E-ISSN: 3062-3731

SABUNCUOGLU SEREFEDDIN HEALTH SCIENCES

2025 | Volume 7 | Issue 2

AMASYA UNIVERSITY

Sabuncuoglu Serefeddin Health Sciences (SSHS)
Volume: 7 / Issue: 2
2025
e-ISSN: 3062-3731

e-ISSN
3062-3731

Volume
7

Issue
2

Publication Date
August/2025

Publication Language
English

Publication Period
Three issues per year
(April & August & December)

Scope
Health Research

PUBLICATION MANAGEMENT PLACE
Amasya University, Sabuncuoğlu Serefeddin Health Services Vocational School,
Amasya/Türkiye

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Sabuncuoglu Serefeddin Health Sciences (SSHS)
Volume: 7 / Issue: 2
2025
e-ISSN: 3062-3731

Sabuncuoglu Serefeddin Health Sciences (SSHS)
Volume: 7 / Issue: 2
2025
e-ISSN: 3062-3731

Sabuncuoglu Serefeddin Health Sciences (SSHS)
Volume: 7 / Issue: 2
2025
e-ISSN: 3062-3731

Sabuncuoglu Serefeddin Health Sciences (SSHS)
Volume: 7 / Issue: 2
2025
e-ISSN: 3062-3731

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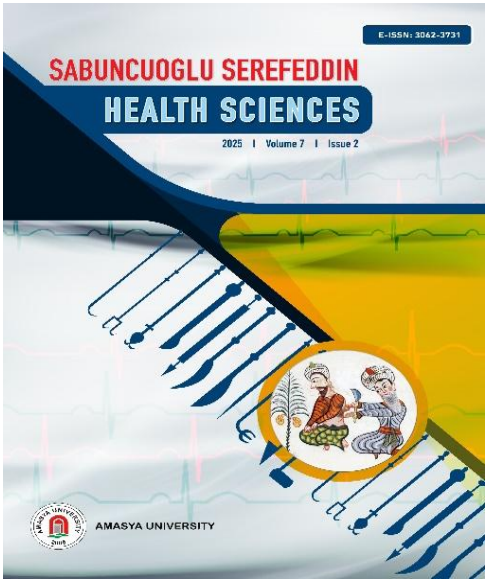
REFEREE BOARD

Sabuncuoglu Serefeddin Health Sciences Journal uses a double-blind peer revise system fulfilled by at least two independent reviewers. The names of referees are kept strictly confidential.

COVER DESIGN

The cover design of the Sabuncuoglu Serefeddin Health Sciences Journal was created by Asst. Prof. Dr. Aysel GÜNEY TÜRKEÇ.



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SSHS, 2025; 7(2), 43-49
DOI: 10.55895/sshs.1715760
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

THE ROLE OF TRADITIONAL, COMPLEMENTARY AND INTEGRATIVE MEDICINE PRACTICES IN GLOBAL HEALTH SYSTEMS: AN ECOLOGICAL ANALYSIS

GELENEKSEL, TAMAMLAYICI VE BÜTÜNLEYİCİ TIP UYGULAMALARININ KÜRESEL SAĞLIK SİSTEMLERİNDEKİ YERİ: EKOLOJİK BİR ANALİZ

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Research Article
Received: 07.06.2025, **Accepted:** 02.07.2025
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Abstract
This study aims to examine the structural characteristics of Traditional, Complementary and Integrative Medicine (TCIM) systems within global health systems and their association with socioeconomic indicators. Designed as an ecological study, the research evaluates TCIM indicators from 103 countries based on data obtained from the WHO TCIM Dashboard. Key variables include the presence of national legislation on TCIM, responsible national bodies, university-level education, national research institutes, and payment systems. Their associations with health expenditure per capita and the Human Development Index (HDI) were analysed. Data were analysed using SPSS v25.0; Mann-Whitney U and Kruskal-Wallis tests were used for group comparisons, while the chi-square test was applied to categorical variables. The findings revealed significant structural differences in TCIM systems across countries. Countries with national TCIM legislation had significantly higher HDI scores (p=0.027), and HDI was also higher in countries with national research institutes (p=0.008). Significant regional differences were observed in the distribution of TCIM structural indicators across WHO regions. In conclusion, the level of institutionalization of TCIM systems appears to be associated with countries' development indicators, and integration into health systems is not equally distributed globally.

Keywords: Health Policies, Human Development Index, Regional Analysis, TCIM

Öz
Bu çalışmanın amacı, küresel sağlık sistemleri içindeki Geleneksel, Tamamlayıcı ve Bütünleyici Tıp (TCIM) sistemlerinin yapısal özelliklerini ve sosyoekonomik göstergelerle ilişkilerini incelemektir. Ekolojik bir çalışma olarak tasarlanan araştırma, DSÖ TCIM Gösterge Tablosundan elde edilen verilere dayanarak 103 ülkeden TCIM göstergelerini değerlendirmektedir. Temel değişkenler arasında TCIM ile ilgili ulusal mevzuatın varlığı, sorumlu ulusal kurumlar, üniversite düzeyinde eğitim, ulusal araştırma enstitüleri ve ödeme sistemleri yer almaktadır. Kişi başına sağlık harcaması ve İnsani Gelişme Endeksi (HDI) ile ilişkileri analiz edilmiştir. Veriler SPSS v25.0 kullanılarak analiz edilmiştir; grup karşılaştırmaları için Mann-Whitney U ve Kruskal-Wallis testleri kullanılırken, kategorik değişkenlere ki-kare testi uygulanmıştır. Bulgular, ülkeler arasında TCIM sistemlerinde önemli yapısal farklılıklar olduğunu ortaya koymuştur. Ulusal TCIM mevzuatına sahip ülkelerin önemli ölçüde daha yüksek HDI puanları vardı (p=0,027) ve ulusal araştırma enstitülerine sahip ülkelerde de HDI daha yüksekti (p=0,008). TCIM yapısal göstergelerinin DSÖ bölgeleri genelindeki dağılımında önemli bölgesel farklılıklar gözlemlenmiştir. Sonuç olarak, TCIM sistemlerinin kurumsallaşma düzeyi, ülkelerin kalkınma göstergeleriyle ilişkili görünmektedir ve sağlık sistemlerine entegrasyon küresel olarak eşit bir şekilde dağılmamıştır.

Anahtar Kelimeler: Sağlık Politikaları, İnsani Gelişme Endeksi, Bölgesel Analiz, TCIM

1. Introduction

Traditional medicine has played a central role in human health and well-being across cultures and countries for centuries. Traditional, Complementary and Integrative Medicine (TCIM) encompasses practices used by billions of people worldwide as a primary means of healthcare or as a preferred option for health and wellness (WHO, 2025). In recent years, the global rise in chronic diseases, along with shifts in individual preferences and expectations regarding healthcare, has led to increased interest in TCIM practices. In response to this growing interest, many countries have begun to develop policies aimed at defining, regulating, and integrating TCIM into their national healthcare systems (Deniz, Sevimli, &Ünlü, 2021).

The institutional structure of TCIM systems in countries comprises multiple dimensions, including legal regulations, educational opportunities, research infrastructure, and financing models. These components play a critical role not only in the prevalence and acceptance of TCIM, but also in the quality, accessibility, and sustainability of the services provided. However, these structural elements are not equally developed across all countries, and regional differences as well as socioeconomic factors appear to play a significant role in shaping this landscape (Raja, Cramer, Lee, Wieland, & Ng, 2024).

The World Health Organization (WHO) has had a traditional medicine program since 1975, and a Traditional, Complementary and Integrative Medicine Unit is established at WHO headquarters (WHO, 2025). WHO published global strategy documents for the period 2014–2023 to guide policy-making processes in the field, aiming to promote the safer and more effective implementation of TCIM at the national level (WHO, 2013).

Despite these efforts, there is a lack of comparative analyses on the extent to which TCIM systems have been institutionalized in different countries and how this institutionalization is associated with specific health system or socioeconomic indicators. In this context, the aim of our study is to evaluate, at an ecological level, the relationship between key structural indicators of TCIM practices (such as legal regulation, national policy body, education and research infrastructure, and financing system) and macro-level indicators like national health expenditures and the Human Development Index (HDI), using the most recent and accessible data from 103 countries. Additionally, the study aims to analyse regional differences in the distribution of TCIM systems based on WHO regions.

2. Material and Methods

This study is a descriptive, ecological analysis examining the relationship between TCIM systems and global health systems. The data were obtained from the WHO Traditional, Complementary and Integrative Medicine dashboard, which includes 2023 data published on the Microsoft Power BI platform. It includes up-to-date TCIM system data provided by the WHO as part of its free and open-access information resources (WHO, 2023).

The following TCIM system indicators from 103 countries were evaluated in the study:

- Presence of national legislation for TCIM practices
- Existence of a national authority/body responsible for TCIM policies
- Availability of TCIM education at the university level
- Presence of a national research institute in the field of TCIM
- Payment system for TCIM services (public insurance, private insurance, out-of-pocket payments)
- Regional distribution (based on WHO regions)

In addition, countries' socioeconomic indicators (HDI and per capita health expenditure in USD) were obtained from the 2023 databases of the United Nations Development Programme (UNDP) and the World Bank (Group, 2025; Reports, 2025).

The Human Development Index (HDI) is a composite indicator developed by the United Nations Development Programme (UNDP) to assess a country's overall human development. It combines indicators of life expectancy at birth, mean years of schooling, expected years of schooling, and gross national income per capita. Higher HDI values indicate better average achievements in human development dimensions (UNDP, 2023).

Per capita health expenditure refers to the average amount spent on healthcare services per person in a given country, expressed in current US dollars. It includes public and private health expenditure and serves as an important proxy for a country's investment in health systems and access to care (World Bank, 2023).

Data analysis was performed using SPSS version 25.0 software. Descriptive statistics were presented as counts and percentages. The distribution of continuous variables was assessed using the Kolmogorov-Smirnov test. For data that did not show a normal distribution, the Mann-Whitney U test was used, and differences among three or more groups were analysed with the Kruskal-Wallis test. For categorical variables, frequencies and percentages were calculated, and the Chi-square test was applied to evaluate differences between groups. A significance level of $p < 0.05$ was accepted.

3. Results and Discussion

National legislation for TCIM practices exists in 62.1% of the countries, a national authority/body responsible for TCIM policies in 63.1%, and

university-level TCIM education in 46.6%. The proportion of countries with a national research institute for TCIM is 41.7%. The most common payment method for services is out-of-pocket payment (57.4%), followed by public insurance coverage (28.2%) and private insurance coverage (4.8%) (Table 1).

Table 1. Distribution of traditional, complementary and integrative medicine system indicators by country

		n	%
WHO Region	African Region	28	27.2
	Region of the Americas	16	15.5
	Eastern Mediterranean Region	15	14.6
	European Region	19	18.4
	South-East Asia Region	11	10.7
	Western Pacific Region	14	13.6
National legislation for TCIM	Yes	64	62.1
	No	39	37.9
National authority/body responsible for TCIM policies	Yes	65	63.1
	No	38	36.9
University-level education in TCIM	Yes	48	46.6
	No	55	53.4
National research institute for TCIM	Yes	43	41.7
	No	60	58.3
What payment system is used for TCIM services?	Public insurance	29	28.2
	Private insurance	5	4.8
	Out-of-pocket	59	57.3
	Data not available	10	9.7

TCIM = Traditional, Complementary and Integrative Medicine

These results indicate that although many countries have taken steps to institutionalize TCIM through legislation and regulatory bodies, significant disparities remain in education, research, and financial coverage. The relatively low prevalence of university-level training and research institutes reflects ongoing challenges in standardization and scientific validation of TCIM practices (WHO, 2019; Raja et al., 2024). Additionally, the high reliance on out-of-pocket payments may create financial barriers and exacerbate health inequities, especially in low-resource settings (Sirag & Mohamed Nor, 2021).

Table 2. Average per capita health expenditure by traditional, complementary and integrative medicine structural components

TCIM Structural Component	Status	Mean ± SD	Median	Min–Max (USD)	p-value
National legislation for TCIM	Yes	1234.3 ± 2132.7	369.9	15.3 – 8692.6	0.277
	No	985.8 ± 2215.5	237.8	16.3 – 12434.4	
National authority/body for TCIM policies	Yes	1208.8 ± 2113.4	369.9	15.3 – 8692.6	0.220
	No	1022 ± 2253.4	203.8	15.3 – 12434.4	
University-level education in TCIM	Yes	1249.6 ± 2212.8	369.9	15.3 – 8692.6	0.724
	No	1044 ± 2122.9	283.9	15.6 – 12434.4	
National research institute for TCIM	Yes	1237 ± 2208.4	369.9	15.3 – 8692.6	0.342
	No	1070.1 ± 2135.4	281.1	15.4 – 12434.4	
Payment system for TCIM services	Public insurance	1174.2 ± 2044.9	369.9	15.3 – 6432.4	0.605
	Private insurance	1153.6 ± 1357.8	369.9	154.5 – 3352.8	
	Out-of-pocket	1140.8 ± 2340.8	278.4	15.3 – 12434.4	

TCIM = Traditional, Complementary and Integrative Medicine, SD = Standard Deviation, Min = Minimum, Max = Maximum

In line with this, the limited coverage of TCIM services by public insurance reported at only 28.2% further highlights the lack of full integration into national health systems, posing challenges for equitable access (Biçer & Balçık, 2019). The lack of coherent integration pathways, insufficient regulatory oversight, and weak health information systems were cited as key barriers to mainstreaming TCIM services into public health frameworks (Peltzer & Pengpid, 2018). These findings align with previous literature suggesting that while TCIM has gained recognition, further efforts are needed to ensure its safe, evidence-based, and equitable integration into health care systems (von Schoen-Angerer et al., 2023). The recent establishment of the WHO Global Centre for Traditional Medicine and the 2023 Traditional Medicine Global Summit demonstrate growing institutional commitment to advancing TCIM integration on a global scale (Patwardhan, Wieland, Aginam, Chuthaputti, Ghelman, Ghods, et al., 2023). No statistically significant difference was found in the average per capita current health expenditure according to the presence of structural TCIM elements. Average per capita health expenditures according to TCIM structural elements are shown in Table 2. This result indicates that the presence of TCIM-related structures may not be directly associated with higher per capita health expenditure. HDI was 0.74 ± 0.15 in countries with national legislation for TCIM and 0.67 ± 0.16 in countries without it (p = 0.027). Countries with a national authority responsible for TCIM policies had an HDI of 0.74 ± 0.14, compared to 0.66 ± 0.17 in countries without such authority (p = 0.027). The HDI was 0.77 ± 0.14 in countries with a national research institute for TCIM and 0.68 ± 0.16 in countries without one (p = 0.008) (Table 3).

Table 3. Human development index values by traditional, complementary and integrative medicine structural components

TCIM Structural Component	Status	Mean ± SD	Median	Min–Max	p-value
National legislation for TCIM	Yes	0.74 ± 0.15	0.74	0.36 – 0.97	**0.027**
	No	0.67 ± 0.16	0.69	0.39 – 0.93	
National authority/body for TCIM policies	Yes	0.74 ± 0.14	0.73	0.42 – 0.97	**0.027**
	No	0.66 ± 0.17	0.69	0.36 – 0.93	
University-level education in TCIM	Yes	0.73 ± 0.16	0.74	0.39 – 0.97	0.351
	No	0.70 ± 0.16	0.73	0.36 – 0.96	
National research institute for TCIM	Yes	0.77 ± 0.14	0.77	0.39 – 0.97	0.008
	No	0.68 ± 0.16	0.70	0.36 – 0.96	
Payment system for TICM services	Public insurance	0.74 ± 0.16	0.74	0.45 – 0.96	0.313
	Private insurance	0.80 ± 0.09	0.80	0.67 – 0.92	
	Out-of-pocket	0.70 ± 0.16	0.72	0.36 – 0.97	

TCIM = Traditional, Complementary and Integrative Medicine, SD = Standard Deviation, Min = Minimum, Max = Maximum

Globally, patients utilize traditional, complementary, and integrative medicine (TCIM) services for various reasons. Especially in the Global South, traditional medicine often constitutes the most geographically and/or financially accessible form of healthcare; this remains true even though patients may prefer biomedical services (Keshet & Simchai, 2014). The presence of national legal regulations for TCIM practices is more common in countries with higher HDI levels, indicating that the socioeconomic and administrative capacities of these countries are also
reflected in the field of traditional and complementary medicine. Among the components of HDI, life expectancy, education level, and income per capita are indicators that directly influence both the scope and effectiveness of health policies and public health regulations. A high level of education and access to information can increase public awareness of alternative health approaches, while a strong economic structure enables the provision of necessary resources for the regulation and supervision of these services (UNDP, 2023). In this context, the greater prevalence of legal regulations related to TCIM in countries with high HDI suggests that the level of development is supported by institutional policies that encompass a holistic approach to public health.

HDI in countries with national research institutes for TCIM indicates that the scientific infrastructure and knowledge production also extend to the field of traditional medicine. Further transdisciplinary research, appropriate funding, and international standards are necessary to ensure safe, evidence-

based integration of TCIM into modern health systems (Patwardhan, Wieland, Aginam, Chuthaputti, Ghelman, Ghods, et al., 2023). The presence of research and development activities allows for the evaluation of these practices not only in terms of service delivery but also regarding their efficacy, safety, and cost-effectiveness. This situation shows that developed countries lead in grounding traditional and complementary medicine services on scientific evidence. However, although TCIM research is increasing worldwide, this growth does not directly parallel the rates of service utilization. Therefore, it is reported that TCIM research should be given greater priority and funding within national research policies and programs (von Schoen-Angerer et al., 2023).

Table 4. Distribution of traditional, complementary and integrative medicine system indicators by world health organization regions

TCIM Indicator	African Region	Region of the Americas	Eastern Mediterranean Region	European Region	South-East Asia Region	Western Pacific Region
National legislation for TCIM						
Yes	22 (34.4%)	11 (17.2%)	7 (10.9%)	7 (10.9%)	9 (14.1%)	8 (57.1%)
No	6 (15.4%)	5 (12.8%)	8 (20.5%)	12 (30.8%)	2 (5.1%)	6 (42.9%)
p	**0,033**					
National authority/body for TCIM policies						
Yes	22 (33.8%)	11 (16.9%)	7 (10.8%)	7 (10.8%)	9 (13.8%)	9 (13.8%)
No	6 (15.8%)	5 (13.2%)	8 (21.1%)	12 (31.6%)	2 (5.3%)	5 (13.2%)
p	**0,032**					
University-level education in TCIM						
Yes	6 (12.5%)	9 (18.8%)	5 (10.4%)	8 (16.7%)	9 (18.8%)	11 (22.9%)
No	22 (40.0%)	7 (12.7%)	10 (18.2%)	11 (20.0%)	2 (3.6%)	3 (5.5%)
p	**0,001**					
National research institute for TCIM						
Yes	12 (27.9%)	5 (11.6%)	7 (16.3%)	5 (11.6%)	8 (18.6%)	6 (14.0%)
No	16 (26.7%)	11 (18.3%)	8 (13.3%)	14 (23.3%)	3 (5.0%)	8 (13.3%)
p	0.205					

TCIM = Traditional, Complementary and Integrative Medicine

A significant difference was found between WHO regions in terms of the presence of national legislation for TCIM practices (p = 0.033). The highest rate was observed in the Western Pacific Region (57.1%), while the lowest rate was in the Eastern Mediterranean Region (10.9%) (Table 4). Similarly, a significant difference was also identified among regions regarding the presence of a national authority/body responsible for TCIM policies (p = 0.032). The highest rates were again recorded in the African Region (33.8%) and the Western Pacific Region (13.8%). This indicates that TCIM has a more institutionalized structure within the health systems of some regions, while in others, it remains insufficiently organized. There was a significant regional difference in university-level TCIM education (p = 0.001). The rates of university-level education were low in the European, Eastern Mediterranean, and South-East Asian regions, whereas they were higher in the Americas and Western Pacific regions. These regional discrepancies underscore the importance of culturally sensitive and locally adapted strategies to integrate TCIM education and services equitably across diverse health systems (Patwardhan, Wieland, Aginam, Chuthaputti, Ghelman, Ghods, et al., 2023). This finding suggests that academic integration is not geographically uniform and highlights the need for region-specific approaches to education policies (Biçer & Balçık, 2019). A regional review from the WHO South-East Asia Region found that although many countries had adopted national policies, effective implementation was hampered by fragmented regulatory systems, limited financial resources, and inadequate coordination between ministries (Peltzer & Pengpid, 2018).

4. Conclusion

This study revealed significant relationships between the institutional presence of traditional and complementary medicine (TCIM) systems at the country level and socioeconomic indicators. Countries with legal regulations and institutional structures in the TCIM field were found to have higher human development levels, suggesting that integration into health systems progresses in parallel with development. Additionally, it was

determined that the education and research infrastructure for TCIM is unevenly distributed geographically, with notable structural disparities in certain WHO regions. These findings highlight the need to consider regional needs and socioeconomic conditions when developing global TCIM policies. Future studies should focus on exploring the mechanisms through which socioeconomic development facilitates or hinders the institutionalization of TCIM, as well as examining context-specific barriers and enablers in different regions to support more equitable and effective policy implementation.

Limitations

The data on which payment systems are used by 10 countries in the distribution of Traditional, Complementary, and Integrative Medicine System indicators by country is unavailable.

Acknowledgment

The authors would like to thank all participants for their time and excellent cooperation.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Funding Statement

This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

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SSHS, 2025; 7(2), 50-56
DOI: 10.55895/sshs.1714592
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

MEASURING THE HEALTH PERCEPTION AND HEALTH LITERACY LEVEL OF CHILDREN AGED 14-15: THE SAMPLE OF SAKARYA PROVINCE

14-15 YAŞ ARALIĞI ÇOCUKLARIN SAĞLIK ALGISI VE SAĞLIK OKURYAZARLIĞI DÜZEYİNİN ÖLÇÜLMESİ: SAKARYA İLİ ÖRNEĞİ

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Research Article
Received: 04.06.2025, **Accepted:** 09.07.2025
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Abstract
During middle adolescence, identity formation intensifies, social relationships gain importance, and engagement in risky behaviors tends to increase. Health literacy and health perception developed during this critical developmental stage play a key role in shaping individuals' long-term health attitudes and behaviors. This study aimed to examine the levels of health literacy and health perception among middle adolescents. The research was conducted with 244 students from Sakarya province who participated with parental consent. Data were collected using two scales and a questionnaire consisting of the socio-demographic characteristics of the participants. The first scale is the Health Perception Scale developed by Diamond et al. (2007) and adapted into Turkish by Kadıoğlu and Yıldız (2012). The other is the Health Literacy Scale for School-Age Children, developed by Paakkari et al. (2016) and validated and reliably analyzed by Ozturk Haney (2018). Descriptive statistics, correlation analysis, regression analysis, Mann–Whitney U test, and Kruskal–Wallis H test were used to analyze the data. The findings revealed that participants had moderate levels of health literacy and health perception. A significant positive relationship was observed between the two variables. Among the sub-dimensions of health literacy, both practical information and theoretical knowledge were found to be significant positive predictors of health perception. Based on these results, it is recommended that educational programs for adolescents include content designed to enhance both health literacy and health perception. Furthermore, academic research should be encouraged to expand knowledge and raise awareness in this important area.

Keywords: Adolescent Health, Health Education, Health Literacy, Health Perception, Middle Adolescence

Öz
Orta ergenlik döneminde kimlik oluşumu yoğunlaşmakta, sosyal ilişkiler önem kazanmakta ve riskli davranışlarda bulunma eğilimi artmaktadır. Bu kritik gelişim döneminde geliştirilen sağlık okuryazarlığı ve sağlık algısı, bireylerin uzun vadeli sağlık tutum ve davranışlarını şekillendirmede önemli rol oynamaktadır. Bu araştırmanın amacı orta ergenlik dönemindeki gençler arasında sağlık okuryazarlığı ve sağlık algısı düzeylerini incelemektir. Araştırma, velilerin izniyle Sakarya ilinde bulunan 244 öğrenci ile yürütülmüştür. Veriler Diamond ve arkadaşları (2007) tarafından geliştirilen ve Kadıoğlu ve Yıldız (2012) tarafından Türkçeye uyarlanan Sağlık Algısı Ölçeği, Paakkari ve arkadaşları (2016) tarafından geliştirilen ve Ozturk Haney (2018) tarafından geçerlilik ve güvenirliği yapılan Okul Çağı Çocukları İçin Sağlık Okuryazarlığı Ölçeği ve demografik soru formu kullanılarak toplanmıştır. Verilerin analizinde tanımlayıcı istatistikler, korelasyon analizi, regresyon analizi, Mann-Whitney U testi ve Kruskal-Wallis H testi kullanılmıştır. Bulgular katılımcıların orta düzeyde sağlık okuryazarlığı ve sağlık algısına sahip olduğunu ortaya koymuştur. İki değişken arasında anlamlı ve pozitif bir ilişki gözlenmiştir. Sağlık okuryazarlığının alt boyutları arasında hem pratik bilgi hem de teorik bilginin sağlık algısının önemli

pozitif yordayıcıları olduğu bulunmuştur. Bu sonuçlara dayanarak, ergenler için eğitim programlarının hem sağlık okuryazarlığını hem de sağlık algısını geliştirmek için tasarlanmış içerikler içermesi önerilir. Ayrıca, bu önemli alanda bilgiyi genişletmek ve farkındalığı artırmak için akademik araştırmalar teşvik edilmelidir.

Anahtar Kelimeler: Ergen Sağlığı, Orta Adölesan Dönem, Sağlık Algısı, Sağlık Eğitimi, Sağlık Okuryazarlığı

1. Introduction

The transition from childhood to adolescence is an extraordinary period associated with significant physical, emotional, cognitive and social changes. This period is characterized by a dynamic development in which the relationship with the environment is shaped by individuals' capacities that promote well-being and health (Gniewosz & Gniewosz, 2020). This period, called adolescence, is defined as a period of rapid physical, mental and social growth and development from childhood to adulthood (Ünalan et al., 2007). This period, which the World Health Organization describes as a unique stage of human development and a critical time when the foundations of good health are established, covers individuals aged 10–19 (WHO, 2025a). However, some studies divide adolescence into three stages of psychosocial development: early, middle, and late, and extend it up to the age of 21 (Derman, 2008). According to this distinction, the 10–14 age group is defined as early adolescence, the 15–17 age group is defined as middle adolescence, and the 18–21 age group is defined as late adolescence (WHO, 2025a; Derman, 2008).

Adolescence is the transition period between childhood and adulthood and is considered a developmentally critical period in which individuals experience rapid physical, mental and social changes. The 14–16 age range, which is in the middle of this period, represents a process in which the individual develops a sense of identity, discovers social roles, increases sensitivity to environmental factors, engages in or observes risky behaviors and develops a sense of autonomy (Arıkan et al., 2013). Therefore, adolescents' lifestyles, habits and health-related attitudes play an important role in determining their current and future health status.

Health perception is a comprehensive evaluation that covers physical health as well as mental, social, and cultural aspects (Jylhä, 2009). In adolescence, how individuals perceive their health and their level of health literacy play an important role in shaping their health behaviors and attitudes. While health perception includes the individual's subjective evaluations, expectations and attitudes about their health status, health literacy refers to the individual's ability to access, understand and apply health-related information (Özger, 2025; Paakkari et al., 2016). High health literacy enables individuals to make health-related decisions more consciously and effectively and contributes to the positive development of health perception (Nutbeam, 2000). In general, health literacy refers to the ability of individuals to "access, understand and use information in ways that promote and maintain good health" for themselves, their families and communities (WHO, 2025b). The Ministry of Health defines health literacy as the ability to access, understand, and use information to protect and improve an individual's health, and regards the development of this competence as a key strategy for enhancing public health (Aslantekin & Yumrutaş, 2014). Health literacy also encompasses the ability to obtain, comprehend, and apply health-related information, along with the communication skills necessary to achieve health goals (Özger, 2025). Therefore, the development of health literacy at an early age can directly affect an individual's ability to manage their health in later ages (Bilir, 2014; Kolcu, 2024). Increasing the level of health literacy enables individuals to benefit from health services more efficiently, improves self-care skills and helps them adopt preventive health behaviors (Kuloğlu& Uslu, 2022). On the other hand, individuals with limited health literacy realize health problems too late, their risk of being exposed to misinformation increases, and this situation negatively affects individual health perceptions (Cangussú et al., 2020).

Studies reveal that individuals with high levels of health literacy also have high health perception (Deniz & Oğuzöncül, 2020; Yiğitalp et al., 2021). The interaction between these concepts affects individuals' use of health services, the adoption of preventive health behaviors, and their overall quality of life. Health literacy skills acquired, especially in middle adolescence, can determine the individual's health decisions and their effects on their family and environment. In this context, the ability of individuals to acquire and apply health-related information during this period is strategically important in terms of their future health attitudes (Aldemir, 2024).

Health perception is closely linked to how individuals physically and psychosocially evaluate themselves. A person's subjective perception of their health can predict various health outcomes, particularly the risk of mortality. This assessment involves biological indicators and a range of factors, including the individuals' stress level, psychological resilience, and social support system (Jylhä, 2009). The multidimensional nature of health perception complicates and enriches the individual's relationship with health literacy (Pala, 2023).

There is a strong relationship between health literacy and health perception. Perceived health status is directly related to health promotion and

has a causal relationship with the level of health literacy. Health literacy plays a vital role in the perception, interpretation, and implementation of health-related behaviors such as physical activity, eating habits, medication use, smoking, and alcohol consumption (Aldemir, 2024). In the process of improving and developing the health status of individuals, the individuals' level of health literacy and perception of health are of great importance. Therefore, the level of health perception should also be considered when evaluating individuals' health literacy level (Gürses, 2023). Individuals with adequate health literacy attach more importance to preventive and protective health services and adopt positive health behaviors. On the other hand, individuals with limited health literacy benefit less from preventive health services because they fail to realize that their health status is deteriorating, and this leads to a lack of self-care. All these factors negatively affect the individual's perception of health (Kuloğlu & Uslu, 2022).

Finally, the World Health Organization (WHO) defines adolescence as a critical period in which the individual is independent, social skills and learning behaviors develop, and risky health behaviors increase in many ways, along with rapid physical, cognitive and psychological development (WHO, 2024).Supporting health literacy and positively shaping health perception during this period represents a valuable investment in both individual and public health. In this context, this study aims to examine the health perception and health literacy levels of secondary school students aged 14–16 and to reveal the relationship between these two variables. The findings are expected to contribute to the design of school-based health education, social awareness campaigns and national health policies.

2. Material and Methods

The study was conducted using quantitative research methods and was designed as a cross-sectional study. Before data collection, approval was obtained from the Ethics Committee of the Faculty of Social and Human Sciences at Sakarya University, with official letters dated 13.04.2025 and numbered E-050.99-0.

2.1. Population and sample

The study population comprises individuals aged 14 to 16 residing in the Adapazarı district of Sakarya province. The sample was selected using a convenience sampling method. A total of 244 children, whose parents provided consent, participated in the study.

2.2. Data collection tools

A questionnaire was used for data collection. The first part of the questionnaire consists of the health perception scale. The scale, developed by Diamond et al. (2007), consists of 15 statements and four sub-factors. Its Turkish adaptation was conducted by Kadıoğlu and Yıldız (2012). Items 1, 5, 9, 10, 11, and 14 reflect positive attitudes, while items 2, 3, 4, 6, 7, 8, 12, 13, and 15 reflect negative attitudes. Positive statements were structured using a Likert scale as 1-strongly disagree, 2- disagree, 3-undecided, 4-agree and 5-strongly agree. In negative statements, the scale is reversed. The scale can be scored between 15 and 75 points. In the adaptation study of the scale, Cronbach's alpha values were 0.90 for Control center, 0.91 for Self-awareness, 0.91 for Certainty and 0.82 for Importance of health. The second part of the questionnaire consists of the Health Literacy Scale for School-Age Children. The scale, developed by Paakkari et al. (2016) and validated for use in Turkish by Ozturk Haney (2018), assesses the health literacy of school-age children across five domains. These domains are theoretical knowledge (1, 5), practical knowledge (4, 7), critical thinking (3, 9), self-awareness (8, 10) and citizenship (2, 6). The 4-point Likert scale is designed as 1 - definitely not true, 2 - completely not true, 3 - somewhat true and 4 - definitely true. The total score obtained by summing the item scores varies between 10-40 points. Mean scores between 10 and 25 define low health literacy, between 26 and 35 define moderate health literacy, and between 36 and 40 define high health literacy. In the Turkish version of the scale, Cronbach's alpha was 0.77. The last part of the questionnaire includes the socio-demographic characteristics of the respondents.

2.3. Methods used in data analysis

The data were first analyzed for validity and reliability. The Kolmogorov-Smirnov test was conducted to assess whether the data were normally distributed.

Nonparametric analysis methods were preferred in the data analysis since the analyses did not meet normal distribution conditions and there were considerable differences in the socio-demographic characteristics of the participants. Descriptive statistics, correlation analysis, Kruskal-Wallis H test and Man - Whitney U test were used to analyze the data. Data were analyzed at a 95% confidence level ($p = 0.05$).

2.4. Validity and reliability analysis of scales

Furthermore, RMSEA and RMR values were <0.080. Accordingly, the scales meet the fit indices required for CFA (Karagöz, 2017; Byrne, 2011). Cronbach's alpha value of the health perception scale was 0.725; this value was 0.702 for the importance of health, 0.796 for control center, 0.844 for self-awareness, and 0.833 for certainty. Cronbach's alpha value on health literacy scale for school-age children was 0.844. This value was 0.725 for theoretical

knowledge, 0.803 for citizenship, 0.758 for critical thinking, 0.770 for practical knowledge and 0.783 for self-awareness. According to these findings, the scales meet the necessary conditions for reliability (Karagöz, 2017).

3. Results and Discussion

Table 1 shows the socio-demographic characteristics of the participants. As shown in the table, half of the participants were male students and half were female students. Among students aged 14–15, 15.6% had at least one health worker in their households and 33.2% had household members with chronic diseases. They received health information mostly from their families (43.9%). The least utilized source of health information was television (4.9%). In addition, 38.5% of the participants reported having received health education. Since the scales used in the study had previously been adapted into Turkish, only confirmatory factor analysis and reliability analyses were conducted in this study.

According to the literature, if the sample size is below 250, CMIN/DF<2.5; if it is above 250, CMIN/DF<5 (Byrne, 2011). This condition was met for health perception (2.407) and the health literacy scale for school-age children (2.304) used in this study. In addition, GFI >0.85 and NFI >0.90; IFI, TLI and CFI >0.95 were found in the scales.

Table 1. Socio-demographic characteristics of participants

		Number	Percentage
Gender	Female	122	50.0
	Male	122	50.0
Age	14	219	89.8
	15	25	10.2
Is there a health worker in the family?	Yes	38	15.6
	No	206	84.4
Classroom	8	225	92.2
	9	19	7.8
Does anyone in the household have a chronic disease?	Yes	81	33.2
	No	163	66.8
The most frequent source of health information	Family	107	43.9
	Teachers	15	6.1
	Television	12	4.9
	Internet/social media	84	34.4
	Health workers	26	10.7
Received health education	Yes	94	38.5
	No	150	61.5

Table 2 presents the minimum, maximum, and mean values obtained from both the health perception and health literacy scales. According to the results in Table 2, scores on the health perception scale ranged from 34 to 68. The mean score on the health perception scale was 51.89 (SD = 6.54). The mean score on the health literacy scale was 29.26 (SD = 4.903). These findings suggest that the participants demonstrated moderate levels of both health literacy and health perception, based on their average scores. In their study on the relationship between health literacy and health perception, Kerkez and Şahin (2022) reported a moderate correlation between the two variables.

Table 2. Health perception and health literacy score ranges and means of participants

	Minimum	Maximum	Mean	Standard Deviation
Health perception	34,00	68,00	51,89	6,540
Health literacy	15,00	40,00	29,26	4,903

Table 3 presents the relationship between health literacy levels and the health perceptions of children aged 14–15. As shown in the table, there is a weak but statistically significant relationship between health perception and both overall health literacy and each of its sub-dimensions ($p < 0.05$). This association is consistent with findings from previous research (Kerkez & Şahin, 2022; Jovic Vranes et al., 2010), which also reported a similar link between health literacy and health perception. Moreover, this result is important as it suggests that higher health literacy may be associated with improved health perception, which could potentially contribute to more positive health-related attitudes among children over time.

Table 3. The relationship between health perception and health literacy

	1	1.1	1.2	1.3	1.4	2	2.1	2.2	2.3	2.4
1. Health Perception	1.000									
1.1. Importance of Health	.466**	1.000								
1.2. Control Center	.706**	.122	1.000							
1.3. Self-Awareness	.421**	.152*	.134*	1.000						
1.4. Precision	.571**	.045	.103	.052	1.000					
2. Health Literacy	.280**	.247**	.163*	.123	.146*	1.000				
2.1. Theoretical Knowledge	.231**	.303**	.047	.094	.157*	.666**	1.000			
2.2. Citizenship	.199**	.108	.105	.087	.177**	.712**	.410**	1.000		
2.3. Critical Thinking	.180**	.101	.173**	.041	.059	.693**	.330**	.401**	1.000	
2.4. Practical Knowledge	.275**	.210**	.156*	.180**	.122	.721**	.410**	.369**	.385**	1.000
2.5. Self-Awareness	.183**	.167**	.133*	.102	.070	.663**	.272**	.316**	.371**	.428**

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed)

This study employed stepwise regression analysis to identify which dimensions of health literacy influence individuals' perception of health. The regression analysis revealed significant findings regarding the influence of health literacy sub-dimensions on health perception in two stages, as shown in Table 4. In the first stage, a significant effect of practical knowledge on health perception ($\beta = 0.179$) was found ($p < 0.05$). The model explained 7.4% of health perception. In the second stage, practical knowledge ($\beta=0.129$) and theoretical knowledge ($\beta=0.114$) significantly affected health perception. The model explained 9.9% of the variance in health perception. This finding indicates that the addition of theoretical knowledge increased the model's explanatory power by 2.5%. This suggests that while practical and theoretical knowledge may influence health perception among individuals in middle adolescence, these are not the only contributing factors. Among the sub-dimensions of health literacy, theoretical knowledge, citizenship, critical thinking, and self-awareness were excluded from the model in the first stage, while in the second stage, only citizenship, critical thinking, and self-awareness remained excluded.

According to these results, the "practical knowledge" and "theoretical knowledge" dimensions of health literacy were identified as significant predictors of health perception. This result is consistent with previous studies that have reported a significant association between health literacy and health perception (Deniz & Oğuzöncül, 2020; Yiğitalp et al., 2021; HLS-EU Consortium, 2012). According to the Kruskal-Wallis H test and Man-Whitney U test findings based on the socio-demographic characteristics of the participants, no significant difference was found in health literacy and health perception in terms of age, the presence of a health worker in the family, the class of the student, the status of receiving health education and the sources of health information. On the other hand, a significant difference was found in health literacy levels according to the participants' gender ($p < 0.05$). Regarding gender, female students' health literacy level was higher than that of male students. In previous studies, female students' health literacy level was higher than that of male students. However, no significant difference was found between genders regarding health perception. This result is consistent with other studies on similar age groups (Yalçın, 2020; Mollaoğlu et al., 2021).

Another important finding based on differences in socio-demographic characteristics was found in the critical thinking sub-dimension of health literacy according to the presence of individuals with chronic diseases in the household ($p < 0.05$).

Regarding critical thinking, those with chronic diseases in the household had higher values than those without chronic diseases. This result shows that the family environment in which individuals with chronic diseases are present may contribute to increased awareness and critical thinking skills on health-related issues. In the literature, this finding is supported by previous studies (Güven, 2016; Karabulut, 2021).

4. Conclusion

The middle adolescence period represents a critical stage in the formation of individuals' future health-related attitudes and behaviors. This study investigated the relationship between adolescents' health literacy levels and their health perceptions, both of which are considered influential in shaping these future outcomes. The findings indicate a statistically significant relationship between health literacy and health perception among adolescents and suggest that participants possess a moderate level of knowledge in both areas. Enhancing adolescents' health literacy through targeted education during this developmental period may contribute to improved health perceptions and foster future generations who are more health-literate and proactive in maintaining their well-being. Therefore, integrating health literacy and health perception-enhancing content into school curricula may prove beneficial. Furthermore, additional research in this field should be encouraged and diversified in scope to expand understanding and raise awareness of the importance of adolescent health education.

Table 4. The effect of dimensions of health literacy on health perception

Model		Unstandardized Coefficients		Standardized Coefficients	t	p	R	R^2	F	p
		B	Standard error	β						
1	(Constant)	2.896	0.131		22.160	0.000	0.273	0.074	19.429	<0.001
	Practical information	0.179	0.041	0.273	4.408	0.000				
2	(Constant)	2.746	0.142		19.403	0.000	0.315	0.099	13.291	<0.001
	Practical information	0.129	0.044	0.197	2.913	0.004				
	Theoretical knowledge	0.114	0.044	0.175	2.587	0.010				

Acknowledgement

We are grateful to the parents who allowed their children to participate in the study and to the educators who helped us in this regard.

Conflicts of interest

The authors contributed equally to the conception, design, data collection, analysis, and writing of the manuscript. The authors declare that there are no conflicts of interest related to this study.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.

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SSHS, 2025; 7(2), 57-66
DOI: 10.55895/sshs.1716038
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

INVESTIGATION OF THE RELATIONSHIP BETWEEN DEPRESSION SYMPTOMS AND WORK-FAMILY CONFLICT AND PERCEIVED SOCIAL SUPPORT IN FEMALE HEALTHCARE WORKERS

SAĞLIK ÇALIŞANI KADINLARDA DEPRESYON BELİRTİLERİ İLE İŞ-AİLE ÇATIŞMASI VE ALGILANAN SOSYAL DESTEK İLİŞKİSİNİN İNCELENMESİ

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Research Article
Received: 13.06.2025, **Accepted:** 12.08.2025
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Abstract
The aim of this study is to examine the levels of work-family conflict and perceived social support as predictors of depression in female healthcare workers. This study, which is cross-sectional research in the relational screening model, was conducted with 296 women working in Eskişehir City Hospital between October 16 and December 16, 2023. Data were collected using the "Personal Information Form", "The Work-Family Conflict Scale (WAFCS)", "Multidimensional Scale of Perceived Social Support (MSPSS)" and "Beck Depression Inventory (BDI)". The data obtained in the study were analyzed with a statistical program. It was determined that female healthcare workers experienced moderate work-family conflict (29.32±12.01), high level of perceived social support (60.08±15.46), and low depression symptoms (11.57±7.40). It was determined that there was a positive significant relationship between depression symptoms and work-family conflict in female healthcare workers (r=0.436; p<0.001), and a negative significant relationship between depression symptoms and perception of social support (r=-0.290; p<0.001). As work-family conflict increases in female healthcare workers, the level of depression increases, as perception of social support increases, the level of depression decreases. In this context, it is recommended that new studies be conducted by considering other variables that may be predictors of depression in female healthcare workers, and that individual or managerial strengthening studies be planned for the identified risk factors.

Keywords: Depression, Health professional, Social support, Woman, Work-family conflict

Öz
Bu araştırmanın amacı; sağlık çalışanı kadınlarda depresyonun yordayıcısı olarak iş-aile çatışması ve algılanan sosyal destek düzeylerini incelemektir. İlişkisel tarama modelinde kesitsel bir araştırma olan bu çalışma, 16 Ekim-16 Aralık 2023 tarihleri arasında Eskişehir Şehir Hastanesi'nde çalışan 296 kadın ile yapıldı. Veriler; "Kişisel Bilgi Formu", "İş-Aile Çatışması Ölçeği (İAÇÖ)", "Çok Boyutlu Algılanan Sosyal Destek Ölçeği (ÇBASDÖ)" ve "Beck Depresyon Envanteri (BDE)" kullanılarak toplandı. Araştırmada elde edilen veriler bir istatistik programı ile analiz edildi. Sağlık çalışanı kadınların orta düzeyde iş-aile çatışması (29,32±12,01), yüksek düzeyde sosyal destek algısı (60,08±15,46), hafif düzeyde depresyon belirtileri (11,57±7,40) yaşadıkları belirlendi. Sağlık çalışanı kadınlarda depresyon belirtileri ile iş-aile çatışması arasında pozitif yönlü anlamlı (r=0,436; p<0,001); depresyon belirtileri ile sosyal destek algısı arasında negatif yönlü anlamlı (r=-0,290; p<0,001) bir ilişki olduğu saptandı. Sağlık çalışanı kadınlarda iş-aile çatışması arttıkça depresyon düzeyi artmakta; sosyal destek algısı attıkça depresyon düzeyi azalmaktadır. Bu doğrultuda sağlık çalışanı kadınlarda depresyonun yordayıcıları olabilecek diğer değişkenlerin de ele alınarak yeni çalışmalar yapılması, belirlenen risk faktörlerine yönelik bireysel ya da yönetsel güçlendirme çalışmalarının planlanması önerilmektedir.

Anahtar Kelimeler: Depresyon, İş-aile çatışması, Kadın, Sağlık profesyoneli, Sosyal destek

1. Introduction

With the increasing need for healthcare workers in the world, the employment of female healthcare workers has also increased. On the other hand, the number of female healthcare workers lags male healthcare workers in many countries and there is gender-based discrimination (Okimoto & Heilman, 2012; ALobaid et al., 2020). Inequality of opportunity in starting a job, inadequate benefit from vocational training, wage inequality, obstacles to career and promotion are some of the discriminations that women encounter in working life (Machado et al., 2016; Dokuka et al., 2022). In addition to these, the physical and mental fatigue such as shift work system, intense workload, long working hours in female healthcare workers, the decrease in energy and time to spare for spouse and children in home life, and the disruption of responsibilities lead to work-family life conflict for women (Jolly et al., 2014). While trying to maintain this balance, when work life prevents meeting family life responsibilities, work-family conflict or when family life prevents meeting work life responsibilities, family-work conflict occurs (Novrandy & Tanuwijaya, 2022; Perreault & Power, 2023).

The conflict experienced by female healthcare workers between work and family life causes emotional exhaustion and intense stress, which triggers depression (Otte et al., 2016). In particular, working women experience more negative situations than men due to working conditions, which leads to women being more exposed to depression (Yiğitbaş, 2020). It has been observed that female healthcare workers spend more time on domestic responsibilities, motherhood, and childcare than their male colleagues, and it has been stated that this situation increases the risk of depression in women (Li & Zhang, 2015). A positive relationship has been found between work-family conflict and depressive symptoms in female healthcare workers, and work-family conflict has been determined as a risk factor for depression (Hao et al., 2016).

Perception of social support is a protective factor before the diagnosis of depression, but it plays a healing role in the possible treatment process (Shelton et al., 2017). Perceived social support is the individual's subjective evaluation of the existence and adequacy of the help, acceptance and understanding received from social resources and networks (Ju et al., 2023). Social support can be provided through the characteristics of the workplace organization, harmony with co-workers, and supportive sources outside of work (such as family, friends, romantic partners) (Öksüz et al., 2019). The presence of social support in working women positively affects work performance, career plans and their ability to maintain work-family life balance (Kumar et al., 2019). While the risk of depression is low in individuals with social support, it is seen that individuals with weak social support are vulnerable to depression and are in the high-risk group (Gariepy et al., 2016). Perceived social support and depression were found to be negatively correlated in female healthcare workers (Nazim et al., 2022).

In this context, the aim of this study is to examine the levels of work-family conflict and perceived social support as predictors of depression among female healthcare workers and to determine whether there is a relationship between work-family conflict and depression symptoms, and between perceived social support and depression symptoms.

2. Material and Methods

2.1. Design

This research is a cross-sectional study in the relational screening model. The research was conducted between September 2023 and May 2024 at Eskişehir City Hospital.

2.2. Sample

The general universe of this research is all working women; the study universe is women working in the hospital where the research was conducted. The criteria of being an employee of the institution, being at least 18 years old, and not having depression or another psychiatric diagnosis were sought in the women participating in the research. Based on the August 2023 data, there are 1255 female employees in the institution where the research was conducted. 150 of this number were on leave during the period when the research was conducted. The remaining number (n=1105) was listed and selected for the sample group using the simple random sampling method using the random numbers table. Considering the 95% confidence interval and 5% margin of error, the minimum sample size to represent the universe of this research is 286. Data collection continued until the sample size was reached and the research was completed with 296 participants.

2.3. Data collection tools

In order to determine the descriptive characteristics of the participants in the study, a "Personal Information Form" was used. In order to examine the variables of the study, structured, self-reporting measurement tools, which were validated and reliable in Turkish, were used.

The Work-Family Conflict Scale (WAFCS) was adapted to Turkish by Akın et al. (2017). The scale consists of 10 items with a 7-point Likert-type rating from 1 to 7 (Strongly Disagree-Strongly Agree). The scale, which consists of two sub-dimensions as

work-family (items 1-5) and family-work (items 6-10), is evaluated both according to the sub-dimensions and the total score. A high score obtained from the scale indicates a high level of conflict in work and family life. The Cronbach Alpha internal consistency coefficient of the scale was found to be 0.86. In this study, it was 0.878.

Multidimensional Scale of Perceived Social Support (MSPSS) was adapted to Turkish by Eker and Arkar (1995). The scale, which consists of 12 items in total, has a 7-point Likert-type rating from 1 to 7 (Definitely No-Definitely Yes). The scale has three sub-dimensions, each consisting of four items, reflecting the individual's support sources: family (items 3, 4, 8, 11), friend (items 6, 7, 9, 12), and special person (items 1, 2, 5, 10). A high score indicates that perceived social support is high. The Cronbach Alpha internal consistency coefficient of the scale was determined to be between 0.78-0.92 in the three sub-dimensions. In this study, Cronbach Alpha values were between 0.722-0.742.

Beck Depression Inventory (BDI); was adapted to Turkish by Hisli (1989). BDI is a 21-item self-assessment scale that measures depression symptoms. Each item is scored between 0-3. The scores that can be obtained from the scale vary between 0 and 63. Those who score 17 and above are considered to be in the risk group for depression. The Cronbach Alpha internal consistency coefficient of the scale was found to be 0.74. In this study, it was 0.868.

2.4. Collection of data

The women included in the study were visited in their units, informed verbally about the study, and those who agreed to participate and met the criteria signed an "Informed Consent Form". Data collection forms were delivered to individuals in writing to be filled out at their own convenience. Sufficient time was given for the forms to be completed, and the completed forms were received by the researcher. Participants spent approximately 15 minutes completing all forms.

2.5. Statistical analysis

The data obtained in the study were analyzed using a statistical program. Descriptive statistical methods (number, percentage, mean, standard deviation) were used while evaluating the data. In comparing quantitative data, an independent sample t-test was used for two independent group comparisons. In groups with more than two categories, one-way variance analysis (F test, ANOVA test) was applied. The Bonferroni test was used to identify groups that showed differences. The relationship between continuous variables was examined with Pearson correlation analysis in normally distributed data. Linear regression analysis was performed between dependent and independent variables.

2.6. Ethical dimension

In order to conduct the study, written permission was obtained from Amasya University Non-Interventional Clinical Research Ethics Committee (decision numbered 2023/73 dated 17.05.2023) and Eskişehir City Hospital Education Planning Committee (decision numbered 221495326 dated 04.08.2023).

3. Results and Discussion

Of the female healthcare workers participating in the study, 43.2% were between the ages of 31-45, 58.8% had a bachelor's degree, 31.0% were nurses, and 28.7% worked in polyclinics (Table 1).

It was determined that female healthcare workers experienced moderate work-family conflict (29.32±12.01), high perceived social support (60.08±15.46), and low symptoms of depression (11.57±7.40) (Table 2).

In the study, it was found that there was a significant difference between the unit in which the participants worked and the level of work-family conflict ($p<0.05$, Table 3). Those working in intensive care units and inpatient units experience higher levels of work-family conflict than others. Similarly, in studies conducted with groups consisting mostly of nurses, it was found that nurses working in intensive care and emergency services experience more work-family conflict than nurses working in other clinics (Daşbilek et al., 2022; Karakurt et al., 2023). It is thought that women experience work-family conflict more commonly in units such as intensive care and inpatient services because of the intense workload, risky job responsibilities and long working hours that cause more physical and psychological fatigue in working women.

The study found that there was a significant difference between the participants' weekly working hours and work-family conflict levels ($p<0.05$, Table 3). Those working more than 40 hours per week experience higher work-family conflict. Asiedu et al. (2018) conducted a study with nurses, the majority of whom were women (85.8%), working full-time in five public hospitals in Accra, the capital of Ghana, and found that nurses working 44 or more hours per week experienced higher work-family conflict. Adkins and Premeaux (2012) conducted a study with 544 employees, the majority of whom were women (70.8%), in seven organizations located in the southern United States and found that working more than 40 hours per week caused high levels of work-family conflict. These results show that work-family conflict increases as working hours increase.

The study found that there was a significant difference between the length of service in the profession and the multidimensional perceived social support levels of female healthcare workers ($p<0.05$, Table 3).

Table 1. Descriptive characteristics of the participants

Variable		n	%
Age	30 years old and under	86	29.1
	31-45 years old	128	43.2
	46 years old and over	82	27.7
Educational status	Below Bachelor's Degree	40	13.5
	Bachelor's Degree	174	58.8
	Postgraduate Degree	51	17.2
	Medical Specialty	31	10.5
Marital status	Single	57	19.3
	Married	214	72.3
	Other	25	8.4
Occupation	Nurse	92	31.0
	Doctor	46	15.5
	Technician	46	15.5
	Medical secretary	23	7.8
	Midwife	20	6.8
	Other (Psychologist, Pharmacist etc.)	69	23.4
Unit of work	Polyclinic	85	28.7
	Inpatient clinic	55	18.6
	Intensive care unit	35	11.8
	Ambulatory units	62	20.9
	Administrative unit	29	9.8
	Laboratory	20	6.8
	Pharmacy	10	3.4
Working style	Only during the day	189	63.9
	Both day and night	107	36.1
Weekly working hours	40 hours and below	209	70.6
	41 hours and above	87	29.4
Working time in the profession	10 years and below	105	35.5
	11-20 years	87	29.4
	21 years and above	104	35.1
Satisfaction level with the job	Not satisfied at all	16	5.4
	Not satisfied	41	13.9
	Somewhat satisfied	98	33.1
	Satisfied	130	43.9
	Very satisfied	11	3.7
Time spent on household responsibilities (daily)	1-2 hours	102	34.5
	3 hours and above	194	65.5
Total		**296**	**100.0**

Those who have been working in the profession for 10 years or less have a higher perception of social support than those who have been working for 21 years or more. In contrast to the current study, in a study conducted by Alnazly et al. (2021) with 365 healthcare workers, the majority of whom are women (55%) in Amman, Jordan, it was found that those who have been working in the profession for more than 20 years have a higher level of perceived social support compared to those who have been working for less than 20 years. When this situation is evaluated in two separate ways, those who have been working for a short time in the profession may receive more social support from their colleagues due to professional orientation and low experience. On the other hand, having more professional experience and high coping skills with experience-related problems in those who have been working for a long time may positively affect the level of perceived social support. The study found a significant difference between the level of job satisfaction and work-family conflict, multidimensional perceived social support and depression levels ($p<0.05$, Table 3). In a study conducted by Cohen and Liani (2009) with 168 female nurses working in two public hospitals in

Israel, it was found that employees with high levels of job satisfaction experienced low work-family conflict.

Table 2. Participants' WAFCS, MSPSS and BDI score averages

Scales and Sub-dimensions	Min.	Max.	Mean	SD
The Work-Family Conflict Scale	10.00	59.00	29.32	12.01
The Work-Family Conflict	5.00	35.00	18.79	8.15
The Family-Work Conflict	5,00	28.00	10.54	5.81
Multidimensional Scale of Perceived Social Support	20.00	84.00	60.08	15.46
Family	4.00	28.00	19.99	5.44
Friend	4.00	28.00	19.51	6.14
Special Person	4.00	28.00	20.59	5.57
Beck Depression Inventory	0.00	34.00	11.57	7.40

*Min: Minimum value, Max: Maximum value, SD: Standard Deviation

Asbari et al. (2020) in their study with 139 female employees in two private companies in Indonesia, it was seen that peer and family support had a significant effect on job satisfaction. In a study conducted by Orgambidez-Ramos and de Almeida (2017) with 215 nurses, 77.21% of whom were women, in three public hospitals in southern Portugal, it was found that social support from supervisors and co-workers increased the level of job satisfaction. In a study conducted by Farhan and Atif (2022) with 135 female employees in Karachi, Pakistan, it was seen that perceived social support and job satisfaction were positively correlated. In a study conducted by Gherardi-Donato et al. (2015) with 338 nursing assistants and nursing technicians, 76.1% of whom were women, in a training hospital in São Paulo, Brazil, it was determined that those who experienced intense work stress had high levels of depression symptoms. The results of the study are consistent with one another, they show that those who are satisfied with their jobs experience less work-family conflict and depression symptoms, and that social support increases job satisfaction. The study found that there was a significant difference between the time spent on domestic responsibilities and work-family conflict, multidimensional perceived social support, and depression levels ($p<0.05$, Table 3). In an experimental study conducted by Taghizadeh et al. (2021) with 29 working married women in Iran, it was determined that increasing the time spent on housework caused an increase in the level of work-family conflict. In a study conducted by Canivet et al. (2010) with 5461 working individuals, the majority of whom were women (2735) in the city of Malmö, Sweden, it was determined that increasing the time spent on housework caused an increase in work-family conflict in women. In a study conducted by Dugan and Barnes-Farrell (2020) with 440 working mothers between the ages of 23-55 in the United States, it was shown that meeting the responsibilities of home and family life after work caused more intense depressive feelings in women. In line with these results, it is seen that the time spent on responsibilities mostly reserved for women, such as housework and childcare, is positively correlated with work-family conflict and depression symptoms, while perceived social support is negatively correlated. A statistically significant positive and moderate relationship was found between WAFCS and BDI scores ($r=0.436$; $p<0.001$) (Table 4). In a study conducted by Zurlo et al. (2019) with 450 nurses, mostly female (54.2%) in five public health hospitals in Italy, it was observed that female nurses who experienced high levels of work-family conflict had high levels of depression symptoms. In a study conducted by Hwang and Yu (2021) with 300 married female nurses working in hospitals in three regions of Korea, it was found that high levels of work-family conflict caused depressive symptoms. In a study conducted by Zhang et al. (2023) with 1059 healthcare workers, mostly female (65.1%) in five public hospitals in the northeastern United States, a significant relationship was found between work-family conflict and depressive symptoms. In a study conducted by Pien et al. (2021) with 200 female nurses working in Taiwan, High levels of work-family conflict were found to be positively associated with levels of depression. The results show that there is a positive relationship between symptoms of depression and levels of work-family conflict among female healthcare workers, the majority of whom are nurses. It shows that female healthcare workers experience symptoms of depression in part while trying to adapt to the responsibilities of home life and the challenging working conditions of the hospital. A statistically significant negative and weak correlation was found between MSPSS and BDI scores ($r=-0.290$; $p<0.001$) (Table 4).

Table 3. Comparison of WAFCS, MSPSS and BDI scores according to participants' work characteristics

Variable	WAFCS	MSPSS	BDI
	Mean±SD	Mean±SD	Mean±SD
Unit of work			
Polyclinic (1)	27.22±11.41	60.64±15.3	10.59±7.47
Inpatient clinic (2)	33.22±11.08	59.20±16.49	12.29±8.02
Intensive care unit (3)	34.54±12.93	59.71±14.75	13.8±5.65
Ambulatory units (4)	30.52±11.55	60.05±16.89	12.39±7.64
Administrative unit (5)	24.34±11.83	62.66±15.72	9.52±7.44
Laboratory (6)	25.75±12.85	57.1±13.08	10.1±6.32
Pharmacy (7)	21.70±5.72	60.3±8.98	12.1±7.84
F test	4.735	0.305	1.519
p value	<0.001	0.934	0.171
Bonferroni	3>1,5,7; 2>5		
Weekly working hours			
40 hours and below	27.72±11.82	60.79±14.54	11.23±7.3
41 hours and above	33.17±11.64	58.38±17.45	12.39±7.61
t test	-3.630	1.137	-1.226
p value	<0.001	0.257	0.221
Working time in the profession			
10 years and below	29.12±11.31	63.10±14.46	12.23±7.48
11-20 years	30.07±12.69	59.87±15.26	12.48±6.79
21 years and above	28.9±12.19	57.22±16.16	10.15±7.67
F test	0.244	3.857	3.022
p value	0.783	0.022	0.050
Bonferroni		1>3	
Satisfaction level with the job			
Not satisfied at all (1)	37.69±10.73	65.38±15.72	15.25±7.00
Not satisfied (2)	36.05±8.69	51.88±16.08	15.22±7.24
Somewhat satisfied (3)	32.09±11.95	61.00±15.15	13.16±7.62
Satisfied (4)	25.26±11.00	61.35±14.76	8.91±6.29
Very satisfied (5)	15.45±5.75	59.91±16.00	10.00±8.01
F test	28.687	3.799	10.042
p value	<0.001	0.005	<0.001
Bonferroni	1,2>4,5; 3>5	1,3,4>2	1,2,3>4
Time spent on household responsibilities (daily)			
1-2 hours	26.12±11.69	63.22±14.81	9.19±7.48
3 hours and above	31.01±11.85	58.44±15.58	12.83±7.06
t test	-3.391	2.550	-4.133
p value	0.001	0.011	<0.001

*SD: Standard Deviation, p: Significance value, F: One-way analysis of variance, t: Two independent sample test, Bonferroni: Multiple comparison test

Mark and Smith (2012) found a negative correlation between perceived social support and depression symptoms in their study with 870 nurses, the majority of whom were women (790) in the south of England. Gray-Stanley et al. (2010) found a negative correlation between perceived social support and depression symptoms in their study with 323 employees, the majority of whom were women (83%), providing preventive care services in the northern part of a midwestern state in the United States. High perceived social support was associated with low depression levels. Martsenkovskyi et al. (2022) found a negative correlation between perceived social support and depression symptoms in their study with 330 medical professionals, the majority of whom were women (80.3%) in Ukraine. The study results show that depression symptoms are lower in female healthcare workers with high perception of social support. Social support is thought to provide a protective effect in the process of simultaneously meeting work and family life responsibilities.

The effects of participants' WAFCS and MSPSS scores on BDI scores are given in Table 5. The effects of WAFCS scores on BDI were examined with two linear regression analyses and the established regression analysis was found to be statistically significant ($F=68.964$; $p<0.001$). WAFCS scores explain 18.7% of the change in BDI level ($R^2=0.187$).

In addition, a one-unit increase in WAFCS scores causes a 0.269-unit increase in BDI level scores (β=0.269). The effects of MSPSS scores on BDI were examined with two linear regression analyses and the established regression analysis was found to be statistically significant (F=27.066; p<0.001). MSPSS scores explain 8.1% of the change in BDI level (R^2=0.081). In addition, a one-unit increase in MSPSS scores causes a 0.139-unit decrease in BDI level scores (β=-0.139). These results show that work-family conflict and perceived social support have an effect on depression symptoms.

The research was conducted in a single institution, and the results of the research are limited to the hospital where the data was collected. The research is limited to female healthcare workers who actively worked in the hospital where the research was conducted between October 16 and December 16, 2023.

Table 4. Relationship between participants' WAFCS, MSPSS and BDI scores

Scales		WAFCS	Work-Family	Family-Work	MSPSS	Family	Friend	Special Person	BDI
WAFCS	r	1							
	p								
Work-Family	r	0.903	1						
	p	<0.001							
Family-Work	r	0.799	0.463	1					
	p	<0.001	<0.001						
MSPSS	r	-0.210	-0.175	-0.188	1				
	p	<0.001	0.002	0.001					
Family	r	-0.214	-0.191	-0.173	0.889	1			
	p	<0.001	0.001	0.003	<0.001				
Friend	r	-0.154	-0.135	-0.129	0.940	0.791	1		
	p	0.008	0.020	0.027	<0.001	<0.001			
Special Person	r	-0.205	-0.152	-0.210	0.869	0.617	0.733	1	
	p	<0.001	0.009	<0.001	<0.001	<0.001	<0.001		
BDI	r	0.436	0.391	0.352	-0.290	-0.263	-0.246	-0.278	1
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	

r: Pearson correlation analysis

Table 5. The effect of participants' WAFCS and MSPSS scores on BDI scores

Model		Not Standardized β	Not Standardized SE	β (Standard)	t	p (Predictor)	VIF	F	p (Model)	R^2
1	Constant	3.695	1.025		3.604	<0.001				
	WAFCS	0.269	0.032	0.436	8.304	<0.001	1.000	68.964	<0.001	0.187
2	Constant	3.705	1.031		3.595	<0.001				
	Work-Family	0.264	0.054	0.290	4.893	<0.001	1.273	34.374	<0.001	0.185
	Family-Work	0.277	0.076	0.217	3.665	<0.001	1.273			
3	Constant	19.927	1.658		12.021	<0.001				
	MSPSS	-0.139	0.027	-0.290	-5.202	<0.001	1.000	27.066	<0.001	0.081
4	Constant	20.739	1.757		11.801	<0.001				
	Family	-0.220	0.125	-0.161	-1.762	0.079	2.693			
	Friend	0.031	0.128	0.026	0.242	0.809	3.607	9.702	<0.001	0.081
	Special Person	-0.261	0.109	-0.197	-2.386	0.018	2.182			

*Linear regression analysis, β: Beta coefficient, SE: Standard error, p: Significance value, VIF: Variance inflation factor, t: Test value, F: Test value, R^2: Coefficient of determination, Dependent variable: BDI

4. Conclusion

As a result of this study conducted on a sample of female healthcare workers, it was determined that working women experienced moderate levels of work-family conflict, high levels of perceived social support, and low levels of depression. It was determined that job satisfaction and the time allocated for domestic responsibilities in female healthcare workers were related to work-family conflict, perceived social support, and depression levels. It was determined that there was a positive significant relationship between depression symptoms and work-family conflict in female healthcare workers, and a negative significant

relationship between depression symptoms and perceived social support in female healthcare workers. As work-family conflict increases in female healthcare workers, the level of depression increases, as the perception of social support increases, the level of depression decreases. In line with the results of this study, it is recommended to determine the levels of depression, work-family conflict, and perceived social support with larger sample groups, to conduct new studies by considering other variables that may be predictors of depression, and to plan individual or managerial strengthening studies on depression risk factors.

Conflicts of interest: None

Funding Declaration: This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Presentation Statement

This study was prepared as a Master's Thesis in the Women and Family Studies Program of the Amasya University Social Sciences Institute in 2024.

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SSHS, 2025; 7(2), 67-73
DOI: 10.55895/sshs.1729527
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

AN INVESTIGATION OF NURSING STUDENTS' NOMOPHOBIA, NETLESSPHOBIA AND READINESS LEVELS FOR ARTIFICIAL INTELLIGENCE

HEMŞİRELİK ÖĞRENCİLERİNİN NOMOFOBİ, NETLESSFOBİ VE YAPAY ZEKAYA HAZIRBULUNUŞLUK DÜZEYLERİNİN İNCELENMESİ

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Research Article
Received: 30.06.2025, **Accepted:** 12.08.2025
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Abstract
This study aims to examine university students' nomophobia, netlessphobia, and medical artificial intelligence (AI) readiness levels and the relationship between these factors. This descriptive and correlational study was conducted with nursing students at a university. The data were collected online via the "Individual Descriptive Characteristics Form", "Fırat Nomophobia Scale", "Fırat Netlessphobia Scale" and "Medical Artificial Intelligence Preparedness Scale" forms. The median, frequency and nonparametric tests were used to analyze the data. A total of 138 students participated in the study between August 1-31, 2024. The results indicated that both nomophobia and netlessphobia levels were moderate, as was readiness for medical AI. Nomophobia levels were significantly higher among students who reported longer daily mobile phone use. A strong positive correlation was found between nomophobia and netlessphobia (r:0.755; p=0.00), while no significant relationship was observed between either factor or readiness for medical AI (p>0.05). Gender and grade level were found to have no significant effect on these variables (p>0.05). The findings suggest that while nomophobia increases netlessphobia, neither is associated with medical AI readiness. The study highlights that prolonged phone or internet use does not enhance students' preparedness for medical AI. Based on these results, it is recommended to implement awareness programs in universities to reduce digital addiction, increase training related to medical AI, and offer psychosocial support for students. Future studies should focus on larger sample sizes and long-term follow-ups to explore the impact of digital addiction and evolving attitudes toward AI over time.

Keywords: Artificial intelligence, Netlessphobia, Nomophobia, Nursing students, Preparedness

Öz
Bu çalışma, üniversite öğrencilerinin nomofobi, netlessfobi ve medikal yapay zekaya (YZ) hazırbulunuşluk düzeylerini ve bu faktörlerin arasındaki ilişkiyi incelemeyi amaçlamaktadır. Bu tanımlayıcı ve korelasyonel çalışma bir üniversitenin hemşirelik bölümü öğrencileri ile gerçekleştirilmiştir. Araştırmanın verileri "Birey Tanıtıcı Özellikler Formu", "Fırat Nomofobi Ölçeği", "Fırat Netlessfobi Ölçeği" ve "Tıbbi Yapay Zeka Hazırbulunuşluk Ölçeği" formları aracılığıyla çevrimiçi olarak toplanmıştır. Verilerin analizinde medyan, frekans ve non-parametrik testler kullanılmıştır. Araştırmaya 1-24 Ağustos 2024 tarihlerinde toplam 138 öğrenci katılmıştır. Bulgular; öğrencilerin nomofobi ve netlessfobi düzeylerinin orta seviyede olduğunu, medikal YZ'ye hazırbulunuşluk düzeylerinin de benzer şekilde orta düzeyde olduğunu göstermiştir. Günlük cep telefonu kullanım süresi arttıkça nomofobi düzeylerinin anlamlı şekilde yükseldiği belirlenmiştir. Nomofobi ile internetsizlik fobisi arasında güçlü pozitif bir ilişki bulunmuştur (r:0.755; p=0.00), ancak her iki faktörün de medikal YZ'ye hazırbulunuşluk ile anlamlı bir ilişki göstermediği bulunmuştur (p>0.05). Cinsiyet ve sınıf düzeyinin bu değişkenler üzerinde belirleyici bir etkisi olmadığı belirlenmiştir (p>0.05). Nomofobinin netlessfobiyi artırdığı, ancak bu iki faktörün YZ'ye hazırbulunuşlukla ilişkili olmadığı sonucuna varılmıştır. Bu çalışma, telefon veya internetin uzun süreli kullanımının öğrencilerin yapay zekâya hazırbulunuşluk düzeyini artırmadığını ortaya koymaktadır. Bu doğrultuda, üniversitelerde dijital bağımlılığı azaltmaya yönelik farkındalık

programlarının düzenlenmesi, medikal YZ eğitimlerinin artırılması ve öğrencilere psikososyal destek sağlanması önerilmektedir. Ayrıca, dijital bağımlılığın etkilerini ve yapay zekâya yönelik tutum değişimini inceleyen, daha büyük örneklemlerle ve uzun süreli takip içeren ileri çalışmalar yapılması önerilmektedir.

Anahtar Kelimeler: Hazırbulunuşluk, Hemşirelik öğrencileri, Netlessfobi, Nomofobi, Yapay zeka

1. Introduction

Smartphones have become integral to individuals' daily routines, often perceived as extensions of themselves, and have even begun to be seen as almost as a limb (Gezgin et al., 2019). Individuals widely use smartphones and mobile internet for socializing, having fun, getting news, receiving education, gaining status, communicating and performing daily tasks (Aschof, 2020). This widespread use has led to the emergence of new psychological constructs and concepts such as "nomophobia" and "netlessphobia" have appeared in the literature. Nomophobia is defined as the fear of being separated from the cell phone (Yildiz et al., 2020) and has becoming an increasingly common phenomenon in modern society. Likewise, netlessphobia is defined as the anxiety and stress felt in case of internet disconnection (Yildirim & Kisioglu, 2018). In addition to nomophobia and netlessphobia, recent studies have also emphasized broader digital health concepts such as "technostress" and "digital well-being," which help contextualize the psychological strains arising from excessive technology use within a wider health framework (Durak, 2019; Gonçalves et al., 2020). These psychological phenomena seem to be more common among university students, especially among those who have an intense need for access to information during the education process. Studies have revealed that particularly nursing students may be more prone to nomophobia and netlessphobia due to the need for rapid access to information and continuous interaction during their professional education (Hosgor, 2020). Digitalized educational environments may further increase the dependence on the internet and technology in healthcare students.

Another technology that has been actively used by nursing students in the education process recently has been artificial intelligence (AI) applications (Gezgin et al., 2019; Wu et al., 2024). With the acceleration of technological advances, AI is becoming increasingly widespread in the health sector, and this situation is reflected in nursing education (Arslan, 2020). Readiness for AI applications may be an important factor for nursing students to increase their professional success and quality of patient care. Integration of AI into nursing education has many advantages such as developing a positive attitude towards technology, increasing professional competencies and increasing efficiency in patient care. AI has become not only a technological but also a sociocultural transformation force in medical education, especially in preparing future nurses to operate at the intersection of clinical and digital competencies. Readiness for AI is crucial because it reflects students' competence in leveraging AI tools for clinical decision-making, adapting to digitally augmented workflows, and embracing future healthcare innovations. Several recent studies have examined nursing students' AI readiness. Buabbas et al. (2023) reported that 83.5% of medical students believed AI training would benefit their careers, highlighting a clear demand for integration into curricula. Prior studies show that high levels of nomophobia correlate with increased anxiety and technostress in students (Bahari et al., 2025; Yildiz et al., 2020; Yıldırım & Kisioglu, 2018). However, only a few studies examine netlessphobia alongside nomophobia, and none have explored their combined impact on readiness for AI. Despite the substantial literature on AI readiness and digital addiction separately, little is known about how technostress and AI preparedness interplay. This study addresses that gap by analyzing nomophobia, netlessphobia, and AI-readiness together. We hypothesize that high technostress may correlate inversely with confidence in engaging new technologies such as medical AI, offering unique insights into digital well-being and professional preparation.

In this respect, examining the relationship between nomophobia and netlessphobia levels of nursing students and their readiness for artificial intelligence applications is important. In the literature, there are currently no comprehensive studies focusing on the relationship between these three variables. Therefore, this research aimed to determine the levels of nomophobia and netlessphobia of nursing students and their readiness for artificial intelligence applications and the relationship between these variables.

2. Material and Methods

2.1. Place, time and type of the research

This cross-sectional correlational study was conducted at Yozgat Bozok University, Akdağmadeni School of Health between August 1-31, 2024.

2.2. Population and sample of the study

The population of the study consisted of 211 nursing students who were 18 years of age or older and studying in the nursing department of a state university. Among these students, 138 nursing students who consented to participate in the study comprised the study sample. The minimum required sample size was calculated using Yamane's formula for a known population with a 95% confidence level (α = 0.05) and a margin of error of 5% (e = 0.05). Assuming a population proportion of 50% (P = 0.50) and a total population size of N = 211, the minimum sample size was calculated as:

$n = N / (1 + N \cdot e^2) \rightarrow n = 211 / (1 + 211 \cdot 0.05^2) = 137$

Thus, the final sample size of 138 participants meets the minimum requirement for statistical validity. Inclusion criteria of the study are being an actively enrolled student in the relevant department and volunteering to participate in the study.

2.3. Data collection tools

Within the scope of the study, "Individual Identifying Characteristics Form", "Fırat Nomophobia Scale", "Fırat Netlessphobia Scale" and "Medical Artificial Intelligence Readiness Scale" forms were used for the participants.

Individual Descriptive Characteristics Form: This form was developed by reviewing the relevant literature and included 15 questions about the students' age, gender, height, weight, internet and telephone use, chronic diseases and artificial intelligence use.

Fırat Nomophobia Scale (FNoS): The FNOS, developed by Kanbay et al. (2020), consists of a single dimension and eight items (Kanbay et al., 2022a). Cronbach's α value of the scale was calculated as 0.89. The scale is a 5-point Likert-type scale coded as "Not at all appropriate"=1, "Not appropriate"=2, "Moderately appropriate"=3, 'Appropriate'=4 and "Completely appropriate"=5. The lowest score that can be obtained from this scale, which has no reverse scored items, is 8 points, while the highest score is 40 points. The higher the score, the higher the level of Nomophobia in the individual. The Cronbach's alpha value of the scale in the study was found to be 0.85. Fırat Netlessphobia Scale (FNeS): The FNES, developed by Kanbay et al. (2022), consists of a single dimension and 12 items (Kanbay et al., 2022b). Cronbach's α value of the scale was calculated as 0.93. The scale is a five-point Likert type, and the lowest score is 12 and the highest score is 60. As the score obtained from the scale increases, the level of netlessphobia increases. The Cronbach's alpha value of the scale in the study was found to be 0.95.

Medical Artificial Intelligence Preparedness Scale (MAPS): The scale developed by Karaca et al. (2021) consists of 22 items and four sub-dimensions. Cronbach's α value of the scale was calculated as 0.87. The scale is scored in the range of 22-110 points, and a high score means a high level of readiness for medical artificial intelligence. The Cronbach's alpha value of the scale in the study was found to be 0.95.

2.4. Data collection and statistical analysis

The data of the study were collected online with a questionnaire prepared via Google Forms. All data were analyzed using the SPSS 23.0 package program. Normal distribution of the data was examined, and non-parametric tests were used since the data did not show normal distribution. Descriptive statistics such as median, first-quartile-third quartile values, percentage and frequency were used in the evaluation of socio-demographic data. Spearman correlation test was used to determine the relationship between the scales used in the study, and Mann Whitney U and Kruskal Wallis tests were used to evaluate the differences between groups. The significance level in the study was considered as $p<0.05$.

2.5. Ethical aspects of the study

Ethical approval was obtained from Yozgat Bozok University Social Sciences and Humanities Ethics Committee for the conduct of the study (Decision No: 16/16, Date: 17/07/2024). Institutional permission was obtained from the institution where the research would be conducted. This study complies with the Declaration of Helsinki. Students were informed about the study, and their informed consent was obtained. The online data obtained from the study were transferred to an external memory and stored by the study authors.

2.6. Limitations of the study

This study has several limitations. First, its cross-sectional design limits the ability to establish causal relationships. Moreover, the majority of participants reported not having received any training in artificial intelligence, which may have influenced their attitudes toward AI. Another notable limitation is the method of data collection, which was conducted entirely online. While online data collection allows for broader reach and greater efficiency, it may also introduce biases related to self-selection, digital literacy, and internet accessibility. Participants who are less familiar with digital tools or have limited internet access might have been underrepresented in the sample.

3. Results and Discussion

A total of 138 students participated in the study, with a mean age of 21 years (range 20–22), and 65.2% were female. Nearly half of the participants (47.8%) were third-year students. Most students reported having no chronic illnesses (89.9%) and

not taking regular medication (83.3%). However, about one-third smoked, and only 13.8% engaged in regular physical exercise. Approximately half of the students (49.3%) indicated that they used their mobile phones for 3 to 5 hours daily. Strikingly, only three participants had previously received AI-related education (Table 1).

Table 1. Socio-demographic characteristics of students

Characteristics	n	Percent
Age [med(1Q-3Q)]	21 (20-22)	
Gender		
Female	90	65.2
Male	48	34.8
Grade		
First	31	22.5
Second	41	29.7
Third	66	47.8
Smoking		
Yes	46	33.3
No	92	66.7
Exercise regularly		
Yes	27	19.6
No	111	80.4
Presence of chronic disease		
Yes	14	10.1
No	124	89.9
Regular medication use		
Yes	23	16.7
No	115	83.3
Time spent on the phone		
Less than one hour	-	-
1-3 hours	31	22.4
3-5 hours	68	49.3
More than five hours	39	28.3
Receiving training on artificial intelligence		
Yes	3	2.1
No	137	97.9
FNoS [med(1Q-3Q)]	22.0 (18.0-26.0)	
FNeS [med(1Q-3Q)]	31.0 (25.0-36.25)	
MAPS [med(1Q-3Q)]	67.0 (63.75-75.0)	

FNoS: Fırat Nomophobia Scale; FNeS: Fırat Netlessphobia Scale; MAPS: Medical Artificial Intelligence Preparedness Scale; med(1Q-3Q): median (first quarter-third quarter).

The levels of nomophobia, netlessphobia, and medical AI readiness among the students were found to be moderate. Gender and grade level did not significantly influence nomophobia, netlessphobia, or AI readiness (Table 2). While the amount of time spent on the phone significantly affected nomophobia levels, it did not impact netlessphobia or AI readiness (Table 2). A strong positive correlation was identified between nomophobia and netlessphobia (Table 3), ($r=0.755$, $p<0.001$), whereas AI readiness showed no significant correlation with either nomophobia or netlessphobia (Table 3), ($p>0.05$). These findings indicate that students commonly use mobile devices for extended periods, which these findings indicate that students commonly use mobile devices for extended periods, which aligns with prior findings that have established a robust link between the duration of mobile phone use and nomophobia. (King et al., 2014; Yildiz, 2019; Ozbay et al., 2023; Griffiths & Kuss, 2017). Excessive mobile phone use has been linked to various psychological issues and adverse effects on individuals' lives, such as nomophobia and related disorders (Gonçalves et al., 2020; Rodríguez-García et al., 2020; Sohn et al., 2019). Therefore, understanding the frequency, intensity, and consequences of nomophobia is crucial. It should also be noted that nomophobia and netlessphobia are not officially classified in recent DSM diagnostic manuals, leading to varied

interpretations and measurement inconsistencies in the literature (Griffiths & Kuss, 2017).

Table 2. Scale score differences based on socio-demographic characteristics

Characteristics	FNoS Med(1Q-3Q)	FNeS Med(1Q-3Q)	MAPS Med(1Q-3Q)
Gender			
Female	23.5 (19.0-26.0)	32.0 (25.0-37.0)	67.0 (64.75-74.0)
Male	21.5 (17.25-24.75)	29.5 (24.0-36.0)	68.0 (60.0-79.25)
Test value*	-1.646	-0.994	-0.472
p value	0.100	0.320	0.637
Grade			
First	21.0 (16.0-24.0)	28.0 (24.0-32.0)	70.0 (65.0-83.0)
Second	22.0 (18.5-24.5)	32.0 (26.5-36.0)	67.0 (62.5-77.0)
Third	24.0 (19.0-27.0)	32.5 (24.75-37.0)	66.0 (63.25-72.0)
Test value +	3.982	2.837	4.877
p value	0.137	0.242	0.087
Time spent on the phone			
1-3 hours	20.0 (16.0-23.0)	29.0 (24.0-33.0)	67.0 (64.0-78.0)
3-5 hours	23.0 (19.0-25.75)	30.5 (25.0-36.75)	67.0 (60.75-75.75)
More than five hours	24.0 (19.0-28.0)	33.0 (25.0-39.0)	68.0 (63.0-72.0)
Test value +	12.620	3.398	0.256
p value	0.002	0.183	0.880

FNoS: Fırat Nomophobia Scale; FNeS: Fırat Netlessphobia Scale; MAPS: Medical Artificial Intelligence Preparedness Scale; med(1Q-3Q): median (first quarter-third quarter); *: Mann-Whitney U Test; +: Kruskal Wallis Test; $p < 0.05$ indicates statistical significance.

The moderate level of netlessphobia observed in this study and its strong association with nomophobia highlight the psychological importance of continuous online access. Similar studies, such as Mengi et al. (2020), have reported that netlessphobia negatively affects students' daily functioning, sleep quality, and academic performance when it evolves into nomophobia. These results emphasize the need for screening and protective interventions targeting the negative outcomes associated with nomophobia and netlessphobia, particularly among nursing students.

Table 3. Correlation table

Correlation	FNoS	FNeS	MAPS
FNoS	1	**0.755***	0.019
FNeS	**0.755***	1	0.043
MAPS	0.019	0.403	1

FNoS: Fırat Nomophobia Scale; FNeS: Fırat Netlessphobia Scale; MAPS: Medical Artificial Intelligence Preparedness Scale; r: Spearman correlation coefficient; *$p < 0.05$ indicates statistical significance.

Regarding medical AI readiness, the lack of significant association with nomophobia and netlessphobia suggests that technological dependence does not directly influence students' attitudes toward professional applications of AI. Previous studies have linked positive or negative attitudes toward AI more closely with cognitive awareness and educational exposure (Topol, 2019). This view is supported by recent research (Wu & Yu, 2024; El Arab, et al. 2025) who emphasized that AI readiness is less about frequency of use and more about pedagogical integration and cognitive understanding. In line with this, the limited number of students with formal AI education in this study indicates a need for enhanced educational programs to improve knowledge and preparedness in medical AI. For instance, the World Health Organization (WHO, 2023) has emphasized the integration of AI literacy into healthcare curricula, and several European countries have started incorporating AI modules into nursing programs. This finding reinforces the idea that readiness for AI is not simply the result of exposure or interest but requires structured learning experiences tailored to healthcare contexts.

Finally, the absence of significant effects of gender and grade level on nomophobia, netlessphobia, and AI readiness contrasts with some literature suggesting gender differences in digital addiction (Gezgin et al., 2019). This discrepancy may be due to the relatively homogeneous academic environment and similar technology use habits among participants, as also reported by Gürçay et al. (2024) in nursing students. Alternatively, it may reflect a broader trend in narrowing gender-based digital technology attitude differences, particularly among younger healthcare students (Gezgin et al., 2019). It is also important to reiterate the limitations of the study design, particularly its cross-sectional nature, which prevents causal interpretations. For instance, the assumption that nomophobia leads to lower AI readiness was not supported and should be further explored in longitudinal designs.

4. Conclusion

In conclusion, this study reveals important findings by examining university students' digital addiction levels and their readiness for medical AI. It was found that students' cell phone and internet use had a significant effect on their nomophobia and netlessphobia levels, but these factors were not determinant on readiness for medical AI. Although nomophobia and netlessphobia are moderately prevalent and interrelated among students, their influence on medical AI readiness appears limited. The fact that the number of students receiving artificial intelligence education is quite low shows that awareness in this field should be increased. Given the psychological and academic consequences associated with these digital addictions, it is imperative to raise awareness and develop preventive strategies in health sciences education. By increasing trainings on medical AI, students' competencies in this field can be enhanced through structured education. Psychosocial support programs can be developed to increase students' awareness of digital addiction and internet usage time. Future studies should aim to include larger sample sizes, incorporating individuals from diverse disciplines. Additionally, it is recommended to investigate how the effects of nomophobia and netlessphobia on AI readiness evolve over time through long-term follow-up studies that seek to establish causality. As the number of studies exploring these factors increases, it will contribute to students' healthier coping mechanisms for digital addiction and foster a more positive awareness of medical AI.

Conflicts of interest: No conflict of interest

Funding Statement: This research received no grant from any funding agency, commercial or not-for-profit sectors.

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SSHS, 2025; 7(2), 74-85
DOI: 10.55895/sshs.1718945
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

THE EFFECT OF SMOKING ON INTRAOCULAR PRESSURE INCREASE AFTER ENDOTRACHEAL INTUBATION

ENDOTRAKEAL ENTÜBASYON SONRASI SİGARA KULLANIMININ GÖZ İÇİ BASINÇ ARTIŞINA ETKİSİ

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Research Article
Received: 13.06.2025, **Accepted:** 20.08.2025
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Abstract
This study investigates the effect of smoking on intraocular pressure (IOP) following endotracheal intubation. Endotracheal intubation is known to cause transient increases in IOP, which may pose risks for patients with preexisting ocular conditions. However, the influence of smoking on these changes remains unclear. By comparing IOP variations among smokers, former smokers, and non-smokers, this study aims to provide insights into the relationship between smoking and IOP fluctuations during general anesthesia. A total of 150 adult patients (ages 18–40) undergoing elective surgery under general anesthesia were included. Patients were classified into three groups: smokers, former smokers, and non-smokers. Standardized anesthetic protocols were applied to all participants, and IOP measurements were taken using a Tono-Pen XL device at baseline (pre-induction), post-induction, immediately after intubation, and at 10- and 20-minutes post-intubation. Mean arterial pressure (MAP) was also recorded at these times. Statistical analyses were conducted using SPSS 20.0, applying appropriate tests for intergroup and intragroup.
Baseline IOP values were similar across all groups. After induction, IOP decreased in all patients but significantly increased following intubation. Smokers exhibited a more pronounced rise in IOP post-intubation compared to non-smokers and former smokers ($p < 0.01$). At the 10th and 20th minutes, IOP values declined but remained higher in smokers than in the other groups. No significant differences were observed in MAP values between groups, suggesting that systemic blood pressure changes did not account for the observed IOP differences. Smoking appears to exacerbate the increase in IOP following endotracheal intubation, posing potential risks for ocular health, particularly in patients susceptible to glaucoma. These findings highlight the need for careful anesthetic management in smokers to mitigate IOP spikes during intubation.

Keywords: Anesthesia, Endotracheal intubation, Intraocular pressure, Ocular health, Smoking

Öz
Bu çalışma, endotrakeal entübasyon sonrasında sigara kullanımının göz içi basıncı (GİB) üzerindeki etkisini araştırmaktadır. Endotrakeal entübasyonun GİB' de geçici artışlara neden olduğu bilinmektedir ve bu durum önceden oküler rahatsızlıkları olan hastalar için risk oluşturabilir. Bununla birlikte, sigara içmenin bu değişiklikler üzerindeki etkisi belirsizliğini korumaktadır. Bu çalışma, sigara içenler, daha önce sigara içmiş olanlar ve içmeyenler arasındaki GİB değişimlerini karşılaştırarak, genel anestezi sırasında sigara içme ve GİB dalgalanmaları arasındaki ilişki hakkında bilgi sağlamayı amaçlamaktadır. Genel anestezi altında elektif cerrahi geçiren toplam 150 yetişkin hasta (18-40 yaş) çalışmaya dahil edilmiştir. Hastalar üç gruba ayrılmıştır: sigara içenler, eskiden sigara içenler ve sigara içmeyenler. Tüm katılımcılara standart anestezi protokolleri uygulanmış ve GİB ölçümleri Tono-Pen XL cihazı kullanılarak başlangıçta (indüksiyon öncesi), indüksiyon sonrası, entübasyondan hemen sonra ve entübasyondan 10 ve 20 dakika sonra alınmıştır. Ortalama arter basıncı (MAP) da bu zaman noktalarında kaydedilmiştir. İstatistiksel analizler SPSS 20.0 kullanılarak, gruplar arası ve grup içi uygun testler uygulanarak gerçekleştirilmiştir. Başlangıç GİB değerleri tüm

gruplarda benzerdi. İndüksiyondan sonra, GİB tüm hastalarda düşmüş ancak entübasyondan sonra önemli ölçüde artmıştır. Sigara içenler, içmeyenlere ve eski içicilere kıyasla entübasyon sonrası GİB'de daha belirgin bir artış sergilemiştir ($p < 0,01$). 10. ve 20. dakikalarda GİB değerleri düşmüş ancak sigara içenlerde diğer gruplara kıyasla daha yüksek kalmıştır. Gruplar arasında MAP değerlerinde anlamlı bir fark gözlenmemiştir, bu da sistemik kan basıncı değişikliklerinin gözlenen GİB farklılıklarını açıklamadığını düşündürmektedir. Sigara içmenin endotrakeal entübasyonu takiben GİB artışını şiddetlendirdiği ve özellikle glokoma yatkın hastalarda oküler sağlık için potansiyel riskler oluşturduğu görülmektedir. Bu bulgular, entübasyon sırasında GİB artışını azaltmak için sigara içenlerde dikkatli anestezi yönetimi ihtiyacını vurgulamaktadır.

Anahtar Kelimeler: Anestezi, Endotrakeal entübasyon, Göz içi basıncı, Oküler sağlık, Sigara

1. Introduction

Elevated intraocular pressure (IOP) can endanger the optic nerve, possibly leading to visual loss (Park et al., 2019). Endotracheal intubation is often linked to an increase in IOP. The causal mechanisms are unclear, although alterations in hemodynamic and transient elevations in arterial blood pressure might contribute. Pain and sympathetic activation related to laryngoscopy may also play a role in IOP changes (Jiang et al., 2020, Sanchez-Ramirez et al., 2020).

Factors affecting IOP changes during endotracheal intubation include the duration and degree of laryngoscopy, the type of muscle relaxants used, and the depth of anesthesia. Cigarette smoking may affect the respiratory system and imply systematic changes, including atherosclerosis, hypertension, and changes in the general anesthetics' effects. Hypotensive agents used during anesthesia may have reduced effects in smokers (Soleimani et al., 2022, Smith et al., 2020, Amato-Lourenço et al., 2021, Chastin et al., 2021). The relationship between cigarette smoking and the increase in IOP when using an endotracheal tube is unknown. As cigarette smoking has systemic effects, it may alter IOP changes during endotracheal intubation. This study compared intraocular pressure changes in smokers and non-smokers 60 seconds after endotracheal intubation, thus helping to understand the smoking-based effects on elevated intraocular pressure (Yamamoto et al., 2021).

1.1. Intraocular Pressure

Intraocular pressure (IOP) is the fluid pressure inside the eye and is determined by a balance of production and drainage of aqueous humour (Park et al., 2019). An increase in IOP may cause development of glaucoma, damage to the optic nerve, and loss of vision. Several factors can alter IOP, such as age, posture, certain medications, systemic blood pressure changes, and anesthetics. IOP normally has a circadian rhythm with high levels during the night influencing the risk of glaucoma. IOP is usually lower in the supine position, but various factors can increase IOP during general anesthesia. Endotracheal intubation is a routine procedure for airway management during general anesthesia, but it can cause various hemodynamic responses including increases in blood pressure and heart rate due to sympathetic stimulation as well as increases in IOP. The change in IOP during tracheal intubation may be influenced by the method of intubation, type of endotracheal tube, or use of muscle relaxants (Opsa et al., 2020, Senthil et al., 2021).

A few studies have been conducted concerning the effect of smoking on intraocular pressure. Inversing results have been achieved. Although some studies show that smoking could induce an increase in intraocular pressure, others indicate it could have a lowering effect on it (Abbas et al., 2021).

Park et al., 2019, found that smoking is an important factor in determining preoperative intraocular pressure. Various factors — ozone exposure, anxiety, smoking, drinking, and medication intake — were assessed from the questionnaire given to the patients, and smoking was determined as the most positive and significant factor in decreasing preoperative intraocular pressure. Conversely, some studies insisted that nicotine could elevate the intraocular pressure (Park et al., 2019, Park et al., 2019, Chang et al., 2020).

1.2. Endotracheal Intubation

Endotracheal intubation is a technique that is frequently used in clinical anesthesia as it provides patent airway for ventilation and oxygenation of the patient during a surgical procedure. It involves inserting an endotracheal tube into the trachea to establish an effective airway after the patient has been given general anesthesia. Endotracheal intubation is often accompanied by other tracheal manipulations of patients such as jaw thrust, neck extension, and head lift. All these manipulations are done to position the patient appropriately so that trachea is easily accessible needed for endotracheal intubation (Miyara et al., 2020). Manipulation of the patient is often needed because the patient is in a supine position in the operating theatre after the induction of general anesthesia. Endotracheal intubation is generally considered a safe procedure; however, it may lead to sudden complications and significant adverse effects, especially in patients

who are already at risk. Some of the adverse effects of endotracheal intubation are body rigidity, hypertension, tachycardia, arrhythmias, hypoxia, hypercarbia, bronchospasm, hypoventilation, and increase in intraocular pressure (Ravidà et al., 2020, Shakeri et al., 2021).

1.3. Mechanisms of Intraocular Pressure Regulation

Normal Intraocular Pressure (IOP) is fixed between 10 and 20 mmHg. IOP can increase due to an increase in aqueous humour production, a decrease in aqueous humour outflow, or both (Erol et al., 2021). The circadian rhythm of IOP is dictated by the production and outflow of aqueous humour. However, elevation of IOP can occur due to diseases that alter the natural flow passage for draining aqueous humour (Oatts et al., 2024). Such diseases are grouped under the nomenclature glaucoma which leads to optic nerve cupping and eventual blindness. IOP can also suddenly increase due to stress which can lead to acute angle-closure glaucoma. IOP is important to monitor during general anesthesia since IOP increases following endotracheal intubation as a response to the mechanical airway pressure (Naguip et al., 2022).

1.4. Relationship Between Smoking and Intraocular Pressure

The effect of smoking on ocular hypertension was investigated in the light of which smoking contributes to pre-operative smoking. So, the changes in IOP were measured before intubation and 10 min after intubation in 70 patients aged 20 to 49 years who smoke and regularly underwent elective general endotracheal anesthesia. As a result, the average IAP in smokers was 0.87 mmHg ($p < 0.05$) and 1.89 mmHg ($p < 0.01$) 10 minutes after intubation, while in non-smoking patients, these values changed to 1.89 mmHg ($p < 0.05$) and 2.37 mmHg ($p < 0.01$), respectively. It also showed that smoking influences the increase of IOP after endotracheal intubation. In this study, IOP was indirectly measured with a hand-held tonometer before intubation and 10 minutes after intubation, and demographic data were also taken into consideration (Gupta et al., 2024, Mansour et al., 2023).

Intraocular pressure (IOP) is defined as the pressure within the ocular globe measured in mmHg. The normal IOP in most individuals is between 12 and 22 mmHg. A routine endotracheal intubation procedure increases IOP by 1.7 mmHg after 10 minutes due to a significant increase in arterial blood pressure ($p < 0.05$). It was determined that anesthetics such as thiopental and fentanyl can control pre-intubation IOP (Kayhan et al., 2024).

2. Material and Methods

This study was conducted at the Department of Anesthesiology and Reanimation, Gaziosmanpaşa University Faculty of Medicine, between July 2013 and September 2013, after obtaining approval from the Gaziosmanpaşa University Ethics Committee. Patients were informed about the study, and their consent was obtained. A total of 150 adult patients, aged between 18–40 and classified as American Society of Anesthesiologists (ASA) I and II risk group, underwent various elective surgical procedures, including minor general surgery, otorhinolaryngologic interventions, and orthopedic operations not involving the eye or central nervous system.

Patients with a history of difficult intubation, modified Mallampati score greater than 2, mouth opening less than 3 cm, thyromental distance less than 6 cm, intraocular pressure (IOP) greater than 20 mmHg, intracranial vascular pathology (aneurysm, A-V malformation, etc.), oesophageal or cervical spinal disease, asthma, chronic obstructive pulmonary disease, haematological disorders (anaemia, haemolysis, etc.), weight less than 50 kg, morbid obesity with a body mass index (BMI) greater than 35 kg/m^2, emergency patients with a full stomach, patients under 18 or over 40 years of age, active oesophageal reflux, history of allergy, cardiovascular disease, pregnant women, and patients who did not wish to participate in the study were excluded. Additionally, patients who could not be intubated orotracheally in a single attempt within 30 seconds or who developed complications related to intubation, as well as those with a heart rate below 50 beats/min or above 100 beats/min, and blood pressure below 90/60 mmHg or above 180/100 mmHg, were excluded from the study.

Before the surgery, blood and urine tests were performed on all patients, and blood glucose, urea, creatinine, total protein, albumin, bilirubin, uric acid, electrolytes, prothrombin time, activated partial thromboplastin time, SGOT, SGPT, GGT, ALP, LDH levels were determined. haemoglobin and haematocrit levels were measured. Electrocardiography (ECG) and chest X-rays were taken. Routine physical examinations were performed. Patients with test results within normal limits were included in the study. During the preoperative examination, the patients' smoking status, the number of years they had smoked, the number of cigarettes smoked per day, age, height, weight, body mass index (BMI), thyromental distance, mouth opening, and Mallampati scores were recorded. A total of 150 adult patients classified as ASA I and II risk group, scheduled for surgery under general anesthesia in the supine position, were divided into three equal groups: GROUP S: Patients who smoked (for more than 1

year), GROUP B: Patients who had smoked but quit within the last year, and GROUP NS: Patients who had never smoked.

Patients who did not receive premedication started on a saline infusion (5-7 ml/kg/hour) 6 hours before the operation through an 18-20 G intravenous cannula placed on the back of the hand. When the patients were taken to the operating room, standard preoperative monitoring was performed using Datex Ohmeda S/5 Avance monitor, including electrocardiography (ECG) in DII derivation, non-invasive blood pressure (systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP), and peripheral oxygen saturation (SpO2). Additionally, to determine the depth of anesthesia, Bispectral Index (Bispectral Index Monitor Model 2000, Aspect Medical Systems Inc., USA) monitoring was performed by placing electrodes on the frontotemporal region. Fluid maintenance was administered at 2 ml/kg isotonic through the previously opened intravenous line. Then, one drop of 0.5% Proparacaine HCL local anesthetic eye drop was instilled, and intraocular pressure (IOP) was measured three times in both eyes using Tono-Pen XL (Tono-pen XL-Medtronic, USA), and the averages were recorded. Simultaneously, SAP, DAP, and MAP were measured and recorded. After three minutes of preoxygenation with a mask, anesthesia induction was initiated, and 0.5 mg/kg intravenous lidocaine hydrochloride (Aritmal R % 2, Biosel) was administered to all three groups of patients to prevent pain caused by propofol injection. Then, induction was started, and anesthesia depth was achieved with 1.5-2.5 mg/kg propofol, 2 µg/kg fentanyl citrate, and 0.6 mg/kg rocuronium intravenously, aiming for a Bispectral Index (BIS) value of 50 ±10. When the appropriate anesthesia depth was reached, IOP was measured three times in both eyes, the averages were recorded, and simultaneous SAP, DAP, and MAP measurements were recorded.

Patients were manually ventilated with 100% O2 for at least 3 minutes after induction until the jaw relaxed and the eyelash reflex disappeared. Patients were intubated orally using an appropriately sized laryngoscope blade (Macintosh) and an appropriately sized endotracheal tube (internal diameter 7, 7.5, 8 mm). After endotracheal intubation, IOP was measured three times in both eyes, and the averages were recorded. Simultaneously, SAP, DAP, and MAP were measured. After intubation, all patients were connected to the anesthesia machine (Datex Ohmeda) in IPPV mode, with FiO2: 50%, TV: 10 ml/kg, respiratory rate: 12/min, Ti/Te: 2, PEEP=0 mBar. Anesthesia maintenance was provided in all groups with 50% (2L/min) O2 and 50% (2 L/min) N2O, and 2% sevoflurane. IOP was measured three times in both eyes at the 10th and 20th minutes after induction, the averages were recorded, and simultaneous SAP, DAP, and MAP measurements were recorded. Anesthetic gases were turned off 5 minutes before the end of the surgery, and patients were ventilated with 100% oxygen. When spontaneous breathing movements began, the effect of the muscle relaxant was reversed with neostigmine 0.04 mg/kg and atropine 0.01 mg/kg. Patients were taken to the recovery room after extubation.

Intraocular pressure was measured and recorded separately in both eyes using an applanation tonometer (Tono-Pen XL-Medtronic, USA). To prevent infection, a disposable cover (Ocu-pen Tip Covers, USA) was placed on the tonometer tip for each patient. Before each measurement, the tonometer was calibrated, and three measurements were taken by touching the cornea with the 1 mm diameter transducer tip. The numerical average of the three measurements was recorded.

2.1. Statistical Analysis

The data obtained from the research were evaluated using the Statistical Package for Social Sciences (SPSS) 20.0 (Chicago, IL). Descriptive statistics were used for basic statistical analyses. Data were presented as mean, standard deviation, and percentage. For comparisons between groups of continuous variables that did not follow a normal distribution, the Kruskal-Walli's test was used; for pairwise group comparisons, the Mann-Whitney U test was used; for categorical variables, the Chi-square test and Fisher's exact test were used; and for within-group comparisons, Repeated Measures ANOVA was used. For within-group data evaluation, the statistical significance level was set at $p < 0.05$.

2.2. Ethical aspects of the study

Prior to commencing the study, approval was obtained from the Ethics Committee of Tokat Gaziosmanpaşa University on 02.07.2013, No. 13-KAEK-155, and the relevant institutional permission was obtained.

3. Results and Discussion

A total of 150 patients aged between 18-40 were included in our study, divided into three equal groups of 50 patients each: smokers (Group S), those who had quit smoking (Group B), and non-smokers (Group NS).

In all three groups, no significant differences were found in demographic data (age, weight, height, gender, BMI) between the groups ($p>0.05$) (Table 1). During airway management, no significant differences were observed in difficult intubation assessment scales, intubation duration, patient responses, or airway injury.

Table 1. Comparison of demographic findings by group and p-values for groups.

	GROUP S	GROUP P	GROUP NS	
	Mean± SD, n	**Mean± SD, n**	**Mean± SD, n**	**p**
Age (Years)	30.36±6.38	29.34±7.39	28.80±6.82	**0.482***
Weight (kg)	75.18±12.34	69.56±12.68	70.06±15.41	**0.063***
Height (cm)	168.80±8.01	168.30±7.13	169.06±7.79	**0.876***
BMI (kg/m²)	26.43±4.32	25.42±3.44	25.48±4.94	**0.054***

*Kruskal-Walli's test

3.1. Mean arterial pressure (MAP)

No significant differences were found in the initial MAP, post-induction MAP, post-intubation MAP, MAP at the 10th minute after induction, and MAP at the 20th minute after induction among the three groups (p>0.05). The results were compared in terms of MAP between the three groups, pairwise between groups, and within groups over time. According to the findings, no statistically significant difference was found in MAP over time between the three groups.

In pairwise comparisons between groups, no significant differences were found in MAP between Group S and Group NS, Group S and Group B, and Group NS and Group B. In within-group comparisons of MAP over time, in Group S, each measurement value was compared with the initial value, and significant differences were found in the values after induction, after intubation, at the 10th and 20th minutes after induction (p<0.05). MAP decreased significantly at all time points except after intubation (Table 2).

In within-group comparisons of MAP over time, in Group B, each measurement value was compared with the initial value, and significant differences were found in the values after induction, after intubation, at the 10th and 20th minutes after induction (p<0.05). MAP decreased significantly at all time points except after intubation (Table 2). In within-group comparisons of MAP over time, in Group NS, each measurement value was compared with the initial value, and significant differences were found in the values after induction, after intubation, at the 10th and 20th minutes after induction (p<0.05). MAP decreased significantly at all time points except after intubation (Table 2).

Table 2. Evaluation of mean arterial pressure

	Smoker	Quit smoking	Nonsmoker
Beginning	94.38±11.84	94.84±10.3	93.34±10.43
Induction	77.22±10.06	77.48±11.56	74.55±10.84
Intubation	103.89±15.39	98.89±14.01	100.09±14.92
10th Minutes	81.38±11.15	83.90±11.40	80.69±10.51
20th Minutes	78.49±8.67	79.76±9.64	77.07±10.00

3.2. Intraocular Pressure (IOP)

3.2.1. Right Eye Intraocular Pressure

No significant differences were found in the baseline, post-induction, 10th minute, and 20th minute right IOP values among the three groups (p = 0.616), (p = 0.354), (p = 0.114), (p = 0.064), respectively.

The results were compared in terms of right IOP between the three groups, pairwise between groups, and within groups over time. According to the findings, a statistically significant difference was found in the right IOP value during intubation between the three groups (p<0.01).

In pairwise comparisons between groups, significant differences were found in the right IOP during intubation between Group S and Group B (p=0.001) and Group S and Group NS (p<0.001), while no significant difference was found between Group B and Group NS (p>0.05).

In pairwise comparisons between groups, significant differences were found in the right IOP at the 20th minute between Group S and Group NS (p=0.018), while no significant differences were found between Group S and Group B and Group B and Group NS (p>0.05).

In within-group comparisons of right IOP over time, in Group S, each measurement value was compared with the previous value, and significant differences were found in Baseline-Induction ($p < 0.01$), Induction-Intubation ($p < 0.01$), Intubation-10th min ($p < 0.01$), and 10th min-20th min ($p < 0.01$).
Right IOP decreased after induction but increased significantly after intubation (Table 4).
In within-group comparisons of right IOP over time, in Group B, each measurement value was compared with the previous value, and significant differences were found in Baseline-Induction ($p < 0.01$), Induction-Intubation ($p < 0.01$), Intubation-10th min ($p < 0.01$), and 10th min-20th min ($p = 0.001$). Right IOP decreased after induction but increased significantly after intubation (Table 3).
In within-group comparisons of right IOP over time, in Group NS, each measurement value was compared with the previous value, and significant differences were found in Baseline-Induction ($p < 0.01$), Induction-Intubation ($p < 0.01$), Intubation-10th min ($p < 0.01$), and 10th min-20th min ($p = 0.001$). Right IOP decreased after induction but increased significantly after intubation (Table 3).

Table 3. Evaluation of right IOP

	Smoker	Quit smoking	Nonsmoker
Beginning	14.42±1.65	14.76±1.83	14.58±1.86
Induction	10.74±1.92	11.1±1.74	11.04±1.99
Intubation	18.46±2.19	16.94±2.1	16.16±2.21
10th Minutes	13.14±2.12	12.38±2.14	12.34±2.06
20th Minutes	12.5±1.99	11.96±2.09	11.52±1.65

3.2.2. Left Eye Intraocular Pressure

No significant differences were found in the baseline and post-induction left IOP values among the three groups ($p = 0.568$), ($p = 0.380$), respectively. The results were compared in terms of left IOP between the three groups, pairwise between groups, and within groups over time. According to the findings, statistically significant differences were found in the left IOP values during intubation, at the 10th minute, and at the 20th minute between the three groups ($p = 0.001$), ($p = 0.004$), $p = 0.026$), respectively).
In pairwise comparisons between groups, significant differences were found in the left IOP during intubation between Group S and Group B ($p=0.038$) and Group S and Group NS ($p < 0.01$), while no significant difference was found between Group B and Group NS ($p>0.05$).
In pairwise comparisons between groups, significant differences were found in the left IOP at the 10th minute between Group S and Group B ($p = 0.009$) and Group S and Group NS ($p = 0.002$), while no significant difference was found between Group B and Group NS ($p>0.05$).
In pairwise comparisons between groups, significant differences were found in the left IOP at the 20th minute between Group S and Group NS ($p = 0.006$), while no significant differences were found between Group S and Group B and Group B and Group NS ($p>0.05$).
In within-group comparisons of left IOP over time, in Group S, each measurement value was compared with the previous value, and significant differences were found in Baseline-Induction ($p < 0.01$), Induction-Intubation ($p < 0.01$), Intubation-10th min ($p < 0.01$), and 10th min-20th min ($p < 0.01$).
Left IOP decreased after induction but increased significantly after intubation (Table 4).
In within-group comparisons of left IOP over time, in Group B, each measurement value was compared with the previous value, and significant differences were found in Baseline-Induction ($p < 0.01$), Induction-Intubation ($p < 0.01$), Intubation-10th min ($p < 0.01$), and 10th min-20th min ($p < 0.01$).
Left IOP decreased after induction but increased significantly after intubation (Table 4).
In within-group comparisons of left IOP over time, in Group NS, each measurement value was compared with the previous value, and significant differences were found in Baseline-Induction ($p < 0.01$), Induction-Intubation ($p < 0.01$), Intubation-10th min ($p < 0.01$), and 10th min-20th min ($p = 0.001$). Left IOP decreased after induction but increased significantly after intubation (Table 4).

Table 4. Evaluation of left IOP

	Smoker	Quit smoking	Nonsmoker
Beginning	14.2±1.78	14.06±1.92	14.36±1.81
Induction	10.22±1.88	10.64±1.78	10.64±2.09
Intubation	17.66±2.5	16.64±22.09	15.78±2.36
10th Minutes	13.82±1.9	12.74±2.28	12.54±1.92
20th Minutes	12.72±2.04	12.06±2.19	11.64±1.6

Intubation is performed to maintain airway patency, control respiration, reduce respiratory effort, prevent aspiration, and facilitate resuscitation in case of any problem (Kayhan, 2004, Butterworth et al., 2013). In patients undergoing general anesthesia, airway control can be achieved through laryngoscopy and endotracheal intubation. Significant hemodynamic changes occur during anesthesia induction, laryngoscopy, and tracheal intubation (Hamaya et al., 2000). Factors such as age, gender, weight, and height are known to affect the success of laryngoscopy and endotracheal intubation, as well as hemodynamic responses. In our study, the groups were similar in terms of age, gender, weight, and height. This similarity standardized the responses to laryngoscopy and intubation, making the results independent of patient-related factors and more reliable (Mehra et al., 1976). During endotracheal intubation, unwanted hemodynamic responses occur due to sympathetic system discharge. Although these hemodynamic changes are usually transient and do not have significant clinical effects in most patients, they can increase morbidity and mortality in patients with coronary artery disease, history of myocardial infarction, hypertension, increased intracranial pressure due to intracranial tumors, cerebrovascular disease, or elevated intraocular pressure (Kaplan & Schuster, 1911).

Patients included in the study were selected from the ASA I and II group, without any known systemic or ophthalmic diseases, and the same anesthetic agents were used to minimize the effects on hemodynamic values and intraocular pressure. The depth of anesthesia is known to affect hemodynamic responses and IOP changes during laryngoscopy and endotracheal intubation (Tulunay & Cuhruk, 2008). In our study, BIS was used to ensure that the depth of anesthesia was within the appropriate range for all patients, preventing unwanted results due to superficial anesthesia and the resulting changes in IOP. Franklin et al. (Franklin et al., 1997) found a relationship between vascular changes and age. Consistent with these results, Ismail et al. (Ismail et al., 2002) examined hemodynamic responses to endotracheal intubation in different age groups and found that middle-aged patients (40-50 years) had a greater diastolic blood pressure (DBP) and chronotropic response, while in older patients (65-80 years), the chronotropic response decreased, and systolic blood pressure (SBP) increased. Patients over 40 years of age were not included in our study, allowing us to differentiate the hemodynamic response seen in patients over 40. An important parameter of the hemodynamic response to intubation is the increase in blood pressure. Shribman et al. (Shribman et al., 1987) conducted a study on 24 patients and found that direct laryngoscopy and supraglottic irritation were the main causes of the sympathoadrenal response during endotracheal intubation. It was thought that the endotracheal tube passing through the vocal cords and the inflated cuff would cause minimal stimulation in the infraglottic region.

Hassan et al. (Hassan et al., 1991) conducted a study on 40 patients and concluded that direct laryngoscopy with pressure on the base of the tongue caused arterial hypertension, tachycardia, and increased catecholamine levels due to proprioceptor activation. It was reported that endotracheal intubation after laryngoscopy stimulated additional receptors in the larynx and trachea, increasing the hemodynamic and epinephrine response.

There is a relationship between smoking and increased blood pressure. With each cigarette smoked, blood pressure temporarily increases, and this increase can last up to half an hour after the last cigarette. This increase is most pronounced in the first cigarette of the day, even in long-term smokers: in normotensive individuals, systolic blood pressure (SBP) increased by an average of 20 mmHg after the first cigarette (Groppelli et al., 1992). In individuals with moderate essential hypertension, the combined use of cigarettes and caffeine caused a 6-mmHg increase in SBP throughout the day (Narkiewicz et al., 1995). In contrast, chronic active smokers generally have slightly lower blood pressure than non-smokers. This decrease has been attributed to smokers being lighter in weight than

non-smokers and to cotinine, the main metabolite of nicotine, having a vasodilatory effect (Benowitz et al., 1989). In a study conducted in France on 12.417 individuals, the relationship between smoking and hypertension was investigated, and the prevalence of hypertension was found to be higher in those who quit smoking than in those who never smoked. Especially in men over 60 years of age, both active smokers and those who quit smoking had a high risk of systolic hypertension. The risk of hypertension was associated with the number of cigarettes smoked per day and the duration since quitting smoking. When adjusted for BMI, this risk was significant in active smokers (Halimi et al., 2002). All patients were selected without hypertension. In our intra-group and inter-group comparisons, no differences were found in the patients' baseline blood pressure values, and these values were within normal limits. The increase in IOP with elevated systemic blood pressure has been explained by various mechanisms. Although the relationship between IOP and SBP, DBP, and MAP has been shown by many researchers, the exact relationship has not been clearly demonstrated. The most researched and accepted mechanisms are as follows: IOP is positively and independently related to increased blood pressure, and its mechanism is that increased blood pressure increases ciliary artery pressure, which increases the filtration fraction of aqueous humor, leading to an increase in IOP (Leske et al., 1983). Some researchers have suggested that it is due to sclerotic changes and increased serum corticosteroids (Carel et al., 1984). In our study, the lack of differences in MAP values between the groups excluded the effect of blood pressure on IOP. MAP decreased after induction in all three groups and increased during intubation, but this increase remained within physiological limits (Hibsh et al., 2024).

There are publications showing that intraocular pressure increases during laryngoscopy and intubation (Duman et al., 2001).

This increase in IOP increases morbidity in eye surgery and directly affects the success of the surgery. Gulati et al. (Gulati et al., 2004) conducted a study on 60 pediatric patients and found that laryngoscopic endotracheal intubation caused a significant increase in IOP. In our study, we also found that IOP increased significantly in all groups after intubation. After intubation, IOP was significantly higher in the smoking group compared to the quit and non-smoking groups. We attributed this to smoking.

In patients with normal intraocular pressure, even temporary increases in IOP can impair retinal perfusion and cause retinal ischemia. Therefore, detailed systemic examinations should be performed before eye surgery. Another parameter to be considered in eye surgery is maintaining stable intraocular pressure (Kayhan, 2004).

One of the factors contributing to the success of eye surgery is intraocular pressure. Intraocular pressure is influenced by many factors. An important effect of anesthesia on the outcomes of eye surgery is the changes it causes in intraocular pressure. While changes in intraocular pressure in normal eyes do not cause any pathology, they can lead to pathologies, including blindness, in patients with eye diseases (Mehra et al., 1976).

Previous studies have shown a positive relationship between obesity and IOP, and obesity has been reported as an independent risk factor for elevated IOP. Obesity has been reported as an independent risk factor for elevated IOP, and IOP is higher in obese individuals in various literature. In these studies, increased intraocular fat tissue raises episcleral and venous pressure, reducing the outflow of aqueous humor. Additionally, weight gain increases red blood cell count, hemoglobin, and hematokrit, increasing blood viscosity and creating resistance to outflow in episcleral veins (Mori et al., 2000). Furthermore, obesity has been reported as a risk factor for hypertension, and elevated blood pressure is thought to increase ciliary artery pressure, increasing the ultrafiltration of aqueous humor and thus increasing IOP (Yip et al., 2007). In a study conducted Karadağ et al. on 60 healthy individuals, two groups with different BMIs were compared, and IOP values were found to be similar in both the low BMI and high BMI groups (Karadağ et al., 2009). In the Tanjong Pagar study, multiple linear regression analysis found no relationship between BMI and IOP. In our study, there was no significant difference in BMI between the groups, thus excluding the effect of BMI on IOP (Yip et al., 2007).

Normally, right and left IOPs are similar, and a difference of 4 mmHg between the two eyes is seen in only 4% of normal individuals (Karadağ et al., 2009). Afshan et al. found no significant difference in IOP values between the right and left eyes in their study (Afshan et al., 2012). In a study conducted by Havelius and Hansen, IOP values were compared to 20 smokers and 20 non-smokers without any additional diseases, and no significant difference was found between the right and left eyes (Havelius et al., 2005). The Barbados study also found no significant difference in IOP between the right and left eyes. The Tajimi Eye Study, conducted in Tajimi, Japan, included 7,313 individuals over 40 years of age, 61% of whom were women. This study also found no difference in IOP between the right and left eyes or between men and women (Suziki et al., 2005, Iwase et al., 2004). In our study, consistent with these studies, no significant difference was found in IOP values between the right and left eye.

Smoking is known to affect many systems in our body and is a risk factor for the development of some eye diseases. Smoking has been associated with thyroid ophthalmopathy, scleritis, toxic and non-arthritic ischemic optic neuropathy, Leber's optic neuropathy, strabismus, diabetic retinopathy, primary open-angle glaucoma, refractive errors, age-related macular degeneration, and uveitis in various studies (Grzybowski, 2008). Lee et al. (Lee et al., 2003) and Wu et al. (Wu et al., 1997) found in their studies that smoking increases IOP. In a study conducted by Yoshida et al. on 569 patients, it was found that smoking increased IOP; this was attributed to the systemic blood pressure-increasing effect of smoking and the resulting increase in ultrafiltration, as well as the blood viscosity-increasing effect of smoking. In another study supporting the increase in IOP, Rojanapongpun et al. showed that nicotine significantly increased ophthalmic artery blood flow but decreased peripheral blood circulation in smokers (Yoshida et al., 2003). In a study conducted by Tamaki et al., it was found that nicotine caused vasospasm in peripheral small vessels due to its metabolic and vascular effects, leading to acute impairment in optic nerve head circulation in smokers (Tamaki et al., 1999). In a study conducted by Afshan et al., 100 patients aged 40-60 were divided into two groups of 50 smokers and 50 non-smokers. The control group of non-smokers was compared with the smoking group, and IOP was significantly higher in the smoking group (Yip et al., 2007).

In a study conducted by Carel et al., a weak relationship was found between smoking habits and high IOP values (Carel et al., 1984). In a study conducted by Wang et al. on 248 Chinese individuals, no relationship was found between smoking and elevated IOP (Wang et al., 2012). The Beaver Dam (Klein et al., 1992) and Melbourne studies (Helm et al., 2015) found no effect of smoking on IOP.

4. Conclusion

When we look at the results of the studies, there are different results regarding the relationship between IOP and smoking, and there are various interpretations of the relationship between smoking and IOP. In our study, we found that baseline IOP values were similar in both eyes in smokers, quitters, and non-smokers. This result can be explained by the development of tolerance to nicotine in smokers. Further studies are needed to evaluate the relationship between smoking and IOP and to clarify the exact mechanisms.

The negative changes caused by increased intraocular pressure during endotracheal intubation, especially the negative effects on eye surgery, should be considered, and measures should be taken to prevent the increase in intraocular pressure in smokers during intubation. Smoking, one of the most significant habits threatening public health, should be considered for its systemic and ocular side effects; it can increase intraocular pressure, cause ocular damage, and increase the risk of various eye diseases such as glaucoma, and it may make IOP control more difficult in glaucoma patients. The public should be informed about this issue; considering our results, quitting smoking will increase intraocular pressure less during intubation, allowing safer anesthesia to be administered to patients.

Conflicts of interest: No conflict of interest

Author Contribution Statement

All authors were responsible for the design of this study, extracting and analyzing data, drafting the manuscript, revising the manuscript critically, providing feedback on the study and updating reference lists.

Funding Statement: This research received no grant from any funding agency, commercial or not-for-profit sectors.

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SSHS, 2025; 7(2), 86-94
DOI: 10.55895/sshs.1593145
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

NON-CELIAC GLUTEN SENSITIVITY: A TRADITIONAL REVIEW

NON-ÇÖLYAK GLUTEN HASSASİYETİ: GELENEKSEL BİR DERLEME

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Review Article
Received: 29.11.2024, **Accepted:** 11.05.2025
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Abstract
Non-celiac gluten sensitivity (NCGS) is a disorder characterized by gastrointestinal and extra-intestinal symptoms caused by the consumption of gluten-containing foods in individuals who do not have celiac disease or wheat allergy. The limited knowledge regarding NCGS has led to various challenges in diagnosis and disease management. Due to the lack of sensitive and reproducible biomarkers for diagnosis, current evidence on NCGS prevalence is primarily based on survey studies. Although it is believed that both innate and adaptive immune systems play a role in the pathogenesis of NCGS, this remains an area of uncertainty. A gluten-free diet is recommended as the best treatment method for symptom control in NCGS. However, the gluten-free diet may lead to deficiencies in certain macro and micronutrients, and thus should be followed under the supervision of a nutritionist and clinician. With the continuously evolving body of knowledge, significant progress has been made in understanding the perspective on NCGS. The aim of this review is to provide a comprehensive overview of the etiopathogenesis, clinical features, and treatment of NCGS considering the most recent data.

Keywords: Diagnose, Epidemiology, Gluten-free diet, Non-celiac gluten sensitivity

Öz
Non-çölyak gluten hassasiyeti (NCGS), çölyak hastalığı veya buğday alerjisi olmayan bireylerde, gluten içeren besinlerin tüketimi ile gastrointestinal ve ekstraintestinal semptomlara neden olan bir bozukluktur. NCGS'ye ilişkin bilgilerin oldukça sınırlı olması, tanı koymada ve hastalık yönetiminde çeşitli zorluklara neden olmaktadır. Tanı için duyarlı ve tekrarlanabilir biyobelirteçlerin eksikliği nedeni ile NCGS prevalansını belirlenmeye yönelik mevcut kanıtlar anket çalışmalarına dayanmaktadır. NCGS patogenezinde doğuştan gelen ve adaptif bağışıklık sisteminin etkili olduğu düşünülmekle birlikte bu durum henüz netliğe kavuşturulmamıştır. NCGS'de semptomların kontrolü için en iyi tedavi yöntemi olarak glutensiz diyet önerilmektedir. Glutensiz diyet, bazı makro ve mikro besin ögelerinde eksikliklere neden olabilir bu nedenle beslenme uzmanı ve klinisyen kontrolünde yürütülmelidir. Sürekli güncellenen bilgiler ile NCGS'ye ait bakış açısında ilerleme kaydedilmektedir. Bu derleme çalışmasının amacı ise güncel bilgiler ışığında NCGS'nin etiyopatolojisi, klinik özelliklerinin daha iyi anlaşılması ve tedavisine yönelik genel bir bakış açısı sunmaktır.

Anahtar Kelimeler: Tanı, Epidemiyoloji, Glutensiz diyet, Non-çölyak gluten hassasiyeti

1. Definition and clinical features of non-celiac gluten sensitivity

Gluten-related disorders encompass allergic reactions, autoimmune diseases (such as dermatitis herpetiformis, gluten ataxia, and celiac disease), and, more recently, the increasingly reported condition known as non-celiac gluten sensitivity (NCGS). The earliest descriptions of gluten sensitivity were made in the literature in the 1980s (Cooper et al., 1980). A panel of experts was subsequently convened in London in February 2011 to build consensus on a new nomenclature and classification of gluten-related disorders. After this panel, NCGS emerged as a new definition to avoid confusion with celiac disease, which is defined as gluten-sensitive enteropathy (Sapone et al., 2012). These disorders, which are

prevalent worldwide, significantly reduce individuals' quality of life (Miranda et al., 2023).

NCGS is a condition characterized by various symptoms triggered by the consumption of gluten-containing foods in individuals without celiac disease or wheat allergy. In addition to gastrointestinal symptoms, extraintestinal manifestations can also occur in individuals with NCGS (Sürmeli & Karabudak, 2019). Typically, symptoms begin shortly after the consumption of gluten-containing foods, decrease or disappear upon gluten withdrawal, and reappear with gluten reintroduction (Barbaro et al., 2020). The most common symptoms of NCGS include abdominal pain, bloating, changes in bowel habits, fatigue, headache, brain fog, anxiety, joint and muscle pain, and numbness in the legs or arms (Barbaro et al., 2020; Cárdenas-Torres et al., 2021). Studies based on self-reported data from individuals with NCGS indicate that gastrointestinal symptoms are more prevalent than extraintestinal ones (Mansueto et al., 2019; Potter et al., 2020; Cárdenas-Torres et al., 2021). NCGS has been reported to occur more frequently in women than men and in young to middle-aged individuals compared to other age groups. Autoimmune diseases are present in 24–25.3% of individuals diagnosed with NCGS, with autoimmune thyroid disease being the most common, observed in 69.5–100% of cases (Cárdenas-Torres et al., 2021).

2. Epidemiology of non-celiac gluten sensitivity

Due to its relatively recent recognition and the absence of sensitive and reproducible biomarkers for diagnosis, the global prevalence of NCGS remains unknown. Epidemiological studies have estimated the prevalence of NCGS based on self-reported data (Vasagar et al., 2017). These studies have identified three criteria for diagnosing NCGS: the presence of discomfort or adverse reactions following the consumption of gluten-containing foods, the absence of a physician-diagnosed celiac disease or wheat allergy, and adherence to a gluten-free diet (Cárdenas-Torres et al., 2021).

Although these studies rely on self-reported data rather than objective tests to exclude celiac disease and wheat allergy, which is a limitation, they provide a foundation for further epidemiological research. In Western populations, the prevalence of NCGS has been reported to range from 0.6% to 10.6% (Shahbazkhani et al., 2020).

3. Pathogenesis of non-celiac gluten sensitivity

While the pathogenesis of NCGS remains unclear, evidence suggests a role for the innate immune system. Compared to healthy individuals and those with celiac disease, intestinal biopsies from individuals with NCGS show increased expression of toll-like receptor 2 (TLR2) and decreased expression of FOXP3 (forkhead box P3), a member of the FOX protein family (Shahbazkhani et al., 2020). Elevated levels of interleukin (IL)-10, transforming growth factor (TGF)-α, granulocyte-macrophage colony-stimulating factor (GM-CSF), and lipopolysaccharide (LPS)-binding protein have been observed in individuals with wheat sensitivity, even in the absence of celiac disease (Cárdenas-Torres et al., 2021).

The detection of RNA transcripts involved in the activation of the innate immune system, such as azurocidin 1 (AZU1), bone morphogenetic protein-7 (BMP7), and cluster of differentiation 70 (CD70), in the intestinal mucosa of individuals with NCGS underscores the dominant role of innate immunity (Efthymakis et al., 2020). Furthermore, approximately half of individuals with NCGS exhibit anti-gliadin antibodies, and elevated levels of tumor necrosis factor (TNF)-α and IL-17 compared to healthy controls suggest a potential involvement of the adaptive immune system as well (Mansueto et al., 2020).

Increased eosinophils, intraepithelial CD3+ T cells, lamina propria CD45+ cells in the duodenum and rectal tissues, and mast cells in the duodenum of NCGS patients have been linked to intestinal inflammation (Cárdenas-Torres et al., 2021). Additionally, an increased percentage of cells expressing cytokines that induce and sustain Th1 and Th17 responses, such as IL-12, IL-15, and IL-2, as well as those expressing TNF-α and IL-1β, highlights the simultaneous roles of both innate and adaptive immune systems in NCGS (Castillo-Rodal et al., 2020).

Changes and dysfunction in the intestinal barrier in individuals with NCGS stimulate immune responses by facilitating the activation of both innate and adaptive immune systems through the translocation of microbial products (Uhde et al., 2016). Although the specific triggering role of gluten remains unclear, it has been suggested that the pathogenesis of NCGS may be multifactorial. Gluten has been reported to induce the release of zonulin, which increases intestinal permeability and allows the passage of molecules from the intestinal epithelium to the lamina propria. Gliadin peptides, upon entering the lamina propria, activate the innate immune system via TLR-2 and TLR-4 receptors, inducing the release of pro-inflammatory cytokines (Herrera et al., 2018).

Amylase/trypsin inhibitors (ATIs), resistant to gastrointestinal proteases and found in the endosperm of plant seeds, have been implicated in NCGS pathophysiology, although their exact role remains uncertain. ATIs are known to activate the innate immune system by triggering the nuclear factor kappa-B (NF-κB) pathway, which leads to the release of pro-inflammatory cytokines such as IL-8, IL-15, TNF-α, and monocyte chemoattractant protein-1 (MCP-1) by dendritic cells, macrophages, and monocytes. Intestinal barrier dysfunction may allow

ATIs to reach the lamina propria and interact with immune cells, thereby exacerbating the release of pro-inflammatory cytokines (Zevallos et al., 2017).

4. Diagnostic process of non-celiac gluten sensitivity

There are no specific biochemical, immunological or histopathological markers associated with NCGS (Al-Toma et al., 2019). The diagnosis of NCGS is considered in patients with persistent intestinal complaints where celiac disease and wheat allergy biomarkers are normal, yet various symptoms are triggered by consuming gluten-containing foods (Roszkowska et al., 2019). Symptoms in NCGS typically begin immediately after gluten intake and resolve upon gluten withdrawal from the diet. And most of these patients are already on a gluten-free diet (GFD) when they are first seen in a specialised clinic. Due to its similarity to symptoms of irritable bowel syndrome (e.g., headache, fatigue, muscle pain), diagnosing NCGS is challenging, especially in the absence of sensitive and specific biomarkers (Barbaro et al., 2018; Sürmeli & Karabudak, 2019). A multi-step approach is recommended by the Salerno Expert Criteria to diagnose NCGS (Catassi et al., 2015).

- In the first stage, a clinical and laboratory evaluation should be performed to exclude celiac disease and wheat allergy when consuming a GFD. If celiac disease is suspected, a duodenal biopsy can be performed and if Marsh (0-1), i.e. the risk of celiac disease is low, basic symptoms should be determined while the patient is on a gluten-containing diet, GFD should be monitored for at least 6 weeks and symptoms should be reassessed. Additionally, the modified version of the Gastrointestinal Symptom Rating Scale (GSRS) can be employed for symptom assessment (Kulich et al., 2008). Non-celiac gluten sensitivity is excluded in individuals who do not show improvement in symptoms.

-In the second stage, a clinical evaluation is performed with single or double-blind placebo-controlled gluten loading tests. Gluten loading is necessary in patients responding to GFD therapy and in individuals who were on GFD prior to testing. Whether this should be done by the addition of gluten or by some other means that excludes FODMAP is a matter of debate. Ideally, specific laboratory tests should be repeated serially in clinical evaluations. According to the Salerno Expert Criteria, approximately 40% of individuals with suspected NCGS exhibit a direct relationship between gluten challenge and symptom exacerbation (Lionetti et al., 2017).

Due to the wide variety of clinical symptoms associated with NCGS, it is recommended that diagnostic criteria include negative endomysial antibody (EMA) and anti-tissue transglutaminase (anti-tTG) antibody results, no mucosal abnormalities on small intestinal biopsy, or findings consistent with Marsh grade 0/1 (Sümer et al., 2015). Specific immunoglobulin E (IgE) testing and skin prick testing should be performed to exclude wheat allergy, with no detectable specific IgE antibodies expected. Additionally, an appropriate screening for celiac disease must precede the diagnosis of NCGS. Patients diagnosed with NCGS have been found to have positive antigliadin antibody IgG and IgA levels, although these levels are significantly lower compared to those in celiac disease patients (Uhde et al., 2020). Human leukocyte antigen (HLA) DQ2/DQ8 haplotypes, commonly associated with celiac disease, are present in approximately 50% of NCGS patients, whereas this prevalence exceeds 95% in celiac disease cases (Mansueto et al., 2019). These biomarkers are critical for accurately distinguishing NCGS from celiac disease and wheat allergy. Furthermore, the intensity of symptoms in NCGS is typically lower than in celiac disease or wheat allergy, and symptoms tend to resolve more quickly (Cabanillas, 2020). Symptoms such as bloating, abdominal pain, and altered bowel habits, observed in irritable bowel syndrome (IBS), may also occur in NCGS. However, while triggers in NCGS include gluten, amylase/trypsin inhibitors (ATIs), and FODMAPs, IBS can involve a broader range of dietary triggers beyond gluten-containing grains (Rinninella et al., 2019). Small intestinal biopsies from patients with NCGS often appear normal or show mild inflammation. Table 1 compares gluten-related disorders, highlighting their key distinctions. In addition, the European Society for the Study of Coeliac Disease (ESsCD) has recommendations on the diagnosis and management of NGCS and celiac disease (Al-Toma et al., 2019).

1. The presence of NCGS should be considered in patients with gluten-related intestinal and/or extraintestinal complaints and normal results of celiac disease and wheat allergy serological markers on a gluten-containing diet (Strong recommendation, moderate level of evidence).
2. Serology and small bowel histology (when the patient is on a gluten-containing diet) and HLA-DQ typing are necessary to differentiate between celiac disease and NCGS (Strong recommendation, moderate level of evidence).
3. The diagnosis of NCGS is excluded in patients who do not show symptomatic improvement after six weeks of GFD (Strong recommendation, moderate level of evidence).
4. A less-strict GFDs are sufficient in individuals with NCGS compared with individuals with celiac disease (Conditional recommendation, low level of evidence).
5. Other possible causes of IBS-like symptoms should be investigated in patients with a negative gluten test (Conditional recommendation, low level of evidence).

Table 1. Comparison of gluten-related disorders (Cárdenas-Torres et al., 2021)

Characteristic	Non-Celiac Gluten Sensitivity	Celiac Disease	Wheat Allergy
Trigger	Gluten, ATIs, FODMAPs	Gluten	Wheat proteins
Prevalence	0.49–14.9%	1%	1%
Pathogenesis	Predominantly innate immunity	Autoimmune	IgE-mediated allergic reaction
HLA DQ2/DQ8	50% carry HLA DQ2/DQ8 haplotypes	>95% carry HLA DQ2/DQ8 haplotypes	No HLA DQ2/DQ8 restriction
Serological markers	Lack of serological biomarkers (50% IgG AGA positive)	IgA EMA, IgA tTG, IgG DGP	IgE to wheat proteins
Histology	Marsh 0 to 1	Marsh 1 to 4	Normal
Symptom types	Intestinal and extra-intestinal	Intestinal and extra-intestinal	Intestinal and extra-intestinal
Symptom onset	Within hours to days	Within days to weeks	Within minutes to hours
Symptom intensity	Mild	Low to high	Low to high
Complications	Unknown	Long-term complications	Anaphylaxis
Diagnosis	Double-blind placebo-controlled gluten challenge	HLA DQ2/DQ8, antibodies, biopsy	IgE to wheat, skin prick test
Treatment	Gluten-free diet, low-FODMAP diet	Gluten-free diet	Wheat-free diet
Duration of treatment	Unknown	Lifelong	Lifelong

ATI: Amylase-trypsin inhibitors; FODMAPs: Fermentable oligo-, di-, monosaccharides, and polyols; AGA: Anti-gliadin antibodies; DGP: Deaminated gliadin peptides; EMA: Endomysial antibodies; tTG: Tissue transglutaminase.

5. Dietary Treatment in Non-Celiac Gluten Sensitivity

Fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs), have been implicated in triggering symptoms associated with various gastrointestinal disorders, including NCGS. Studies suggest that a low-FODMAP diet may help alleviate NCGS symptoms (Bellini et al., 2020). FODMAPs are fermented by gut bacteria, increasing luminal water content and gas production, which can lead to intestinal distension. This distension activates intestinal mechanoreceptors and the enteric nervous system, potentially contributing to neuropsychiatric symptoms (Khan et al., 2020). However, the specific role of FODMAPs and other grain components in the pathophysiology of NCGS remains unclear (Fernandes Dias et al., 2023).

A gluten-free diet is recommended for individuals with NCGS. However, unlike celiac disease, it has not yet been clarified whether a lifelong gluten-free diet is necessary (Serena et al., 2020). A study reported that 74% of individuals with NCGS continued to follow a gluten-free diet 8 years after diagnosis, and symptoms worsened with the consumption of gluten-containing foods (Carroccio et al., 2017). In a gluten-free diet, gluten, a protein found in grains such as wheat, barley, and rye, is completely removed from the diet. While oats are not thought to trigger an immune response, they can become contaminated with gluten if processed or grown in the same area as wheat, barley, or rye (Sürmeli & Karabudak, 2019; Husby et al., 2020).

Therefore, oats that are specially cultivated, processed, and packaged as gluten-free are considered safe for NCGS patients. There is no tolerance threshold for gluten or wheat in individuals with NCGS (Pinto-Sánchez et al., 2017). Products such as sauces, ready-made soups, ice cream, sausages, candies, desserts, and fruit nectars, even if initially produced as gluten-free, may become contaminated with gluten. Therefore, gluten-free diets should ideally be based on naturally gluten-free and minimally processed foods (Cárdenas-Torres et al., 2021). Information on gluten-containing and gluten-free foods is provided in Table 2. To be considered gluten-free, a food must contain less than 20 ppm/kg or 20 mg/kg of gluten. This threshold is recognized by international authorities, and foods labeled as gluten-free must not exceed 20 ppm of gluten (Wieser et al., 2021). Gluten-free foods can be identified by labels that state "gluten-free" or display a logo indicating that they are gluten-free, or by statements confirming that the product does not contain gluten (Thompson & Simpson, 2015; Serena et al., 2020). Despite patients' efforts to avoid gluten and manufacturers' efforts to produce gluten-free foods, adhering to a strict gluten-free diet is quite challenging.

Table 2. Gluten-containing and gluten-free foods (Presutti et al., 2007)

	Gluten-Containing	Gluten-Free
Cereals	Barley, bulgur, rye, wheat-based semolina, bread or pasta containing wheat or wheat bran, cereals made with wheat, rye, or barley, or cereals containing malt extract or malt flavor, non-pure gluten-free oats	Arrowroot, corn, buckwheat, cornmeal, corn grits, millet, potato starch, rice, rice bran, starch, soy, popcorn, white or brown rice, pure gluten-free oats, quinoa
Vegetables and Legumes	Creamed or breaded vegetables, some types of fried potatoes, canned baked beans	Fresh, frozen, or canned vegetables, soybeans
Fruits	Some commercial fruit pie fillings and dried fruits	All fruits
Dairy Products	Malted milk, some dairy beverages, and flavored or frozen yogurts	Dairy products and milk without gluten additives
Meat, Poultry, Fish, Shellfish, Eggs, and Nuts	Some deli products, sausages, sandwich spreads, and canned meats made with barley, oats, rye, wheat, or gluten-based stabilizers or fillers	Unseasoned meats, poultry, fish, and shellfish; deli products, sausages, sandwich spreads without gluten fillers, eggs, nuts, and peanut butter
Snacks and Sauces	Many commercial salad dressings, instant soups, sauces, and condiments	Butter, margarine, honey, jam, jelly, molasses, sugar, coconut, hard candies, plain chocolate
Beverages	Flavored instant coffees, herbal teas, instant hot chocolate mixes, non-dairy creamers	Pure, instant, or ground coffee; tea, carbonated beverages, fruit juices

5.1. Challenges in implementing gluten-free diets

Applying a gluten-free diet is quite challenging, and patients may unknowingly be exposed to gluten (Rubio-Tapia et al., 2010). A significant portion of celiac disease patients on a gluten-free diet have shown no improvement in intestinal mucosa, and at least 30% of patients experience persistent intestinal symptoms. It has been noted that unknowingly being exposed to gluten may be associated with these issues (Penny et al., 2020).

Adherence to gluten-free diets can cause social and economic difficulties, particularly when eating outside the home, and can negatively affect individuals' quality of life (Penagini et al., 2013). Additionally, it can create further challenges for adolescent patients who seek to avoid social exclusion in environments like school. Moreover, the low nutritional quality of gluten-free packaged foods may lead to certain nutritional problems (Barbaro et al., 2018).

5.2. Nutritional concerns in gluten-free diets

While gluten-free diets improve the clinical symptoms of NCGS, they can also lead to some nutritional concerns. Generally, gluten-free diets are low in complex carbohydrates and proteins, while being high in fats and simple carbohydrates. Because gluten-free packaged foods tend to be higher in energy compared to their gluten-containing counterparts, individuals may experience weight gain when transitioning to a gluten-free diet (Amirikian et al., 2019; Cárdenas-Torres et al., 2021; Vereczkei et al., 2023).

5.3. Nutritional concerns related to macronutrient intake

Fruits, vegetables, and whole grain foods are rich in both complex carbohydrates and fiber. As a result, they play a key role in regulating intestinal motility, promoting satiety, and improving blood glucose and lipid profiles. Gluten-free diets, depending on the type of flour and starch used, lead to high carbohydrate and sugar intake while causing a low fiber intake (Cardo et al., 2021).

The quality of dietary fat (saturated, unsaturated fatty acids) is as important as the quantity of fat in the diet. It has been reported that gluten-free packaged foods tend to be high in saturated and hydrogenated fats (Wu et al., 2015). Since dietary fat provides more energy compared to other macronutrients, switching to a gluten-free diet may result in weight gain. Furthermore, an increase in saturated fat intake in individuals on gluten-free diets has been linked to a higher risk of cardiovascular disease (Vici et al., 2016; Niland & Cash, 2018; Ciccone et al., 2019; Motazedian et al., 2023).

Generally, the percentage of energy derived from protein in a gluten-free diet is reported to be lower (Larretxi et al., 2019). A systematic review and meta-analysis have found that gluten-free foods are lower in protein content (Melini & Melini, 2019). This is concerning, as proteins provide multiple benefits such as enhancing satiety, supporting thermogenesis, and preserving muscle mass (Penagini et al., 2013).

5.4. Nutritional concerns related to micronutrient intake

Celiac disease is an autoimmune disease triggered by gluten in which small intestinal enteropathy is observed in individuals with genetic predisposition (positive for HLA-DQ2/HLA-DQ8 alleles) and histologically villous atrophy, crypt hyperplasia and enteropathy caused by increased intraepithelial

lymphocytes in duodenal biopsies are observed (Catassi et al., 2022). Non-celiac gluten sensitivity is considered a clinical disorder characterised by gastrointestinal and extra-intestinal symptoms caused by wheat and/or gluten-containing foods. Unlike celiac disease, there is no specific test to test NCGS, leading to a lack of understanding of its pathophysiology (Abdi et al., 2023). Gluten ingestion does not cause enteropathy or malabsorption in NCGS, but only gastrointestinal and extraintestinal symptoms such as abdominal pain, diarrhoea, constipation, bloating, headache and brain fog (Skodje et al., 2018). While the only available treatment for celiac disease is a GFD, adherence to a GFD is also recommended in patients with NCGS (Abdi et al., 2023). Individuals with active celiac disease may experience deficiencies in micronutrients such as iron, vitamin B12 and folate due to malabsorption resulting from villous atrophy (Martín-Masot et al., 2019). Additionally, impaired fat absorption can lead to decreased levels of fat-soluble vitamins (Jivraj et al., 2022). However, micronutrient deficiencies can also occur in individuals following a gluten-free diet, suggesting that nutrient deficiencies are not solely associated with malabsorption issues. Limited food options and the lack of fortification in gluten-free products have been identified as key factors contributing to micronutrient deficiencies in gluten-free diets (Di Nardo et al., 2019). It has been reported that gluten-free products have particularly low levels of folate and iron (Martín-Masot et al., 2019). Studies have shown that individuals on a gluten-free diet tend to consume lower amounts of folic acid, vitamin C, vitamin B12, magnesium, zinc, and iron (Vici et al., 2016; Niland & Cash, 2018; Melini & Melini, 2019). Since naturally gluten-free foods such as fruits, vegetables, meat, poultry, and fish contain essential vitamins and minerals, the consumption of these foods by individuals with NCGS may help prevent micronutrient deficiencies. However, if deficiencies do occur, healthcare professionals may recommend dietary supplements.

6. Conclusion

The limited knowledge regarding NCGS poses various challenges in diagnosis and disease management. The lack of sensitive and reproducible biomarkers for diagnosing NCGS, along with the absence of a sufficient diagnostic approach for clinical practice, complicates the determination of NCGS prevalence. Current evidence on prevalence relies on survey studies related to NCGS. Although it is believed that both innate and adaptive immune systems play a role in the pathogenesis of NCGS, this remains unclear. A gluten-free diet is recommended as the best treatment method for controlling symptoms in NCGS. However, gluten-free diets may lead to deficiencies in some macro- and micronutrients, and therefore, should be implemented under the supervision of a nutritionist and clinician.

Conflicts of interest: None

Funding Declaration: This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

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SSHS, 2025; 7(2), 95-103
DOI: 1055895/sshs.1660884
Sabuncuoglu Serefeddin Health Sciences
E-ISSN: 2667-6338

BREAST CANCER AND NURSING MANAGEMENT

MEME KANSERİ VE HEMŞİRELİK YÖNETİMİ

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Review Article
Received: 19.03.2025, **Accepted:** 15.04.2025
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Abstract
Breast cancer is one of the most common cancer types among women globally and is a manageable disease with early diagnosis and treatment. Healthy lifestyle changes and regular screening programs play a crucial role in reducing the risk of breast cancer. Nurses play a vital role in increasing patient participation in screening programs, managing treatment side effects, and providing emotional support. Multidisciplinary treatment approaches, combining surgical interventions, radiotherapy, chemotherapy, and hormonal therapies, aim to improve the quality of life of patients. Nursing interventions have been effective in improving patients' quality of life by reducing symptoms such as anxiety, depression, and fatigue. Consequently, the critical role of nurses in the fight against breast cancer is to improve patients' quality of life and enhance their treatment adherence by adopting holistic approaches that address both physical and psychosocial needs.

Keywords: Breast Cancer, Non-pharmacological Methods in Breast Cancer, Nursing Care.

Öz
Meme kanseri küresel anlamda kadın cinsiyette en sık rastlanan kanser türlerinden biri olup, erken teşhis ve tedavi ile yönetilebilir bir hastalıktır. Meme kanseri riskini azaltmada sağlıklı yaşam tarzı değişiklikleri ve düzenli tarama programlarının önemi büyüktür. Hemşireler, bu süreçte hastaların tarama programlarına katılımını artırma, tedavi yan etkilerini yönetme ve duygusal destek sağlama konularında hayati bir rol oynar. Multidisipliner tedavi yaklaşımları, cerrahi müdahaleler, radyoterapi, kemoterapi ve hormonal tedavilerle birleştirilerek hastaların yaşam kalitesini artırmayı hedefler. Hemşirelik müdahaleleri, anksiyete, depresyon ve yorgunluk gibi semptomları azaltarak hastaların yaşam kalitesini iyileştirmede etkili olmuştur. Sonuç olarak, meme kanseriyle mücadelede hemşirelerin kritik rolü, hastaların fiziksel ve psikososyal ihtiyaçlarını karşılamaya yönelik bütüncül yaklaşımlar benimseyerek hastaların yaşam kalitesini iyileştirmek ve tedaviye uyumlarını artırmaktır.

Anahtar Kelimeler: Hemşirelik Bakımı, Meme Kanseri, Meme Kanserinde Nonfarmakolojik Yöntemler.

1. Introduction

Cancer is a disease characterized by the uncontrolled proliferation of abnormal body cells. These cells can originate in any organ or tissue and spread throughout the body, disrupting the functions of these regions. Cancer ranks among the most significant non-communicable diseases (NCDs) worldwide. According to the World Health Organization (WHO), the four most common cancer types globally and in Turkey are lung, breast, colorectal, and prostate cancers. While lung cancer is the most common among men, breast cancer is the most prevalent cancer type in women (International Agency for Research on Cancer, 2023a; International Agency for Research on Cancer, 2023b).

Breast cancer has an extremely heterogeneous nature. The 5-year survival rate for breast cancer patients ranges from 65% to 80%, while the 10-year overall survival rate ranges from 55% to 96% (Phung, Tin, & Elwood, 2019). In high-income countries, the 5-year survival rate exceeds 90%, while it is 66% in India and 40% in South Africa. Addressing inequalities in breast cancer outcomes can be achieved through systematic improvements in access to quality healthcare services, along with alignment to existing resources. The Global Breast Cancer Initiative (GBCI), established by the World Health Organization in 2021, is an initiative that

brings together stakeholders aimed at reducing breast cancer rates by 2.5% annually. This initiative is expected to reduce breast cancer rates by 2.5% over the next 20 years (WHO, 2024a).

Research on pre-cancer, treatment, and care strategies emphasizes that early diagnosis and effective risk reduction methods are critical in the fight against the disease. Lifestyle changes that reduce risk factors and regular screening programs play a strategic role in combating breast cancer (Vidali, & Susini, 2023).

Proactive measures such as early initiation of genetic counseling and regular mammography screenings are recommended for women at high risk. Additionally, a healthy diet, especially the Mediterranean diet, and regular exercise can effectively reduce the likelihood of developing breast cancer. Although hormonal contraceptive methods carry a small risk, it has been observed that this risk decreases after discontinuation of use (Vidali, & Susini, 2023).

In nursing care, nurses play multifaceted roles in increasing patient participation in screening programs, managing treatment side effects, and providing emotional support. In particular, nurse-led patient education and guidance are crucial in overcoming the challenges encountered during the treatment process (Vidali, & Susini, 2023). The aim of this review is to provide information on breast cancer prevention, treatment strategies, and nursing care based on current data.

2. Literature Review

2.1. Epidemiology

Breast cancer is a malignancy that accounts for 36% of all oncological diseases, with the highest incidence rate in women. In 2018, approximately 2.089 million women were diagnosed with breast cancer. This number has a higher incidence in industrialized countries. Nearly half of the global cases occur in developed countries, a situation associated with a Western lifestyle characterized by poor nutrition, tobacco use, high stress, and insufficient physical activity. In 2018, the United States recorded 234,087 cases, the United Kingdom reported 55,439, France had 56,162, and Germany documented 71,888 cases of breast cancer. Belgium had the highest incidence rate, while Southeast Asia and Africa reported the lowest rates (Smolarz et al., 2022). In 2022, breast cancer led to 670,000 deaths worldwide, approximately half of which occurred in women without significant risk factors other than age and gender. While breast cancer occurs in both sexes, men represent approximately 0.5-1% of the total cases (WHO, 2024b).

2.2. Etiology

Breast cancer has significant genetic and clinical heterogeneity, with the majority being adenocarcinomas. These cancers are typically classified based on invasiveness, morphology, immunohistochemical marker expression, and genetic profiles. These characteristics are associated with varying responses to treatment and prognosis. Localized breast cancers are confined to the ducts or lobules. Ductal carcinoma in situ (DCIS) is more common than lobular carcinoma in situ (LCIS), and both are considered risk factors for invasive breast cancer; however, LCIS is not regarded as a lesion with malignant potential. Women with a first-degree relative diagnosed with breast cancer have a 2 to 3 times higher risk.

It is estimated that 10-15% of breast cancers are hereditary, but only 30% of hereditary cases have a known pathogenic mutation. Approximately 5-10% of breast cancers arise from germline mutations, including mutations in the BRCA1 and BRCA2 genes (Houghton, & Hankinson, 2021).

2.3. Risk factors

Risk factors for breast cancer are categorized into modifiable and non-modifiable factors. Modifiable risk factors include obesity, excessive alcohol consumption, a sedentary lifestyle, use of birth control, external hormone exposure (such as hormone replacement therapy), and radiation exposure. Non-modifiable risk factors include advancing age, genetic predisposition (mutations in BRCA1 or BRCA2, PALB2, TP53, PTEN, STK11, NF1), endogenous hormone exposure, early menarche, late menopause, nulliparity, and late pregnancies. Protective factors include breastfeeding, physical activity, reducing alcohol consumption, and the use of medications such as aspirin (Katsura et al., 2022).

2.4. Pathology

The majority of breast cancers are adenocarcinomas, with 85% originating from the mammary ducts and 15% from lobular epithelium. Ductal pathology varies from in situ ductal carcinoma to invasive carcinomas that breach the basal membrane and spread to adjacent breast parenchyma. Other forms of breast cancer include Paget's disease, inflammatory breast cancer, and papillary carcinomas. Sarcomas, particularly malignant phyllodes tumors and angiosarcomas, are very rare. Tumor formation results from the dysregulation of pathways controlling cell proliferation and apoptosis (Katsura et al., 2022).

2.5. Breast cancer symptoms

Common symptoms of breast cancer include breast swelling or thickening, pain in the breast or armpits, skin puckering or dimpling, redness of the breast skin, discharge or bleeding from the nipple, rashes

on the breast, and changes or retraction of the nipple. Other symptoms may include swelling in the armpits, changes in the shape and size of the breast or nipple, unexplained weight loss, and fatigue (Elshami et al., 2022).

2.6. Early diagnosis and screening prevention

Targeted risk factors for breast cancer prevention include maintaining a healthy weight, regular physical activity, reducing or completely avoiding alcohol consumption, and limiting postmenopausal hormone replacement therapy. Healthy eating and breastfeeding also play a role in reducing risk factors. For women at high risk, selective estrogen receptor modulators or aromatase inhibitors are recommended. Prophylactic mastectomy and oophorectomy are surgical options for risk reduction (Houghton, & Hankinson, 2021).

Screening and Early Diagnosis: Mammography is the most commonly used method for screening. However, recommendations regarding the age and frequency of screening vary among organizations. In high-income countries, screenings are typically conducted biennially for women aged 50-69 or 70. Mammography can detect the disease at early and treatable stages, potentially reducing breast cancer mortality. However, screening may result in false positive results and overdiagnosis. For women at high risk, additional annual MRI screenings are recommended, with other alternative screening methods including ultrasound, MRI, and digital breast tomosynthesis. Various studies continue to explore optimal screening intervals, starting ages, and alternative methods (Esserman, 2017).

In Turkey, as part of the national screening program, women are provided with counseling services to perform monthly breast self-examinations, annual clinical breast exams are conducted, and mammography is recommended every two years for women aged 40-69 (Sağlık Bakanlığı, 2024).

Palpation: During a breast examination, the palmar surface of the index, middle, and ring fingers is used to gently palpate the upper and lower edges, as well as the medial and lateral sides of both breasts. This technique allows the examiner to detect differences in tissue density. Subsequently, the tips of these three fingers are used to palpate the superficial, middle, and deep planes of the breast tissue in its four quadrants, as well as the nipple. Benign masses typically do not cause changes in the skin and are generally smooth, mobile, and well-defined. However, fibroadenomas and tense cysts may feel firmer. To palpate the axillary lymph nodes, the patient's forearm is supported from below, and the fingertips of the opposite hand palpate the four corners of the axilla and deep axillary nodes. Finally, the supraclavicular nodes on both sides are palpated (Katsura et al., 2022).

3. Treatment

3.1. Multidisciplinary treatment decisions

Treatment plans are determined based on tumor characteristics, the patient's overall health, and preferences. Decision-making tools such as Adjuvant Online, Predict, and NICE guidelines are used. Additionally, tumor profiling analyses (e.g., Oncotype DX, MammaPrint) are employed to assess the risk of recurrence and monitor treatment response (Goggins, 2024). Surgical treatment includes the removal of the breast cancer and axillary lymph nodes. Oncoplastic breast-conserving surgery aims to optimize cosmetic outcomes and quality of life while maintaining oncological safety. The use of sentinel node biopsy ensures accurate staging with minimally invasive surgery and reduces morbidity (Goggins, 2024).

3.2. Upper extremity edema

Postmastectomy syndrome (PMES) is the most commonly observed symptom, affecting 2% to 90% of patients. Research shows that the progression of PMES leads to loss of workforce capacity in one-third of patients following surgery. After radical mastectomy, neurological symptoms and limited mobility in the shoulder region are commonly seen. PMES is characterized by impaired lymphatic drainage, fibrous tissue formation, and brachial plexopathy. Postoperative radiotherapy can exacerbate fibrosis, leading to severe physical and psycho-emotional distress. Lymphedema can develop due to high protein concentration and granulation tissue (Filonenko et al., 2021).

3.3. Adjuvant therapy

Radiotherapy reduces the risk of local recurrence, while endocrine therapy and chemotherapy reduce the risk of systemic recurrence. Endocrine therapy uses drugs that target estrogen receptors, while chemotherapy often employs combination regimens to minimize toxicity and prevent resistance development (Goggins, 2024).

3.4. Molecular targeted therapies

In HER2-positive patients, monoclonal antibodies such as trastuzumab are used, while promising new treatments like CDK 4/6 inhibitors and PD-1/PD-L1 targeted immunotherapies are being investigated for ER-positive patients. PARP inhibitors have shown efficacy in patients with BRCA gene mutations (Goggins, 2024).

3.5. Post-breast cancer follow-up care

The NICE guidelines (2009) recommend annual mammography and clinical follow-up until adjuvant treatments are completed, for a period of five years. Follow-up protocols are typically determined at the local level and should include the management of

the side effects of adjuvant hormones, particularly their impact on bone health (Goggins, 2024).

4. Nursing Management

4.1. Preoperative nursing care for breast cancer patients

It is important to understand individuals' knowledge and experiences in order to prevent misunderstandings and develop an appropriate education plan. Nurses, in collaboration with doctors, should aim to reduce the patient's anxiety and answer any questions. Before surgery, details about the procedure, its rationale, risks, the shape, location, and drainage of the incision should be explained. Additionally, exercises such as turning in bed, sitting, coughing, deep breathing, and shoulder and arm exercises should be taught and practiced. Patients should be encouraged to express their thoughts and feelings regarding breast loss, and, when possible, communicate with individuals who have undergone similar surgeries (Ateş, & Dikmen Totur, 2021).

4.2. Postoperative nursing care for breast cancer patients

The patient should be provided with self-care education, with adjustments made based on their anxiety levels. Self-care measures should also be taught, and routine surgical procedures clarified. Empathetic and compassionate care should be provided to enhance the patient's hope and morale. A comprehensive care plan addressing physical, emotional, and spiritual needs should be created, and patients should be encouraged to express their hopes, dreams, anxieties, and sadness. The patient's and family's psychosocial history should be investigated, and a biopsychosocial care plan should be developed. Patients should be instructed to wash their hands before touching the incision area and informed about performing regular exercises at home. The patient should be advised to seek medical attention if there is swelling or inflammation at the incision site, and dressing should be checked for bleeding or serous fluid leakage. During dressing changes, wound healing and signs of infection should be reviewed. For patients discharged with drainage, instructions on how to follow up with drainage and empty the drainage bag should be provided. A high-calorie, high-protein diet should be given to meet energy needs and support tissue repair. Patients should be encouraged to openly and sensitively discuss their thoughts on privacy, sexuality, body image, and treatment effects. If the patient is married, their spouse should be encouraged to participate in these stages. Within the first 24 hours after mastectomy, the patient should be instructed to avoid arm and shoulder movements, perform hand exercises, and elevate the arm with a pillow. No powder, deodorant, lotion, or perfume should be applied to the incision area until it heals. Blood pressure measurements, intravenous procedures, or injections should not be done on the arm with the incision site (Kalkan, 2022).

4.3. Symptom management nursing care for breast cancer patients

Pain: Pain management should include both pharmacological and complementary methods. Nursing care should be coordinated, and the side effects of analgesics should be monitored. Evidence-based methods should be supported (Bahar et al., 2019).

Nausea and Vomiting: Adequate fluid intake and small, frequent meals should be ensured. Alternative methods such as hypnosis, aromatherapy, acupuncture, and progressive relaxation techniques can also be utilized (Bahar et al., 2019).

Fatigue: The causes of fatigue should be identified, and appropriate medication or vitamin supplementation should be provided. A high-protein diet should be followed, and psychosocial interventions should be planned. Physical therapy and exercise should be encouraged, regular physical activity recommended, and customized exercise programs created (Bahar et al., 2019).

Dyspnea: To manage dyspnea, air circulation should be increased, relaxation techniques should be used, position changes should be encouraged, anxiety should be reduced, and supportive oxygen therapy with postural drainage should be implemented (Bahar et al., 2019).

Oral Mucosal Inflammation (Mucositis): The oral cavity should be monitored, and proper oral hygiene should be maintained. Patients should be educated on preventing mucositis and maintaining oral care, with recommendations to gargle with saline and sodium chloride solutions (Bahar et al., 2019).

Hair Loss (Alopecia): Information about hair loss should be provided, and self-care strategies should be taught. Patients should be encouraged to cut their hair before it falls out and informed about materials available for managing hair loss (Bahar et al., 2019).

Constipation: The patient's bowel function should be assessed, and they should be encouraged to visit the bathroom after meals to establish bowel habits, thus stimulating the gastrocolic reflex. Adequate fluid intake should be ensured, a high-fiber diet recommended, and daily exercise encouraged (Bahar et al., 2019).

Diarrhea: The causes of diarrhea should be identified, and fluid-electrolyte balance should be maintained. Trigger foods such as spicy and fried foods should be avoided (Bahar et al., 2019).

Neutropenia: Infection symptoms should be closely monitored, and both the patient and their family

should be educated on infection prevention strategies (Bahar et al., 2019).

Thrombocytopenia: A safe environment should be provided, and the patient should be protected from trauma. Platelet counts should be monitored (Bahar et al., 2019).

Anxiety and Stress: Complementary therapies, such as reflexology and yoga, can promote deep relaxation and parasympathetic responses. For depression symptoms, massage therapy and music therapy should be used, and support from family, friends, and spouses should be encouraged (Bahar et al., 2019).

Terminal Delirium: Excessive stimuli should be avoided, and a familiar environment should be created to ensure the patient's safety (Bahar et al., 2019).

Insomnia: Factors contributing to insomnia should be identified, and education on sleep hygiene should be provided. Supportive methods such as massage, yoga, and meditation should be utilized (Bahar et al., 2019).

5. Effectiveness of Nursing Care in Breast Cancer Patients

Studies by Maguire et al. (1980) and McArdle et al. (1996) found that nursing care reduces anxiety and depression in breast cancer patients (Maguire et al., 1980; McArdle et al., 1996). Ritz et al. (2000) and Wengström et al. (1999) also reported that nursing care reduces uncertainty and depression in breast cancer patients (Wengström et al., 1999; Ritz et al., 2000). A study by Goodwin et al. (2003) found that nurse-led case management interventions, applied to 335 breast cancer patients over 12 months, resulted in significant improvements in arm function within two months post-surgery (Goodwin et al., 2003). Coleman et al. (2005) evaluated the social support and education provided by oncology nurses via phone for 2-4 weeks after surgery. Both the experimental and control groups showed a reduction in symptom distress (Coleman et al., 2005).

Arving et al. (2007) found that nursing care interventions significantly reduced side effects such as nausea, vomiting, insomnia, and dyspnea in the intervention group (Arving et al., 2007). There is strong evidence supporting the effectiveness of nurse-led education, guidance, and case management interventions in symptom management (Chan at al., 2020).

According to a meta-analysis by Lu et al. (2022), nursing interventions improved sexual function and satisfaction, reduced depression, and increased overall quality of life. Long-term effects on sexual function were particularly evident in younger patients, while short-term improvements in sexual satisfaction were observed in older patients. These findings highlight the potential significant role of nursing interventions in breast cancer treatment (Lu et al., 2022).

A systematic review examining the effectiveness of care interventions for breast cancer patients analyzed 1,972 references and included 13 studies. The interventions included psychological support, end-of-life discussions and preparations, physical activity, lifestyle changes, and medication-assisted self-management. The frequently applied multimodal interventions were found to be effective, with physical activity interventions having a positive impact on symptom experience (Keane et al., 2023).

In a study conducted by Brown et al. (2021) on breast cancer patients, it was found that psychosocial interventions provided by expert cancer nurses were more effective compared to standard care (Brown et al, 2021).

A study investigating the impact of evidence-based nursing (EBN) interventions on upper extremity function in postoperative breast cancer patients demonstrated that EBN interventions improved emotional well-being, reduced lymphedema, and positively affected upper extremity function. Significant improvements were also observed in shoulder and elbow performance, overall health, physical pain, mental health, and physiological function (Wang et al., 2020).

In a study by Zhou et al. (2020), a WeChat-based multimodal nursing program was found to increase the quality of life during early rehabilitation in postoperative breast cancer patients (Zhou et al., 2020).

Nursing interventions have shown a statistically significant effect in reducing cancer patients' symptoms and improving their quality of life (Nayak, & George, 2023).

A study by Zhang et al. (2022) found that evidence-based nursing (EBN) interventions significantly improved sleep quality and psychological well-being in breast cancer patients with liver metastasis. The experimental group had higher sleep quality and lower levels of anxiety, depression, fatigue, distress, and anger compared to the control group. Additionally, EBN interventions increased patients' self-care skills, health knowledge, and mental health (Zhang et al., 2022).

Khezri et al. (2022) found that nursing care increased the levels of hope in breast cancer patients. The nursing intervention program led to improvements in sexual dysfunction, a reduction in stress levels, and an increase in quality of life (Khezri et al., 2022). It is recommended to increase nursing staff awareness regarding the side effects of breast and gynecological cancer treatments (Nady et al., 2018).

6. Effectiveness of Yoga, Exercise, and Other Interventions in Breast Cancer Patients

In a study by Hsueh et al. (2021), it was found that among breast cancer patients who experienced post-treatment complications, the experimental group showed higher levels of social, emotional, and functional health, as well as a better quality of life compared to the control group. Yoga practice in breast cancer patients resulted in significant improvements in physical health, mental health, and sleep quality, with reductions in anxiety, depression, stress, fatigue, and pain intensity (Hsueh et al., 2021).

Lin et al. (2023) found that the most effective intervention for improving post-surgical quality of life and preventing lymphedema among breast cancer survivors was the combination of progressive resistance exercises (PRE) with joint mobility exercises (JME). JME combined with aerobic exercise (AE) was effective in pain relief, while JME combined with PRE showed better overall results in terms of functionality (Lin et al., 2023).

Wang et al. (2023), in a meta-analysis, found that yoga practice significantly improved the quality of life in breast cancer patients experiencing post-treatment complications. The experimental group showed higher levels of social, emotional, and functional health compared to the control group. Additionally, the yoga group showed significant improvements in physical and mental health, sleep quality, anxiety, depression, stress, fatigue, and pain intensity. These findings suggest that yoga practice can enhance the overall well-being of breast cancer patients after treatment (Wang et al., 2023).

In a study by Kunkler et al. (2023), breast cancer patients in the experimental group received radiotherapy, while the control group did not. Over a 10-year period, the cumulative incidence of local breast cancer recurrence was found to be 9.5% in the group that did not receive radiotherapy and 0.9% in the group that received radiotherapy (Kunkler, et al., 2023).

In a study by Li et al. (2021), evidence-based nursing interventions applied to 263 breast cancer patients were found to improve quality of life, relieve symptoms, and reduce negative emotions and postoperative complications (Li et al., 2021).

7. Non-Pharmacological Interventions for Breast Cancer Patients

In a systematic review conducted by Tola et al. (2021), it was found that non-pharmacological interventions such as music, aromatherapy, and acupuncture were effective in reducing pre-surgical anxiety and post-surgical pain in breast cancer patients (Tola et al., 2021).

Jung et al. (2023) found that auricular acupuncture, when managed by nurses, was effective in managing chemotherapy-induced peripheral neuropathy symptoms in breast cancer patients (Jung et al., 2023).

Wei et al. (2022) emphasized that Baduanjin exercises provided positive effects by reducing fatigue and improving anxiety in breast cancer patients undergoing chemotherapy (Wei et al., 2022).

He et al. (2022) reported that culturally specific dance interventions were seen as a promising method for managing fatigue, sleep disturbances, and depression symptoms in breast cancer patients undergoing chemotherapy, and they improved the quality of life. Given the program's acceptability and feasibility, it is suggested that it could be integrated into routine cancer care (He et al., 2022).

Aybar et al. (2020) found that breast cancer patients who performed breathing exercises experienced a reduction in chemotherapy-induced nausea, vomiting, and choking sensations compared to the control group, and their functional status was positively affected (Aybar et al, 2020).

In a study by Chin et al. (2021), it was observed that symptom management self-efficacy and self-care positively impacted the quality of life of oncology patients (Chin et al., 2021).

8. Conclusion

Breast cancer is the most frequently diagnosed malignancy in women, and early diagnosis and risk reduction strategies are vital in managing the disease. Regular screening programs and healthy lifestyle changes are effective in reducing the risk of breast cancer. Nurses play a significant role in increasing patient participation in screening programs, managing treatment side effects, and providing emotional support.

Multidisciplinary approaches in breast cancer treatment aim to improve the quality of life of patients by combining surgical interventions, radiotherapy, chemotherapy, and hormonal therapies. Nursing interventions have been proven effective in reducing symptoms such as anxiety, depression, and fatigue, thereby improving patients' overall quality of life.

In conclusion, effective nursing care in the fight against breast cancer should be supported by early diagnosis and preventive strategies, with a holistic approach that addresses both the physical and psychosocial needs of patients. The critical role of nurses in this process is indispensable for improving patients' quality of life and enhancing their adherence to treatment.

Conflicts of interest: The authors have no conflicts of interest to declare.

Funding Statement: This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

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SSHS, 2025; 7(2), 104-115
DOI: 10.55895/sshs.1733521
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

CLIMATE CHANGE AND THE SUSTAINABLE DEVELOPMENT GOALS FROM A WOMEN'S HEALTH PERSPECTIVE

KADIN SAĞLIĞI PERSPEKTİFİNDEN İKLİM DEĞİŞİKLİĞİ VE SÜRDÜRÜLEBİLİR KALKINMA HEDEFLERİ

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Review Article
Received: 03.07.2025, **Accepted:** 29.07.2025
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Abstract
Climate change, driven by human activities causing global warming, is a significant public health issue that exacerbates social and environmental inequalities worldwide. Climate-related changes such as extreme weather events, disasters, droughts, air pollution, and vector-borne diseases pose serious direct and indirect threats to health. Among the most vulnerable groups affected by these impacts are women, pregnant individuals, and children. Especially in developing countries, limitations in access to fertility, sexual, and reproductive health services further amplify the effects of climate change on women's health. Healthcare professionals, including nurses specializing in women's health and diseases, play a crucial role in mitigating the adverse effects of climate change on women's health. Empowering women against environmental stressors, increasing their adaptive capacity to climate change, and developing health policies that emphasize environmental justice form the foundation of this process. Policies developed in line with the United Nations Sustainable Development Goals — including Gender Equality (Goal 5), Good Health and Well-being (Goal 3), and Climate Action (Goal 13) — have the potential to offer holistic and sustainable solutions for women's health. This review aims to evaluate the impacts of climate change on women's health based on current literature, discuss how these effects relate to sustainable development goals, and offer recommendations for policy and practice-level interventions.

Keywords: Climate action, Climate change, Nursing, Sustainable development goals, Women's health

Öz
İnsan faaliyetlerinin neden olduğu küresel ısınma kaynaklı iklim değişikliği, toplumsal ve çevresel eşitsizlikleri derinleştiren önemli bir halk sağlığı sorunu olarak öne çıkmaktadır. Aşırı hava olayları, doğal afetler, kuraklık, hava kirliliği ve vektör kaynaklı hastalıklar gibi iklim değişikliğine bağlı gelişmeler, sağlığı doğrudan ve dolaylı yollarla tehdit eden ciddi riskler oluşturmaktadır. Bu etkilerden en çok etkilenen gruplar arasında kadınlar, gebeler ve çocuklar yer almaktadır. Özellikle gelişmekte olan ülkelerde doğurganlık, cinsel sağlık ve üreme sağlığı hizmetlerine erişimde yaşanan sınırlılıklar, iklim değişikliğinin kadın sağlığı üzerindeki olumsuz etkilerini daha da artırmaktadır. Kadın sağlığı ve hastalıkları alanında uzmanlaşmış hemşireler de dâhil olmak üzere sağlık profesyonelleri, iklim değişikliğinin kadın sağlığı üzerindeki olumsuz etkilerinin azaltılmasında kritik bir rol üstlenmektedir. Kadınların çevresel stres etkenlerine karşı güçlendirilmesi, iklim değişikliğine uyum kapasitelerinin artırılması ve çevresel adaleti önceleyen sağlık politikalarının geliştirilmesi bu sürecin temel yapı taşlarını oluşturmaktadır. Birleşmiş Milletler Sürdürülebilir Kalkınma Amaçları doğrultusunda geliştirilecek politikalar — Toplumsal Cinsiyet Eşitliği (Hedef 5), Sağlık ve Kaliteli Yaşam (Hedef 3) ve İklim Eylemi (Hedef 13) — kadın sağlığına yönelik bütüncül ve sürdürülebilir çözümler sunma potansiyeline sahiptir. Bu derleme çalışması, iklim değişikliğinin kadın sağlığı üzerindeki etkilerini güncel literatür doğrultusunda değerlendirmeyi, bu etkilerin sürdürülebilir kalkınma hedefleriyle ilişkisini tartışmayı ve politika ile uygulama düzeyinde müdahale önerileri sunmayı amaçlamaktadır.

Anahtar Kelimeler: Hemşirelik, İklim değişikliği, İklim eylemi, Kadın sağlığı, Sürdürülebilir kalkınma hedefleri

1. Introduction

According to the World Health Organization (WHO), climate change is considered one of the most serious environmental threats to human health (WHO, 2019). The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as alterations resulting from human activities that modify the global atmospheric composition (UNFCCC, 1992). Human-induced factors such as industrialization, urbanization, fossil fuel consumption, and deforestation have increased greenhouse gas emissions, leading to atmospheric warming (Ağıralan & Sadioğlu, 2021; EIA, 2021). This has resulted in increased frequency and intensity of natural disasters such as extreme heat, droughts, floods, and wildfires (IPCC, 2012; UNDRR, 2019). It is reported that 84% of disasters occurring between 2008 and 2017 were related to climate change (Watts et al., 2019). These disasters reduce agricultural productivity, cause food insecurity, spread vector-borne diseases, increase forced migration, and restrict access to healthcare services (Scafetta, 2023). Women, pregnant individuals, and children are among the groups most affected by climate change (Sillmann et al., 2021). Women face multifaceted impacts such as malnutrition, mental health problems, difficulties accessing sexual and reproductive health services, obstetric complications, and increased mortality risk (Sbiroli et al., 2022). During pregnancy, adverse outcomes such as placental abruption, preterm labor, and low birth weight are reported to increase; in the menopausal period, vasomotor symptoms and sleep disorders tend to worsen (Giudice et al., 2021; Cucinella et al., 2023). Moreover, environmental factors may contribute to increased incidence of breast, lung, and colorectal cancers (Hiatt & Beyeler, 2023).

In this context, interventions by healthcare professionals, especially nurses, play a crucial role. The International Council of Nurses (ICN) emphasizes that nurses can take significant roles in combating climate change. Nurses are actively involved in promoting environmentally friendly lifestyles at individual and community levels, preparing for disasters, ensuring continuity of healthcare services, and supporting women's adaptation to climate change (ICN, 2018). Professionals working in women's health are also urged to take active roles in advocacy, research, education, and capacity building (Giudice et al., 2021).

The United Nations Sustainable Development Goals (SDGs) approach the interaction between climate change and women's health holistically (UN, 2015). Goals such as Climate Action (Goal 13), Gender Equality (Goal 5), and Good Health and Well-being (Goal 3) aim to mitigate the effects of climate change on women. Accordingly, women's health policies need to be reshaped with a focus on environmental justice and climate sensitivity. The sustainable development approach offers comprehensive solutions not only to environmental threats but also to social inequalities.

This review aims to evaluate the effects of climate change on women's health based on current scientific evidence, provide a multidimensional perspective aligned with the Sustainable Development Goals, and develop recommendations for health policies and practices.

2. Pregnancy and Climate Change

Pregnancy is a period in a woman's life characterized by significant physiological and psychosocial changes. However, environmental stressors caused by climate change—such as air pollution, extreme temperatures, natural disasters, infectious diseases, and displacement—complicate adaptation to pregnancy and adversely affect maternal and fetal health (Giudice et al., 2021). According to the IPCC 2022 report, pregnant women are more vulnerable to climate-related risks including extreme heat, air pollution, inadequate sanitation, and food insecurity. These risks are associated with adverse pregnancy outcomes such as spontaneous miscarriage, stillbirth, low birth weight, and preterm birth (IPCC, 2022).

2.1 Effects of air pollution on pregnancy

Pregnant women and newborns are more vulnerable to air pollution due to physiological differences. Increased oxygen consumption, ventilation rate, and cardiac output during pregnancy lead to greater exposure to inhaled pollutants (Fan & Zlatnik, 2023). Newborns are further affected by immature lung structures, high oxygen demand, and insufficient respiratory muscles (Trachsel et al., 2022; Salvi, 2007). Studies indicate that pollutants can cross the placental barrier and negatively impact fetal development (Bongaerts, 2022). Air pollution has been associated with hypertensive disorders and postpartum depression during pregnancy, as well as placental abruption, preterm birth, low birth weight, and neonatal mortality during the intrauterine period (Aguilera et al., 2023).

2.1.1. Hypertensive disorders

Nationwide studies, systematic reviews, and meta-analyses have demonstrated a significant association between air pollution and hypertensive disorders during pregnancy, including gestational hypertension, preeclampsia, and eclampsia. A study examining over 5 million births in the United States between 1999 and 2004 reported that every 5 $\mu g/m^3$ increase in PM2.5 exposure raised the risk of hypertensive disorders by 10% (Trachsel et al., 2022). A systematic review and meta-analysis of 17 studies

published between 1999 and 2021 found that PM exposure during the first trimester increased the risk of gestational hypertension and preeclampsia, and that every 5 μg/m^3 increase in PM10 exposure throughout pregnancy was significantly associated with this risk (Cao, 2021). Another meta-analysis revealed that each 10 μg/m^3 increase in PM10 exposure during the first trimester raised the risk of gestational hypertension by 7%, while every 5 μg/m^3 increase in PM2.5 exposure throughout pregnancy increased the risk by 18% (Bai et al., 2020).

2.1.2. Postpartum depression

There are limited studies examining the relationship between exposure to air pollutants during pregnancy and postpartum depression (PPD). A cohort study conducted in Mexico with 509 mothers reported that every 5 μg/m^3 increase in PM2.5 exposure during pregnancy was associated with a 1.59-fold increase in the risk of depression at 6 months postpartum (Niedzwiecki et al., 2020). Similarly, a study in China involving 10,209 pregnant women found that every 10 μg/m^3 increase in PM10 and nitrogen dioxide (NO2) exposure during pregnancy was associated with 1.47 and 1.63 times higher risk of PPD at 6 weeks postpartum, respectively (Bastain et al., 2021). Another systematic review and meta-analysis showed that PM10 exposure during the second trimester increased the risk of PPD by 1.26 times (Pourhoseini et al., 2022).

2.1.3. Neonatal death and preterm labor

The impact of air pollution on infant mortality represents a significant global public health issue. According to the State of Global Air (2020) report, in 2019, 476,000 infants died within their first month of life due to health problems related to air pollution. A study conducted in China found that every 10 μg/m^3 increase in PM2.5 levels raised infant mortality by 1.63% (Wang et al., 2023). In the United States, an assessment following the Regional Greenhouse Gas Initiative (RGGI) showed that reductions in CO_2 emissions were associated with a decrease in neonatal mortality by 0.41 per 1,000 live births (Lee & Park, 2019). Another study in Italy demonstrated that each 10 μg/m^3 increase in weekly PM2.5 levels during pregnancy increased the risk of preterm birth by 1.023 times, ozone exposure by 1.02 times, and aeroallergen exposure by 1.01 times (Cocchi et al., 2023). These findings indicate a strong association between air pollution, preterm birth, and neonatal mortality.

2.1.4. Low birth weight

Low birth weight (LBW) is an important risk factor for neonatal health and predisposes to long-term health problems. A systematic review reported that every 10μg/m^3 increase in PM10 exposure during pregnancy resulted in a 6.57–8.65 gram decrease in birth weight and found a significant association between prenatal PM10 exposure and LBW (Uwak et al., 2021). The same study identified that exposure to pollutants such as PM2.5, PM10, NO_2, CO, SO_2, and O_3 increased the risk of LBW. The effects varied by trimester, with NO_2 and CO showing stronger associations in the first trimester, PM10 in the second trimester, and PM2.5 in the third trimester. Each 10 μg/m^3 increase in PM2.5 exposure raised the risk of LBW by 8% (1.08 times), PM10 by 5% (1.05 times), NO_2 by 3% (1.03 times), CO by 1% (1.01 times), SO_2 by 13% (1.13 times), and O_3 by 5% (1.05 times) (Li et al., 2020). These data indicate that especially PM2.5 exposure poses a significant public health risk regarding LBW.

2.2. Effects of extreme temperatures on pregnancy

Extreme weather events and natural disasters lead to significant health threats such as food insecurity, water contamination, infectious disease risk, psychological trauma due to displacement, and violence against women (Camey et al., 2020). Studies show that women are more affected by extreme temperatures compared to men, and this is associated with adverse maternal-fetal outcomes (Marí-Dell'Olmo et al., 2019). Specifically, heatwaves increase the risk of preterm birth and low birth weight, supported by various national studies (MacVicar et al., 2017; Marí-Dell'Olmo et al., 2019). Exposure to increased intrauterine temperature has been linked to higher incidences of congenital anomalies such as conotruncal and septal heart defects and cataracts in the fetus (Lin et al., 2018; Van et al., 2012). In the United States, congenital heart defect cases related to temperature increases are expected to rise by 60% by 2035 (Hu et al., 2019). Additionally, high temperature exposure increases the risks of pregnancy-induced hypertension and placental abruption (He et al., 2018).

2.3. Effects of floods and inundations on pregnancy

Climate change, through changes in precipitation patterns, storms, and the melting of glaciers, leads to rising sea levels, which in turn increase the risk of floods and inundations. Floods and river overflows can cause serious physical and psychosocial issues in women, such as exposure to pollution and toxic substances, infections, stress, anxiety, and depression (Giudice et al., 2021). During flood disasters in Bangladesh, cultural constraints and lack of social services have led to frequent menstrual problems, urinary tract infections, pregnancy complications, and malnutrition among women (Kamal et al., 2018). Hurricanes, on the other hand, have been associated with increased risks of hypertensive disorders, depression, post-traumatic stress disorder, preterm labor, and low birth weight in pregnant women (Xiao et al., 2019). According to the Food and Agriculture Organization (FAO, 2021), floods, droughts, and

wildfires significantly increase food insecurity, especially in low- and middle-income countries, which contributes to health problems such as anemia, preeclampsia, preterm birth, and low birth weight in pregnant women.

2.4. Effects of vector-borne diseases on pregnancy

Vector-borne diseases cause over one million deaths worldwide each year and pose a significant public health threat, especially for pregnant women and newborns. Diseases such as malaria, dengue fever, Zika virus, and Chagas disease are influenced by environmental factors including temperature, precipitation, and climate change (Bambra, 2022). During pregnancy, increased respiratory rate and carbon dioxide exhalation create an attractive environment for many vectors, while increased skin temperature makes pregnant women more vulnerable to vector exposure (Lindsay et al., 2000).

Malaria is one of the most risky vector-borne infections during pregnancy. Approximately 32% of pregnant women in Africa are exposed to malaria, with a risk three times higher than non-pregnant women, and mortality rates reaching up to 50% (WHO, 2022; Desai et al., 2007). The placenta serves as a focus where parasitized erythrocytes adhere, causing complications such as asymptomatic anemia (Duffy, 2007; Sharma & Shukla, 2017). This can lead to serious outcomes including premature birth, intrauterine death, low birth weight, and maternal and infant mortality (Lindsay et al., 2000).

The Zika virus is another high-risk vector-borne disease for pregnant women. Global temperature increases have expanded the distribution of the Aedes mosquitoes, the primary vector, putting an estimated one billion people at risk by 2080 (Ryan et al., 2019). Zika infection during the first trimester of pregnancy can cause serious congenital anomalies such as microcephaly, ventriculomegaly, and agenesis of the corpus callosum (Mlakar et al., 2016; Brasil et al., 2016). According to Center for Disease Control and Prevention (CDC) data, 6.1% of pregnancies infected with Zika result in congenital anomalies (Roth et al., 2022). The virus has also been linked to increased rates of fetal death and stillbirth.

Data on dengue fever show that the risk of hemorrhagic shock during pregnancy increases 3.4 times (Machado et al., 2013). Systematic reviews indicate associations between the disease and obstetric complications such as miscarriage, preterm birth, and low birth weight (Paixao et al., 2016; Pouliot et al., 2010). Increased maternal mortality rates have also been observed (Paixao et al., 2018).

Chagas disease is primarily transmitted by the Triatomine bug and can be passed to the fetus via placental transmission (Coura, 2015). Climate change and migration have expanded the distribution of this vector to wider latitudes, increasing infection risk (Garza et al., 2014). Congenital Chagas infection can cause short-term effects such as low birth weight, myocarditis, and meningoencephalitis, as well as long-term serious complications including megacolon, arrhythmia, aneurysm, and sudden cardiac death (Messenger & Bern, 2018; Pereira & Navarro, 2013). Therefore, World Health Organization (WHO) and Pan American Health Organization (PAHO) recommend screening all pregnant women in Central and South America (CDC, 2021; Livingston et al., 2021).

3. Fertility and Climate Change

The effects of increasing air pollution within the context of climate change on fertility are noteworthy. Exposure to air pollutants before and during pregnancy has been shown to reduce pregnancy rates—whether conceived naturally or via assisted reproductive technologies (ART)—and to cause adverse birth outcomes such as miscarriage, preterm labor, and low birth weight (Ha et al., 2014). Carré et al. (2017), in their systematic review of 61 studies examining the relationship between environmental air pollution and reproductive health, demonstrated that air pollutants negatively affect gametogenesis in both women and men, reducing both the quantity and quality of gametes and impairing embryo development. Although the underlying mechanisms remain incompletely elucidated, hormonal imbalances, oxidative stress, cellular DNA damage, and epigenetic changes are considered the primary contributing factors.

Similarly, a systematic review by Vizcaíno et al. (2016) found a significant association between air pollution and decreased fertility rates (Vizcaíno et al., 2016). Another review focusing specifically on female infertility reported that exposure to pollutants such as nitric oxide and ozone during in vitro fertilization (IVF) was associated with reduced live birth rates, and that high particulate matter (PM) exposure may increase the risk of miscarriage following IVF (Conforti et al., 2018). Corroborating these findings, a study in the United States showed that couples undergoing IVF living near highways had lower fertility success rates. Gaskins et al. (2018) reported that fertility rates were 33% among those living within 50 meters of a highway, compared to 46% among those living more than 400 meters away (Gaskins et al., 2018). These data indicate that environmental air pollution exerts multifaceted and clinically significant effects on both spontaneous and assisted reproductive processes.

4. Menopause and Climate Change

While most climate change research has focused on reproductive and maternal health, the effects on women's health during the climacteric period have been less studied (Girardi & Bremer, 2022). However, some mechanisms associated with climate change are suggested to exacerbate menopausal symptoms and

accelerate ovarian aging (Smith et al., 2020; Vabre et al., 2017). Rising temperatures may particularly intensify vasomotor symptoms (VMS) and cause geographic and seasonal variations in symptom severity (Bachmann & Phillips, 2021; Hunter IMS-CAT, 2013).

Sleep disturbances are also sensitive to seasonal fluctuations similar to VMS. The Study of Women's Health Across the Nation (SWAN) study found these problems increased during summer months and decreased in winter (Harlow et al., 2020). Higher temperatures may negatively affect nighttime awakenings and sleep quality (Cianconi et al., 2020). Although direct evidence on genitourinary syndrome is limited, animal studies have shown that elevated temperatures alter the vaginal microbiota (Stabile et al., 2022; Shi et al., 2022). Environmental toxins have also been reported to advance the age of menopause. Endocrine disruptors may accelerate ovarian aging via hormonal pathways (Cucinella et al., 2023). A study in the U.S. demonstrated that high exposure to certain chemicals advanced menopause by 1.9 to 3.8 years (Grindler et al., 2015). Additionally, women with elevated blood lead levels experienced earlier menopause (Eum et al., 2014), whereas those living in green spaces had a later onset of menopause (Triebner et al., 2019). These findings suggest that climate change and environmental factors may have long-term impacts not only on menopausal symptoms but also on women's reproductive lifespan and overall health.

The menopausal period is a critical transition phase during which metabolic and cardiovascular risks increase in women (Alahmad et al., 2023). Declining estrogen levels are associated with an atherogenic lipid profile, visceral fat accumulation, insulin resistance, and endothelial dysfunction, thereby accelerating atherosclerosis (Nappi et al., 2022). Climate change-related air pollution plays a significant role in the increase of cardiovascular and metabolic diseases. Research based on the SWAN study showed that exposure to PM2.5, NO2, and ozone increased fat mass and decreased muscle mass in menopausal women (Wang et al., 2022). Long-term exposure to environmental pollutants may elevate risks of lipid metabolism disorders, atherosclerosis, and type 2 diabetes (Hansen et al., 2016). Moreover, air pollution has been linked to decreased bone mineral density and cognitive decline after menopause (Prada et al., 2023; Mo et al., 2023).

5. Cancers and Climate Change

Recently, the effects of climate change on cancer have garnered increasing attention, as air pollution, ultraviolet radiation, environmental toxins, food supply, and health systems influence cancer development, diagnosis, treatment, and survival processes (Hiatt & Beyeler, 2023). Although this has significant implications for women's health, no etiological link has yet been established between climate change and cancers of the stomach, thyroid, ovary, and endometrium (Hiatt & Beyeler, 2023).

Lung Cancer: Among women, lung cancer is the second leading cause of cancer death after breast cancer. Environmental carcinogens are an important risk factor, especially in non-smoking women. Air pollution, wildfires, and pollutants such as polycyclic aromatic hydrocarbons (PAHs), PM2.5, and benzene increase the incidence of lung cancer (Hiatt & Beyeler, 2023; Landrigan et al., 2018).

Breast Cancer: Breast cancer, the most common cancer among women worldwide, is linked to reproductive factors and hormones. However, the role of environmental chemicals, particularly PAHs and nitrogen oxides as air pollutants, is gaining increasing importance. These chemicals may increase breast cancer risk, especially with early-life exposure (Hiatt & Brody, 2018).

Colorectal Cancer: Colorectal cancer ranks fourth among causes of cancer-related deaths in women and is associated with dietary habits. Climate change-related extreme weather events, reductions in food production, and diminished nutritional value pose increased risks (Hiatt & Beyeler, 2023; Kang, 2011). Challenges in accessing healthcare may also negatively impact screening and treatment processes (Hiatt & Beyeler, 2023).

Skin Cancers: Although climate change does not directly affect Ultraviolet radiation (UVR) levels, heat waves may increase outdoor exposure time, thereby increasing risk for melanoma and other skin cancers (Hiatt & Beyeler, 2023). Improvements in the ozone layer have limited UVR increases (Hiatt & Beyeler, 2020).

Cervical Cancer: Cervical cancer, with high morbidity and mortality especially in low- and middle-income countries, has decreased in high-income countries due to regular screening and HPV vaccination. However, climate change's impact on healthcare infrastructure could adversely affect vaccination programs (Hiatt & Beyeler, 2023). Direct effects of climate change on HPV infection and infection-related cancers are not expected (Hiatt & Brody, 2018).

6. Relationship Between Women's Health, Climate Change, and Sustainable Development Goals (SDGs)

Climate change has significant and multifaceted effects on women's health and directly influences the achievement of the Sustainable Development Goals (SDGs). Women, especially those in low-income and vulnerable communities, are more sensitive to environmental changes and face greater health, economic, and social risks (WHO, 2014). Therefore, the interaction between women's health and climate change should be prioritized within the SDG framework.

The United Nations 2030 Agenda for Sustainable Development highlights SDG 3 (Good Health and Well-being), SDG 5 (Gender Equality), and SDG 13 (Climate Action) as foundational pillars for understanding this tripartite relationship (United Nations, 2015).

SDG 3 aims to ensure healthy lives and promote well-being for all. Reducing the adverse health impacts of climate change is critical to achieving this goal. Managing climate-related risks on women's reproductive and maternal health is essential for protecting maternal and child health (Girardi & Bremer, 2022).

SDG 5 promotes women's empowerment, gender equality, and full participation of women in decision-making processes. Women's active roles in climate adaptation and mitigation policies are indispensable for enhancing social resilience. Access to education, healthcare, and economic resources reduces women's vulnerability to the climate crisis (UN Women, 2019).

SDG 13 targets combating climate change and its impacts, including strengthening health systems' resilience to climate change, managing environmental risks, and developing sustainable health service models. Adoption of environmentally friendly practices in women's health services and support for research on climate change's health impacts fall within SDG 13's scope (WHO, 2021). Additionally, SDG 1 (No Poverty) and SDG 6 (Clean Water and Sanitation) are also crucial in the context of women's health and climate change. Increasing natural disasters, water scarcity, and food insecurity caused by climate change adversely affect the health and quality of life of women and girls (Giudice et al., 2021).

In conclusion, combating climate change and protecting women's health require a holistic approach aligned with the Sustainable Development Goals. Effective participation of women in climate policies, strengthening health systems, and ensuring social equity are critical for both global health and environmental sustainability (UN, 2015; WHO, 2021).

7. Role and Responsibilities of Women's Health Nurses in Mitigating the Effects of Climate Change

Nurses have broad responsibilities within health systems in combating climate change, addressing individual health issues as well as raising awareness in communities (ANHE, 2019). The International Council of Nurses (ICN) emphasizes that nurses play critical roles in mitigating the effects of climate change and supporting community adaptation; it also highlights that nurses should take leadership in creating climate-safe and sustainable health systems (ICN, 2018). The American Nurses Association (ANA) recommends developing strategies that guide nursing practice according to environmental health principles, encouraging nurses to integrate environmental health knowledge and skills into their professional practice and to act as advocates in this field (ANA, 2007). Additionally, the Canadian Nurses Association (CNA) has addressed the health impacts of climate change and the role of nurses in adaptation and mitigation strategies from a social justice perspective; linking environmental health with global issues, it underscores the responsibility of nurses (CNA, 2008; CNA, 2009).

The International Federation of Gynecology and Obstetrics (FIGO) supports recognizing the climate crisis as a global emergency and recommends that health professionals take active roles especially in advocacy, education, research, and capacity building (Giudice et al., 2021). Women's health specialists engage in policy advocacy to reduce pollutants causing climate change and adopt sustainable clinical practices that reduce carbon footprints, thereby taking responsibility for protecting the health of current patients and future generations (Lenzen et al., 2020).

The healthcare sector is a significant source of carbon emissions in developed countries, accounting for approximately 4.4% of global carbon output (Health Care Without Harm, 2019). For example, cesarean deliveries in the U.S. generate twice the carbon emissions compared to vaginal births (Campion et al., 2012), and surgical procedures in Australia and the U.S. also have a high carbon footprint (Conry & Robson, 2023).

The United Nations Framework Convention on Climate Change (UNFCCC) states that climate change is not merely a technical issue but a complex matter encompassing human rights, health systems, social justice, and gender dynamics (UNFCCC, 2018). In this context, policymakers and civil society organizations must adopt a women's health perspective to better understand women's vulnerabilities and their roles in adaptation and mitigation regarding climate change (Duus & Montag, 2022). Nurses' leadership roles in this process will create lasting impacts on community health and safety and enhance the sustainability of health systems.

Key statements from nursing organizations regarding nurses' roles in the fight against climate change are summarized in Table 1.

Table 1. Key statements from nursing organizations on nurses' roles in combating climate change

Organization	Statement
International Council of Nurses (ICN):	The ICN emphasizes that nurses can make significant contributions to mitigating the effects of climate change and helping individuals adapt to these changes. It highlights that nurses should take the lead in establishing climate-resilient and sustainable health systems through proactive efforts (ICN, 2018).
Alliance of Nurses for Healthy Environments (ANHE):	Nurses have a broad sphere of influence in combating climate change and, due to their vital responsibilities within healthcare services, they play critical roles in addressing individuals' health concerns and raising public awareness on these issues (ANHE, 2019).
American Nurses Association (ANA)	The ANA advocates that nurses should integrate environmental health knowledge and skills into their professional practice, as outlined in its document *"Principles of Environmental Health for Nursing Practice with Implementation Strategies,"* which presents ten guiding principles (ANA, 2007).
Canadian Nurses Association (CNA)	In its position statement *"Climate Change and Health,"* the CNA states that nurses should take active roles in practice, research, leadership, education, and policy to address climate change (CNA, 2008).
International Federation of Gynecology and Obstetrics (FIGO)	As essential members of healthcare services, nurses are leading efforts in advocacy, research interpretation, capacity building, and education (Giudice et al., 2021).
Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN)	Nurses play a critical role in public health and are ideally positioned to inform women and families about the potential health impacts of climate change (Angelini, 2017).

8. Conclusion and Recommendations

The climate crisis disproportionately impacts women's health due to their biological, social, and environmental vulnerabilities. Pregnant women, infants, and women living in marginalized communities are particularly susceptible to environmental stressors, leading to long-term health disparities on both individual and societal levels.

Within the framework of the Sustainable Development Goals (SDGs), targets such as "Good Health and Well-Being" (Goal 3), "Gender Equality" (Goal 5), and "Climate Action" (Goal 13) are critically important for protecting and promoting women's health. To achieve these goals, the effects of the climate crisis on women's health must be addressed through both health and environmental policies.

In this process, women's health and obstetric nurses are key health professionals who adopt a holistic perspective on the health risks women face throughout their life course and who directly observe changes in the field. They play a multifaceted role in raising awareness of the health impacts of climate change, providing health counseling, and supporting vulnerable populations while upholding the specific needs of women's health. Furthermore, they hold the potential to strengthen the climate resilience of health systems through environmentally sustainable care practices.

In conclusion, strategies developed to combat the climate crisis must prioritize women's health and be based on equity and environmental sensitivity. In this context, making greater use of the knowledge and experience of women's health and obstetric nurses—while encouraging their active participation in education, research, and policy-making processes—will be a significant step toward safeguarding public health today and in the future.

Conflicts of interest: None

Funding Statement: This research received no grant from any funding agency, commercial or non-profit sectors.

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SSHS, 2025; 7(2), 116-120
DOI: 10.55895/sshs.1706601
Sabuncuoglu Serefeddin Health Sciences
e-ISSN: 3062-3731

THE TRANSFORMATION OF HEALTH SERVICES AND EMPLOYMENT PATTERNS IN HEALTHCARE: THE IMPACT OF NEO-LIBERAL POLICIES

SAĞLIK HİZMETİNİN VE SAĞLIKTA İSTİHDAM BİÇİMİNİN DÖNÜŞÜMÜ: NEO-LİBERAL POLİTİKALARIN ETKİSİ

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Review Article
Received: 25.05.2025, **Accepted:** 14.07.2025
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Abstract
This article examines the transformation of health services and employment patterns in Turkey under the influence of neo-liberal policies. Initiated in 2003, the Health Transformation Program (HTP) reshaped healthcare from public rights into a market-oriented service. Hospitals began to be managed with business logic, patients were redefined as customers, and health workers faced flexible and insecure forms of employment. The study analyzes the state-capital relationship and the guiding role of international organizations (World Bank, WHO) through historical and comparative methods. Findings suggest that while HTP increased life expectancy, it also exacerbated inequalities in healthcare access and deepened precarity among healthcare workers. City Hospitals, General Health Insurance, subcontracting practices, and performance-based payment systems are critically discussed within the framework of welfare state erosion and capital accumulation dynamics.

Keywords: Employment Pattern, Health Services, Health Transformation, Marketization, Neoliberalism

Öz
Bu makale, Türkiye'de sağlık hizmetlerinin ve sağlık alanındaki istihdam biçimlerinin neo-liberal politikaların etkisiyle geçirdiği dönüşümü incelemektedir. 2003 yılında uygulamaya konulan Sağlıkta Dönüşüm Programı (SDP), sağlık hizmetlerinin kamusal bir hak olmaktan çıkarılıp piyasa mantığına göre yeniden yapılandırılmasına neden olmuştur. Bu süreçte hastaneler işletme, hastalar müşteri, sağlık çalışanları ise esnek ve güvencesiz istihdam modellerinin öznesi hâline gelmiştir. Araştırma, devlet-sermaye ilişkileri ve uluslararası kuruluşların (Dünya Bankası, Dünya Sağlık Örgütü) yönlendirici rolünü tarihsel ve karşılaştırmalı yöntemlerle analiz etmektedir. Elde edilen bulgular, SDP'nin yaşam süresinde artış sağlamakla birlikte, sağlık hizmetlerine erişimde eşitsizlikleri derinleştirdiğini ve çalışanların güvencesizliğini artırdığını göstermektedir. Şehir Hastaneleri, Genel Sağlık Sigortası, taşeronlaşma ve performansa dayalı sistemler, sosyal devletin gerilemesi bağlamında ele alınmakta; sermaye birikim rejiminin sağlık politikaları üzerindeki etkileri ortaya konulmaktadır.

Anahtar Kelimeler: İstihdam Modeli, Sağlık Hizmetleri, Sağlık Dönüşümü, Piyasalaştırma, Neoliberalizm

1. Introduction

Since the 1980s, the implementation of economic restructuring policies in Turkey has led to fundamental transformations in the provision of public services. The structural adjustment process that began with the decisions of January 24, 1980 adopted a development model based on free market principles and was later institutionalized through the 1982 Constitution. Although the Constitution formally preserved the principle of the welfare state, in practice, it limited the state's responsibilities in key public service areas such as health (Çelik, 2016).

In the 1990s, social policies were restructured in line with global economic trends, increasing the role of the private sector in the healthcare system. This tendency was institutionalized through the HTP, launched in 2003 by the Justice and Development Party (Adalet ve Kalkınma Partisi- AKP) government. Designed under the guidance of international actors such as the World Bank and the

World Health Organization, the HTP aimed to restructure healthcare into a performance-based, competitive, and business-oriented model (Yılmaz, 2019).

This transformation has deeply affected not only the way healthcare is delivered but also the labor regime within the health sector. Health workers have been subjected to performance-based, flexible, and precarious employment conditions, while public resources have increasingly been redirected in favor of private investment. As a result, the egalitarian function of the welfare state has weakened, and the health system has evolved into a profit-oriented service sector (Sönmez, 2011; Yenimahalleli Yaşar, 2015).

The aim of this study is to analyze how neoliberal policies have transformed healthcare services and the healthcare labor regime in Turkey since the 1980s. The central research question is as follows: How have neoliberal policies reshaped public healthcare and employment patterns in Turkey's health sector?

Within this framework, the study historically examines changes in performance-based governance, public-private partnership models, social security reforms, and employment conditions of healthcare workers. It also assesses the impact of this transformation on social inequalities, welfare rights, and gender-based disparities. Previous research on the subject (Ağartan, 2012; Yılmaz, 2019; Öztürk, 2017) provides the theoretical and empirical foundation for the analytical framework developed in this article.

2. Material and Methods

2. 1. The determination of the historical context and policy background

This section establishes the historical context and policy background that shapes the analytical framework of this study. By examining the origins of neoliberal restructuring since 1980, the study situates the HTP within broader global and national policy shifts. This contextual analysis is methodologically essential, as it clarifies how structural adjustment policies, legislative changes (e.g., Decree Law No. 181), and international institutions have influenced the marketization of health services and the transformation of employment patterns. Grouping this discussion under clear subheading strengthens the methodological transparency of the study and demonstrates the systematic approach to analyzing historical policy determinants.

The neoliberal policies implemented in Turkey after 1980 paved the way for a market-oriented restructuring of the healthcare sector. The first step in this transformation was the structural adjustment process initiated by the economic decisions of January 24, 1980. These decisions reflected a paradigm shift that aimed to reduce public spending, privatize social services, and reallocate public resources in favor of the private sector. Although the 1982 Constitution preserved the notion of the welfare state at the constitutional level, in practice, it introduced provisions that limited the state's responsibilities and expanded the scope of the market in essential services such as healthcare (Çelik, 2016). It is crucial to note here that this legal contradiction between constitutional guarantees and actual practice laid the groundwork for deep structural inequalities. The study positions this paradox as a critical driver of the commodification of health services in Turkey.

The enactment of Decree Law No. 181 in 1987, along with the implementation of the Fundamental Law on Health Services the same year, laid a legal foundation for the expansion of private healthcare services and the restructuring of public hospitals. As a result, the health sector began to shift away from its public service orientation toward a profit-driven structure.

This transformation was institutionalized through HTP, launched in 2003 during the rule of AKP. HTP aimed to comprehensively restructure the healthcare system by introducing performance management, service procurement, hospital corporatization, and patient co-payments-thus deepening the marketization of health services. The program was designed with the technical and financial support of international institutions such as the World Bank and the World Health Organization and reconfigured Turkey's health system in accordance with global capital dynamics (Yenimahalleli Yaşar, 2015).

As part of HTP, the health insurance system was overhauled by merging different social security institutions under the umbrella of the General Health Insurance (GHI) scheme. While this reform centralized the system, it also linked access to healthcare to premium payments and individual responsibility. Consequently, social rights were redefined as conditional benefits, and access to healthcare services became increasingly stratified by income level.

In this context, neoliberal health reforms should not be viewed merely as technical restructuring processes. Rather, they represent a paradigm shift that has fundamentally altered the meaning, organization, and public-civil relations of healthcare provision.

3. Results and Discussion

3.1. The Marketization of Health Services

The GHI system, introduced in 2008 as one of the core components of the HTP, consolidated Turkey's fragmented social security institutions—including

SSK, Bağ-Kur, and the Pension Fund—under a single framework. However, by linking access to healthcare to the payment of premiums, the system created income-based inequalities in service utilization. According to a 2018 report by the World Bank, nearly 5 million people were unable to access healthcare in 2020 due to outstanding premium debts. This situation has been criticized as a violation of the principle of the universality of the right to health (Yılmaz, 2019).

A significant turning point in the institutional restructuring of healthcare services came with the establishment of Public Hospital Unions in 2011, through Decree Law No. 663. These unions redefined public hospitals as cost-efficient enterprises to be managed according to performance-based criteria. Consequently, hospital administrators came under increasing pressure to generate revenue, and the logic of commercial management became dominant in public healthcare institutions (Öztürk, 2017). This shift prioritized quantitative performance indicators over the qualitative aspects of service delivery.

One of the most concrete examples of this transformation is the implementation of the City Hospitals project. Constructed through public-private partnership (PPP) models, these hospitals bind public resources to long-term financial obligations by committing to pay rent and service fees to private sector companies over a 25-year period. According to audit reports by the Court of Accounts and budget data from the Ministry of Health, the government paid over 21.6 billion TL in 2022 solely for rent and service procurement under this model (Sönmez, 2023; Sayıştay Başkanlığı, 2023). This structure demonstrates how healthcare has been directly integrated into capital accumulation processes.

3.2. The transformation of employment patterns in healthcare

Another key dimension of HTP concerns the transformation of employment structures within the healthcare workforce. Between 2003 and 2015, the number of healthcare workers employed in the public sector increased by 57%, while the increase in the private sector reached 278% (TOBB, 2017). This disparity highlights the growing dominance of the private sector in healthcare and the contraction of public service provision in favor of market actors. During this period, subcontracting became widespread, particularly in non-clinical services such as cleaning, security, and technical support. According to Öztürk (2017), by 2020, the number of subcontracted workers in the health sector exceeded 150,000. This expansion has generated serious problems in terms of job security, labor rights, and wage equality. However, this paper argues that the proliferation of subcontracting should be understood not merely as a labor management strategy but as an intentional policy instrument that redistributes risk to workers while protecting capital interests. This insight points to the need for a rights-based approach to employment reform in the health sector.

The performance-based remuneration system has exacerbated income disparities among physicians and healthcare staff. The patient-based point system prioritizes quantity over quality, incentivizing increased patient turnover rather than improved care. Similarly, under the Family Medicine model, the per capita payment structure has increased physicians' workloads, shortened patient consultations, and undermined the humane character of medical services (Yılmaz, 2019). This study contends that the excessive emphasis on measurable outputs has fundamentally altered the patient-physician relationship. Instead of fostering comprehensive and continuous care, the system rewards short-term thought, which risks undermining the core humanistic values of medical practice.

Taken together, the developments discussed under this section reveal that the marketization of healthcare and the flexibilization of labor are not independent reforms, but rather mutually reinforcing processes that constitute two core pillars of the neoliberal restructuring of Turkey's health system.

3.3. Gender-based inequalities and the healthcare labor force

Women's labor has long played a central role in Turkey's healthcare sector. According to data from 2011, 59% of healthcare workers were women (Öztürk, 2017). However, this high rate of representation does not imply that women work under equal or fair conditions. Female workers are predominantly concentrated in lower-paid and less decision-making roles such as nursing, auxiliary health services, and administrative support.

The expansion of flexible and precarious employment arrangements under neoliberal policies has had disproportionately adverse effects on female healthcare workers. Long and irregular working hours, low wages, job insecurity, work–life imbalance, and the emotional burden of care labor have significantly increased burnout and fatigue among women in the health sector. Moreover, performance-based systems tend to render women's care work invisible by reducing productivity to quantifiable technical metrics (Öztürk, 2017). This reveals that market-driven efficiency models fail to acknowledge the qualitative dimensions of women's labor, especially emotional and relational care work. Addressing this blind spot is critical to developing gender-sensitive health

employment policies that value care beyond numerical outputs.

This situation reveals that health reform policies function as mechanisms that reproduce and deepen gender-based inequality. The structural devaluation of women's labor in the healthcare system should not be viewed merely as an individual problem, but rather as a manifestation of systemic political inequality.

3.4. Evaluation from a social policy perspective

The structural transformation of the healthcare system in Turkey illustrates a departure from the foundational principles of the welfare state and the adoption of a market-oriented administrative logic. Reducing healthcare from a universal right to a transactional commodity has particularly limited access for low-income groups and has produced profound inequalities based on income, education, and living conditions.

Performance-based practices have diminished the professional satisfaction of healthcare workers by prioritizing measurable outputs over qualitative aspects of care. Additionally, subcontracting and public-private partnership (PPP) models have led to the erosion of social rights. As market actors gain greater influence in decision-making processes, the public-oriented nature of the health system has weakened, and the direction of social policy has shifted toward the interests of private stakeholders. In addition, the digitalization efforts within health information systems have reinforced this shift by providing rationalized data flows that facilitate private sector investments, further embedding the logic of marketization into the health system (Avaner & Fedai, 2017, p. 1540).

Compared to the example of the National Health Service (NHS) in the United Kingdom, the transformation in Turkey has occurred more rapidly and comprehensively, but it has also resulted in more severe losses in terms of social rights (Ağartan, 2012). This comparative perspective emphasizes that neoliberal restructuring is not inevitable but rather a political choice. The study therefore calls for re-examining policy pathways that protect universal access and labor rights, inspired by more inclusive international models. The Turkish case reveals that health reforms are not merely technical arrangements but are deeply embedded in ideological and class-based dynamics.

4. Conclusion

This study has examined the multidimensional transformation of Turkey's healthcare system within the framework of neoliberal policies implemented since the 1980s. HTP, introduced in 2003, redefined healthcare as a market-driven service rather than a public right, fundamentally altering the provision, governance, and employment structures within the health sector.

Quantitative indicators such as the increase in life expectancy (from 71.5 years in 2002 to 78.47 years in 2022) and the decline in infant mortality rates point to certain improvements. However, inequalities, especially in access to healthcare, have deepened. Practices like the General Health Insurance scheme have linked healthcare access to premium payments, undermining social justice, while the City Hospital model has integrated the healthcare system directly into capital accumulation processes.

From a labor perspective, flexible and insecure forms of employment have become widespread, and performance-based remuneration systems have reduced the quality of care to quantitative outputs. Moreover, women healthcare workers have been disproportionately affected by these changes, exacerbating gender-based inequalities within the system.

In conclusion, the transformation of Turkey's healthcare system is not merely a technical reform; it represents a complex structure involving the retrenchment of the welfare state, the commodification of public services, and the precarization of healthcare labor. This transformation poses serious challenges to the universality of the right to health, equitable access to services, and the protection of healthcare workers' rights.

Future research should focus on the multidimensional analysis of regional disparities, healthcare workers' experiences, and patient satisfaction, while also reopening the debate around a public-oriented, equitable, and comprehensive healthcare policy frameworkIn light of the findings, it is evident that Turkey's health transformation process must be critically reconsidered through a public policy lens that prioritizes equity and universal access.

This study highlights that the commodification of health services and the flexibilization of labor deepen existing inequalities and erode fundamental welfare principles. Future research should expand on this by conducting micro-level field studies that capture the lived experiences of healthcare workers and patients across different regions. Policymakers should also explore alternative models that strengthen public accountability, restore secure employment, and reorient the healthcare system towards the collective good rather than profit motives.

Conflicts of interest: No conflict of interest

Funding Statement: This research received no grant from any funding agency, commercial or not-forprofit sectors.

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