Mn}_{0,1}\text{Co}_{0,1}\text{O}_2$ (NMC811) katot kombinasyonuna sahip katı hal piller ile ilgili çalışma yapılmıştır. NMC811-PEO katı polimer pillerin stabilize edilmesi için NMC811 elektrot yüzeyi üzerine atomik katman biriktirme yoluyla yüksek voltaja dayanıklı bir katı hal elektrolit katmanı lityum niyobyum oksit (LNO) kaplanmıştır. Elektrokimyasal testler, LNO kaplamanın NMC811 aktif malzemelerini stabilize edebildiğini ve döngü süreci sonrasında katı polimer elektrolitin ayrışmasını azaltabildiğini göstermiştir [4].

Yayınlanan bir haberde National University of Singapore (NUS)'da bulunan Gelişmiş 2D Malzemeler Merkezi (The Centre for Advanced 2D Materials-CA2DM) ve Brezilyalı niyobyum üreticisi CBMM tarafından geliştirilen niyobyum-grafen pillerin yaklaşık 30 yıl performans süresi olacağı belirtilmiştir. Ayrıca, araştırmacılar bir aracın 10 dakikadan kısa sürede tamamen şarj olacağını da iddia etmektedir. Deneysel çalışmalarında, niyobyum, pillerin negatif elektrotunda birincil aktif madde olarak görev yaparken, pozitif elektrotta da katkı maddesi olarak kullanıldığı vurgulanmıştır. Grafen ise elektronik iletkenliği ve yapısal stabiliteyi artırmak için hem negatif hem de pozitif elektrotlarda kullanılmıştır. Negatif elektrotta, niyobyum malzemelerinin benzersiz kristal yapısı, yapıya zarar vermeden hızlı şarjı kolaylaştırdığı belirtilmiştir. Pozitif elektrotta niyobyum malzemeleri iyonik iletkenliği artıracığı ve aktif malzemeyi bozulmaya karşı koruyacağı haberde yer almaktadır. Ek olarak, grafenin düşük yoğunluklu yapısı, pilin genel enerji yoğunluğundan ödün vermeden her iki elektrotun elektronik iletkenliğini önemli ölçüde artıracığı ifade edilmiştir [5].

Bir çalışmada Li_3NbS_4 (lityum niyobyum sülfid) pozitif elektrot olarak katı hal pilinde test edilmiştir. Li_3NbS_4 gibi lityum niyobyum sülfürler, metal polisülfid malzemeler arasında nispeten yüksek yoğunluk, iletkenlik ve hız kapasitesine sahiptir ve bu malzemeleri içeren piller, geleneksel lityum iyon bataryaların gravimetrik enerji yoğunluğunu potansiyel olarak aşacak kadar yüksek kapasitelere sahiptir. Elektrot ve elektrolit parçacıkları arasındaki uygun katı-katı teması, yüksek performanslı katı hal pillerin üretilmesi için önemli bir faktördür. Geleneksel oksit bazlı pozitif elektrot malzemeleri, üretimi ve/veya şarj-deşarj işlemleri sırasında çatlaklara neden olma eğilimindedir. Burada, yüksek işlenebilirliklerinden dolayı lityum sülfür elektrot malzemeleri kullanılarak uygun katı-katı temasın sağlandığı, pozitif elektrot malzemesi olarak lityum niyobyum sülfid kullanan tüm katı hal hücrelerini rapor etmişlerdir. Yaklaşık 400 mAh/g yüksek kapasiteyle şarj vedeşarjdan önce veya sonra, tamamen katı hal hücrelerindeki elektrot parçacıklarında neredeyse hiç çatlak gözlenmemiştir. Lityum niyobyum sülfür elektrodunun önemli bir mekanik hasar yaşamadan şarj edildiğini ve boşaltıldığını göstermektedir. Sonuç olarak, tamamen katı hal hücreleri, 0,5 mA/cm²'de 200 şarj vedeşarj döngüsünden sonra başlangıç kapasitelerinin %90'ından fazlasını koruduğu belirtilmiştir [6].

Saber ve ark. tarafından Li konsantrasyonunun bir fonksiyonu olarak $\text{Li}_x\text{TiNb}_2\text{O}_7$ 'nin redoks mekanizmaları, yapısal değişiklikleri ve elektrokimyasal özelliklerine ilişkin derinlemesine bir çalışma yapılmıştır. Metal dimer redoks mekanizması, lityumun TiNb_2O_7 'e eklenmesiyle metal-metal bağlarının oluşmasına neden olduğu bu durumda kafes parametrelerini etkileyerek katyon çiftlerinin mesafesinin kısılmasına yol açtığı belirtilmektedir. Metal dimer redoks mekanizmalarının neden olduğu yapısal değişikliklerin kontrol altına alınması, pilin döngü ömrünü ve stabilitesini artırdığı belirtilmiştir. Wadsley-Roth fazları için elektrokimyasal özelliklerin iyileştirilmesine yönelik stratejiler geliştirilmesi de pil performansının artırılmasına katkı sağlayacağı vurgulanmıştır [7].

Başka bir çalışmada, $TiNb_6O_{17}$ ve $TiNb_2O_7$, katı hal yöntemi kullanılarak sentezlendi. Şarj-deşarj eğrileri ve döngüsel voltametri, $TiNb_6O_{17}$ 'nin $TiNb_2O_7$ 'ye benzer redoks potansiyeline ve ayrıca yüksekdeşarj kapasitesine sahip olduğunu ortaya çıkardı. $TiNb_6O_{17}$ 'nin hız performansı, hız kapasitesi testi kullanılarak ölçülmüş ve $TiNb_6O_{17}$ 'nin şarj sırasında daha yüksek lityum difüzyon katsayılarına sahip olduğunu belirtilmiştir [8].

Sülfür katı hal elektrolitleri ve yüksek voltajlı Ni açısından zengin oksit katotlar arasındaki arayüzey stabilitesi, tüm katı hal pillerinin elektrokimyasal performansları için kritik öneme sahiptir, Burada, $TiNb_2O_7$ kaplı ve Ti katkılı $LiNi_{0,6}Mn_{0,2}Co_{0,2}O_2$ tek kristallerinin kombinasyonu yoluyla oldukça kararlı bir arayüz elde etmek amacıyla elektrot geliştirilmiştir. Termodinamik ve elektrokimyasal stabiliteye ve elektronik izolasyona sahip $TiNb_2O_7$ kaplama katmanı, sülfür katı hal elektrolitlerin ayrışmasını önler. Ti katkısıyla elde edilen güçlü Ti-O bağı, kafes oksijenini stabilize edebilir ve oksijenli sülfür ve fosfor türleri oluşturmak için sülfid elektrolitlerinin elektrokimyasal olarak oksitlenmesini önleyeceği belirtilmiştir. Modifiye edilmiş bu katot, 4,4 V'luk yüksek bir kesme voltajında 140 döngüden sonra %92,2'lik bir kapasite tutma oranıyla mükemmel uzun döngü stabilitesi sergilemektedir [9].

Inada ve ark. yaptıkları çalışmayla $TiNb_2O_7$ 'nin katı hal pillerinin geliştirilmesinde film elektrotu olarak kullanılması, bu alandaki uygulama potansiyelini ortaya koymaktadır [10]. Ayrıca, $TiNb_2O_7$, yüksek lityum depolama kapasitesi, iyi kapasite tutma özelliği ve düşük voltaj histerisi nedeniyle katı hal pillerinde anot malzemesi olarak büyük potansiyel göstermiştir [11].

$TiNb_2O_7$ 'ye oksijen boşluklarının eklenmesinin, özellikle elektronik iletkenlik ve lityum iyon difüzyon katsayısı açısından elektrokimyasal performansını arttırdığı bulunmuştur. Ekstra oksijen boşluklarına sahip $TiNb_2O_7$ bileşiği, benzersiz süperkritik akışkan işlemi yoluyla sentezlenir. Lityum iyon piller için anot olarak üretildiğinde, bu tür $TiNb_2O_7$ anot, 100 mA/g akım yoğunluğunda 231 mAh/g yüksek başlangıçdeşarj kapasitesi sergiler ve 1,0–3,0 V voltaj aralığında 250 döngüden sonra bile 169 mAh/g kapasiteyi korumaktadır [12].

Griffith ve ark. çalışmasında yeni bir lityum iyon pil anot malzemesi olarak $TiNb_2O_7$ 'nin (TNO) önerilmiştir. TNO, grafitten daha iyi hız ve güvenlik özelliklerine ve $Li_4Ti_5O_{12}$ 'ye göre daha yüksek enerji yoğunluğuna sahip olarak tasarlanmıştır. TNO'nun yüksek kapasitesi Nb^{5+} 'nin Nb^{3+} 'ya çoklu elektron redoksundan kaynaklanır, Li^+/Li indirgeme potansiyelinin çok üzerindeki çalışma voltajı penceresi lityum dendrit oluşumunu engellemektedir ve açık kristal yapısı yüksek güç performansına yol açmaktadır [13].

$Li_3TiIII NbIV_2O_7$ 'ye (geçiş metali başına bir lityum) indirgeme, Li^+/Li 'ye karşı yaklaşık 1,4 V'ta meydana gelir ve 232,6 mAh/g teorik kapasite sağlar. Reaksiyon, voltaj azaldıkça daha da ilerler ve 387,7 mAh/g. $TiNb_2O_7$ 'nin çok elektronlu redoks kimyası, onu grafitin gravimetrik kapasitesiyle (371,9 mAh/g) eşit hale getirir [13].

SONUÇLAR VE TARTIŞMA

Titanyum Niyobyum Oksit'in üretilmesi için TiO_2 ve Nb_2O_5 'i aseton içinde karıştırıp ardından 1250 °C'de 48 saat boyunca kurutup sinterlenerek katı hal reaksiyonuyla TNO sentezlenir. Bu oksitlerin katı hal yöntemi kullanılarak $TiNb_2O_7$ 'ye dönüştürülmesi, TiO_2 - Nb_2O_5 faz diyagramında gösterildiği gibi 1:1 molar oranda karıştırıldıklarında termodinamik olarak tercih edilir ve yüksek sıcaklıklarda kinetik olarak etkinleştirilir [14].

Katı hal piller için önemli olan niyobyumun dünyadaki en büyük üreticisi Brezilya'dır. Brezilya'da bulunan Companhia Brasileira de Metalurgia e Mineração (CBMM) isimli şirket tarafından şu anda üretilen niyobyum miktarı yılda 40.000 ton seviyesindedir.

Kanada'daki niyobyum, IAMGOLD adlı bir şirkete aittir ve bu nadir metalin ikinci büyük üreticisi konumundadır (yıllık 4.167 ton). Bu miktar, dünyadaki niyobyum üretiminin sadece %9'una karşılık gelmektedir. Nijerya ve Ruanda Kanada'dan sonraki en yüksek niyobyum üreticileridir [15].

Diğer üretici ülkeler arasında Avustralya, Etiyopya, Kongo Demokratik Cumhuriyeti, Angola, Burundi, Mozambik, Namibya, Zambiya, Zimbabve, Finlandiya, Fransa, Norveç, Rusya, Kazakistan, Tacikistan, Özbekistan, Çin, Hindistan, Malezya, Tayland, Vietnam, Endonezya, Filipinler, Kolombiya, Venezuela, Arjantin, Şili, Peru, Meksika, ABD sayılabilir [16].

Mevcut tanımlanmış niyobyum kaynakları ağırlıklı olarak Brezilya'da (yaklaşık yüzde 95) ve Kanada'da (yaklaşık yüzde 3,5) bulunduğu bildirilmektedir. Görünür ve muhtemel olarak Brezilya'da 452 milyon ton ve Kanada'da 32 milyon ton niyobyum rezerv olduğu; bu değerlerden de Brezilya'da yaklaşık 11 milyon ton ve Kanada'da da 180 bin ton civarında niyobyum oksit bulunduğu hesaplanmıştır. Bu iki ülkeden başka Angola, Avustralya, Çin, Grönland, Malavi, Rusya, Güney Afrika ve Amerika Birleşik Devletleri'nde de kaynaklar bulunmakla birlikte; kesin olarak rezerv veya kaynak tespiti literatürde bulunmamaktadır. Bu ülkelerden ABD'de yaklaşık 150 bin ton niyobyum kaynağına sahip olduğu tahmin edilmektedir [17].

Bu bulgular, niyobyumun katı hal pil teknolojilerindeki uygulamalarının geniş bir yelpazeye sahip olduğunu ve bu elementin gelecekteki enerji depolama çözümlerinde önemli bir rol oynayabileceğini göstermektedir. Niyobyumun katı hal pillerdeki mevcut ve potansiyel kullanımları, pil performansını artırma, güvenlik ve sürdürülebilirlik açısından önemli faydalar sunmaktadır.

Özellikle, niyobyum bazlı malzemelerin katotlarda dopant veya kaplama maddesi olarak kullanılması, pillerin stabilitesini ve lityum difüzyon kinetiğini iyileştirebilir. Niyobyumun kullanımı, kobalt gibi çevresel açıdan daha tartışmalı malzemelerin yerini alarak, daha çevre dostu pil teknolojilerinin geliştirilmesine imkân tanıyabilir. Niyobyumun bu alandaki potansiyelinin tam olarak anlaşılması ve ticarileştirilmesi için devam eden araştırma ve geliştirme çalışmaları büyük önem taşımaktadır.

TiNb₂O₇'nin yüksek lityum iyon difüzyon hızı ve iyi siklus stabilitesi, katı hal bataryalarda anot malzemesi olarak özellikle çekici kılar. Bu malzeme, yüksek şarj/deşarj hızlarına ve mükemmel uzun vadeli performansa imkân tanıyabilir, bu da onu elektrikli araçlar ve taşınabilir elektronik cihazlar için ideal bir seçenek yapmaktadır.

Bu ufuk açıcı yayında, H-Nb₂O₅, VNb₉O₂₅, GeNb₁₈O₄₇, O-Ti₂Nb₁₀O₂₉, TiNb₂₄O₆₂, Nb₁₂WO₃₃, Nb₁₄W₃O₄₄ ve Nb₁₈W₈O_{69,4} dahil olmak üzere bir dizi diğer Wadsley-Roth fazının lityumlaşma davranışlarının incelenmesi araştırmacılara tavsiye edilmektedir. Bu bileşiklerin katı hal pil teknolojileri için gelecekte önemli birer potansiyel olacağı düşünülmektedir.

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OBJECT DETECTION WITH INCEPTION BASED FEATURE EXTRACTOR ON UAV VIDEOS USING CNN

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ABSTRACT

Object Detection is more complex in the machine due to increasing in collections of digital images. Unmanned Aerial Vehicles (UAV) videos helped to improve the accuracy of object detection. The aim of this research is to show the implementation of object detection with Inception base feature extractor on UAV videos using Convolution Neural Network (CNN). The function of the research is to improve the performance of the object detection algorithm and feature extractor for identifying the common objects people, animals, buildings from real-world video frames taken by UAV. In this research the CNN to train detection model by taking single frames as input. The domain motion features are combines with the CNN to detect the UAV objects. The image obtain between two frames using UAV are processed and fed into the CNN for object detection. In this research, lots of experiments are done to solve our functional problems. The purpose of the proposed method is to reduce the occurrence of the false and missed detection of objects.

Key Words: Object Detection; Convolution Neural Network; Unmanned Aerial Vehicles; Feature Extraction Algorithm; Drone Videos

GENDER INEQUALITY AND ABORTION: A REVIEW STUDY

TOPLUMSAL CİNSİYET EŞİTSİZLİĞİ VE KÜRTAJ: BİR DERLEME ÇALIŞMASI

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ABSTRACT

Gender inequality is a problem that arises based on social roles between men and women. This inequality causes women to be discriminated against and limited in many areas. Gender inequality is an illegal approach between genders that makes women dependent on men and less valuable. This inequality can lead to restrictions on women's decision-making processes and their right to have control over their bodies. In this context, the right to abortion, which is one of the rights of women over their own body, is not an individual decision but is considered a public discussion area. Abortion is an issue discussed in many areas in terms of ethics, law and gender. Ethically, a balance must be established between the individual's right to make decisions over his or her own body and the right to life. The legal right to abortion often varies between countries and societies. In the context of gender, it is important to ensure that women have equal and fair access to the right to abortion. In order to overcome gender inequality, it is important to respect women's rights over their own bodies and support education and awareness activities. This review aims to evaluate gender inequality and women's right to abortion.

Key words: Gender Inequality, women, abortion right

ÖZET

Toplumsal cinsiyet eşitsizliği kadın ve erkek arasındaki toplumsal rollere dayalı olarak ortaya çıkan bir sorundur. Bu eşitsizlik birçok alanda kadınların ayrımcılığa uğramasına ve sınırlanmasına neden olmaktadır. Toplumsal cinsiyet eşitsizliği, cinsiyetler arasındaki yasal olmayan ve kadını erkeğe bağımlı ve daha az değerli gösteren bir yaklaşımdır. Bu eşitsizlik, kadınların karar alma süreçlerinde ve bedenleri üzerinde kontrol sahibi olma haklarında kısıtlamalara yol açabilir. Bu bağlamda kadının kendi bedeni üzerindeki haklarından biri olan kürtaj hakkı bireysel bir karar olmayıp kamuya açık bir tartışma alanı olarak değerlendirilmektedir. Kürtaj, etik, hukuk ve toplumsal cinsiyet açısından birçok alanda tartışılan bir konudur. Etik açıdan bireyin kendi bedeni üzerinde karar alma hakkı ve yaşam hakkı arasında bir denge kurulmalıdır. Hukuki açıdan kürtaj hakkı genellikle ülkeler ve toplumlar arasında farklılık gösterir. Toplumsal cinsiyet bağlamında ise kürtaj hakkının kadınların eşit ve adil bir şekilde erişebilmesini sağlamak önemlidir. Toplumsal cinsiyet eşitsizliğini aşmak için kadınların kendi bedenleri üzerindeki haklarına saygı gösterilmesi, eğitim ve farkındalık çalışmalarının desteklenmesi önemlidir. Bu derlemede toplumsal cinsiyet eşitsizliği ve kadının kürtaj hakkının değerlendirilmesi amaçlanmıştır.

Anahtar Kelimeler: Toplumsal cinsiyet, kadın, kürtaj hakkı

SIRT-2 IMMUNOREACTIVITY IN PLACENTAS OF PREGNANT WOMEN WITH GESTATIONAL DIABETES

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Abstract

Gestational diabetes mellitus (GDM) is carbohydrate intolerance that occurs during pregnancy or is first recognized during pregnancy. In this study, we investigated the immunohistochemical staining of SIRT-2 expression in the placenta of a pregnant woman with gestational diabetes mellitus (GDM). Materials and methods: Placentas of 10 healthy and 10 women with GDM were processed for routine histological tissue processing. For histopathological analysis, placental sections were taken and fixed in 10% buffered formalin, dehydrated in ethanol (50% to 100%), purified in xylene and embedded in paraffin. Sections (4-5 mm thick) were cut. Placentas were stained with SIRT-2 immunostaining. In the control group, SIRT-2 expression was negative in decidual and connective cells and endothelial cells. SIRT-2 expression was increased in syncytial nodes and bridges, especially in decidual cells in the GDM group. As a proinflammatory response, SIRT-2 increased in GDM placentas.

It has been observed that the increase in proinflammatory signal with SIRT-2 expression in GDM placentas may be an important signal in determining the direction of angiogenesis and apoptosis in blood vessels in chorionic villi.

Keywords: Gestational diabetes mellitus, Placenta, Sirtuin-2 (SIRT-2)

Introduction

GDM) is a carbohydrate intolerance that occurs during pregnancy or is noticed for the first time during pregnancy, and because of its location between maternal and fetal blood flows, the human placenta not only provides materno-fetal transport of nutrients and gases, but also to intrauterine conditions that adversely affect placental and fetal development. exposure has been demonstrated [1]. These changes are mainly based on changes at the micro-anatomical and/or

even molecular level, including abnormal villous vascularization, imbalance of vasoactive molecules, and increased oxidative stress. As a result, it causes disruption in transplacental glucose flow together with impaired fetal oxygenation and changes in transplacental nutrient supply. significant hyperplasia was seen in the cytotrophoblas [2, 3]. The SIRT-2 protein, which affects the mRNA of apoptotic molecules, plays an important role in the regulation of necroptosis. They revealed the presence of SIRT2 in trophoblast syncytial nuclear aggregates and preecliptic placentas shed from first trimester placental tissue according to the presence or absence of necroptosis signal in trophoblast particles in syncytial nodes.

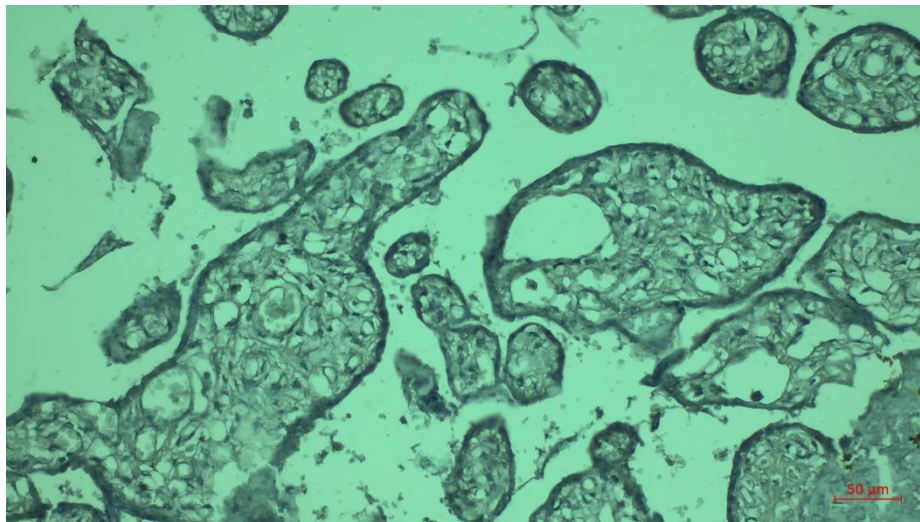
In this study, the effect of SIRT-2 expression in the placenta of a pregnant woman with gestational diabetes mellitus (GDM) on determining the inflammation and apoptotic process was investigated.

Material and Method

Placentas of 10 healthy and 10 women with GDM were processed for routine histological tissue processing. For histopathological analysis, placental sections were taken and fixed in 10% buffered formalin, dehydrated in ethanol (50% to 100%), purified in xylene and embedded in paraffin. Sections (4-5 mm thick) were cut. Placentas were stained with SIRT-2 immunostaining. Sections (4-5 mm thickness) were cut. SIRT-2 antibody was applied and incubated for 1 night at 4 degrees. Secondary antibody was applied for 14 minutes. Streptavidin peroxidase was kept for 15 minutes. DAB chromogen was applied and then stained with Harris hematoxylin and examined under a microscope.

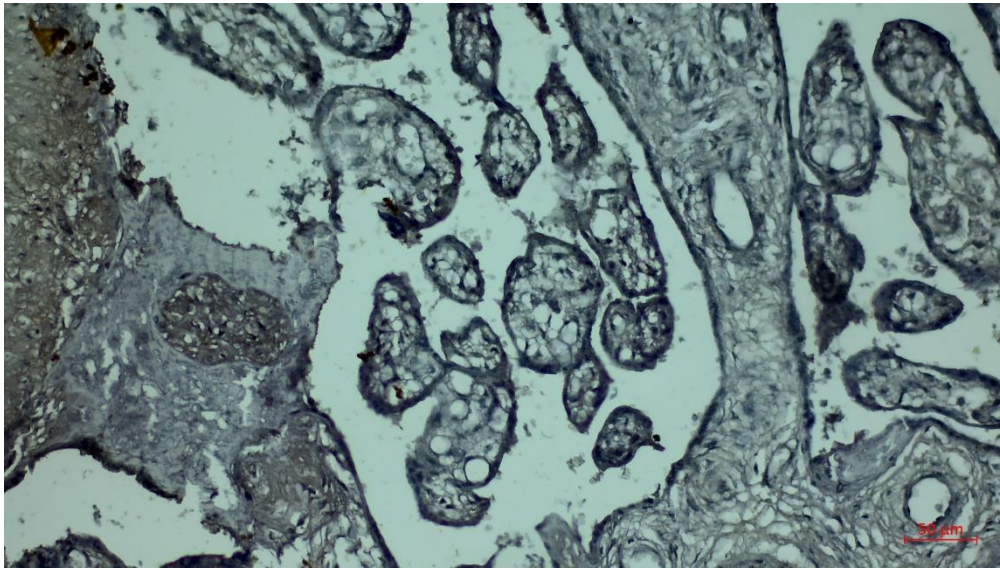
Results

In the control group, SIRT-2 expression was found to be negative in decidual and connective cells and endothelial cells in the distribution of cells in the area where the maternal and fetal composition of the placenta was.



Control group

Expression was also positive in surrounding endothelial cells and surrounding connective tissue cells. SIRT-2 increased in GDM placentas as a proinflammatory response.



Gdm sirt-2

Discussion

Gestational diabetes mellitus (GDM) is a pregnancy complication that affects maternal and child health. In patients with GDM, the secretion of antiangiogenic factors and proinflammatory cytokines is elevated as a result of the occurrence of oxidative stress [4]. Oxidative stress causes the placenta to implant shallowly, resulting in inhibition of migration and infiltration of placental trophoblast cells [5, 6]. Mitochondria are then damaged and mitochondria dysfunction affects the development of the placenta and also affects the growth of the fetus. In preeclamptic placentas, it has been shown that in the first trimester, SIRT-2 is localized in the syncytiotrophoblast-cytotrophoblast layer, as well as in cell subpopulations (appearing as leukocytes) found in the villous stroma. SIRT2 was observed in the epithelium in the amnion, in the trophoblast layer of the chorion and in the cells in the syncytial nodes, and in the cells that entered the apoptotic process [7]. In another study, a significant decrease in SIRT2 protein expression was found in both PE and FGR placentas [8]. SIRT-1 expression or activity is also associated with endothelial dysfunction in persons with T2D, GDM, or metabolic syndrome, where SIRT-1 regulates glucose and lipid metabolism, in addition to inflammatory responses, gluconeogenesis, and levels of reactive oxygen species, which together contribute to the development of insulin resistance [9, 10]. SIRT-2 increased.

Conclusion:

It has been observed that the increase in proinflammatory signal with SIRT-2 expression in GDM placentas may be an important signal in determining the direction of angiogenesis and apoptosis in blood vessels in chorionic villi.

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THE NEXUS BETWEEN DEMOGRAPHIC CHARACTERISTICS AND THE ATTITUDES TOWARDS PHARMACEUTICAL CARE OF PHARMACY STUDENTS

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ABSTRACT

In the practice of pharmaceutical care, the provider assumes accountability for the patient's medication-related necessities and is responsible for meeting those necessities. In the modern era, it has become essential to integrate pharmaceutical care and is now widely practiced by pharmacists worldwide. Even though developed countries have put it into practice and applied it for an extended period of time, with the significant and complex role that patient-centered care pharmacies play, there is still additional research that needs to be done, as the previously mentioned findings demonstrated. Additionally, future implementation of pharmaceutical care may be hindered by pharmacy students' negative attitudes of it. Therefore, the perception of pharmacy students towards pharmaceutical care was aimed at being analysed in this study. In order to understand the attitude of pharmacy students towards pharmaceutical care and the factors associated with it, we used the demographic characteristics of the respondents and the Pharmaceutical Care Scale (PCS) in the analyses. For the purpose of this study, descriptive statistics and non-parametric tests were conducted using survey data employed among pharmacy students. The results of the analyses showed that students who participated in this study have high positive attitudes toward pharmaceutical care, with an average score of 50 out of 65. Moreover, the data analyzed showed that gender was significantly associated with the dimensions of Return on Effort (RE) and Professional Benefit (PB), age was significantly associated with the dimension of Professional Benefit (PB), academic years of the students were significantly associated with the dimensions of Return on Effort (RE) and Professional Benefit (PB), marital status was only significantly associated with the dimension of Return on Effort, and work experience among pharmacy students was significantly associated with the dimension of Return on Effort (RE). The study's findings indicate that pharmaceutical care services provided to patients by pharmacists is significantly crucial, and policy makers should incorporate the notion of pharmaceutical care throughout the health sectors.

Keywords: Pharmacy students, Pharmaceutical care, Non-parametric tests

**DETERMINATION OF ENTREPRENEURSHIP LEVELS OF HEALTH
MANAGEMENT DEPARTMENT STUDENTS: THE CASE OF TÜRKİYE**

**SAĞLIK YÖNETİMİ BÖLÜMÜ ÖĞRENCİLERİNİN GİRİŞİMCİLİK
DÜZEYLERİNİN BELİRLENMESİ: TÜRKİYE ÖRNEĞİ***

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ÖZET

Bu araştırmada, Türkiye genelinde devlet ve vakıf üniversitesinde eğitime devam eden sağlık yönetimi bölümü öğrencilerinin girişimcilik düzeylerini belirlemek ve bireysel özelliklerin bu düzey üzerinde bir farklılığa neden olup olmadığını incelemek amaçlanmıştır. Bu araştırmanın evrenini, Türkiye’de faaliyet göstermekte olan devlet ve vakıf üniversitelerinin sağlık yönetimi bölümünde eğitime devam eden tüm lisans öğrencileri oluşturmaktadır. Araştırmanın örneklemini ise, basit rastgele örneklem yoluyla gönüllük esasına dayalı olarak, araştırmaya katılmayı kabul eden 486 sağlık yönetimi lisans öğrencisi oluşturmaktadır. Veriler google form aracılığıyla toplanmıştır. Araştırmada veri toplama aracı olarak; sağlık yönetimi bölümünde eğitime devam eden lisans öğrencilerinin girişimcilik düzeylerini belirlemek için Öztürk ve arkadaşları (2014) tarafından geliştirilen “Sağlık Yönetimi Girişimcilik Ölçeği” ve bireysel özelliklerin belirlenmesinde de araştırmacılar tarafından oluşturulan “Kişisel Bilgi Formu” kullanılmıştır. Sağlık Yönetimi Girişimcilik Ölçeği; toplamda 51 madde ve liderlik, yenilikçilik, üretkenlik ve sorumluluk olmak üzere dört alt boyuttan oluşan 5’li likert tipi bir ölçektir. Ölçekten alınan puanlar öğrencilerin girişimcilik düzeylerini belirlemektedir. Araştırmada verilerin analizinde; tanımlayıcı istatistikler, bağımsız örneklem t testi ve tek yönlü varyans analizi (ANOVA) kullanılmıştır. ANOVA sonucu anlamlı sonuçlarda gruplar arasındaki farkı ortaya koymak için Post Hoc testlerinden Tukey testi kullanılmıştır. Yapılan analizler sonucunda; sağlık yönetimi girişimcilik ölçeği toplam puanından alınan ortalama puan incelendiğinde ($\bar{X}= 223,07$) sağlık yönetimi öğrencilerinin girişimcilik düzeylerinin çok yüksek

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girişimcilik (211-250) grubunda yer aldığı görülmüştür. Özellikle anne-baba çalışma durumunun (annesi çalışmayan öğrencilerde daha yüksek) ve öğrencinin daha önceden bir işte çalışıp çalışmamasının girişimcilik düzeyleri üzerinde farklılığa neden olduğu bulunmuştur. Sağlık yönetimi bölümü öğrencilerinin yarıdan fazlası (%57,2) kendine ait bir iş fikri olduğunu ve kendini girişimci olarak gördüğünü (%72,6) belirtmiştir. Bu çalışma ile görülmektedir ki; sağlık yönetimi bölümü öğrencilerinin girişimcilik konusundaki farkındalığı üst düzeydedir. Araştırmadan elde edilen sonuçlara göre sağlık yönetimi bölümünde okuyan öğrencilerin ders müfredatlarında girişimcilik dersi olmayan fakültelerin müfredatlarına bu dersi eklemeleri ve bu konuda çeşitli eğitimlerin verilmesi ile farkındalığın artması sağlanacaktır. Bu sayede; sağlık hizmetlerindeki ihtiyaçların ve açıkların neler olduğunu belirleyebilen ve bunlara yanıt verebilen girişimci bireylerin yetişmesi sağlanabilecektir.

Anahtar Kelimeler: Girişimcilik, sağlık yönetimi, üniversite öğrencileri, Türkiye.

ABSTRACT

In this research, it is aimed to determine the entrepreneurship levels of health management department students studying at state and foundation universities throughout Türkiye and to examine whether individual characteristics cause a difference on this level. The population of this research consists of all undergraduate students who continue their education in the health management department of state and foundation universities operating in Türkiye. In the sample of the research, data were collected from 486 health management undergraduate students who accepted to participate in the research on the basis of volunteerism through simple random sampling via google form. In the research, "Health Management Entrepreneurship Scale" developed by Öztürk et al. (2014) to determine the entrepreneurship levels of undergraduate students studying in the department of health management and "Personal Information Form" created by the researchers to determine individual characteristics were used as data collection tools. The Health Management Entrepreneurship Scale is a 5-point Likert-type scale consisting of 51 items in total and four sub-dimensions: leadership, innovation, productivity and responsibility. The scores obtained from the scale determine the entrepreneurship levels of the students. In the analysis of the data in the research were used descriptive statistics, independent sample t test, and one-way analysis of variance (ANOVA). Tukey test, one of the Post Hoc tests, was used to reveal the difference between the groups in significant results of ANOVA. As a result of the analyses; when the average score obtained from the total score of the health management entrepreneurship scale was examined ($\bar{X}= 223.07$), it was seen that the entrepreneurship levels of health management students were in the very high entrepreneurship (211-250) group. In particular, it was found that the working status of the parents (higher in students whose mothers did not work) and whether the student had previously worked in a job caused a difference in entrepreneurship levels. More than half of the health management department students (57.2%) stated that they had their own business idea and saw themselves as entrepreneurs (72.6%). It is seen with this study that the awareness of health management

department students on entrepreneurship is at a high level. According to the results obtained from the research, awareness will be increased by adding this course to the curricula of the faculties that do not have entrepreneurship courses in the curricula of the students studying in the department of health management and by providing various trainings on this subject. In this way, it will be possible to raise entrepreneurial individuals who can identify and respond to the needs and deficits in health services.

Key Words: Entrepreneurship, health management, university students, Türkiye.

GİRİŞ

Bireyin girişimcilik kapasitesi; bireyi girişimci olmaya yönlendiren ve bu konuda başarılı kılan en önemli etkidir. Bireyler, kendilerinde var olan girişimcilik kapasitesinden yararlanarak; hayallerini gerçekleştirmek, yeteneklerini ispatlamak veya yaratıcılıklarını göstermek amacıyla iş hayatına atılmaya karar verirler (Oktay, 1996).

Girişimci; emek, sermaye ve doğal kaynak gibi üretim faktörlerinin bir araya getirilmesini sağlayarak, kaynakları etkili bir şekilde kullanıp mal ya da hizmet üretimi yapmak suretiyle para kazanan aynı zamanda riski üstlenen kişi, şeklinde tanımlanmaktadır (Yılmaz ve Sünbül, 2009:196; Stevenson ve Jarillo, 1990: 17; Miller, 1983: 770; Revichandran ve Nakkiran, 2015). Girişimcilik ise; girişimcilerin risk alma, fırsatları kovalama, hayata geçirme ve yenilik yapma süreçlerinin tümünü kapsayan bir kavramdır. Diğer bir ifade ile yenilikçi bir faaliyet olan girişimcilik, büyük bir enerjinin, bir girişim veya organizasyonu oluşturmaya harcanmasıdır (Bodur, 2018:140, 141). Girişimci olmak ve başarıyla bir işletmeyi yönetebilmek için, girişimcinin belli özellikleri taşıması gerekir. Risk alabilen, sorumluluk üstlenebilen, dinamik bir kişiliğe sahip, yeniliğe, değişime ve dönüşüme açık bir yapıda olmaları, başarıya ihtiyacı, kendine güven, belirsizliğe tolerans vb. bu özelliklerden birkaçıdır (Akyüz vd., 2009:150; Çetinkaya Bozkurt vd., 2012:240; Göç, 2010: 28; Koh, 1996; Oktay,1996; Öneren, 2012:14; Yıldırım vd., 2011:193; Yüksel vd., 2015:144).

Girişimciler, bir ülkenin kalkınmasına ve gelişmesine katkıda bulunan kişilerdir. Girişimcilik faaliyetlerini istenilen düzeyde gerçekleştirmek yoluyla, ülkelerin ekonomik sürdürülebilirlikleri sağlanabilir. Girişimcilik, rekabet üstünlüğü sağlama ve istihdam imkânı sunması sebebiyle ekonomik kalkınma ve toplumsal refahın artmasında son derece önemlidir. Küreselleşme ve artan rekabet nedeniyle dünyadaki birçok ülke gelecekte varlıklarını devam ettirebilmek için girişimcilik faaliyetlerine yönelmektedir. Buradan hareketle, girişimcilik küresel gelişim içinde değerlendirildiğinde; milli ekonominin ayakta kalabilmesi, değeri yüksek ürünlerin üretimine yönelerek mümkün olabilir. Tüm bunların hayata geçirilebilmesi ve girişimcilik ruhunun tüm toplumda hissedilebilmesi için, nitelikli insan gücünün yetiştirilmesi gereklidir (Hessels, Naudé, 2019; Çakıroğlu vd., 2021:409; Eren, 2016:100). Bu nedenle, üniversite öğrencilerinin girişimcilik düzeylerinin belirlenmesi yerinde olacaktır.

Sağlık sektöründe girişimcilik kavramı, yeni bir kavram değildir. Ekonomik dalgalanmalar,

bireylerin deęişen saęlık ihtiyaları, tüklenmişlik ve işten memnun olmama gibi faktörler saęlık alışanlarını girişimci olmaya teşvik edebilmektedir (akıroęlu vd., 2021:409).

Saęlık işletmelerindeki mevcut aığı ve ihtiyaları belirleyerek, bunlara cevap vermek; saęlık yönetimi mesleęinin gelişmesini ve profesyonelleşmesini saęlamaktadır. Gün getike, kendi işini kuran saęlık yönetici sayısı artmaktadır. Girişimci saęlık yöneticileri, alana yenilik katmak veya var olanı farklı biçimlerde kullanarak yeni yöntemler geliştirmek istemektedirler. Bu anlamda saęlık yönetimi bölümünde eğitime devam eden üniversite öğrencilerinin girişimcilięe bakış açıları deęerlendirilerek, farkındalıklarının arttırılması saęlanmalıdır.

Üniversite öğrencilerinin girişimcilik üzerine aldıkları eğitim sayesinde, girişimcilik özellikleri gelişmektedir. Hedef odaklı olma, önüne ıkan fırsatları deęerlendirme, başarma arzusu, kararlılık ve problem özme becerileri vb. girişimcilere özgü özellikler eğitim aracılığıyla girişimci adaylarına öğretilmektedir. Bu sayede, girişimci adaylarına fırsatları farkedebilme, özüm odaklı olma, daha güçlü iletişim kurabilme ve özgüven artışı vb. yetenekler kazandırılmaktadır (Arıkan, 2002; Taęraf, Halis, 2008).

Yöneticilik ve girişimcilik özellięinin her ikisine de sahip olan bireyler; hem işletmenin başarısına hem de ülkenin ekonomik başarısına katkıda bulunmaktadır. Türkiye'nin ekonomik ilerlemesine destek olabilmek için; girişimcilik potansiyeline sahip olan bireylerin ön plana ıkarılması ve bu bireylere fırsat tanınması gerekir. Ekonomik deęerlerin oluşturulması için girişimcilik cazip hale getirilmelidir (Öztürk ve ark.,2014). Birok üniversitede girişimcilik ders olarak okutulmakta ve kendi işini kurma hevesi içinde olan öğrencilere girişimcilik konusunda eğitim verilmektedir.

Hizmet sektörü içerisindeki en dinamik sektörlerden biri de saęlık sektörüdür. Bu durum; sektörde yer alan fırsatları beraberinde getirmekte, yeni pazarların oluşmasını, ciddi ekonomik atılımların gerçekleşmesini ve yeni istihdam alanlarının oluşmasını saęlamaktadır. Bu ortam içerisinde yeni fırsatların deęerlendirilmesi, saęlık yönetimi öğrencilerinin söz konusu sektörü tanımaları ve bu fırsatları deęerlendirecek girişimci eğilimlere sahip olmaları ile saęlanabilir (Öztürk ve ark.,2014).

Bu araştırma, rekabet koşullarının hızla farklılaştığı saęlık sektörünün gelecekteki aranan elemanı olduęu düşünölen saęlık yönetimi bölümü öğrencilerinin girişimcilik düzeylerinin belirlenmesi bakımından önemli görölmektedir. Aynı zamanda girişimcilik ile ilgili birok alışma (İşcan, Kaygın, 2011; Eren, 2016; Soysal ve ark., 2017; Boza, 2019; Bayer ve ark., 2022) yapılmış olsa da, bu araştırmanın saęlık yönetimi bölümü öğrencilerine yönelik olarak geliştirilmiş özel bir ölekle yapılmış olması ve Türkiye genelini kapsaması açısından ilk olma özellięi göstermekte olup; saęlık yönetimi bölümü lisans öğrencilerinin eğitimleri esnasında aldıkları derslerin yeniden dikkate alınmasına, girişimcilik farkındalıęının oluşmansa, sektörün bu yöndeki ihtiyalarının aığa ıkmasına ve gerekli düzenlemeler yapılmasına katkı saęlayacağı düşünölmektedir.

Bu araştırma, Türkiye genelinde devlet ve vakıf üniversitesinde eğitime devam eden saęlık yönetimi bölümü öğrencilerinin girişimcilik düzeylerinin belirlenmesi ve bireysel özelliklerin bu düzey üzerinde bir farklılıęa neden olup olmadığının incelenmesi amacıyla yapılmıştır.

YÖNTEM

Tanımlayıcı ve kesitsel nitelikteki bu araştırmanın evrenini, Türkiye genelinde faaliyet göstermekte olan devlet ve vakıf üniversitelerinin sağlık yönetimi bölümünde eğitime devam eden tüm lisans öğrencileri oluşturmaktadır. Yükseköğretim Bilgi Yönetim Sistemi verilerine göre (<https://istatistik.yok.gov.tr/>) Türkiye genelinde toplam 74 adet devlet ve vakıf üniversitesinde eğitime devam eden sağlık yönetimi bölümü öğrenci sayısı yaklaşık 20.000 civarındadır. Minimum örneklem büyüklüğü, evreni bilinen örneklem hesaplama formülü ile (Kılıç, 2012) 377 öğrenci olarak hesaplanmıştır. Araştırmanın örneklemini ise, basit rastgele örneklem yoluyla gönüllük esasına dayalı olarak, araştırmaya katılmayı kabul eden 503 öğrenciden veri toplanmış olup, toplanan veriden aşırı uç değerler çıkarılıp analizler 486 veri üzerinden sürdürülmüştür. Gerekli izinler alındıktan sonra veriler, google form aracılığıyla toplanmıştır. Google formu hazırlanarak oluşturulan linkin; ulaştığı öğrencilere, ilk sayfada çalışmanın amacı ve isim bilgisi vermeleri gerekmeyi açıklanarak, katılımcıların online olarak formu doldurmaları istenmiştir.

Araştırmada kullanılan anket formu iki bölümden oluşmaktadır. İlk bölümde; sağlık yönetimi bölümü lisans öğrencileri hakkında gerekli verileri elde etmek amacıyla araştırmacılar tarafından literatür (Eren, 2016; Soysal ve ark., 2017; Bozça, 2019; Bayer ve ark., 2022) doğrultusunda hazırlanan ve öğrencilerin cinsiyet, yaş, sınıf, anne-baba mesleği, ailenin gelir durumu, girişimcilik konusunda eğitim alıp almadıkları, kariyer hedefleri, en uzun yaşadıkları bölge, bir işte çalışıp çalışmadıkları, kendilerine ait bir iş fikrinin olup olmadığı, kendilerini girişimci olarak görme ve girişimcilik faaliyetinde bulunma durumuna yönelik bireysel özelliklerin sorulduğu “kişisel bilgi formu” yer almaktadır. Anketin ikinci bölümünde, Öztürk ve arkadaşları (2014) tarafından sağlık yönetimi bölümü öğrencilerinin girişimcilik düzeylerini belirlemek amacıyla geliştirilen “Sağlık Yönetimi Girişimcilik Ölçeği” kullanılmıştır. Bu ölçek; toplamda 51 madde ve liderlik, yenilikçilik, üretkenlik ve sorumluluk olmak üzere dört alt boyuttan oluşan 5’li likert tipi bir ölçektir. Ölçekten alınan puanlar öğrencilerin girişimcilik düzeylerini belirlemektedir. Bu değerler; 50-90 arası puan, çok düşük girişimcilik; 91-130 arası puan, düşük girişimcilik; 131-170 arası puan, orta düzeyde girişimcilik; 171-210 arası puan, yüksek girişimcilik; 211-250 arası puan, çok yüksek girişimcilik şeklindedir. Geliştirilen ölçeğin alt boyutlarının güvenirlik değerleri sırasıyla; 0,989, 0,988, 0,791, 0,887 olarak hesaplanmıştır (Öztürk ve ark., 2014). Bu oranlar ölçeğin oldukça güvenilir olduğunu göstermektedir.

Araştırma sonucunda elde edilen veriler SPSS istatistik paket programında analiz edilmiştir. Araştırma verilerini toplamak için kullanılan ölçme aracının güvenirlik katsayıları incelendiğinde “Sağlık Yönetimi Girişimcilik Ölçeği” alt boyutlarından “Liderlik” için 0,87 “Yenilikçilik” için 0,93 “Üretkenlik” için 0,89 “Sorumluluk” için 0,94 olarak hesaplanmıştır. Ölçeğin tamamından alınan toplam puan için ise 0,97 olarak hesaplanmıştır. Araştırmanın verileri analiz edilmeden önce normallik varsayımını sağlayıp sağlamadığını kontrol etmek için z skorlarının ± 3 arasında olması ile çarpıklık ve basıklık katsayıları incelenmiştir. Elde edilen puanlarda çarpıklık basıklık değerlerinin 0’a yakın olması normallik göstergesi olarak

görülürken değerlerin $\pm 1,5$ arasında olması verilerin normallik varsayımını sağladığını göstermektedir (George ve Mallery, 2016). Tablo 3’de puanlara ilişkin betimsel istatistikler incelendiğinde Sağlık Yönetimi Girişimcilik Ölçeği normallik varsayımlarını sağlamaktadır. Verilerin normal dağılım gösterdiği analizlerde bağımsız değişkenlerden cinsiyet, anne-baba çalışma durumu, girişimcilik eğitimi alma, bir işte çalışmış olma, kendini girişimci olarak görme ve girişimcilik faaliyetinde bulunma için Bağımsız Örneklemeler T Testi; yaş, sınıf, gelir durumu, kariyer hedefleri ve yaşadığı bölge değişkenlerinde ise Tek Yönlü Varyans Analizi (ANOVA) kullanılmıştır. ANOVA sonucu anlamlı sonuçlarda gruplar arasındaki farkı ortaya koymak için Post Hoc testlerinden Tukey testi kullanılmıştır. Analizler %95 güven düzeyinde gerçekleştirilmiştir. Elde edilen bulgular, tablolar aracılığıyla sunulmuştur.

BULGULAR

Araştırmada yer alan sağlık yönetimi bölümü öğrencilerinin bireysel özelliklerine ilişkin tanımlayıcı bilgilere Tablo 1’de yer verilmiştir.

Tablo 1. Sağlık Yönetimi Bölümü Öğrencilerine Ait Tanımlayıcı İstatistikler (n=486)

Değişken	Grup	Sayı (n)	Yüzde (%)
Cinsiyet	Kadın	384	79,0
	Erkek	102	21,0
Yaş	18-20 yaş	185	38,1
	21-23 yaş	215	44,2
	24-26 yaş	43	8,8
	+27 yaş	43	8,8
Sınıf	1.Sınıf	124	25,5
	2. Sınıf	97	20,0
	3. Sınıf	97	20,0
	4. Sınıf	168	34,6
Anne Çalışma	Çalışmıyor	413	85,0
	Çalışıyor	73	15,0
Baba Çalışma	Çalışmıyor	171	35,2
	Çalışıyor	315	64,8
Gelir Durumu	Gelir Giderin Altında	164	33,7
	Gelir Gidere Eşit	246	50,6
	Gelir Giderin Üstünde	76	15,6
Yaşadığı Bölge	Marmara	79	16,3
	İç Anadolu	194	39,9
	Ege	44	9,1
	Karadeniz	33	6,8
	Güneydoğu Anadolu	45	9,3
	Akdeniz	56	11,5
	Doğu Anadolu	35	7,2

Tablo 1 incelendiğinde araştırmaya katılan öğrencilerin büyük bir bölümünün kadın (%79) olduğu ve yaş gruplarının 18-20 (%38,1) ila 21-23 (%44,2) arasında dağılım gösterdiği görülmektedir. Öğrencilerin annelerinin sadece %15’i herhangi bir alanda çalışırken, babaların %64,8’i herhangi bir işte çalışmaktadır. Gelir durumları incelendiğinde %50,6’sının

geliri giderine eşit olduğu, %33,7'sinin ise gelirinin giderinin altında olduğu görülmektedir. Öğrencilerin %39,9'unun ise en uzun süre yaşadığı bölge İç Anadolu bölgesidir.

Tablo 2. Sağlık Yönetimi Bölümü Öğrencilerinin Girişimcilik ile İlgili Görüşlerine Yönelik Tanımlayıcı Bulguları

Değişken	Grup	Sayı (n)	Yüzde (%)
Girişimcilik Eğitimi Alma Durumu	Evet	144	29,6
	Hayır	342	70,4
Kariyer Hedefi	Kamu sektörü	282	58,0
	Özel sektör	160	32,9
	Kendi işi-Aile işi	44	9,1
Çalışma Durumu	Evet	261	53,7
	Hayır	225	46,3
Kendisine Ait İş Fikri	Var	278	57,2
	Yok	208	42,8
Kendini Girişimci Görme	Evet	353	72,6
	Hayır	133	27,4
Girişimci Faaliyette Bulunma	Evet	132	27,2
	Hayır	354	72,8

Tablo 2 incelendiğinde öğrencilerin %70,4'ü girişimcilik ile ilgili herhangi bir eğitim almamıştır. Öğrencilerin kariyer hedefinin ise çoğunlukla kamu sektörü (%58) yönünde olduğu, ardından özel sektör (%32,9) olduğu görülmüştür. Çok küçük bir grup ise kendi işi veya aile işini (%9,1) yürütmek istemektedir. Öğrencilerin %53,7'si daha önceden/şu anda bir işte çalıştığını; %57,2'si kendisine ait bir iş fikri olduğunu; %72,6'sı kendini girişimci olarak gördüğünü; %72,8'i daha önce hiçbir girişimci faaliyette bulunmadığını belirtmiştir.

Tablo 3. Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin Betimsel İstatistikler

Ölçek Boyutları	n	\bar{x}	s.s	Çarpıklık		Basıklık	
				İst.	Std. hata	İst.	Std. hata
Liderlik	486	39,04	4,19	,47	,11	-1,17	,22
Yenilikçilik	486	57,32	5,81	,03	,11	-1,32	,22
Üretkenlik	486	42,84	4,84	,20	,11	-1,09	,22
Sorumluluk	486	83,85	7,76	,11	,11	-1,29	,22
Girişimcilik Toplam	486	223,07	21,18	,21	,11	-1,29	,22

Sağlık Yönetimi Girişimcilik Ölçeği toplam puanından alınan ortalama puan incelendiğinde (\bar{X} = 223,07); sağlık yönetimi öğrencilerinin girişimcilik düzeylerinin çok yüksek girişimcilik (211-250) grubunda yer aldığı görülmüştür.

Tablo 4. Cinsiyete Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Cinsiyet	n	\bar{X}	t	sd	η^2	p
Liderlik	Kadın	384	39,01	-0,28	484	,00	,78
	Erkek	102	39,14				
Yenilikçilik	Kadın	384	57,42	0,78	484	,00	,43
	Erkek	102	56,92				
Üretkenlik	Kadın	384	42,85	0,05	484	,00	,96
	Erkek	102	42,82				
Sorumluluk	Kadın	384	84,02	0,91	484	,00	,36
	Erkek	102	83,23				
Girişimcilik Toplam	Kadın	384	223,32	0,51	484	,00	,61
	Erkek	102	222,12				

Tablo 4'e göre öğrencilerin Sağlık Yönetimi Girişimcilik Ölçeğinden elde ettikleri puan ortalamaları incelendiğinde kadınlar ve erkekler arasında alt boyutlarda anlamlı bir fark bulunmamaktadır. Ölçeğin toplam puanı incelendiğinde de kadınların puan ortalaması ($\bar{X}=223,32$) erkeklerin puan ortalamasından ($\bar{X}=222,12$) anlamlı düzeyde farklılaşmamaktadır [$t(484)=0,51$ $p=,61$]. Bu durum girişimcilik düzeyinin cinsiyete göre değişmediğini göstermektedir.

Tablo 5. Yaşa Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin ANOVA Sonuçları

Ölçek Boyutları	n	Grup	\bar{X}	Varyans Kaynağı	KT	sd	KO	F	η^2	p	Fark				
Liderlik	185	18-20 yaş	38,61	Gruplararası	76,88	3	25,62	1,46	,01	,23					
	215	21-23 yaş	39,13												
	43	24-26 yaş	39,67									Grup İçi	8478,12	482	17,58
	43	+27 yaş	39,79									Toplam	8555,00	485	
Yenilikçilik	185	18-20 yaş	56,57	Gruplararası	222,22	3	74,07	2,21	,01	,09					
	215	21-23 yaş	57,50												
	43	24-26 yaş	58,41									Grup İçi	16192,06	482	33,59
	43	+27 yaş	58,51									Toplam	16414,28	485	
Üretkenlik	185	18-20 yaş	42,61	Gruplararası	31,49	3	10,49	0,45	,00	,72					
	215	21-23 yaş	42,86												
	43	24-26 yaş	43,51									Grup İçi	11329,93	482	23,50
	43	+27 yaş	43,09									Toplam	11361,42	485	
Sorumluluk	185	18-20 yaş	83,18	Gruplararası	235,30	3	78,43	1,31	,01	,27					
	215	21-23 yaş	83,92												
	43	24-26 yaş	85,46									Grup İçi	28970,61	482	60,10
	43	+27 yaş	84,81									Toplam	29205,91	485	
Girişimcilik Toplam	185	18-20 yaş	220,99	Gruplararası	1936,09	3	645,36	1,44	,01	,23					
	215	21-23 yaş	223,42												
	43	24-26 yaş	227,06									Grup İçi	215653,53	482	447,41
	43	+27 yaş	226,20									Toplam	217589,62	485	

Tablo 5'e göre Sağlık Yönetimi Girişimcilik Ölçeği alt boyutlarından alınan puanlar yaşa göre anlamlı farklılık göstermemektedir. Girişimcilik toplam puanları incelendiğinde de en yüksek ortalamanın 24-26 yaş grubundaki öğrencilerde ($\bar{X}= 227,06$) olduğu ancak yaş grupları arasında anlamlı düzeyde bir fark olmadığı bulunmuştur [$F(3,482)=1,44$; $p=,23$].

Tablo 6. Sınıf Düzeyine Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin ANOVA Sonuçları

Ölçek Boyutları	n	Grup	\bar{X}	Varyans Kaynağı	KT	sd	KO	F	η^2	p	Fark
Liderlik	124	1.Sınıf	38,70					0,46	,00	,71	
	97	2.Sınıf	38,96	Gruplararası	24,24	3	8,08				
	97	3.Sınıf	39,16	Grup İçi	8530,76	482	17,69				
	168	4.Sınıf	39,26	Toplam	8555,00	485					
Yenilikçilik	124	1.Sınıf	56,64					0,92	,01	,43	
	97	2.Sınıf	57,52	Gruplararası	93,17	3	31,05				
	97	3.Sınıf	57,23	Grup İçi	16321,11	482	33,86				
	168	4.Sınıf	57,75	Toplam	16414,28	485					
Üretkenlik	124	1.Sınıf	42,66					0,34	,00	,80	
	97	2.Sınıf	42,83	Gruplararası	23,85	3	7,95				
	97	3.Sınıf	42,59	Grup İçi	11337,57	482	23,52				
	168	4.Sınıf	43,13	Toplam	11361,42	485					
Sorumluluk	124	1.Sınıf	83,20					0,82	,01	,49	
	97	2.Sınıf	84,03	Gruplararası	147,58	3	49,19				
	97	3.Sınıf	83,38	Grup İçi	29058,33	482	60,28				
	168	4.Sınıf	84,50	Toplam	29205,91	485					
Girişimcilik Toplam	124	1.Sınıf	221,22					0,67	,00	,57	
	97	2.Sınıf	223,36	Gruplararası	901,03	3	300,34				
	97	3.Sınıf	222,38	Grup İçi	216688,59	482	449,56				
	168	4.Sınıf	224,66	Toplam	217589,62	485					

Tablo 6'ya göre Sağlık Yönetimi Girişimcilik Ölçeği alt boyutlarından alınan puanlar sınıf düzeyine göre anlamlı farklılık göstermemektedir. Girişimcilik toplam puanları incelendiğinde de en yüksek ortalamanın 4. sınıf düzeyindeki öğrencilerde ($\bar{X}= 224,66$) olduğu ancak yaş grupları arasında anlamlı düzeyde bir fark olmadığı bulunmuştur [$F(3,482)=0,67$; $p=,57$].

Tablo 7. Anne Çalışma Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Anne Çalışma	n	\bar{X}	t	sd	η^2	p
Liderlik	Çalışmıyor	413	39,25	2,69	484	,02	,01
	Çalışıyor	73	37,83				
Yenilikçilik	Çalışmıyor	413	57,59	2,45	484	,01	,02
	Çalışıyor	73	55,79				
Üretkenlik	Çalışmıyor	413	42,98	1,52	484	,01	,13
	Çalışıyor	73	42,05				
Sorumluluk	Çalışmıyor	413	84,22	2,48	484	,01	,01
	Çalışıyor	73	81,79				
Girişimcilik Toplam	Çalışmıyor	413	224,05	2,46	484	,01	,01
	Çalışıyor	73	217,47				

Tablo 7'ye göre Sağlık Yönetimi Girişimcilik Ölçeğinin Liderlik alt boyutundan elde edilen puan ortalamaları incelendiğinde annesi çalışmayanların ($\bar{X}= 39,25$) puan ortalaması, annesi çalışanlara ($\bar{X}= 37,83$) göre daha yüksek olarak bulunmuştur [$t(484)=2,69$ $p=,01$]. Yenilikçilik [$t(484)=2,45$ $p=,02$] ve Sorumluluk [$t(484)=2,48$ $p=,01$] boyutlarında da benzer şekilde annesi çalışmayanların puan ortalaması anlamlı düzeyde daha yüksektir. Ancak Üretkenlik boyutunda oluşan puan farkının istatistiki olarak bir önemi yoktur. Ölçeğin toplam puanı incelendiğinde de annesi çalışmayanların puan ortalaması ($\bar{X}= 224,05$) çalışanların puan ortalamasından ($\bar{X}= 217,47$) anlamlı düzeyde farklılaşmaktadır [$t(484)=2,46$ $p=,01$]. Bu durum girişimcilik düzeyinin annesi çalışmayan öğrencilerde daha yüksek olduğunu göstermektedir.

Tablo 8. Baba Çalışma Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Baba Çalışma	n	\bar{X}	t	sd	η^2	p
Liderlik	Çalışmıyor	171	38,71	-1,26	484	,00	,21
	Çalışıyor	315	39,22				
Yenilikçilik	Çalışmıyor	171	56,94	-1,06	484	,00	,29
	Çalışıyor	315	57,53				
Üretkenlik	Çalışmıyor	171	42,23	-2,06	484	,01	,04
	Çalışıyor	315	43,17				
Sorumluluk	Çalışmıyor	171	83,05	-1,67	484	,01	,09
	Çalışıyor	315	84,28				
Girişimcilik Toplam	Çalışmıyor	171	220,95	-1,63	484	,01	,11
	Çalışıyor	315	224,21				

Tablo 8'e göre Sağlık Yönetimi Girişimcilik Ölçeğinin Üretkenlik alt boyutundan elde edilen puan ortalamaları incelendiğinde babası çalışanların ($\bar{X}= 43,17$) puan ortalaması, babası çalışmayanlara ($\bar{X}= 42,23$) göre daha yüksek olarak bulunmuştur [$t(484)=-2,06$ $p=,04$] ve istatistiksel olarak anlamlı bir farklılık vardır. Diğer alt boyutlarda ise babaların çalışma durumu öğrencilerin puan ortalamasını değiştirmemektedir. Toplam girişimcilik puanı incelendiğinde babası çalışmayanların puan ortalaması ($\bar{X}= 220,95$) ile çalışanların puan ortalaması ($\bar{X}= 224,21$) arasında anlamlı bir farklılık yoktur [$t(484)=-1,63$ $p=,11$].

Tablo 9. Gelir Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin ANOVA Sonuçları

Ölçek Boyutları	n	Grup	\bar{X}	Varyans Kaynağı	KT	sd	KO	F	η^2	p	Fark
Liderlik	164	Giderden az	39,28	Gruplararası	14,99	2	7,49	0,42	,00	,65	
	246	Gidere eşit	38,89	Grup İçi	8540,01	483	17,68				
	76	Giderden faz.	39,03	Toplam	8555,00	485					
Yenilikçilik	164	Giderden az	57,98	Gruplararası	109,41	2	54,70	1,62	,01	,19	
	246	Gidere eşit	56,97	Grup İçi	16304,87	483	33,75				
	76	Giderden faz.	57,00	Toplam	16414,28	485					
Üretkenlik	164	Giderden az	43,28	Gruplararası	54,80	2	27,40	1,17	,00	,31	
	246	Gidere eşit	42,53	Grup İçi	11306,62	483	23,40				
	76	Giderden faz.	42,90	Toplam	11361,42	485					
Sorumluluk	164	Giderden az	84,43	Gruplararası	84,36	2	42,17	0,70	,00	,49	
	246	Gidere eşit	83,57	Grup İçi	29121,56	483	60,29				
	76	Giderden faz.	83,51	Toplam	29205,92	485					
Girişimcilik Toplam	164	Giderden az	224,98	Gruplararası	923,86	2	461,93	1,03	,00	,35	
	246	Gidere eşit	221,97	Grup İçi	216665,76	483	448,58				
	76	Giderden faz.	222,46	Toplam	217589,62	485					

Tablo 9'a göre Sağlık Yönetimi Girişimcilik Ölçeği alt boyutlarından alınan puanlar gelir durumuna göre anlamlı farklılık göstermemektedir. Girişimcilik toplam puanları incelendiğinde de en yüksek ortalamanın geliri giderinden az olan öğrencilerde ($\bar{X}=224,98$) olduğu ancak gelir grupları arasında anlamlı düzeyde bir fark olmadığı bulunmuştur [$F(2,483)=1,03$; $p=,35$].

Tablo 10. Girişimcilik Eğitimi Alma Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Girişimcilik Eğitimi	n	\bar{X}	t	sd	η^2	p
Liderlik	Evet	144	39,18	0,46	484	,00	,65
	Hayır	342	38,98				
Yenilikçilik	Evet	144	57,51	0,47	484	,00	,64
	Hayır	342	57,24				
Üretkenlik	Evet	144	43,26	1,24	484	,00	,22
	Hayır	342	42,66				
Sorumluluk	Evet	144	84,00	0,27	484	,00	,79
	Hayır	342	83,79				
Girişimcilik Toplam	Evet	144	223,95	0,60	484	,00	,55
	Hayır	342	222,69				

Tablo 10'a göre Sağlık Yönetimi Girişimcilik Ölçeğinin alt boyutlarında girişimcilik eğitimi alma durumu öğrencilerin puan ortalamasını değiştirmemektedir. Toplam girişimcilik puanı

incelendiğinde de benzer şekilde girişimcilik eğitimi alanların puan ortalaması ($\bar{X}= 223,95$) ile girişimcilik eğitimi almayanların puan ortalaması ($\bar{X}= 222,69$) arasında anlamlı bir farklılık yoktur [$t(484)=0,60$ $p=,55$].

Tablo 11. Kariyer Hedefine Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin ANOVA Sonuçları

Ölçek Boyutları	n	Grup	\bar{X}	Varyans Kaynağı	KT	sd	KO	F	η^2	p	Fark
Liderlik	282	Kamu sek.	39,35	Gruplararası	62,83	2	31,41	1,79	,01	,17	
	160	Özel sek.	38,62	Grup İçi	8492,17	483	17,58				
	44	Kendi işi	38,61	Toplam	8555,00	485					
Yenilikçilik	282	Kamu sek.	57,53	Gruplararası	42,83	2	21,41	0,63	,01	,53	
	160	Özel sek.	56,90	Grup İçi	16371,45	483	33,89				
	44	Kendi işi	57,47	Toplam	16414,28	485					
Üretkenlik	282	Kamu sek.	43,16	Gruplararası	101,39	2	50,69	2,17	,01	,12	
	160	Özel sek.	42,19	Grup İçi	11260,03	483	23,31				
	44	Kendi işi	43,18	Toplam	11361,42	485					
Sorumluluk	282	Kamu sek.	84,33	Gruplararası	170,16	2	85,08	1,41	,01	,24	
	160	Özel sek.	83,05	Grup İçi	29035,75	483	60,11				
	44	Kendi işi	83,70	Toplam	29205,91	485					
Girişimcilik Toplam	282	Kamu sek.	224,39	Gruplararası	1339,11	2	669,55	1,49	,01	,23	
	160	Özel sek.	220,76	Grup İçi	216250,51	483	447,72				
	44	Kendi işi	222,97	Toplam	217589,62	485					

Tablo 11'e göre Sağlık Yönetimi Girişimcilik Ölçeği alt boyutlarından alınan puanlar kariyer hedefine göre anlamlı farklılık göstermemektedir. Girişimcilik toplam puanları incelendiğinde de kamu sektöründe çalışmayı hedefleyen öğrencilerin puan ortalamasının ($\bar{X}= 224,39$) olduğu, özel sektörde çalışmayı hedefleyen öğrencilerin puan ortalamasının ($\bar{X}= 220,76$) olduğu ve kendi işi ya da aile işini yapmak isteyenlerin puan ortalamasının ($\bar{X}= 222,97$) olduğu görülmüştür. Ancak kariyer hedeflerine göre anlamlı düzeyde bir fark olmadığı bulunmuştur [$F(2,483)=1,49$; $p=,23$].

Tablo 12. Yaşanılan Bölgeye Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin ANOVA Sonuçları

Ölçek Boyutları	n	Grup	\bar{X}	Varyans Kaynağı	KT	sd	KO	F	η^2	p	Fark
Liderlik	79	Marmara	38,39								
	194	İç Anadolu	39,20								
	44	Ege	38,65	Gruplararası	104,97	6	17,49				
	33	Karadeniz	38,27	Grup İçi	8450,03	479	17,64	0,99	,01	,43	
	45	Güneydoğu Anadolu	38,93	Toplam	8555,00	485					
	56	Akdeniz	38,66								
	35	Doğu Anadolu	40,40								
Yenilikçilik	79	Marmara	57,36								
	194	İç Anadolu	57,51								
	44	Ege	57,02	Gruplararası	200,74	6	33,45				
	33	Karadeniz	55,96	Grup İçi	16213,54	479	33,84	0,99	,01	,43	
	45	Güneydoğu Anadolu	56,80	Toplam	16414,28	485					
	56	Akdeniz	56,94								
	35	Doğu Anadolu	59,08								
Üretkenlik	79	Marmara	43,00								
	194	İç Anadolu	43,01								
	44	Ege	42,27	Gruplararası	113,87	6	18,97				
	33	Karadeniz	42,36	Grup İçi	11247,55	479	23,48	,81	,01	,56	
	45	Güneydoğu Anadolu	42,04	Toplam	11361,42	485					
	56	Akdeniz	42,66								
	35	Doğu Anadolu	44,08								
Sorumluluk	79	Marmara	83,93								
	194	İç Anadolu	84,45								
	44	Ege	82,81	Gruplararası	579,02	6	96,50				
	33	Karadeniz	82,75	Grup İçi	28626,89	479	59,76	1,61	,02	,14	
	45	Güneydoğu Anadolu	82,26	Toplam	29205,91	485					
	56	Akdeniz	82,76								
	35	Doğu Anadolu	86,48								
Girişimcilik Toplam	79	Marmara	223,24								
	194	İç Anadolu	224,18								
	44	Ege	220,77	Gruplararası	3279,42	6	546,56				
	33	Karadeniz	219,36	Grup İçi	214310,20	479	447,41	1,22	,02	,29	
	45	Güneydoğu Anadolu	220,04	Toplam	217589,62	485					
	56	Akdeniz	221,03								
	35	Doğu Anadolu	230,05								

Tablo 12'ye göre Sağlık Yönetimi Girişimcilik Ölçeği alt boyutlarından alınan puanlar yaşadıkları bölgeye göre anlamlı farklılık göstermemektedir. Girişimcilik toplam puanları incelendiğinde de benzer şekilde yaşanan bölgeye göre anlamlı düzeyde bir fark olmadığı bulunmuştur [F(6,479)=1,22; p=,29].

Tablo 13. Çalışma Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Çalışma	n	\bar{X}	t	sd	η^2	p
Liderlik	Evet	261	39,45	2,35	484	,01	,02
	Hayır	225	38,56				
Yenilikçilik	Evet	261	57,84	2,13	484	,01	,03
	Hayır	225	56,72				
Üretkenlik	Evet	261	43,38	2,67	484	,02	,01
	Hayır	225	42,21				
Sorumluluk	Evet	261	84,41	1,69	484	,01	,01
	Hayır	225	83,21				
Girişimcilik Toplam	Evet	261	225,09	2,28	484	,01	,02
	Hayır	225	220,71				

Tablo 13'e göre Liderlik alt boyutunda daha önce bir işte çalışanların puan ortalaması (\bar{X} = 39,45), daha önce bir işte çalışmayanlara (\bar{X} = 38,56) göre yüksek bulunmuştur [t(484)=2,35 p=,02]. Benzer şekilde girişimciliğin diğer alt boyutları olan Yenilikçilik [t(484)=2,13 p=,03], Üretkenlik [t(484)=2,67 p=,01] ve Sorumlulukta [t(484)=1,69 p=,01] da daha önce bir işte çalışanların puan ortalamaları daha yüksektir. Toplam girişimcilik puanı incelendiğinde daha önce çalışanların puan ortalaması (\bar{X} = 225,09) ile daha önce çalışmayanların puan ortalaması (\bar{X} = 220,71) arasında anlamlı bir farklılık vardır [t(484)=2,28 p=,02].

Tablo 14. İş Fikri Olma Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	İş Fikri	n	\bar{X}	t	sd	η^2	p
Liderlik	Evet	278	39,24	1,21	484	,00	,23
	Hayır	208	38,77				
Yenilikçilik	Evet	278	57,53	0,92	484	,00	,36
	Hayır	208	57,04				
Üretkenlik	Evet	278	43,01	0,88	484	,00	,38
	Hayır	208	42,62				
Sorumluluk	Evet	278	84,17	1,04	484	,00	,30
	Hayır	208	83,43				
Girişimcilik Toplam	Evet	278	223,96	1,08	484	,00	,28
	Hayır	208	221,87				

Tablo 14'e göre Sağlık Yönetimi Girişimcilik Ölçeğinin alt boyutlarında iş fikri olma durumu öğrencilerin puan ortalamasını değiştirmemektedir. Toplam girişimcilik puanı incelendiğinde de benzer şekilde iş fikri olanların puan ortalaması (\bar{X} = 223,96) ile iş fikri olmayanların puan ortalaması (\bar{X} = 221,87) arasında anlamlı bir farklılık yoktur [t(484)=1,08 p=,28].

Tablo 15. Kendini Girişimci Görme Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Girişimci Görme	n	\bar{X}	t	sd	η^2	p
Liderlik	Evet	353	39,26	1,87	484	,01	,06
	Hayır	133	38,46				
Yenilikçilik	Evet	353	57,52	1,26	484	,00	,21
	Hayır	133	56,78				
Üretkenlik	Evet	353	43,04	1,46	484	,00	,14
	Hayır	133	42,32				
Sorumluluk	Evet	353	84,15	1,39	484	,00	,17
	Hayır	133	83,06				
Girişimcilik Toplam	Evet	353	223,98	1,56	484	,01	,12
	Hayır	133	220,63				

Tablo 15'e göre Sağlık Yönetimi Girişimcilik Ölçeğinin alt boyutlarında kendini girişimci görme durumu öğrencilerin puan ortalamasını değiştirmemektedir. Toplam girişimcilik puanı incelendiğinde de benzer şekilde kendini girişimci görenlerin puan ortalaması ($\bar{X}= 223,98$) ile girişimci görmeyenlerin puan ortalaması ($\bar{X}= 220,63$) arasında anlamlı bir farklılık yoktur [$t(484)=1,56$ $p=,12$].

Tablo 16. Girişimci Faaliyette Bulunma Durumuna Göre Sağlık Yönetimi Girişimcilik Ölçeği Puanlarına İlişkin T Testi Sonuçları

Ölçek Boyutları	Girişimci Faaliyet	n	\bar{X}	t	sd	η^2	p
Liderlik	Evet	132	39,34	0,95	484	,00	,34
	Hayır	354	38,93				
Yenilikçilik	Evet	132	57,42	0,23	484	,00	,81
	Hayır	354	57,28				
Üretkenlik	Evet	132	43,29	1,25	484	,00	,21
	Hayır	354	42,67				
Sorumluluk	Evet	132	84,22	0,64	484	,00	,52
	Hayır	354	83,71				
Girişimcilik Toplam	Evet	132	224,28	0,77	484	,00	,44
	Hayır	354	222,61				

Tablo 16'ya göre Sağlık Yönetimi Girişimcilik Ölçeğinin alt boyutlarında daha önce bir girişimci faaliyette bulunma durumu öğrencilerin puan ortalamasını değiştirmemektedir. Toplam girişimcilik puanı incelendiğinde de benzer şekilde girişimci faaliyette bulunanların puan ortalaması ($\bar{X}= 224,28$) ile faaliyette bulunmayanların puan ortalaması ($\bar{X}= 222,61$) arasında anlamlı bir farklılık yoktur [$t(484)=0,77$ $p=,44$].

TARTIŞMA VE SONUÇ

Sağlık sektöründe girişimciliğin önemi günden güne artmaktadır. Nüfusun giderek artması sağlık alanındaki girişimcileri harekete geçirmekte ve sağlık sektöründe daha iyi hizmet sunabilmek için farklı arayışlara itmektedir. Dolayısıyla bu alanda önüne çıkan fırsatları değerlendirebilen, yenilikleri yakalayabilen, risk alabilen, rekabet ortamında ayakta kalmayı sağlayabilen, sağlık yönetimi sektörüne yeni bir bakış açısı sunabilen, hizmet sunmak ya da bir ürün geliştirmek için yönetsel işlevleri kullanabilen, işletme kurarak bir iş alanı oluşturabilen ve bu işin devamlılığı için faaliyetlerini sürdürebilen girişimci ruhlu ve eğitilmiş sağlık yöneticilerine ihtiyaç duyulmaktadır. Bu araştırmada, Türkiye genelinde devlet ve vakıf üniversitesinde eğitime devam eden sağlık yönetimi bölümü öğrencilerinin girişimcilik düzeylerini belirlemek ve bireysel özelliklerin bu düzey üzerinde bir farklılığa neden olup olmadığını incelemek amaçlanmıştır. Türkiye’de okuyan sağlık yönetimi bölümü öğrencilerinin “Sağlık Yönetimi Girişimcilik Ölçeği”nden elde ettikleri puan ortalamaları incelendiğinde; girişimcilik düzeyi ile cinsiyet, yaş, sınıf düzeyi, gelir durumu, kariyer hedefi, girişimcilik eğitimi alma durumu, yaşadıkları bölge, iş fikri olma, kendini girişimci görme ve daha önce bir girişimci faaliyette bulunma durumlarına göre istatistiksel olarak anlamlı bir farklılık görülmemektedir ($p>0,05$). Yapılan analiz sonucunda; sağlık yönetimi öğrencilerinin girişimcilik düzeylerinin çok yüksek girişimcilik (211-250) grubunda yer aldığı görülmektedir. Sağlık yönetimi bölümü öğrencilerinin yarıdan fazlası (%57,2) kendine ait bir iş fikri olduğunu ve kendini girişimci olarak gördüğünü (%72,6) belirtmiştir.

Girişimcilik ile ilgili birçok çalışma yapılmış olsa da, bu araştırmanın sağlık yönetimi bölümü öğrencilerine yönelik olarak geliştirilmiş özel bir ölçekle yapılmış olması ve Türkiye genelini kapsamı açısından ilk olma özelliği göstermektedir. Literatürdeki diğer çalışmalar incelendiğinde; Bozça (2019) tarafından İstanbul’da okuyan sağlık yönetimi bölümü öğrencileri üzerinde yapılan araştırmada, öğrencilerin girişimcilik eğilimi puanının yüksek olduğu saptanmıştır. Gemlik ve Kıracı (2016) tarafından Marmara Üniversitesi Sağlık Yönetimi Bölümü öğrencileri üzerinde yapılan araştırmada; öğrencilerin büyük bir çoğunluğunu girişimci oldukları ancak girişimci ruha sahip olduklarının farkında olmadıkları tespit edilmiştir. Kavşur (2015) tarafından “Sağlık Yönetimi Lisans Öğrencilerinin Girişimcilik Eğilimlerinin Belirlenmesine Yönelik Bir Araştırma” isimli çalışmada; girişimcilik eğitimi alan öğrencilerin girişimcilik eğilim puanının eğitim almayanlara göre yüksek olduğu saptanmıştır. Arslan ve Esatoğlu (2018) tarafından yapılan araştırma üç farklı kamu üniversitesinin Sağlık Yönetimi Bölümündeki birinci ve dördüncü sınıf öğrencileri üzerinde yapılmış ve öğrencilerin girişimcilik düzeylerinin yüksek olduğu sonucuna ulaşılmıştır. Bayer ve arkadaşlarının (2022) sağlık bilimleri alanında eğitim alan öğrenciler üzerinde yaptığı araştırmada; öğrencilerin girişimcilik eğilim ölçeği ve girişimci kişilik ölçeğinden aldıkları puan ortalamasının orta düzeyde olduğu ve girişimci kişiliğin girişimcilik eğilim düzeyini etkilediği tespit edilmiştir. Literatürdeki çalışmalar, yapılan bu çalışma ile benzer sonuçlar göstermektedir.

Yapılan analiz sonucunda bu çalışmada görülmektedir ki; sağlık yönetimi bölümü öğrencilerinin girişimcilik konusundaki farkındalığı üst düzeydedir. Özellikle annesi çalışmayan öğrencilerde girişimcilik düzeyinin liderlik, yenilikçilik ve sorumluluk alt boyutlarında; babası çalışan öğrencilerin girişimcilik düzeyinin üretkenlik alt boyutunda daha yüksek olduğu ve öğrencinin daha önceden bir işte çalışıp çalışmamasının girişimcilik düzeyleri üzerinde farklılığa neden olduğu bulunmuştur ($p<0,05$). Sağlık yönetimi bölümünde okuyan öğrencilerin girişimcilik ruhunun geliştirilmesi bu yönde verilebilecek eğitimlerin niteliğine bağlıdır. Bu anlamda ders müfredatlarında girişimcilik dersi olmayan fakültelerin müfredatlarına bu dersi eklemeleri ve bu konuda çeşitli eğitimlerin verilmesi farkındalığın artmasını sağlayacaktır. Bu sayede; sağlık hizmetlerindeki ihtiyaçların ve açıkların neler olduğunu belirleyebilen ve bunlara yanıt verebilen girişimci bireylerin yetişmesi sağlanabilecektir. Böylece girişimcilik potansiyeline sahip olan bu bireylerle hem sağlık kurumunun hem de ülkenin ekonomik başarısının daha da ileriye götürülebileceği düşünülmektedir.

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INTERVENTIONS FOR PERINEAL TRAUMA: A REVIEW STUDY

PERİNEAL TRAVMA İÇİN MÜDAHALELER: BİR DERLEME ÇALIŞMASI

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ABSTRACT

One very typical and expected side effect of vaginal delivery is perineal trauma. Malpresentation, including persistent occiput posterior position and advancing gestational age, both contribute to perineal lacerations. Lacerations on the perineum, cervix, vagina, and vulva can happen naturally or because of medical intervention, such as an episiotomy. When giving birth, more than 53–89% of women will sustain a perineal laceration of some kind. The majority of first- or second-degree perineal lacerations that happen during vaginal birth fall into one of two categories. Sixty to seventy percent of these cuts will need sutures. The incidence and severity of perineal damage diminish with each subsequent birth. Interventions to lower the incidence of perineal injuries are still controversial despite a great deal of study. In this review paper, we provide the information that is currently available on the prevention of perineal trauma and the measures that can be used to do so.

Key words: Birth, perineal trauma, postpartum

ÖZET

Vajinal doğumun çok tipik ve beklenen etkisi perine travmasıdır. Oksiput posterior pozisyonu ve ilerleyen gebelik yaşı dahil olmak üzere yanlış prezentasyon, perineal laserasyonlara neden olmaktadır. Perine, serviks, vajina ve vulvada yırtılmalar doğal olarak veya epizyotomi gibi tıbbi müdahaleler nedeniyle meydana gelebilir. Doğum yaparken, kadınların %53-89'undan fazlası bir tür perine yırtılmasına maruz kalacaktır. Vajinal doğum sırasında meydana gelen birinci veya ikinci derece perine yırtılmalarının çoğunluğu iki kategoriden birine girer. Bu kesiklerin yüzde altmış ila yetmişinin dikilmesi gerekecektir. Perineal hasarın görülme sıklığı ve şiddeti sonraki her doğumda azalır. Perine yaralanmalarının insidansını azaltmaya yönelik müdahaleler, çok sayıda çalışmaya rağmen hala tartışmalıdır. Bu derleme yazısında, perineal travmanın önlenmesi ve bu amaçla kullanılabilecek önlemler hakkında mevcut bilgiler sunulmaktadır.

Anahtar kelimeler: Doğum, perineal travma, doğum sonu

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ÖZET

Giriş ve Amaç: Hücrelerin canlılığını sürdürmesinde büyüme faktörlerinin önemli olduğu ve bu faktörlerin eksikliğinde apoptotik hücre ölüm mekanizmalarının aktive olduğu bilinmektedir. Nörotrofin, büyüme için gereken trofik desteği sağlayarak nöronların yaşamasını, çoğalmasını ve fonksiyonlarını etkileyen, sinapsların stabilizasyonunu sağlayan, sinaptik fonksiyonu ve sinaptik plastisiteyi kontrol eden ve bunun yanında akson ve dendrit dallanmalarını düzenleyen dimerik polipeptid yapılı büyüme faktörü ailesidir. Nörotrofinler etkilerini, yüksek bağlanma eğiliminde oldukları tirozin kinaz reseptör (Trk) ve daha düşük bağlanma eğiliminde oldukları pan-nörotrofik reseptör (p75NTR) aracılığı ile gösterirler. İlk nörotrofik faktör olan sinir büyüme faktörü (NGF) 1950'lerin başında keşfedilmiştir. Bundan yaklaşık 30 yıl sonra beyin türevi nörotrofik faktör (BDNF) bulunmuştur. Bu faktörler hücre popülasyonlarının büyüme, gelişme, farklılaşma ve hayatta kalmalarının düzenlenmesine ve çevresel etkilere adaptasyonlarına katılırlar. İlerleyen dönemde nörotrofin-3 (NT-3) ve nörotrofin-4/5 (NT-4/5) gibi nörotrofin ailesinin diğer üyeleri bulunmuştur. Nörotrofinlerin etkinlikleri bulunabilirlik düzeylerine, transmembran reseptörlere bağlanabilme afinitelerine ve reseptör aktivasyonundan sonraki sinyal yollarının uyarılmasına bağlıdır. Nörotrofinler ve reseptörleri birçok sinyal yolağını aktive ederek nöronal sağ kalımı düzenler, sinaptik plastisite üzerine katkı sağlar. Bu özellikleri ile nörolojik hastalıkların tedavisinde potansiyeli olan bir konu başlığı olarak karşımıza çıkarlar. Nörotrofinler, merkezi sinir sistemi, periferik sinir sistemi nöronları ve periferik dokulardaki birçok hücre tipinden sentezlenmektedir ve hem sinir sisteminde hem de sinir sistemi dışındaki pek çok dokuda biyolojik etkiye sahiptirler. Bu bildiride nörotrofinlerin yapıları, sentezlendiği hücreler, etki mekanizmaları ve fonksiyonları hakkında bilgi sunulmaktadır.

Anahtar Kelimeler: Nörotrofin; NGF; BDNF; NT-3; NT-4/5

ABSTRACT

Introduction and Purpose: It is known that growth factors are important in maintaining the viability of cells, and apoptotic cell death mechanisms are activated in the absence of these factors. Neurotrophin is a family of growth factor with a dimeric polypeptide structure that affect the survival, proliferation and function of neurons by providing the trophic support necessary for growth, ensure the stabilization of synapses, control synaptic function and synaptic plasticity, and regulate axon and dendrite branching. Neurotrophins exert their effects through the tyrosine kinase receptor (Trk), where they have a high binding tendency, and the pan-neurotrophic receptor (p75NTR), where they have a lower binding tendency. The first neurotrophic factor, nerve growth factor (NGF), was discovered in the early 1950s. About 30 years later, brain-derived neurotrophic factor (BDNF) was discovered. These factors participate in the regulation of the growth, development, differentiation and survival of cell populations and the adaptation to environmental influences. Later, it was found other members of the neurotrophin family such as neurotrophin-3 (NT-3) and neurotrophin-4/5 (NT-4/5). The activities of neurotrophins depend on their availability, their affinity to binding to transmembrane receptors, and the stimulation of signaling pathways after receptor activation. Neurotrophins and their receptors regulate neuronal survival by activating many signaling pathways and contribute to synaptic plasticity. With these characteristics, it appears as a topic with potential in the treatment of neurological diseases. Neurotrophins are synthesized from many cell types in the central nervous system, peripheral nervous system neurons and peripheral tissues, and have biological effects both in the nervous system and in many tissues outside the nervous system. In this article, information about the structures of neurotrophins, the cells in which they are synthesized, their mechanisms of action and functions is presented

Key Words: Neurotrophin; NGF; BDNF; NT-3; NT-4/5

NÖROTROFİN AİLESİ

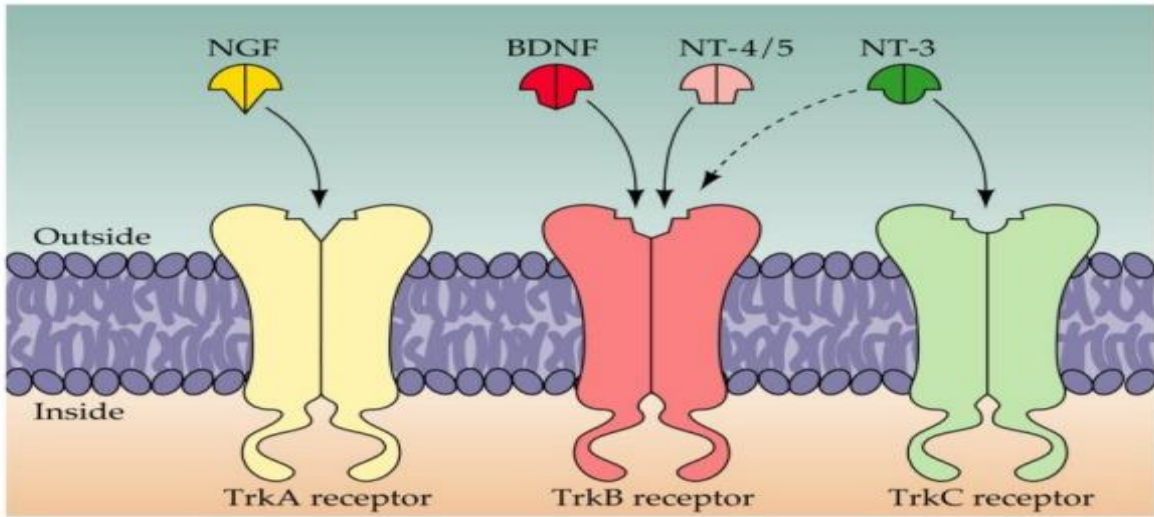
Büyüme için gerekli trofik desteği sağlayarak sinir hücrelerinin işlevlerini etkileyen yaşaması ve çoğalmasını sağlayan ayrıca sinapsların stabilizasyonunu, sinaptik fonksiyonu ve plastisiteyi denetleyen büyüme faktörü ailesidir (Yano ve Chao 2000).

1950'lerin başında ilk nörotrofik faktör olan NGF ve bundan 30 yıl sonra da BDNF adlı nörotrofik faktör bulunmuştur (Bard ve ark 1982). İlerleyen dönemlerde nörotrofin ailesinin diğer üyeleri olan NT-3 ve NT-4/5 bulunmuştur. Her biri periferik nöronlarda ve merkezi sinir sisteminde çeşitli trofik özelliklere sahiptir (Binder ve Scharfman 2004). Bu nörotrofik faktörler hücre popülasyonlarının gelişmesine, büyümesine, farklılaşmasına ve çevresel etkilere karşı uyumuna dahil olurlar (Gomazkov 2007, Popova ve Morozova 2013). Başlangıçta nörotrofinler, prekürsörler ya da pronörotrofinler olarak sentezlenir, ardından olgun ve aktif proteinleri meydana getirmek için bölünürler. Olgun proteinler, 12-14 kDa büyüklüğündedir. Matür proteinler nörotrofin etkinliklerini sağlamak için Trk reseptörlerine bağlanırlar (Thoenen 1995). TNF reseptör ailesine dahil olan Trk reseptörü tirozin kinaz ve p75NTR'dir. Trk reseptörleri, , tek transmembran alanı, hücre ligand bağlayıcı proteinini ve yüksek derecede korunmuş hücre içi tirozin kinaz alanını içerir. P75NTR ise, tekli transmembran alanını, hücre dışı ligand bağlayıcı bölgeyi, ve hücre içi protein asosiyasyon bölgesini içermektedir (Friedman ve Greene 1999).

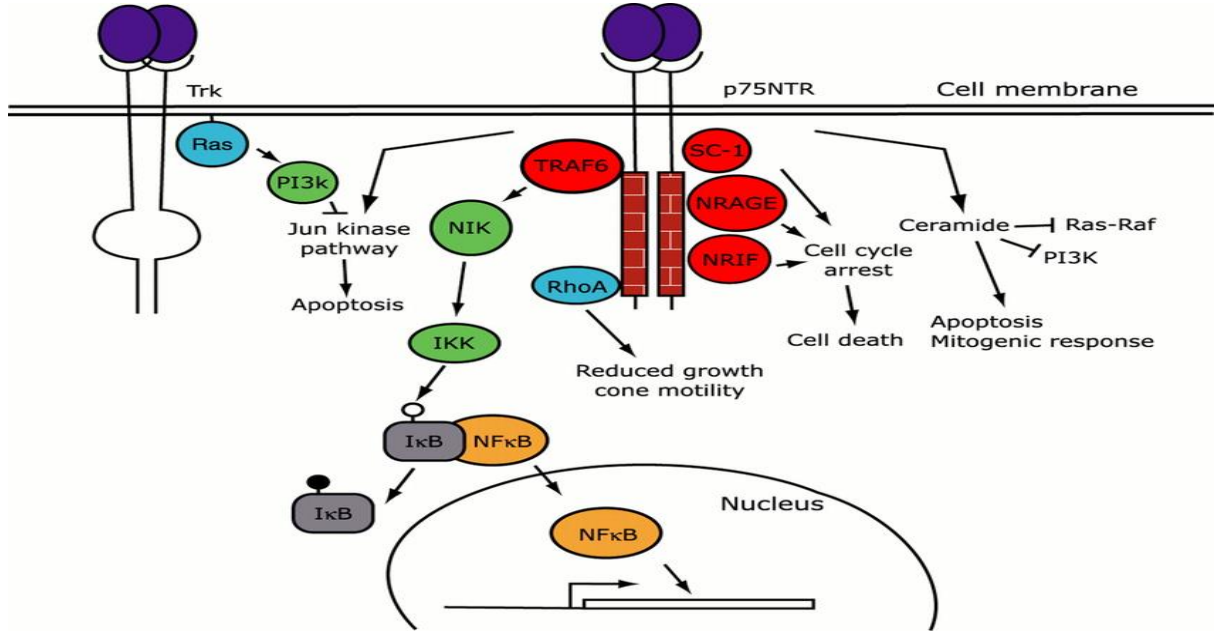
P75NTR'nin kendi içinde birçok hücre içi sinyal yollarını başlatır. Ayrıca TRAF6, RhoA, NRAGE, SC-1 ve NRIF gibi farklı proteinler ile bağlantı kuran P75NTR reseptörü hücre döngüsünü, apoptozu ve mitojenik yanıtları düzenleyen genlerin ekspresyonunu sağlamaktadır. Nörotrofinler p75NTR bağlanarak Jun kinaz yolağını aktive ettiğini ve bu Jun kinaz yolağının

Trk vasıtası ile uyarılan PI3K yolağıyla engellendiği de bilinmektedir (Huang ve Reichardt 2001).

Trk reseptörleri, TrkA, TrkB ve TrkC olmak üzere 3 tipi vardır (Huang ve Reichardt 2003, Stoleru ve ark 2013). Trk reseptörlerine özgül nörotrofin bağlanmasıyla dimerize ve fosforile olur. Bu reseptörler genellikle PI3K/Akt, MAPK/ERK ve PLCg/ PKC yollarının aktivasyonu ile destekleyici fonksiyonlarını gösterirler. Bunların ilki Ras aktivasyonu ile harekete geçen MAPK sinyal kaskadıdır. Bu yolak nöronal farklılaşmayı ve nörit gelişimine destek olur. İkinci olarak, Ras veya Gab1 vasıtasıyla aktifleşen PI3K yolağıdır. Bu kaskadın uyarımı nöronal gelişime ve sağkalıma aracılık eder. Son olarak, PLC- γ 1 aktivasyonu sinaptik plastisiteyi destek olan Ca^{+2} PKC ile düzenlenen yolları aktive eder. Bu durumda sinaptik plastisiteyi, farklılaşmayı ve nöronal sağ kalımı sağlar. Böylece reseptörler aktifleşir ve sinyal iletimini başlatarak nükleusta transkripsiyon faktörlerini uyarır. Nörotrofinler ve etki ettiği reseptörlerden; NGF/TrkA sinyal kompleksi, bazal ön beyin kolinerjik nöronlarında nöronal fonksiyonun düzenlenmesi ve miyelinasıyona aracılık ederken (Villoslada ve ark 2000, Stoleru ve ark 2013), BDNF ve NT-4/5/TrkB kompleksinin sinaptik plastisite ve LTP'a, NT-3 /TrkC ise mikroglial aktivasyona aracılık ettiği bildirilmiştir (Zhou ve Rush 1996, Yamada ve Nabeshima 2003, Sanchez-Ortiz ve ark 2012).



Şekil 3: Nörotrofin ailesinin reseptörleri ve bu reseptörler ile etkileşimi (Purves ve ark 2004)



Şekil 4: P75NTR sinyal yolağının şematik gösterimi (Huang ve Reichardt 2001).

SİNİR BÜYÜME FAKTÖRÜ (NGF)

NGF, ilk etapta tümör dokusunun yaşamasına destek olduğu ve bu dokularından yayıldığı düşünülmekteydi. Stanley Cohen ve R. Levi-Montalcini yaptıkları çalışmalar sonucunda farenin çene altı tükürük bezini incelemişler ve tükürük bezinde daha fazla miktarda bulunduğunu keşfetmişlerdir. Bir süre sonra tükürük içerisinde ki bu faktörü saflaştırıp Sinir Büyüme Faktörü olarak adlandırmışlardır (Levi-Montalcini ve Cohen 1956).

Tüm nörotrofinler 30 kDa formunda sentezlenmektedir ve 13 kDa olgun formuna dönüştürülmektedir (Greene ve Kaplan 1995).

NGF sadece merkezi ve periferal sinir sistemindeki hedef dokulardan değil, bunun yanında mast hücreleri, kıl folikülleri, yağ doku hücreleri, lenfositler, pankreatik β hücreleri (Aloe ve Levi-Montalcini 1977, Sornelli ve ark 2009), fibroblastlar, düz kas hücreleri (Faydacı ve ark 2004, Aydınlı 2005), Schwann hücrelerinden ve sinir hücresi aksonlarını içeren dokulardanda sentezlendiği görülmüştür (Davies ve ark 1987, Chaldarov ve ark 2009).

NGF, tirozin kinaz reseptörüne (TrkA) bağlanmaktadır. Fosforile edilmiş tirozinler, fosfolipaz C (PLC)'yi desteklemek ile birlikte üç ana sinyal yolunu aktive etmektedir. Bu yollar başlıca; Akt kinazın aktivasyonuna sebep olan PI3 kinaz yolu, MAP kinaz aktivasyonuna sebep olan Ras yolu ile PLC intrasellüler Ca^{+2} salınımına neden olan ve PKC'nin aktivasyonunu sağlayan yoldur. Ras ve PLC yolaqları temelinde nöronal farklılaşmadan sorumlu süreçleri uyarırken, PI3 kinaz yolağı, hücre sağ kalımı ile ilgilidir (Purves ve ark 2008).

NGF, TrkA'ya bağlanarak Bcl-2 adı verilen bir molekülü aktifler ve bir sonraki molekül olan Apaf 1 baskılayarak kaspazlar inaktif halde kalmasını sağlar. NGF'nin yeterli olmadığı durumlarda Bcl-2 aktif hale geçemeyeceği için Apaf 1 baskılanmaz aktif kalan Apaf 1 tarafından kesilen kaspazlar ise aktif hale geçer ve böylece apoptoz gerçekleşir (Jessell ve Sanes 2000). NGF'nin durumu TrkA bulunan hücrelerin davranışlarını etkiler. TrkA'nın yüksek seviyeleri erken yaş ve MYCN amplifikasyonunun olmaması bağlantılıdır (Brodeur ve ark 1997).

NGF'nin bağışıklık yanıtlarına aracılık etmesi ve yangısal reaksiyonlarda yer alması TrkA reseptörüne bağlanması aracılığı olur. NGF'ün, hematopoetik kök hücrelerin, lenfositlerin, nötrofillerin ve monositlerin yaşamasını, farklılaşımını ve çoğalmasını etkilemektedir (Kazak ve Yarım 2014). NGF, afferent nöronlar, sempatik nöronlar ve adrenal medulla hücrelerinin canlılık ve gelişiminde rol alır (Ratto ve ark 2012). İlk etapta araştırmacılar kemirgenlerin ovariumunda uyarılmanın nörotrofinlerin görevi olduğunu düşünseler de, son zamanlarda ovarium fonksiyonları, foliküler gelişiminde ve ovulasyon steroid sekresyonu etkilediği anlaşılmıştır. Bunu destekleyen çalışma ratlarda NGF ve reseptörünün TrkA'nın folikül içerisinde saptanmasıdır (Dissen ve ark 1996).

NGF, beta-4 integrin ve matriks (MMP-9) vasıtası ile kornea epitelyumun iyileşmesini hızlandırır (Blanco-Mezquita ve ark 2013). 3 gruba bölünen ve diyabet modeli oluşturulan 18 rat üzerinde bir çalışma yapılmış ve çalışma grubundaki ratlara 21 gün boyunca β -NGF uygulanmıştır. IL-1 β , TNF- α gibi birçok faktör açısından incelenmiş olup β -NGF'nin, diyabette ortaya çıkabilen kornea hücrelerinde ölümü ve inflamasyonu azaltması ile diyabetik keratopatinin tedavisinde etkili olabileceği düşünülmüştür (Park ve ark 2016).

NGF, NGF reseptörlerine sahip T ve B lenfositleri tarafından üretilmek ile birlikte çoğalmasını ve farklılaşmasını desteklemektedir (Brodie ve Gelfand 1992).

48-72 saat NGF ile uyarılan insan retina endotel hücrelerinde retina sinir hücrelerinin sayısını arttırdığı görülmüştür. Bunun sonucunda iskemiye maruz kalan sinirler üzerinde NGF'nin anjiyogenik katkısı olabileceği anlaşılmaktadır (Jadhao ve ark 2012).

Kutanöz basınç ülseri, glokom, kornea ülseri, retinal makülopati, retinitis pigmentosa ve pediatrik optik gliomalar ve beyin travmaları üzerinde NGF'nin topikal uygulamasının önemli terapötik özelliklere sahip olduğu ortaya konulmuştur (Rocco ve ark 2018).

Nazal uygulama ile NGF, mayotik spermatogonia (Stra8) ve spermatositleri (SYCP3) eksprese eden belirteçleri önemli ölçüde upregüle edebileceği, spermatogenezi düzeltebileceği ve cinsel hormonların salgılanmasını arttırabileceği bildirilmektedir (Luo ve ark 2021). Retinitis Pigmentosa hastalığında NGF'nin rolü araştırılmıştır. NGF'nin reseptörüne bağlanmasının, fotoreseptörün hayatta kalması ve işlevselliği için spesifik bir biyolojik belirteç olan rodopsin ekspresyonunu modüle ettiği gözlemlenmiştir (Rocco ve ark 2021).

Kronik stres durumunda kanda NGF seviyesinin azalması, akut stres esnasında ise NGF seviyesinde artış gözlenmesi genel olarak psikiyatrik hastalıkların temelinde NGF seviyelerindeki değişikliklerin sebep olduğunun göstergesidir (Alleva ve ark 1996). Depresif bozukluklar üzerine yapılan araştırmalar da NGF seviyelerindeki değişiklikler çelişkili sonuçlar vermiştir. Yapılan bir araştırmada depresyon hastalarında sağlıklı kontrollere göre serum NGF düzeyinde düşüş görülmüş (Xiong ve ark 2011), bazı araştırmalarda ise anlamlı farklar görülmemiştir (Alleva ve ark 1996, Cirulli ve Alleva 2009).

NÖROTROFİN-3

Nörotrofin ailesinin üçüncü üyesi dir ve,13.6 kDa ağırlığındadır (Hohn ve ark 1990, Kelly ve ark 1994). İlk defa fare hipokampusünde NT-3 mRNA aktivitesi bildirilmiştir (Hohn ve ark 1990).İnsandan, rattan, fareden ve kanatlılardan NT-3 izole edilmiştir (Hohn ve ark 1990, Hallböök ve ark 1991, Brodski ve ark 2000). Merkezi sinir sistemi hücrelerinde, kalpte, karaciğerde, akciğerde, böbrekte, dalakta, deride, timusta, bağırsakta ve iskelet kasında NT-3 ekspresyonu mevcuttur.

NT-3 etkisini güçlü bağlanma eğilimi TrkC aracılığı ile gösterir ve ÇSS nöronlarının sağkalımını ve farklılaşmasını sağlar (Brodski ve ark 2000, Cristofaro ve ark 2010). Zayıf bağlanma eğilimi gösteren TrkA ve TrkB reseptörlerine de NT-3 bağlanmaktadır ve nöronların sağkalımını desteklemektedir (Patapoutian ve Reichardt 2001, Cristofaro ve ark 2010). Diğer nörotrofik faktörlerle birlikte oligodendrositlerin gelişiminde NT-3, oligodendrosit prekürsör hücrelerin çoğalmasını tetikleyerek görev alır (Barres ve ark 1994).

NT-3'ün, sinir büyüme faktörü ve beyin kaynaklı nörotrofik faktöre benzemektedir ve bununla birlikte yetişkin beyninde miktarının azalması ile onlardan ayrışmaktadır. Fetal gelişim sırasında merkezi sinir sisteminde yüksek seviyede bulunuyor olması NT-3'ün erken nöral gelişimde önemli bir role sahiptir ve nörogelişimsel bozukluklarda yeri olduğu düşünülebilir (Maisonpierre ve ark 1991, Lewin ve Barde 1996). NT-3 erken sinirsel gelişimde dopamin üreten sinir hücrelerinin yaşamalarını sağlar bu durumda nöropsikiyatrik bozuklukların patofizyolojisinde rol sahibi olabileceği düşünülmektedir (Şizofreni, Parkinson ve Tourette's sendromu gibi) (Maisonpierre ve ark 1990). Bu, şizofreninin nörogelişimsel hipoteziyle de uyumludur (Hohn ve ark 1990, Fariñas ve ark 1994).

Genellikle iskelet kasında sentezlenen NT-3'ün motor sinir hücrelerinin gelişimine katkı sağladığı bilinmektedir. NT-3'ün veya TrkC ekspresyonunda ki kusurlar duyu hasarlarına sebebiyet verir. NT-3'ün aynı zamanda embriyonik dorsal kök gangliyon nöronlarının yaşayabilirliğinde teşvik edici etkiye sahiptir (Funakoshi ve ark 1993).

NÖROTROFİN 4/5

NGF ile yapısal benzerlik göstermekle birlikte 13.9 kDa ağırlığında dimerik bir polipeptit olan NT-4, ilk kez *xenopus laevis*'den izole edilmiştir. NGF ile %50, NT-3 ile %52 ve BDNF ile %54 homologdur (Berkemeier ve ark 1991, Tokunaga ve ark 2002). NT-4 memeli nörotrofini iki grup tarafından kopyalandığından dolayı NT-4 veya NT-5 olarak adlandırılmış, ancak daha yaygın NT-4/5 adıyla kullanılmaktadır (Berkemeier ve ark 1991). NT-4/5 TrkB reseptörüne bağlanır (Klein ve ark 1992).

İnsanda beyin ve omurilik dışında, iskelet kası, prostat, timus, plesanta ve testiste, ratlarda ise hipokampus, beyin sapı, pons, hipotalamus, serebral korteks, talamus, beyincik, kalp, akciğer, böbrek, testis, yumurtalık kas, deri ve karaciğerde, bu faktörün mRNA ekspresyonu mevcuttur (Timmusk ve ark 1993).

Nörotrofik faktör ailesinin üyeleri olan NT-3 ve NT-4/5'in merkezi ve periferik sinir sistemi nöronlarının canlılığını devam ettirmesine ve yenilenmesine katkıda bulunur (Takeda ve ark 2005).

Duyu nöronlarının gelişimi sırasında diğer faktörlere göre canlılığın korunmasında NT-4/5'in diğer NT ailesi üyelerine göre, daha az etkiye sahiptir. (Acheson ve ark 1995). Belli embriyonik kranial duyu nöronları için canlılıklarını sürdürmede yardımcı olduğu yapılan çalışmalarda görülmüştür (Nicholls ve ark 1992).

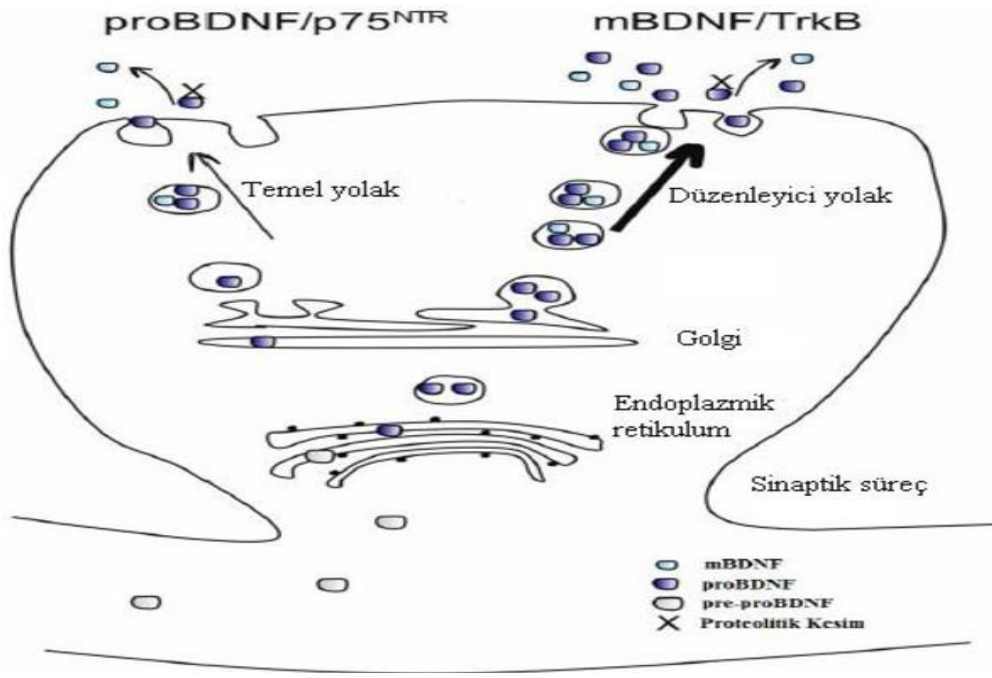
BEYİN KAYNAKLI NÖROTROFİK FAKTÖR

NGF, NT-3 ve NT-4/5'in de içinde bulunduğu nörotrofin ailesine dahil olan BDNF, hem MSS hem de periferik dokulardan salgılanan bir faktördür. 1982'de ilk olarak domuz beyni dokusundan izole edilmiş, 1995'te insan kanında belirlenmiştir. BDNF'nin merkezi sinir sisteminde sinir hücresi harici, lenfositlerden, trombositlerden, lökositlerden, monositlerden, periferde vasküler endotel hücrelerinden sentezlenmiştir (Yamamoto ve Gurney 1990, Kerschensteiner ve ark 1999). BDNF mRNA ekspresyonu ayrıca dalakta, akciğer dokusunda, kalpte, büyük damarlarda, böbrek, mesane ve podositlerde de görülmüştür (Timmusk ve ark 1993, Yamamoto ve ark 1996, Lommatzsch ve ark 1999). BDNF kan beyin bariyerini geçtiği bilinmektedir bununla birlikte serum ve plazma düzeyleri, yaş, cinsiyet, beden kitle indeksi ile etkileşim göstermektedir (Poduslo ve Curran 1996).

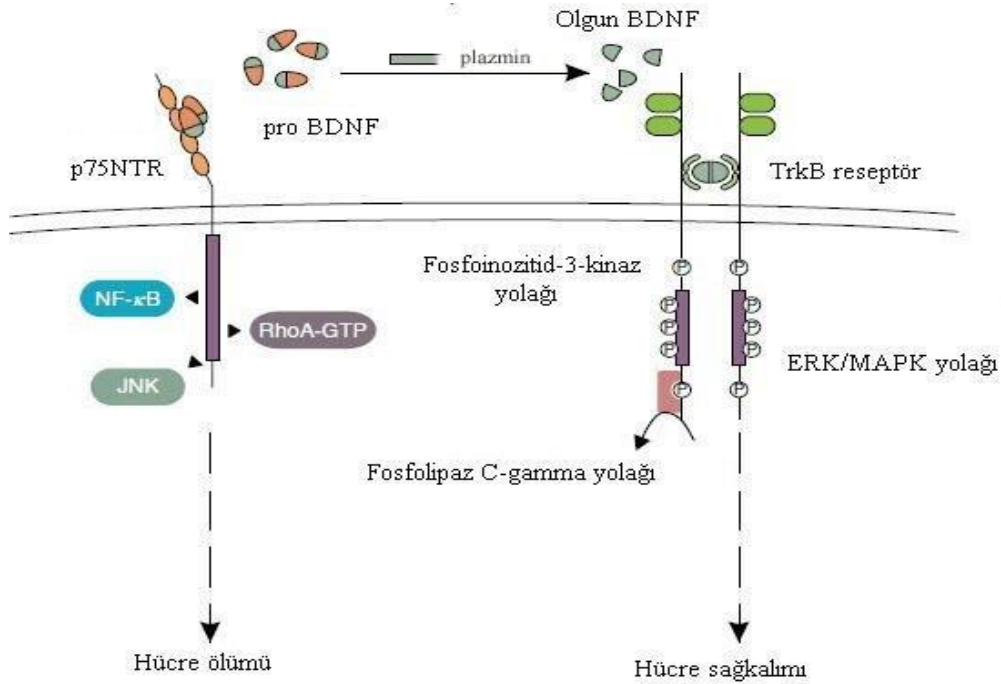
Trombositlerde yüksek oranda depolanır (Pliego-Rivero ve ark 1997). BDNF üretimi Trombositlerde gerçekleştirilememektedir ama MSS kan-beyin bariyerini geçerek gelen BDNF'i belirli uyarılarla dolaşıma salmaktadır (Lommatzsch ve ark 2005). Balıklarda, sürüngenlerde, amfibilerde ve memelilerde BDNF gen kodları görülmüştür (Isackson ve ark 1991, Murer ve ark 2001). BDNF ekspresyonunun, fetal gelişim esnasında düşük düzeyde olduğu ve doğumun sonrasındaki evrelerde arttığı erişkinlerde de azaldığı görülmüştür (Maisonpierre ve ark 1990).

BDNF proteini preBDNF ve proBDNF olmak üzere iki şekilde sentezlenir daha sonra 32kDa'lık proBDNF olarak Golgi aygıtı vasıtasıyla trans golgi ağına hareket eder. 14kDa'luk olgun BDNF'nin meydana geliş süreci, proBDNF olarak salındıktan sonra ekstrasellüler alanda metalloproteinaz ve plazmin gibi proteazlarla kesime uğraması ya da ProBDNF'nin intrasellüler alanda furin veya prokonvertaz enzimleri tarafından kesilme uğraması sonucu olur (Cunha ve ark 2010). BDNF reseptörlerinden olan TrkB'ye olgun BDNF, p75'e ise proBDNF bağlanmaktadır. P75 nörotrofin reseptörü Pro-BDNF'i bağlanması ile birlikte aktifleşen reseptörü apoptotik hücrenel süreçleri tetikler. Uyarılan NF-κB ve JNK yolları nöronların dentritik budanmasında etkilidir. TrkB reseptörüne bağlanan olgun BDNF, farklı sinyal yollarını aktifleştirir (Chao 2003).

BDNF salınımı düzenleyici (somadan uzak alanlarda) ve sürekli salgılanma (somada) yolları ile gerçekleşir.



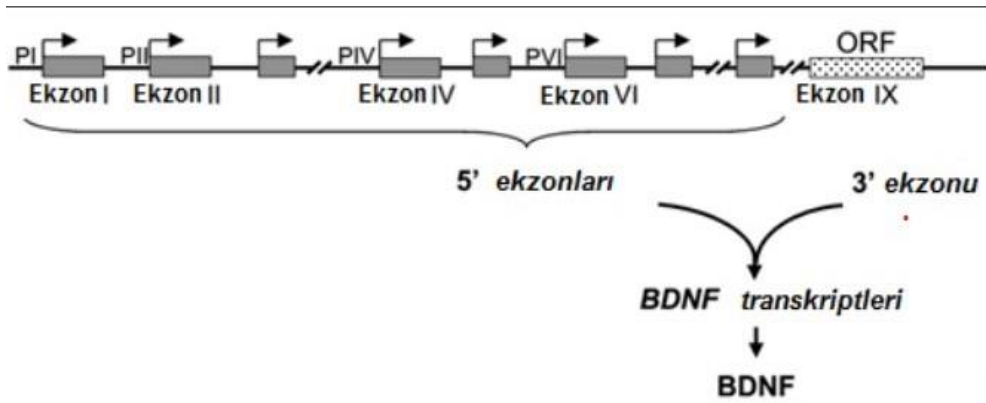
Şekil 5: BDNF'nin olgun BDNF ve öncül BDNF olarak salınımı (Cunha ve ark 2010).



Şekil 6: BDNF'nin etki mekanizması (Woo ve Lu 2009).

BDNF geni 11. Kromozomun p13 bandında lokalizedir (Pruunsild ve ark 2007). BDNF geninin farklı promoterler içeren dört kısa 5' eksonu, matür BDNF proteinini kodlayan bir 3' eksonu ve bir çok düzenleyici elementi içeren karmaşık yapıya sahiptir. Promoterlerin farklı kullanımları ve farklı bağlantıları 8 farklı BDNF mRNA oluşmasını sağlar (Nair ve ark 2007).

Beyinde mRNA içeren I, II ve III eksonlar aktif iken, periferik dokularda ise promotör IV aktiftir. Fizyolojik ve patolojik uyarılara cevap olarak beyinde farklı BDNF mRNA ekspresyonları regüle edilir (West ve ark 2001). BDNF geninin aktivite-bağımlı kalsiyum ilişkili düzenlenmesindeki ilk adım sitoplazmaya kalsiyum girişinin olmasıdır (Branchi ve ark 2006). Böylece BDNF ekson III ekspresyonunun indüksiyonu aktive edilir. CREB proteini gerekli olmakla birlikte bu aktivasyon için yetersizdir. Aktivasyon için CREB'in Serin-133 bölgesinden protein kinaz A, **KaM kinaz** veya mitojenik aktive edilen protein kinaz tarafından fosforilasyonu gerekmektedir (Tao ve ark 1998, Duman ve Monteggia 2006). SSS' de aktivite bağımlı BDNF regülasyonu GABA ile "down-regüle" olur iken glutamat, serotonin ve asetilkolin ile "up-regüle", olur (Nair ve ark 2007). Diğer yandan, nöronal aktivasyona veya elektriksel stimülasyona yanıt olarak yeni protein sentezine ihtiyaç olmadan BDNF'nin III ve IV transkriptlerinin "early gene" olarak hızla indüklenebildikleri de gösterilmiştir (Tao ve ark 1998, Nair ve ark 2007).



Şekil 7: BDNF gen yapısı ve transkript oluşumu

BDNF mRNA'sı, serebral korteks ve hipokampusta yaygın biçimde görülmüştür. Hem akson terminali hem de dendritlerde BDNF içeren veziküller bulunur ayrıca astrositlerden ve düz/çizgili kaslardan da BDNF salgılanır (Dougherty ve ark 2000). SSS patolojilerinde nöronlarda sinaptik plastisite modülasyonunda önemli görevler üstlenmesi öğrenme-bellek gibi fizyolojik olaylarda ve depresyon, epilepsi, ağrı, bağımlılık, yoksunluk gibi birçok durumda BDNF rol oynar (Heberlein ve ark 2011). Egzersiz ve öğrenme hipokampüste BDNF seviyelerini hızlıca artırır. Yapılan çalışmalarda BDNF ekspresyonu hem akut hem kronik stres de azaldığı görülmüştür (Gürpınar ve ark 2007). Dopamin D1, D2, D3, D4 ve D5 olmak üzere beş alt reseptöre bağlanarak etki gösterir. BDNF D3 reseptörünün, ekspresyonunu kontrol etmektedir. BDNF, 5-HT nörotransmitter sisteminin gelişimi için ve fonksiyonu için önemlidir. Farelerde SSRI uygulamasının kortikal ve limbik bölgelerde BDNF ekspresyonunu arttırdığı görülmüştür (Glatt ve Lee 2016). Ayrıca BDNF, kan lipid ve glukoz profili üzerinde etkili olduğu, bununla birlikte glukoz kullanımını artırdığı, doyumluk sağladığı, insülinotrofik etkileri olduğu, langerhans adacık hücrelerini koruduğu ve ayrıca kas hücrelerinde oksidasyonunu artırması yönüyle, bir metabotrofindir (Krabbe ve ark 2007).

BDNF yoğunluğu yaş artışından etkilenir. Yapılan çalışmalar da, Alzheimer hastalığı için BDNF düzeylerinin potansiyel bir belirteç olduğunu görülmüştür (Zuccato ve Cattaneo 2009, Diniz ve Teixeira 2011, Kowiański ve ark 2018). Huntington, Alzheimer, bunama ve Parkinson gibi nörodejeneratif hastalıklarda, BDNF'nin nöronların büyümesini ve korunmasını

düzenlediği için yetersiz bilişsel işlevler üzerinde önemli etkileri olduğu düşünülmektedir (Erickson ve ark 2011, Tolppanen ve ark 2015).

KAYNAKLAR

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PERCEPTION OF GREEN TRANSITION IN THE INTERNATIONAL ENVIRONMENT

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ABSTRACT

Introduction and Purpose: In recent years, much attention has been paid to the topic of green transformation, but it is often treated in a fragmented way. The theoretical part of this presentation will explain the issue of "green transition", while the practical part includes a bibliometric analysis of this phenomenon. The presentation of research results would answer the question to what extent this problem is addressed in economics, econometrics and finance. For comparison, the phenomenon of economic growth in the examined period was also presented. The study used output data from the SCOPUS database, and visualization results were obtained using the VOSviewer computer program.

Key Words: Green transition, Bibliometric Analysis, Vosviewer.

EFFECT OF LIFESTYLE ON BONE MINERAL DENSITY IN EUROPEAN MEN: THE RESULTS OF CROSS-SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Introduction and Purpose: Low bone mineral density is a major risk factor for osteoporosis. Osteoporosis is becoming an increasingly common health problem among men. It is estimated that 30% of all hip fractures occur in men, and the mortality rate after a hip fracture is higher than in women. The cross-sectional observational study aimed to evaluate the effect of lifestyle on bone mineral density in European men.

Materials and Methods: 300 Caucasian men aged 32.8 ± 2.3 years from Poland were surveyed. Bone mineral density (BMD) of the femoral neck and lumbar spine was assessed by dual-energy X-ray Absorptiometry (Norland XR-46, Swissray-USA, Norland Medical Systems, Madison, WI, USA). Eating habits, consumption of dairy products, and protein intake were calculated from face-to-face interview data and Food Frequency Questionnaires. Physical activity was examined by the International Physical Activity Questionnaire. Attitudes toward smoking were assessed using the Global Adult Tobacco Survey. To assess the amount of time spent sedentarily the Sedentary Behaviour Questionnaire was used. The research results were analysed with the use of Statistica software (v.11, Stat. Soft., USA).

Results: The results of the covariance analyses indicated that the main parameters affecting BMD in the femoral neck were dairy products intake (medium effect: $\eta^2 = 0.083$), and also protein intake (medium effect: $\eta^2 = 0.082$) and physical activity (medium effect: $\eta^2 = 0.115$).

BMD in the lumbar spine was affected by physical activity (large effect: $\eta^2 = 0.175$). It has been shown that the longer the time spent sitting, sedentary, the weaker the BMD in both the hip and spine.

Discussion and Conclusion: The results of the study confirm the important role of physical activity in maintaining bone health in European men. Diet and especially the consumption of dairy products and dietary protein intake is an important factor in positively influencing bone mineralization in men.

Key Words: Bone Mineralization; Lifestyle; Caucasian Male Population

INVESTIGATION OF PERFORMANCE AND SPECIFIC EMISSIONS IN A LOW-POWER COMPRESSION IGNITION ENGINE USING BIODIESEL/METHANOL MIXTURE

BİYODİZEL/METANOL KARIŞIMI KULLANILAN DÜŞÜK GÜÇLÜ SIKIŞTIRMA ATEŞLEMELİ BİR MOTORDA N PERFORMANS VE ÖZGÜL EMİSYONLARIN ARAŞTIRILMASI

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ABSTRACT

Introduction and Purpose: Today, when the sustainability and environmental impacts of energy resources are evaluated, it is important to investigate the use of alternative fuels in low-power (non-road) engines. Low-power engines are widely used in many areas such as generators, garden maintenance vehicles, water pump drive and conveyors. In these sectors where the use of renewable energy is also possible, it is important to investigate the availability of alternative fuels in terms of environmental and economic aspects during the transition process. The main purpose of this study is to experimentally examine in detail the effect of using biodiesel/methanol mixture on engine performance and exhaust emissions in low-power (non-road) engines.

Materials and Methods: In this study, biodiesel (B100) produced from waste frying oil diesel (B0), 80% biodiesel + 20% diesel mixture (B80) and a mixture fuel with 20% pure methanol added into this mixture (B80M20) were used as test fuels. Experiments were carried out with a single-cylinder compression engine having low-power, naturally aspirated engine with 200 bar injection pressure at different loads. With the tests carried out at four different loads (5, 10, 15 and 20 Nm) and 2200 1/min engine speed, the engine's brake effective efficiency (BTE), brake specific fuel consumption (BSFC), brake specific energy consumption (BSEC), brake specific carbon Changes in brake monoxide (BSCO), brake specific hydrocarbon (BSHC), brake specific carbon dioxide (BSCO₂) and brake specific nitrogen oxide (BSNO_x) were examined.

Results: In general, it has been observed that the use of B80M20 in all loads increases BTE and improves BSFC. However, a decrease in BSEC was detected compared to B0. It was found that the use of B80M20 increased BTE by an average of 12.43% at low loads (5 and 10 Nm) compared to B0, while it raised by 3.84% at high loads. With the effect of this, the increase in BSFC at high loads reached 17.12%. However, these values remained at lower levels compared to B100 and B80. When exhaust emissions are evaluated, it has been observed that the use of biodiesel and blended fuels generally reduces BSCO and BSHC compared to B0. In the study, the lowest levels of these emission types were reached with B80M20 fuel. With B80M20, BSCO and BSHC emissions decreased by an average of 7.6% and 27.35%, respectively, for all

loads compared to B0. It was determined that the changes in BSCO₂ and BSNO_x emissions with the use of B80M20 fuel decreased by an average of 2.62% and 0.67%, respectively, at low loads, while they increased by 4.46% and 8.88% at high loads. When evaluated in general, it has been observed that these emission levels achieved with B80M20 are generally improved when compared to B100 and B80.

Discussion and Conclusion: It has been observed that the addition of 20% methanol into B80 is more suitable for 5 Nm and 10 Nm engine loads in terms of engine performance and exhaust emissions. As a result, it has been found that the addition of methanol at low loads will be more effective when using biodiesel as an alternative fuel in low-power engines. Dual fuel tank systems and systems that can add methanol to pure biodiesel can be modeled. Even electronically controlled fuel systems that can adjust these rates can be developed.

Key Words: Biodiesel; Low-power Engine; Methanol; Engine Performance; Specific Exhaust Emission.

ÖZET

Giriş ve Amaç: Günümüzde enerji kaynaklarının sürdürülebilirliği ve çevresel etkileri göz önünde bulundurulduğunda düşük güçlü (non-road) motorlarda alternatif yakıtların kullanımının araştırılması önemli bir faktör olarak karşımıza çıkmaktadır. Düşük güçlü motorlar başta jeneratörler olmak üzere, bahçe bakım araçları, su pompalarının tahriki, konveyörler gibi birçok alanda yaygın olarak kullanılmaktadır. Yenilenebilir enerji kullanımında mümkün olduğu bu sektörlerde, geçiş sürecinde çevresel ve ekonomik açıdan alternatif yakıtların kullanılabilirliğinin araştırılması önemlidir. Bu çalışmanın temel amacı, düşük güçlü (non-road) motorlarda biyodizel/metanol karışımı kullanımının motor performansını ve egzoz emisyonu üzerine etkisinin detaylı bir şekilde deneysel olarak araştırılmasıdır.

Gereç ve Yöntem: Bu çalışmada yakıt olarak atık kızartma yağından üretilmiş biyodizel (B100), dizel (B0), %80 biyodizel+%20 dizel karışımı (B80) ve bu karışım içerisine %20 saf metanol ilaveli karışım yakıtı (B80M20) kullanılmıştır. Tek silindirli, düşük güçlü, doğal emişli ve 200 bar püskürtme basıncına sahip bir motorda farklı yüklerde deneyler gerçekleştirilmiştir. Dört farklı yükte (5, 10, 15 ve 20 Nm) ve 2200 1/min motor hızında gerçekleştirilen testler ile motorun fren efektif verimi (BTE), fren özgül yakıt tüketimi (BSFC), fren özgül enerji tüketimi (BSEC), fren özgül karbon monoksit (BSCO), fren özgül hidrokarbon (BSHC), fren özgül karbondioksit (BSCO₂) ve fren spesifik nitrojen oksit (BSNO_x)’deki değişimler incelenmiştir.

Bulgular: Genel olarak tüm yüklerde B80M20 kullanımının BTE’yi yükselttiği BSFC’yi ise iyileştirdiği gözlemlenmiştir. Ancak BSEC’de B0’a göre bir azalma tespit edilmiştir. B80M20 kullanımı B0’a kıyasla BTE’yi düşük yüklerde (5 ve 10 Nm) ortalama %12,43 artırırken, yüksek yüklerde (15 ve 20 Nm) bu artışın %3,84’te kaldığı bulunmuştur. Bunun etkisiyle yüksek yüklerde BSFC’deki artış %17,12’ye ulaşmıştır. Ancak, B100 ve B80’e göre bu değerler daha düşük seviyelerde kalmıştır. Egzoz emisyonları değerlendirildiğinde biyodizel ve karışım yakıtlarının kullanımı B0’a göre genel olarak BSCO ve BSHC’yi düşürdüğü gözlemlenmiştir. Çalışmada bu emisyon türlerinde en düşük seviyelere B80M20 yakıtı ile ulaşılmıştır. B80M20 ile B0’a göre BSCO ve BSHC emisyonları bütün yükler için sırasıyla ortalama %7,6 ve %27,35 oranlarında azalmıştır. B80M20 yakıtı kullanımı ile BSCO₂ ve BSNO_x emisyonlarındaki

değişimler ise düşük yüklerde sırasıyla ortalama %2,62 ve %0,67 oranlarında düşüş olarak gerçekleşirken yüksek yüklerde %4,46 ve %8,88 oranlarında arttığı tespit edilmiştir. Genel olarak değerlendirildiğinde B80M20 ile ulaşılan bu emisyon seviyelerinin B100 ve B80'e göre kıyaslandığında genel olarak iyileştiği görülmüştür.

Tartışma ve Sonuç: Motor performansı ve egzoz emisyonları açısından B80 içerisine %20 metanol ilavesinin 5 Nm ve 10 Nm motor yükleri için daha elverişli olduğu gözlemlenmiştir. Sonuç olarak düşük güçlü motorlarda alternatif yakıt olarak biyodizel kullanımda düşük yüklerde metanol ilavesinin daha etkili olacağı bulunmuştur. Çift yakıt depolu sistemler ile saf biyodizel içerisine metanol ilave edebilecek sistemler modellenebilir. Hatta bu oranları ayarlayabilecek elektronik kontrollü yakıt sistemleri geliştirilebilir.

Anahtar Kelimeler: Biyodizel; Düşük-güçlü Motor; Metanol; Motor Performansı; Özgül Egzoz Emisyonu.

PVNLP5 PROMOTER ACTIVITY DURING NODULE FORMATION AND DEVELOPMENT IN PHASEOLUS VULGARIS

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ABSTRACT

NIN-like proteins (NLPs) represent a category of transcription factors distinguished by the presence of the RWP-RK domain, PB1 domain, and GAF-like domain. These versatile proteins play diverse roles in plant responses to abiotic stresses such as drought and cold, functioning as nitrate sensors, influencing rhizobial symbiosis processes, participating in nitrogen sensing and signaling mechanisms, and contributing to overall plant development. The functional involvement of NLPs in *Phaseolus vulgaris* and rhizobial symbiosis remains inadequately elucidated. This study aims to explore the functional association of *P. vulgaris* NLP5 during root nodule symbiosis. To achieve this objective, we inserted the 1.2Kb *P. vulgaris* NLP5 promoter region into the pBGWSF7.0-PvNLP5:GUS-GFP vector and subsequently produced transgenic hairy roots on *P. vulgaris* using *Agrobacterium rhizogenes* K599. The empty pBGWSF7.0 vector served as a control. Two-week-old composite plants were transferred to sterile vermiculite and then inoculated with *Rhizobium tropici* CIAT 899. Phenotypic observations were made at various time points employing the GUS assay. The findings indicate that NLP5 is inactive during the early stages of nodule formation. Nevertheless, the NLP5 promoter exhibits activity in the nodule vasculature as nodules mature, suggesting its role in nodule development and involvement in the transport of water and nutrients. Further gene functional analysis is imperative to gain a precise understanding of NLP5's function in *P.*

vulgaris nodules. We express our gratitude to DGAPA scholarship to M.L.S; PAPIIT-UNAM for partially funding this research through grant no. IN216321 to K.N and IN213221 to M.K.A.

Keywords: Promoter NLP5, Phaseolus vulgaris, Nodule development, NIN-like proteins.

GLOBAL APPLICATION OF AASHTO STANDARD METHODOLOGY FOR BITUMEN GRADE DETERMINATION BASED ON SOFTENING POINT USING PYTHON PROGRAMMING LANGUAGE

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ABSTRACT

This study presents a novel use of the Python computer language in conjunction with the AASHTO standard technique to determine the bitumen grade according to the level of softening, which is deduced based on the historic maximum temperature of every city in the globe. AASHTO, the requirements for graded bitumen, a crucial component in road building and upkeep, includes the softening point as one of its crucial parameters. As per the AASHTO standard, the Python software uses conditional logic to correlate the point of softening with the hypothetical bitumen grade. By making it easier for civil engineers and other relevant experts to determine the appropriate bitumen grade for their particular geographic area, this user-friendly tool encourages the use of more effective and efficient road construction techniques. The application shows how versatile Python is as a tool for automating and simplifying complex engineering calculations and procedures. It also highlights how important it is to consider local weather, especially temperature, when choosing material for infrastructure projects. Future improvements to this application may incorporate penetration grade (Pen) and performance grade (PG), two additional essential bitumen grading criteria, and interface using real-time weather APIs to automatically get temperature data. This project is a part of a bigger effort to use data retrieval methods and contemporary programming languages to enhance infrastructure building and planning. It is expected that professionals in the field of infrastructure planning and civil engineering would find this Python-based implementation using the The American Association for Highway standard methodology to be a helpful resource.

Keywords: AASHTO Standard Methodology; Bitumen Grade; Softening Point; Python Programming Language; Road Construction

INTRODUCTION

The materials utilized can have a big influence on the final result in the field of engineering for civil construction and the development of infrastructure. This is especially true when building roads, where the longevity of the finished product can be greatly impacted by the kind of bitumen grade utilized. This study presents a novel Python program that simplifies the process of selecting the appropriate bitumen grade according to the AASHTO standard methodology. The softening point, crucial component of the AASHTO specifications for graded bitumen, is estimated by the program using highest temperature data collected from cities throughout the globe. In order to help engineers and other experts choose the appropriate bituminous grade for their particular area, the Python application uses conditional logic to correlate a softening point with potential bitumen grades.

This tool highlights the need of considering local weather conditions, particularly temperature, when choosing materials for infrastructure projects, in addition to showcasing Python's ability to automate and simplify complex engineering calculations. This study is a component of a larger effort to improve infrastructure planning and construction by leveraging modern programming languages as well as data retrieval techniques. Potential future developments for this tool would include the incorporation of two more significant bitumen grading criteria, penetration grade (PG) and performance grade (Pen), as well as the utilization of actual weather APIs for automated temperature data retrieval. Experts in the fields of infrastructure development and civil engineering are anticipated to find great value in this Python-based implementation of the American Association for Highway standard approach.

AASHTO T 53 [1]

The AASHTO, has developed a standard process called AASHTO T-53 for figuring out bitumen's softening point. This is an important factor to consider when grading bitumen for use in road building. The Ring-and-Ball apparatus is a tool used to find the softening point. Bitumen is inserted between two metal rings using this technique. After that, these rings are submerged in distilled water in a bath. Upon top of the bituminous in each ring lies a steel ball. The water bath's temperature is progressively raised. The bitumen softens and the ball starts to go through it as the temperature rises.

The point of softening is the degree Celsius at which a ball drops a certain distance. A crucial component of bitumen grading is the softening point, which denotes the highest temperature where a specific bitumen grade can continue to support a given amount of weight. The bitumen, which serves as a binder, begins to melt as the ambient temperature rises over the softening point, causing the road surface to become tacky. The efficacy and longevity of bituminous built roads are contingent upon a knowledge of the softening point.

METHODOLOGY

The research methodology for this study is organized into several key steps:

Step 1: Data Acquisition

Collect historical maximum temperature data for all cities worldwide. This data will be used to deduce the softening point of bitumen according to the local climate, which is a crucial parameter in the AASHTO standard for graded bitumen.

Step 2: Python Software Development

Develop a Python code that uses conditional logic to correlate the softening point with the hypothetical bitumen grade, as per the AASHTO standard. This novel use of the Python computer language aims to make it easier for civil engineers and other relevant experts to determine the appropriate bitumen grade for their particular geographic area.

Step 3: Application Development

Create a user-friendly tool that automates and simplifies complex engineering calculations and procedures. This application showcases the versatility of Python as a tool for infrastructure projects, particularly in road building and upkeep.

Step 4: Consideration of Local Weather

Highlight the importance of considering local weather, especially temperature, when choosing material for infrastructure projects. The Python software will take into account the historic maximum temperature of every city in the globe to determine the bitumen grade.

Step 5: Future Improvements

Plan for future enhancements to the application, such as incorporating penetration grade (Pen) and performance grade (PG), two additional essential bitumen grading criteria. Also, plan to interface with real-time weather APIs to automatically retrieve temperature data.

This research methodology is part of a larger effort to use data retrieval methods and contemporary programming languages to enhance infrastructure building and planning. It is expected that this Python-based implementation using the AASHTO standard methodology will be a valuable resource for professionals in the field of infrastructure planning and civil engineering.

PYTHON CODE:

```
def bitumen_grade(max_temp):
    if max_temp < 35:
        return "120/150"
    elif max_temp < 38:
        return "100/120"
    elif max_temp < 42:
        return "80/100"
    elif max_temp < 45:
        return "70/80"
    elif max_temp < 50:
        return "60/70"
    elif max_temp < 54:
        return "50/60"
    elif max_temp < 60:
        return "40/50"
    elif max_temp < 63:
        return "30/40"
    elif max_temp < 65:
        return "20/30"
    else:
        return "10/20"
city_name = input("Enter the city name: ")
max_temp = get_temperature(city_name)
```

INPUT:

```
Enter the city name: Multan|
```

OUTPUT:

```
The grade of bitumen for Multan is 40/50.
```

CONCLUSION AND DISCUSSION

The study introduces a unique application of the Python programming language, combined with the AASHTO standard method, to ascertain the suitable bitumen grade based on the highest temperature of a specific location. The script uses the OpenWeatherMap API [2] to gather the

maximum temperature data, which is then used to calculate the softening point of bitumen, a key parameter in the AASHTO standard for bitumen grading.

The Python script uses conditional logic to match the softening point with the potential bitumen grade, offering a convenient tool for civil engineers and other professionals. This approach promotes more efficient and effective road construction methods by ensuring the selection of the most appropriate bitumen grade for the local climate.

The study also emphasizes the flexibility of Python as a tool for automating and streamlining complex engineering calculations and procedures. It highlights the significance of considering local weather conditions, particularly temperature, when selecting materials for infrastructure projects.

In conclusion, the Python-based tool developed in this study offers a valuable resource for professionals in infrastructure planning and civil engineering. By automating the process of determining the appropriate bitumen grade based on local maximum temperatures, the tool enhances the efficiency and effectiveness of road construction and maintenance.

Future enhancements to this tool may include additional bitumen grading criteria and integration with real-time weather APIs to automatically gather temperature data. This project is part of a broader initiative to use data retrieval methods and modern programming languages to improve infrastructure building and planning. The successful implementation of this tool underscores the potential of such approaches in the field of civil engineering.

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A DIGITAL APPROACH TO THE BEHAVIOR OF A WIND TURBINE INSTALLATION

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Abstract

The principle underlying wind energy operation is founded on the conversion of kinetic energy into mechanical energy and subsequently into electrical energy. In this process, the wind propels blades, which, in turn, rotate the generator within the wind turbine. The generator then converts the mechanical energy of the wind into electrical energy. Subsequently, this electric current undergoes transformation and is injected into the electricity grid to power homes. Furthermore, there is the possibility of storing this energy for later use.

A digital approach to the behavior of a wind turbine installation involves leveraging advanced technologies and digital tools to monitor, analyze, and optimize the performance of the wind turbine system. This approach enables real-time data collection, analysis, and decision-making to enhance the overall efficiency, reliability, and output of the wind energy system. By adopting a digital approach, operators can enhance the overall performance, reliability, and longevity of wind turbine installations while contributing to the sustainable generation of renewable energy.

Keywords: Renewable energy, Wind, Turbines, Blades, Electricity.

**GREEN SYNTHESIS OF LAVANDULA MAIREI-MEDIATED SILVER
NANOPARTICLES: ANTIBACTERIAL EFFICACY AGAINST KLEBSIELLA
PNEUMONIAE STRAINS**

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ABSTRACT

Introduction and Purpose: Silver nanoparticles (Ag-NPs) have gained considerable attention in various fields, including medicine, due to their unique properties, especially their antimicrobial, antibiofilm and quorum-sensing activities. In this study, we focused on the synthesis of silver nanoparticles using *Lavandula mairei* (*L. mairei*) aqueous extract and evaluated their antibacterial activity against *Klebsiella pneumoniae* strains.

Materials and Methods: Silver nanoparticles were synthesized using an aqueous extract of *L. mairei* using a green and ecological method. UV-visible spectroscopy was used to monitor the

reduction of silver ions. Moreover, X-ray diffraction (XRD), scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) were used to characterize the synthesized nanoparticles. The antibacterial activity of silver nanoparticles was evaluated against *K. pneumoniae* strains using the broth microdilution method to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC).

Results: The synthesized silver nanoparticles showed a characteristic peak at 440 nm in the UV-Visible spectrum, confirming their formation. XRD analysis revealed the crystalline nature of the nanoparticles, while TEM images showed their spherical morphology with a size between 40 and 70 nm. EDS confirmed the elemental composition of the nanoparticles, leading to a better understanding of their chemical structure. Biological silver nanoparticles showed significant antibacterial activity. MIC values ranged from 312 to 625 $\mu\text{g/mL}$, and MBC value was 625 $\mu\text{g/mL}$ against the *Klebsiella pneumoniae* strains tested.

Discussion and Conclusion: In summary, silver nanoparticles derived from *L. mairei* demonstrated potent antibacterial activity against *Klebsiella pneumoniae* strains, showcasing their potential as effective and environmentally friendly antimicrobial agents. Further research is warranted to explore their mechanisms and assess their suitability for practical applications.

Key Words: *Lavandula mairei*; Green synthesis; Silver nanoparticles; *Klebsiella pneumoniae*; Nanomaterial characterization

MEDICAL NUTRITION THERAPY OF CYSTIC FIBROSIS – ASSOCIATED DIABETES

KİSTİK FİBRÖZİS İLİŞKİLİ DİYABETTE TIBBİ BESLENME TEDAVİSİ

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ABSTRACT

Cystic fibrosis is a disease that occurs due to the deficiency of the chloride channel called Cystic Fibrosis Transmembrane Regulator in the epithelial cell membrane. The disease often affects the sweat glands, reproductive system, digestive system, pancreas and respiratory system. One of the most important complications of cystic fibrosis is cystic fibrosis-related diabetes. It is important to apply medical nutrition therapy in this complication to improve the patient's living conditions. Cystic fibrosis-related diabetes causes decreased insulin secretion by reducing the number of mature beta cells along with inflammation and causing natural beta cell dysfunction. Glucose intolerance develops with decreased insulin secretion. In the research conducted; In the medical nutrition treatment of cystic fibrosis-related diabetes, a high-calorie, high-fat and high-salt diet is recommended to ensure growth and development in pediatric patients and to maintain BMI in adult patients. Additionally, carbohydrate intake should be monitored to improve impaired glucose tolerance. It has also been suggested to spread carbohydrates throughout the day to improve impaired glucose tolerance. It is recommended that fat intake constitute 35-40% of total calories. It is recommended that protein intake be approximately 1.5-2 times the recommended values for healthy individuals. Within these limits, growth and development are ensured for pediatric patients and continuity of BMI is ensured for adult patients. It is very important that patients with cystic fibrosis-related diabetes are evaluated and monitored by multidisciplinary teams at regular intervals. Thus, patients' quality of life increases, morbidity and mortality rates may decrease. More studies are needed on this subject.

Key Words: Cystic Fibrosis, Cystic Fibrosis Associated Diabetes, Medical Nutrition Therapy of Cystic Fibrosis, Medical Nutrition Therapy of Cystic Fibrosis Associated Diabetes

ÖZET

Kistik fibrözis, epitel hücresi membranındaki Kistik Fibrözis Transmembran Regülatör adlı klor kanalının eksikliğine bağlı ortaya çıkan hastalıktır. Hastalıkta sıklıkla ter bezleri, üreme sistemi, sindirim sistemi, pankreas ve solunum sistemi etkilenir. Kistik fibrözisin en önemli komplikasyonlarından biri kistik fibrözis ilişkili diyabettir. Hastanın yaşam koşullarının iyileştirilmesi için bu komplikasyonda tıbbi beslenme tedavisinin uygulanması önem arz etmektedir. Kistik fibrözis ilişkili diyabet inflamasyonla birlikte olgunlaşmış beta hücresi sayısını azaltarak ve doğal beta hücresi disfonksiyonuna sebep olarak insülin sekresyonunun azalmasına neden olur. Azalan insülin sekresyonuyla birlikte glukoz intoleransı gelişmektedir. Yapılan araştırmalarda; kistik fibrözis ilişkili diyabetin tıbbi beslenme tedavisinde pediatri hastalarında büyüme ve gelişmenin sağlanabilmesi için; yetişkin hastalarda ise BKİ'nin devamlılığını sağlamak için yüksek kalorili, yüksek yağlı ve yüksek tuz içeriğine sahip diyet önerilmektedir. Ek olarak bozulmuş glukoz toleransını iyileştirmek amacıyla karbonhidratların alınımının takibi yapılmalıdır. Bozulmuş glukoz toleransını iyileştirebilmek için aynı zamanda karbonhidratların gün boyunca yayılması önerilmiştir. Yağ alınımının toplam kalorinin %35-40'ını oluşturması tavsiye edilmiştir. Protein alınımının sağlıklı bireylere önerilen değerlerin yaklaşık 1.5 – 2 katı kadar olması önerilmiştir. Bu sınırlar içerisinde pediatri hastaları için büyüme ve gelişme, yetişkin hastalar için ise BKİ'nin devamlılığı sağlanmış olur. Kistik fibrözis ilişkili diyabeti olan hastaların belirli aralıklarla multidisipliner ekipler tarafından değerlendirilmesi, izlem ve takiplerinin sağlanması oldukça önemlidir. Böylece hastaların yaşam kalitesi artar, morbidite ve mortalite oranları düşebilir. Bu konuda daha fazla çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: Kistik Fibrözis, Kistik Fibrözis İlişkili Diyabet, Kistik Fibrözisin Tıbbi Beslenme Tedavisi, Kistik Fibrözis İlişkili Diyabetin Tıbbi Beslenme Tedavisi

**EFFECT OF VITAMIN-D ON THE EXPRESSION OF SOME ADIPOKINES IN RAT
OVARY IN AN EXPERIMENTAL POLYCYSTIC OVARY SYNDROME (PCOS)
MODEL**

**DENEYSEL POLİKİSTİK OVER SENDROMU (PKOS) MODELİNDE SIÇAN
OVARYUMUNDAKİ BAZI ADİPOKİNLERİN EKSPRESYONU ÜZERİNE
VİTAMİN-D'NİN ETKİSİ**

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ABSTRACT

Introduction and Purpose: Polycystic ovary syndrome (PCOS) is the most common endocrinopathy in women of reproductive age, characterized by menstrual irregularity, elevated androgen levels, and polycystic-looking ovaries. Although significant advances have been made in the field of PCOS, the etiopathogenesis and diagnostic criteria of the syndrome are still unclear. It is known that insulin resistance has a central role in the pathogenesis of PCOS. It has been reported that insulin resistance stimulates androgen production in ovarian theca cells by inhibiting sex hormone binding globulin synthesis via insulin. Increased androgen levels and insulin resistance have also been shown to produce long-term signs of mild inflammation. This study aims to experimentally create a PCOS model and evaluate the effect of vitamin-D on FSH, LH and testosterone levels, which are markers of PCOS, as well as insulin resistance and inflammation biomarkers.

Materials and Methods: 40 adult female Wistar-Albino rats, which were determined to have regular cycles by vaginal cytology follow-up, were divided into 5 groups.

Group 1: Control group (n=8); Control group rats were not given any treatment other than food and water during the experiment.

Group 2: Dimethyl Sulfoxide (DMSO) group (n=8); DMSO group rats were administered 2% DMSO dissolved in canola oil at a dose of 1 ml/kg/day via gavage during the experiment.

Group3: PCOS group (n=8); Letrozole at a dose of 1 mg/kg/day was administered to PCOS group rats via gavage in 2% DMSO during the experiment.

Group 4: PCOS + Vitamin-D group (n = 8); Vitamin-D was simultaneously administered orally at a dose of 200 IU/day to the PCOS + Vitamin-D group rats during the PCOS induction period.

Group 5: Vitamin-D group (n=8); Vitamin-D was administered orally to vitamin-D group rats at a dose of 200 IU/day throughout the experiment. At the end of the experimental study, the weights of the rats in all groups were determined and following the application of general anesthesia, blood was taken intracardiacly and then decapitation was performed. Blood samples were centrifuged at 3000-4000 rpm and ELISA method was applied for biochemical examinations. In the comparison involving all groups, SPSS Statistics-25 One Way ANOVA, post-hoc: Duncan variance analysis test was applied.

Results: While FSH and LH values were lower in the PCOS group compared to the control group, testosterone, IL1, TNF α , HOMA-IR values were found to be higher (p<0.05). On the other hand, it was shown that the values in the PCOS + vit D group were closer to the control group.

Discussion and Conclusion: This study showed that vitamin-D application has recovering effects on the biochemical parameters of PCOS model rats. As a result, it has been revealed that vitamin-D has a mitigating effect on hyperandrogenism, hyperinsulinemia and inflammation.

Key Words: PCOS; Vitamin-D; Insulin Resistance; Inflammation;Hyperandrogenism

ÖZET

Giriş ve Amaç: Polikistik over sendromu (PKOS); menstrual düzensizlik, yükselmiş androjen seviyeleri ve polikistik görünümlü over özelliğiyle üreme çağındaki kadınlarda en sık görülen endokrinopatidir. PKOS alanında önemli gelişmeler kaydedilmiş olmasına karşın günümüzde hala sendromun etiopatogenezi ve tanı kriterleri netlik kazanmamıştır. PKOS'un patogenezi insülin direncinin merkezi bir role sahip olduğu bilinmektedir. İnsülin direncinin insülin yoluyla seks hormon bağlayıcı globulin sentezini inhibe ederek, ovaryan teka hücrelerindeki androjen üretimini uyardığı bildirilmiştir. Artmış androjen seviyelerinin ve insülin direncinin de uzun süreli hafif seyreden inflamasyon belirtilerini ortaya çıkardığı gösterilmiştir. Bu çalışma; deneysel olarak PKOS modeli oluşturmayı ve PKOS belirteçlerinden olan FSH, LH ve testosteron düzeyleri ile insülin direnci ve inflamasyon biyobelirteçleri üzerine vitamin-D'nin etkisini değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Vajinal sitoloji takibi ile düzenli siklus gösterdiği tespit edilen 40 yetişkin dişi Wistar-Albino rat 5 gruba ayrıldı.

Grup 1: Kontrol grubu (n=8); kontrol grubu sıçanlara deney süresince yem ve su dışında herhangi bir uygulama yapılmadı.

Grup 2: Dimetil Sülfoksit (DMSO) grubu (n=8); DMSO grubu sıçanlara deney süresince, kanola yağı içerisinde 1 ml/kg/gün dozunda, çözdürülmüş %2' lik DMSO gavaj yolu ile uygulandı.

Grup3: PKOS grubu (n=8); PKOS grubu sıçanlara deney süresince, 1 mg/kg/gün dozunda letrozol, %2 lik DMSO içerisinde gavaj yolu ile uygulandı.

Grup 4: PKOS + Vitamin-D grubu (n= 8); PKOS + Vitamin-D grubu sıçanlara PKOS oluşturma süresince, eş zamanlı olarak 200 IU/gün dozunda vitamin-D oral yolla uygulandı.

Grup 5: Vitamin-D grubu (n=8); vitamin-D grubu sıçanlara deney süresince 200 IU/gün dozunda Vitamin-D oral yolla uygulandı. Deneysel çalışmanın sonunda tüm gruplardaki sıçanların ağırlıkları belirlendi ve genel anestezi uygulamasını takiben intrakardiyak yolla kan alındı ve sonrasında dekapitasyon işlemi uygulandı. Kan örnekleri 3000-4000 rpm hızda santrifüj edildi ve biyokimyasal incelemeler için ELISA yöntemi uygulandı. Tüm grupları içeren karşılaştırmada SPSS Statistics-25 One Way ANOVA, post-hoc: Duncan varyans analiz testi uygulandı.

Bulgular: Kontrol grubuna kıyasla PKOS grubunda FSH ve LH değerleri daha düşük seviyede iken, testosteron, IL1, TNF α , HOMA-IR değerlerinin daha yüksek seviyede olduğu tespit edilmiştir. Buna karşın PKOS+ vit D grubunda ise değerlerin kontrol grubuna daha yakın olduğu gösterilmiştir.

Tartışma ve Sonuç: Bu çalışma PKOS modeli ratların biyokimyasal parametreleri üzerine vitamin-D uygulamasının iyileştirici etkilerinin olduğunu göstermiştir. Sonuç olarak vitamin-D uygulamasının hiperandrojenizm, hiperinsülinemi ve inflamasyonu hafifletici etkisinin olduğu ortaya konulmuştur.

Anahtar Kelimeler: PKOS; Vitamin-D; İnsülin Direnci; İnflamasyon;Hiperandrojenizm

EFFECT OF ETIOLOGICAL FACTORS ON ALPHA FETO PROTEIN LEVELS: A COMPARATIVE ANALYSIS IN HEPATOCELLULAR CARCINOMA PATIENTS

ETYOLOJİK FAKTÖRLERİN ALFA FETO PROTEİN DÜZEYLERİ ÜZERİNDEKİ ETKİSİ: HEPATOSELLÜLER KARSİNOMA HASTALARINDA BİR KARŞILAŞTIRMALI ANALİZ

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ABSTRACT

Introduction and Purpose: Hepatocellular carcinoma (HCC) is the most common type of liver cancer and is often associated with chronic liver diseases such as cirrhosis, HBV, HCV, NAFLD. Alpha-fetoprotein (AFP) is the most frequently used marker for HCC diagnosis and follow-up, but not all HCC patients have elevated levels of this value. Etiological agent can affect the AFP levels of HCC patients. Therefore, examining the distribution of AFP positive and negative HCC patients according to the etiological agent can be important for understanding the pathogenesis and prognosis of HCC. The aim of this study is to investigate whether the AFP levels of HCC patients differ according to the etiological factors.

Materials and Methods: A total of 530 patients diagnosed with HCC in our center were included in the study. After determining the AFP values, two groups were formed as AFP<20 negative and AFP>20 positive. All demographic data of HCC patients were determined. Etiological factors were examined in three groups as HBV, HCV and Cryptogenic. The cryptogenic group consisted of Alcohol, NAFLD, Autoimmune, Wilson patients. These data were analyzed in SPSS program.

Results: The average age of the HCC patients included in the study was 63.60 ± 11.39 years. They were divided into two groups: AFP negative HCC (n=202) and AFP positive HCC (n=326). The mean age of AFP negative HCC patients was 63.21 ± 11.60 , while the mean age of AFP positive HCC patients was 63.85 ± 11.27 , with a p value of 0.53. Among AFP negative HCC patients, HBV (37.6%), HCV (39.6%), and Cryptogenic (39.2%) were the etiological factors, while among AFP positive HCC patients, HBV (62.4%), HCV (60.4%), and Cryptogenic (60.8%) were the etiological factors, with a p value of 0.78. In the AFP negative HCC group, the highest mean age was found in HCV etiology (68.91 ± 7.93), while the largest tumor diameter was found in Cryptogenic etiology (2.58 ± 0.50).

Discussion and Conclusion: The sensitivity and specificity of AFP vary depending on the stage, tumor size and etiology of HCC. Some studies have shown that the etiological factors of

HCC affect the AFP levels. For example, AFP levels are higher in HCCs associated with HBV, and lower in HCCs associated with HCV. Our results support the findings of these studies. This study may be useful for evaluating the use of AFP in the diagnosis and prognosis of HCC.

Key Words: Hepatocellular carcinoma; Etiology; Alpha fetoprotein; Prognosis; Diagnosis

ÖZET

Giriş ve Amaç: Hepatosellüler karsinoma (HCC), karaciğer kanserinin en yaygın tipidir ve çoğu zaman siroz, HBV, HCV, NAYKH gibi kronik karaciğer hastalıkları ile ilişkilidir. Alfa fetoprotein (AFP), HCC tanısında ve takibinde en sık kullanılan belirteçtir, ancak tüm HCC hastalarında bu değer yüksek değildir. Etiyolojik etken, HCC hastalarının AFP düzeylerini etkileyebilir. Bu nedenle, etiyolojik etkene bağlı olarak AFP pozitif ve negatif HCC hastalarının dağılımını incelemek, HCC'nin patogenezi ve prognozunu anlamak için önemli olabilir. Bu çalışmanın amacı, HCC hastalarında AFP düzeylerinin etiyolojik faktörlere göre farklılık gösterip göstermediğini araştırmaktır.

Gereç ve Yöntem: Merkezimizde HCC tanısı konmuş toplam 530 hasta çalışmaya dahil edildi. AFP değerleri belirlendikten sonra AFP<20 negatif ve AFP>20 pozitif olmak üzere iki grup oluşturuldu. HCC hastalarının tüm demografik verileri tespit edildi. Etiyolojik faktörler HBV, HCV ve Kriptojenik olmak üzere üç grupta incelendi. Kriptojenik grubu; Alkol, NAYKH, Otoimmün, Wilson hastaları oluşturdu. Bu veriler SPSS programında analiz edildi.

Bulgular: Çalışmaya dahil edilen HCC hastalarının yaş ortalaması $63,60 \pm 11,39$ olarak tespit edildi. AFP negatif HCC sayısı (n=202), AFP pozitif HCC sayısı (n=326) olmak üzere 2 grupta incelendi. AFP negatif HCC hastalarının yaş ortalaması $63,21 \pm 11,60$, AFP pozitif HCC hastalarının yaş ortalaması $63,85 \pm 11,27$, p değeri 0,53 olarak belirlendi. AFP negatif HCC hastalarında, HBV (%37,6), HCV (%39,6), Kriptojenik (%39,2) iken, AFP pozitif HCC hastalarında HBV (%62,4), HCV (%60,4), Kriptojenik (%60,8), p değeri 0,78 olarak belirlendi. AFP negatif HCC grubunda en yüksek yaş ortalaması HCV ($68,91 \pm 7,93$) etiyolojisinde iken, en yüksek tumor çapı Kriptojenik ($2,58 \pm 0,50$) etiyolojisinde bulunmuştur.

Tartışma ve Sonuç: AFP'nin duyarlılığı ve özgüllüğü, HCC'nin evresine, tumor boyutuna ve etiyolojisine bağlı olarak değişir. Bazı çalışmalar, HCC'nin etiyolojik faktörlerinin AFP düzeyleri üzerinde etkili olduğunu göstermiştir. Örneğin, hepatit B virüsü (HBV) ile ilişkili HCC'lerde AFP düzeyleri daha yüksek, hepatit C virüsü (HCV) ile ilişkili HCC'lerde ise daha düşük bulunmuştur. Bizim sonuçlarımız bu çalışmalardaki sonuçları desteklemektedir. Bu çalışma, HCC'nin tanı ve prognozunda AFP'nin kullanımını değerlendirmek için yararlı olabilir.

Anahtar Kelimeler: Hepatosellüler karsinoma; Etiyoloji; Alfa fetoprotein; Prognoz; Tanı

NANOTECHNOLOGICAL APPLICATIONS IN DAIRY INDUSTRY

SÜT ENDÜSTRİSİNDEKİ NANOTEKNOLOJİK UYGULAMALAR

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ABSTRACT

Nanotechnology has significant appeal in the dairy industry by addressing the properties of various products such as milk, cheese, yoghurt, butter, fermented milk and buttermilk. Using both bottom-up and bottom-down processing approaches provides comprehensive insights into both the internal and external aspects of dairy products. Various nano techniques such as nanoemulsion, nanoencapsulation, nanoliposomes, nanotubes, nanofibers and nanocapsules find application in the dairy industry. These techniques, including nanosensors, nanolaminates, and nanocoatings, serve as effective packaging methods, providing information on product safety, stability, and quality. Nanotechnology is also effective in detecting foodborne pathogens; It is especially successful in detecting pathogens such as *Listeria monocytogenes*, *Salmonella typhimurium* and *Pseudomonas aeruginosa*. It plays an important role in fortifying food by encapsulating nutrients, ingredients and compounds, thus improving texture, taste, aroma, quality and nutritional value. Various nanoparticles, especially zinc oxide, silver and titanium, have effective mechanisms to disrupt bacterial cell walls, facilitate compound absorption and improve body functions.

In this study, various nanotechnological applications such as nanoemulsion, nanoencapsulation, nanoliposomes, nanotubes, nanofibers and nanocapsules used in the dairy industry and their studies and results on their use in dairy products are presented

.Key Words: Nano particles, Nanosensors, Nano food, additives, Nano encapsulation, Nano-packaging

ÖZET

Nanoteknoloji, süt, peynir, yoğurt, tereyağı, fermente süt ve ayran gibi çeşitli ürünlerin özelliklerini ele alarak süt endüstrisinde önemli bir çekiciliğe sahiptir. Hem aşağıdan yukarıya hem de aşağıdan aşağıya işleme yaklaşımlarının kullanılması, süt ürünlerinin hem iç hem de dış yönlerine ilişkin kapsamlı bilgiler sağlar. Nanoemülsiyon, nanokapsülleme, nanolipozomlar, nanotüpler, nanofiberler ve nanokapsüller gibi çeşitli nano teknikler süt endüstrisinde uygulama alanı bulmaktadır. Nanosensörler, nanolaminatlar ve nanokaplamalar dahil olmak üzere bu teknikler, ürün güvenliği, stabilitesi ve kalitesi hakkında bilgi sağlayan etkili paketleme yöntemleri olarak hizmet vermektedir. Nanoteknoloji aynı zamanda gıda kaynaklı patojenlerin tespitinde de etkilidir; Özellikle *Listeria monocytogenes*, *Salmonella typhimurium* ve *Pseudomonas aeruginosa* gibi patojenlerin tespitinde başarılıdır. Besinleri, içerikleri ve bileşikleri kapsülleyerek gıdanın güçlendirilmesinde önemli bir rol oynar, böylece dokuyu, tadı, aromayı, kaliteyi ve besin değerini artırır. Çeşitli nanopartiküller, özellikle çinko oksit, gümüş ve titanyum, bakteri hücre duvarlarını bozan, bileşiğin emilimini kolaylaştıran ve vücut fonksiyonlarını geliştiren etkili mekanizmalara sahiptir. Bu çalışmada süt endüstrisinde kullanılan nanoemülsiyon, nanoenkapsülasyon, nanolipozomlar, nanotüpler, nanolifler ve nanokapsüller gibi çeşitli nanoteknolojik uygulamalar ve bunların süt ürünlerinde kullanımına ilişkin çalışmalar ve sonuçları sunulmaktadır

Anahtar Kelimeler: Nano parçacıklar, Nanosensörler, Nano gıda, katkı maddeleri, Nano kapsülleme, Nano paketleme

THE EFFECTS OF DIFFERENT WAVELENGTH LED LAMPS EARLINESS AND GROWTH OF TULIP (*Tulipa gesneriana* L.)

FARKLI DALGA BOYLU LED LAMBALARIN LALE (*Tulipa gesneriana* L.)'DE ERKENCİLİK VE BİTKİ GELİŞİMİ ÜZERİNE ETKİLERİ

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ABSTRACT

The experiment was carried out in 2022 in the Cold Storage Research and Application Unit and Greenhouse of the Department of Horticulture, Faculty of Agriculture, Uludag University, Bursa. It was aimed to determine the effects of different wavelength LED lamps on the earliness and plant growth of tulip (*Tulipa gesneriana* L.). For this purpose, 3 different LED wavelengths (blue 100%, red 100%, yellow 100%) and 3 different supplementary lighting times (2, 4 and 6 hours) were used in 2 different tulip varieties. The bulbs of Apeldoorn and Ronaldo tulip varieties obtained from Asian Tulip Company were used as plant material. The experiment was planned in two phases. In the first phase, two different tulip varieties were used in the cold storage research and application unit and LED supplementary lighting was started on November 5 at 5°C for 4 weeks. In the experiment, which was established in 3 replicates with 4 tulip bulbs in each replicate, tulip bulbs were placed in empty vials with the shoot ends upwards. Irrigation was done by spraying once a week. The tulip bulbs, which were in the second stage cold storage research and application unit and applied additional light, were planted in the greenhouse with 15x15 cm between rows and 15x15 cm above rows in order to observe their growth. As a result of the treatments, emergence rate (%), flower diameter (cm), flower length (cm), bud diameter (cm), bud length (cm), number of leaves (pcs), plant height (cm), stem thickness (mm) parameters were determined. The best results in flower diameter, flower length and plant height were obtained at red LED wavelength for 6 hours of supplementary illumination. The best results in bud length were obtained in the LED wavelength blue color treatment with 6 hours of additional illumination time. The best results in leaf number and stem thickness were obtained in the LED wavelength blue color treatment with 4 hours of additional illumination. Considering the data, it was determined that the time in the cold storage research and application unit for 4 weeks was sufficient and provided earliness. When it is desired to be used in cut flower cultivation, LED wavelength red color 6-hour additional lighting application is recommended for yield and quality.

Key Words: LED wavelength, Tulip bulbs, Earliness

ÖZET

Deneme, Bursa Uludağ Üniversitesi Ziraat Fakültesi Bahçe Bitkileri Bölümüne ait Soğuk muhafaza araştırma ve uygulama ünitesinde ve Örtüaltı Araştırma ve Uygulama Serasında 2022 yılında yürütülmüştür. Farklı dalga boylu LED lambaların lale (*Tulipa gesneriana* L.)'de erkencilik ve bitki gelişimi üzerine etkilerinin belirlenmesi amaçlanmıştır. Bu amaçla 2 farklı lale çeşidinde, 3 farklı LED dalga boyu (mavi %100- kırmızı %100- sarı %100) ve 3 farklı ek aydınlatma süresi (2, 4 ve 6 saat) kullanılarak gerçekleştirilmiştir. Araştırmada bitkisel materyal olarak Asya lale firmasından temin edilen Apeldoorn ve Ronaldo lale çeşitlerinin soğanları kullanılmıştır. Deneme iki aşama da planlanmıştır. İlk aşama soğuk muhafaza araştırma ve uygulama ünitesinde iki farklı lale çeşidi kullanılarak 5 Kasım tarihinde 5°C de 4 hafta süre ile LED ilave aydınlatma başlatılmıştır. Her tekerrürde 4 adet lale soğanı olacak şekilde 3 tekerrürlü olarak kurulan denemede, lale soğanları boş viyollere sürgün uçları yukarıya gelecek şekilde yerleştirilmiştir. Haftada bir püskürtme şeklinde sulama yapılmıştır. İkinci aşama soğuk muhafaza araştırma ve uygulama ünitesinde bulunan ve ilave ışık uygulanan lale soğanları Örtüaltı araştırma ve uygulama serasına gelişimlerini gözlemlemek için sıra arası ve sıra üzeri 15x15 cm olacak şekilde dikimi gerçekleştirilmiştir. Uygulamalar sonucunda, çıkış oranı (%), çiçek çapı (cm), çiçek boyu (cm), tomurcuk çapı (cm), tomurcuk boyu (cm), yaprak sayısı (adet), bitki boyu (cm), sap kalınlığı (mm) parametreleri belirlenmiştir. Çiçek çapı, çiçek boyu ve bitki boyunda en iyi sonuçları kırmızı LED dalga boyunda 6 saat ek aydınlatma süresinde elde edilmiştir. Tomurcuk boyunda en iyi sonuçları LED dalga boyunda mavi renk uygulamasında 6 saatlik ek aydınlatma süresinde elde edilmiştir. Yaprak sayısı ve sap kalınlığında en iyi sonuçları LED dalga boyunda mavi renk uygulamasında 4 saatlik ek aydınlatma sonucunda elde edilmiştir. Veriler göz önünde bulundurulduğunda 4 hafta süre ile soğukta muhafaza araştırma ve uygulama ünitesindeki sürenin yeterli olduğu ve erkencilik sağladığı belirlenmiştir. Kesme çiçek yetiştiriciliğinde kullanılmak istendiğinde verim ve kalite de LED dalga boyunda kırmızı renk 6 saatlik ek aydınlatma uygulaması tavsiye edilmektedir.

Anahtar Kelimeler: LED dalga boyu, Lale soğanları, Erkencilik

RASHBA SPLITTING IN 2D CHIRAL PEROVSKITES: A COMPUTATIONAL STUDY

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Abstract

Ferromagnetic materials are widely used in spintronic devices to provide spin-polarized electrons, which are controlled by external magnetic fields. However, the utilization of spin-orbit phenomena offers promising alternatives to move towards smaller and faster spintronic components. Chiral lead-halide organic-inorganic perovskites (HOIPs) have recently been suggested as new key materials for spintronic and spin-optoelectronic applications owing to their spin-polarized induced by chiral organic and strong spin-orbit coupling of lead, but the nontoxic lead-free chiral perovskites are still greatly desired for spintronic devices. Here, using density functional theory (DFT), we investigate the Rashba-type spin-splitting of the lead-free chiral HOIPs without using an external magnetic field. Our results demonstrate that chiral perovskites have Rashba-type splitting with a strength of 0.71 eV\AA^{-1} . Furthermore, we demonstrate that spin-polarized can be controlled and manipulated depending on the enantiomeric form of perovskites without any external magnetic field. These results will provide a new platform for future structural engineering to modulate the splitting of lead-free perovskites with the potential for use in advanced spintronic devices.

Keywords: DFT, Chiral perovskite, Band structure, Rashba splitting

DFT ANALYSIS OF THE CATALYTIC ACTIVITY OF Cu_{55} AND $\text{Cu}_{13}\text{@Ni}_{42}$ NANOPARTICLES AS CATALYSTS FOR THE HYDROGENATION OF CO_2 TO FORMIC ACID

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Abstract

The present study provides a detailed DFT analysis of the thermodynamic properties of Cu_{55} and core-shell $\text{Cu}_{13}\text{@Ni}_{42}$ clusters. The potential of identifying stable and active catalytic systems that convert CO_2 into formic acid was investigated using Density Functional Theory (DFT) method. Cu_{55} and $\text{Cu}_{13}\text{@Ni}_{42}$ clusters are both promising catalysts for the process of CO_2 conversion to HCOOH . The adsorption energies (eV) of intermediates on the two clusters are all negative values indicating that it is possible for the reaction CO_2 to formic acid to occur on the surface of both clusters. However, the bimetallic core-shell cluster $\text{Cu}_{13}\text{@Ni}_{42}$ showed higher adsorption energies than monometallic Cu_{55} . According to the DFT results, the presence of Ni improves the stability by lowering the relative energy value of HCOO^* from -0.948 eV for pure Cu_{55} to -1.679 eV. And because, the rate-determining step is the hydrogenation of the formate intermediate. This step is recognized as $\text{HCOO}^* \rightarrow \text{HCOOH}^*$. Therefore, we can conclude that the bimetallic $\text{Cu}_{13}\text{@Ni}_{42}$ is more catalytically active than the monometallic Cu_{55} due to the core-shell design as the presence of Ni at the surface contributed to the catalytic activity. This study aims to provide a comprehensive analysis of the structural and thermodynamic properties of Cu_{55} and bimetallic core-shell $\text{Cu}_{13}\text{@Ni}_{42}$ clusters to identify the best catalyst as a potential candidate for the catalytic conversion of CO_2 into formic acid.

P - LABELING OF POSETS

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Abstract

The concept of graph labeling was introduced in mid of 1960. In this paper we define p - labeling for finite posets. We obtain p - labeling of a chain, a fence and a crown. In 2002, Thakare, Pawar and Waphare introduced the concept of adjunct operation of two lattices with respect to a pair of elements. In this paper, we also obtain p - labeling of adjunct of two chains.

EFFECTIVENESS OF ONE-TIME SELF-MASSAGE USING A FOAM ROLLER IN REDUCING FUNCTIONAL LIMITATIONS OF THE MUSCULOSKELETAL SYSTEM

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ABSTRACT

Introduction and Purpose: Foam rolling is coming one of the most popular treatment performing to prevent injuries in sport. The aim of this study was to determine the effect of a single session of self-massage with a roller on functional limitations of the musculoskeletal system.

Materials and Methods: The study included 101 persons (69 women and 32 men) aged 19 to 23. Group 1 consisted of 55 people who have received training in self-massage with a roller. Group 2 consisted of 46 people who constituted the control group. Every people performed Functional Movement Screen (FMS), without warm-up and next (after one week) performed FMS once again after warm-up with foam rolling (Group 1), and traditional warm-up (Group 2). Functional Movement Screen consists of seven exercises assessing basic movement patterns: 1. Deep Squat; 2. Hurdle Step; 3. In-line Lounge; 4. Shoulder Mobility; 5. ASLR – Active Straight Leg Raise; 6. Trunk Stability Push Up; 7. Rotation Stability. Each task is assessed on a four-point scale from 0 to 3 points.

Results: A significant improvement in the overall total FMS test score was observed after both forms of warm-up (exercises + rolling, exercises). The largest differences in Group 1 were noted in the deep squat and hurdle step tests ($p \leq 0.001$). In Group 2, a significant difference was found in exercise six: trunk stability ($p \leq 0.001$).

Discussion and Conclusion: The roller-assisted warm-up had a particularly positive effect on the results of global movement tasks requiring postural muscle capacity and a high level of flexibility (deep squat and hurdle step). Using a roller in the initial part of the training is therefore fully justified.

Key Words: foam rolling, warm-up, FMS, injury prevention, functional assessment

IMPACTS OF ORGANIC MANURE AND CHEMICAL MANURE ON DIFFERENT DEVELOPMENTAL STAGES OF CHICKPEA UNDER SEMI-CONTROLLED GREENHOUSE CONDITIONS

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ABSTRACT

Introduction and Purpose: The fertilization plays a significant role in yield and quality in agricultural activities. Legumes used for culinary purposes have traditionally been considered a plant group with minimal or no need for fertilization. However, in recent years, fertilization, including chickpeas, has been introduced in the cultivation of this plant group. There are varying opinions among producers regarding the form and quantity of fertilization in chickpeas. This study aims to determine the extent to which different types of fertilizers contribute to increased yield and yield parameters of chickpea varieties.

Materials and Methods: The research was conducted in 2020 under semi-controlled greenhouse conditions belonging to the Department of Field Crops of Dicle University Faculty of Agriculture. Different chickpea varieties (Arda, Gökce, and Local variety) and various plant nutrients (control, ovine manure (5 ton/ha), cattle manure (5 ton/ha), solid vermicompost (3 ton/ha), leonardite (750 kg/ha), chicken manure (3 ton/ha), and chemical fertilizer (50 kg N/ha,

90 kg P/ha)) were employed in the study. The trial were arranged according to randomized plots in split plots design with three replications for harvested for full bloom, pod setting and full maturity periods.

Results: During the flowering period, the increase in root dry weight compared to the control group ranged from 4.6% (chicken manure) to 15.7% (NP), while decreases varied from 14.8% (leonardite) to 28.7% (ovine manure). In the pod-setting period, an increase in root dry weight was observed only in the ovine manure application, with no increase detected in other applications. In the flowering period, the highest increase in leaf dry weight was observed in chicken manure, while the highest decrease occurred in the ovine manure application. In the pod-setting period, an increase in leaf weight was observed in the ovine manure application, and a decrease was observed in the chicken manure application. During the maturation period, the number of pods in the plant increased by percentages ranging from 81.3% (chicken manure) to 131.3% (solid vermicompost) compared to the control group. Pod weight in the plant ranged from 1.13 to 2.16 g, with an average of 1.65 g for all applications except solid vermicompost (14.4%) and ovine manure (16.8%), which were lower than the control group. The number of seeds in the plant varied between 2.66 and 5.88 per plant, with an average of 4.15 seeds, and all applications, except ovine manure (17.6%) and NP (6.6%) treatments, were lower than the control group. Seed yield per plant ranged from 0.71 to 1.81 g/plant, with an average of 1.24 g/plant, and all applications, except ovine manure, were lower than the control group.

Discussion and Conclusion: In conclusion, the results of the studied plant characteristics during the growth and development stages indicate that organic fertilizer applications result in higher yields compared to inorganic fertilizer applications. This suggests that the use of organic fertilizers can be recommended in chickpea cultivation.

Key Words: Organic manure, chickpea, greenhouse condition, development stage, yield

EFFECT OF POTASSIUM NITRATE APPLICATION ON QUALITY OF GARLIC CLOVES

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ABSTRACT

Introduction and Purpose: In the study, it was aimed to increase the head weight, head size and color content of garlic by applying potassium fertilizer through soil irrigation and from leaves to shoots during the vegetation period.

Materials and Methods: This study was carried out in the autumn period of 2021 in the agricultural area of Dicle University on the banks of the Tigris River. Garlic cloves, which are the local genotype of Kulp district of Diyarbakır, were used in the study. The experiment was carried out according to the randomized block design with 4 replications; each parcel was established as 2 x 3m. The clove were planted in a wooden planting system, with 20 cm between rows and 10 cm above the row. In this context, Potassium Nitrate (13-0-45,5) powder fertilizer of Gübretaş company was applied to the soil and plants at a time during the vegetation period, at the rate of 11 kg per decare, according to the manufacturer's declaration and analysis reports. In the study, garlic head weight, head diameter, head length, length/head index, number of

clove, cloves diameter, weight, amount of water soluble solids (WSS), pH, and clove color values and L*, a* and b* contents were examined.

Results: In terms of garlic head weight, the highest weight was obtained as a result of applying fertilizer from the soil (42 g); the lowest weight was obtained from the clove in control group (38.72 g). While the highest value in garlic head diameter was obtained from the fertilizer applied to soil (49.54 mm); the lowest value was obtained from garlic heads in the control group (43.25 mm). While soil and foliar fertilizer application was found to be important in clove diameter (18.8 and 17.61 mm, respectively); the minimum clove diameter in the control group was determined as (14.48 mm). While the highest value in terms of SSC content was obtained from soil potassium application (32.23%); similar results were obtained in the control group and foliar potassium application (30.31 and 30.00%). As a result of potassium fertilizer applications, the pH content of garlic heads increased according to the control parcels.

Discussion and Conclusion: At the end of the study, it was observed that the application of Potassium Nitrate fertilizer to the soil had a significant effect on the head and clove quality parameters of garlic, but the values were lower in control group. With this study, it was determined that potassium fertilizer increased the head quality of garlic.

Key Words: Garlic, Potassium Nitrate, Head- clove, Tigris River

ULTRASONIC EXTRACTION OF SUGAR JUICE FROM CAROB PULP: EFFECTS OF EXTRACTION FACTORS

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ABSTRACT

Carob syrup is one of the main carob-based products. Due to its antibacterial and antioxidant properties, it is appreciated in many sectors, notably in the food industry as a fruit preservative in bakery and confectionery products, and in the pharmaceutical industry for its richness in polyphenols.

Traditionally, carob syrup is produced using a time-consuming process involving solid-liquid extraction in boiling water followed by concentration at high temperature, which can lead to decomposition of its active compounds. For this reason, this study proposes an alternative green extraction method based on ultrasonic technology to produce the sweet juice leading to syrup from carob pulp.

Factors that are important for product quality, such as extraction time and temperature, are not taken into account in the traditional manufacture of carob sugar syrup. Also, increasing the amount of water used in extraction reduces production efficiency and quality, while increasing energy consumption.

In this study, the effects of the independent variables of ultrasound-assisted extraction, namely: extraction time (t) and temperature (T), liquid (water)-solid (carob pulp powder) ratio (L/S) and carob pulp particle size (PS), which affect the quality of the sugar juice quantified by the Brix value of the juice extracted from the carob pulp, were investigated experimentally.

Keywords: Carob pulp, sugar juice, ultrasound, extraction factors, Brix.

THE EFFECT OF NASALE CONGESTION ON ANXIETY AND QUALITY OF LIFE IN SEPTORHINOPLASTY PATIENTS

SEPTORİNOPLASTİ HASTALARINDA BURUN TIKANIKLIĞININ ANKSİYETE VE YAŞAM KALİTESİ ÜZERİNE ETKİSİ

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ÖZET

Amaç: Bu çalışma, septorinoplasti (SRP) hastalarında burun tıkanıklığının anksiyete ve yaşam kalitesi üzerine etkisinin incelenmesi amacı ile yapıldı.

Yöntem: Çalışma tanımlayıcı tiptedir ve bir ilçe devlet hastanesinde yapılan 154 SRP hastası ile yürütüldü. Çalışmanın verileri demografik bilgi formu, Burun Tıkanıklığı Semptom Skalası (BTSS), Spielberg Durumluk Süreklilik Anksiyete Envanteri (STAI), Rinoplasti Yaşam Kalitesi Ölçeği (RYKÖ) olmak üzere 4 ayrı veri toplama aracı ile toplandı. Durumluluk anksiyetesi (DA) ve süreklilik anksiyetesi (SA) ayrı ayrı incelendi. Veriler, SPSS 22.0 paket programı ile değerlendirildi ve yapılan analizlerde verilerin normal dağılım gösterdiği belirlendi bu nedenle parametrik testler ile veriler analiz edildi.

Bulgular: Hastaların yaş ortalaması 23.51 ± 5.45 idi, %76'sının kadındı ve %64,3'ünün cerrahiye tercih etme nedeninin hem nefes alamamak/burun tıkanıklığı hem de eğrilik/şekil bozukluğu olduğu belirlendi. Hastaların cinsiyeti ile BTSS ($p < 0.05$), DA ($p \leq 0.001$) ve SA ($p < 0.001$) arasında, yaşanan yer ile BTSS ve SA arasında ($p < 0.05$), eğitim durumu, sigara kullanım ve çalışma durumu ile DA ve SA arasında ($p < 0.05$), cerrahiye tercih etme nedeni ile BTSS ($p < 0.001$), RYKÖ ($p < 0.001$), DA ve SA ($p < 0.05$) arasında istatistiksel olarak anlamlı fark bulundu. Ayrıca RYKÖ ile BTSS arasında negatif yönlü orta düzeyde ilişki olduğu, DA ve SA ile BTSS arasında negatif yönlü düşük düzeyde anlamlı ilişki olduğu belirlendi ($p < 0.05$).

Sonuç: Sonuç olarak, bu çalışma SRP hastalarının burun tıkanıklığının hem yaşam kalitesini olumsuz etkilediğini hem de durumluluk ve süreklilik anksiyetesini artırdığını ortaya koymaktadır.

Anahtar Kelimeler: Septorinoplasti, burun tıkanıklığı, anksiyete, yaşam kalitesi, hemşire.

ABSTRACT

Objective: This study aimed to investigate the impact of nasal obstruction on anxiety and quality of life in patients undergoing septorhinoplasty (SRP).

Method: The study is of descriptive type and was conducted with 154 patients undergoing SRP at a district state hospital. The data for the study were collected using four different data collection tools: a demographic information form, the Nasal Obstruction Symptom Envantory (NOSE), the State-Trait Anxiety Inventory (STAI) by Spielberg, and the Rhinoplasty Quality of Life Envantory (ROE). State anxiety (SA) and trait anxiety (TA) were examined separately. The data were evaluated using the SPSS 22.0 package program, and since the data showed a normal distribution in the analyses, parametric tests were used for data analysis.

Results: The mean age of the patients was 23.51 ± 5.45 , 76% of whom were female, and it was determined that 64.3% preferred surgery due to both the inability to breathe/nasal obstruction and deviation/shape deformity. Statistically significant differences were found between patients' gender and NOSE ($p < 0.05$), SA ($p \leq 0.001$), and TA ($p < 0.001$). Significant differences were also found between the location of living and NOSE and TA ($p < 0.05$), education level, smoking status, and employment status, and SA and TA ($p < 0.05$), the reason for choosing surgery and NOSE ($p < 0.001$), ROE ($p < 0.001$), SA, and TA ($p < 0.05$). Additionally, a negative moderate-level relationship between ROE and NOSE was determined, and a negative low-level significant relationship between SA and TA with NOSE ($p < 0.05$).

Conclusion: In conclusion, this study reveals that nasal obstruction in SRP patients negatively affects both quality of life and increases state and trait anxiety.

Keywords: Septorhinoplasty, nasal congestion, anxiety, quality of life, nurse.

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GİRİŞ

Burun tıkanıklığı rinoloji uygulamalarında en sık tariflenen şikayettir (Tsang ve ark., 2018). Ana nedenlerinden biri nazal septal deviasyondur ve septal deviasyonun kesin tedavisi olarak kabul edilen septoplasti (Nellis ve ark., 2018), en sık görülen üçüncü kulak/burun/boğaz ameliyatıdır (Valsamidis ve ark., 2019). Nazal septum deviasyonuna atfedilen burun tıkanıklığının, hastaların yaşam kalitesini etkileyen çeşitli semptomlardan sorumlu olduğu gösterilmiştir (Cingi ve Eskiizmir, 2013; Wähmann ve ark., 2018). Ayrıca özellikle external nazal deformitenin eşlik ettiği hastalarda anksiyete de yaşayabilir. Çünkü fiziksel olarak iyi bir izlenim bırakmadıklarını düşünen insanlarda kaygı artar. Bireyler daha genç, daha güzel, daha fark edilebilir olma, takdir görme, karşı cinsi etkileme ve sosyal olarak kabul görme gibi istekleri için insanlık tarihi boyunca estetik operasyonları geçirmek istemektedirler (Sevim ve Sevim, 2014; Nellis ve ark., 2018). Nitekim hastaların durumla başa çıkma şekilleri, yaşadıkları duygusal tepkiler ve adaptasyon süreci, bedensel algılamalar farklılık gösterir (Tulacı ve Arslan, 2020). Ayrıca nazal yapıdaki anormallikler ve deformiteler gibi faktörler nedeniyle septum deviye olabilir (Yang ve ark., 2018). Bu sebeple hastalar nefes almakta zorluk yaşarlar (Kalankuntla ve ark., 2019) ve çoğunlukla septorinoplasti (SRP) adı verilen cerrahi işlem ile tedavi edilirler (Nellis ve ark., 2018). SRP yüz plastik cerrahisinde en sık uygulanan cerrahi prosedürlerden biridir ve burnun hem fonksiyonel hem de estetik açıdan yaşam kalitesini

artırabilir (Hohenberger ve ark., 2023). Ayrıca SRP, sadece burnun şeklini veya fonksiyonel kusurunu düzeltmeyi amaçlayan değil, aynı zamanda hastanın psikolojisini de etkileyen karmaşık bir ameliyattır (Swartout ve Toriumi, 2007). Her cerrahi işlem hastalarda anksiyete sebebidir. Ancak yüz cerrahileri görünür olması nedeni ile kişilerdeki kaygıyı artırır (Hohenberger ve ark., 2023). Hastalar beden algısının bozulmasının yanı sıra fonksiyonel durumun düzelmemesi ile ilgili de kaygı yaşayabilirler. Tüm bu durumlar düşünüldüğünde SRP hastalarının ameliyatları boyunca uygun bakımın verilmesinin önemi ortaya çıkmaktadır. Ancak ne yazık ki günümüzde en çok göz ardı edilen durumlardan biri de SRP gibi estetik cerrahi hastalarının perioperatif bakımındır. Bu nedenle SRP hastalarının yaşadıkları durumların ve etkilerinin belirlenmesi; hem hemşirelerin hasta ile ilişkili farkındalığını artıracak hem de hastalara verilen bakım kalitesini olumlu yönde etkileyecektir. Bu nedenle bu çalışmada, SRP hastalarında burun tıkanıklığının anksiyete ve yaşam kalitesi üzerine etkisinin incelenmesi amaçlandı.

YÖNTEM

Araştırmanın Tipi

Bu araştırma, tanımlayıcı tiptedir.

Araştırmanın Yapılacağı Yer ve Özellikleri

Araştırma, Sivas iline bağlı Suşehri ilçesinin devlet hastanesinde cerrahi kliniğinde ve yürütüldü. Suşehri Devlet Hastanesi ortopedi, gastrointestinal sistem, göz, kulak burun boğaz, kadın hastalıkları ve ürogenital sistem cerrahisi uygulanan hastaların tedavi edildiği bir genel cerrahi kliniğine ve ameliyathaneye sahip olan üçüncü basamak sağlık hizmeti veren bir kurumdur.

Araştırmanın Evreni ve Örneklem Seçimi

Araştırmanın evrenini, 1 Mayıs 2023 – 1 Ocak 2024 tarihleri arasında Suşehri Devlet Hastanesi'nde SRP cerrahisi geçiren bireyler oluşturdu. Çalışmada, hastanenin yatak sayısının az olması nedeni ile örneklem seçimi yapılmadı, hastaların tamamına ulaşılmaya çalışıldı ve uygulama tarihleri arasındaki tüm SRP hastalarına ulaşıldı. Haftada 3-5 arasında SRP vakasına işlem yapıldı. Çalışma toplam 154 kişi ile tamamlandı.

Veri Toplama Araçları

Araştırmanın verileri; demografik bilgi formu, Burun Tıkanıklığı Semptom Skalası (BTSS), Spielberg Durumluk Süreklilik Anksiyete Envanteri (STAI), Rinoplasti Yaşam Kalitesi Ölçeği (RYKÖ) 4 ayrı veri toplama aracı ile toplandı.

- **Demografik Bilgi Formu:** Form literatür doğrultusunda (Gerecci ve ark. 2019; Wähmann ve ark. 2018; Çelik ve Altıntaş, 2019) araştırmacılar tarafından oluşturuldu. Formda yaş, cinsiyet, yaşanılan yer, medeni durum, öğrenim durumu, çalışma durumu, sigara-alkol kullanımı ve burunla ilişkili yaşanan temel soruna yönelik toplam 9 soru yer aldı.
- **Burun Tıkanıklığı Semptom Skalası (BTSS):** Stewart ve ark. tarafından (2004) geliştirilen BTSS'nin Türkçe geçerlilik ve güvenilirlik çalışması 2018 yılında Karahatay ve ark. tarafından yapılmıştır. BTSS hastaların son bir ayda yaşadığı yakınmaları değerlendirmek amacıyla yapılır. Bu skalada hastalara burunda şişlik, burunda nefes almada güçlük, uyuma güçlüğü ve egzersiz veya yorulma anında burundan yeterli nefes alamama gibi semptomlarına yönelik değerlendirme yapılır. Buradan elde edilen ve 0-20 arasında değişen ham değerler 0-100 arasında puanlanması için 5 ile çarpılır. Ölçek için Cronbach alfa değerleri Stewart ve ark. tarafından 0.78, Karahatay ve ark. tarafından 0.86 olarak bulunmuştur (Stewart ve ark, 2004; Karahatay ve ark, 2018) Bu çalışmada ise Cronbach alfa değeri 0,89 olarak belirlendi.

- **Spielberg Durumluk Süreklilik Anksiyete Envanteri (STAI):** STAI Spielberger ve arkadaşları (1971) tarafından geliştirilmiştir. Türkçe geçerlilik ve güvenilirlik çalışması, Öner ve Lecompte (1977) tarafından yapılmıştır. Durumluk ve Sürekli Anksiyete Envanteri; bireyin belirli bir anda ve belirli koşullarda kendisini nasıl hissettiğini betimlenmesi için, ölçeğin maddelerinden o anki duyguların şiddetine göre (1) hiç, (2) biraz, (3) oldukça, (4) tamamen seçeneklerinden birinin işaretlenmesini içerir. Ölçek; bireyin genellikle kendisini nasıl hissettiğini duygularının sıklık derecesine göre, (1) hemen hemen hiçbir zaman, (2) bazen, (3) çok zaman, (4) hemen her zaman gibi dört seçenekten bir tanesinin işaretlenmesini gerektirir. Durumluk ve Sürekli Anksiyete Envanteri, her bir ölçekte 20 madde olmak üzere toplam 40 maddeden oluşmuştur. Ölçeklerde iki tür ifade bulunmaktadır, bunlara; doğrudan ya da düz (direct) ve tersine dönmüş (reverse) ifadeler denmektedir. Doğrudan ifadeler, olumsuz duyguları; tersine dönmüş ifadeler ise olumlu duyguları dile getirmektedir. Durumluluk anksiyete (DA) envanterinde 10 adet tersine dönmüş ifade bulunmaktadır. Bunlar: 1., 2., 5., 8., 10., 11., 15., 16., 19., 20. maddelerdir. Sürekli Anksiyete (SA) Envanterinde ise, tersine dönmüş ifadelerin sayısı yedidir. Bunlar: 21., 26., 27., 30., 33., 36. ve 39. maddeleri oluşturur. Puanlama elle ya da bilgisayarla olmak üzere iki şekilde yapılır. Elle puanlamada doğrudan ve tersine dönmüş ifadelerin ayrı ayrı toplam ağırlıkları saptanır. Doğrudan ifadeler için elde edilen toplam ağırlık puanından, ters ifadelerin toplam ağırlıklı puanı çıkartılır. Bu sayıya önceden saptanmış ve değişmeyen bir değer eklenir, DA için bu değer 50, SA için ise 35'tir. En son elde edilen puan bireyin anksiyete puanıdır. Ölçekten elde edilen puanlar kuramsal olarak 20 ile 80 arasında değişmektedir. DA ve SA puanlarının kesim noktası yoktur. Yüksek puan yüksek anksiyete düzeyini, düşük puan ise düşük anksiyete düzeyini ifade etmektedir. Toplam puan üzerinden 20-29: Anksiyete yok; 30-37: Hafif anksiyete; 38-44: Orta düzey anksiyete; 45-80: Ciddi anksiyete olarak değerlendirilmektedir. Türkiye'deki uygulamalarda saptanan ortalama puan düzeyi 36-41 arasında değişmektedir (Öner ve Le Compte 1998). Ölçeğin cronbach alfa değeri DA için 0.94-0.96 arasında, SA için ise, 0.84-0.85 arasında belirlenmiştir. Bu çalışmada ise cronbach alfa değeri DA için 0.90, SA için ise, 0.83 olarak belirlendi.

- **Rinoplasti Yaşam Kalitesi Ölçeği (ROE):** ROE Türkiye'de 2009 yılında Ünlü ve ark. tarafından geliştirilen bir ölçme aracıdır. Eksternal nazal rekonstrüksiyon yapılan hastaların, fonksiyonel ve estetik sonuçlardan tatmin olma miktarlarını belirlemek için standardize edilmiş 6 sorudan oluşan ve 5 li likert ölçeği ile değerlendirilen bir testtir. Her soruya 0 ile 4 arasında bir puan verilir. Yüksek puan fonksiyonel ve estetik memnuniyeti düşük puan ise memnuniyetsizliği gösterir. Ölçeğin cronbach alfa değeri 0.70 olarak belirlenmiştir. Bu çalışmada ise cronbach alfa değeri 0.72 olarak bulundu.

Araştırma Verilerinin Toplanması

Araştırmaya başlamadan önce Sivas Cumhuriyet Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu'ndan Etik Kurul Onayı (Karar No: 2023-04/01) alındı. Örneklemeye alınan katılımcılara araştırmanın konusu ve amacı hakkında gerekli bilgiler verildi. Katılımcılardan araştırmaya katılmayı kabul ettiklerine dair izin alındı, veri toplama araçları katılımcılara; yapılacak çalışma ile ilgili bilgilendirilmiş hasta onamı alındıktan sonra genel cerrahi kliniğinde yüz yüze olarak uygulandı.

Verilerin Değerlendirilmesi

Veriler, SPSS 22.0 paket programı ile değerlendirildi. Analizlere başlamadan önce veriler, Kolmogorov-Smirnov testi kullanılarak normal dağılım açısından incelendi. Verilerin normal dağılım gösterdiği belirlendi. Bu nedenle bağımsız iki grup için independent sample t testi ile analiz edildi. İki den fazla gruplu karşılaştırmalar için ANOVA kullanıldı. Ölçek toplam puan ortalamaları arasındaki ilişkiyi ortaya çıkarmak için Pearson Korelasyon analizi yapıldı. Sonuçlar %95 güven aralığında ve $p < 0.05$ anlamlılık düzeyinde değerlendirildi.

BULGULAR

Hastaların tanıtıcı özellikleri Tablo 1’de verilmiştir. Tablo incelendiğinde hastaların yaş ortalamasının 23.51(Ss±5.45) olduğu görülmektedir. Ayrıca hastaların %76’sının kadın %98,1’inin kentsel bölgede yaşadığı %87,7’sinin bekar olduğu, %68,2’sinin üniversite mezunu olduğu %68,8’inin sigara kullanmadığı %94,8’inin alkol kullanmadığı %72,1’inin çalışmadığı ve %64,3’ünün cerrahiye tercih etme nedeninin hem nefes alamamak/burun tıkanıklığı hem de eğrilik/şekil bozukluğu olduğu belirlendi.

Tablo 1. Hastalarının Tanıtıcı Özellikleri (n=154)

Tanıtıcı Özellikler	$\bar{X} \pm Ss$	
Yaş	23.51±5.45	
	n	%
Cinsiyet		
Kadın	117	76
Erkek	37	24
Yaşadığı yer		
Kentsel	151	98,1
Kırsal	3	1,9
Medeni durum		
Evli	19	12,3
Bekar	135	87,7
Eğitim durumu		
İlkokul	2	1,3
Ortaokul	2	1,3
Lise	45	29,2
Üniversite	105	68,2
Sigara kullanımı		
Evet	48	31,2
Hayır	106	68,8
Alkol kullanımı		
Evet	8	5,2
Hayır	146	94,8
Çalışma durumu		
Evet	43	27,9
Hayır	111	72,1
Cerrahiye tercih etme nedeni		
Nefes alamama/burun tıkanıklığı	7	4,5
Eğrilik/şekil bozukluğu	48	31,2
Her ikisi de	99	64,3

Tablo 2’de hastaların tanıtıcı özelliklerine göre burun tıkanıklığı, rinoplasti yaşam kalitesi, durumluluk ve süreklilik anksiyetesi ölçek puan ortalamalarının karşılaştırılması verilmiştir. Tabloya göre; cinsiyet ile BTSS ($p<0.05$), DA ($p\leq 0.001$) ve SA ($p<0.001$) arasında, yaşanan yer ile BTSS ve SA arasında ($p<0.05$), eğitim durumu ile DA ve SA arasında ($p<0.05$), sigara kullanımı ile DA ve SA arasında ($p<0.05$), çalışma durumu ile DA ve SA arasında ($p<0.05$), cerrahiye tercih etme nedeni ile BTSS ($p<0.001$), RYKÖ ($p<0.001$), DA ($p<0.05$) ve SA ($p<0.05$) arasında istatistiksel olarak anlamlı fark bulundu.

Tablo 2. Hastaların tanıtıcı özelliklerine göre burun tıkanıklığı, rinoplasti yaşam kalitesi, durumluluk ve süreklilik anksiyetesi ölçek puan ortalamalarının karşılaştırılması (n=154)

Tanıtıcı Özellikler	BTSS	RYKÖ	DA	SA
	$\bar{X} \pm Ss$	$\bar{X} \pm Ss$	$\bar{X} \pm Ss$	$\bar{X} \pm Ss$
Cinsiyet				
Kadın	34,23±24,05	15,38±2,48	49,66±7,95	49,45±7,30
Erkek	43,24±19,66	15,64±2,58	44,84±6,74	40,38±7,55
TEST (t)	5,135	,010	,531	,154
p	,024*	,587	,001**	,000**
Yaşanan yer				
Kentsel	35,89±23,28	15,40±2,47	48,41±7,98	47,25±8,38
Kırsal	61,67±2,89	18,00±3,46	53,00±3,46	48,33±1,15
TEST (t)	5,497	,638	1,674	4,257
p	,020*	,426	,198	,041*
Medeni durum				
Evli	41,05±25,03	14,79±1,87	47,42±7,40	43,32±7,72
Bekar	35,74±23,10	15,54±2,57	48,65±8,01	47,83±8,26
TEST (t)	,231	3,828	,291	,004
p	,632	,052	,590	,947
Eğitim durumu				
İlkokul	65,00±0,00	16,50±3,54	55,00±2,83	45,00±2,83
Ortaokul	57,50±17,68	13,00±1,41	46,00±8,49	56,50±6,36
Lise	38,00±24,18	15,20±2,68	45,64±8,07	44,16±8,25
Üniversite	34,76±22,85	15,58±2,42	49,65±7,65	48,48±8,05
TEST (F)	1,819	1,004	3,336	3,937
p	,146	,393	,021*	,010*
Sigara kullanımı				
Evet	37,92±23,63	15,29±2,57	46,08±7,65	44,67±9,84
Hayır	35,71±23,27	15,52±2,48	49,59±7,85	48,45±7,25
TEST (t)	,000	,001	,151	8,222
p	,591	,608	,010*	,005*
Alkol kullanımı				
Evet	30,00±26,59	16,25±1,98	47,63±7,13	48,50±9,30
Hayır	36,75±23,19	15,40±2,52	48,55±7,99	47,21±8,28
TEST (t)	,018	,884	,032	,110
p	,892	,349	,858	,740
Çalışma durumu				
Evet	40,12±24,89	15,60±2,66	46,33±8,32	43,86±9,15
Hayır	34,96±22,65	15,39±2,44	49,34±7,65	48,59±7,59
TEST (t)	,253	,759	,300	3,778
p	,616	,385	,043*	,004*
Cerrahiye tercih etme nedeni				
Nefes alamama/burun tıkanıklığı	65,00±19,36	18,29±1,38	41,57±5,80	42,00±3,21
Eğrilik/şekil bozukluğu	12,60±17,68	14,54±2,15	50,38±6,49	49,69±7,92
Her ikisi de	45,91±15,80	15,69±2,53	48,08±8,41	46,47±8,45

TEST (F)	76,301	8,962	4,329	4,054
p	,000**	,000**	,015*	,019*

**p<0.001, *p<0.05, BTSS: Burun Tıkanıklığı Semptom Skalası, RYKÖ: Rinoplasti yaşam kalitesi ölçeği, DA:Durumluluk Anksiyete, SA: Süreklilik Anksiyete

Kadın cinsiyetin DA ve SA ölçek puan ortalamaları erkeklere oranla daha yüksekti. Kırsal bölgede yaşayanların kentsel bölgede yaşayanlara göre ve ilkokul mezunu olan hastaların diğer öğrenim düzeyine sahip olan hastalara göre tüm ölçek puan ortalamaları daha yüksek bulundu. Evli olanların bekar olanlara oranla; BTSS puan ortalaması daha yüksek; RYKÖ, DA ve SA puan ortalamaları daha düşük olarak belirlendi. Sigara kullananların kullanmayanlara oranla; BTSS puan ortalaması daha yüksek, DA ve SA puan ortalamaları daha düşük, RYKÖ puan ortalamalarının benzer olduğu olarak belirlendi. Diğer değişkenlere göre, ölçek puan ortalamaları tabloda yer almaktadır.

Ölçek toplam puan ortalamalarının BTSS ile korelasyon analizi incelendiğinde (Tablo 3), RYKÖ ile BTSS arasında negatif yönlü orta düzeyde ilişki olduğu, DA ve SA ile BTSS arasında negatif yönlü düşük düzeyde anlamlı ilişki olduğu görülmektedir (p<0.05).

Tablo 3. Burun tıkanıklığı, yaşam kalitesi, durumluluk ve süreklilik anksiyetesi ölçek puan ortalamaları arasındaki Pearson korelasyon analizi (n=154)

ÖLÇEKLER	BTSS	
	r	p
RYKÖ	-,371**	,000
DA	-,185*	,021
SA	-,194*	,016

**p<0.001, *p<0.05, BTSS: Burun Tıkanıklığı Semptom Skalası, RYKÖ: Rinoplasti yaşam kalitesi ölçeği, DA:Durumluluk Anksiyete, SA: Süreklilik Anksiyete

TARTIŞMA

SRP hem kozmetik amaçlı hem de fonksiyon kaybını gidermek için yapılan kompleks bir cerrahidir. Günümüzde tüm estetik cerrahi işlemleri ile birlikte SRP ameliyatında da artış gözlenmektedir. SRP hastaların yaşam kalitesinin artırılmasını da hedeflemektedir. Bu bağlamda bu çalışma, SRP hastalarında burun tıkanıklığının anksiyete ve yaşam kalitesi üzerine etkisinin incelenmesi amacı ile yapıldı.

Bu çalışma, kadınlara erkeklere oranla daha fazla SRP cerrahisi uygulandığını göstermektedir. Ayrıca bu çalışmada erkeklerin daha yoğun burun tıkanıklığı yaşadığı, ancak kadınların yaşam kalitesinin erkeklere oranla daha düşük olduğu, aynı zamanda durumluluk ve süreklilik anksiyetelerinin de daha yüksek olduğu bulundu. Bu durum Türk toplumunda kadın cinsiyetin beden algısında bozulmasının erkeklerden daha fazla olmasından kaynaklı olduğunu düşündürmektedir. Burun tıkanıklığını daha az yaşamalarına rağmen cerrahi işlem oranlarının erkeklere oranla fazla olması bu durumu açıklayabilir. Nitekim diğer çalışmalar (Yamasaki ve ark., 2019; Gürler ve Demir, 2023; Vermisli ve ark., 2021) da kadınların cerrahi işlemi tercih etme oranlarının erkeklere oranla fazla olduğunu göstermektedir. Ayrıca yapılan bir çalışmada (Hohenberger ve ark., 2023); SRP hastalarında beden algısındaki bozukluğun yaşam kalitesini azalttığı bulunmuştur. Başka bir çalışma SRP olan kadın hastaların erkeklere oranla yaşam kalitesinin daha düşük olduğunu ortaya koymuştur (Arrington-Sanders ve ark., 2006).

Bu çalışmada; kırsal bölgede yaşayan hastaların burun tıkanıklığının kentsel bölgede yaşayanlara oranla daha yüksek olduğu bulundu ve kırsal bölgede yaşayanların süreklilik anksiyetesi de daha yüksekti. Bu durum SRP cerrahisinin daha çok kentsel bölgelerdeki sağlık

hizmeti verilen hastanelerde gerçekleşmesi ve sağlık kurumuna iletişimin zor olmasından dolayı daha yüksek anksiyete yaşamalarına neden olması şeklinde açıklanabilir. Bu bulguyu destekleyecek ya da çürütecek başka bir sonuca literatürde rastlanmamıştır. Bu nedenle kırsal bölgede yaşayan SRP hastalarının takip edilme süreci önem kazanmaktadır.

Bu çalışmada; eğitim seviyesi ile durumluluk ve süreklilik anksiyete puanları arasında istatistiksel olarak fark bulundu ancak eğitim seviyesi ile bu puanların artış ya da azalışı arasında belirgin bir fark kanıtlanamadı. SRP cerrahisi yapılan hastaların eğitim durumları ile burun tıkanıklığı, yaşam kalitesi ve anksiyete düzeyinin karşılaştırıldığı bir çalışmaya rastlanılmadı. Ancak son zamanlarda SRP dışında yapılan cerrahi işlemler ile ilgili STAI düzeyinin ölçüldüğü bir çalışmada (Şavk ve ark., 2022) eğitim düzeyi yükseldikçe anksiyetenin artacağı; diğer çalışmalarda ise durumun tam tersi yönde olduğu (Altınbaş ve Kutanis, 2023; Peker, 2020; Baysal ve ark., 2022) bulunmuştur. Bu durum bu konuda daha fazla araştırma yapılmasının gerekliliğini ortaya koymaktadır.

Sunulan çalışmaya göre; sigara kullananların ise burun tıkanıklığı daha fazla idi. Yapılan bir çalışma da (Larrosa e ark., 2015) bizim çalışmamızın sonuçlarını doğrular nitelikte olup, sigara kullananların daha yoğun burun tıkanıklığı yaşadığını göstermektedir. Ayrıca sigara kullanmayan hastaların DA ve SA kullananlara oranla daha yüksekti. Bu sonuçlar; burun tıkanıklığı yaşayan ve sigara kullanan kişilerin anksiyete düzeylerinin düşük olduğunu göstermektedir. Bu durum sigaranın etkisiz baş etme yöntemi olmasına rağmen hastaların anksiyete düzeyini düşürmede etkili olabileceğini düşündürmektedir.

Bu çalışmada; cerrahiyi tercih etme nedeni şekil bozukluğu olan hastaların burun tıkanıklığının ve yaşam kalitesi düzeyinin en az olduğu ancak en yoğun anksiyete düzeyine sahip oldukları ortaya koyulmuştur. Bu durumda, cerrahiyi estetik amaçlı tercih eden hastaların fonksiyon kaybı yaşayanlara oranla anksiyete düzeyinin daha fazla olması şeklinde açıklanabilir. Çünkü estetik cerrahinin Türkiye’de isteğe bağlı olarak yapıldığı göz önünde bulundurulursa, hastanın olumsuz sonuçlarla karşılaşma riski anksiyete düzeyini yükseltebileceğini düşündürmektedir.

Çalışmanın sonuçları hastaların burun tıkanıklığının hem yaşam kalitesini olumsuz etkilediğini hem de durumluluk ve süreklilik anksiyetesini artırdığını ortaya koydu. Bu durum nazal geçirgenliğin yaşam kalitesini etkilediğini düşündürebilir. Ancak hasta popülasyonumuzda tıkanıklığın nedeni hasta hoşnutsuzluğunun ana nedeni olmayabilir ve hastanın duygusal durumu gibi diğer faktörler bu algıyı etkileyebilir. Çünkü çalışmamızda estetik nedenle ameliyatı tercih edenlerin sayısı daha fazla idi. Ayrıca son zamanlarda yapılan çalışmalarda (García-Chabur ve ark., 2023; Feng ve ark., 2022), SRP sonrası burun tıkanıklığının azalması ile birlikte yaşam kalitesinde artış olduğunu göstererek bizim çalışmamızın sonuçlarını desteklemektedir.

SONUÇ

SRP cerrahisi uygulanan hastalarda burun tıkanıklığının yaşam kalitesini düşürdüğü, durumluluk ve süreklilik anksiyetesini artırdığı sonucuna varıldı. Bu çalışma, analiz etmek istediğimiz parametreleri ölçmek için doğrulanmış ölçekler kullandığımız bir çalışma olma avantajına sahip olmakla birlikte sonuçların SRP hastaları popülasyonuna genellenebilmesi için, bu ölçeklerin kullanılarak daha fazla çalışmanın literatüre katkı sunması önerilmektedir. Ek olarak, literatürde SRP hastalarındaki burun tıkanıklığının hastanın yaşamını nasıl etkilediğini ve kaygı durumunu değerlendiren herhangi bir çalışmaya rastlanılmaması bu çalışmanın farkındalık yaratması açısından önemli olduğunu düşündürmektedir.

Araştırmanın Sınırlılıkları: Bu çalışmanın bazı sınırlılıkları vardı. Bunlar: randomize olmayan örneklem, çalışmanın bir ilçede üçüncü basamak bir hastanede sınırlı sayıda hasta

popülasyonu ile yürütülmesi ve örneklemin sadece SRP cerrahi endikasyonu olan hastalardan oluşması.

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EVALUATION COMPORTEMENTALES ET ADAPTATIVES D'UN STRESS DE CONTENTION CHEZ LES RATTES WISTAR

EFFET D'UN ORGANOPHOSPHOREE ET D'UN ANTIOXYDANT SUR LES PARAMETRES BIOCHIMIQUES DANS UN ENVIRONNEMENT NOCICEPTIF CHEZ LE RAT MALE WISTAR

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Résumé

Avec le rythme accéléré de notre mode de vie à l'époque actuelle, les pressions et les tensions augmentent et la sensation de stress augmente. Le stress est un groupe de réactions physiques et physiologiques du corps face à une situation spécifique qui peut généralement affecter tout organisme vivant. Pendant une courte période, cependant, l'état de stress chronique est satisfaisant.

Chez les rongeurs de laboratoire, nous avons exercé un stress causé par la retenue de l'animal, exposant ainsi l'organisme à l'anxiété et à la peur résultant de l'incapacité de s'échapper. Grâce à cette expérience, nous avons voulu faire la lumière sur l'action récurrente des pressions d'adhérence, en plus d'étudier le poids corporel, le glucose, le cholestérol et les triglycérides.

Par conséquent, nous avons soumis 12 rats femelles à deux séances de pression par jour (matin-après midi). Attaché dans un flacon en plastique sur une période de 10 jours, après quoi nous avons mesuré le niveau d'anxiété, de mouvement et d'activité exploratoire à travers le test de Open field et le test de Place maze et les avons comparés au groupe témoin.

Les résultats confirment l'effet négatif et néfaste sur le corps du stressé, et donc la santé et l'éthique psychologique doivent être respectées pour un corps sain et sain.

Mots clés : Stresse de contention, Anxiété, Ratte, Paramètres biochimiques, Poids corporel.

Résumé

Les composés organophosphorés (COP) sont une classe importante de substances chimiques organiques, ils ont en commun une certaine liposolubilité et leur mode d'action sur le système nerveux en tant qu'inhibiteurs irréversibles de l'acétylcholinestérase, ce qui les rend très toxiques. Malgré les interdictions ou restrictions d'utilisation et la faible persistance de ces COP, ils sont détectés dans les sols, les eaux de surface et les organismes vivants dans tous les pays du monde. Parmi les organophosphorés, nous nous sommes intéressés au méthyl parathion « insecticide organophosphoré » qui est largement étudié pour ses propriétés neurotoxiques chez les mammifères et les poissons.

Ce travail consiste à mettre en évidence d'une part, l'effet inhibiteur des organophosphates (méthyl parathion) sur les taux de glucose, cholestérol et les triglycérides. D'autre part, étudier l'effet de la taurine antioxydante associée au MPT sur les paramètres biochimiques chez des rats mâles Wistar.

L'expérimentation consiste à administrés aux 18 rats males répartis en 3 lots à raison de 6 rats par lots, il s'agit : le lot T (témoin), le lot gavé au MPT (4mg/Kg) et le lot gavé au MPT + TA (2%) pendant 10 jours.

Les résultats obtenus montrent que l'insecticide organophosphoré appliqué par gavage induit des modifications des taux de glucose, cholestérol et les triglycérides. Le traitement de rats gavés (MPT) avec de la taurine a restauré les valeurs basales.

Le traitement MPT induit une augmentation significative de la concentration en glucose, triglycérides et cholestérol dans le sang. Le traitement des rats gavés au (MPT) par la taurine rétablie les valeurs basales des paramètres métaboliques.

Mots clé : MPT, La taurine, Glucose, Cholestérol, Triglycérides, Rat.

PHYSICAL EXERCISE OF GERIATRIC PATIENTS WITH ASSISTIVE HEALTH-CARE HUMANOID ROBOTS UTILIZING SOCIAL DIALOGUE AND MACHINE LEARNING ALGORITHMS

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ABSTRACT

The emergence of socially assistive health-care humanoid robots constitutes a promising technological intervention aimed at alleviating the challenges associated with the aging population. These sophisticated robots, for instance, have the ability to provide personalized physical exercise routines based on the specific requirements of geriatric individuals. This paper proposes a four-stage physical exercise algorithm and subsequently illustrates its implementation to Humanoid Robots (HRs). The initial stage of the proposed algorithm involves the Viola-Jones algorithm to accurately detect and continuously track the human body within the robot perceptual framework. Following this, geometric-based distance measurements are employed to characterize human actions, thereby enabling the algorithm to comprehend physical movements relevant to targeted exercises for geriatric individuals. Then, in the third stage, the characterized human actions are learned through a Long Short-Term Memory-Based Recurrent Neural Network (LSTM-RNN) combined with a genetic algorithm. Finally, in the last stage, a structured and user-friendly engagement is executed by employing a Finite State Machine (FSM) dialogue model. While this algorithm is expressly implemented on Alpha Mini and Alpha 1Pro HRs within the scope of this research, but its applicability extends to encompass all other HRs. The reliability of the developed algorithm is rigorously substantiated through a comprehensive analysis of each terminal decision across all stages with the evaluation of exercise stages derived from the learned human actions. Moreover, a comprehensive assessment of the computational burden and accuracy of the algorithm is conducted to demonstrate the efficacy of the proposed algorithm.

Keywords: Finite state machine, Genetic algorithm, Geriatric individuals, Humanoid robots, Long short-term memory-based recurrent neural network, Physical exercise, Viola-Jones algorithm.

INTRODUCTION

According to the Turkish Statistical Institute (2023), the population of individuals aged 65 and above has increased significantly over the last five years. In 2017, this demographic consisted of 6,895,385 people, experiencing a notable growth of 22.6% by 2022, reaching a total of 8,451,669 individuals. This demographic shift is noteworthy, especially considering its impact

on the overall population dynamics. The proportion of the geriatric population within the total population has also seen an uptick, rising from 8.5% in 2017 to 9.9% in 2022.

Despite this demographic shift, there exists a concerning trend of a low rate of physical exercise among these geriatric individuals. In this regard, World Health Organization (2023) recommends regular physical exercise for individuals aged 65 and above. This includes dedicating a minimum of 150 minutes per week to moderate-intensity aerobic activities or 75 minutes per week to vigorous-intensity activities. Muscle-strengthening activities should be incorporated into their routine on two or more days each week (Di Lorito et al., 2022). To enhance functional ability and reduce falls, activities aimed at improving balance and flexibility should be performed on at least three days. Beginners should start with shorter durations and gradually increase the duration, frequency, and intensity. Furthermore, encouraging and facilitating exercise among the geriatric individuals can mitigate the risks associated with sedentary lifestyles, such as cardiovascular diseases and muscular atrophy. It plays a pivotal role in maintaining mobility, managing chronic conditions, and enhancing mental health. It also fosters social interactions and community engagement, addressing not only the physical but also the emotional and social aspects of aging such as cognitive decline and depression (Larsson Ranada and Österholm, 2022).

The integration of assistive humanoid robots in the domain of geriatric care holds considerable potential for enhancing well-being through improved access to physical exercise opportunities. These robots offer personalized exercise programs tailored to individual needs, thereby providing support in a safe environment. Moreover, they possess the ability to monitor exercise sessions over an extended duration, evaluate progress, and facilitate the sharing of relevant data with healthcare professionals for more effective health management. A significant number of studies in the literature have focused on the utilization of assistive humanoid robots for interventions aimed at facilitating physical exercise among geriatric patients. For instance, Fasola and Matarić (2013) employed the Bandit robot to facilitate upper body exercises in a one-on-one setting. Therein, participants interacted with both a physical robot and a virtual representation over four sessions. The study aimed to assess user acceptance, perception, and the impact of embodiment. Notably, participants engaging with the physical robot evaluated it more favorably, but no statistically significant differences were observed in participant performance between the two study groups.

In their investigation, Schneider and Kümmert (2016) aimed to determine the influence of a humanoid robot as an exercise partner on user engagement during physical activities. The study involved 56 participants who performed five isometric exercises under three conditions: exercising alone, with a humanoid robot instructor, or with a humanoid robot companion. The results indicated that the presence of a humanoid robot companion led to increased motivation and longer exercise durations compared to the other conditions. In a separate investigation conducted by Görer et al. (2017), the NAO robot was programmed to learn exercises from human demonstrators using geometric-based distance measurements with derivatives-free Constrained Optimization BY Linear Approximations (COBYLA) (Bagnato, Farcomeni, and Punzo, 2023). The robot then performed these exercises with older adults in one-on-one exercise sessions over a 5-week period. The investigation showed significant improvements in participants' exercise performance after three sessions for most exercises. Participants reported high levels of enjoyment and accepted the robot as their fitness coach. However, there was a slight decline in the robot's acceptance as a friend over time, with participants preferring human companions. During complex exercises, participants initially displayed confusion but became more familiar with the robotic exercise regimen over time.

In a subsequent study, Martinez-Martin and Cazorla (2019) focused on developing a socially assistive robot to encourage exercise among geriatric individuals. They created a specialized

image dataset for recognizing specific physical exercises and conducted a comparative analysis of deep learning approaches using geometric-based distance measurements. In another inquiry, Ruf, Lehmann, and Misoch (2020) assessed the feasibility of using a robot as a motivational tool for physical activity in older adults' home environments. The study involved seven participants who engaged in a 12-14 week training period with three instruction conditions: robot, video, and written instructions. While participants accepted and appreciated the robot, they would not recommend it due to technical and other issues, highlighting the need for further modifications to make it suitable for autonomous exercise training at home for older adults.

Similarly, Céspedes et al. (2021) utilized a NAO robot to provide assistance in outpatient cardiac rehabilitation for a duration of 18 weeks, consisting of 36 sessions, targeting individuals aged 43 to 80 years. The robot performed the dual functions of heart rate monitoring via electrocardiogram and posture tracking, promptly notifying healthcare staff if the heart rate exceeded the established threshold and delivering feedback to encourage proper cervical posture. The findings revealed that participants who received robot-assisted rehabilitation exhibited a reduced dropout rate and demonstrated significant improvements in cardiovascular recovery compared to those who did not have access to the robot under baseline conditions. In their study, Duczek, Kerzel, and Wermter (2021) proposed a Grow-When-Required Network (GWR) with recurrent connections, episodic memory, and a sub-node mechanism for detecting and correcting physical exercises. Therein, GWR stores pose and movement information for each exercise frame and compares it to the predicted output, providing feedback on both pose and motion velocity. Using an expert's performance as a reference, the Pepper humanoid robot provides feedback on patient execution. To address multiple users, they monitored catastrophic forgetting and introduced a synthetic dataset methodology.

In a study by Salomons et al. (2022), the impact of a physical robot versus a video-displayed robot on exercise was assessed. Key points related to the body's center were translated and normalized by torso length to accommodate height variations. The accurate execution of exercises was determined through the utilization of support vector machines, k-nearest neighbor, and a feedforward neural network in conjunction with Kalman filters. Participants in the robot condition reported increased fitness and higher exercise motivation than those in the tablet condition. In a recent study, Hun Lee et al. (2023) iteratively engaged therapists and post-stroke survivors to design, develop, and evaluate a personalized social robot equipped with an exercise coaching system. This integrated system utilizes an Adam Optimizer and a rule-based neural network model for the autonomous monitoring and assessment of patients' exercises. The system demonstrated substantial performance improvements by achieving an average performance of 0.81 in a real-world evaluation with post-stroke survivors.

In conjunction with the aforementioned noteworthy studies, the distinctive aim of this paper is to initiate the development of assistive health-care HRs which can act as personal trainers for geriatric individuals by administering periodic physical exercises. This contribution is pursued through the integration of a social dialogue and a machine learning-based solution into the robotic framework. The ultimate aspiration is to evolve HRs into personalized and social entities capable of positively impacting the lives of geriatric individuals at every stage of life. In pursuit of these objectives, the proposed algorithm involves Viola-Jones for accurate human detection, geometric-based measurements for action characterization, LSTM-RNN combined with a genetic algorithm for learning actions, and a user-friendly engagement through FSM dialogue model. Although implemented on Alpha Mini and Alpha 1Pro HRs, the algorithm's applicability extends to all HR models. Rigorous analysis validates decision reliability, exercise stage evaluation, computational burden, and algorithm accuracy.

In the rest of the paper, Section 2 reviews the proposed physical exercise algorithm, Section 3 introduces the Viola-Jones algorithm, and Section 4 explains geometric-based distance

measurements. Section 5 presents the explanation of the LSTM-RNN combined with a genetic algorithm. Section 6 gives information about the FSM dialogue model and Section 7 express the implementation of the algorithm on Alpha Mini and Alpha 1Pro HRs. Then, Section 8 analyses the simulation and experimental results and finally, Section 9 summarizes the paper.

HUMAN BODY DETECTION USING VIOLA-JONES ALGORITHM

This section provides a concise overview of the Viola-Jones algorithm used for human body detection. The algorithm comprises four key steps, namely Haar-like features, integral image, Ada-Boost, and Cascade classifier. Initially, the algorithm partitions the input image into parallelogram rectangles to enhance the efficiency of feature extraction. Herein, the number of the rectangles varies, but generally, two, three or four rectangles are considered to extract the desired human body features as shown in the following figure.

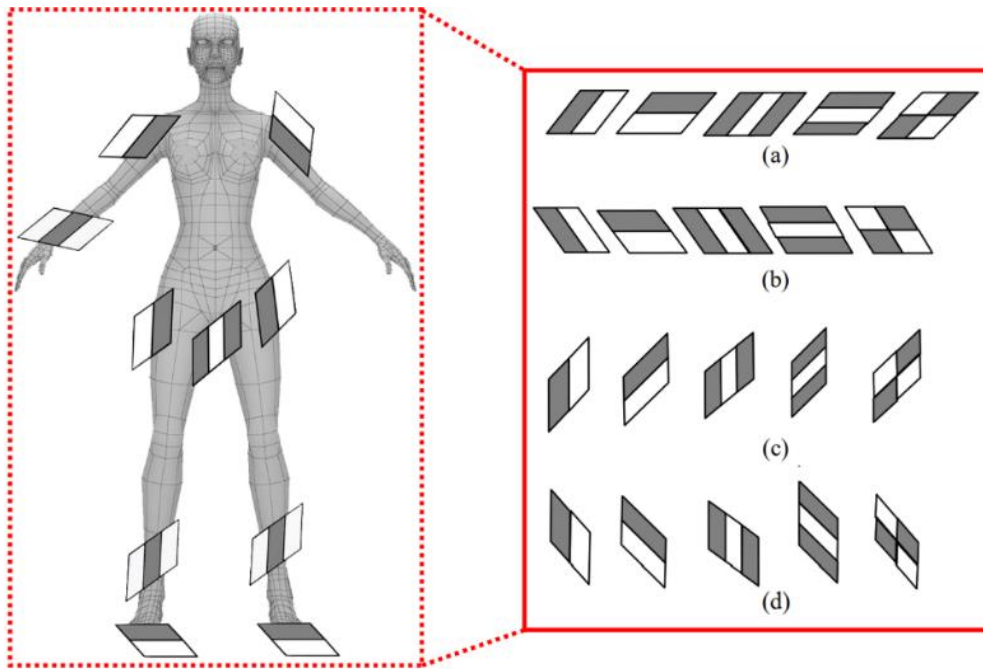


Figure 26. Rectangle-based feature collection with two, three, and four rectangles

Following the extraction of these specified features within the rectangles, the subsequent step involves determining the sum of features in each rectangle and across the entire image. This process is iteratively performed for various features and scales. To optimize computational efficiency, Summed Area Charts (C_R) were employed for the designated rectangles. Herein, four different tables were created for different feature types. As exemplified in Figure 27(a), $C_R^{(1)}$ represents the first feature type of C_R , and its calculation is defined by:

$$C_R^{(1)}(x, y) = \sum_{j=1}^y \sum_{i=1}^{x+y-j} H(i, j) \quad (1)$$

where $H(i, j)$ represents the intensity of corresponding human body image at pixel (i, j) .

Expanding the aforementioned equation entails its computation across all pixels in a left-to-right and top-to-bottom manner and expressed as:

$$C_R^{(1)}(x, y) = C_R^{(1)}(x-1, y) + C_R^{(1)}(x+1, y-1) - C_R^{(1)}(x, y-1) + H(x, y) \quad (2)$$

where $C_R^{(1)}(x, 0) = 0$ and $C_R^{(1)}(0, y) = C_R^{(1)}(1, y-1)$ for all x and y values.

The remaining three feature types of C_R are computed analogously as follows:

$$C_R^{(2)}(x, y) = \sum_{j=1}^y \sum_{i=x+j-y}^k H(i, j) \quad (3)$$

$$= C_R^{(2)}(x-1, y-1) + C_R^{(2)}(x+1, y) - C_R^{(2)}(x, y-1) + H(x, y)$$

$$C_R^{(3)}(x, y) = \sum_{i=1}^x \sum_{j=1}^{y+x-j} H(i, j) \quad (4)$$

$$= C_R^{(3)}(x-1, y+1) + C_R^{(3)}(x, y-1) - C_R^{(3)}(x-1, y) + H(x, y)$$

$$C_R^{(4)}(x, y) = \sum_{i=x}^k \sum_{j=y+i-x}^l H(i, j) \quad (5)$$

$$= C_R^{(4)}(x, y-1) + C_R^{(4)}(x+1, y+1) - C_R^{(4)}(x+1, y) + H(x, y)$$

where k and l represent the width and height of the image, respectively.

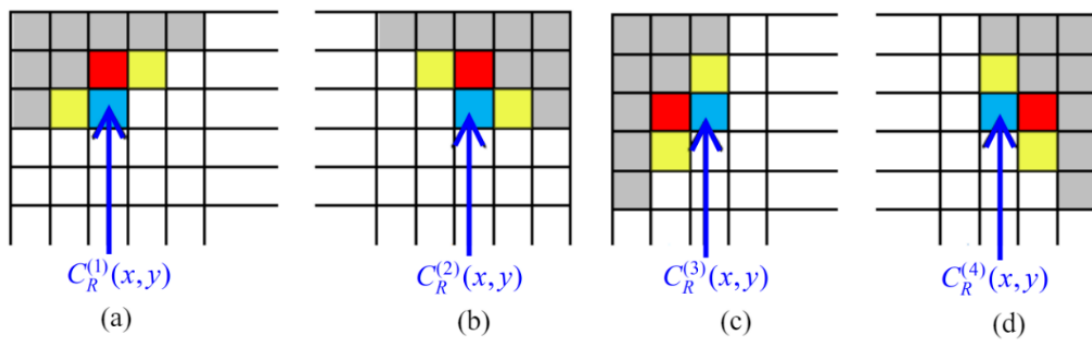


Figure 27. Calculation of C_R Charts

Subsequently, the cumulative sum of intensities within a specified rectangular region (IS_R) can be computed using the established C_R values, as depicted in Figure 28. For instance, the computation of IS_R for the initial set of features is performed as follows:

$$IS_R^{(1)}(x, y, w, h) = C_R^{(1)}(x+w-h, y+h-1) + C_R^{(1)}(x-h, y+h-1) - C_R^{(1)}(x+w, y-1) - C_R^{(1)}(x, y-1) \quad (6)$$

where (x, y) represents the coordinates of the top-leftmost point of the region in the image, while w and h denote the width and height of the parallelogram region, respectively.

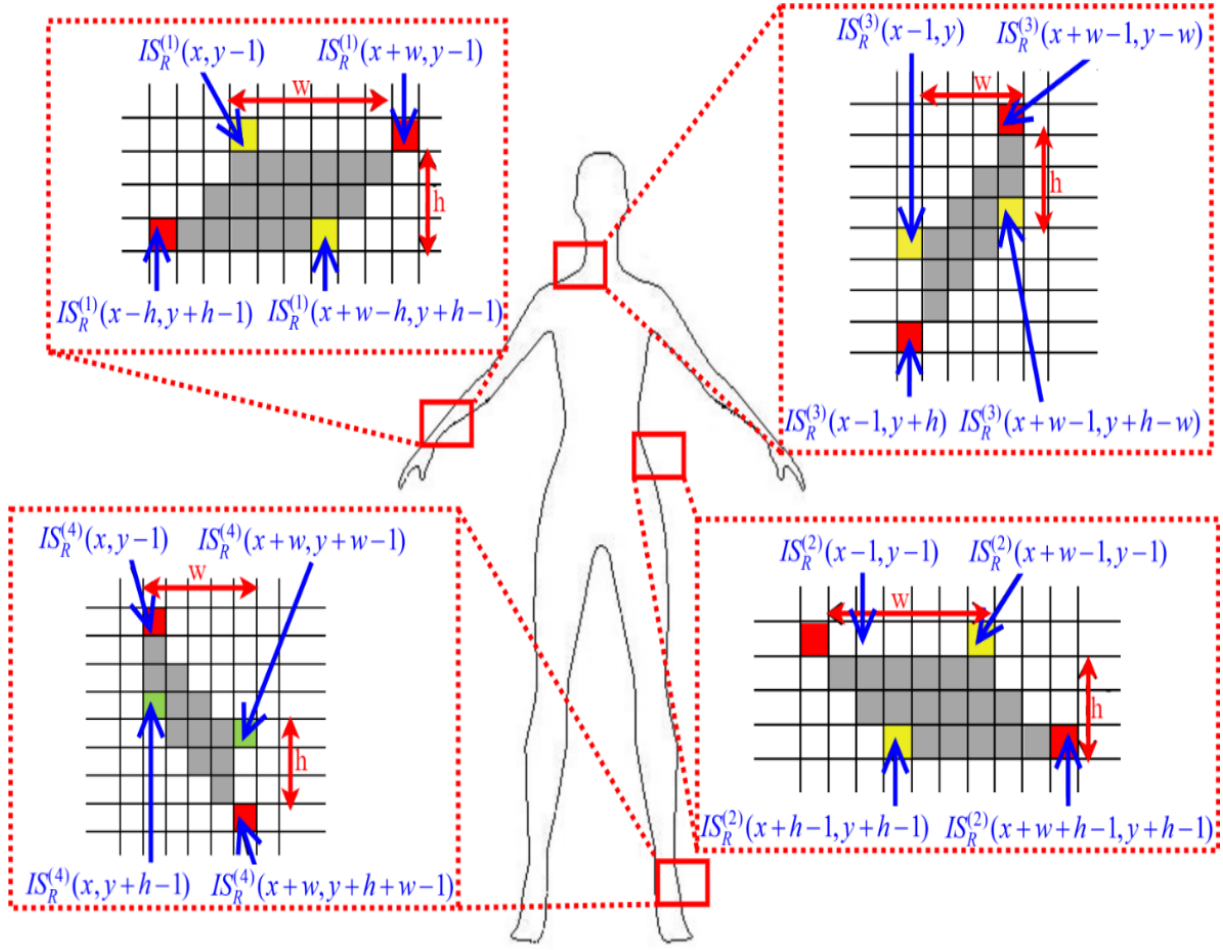


Figure 28. Calculation of IS_R

IS_R for the remaining C_R values are calculated using a similar methodology, as delineated below:

$$IS_R^{(2)}(x, y, w, h) = C_R^{(2)}(x+h-1, y+h-1) + C_R^{(2)}(x+w-1, y-1) - C_R^{(2)}(x-1, y-1) - C_R^{(2)}(x+w+h-1, y+h-1) \quad (7)$$

$$IS_R^{(3)}(x, y, w, h) = C_R^{(3)}(x+w-1, y+h-w) + C_R^{(3)}(x-1, y) - C_R^{(3)}(x-1, y+h) - C_R^{(3)}(x+w-1, y-w) \quad (8)$$

$$IS_R^{(4)}(x, y, w, h) = C_R^{(4)}(x, y+h-1) + C_R^{(4)}(x+w, y+w-1) - C_R^{(4)}(x, y-1) - C_R^{(4)}(x+w, y+h+w-1) \quad (9)$$

Following the aggregation of features within rectangles exhibiting varied intensities, the Ada-Boost algorithm employs to these aggregated features in order to categorize them as either weak or strong candidates for the target human body. Following this categorization, the labeled weak and strong candidates undergo comparison with the designated testing samples corresponding to each human body component. Successful candidates progress through successive stages, eventually resulting in the detection of the corresponding human body components.

HUMAN ACTION CHARACTERIZATION USING GEOMETRIC-BASED DISTANCE MEASUREMENT

After the human body detection stage, it is assigned to a coordinate system to characterize the actions. Initially, the center of the detected human body with its related parts such as neck, shoulders, arms, torso, legs, and feet are specified by using the box as illustrated in Figure 4.

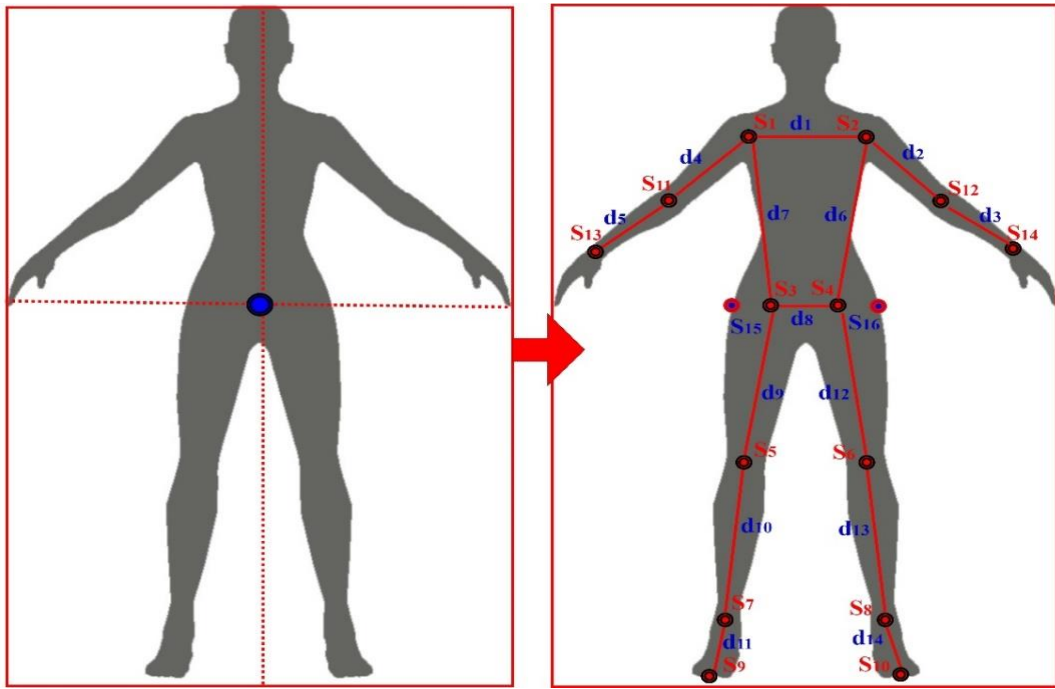


Figure 29. Placement of the human body points in the geometric frames

Upon locating the center of the human body, sixteen feature points are strategically positioned to ascertain the movements of the corresponding body parts as illustrated in Table 2. In this context, the distances and angles between these feature points are precisely measured to determine the action states of the respective individuals.

Table 2. Description of the geometric-based distance measurements

Point	Description	Dist.	Description	Dist.	Description
s_1	Right shoulder	d_1	Distance between s_1 and s_2	d_{17}	Distance between s_{11} and s_{15}
s_2	Left shoulder	d_2	Distance between s_2 and s_{12}	d_{18}	Distance between s_{13} and s_{15}
s_3	Right hip	d_3	Distance between s_{12} and s_{14}	d_{19}	Distance between s_9 and s_{10}
s_4	Left hip	d_4	Distance between s_1 and s_{11}	d_{20}	Distance between s_{11} and $s_{11} - 1$
s_5	Right Knee	d_5	Distance between s_{11} and s_{13}	d_{21}	Distance between s_{12} and $s_{12} - 1$
s_6	Left knee	d_6	Distance between s_2 and s_4	d_{22}	Distance between s_{14} and $s_{14} - 1$
s_7	Right ankle	d_7	Distance between s_1 and s_3	d_{23}	Distance between s_{13} and $s_{13} - 1$
s_8	Left ankle	d_8	Distance between s_3 and s_4	q_1	Angle between s_2, s_1, s_3
s_9	Right big toe	d_9	Distance between s_3 and s_5	q_2	Angle between s_{15}, s_1, s_{11}
s_{10}	Left big toe	d_{10}	Distance between s_5 and s_7	q_3	Angle between s_1, s_{11}, s_{13}
s_{11}	Right elbow	d_{11}	Distance between s_7 and s_9	q_4	Angle between s_1, s_2, s_{16}
s_{12}	Left elbow	d_{12}	Distance between s_4 and s_6		
s_{13}	Right wrist	d_{13}	Distance between s_6 and s_8	q_5	Angle between s_{16}, s_2, s_{12}
s_{14}	Left wrist	d_{14}	Distance between s_8 and s_{10}		
s_{15}	Left border hip	d_{15}	Distance between s_{12} and s_{16}	q_6	Angle between s_2, s_{12}, s_{14}
s_{16}	Right border hip	d_{16}	Distance between s_{14} and s_{16}		

Herein, the relative distance measurements d_{ij} are determined in x-y axes between two feature points $(s_{x,i}, s_{y,i})$ and $(s_{x,j}, s_{y,j})$ as:

$$d_{ij} = \begin{bmatrix} d_{x,ij} \\ d_{y,ij} \end{bmatrix} = \begin{bmatrix} s_{x,i} \\ s_{y,i} \end{bmatrix} - \begin{bmatrix} s_{x,j} \\ s_{y,j} \end{bmatrix} \quad (10)$$

and angle measurements q_{ijl} between three feature points $(s_{x,i}, s_{y,i})$, $(s_{x,j}, s_{y,j})$, and $(s_{x,l}, s_{y,l})$ are calculated as:

$$q_{ijl} = \arccos \left(\frac{\left(\begin{bmatrix} s_{x,j} \\ s_{y,j} \end{bmatrix} - \begin{bmatrix} s_{x,i} \\ s_{y,i} \end{bmatrix} \right) \left(\begin{bmatrix} s_{x,j} \\ s_{y,j} \end{bmatrix} - \begin{bmatrix} s_{x,l} \\ s_{y,l} \end{bmatrix} \right)}{\sqrt{(s_{x,j} - s_{x,i})^2 + (s_{y,j} - s_{y,i})^2} \sqrt{(s_{x,j} - s_{x,l})^2 + (s_{y,j} - s_{y,l})^2}} \right) \quad (11)$$

Using the following formula, a comparative analysis is conducted on the cumulative displacement of the wrist, elbow, and shoulder across successive frames during each repetition.

$$T_d = \sum_k \sum_a \|s_{la,k}^i - s_{la,k-1}^i\| - \sum_k \sum_a \|s_{ra,k}^a - s_{ra,k-1}^a\| \quad (12)$$

where $s_{la,k-1}^i$ and $s_{ra,k-1}^i$ represent 2-dimensional (2D) vectors indicating the (s_x, s_y) coordinates of the left and right arms a in the preceding frame $k-1$, while $s_{la,k}^i$ and $s_{ra,k}^i$ are 2D vectors corresponding to the current frame k . The assessment of this outcome is contingent on the condition that if $T_d > 0$, it signifies that the left arm is executing the specified action. Otherwise the right arm is performing specified action.

After conducting these comprehensive calculations, the executed actions are characterized for six fundamental physical exercises. These include the stretching of the left arm by lifting it towards the left side, raising the left arm in an upward direction, stretching the right arm by lifting it towards the right side, raising the right arm in an upward direction, simultaneously stretching both the left and right arms by lifting them towards their respective lateral sides, and finally, simultaneously stretching both the left and right arms in an upward direction. For each physical exercise, specific measurement constraints are delineated to account for complete, partially complete, and resting actions as illustrated in Table 3.

Table 3. Measurement constraints for each physical exercise include criteria for complete, partially complete, and resting actions

Exercises	Complete Action Measurements	Partially Complete Action Measurements
Stretching left arm by lifting it towards the left side	$d_{15} \geq 55cm, d_{16} \geq 70cm, q_4 \geq 90^\circ, q_5 \geq 80^\circ, q_6 \geq 175^\circ$	$d_{15} < 55cm, d_{16} < 70, q_4 < 90^\circ, q_5 < 80^\circ, q_6 < 175^\circ$
Raising left arm upward direction	$d_{15} \geq 70cm, d_{16} \geq 95cm, q_4 \geq 90^\circ, q_5 \geq 125^\circ, q_6 \geq 175^\circ$	$d_{15} < 70cm, d_{16} < 95cm, q_4 < 90^\circ, q_5 < 125^\circ, q_6 < 175^\circ$
Stretching right arm by lifting it towards the right side	$d_{17} \geq 55cm, d_{18} \geq 70cm, q_1 \geq 90^\circ, q_2 \geq 80^\circ, q_3 \geq 175^\circ$	$d_{17} < 55cm, d_{18} < 70cm, q_1 < 90^\circ, q_2 < 80^\circ, q_3 < 175^\circ$
Raising right arm upward direction	$d_{17} \geq 70cm, d_{18} \geq 95cm, q_1 \geq 90^\circ, q_2 \geq 125^\circ, q_3 \geq 175^\circ$	$d_{17} < 70cm, d_{18} < 95cm, q_1 < 90^\circ, q_2 < 125^\circ, q_3 < 175^\circ$
Simultaneously stretching the left and right arms by lifting them towards their respective lateral sides	$d_{15}, d_{17} \geq 55cm, d_{16}, d_{18} \geq 70cm, q_1, q_4 \geq 90^\circ, q_2, q_5 \geq 80^\circ, q_3, q_6 \geq 175^\circ$	$d_{15}, d_{17} < 55cm, d_{16}, d_{18} < 70cm, q_1, q_4 < 90^\circ, q_2, q_5 < 80^\circ, q_3, q_6 < 175^\circ$
Simultaneously stretching both the left and right arms in an upward direction	$d_{15}, d_{17} \geq 70cm, d_{16}, d_{18} \geq 95cm, q_1, q_4 \geq 90^\circ, q_2, q_5 \geq 125^\circ, q_3, q_6 \geq 175^\circ$	$d_{15}, d_{17} < 70cm, d_{16}, d_{18} < 95cm, q_1, q_4 < 90^\circ, q_2, q_5 < 125^\circ, q_3, q_6 < 175^\circ$

In accordance with the information presented in Table 2, the initial exercise routine initiates from a seated position, wherein the left arm is stretched by lifting it towards the left side in parallel to the shoulders at a predetermined angle. Subsequently, the left arm undergoes an upward movement, followed by a return to the initial position. This series of exercises is then duplicated for the right arm, following the same sequence. An illustrative representation of this exercise routine is provided in Figure 30 respectively.

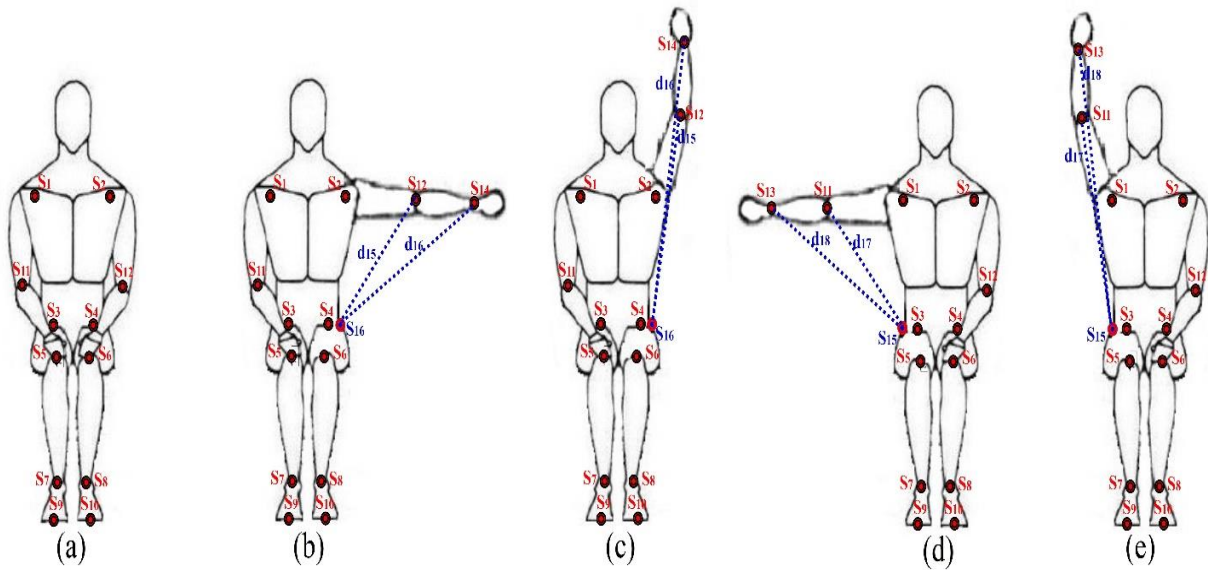


Figure 30. The first exercise routine with (a) a seated position, (b) stretching left arm by lifting it towards the left side, (c) raising left arm upward direction, (d) stretching right arm by lifting it towards the right side, and (e) raising right arm upward direction

Moreover, the visual depiction of the distance and angular alterations within this exercise routine is illustrated in Figure 31.

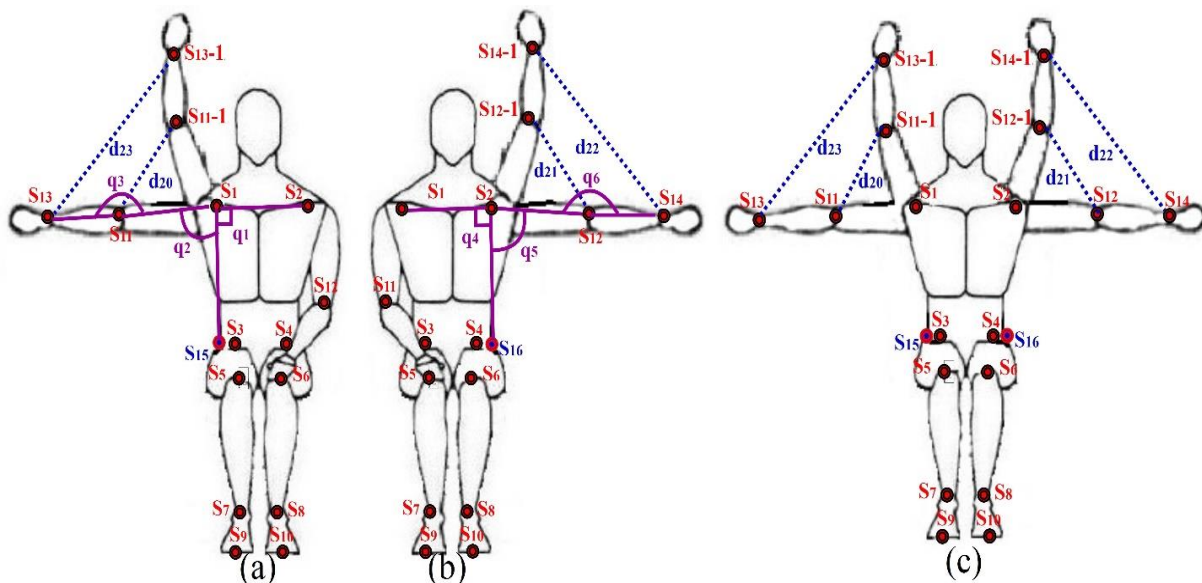


Figure 31. The visual depiction of alterations in distance and angular positions is provided for (a) the left arm, (b) the right arm, and (c) both arms, respectively

For the second exercise routine, it again commences from a seated position. Subsequently, both the left and right arms are concurrently stretched by lifting them towards their respective lateral sides. From this position, a simultaneous upward stretch of both the left and right arms is performed. Finally, the routine concludes with another simultaneous stretch by lifting both arms towards their respective lateral sides as illustrated in the following figure.

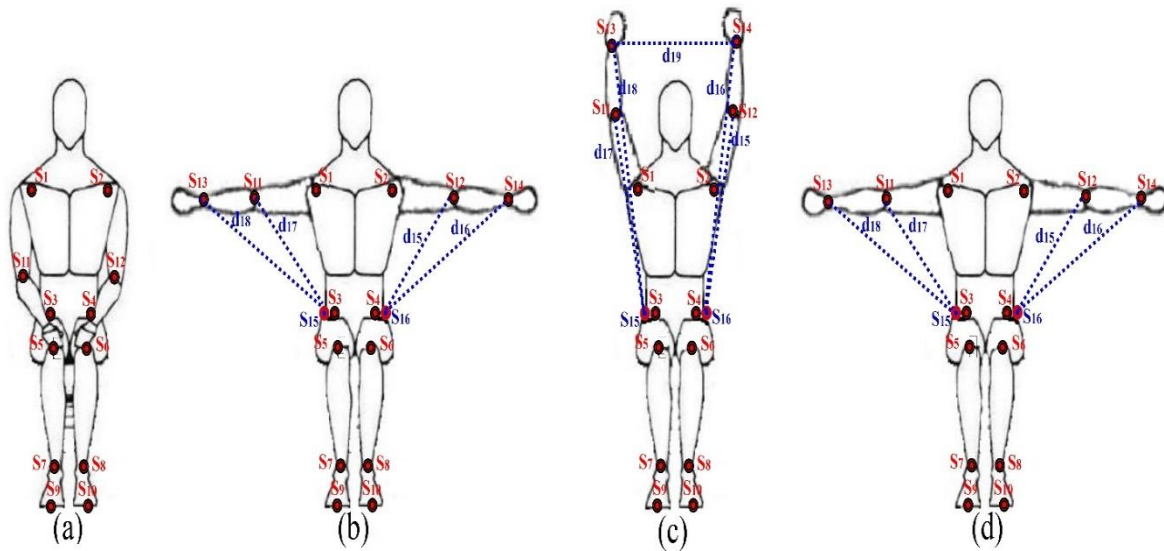


Figure 32. The second exercise routine with (a) a seated position, (b) simultaneously stretching the left and right arms by lifting them towards their respective lateral sides, (c) simultaneously stretching both the left and right arms in an upward direction, and (d) again stretching the left and right arms simultaneously by lifting them towards their respective lateral sides

Finally, with the disclosure of latest exercise routine, this section has been completed. The ultimate stage of the proposed algorithm will be comprehensively addressed in the next section.

HUMAN ACTION LEARNING USING LSTM-RNN WITH GENETIC ALGORITHM

In the last stage of the proposed algorithm, after completing the characterization of human actions, physical exercise learning is performed. In this regard, this section proposes an optimized LSTM-RNN structure based on a genetic algorithm. In this structure, the cost function designed as the fitness function, and the genetic algorithm is utilized to globally optimize the unknown parameters between neuron nodes of the LSTM-RNN structure to improve the classification performance.

The Proposed LSTM-RNN Structure

LSTM structures represent a specialized form of RNNs designed to address the challenges of capturing and learning long-term dependencies in sequential data. Introduced as a solution to mitigate the vanishing and exploding gradient problems, LSTM-RNNs employ a unique architecture enabling them to selectively retain or discard information over extended sequences. Such a tailored design renders LSTM-RNNs highly efficacious, especially in the realm of human action learning.

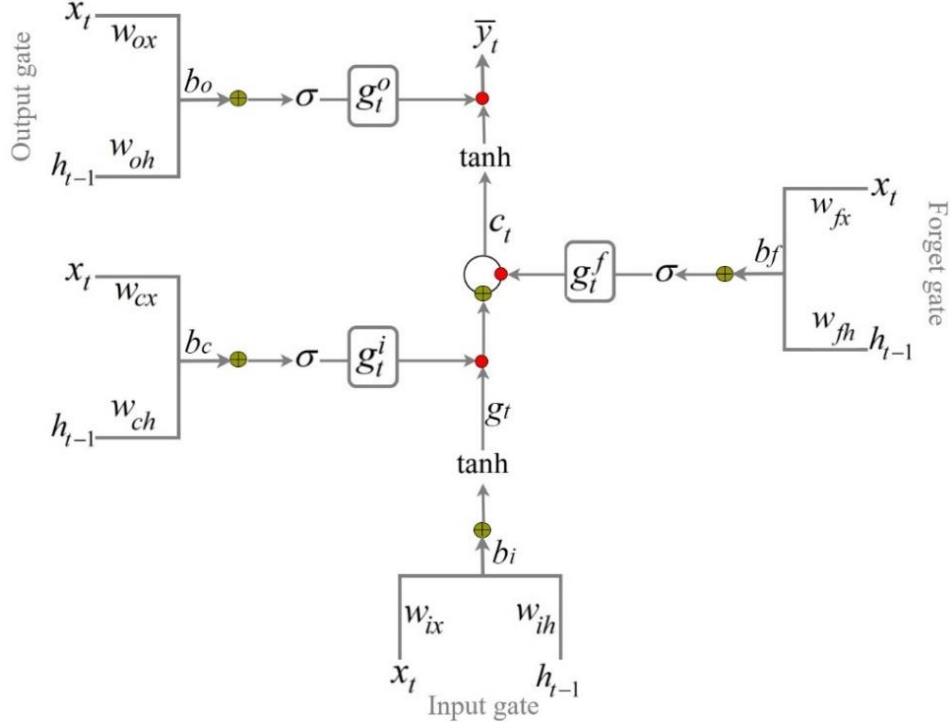


Figure 33. The proposed LSTM-based RNN structure

As illustrated in Figure 33, the lowermost layer of the LSTM-RNN unit corresponds to the input layer, wherein the characterized human actions are introduced at each time step within each time frame.

$$x_t = [s_1 \quad \dots \quad s_{20} \quad d_1 \quad \dots \quad d_{23} \quad q_1 \quad \dots \quad q_6] \quad (13)$$

with the corresponding unknown parameter vector:

$$w_t = [w_{cx} \quad w_{ch} \quad w_{ix} \quad w_{ih} \quad w_{fx} \quad w_{fh} \quad w_{ox} \quad w_{oh}] \quad (14)$$

Within the LSTM-RNN structure, there are three layers, denoted as the input g^i , forget g^f , and output g^o gates. Each gate within the corresponding cell state accepts the current feature input x_t , the hidden state h_{t-1} from the previous moment, and the state information c_{t-1} of the internal memory of the cell c_t , respectively. The final layer consists of a softmax output layer, serving to facilitate the learning of human actions corresponding to the six specified states associated with physical exercises.

In the computational procedure of each LSTM unit, the calculation of the candidate memory cell value \bar{c}_t is initiated according to the following equation:

$$\bar{c}_t = \gamma(w_{cx}x_t + w_{ch}h_{t-1} + b_c) \quad (15)$$

Herein, γ denotes the hyperbolic tangent activation function, b_c represents the bias term of the corresponding cell, x_t signifies the input of the current cell, h_{t-1} is the output of the preceding cell, and w_{cx} and w_{ch} denote the unknown parameters associated with the input and hidden state of the relevant cell, respectively.

Subsequently, an input gate g^i is introduced to govern the extent to which information in \bar{c}_t will flow into the new memory cell c_t as:

$$g_t^i = \sigma(w_{ix}x_t + w_{ih}h_{t-1} + b_i) \quad (16)$$

where σ signifies the sigmoid activation function, b_i denotes the bias term associated with the input gate, while w_{ix} and w_{ih} represent the unknown parameters for the input and hidden state of the corresponding input gate, respectively.

Following this, a forget gate g_t^f is introduced as:

$$g_t^f = \sigma(w_{fx}x_t + w_{fh}h_{t-1} + b_f) \quad (17)$$

In the given expression, σ denotes the sigmoid activation function, b_f represents the bias term associated with the forget gate, and w_{fx} and w_{fh} stand for the unknown parameters relevant to the input and hidden state of the forget gate, respectively.

In this context, the information derived from h_{t-1} and x_t undergoes the sigmoid activation function, resulting in an output value within the range of 0 to 1. A value closer to 0 signifies that the corresponding information will be discarded, whereas a value closer to 1 implies the retention of more information.

Subsequently, the updated value of c_{t-1} is incorporated into the new cell state c_t through the following process:

$$c_t = g_t^i \bar{c}_t + g_t^f c_{t-1} \quad (18)$$

In the next stage, an output gate g_t^o is introduced to determine the specific portion of the memory cell c_t that should propagate into the final hidden state h_t as:

$$g_t^o = \sigma(w_{ox}x_t + w_{oh}h_{t-1} + b_o) \quad (19)$$

and

$$h_t = g_t^o \gamma(c_t) \quad (20)$$

In the aforementioned equation, the symbols σ and γ correspond to the sigmoid and hyperbolic tangent activation functions, respectively. The variable b_o is employed to denote the bias term associated with the output gate, while w_{ox} and w_{oh} represent the unknown parameters of the output layer.

Finally, all computed outputs of the LSTM-RNN are fed into a softmax layer ϕ to calculate the predicted states of the six specified physical exercises \bar{y} across the class labels as:

$$\bar{y}_t = \phi(w_{hy}h_t + b_y) \quad (21)$$

Then, training error e_t is computed as:

$$e_t = y_t - \bar{y}_t \quad (22)$$

Herein, y_t is used to denote the actual output.

Following this, the constrained cost function J_t to be minimized for the optimal w_t is calculated as:

$$J_t = \min(e_t e_t^T) \text{ subject to } w_{t_min} \leq w_t \leq w_{t_max} \quad (23)$$

where w_{t_min} and w_{t_max} denote the minimum and maximum boundaries of the w_t respectively.

The next section presents the genetic algorithm-based optimization of the LSTM-RNN learning model in equation (18).

Parameter Optimization of LSTM-RNN with Genetic Algorithm

Optimization algorithms play a pivotal role in parameter estimation by numerically estimating and refining model parameters. These algorithms facilitate the calibration of model parameters using experimental data, leading to an improvement in the accuracy of the model. The iterative nature of these algorithms enables the generation of model parameter values that adhere to predefined constraints, thereby optimizing the model's performance and bolstering its reliability in accurately representing underlying patterns within the data. The literature encompasses various optimization algorithms, such as evolutionary algorithms, gradient-based methods, meta-heuristic approaches, and nature-inspired algorithms. In the context of this study, the genetic algorithm is specifically selected to optimize the unknown parameters of LSTM-RNN networks for the human action learning task. Herein, the genetic algorithm provides a systematic, evolution-inspired mechanism for refining these unknown parameters. Its detailed pseudo-code is presented with the following Algorithm 1 respectively.

Algorithm 1. Learning model optimization with the genetic algorithm

Input: w_t : Initialized unknown parameters, w_{t_min} : the lower limit of : w_t , w_{t_max} : the upper limit of w_t , J_t : Initialized cost function, \bar{J}_t : Best cost function, δ : Size of the population, β : Rate of the reproduction, α : Number of iterations, μ : Rate of crossover, γ : Mutation threshold, λ : Rate of the mutation.

Output: Optimized unknown parameters $w_t \in \mathfrak{R}^{1 \times n}$

Step 1: Initialization of the population

for $i=1$ to δ

1. Generate a random population of w_t .

$$w_t(i) = \text{uniform_random}(w_{t_min}, w_{t_max}, n) \quad (24)$$

2. Construct the input x_t in equation (13).

3. Calculate the gating units in equations (15)-(20).

4. Calculate estimated output \bar{y} in equation (21).

5. Assess the constrained cost function $J_t(i)$ in equation (23).

6. Compare the obtained solution to the best cost function \bar{J}_t as

if $\bar{J}_t > J_t$

update $\bar{w}_t = w_t(i)$ and $\bar{J}_t = J_t(i)$

endif

endfor

Main Loop:

for $j = 1$ to α

7. Obtain the average cost function as

$$J_{t_avg} = J_t(j) / \sum_{k=1}^j J_t(k). \quad (25)$$

8. Calculate the reproduction probability as

$$p(j) = e^{-\beta J_t(j)}. \quad (26)$$

9. Perform roulette wheel selection-based crossover.

for $l = 1$ to $\delta / 2$

Determine the first parent p_1 as

1. Generate random value as $r = rand \sum_{k=1}^j p(k)$. (27)

2. Obtain cumulative probability as $c(k) = c(k-1) + p(k)$. (28)

3. Determine the selected p_1 as $p_1(l) = \arg \min_k (r \leq c(k))$. (29)

4. Repeat equations (26)-(28) for the second parent p_2 .

5. Perform crossover for the first and second parents' unknown parameters w_{c_p1} and w_{c_p2} as

$$w_{c_p1}(l) = \mu p_1(l) + (1 - \mu) p_2(l) \quad (30)$$

$$w_{c_p2}(l) = \mu p_2(l) + (1 - \mu) p_1(l) \quad (31)$$

6. Save the results in w_{c_p} .

endfor

10. Perform the mutation process to w_{c_p} .

for $m = 1$ to δ

1. Apply Gaussian mutation to w_{c_p} parameters as

$$f = rand(\delta) < \gamma \quad (32)$$

$$gauss = randn(\delta) \quad (33)$$

$$w_{c_p}(l) = w_{c_p}(f + \lambda) gauss(f) \quad (34)$$

2. Apply the selected constraints on $w_{c_p}(l)$ as

$$w_{c_p} = \min(w_{c_p}, w_{t_min}) \quad (35)$$

$$w_{c_p} = \max(w_{c_p}, w_{t_max}) \quad (36)$$

3. Repeat steps 1,2,3,4 and 5 respectively.

endfor

In addition to the provided pseudo-code, the Table 4 delineates the parameters of the genetic algorithm in a respective manner.

Table 4. Parameters of proposed genetic algorithm

Parameters	Descriptions	Parameters	Descriptions
$J_i = \text{inf}$	Initialized cost function	$\lambda = 0.3$	Rate of the mutation
$\beta = 1$	Rate of the reproduction	$\alpha = 500$	Number of iterations
$\gamma = 0.1$	Mutation threshold	$\delta = 100$	Size of the population

Following the specification of genetic algorithm parameters, an initial population is created to encompass a diverse array of potential unknown parameter configurations for the LSTM-RNN network. Each configuration's fitness is assessed based on its efficacy in accurately predicting human actions. Genetic operators, including selection, crossover, and Gaussian mutation, are iteratively applied to evolve the population toward configurations demonstrating superior action estimation performance. This adaptive and evolutionary approach emulates the principles of natural selection and genetic inheritance, enabling the algorithm to discover parameter configurations that enhance the network's ability to comprehend and predict intricate human body actions across diverse contexts.

IMPLEMENTATION OF THE PROPOSED ALGORITHM TO HRS

This section briefly introduces the utilized humanoid robots and the implementation of the proposed physical exercise algorithm.

An Overview of Alpha Mini and Alpha 1Pro HRs

In this study, the proposed algorithm has been implemented on the Alpha Mini and Alpha 1Pro HRs as illustrated in Figure 9 respectively. Herein, the Alpha Mini HR is distinguished by its compact and portable design, encompassing interactive features, expressive capabilities, and voice interactions. Enhanced with 4G LTE connectivity and advanced human face and body recognition technologies, the Alpha Mini significantly enhances the human experience. Its functionality is facilitated by 14 servo motors, enabling dynamic actions, while the expressive LCD eyes convey emotions, rendering it a delightful tool for physical exercise routines (UBTECH Robotics, 2023).

Likewise, the Alpha 1 Pro HR exhibits the capability to simulate and execute a diverse set of dynamic actions. With a sophisticated design incorporating 16 high-precision servo motors, the Alpha 1 Pro HR demonstrates a broad spectrum of fluid and realistic movements, facilitating the execution of intricate tasks and expressive gestures. Additionally, it is equipped with various sensors, including touch sensors integrated into its hands, facilitating tactile interaction. The inclusion of Bluetooth connectivity further enhances its functionality by enabling seamless communication with external devices (UBTECH Robotics, 2023).

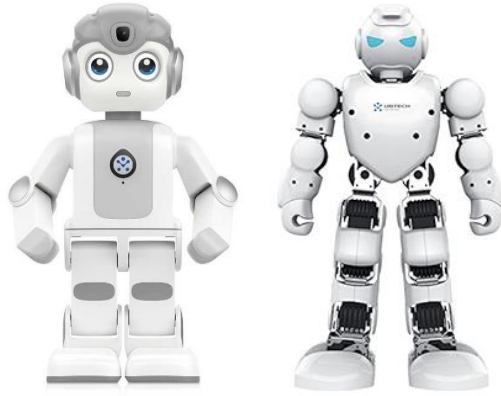


Figure 34. Alpha Mini and Alpha 1Pro HRs

For this research, UCode and AlphaRobot1s software packages will be employed to simulate physical exercises, enabling Alpha Mini and Alpha 1Pro humanoid robots to demonstrate corresponding physical actions. Subsequently, the algorithm's implementation involves the utilization of OpenCV and the Python programming language for additional processing, analysis, and comprehension.

Following the successful definition of the utilized robots, the subsequent sub-section engages in the phase of creating the dialogue model.

Dialogue Model for the HRs

FSMs play a crucial role in developing dialogues for HRs, particularly in the context of interacting with geriatric patients. These state machines provide a structured framework for mapping out and defining various states and transitions in the dialogue model. Each state represents a specific phase or condition in the interaction, while transitions dictate how the robot transitions between these states based on input or conditions.

By utilizing FSMs, the dialogue model ensures a systematic and organized approach to HR behaviors, facilitating effective and context-aware interactions with geriatric individuals. In the current study, the estimation of user states during physical exercise sessions is conducted to ascertain robot reactions based on monitored body actions, thereby evaluating performance through user engagement as illustrated in Figure 35.

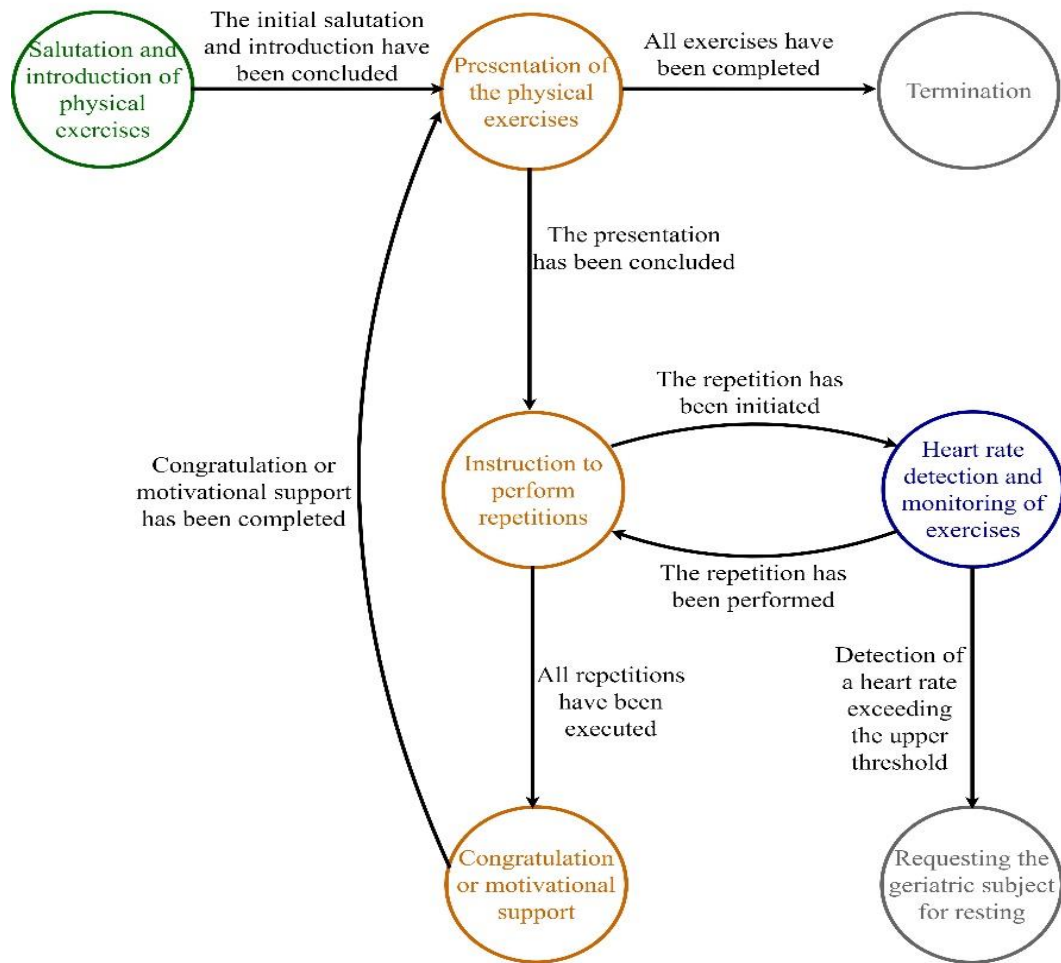
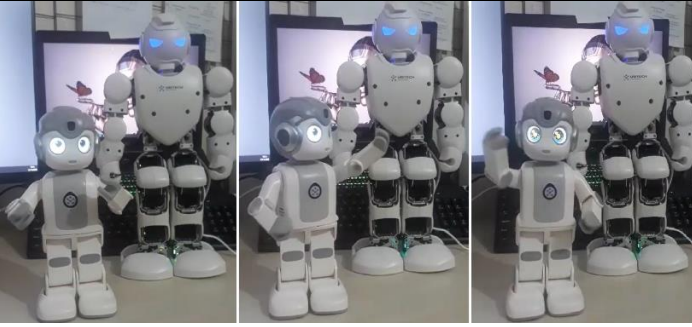
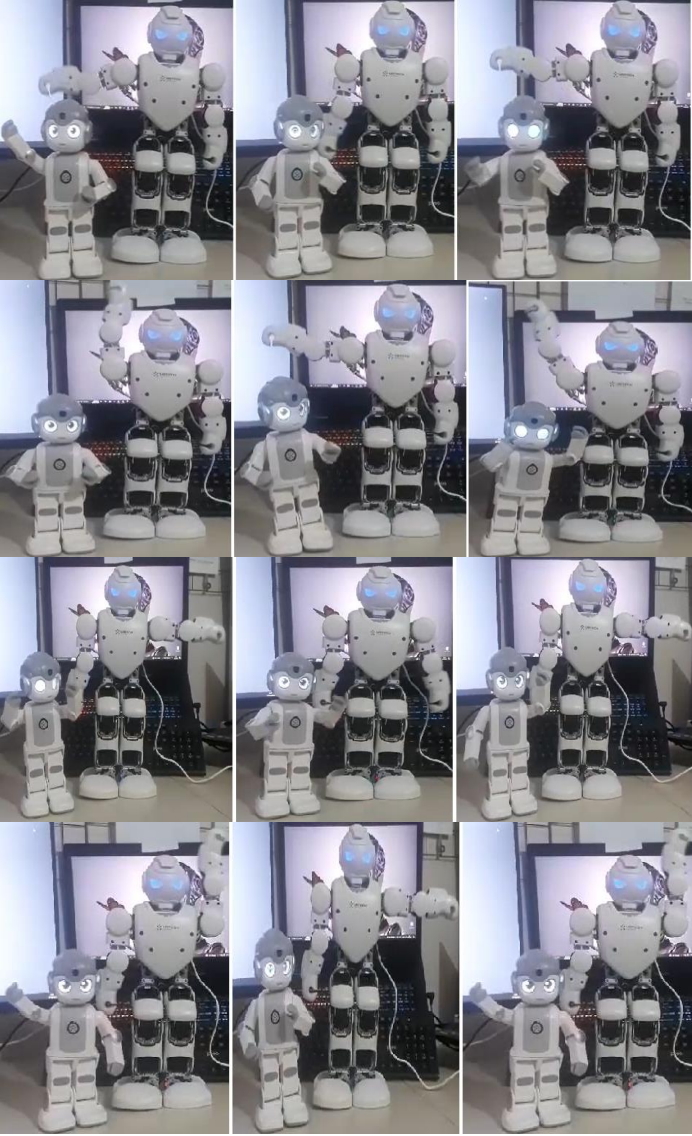

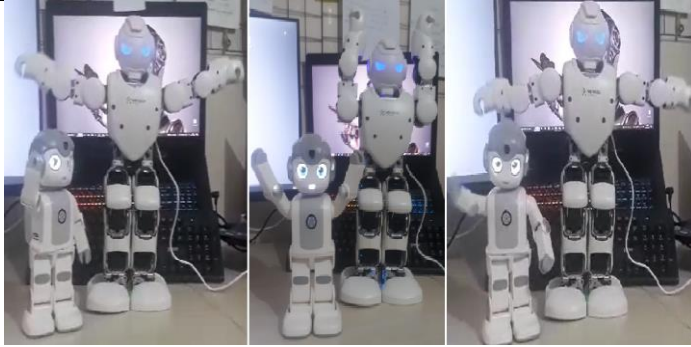


Figure 35. FSM dialogue model for HRs

In this context, HRs articulate their behaviors employing a combination of speech, body gestures, and alterations in eye colors as outlined in Table 5. In instances where no movement is detected, the HRs encourage users to retry the physical exercises.

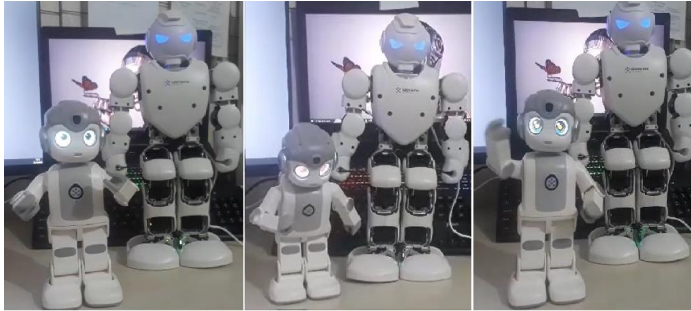
Table 5. Specified HR behaviors for physical exercise sessions wherein Stage 1 encompasses the "Salutation," Stage 2 involves the "Introduction of the first physical exercise routine," Stage 3 signifies the "Application of the second physical exercise routine," and, lastly, Stage 4 denotes the "Termination" of the exercise session, respectively

Stage	Non-Verbal Interaction	Verbal Interaction
1		<p>"Hello, my name is Alpha mini, and this is my friend Alpha 1Pro. Today, we will be guiding you through some exercises together. Throughout this process, if you feel tired, do not push yourself and take a break. So, are you ready to begin?"</p>
2		<p>"Initially, stretch your left arm by lifting it towards the left side in parallel to the shoulders as demonstrated by Alpha 1Pro. Following this, lift your left arm upward from the aforementioned position and then return to the initial position following the actions performed by Alpha 1Pro".</p>
3		<p>"We will now perform these exercises five times. I have confidence in your ability to complete them! Let's begin. One, two, three, four and the final one!</p> <p>"Excellent job! We thoroughly enjoyed participating in these exercises with you."</p> <p>"Let's now repeat the same exercises for the right arm five times. You are doing great! Inform me if you experience fatigue. Otherwise, we will proceed to the next exercise routine".</p> <p>"Alright, now we are going to perform the second exercise routine. Are you ready? Follow the Alpha 1 Pro robot. Let's begin!",</p> <p>"Now stretch your left and right arms by lifting them</p>



towards their respective lateral sides. Subsequently, raise both your left and right arms in an upward direction, and once more, simultaneously stretch your left and right arms by lifting them towards their respective lateral sides". "Let's repeat these for five times!"

4



"You performed these exercises excellently! I wish you a great remainder of the day. Let's repeat this tomorrow. Goodbye for now!"

Furthermore, in instances where the user's heart rate surpasses the predefined upper threshold, HR concludes the exercise sessions and advise the user to take a break. Following the completion of each exercise, the HR expresses congratulations or encouragement to the user based on their performance. Upon concluding the entire physical exercise routine, the HR delivers a concluding salutation to the users. The comprehensive response time of the HR throughout exercise facilitation is approximately 25 seconds, encompassing the duration required for the HR to respond based on user states subsequent to the user's execution of a specific physical exercise.

Thus, the successful completion of the dialogue model creation stage marks its transition to the evaluation phase.

SIMULATION AND EXPERIMENTAL RESULTS

This section systematically assesses the proposed physical exercise algorithm in both simulation and experimental environments. It commences by introducing the experimental setting, followed by a comprehensive evaluation of the obtained results.

Simulation and Experimental Settings

To assess the resilience and efficacy of the proposed algorithm, a self-curated dataset is generated. The evaluation encompasses two distinct exercise routines, each spanning a duration of 5 minutes, and involves the participation of three subjects with 30 sessions.

Moreover, the learning performance of the proposed algorithm across the specified dataset is systematically assessed through the application of performance metrics, encompassing accuracy (m_a), precision (m_p), recall (m_r), and F1-Score (m_{F_1}). In this context, m_a is rigorously defined as the proportion of accurately predicted test samples, thereby serving as a metric indicative of the overall success rate of the proposed learning algorithm, as elucidated in the ensuing equation.

$$m_a = \frac{t_p + t_n}{t_p + t_n + f_p + f_n} \quad (37)$$

The m_p is expressed as the ratio of accurately predicted positive samples to the total predicted positive samples, while m_r is defined as the ratio of predicted positive samples to the total true positive samples, as elucidated in the following equations.

$$m_p = \frac{t_p}{f_p + t_p}, m_r = \frac{t_p}{f_n + t_p} \quad (38)$$

Subsequently, the calculation of the m_{F1} is conducted as follows:

$$m_{F1} = 2 \left(\frac{m_p m_r}{m_p + m_r} \right) \quad (39)$$

where, t_p denotes instances of true positive samples, t_n is employed for the categorization of true negative samples, f_p is utilized to represent false positive samples, and f_n is assigned to denote instances of false negative samples.

Subsequent to comprehensive performance analyses, the proposed algorithm is implemented on Alpha mini and Alpha 1Pro HRs to substantiate its applicability and reliability within a natural environment. Then, the systematic evaluation of subjects' experiences and preferences is facilitated through the application of the 5-point Likert scale (Likert, 1932). This scale serves as a structured instrument for the quantification of subjective feedback across dimensions such as enjoyment, perceived effectiveness, clarity of instructions, perceived difficulty, and overall satisfaction. The utilization of this quantitative approach enables researchers to rigorously assess the acceptability and effectiveness of HRs in geriatric exercise routines. The findings derived from such assessments contribute valuable insights that inform subsequent developments and enhancements, aiming to more effectively address the distinctive needs and preferences of older individuals.

Results

Following the delineation of simulation and experimental configurations, the initial evaluation of the proposed algorithm's performance involves an analysis based on m_a , m_p , m_r , and m_{F1} metrics, as presented in Table 6.

Table 6. The learning outcomes of the proposed algorithm on the generated dataset

Routine number	m_a	m_p	m_r	m_{F1}
1	0.92	0.93	0.92	0.92
2	0.91	0.90	0.90	0.90

Herein, Table 5 provides a comprehensive overview of the noteworthy learning outcomes of the proposed physical exercise algorithm. The meticulous analysis of performance metrics conducted across two distinct exercise routines reveals significant achievements. In the first exercise routine, the algorithm manifests a commendable accuracy of 0.92, denoting a high proportion of accurately predicted outcomes. The m_p , at 0.93, indicates a minimal incidence of

false positives, while the m_r of 0.92 underscores the algorithm's adeptness in capturing a substantial portion of true positive instances. The derived m_{F1} of 0.92 reflects a balanced combination of between m_p and m_r . The algorithm's robust performance persists in the second exercise routine, where it attains an accuracy of 0.91, m_p of 0.90, m_r of 0.90, and an m_{F1} of 0.90. These findings collectively underscore the algorithm's efficacy in precisely categorizing exercise-related activities, affirming its potential applicability in supporting diverse physical exercise routines.

In conjunction with the conducted experiments, the proposed physical exercise algorithm is implemented on Alpha mini and Alpha 1Pro HRs to initiate a social-interactive dialogue with the subject, as illustrated in the ensuing figure.

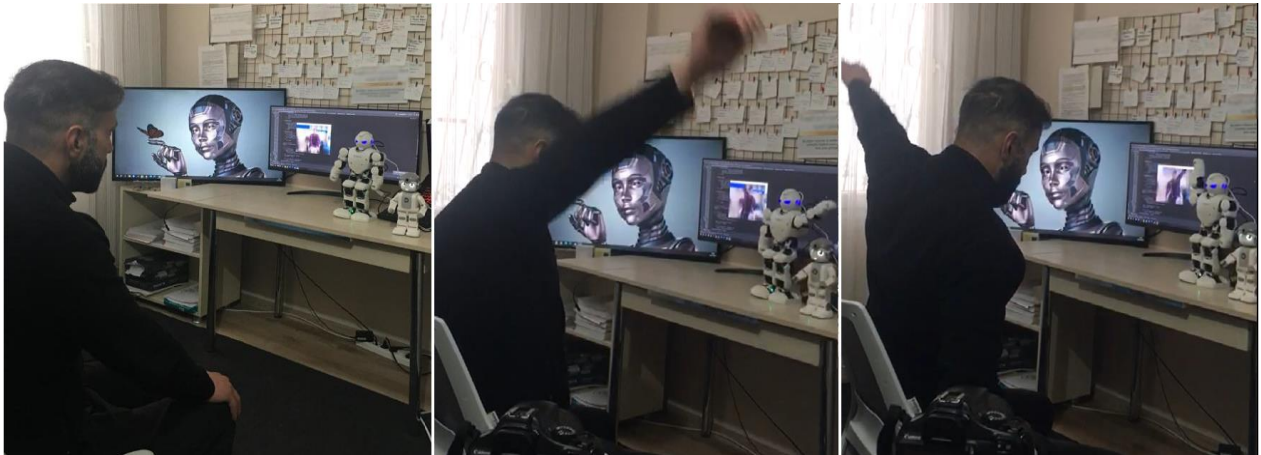


Figure 36. Application of the first physical exercise routine with HRs

As depicted in Figure 36, in the initial stage of social interaction, the Alpha Mini HR provides detailed clarification of the procedures to the pertinent subject, subsequently progressing to the commencement of the initial physical exercise routine in collaboration with the Alpha 1Pro HR. Across each phase, the Alpha Mini HR plays a supportive role in motivating the subject to enhance performance. Upon the completion of the inaugural exercise routine, the subject completes the exercises with a noteworthy success rate of 91%.

Moreover, as illustrated in the figure presented below, the HRs have proven effective in encouraging the subject to engage in exercises during the second exercise routine. Herein, the subject completed the respective exercises with a precise success rate of 90%.

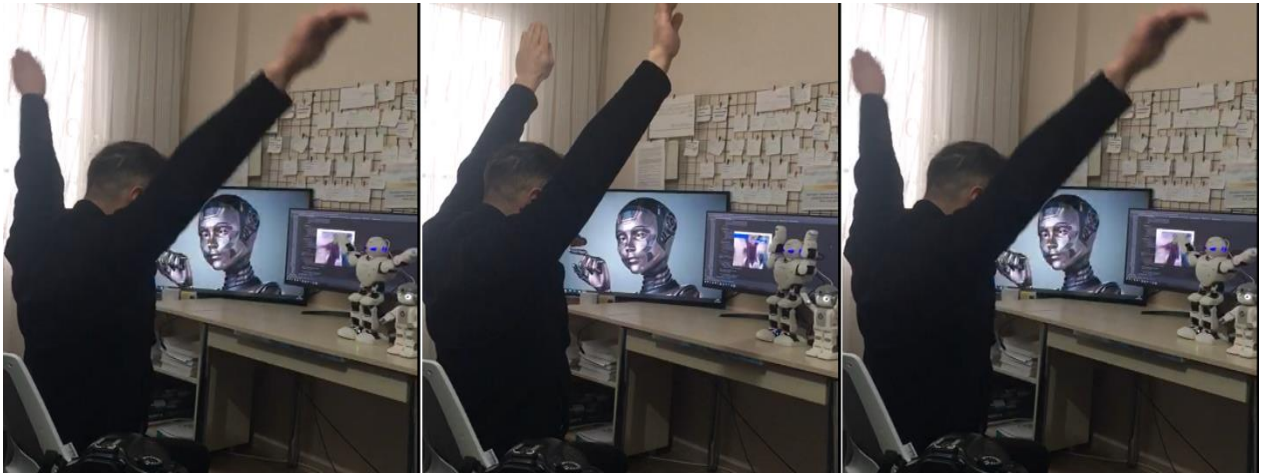


Figure 37. Application of the second physical exercise routine with HRs

As a final analysis, the 5-point Likert scale responses from the subjects convey a markedly favorable inclination toward the prescribed physical exercise routines as demonstrated in the following Table 7.

Table 7. Findings from participant assessments employing a 5-point Likert scale

Points	Mean	Standard deviation
Enjoyment	3.875	0.4305
Effectiveness	3.90	0.4100
Clarity of instructions	3.975	0.3550
Perceived difficulty	2.030	0.4500
Overall satisfaction	3.980	0.3615

As can be seen from Table 7, subjects expressed an average enjoyment score of 3.875, denoting a substantial degree of gratification and contentment throughout the exercise sessions. The perceived effectiveness yielded an impressive mean of 3.90, signifying subjects' confidence in the routine's efficacy in achieving positive outcomes. Notably, the clarity of instructions garnered a high mean score of 3.975, signifying subjects' perception of the instructions as lucid and easily comprehensible. The perceived difficulty attained a reasonable mean score of 2.030, indicating a well-balanced level of challenge deemed manageable by the subjects. The overall satisfaction metric exhibited exceptional positivity with a mean score of 3.980, emphasizing participants' overall contentment with the entire exercise routine. The consistently low standard deviations observed across these metrics further underscore a uniform and positive response from the participant cohort.

CONCLUSION AND FUTURE WORKS

In this paper, a four-stage physical exercise algorithm is introduced and implemented to HRs. The initial stage of the proposed algorithm utilizes the Viola-Jones algorithm to achieve accurate detection and continuous tracking of the human body within the perceptual framework of HR. Subsequently, geometric-based distance measurements are employed to characterize human actions, enabling the algorithm to comprehend physical movements relevant to targeted exercises for geriatric individuals. In the third stage, the characterized human actions are learned through an LSTM-RNN in conjunction with a genetic algorithm. The final stage involves the execution of a structured and user-friendly engagement utilizing an FSM dialogue

model. While this algorithm is explicitly implemented on Alpha Mini and Alpha 1Pro HRs within the context of this research, its applicability extends to encompass all other HR models. The reliability of the developed algorithm is rigorously substantiated through a comprehensive analysis of each terminal decision across all stages, accompanied by the evaluation of exercise stages derived from the learned human actions. Furthermore, a comprehensive assessment of the computational burden and accuracy of the algorithm is conducted to demonstrate its efficacy. In future research endeavors, the proposed algorithm will be implemented with an increased participant cohort, specifically targeting geriatric individuals living alone or residing in care facilities. Furthermore, physical exercise actions will be expanded, thereby contributing to the development of a more comprehensive array of exercise routines.

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RESUSITATION AND NURSING DURING PREGNANCY

GEBELİKTE RESÜSİTASYON ve HEMŞİRELİK

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ÖZET

Gebelikte kardiyak arrest (ani kalp durması) nadir görülmektedir. Gebelikte kardiyak arreste travma, kanama, pulmoner emboli, sepsis, inme, preeklampsi/eklempsi gibi durumlar neden olabilmektedir. Gebelikte kardiyak arrest anne ve fetüsü birlikte etkilediği için altın saat içindeki ilk canlandırmanın hızlı bir şekilde gerçekleştirilmesi gerekmektedir. Gebeliğin fizyolojik ve anatomik değişikliklerinden dolayı gebe bir kadını canlandırmanın spesifik farklılıkları bulunabilmektedir. Bu farklılıkları gebelerle doğrudan ve dolaylı yünden çalışan bir ekibin parçası olan hemşirelerin de bilmesi gerekmektedir. Bu derleme güncel klavuzlar doğrultusunda gebelikte resüsitasyonu ele alarak gebelerle çalışan hemşirelerin bilgi birikimini arttırmak için yazılmıştır.

Anahtar Kelimeler: Gebelik, Kardiyak Arrest, Resüsitasyon, Hemşirelik

ABSTRACT

Cardiac arrest (sudden cardiac arrest) is rare during pregnancy. Cardiac arrest during pregnancy can be caused by conditions such as trauma, bleeding, pulmonary embolism, sepsis, stroke, preeclampsia/eclampsia. Since cardiac arrest during pregnancy affects the mother and the fetus together, the first resuscitation within the golden hour must be performed quickly. Due to the physiological and anatomical changes of pregnancy, there may be specific differences in resuscitating a pregnant woman. Nurses who are part of a team working directly or indirectly with pregnant women also need to know these differences. This review was written to increase the knowledge of nurses working with pregnant women by addressing resuscitation during pregnancy in line with current guidelines.

Key Words: Pregnancy, Cardiac Arrest, Resuscitation, Nursing

GEBELİKTE RESÜSİTASYON

Resüsitasyon, sıralı olarak değil, eş zamanlı olarak gerçekleştirilen müdahaleleri içermektedir (Zelop ve Brickner, 2023). Gebelikte kardiyak arrest yönetimi için anesteziyoloji, kardiyoloji, kadın doğum, neonatologdan oluşan bir ekibin oluşturulması ve bu ekibin iş birliği içinde hareket etmesi önerilmiştir (AHA, 2020; Merchant ve ark., 2020).

Havayolu yönetimi ilk dikkate alınması gereken durumlardan biridir. Gebeler fonksiyonel rezidüel kapasitenin azalması ve oksijen tüketiminin artması nedeniyle hızla gelişen hipoksemi riski altında olabilmektedir (Pernoll ve ark., 1975; Baldwin ve ark., 1977). Yüzde 100 oksijenle (iki elle, >15 L/dakika) balon valf maske ventilasyonu (8 ila 10 nefes/dakika) ve hava yolunun aspirasyonu, desatürasyonu önlemek için gebe bir hastada entübasyondan önce kritik öneme sahip olabilmektedir (Zelop ve Brickner, 2023). Hava yolu açıklığını sağlamak için deneyimli bir kişi tarafından en fazla iki laringoskopi denemesinde 6,0-7.0 iç çapa sahip endotrakeal entübasyon tüpü ile entübasyon yapılması önerilmektedir (Lott ve ark., 2021). Gebeliğin son trimesterinde üst solunum yollarının daralması ve toraks kompliyansının azalmasından kaynaklı entübasyon yapmak zorlaşabilmektedir (Zelop ve Brickner, 2023). Bu durumlarda supraglottik hava yolu ekipmanları (örn. laringeal maske) ve krikotirotonomi gibi hava yolu açma yöntemleri düşünülmesi gerekebilmektedir (Lipman ve ark., 2014). Endotrakeal tüpün yerleşimi kapnografi kullanılarak doğrulanabilmektedir (Sandroni ve ark., 2018). Bir zamanlar evrensel olarak tavsiye edilen laringoskopi sırasında krikoid basıncı, yararına dair kanıt bulunmaması ve hem entübasyonu hem de supraglottik hava yolunun yerleştirilmesini daha zor hale getirmesi nedeniyle artık kullanılmamaktadır (Priebe ve ark., 2021). Aşırı hiperventilasyonun olumsuz etkileri vardır. Resüsitasyon uygulanan herhangi bir hastada da bundan kaçınılmalıdır. Gebelikte fizyolojik olmayan solunumsal alkaloz uterus vazokonstriksiyonuna neden olabilmekte ve bu da fetal hipoksi ve asidoza yol açabilmektedir (Levinson ve ark., 1974).

Gebede göğüs kompresyonları aynı şekilde yapılmaktadır. Dakikada 100-120 kompresyon hızı ve en az 5-6 cm derinlikte, el göğsün tam ortasında olacak şekilde bası uygulanmaktadır (Lott ve ark., 2021). Göğüs kompresyonu sırasında anne pozisyonu sırtüstüdür. Aortokaval kompresyondan kaçınmak, sırtüstü pozisyonunu korumak ve optimum göğüs kompresyonu için uterusun manuel olarak sol yana yer değiştirilmesi önerilmektedir (Merchant ve ark., 2020). Orta hattan yaklaşık 1,5 inçlik bir yer değiştirmeyi sağlamak için uterusun sağ üst kenarına maksimum sola doğru itme uygulamak için bir el kullanılabilir. Uterusun aşağı doğru itilmesinden kaçınmak gereklidir (Kundra ve ark., 2007). Ancak, uterusun manuel olarak yer değiştirmesi mümkün değilse, ameliyathane masası yatırılmalı veya yastıklar, tahta rulo haline getirilmiş havlu veya battaniyeler hastanın altına yerleştirilerek 30 dereceden fazla olmayan bir eğim elde edilmelidir (Rees ve Willis.1988). Kardiyak arrest sırasında, fundus yüksekliği umbilikusta veya üzerinde olan gebe kadında, resüsitasyon çalışmaları ile ve manuel sol lateral uterus yer değiştirmesi ile spontan dolaşım geri dönmedi ise, resüsitasyon devam ederken uterusu boşaltmak için hazırlık yapılması önerilmektedir (Merchnat ve ark., 2020; Page-Rodriguez ve Gonzalez-Sanchez, 1999; Cardosi ve Peter, 1998). Annenin kalp durmasının başlamasından sonra dört dakika geçtiğinde özel bir zamanlayıcı tüm resüsitasyon ekibini uyarmalıdır. Olağan resüsitasyon önlemleriyle spontan dolaşıma dönüş yoksa ve uterus fundusu göbek hizasında veya üzerindeyse, dört dakika sonra perimortem sezaryene başlanması gerekmektedir. Yenidoğanın doğumu beş dakika içinde tamamlanmalıdır (Jeejeebhoy ve ark., 2015; Zelop ve Brickner, 2023). Perimortem sezaryen doğum, kardiyopulmoner resüsitasyon başlatıldıktan sonra yapılan sezaryen doğum olarak tanımlanmaktadır (Dijkman ve ark., 2010). Perimortem sezaryen doğum için minimum gebelik yaşı tartışmalıdır. Fizyolojik olarak aortokaval kompresyon 20 hafta gibi erken bir zamanda başlasa da 20 ila 24 hafta aralığında bazı belirsizlikler vardır. Aortokaval kompresyonu hafifletmek ve fetal durumdan (canlı veya ölü) bağımsız olarak spontan dolaşımın geri dönüşünü kolaylaştırmak için ≥ 20 haftalık

gebelik/uterus büyüklüğü/umbilikus veya üzerinde olan gebelikler için makul bir seçenek olarak belirtilmektedir (Ueland ve ark., 1969; Johnson ve ark., 1998; Katz ve ark., 2005).

İntravenöz girişim diyafram üzerinden sağlanmalıdır. Hamile olmayan hastada kardiyak arrest tedavisi için kullanılan tüm ilaçlar (amiodoran dahil) hamile hasta için aynı dozlarda kullanılmaktadır. Magnezyum sülfat obstetride çeşitli endikasyonlar için yaygın olarak kullanılmaktadır (eklamptik nöbetlerin önlenmesi, erken doğumdan önce fetal nöroproteksiyon, tokoliz). Magnezyum toksisitesinden şüpheleniliyorsa, magnezyum sülfat infüzyonu kesilmeli ve resüsitasyon sürecinin erken dönemlerinde kalsiyum klorür veya kalsiyum glukonat verilmelidir (Lavonas ve ark., 2015). Güncel kardiyak yaşam desteği kalvuzları kardiyopulmoner resüsitasyon sırasında sodyum bikarbonatın rutin kullanımını önermemektedir, ancak yaşamı tehdit eden hiperkalemi veya trisiklik antidepresan doz aşımında yararlı olabilmektedir (Alshahrani ve ark., 2021).

İntravenöz erişimin olmadığı durumlarda, ticari olarak temin edilebilen kitler kullanılarak birkaç saniye içinde hızlı intraosseöz erişim sağlanabilmektedir. İntravenöz ve intraosseöz erişim yapılamadığında epinefrin, atropin, lidokain gibi bazı ilaçları uygulamak için endotrakeal tüp kullanılabilir (Zelop ve Brickner, 2023).

Defibrilasyon gereken durumlarda yetişkin defibrilasyonu için kullanılan mevcut enerji gereksinimleri hamile hastalarda da kullanıma uygundur. Şoku uygulamadan önce hastanın veya kurtarıcılarının elektrik çarpması sonucu yaralanmasını önlemek için fetal izleme ekipmanını çıkartılmalıdır. Kalp pili veya implante edilebilir kardiyoverter defibrilatör varsa defibrilasyon yine de uygundur. Harici pedler bu cihazlardan en az bir inç uzağa yerleştirilmelidir (Zelop ve Brickner, 2023).

Gebelik yaşının belirlenmesi; hamile hastalarda, neonatal yaşayabilirlik olasılığı karar vermede bir faktör olduğundan gebelik yaşının belirlenmesi kritik öneme sahiptir. Doğum öncesi kayıt veya bunu doğrulayan bir aile üyesi mevcut değilse, fizik muayene gebelik yaşının tahmin edilmesine yardımcı olabilmektedir. Ultrason, gebelik yaşı değerlendirmesi için güvenilir bir yöntemdir ancak annenin değerlendirilmesi ve canlandırılması sırasında zaman ve lojistik kısıtlamalar nedeniyle mümkün olmayabilmektedir (Zelop ve Brickner, 2023).

Fetal kalp atış hızının izlenmesi; genel olarak annenin durumu, resüsitasyon sürecinde yön vermedir. Eğer annenin durumu kötüye ve kötüleşiyorsa fetüsün durumu daha da tehlikeye girecektir. Bu nedenle resüsitasyon işlemi sırasında fetal kalp hızının izlenmesi önerilmemektedir (Zelop ve Brickner, 2023). CPR başarılı olursa ve anne hemodinamik olarak stabil hale gelirse, potansiyel olarak yaşayabilir gebelik çağındaki bir fetüsün durumunu değerlendirmek için fetal kalp hızı monitörleri uygulanabilmektedir (Özüçelik, 2020; Zelop ve Brickner, 2023).

HEMŞİRELİK VE RESÜSİTASYON

Gebe hastalarda kalp durması, anne ve yenidoğan ölüm oranlarıyla ilişkili olabilmektedir. Hemşirelerin yüksek riskli hastaları belirlemesi gerekmektedir. Bunun içinde risk değerlendirmelerini gerek prekonsepsiyonel bakım gerek doğum öncesi ve doğum sonrası ele almalıdır. İdeal olarak risk değerlendirmesi, gebelik öncesi danışmanlığa olanak sağlamak ve sonuçları optimize etmek için doğumdan önce ileri multidisipliner ekip planlamasına izin vermek için gebe kalmadan önce ve/veya ilk doğum öncesi değerlendirme sırasında yapılmalıdır (Regitz ve ark., 2018; Creanga ve ark., 2017).

Risk değerlendirmesi, kalp hastalığının ve kalp fonksiyonunu etkileyebilecek tıbbi bozuklukların belirti ve semptomlarını tanımlamak için bir öykü/fizik muayene yapılmasını, kişisel veya ailede konjenital veya edinilmiş kardiyovasküler hastalık öyküsünün elde edilmesini ve mevcut hastaya özgü verilerin kontrolünü içermelidir (örn. elektrokardiyogram,

ekokardiyografi, stres testi). Önceki aritmi öyküsü, sistemik veya pulmoner ventriküler fonksiyon bozukluğu ve uzamış QRS aralıkları, gebelik sırasında kardiyak arrest için risk faktörleri olarak tanımlanmıştır (Priori ve ark., 2015; Brickner, 2014). Hemşirelerin gebelik döneminde ortaya çıkan aritmilere yaklaşımda; gebelikte ortaya çıkan fizyolojik değişiklikleri iyi bilmesi ve bu değişikliklerin gebelik öncesi var olan kalp hastalıkları üzerine etkisini de anlaması gereklidir (Küçükler, Hıdıroğlu ve Şener, 2013). Ayrıca hipertansiyon, sigara içimi, obezite, diyabet ve ailede erken koroner kalp hastalığı veya miyokard enfarktüsü öyküsünde mutlaka sorgulanmalıdır.

Sonuç olarak anne ve yenidoğanın hayatta kalması, altta yatan etiyoloji, hipotansiyon/hipoperfüzyon durumu, annenin konumu (hastane dışı veya hastane içi; doğum odası veya diğer hastane içi) dahil olmak üzere çeşitli faktörlere bağlıdır. Aynı zamanda resüsitatif çabaların hızı, sağlık hizmeti sağlayıcılarının becerileri ve kaynakları etkin kullanabilmelerine de bağlıdır (Zelop ve Brickner, 2023). Bu sebeple başta kadınlarla doğrudan çalışan hemşirelerin özel durumlarda resüsitasyon bilgilerini güncellemeleri gerekmektedir.

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THE ASSOCIATION OF RAFTLIN AND DISEASE ACTIVITY IN SEBORRHEIC DERMATITIS

SEBOREİK DERMATİTTE RAFTLİN VE HASTALIK AKTİVİTESİ İLİŞKİSİ

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Abstract

Objectives: The pathogenesis of seborrheic dermatitis (SD) has not been clearly identified, and many factors are thought to play a role in its development. Raftlin, which is defined as a major lipid raft protein, is important for the regulation of signal transduction and inflammatory processes. In this study, we aimed to determine the levels of Raftlin in SD and the correlation of disease severity with this parameter.

Materials and Method: Fifty, patients who were clinically and/or histopathologically diagnosed with SD were included in the study. Fifty-four healthy volunteers constituted the control group. Disease severity in patients with SD was scored according to the Seborrheic Dermatitis Area and Severity Index (SDASI). Serum Raftlin was measured in all patients and control subjects by ELISA.

Results: The mean Raftlin values were significantly higher in the patient group than in the control group ($p = 0.031$). There was no correlation between SDASI and Raftlin. In this study, the association of Raftlin and disease activity has first investigated in SD.

In conclusion: The present study serves as the first study revealing the role of the increase in Raftlin levels on the etiopathogenesis of SD.

Key words: Raftlin, Seborrheic Dermatitis, Disease Activity, SDASI

Özet

Amaç: Seboreik dermatitin (SD) patogenezi net olarak anlaşılamamıştır ve gelişiminde birçok faktörün rol oynadığı düşünülmektedir. Majör bir lipid sal proteini olarak tanımlanan Raftlin, sinyal iletiminin ve inflamatuvar süreçlerin düzenlenmesinde önemlidir. Bu çalışmada SD'de Raftlin düzeylerini ve hastalık şiddetinin bu parametre ile ilişkisini belirlemeyi amaçladık.

Gereç ve Yöntem: Klinik ve/veya histopatolojik olarak SD tanısı alan 50 hasta çalışmaya dahil edildi. Elli dört sağlıklı gönüllü kontrol grubunu oluşturdu. SD'li hastalarda hastalık şiddeti Seboreik Dermatit Alan ve Şiddet İndeksine (SDASI) göre puanlandı. Serum Raftlin tüm hastalarda ve kontrol bireylerinde ELISA ile ölçüldü.

Bulgular: Ortalama Raftlin değerleri hasta grubunda kontrol grubuna göre anlamlı derecede yüksekti ($p=0,031$). SDASI ile Raftlin arasında herhangi bir korelasyon yoktu. Bu çalışmada Raftlin ile hastalık aktivitesi arasındaki ilişki ilk olarak SD'de araştırılmıştır.

Sonuç: Bu çalışma Raftlin düzeylerindeki artışın SD etyopatogenezindeki rolünü ortaya koyan ilk çalışma olma özelliğini taşımaktadır.

Anahtar kelimeler: Raftlin, Seboreik Dermatit, Hastalık Aktivitesi, SDASI

GİRİŞ

Seboreik dermatit (SD), derinin sebumdan zengin bölgelerinde eritemli bir arka plana sahip yağlı pullanma ile karakterize inflamatuvar bir cilt hastalığıdır. Saçlı deri, kaşlar, kulaklar, nazolabial kıvrımlar, presternal ve interskapüler bölgeler, aksillalar ve kasık kıvrımları vücudun en çok etkilenen bölgeleridir. Seboreik dermatit sağlıklı yetişkinlerin %2-10'unu etkiler ve erkeklerde, genç yetişkinlerde ve ergenlerde daha sık görülür (1). SD'nin patogenezi net olarak anlaşılmamıştır. SD lezyonlarının gelişiminde birçok faktörün rol oynadığı ileri sürülmektedir. Bununla birlikte, patogenezi en çok *Malassezia furfur* ya da onun maya formu *Pityriopsis ovale*'nin SD etyolojisindeki muhtemel rolü üzerinde durulmaktadır. İlk olarak 19. yüzyılın sonlarına doğru saçlı deride kepeklerde organizma gösterilmiştir (2-4). İlerleyen yıllarda *Malassezia*'nın normal floranın bir elemanı olarak rastlantısal bu hastalarda tespit edildiği aslında SD'nin psoriasis gibi epidermal hücre döngüsünde artışla sonuçlanan inflamatuvar bir hastalığın sonucu olduğu hipotezi popülerite kazanmıştır (5). Ketakonazolün keşfiyle beraber bu antifungal ilacın verildiği hastalarda lezyonlarda iyileşme gösterilmiştir. Bunun üzerine *malassezia* teorisini yeniden öne çıkarmıştır (6).

Raftlin, majör bir lipid sal proteini olarak bilinmektedir. Razi B hücrelerinden tanımlanan Raftlin, B hücresi antijen reseptörlerinin sinyal iletiminde ve lipid sal bütünlüğünün sağlanmasında gereklidir (7). Ayrıca, Raftlin TLR3 aktivasyonunun indüklenmesine ve otoimmün tepkiye de katılır. Lipid sal proteinleri, vasküler inflamatuvar yanıtların patofizyolojisinde önemli bir rol oynar (8). Raftlin, T hücresi bağışıklık tepkilerini modüle eden bir faktördür. Deneysel çalışmalarda raftlin eksikliği olan fare modellerinde interlökin ve interferon düzeylerinin azaldığı görülmüştür. Raftlin eksikliği olan T yardımcı hücrelerine sahip farelerde sitokin üretiminin azalması nedeniyle otoimmün hastalıklar azalır (9).

Literatürde SD' de oksidatif stres ile ilgili çalışmalar bulunmasına rağmen, vasküler inflamatuvar yanıtta rol oynadığı bilinen Raftlin'in düzeylerine ilişkin bir çalışma bulunmamaktadır. Bu çalışma da oksidatif stresin yeni biyobelirteçi olarak gösterilen raftlin'in serum düzeylerine ve hastalık şiddeti ile ilişkisi değerlendirildi.

MATERYAL VE METOT

Bu çalışma Helsinki deklarasyonuna uygun olarak Kahramanmaraş Sütçü İmam Üniversitesi Hastanesinde Şubat 2022 ile Haziran 2023 tarihleri arasında gerçekleştirildi. Hastanenin Klinik Araştırmalar Etik Kurulu çalışmayı onayladı. Çalışmaya klinik ve/veya histopatolojik olarak SD tanısı almış 50 hasta ve 54 sağlıklı kontrol birey dahil edildi. Ne hastalar ne de kontrol bireyleri katılım sırasında antiinflamatuvar ve/veya antimikotik ilaçlarla herhangi bir lokal ve/veya sistemik tedavi almadı. Hamile veya emziren kadınlar, kalp, böbrek veya karaciğer hastalığı, diyabet, HIV testi pozitif olan, alerjisi veya aktif enfeksiyonu olan hastalar çalışma dışı bırakıldı. SD'li hastalarda hastalık şiddeti, Seboreik Dermatit Alan ve Şiddet İndeksine (SDASI) (puan aralığı 0-12.6) göre puanlandı (10). Tüm katılımcılara çalışma hakkında bilgi verildi ve imzalı onamları alındı.

Her iki gruptan (kontrol ve hastadan) alınan kan örnekleri Biyokimya laboratuvarında soğutulmuş bir santrifüjde serumlarına ayrıştırıldı ve analize kadar -40°C 'de serum olarak saklandı. Serum örneklerinde Raftlin düzeyleri, ticari bir kit (MyBioSource Company, ABD) kullanılarak kantitatif bir sandviç enzim immünolojik tekniği (ELİSA) ile ölçüldü. Raftin parametresinin absorbanları bir mikropalak okuyucu (Model 680 BioRad Hercules, ABD) kullanılarak 450 nm'de ölçüldü ve sonuçlar GraphPad PRISM 5.0 (GraphPad Software Inc., La Jolla, CA, ABD) kullanılarak hesaplandı.

İstatiksel Analiz

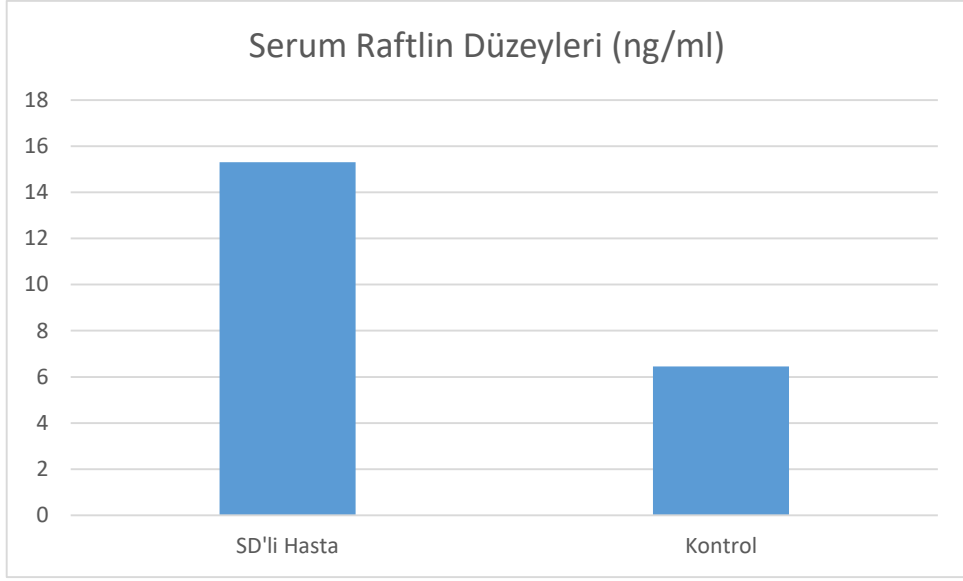
Tüm analizler SPSS 23.0 istatistik paket programı kullanılarak yapıldı. Nümerik değişkenlerin normal dağılıma uygunluğu Shapiro Wilk Testi ile sınıandı. Kategorik değişkenler frekans ve yüzde, nümerik değişkenler ortalama ve standart sapma veya medyan ve minimum-maksimum değerleri kullanılarak betimlendi. İki bağımsız değişken arasındaki ilişki Ki-kare Testi, iki nümerik değişken arasındaki ilişki Pearson veya Spearman Korelasyon Analizi ile araştırıldı. İki bağımlı örnek ortalaması Bağımsız grupların karşılaştırılmasında t testi ile karşılaştırıldı. İki bağımsız medyan değeri Mann-Whitney U Testi, ikiden fazla bağımsız medyan değeri Kruskal Wallis ile karşılaştırıldı. SD'li hastalarda raftlin'in tanısal performansını değerlendirmek için ROC eğrisi çizildi. $P < 0.05$ 'den olduğunda anlamlı olarak kabul edildi.

BULGULAR

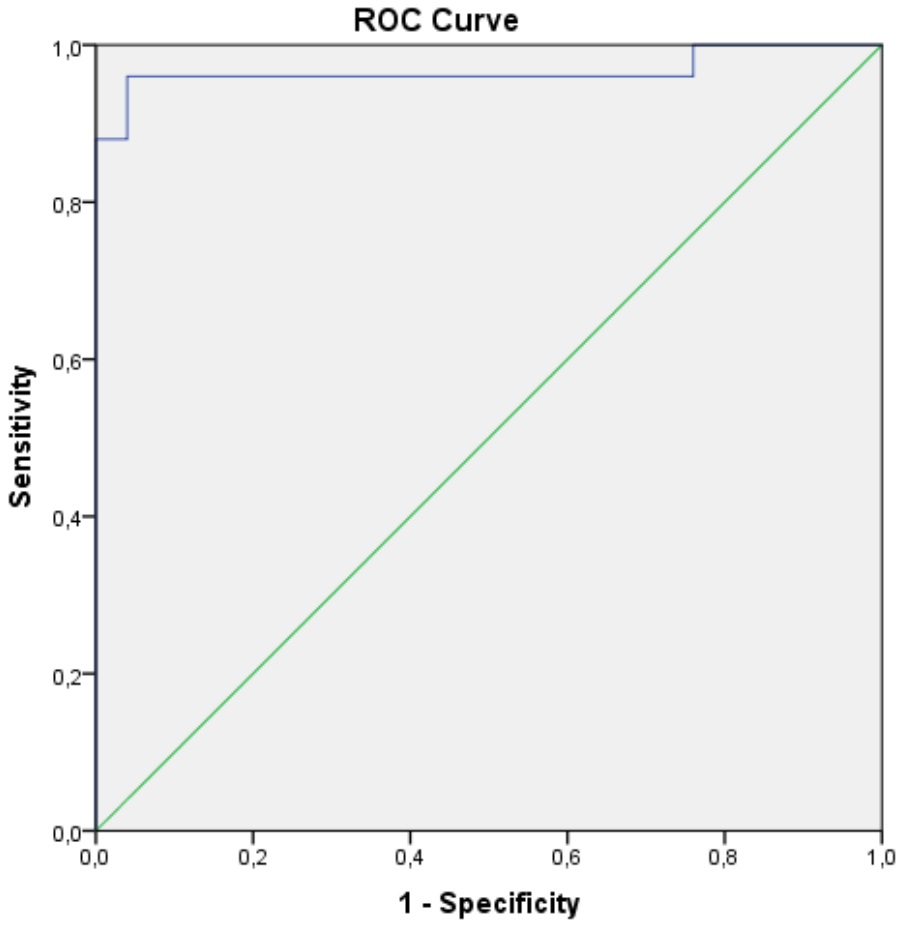
Çalışmamızda hasta grubuna 35 kadın ve 15 erkek, kontrol grubuna ise 35 kadın 19 erkek katıldı. İki grup arasında yaş ve cinsiyet açısından istatistiksel olarak anlamlı fark yoktu (sırasıyla $p=0,255$ ve $p=0,422$). Hastaların %51'sinde saçlı deri lezyonu, %20'inde nazolabial sulkus tutulumu, %15 kaş, %10 postauriküler, %3 kasık ve %1 lezyon vardı. SD'nin sternal lezyonları vardı. Hastaların ortalama SDASI'si $2,33 \pm 0,89$ ve skor aralığı 0,5-5,0'di. Tam kan sayımı ve biyokimya sonuçları hem hastada hem de kontrollerde normal sınırlarda ve benzerdi. Ortalama Raftlin düzeyleri hasta grubunda kontrol grubuna göre anlamlı derecede yüksekti ($p=0,031$). Hastalığın şiddeti ile Raftlin düzeyleri arasında korelasyon yoktu ($p>0,05$).

Tablo 1. Kontrol ve Hasta bireylerde Raftlin düzeyleri

		Seboreik Dermatit (n=50)	Kontrol (n=54)	P değeri
Raftlin (ng/ml)	Medyan (Q1-Q3)	15.30 (9.94-16.72)	6.45 (4.52-7.36)	0.031



Şekil 1. Hasta ve kontrol bireylerde Raftlin Düzeyleri



Şekil 2. Raftlin Düzeyleri için ROC eğrisi.

Table 3. Serum Raftlin'in tanısal değerleri (AUC, sensitivite, spesifite, cut-off değerleri)

Risk Factor AUC 95%	P	Cut off	Sensitivity (%)	Specificity
0.966 (0.907-1.0)	<0.001	11.24	96	88

TARTIŞMA

Reaktif oksijen türleri oksidatif sistemin en önemli bileşenleridir (11, 12). Keratinositlerin kimyasal tahriş edici maddelere, alerjenlere veya UVA ve UVB radyasyonu gibi inflamatuvar ajanlara maruz kalması ROS aktivasyonuna neden olur. ROS biyolojik süreçlerde ikinci haberci olarak görev yapabilir ve alerjik reaksiyonların ve derideki inflamasyonun patogeneğinde tetikleyici bir rol oynayabilir. Hücre zarında lipit peroksidasyonuna, DNA hasarına ve inflamatuvar sitokinlerin salgılanmasına neden olarak bir bağışıklık ve inflamatuvar yanıt ortaya çıkarırlar (13-15).

Çalışmamızda raftlin'in SD'de kontrol grubuna göre anlamlı olarak daha yüksek olduğu görüldü. Literatür taramasında SD'de Raftlin düzeyleri ile ilgili herhangi bir çalışmaya rastlanmamıştır. Dolayısıyla bir karşılaştırma yapamadık. Artan raftlin düzeyleri SD'deki oksidatif stresle ilişkili olabilir. Ayrıca Raftlin'in erken ve doğrudan etkileşiminin, BCR sinyal yolunun dinamiğinde değişikliklere ve SD'de vasküler inflamasyonun artmasına neden olabileceğini de tahmin ettik. SD'nin erken evrelerinde bile bu disfonksiyonu yansıtacak bir belirteç olarak raftlin düzeyine bakılmasını öneriyoruz. Bu çalışmada mevcut veriler, oksidatif stresin yeni bir göstergesi olan raftlin'in SD bozukluklarında tanı ve prognozun biyobelirteçlerinden biri olabileceğini göstermiştir. Ayrıca bu veriler, Raftlin'in lipid salların oluşumunda ve/veya korunmasında önemli bir rol oynayabileceğini, dolayısıyla BCR aracılı sinyallemeyi düzenleyebileceği düşünülmektedir.

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THE DEVELOPMENT OF A NANOTECHNOLOGY – BASED PROBIOTIC FOOD SUPPLEMENT FOR THE INDIVIDUAL TREATMENT OF NEUROLOGICALLY EFFECTIVE GASTROINTESTINAL DISEASES: SYSTEMATIC ANALYSIS

NÖROLOJİK ETKİLİ GASTROİNTESTİNAL HASTALIKLARIN BİREYE YÖNELİK TEDAVİSİ İÇİN NANOTEKNOLOJİ TEMELLİ PROBİYOTİK GIDA TAKVİYESİ GELİŞTİRİLMESİ: SİSTEMATİK ANALİZ

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ABSTRACT

Introduction and Purpose: Neurological problems are associated with gastrointestinal diseases. Neurological symptoms could potentially serve as early signals of gastrointestinal disease. Several studies have substantiated and recognized the importance of probiotics containing advantageous living microorganisms in the first stages of managing gastrointestinal disorders. The main question is whether probiotics are universally effective for all individuals or if customizing probiotic therapy can speed up the resolution of the condition. The objective of this study is to examine the effectiveness of individualized probiotic food manufacturing in treating gastrointestinal illnesses associated with neurological conditions. This will be achieved through a comprehensive analysis using methodical techniques.

Materials and Methods: Our study was first carried out using the Scopus database, recognized for its comprehensive and systematic analysis powers. Our research was specifically focused on the phrase "personalized probiotic" and we limited our search to academic journals and compilations. The decision to go with of this approach was based on its potential to give an up-to-date and personalized review of probiotics that are specifically designed for individuals. The second phase involves carrying out an extensive search in the PubMed database, primarily focusing on the keywords "personalized probiotic" and "gastrointestinal disease" in clinical studies conducted during the past five years. In the final phase of the investigation, we performed an extensive search of papers and compilations in the database from the past five

years, specifically focusing on the terms "probiotic" and "nanotechnology". The goal was to look into the impact of nanotechnologies to the advancement of probiotics.

Results: During our study of customized probiotics, we found an overall number of 17 publications, including both articles and compilations. Our review discovered that several trials carried out on digestive problems or other diseases failed to provide sufficient evidence to reach an accurate conclusion concerning tailored probiotics. However, its influence has been noted in other fields. The analysis, conducted on Pubmed, included 175 clinical trials conducted in the last five years. During our phase 3 analysis, we have discovered a total of 29 papers and reviews that particularly address breakthroughs in nanotechnology that are important to probiotics

Discussion and Conclusion: The completed studies have confirmed the significance of nanotechnology for enhancing the distribution and bioavailability of probiotics. This method reduces the abnormal spread of probiotics from ingestion to absorption and guarantees their efficient usage. Nanotechnology facilitates the conservation of probiotics through various methods of encapsulation, thereby enhancing their bioavailability. Various studies have shown that probiotics are widely and effectively used to treat gastrointestinal diseases. Nevertheless, the crucial factor is that the probiotic exhibits a delayed onset and cannot be completely remedied. Currently, our comparative study examines the potential of nanotechnology and bioavailability to forecast gastrointestinal diseases and retain probiotics throughout the body. The study primarily investigates their impact on brain function during the initial stages. Personalizing and manufacturing probiotics on a case-by-case basis can enhance the efficacy of this therapy. However, our research suggests that further examination of individualized probiotics is required.

Key Words: Neurological Disease; Nanotechnology; Probiotic; Gastrointestinal; Systematic Analysis

ÖZET

Giriş ve Amaç: Gastrointestinal hastalıklar nörolojik hastalıklarla ilişki içerisindedir. Ayrıca gastrointestinal hastalık ortaya çıkmadan önce nörolojik belirtilerle ilk uyarılarını verebilmektedir. Bu hastalıkların tedavisinin ilk aşamasında faydalı canlı mikroorganizmalar taşıyan probiyotiklerin önemi bir çok çalışmada kanıtlanmış ve kabul görmüştür. Burada odaklandığımız temel nokta her probiyotiğin her bireye fayda sağlayıp, sağlamayacağı veya eğer kişiselleştirilmiş probiyotik kullanılırsa hastalığın çözümüne daha hızlı ulaşıp, ulaşamayacağı sorularıdır. Bu nedenle, bu çalışmanın amacı nörolojik etkili gastrointestinal hastalıklarda bireye özel probiyotik gıda üretiminin tedavi sürecine katkısını değerlendirmek ve sistematik bir şekilde inceleme yaparak genel bir yargıya ulaşmaktır.

Gereç ve Yöntem: Öncelikle detaylı sistematik analiz yapmaya izin veren Scopus veri tabanı kullanılarak kişiselleştirilmiş bireye özgü probiyotikler güncelliğini koruyan ve geliştirilmeye açık bir alan olduğu için incelememize {personalized probiotic} anahtar kelimesini kullanarak başladık ve taramayı makale ve derleme olarak kısıtlandırdık. İkinci aşama, PubMed veri tabanında, özellikle son beş yıllık klinik çalışmalarda "kişiselleştirilmiş probiyotik" ve "gastrointestinal hastalık" terimlerini hedef alan kapsamlı bir araştırma yapılmasını içeriyor. Çalışmanın son basamağında probiyotik üretimi için nanoteknolojinin geldiği konumu gözlemek amacıyla Scopus veri tabanında son 5 yıl içerisinde {probiotic} ve {nanotechnology} anahtar kelimelerini içeren makale ve derlemeler taranmıştır.

Bulgular: Kişiselleştirilmiş probiyotiklerle ilgili olan incelememizde 17 dosyaya ulaştık bunlar makale ve derlemeleri içeriyordu. Yapılan incelememizin sonucunda gastrointestinal hastalıklar veya diğer rahatsızlıklar üzerinde bazı denemeler yapılsada çalışmalar kesin bir yargıya varmak için çok yetersizdi. Ama buna rağmen etkisinin gözlemlendiği bir çok alanda görülmüştür. Pubmedde son 5 yıldaki klinik çalışmalar için yapılan sorguda 175 çalışma bulunmuştur. 3. adım çalışmamızda, özellikle probiyotiklerle ilgili nanoteknolojideki gelişmeleri tartışan toplam 29 makale ve inceleme belirledik.

Tartışma ve Sonuç: Yapılan taramalar, probiyotiklerin dağılımını ve biyoyararlılığını arttırmada nanoteknolojinin önemini doğruladı. Bu teknoloji, probiyotiklerin sindirimden emilime kadar düzensiz dağılımını önleyerek etkin kullanımını sağlar. Nanoteknoloji, çeşitli kapsülleme stratejileri kullanarak probiyotiklerin korunmasını sağlar, dolayısıyla biyoyararlanımlarını optimize eder. Birçok çalışma, gastrointestinal bozuklukların tedavisinde probiyotiklerin yaygın ve etkili bir şekilde kullanıldığını göstermiştir. Ancak en önemli husus, probiyotiğin ortaya çıkışının gecikmiş olması ve tamamen iyileştirilememesidir. Şu anda karşılaştırma çalışmamız, başlangıçta beyni nasıl etkilediklerine odaklanarak, nanoteknolojinin ve biyoyararlanımın gastrointestinal bozuklukları tahmin etmek ve probiyotikleri vücutta tutmak için kullanılıp kullanılmayacağını araştırıyor. Probiyotiklerin bireysel bazda özelleştirilmesi ve üretilmesi bu tedavinin etkinliğini artırabilir. Bununla birlikte, araştırmamız kişisel probiyotiklere ilişkin ek araştırmaların gerekli olduğunu göstermektedir.

Anahtar Kelimeler: Nörolojik Hastalık; Nanoteknoloji; Probiyotik; Gastrointestinal; Sistemik

SYNTHESIS AND SELF-ASSEMBLY OF COUMARIN- PEPTIDE HYDROGELATOR FOR BIOMEDICAL APPLICATIONS

BİYOMEDİKAL UYGULAMALAR İÇİN KUMARİN-PEPTİT HİDROJELATÖRÜN SENTEZİ VE KENDİ KENDİNE MONTAJI

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ABSTRACT

Introduction and Purpose: Peptides contain biologically active sequences that play a crucial role in biological systems by mimicking the functions of various bioactive components, making them suitable for the repair of damaged tissues (Chen et al., 2023; Guan et al., 2022). Specifically, the GRGDS peptide, derived from osteopontin, stands out as it promotes cell proliferation and adhesion by binding to integrin receptors (Kolasa et al., 2022); thus, GRGDS peptide-loaded hydrogels have the potential to effectively support the formation of blood vessels (Rocha et al., 2020). This study aims to synthesize a self-assembling peptide using the GRGDS peptide, facilitated by a coumarin group, with the goal of promoting the regeneration of injured tissues.

Materials and Methods: Peptide (Coumarin-K-GRGDS) was synthesized on a Rink amide 4-methylbenzhydrylamine (MBHA) resin alongside with HBTU (4 eq) and DIEA (8 eq) as coupling reagents by using standard Fmoc-based solid-phase peptide synthesis (SPSS) at room temperature. The peptide was functionalized with N- α -Fmoc-N- ϵ -4-methyltrityl-L-lysine (Fmoc-Lys(Mtt)-OH) to allow coupling of protected maleimide. 7-Mercapto-4-methyl coumarin was coupled with thiol-ene reaction. The peptide was cleaved from resin under TFA/water/thioanisole (95:2.5:2.5, v/v/v) for 3 h and purified by reverse-phase chromatography using a semi-preparative HPLC, and crude peptide was analysed using an LC/MS.

Results: The peptide self-assembles in water and PBS to form a hydrogel. Light at a wavelength of 365 nm triggers the dimerization of coumarin groups and stabilizes the hydrogel by cross-linking it. This increases the mechanical properties of the hydrogel. As a result, in this study, a photosensitive self-organizing peptide was synthesized and a hydrogel was developed.

Discussion and Conclusion: This study demonstrates that the peptide self-assembles into a hydrogel, and the induced dimerization through light-sensitive coumarin derivatives enhances mechanical strength by forming cross-links. The increased stability of this peptide, which promotes cell proliferation and adhesion, may contribute to its reliable use as a material in biomedical applications.

Key Words: Photosensitive self-organizing peptide; solid phase peptide synthesis; hydrogel; bioactive peptide; thiol-ene reaction.

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ÖZET

Giriş ve Amaç: Peptitler, biyolojik sistemlerde önemli bir rol oynayan ve biyoaktif bileşenlerin işlevlerini kopyalayabilen biyolojik olarak aktif diziler içermektedir, bu sayede hasarlı dokunun onarılmasında kullanılabilirler (Chen vd., 2023; Guan vd., 2022). Özellikle, osteopontinden türetilmiş GRGDS peptidi, integrin reseptörlerine bağlanarak hücre proliferasyonunu ve yapışmasını teşvik eder (Kolasa vd., 2022); bu nedenle GRGDS peptidi yüklü hidrojeller, kan damarlarının etkili bir şekilde oluşumunu destekleyebilir (Rocha vd., 2020). Bu çalışma, GRGDS peptidi kullanılarak kendi kendine birleşen ve kumarin grubu sayesinde dimerizasyonu sağlayan bir peptit sentezleyerek, yaralanmış dokunun yenilenmesini teşvik etmeyi amaçlamaktadır.

Gereç ve Yöntem: Peptit (Kumarin-K-GRGDS), standart Fmoc tabanlı katı fazlı peptit sentezi kullanılarak Rink amid 4-metilbenzildrilamin (MBHA) reçinesi üzerinde (0.36 mmol/g) HBTU (4 kat) ve DIEA (8 kat) çiftleştirme ajanları ile birlikte oda sıcaklığında sentezlendi. Peptit, korumalı maleimidin çiftleştirilmesine izin vermek için N- α -Fmoc-N- ϵ -4-metiltrityl-L-lizin (Fmoc-Lys(Mtt)-OH) ile fonksiyonelleştirildi. 7-Merkapto-4-metil kumarin, tiyol-en reaksiyonu ile çiftleştirildi. Peptit, TFA/su/tioanisol (95:2.5:2.5, v/v/v) karışımında 3 saat boyunca reçineden kesildi ve yarı preparatif HPLC kullanılarak ters fazlı kromatografi ile saflaştırıldı; ham peptit LC/MS kullanılarak analiz edildi.

Bulgular: Peptit, su ve PBS içinde kendiliğinden düzenlenerek bir hidrojel oluşturmaktadır. 365 nm dalga boyundaki ışık kumarin gruplarının dimerizasyonu tetikler ve hidrojeli çapraz bağlayarak stabilize eder. Bu da hidrojelin mekanik özelliklerini artırır. Sonuç olarak, bu çalışma ile ışığa duyarlı kendi kendine düzenlenebilen peptit sentezlenmiştir ve hidrojel geliştirilmiştir.

Tartışma ve Sonuç: Bu çalışma, peptidin kendi kendine birleşmesi sonucunda hidrojel oluşturduğunu ve ışığa duyarlı kumarin türeyle indüklenen dimerizasyonun, çapraz bağ

oluşturarak mekanik dayanıklılıđı artırdıđını göstermektedir. Hücre proliferasyonunu ve yapışmasını teşvik eden bu peptidin stabilitesinin artması biyomedikal uygulamalarda güvenilir birer materyal olarak kullanılmasına katkıda bulunabilir.

Anahtar Kelimeler: Işıđa duyarlı kendi kendine düzenlenen peptit; katı fazda peptit sentezi; hidrojel; biyoaktif peptit; tiyol-en reaksiyonu

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SMOKING AND INFERTILITY

SİGARA KULLANIMI VE İNFERTİLİTE

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Özet

İnfertilite önemli psikolojik, ekonomik, demografik ve tıbbi sonuçları olan yaygın bir durumdur. İnfertilitenin nedenleri erkek ve/veya kadın kaynaklı olabilmektedir. Bazı durumlarda açıklanamayan nedenler de olabilmektedir. Bunların dışında infertilite yaşam tarzı faktörlerinden de etkilenebilmektedir. Bu faktörlerden biri de sigaradır. Sigara içmek hem erkeklerde hem de kadınlarda çeşitli üreme bozuklukları riskinin artmasına neden olabilmektedir. Sigara içmeyle ilişkili çok sayıda sağlık riski göz önüne alındığında, doğurganlık ve hamilelik sorunlarına bakılmaksızın sigaranın bırakılması teşvik edilmelidir. Sigaranın bırakılmasının teşvik edilerek fertilitenin optimizasyonun sağlanmasında hemşirelere de önemli rol ve sorumluluklar düşmektedir. Bu derleme de sigara kullanımının infertilite ile ilişkisi ele alınarak hemşirelerin infertil çiftlerde fertilitate koruyucu yaşam tarzı davranışlarının geliştirmesinin öneminden bahsedilmektedir.

Anahtar Kelimeler: İnfertilite, Sigara, Fertilitate, Hemşirelik

ABSTRACT

Infertility is a common condition with significant psychological, economic, demographic and medical consequences. The causes of infertility may be male and/or female. In some cases, there may be unexplained reasons. Apart from these, infertility can also be affected by lifestyle factors. One of these factors is smoking. Smoking can increase the risk of various reproductive disorders in both men and women. Given the numerous health risks associated with smoking, smoking cessation should be encouraged regardless of fertility and pregnancy problems. Nurses also have important roles and responsibilities in optimizing fertility by encouraging smoking cessation. In this review, the relationship between smoking and infertility is discussed and the importance of nurses developing fertility-preserving lifestyle behaviors in infertile couples is mentioned.

Key Words: Infertility, Smoking, Fertility, Nursing

İNFERTİLİTE

İnfertilite, korunmasız cinsel aktiviteye rağmen bir yıl içinde gebe kalmanın sağlanamaması olarak tanımlanan, önemli bir halk sağlığı sorunudur (Warner ve ark., 2015; Carson ve Kallen;

2021). İnfertilite probleminin dünyadaki prevalansının arttığı ve sıklığının %12-15 arasında olduğu tahmin edilmektedir (Agarwal ve ark., 2015; Casu ve Gremigni, 2016). Türkiye Nüfus ve Sağlık Araştırmasında (TNSA) belirtildiğine göre, infertilite problemi olanların oranı 2013'te %11,2 iken; bu oran 2018 yılında %12 olarak açıklanmıştır (TNSA, 2018). İnfertilitede kadın faktörü(%40-50), erkek faktörü(%30-40), %20,0- 25,0'ından hem erkek hem kadına ait patolojilerin(%20,0- 25,0) birlikte sorumlu olduğu belirtilmektedir (Demirci ve Beji, 2017). Literatürde kadınlarda infertilite nedenlerinin daha fazla ve karmaşık olduğu belirtilmektedir. Kadına ait faktörlerin başında ovulatuvar disfonksiyon (%30-40,0) ve tubal ve pelvik patolojiler (%30-40,0) gelmektedir. Diğer nedenler ise uterin, servikal patolojiler (%10) ve açıklanamayan infertilite (%10) kadına ait diğer faktörler arasında yer almaktadır (Çelik, 2011; Yumru ve Öndeş, 2011; Kuohung ve ark., 2023). Erkeklerde infertilite nedenleri pretestiküler (kromozomal, hormonal, ejakülasyon bozuklukları), testiküler (konjenital anomaliler, antispermatojenik ilaçlar, immünolojik durumlar, tümörler, idiyopatik) ve posttestiküler (obstrüktif, aksesuar bez enfeksiyonları) olmak üzere üç grupta sınıflanabilmektedir (Çelik, 2011; Yumru ve Öndeş, 2011; Anawalt 2020). İnfertilite nedenini saptayabilmek için çiftlerin ayrıntılı değerlendirilmesi gerekmektedir. İnfertilite değerlendirmesinde kadının yaşı da dikkate alınmaktadır. 35 yaş altı olan kadınlarda bir yıl düzenli korunmasız ilişki sonrasında, 35 yaş ve üzeri olan kadınlarda ise altı ay korunmasız ilişki sonrasında infertilite değerlendirilmesine başlanmaktadır. Bununla birlikte, 40 yaş ve üzeri kadınlarda ve düzensiz menstrüal döngüye sahip olan veya pelvik inflamatuvar hastalık öyküsü, endometriozis, , pelvik cerrahi öyküsü veya üreme sistemi malformasyonları gibi infertilite için bilinen risk faktörleri olan kadınlarda değerlendirmenin daha erken başlatılması gerekmektedir (Kuohung ve ark., 2023). Bu risk faktörlerinin dışında çiftler ayrıntılı değerlendirilirken beslenme durumu, kilo yönetimi, egzersiz, stresle baş etme, tütün kullanma durumu, kafeinli içecek tüketme durumu, çevresel faktörler gibi sağlıklı yaşam davranışları açısından da ele alınmalıdır (Homan ve ark., 2007).

SİGARA KULLANIMI ve İNFERTİLİTE

Sigara içmek dünya çapında hastalık ve ölümlerin önde gelen ve önlenebilir nedenidir (Li ve ark., 2017; Cui ve ark., 2018). Geçmiş yıllarda sigara kullanımı erkeklere özgü bir davranış olarak bilirse de 1960'lı yıllarda bu durum değişmeye başlamıştır. 1990'lı yıllarda kadın ve erkeklerin sigara kullanım oranlarının benzer düzeylere geldiği belirtilmiştir (Groner ve ark. 2000). Sigara kullanımı birçok sağlık probleminin neden olmanın yanında Dünya Sağlık Örgütü'nün verilerine (WHO, 2020) göre, yılda yaklaşık olarak 8 milyon insanın hayatını kaybetmesine neden olmaktadır. Sigara kullanımının benzer şekilde devam ettirilmesi halinde ise bu sayının 2030 yılına kadar 10 milyon insanın ölümüne neden olacağı tahmin edilmektedir (WHO, 2011). Dünyada kullanım oranı artarken ülkemizde de tütün kullanımının arttığı gözlenmektedir. Ülkemizde 15 yaş ve üzeri bireylerin 2016 yılında %26,5 olan tütün kullanım oranının 2019 yılında %28'e çıktığı gözükmektedir. Kadın cinsiyet olarak bakıldığında ise 2016 yılında %13.3 olarak belirtilen bu oranının, 2019 yılında 14.9'a çıktığı belirtilmiştir. Ayrıca kadınların %14.9'unun her gün tütün kullandıkları belirtilmiştir (TUIK, 2019).

Sigara içmek akciğer kanseri, solunum hastalıkları, kalp hastalıkları gibi risklerinin yanı sıra hem kadının hem de erkeğin üreme fonksiyonlarında olumsuz etkileyebilmektedir. Sigara içmenin kadınlarda yumurtalık, yumurta kanalı ve rahim dahil olmak üzere çeşitli hedefler üzerinde çoklu farklı etkiler uygulayarak kadın üreme fonksiyonunun ve dolayısıyla doğal kadın doğurganlığının çeşitli yönlerini etkilediği belirtilmektedir (Budani ve Tiboni 2017; Talbot ve Riveles, 2005; Dechanet ve ark., 2011). Ayrıca sigara içmenin yardımcı üreme teknolojilerinin (ART) sonuçlarını azalttığı gösterilmiştir (Waylen ve ark., 2009). Sigara içmenin erkeklerde sperm kreatin kinaz aktivitesini azalttığı ve bundan dolayı olarak sperm

motilitesi ve enerji homeostazis durumunu olumsuz etkilediği gösterilmiştir (Ghaffari ve Rostami, 2013). Yapılan in vitro arařtırmalar da olası sorumlu faktörler olarak; nikotin, kotinin ve kadmiyum gösterilmiştir. İn vivo arařtırmalarda ise hem sigara içme süresinin hem de günde sigara içilen sigara miktarının, sperm içindeki kreatin kinaz aktivitesini azaltabildiği belirtilmiştir (Sofikitis ve ark., 2010). Sigara içmenin intrauterin inseminasyon sonuçlarını da olumsuz yönde etkilediği ve sperm kromatin kondansasyon oranını azalttığı belirtilmiştir (İrez ve ark., 2013). Literatürde sigara tüketiminin gebe kalma süresini uzattığı (Sapra ve ark. 2016, Emokpae ve Brown, 2021), menapoz yaşını öne çektiği (Freeman ve ark. 2012; Radin ve ark. 2014), YÜT tedavisi alan ve sigara içen kadınlarda AMH seviyesini önemli ölçüde düşürdüğü (Sowers ve ark. 2010), FSH seviyesini yükselttiği (Vanegas ve ark. 2017), erken gebelik kayıplarına (Xu ve ark. 2014) ve sperm DNA hasarına neden olduğu belirtilmiştir (Emokpae ve Brown, 2021).

Literatürde sigara kullanımı ile infertilite arasındaki ilişkiye dair tartışmalı kanıtlar bulunmaktadır. İnfertilite olasılığında genel olarak %60'lık bir artış tahmin eden bir meta-analiz çalışmasında sigara içimi ile infertilite arasında anlamlı bir korelasyonun altını çizmektedir (Augood ve ark., 1998). Yapılan başka bir çalışmada ise bazı faktörler kontrol edildikten sonra, sigara içenlerle içmeyenler arasında doğurganlık açısından fark edilebilir bir fark bulamamıştır (de Mouzon ve ark., 1988). Arařtırmaların çoğu ise halihazırda sigara içen kadınların ve hamile kalmadan önce ebeveynlerinin sigara içmesine maruz kalan kadınların doğal doğurganlığının daha düşük olduğunu göstermektedir (de Angelis ve ark., 2020). Kuzey Amerika'da 2013–2018 yılları arasında yapılan bir kohort arařtırmasında; 5473 kadın ve 1411 erkek 53 ay boyunca takip edilmiştir. Arařtırma sonucunda kadınlarda sigara içmenin doğurganlığı uzun dönemde olumsuz yönde etkilediği belirtilmiştir (Wesselink ve ark., 2019). 15,000 gebenin verilerinin incelendiği BM'de yapılan bir arařtırmada, 6 ve 12 aylık çalışma sürelerinde aktif olarak sigara tüketimi gebe kalamama ile ilişkilendirilmiştir. Sigara kullananlarda içmeyenlere göre gebe kalma süresinin 12 aydan uzun sürdüğü bildirilmiştir. Pasif içiciliğe maruz kalanlarda ise etkinin aktif içime göre daha düşük olduğu belirtilmiştir (ASRM, 2018).

İNFERTİLİTE, SİGARA KULLANIMI ve HEMŞİRELİK

İnfertilite tedavi süreci uzun, maliyetli, duygusal olarak yorucu bir süreç olması sebebi ile çiftlerde fizyolojik ve psikolojik sorunlara yol açabilmektedir (Karaca ve Ünsal, 2012; Altıntuğ ve ark., 2012). Hemşireler infertil çiftler ile en sık karşılaşan sağlık profesyoneleridir. Bundan dolayı hemşirelere tanı ve tedavi sürecinde yaşam deneyimlerinin paylaşılması, eğitim ve danışmanlık yapılması noktasında oldukça önemli görevler düşmektedir. Bilginin hızla değiştiği günümüzde hemşireler infertil çiftlere bakım hizmeti sunarken kanıta dayalı uygulamalar kapsamında hareket etmelidir (Stevenson vd., 2016; Chien, 2019).

- Kadın ya da erkeğin intrauterin dönemde sigaraya maruz kaldığında fertilitésinin azaldığı, pasif sigara içen kadınlarda konsepsiyonda gecikmeye neden olmaktadır (Kanıt Düzeyi 2b).
- Kadın ya da erkeğin yardımcı üreme teknikleri girişimlerinden önce sigara içmesinin IVF başarısını azalttığı, erkeğin sigara kullanmasının da IVF ve ICSI başarı oranlarını azalttığı (Kanıt Düzeyi 3).
- Sigara içen kadınlar sigaranın doğurganlığa etkisi konusunda bilgilendirilmelidir. Ayrıca pasif sigara içiciliğinde gebe kalma durumunu etkileyebileceği açıklanmalıdır. (Kanıt Düzeyi B).
- Sigara içen kadınlar sigarayı bırakmaları konusunda desteklenerek bir sigara bırakma programına sevk edilmelidir. (Kanıt Düzeyi A) (RCOG, 2013; NICE, 2017; ASRM, 2022; Hornstein vd., 2021).

Hemşireler kadınlara fertilitate farkındalığı konusunda eğitim yapmalıdır. Fertilitate farkındalığı kadının bedeninin farkında olması ve vücudundaki belirtileri tanımasını ifade etmektedir (Mehling vd., 2009). Fertilitateyi etkileyen yaşam biçimi alışkanlıkları olarak beslenme durumu, kilo yönetimi, egzersiz, stresle baş etme, tütün kullanma durumu, kafeinli içecek tüketme durumu, çevresel faktörler, cinsel davranışlar, kontraseptif kullanımı vb. durumlar sayılabilir (Sharma vd., 2013). Bu faktörlerin üreme sağlığı üzerindeki etkisinin farkında olan bireyler, olumlu davranışlarda bulunmakta ve fertilitelerini koruyabilmektedir. Fertilitenin korunması için sağlıklı yaşam biçimi davranışlarına sahip olunması, fertilitate farkındalığının geliştirilmesi ve genel sağlık durumunun iyileştirilmesi açısından oldukça önemlidir (Tabernerico-Rico ve Garcia-Velasco, 2019; Espinos vd., 2020).

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STANDARDIZATION FOR TOURISM AND RELATED SERVICES – ALBANIA

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ABSTRACT

Tourist information offices, whose purpose is to promote and support tourism, nowadays will need to adapt and integrate into the increasingly qualified structures for the promotion of tourist destinations and the quality of tourist information. Access to tourist information has undergone significant changes during the last two decades due to the massive use of the Internet. This study aims to guide or advise these tourism offices in Albania, giving importance to their role as a source of information and promoter of tourism, to evaluate their skills towards the behaviors and demands of tourism in the twenty-first century, especially in relation to adapting to new communication methods in tourism, thus achieving standardization. This article explores the standards published by ISO (The International Organization for Standardization) for Tourism and Related Services with the aim of examining the possibility of their application by public authorities in the field and tourist operators. The ISO 14785:2014 standard which focuses on Tourist Information Offices (TIO) is presented in more detail. The choice is based on the fact that such services are installed in the main cities and the most important tourist destinations in our country. In this study, an action plan has been developed for the application of this standard in practice by the Tourist Information Offices, an important element of which is also the development of a certification scheme.

Keywords: ISO Standard, Tourist Information Office, Tourism, Standardization

INTRODUCTION

Tourism is becoming one of the most profitable sectors of the economies of many countries in the world and for some economies we can even say that it is the main sector. With the significant increase in the number of tourists, especially after the extraordinary situation of the pandemic, comes the necessity of fulfilling their needs and desires in the right way. In these conditions, as well as in the spirit of the globalization process in the world, we can say that there is a need to study and bring to attention the process of standardization of tourism and related services, as a good indicator in measuring the performance of structures in the service of tourism by studying the tourist experience in all its dimensions.

The structure responsible for organizing the standardization process is ³ISO (the International Organization for Standardization), a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization. Standardization involves the terminology and specifications of the services offered by tourism service providers, including related activities, touristic destinations and the requirements of facilities and equipment used by them, to provide tourism buyers, providers and consumers with criteria for making informed decisions.

In this article, ISO standards for Tourism and Related Services are brought to attention, focusing on the advantages they offer and the contribution they bring to making tourism more accessible at the global level. This topic is of interest for our country, since in 2023, according to INSTAT data, an increase of 94.2% in the number of foreign tourists was observed compared to a year ago. The significant increase in foreign tourists translates into a demand for better services in accordance with foreign standards. Triggered by the increase in the number of Tourist Information Offices in recent years in this framework, the relevant standard related to this service has been looked at in more detail: ISO 14785:2014 Tourist Information Offices. The goal is for the relevant structures to become familiar with the standard and to ensure their implementation. For this reason, an action plan has been drafted which would help the Ministry of Tourism and/or other structures that would control and guarantee the implementation of this standard. Also, in order to understand more concretely the activity of these offices in our country, some of them have been sent Checklists in accordance with the implementation of the standard and the respective answers have been received.

REVIEW OF LITERATURE

Tourism remains one of the fastest growing sectors of the global economy. Global inbound tourist arrivals showed strong signs of recovery in the post-pandemic years, totaling just under 1.3 billion in 2023. ⁴Since 2005, Europe has been the global region attracting the highest number of international tourists. While inbound tourist arrivals in Europe rose significantly in 2022 over the previous year, they did not catch up yet with pre-pandemic levels. Within this region, Southern and Mediterranean Europe was the most popular area for international tourism, recording around 265 million arrivals in 2022. That said, it is of interest in studying the means in helping in the process of standardization of tourism and related services as our country is part of Mediterranean Europe.

In general, when searching for suitable tourism services, it can be difficult to find clear and accurate information on the accessibility of the offer, service or the destination facility. This situation should be improved with more consistently applied standards and better training of

³ **ISO 21902:2021(en)**

Tourism and related services — Accessible tourism for all — Requirements and recommendations

⁴ “Number of international tourist arrivals worldwide 1950-2023”, Statista Research Department, Jan 26, 2024

tourism professionals. ⁵Most studies of accessible tourism have shown that one of the major difficulties for the application of standards is the lack of knowledge among tourism providers about the existing tools and possible solutions. There is a lack of information on where to find guidance and there can be contradictory information in different standards between different countries and regions, while in some countries there are no available standards. Furthermore, tourism providers face difficulties in knowing how to proceed in situations for which no International Standards have been adopted yet.

Standards on Tourism and related services are covered globally by ISO (The International Organization for Standardization). The standards published by ISO are based on the principles formulated in the "Agreement on Technical Barriers to Trade" of the WTO (World Trade Organization). ⁶In entering into this agreement, it is estimated:

- The important contribution played by international standards and conformity assessment systems for improving the effectiveness of product realization;
- Ensuring that technical rules and standards, including requirements for conformity assessment procedures do not create unnecessary obstacles for international trade;
- The contribution of international standardization to the transfer of technology from developed to developing countries;
- That developing countries may face special difficulties in the formulation and implementation of technical rules, standards and procedures for assessing conformity with technical conditions and standards.

Based on these principles, the ISO standards on Tourism and related services are an important instrument of technology transfer in this field, are completely applicable in any country and support the circulation of tourist services without barriers. ISO standards are also European standards because CEN (European Committee for Standardization) is a very important part of ISO. Responsible committee of ISO is ISO/TC 228, Tourism and related services. After a review of the content of ISO standards in the field, we can list those ⁷standards that, in our view, would have a direct impact on increasing the quality of tourist services, their effective marketing as well as would serve as technical requirements for private operators seeking partnership with public authorities in the field.

ISO 13009:2015 Tourism and related services -- Requirements and recommendations for beach operation

ISO 13687-1:2017 Tourism and related services -- Yacht harbours -- Part 1: Minimum requirements for basic service level harbours

ISO 13687-2:2017 Tourism and related services -- Yacht harbours -- Part 2: Minimum requirements for intermediate service level harbours

ISO 13687-3:2017 Tourism and related services -- Yacht harbours -- Part 3: Minimum requirements for high service level harbours

ISO 13810:2015 Tourism services -- Industrial tourism -- Service provision

ISO/TS 13811:2015 Tourism and related services -- Guidelines on developing environmental specifications for accommodation establishments

⁵ <https://www.iso.org/obp/ui/en/#iso:std:iso:21902:ed-1:v1:en>

⁶ Results of the Uruguay round for multilateral trade negotiations: legal texts/ comp., ed., translated by Adriana Civici, etc. - Tirana: Pegi 2005

⁷ <https://www.iso.org>

ISO 14785:2014 Tourist information offices -- Tourist information and reception services -- Requirements

ISO 17679:2016 Tourism and related services -- Wellness spa -- Service requirements

ISO 18065:2015 Tourism and related services -- Tourist services for public use provided by Natural Protected Areas Authorities -- Requirements

ISO 18513:2003 Tourism services -- Hotels and other types of tourism accommodation -- Terminology

ISO/DIS 20611 Adventure tourism -- Sustainability good practices -- Requirements and recommendations

ISO 21101:2014 Adventure tourism -- Safety management systems -- Requirements

ISO/TR 21102:2013 Adventure tourism -- Leaders -- Personnel competence

ISO 21103:2014 Adventure tourism -- Information for participants

ISO/DIS 21401 Tourism and related services -- Sustainability management system for accommodation establishments -- Requirements

ISO/DIS 21426 Tourism and related services -- Medical spas -- Service requirements

Tourist Information Offices (TIOs) play an important role in managing marketing and promotional activities for tourist destinations. By disseminating information through the current and potential visitors, TIOs provide communication and information that can increase the production of tourist services⁸. For these services, the reference standard is ISO 14785: 2014. The standard defines the requirements on tourist information offices (TIO), among which are of particular interest:

1. Their legal status. In most cases, TIOs are managed by public authorities, but they can also be private operators but the standard specifies that private operators must work in partnership with relevant public authorities in the field of tourism and at the same time public authorities request the implementation of the standard in TIOs with different legal status.
2. TIOs can also perform commercial services listed in the standard, but they must have implemented a documented procedure that is in accordance with the legal and statutory requirements for commercial transactions. The standard also defines that, before providing any services, the TIO shall clarify which services have to be paid for.
3. The standard specifies challenging requirements for TIO related to Contact, call and mail handling, provision of information. Among other things, the TIO must manage a telephone calls handling procedure. In this procedure the following are a must. Time limits are defined between the first ring and the transfer of the call to a staff member. It is determined how, in cases where the above limits are exceeded, the visitors are clarified about the method of contacting the TIO (via the web, by e-mail) as well as the obligation to give the visitors the option of leaving the contact number.
4. The standard also includes recommendations, always based on good practices related to the level of service in handling calls.4. Obligation of the TIO to maintain a database focused on the profile of visitors and their requests. Based on this database, the TIO must make annual

⁸ Mistilis, N., and R. Daniele. 2004. "Challenges for Competitive Strategy in Public and Private Sector Partnerships in Electronic National Tourist Destination Marketing Systems." *Journal of Travel and Tourism Marketing* 17 (4): 63–73.

reports and its publication is recommended. The standard defines the minimum data that must be included in the database.

5. The standard specifies important requirements for TIOs related to human resources, infrastructure, facilities, equipment and communication technologies.

⁹Meanwhile we are witnessing a shift from “physical access” by “digital access” that threatens traditional structures of promotion, TIOs, whose mission of spreading information and support tourism is becoming ever more demanding, are under pressure to readjust in order to promoting a socializing contact with tourists, offering services that go beyond information and provide themselves with the means of developing the promotion of the destination.

METODOLOGY

This article is focused on the presentation of a not very well-known concept among the interested parties, standardization in the field of tourism and related services. The ISO standard in relation to Tourist Information Offices has been brought to attention due to its special importance as a marketing tool in the most traditional countries, mainly for rural tourism. During the review of the literature, we noticed that the topic is little treated in general and for our country we can say that similar studies are missing, so it is worth analyzing. The research methods used in this case are secondary and primary research. The secondary data were obtained from legal documents related to the process of standardization in the world as well as from scientific articles that have analyzed different aspects related to this process. The primary data was obtained from the completion of the relevant checklists for fulfilling the criteria of the ISO standard for TIO, which were sent by email to the representatives of five of the Tourist Information Offices in our country.

DISCUSSION

From a quick look at the digital information provided by the Ministry of Tourism and Environment of Albania, the public operators under it as well as the private operators, we conclude that there is no reference to these important standards. Of course, the promotion and implementation of international and harmonized European standards faces challenges in other areas, more or less, but in the field of tourism, the problems are still big and basic for many reasons.

First, the standards in the field of tourism and related services are relatively new and their use has no tradition in our country. Secondly, the promotion, training and implementation of these standards should be requested by the public authorities charged with the development and regulation of this industry. Among other things, this also requires that the requirements of the standards be established as a basis for evaluating the performance of public and private operators, an evaluation that will be used in licensing, in public tenders or in the granting of public funding. Thirdly, the ¹⁰universities that develop study programs related to the field of

⁹ Vitor Roque, 2013 “The importance of tourism offices in promoting and building the image of a destination in rural areas: The case of Serra da Estrela”

¹⁰ Implementing standardization education at the national level, Henk J. De Vries, International Journal of IT Standards and Standardization Research, Vol.9, No.2, 2011

tourism and related services should, in cooperation with each other, create national programs that would aim at the implementation of education on standardization in the field of tourism. The educational implementation program on standardization in the field of tourism should have the following main actions:

1. Determining the need for training and education for standardization. ¹¹For this, it will be necessary to carry out a survey on training and education on standardization in the field of tourism and related services in our country, on the basis of which the needs in pre-university schools, universities, in public, central and premises, private operators, etc.
2. ¹²A steering committee in which, in addition to universities, other parties with special interest (representatives of industry, quality infrastructure institutions, public operators, etc.) would participate.
3. ¹³Drawing up an action plan with the aim of including standards in university curricula, staff training, organization of an awareness campaign between public and private operators, etc.

When it comes to Tourist Information Offices, exploring in our country database we can say that they are present in most of the cities, especially in Berat, Gjirokastra, Tirana, Rinas, Valbone etc but not all of them are well established or functional at all. Having in focus the standard related to Tourist Information Offices, a Checklist regarding the implementation of requirements of the standard was sent to 5 TIOs in Albania respective answers were given.

From a descriptive analysis that was done on this behalf, in the cities of Tirana, Elbasan, Gjirokaster, Sarande, Mirdite, Peshkopi some issues were identified that naturally require further treatment. This preliminary analysis on tourism offices results in the efforts of public tourism entities and local government to provide a tourist information service, although essentially static and focused on the time horizon corresponding to the trip, forgetting the dynamic nature of information and in time horizon before the trip, there is little involvement of the private sector as well as concentration of information for tourists. Although some basic information is provided for them, such as the location and opening times, TIO websites often do not fulfill even the elementary requirements of the standard, such as time limits for responses, the telephone secretary with the possibility of leaving the contact number, with the use of foreign languages as well. most used by visitors, etc. Given the results obtained, there is a way to achieve a better and more qualified promotion of information and tourist support in Albania.

From the above, the necessity that:

1. ISO 14785: 2014 to be a reference standard in all TIO activities.
2. The central and local public administration should ask public and private TIOs to implement the ISO 14785: 2014 standard.
3. To create a certification scheme for tourist operators, including TIO certification for compliance with the ISO 14785: 2014 standard.

Based on the experiences of certification systems in other products and services, we are convinced that the establishment and maintenance of such a system in the field of tourism and related services would be a voluntary regulatory instrument that rests on the legal framework. but that also helps him a lot.

¹¹Training and education for standardization in Europe, Survey Report, Aicha Acyl, Universiote Paris VIII, Jean – Michel Borde 2003

¹² Implementing standardization education at the national level, Henk J. De Vries, International Journal of IT Standards and Standardization Research, Vol.9, No.2, 2011

¹³ White paper, Academic Standardization in Europe, Wilfried Hesser, Henk de Vries, www.euras.org

Reference standards for the organization of the certification scheme and for the organization certification body for the above would be:

1. ISO/IEC 17067:2013 Conformity assessment fundamentals of product certification and guidelines for product certification schemes
2. ISO/IEC 17065:2012 Conformity assessment – Requirements for bodies certifying products, processes and services.

CONCLUSIONS

ISO standards for Tourism and Related Services contribute in making tourism more accessible at the global level, therefore should be acknowledged and promoted.

The standards in the field of tourism and related services are relatively new and their use has no tradition in our country.

There was no knowledge amongst the representatives of 5 TIOs in our country about the existence of the relevant standard nevertheless some of the requirements were successfully fulfilled.

For the promotion and application of standards on tourism and related services, it is necessary to implement education on standards in university study programs.

In addition to awareness campaigns, trainings, etc., for the implementation of standards, their use by the public administration to evaluate the performance of tourist operators is very important.

The creation of the certification scheme of tourist operators is an important instrument of voluntary regulation that supports the legal framework of the field.

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ISO 14785:2014 Tourist information offices -- Tourist information and reception services – Requirement.

ISO 21902:2021(en) Tourism and related services — Accessible tourism for all — Requirements and recommendations

ISO/IEC 17065:2012 Conformity assessment – Requirements for bodies certifying products, processes and services.

ISO/IEC 17067:2013 Conformity assessment fundamentals of product certification and guidelines for product certification schemes

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METHODS TO CONSTRUCT T-NORMS (T-CONORMS) ON APPROPRIATE BOUNDED LATTICES

UYGUN SINIRLI KAFESLER ÜZERİNDE T-NORMLARI (T-KONORMLARI) OLUŞTURMAK İÇİN YÖNTEMLER

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ABSTRACT

In this paper, the structures of t-norms and t-conorms on finite lattice L that satisfies some restrictions for a fixed $a \in L \setminus \{0,1\}$ are investigated. We present construction dealings for t-norms and t-conorms on finite lattice L where some necessary and sufficient conditions are required. In this context some precise examples are given.

Keywords: t-norm, t-conorm, bounded lattice.

ÖZET

Bu çalışmada $a \in L \setminus \{0,1\}$ için bazı kısıtlamalara sahip keyfi sınırlı bir L kafesi üzerinde t-normların ve t-konormların inşası üzerinde çalışılmıştır. Bazı gerek ve yeter koşulların gerekli olduğu sınırlı kafeslerde t-normlar ve t-konormların inşası için yaklaşımlar sunulmuştur. Bu kapsamda bazı irdeleyici örnekler verilmiştir.

Anahtar Kelimeler: t-norm, t-konorm, sınırlı kafes.

1.GİRİŞ

Üçgensel normlar Menger tarafından 1942 tarihinde ilk olarak tanımlanmıştır. Daha sonra Schweizer ve Sklar (1960) tarafından olasılıksal metrik uzaylar çerçevesinde özel birleşmeli fonksiyonların bir çeşidi olarak tanıtılmıştır. Üçgensel normlar çok değerli mantıkta (Gottwald, 2001; Hájek, 1998; Klement, Mesiar, & Pap, 2000), bulanık mantıkta (Nguyen & Walker, 1997; Zadeh, 1965), karar verme teorisinde (Fodor & Roubens, 1994; Grabisch, Nguyen, & Walker, 1995), istatistik bilimlerinde (Nelsen, 1999), ölçü teorilerinde (Pap, 1995; Sugeno, 1974; Weber, 1984) ve oyun teorisinde (Butnariu & Klement, 1993) uygulamalara sahiptirler.

Üçgensel normların birçok alanda önemli uygulamaları ve kullanım alanları olması sebebiyle araştırmacılar tarafından ilgi çeken bir konu olmuş ve çeşitli açılardan ele alınmıştır.

Saminger (2006) çalışmasında zincir olması gerekmeyen bazı sınırlı kafesler üzerinde etkili olan t-normların (t-konormların) ordinal toplamlarına odaklanmıştır. Ayrıca, bazı sınırlı kafesler üzerinde yeni bir t-normu veren bir ordinal toplam işlemi için gerekli ve yeterli koşullar tanıtmıştır. Fakat bahsi geçen inşa metodu her durumda herhangi bir kafes üzerinde veya keyfi t-normlar için bir t-norm üretmemektedir. Daha sonra Ertuğrul, Karaçal, & Mesiar, (2015) Saminger'in inşa yönteminin her durumda bir t-norm ve t-konorm üretmiyor olması gerçeğinden hareketle, ordinal toplamların keyfi sınırlı bir kafes üzerinde t-normları ve t-konormları ile sonuçlanan bir modifiye göstermişlerdir. Ayrıca, $[a,1]$ alt kafesi üzerinde t-normlarının ve t-konormlarının varlığını kullanarak keyfi sınırlı bir L kafesi üzerinde t-normlarını ve t-konormlarını oluşturmak için yeni bir yöntem sunmuşlardır.

Bu çalışmada sınırlı kafesler üzerindeki t-norm ve t-konormlar için inşa yöntemleri üzerine çalışılmıştır. Bu çalışma aşağıdaki şekilde organize edilmiştir. Bölüm 2 de bazı temel kavramlar sunulmuştur. Bölüm 3' te sınırlı kafesler üzerindeki t-norm ve t-konormlar için inşa yöntemleri araştırılarak, bazı gerek ve yeter koşulların gerekli olduğu sınırlı kafeslerde t-normlar ve t-konormların inşası için yaklaşımlar sunulmuştur. Bu kapsamda irdeleyici örnekler verilmiştir. Son olarak sonuç bölümü verilmiştir.

2. TEMEL TANIM VE TEOREMLER

Tanım 2.1 (Birkhoff 1967): Sınırlı bir $(L, \leq, 0, 1)$ kafesi sırasıyla 1 ve 0 olarak yazılan en büyük ve en küçük elemanlara sahip bir kafestir, yani tüm $x \in L$ için $0 \leq x \leq 1$ olacak şekilde $1, 0 \in L$ elemanı mevcuttur.

Tanım 2.2 (Birkhoff 1967): $(L, \leq, 0, 1)$ sınırlı bir kafes ve $a, b \in L$ verildiğinde a ve b kıyaslanamaz ise, bu durumda $a \parallel b$ gösterimi kullanılır. a ile kıyaslanamayan elemanların kümesi I_a gösterilir. Yani $I_a = \{x \in L \mid x \parallel a\}$.

Tanım 2.3 (Birkhoff 1967): $(L, \leq, 0, 1)$ sınırlı bir kafes ve $a, b \in L, a \leq b$ verildiğinde L' nin bir alt aralığı $[a, b]$ şu şekilde tanımlanır:

$$[a, b] = \{x \in L \mid a \leq x \leq b\}$$

Benzer şekilde,

$$[a, b) = \{x \in L \mid a \leq x < b\}, (a, b] = \{x \in L \mid a < x \leq b\}, (a, b) = \{x \in L \mid a < x < b\}$$

kümeleri tanımlanır.

Tanım 2.4 (Saminger 2006): $(L, \leq, 0, 1)$ sınırlı kafesi üzerindeki (T1)-(T4) özelliklerini sağlayan $T: L^2 \rightarrow L$ fonksiyonuna bir t-norm denir. (Her $x, y, z \in L$ için)

$$(T1) \quad T(x, y) = T(y, x) \quad (\text{Komütatiflik})$$

$$(T2) \quad T(x, T(y, z)) = T(T(x, y), z) \quad (\text{Birleşme})$$

$$(T3) \quad y \leq z \text{ ise } T(x, y) \leq T(x, z) \quad (\text{Monotonluk})$$

$$(T4) \quad T(x, 1) = x \quad (\text{Sınır Şartı})$$

Örnek 2.5 (Saminger 2006) : T_M, T_L, T_P, T_D temel t-normları aşağıdaki gibidir:

$$T_M = \min(x, y)$$

$$T_L = \max(x + y - 1, 0)$$

$$T_P = xy$$

$$T_D = \begin{cases} 0 & (x, y) \in [a, 1]^2, \\ \min(x, y) & \text{aksi takdirde} \end{cases}$$

Tanım 2.6 (Saminger 2006): $(L, \leq, 0, 1)$ sınırlı kafesi üzerindeki (T1)-(T3) özellikleri ile birlikte (S4) özelliğini sağlayan $S: L^2 \rightarrow L$ fonksiyonuna bir t-konorm denir. (Her $x, y, z \in L$ için)

$$(S4) \quad S(x, 0) = x \quad (\text{Sınır Şartı})$$

Örnek 2.7 (Saminger 2006) : S_M, S_L, S_P, S_D temel t-konormları aşağıdaki gibidir:

$$S_M = \max(x, y)$$

$$S_L = \min(x + y, 1)$$

$$S_P = x + y - xy$$

$$S_D = \begin{cases} 1 & (x, y) \in [a, 1]^2, \\ \min(x, y) & \text{aksi takdirde} \end{cases}$$

Tanım 2.8 (Saminger 2006): $(L, \leq, 0, 1)$ sınırlı bir kafes , $[a, b]$ L' 'nin bir alt aralığı ve $T^{[a,b]}$, $[a,b]$ üzerinde bir t-norm olsun. $T: L^2 \rightarrow L$ şu şekilde tanımlanır.

$$T(x, y) = \begin{cases} T^{[a,b]}(x, y) & (x, y) \in [a, b]^2, \\ x \wedge y & \text{aksi takdirde} \end{cases}$$

Tanım 2.9 (Saminger 2006): $(L, \leq, 0, 1)$ sınırlı bir kafes ve $[a, b]$ L 'nin alt aralığı ve $S^{[a, b]}$, $[a, b]$ üzerinde bir t- konorm olsun. $S: L^2 \rightarrow L$ şu şekilde tanımlanır.

$$S(x, y) = \begin{cases} S^{[a, b]}(x, y) & (x, y) \in [a, b]^2 \\ x \vee y & \text{aksi takdirde} \end{cases}$$

3. YAPILAN ÇALIŞMALAR

Teorem 3.1. $(L, \leq, 0, 1)$ sınırlı kafes, $[0, a]$ üzerinde bir t-norm V ve $a \in L \setminus \{0, 1\}$ olsun. (1) de verilen $T: L \times L \rightarrow L$ fonksiyonunun bir t-norm olması için gerek ve yeter koşul $x \in I_a$ ve $y \in (0, a]$ için $x \parallel y$ olmasıdır.

$$T(x, y) = \begin{cases} V(x, y) & (x, y) \in [0, a]^2, \\ 0 & (x, y) \in [0, a) \times I_a \cup I_a \times [0, a) \cup I_a \times I_a \\ & \cup [a, 1) \times I_a \cup I_a \times [a, 1), \\ a & (x, y) \in [a, 1]^2, \\ x \wedge y & \text{aksi takdirde} \end{cases} \quad (1)$$

İspat :

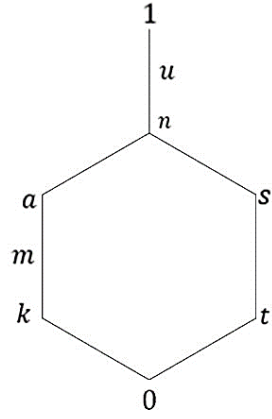
Gerek koşul : T, L üzerinde bir t-norm olsun. Her $x \in I_a$ ve $y \in (0, a]$ için $x \parallel y$ olduğu gösterilmelidir. Kabul edelim ki $x \not\parallel y$ olmasın. Bu durumda $x \leq y$ veya $y < x$ olmak zorundadır. $x \in I_a$ ve $y \in (0, a]$ olduğundan $x \leq y$ durumu mümkün değildir. Çünkü bu durumda $x \leq y \leq a$ eşitsizliği görülür. Buradan $x \in I_a$ çelişkisi elde edilir. Bu nedenle $y < x$ olmak zorundadır.

$z \in (0, a]$ keyfi seçilirse, $T(y, z) = V(y, z)$ ve $T(x, z) = 0$ elde edilir. Bu ise T t-normunun monotonluk özelliği ile çelişir. Dolayısıyla $x \parallel y$ olmak zorundadır.

Yeter koşul: $a \in L \setminus \{0, 1\}$, $[0, a]$ üzerinde V bir t-norm ve her $x \in I_a$ ve $y \in (0, a]$ için $x \parallel y$ olsun. (Aşıcı, 2021) den T, L üzerinde bir t-normdur.

Örnek 3.2. $(L = \{0, k, m, a, t, s, n, u, 1\}, \leq, 0, 1)$ sınırlı kafesi Şekil 1 deki gibi verilsin. Tablo 1 de tanımlanan T fonksiyonu L üzerinde bir t-normdur. Burada V t-normu $[0, a]$ üzerinde aşağıdaki şekilde tanımlanmıştır.

$$V(x, y) = \begin{cases} x \wedge y & a \in \{x, y\}, \\ 0 & \text{aksi takdirde} \end{cases}$$



Şekil1.T t-normu

Tablo 1. L üzerindeki T t- normu

T	0	k	m	a	t	s	n	u	1
0	0	0	0	0	0	0	0	0	0
k	0	0	0	k	0	0	k	k	k
m	0	0	0	m	0	0	m	m	m
a	0	k	m	a	0	0	a	a	a
t	0	0	0	0	0	0	0	0	t
s	0	0	0	0	0	0	0	0	s
n	0	k	m	a	0	0	a	a	n
u	0	k	m	a	0	0	a	a	u
1	0	k	m	a	t	s	n	u	1

Teorem 3.3 ($L, \leq, 0, 1$) sınırlı kafes, $[a, 1]$ üzerinde bir t-konorm W ve $a \in L \setminus \{0, 1\}$ olsun. (2) de verilen $S: L \times L \rightarrow L$ fonksiyonunun bir t-konorm olması için gerek ve yeter koşul $x \in I_a$ ve $y \in [a, 1)$ için $x \parallel y$ olmasıdır.

$$S(x, y) = \begin{cases} W(x, y) & (x, y) \in [a, 1]^2, \\ 1 & (x, y) \in (a, 1] \times I_a \cup I_a \times (a, 1] \cup I_a \times I_a \\ & \cup (0, a] \times I_a \cup I_a \times (0, a], \\ a & (x, y) \in (0, a]^2, \\ x \vee y & \text{aksi takdirde} \end{cases} \quad (2)$$

İspat :

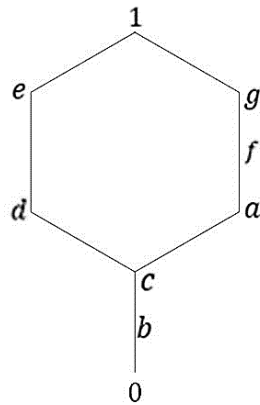
Gerek şart: S, L üzerinde bir t-konorm olsun. Her $x \in I_a$ ve $y \in [a, 1)$ için $x \parallel y$ olduğu gösterilmelidir. Kabul edelim ki $x \parallel y$ olmasın. Bu durumda $x < y$ veya $y \leq x$ olmak zorundadır. $x \in I_a$ ve $y \in [a, 1)$ olduğundan $y \leq x$ durumu mümkün değildir. Çünkü bu durumda $a \leq y \leq x$ eşitsizliği görülür. Buradan $x \in I_a$ çelişkisi elde edilir. Bu nedenle $x < y$ olmak zorundadır.

$z \in [a, 1)$ keyfi seçilirse, $S(x, z) = 1$ ve $S(x, z) = W(y, z)$ elde edilir. Bu ise t-konormunun monotonluk özelliği ile çelişir. Dolayısıyla $x \parallel y$ olmak zorundadır.

Yeter Şart : $a \in L \setminus \{0, 1\}$, $W[a, 1]$ üzerinde bir t-konorm ve her $x \in I_a$ ve $y \in [a, 1)$ için $x \parallel y$ olsun. Bu durumda S 'nin L üzerinde bir t-konorm olduğu (Aşıcı, 2021) gösterilmiştir.

Örnek 3.4. ($L = \{0, b, c, d, e, a, f, g, 1\}, \leq, 0, 1$) sınırlı kafesi Şekil 2 deki gibi verilsin. Tablo 2 de tanımlanan S fonksiyonu L üzerinde bir t-konormdur Burada W t-konormu $[a, 1]$ üzerinde aşağıdaki şekilde tanımlanmıştır.

$$W(x, y) = \begin{cases} x \vee y & a \in \{x, y\}, \\ 1 & \text{aksi takdirde} \end{cases}$$



Şekil 2.S t-konormu

Tablo 2 . L üzerindeki S t-konormu

S	0	b	c	d	e	a	f	g	1
0	0	b	c	d	e	a	f	g	1
b	b	a	a	1	1	a	f	g	1
c	c	a	a	1	1	a	f	g	1
d	d	1	1	1	1	1	1	1	1
e	e	1	1	1	1	1	1	1	1
a	a	a	a	1	1	a	f	g	1
f	f	f	f	1	1	f	1	1	1
g	g	g	g	1	1	g	1	1	1
1	1	1	1	1	1	1	1	1	1

4. SONUÇ

Bir çok uygulama alanına sahip olmasından dolayı sınırlı kafesler üzerindeki t-normlar ve t-conormlar araştırmacılar tarafından her zaman ilgi çeken bir konu olmuştur. Ayrıca t-normlar ve t-conormlar için elde edilecek inşa yöntemlerinin literatüre oldukça önemli katkıları bulunmaktadır. Bulanık mantıkta önemli bir yere sahip olan uninormlar ve nullnormlar t-normlar ve t-conormların genişlemeleri olduklarından t-normlar ve t-conormlar üzerine yapılan çalışmaları daha da önemli kılmaktadır. Bu çalışmada $a \in L \setminus \{0,1\}$ için bazı kısıtlamalara sahip keyfi sınırlı kafes üzerinde t-norm ve t-conormların inşası üzerinde çalışılmıştır. Bazı gerek ve yeter koşulların gerekli olduğu sınırlı kafeslerde t-normlar ve t-konormların inşası için yaklaşımlar sunulmuştur. Söz konusu gerek ve yeter şartın önemini vurgulamak için bazı irdeleyici örnekler verilmiştir. Bundan sonraki çalışmalarda ise söz konusu gerek ve yeter koşullara ek şartlar eklenerek yeni bir inşa yöntemi elde edilebilir mi? problemi üzerine araştırmalar yapılması planlanmaktadır.

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THE ROLE OF PROBIOTICS IN THE TREATMENT OF DISEASES ASSOCIATED WITH GUT MICROBIOTA DYSBIOSIS

PROBİYOTİKLERİN BAĞIRSAK MİKROBİYOTASI DİSBIYOZİSİ İLE İLİŞKİLİ HASTALIKLARIN TEDAVİSİNDEKİ ROLLERİ

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ÖZET

Gastrointestinal sistemde kolonize olan ve konakçı ile simbiyotik bir ilişki içinde yaşayan bakteri, arkea ve ökaryotların oluşturduğu mikrobiyal topluluğa “bağırsak mikrobiyotası” denilmektedir. Bağırsak mikrobiyotası, sindirime dirençli besin maddelerini parçalayarak kısa zincirli yağ asitleri (KZYA), aminoasitler ve vitaminler üretmek, bağırsak endotel hücrelerinin gelişimini uyarmak, bağırsakları patojen istilasından korumak ve bağırsaklarla bağlantılı immün sistemi düzenlemek gibi çeşitli fizyolojik ve immünolojik fonksiyonlara sahiptir.

Bağırsak mikrobiyotasında yerleşik iyi huylu bakterilerin azalıp fırsatçı patojen bakterilerin artması ve mikrobiyota kompozisyonun bozulması “bağırsak mikrobiyotası disbiyozisi” olarak adlandırılmaktadır. Bağırsak enfeksiyonları, stres, yanlış beslenme ve antibiyotik, kortikosteroid ve antiinflamatuvar ilaçların sık kullanımı disbiyozise neden olabilmektedir. Bağırsak disbiyozisi inflamatuvar bağırsak hastalığı, tip I ve tip II diyabet, obezite, metabolik sendrom ve kardiyovasküler bozukluklar gibi birçok hastalığın etiyolojisi ile ilişkilendirilmektedir. Bu durum probiyotiklerin bağırsak mikrobiyotası disbiyozisi ile ilişkili hastalıkların tedavisinde kullanımlarını gündeme getirmiştir.

Probiyotikler, yeterli miktarda tüketildiklerinde sağlığa olumlu etkileri olan canlı organizmalar olarak tanımlanmaktadır. En yaygın kullanılan probiyotikler yerleşik bağırsak mikrobiyotasında da yer alan *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, *Bacillus* ve *Streptococcus* cinsi laktik asit üreten bakterilerdir. Probiyotiklerin etki mekanizmaları arasında bağırsaklarda besin maddeleri ve tutunacak yüzey için patojenlerle yarışmak, ürettikleri antimikrobiyal maddelerle patojenleri baskılamak, bağırsak mikrobiyotasının enzimatik aktivitesini uyarıp KZYA sentezini arttırmak, immün sistemi düzenlemek, bağırsak epitel hücrelerinin bariyer fonksiyonunu arttırmak ve bağırsaklarda çeşitli lokal hormonların salınımını uyarmak yer almaktadır. Probiyotikler, adı geçen mekanizmalar ile ülseratif kolit ve Crohn hastalığını da içeren inflamatuvar bağırsak hastalığı, tip I ve tip II diyabet ve metabolik

sendrom gibi bağırsak mikrobiyotası disbiyozisi ile ilişkili hastalıkların kontrolünde ilaçlara etkili birer eşlikçi ve/veya alternatif olma potansiyeli taşımaktadırlar.

Anahtar Kelimeler: *Bifidobacterium*, Diyabet, İnflamatuar bağırsak hastalığı, *Lactobacillus*, Metabolik sendrom.

ABSTRACT

The microbial community of bacteria, archaea and eukarya that colonize the gastrointestinal tract and live in a symbiotic relationship with the host is called "gut microbiota". The gut microbiota has various physiological and immunological functions, such as breaking down digestion-resistant nutrients to produce short-chain fatty acids (SCFA), amino acids and vitamins, stimulating the development of intestinal endothelial cells, protecting the gut from pathogen invasion and regulating the immune system associated with the gut.

"Gut microbiota dysbiosis" is characterized by a decrease in commensal beneficial bacteria, an increase in opportunistic pathogenic bacteria and a disruption of the microbiota composition. Intestinal infections, stress, malnutrition and frequent use of antibiotics, corticosteroids and anti-inflammatory drugs can cause dysbiosis. Dysbiosis of gut microbiota has been implicated in the etiology of many diseases, including inflammatory bowel disease, type I and type II diabetes, obesity, metabolic syndrome, and cardiovascular disease. This has brought the use of probiotics to the forefront in the treatment of diseases associated with gut microbiota dysbiosis.

Probiotics are defined as living organisms that have positive health effects when consumed in sufficient amounts. The most commonly used probiotics are lactic acid-producing bacteria of the genera *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, *Bacillus* and *Streptococcus*, which are also present in the commensal gut microbiota. The mechanisms of action of probiotics include competing with pathogens for nutrients and attachment surfaces in the intestines, suppressing pathogens with the antimicrobial substances they produce, stimulating the enzymatic activity of the gut microbiota and increasing the synthesis of SCFA, regulating the immune system, increasing the barrier function of intestinal epithelial cells and stimulating the release of various local hormones in the intestines. Probiotics have the potential to be effective companions and/or alternatives to drugs in the control of diseases associated with gut microbiota dysbiosis such as inflammatory bowel disease including ulcerative colitis and Crohn's disease, type I and type II diabetes and metabolic syndrome.

Keywords: *Bifidobacterium*, Diabetes, Inflammatory bowel disease, *Lactobacillus*, Metabolic syndrome.

GİRİŞ

İnsan vücudunda kommensal olarak yaşayan ve özellikle gastrointestinal sistemde kolonize olup konakçı ile etkileşim halinde olan mikroorganizmaların tamamına mikrobiyota denilmektedir. Mikrobiyotanın insan vücudunda en çok tercih ettiği bölge başta kolon olmak üzere gastrointestinal kanaldır. Bağırsak mikrobiyotası geniş çaptaki fizyolojik işlevleri nedeniyle gizli kalmış ek bir organ olarak tanımlanmaktadır. Bağırsak mikrobiyotasının bu işlevleri yerine getirebilmesi yerleşik mikrofloranın bileşiminin ve işlevinin korunmasına bağlıdır. Bağırsak enfeksiyonları, stres, yanlış beslenme ve antibiyotik, kortikosteroid ve antiinflamatuvar ilaçların sık kullanımı sonucu bağırsak mikrobiyotasının kompozisyonu patojen

bakterilerin lehine deđişmekte ve disbiyozis durumu meydana gelmektedir. Bađırsak disbiyozisi inflamatuvar bađırsak hastalıđı, tip I ve tip II diyabet, obezite, metabolik sendrom ve kardiyovasküler bozukluklar gibi birok hastalıđın etiyolojisi ile iliřkilendirilmektedir. Vücuda yeterli miktarlarda alındıđı zaman sađlıđa olumlu etkileri olan canlı mikroorganizmalar olarak tanımlanan probiyotikler çeřitli etki mekanizmaları ile bađırsak disbiyozisi ile iliřkili hastalıkların tedavisinde rol oynamaktadırlar.

BAĐIRSAK MİKROBİYOTASI VE FİZYOLOJİK GÖREVLERİ

Bađırsak mikrobiyotası, gastrointestinal sistemde kolonize olan ve konakçı ile simbiyotik bir iliřki içinde yařayan bakteri, arkea ve ökaryotların oluřturduđu mikrobiyal bir ekosistemdir. Bađırsak mikrobiyotası dođum esnasında vajinal yoldaki mikroorganizmalar ile karřılařma sonrasında řekillenmeye bařlamakta ve yařamın ilk 1-2 yılında stabilize olmaktadır.

Bađırsak mikrobiyotasını oluřturan bakteri filumlarını tespit etmek amacıyla 16S ribozomal RNA yöntemi kullanılmaktadır. Sađlıklı bireylerin bađırsak florasında Bacteroidetes (*Bacteroides*, *Porphyromonas*, *Prevotella* vb. Gram-negatif cinsler - %40), Firmicutes (*Clostridium*, *Eubacterium*, *Ruminococcus*, *Butyrivibrio*, *Anaerostipes*, *Roseburia*, *Faecalibacterium* vb. Gram-pozitif cinsler - %40), Actinobacteria (Gram-pozitif *Bifidobacterium* cinsi - %10), Proteobacteria (*Enterobacteriaceae* vb. Gram-negatif cinsler - %3) ve Verrucomicrobia (*Akkermansia* vb. cinsler) (%3) olmak üzere totalde 5 ana řube bulunmaktadır (Varım, 2017). Firmicutes ve Bacteroidetes řubeleri bađırsak mikrobiyotasının %90'ını oluřturmakta ve sađlıklı bireylerde birbirlerine oranı 1:1 ile 1:3 arasında deđiřiklik göstermektedir (NIH HMP Working Group ve ark., 2009).

Konak canlı olan insanla simbiyotik bir iliřki içinde olan bađırsak mikrobiyotasının temel olarak metabolik, geliřtirici (trofik) ve koruyucu (protektif) olmak üzere geniř bir yelpazede fizyolojik görevleri bulunmaktadır. Kolonda bulunan mikroorganizmaların esas görevi sindirilemeyen veya sindirilemeden kolona gelen besin maddelerini ve mucusu fermente ederek asetat, propiyonat ve bütirat gibi KZYA üretmek ve konak canlıya enerji sađlamaktır. Asetat, KZYA'ların içerisinde kolonda en fazla miktarda bulunan bileřiktir. Asetatın %70'i kolesterol, uzun zincirli yađ asidi, glutamat ve glutamin sentezinde kullanılmak üzere karaciđere geçmektedir. Geriye kalan kısmı ise kaslar, böbrekler, kalp ve yađ doku için enerji kaynađı olarak kullanılmaktadır. Propiyonat ise karaciđerde glikoneogenezise katılarak glikoza dönüşmektedir (Brighenti, 1995). Bütiratın en önemli iřlevi kolonik epitelyumun enerji ihtiyacını karřılamaktır. Kolon epitel hücreleri, enerji ihtiyalarının yaklaşık olarak %60-70'ini bütirattan sađlamaktadır (Besten, 2013).

Bađırsak bakterilerinin diđer görevi oluřturdukları KZYA ile bađırsak epitel hücreleri üzerine trofik (geliřtirici) etkiler oluřturmaktır. Bađırsak mikrobiyotasındaki bakteriler ürettikleri KZYA ile epitel hücrelerinin farklılařmasını ve çođalmasını uyarmaktadır. Trofik etki daha ok asetat ve propiyonat ile oluřturulurken, bütirat kolon epitel hücrelerinin üremesini engelleyerek farklılařmasını stimüle etmektedir (Göker, 2019).

Bađırsak mikrobiyotasının en önemli fonksiyonlarından biri bađırsak yüzeyinde bir bariyer oluřturarak bađırsak dokusunun patojenler tarafından istila edilmesini engellemek ve bu yolla koruyucu (protektif) bir iřlev görmektir. Bađırsak yüzeyinde biyofilm oluřturan mikrobiyal flora, substrat ve tutunacak yüzey için patojen mikroorganizmalarla yarışarak, fiziksel olarak yer bırakmayarak ve ürettiđi bakteriyosin adı verilen toksik maddelerle patojen mikroorganizmaların

ölümüne sebep olarak patojenlerin bağırsakta kolonize olmasına engel olur (O'Hara & Shanahan, 2006).

BAĞIRSAK MİKROBİYOTASI DİSBIYOZİSİ

Bağırsak mikrobiyotasında yerleşik iyi huylu bakterilerin azalıp fırsatçı patojen bakterilerin artması ve mikrobiyota *kompozisyonun* bozulması “bağırsak mikrobiyotası disbiyozisi” olarak adlandırılmaktadır (Avcı, 2022). Bağırsak enfeksiyonları, stres, yanlış beslenme, hareketsiz yaşam ve antibiyotik, kortikosteroid ve antiinflamatuvar ilaçların sık kullanımı disbiyozisin en yaygın sebepleri arasında yer almaktadır (Ferreira ve ark., 2022). Hayvan modellerinde ve insanlarda yapılan çalışmalar, bağırsağın mikrobiyal topluluğundaki kalıcı bir dengesizliğin, inflamatuvar bağırsak hastalıkları, irritabl bağırsak sendromu, diyabet, obezite ve kanserin yanısıra kardiyovasküler ve nörolojik birçok hastalık ile ilişkili olduğunu göstermiştir (Belizário & Faintuch, 2018). Disbiyozis durumunda salınımları artan lipopolisakkaritler (LPS) ve *inflamatuvar* sitokinler bağırsak bariyerini bozmakta ve bunun sonucunda gelişen endotoksemi, ilgili hastalıkların patogenezisinde önemli rol oynamaktadır (Sarkar ve ark., 2020; An ve ark., 2022). Bağırsak mikrobiyotasındaki spesifik yararlı bakterilerin hastalara probiyotik formunda yeniden sunulması ile disbiyozisin düzeltilebileceği bildirilmektedir (Dahiya & Nigam, 2023).

PROBİYOTİKLER

Probiyotikler, yeterli miktarda tüketildiklerinde sağlığa olumlu etkileri olan canlı organizmalardır. Günümüzde probiyotiğin tanımı, insan ve hayvan sağlığını destekleyen ve gıda, yem veya gıda katkı maddelerine eklenen tüm mikrobiyal preparatları kapsamaktadır (Salminen ve ark., 1996). Probiyotik olarak kullanılan bakteriler arasında en yaygın olanları *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, *Bacillus* ve *Streptococcus*'tur (Gupta & Garg, 2009). Bunlar arasında *Bifidobacterium*, *Lactobacillus*, *Enterococcus* ve *Streptococcus* “laktik asit bakterileri” olarak tanımlanan grup içerisinde yer almakta ve en yaygın kullanılan mikroorganizmaları ise *Bifidobacterium* ve *Lactobacillus* oluşturmaktadır. *Saccharomyces* ve *Candida* gibi mayaların yanı sıra *Aspergillus* gibi küf türleri de probiyotik ürünlerin hazırlanmasında kullanılmaktadır (Salminen ve ark., 1996).

Probiyotik mikroorganizmaların tanımlanması için gerekli olan kriterler LABIP (Lactic Acid Bacteria Industrial Platform; Laktik Asit Bakterileri Endüstriyel Platformu) tarafından tanımlanmaktadır. Bu tanıma göre probiyotik potansiyeli olan mikroorganizmaların taşıması gereken özellikler şunlardır (Harmsen ve ark., 2000):

- Bağırsakla ilişkili bağışıklık hücreleriyle etkileşime girmeli veya sinyaller gönderebilmelidir.
- İnsan kökenli olmalıdır.
- Patojen özellik içermemelidir.
- Bağırsak epitel dokularına tutunabilmelidir.
- Gastrik asit ve safra tuzuna karşı direnç göstermelidir.
- Lokal metabolik aktiviteyi etkileme kapasitesine sahip olmalıdır.
- Gastrointestinal sistemde kısa süreler için de olsa sürekliliğini devam ettirebilmelidir.

- Teknolojik süreçlere karşı direnç göstermelidir.

Probiyotiklerin etki mekanizmaları arasında bağırsaklarda besin maddeleri ve tutunacak yüzey için patojenlerle yarışmak, ürettikleri antimikrobiyal maddelerle patojenleri baskılamak, bağırsak mikrobiyotasının enzimatik aktivitesini uyarıp KZYA sentezini arttırmak, immün sistemi düzenlemek, bağırsak epitel hücrelerinin bariyer fonksiyonunu arttırmak ve bağırsaklarda çeşitli lokal hormonların salınımını uyarmak yer almaktadır (Power ve ark., 2014).

PROBİYOTİKLERİN BAĞIRSAK MİKROBİYOTASI DİSBIYOZİSİ İLE İLİŞKİLİ HASTALIKLARIN TEDAVİSİNDEKİ ROLLERİ

Tip 1 Diyabet

Tip 1 diabetes mellitus, çocukluk yaş grubunda sık görülen T-hücrelerinin aracılık ettiği insülin üretiminde görev alan pankreasın β -hücrelerinin süregelen otoimmün veya otoimmün dışı nedenlerle haraplanması sonucu gelişen insülinopeni ve hiperglisemi ile karakterize kronik metabolik bir hastalıktır. Hastalığın bağışıklık düzenlemesindeki bir bozulmanın sonucu olarak ortaya çıktığı bildirilmektedir. Bunun sonucunda otreaktif $CD4^+$ ve $CD8^+$ T hücreleri ile otoantikor üreten B lenfositler çoğalmakta ve tüm bu bağışıklık bileşenleri doğuştan gelen bağışıklık sistemi ile işbirliği yaparak insülin üreten β -hücrelerini yok etmek üzere aktive olmaktadır (Bluestone ve ark., 2010).

Probiyotiklerin tip 1 diyabet üzerine bildirilen etki mekanizmaları arasında toll benzeri reseptör (TLR) sinyali baskılayarak pro-inflamatuar sinyal yollarını düzenlemek yer almaktadır. Probiyotikler interlökin-6 (IL-6), IL-1B ve tümör nekroz faktörü alfa (TNF- α) gibi proinflamatuar sitokinlerin seviyesini azaltırken, dönüştürücü büyüme faktörü- β (TGF- β) ve IL-10 gibi anti-inflamatuar sitokinlerin seviyesini artırmaktadırlar. Bütirat başta olmak üzere KZYA'ların üretimini artırabilmekte ve böylece bağışıklık sistemini düzenlemektedirler. Bütirat bakteriyel translokasyonu azaltmakta, sıkı bağlantı noktalarının organizasyonunu iyileştirmekte ve bağırsak epitelinin bütünlüğünü koruyan müsin sentezini uyarmaktadır. Probiyotikler, pankreatik β -hücrelerinden insülin salgılanmasını uyaran ve böylece kan şekerini düşüren glukagon benzeri peptid-1 (GLP-1) hormonu üretimini de artırmaktadır (Mishra ve ark., 2019). Tip 1 diyabet patogenezi dahil olan faktörler arasında bağırsak geçirgenliğinin artması ile pankreatik β -hücrelerine zarar verebilen antijenlerin emiliminin kolaylaşması da yer almaktadır. Probiyotikler bağırsak geçirgenliğinin düzenlenmesiyle ilgili olan zonulin ekspresyonunu artırarak bağırsak epitel hücreleri arasındaki paraselüler boşluğun azalmasını sağlamakta ve bu şekilde sıkı bağlantıların yapısını düzenlemektedirler (Ohland & Macnaughton, 2010).

Tip 2 Diyabet

Tip 2 diyabet, insülin sekresyonunda ve/veya hücrelerin insüline direncinde bozukluk ya da azalma ile karbonhidrat, protein ve yağ metabolizmasında değişikliklerle ortaya çıkan ve dünyada *prevelansı* giderek artan bir hastalıktır. *Prevelansının* artmasındaki temel etkenler ise yanlış beslenme ve hareketsiz yaşam şeklidir (Saeedi ve ark., 2019).

Yüksek yağlı bir beslenme bağırsaklarda Gram-negatif bakterilerin büyümelerini uyarmakta ve bunlardan serbestlenen LPS'lerin bağırsak bariyerinden kana translokasyonuna neden

olmaktadır. LPS'ler, monositler, endotel hücreler ve makrofajlar üzerindeki TLR-4'e bağlanarak, Nükleer Faktör kappa B (NF-κB) ve aktivatör protein-1 (AP-1) aktivasyonuna yol açmaktadır. Bu da immün hücrelerden proinflamatuvar sitokinlerin (TNF-α, IL-6 ve IL-1) salgılanmasını ve reaktif oksijen türlerinin (ROS) üretimini uyararak endotel hasarına ve işlev bozukluğuna neden olmaktadır. Tüm bu süreç "metabolik endotoksemi" olarak bilinmektedir. Sistemik immün yanıtın ilerleyen aktivasyonunun sonucu olarak, insülin direnci daha belirgin hale gelmekte ve diyabet ortaya çıkmaktadır (Gomes ve ark., 2014). Diyabette probiyotik kullanımının LPS aracılı TLR-4 aktivasyonunu zayıflattığı ve Gram-negatif bakterilerin translokasyonunu ve mukozal yapışkanlığını azalttığı bildirilmektedir. Probiyotikler ayrıca intestinal geçirgenliğin azalmasına yardımcı olan adezyon proteinlerinin ekspresyonunu arttırmaktadır. Bunun sonucunda insülin duyarlılığı artmakta ve kan glukoz düzeyi olumlu yönde etkilenmektedir (Gomes ve ark., 2014).

İnflamatuvar Bağırsak Hastalıkları

İnflamatuvar bağırsak hastalıkları tekrarlayıcı ve kronik bir inflamasyon ile karakterize olan hastalıklardır. Temelde Crohn hastalığı ve ülseratif kolit olmak üzere iki farklı formu bulunmaktadır. Ülseratif kolit genel olarak kalın bağırsağın iç yüzeyinde bulunan tabakanın ödemli, ülserli ve iltihaplı olması ile karakterizedir. Crohn hastalığı ise ağızdan anüse kadar gastrointestinal sistemin tamamını kapsayan ve transmural inflamasyon ile öne çıkan bir hastalıktır. Probiyotiklerin inflamatuvar bağırsak hastalıkları üzerine olan olumlu etkilerini patojen mikroorganizmaların epitele tutunmasını engelleyerek, hidrojen peroksit ve bakteriyosin gibi antimikrobiyal maddeler açığa çıkarıp patojen mikroorganizmaların üremesini baskılayarak, mukozanın bariyer işlevlerini güçlendirerek ve bağırsak ile ilişkili lenfoid hücrelerin immün işlevlerini uyararak gösterdikleri bildirilmektedir (Rioux & Fedorak, 2006).

Metabolik Sendrom ve Bileşenleri

Metabolik sendrom, içeriğinde obezite, dislipidemi, hipertansiyon ve bozulmuş glikoz metabolizmasını kapsayan bir halk sağlığı sorunu olarak tanımlanmaktadır. Bu durumun ortaya çıkmasında hem genetik faktörler hem de çevresel faktörler rol oynamaktadır (Alberti ve ark., 2009).

Obesite. Obezite, alınan enerjinin harcanan enerjiden daha fazla olmasından dolayı vücudun enerji dengesinin bozulması ve buna bağlı olarak vücut ağırlığının artmasıdır. Obez insanların bağırsak florasındaki değişiklikler nedeniyle probiyotiklerin obeziteyi tedavi etmek için kullanılabilmesi düşünülmektedir (Arslan ve ark., 2005). Probiyotik kullanımının obezitede artmış olan leptin düzeyini azalttığı ve yağ depolanması üzerinde olumsuz etkileri olan adiponektin ve açlıkla indüklenen yağ faktörü (FİAF) ekspresyonunu ise arttırdığı bildirilmektedir. Probiyotiklerin obezite üzerine olumlu etkilerine aracılık eden etki mekanizmaları arasında TNF-α düzeyini düşürerek endotoksemiye, mukozal geçirgenliği ve oksidatif stresi azaltmak ve insülin sensitivitesini artırmak yer almaktadır (Arora ve ark., 2013).

Glisemik indeks. Probiyotiklerin metabolik sendrom parametrelerinden biri olan glisemik indeks üzerine etkisi son yıllarda birçok araştırmaya konu olmuştur. Probiyotikler glisemik indeks üzerindeki etkilerini bağırsaktaki KZYA sentezini artırarak göstermektedirler. KZYA, insülin sinyalini düzenleyen ve yağ birikimini engelleyen GPR41 ve GPR43'ü aktive etmektedir. KZYA iştah ve kan şekeri kontrolünde rol oynayan GLP-1 ve GLP-2 gibi bağırsak hormonlarının salgılanmasını da uyarmaktadır (Kim ve ark., 2018). GLP-1, iştahı azaltarak

konağın tokluk durumunu düzenlerken, GLP-2 bağırsak epitel hücrelerinin çoğalmasını ve bariyer bütünlüğünün korunmasını sağlayarak metabolik endotoksemiye azaltmaktadır. Bunların yanı sıra bütirat mütin sentezini artırarak epitel hücre bütünlüğünü artırmakta ve böylece geçirgen bağırsak sendromunu engellemektedir (Cani, 2012). Ayrıca asetat ve propiyonatın karaciğer ve doku hücrelerinde enerji ve lipid metabolizmasına katılmasının, canlının standart diyetle aldığı oral glikoza olan ihtiyacı ve dolayısıyla glisemik cevabı düşürdüğü bildirilmiştir (Brighenti ve ark., 1995).

Hiperlipidemi. Probiyotikler hiperlipidemi üzerine çeşitli mekanizmalar ile etkili olmaktadır (Kumar ve ark., 2012). Bu mekanizmalardan en çok araştırılanı safra tuzu hidrolaz aktivitesidir. Safra tuzu hidrolaz aktivitesi *Lactobacillus* ve *Bifidobacterium* cinsine ait birçok bakteride gösterilmiştir (Tanaka ve ark., 1999). Safra tuzu hidrolaz enzimiyle safra asitlerinin dekonjugasyonu, safranın çözünürlüğünün ve emilebilirliğinin azalmasına neden olmakta ve dışkıyla atılmasını sağlamaktadır. Bunun sonucunda kolesterolden safra asitleri yeniden sentezlenmekte ve serum kolesterol düzeyi düşmektedir (Kumar ve ark., 2012).

Hipertansiyon. Metabolik sendrom bileşenlerinden biri olan hipertansiyon da bağırsak disbiyozu ile ilişkilendirilmektedir. Hipertansiyonu olan sıçanlar ve insanlarda *Bifidobacterium* türleri ile birlikte bağırsak mikrobiyotasındaki çeşitliliğin ve zenginliğin de azaldığı tespit edilmiştir (Yang ve ark., 2015). Bağırsak mikrobiyotası ile hipertansiyon arasındaki ilişkiyi araştıran bir çalışmada, hipertansif bir hastadan germ free (mikropsuz) farelere fekal mikrobiyota transplantasyonu yapılmıştır. Sekiz haftanın sonunda ise farelerin sistolik ve diyastolik kan basınçlarında artış olduğu gözlenmiştir (Li ve ark., 2017). Yüksek tuz tüketiminin bağırsak mikrobiyotasında *Lactobacillus spp.*'yi azalttığı ve bunun sonucunda kan basıncının yükseldiği bildirilmiştir. Bu durumda yapılan probiyotik tedavisinin kan basıncını düzenlediği ve vasküler fonksiyonu iyileştirdiği bildirilmektedir (Wilck ve ark., 2017). Bunun yanında KZYA'ların renin salgılanmasında ve kan basıncının düzenlenmesinde rolü olan G-protein eşli reseptör (GPCR) yolları üzerinde etkileri bulunmaktadır. GPR43 ve GPR41'in aktive olması vazodilatasyon ve kan basıncında azalma sağlamaktadır. Probiyotikler GPR43 ve GPR41'in aktive olmasına neden olarak kan basıncını düşürmektedir (Tang ve ark., 2017). Bu sonuçlar, insan bağırsak mikrobiyotasının probiyotiklerle modülasyonunun hipertansiyonun kontrolünde rol oynayabileceğini düşündürmektedir.

SONUÇ

Bağırsak mikrobiyotası konakçı ile simbiyotik bir ilişki içinde yaşamakta ve metabolik, trofik ve protektif etkileri ile konakçının sağlığını olumlu yönde etkilemektedir. Mikrobiyotada dengesiz beslenme, antibiyotik kullanımı ve çeşitli yangısal hastalıkların etkisiyle disbiyozis meydana gelebilmektedir. Bağırsak disbiyozisi inflamatuvar bağırsak hastalığı, tip I ve tip II diyabet, obezite, metabolik sendrom ve kardiyovasküler bozukluklar gibi birçok hastalığın etiyojisi ile ilişkilendirilmektedir. Birçoğu bağırsak mikrobiyotasına dahil olan yararlı bakterilerden oluşan probiyotikler bağırsak koşullarını yerleşik mikrobiyotadaki yararlı bakterilerin lehine olacak şekilde düzenleyerek ve bağırsak bariyerini, bağırsakla bağlantılı immün sistemi ve bağırsakların endokrin fonksiyonlarını destekleyerek ilgili hastalıkların tedavi süreçlerini olumlu yönde etkilemektedirler. Probiyotikler bu yönleriyle bağırsak mikrobiyotası disbiyozisi ile ilişkili hastalıkların kontrolünde ilaçlara etkili birer eşlikçi ve/veya alternatif olma potansiyeli taşımaktadırlar.

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THE SIGNALING PATHWAYS IN THE TREATMENT OF OVARIAN CANCER

YUMURTALIK KANSERİ TEDAVİSİNDE SİNYAL YOLAKLARI

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Abstract

Cancer is the whole of the damage that occurs in tissues and organs as a result of uncontrollable cell divisions. There are many types of cancer associated with different incidence and mortality rates. Ovarian cancer ranks seventh in prevalence worldwide and ranks fifth as the cause of cancer-related death. Although cancer types have standard treatment methods in themselves, individuals give different answers to these treatment methods. In ovarian cancer, there are certain genes that allow cancerous cells to grow instead of killing them. Apoptosis occurs in two ways, intrinsic and extrinsic. Cancer incidence, metastasis, drug resistance and recurrence are critical issues of oncological diseases, especially ovarian cancer. There is a need to understand the mechanism and develop new strategies to overcome the resistance mechanism. With the increase in studies to determine targeted treatment approaches and molecular characterization of ovarian cancer, the problem that is an important cause of infertility will be eliminated and precautions will be taken for an important factor of morbidity and mortality in women.

Keywords: Hedgehog, ovary cancer, cancer therapy, signaling pathway

Introduction

As in all gynecological cancers, early diagnosis and treatment in ovarian cancer are promising. However, high morbidity and difficulty in early diagnosis in an advanced stage ovarian cancer and the survival rate is very low due to the lack of promising screening tools (1). Despite all the treatment strategies developed, ovarian cancer still has a high mortality rate. In recent years, many studies conducted within the scope of targeted therapy strategies in ovarian cancer focus on pathways and treatment options specific to these pathways. In ovarian cancer cells, the activity of the pathways may be increased or inactivated to cause the characteristic features of cancer cells such as uncontrolled cell proliferation, blocking of cell differentiation, apoptosis pathway, and altered tissue structure. It is possible to present more effective treatment approaches to patients by determining the molecular characterization of the differentiations that

occur in the pathways due to the treatment of ovarian cancer or resistance to chemotherapeutics over time. With this study, it was provided to give information about the effectiveness of some pathways determined as a result of studies on ovarian cancer on the disease.

Apoptotic Pathway

In ovarian cancer, there are certain genes that allow cancerous cells to grow instead of killing them. Bcl-2 family proteins and tyrosine-protein kinases are active in intrinsic and extrinsic apoptosis pathways, respectively, while apoptosis inhibitor proteins (IAP) are active in both intrinsic and extrinsic apoptosis pathways. Bcl-2 anti-apoptotic protein is also expressed at very high concentrations in ovarian cancer (2-4). In addition, together with Bcl-X and Mcl-1, it modulates resistance to chemotherapy and reduces survival (5). In contrast, Bid, Bad, Bax and Bak respond to ovarian cancer treatment by inducing apoptosis and increase survival. Clinical studies for the treatment of ovarian cancer determined that Bcl-2 inhibitors improved the response to cisplatin, and this result was also seen in pre-clinical models of ovarian cancer studies (6, 7).

Another family of anti-apoptotic genes are IAP proteins. Survivin is a well-characterized inhibitor of apoptotic proteins found in ovarian and other cancer cells. Survivin plays an important role in cell division and thus controls apoptosis. Increased expression level of c-Met affects cell proliferation, infiltration, angiogenesis and resistance (8, 9). The anti-apoptotic activity of c-MET depends on the level of chemoresistance of the treatment (10). Radiotherapy induces c-Met expression and triggers a cascade of signals that increases survival and increases response to therapy.

In a study, it was determined that when ovarian cancer cells were treated with c-Met inhibitors, cell proliferation was significantly reduced and apoptosis of cancer cells increased. Thus, specific proteins inhibit tumor expansion and metastasis via vascular endothelial growth factor (VEGF) (11).

Hedgehog Signal Pathway

In vertebrates, mature Hh proteins are ligands of the cell membrane-bound receptors Patched 1 and Patched 2, and when they bind to these receptors, the Hh signaling pathway is activated. It is known that the expression of human epididymal protein (HE4) is associated with Rab 23 expression in ovarian cancer cells (12). Rab23 is a member of the small Ras-related GTPase superfamily that plays an important role in the Sonic Hedgehog (Shh) signaling pathway. In 2001, Eggenschwiler et al. (13) determined that Rab23 is an important negative regulator of the Sonic Hedgehog signaling pathway and found that Rab23 has a tumor suppressive role. Rab 23 is mainly enriched in the Hedgehog signaling pathway and cancer-associated signaling pathways. There are cases of ovarian cancer in which tumorigenic activation of the Hh signaling pathway has been reported (14). When the Hh pathway is abnormally activated, it is mediated by ligand-independent PTCH, SMO, and Su(Fu) mutations in the Hh pathway (15). In a study by Liao et al., they reported that overexpression of PTCH and Gli1 protein in ovarian cancers negatively affects the survival of patients. In addition, subcellular localization of the Hh signaling protein is also important. Gli1 expression is mainly observed in the cytoplasm of ovarian epithelial tumors, while high levels of Gli1 expression in invasive cancer samples have been associated with diffuse nuclear Gli1 immunoreactivity (16). It has been reported that significantly higher Shh expression is observed in ovarian cancers when normal tissues and benign ovarian tumors are compared.

Conclusion

With the increase in studies to determine ovarian cancer targeted treatment approaches and molecular characterization, it will be possible to develop strategies that have no side effects and increase the quality of life of the patient in the ovarian cancer treatment process in the near future.

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MODELLING OF CUTTING FORCE IN TURNING PROCESS BASED ON ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM

TORNALAMA İŞLEMİNDE KESME KUVVETİNİN UYARLAMALI SİNİRSEL BULANIK ÇIKARIM SİSTEMİ TABANLI MODELLENMESİ

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ÖZET

Bu çalışmada, bir çeliğin tornalama işlemindeki kesme kuvveti, uyarlamalı sinirsel bulanık çıkarım sistemi (ANFIS) yaklaşımına dayalı olarak modellenmiştir. Giriş parametreleri olarak ilerleme hızı, ayna hızı ve kesme derinliği dikkate alınmıştır. Veri seti olarak; çeşitli ilerleme hızlarında, ayna hızlarında ve kesme derinliklerinde gerçekleştirilen bir dizi tornalama deneyinden elde edilen değerler kullanılmıştır. Modelleme sonuçları, ANFIS modelinin ilerleme hızı, ayna hızı ve kesme derinliği açısından kesme kuvveti değerini başarılı bir şekilde tahmin edilebildiğini göstermiştir. İşlem sırasında kesme kuvveti değişimlerini açıklamak için önerilen matematiksel modelden elde edilen sonuçlar tablolar halinde sunulmuştur. Model performansı determinasyon katsayısı (R^2) kullanılarak değerlendirilmiştir.

Anahtar Kelimeler: Ayna hızı, ilerleme hızı, kesme derinliği, kesme kuvveti, tornalama, uyarlamalı sinirsel bulanık çıkarım sistemi, modelleme.

ABSTRACT

In this study, the cutting force in a turning process for a steel was modelled based on the adaptive neuro-fuzzy inference system (ANFIS) approach. Feed rate, chuck speed and cutting depth were considered as the input parameters. The values obtained a series of turning experiments conducted at various feed rates, chuck speeds and cutting depths were used as the data set. The modelling results showed that the ANFIS model could successfully predict the cutting force value in terms of feed rate, chuck speed and cutting depth. The results obtained the mathematical model which proposed to describe the cutting force changes during the process were presented in tables. Model performance was evaluated using the determination coefficient (R^2).

Keywords: Chuck speed, feed rate, cutting depth, cutting force, turning, adaptive neuro-fuzzy inference system (ANFIS), modelling.

GİRİŞ

Tornalama, torna tezgahında yapılan önemli bir talaş kaldırma işlemidir. Bu işlem metal parçaların imalatında kullanılır. Metal parça dönerken kesici takım metali keser ve doğrusal hareketle ileri doğru hareket eder. Bunun sonucunda işlenen malzeme çap olarak şekil alır ve genellikle bu şekil silindirikdir. Kesici takım, farklı şekiller üretmek için farklı açılara ayarlanabilir. Tornalama işlemi universal tornalarda manuel olarak yapılabileceği gibi, daha hassas işlemler gerektiğinde CNC tornalarda da otomatik olarak yapılabilir. CNC işleme özellikle bir parçanın boyutlarının son derece hassas olması gerektiğinde tercih edilir. Kesme işlemini yapacak olan kesici takımların seçimi ve tasarımı ise tornalama işlemini doğrudan etkiler. Bu sebeple kesici takımların tasarımında kullanılacak olan kesme kuvvetlerinin tahmini veya hesaplanması son derece önemlidir. Her zaman bir analitik modelleme söz konusu olmayabilir. Deneysel sonuçlardan yola çıkılarak çeşitli ampirik ve yapay zekâ temelli modeller yapma da mümkündür. Son zamanlarda birçok araştırmacı bu çalışmalara yönelmiştir.

Bu çalışmada, bir tornalama işlemi sonucu oluşan kesme kuvvetinin matematiksel modeli uyarlamalı sinirsel bulanık çıkarım sistemi (ANFIS) kullanılarak elde edilmiştir. Son yıllarda matematiksel modelleme tüm bilim dallarına yayılmış, araştırma ve geliştirme yapılan süreçlerin daha iyi değerlendirilmesini ve incelenmesini sağlamıştır. Mühendislik ve teknolojide matematiksel modelleme; yüksek maliyetler olmadan zaman ve para tasarrufu sağlanarak tahminlerin güvenle yapılabileceği analitik ortamlar sağlamaktadır. Matematiksel modelleme tekniklerinin mühendislik alanındaki başarılı uygulamaları, birçok bilimsel araştırma alanının genişletilmesine yol açmıştır. Her ne kadar bu yeni alanlarda modellemenin genel felsefesi aynı kalsa da simülasyon prosedürleri ve doğrulama kriterleri farklıdır ve model türlerine ve ait oldukları disiplinlere bağlıdır. Matematiksel modelleme, karşı karşıya olduğumuz mühendislik sorunlarını çözmek için mühendislerin ve bilim insanlarının ilgi ve özverilerini harekete geçirmeyi amaçlayan geniş, çok disiplinli bir alan haline gelmiştir. Matematiksel modelleme faaliyetlerindeki en önemli gelişmelerden birisi, çok karmaşık modelleri çözebilen yüksek hızlı bilgisayarların bulunmasıdır. Çözüm teknikleri, deneysel bilgi ve bilgisayar teknolojilerindeki tüm ilerlemelere rağmen, insan zekasının, deneyiminin ve sezgisinin matematiksel modellemede hala önemli bir rol oynamaktadır.

Bu çalışmada, gelecekte önemi daha da artacak olan ve sürekli olarak çeşitlendirilen kesici takımların geliştirilmesinde kullanılabilmek amacıyla kesici takımı doğrudan etkileyen kesme kuvvetinin matematiksel modeli uyarlamalı sinirsel bulanık çıkarım sistemi kullanılarak elde edilmiştir. Deneysel olarak elde edilmiş olan verilerin kullanıldığı bu matematiksel modelleme yaklaşımının kesme kuvvetinin modellenmesinde alternatif olarak kullanılabileceği gösterilmiştir.

TORNALAMA İŞLEMİ SONUCU OLUŞAN KESME KUVVETİ

Şekil 1'de normal tornalama mekanizması kuvvetleri şematik olarak gösterilmiştir. Kesici takımın paralel konumu ve iş milinin hızı da gösterilmiştir. Kuvvet dengesi kuvvetler arasındaki bağlantı olarak tanımlanır. Ortaya çıkan kesme kuvveti ilerleme kuvveti (F_f), teğetsel kesme kuvveti (F_t) ve radyal kuvvetten (F_r) elde edilir [1, 2].

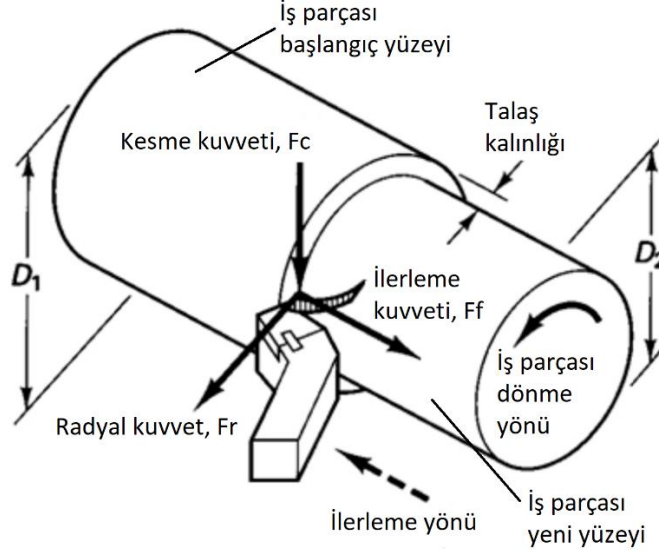
$$F_C = \sqrt{F_f^2 + F_t^2 + F_r^2}$$

F_f (ilerleme kuvveti) kesilmemiş talaşın kalınlığı yönündedir ve esas olarak ilerleme hızından etkilenir. Ancak ilerleme hızı arttıkça ilerleme kuvveti de artar. F_t (teğetsel kuvvet), kesme hızı (V) yönüne etki eder. F_r (radyal kuvvet), takımı iş parçasından uzaklaştıran radyal bir kuvvettir

ve iş parçasının radyal yönü boyunca etki eder. Denge ilkesine göre takım aynı kuvveti aynı genlikte fakat ters yönde alır. Tahmin edilen kesme kuvveti F_C şu şekilde tanımlanabilir:

$$F_C = kV^{C_1}f^{C_2}d^{C_3}$$

burada k , C_1 , C_2 ve C_3 model parametreleridir.



Şekil 1. Tornalama proses geometrisi

Tablo 1. CNC Tornalama parametreleri (Kesici uç malzemesi Tungsten Karbür) [8]

Ayna hızı (d/d)	100	150	200	250
İlerleme hızı (mm/d)	0.4	0.6	0.8	1.0
Kesme derinliği (mm)	0.4	0.6	0.8	1.0

Son yıllarda yapay sinir ağlarına ve bulanık kümelere odaklanan çeşitli modelleme yaklaşımları bulunmaktadır. Çoğu araştırmacı bu araçları, takım aşınması, kesme kuvveti ve işlenmiş parça yüzey pürüzlülüğü dahil olmak üzere çeşitli işleme parametrelerini tahmin etmek için kullanmıştır. İşlenen yüzeyin tutarlılığı, kendiliğinden oluşan titreşimler, takım aşınması vb. ile doğrudan bağlantılı olduğundan tornalama mekanizmasındaki kesme kuvvetini modellemek ve tahmin etmek çok önemlidir. Kesici takımlarının mukavemet ihtiyaçlarını tahmin etmek için kesme kuvvetinin belirlenmesi çok önemlidir. Ekipman ve takımlar etkili bir işleme operasyonuna katkıda bulunduğundan, çalışma koşullarının ve makine ekipmanının uygun seçimi için kesme kuvvetinin bilinmesi gereklidir. Ayrıca kesme kuvveti izlenmek suretiyle kırılma ve takım aşınmasının tespit edilmesi için kullanılır. Kesme işlemi son derece karmaşıktır ve bu kuvvetleri etkileyen birbiriyle yüksek düzeyde bağlantılı birçok değişken nedeniyle kesme kuvvetini kesin olarak modellemek zordur. Literatürde kesme kuvvetinin modellenmesine yönelik birçok yaklaşım vardır [3-7]. Bu çalışmada ise tornalama işleminde kesme kuvvetinin uyarlamalı sinirsel bulanık çıkarım sistemi tabanlı modellenmesi gerçekleştirilmiştir.

Bu çalışmada tornalama işlemine tabi tutulacak numune milin malzemesi EN8, uzunluğu 200 mm ve çapı 50 mm olarak düşünülmüştür. CNC tezgahının EN8 malzemesinin tornalanması için kullanımına yönelik işlem değişkenlerinin değerleri Tablo 1 'de verilmiştir [8]. Tablo 2 'de CNC tornalama prosesinin proses faktörleri ve bunlara karşılık gelen kesme kuvvetlerinin

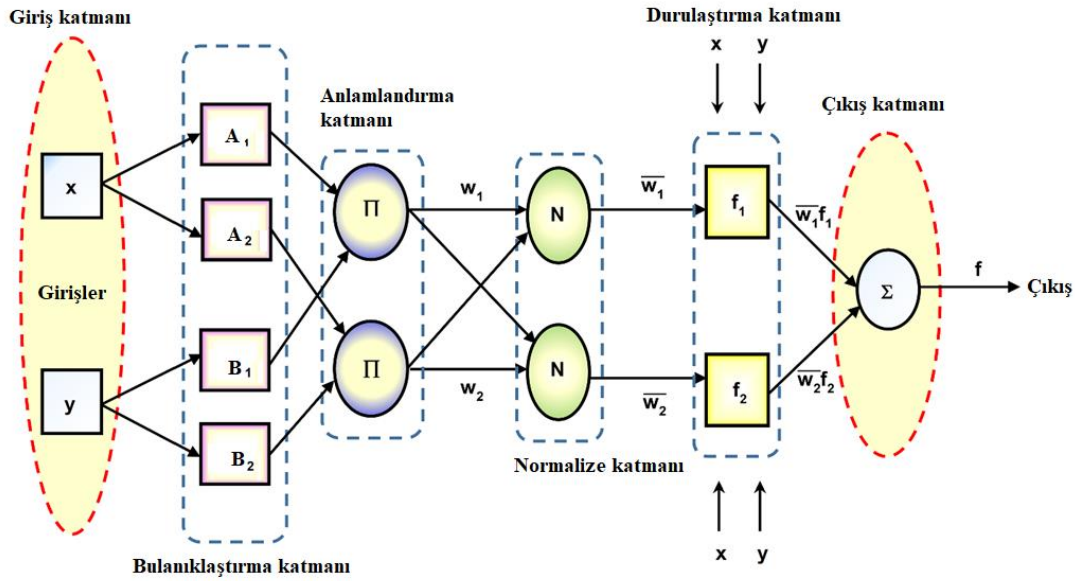
deneyisel olarak elde edilen deęerleri verilmiřtir. 100 d/d ayna hızı, 0.4 mm/d ilerleme ve 0.4 mm kesme derinlięinin etkisiyle minimum kesme kuvveti 375,24 N olarak bulunmuřtur [8].

Tablo 2. Farklı CNC tornalama faktörlerine karřı kesme kuvvetleri [8]

Ayna hızı (d/d)	İlerleme hızı (mm/d)	Kesme derinlięi (mm)	Kesme kuvveti (N)
100	0.4	0.4	375.24
100	0.6	0.6	424.23
100	0.8	0.8	431.05
100	1.0	1.0	410.89
150	0.4	0.6	441.31
150	0.6	0.4	422.98
150	0.8	1.0	457.78
150	1.0	0.8	449.73
200	0.4	0.8	467.05
200	0.6	1.0	474.34
200	0.8	0.4	437.91
200	1.0	0.6	456.82
250	0.4	1.0	475.63
250	0.6	0.8	496.51
250	0.8	0.6	486.34
250	1.0	0.4	438.30

UYARLAMALI SİNİRSEL BULANIK ÇIKARIM SİSTEMİ (ANFİS)

Uyarlamalı sinirsel bulanık çıkarım sistemi, işlevi bulanık çıkarım sistemine oldukça benzeyen uyarlanabilir ve eğitici bir sinirsel sistemdir. Giriş ve çıkış veri kümelerine dayalı optimal bir bulanık sistem oluşturmak için bulanık mantık tabanlı bir yapı kullanılır. Hem bulanık hem de yapay sinir ağı yöntemlerin avantajlarını kullanan sinirsel bulanık yöntemler, kontrollü sistemdeki belirsizlikler ve gürültüyle başa çıkma yeteneğine sahiptir. Dolayısıyla bulanık bir yapıyı bir sinir ağı aracılığıyla birbirine dönüřtürmek veya tam tersini yapmak mümkündür. Aslında her iki yöntemden de faydalanmak mümkündür. Bulanık kuralların öğretilmesi ve üyelik fonksiyonlarının yapay sinir aęları tarafından en uygun şekilde düzenlenmesi için birçok algoritma bulunmaktadır. Bu yapı Jang tarafından önerilmiřtir [9]. ANFİS, aslında eğitim yeteneęine sahip ileri beslemeli bir yapay sinir ağı olan uyarlanabilir yeteneęe sahip bulanık bir çıkarım sistemidir. Bulanık mantık yapısında bu yapıya iliřkin sinir aęını eğitmenin iki yolu vardır: 1. Hatanın geriye yayılma yöntemi, 2. Hata yayılım yöntemi ile en küçük kareler yönteminin birleřimi olan hibrit yöntem. Bu yapı ancak SUGENO bulanık sisteminde uygulanabilmektedir. SUGENO bulanık sistemi sıfır veya bir mertebeden olmalıdır. ANFİS ile elde edilen bulanık sistemin tek bir çıktısı vardır ve bulanık olmayan süreci aęırlıklı ortalamadır. Tüm çıkış üyelik fonksiyonları aynıdır ve doęrusal veya sabit tiptedir.



Şekil 2. ANFIS 'in eşdeğer yapısı

ANFIS 'in eşdeğer yapısı Şekil 2 'de görülmektedir. ANFIS ile bulanık bir yapı oluşturmak için iki çözüm bulunmaktadır. Birinci yöntem ağ ayırma, ikinci yöntem ise indirgeme kümelemidir. Bulanık yapı, üyelik fonksiyonlarının sayısı ve istenilen üyelik fonksiyonu tipi ile oluşturulabilmektedir. Basitlik açısından, bulanık sistemimizin iki girişi x ve y olduğunu ve çıkışının z olduğunu varsayalım. Kurallar aşağıdaki gibiyse:

Kural 1: Eğer $x=A_1$ ve $y=B_1$ ise $f_1=p_1x+q_1y+r_1$

Kural 2: Eğer $x=A_2$ ve $y=B_2$ ise $f_2=p_2x+q_2y+r_2$

ve eğer bulanık olmayan üreteç için merkezlerin ortalamasını kullanılırsa çıktı şu şekilde olacaktır:

$\bar{w}_1= w_1 / (w_1+w_2)$ ve $\bar{w}_2= w_2 / (w_1+w_2)$ olmak üzere;

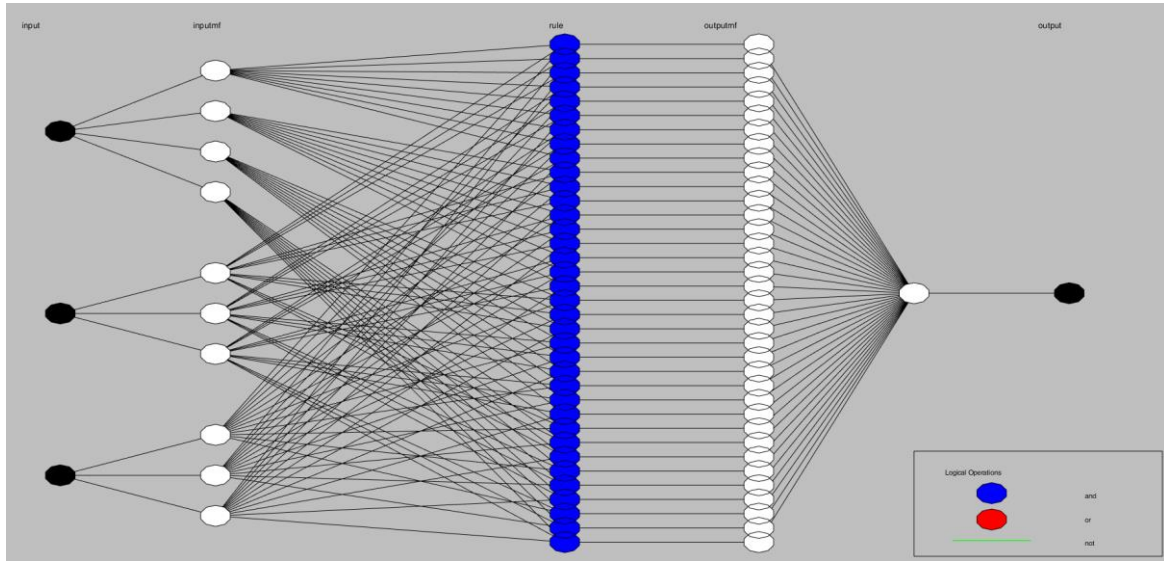
$f= (w_1f_1 + w_2f_2) / (w_1+w_2) = \bar{w}_1f_1 + \bar{w}_2f_2$

TORNALAMA İŞLEMİNDE KESME KUVVETİNİN MODELLENMESİ

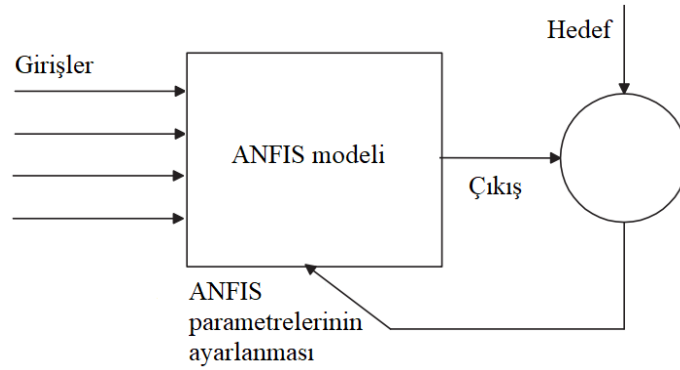
Ele alınan numune milin tornalanmasında oluşan kesme kuvvetinin modellenmesinde kullanılan ANFIS 'i eğitmek için kullanılan parametreler ve faktörler Tablo 3 'te verilmiştir. Sonuçta ortaya çıkan ANFIS yapısı ise Şekil 3 'de görülmektedir. Kesme kuvvetini modellemek için kullanılan ANFIS modelleme mimarisi ise Şekil 4 'de görülmektedir. Gauss üyelik fonksiyonlarına sahip ANFIS yapısı ile modelleme sonucunda determinasyon katsayısı R^2 değeri 0.9999 'dur. Bu durum ANFIS ile modellemekten ne derece doğrulukta bir sonuç alındığını göstermektedir. Elde edilen modelleme sonuçları; ANFIS yapısının tornalama sonucu oluşan kesme kuvvetlerini modellemek için alternatif bir şekilde kullanılabileceğini göstermektedir. Bu sebeple Tablo 2 'de verilen tornalama sonucu oluşan kesme kuvvetlerine ait değerler ile ANFIS tabanlı modelleme sonucu elde edilen değerler karşılaştırmalı olarak verilmemiştir. Çünkü neredeyse değerler birebir çakışmaktadır.

Tablo 3. ANFIS tasarımında kullanılan parametreler

Giriş sayısı	3
Çıkış sayısı	1
Üyelik fonksiyonu sayısı	4 3 3
Veri noktası sayısı	16 (eğitim) ve 10 (test)
İterasyon sayısı	20
Hata toleransı (%)	0
Elde edilen hata (%)	5.4×10^{-4}
Bulanık kural sayısı	36



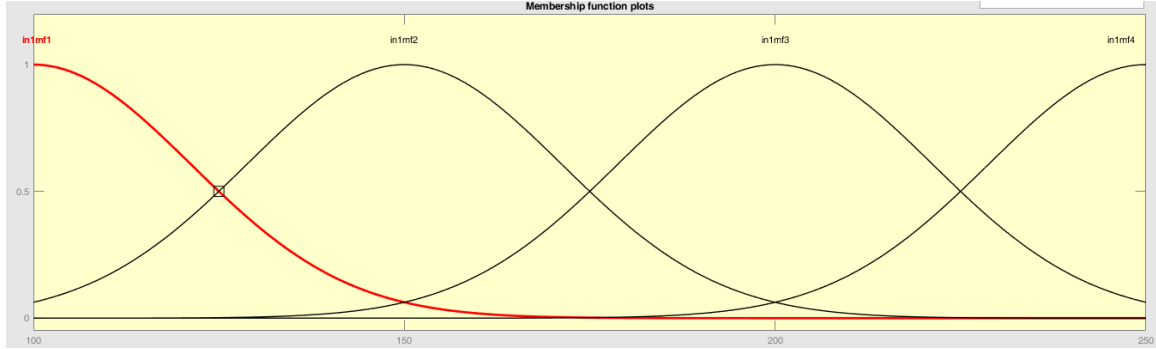
Şekil 3. Kesme kuvvetini modellemede kullanılan ANFIS yapısı



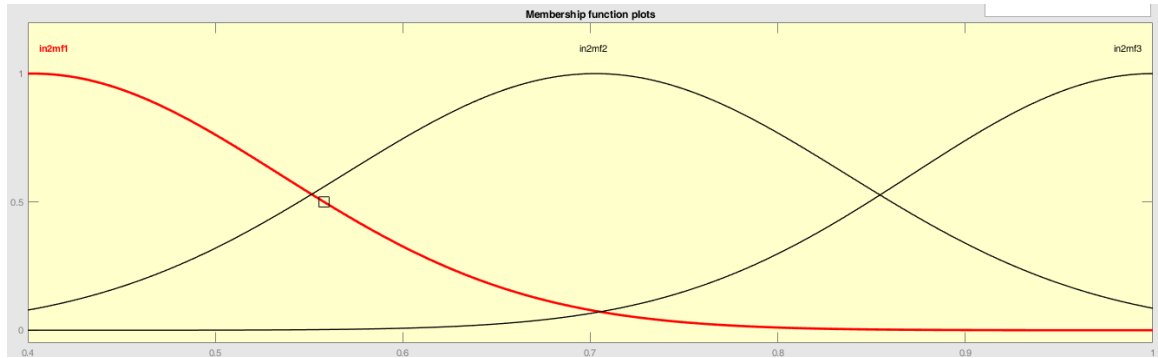
Şekil 4. ANFIS modelleme mimarisi

Ayna hızı (d/d) için giriş üyelik fonksiyonları Şekil 5 'te, ilerleme hızı (mm/d) için giriş üyelik fonksiyonları Şekil 6 'da ve kesme derinliği (mm) için giriş üyelik fonksiyonları Şekil 7 'de görülmektedir. Bütün üyelik fonksiyonları Gauss tipindedir. En iyi sonuçlar ANFIS yapısında Gauss üyelik fonksiyonları ile elde edilmiştir. ANFIS ile eğitim sırasında, üyelik fonksiyonlarının sayısı mümkün olduğunca azaltılmıştır. R^2 değerlerinin 1 'e yaklaşmasıyla da elde edilen modellemenin doğruluğu gösterilmiştir. Ayrıca, ANFIS eğitim aşaması, üyelik

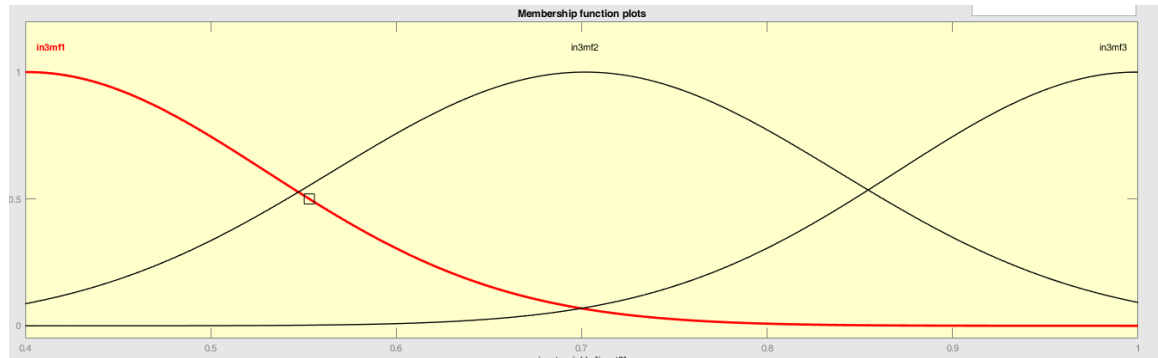
fonksiyonlarının sayısı ne kadar büyük olursa o kadar karmaşık olmaktadır. Dolayısıyla hedef hata oranına yakınsama daha fazla iterasyon gerektirmekte ve çözüm zamanını da artırmaktadır. ANFIS yapısının karma öğrenme algoritmasında, en küçük kareler ve standart geri yayılım yöntemlerinin bir kombinasyonu kullanılmıştır.



Şekil 5. Ayna hızı (d/d) için giriş üyelik fonksiyonları



Şekil 6. İlerleme hızı (mm/d) için giriş üyelik fonksiyonları



Şekil 7. Kesme derinliği (mm) için giriş üyelik fonksiyonları

SONUÇ

Bu çalışmada numune bir milin tornalanması sonucu oluşan kesme kuvvetlerinin uyarlamalı sinirsel bulanık çıkarım sistemi tabanlı modellenmesi yapılmıştır. Kesme kuvveti, ayna hızı (d/d), ilerleme hızı (mm/d) ve kesme derinliğine (mm) bağlı olarak modellenmiştir. Gauss üyelik fonksiyonlarına sahip ANFIS yapısı ile modelleme sonucunda determinasyon katsayısı R^2 değeri 0.9999 'dur. Bu durum ANFIS ile modellemeden ne derece doğrulukta bir sonuç

alındığını göstermektedir. Elde edilen modelleme sonuçları; ANFIS yapısının tornalama sonucu oluşan kesme kuvvetleri modellemek için alternatif bir şekilde kullanılabileceğini göstermektedir.

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EVALUATION OF RAFTLIN AND 8-ISOPROSTAGLANDIN LEVELS ON THE CLINICAL SEVERITY OF CASES WITH COVID-19

RAFTLIN VE 8-İZOPROSTOGLANDİN DÜZEYLERİNİN COVID-19 VAKALARININ KLİNİK ŞİDDETİNE ETKİSİ

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ÖZET

COVID-19 hastalığı, insanlarda şiddetli akut solunum sendromu Koronavirüs 2'nin (SARS-CoV-2) neden olduğu bulaşıcı bir solunum yolu hastalığıdır. Raftlin, hücre zarlarının büyük, majör bir lipid sal proteinidir. Ayrıca, raftlin otoimmün yanıtın ve vasküler inflamatuvar yanıtın indüklenmesinde önemli bir rol oynar. Raftlin seviyeleri daha önce COVID-19 hastalığında çalışılmamıştır. Bununla birlikte, oksidatif stres belirteci olarak 8-iso-prostaglandin F2 α (8-iso-PGF2 α) ile ilgili az sayıda çalışma vardır. Çalışmamızın amacı COVID hastalarında Raftlin ve 8-iso-prostaglandin F2 α (8-iso-PGF2 α) düzeylerindeki değişimi değerlendirmektir. Klinik bulgular sağlıklı kontrol, hafif seyirli ve ağır seyirli covid hastalarından oluşan 3 grup için analiz edildi. Serum örneklerinde Raftlin ve 8-izoprostaglandin F2 α düzeyleri ELISA ile ölçüldü. Raftlin ve 8-izo-PGF2 α düzeyleri şiddetli covid hastalarında kontrol ve hafif seyirli gruplara kıyasla artmış bulundu. Ayrıca, şiddetli covid grubunda Raftlin ve 8-iso-PGF2 α ile anlamlı pozitif korelasyon bulundu. Raftlin seviyelerinin COVID hastalarında sağlıklı gruba kıyasla anlamlı derecede yüksek olduğunu tespit ettik. Bu çalışma, COVID-19 hastalığında Raftlin ve 8-iso-PGF2 α seviyelerindeki değişiklikleri araştıran ilk çalışma olarak değer taşımaktadır.

Anahtar Kelimeler: COVID-19, Raftlin, 8-iso-prostaglandin F2 α

Abstract

COVID-19 disease is an infectious respiratory disease in humans caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2). Raftlin is a large, major lipid raft protein of cell membranes. Also, raftlin plays an important role in the induction of the autoimmune response and the vascular inflammatory response. Raftlin levels have not been previously studied in COVID-19 disease. However, there are few studies on 8-iso prostaglandin F_{2α} (8-iso-PGF_{2α}) as marker of oxidative stress. Our study aimed to evaluate the change of Raftlin and 8-iso-prostaglandin F_{2α} (8-iso-PGF_{2α}) levels in the Covid patients. Clinical findings were analyzed for 3 groups consisting of healthy control, mild course and severe course of covid patients. Raftlin and 8-isoprostaglan F_{2α} levels in the serum samples were measured by ELISA. Raftlin and 8-iso-PGF_{2α} levels were found to be increased in severe covid patients compared to control and mild course groups. In addition, we found a significant positive correlation with Raftlin and 8-iso-PGF_{2α} in the severe covid group. We found that Raftlin levels were significantly higher in COVID-19 patients compared to the healthy group. This study is of value as the first study to investigate the changes in Raftlin and 8-iso-PGF_{2α} levels in COVID-19 disease.

Key words: COVID-19, Raftlin, 8-iso-prostaglandin F_{2α}

GİRİŞ

COVID-19 son yılların en ciddi halk sağlığı sorunlarından biridir. Yüksek mortalitenin yanı sıra ciddi ekonomik ve sosyal sonuçlar nedeniyle hastalığın patogenetik mekanizmalarının ve yeni tedavi hedeflerinin araştırılması büyük önem taşımaktadır (1). COVID-19'un patogenezinin hala belirsiz olan bir yönü, asemptomatik seyirden şiddetli semptomlara kadar hastalar arasındaki yanıtın büyük heterojenliğidir (2). Yaşlılar, kronik hastalıkları olan hastalar, immünsüpresif tedavi alan hastalar ve hamile kadınlar dahil olmak üzere daha hassas gruplarda semptomlar daha agresif ve ölümcül olma eğilimindedir (1,2). COVID-19'un bebekleri nadiren etkilediğine inanılmaktadır, bu nedenle vücut reaktivitesi çalışmaları esas olarak yetişkin hastalara odaklanmaktadır (3).

Canlılarda fizyolojik koşullar altında metabolik aktivite süresince reaktif oksijen türleri (ROT) oluşmaktadır (4). Antimikrobiyal bağışıklık sağlayan hücrelerin, nötrofillerin ve makrofajların aktivasyonu ve proinflamatuvar sitokinlerin üretimi ROT'a bağlıdır (5). Tip I interferonun oluşumu yoluyla antiviral bir bağışıklık yanıtının geliştirilmesinde ROT'un önemli rolü bulunmaktadır (6). ROT, aynı zamanda hücre sinyal yollarının mediatörleri olarak da önemli bir rol oynar, ancak bu, antioksidan mekanizmalar tarafından telafi edilmesi nedeniyle hücre yapıları üzerinde olumsuz bir etki gerektirmemektedir. COVID-19'da dahil olmak üzere ROT'un aşırı üretimi, protein kinazlar, transkripsiyon faktörleri ve proinflamatuvar düzenleyicilerin genomik ekspresyonundaki artış yoluyla inflamatuvar sinyalleşme basamaklarını uyarabilmektedir ve bu da bağışıklık sisteminin hiperaktivasyonuna yol açmaktadır. Bu durum oksidatif hasarın gelişimine neden olabilmektedir (7).

Lipit rafları (lipit salları), doymuş fosfolipitler, sfingolipitler ve kolesterol bakımından zenginleştirilmiş membran mikro domainleridir (8). Sinyal iletimi, endositoz ve ekzositoz, zorunlu hücre içi patojenlerin girişi ve çeşitli hastalıklar ile ilişkili patolojik protein formlarının üretimi dahil olmak üzere çeşitli hücresel süreçlerde yer alırlar (9). Lipit rafları, çeşitli ve farklı protein bileşimine sahiptirler. Ana lipit raft proteini olan Raftlin (RFTN), B hücrelerinde bulunur ve B hücresi antijen reseptörünün (BCR) sinyal iletiminin düzenlenmesinden sorumludur. RFTN ayrıca otoimmün yanıtın ve vasküler inflamatuvar yanıtın indüklenmesinde

önemli rol oynar. RFTN, inflamatuvar hastalıkların tanısını ve immün yanıtı karakterize etmek için vasküler inflamatuvar yanıtın patofizyolojisinde kullanılan bir parametredir (10).

RFTN düzeyleri daha önce COVID-19 hastalığında araştırılmamıştır. Ancak COVID-19’da 8-iso-prostaglandin F2 α ’nın (8-iso-PGF2 α) oksidatif stres belirteci olarak kullanıldığına ilişkin sınırlı sayıda çalışma bulunmaktadır. Çalışmamızda COVID-19 hastalarında RFTN ve 8-iso-PGF2 α düzeylerindeki değişimi değerlendirmeyi amaçladık.

ARAŞTIRMA

01.03.2022 - 01.10.2022 tarihleri arasında Tokat Gaziosmanpaşa Üniversitesi Tıp Fakültesi Hastanesi’ne başvuran, kesin COVID-19 tanısı alan hastalar dahil edilmiştir. Çalışmamız random yöntemle seçilen toplam 75 hastadan oluşmakta olup, evde izolasyonda olan (n=25), serviste yatan (n=25) ve yoğun bakım ünitesinde destek tedavisi gören(n=25) hastalardan oluşmaktadır. Bunun yanı sıra, 25 sağlıklı birey kontrol grubu olarak seçilmiştir. Çalışma kapsamına alınan hasta ve kontrol bireylerin sosyo-demografik verileri Tablo 1’de sunulmuştur.

Biyokimyasal Analiz

Hasta ve kontrol bireylerinden alınan kan örnekleri, açlık venöz kan örnekleri olduğundan sabah 08.00 ile 11.00 arasında ve 8 ile 12 saatlik açlıktan sonra alındı. Serumlar ayrıldı ve asitle yıkanmış tüplerde RFTN ve 8-iso-PGF2 α analizine kadar -20°C’de saklandı. Bu parametrelerin düzeyleri Tokat Gaziosmanpaşa Üniversitesi Tıbbi Biyokimya Anabilim Dalı’nda kontrol edildi. RFTN ve 8-iso-PGF2 α düzeyleri, üreticinin talimatlarına göre ticari bir kit (Mybiosource, USA) kullanılarak kantitatif sandeviç enzim immünoanaliz tekniği (ELISA) ile ölçüldü.

İstatistiksel analiz

Veri toplama aşaması sonunda elde edilen veriler bilgisayar ortamına aktarılarak analiz edilmiştir. Verilerin analizi The Statistical Package for Social Sciences (SPSS 27.0) yazılımı kullanılarak yapıldı.

BULGULAR

Hastaların genel cinsiyet dağılımı incelendiğinde 40’inin (%50,6) erkek, 35’inin (%49,4) kadın olduğu görüldü. Hasta ve kontrol gruplarının sosyo-demografik verileri Tablo 1’de verilmiştir.

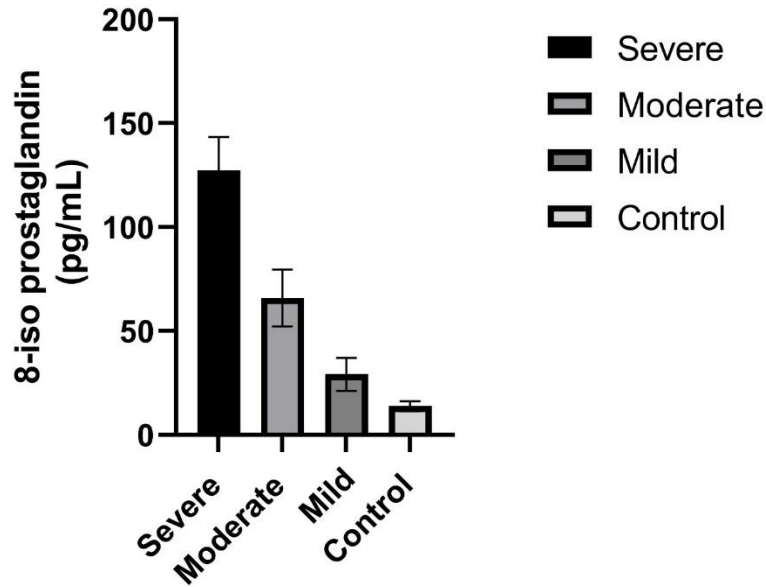
Tablo 1. Hasta ve Kontrol grubundaki bireylerin sosyo-demografik özellikleri.

Parametreler	Hasta (n=75)	Kontrol (n= 25)	P değeri
Yaş (yıl)	43,8 \pm 13,8	40,2 \pm 6,8	0,28
Cinsiyet			0,20
Erkek	40 (70%)	14 (52,4%)	
Kadın	35 (30%)	11 (47,6%)	
VKİ(kg/m ²)	21,9 \pm 2,2	21,1 \pm 1,1	0,15
Klinik Şiddeti			
Hafif	20 (%80)	0 (%)	
Orta	20 (%80)	0 (%)	
Şiddetli	20 (%80)	0 (%)	
Komorbiditeler			
YOK	40 (%80)	0 (%)	
Hipertansiyon	6(%80)	0 (%)	
Diyabet	7(%80)	0 (%)	

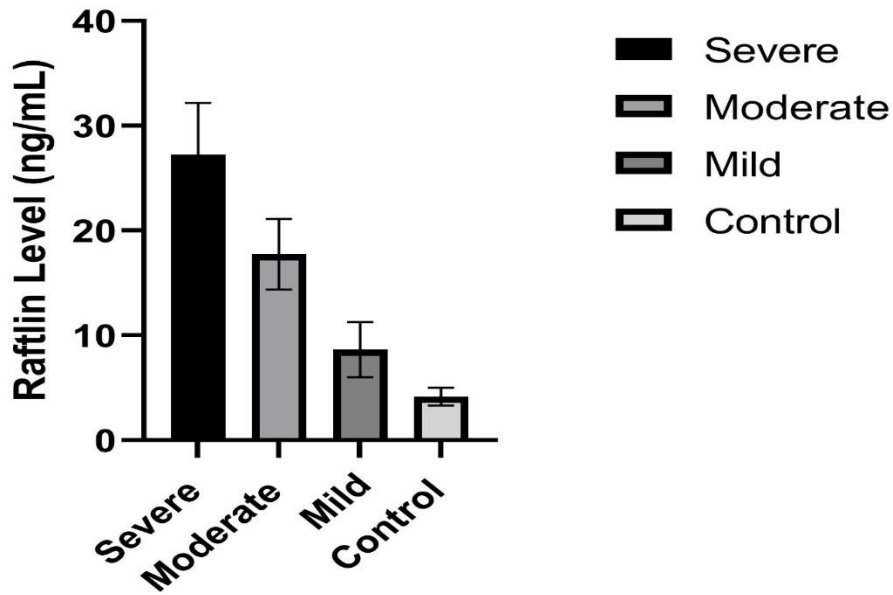
Tablo 2, Şekil 1 ve 2’de görüldüğü gibi, ağır COVID-19 hastalarında serum RFTN ve 8-iso-PGF2 α düzeyleri kontrol grubuna göre anlamlı derecede yüksekti ($p<0,001$). Üstelik, Ağır COVID-19 hastalarında RFTN ve 8-iso-PGF2 α düzeyleri hafif ve orta COVID-19 hastalarına kıyasla oldukça yüksekti ($p<0,001$).

Tablo 2. Raftlin ile 8-iso-Prostaglandin düzeyleri

Değişkenler		COVID-19 Şiddetli (n=25)	COVID-19 Orta (n=25)	COVID-19 Hafif (n=25)	Kontrol (n=25)	p değeri
Raftlin-1 (ng/mL)	Median	27,25	17,75	8,65	4,16	<0,001
	(Q1- Q3)	(22,37- 17,96)	(14,39- 21,45)	(6,02- 11,27)	(3,32- 5,0)	
8- izoprostaglandin (pg/mL)	Median	127,25	65,9	29,2	13,90	<0,001
	(Q1- Q3)	(111,15- 143,35)	(52,27- 79,53)	(21,26- 37,14)	(11,48- 16,3)	



Şekil 1. Gruplar arası 8-izoprostaglandin düzeyleri



Şekil 2. Gruplar arası Raftlin düzeyleri

Tablo 3’de gösterildiği gibi, RFTN düzeyleri için gruplar arasında Spearman korelasyon analizine göre anlamlı pozitif korelasyon bulunmuştur ($p < 0,000$, $r = 0,691$). Tablo 4’te ise 8-izoPGF düzeyleri için gruplar arasında anlamlı pozitif korelasyon bulunmuştur.

Tablo 3. RFTN düzeyleri için gruplar arasında korelasyon sonuçları

		Raftlin	Grup
Raftlin	Correlation Coefficient	1,000	,691**
	Sig. (2-tailed)	.	,000
	N	85	85
Gruplar	Correlation Coefficient	,691**	1,000
	Sig. (2-tailed)	,000	.
	N	85	85

** . Korelasyon 0.01 değeri anlamlıdır level (2-tailed).

Tablo 4. 8-izo prostaglandin düzeyleri için gruplar arasında korelasyon sonuçları

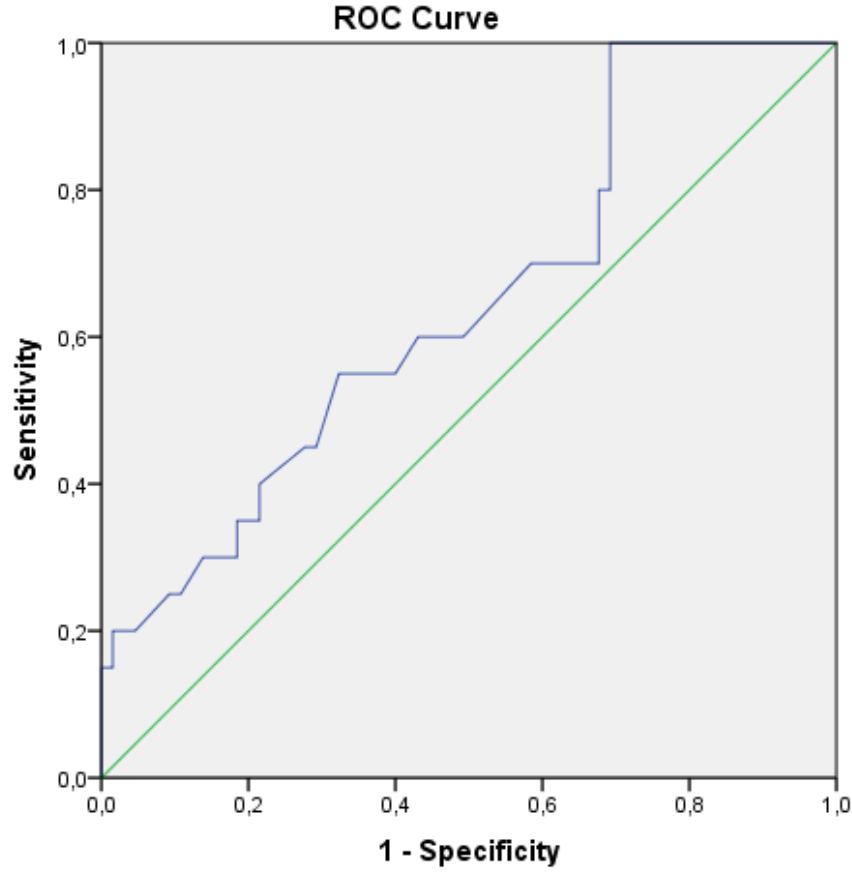
		8-izoPG	Grup
8-isoPG	r value	1,000	,711**
	p-value	.	,000
	N	85	85
Gruplar	r değeri	,711**	1,000
	p-değeri	,000	.
	N	85	85

** . Korelasyon 0.01 değeri anlamlıdır(2-tailed).

RFTN'nin ROC eğrisi AUC, cut off , özgüllük ve duyarlılık değerleri Şekil 3 ve Tablo 4'te gösterilmiştir. Buna göre, RFTN'in cut off 9,5 ng/mL, duyarlılık %85, özgüllük %79 olarak bulunmuştur. Bunun yanı sıra, 8-iso-PGF2 α için ROC eğrisi AUC, cut off özgüllük ve duyarlılık değerleri Şekil 4 ve Tablo 5'te gösterilmiştir. 8-iso-PGF2 α 'nın cut off 97,8 pg/mL, duyarlılık %88 ve özgüllük %85 olarak bulunmuştur.

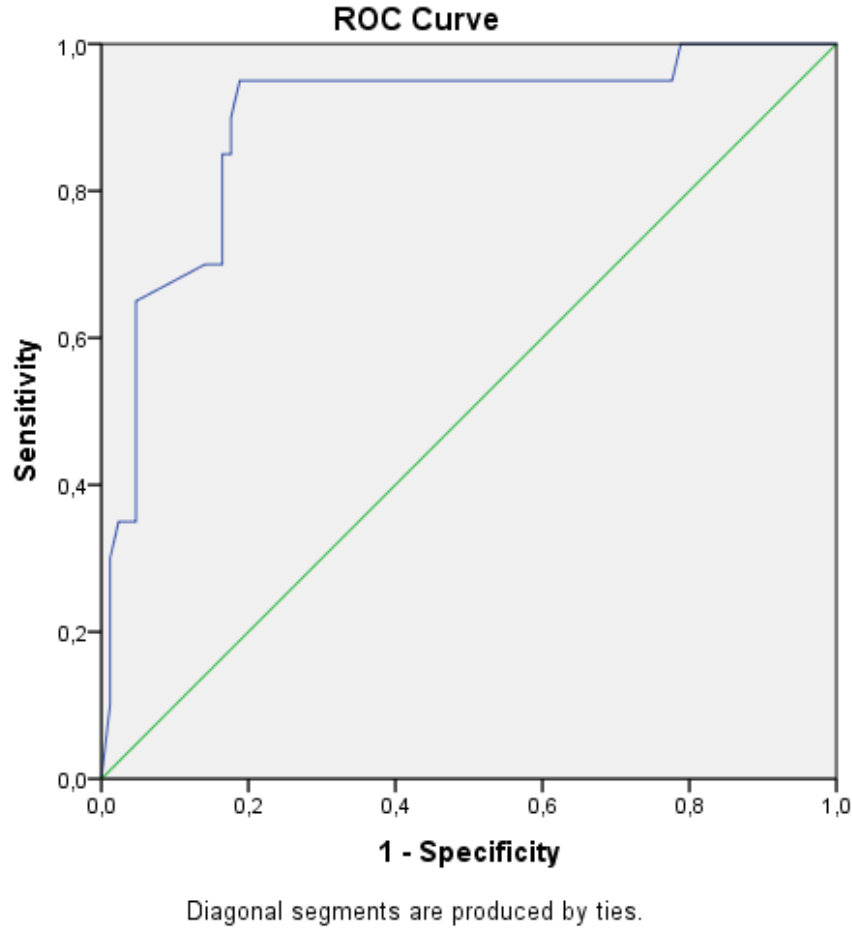
Tablo 4. Raftlin düzeyleri için gruplar arası ROC eğrisi analizi sonuçları

Risk Faktörü AUC 95%	P	Cut off	Duyarlılık(%)	Özgüllük (%)
0,846 (0,702-0,889)	<0,001	9,5	85	79



Diagonal segments are produced by ties.

Şekil 3. Raftlin düzeyleri için gruplar arası ROC eğrisi



Şekil 4. 8-iso-PGF2 α düzeyleri için gruplar arası ROC eğrisi

Tablo 5. 8-iso-PGF2 α düzeyleri için ROC eğrisi analizi sonuçları

Risk Faktörü	AUC	P	Cut off	Duyarlılık (%)	Özgüllük(%)
95%	0,896 (0,813-0,978)	<0,001	97,8	88	85

TARTIŞMA VE SONUÇ

Bu çalışma bildiğimiz kadarıyla, COVID-19 hastalarında serum RFTN ve 8-iso-PGF2 α düzeylerini değerlendiren ilk çalışmadır. Karşılaştırdığımız grupların, COVID-19 hastaları için bu biyobelirteçlerin geçerli bir değerlendirmesini yapmak için yeterince homojen olduğuna inanıyoruz. Çalışmamızda üç ana bulgu gözlemlendi: Birincisi, şiddetli COVID-19 hastalarında hafif COVID-19 hastalarına ve kontrol bireylerine kıyasla yüksek serum RFTN ve 8-iso-PGF2 α düzeyleri tespit edildi. İkincisi, RFTN ve 8-iso-PGF2 α düzeyleri şiddetli COVID hastalarında iyi tanısal performans gösterdi. Üçüncüsü, COVID hasta grubunda RFTN ve 8-iso-PGF2 α düzeyleri arasında pozitif ve anlamlı bir korelasyon bulduk.

Serbest radikallerin oluřtuđu b6lgelede membran lipitleri peroksidasyona karřı hassas olabilir ve bu da izoprostanların oluřmasına yol aabilir. İzoprostanlar fosfolipazların etkisiyle salınır ve dolařımda stabil őrnlendir. Plazma ve diđer vucut sıvılarındaki yu>sek izoprostan dizeyleri oksidatif stresin varlıđını g6sterir ve sıklıkla eřitli h6cre ve dokulardaki hasarın biyobelirteleri olarak kullanılır (11,12).

Derouiche ve ark. (13) serbest radikallerin SARS-COV-2 enfeksiyonu ve endoteldeki NADPH oksidaz tarafından dzenlenen immun yanıtın bir sonucu olarak őrtebilebileđini 6ne sőrmektedir. alıřmamızda COVID-19 enfeksiyonunun tek bařına Fenton reaksiyonunun aracılık ettiđi 8-iso-PGF2 α dizeyinde 2-3 kat artıřa yol atıđı g6rılmektedir. Bu bulgu, 8-iso-PGF2 α 'nın kumulatif oksidatif stresin ve COVID-19 ile enfekte olmuř hastanın durumunun k6tuleřmesinin 6nemli bir 6ng6r6c6 belirteci olabilebileđini d6řündürmektedir. Serbest radikallerin artıřı ve bunu takiben 8-iso-PGF2 α 'nın artması, COVID-19 enfeksiyonunda patogenezinde oksidatif stresin g6stergesi olan 8-iso-PGF2 α 'nın rol oynayabilebileđine dair ilk kanıttır. řiddetli SARS-CoV-2 hastalarında antioksidan dizeyelerinin azalmasına, lipid peroksidasyonunun yanı sıra reaktif oksijen ve nitrojen t6rlerinin daha yu>sek dizeyleri ile kanıtlandıđı gibi, artan oksidatif stresin eřlik ettiđini g6steren alıřmalar da mevcuttur (14). Bu durum COVID hastalarının k6t6 prognozunu g6sterebilir.

6zetle, COVID-19 hastalarında ilk kez sunduđumuz RFTN ve 8-iso-PGF2 α 'nın sonuları bu hastalıđın prognozunda belirleyici bir biyobelirte olabilebileđi y6n6ndedir. Bu alıřma sonularının diđer alıřmalara 6nc6l6k edebilebileđini ve yeni verilerle daha da destekleyici olacađını d6ř6n6yoruz.

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URINARY TRACT INFECTIONS IN TIRANA, ALBANIA

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ABSTRACT

Introduction: UTIs are common infections that happen when bacteria, often from the skin or rectum, enter the urethra, and infect the urinary tract. The infections can affect several parts of the urinary tract, but the most common type is a bladder infection (cystitis). Some people are at higher risk of getting a UTI. UTIs are more common in females because their urethras are shorter and closer to the rectum. This makes it easier for bacteria to enter the urinary tract.

The aim of this study is to determine the most frequent pathogenic microorganisms that cause urinary tract infections in adults divided by gender, as well as the sensitivity of these microorganisms to antibiotics.

Methodology: Midstream urine samples (MSU) were collected from 509 adult patients, 82.5% women and 17.5% men, who gave informed consent and fulfilled other study criteria. The patients performed the Urine Culture and Antibiogram test, during the period January-December 2011 in Tirana, Albania.

Results: Out of 509 patients, 244 patients (47.9%) had a positive urine culture. Out of 244 patients, 85.7% women and 14.3% men. The data showed that the seven most frequent microorganisms isolated from urine culture in descending order were: Escherichia coli 70.92% (61.5% and 9.42 % respectively); Staphylococcus sp. 10.31% (9.5% and 0.81% respectively); Proteus mirabilis 7.79% (6.1% and 1.63% respectively); Staphylococcus saprophyticus 4.49% (3.68% and 0.81% respectively); Staphylococcus aureus 2.44% (2.04% and 0.4% respectively); Proteus sp. 1.62% (0.81% and 0.81% respectively); Enterobacter cloacae 1.22% (1.22% and 0% respectively).

Conclusions: The most frequent causes of urinary infections in adults are Escherichia coli 70.92%, Staphylococcus sp. 10.31% and Proteus mirabilis 7.79%. Urinary tract infections affect women more than men. The antibiotics that have the highest effectiveness against the isolated bacteria are: Escherichia coli has a high sensitivity of over 70% of the antibiotics: Amikacin, Amoxicillin/Clavulanic acid, Ceftazidime, Ceftriaxone, Cefaclor Ciprofloxacin, Gentamicin, Nitrofurantoin and Norfloxacin and over 50% to Cefuroxime sodium, Doxycycline, Nalidixic acid.

Staphylococcus sp. has high sensitivity over 70% to amoxicillin/Clavulanic acid, Gentamicin, Nitrofurantoin. Staphylococcus saprophyticus has a high sensitivity of over 50% to: Amoxicillin/Clavulanic acid, Ciprofloxacin, Gentamicin, Trimethoprim/Sulfamethoxazole. Staphylococcus aureus has a high sensitivity of over 50% to antibiotics such as: Amoxicillin/Clavulanic acid, Ceftriaxone, Doxycycline, Gentamicin, Nitrofurantoin. Enterobacter cloacae has over 50% sensitivity to antibiotics: Cefuroxime sodium, Ceftazidime, Norfloxacin, Gentamicin.

Key words: Urinary infections, Urine culture, Antibiogram.

Introduction

UTIs are common infections that happen when bacteria, often from the skin or rectum, enter the urethra, and infect the urinary tract. The infections can affect several parts of the urinary tract, but the most common type is a bladder infection (cystitis). Some people are at higher risk of getting a UTI. UTIs are more common in females because their urethras are shorter and closer to the rectum. This makes it easier for bacteria to enter the urinary tract.

Methodology

Midstream urine samples (MSU) were collected from 509 patients, 82.5% women and 17.5% men, who gave informed consent and fulfilled other study criteria. Samples were collected for urinalysis, culture and antibiotic susceptibility test at the laboratory, in Tirana, during the period January-December 2011. Keeping in mind that there is always some bacterial colonization in the perianal area and the distal segment of the urethra that can contaminate the urine, the patients are given the following advice: severe cleanliness of the genital organs, and the second was to eliminate the initial part of urine, in order to make some flushing of the urethra and the urine is taken in its middle stream. The urine sample is cultured for 30 minutes after collection. This time has been respected because otherwise the bacteria will multiply in the urine, which is a very good ground for them. Blood agar, Endo agar, McConkey is used as bases.

The identification of enterobacteria was made based on biochemical tests.

Glucose (fermentation and gas production), lactose, mannitol, inositol, indole production, H₂S production, phenyl alanine deamination test, urease production, citrate utilization, motion detection was used. In cases where these were not sufficient, other biochemical tests were used (decarboxylation of lysine, ornithine, adenitis, arabinose, oxidase test, etc.)

Determination of sensitivity to antibiotics. The antibiotic diffusion method was applied. According to this method, the bacterial isolate is growing uniformly over the entire surface of the agar plate. Next, the plate's surface is covered with a disc that has been impregnated with a typical dosage of antibiotic. After then, the antibiotic begins to spread over the field. There is now a diffusion gradient near the disk due to the antibiotic's diffusion. After 18-24 hours of incubation, a layer of grown bacterial colonies is created. There may be areas of bacterial growth inhibition around the disc. The size of the zone of inhibition depends on the diffusion rate of the antibiotic, the sensitivity of the tested bacteria to the antibiotic and the growth rate of bacterial colonies. The zone of inhibition in the diffusion test is reciprocally correlated with the PMI in the dilution test. The diffusion test is done under standardized conditions and

standard zones of inhibition have already been determined for each antibiotic. If the zone of inhibition is equal to or higher than the standard, then it is considered that the microorganism is sensitive to the antibiotic. If the zone of inhibition is smaller than the standard, then it is considered that the microorganism is resistant to the tested antibiotic.

Results

Figure 1 shows the distribution of patients by gender, where out of 509 patients, 420 (82.5%) women and 89 (17.5%) men. Out of 509 patients, 244 (47.9%) had a positive urine culture, of which 209 (85.7%) were women and 35 (14.3%) were men.

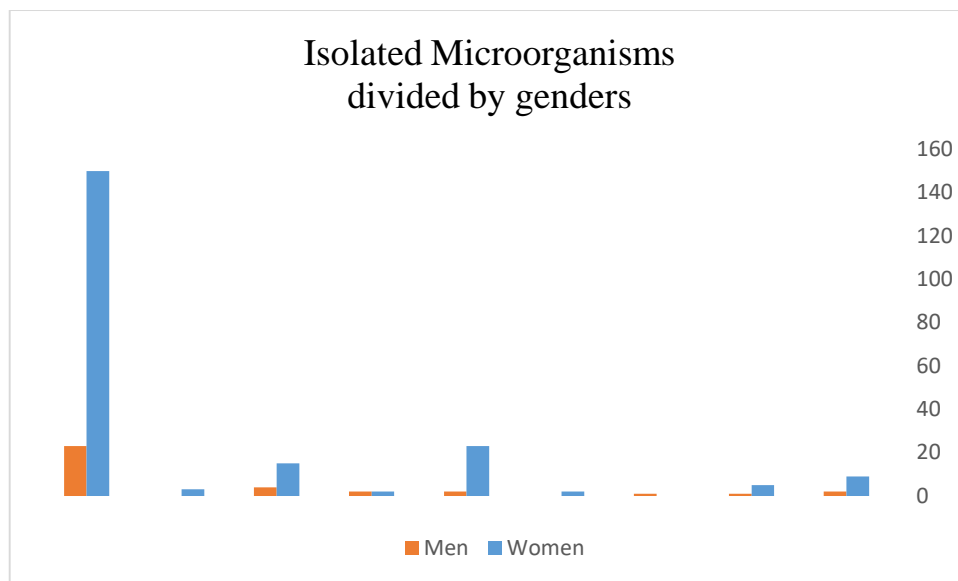


Figure 38. Isolated Microorganisms divided by genders

Figure 2 shows the data that the seven most frequent microorganisms isolated from urine culture in descending order are: **Escherichia coli 70.92%** (61.5% women and 9.42 % men); **Staphylococcus sp. 10.31%** (9.5% women and 0.81% men); **Proteus mirabilis 7.79%** (6.1% females and 1.63% males); **Staphylococcus saprophyticus 4.49%** (3.68% women and 0.81% men); **Staphylococcus aureus 2.44%** (2.04% women and 0.4% men), **Proteus sp. 1.62%** (0.81% women and 0.81% men), **Enterobacter cloacae 1.22%** (1.22% women and 0% men).

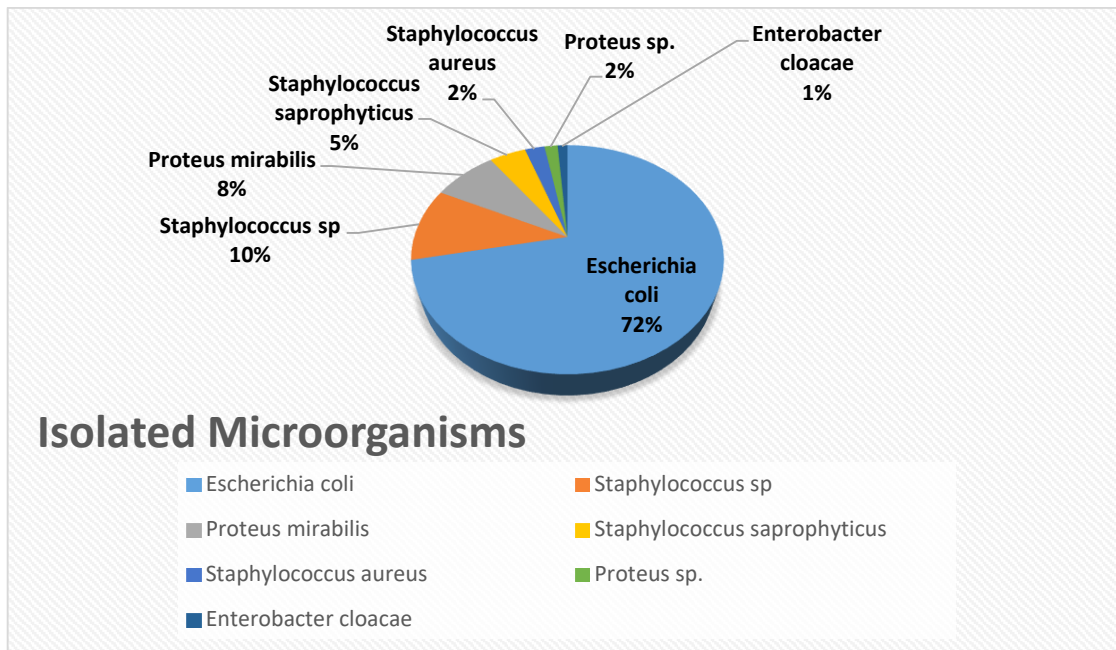


Figure 39. Graphical presentation of isolated microorganisms divided by gender

Discussions:

Referring to the data in our study, we note that the most frequent causes of urinary infections are *Escherichia coli* 70.92%, *Staphylococcus sp.* 10.31%, *Proteus mirabilis* 7.79%, *Staphylococcus Saprophytic* 4.49%, *Staphylococcus aureus* 2.44%, *Proteus sp.* 1.62%, *Enterobacter cloacae* 1.22%, *Staphylococcus*, and *Pseudomonas aeruginosa* 0.4%.

Our findings also corroborate those of others authors who report that 80–85% of urinary infections are caused by *Escherichia coli*, followed by *Staphylococcus saprophytic*, *Proteus mirabilis*, *Streptococcus agalactiae*, etc.

Gram-positive bacteria are also known as the cause of urinary tract infections, although they are rarer, such as *staphylococcus aureus*, *streptococcus*, etc. They more often cause recurrence of the infection. Thus, renal infections with *staphylococcus aureus* occur less often, and even when they do occur, the infection is carried out by hematogenous route. *Staphylococcus aureus* is found mainly in prostate infections, kidney abscesses, postoperative infections, urinary infections secondary to instrumental manipulations.

Comparing our data with authors, we notice the same phenomenon. Therefore, in this study, we noticed that urinary infections are more frequent in women and make up 85.7% of the patients taken in the study.

In both genders, we notice that *Escherichia coli* 70.92%, *Staphylococcus sp.* 10.31%, *Proteus mirabilis* 7.79%, *Staphylococcus saprophytic* 4.49%, *Staphylococcus aureus* 2.44%, *Proteus sp.* 1.62%, and *Enterobacter cloacae* 1.22% occupy the highest percentage.

An important place in the management of urinary infections is not only the correct diagnosis but also their treatment. The treatment is done according to the cause based on the urine culture data (urine culture). *E. coli* resistance to antibiotics is a problem worldwide.

Conclusions

At the end of this study, we reached the following conclusions:

The most frequent causes of urinary infections in adults are *Escherichia coli* 70.92%, *Staphylococcus sp.* 10.31% and *Proteus mirabilis* 7.79%. Urinary tract infections affect women more than men.

Antibiotics that have the highest effectiveness against isolated bacteria are as follows:

E. coli has high sensitivity over 70% to antibiotics: Amikacin, Amoxicillin/Clavulanic acid, Ceftazidime, Ceftriaxone Cefaclor Ciprofloxacin, Gentamicin, Nitrofurantoin and Norfloxacin and over 50% to Cefuroxime sodium, Doxycycline, Nalidixic acid, *Staphylococcus sp.* has high sensitivity over 70% to amoxicillin/Clavulanic acid, Gentamicin, Nitrofurantoin.

The number of strains of *Staphylococcus saprophyticus* has a high sensitivity of over 50% to: Amoxicillin/Clavulanic acid, Ciprofloxacin, Gentamicin, Trimethoprim/Sulfamethoxazole.

Staphylococcus aureus has a high sensitivity of over 50% to antibiotics such as: Amoxicillin/Clavulanic acid, Ceftriaxone, Doxycycline, Gentamicin, Nitrofurantoin *Enterobacter cloacae* has over 50% sensitivity to antibiotics: Cefuroxime sodium, Ceftazidime, Norfloxacin, Gentamicin.

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BODY FAT, LIPID PROFILE AND SELECTED HORMONES IN ACTIVE POLISH STUDENTS CHARACTERIZED BY LOWER AND HIGHER NORMAL TSH LEVELS

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ABSTRACT

Introduction and Purpose: The endocrine system is one of the most crucial systems in the human body, playing a pivotal role in maintaining homeostasis. It significantly influences the survival of the organism by managing the functions of all systems and organs, affecting the body's immune response and its ability to combat diseases. Disruptions in its functioning can lead to improper functioning of other systems and impact various bodily processes, including metabolic functions. The study aim was to evaluate relationship between body fat, lipid profile and selected hormones in the context of lower and higher normal TSH levels in active male students.

Materials and Methods: A total of 112 male students of the Faculty of Physical Education volunteered to participate in the study. Body weight and height were determined using standard medical equipment. Waist circumference was measured using non-stretchable tape. The percentage of body fat was determined from the sum of the thickness of four skinfolds. Circulating lipids, TSH, glucose and insulin level was determined.

Results: Biochemical characteristics revealed that the circulating TC, LDL-C, and TG were significantly lower in male with lower normal TSH levels vs. male with higher normal TSH levels. The analysis of distorted metabolic variables indicated that for male higher normal TSH levels frequency of disturbances was significantly higher than in male lower normal TSH levels. Additionally, this group was characterized by a significantly higher percentage of fat in the body.

Discussion and Conclusion: Diseases of the thyroid gland are among the most common endocrine disorders globally, second only to diabetes mellitus. It is widely known that thyroid dysfunction, particularly hypothyroidism, is associated with dyslipidemia, increasing the risk of endothelial dysfunction, hypertension, and cardiovascular diseases. The most significant finding of our study indicated that even TSH levels within the upper limit of the normal range

have an impact on the occurrence of certain metabolic disorders in physically active young men. It was demonstrated that these men had significantly higher levels of body fat, as well as serum concentrations of TC, LDL-C, and TG compared to men with TSH levels within the lower limit of the reference range. This is consistent with other data indicating a direct influence of thyroid hormones on lipid and lipoprotein metabolism.

Key Words: Lipid profile; Body fat; Endocrine system; Metabolic disorders; TSH

THE ONLY CASE OF SURGICAL CORRECTION OF THE SECOND TYPE OF COMMON ARTERIAL TRUNK, COMPLICATED BY AN EXTREMELY HIGH DEGREE OF PULMONARY HYPERTENSION USING A MATHEMATICAL APPROACH

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ANNOTATION

Truncus arteriosus (TA) is a rare congenital heart defect. In this case, one common great vessel departs from the base of the heart from both ventricles - the TA. TA has a single valve ring consisting of two to six semilunar valves (in most cases the valve consists of three leaflets). The pulmonary artery (PA) or its branches arise from the ascending part of the TA - above its valve ring and to the level of the origin of the brachiocephalic arteries (Figure No.1). Underneath the TA there is a large crescent-shaped ventricular septal defect. From both ventricles there is a pathological discharge of blood through the interventricular septal defect into the TA with mixing of blood in it. TA provides coronary, systemic and pulmonary circulation. The generally accepted worldwide classification of TA according to R. Collett and J. Edwards (1949) divides this defect into 4 types. The frequency of its detection of TA among congenital heart defects ranges from 0.2 – 1.0% to 1.7%. The most common type among them is type I. In this case, the PA artery departs from the TA and divides into two branches. In type II, the branches of the PA arise from the posterior wall of the TA and their orifices are located next to each other. The world literature mainly describes surgical correction of type I TA. However, there are no reports on the incidence and surgical treatment of type II TA.

For the first time in cardiac surgical practice, we performed an original operation of bilateral narrowing of both branches of the pulmonary artery in an infant aged 8 months with a diagnosis of TA type II, complicated by extremely high (100%) pulmonary hypertension (PH). The main manifestations of the child’s disease were monthly severe recurrent pneumonia. The optimal time for radical correction of the defect under artificial circulation was missed in this case. During narrowing, we used our own original methodology, which involves the use of a mathematical approach. We use this technique in children with ventricular septal defects

complicated by high PH. The technique is based on the use of mathematical formulas and a special table proposed by Kirkling (2003), which determines the diameters of normal heart valves depending on the patient's body area. During the operation, we perform three mathematical steps to narrow the LA. First, we determine the surface area of the body of the sick child using the formula Mosteller (1987): $S_{pt} = \sqrt{A \times B / 3600}$ (m²), where A = height of the sick child in cm, B = body weight of the sick child in kg (first step). After obtaining Spt (m²), using Kirkling's nomogram (2003), we determine the proper diameter of the pulmonary artery in a sick child in mm required for narrowing (second step). It is clear that the resulting LA diameter according to Kirkling's nomogram is both the normal LA diameter of a healthy child and the PA diameter (D_{LA}) we need for narrowing in a sick child with the same body area (second step). Next, we calculate the length of the braid (Lbr.) in mm, which narrows the PA of the sick child to normal values with the same body surface. To do this, we use the formula known in mathematics for calculating the circumference - the perimeter of the LA (Pl_a) in mm = D_{LA} x Pi (3.14), where D_{LA} is the diameter of the PA of a healthy child according to the nomogram. It is clear that the perimeter of R1a is equal to the length of the tapering band (Lbr.) in mm (third step).

However, in this case, in a patient with TA, we had to narrow not the whole PA, but both of its branches separately. Therefore, we conditionally divided the diameter of the aircraft by two for each of its branches and calculated the circumference of these branches using the formula described above (see the third step).

The course of the postoperative period was smooth. Recurrent pneumonia has disappeared and is not observed. In the second intercostal space, a systole-diastolic murmur is heard on both sides, as with an open ductus arteriosus. During D-EchoCG, significant pressure gradients appeared at the levels of narrowing of the branches of the PA, which proves a decrease in the degree of PH. In the long-term postoperative period, the sick child increased from IV to II functional class according to NYHA. When measured, SaO₂ is at a level of at least 84%. Considering the fact that 8 years (2024) have passed since the operation (2016), we can state good results of the operation.

Thus, dosed narrowing of the branches of the pulmonary artery in patients with TA type II according to the method of cardiac surgeon R. Madiev, based on a mathematical approach, by correcting the minute volume of blood flow in the pulmonary circulation, effectively reduces high PH in children. In this case, there is no need to use intraoperative tensiometry, it is possible to significantly reduce the "drug burden" for patients after surgery, as well as the dependence on specific therapy for high PH before the second final stage of correction of the defect.

Key words: Truncus arteriosus (TA), pulmonary artery (PA), pulmonary hypertension (PH), type II a TA, narrowing of the branches of the PA in children with the method of cardiac surgeon R. Madiev, mathematical approach.

INTRODUCTION

Truncus arteriosus (TA) is a rare congenital heart defect [1]. In this case, one common great vessel departs from the base of the heart from both ventricles - the TA. TA has a single valve ring consisting of two to six semilunar valves (in most cases the valve consists of three leaflets). The pulmonary artery (PA) or its branches arise from the ascending part of the TA - above its valve ring and to the level of the origin of the brachiocephalic arteries. Underneath the TA there is a large crescent-shaped ventricular septal defect. From both ventricles there is a pathological discharge of blood through the interventricular septal defect into the TA with mixing of blood in it. TA provides coronary, systemic and pulmonary circulation. The generally accepted

worldwide classification of TA according to R. Collett and J. Edwards (1949) divides this defect into 4 types. The frequency of its detection of TA among congenital heart defects ranges from 0.2 – 1.0% to 1.7%. The most common type among them is type I. In this case, the PA artery departs from the TA and divides into two branches. In type II, the branches of the PA arise from the posterior wall of the TA and their orifices are located next to each other. Type II TA can have 2 anatomical variants: a – without pulmonary artery stenosis, b – with pulmonary artery stenosis. A feature of TA type IIa is the rapid, malignant development of high pulmonary hypertension and Eisenmenger syndrome with low chances of reaching adulthood without surgery. The main contingent of sick children with TA without stenosis of the pulmonary artery (pulmonary arteries) die at an early age. The world literature mainly describes surgical correction of type I TA. However, there are no reports on the incidence and surgical treatment of type IIa TA.

PURPOSE OF THE STUDY

In the only case of surgical correction of type IIa TA, complicated by 100% pulmonary hypertension in a sick infant, demonstrate the effectiveness of narrowing of both branches of the pulmonary arteries using a mathematical approach.

MATERIAL AND RESEARCH METHODS

We describe the data of a sick child.

The sick child Shafolatov Doston – born on June 30, 2015, was admitted to the Symbat-Nur clinic on May 4, 2016 with complaints of shortness of breath and palpitations at rest and when crying; periodic cough with sputum that is difficult to separate; cyanosis of the nasolabial triangle and fingers with minor physical exertion; unstable stool; restlessness and crying when urinating; urination in small portions and decreased diuresis.

Case history: A heart murmur was detected immediately after birth in the maternity hospital; congenital heart disease (CHD) was suspected. The child was born weighing 3700 grams. He was discharged from the maternity hospital 10 days after birth. A month after birth, he was examined by a pediatrician and was sent to the regional multidisciplinary children's hospital in Termez for examination. After echocardiography, a diagnosis of congenital heart disease was established. Ventricular septal defect.

In February 2016, the patient was examined at the advisory clinic of the Tashkent Pediatric Medical Institute. For the first time, a diagnosis was made: congenital heart disease. Truncus arteriosus (TA). II a type. After consulting a cardiac surgeon, surgery in India was recommended.

The sick child's condition worsened and in May 2016 he was examined at another medical Center in Tashkent - at "MDS-SERVICE". According to D-EchoCG, the diagnosis was made: congenital heart disease. TA. I a type.

The sick child was consulted by cardiac surgeon R. Madiev. Considering the age and general serious condition of the sick child, as well as very high pulmonary hypertension (the pressure in the pulmonary arteries was equal to the pressure in the aorta, 100% pulmonary hypertension), a two-stage surgical correction of the defect was recommended. The first stage is planned to

narrow both branches of the pulmonary artery, and the second stage is to radically correct the defect under conditions of artificial circulation and cardioplegia.

For preoperative preparation and the first stage of the operation, the sick child was hospitalized in the cardiac surgery department of the Symbat-Nur medical center in the city of Shymkent, South Kazakhstan region.

Life story: The child was born from the second pregnancy. Second natural birth. During this pregnancy, the mother of a sick child suffered severe stress and repeated acute viral respiratory infections. Before hospitalization, the patient suffered monthly from recurrent bronchopneumonia and received inpatient treatment at the regional multidisciplinary children's hospital in the city of Termez.

Current condition: The general condition of the main and concomitant pathology is extremely serious. Weight: = 8.0 kg. Height = 72.0 kg. BSA = 0.4 m². Consciousness is clear. The skin and visible mucous membranes are pink and moist. Cyanosis of the nasolabial triangle is noted during crying and screaming. Peripheral lymph nodes are not enlarged, body temperature is 36.6 °C. Periodically, short-term increases in body temperature to subfebrile levels are observed. When examining the oral cavity, the eruption of four upper and three lower teeth is noted. In the lungs on both sides, weakened vesicular breathing is heard, there are no wheezes. In the lower parts of the left lung, vesicular breathing is sharply weakened.

There is moderate shortness of breath at rest with a respiratory rate of up to 32 per minute with the participation of auxiliary muscles. Sa O₂ at rest = 61-71%.

On auscultation of the heart: the first sound is increased. A rough systolic murmur is heard at the left edge of the sternum. Heart rate 102 beats per minute. Pulse of average filling and tension, 102 beats per minute. Blood pressure 80/40 mm.Hg.

The tongue is clean and moist. The abdomen is of normal shape, soft and painless on palpation. The liver is not enlarged. The gallbladder and spleen are not palpable. Pasternatsky's symptom is negative on both sides. The stool is irregular, there is a periodic increase in stool up to 3-4 times a day. The color of stool is yellow, sometimes with a greenish tint, shaped. Urination is painful, in small portions. During urination, the child behaves restlessly and cries a lot. Diuresis is reduced.

When examining the neck area, the thyroid gland is not enlarged. Nervous system: the child is restless, takes a long time to fall asleep at night and cries a lot. On palpation of the large fontanel, moderate pulsation is determined. When examining the genital organs, pronounced phimosis is noted. The testicles are not palpable in the scrotum. There is no edema in the lower extremities.

The sick child is examined. Due to the child's restless behavior, an ECG was not taken. Among the instrumental examination methods, the main ones were plain radiography of the chest organs and D-EchoCG by an experienced cardiologist before and after surgery. Angiography was not performed, taking into account the child's infant age, unstable hemodynamic state and high-quality diagnosis of the defect using D-EchoCG. In the postoperative period, ultrasound examination of the pleural cavity in dynamics was also performed. At the stages of correction of the defect, along with standard tests, the acid-base state of the venous blood was determined.

For preoperative preparation, minimal drug therapy was used: specific therapy for high pulmonary hypertension with sinegra 5 mg x 3 times a day, Cevicap, eubiotics, Linkas. In the postoperative period, antibacterial and syndromic therapy and postoperative wound dressings were carried out.

Preoperative preparation lasted 10 days. 2 days after admission, we performed urological surgery to excise the foreskin to facilitate a smooth course of the postoperative period.

The data obtained using D-EchoCG were as follows.

A single common arterial truncus (TA) with a diameter of 1.9 cm and with a sealed valve departs from both ventricles. 3.1 cm above the valve ring, on the posterior wall of the TA there is a common pulmonary artery ostium with a diameter of 0.7 cm without stenosis. The further course of the branches of the pulmonary arteries cannot be determined. The walls of the left ventricle are hypertrophied. The thickness of the interventricular septum is 1.0 cm. The thickness of the posterior wall of the left ventricle is 1.1 cm. Mitral and tricuspid valves without structural and functional changes.

With Doppler: there is a bilateral reflux of blood between the ventricles through a large subarterial defect (1.1 cm). There is also reflux of blood from the left atrium into the right atrium through a small defect (2.0 mm). A high-speed turbulent flow at the mouth of the pulmonary arteries is determined.

Conclusion: Congenital heart defect. TA. II a type. Open oval window. High pulmonary hypertension.

On May 15, 2016, an operation was performed under endotracheal anesthesia and invasive blood pressure monitoring (cardiac surgeon R. Madiev). Longitudinal median sternotomy. OSA type IIa was detected. The right pulmonary artery has a diameter of 13 mm. Left pulmonary artery with a diameter of 10 mm. A “metered narrowing of the right and left pulmonary arteries” was performed using our own technique. After narrowing, the right pulmonary artery has a diameter of 7.0 mm, the left pulmonary artery also has a diameter of 7.0 mm. Distal to the narrowing sites, systolic tremor appeared.

Before suturing the postoperative wound, a lavsan artificial vascular prosthesis was left under the sternum, the length of which is equal to the length of the sternum, in order to facilitate repeated sternotomy in the future - during the second stage of the operation.

Postoperative period: Extubation 5 hours after the end of the operation. SaO₂ = 79-80%. Blood pressure 100/70 mmHg. There is no active bleeding from the drains. The drains were removed on the second day after surgery. Stool on the third day. When auscultating the lungs on the left: in the upper sections there is weak vesicular breathing, in the middle sections there is very weak vesicular breathing, in the lower sections vesicular breathing is not audible. Auscultation of the lungs on the right: the patency of the lung in all sections is preserved. Immediately after surgery, respiratory support was provided (humidified oxygen 4 l/min). SaO₂ = 85-95%. The oxygen pressure is gradually reduced to 0.2 l/min. SaO₂ = 75-80% (saturation before surgery was in the range of 61-71%). There is a discharge of thick sputum that is difficult to separate. The temperature is subfebrile.

On the third day of the postoperative period, the child was transferred from the intensive care unit to the ward. In the morning at 07-00 the next day, the child lies on the floor from the bed (the tired mother fell fast asleep). Immediately after this, short-term febrile convulsions were noted. The child was urgently transferred to the intensive care unit. Subsequently, treatment in the intensive care unit continued until the patient was discharged from the medical center (until May 26, 2016).

On May 21, 2016, divergence of the edges of the skin wound in the upper and lower corners was diagnosed (after falling out of bed). On May 23, 2016, interrupted sutures were applied to

these areas of skin. The subclavian catheter was removed on the same day. After coughing up thick mucous sputum, the child's condition gradually began to improve. When auscultating the lungs on the left, starting from May 22, 2016, vesicular breathing began to be heard. As of May 24, 2016, supplemental oxygen therapy was discontinued. Hemodynamic and respiratory parameters have stabilized. At rest $\text{SaO}_2 = 78\text{-}80\%$. The pulsation of the large fontanel disappeared. On May 26, 2016, the sick child was discharged home. Relevant recommendations are given.

RESULTS AND DISCUSSIONS

For the first time in cardiac surgical practice, we performed an original operation of bilateral narrowing of both branches of the pulmonary artery in an infant aged 10 months with a diagnosis of TA type II a, complicated by extremely high (100%) pulmonary hypertension (PH). The main manifestations of the child's disease were monthly severe recurrent pneumonia. The optimal time for radical correction of the defect under artificial circulation was missed in this case. During narrowing, we used our own original methodology, which involves the use of a mathematical approach. We use this technique in children with ventricular septal defects complicated by high PH [2, 4].

The technique is based on the use of mathematical formulas and a special table proposed by Kirkling [3], which determines the diameters of normal heart valves depending on the patient's body area. During the operation, we perform three mathematical steps to narrow the PA.

First step. First, we determine the surface area of the body of the sick child using the formula Mosteller [5]: $\text{Spt} = \sqrt{A \times B / 3600}$ (m^2), where A = height of the sick child in cm, B = body weight of the sick child in kg.

Second step. After obtaining Spt (m^2), using Kirkling's nomogram [3], we determine the proper diameter of the pulmonary artery in a sick child in mm required for narrowing. It is clear that the resulting LA diameter according to Kirkling's nomogram is both the normal LA diameter of a healthy child and the PA diameter (D_{PA}) we need for narrowing in a sick child with the same body area.

Third step. Next, we calculate the length of the braid (Lbr.) in mm, which narrows

the PA of the sick child to normal values with the same body surface. To do this, we use the formula known in mathematics for calculating the circumference of the circumference - the perimeter of the LA (P_{LA}) in mm = $D_{\text{LA}} \times \text{Pi}$ (3.14), where D_{LA} is the diameter of the PA of a healthy child according to the nomogram. It is clear that the perimeter of P_{LA} is equal to the length of the tapering band (Lbr.) in mm.

However, in this case, in a patient with TA, we had to narrow not the whole PA, but both of its branches separately. Therefore, we conditionally divided the diameter of the aircraft by two for each of its branches and calculated the circumference of these branches using the formula described above (see the third step).

The course of the postoperative period was smooth. Recurrent pneumonia has disappeared and is not observed. In the second intercostal space, a systole-diastolic murmur is heard on both sides, as with an open ductus arteriosus. During D-EchoCG, significant pressure gradients appeared at the levels of narrowing of the branches of the PA, which proves a decrease in the degree of PH (L=25 mm Hg., R-28 mm Hg.). In the long-term postoperative period, the sick child increased from IV to II functional class according to NYHA. When measured, SaO_2 is at

a level of at least 84%. Considering the fact that 8 years (2024) have passed since the operation (2016), we can state good results of the operation.

CONCLUSION

Thus, dosed narrowing of the branches of the pulmonary artery in patients with TA type II according to the method of cardiac surgeon R. Madiev, based on a mathematical approach, by correcting the minute volume of blood flow in the pulmonary circulation, effectively reduces high PH in children. In this case, there is no need to use intraoperative tensiometry, it is possible to significantly reduce the “drug burden” for patients after surgery, as well as the dependence on specific therapy for high PH before the second final stage of correction of the defect.

TYPES OF THE TRUNCUS ARTERIOSUS

I

II

III

IV

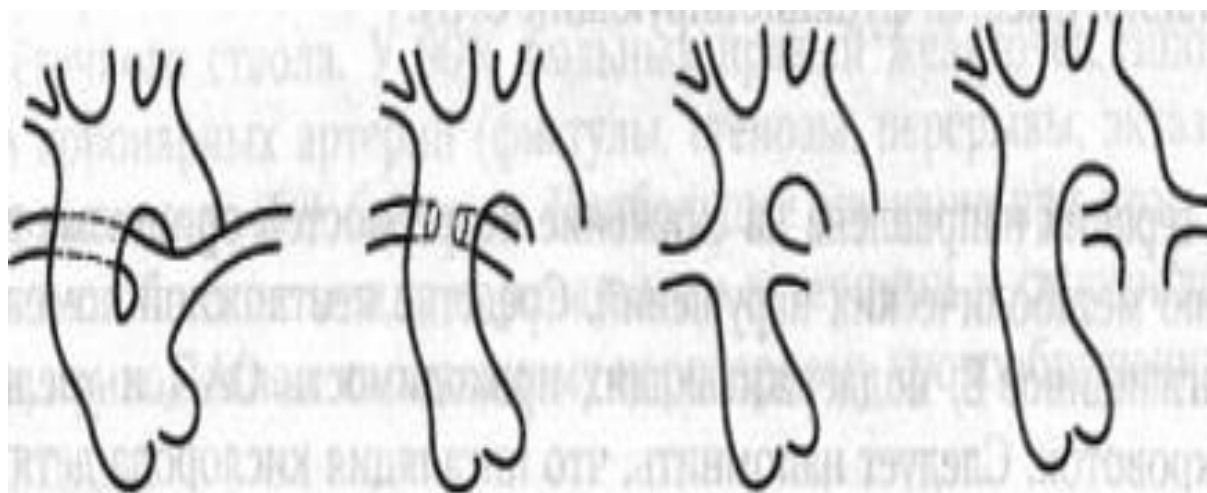


Figure No. 1

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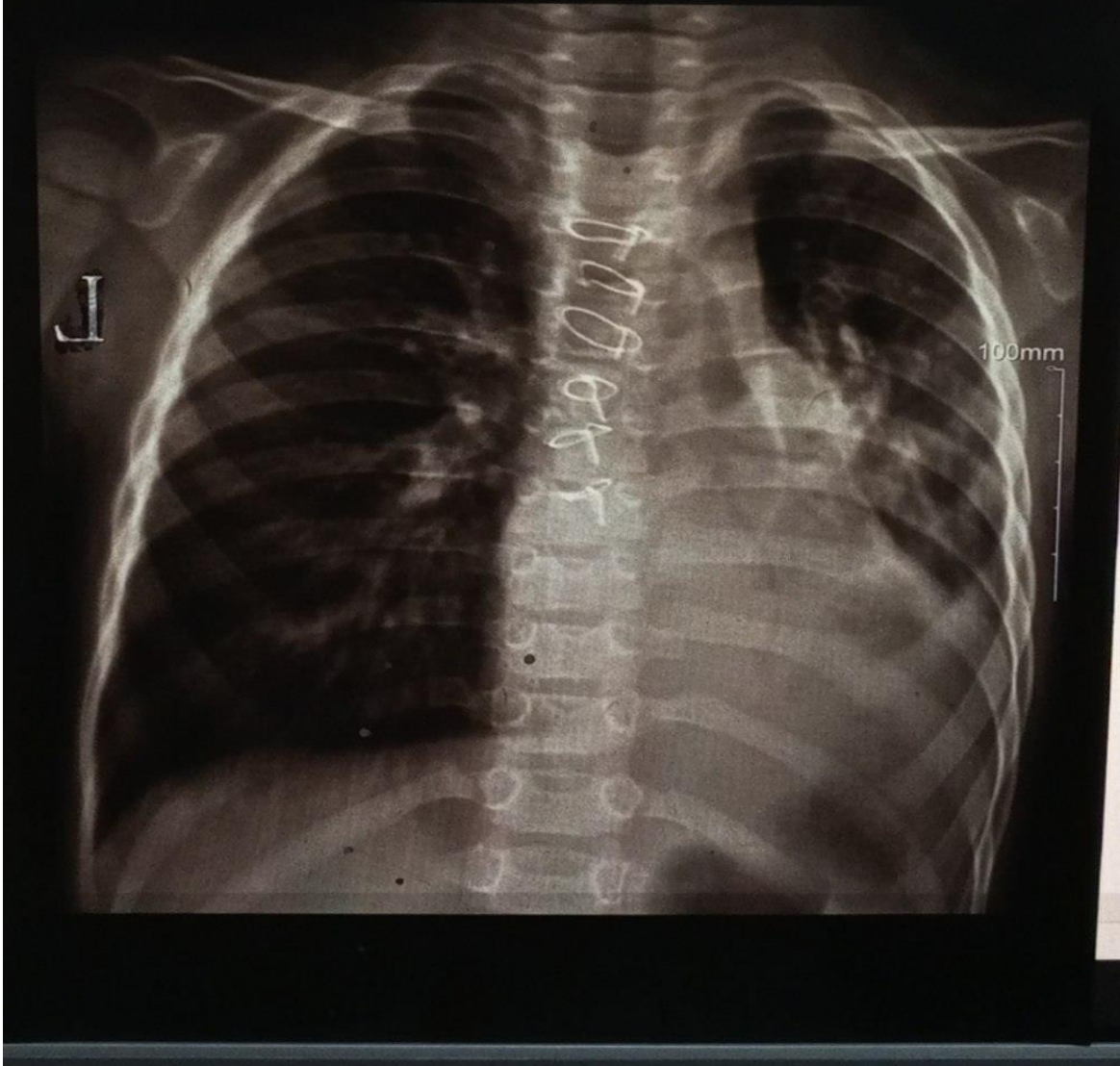


X-ray No. 1 Sick child Doston Shafatov-2015.07.30

10 months

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Shafotov D. A.
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X-ray No. 2

Sick child Doston Shafotov-2015.07.30

2,5 years



X-ray No. 3 Sick child Doston Shafotov-2015.07.30

8,5 years



Photo No. 1

Sick child Doston Shafokatov-2015.07.30

8,5 years

OPTIMIZATION OF CULTIVATION CONDITIONS FOR BACTERIA OF THE GENUS BACILLUS SUBTILIS TO INCREASE CELLULASE ACTIVITY

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Abstract

Cellulolytic enzymes are produced by a variety of bacteria and fungi, aerobes or anaerobes, mesophiles or thermophiles, when they grow on lignocellulosic materials, which can be used as effective feed additives and biotransformation agents in the degradation of agricultural biomass. A promising area of microbial biotechnology is the development of probiotic preparations for feed use. At the same time, much attention is paid to probiotics with cellulolytic properties in connection with the problems of domestic feed production.

During the studies, more than 20 bacterial strains have been isolated from the pet's scar. Isolated aerobic spore-forming bacteria of the genus *Bacillus* have been examined in search of producers of cellulolytic enzymes, with 4 strains of *Bacillus subtilis* capable of breaking down carboxymethylcellulose and cellobioses.

Keywords: microorganisms, cellulose, cellulolytic activity, enzyme, carboxymethylcellulose, cellobiose, glucose, endogluconase, cellobiase.

There are many questions about increasing productivity, which are determined by the physiological and biological characteristics of animals. Organizing the establishment of adequate, high-quality nutrition and the creation of a new feed base for livestock farming, eliminating the causes of shortage and inferiority of feed are serious problems, the solution of which would help to increase the safety and productivity of farm animals. When solving this issue, it is of interest to prepare feed using microorganisms, in particular cellulose-decomposing bacteria. They hydrolyze the polymeric organic substrate cellulose, forming soluble organic compounds.

To increase the cellulolytic properties of the strains, that is, the synthesis of cellulases, nutrient media and optimal growing conditions were selected. Meat-extract broth (MPB), Hutchinson's broth and whey-based nutrient medium were chosen as nutrient media. The most optimal nutrient medium was a whey-based production medium, also the optimal pH value was 5.5 and the temperature was 37°C. The highest indicator was shown by the experimental sample with the addition of yeast extract and bran to the nutrient medium. The highest result is 1.56 units/ml. Thus, cellulolytic bacteria isolated from animals are thermophilic bacteria of the genus *Bacillus subtilis*, which are facultative anaerobes and grow optimally under aerobic conditions. It is noted that the optimal growth of these bacteria is observed in an acidic environment of pH 5.5, since their natural habitat is the gastric juice of animals. Taking into account the data obtained, it should be noted that the studied bacteria are of practical interest for use in the field of feed production and recycling of plant waste. Methods for optimizing cultivation conditions increase the synthesis of cellulase enzymes.

**INVESTIGATION OF THE EFFECTS OF REFRIGERANTS AND
EVAPORATING/CONDENSING TEMPERATURES ON THE CAPACITY OF A
FINNED TUBE EVAPORATOR**

**KANATLI BORULU BİR EVAPORATÖR KAPASİTESİNE SOĞUTUCU AKIŞKAN
VE EVAPORASYON/KONDEZASYON SICAKLIKLARININ ETKİLERİNİN
İNCELENMESİ**

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ÖZET

Kyoto Protokolünün ve Paris İklim Anlaşmasının küresel ısınma ve iklim değişikliğine karşı aldığı önlemler, soğutma sistemlerinde kullanılan bazı soğutucu akışkanların kullanım miktarlarında kısıtlamalar getirirken, bazı soğutucu akışkanların yerine alternatif farklı bir soğutucu akışkan kullanılmasını zorunlu kılmıştır. Bu değişikliklerin bir etkisi olarak, bu çalışmada birbirlerinin alternatifi olarak kullanılan bazı soğutucu akışkanların (R404A, R410A, R407C, R449A, R32, R1234ZE) kanatlı borulu bir evaporatörün kapasitesine olan etkileri incelenmiştir. Ayrıca, sabit bir evaporasyon sıcaklığında farklı kondenzasyon sıcaklıklarının ve sabit bir kondenzasyon sıcaklığında farklı evaporasyon sıcaklıklarının evaporatör kapasitesi üzerindeki etkileri de incelenmiştir. Hem soğutucu akışkanların küresel ısınma potansiyelleri açısından bir karşılaştırması ile en optimum akışkanın belirlenmesi, hem de farklı evaporasyon ve kondenzasyon sıcaklıklarının kapasite üzerinde etkilerinin incelenmesi için bu çalışma hazırlanmıştır. Analizler Unilab Coils yazılımı kullanılarak yapılmış, sonuçlar tablolar ve grafikler yardımıyla sunulmuştur.

Anahtar Kelimeler: Soğutucu akışkanlar, Evaporatör, Kapasite analizi, R404A, R410A, R407C, R449A, R32, R1234ZE.

ABSTRACT

The measures taken by the Kyoto Protocol and the Paris Climate Agreement against global warming and climate change, imposed restrictions on the usage amounts of some refrigerants used in cooling systems, and necessitate the use of an alternative refrigerant instead of some refrigerants. As an effect of these changes, in this study, the effects of some refrigerants used as alternatives (R404A, R410A, R407C, R449A, R32, R1234ZE) on the capacity of a finned tube evaporator have been investigated. Additionally, the effects of different condensation temperatures at a constant evaporation temperature and different evaporation temperatures at a

constant condensation temperature on the evaporator capacity have been also examined. This study has been prepared to determine the most optimum fluid by comparing refrigerants in terms of their global warming potential, and to examine the effects of different evaporation and condensation temperatures on capacity. Analyzes have been performed using the Unilab Coils software and the results have been presented with the help of tables and graphs.

Keywords: Refrigerants, Evaporator, Capacity analysis, R404A, R410A, R407C, R449A, R32, R1234ZE.

GİRİŞ

Dünya nüfusundaki artış ve endüstriyel gelişmeler, enerji talebinin sürekli artmasına sebep olmaktadır. Dahası, mevcut enerji kaynaklarının sınırlı olması nedeniyle enerji arzı ile talebi arasındaki fark da giderek büyümektedir. Bu nedenle, enerji verimliliği ve tasarrufu, bugün olduğu gibi gelecekte de ana gündem maddelerinden biri olmaya devam edecektir.

Enerji verimliliği, belirli bir enerji kaynağı kullanılarak üretilen bir mal veya hizmetin kalitesinde veya miktarında herhangi bir azalma olmadan daha az enerji kullanılarak üretilmesi anlamına gelir. Daha net bir ifadeyle; üretim, ulaşım, aydınlatma, ısıtma, soğutma gibi enerjinin yoğun kullanıldığı alanlarda, aynı işlevin daha az enerji kullanılarak gerçekleştirilmesini sağlar.

Enerji verimliliği, aynı işi daha az enerji kullanarak gerçekleştirme prensibine dayanır ve sürdürülebilir bir gelecek için kritik öneme sahiptir. Ayrıca, ekonomik açıdan bakıldığında, enerji verimliliğinin artırılması, enerji dışa bağımlılığının azaltılması ve ülkelerin enerji maliyetlerinde ciddi düşüşleri de beraberinde getirecektir.

Soğutma, bir maddenin veya ortamın sıcaklığını, çevresel hacmin sıcaklığının altına indirme ve bu düşük sıcaklıkta sabit tutma amacıyla ısıyı uzaklaştırma işlemidir. Bu işlem, genellikle termodinamik prensiplere dayalı olarak gerçekleştirilir ve soğutucu akışkanlar kullanılarak yapılır.

Bir soğutma sistemi, soğutma etkisini üretmek için belirli bir düzen içinde sıralanmış olan bileşenlerin ve ekipmanın oluşturduğu bir sistemdir. En yaygın olarak uygulanan ve karşılaşılan buhar sıkıştırımlı soğutma sistemlerinde, sıvı halden buhar hâline geçen soğutucu akışkanı içeren bir evaporatör (buharlaştırıcı) bulunur. Evaporatörde buharlaşan soğutucu akışkan, düşük basınç tarafından emilir ve yüksek basınçlı kondensere basan bir kompresör tarafından sıkıştırılır. Soğutucu akışkandaki ısıyı alarak onu sıvı hâle getiren bir kondenser (yoğusturucu) ve soğutucu akışkanın evaporatöre, yani düşük basınç tarafına ölçülü ve gerekli miktarlarda verilmesini sağlayan bir genleşme valfi sistemin temel bileşenleridir.

Buhar sıkıştırımlı soğutma çevrimlerinde, evaporatör içinde bulunan soğutucu akışkanlar, doyma basıncında soğutulacak ortamdan ısıyı absorbe ederler. Bu şekilde, evaporatör soğutulacak ortamı soğutur ve istenen sıcaklık seviyesine ulaşmasını sağlar.

Günümüzde soğutkan seçimi yapılırken, bir dizi faktör dikkate alınmalıdır. Bunlar arasında ozon tabakasının korunması, küresel ısınma etkisi, güvenlik gereksinimleri, COP, buharlaşma ve yoğuşma basınçları, yağ karışabilirliği, inertlik, ısı iletkenlik, soğutma kapasitesi, fiziksel özellikler ve kaçak tespitinin kolaylığı yer almaktadır. Ekim 2016'da kabul edilen Montreal Protokolü'ne yapılan bir ek, klima ve soğutucu ekipmanlarda kullanılan akışkanların ağırlıklı küresel ısınma potansiyeli (GWP) değerinin önemli ölçüde azaltılmasını gerektirmektedir (UNEP, 2016). Sonuç olarak, yüksek GWP'ye sahip hidroflorokarbon (HFC) soğutucu akışkanlar ortadan kaldırılacak veya kullanımları önemli ölçüde azaltılacaktır. Bu nedenle, düşük GWP'ye sahip yeni ikame akışkanlar bulunmalıdır.

Bir soğutucu akışkanın kabul edilebilmesi için emniyetli bir şekilde kullanılabilir olmalıdır. Emniyetin sağlanması da soğutucu akışkanın iki temel özelliği ile ilgilidir. Bunlar soğutucu akışkanın zehirlenme etkisi (zehirliliği) ve yanıcılık özelliğidir. ASHRAE tarafından yapılan emniyet sınıflandırması aşağıdaki gibidir:

Yüksek Tutuşucu	A3	B3
Tutuşucu, Düşük Tutuşucu	A2	B2
	A2L	B2L
Tutuşucu Değil	A1	B1
	Düşük Zehirlilik	Yüksek Zehirlilik

Tablo 1: Soğutucu Akışkan Emniyet Sınıflandırması (ANSI-ASHRAE Standard 15-2013)

ANALİZ VE BULGULAR

Bu çalışmada hava soğutmalı kanatlı borulu bir evaporatör seçimi yapılarak, üretim özellikleri sabit tutulmuş, seçilen soğutucu akışkanlar ile Unilab Coils yazılımında hesaplamalar yapılmıştır. Hesaplamalar sırasında sabit bir evaporasyon sıcaklığında kondenzasyon sıcaklığının değişiminin evaporatör kapasitesine etkisi ve sabit bir kondenzasyon sıcaklığında evaporasyon sıcaklığının değişiminin evaporatör kapasitesine etkisi incelenmiştir. Yapılan hesaplamalar neticesinde değerlendirmeler ve yorumlar yapılmıştır.

Çalışmada BUZÇELİK Termik Cihazlar San. A.Ş. Genel Ürün Kataloğundan MSS45 412 ürünü seçilmiştir. Ürün özellikleri aşağıdaki gibidir:

Ürün Adı	MSS45 412
Ürün Tipi	Evaporatör
Geometri	40x35
Boru Çapı	1/2"
Boru Et Kalınlığı	0,35 mm
Boru x Sıra	16 x 4
Lamel Mesafesi	2600 mm
Hatve	8 mm
Devre Sayısı	10 adet
Kollektör Tipi	Bakır
Kollektör Çapları	¼" kılcal – Ø35 mm

Tablo 2: Seçilen Ürün Özellikleri

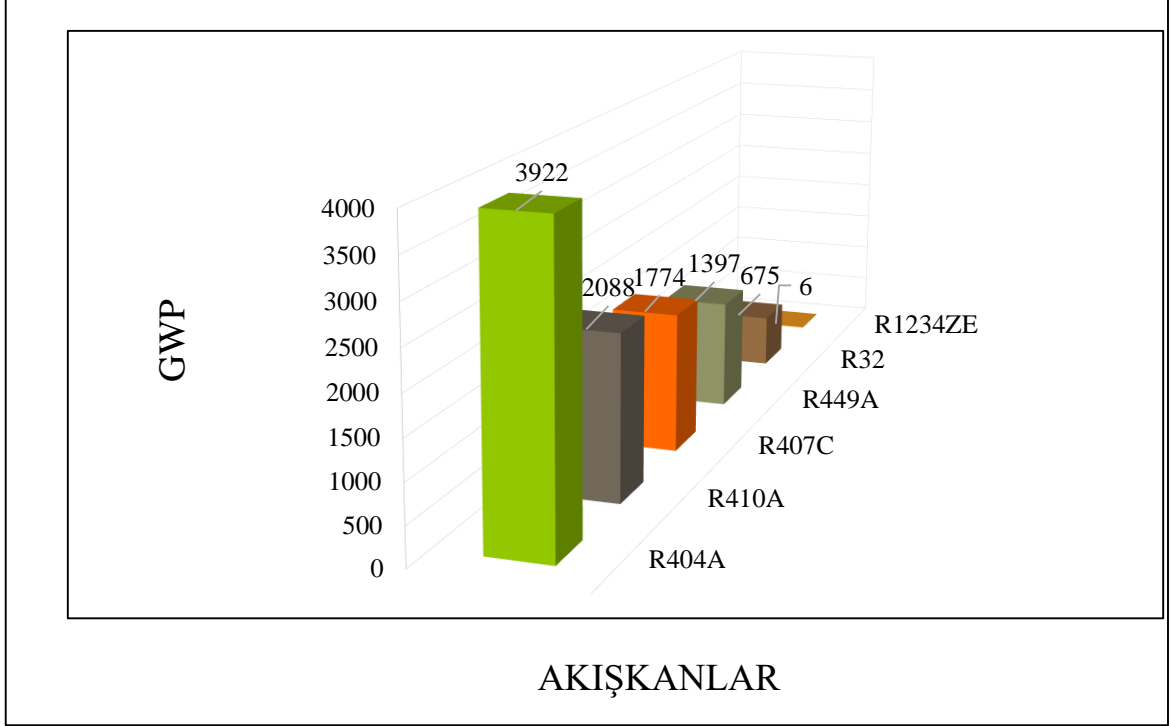
Yapılan hesaplamalarda kullanılan soğutucu akışkanlar ve özellikleri aşağıdaki gibidir:

	R404A	R410A	R407C	R449A	R32	R1234ZE
GWP	3922	2088	1774	1397	675	6
EMNİYET SINIFI	A1	A1	A1	A1	A2L	A2L
ODP	0	0	0	0	0	0
ÇEVRE SINIFLANDIRMASI	HFC	HFC	HFC	HFO	HFC	HFC
BASINÇ (45 °C'de) [bar]	~20	~28	~19	~20	~28	~9

Tablo 3: Analiz için Kullanılan Soğutucu Akışkanlar ve Özellikleri

GWP (Global Warming Potential - Küresel Isınma Potansiyeli), basitçe, bir soğutucunun atmosferi ne kadar ısıttığına işaret eden bir parametredir. Bu, 1 kg F-gazın, 1 kg CO₂'ye kıyasla 100 yıllık bir süre boyunca ne kadar ısınma potansiyeline sahip olduğunu gösterir. GWP genellikle binlik düzeyde ifade edilir. Örneğin, R404A'nın GWP'si 3922 ise, bu, CO₂'ye kıyasla R404A'nın 3922 kat daha fazla sera etkisine sahip olduğu anlamına gelir. Bu nedenle, F-gazların atmosfere salınımının önlenmesi, iklim değişikliğinin olumsuz etkilerini azaltmada etkili bir yol olarak görülebilir. Daha düşük GWP değerlerine sahip alternatif soğutucu akışkanların kullanımı, çevresel sürdürülebilirlik ve iklim koruma çabalarına önemli katkılar sağlayabilir.

Analizde kullanacağımız soğutucu akışkanların GWP karşılaştırmaları aşağıdaki grafikte ayrıca verilmiştir.

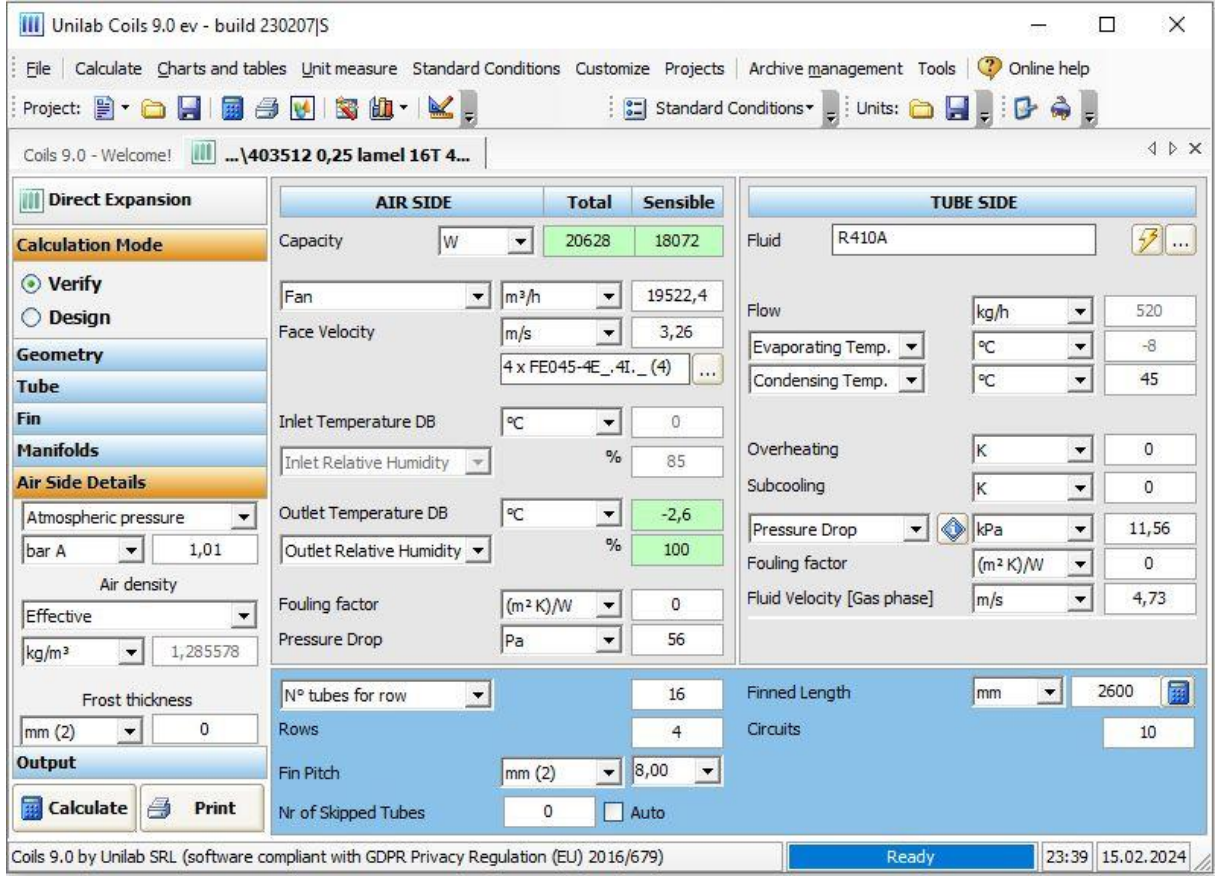


Grafik 1: Soğutucu akışkanların GWP Kıyaslaması

Hesaplamalarda alınan sabitler ve kabuller şöyledir:

- Kararlı hal koşulları kabul edilmiştir.
- Seçilen ürün özellikleri sabit olarak kabul edilmiştir.
- Aksiyal fan olarak Ziehl-Abegg marka FE045-4E_.4I. model 4 adet Ø450 mm çapında fan verileri sabit olarak kullanılmıştır.
- Aksiyal fan için 230V, monofaz, 50 Hz ve 1400 rpm değerleri sabit olarak alınmıştır.

Hesaplama yapılırken Unilab Coils yazılımı kullanılmıştır. Bu yazılım İtalyan menşei olup, kanatlı borulu ısı eşanjörlerinin farklı çalışma modlarında termodinamik özelliklerine ve üretim parametrelerine bağlı olarak eşanjör hesaplamalarının yapılması için sektör içerisinde yaygın olarak kullanılan bir yazılımdır. Yazılım kendi içerisinde hem fan çalışma şartlarına bağlı olarak hava debisi bilgilerini hem de soğutucu akışkan bilgilerini barındırmaktadır. Farklı akışkan ve tasarım parametrelerine göre yazılım aracılığıyla elde edilen sonuçlar hem akışkan hem kapasite açısından karşılaştırılacaktır. Yazılımda tasarım yapılırken kullanılan modül arayüzü aşağıda verilmiştir.

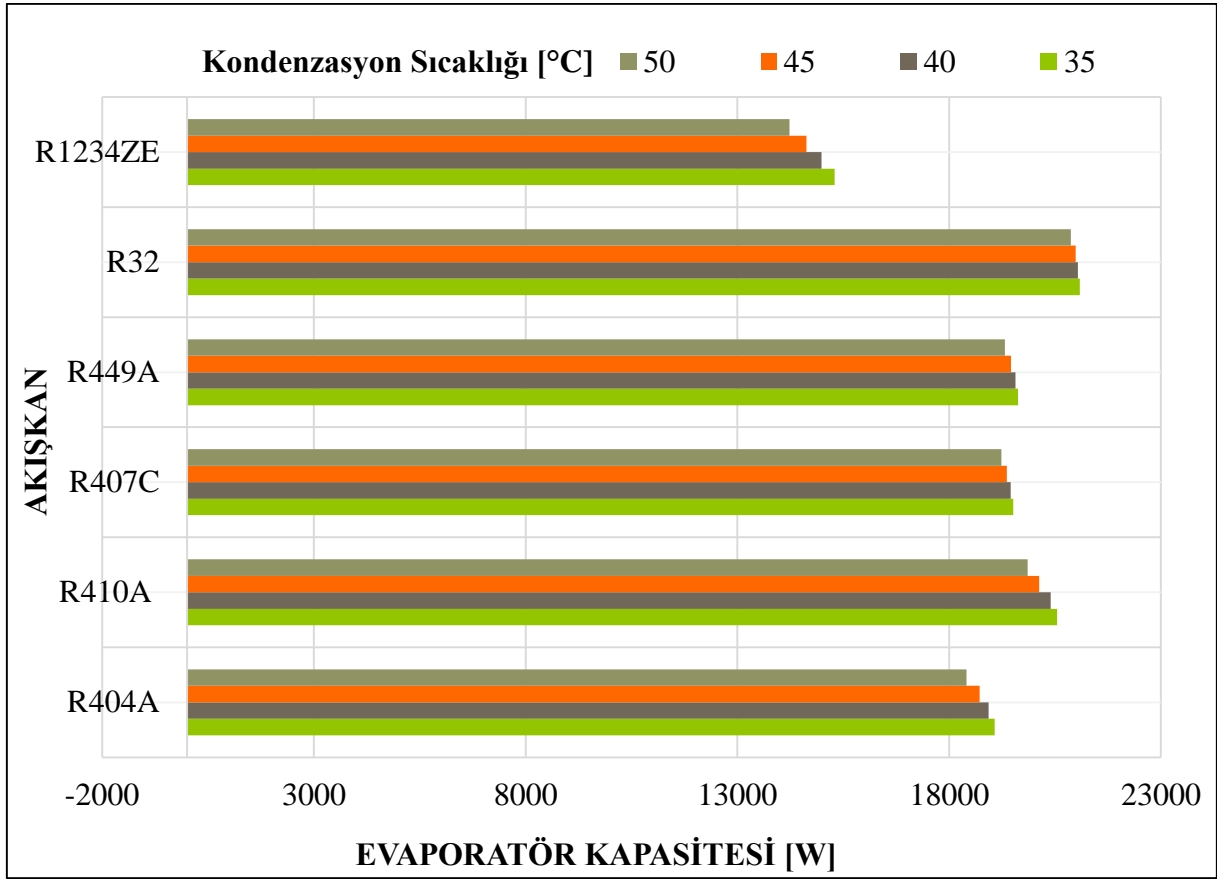


Şekil 1: Unilab Coils Yazılımı Direct Expansion Modül Arayüzü

Yukarıda verilen kabuller, tasarım parametreleri ve bilgiler ışığında yapılan tasarımlar neticesinde elde edilen analiz bilgileri aşağıdaki tablodaki gibidir:

	R404A	R410A	R407C	R449A	R32	R1234ZE
35	19071	20550	19512	19627	21085	15295
40	18932	20400	19453	19563	21037	14984
45	18722	20125	19364	19463	20984	14629
50	18405	19850	19236	19316	20875	14227

Tablo 4: Sabit SC2 Eurovent Şartlarında Farklı Kondenzasyon Sıcaklıklarına Göre Evaporatör Kapasite Tablosu; [Watt]

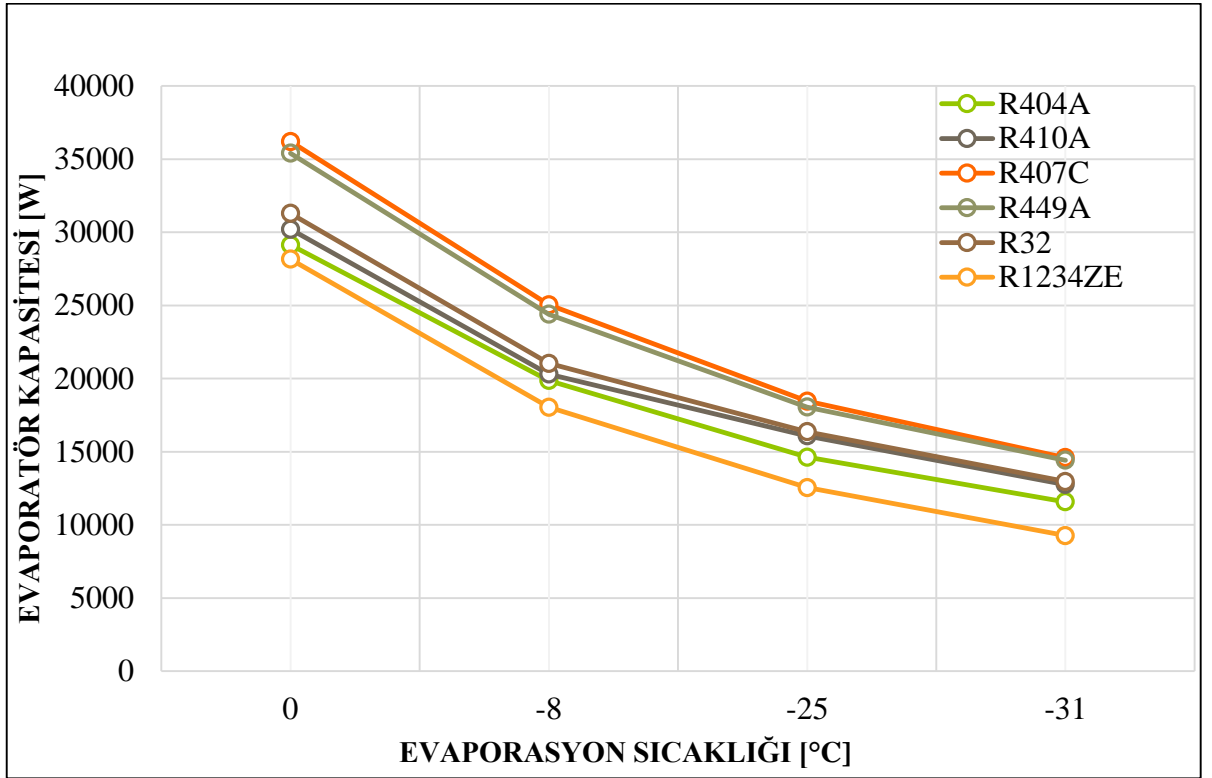


Grafik 2: Sabit SC2 Eurovent Şartlarında Farklı Kondenzasyon Sıcaklıklarına Göre Evaporatör Kapasite Grafiği

Farklı kondenzasyon sıcaklıklarının evaporatör kapasitesine etkisi incelenirken Eurovent SC2 şartları ($T_{\text{evaporasyon}} = -8 \text{ °C}$ ve $T_{\text{soğutulan ortam}} = 0 \text{ °C}$) sabit kabul edilmiştir. Yukarıda tabloda ve grafikte yer alan kapasite çıktıları incelendiğinde, kondenzasyon sıcaklığı arttıkça evaporatör kapasitesi azalmaktadır. Bunun temel nedeni evaporatörün çalışma sıcaklığındaki entalpi farkının azalmasıdır. Dolayısıyla, sabit ısı transfer yüzeyinden yapılan ısı transferi azalmaktadır. Bu veriler ışığında kondenzasyon sıcaklığımızı belirlemede farklı parametrelerde göz önünde bulundurulmalıdır. Kondenzasyon sıcaklığımızı ne dış ortama gerekli ısı transferini yapamayacak derecede küçük ne de evaporatör kapasitesini azaltacak derecede yüksek seçmekten kaçınmak gerekir. Tasarım esnasından tüm çıktıları düşünüp en optimum değeri belirlemek gereklidir. Farklı akışkanlardan elde edilen kapasite değerleri incelendiğinde ise, en yüksek kapasite değerleri R410A ve R32 akışkanları için elde edilmiştir.

	R404A	R410A	R407C	R449A	R32	R1234ZE
0	29134	30202	36199	35403	31287	28156
-8	19869	20300	25041	24391	21037	18041
-25	14628	16077	18454	18046	16367	12544
-31	11572	12749	14588	14422	12965	9260

Tablo 5: Sabit Kondenzasyon Sıcaklığında (45 °C) Farklı Evaporasyon Sıcaklıklarına Göre Evaporatör Kapasite Tablosu; [Watt]

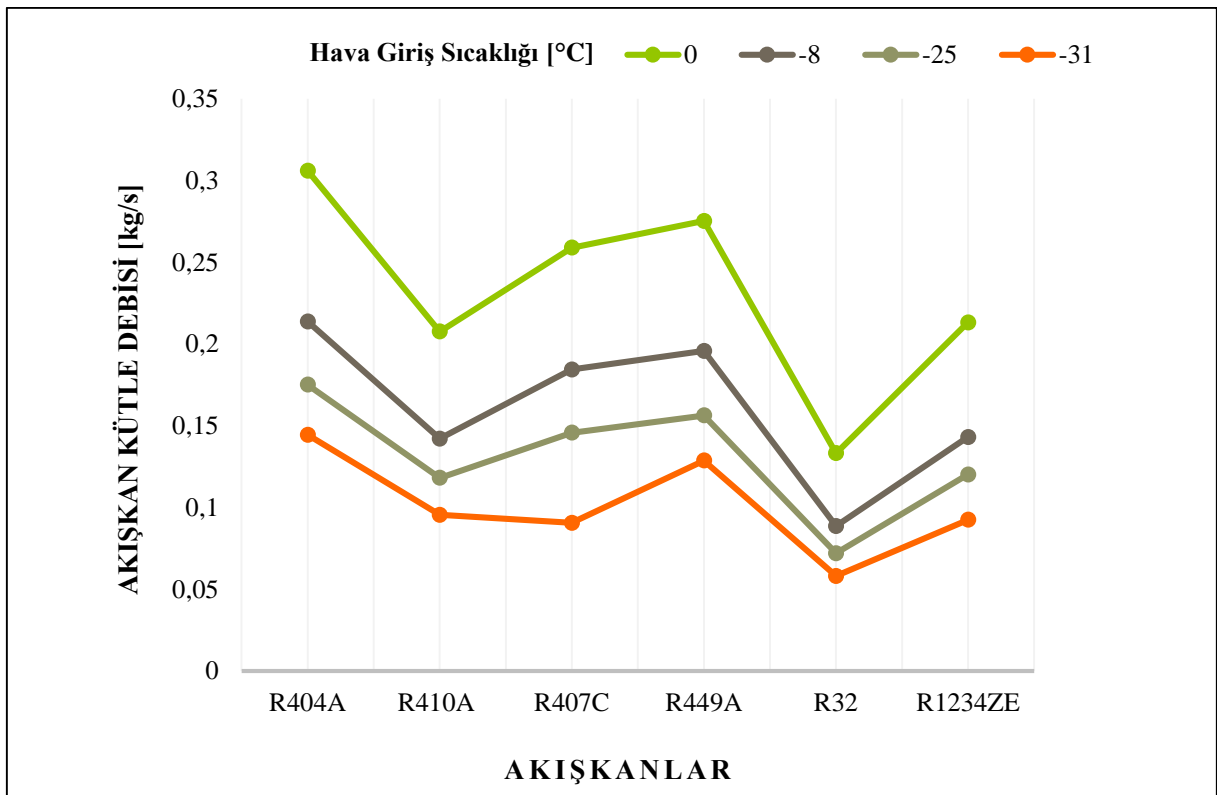


Grafik 3: Sabit Kondenzasyon Sıcaklığında (45 °C) Farklı Evaporasyon Sıcaklıklarına Göre Evaporatör Kapasite Grafiği

Farklı evaporasyon sıcaklıklarının evaporatör kapasitesine etkisi incelenirken kondenzasyon sıcaklığı ($T_{\text{kondenzasyon}} = 45 \text{ °C}$) sabit kabul edilmiştir. Yukarıda tabloda ve grafikte yer alan kapasite çıktıları incelendiğinde, evaporasyon sıcaklığı düştükçe evaporatör kapasitesi azalmaktadır. Bunun temel nedeni evaporatörün çalışma sıcaklığındaki entalpi farkının azalmasıdır. Dolayısıyla, sabit ısı transfer yüzeyinden yapılan ısı transferi azalmaktadır. Netice olarak diyebiliriz ki; daha düşük evaporasyon sıcaklıkları için ısı transfer alanı düşürülebilir ve daha küçük bir ürün seçimi yapılabilir. Farklı akışkanlardan elde edilen kapasite değerleri incelendiğinde ise, en yüksek kapasite değerleri R407C ve R449A akışkanları için elde edilmiştir.

	R404A	R410A	R407C	R449A	R32	R1234ZE
0	0,306	0,2076	0,2589	0,2753	0,1332	0,2132
-8	0,2138	0,1421	0,1844	0,1958	0,0886	0,1431
-25	0,1751	0,1181	0,1457	0,1563	0,072	0,1202
-31	0,1445	0,0955	0,0906	0,1287	0,0581	0,0925

Tablo 6: Sabit Kondenzasyon Sıcaklığında (45 °C) Farklı Evaporasyon Sıcaklıklarına Göre Evaporatör Akışkan Debisi Tablosu; [kg/s]



Grafik 4: Sabit Kondenzasyon Sıcaklığında (45 °C) Farklı Evaporasyon Sıcaklıklarına Göre Evaporatör Akışkan Debisi Grafiği

Yukarıda tabloda ve grafikte yer alan kütleli debi analiz sonuçları göz önüne alındığında, evaporatörün çalışma ortamında bulunan hava giriş sıcaklığı düştükçe, kapasite değeri azaldığı için kütleli debi değeri azalmaktadır. Aynı hava giriş sıcaklığında kütleli debi değerleri incelendiğinde, R32 akışkanı için en az kütleli debi değerinde ortalama olarak iyi bir evaporatör kapasitesi elde edilmiştir. Diğer taraftan, R410A ve R1234ZE akışkanları için R32 akışkanından sonra en az kütleli debisi değerleri elde edilmiştir.

SONUÇ

Bu çalışmada farklı soğutucu akışkanlar kullanılarak hava soğutmalı bir kanatlı borulu evaporatörün tasarımı ve analizleri yapılmıştır. Bu tasarımlar Unilab Coils yazılımı kullanılarak yapılmıştır. Yapılan tasarımlar ve analizler neticesinde, farklı kondenzasyon sıcaklıklarında ve sabit bir evaporasyon sıcaklığında çalışan bir evaporatör için en yüksek kapasite değerleri R410A ve R32 akışkanları için elde edilmiştir. Diğer taraftan farklı evaporasyon sıcaklıklarında ve sabit bir kondenzasyon sıcaklığında çalışan bir evaporatör için en yüksek kapasite değerleri R407C ve R449A akışkanları için elde edilmiştir. Bu akışkanların çalışma basınçları, P-h grafikleri ve yukarıda verilen tablodaki değerler incelendiğinde R449A akışkanı daha yüksek kapasite eldesi ve daha düşük GWP değeri sebebiyle R404A, R410A ve R407C akışkanları için bir alternatif oluşturabileceği görülmektedir. Ayrıca hem ürünün üretim parametreleri üzerinde hem de sistemin işletme şartları diğer akışkanlara göre değişkenlik göstereceği için, bu şartlar göz önünde tutularak GWP değerleri açısından R32 akışkanının da diğer akışkanlara göre (R1234ZE hariç) daha düşük GWP değerine sahip olmasından dolayı bir alternatif oluşturabileceği görülmüştür. Son olarak, farklı evaporasyon sıcaklıklarında ve sabit bir kondenzasyon sıcaklığında çalışan bir evaporatör için tüm akışkanlar karşılaştırıldığında, maksimum %7,8 oranında bir kapasite düşüşüne sahip olsa da, hem düşük çalışma basıncına sahip olması hem de çok düşük GWP değerine sahip olması, R1234ZE akışkanının da diğer akışkanlara göre alternatif bir akışkan olduğunu göstermiştir.

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