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Merhaba,

Sizlere daha önce duyurduğumuz ve 2026 yılında yayınlanacak “*Sağlık Uygulamalarında Yapay Zekâ*” IGUSABDER Özel Sayısına desteğiniz için çok teşekkür ediyoruz. Yazarlarımızın, duyurduğumuz tarihe kadar gönderdikleri makalelerin hakem süreci devam ediyor ve temmuz ayında sizlere ulaşması için IGUSABDER ekibi olarak çalışıyoruz. 2027 yılında “*Sağlıkta Dijital Etik ve Veri Yönetişimi: Klinik, Teknolojik ve Toplumsal Boyutlar*” başlığı ile ikinci özel sayımızı çıkaracağız. Bu sayı için alt başlık olarak; 1-Sağlık bilimlerinde klinik karar destek sistemleri ve veri temelli uygulamalar, 2-Hasta izlem, rehabilitasyon ve uzaktan sağlık teknolojilerinde veri yönetimi, 3-Tıbbi cihazlar ve dijital sağlık teknolojilerinde veri güvenliği ve entegrasyon, 4-Beslenme, metabolizma ve yaşam tarzı verilerinde dijital uygulamalar, 5-Laboratuvar, görüntüleme ve tanı sistemlerinde veri etiği ve yapay zekâ uygulamaları, 6-Yoğun bakım ve kritik klinik ortamlarda veri yönetimi ve hasta güvenliği, 7-Özel gruplarda (pediatrik, geriatrik, engelli vb.) dijital sağlık verilerinin yönetimi, 8-Sağlık profesyonelleri için dijital etik, veri okuryazarlığı ve klinik uygulamalar, 9-Sağlıkta blockchain ve kripto para tabanlı veri güvenliği ve yönetimini belirledik. 2027 yılı özel sayımız için de desteklerinizi ve katkılarınızı bekliyoruz.

Bir başka başarımız ise üniversitelerin akademik performansını bilimsel üretim, dijital görünürlük ve açık erişim politikaları üzerinden değerlendiren Webometrics Dünya Üniversite Sıralamaları açıklandı. Yükseköğretim kurumlarının küresel ölçekteki konumunu ortaya koyan sıralamada İstanbul Gelişim Üniversitesi, 2026 sonuçlarında öne çıkan bir performans sergiledi. “*Araştırma Üniversitesi*” odağı doğrultusunda çalışmalarını sürdüren Üniversitemiz, dünya sıralamasında 1364’üncü sıraya yerleşirken; Türkiye genelinde 28’inci, vakıf üniversiteleri arasında ise 4’üncü sırada yer aldı.

Goethe bir söyleminde, “Keyifle çalışabilmek için sağlık, zorluklara karşı savaşabilmek için güç, hataları kabul etmek için birikim, hedefe ulaşmak için sabır gerekir.” diyor. Bu güzel söylem ışığında sağlıklı günler dileğiyle saygılarımı sunuyorum.

Hoşça kalın.

Dr. Öğr. Üyesi A. Yüksel BARUT

Editör

From the Editor

Dear All,

Thank you very much for your support for the IGUSABDER Special Issue titled “*Artificial Intelligence in Health Applications*,” which we previously announced and will be published in 2026. The peer-review process for the manuscripts submitted by our authors within the announced timeline is ongoing, and as the IGUSABDER team, we are working to ensure that the issue reaches you in July. In 2027, we will publish our second special issue titled “*Digital Ethics and Data Governance in Healthcare: Clinical, Technological, and Societal Dimensions*.” For this issue, we have identified the following subtopics: 1- Clinical decision support systems and data-driven applications in health sciences, 2- Data management in patient monitoring, rehabilitation, and telehealth technologies, 3- Data security and integration in medical devices and digital health technologies, 4- Digital applications in nutrition, metabolism, and lifestyle data, 5- Data ethics and artificial intelligence applications in laboratory, imaging, and diagnostic systems, 6- Data management and patient safety in intensive care and critical clinical settings, 7- Management of digital health data in special populations (pediatric, geriatric, disabled, etc.) 8- Digital ethics, data literacy, and clinical applications for healthcare professionals, 9- Blockchain and cryptocurrency-based data security and management in healthcare. We look forward to your support and contributions to our 2027 special issue as well.

Another achievement we would like to share is that the Webometrics World University Rankings - evaluating the academic performance of universities based on scientific productivity, digital visibility, and open access policies - have been announced. In this global ranking, Istanbul Gelisim University demonstrated a strong performance in the 2026 results. Continuing its efforts in line with its “*Research University*” focus, our University ranked 1,364th worldwide, 28th in Türkiye, and 4th among foundation universities.

As Goethe once said, “To work with joy requires health; to fight challenges requires strength; to accept mistakes requires wisdom; and to reach one’s goals requires patience.” In the light of this inspiring quote, I extend my best wishes for your continued health and well-being.

Kind regards.

Asst. Professor A. Yüksel BARUT

Editor



**Sağlık Bilimleri
Fakültesi**

İstanbul Gelişim Üniversitesi, Sağlık Bilimleri Fakültesi'nin aşağıdaki Bölümleri,
Almanya merkezli **Accreditation Agency in Health and Social Sciences /
Akkreditierungsagentur im Bereich Gesundheit und Soziales (AHPGS)**
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*The Following Departments of Istanbul Gelisim University, Faculty of Health Sciences
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Child Development (Turkish-English Tracks),
Health Management,
Occupational Therapy,
Social Service (Turkish-English Tracks)*** departments were accredited
unconditionally between 2018-2023.

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Gülçin GÖKÇENUR KARATAŞ

IGUSABDER Article Writing Rules

Effects of Educational Materials Designed with a Healthy Nutrition Theme on Nutritional Status of 4-6 Years Old Children*

Hikmet BAYAM**, Merve KUMRU YILDIRIM***, Sabriye BALLI****, Güldane USLU*****

Abstract

Aim: This study aims to evaluate the effect of nutrition education during the preschool period on children's food consumption habits.

Method: The study was designed in a quasi-experimental and descriptive model. Forty-five children aged 4-6 years were included in the study. The intervention involved providing nutrition education aimed at improving healthy eating habits, with the use of visual materials to increase nutrition awareness. The primary dependent variables included the frequency of consumption of various foods. Independent variables included gender and the pre- and post-intervention assessments. Data analysis was performed using IBM SPSS 23.0 programme. A significance level of $p < 0.05$ was used to determine statistical significance.

Results: The majority of the children consumed breakfast, lunch, and dinner regularly before the intervention. After the intervention there was a significant decrease in the consumption of unhealthy foods such as white bread, instant fruit juices, butter, chocolate, etc. Healthy food consumption, although not statistically significant, showed an increase in the consumption of milk, yogurt, cheese, fish, green vegetables, etc.

Conclusion: Nutrition education during the preschool period contributes to the development of healthy eating habits in children.

Keywords: Preschool, nutrition, education.

Özgün Araştırma Makalesi (Original Research Article)

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ETHICAL STATEMENT: This study was carried out with the approval of the Ethics Committee of Kırşehir Ahi Evran University, dated 16/11/2023 and numbered 2023/10/31. A signed subject consent form in accordance with the Declaration of Helsinki was obtained from each participant.

Sağlıklı Beslenme Temalı Tasarlanan Eğitsel Materyallerin 4-6 Yaş Çocuklarda Beslenme Durumuna Etkisi

Öz

Amaç: Bu çalışma, okul öncesi dönemde verilen beslenme eğitiminin çocukların besin tüketim alışkanlıkları üzerindeki etkisini değerlendirmeyi amaçlamaktadır.

Yöntem: Çalışma, yarı deneysel ve tanımlayıcı bir modelde tasarlanmıştır. Çalışmaya 4-6 yaş arası 45 çocuk dahil edilmiştir. Müdahale, görsel materyaller kullanılarak sağlıklı beslenme alışkanlıklarını iyileştirmeyi amaçlayan beslenme eğitimi vermeyi içermektedir. Birincil bağımlı değişkenler, çeşitli besinlerin tüketim sıklığıdır. Bağımsız değişkenler ise cinsiyet ve müdahale öncesi ve sonrası değerlendirmelerdir. Veri analizi IBM SPSS 23.0 programı kullanılarak gerçekleştirilmiştir. İstatistiksel anlamlılığı belirlemek için $p < 0,05$ anlamlılık düzeyi kullanılmıştır.

Bulgular: Çocukların çoğunluğu müdahaleden önce düzenli olarak kahvaltı, öğle yemeği ve akşam yemeği tüketmektedir. Müdahale sonrasında beyaz ekmek, hazır meyve suları, tereyağı, çikolata vb. gibi sağlıksız gıdaların tüketiminde önemli bir azalma görülmüştür. Sağlıklı gıda tüketimi, istatistiksel olarak anlamlı olmasa da süt, yoğurt, peynir, balık, yeşil sebzeler vb. tüketiminde artış göstermiştir.

Sonuç: Okul öncesi dönemde beslenme eğitimi, çocuklarda sağlıklı beslenme alışkanlıklarının geliştirilmesine katkıda bulunmaktadır.

Anahtar Sözcükler: Okul öncesi, beslenme, eğitim.

Introduction

Children aged 4 to 5 years is a critical stage in which the child's physical, cognitive and emotional development is rapidly shaped¹. Nutritional habits acquired during this period play a decisive role in children's lifelong health. Healthy nutrition not only supports the growth and development of children but also has long-term effects on mental performance, academic success and future health². The eating habits of children aged 4 to 5 are largely based on the guidance they receive from their families, carers and educational institutions^{3,4}. For this reason, nutrition education in children aged 4 to 5 years enables laying the foundations of a healthy lifestyle and contributes to the prevention of health problems in the following years⁵.

Nutrition education in the 4–5-year age increases the effectiveness of the strategies used to ensure that children acquire healthy eating habits. In the study examining the effectiveness of nutrition education tools in children aged 4 to 5 years, the importance of educational materials and guidance to improve children's eating habits is emphasised. This study reveals that the creation of nutritional awareness in children aged 4 to 5 years provides positive effects not only on physical health but also on social and cognitive development. Nutrition education in children aged 4 to 5 years offers an important opportunity to contribute to children growing up as healthier individuals in the long term^{5,6}.

Children's eating habits should be shaped according to their individual needs and a balanced diet with the right variety of foods should be provided. However, picky eating behaviour and unbalanced eating habits are among the common nutritional problems encountered in children aged 4 to 5 years¹. Picky eating behaviour is manifested by children's preference for a diet limited to only a few foods, which may lead to deficiency of some nutrients and negatively affect the development of the child⁵. It is known that nutrition education given at an early age helps to develop healthy eating habits in children. It is stated that education in the 4–5-year age years contributes to children's awareness of healthy habits⁶.

Many studies have supported that nutrition education in children aged 4 to 5 helps children make informed food choices⁷. It is recognised that such education plays a critical role in children's adoption of healthy eating habits and is an important factor affecting their long-term health development⁵⁻⁷.

Childhood period is important in terms of creating nutritional awareness because it is the period when habits are acquired. Healthier societies will be formed thanks to children with healthy nutrition awareness. This study is aimed to increase the healthy nutrition awareness of children aged 4 to 5 years in order to create healthier societies. It is also revealed to examine the effectiveness of nutrition education strategies for children aged 4 to 5 years and to evaluate the long-term effects of these strategies on children's eating habits. In addition, developing practical suggestions for increasing nutrition awareness is another objective of this study.

Material and Methods

Study Type

The study was designed in a quasi-experimental and descriptive model.

Population and Sampling

The study was conducted on 4–6 year old children studying at kindergarten. All eligible students (n=45) were included in the study. The study was finalised with a total of 45 participants. Children were classified according to their chronological age at the time of data collection. Age was recorded in half-year intervals and categorized as 4.0, 4.5, 5.0, 5.5, and 6.0 years. This classification was used to reflect developmental differences within the preschool period and to allow a more precise evaluation of age-related nutritional behaviors.

Data Collection Tools

The Food Consumption Frequency Questionnaire is a questionnaire that determines the frequency of consumption of food groups (milk and dairy products, meat-egg-legume group, fresh vegetables and fruits, cereal group, beverages, fatty-sugary foods group) in

the last month in order to evaluate the nutritional status of the child. In addition, a General Information Form was used to collect demographic data.

Data Collection

During the data collection process, voluntary consent forms were obtained at the information meeting held with the parents, and then the Food Consumption Frequency Questionnaire and General Information Form were filled out to evaluate the nutritional status of the children in the last month. In the study, in order to increase children's nutritional awareness, a three-dimensional plate and food samples from food groups were prepared based on the 'Healthy Plate Model'⁸. These materials were designed from felt, plastic sheeting, and cardboard.

For the 'Healthy Human and Obese Human Material', two 3-dimensional human figures were designed as normal (representing the ideal weight body mass index range of 18–25 kilograms/square metre) healthy human figure and obese human figure (representing body mass index $>30 \text{ kg/m}^2$). In addition, 8 healthy food materials (cereal bread, milk, cheese, eggs, fish, apples, carrots, walnuts) and 8 French fries, sausage bread, confectionery, solid fat, ice cream, acidic drinks, salt, packaged chips materials were designed in 3D using fibre, felt, and fabric. The prepared food materials were mixed in a box.

After the children were told what healthy and other foods are, they were instructed to take turns choosing a random food from the box and stick it to the figure of a healthy person with ideal body weight if the food was healthy, or to the figure of an obese person if the food was unhealthy. These activities were organised for 4 weeks and 2 hours per week. Each student completed each activity a minimum of two times. Pre-test and post-test were applied to the participants before and after the intervention in order to evaluate the change in nutritional awareness.

Figure 1. Application of healthy nutrition-themed educational materials in children



Figure 2. Application of healthy nutrition-themed educational materials



Figure 3. Presentation of healthy nutrition-themed materials to children



Ethical Statement

This study was carried out with the approval of the Ethics Committee of Kırşehir Ahi Evran University, dated 16/11/2023 and numbered 2023/10/31. A signed subject consent form in accordance with the Declaration of Helsinki was obtained from each participant. As the study was conducted on children, written informed consent was obtained from the parents/legal guardians of all participating students.

Data Analysis

Data analysis was performed using IBM SPSS 23.0 programme. The conformity of continuous variables to normal distribution was evaluated by Skewness and Kurtosis tests. Skewness and kurtosis values for the Food Consumption Frequency Questionnaire were observed to be between +2.0 and -2.0, and according to Tabachnick and Fidell (2013)⁹, parametric tests can be applied when they are between +1.5 and -1.5. According to George and Mallery (2010)¹⁰, when these values are between +2 and -2, the use of parametric tests is supported. Accordingly, the normality assumption was met for variables other than margarine and parametric analyses were applied. Firstly, the difference tests were examined according to the gender of children aged 4 to 5 years, and then analyses were performed for the values before and after the intervention training. An independent sample t-test was used to evaluate the differences in food consumption frequency depending on the gender variable. Within the scope of descriptive statistics,

the means and standard deviations of the groups were calculated and presented. Mann-Whitney U, Kruskal-Wallis and Spearman correlation tests were applied for nonparametric distributions, and One-Way ANOVA test was applied for parametric distributions. Chi-square analysis was used to evaluate the relationships between categorical variables and the statistical significance level was accepted as $p < 0.05$.

Results

According to Table 1, 58% of the children participating in the study were females; 84% did not have any disease; 51% rarely got sick; 89% ate breakfast, 73% ate lunch and 98% always ate dinner.

Table 1. Distribution according to demographic variables

Variable	Group	Number (n)	Percentage (%)
Gender	Boy	19	42,2
	Girl	26	57,8
Age	4	14	31,1
	4,5	7	15,6
	5	14	31,1
	5,5	4	8,9
	6	6	13,3
Presence of disease	Yes	7	15,6
	No	38	84,4
Frequency of Illness	Less	4	8,9
	Rare	23	51,1
	Frequently	18	40,0
Breakfast	Yes	40	88,9
	No	1	2,2
	Sometimes	4	8,9
Lunch	Yes	33	73,3
	Sometimes	12	26,7
Dinner in the evening	Yes	44	97,8
	Sometimes	1	2,2
	Total	45	100,0

The independent sample t test was used to reveal the differences between the pre-test and post-test attitudes according to the frequency of food consumption of the participants. As a result of the analysis, a statistically significant difference was found in the variables of white bread, instant fruit juices, other vegetable oil, butter, candy, Turkish Delight, jelly candies, chocolate, cake, cake, biscuit, cracker, french fries, lahmacun, pita, döner, junk food and packaged food. Accordingly, while the values of white bread, instant fruit juices, other vegetable oil, butter, candy, Turkish Delight, jelly candies, chocolate, cake pastry, biscuit crackers, french fries, lahmacun pita, doner kebab, junk food and packaged food variables were high before the intervention training. It was observed that these values tended to decrease after the intervention training.

In other words, it can be said that sensitivity to white bread, instant fruit juices, other vegetable oil, butter, candy, Turkish Delight, jelly candies, chocolate, cake, biscuit crackers, french fries, lahmacun pita, doner kebab, junk food and packaged foods developed in children aged 4 to 5 years at the end of the training. In addition, although no statistical difference was found, it was observed that the frequency of milk, yoghurt, buttermilk, cheese, fish, dried legumes, green vegetables, dried fruits and olive oil increased after the intervention training in children aged 4 to 5 years.

Table 2. Comparison of scales according to pre-test post-test variables

	Pre-test-Post-test	N	Average	S.S.	t	df	p
Milk	Pre-test	45	5.1556	2.09930	-.361	88	.719
	Post-test	45	5.3111	1.98657			
Yoghurt	Pre-test	45	5.3111	1.80683	-.938	88	.351
	Post-test	45	5.6444	1.55440			
Buttermilk	Pre-test	45	4.5778	1.61652	-.882	88	.380
	Post-test	45	4.8667	1.48630			
Cheese	Pre-test	45	4.0444	2.63676	-.450	88	.654
	Post-test	45	4.2889	2.51018			
Red meat	Pre-test	45	4.4889	1.27247	.175	88	.862
	Post-test	45	4.4444	1.13929			
Chicken	Pre-test	45	4.3333	1.27920	.266	88	.791
	Post-test	45	4.2667	1.09545			
Fish	Pre-test	45	3.4667	1.56089	-.071	88	.944
	Post-test	45	3.4889	1.40813			
Egg	Pre-test	45	5.4444	1.69967	.062	88	.950
	Post-test	45	5.4222	1.68535			
Dried Legumes	Pre-test	45	3.9556	1.22392	-.597	88	.552
	Post-test	45	4.1111	1.24722			
Oilseed	Pre-test	45	5.5556	1.57474	1.262	88	.210
	Post-test	45	5.1556	1.42949			
Dark green leafy vegetables	Pre-test	45	3.7111	2.14923	-.607	88	.545
	Post-test	45	3.9778	2.01685			
Potato	Pre-test	45	5.1333	.94388	.773	88	.442
	Post-test	45	4.9778	.96505			
Tomato	Pre-test	45	3.9556	2.26591	.094	88	.925
	Post-test	45	3.9111	2.21382			
Other vegetables	Pre-test	45	2.5111	1.59006	-.697	88	.488
	Post-test	45	2.7556	1.73409			
Citrus fruits	Pre-test	45	5.9333	1.48324	.216	88	.829
	Post-test	45	5.8667	1.43970			
Other fruits	Pre-test	45	5.8889	1.62680	.131	88	.896
	Post-test	45	5.8444	1.59481			
Dried fruits	Pre-test	45	3.9333	2.03827	-.970	88	.335
	Post-test	45	4.3333	1.87083			
White bread	Pre-test	45	6.2667	1.38826	3.238	88	.002*
	Post-test	45	5.3111	1.41135			
Whole grain bread	Pre-test	45	2.4444	2.06217	.293	80.169	.770
	Post-test	45	2.3333	1.49241			
Rice	Pre-test	45	4.3778	1.38644	1.243	88	.217
	Post-test	45	4.0444	1.14724			
Pasta	Pre-test	45	4.5778	1.03328	1.901	88	.061
	Post-test	45	4.2000	.84208			
Bulgur	Pre-test	45	4.1111	1.35214	.597	88	.552
	Post-test	45	3.9556	1.10691			

Breakfast cereal	Pre-test	45	1.8667	1.42382	1.213	77.452	.229
	Post-test	45	1.5556	.96661			
Instant fruit juices	Pre-test	45	3.5778	1.86461	3.080	75.710	.003*
	Post-test	45	2.5556	1.21647			
Fizzy drink	Pre-test	45	2.3556	1.56895	1.733	77.136	.087
	Post-test	45	1.8667	1.05744			
Tea-Coffee-Herb tea	Pre-test	45	3.0222	2.24103	1.498	81.038	.138
	Post-test	45	2.4000	1.65694			
Olive oil	Pre-test	45	5.6444	2.24778	-.619	88	.538
	Post-test	45	5.9111	1.81937			
Other oil	Pre-test	45	4.9778	2.15838	2.174	88	.032*
	Post-test	45	4.0444	1.90640			
Margarine	Pre-test	45	1.7111	1.29021	1.741	66.362	.086
	Post-test	45	1.3333	.67420			
Butter I	Pre-test	45	5.8222	1.38644	3.595	88	.001*
	Post-test	45	4.8444	1.18620			
Sugar	Pre-test	45	5.1333	1.80404	1.848	88	.068
	Post-test	45	4.5111	1.35885			
Honey-Cherry-Molasses	Pre-test	45	4.3111	2.30437	1.207	79.970	.231
	Post-test	45	3.8000	1.65968			
Dumplings	Pre-test	45	2.8667	1.47093	.494	79.723	.622
	Post-test	45	2.7333	1.05313			
Milk desserts	Pre-test	45	3.6222	1.19257	1.920	88	.058
	Post-test	45	3.2000	.86865			
Candy, Turkish Delight, Jelly candies	Pre-test	45	4.0889	1.72972	2.704	88	.008*
	Post-test	45	3.2222	1.27723			
Chocolate	Pre-test	45	5.5333	1.61808	4.393	88	.000*
	Post-test	45	4.2000	1.23583			
Cake-Pastry	Pre-test	45	4.2889	1.45574	2.481	76.053	.015*
	Post-test	45	3.6444	.95716			
Biscuits and Crackers	Pre-test	45	4.4444	1.79083	2.698	72.883	.009*
	Post-test	45	3.6000	1.09545			
Chips	Pre-test	45	3.6000	1.67060	1.819	79.375	.073
	Post-test	45	3.0444	1.18620			
French fries	Pre-test	45	4.0222	.96505	2.331	88	.022*
	Post-test	45	3.5778	.83907			
Lahmacun-Pide	Pre-test	45	3.1333	1.09959	2.676	88	.009*
	Post-test	45	2.5556	.94281			
Instant hamburger	Pre-test	45	2.3111	1.16428	1.808	76.899	.075
	Post-test	45	1.9333	.78044			
Instant pizza	Pre-test	45	2.1556	1.16688	1.494	88	.139
	Post-test	45	1.8444	.76739			
Rotary	Pre-test	45	2.7333	1.32116	2.142	70.981	.036*
	Post-test	45	2.2444	.77329			
Junk food	Pre-test	45	4.6000	1.81409	4.242	71.489	.000*
	Post-test	45	3.2667	1.07450			
Packaged food	Pre-test	45	3.7778	2.07681	2.831	72.043	.006*
	Post-test	45	2.7556	1.24600			

*p<.05, Independent Samples t-test

Discussion

Children aged 4 to 5 years is an important stage in which the foundation of the child's physical, mental and emotional development is laid¹. The nutritional habits acquired in this process directly shape the health of children in the following years. In addition to supporting growth and development, balanced and healthy nutrition also plays a decisive role in cognitive abilities and academic success². In this context, the acquisition of

healthy eating habits in the 4–5-year age plays a decisive role in the lifelong health of children.

The main aim of nutrition in the 4–5-year age years is to ensure optimal growth and development with adequate nutritional diversity³. In this process, parents' nutrition attitudes are one of the main factors that shape children's food preferences, eating motivations and long-term eating habits. Adopting mindful nutrition approaches by parents plays a critical role in protecting both physical and metabolic health of children¹¹.

In this study, 45 children aged 4-6 years studying at XXXXX Kindergarten took part. It was found that 89 % of the participants ate breakfast every day, 73% ate lunch, and 98 % always ate dinner. These findings are similar to the results of the study conducted by Lattanzi et al. (2023)⁵. In this study, it was reported that 90% of 108 children had breakfast at home, consumed lunch in the school canteen on weekdays, and all children ate dinner at home.

The findings of our study show that regular eating habits are common in children aged 4 to 5 years and children develop consistent behaviours regarding meal patterns. In the process of gaining healthy eating habits, it was observed that children's individual development was positively affected and parents were effective in gaining healthy habits by modelling their behaviours. These findings are consistent with the literature showing that visual guides and training are effective in the process of developing children's nutritional behaviours¹².

The relationship between dietary habits and gender was also analysed in the present study. Before the intervention, it was determined that only males' egg consumption frequency was significantly higher than that of females. However, no significant difference was observed between the genders in the post-tests conducted after the intervention. This finding suggests that healthy eating habits have similar effects on children of all ages and that education can play an important role in eliminating gender differences.

Pre-test and post-test comparisons of unhealthy dietary habits showed that there was a significant decrease in the consumption of white bread, ready-made fruit juices, oils, butter, confectionery, chocolate, cakes, biscuits and junk food. This finding is in line with the literature showing that visual guides such as "Nutripiatto" are an effective tool in portion control and acquisition of healthy eating habits among children⁵. Similarly, Kostecka (2022)¹³ found that activities such as puzzles, games, label charts and cooking workshops implemented within the scope of the "Colourful Nutrition is Healthy Nutrition" programme, when designed in accordance with children's developmental levels, reduced the consumption of sweetened beverages. It was also reported that the programme increased water intake and reduced the consumption of sweets¹³.

Visual materials used in the present study were found to be an effective tool in teaching children healthy eating habits and ensuring that children consume the correct portions of food. It was observed that the training has the potential to transform eating habits and

encourage healthy food consumption. In addition, it was observed that the training was equally effective on children of all ages by eliminating gender differences. Recent evidence from post-2023 intervention research highlights the effectiveness of structured nutrition education programs in enhancing dietary knowledge and healthy food choices among preschool children. A study examining a MyPlate-based nutrition education intervention found significant improvements in preschoolers' ability to identify food groups and distinguish between healthy and unhealthy foods following the program, emphasizing the value of visual materials and age-appropriate content in shaping dietary behavior in early childhood^{14,15}. Additionally, data from the UPBEAT trial indicate that maternal diet quality and family eating habits are strongly associated with preschool children's dietary patterns, underscoring the influence of home environment and parental modeling on children's eating behaviors and suggesting that educational interventions may be more effective when family dynamics are considered alongside child-focused strategies¹⁶.

In conclusion, the acquisition of healthy eating habits in the children aged 4 to 5 years is a critical step that will positively affect children's lifelong health. It is thought that training in children aged 4 to 5 years in order to gain healthy eating habits will positively affect the lifelong health of children¹⁴.

Conclusion

In our study, it was shown that visual materials can be used as an effective tool to reinforce healthy eating habits and reduce harmful food habits. These findings reveal how effective healthy nutrition education is in children aged 4 to 5 years and that such education will support healthy life behaviours of children in their later ages. This study evaluated the effect of nutrition education on children's eating habits in children aged 4 to 5 years. The findings show that consumption of white bread, instant fruit juices, butter, confectionery, chocolate, cakes, biscuits, junk food and packaged foods decreased, while consumption of milk, yoghurt, cheese, fish, dried legumes, vegetables and olive oil increased. However, this increase in healthy food consumption was not statistically significant. While it was found that the frequency of egg consumption of males was higher than that of females before the education, no significant difference was observed between genders after the education. These results suggest that nutrition education can create positive changes in children's dietary preferences and balance gender differences. In addition, visual materials and guides were found to be effective in increasing healthy eating awareness in children. In conclusion, the acquisition of healthy eating habits in the children aged 4 to 5 years may contribute to the adoption of a healthier lifestyle in later ages. Therefore, it is recommended that nutrition education at an early age should be popularised and supported with effective teaching methods.

Ethical Committee Approval

Approval was obtained from The Ethics Committee of Kırşehir Ahi Evran University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki (Decision no:2023/10/31; Decision date: 16/11/2023). As the study was conducted on

children, written informed consent was obtained from the parents/legal guardians of all participating students.

Conflict of Interest

The authors declare that they have no conflict of interest.

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A Qualitative Research on Unemployment Anxiety Experienced by Social Work Department Final Year Students During their Field Training

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Abstract

Aim: This study aims to explore the experiences of senior students enrolled in social work departments at universities in Konya, Türkiye, regarding their concerns about unemployment during their field training period. The research seeks to uncover the individual, social, and educational factors that influence students' perceptions of unemployment.

Method: The study was conducted using a qualitative research design grounded in reflexive thematic analysis. Participants were selected through snowball sampling, resulting in in-depth interviews with 35 senior students majoring in social work. Of the participants, 24 were female and 11 were male. Data were collected using a Demographic Information Form and a Semi-Structured Interview Form developed based on expert feedback. The collected data were analyzed using reflexive thematic analysis, with MAXQDA 2024 employed to support qualitative data management and organization.

Results: The analysis revealed two main themes and a total of ten sub-themes. The findings indicate that factors such as family attitudes, future uncertainty, the process of anxiety formation, the effects of anxiety, and the choice of academic major significantly shape students' perceptions of unemployment during field training. In particular, the sub-theme addressing the effects of anxiety revealed that students experienced not only emotional and cognitive strain but also behavioral and physical reactions, highlighting the multidimensional nature of their unemployment-related anxiety. Moreover, it was observed that students employed various coping strategies to manage their anxiety, including exploring job opportunities within and outside the field of social work, pursuing graduate education, preparing for public personnel selection exams (KPSS), and enhancing personal motivation.

Conclusion: The results demonstrate that unemployment anxiety among senior social work students is multidimensional, influenced by personal factors as well as social environment and educational experiences. These findings provide valuable insights for developing supportive, program-level practices to enhance students' career development and psychological resilience.

Keywords: Social work, unemployment, anxiety, unemployment anxiety, qualitative research.

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ETHICAL STATEMENT: To conduct this study, ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Selçuk University, Faculty of Health Sciences (Approval no: 2024/456 date: 24.04.2024).

Sosyal Hizmet Bölümü Son Sınıf Öğrencilerinin Uygulama Eğitimi Süreçlerinde Yaşadıkları İşsizlik Kaygısına Dair Nitel Bir Araştırma

Öz

Amaç: Bu araştırmanın amacı, Konya ilinde bulunan üniversitelerde öğrenim gören sosyal hizmet bölümü 4. sınıf öğrencilerinin alan uygulaması (saha eğitimi) sürecinde deneyimledikleri işsizlik kaygısına ilişkin deneyimlerini derinlemesine incelemektir. Araştırma, öğrencilerin işsizlik algılarını şekillendiren bireysel, toplumsal ve eğitsel faktörleri ortaya koymayı hedeflemektedir.

Yöntem: Araştırma, nitel araştırma desenlerinden refleksif tematik analiz temel alınarak yürütülmüştür. Katılımcılar kartopu örnekleme yöntemiyle belirlenmiş olup, toplam 35 sosyal hizmet bölümü son sınıf öğrencisiyle derinlemesine görüşmeler gerçekleştirilmiştir. Katılımcıların 24'ü kadın, 11'i erkektir. Veri toplama sürecinde, araştırmacı tarafından geliştirilen Demografik Bilgi Formu ve uzman görüşleri doğrultusunda oluşturulan Yarı Yapılandırılmış Görüşme Formu kullanılmıştır. Elde edilen veriler, refleksif tematik analiz yaklaşımı doğrultusunda çözümlenmiş; MAXQDA 2024 nitel veri analiz programı veri yönetimi ve düzenlenmesi amacıyla kullanılmıştır.

Bulgular: Veri analizi sonucunda iki ana tema ve bu temalara bağlı toplam 10 alt tema ortaya konmuştur. Bulgular, öğrencilerin işsizlik kaygısının oluşum sürecinde ailenin tutumu, gelecek belirsizliği, bireysel beklentiler ve bölüm tercihinin etkili olduğunu göstermektedir. Özellikle kaygının etkisini ele alan alt tema öğrencilerin sadece duygusal ve bilişsel değil, davranışsal ve bedensel (somatik) tepkiler de yaşadıklarını ortaya koymakta ve işsizlik kaygısının çok boyutlu yanını vurgulamaktadır. Öğrencilerin bu kaygıyla başa çıkma stratejileri arasında sosyal hizmet alanındaki iş olanaklarını değerlendirme, alternatif meslek arayışları, lisansüstü eğitim hedefleme, KPSS'ye hazırlık ve kişisel motivasyonu artırma öne çıkmaktadır.

Sonuç: Araştırma bulguları, sosyal hizmet bölümü son sınıf öğrencilerinin işsizlik kaygısının çok boyutlu olduğunu ve bu kaygının bireysel faktörler kadar sosyal çevre ve eğitimin sistemiyle ilişkili olduğunu ortaya koymaktadır. Elde edilen sonuçlar, sosyal hizmet eğitimi süreçlerinin yeniden değerlendirilmesi ve öğrencilerin kariyer gelişimlerine yönelik destekleyici, program düzeyindeki uygulamaların geliştirilmesi açısından önemli ipuçları sunmaktadır.

Anahtar Sözcükler: Sosyal hizmet, işsizlik, kaygı, işsizlik kaygısı, nitel araştırma.

Introduction

Youth unemployment has emerged as a critical global social and economic challenge, particularly affecting young people during the transition from education to the labor market. Recent international research consistently demonstrates that youth unemployment extends beyond financial deprivation and is strongly associated with increased anxiety, psychological distress, diminished life satisfaction, and long-term adverse career outcomes¹⁻³. Evidence from the United States and European countries further indicates that prolonged unemployment among young adults increases vulnerability to mental health problems and contributes to enduring psychological scarring, and simultaneously weakens future employability, thereby positioning youth unemployment as a significant public mental health concern rather than merely an economic issue^{4,5}.

Unemployment, defined as the inability to find a job despite being willing and able to work, is a significant problem particularly affecting young individuals, leading to

increased anxiety, emotional distress, and reduced psychological well-being⁶⁻⁸. In Türkiye, where youth unemployment is on the rise, the proportion of educated yet unemployed individuals is growing⁹.

According to the Labour Force Statistics for 2024 released by the Turkish Statistical Institute (TÜİK), although the overall unemployment rate declined to 8.7%, the youth unemployment rate (ages 15–24) remained considerably higher at 16.3%, indicating that young people continue to face disproportionate barriers to labour market integration¹⁰. These figures suggest that unemployment among young adults should be considered not only an economic issue but also a significant psychosocial risk factor, as extensive international evidence links youth unemployment to increased psychological vulnerability, emotional distress, and long-term mental health consequences^{5,11,12}. Unemployment anxiety refers to a multidimensional psychological state characterized by persistent worry, fear, and uncertainty regarding future employment prospects, particularly during periods of anticipated or prolonged joblessness¹⁴. Unlike general anxiety, unemployment anxiety is specifically rooted in concerns about future employability and encompasses emotional, cognitive, behavioral, and physical components, including chronic stress, feelings of inadequacy, reduced self-esteem, social withdrawal, and somatic symptoms, which have been widely documented in the international literature on work and mental health^{4,5}. Recent empirical studies further indicate that unemployment anxiety among university students is shaped by perceived labour market conditions, family expectations, educational experiences, and individual coping resources¹²⁻¹⁴.

Social work, as an applied discipline aiming to enhance individual and community well-being, plays a key role in addressing unemployment and its psychosocial consequences¹⁵⁻¹⁸.

However, social work students may experience unemployment anxiety more intensely than students in some other academic disciplines due to the profession's strong ethical orientation toward public service and its historical reliance on state-centered employment structures. The expectation of public-sector employment, combined with competitive recruitment mechanisms and limited appointment quotas, contributes to heightened pressure and uncertainty among social work students.

The issue of unemployment is especially pressing for university students approaching graduation, who often experience uncertainty about their career prospects and future¹⁹⁻²¹. In Türkiye, structural factors such as the rapid and unregulated expansion of social work programs, limited employment opportunities, and recruitment of non-specialists in social work roles exacerbate students' anxiety^{22,23}. These developments risk diminishing the appeal of the profession for future applicants^{24,25}.

Field training experiences may further intensify this anxiety, as students directly encounter institutional constraints, heavy workloads, and employment insecurity within social service settings, reinforcing concerns about their own future employability²⁶.

Although both national and international studies have examined unemployment anxiety among university students, research specifically focusing on social work students—particularly during their field training period—remains limited. Existing studies predominantly adopt quantitative approaches or address general student populations, leaving a significant gap in understanding the lived experiences, meaning-making processes, and coping strategies of senior social work students within the context of field education. This qualitative study addresses this gap by exploring how senior social work students experience unemployment anxiety during their field training, the factors contributing to this anxiety, and the strategies they employ to cope with it. By focusing on the field training process, the study offers an original and context-sensitive contribution to the international literature on social work education and youth unemployment.

This study explores how senior social work students experience unemployment anxiety during their field training process, the contributing factors to this anxiety, and the coping strategies they employ. It specifically aims to understand:

1-What does unemployment anxiety mean to senior students in social work programs?

2-What actions do these students take to cope with their unemployment anxiety?

In line with this aim, the following questions were posed to the participants:

- What does unemployment anxiety personally mean to you?
- Which symptoms of this anxiety do you observe in yourself?
- How did this anxiety develop?
- What were your thoughts about employment opportunities when you chose the social work department?
- What do you do to cope with or reduce your unemployment-related anxiety?

Material and Method

Study Design and Participants

This qualitative study was designed to explore unemployment-related anxiety among senior social work students at universities in the central district of Konya, Türkiye, during their field training period. The study adopted a reflexive thematic analysis (RTA) approach as outlined by Braun and Clarke (2006, 2019), which is well suited to identifying patterned meanings across participants' accounts while acknowledging the active role of the researchers in knowledge production. The analytic focus was not on capturing a single “essence” of experience, but on interpreting shared and divergent meanings related to unemployment anxiety within specific educational and institutional contexts^{27,28}.

Data were collected through semi-structured, in-depth interviews conducted with senior social work students enrolled in field training during the 2023–2024 academic year. The semi-structured interview form consisted of five open-ended questions exploring

students' perceptions of unemployment, psychological and somatic manifestations of anxiety (e.g., sleep disturbances, physical tension, fatigue), motivations behind departmental choice, and coping strategies during field training. Probing questions were used when necessary to encourage participants to elaborate on their emotional and bodily experiences related to unemployment concerns. Snowball sampling was employed to reach participants who could provide rich and relevant insights into the phenomenon under study. To enhance variation, students were recruited from three different universities, which helped reflect diverse institutional contexts and student experiences.

A total of 35 students voluntarily participated, comprising 24 females and 11 males, aged between 21 and 24. The distribution of participants was as follows: 15 from Selçuk University, 10 from Necmettin Erbakan University, and 10 from Karatay University. Before data collection, informed consent was obtained, and participants were assured of their right to withdraw at any stage without consequence. The students completed their field practice across a variety of settings, including public hospitals, social service centers, social assistance foundations, residential care institutions, judicial settings, university-based units, and several civil society organizations.

Data Collection Tool

Face-to-face interviews were conducted with 35 senior social work students in Konya, each lasting 25–40 minutes. A semi-structured interview form consisting of five open-ended questions was developed by the researchers and refined following expert review to ensure clarity, relevance, and comprehensiveness. Initially, ten social work academics were contacted via email to provide expert feedback, and four of them responded. These four experts, each with extensive experience in social work education and field practice supervision, reviewed the form and offered feedback that informed the final version.

With participants' informed consent, audio recordings were taken to ensure accurate and detailed analysis. Throughout the research process, confidentiality and anonymity were strictly maintained. Participants were assigned code identifiers (e.g., P1, P2) rather than real names to protect their identities.

Trustworthiness and Reflexivity

Trustworthiness was ensured through the criteria of credibility, transferability, dependability, and confirmability. Credibility was supported through member checking with five participants, who reviewed preliminary interpretations and confirmed that the themes accurately reflected their experiences^{30,31}.

Dependability and confirmability were enhanced through the maintenance of a detailed audit trail, including documentation of coding decisions, theme development, and reflexive memos recorded throughout the analytic process^{32,33}.

Reflexivity was actively practiced by the research team. The first researcher, an experienced social work academic, continuously reflected on prior professional

assumptions related to field training and student supervision. The second researcher, a practicing social worker, critically examined how professional experiences could shape interpretations. The third researcher, a recent graduate, contributed reflexive awareness of proximity to participants' experiences. Reflexive journals were maintained throughout the study to minimize the influence of preconceptions on analysis and ensure that interpretations remained grounded in participants' accounts.

Ethical Statement

To conduct this study, ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Selçuk University, Faculty of Health Sciences (Approval No: 2024/456 date: 24.04.2024). Written informed consent was obtained from all participants prior to the interviews, and participants were informed of their right to withdraw at any time without consequence. Audio recordings of the interviews were securely stored on a password-protected computer for the duration of the data analysis and were accessible only to the research team. After completion of the data analysis, all recordings were permanently deleted to ensure participant confidentiality.

Data Analysis

The interview data, comprising approximately 40 pages of verbatim transcripts, were analyzed using reflexive thematic analysis following the six-phase process proposed by Braun and Clarke²⁷: familiarization with the data, generation of initial codes, construction of candidate themes, review of themes, defining and naming themes, and producing the report. MAXQDA 2024 was used as a tool to support systematic data organization; however, all coding decisions were interpretative and iterative, allowing themes to evolve through continuous engagement with the data rather than through predefined categories.

Two researchers independently generated initial codes and reflective notes, while a third researcher acted as a critical peer, reviewing the developing code structure and thematic map and prompting reflexive discussions without merely assessing coder agreement. Through this process, analytic depth and coherence were strengthened. Code and meaning saturation was considered to have been reached after approximately 30 interviews, at which point no substantially new conceptual insights emerged and existing themes demonstrated sufficient analytic richness^{28,29}.

Results

As a result of the analysis of the semi-structured interviews conducted with 35 senior-year social work students, two main themes and ten sub-themes were identified. The findings are presented with representative participant quotations for each sub-theme, followed by brief interpretative statements to contextualize the data.

Table 1. Themes and sub-themes identified through interviews

Unemployment Anxiety Experienced by Senior Social Work Students During Their Field Training Process	
Unemployment Anxiety Experienced by Students	Students' Coping Strategies for Anxiety
Family Attitudes	Employment Opportunities in the Field
Future Anxiety	Alternative Job Opportunities
Anxiety Formation Process	Pursuing Graduate Education
Impact of Anxiety	Public Personnel Selection Examination (KPSS)
Choice of Academic Program	Personal Motivation

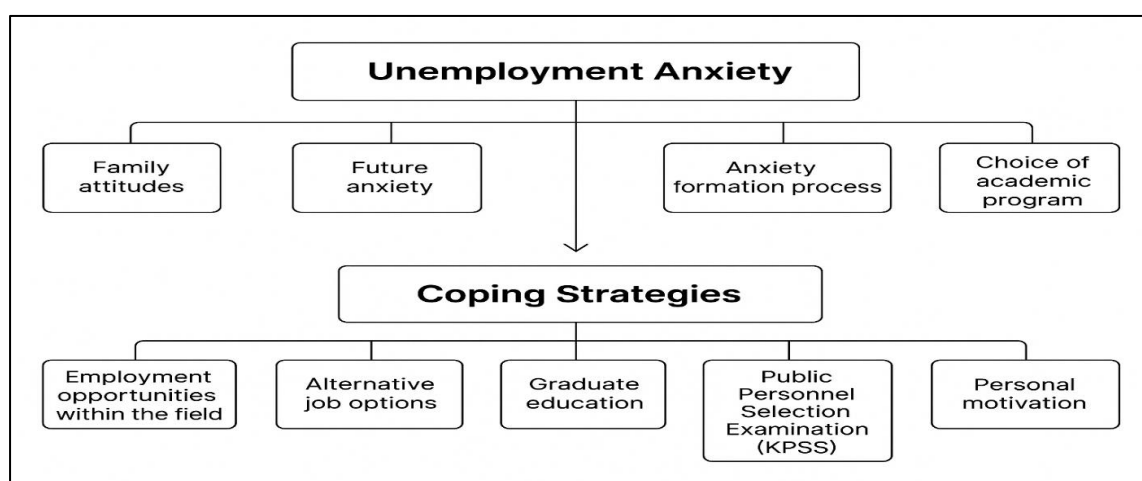
Figure 1. The interrelationships among the themes

Figure 1 visually presents the interrelationships among the themes identified in the analysis.

Unemployment Anxiety Experienced by Students

This theme captures the experiences and perceptions of students regarding unemployment anxiety during their field training. Under this theme, five sub-themes were identified: *family attitudes*, *future anxiety*, *the process of anxiety formation*, *the impact of anxiety*, and *choice of academic program*.

Family Attitudes

This sub-theme reflects the pressure and expectations students perceive from their families regarding post-graduation employment.

- “I’m in my final year, and my father keeps asking what I’m going to do next—implying something, of course.” (P14)

- “My family has invested so much in my education, and the thought of not being able to find a job after graduation makes me feel ashamed.” (P10)

Future Anxiety

This sub-theme encompasses students’ concerns about uncertainty, financial instability, and limited employment opportunities.

- “When I think about the future, the first thing that comes to mind is my employment status—what kind of job I’ll have. And that uncertainty leads to anxiety.” (P21)
- “The state’s issues with appointments, the problems social workers face in finding jobs, the fact that the public personnel exam (KPSS) is only held every two years, and the high score requirements—all these things negatively affect me. I know it will be difficult to find a job in social work, just like it is for everyone else in the field.” (P4)

Anxiety Formation Process

This sub-theme addresses when and how students began experiencing anxiety, from pre-university to field training experiences.

- “After I started university, my plans for the future were still unclear. But by third year, the anxiety started to set in.” (P22)
- “During my internship, I truly realized the seriousness of the situation. No matter how much I improve myself, I still feel like something’s missing. These thoughts intensify my anxiety.” (P32)

Impact of Anxiety

This sub-theme examines the effects of anxiety on students’ emotional, cognitive, behavioral, and physical states.

Emotional and Cognitive Effects

- Emotional and Cognitive Effects: “Your status in society changes with unemployment. It’s a personal issue, but it turns into social pressure.” (P19)
- Behavioral Effects: “At the end of the day, I feel overwhelmed by stress. It affects my whole life. I can’t enjoy anything. I feel guilty even when I’m out, thinking I should be studying.” (P11)
- Physical Symptoms: “My hands get ice cold, my heart races, and I lose my appetite. I feel weak.” (P10)

Choice of Academic Program

This sub-theme describes students' motivations for selecting social work, including perceived employment prospects and personal interest.

- “Before preparing for the university entrance exam, I didn't even know this department existed. I only learned about it through a guidance counselor.” (P6)

Students' Coping Strategies for Unemployment Anxiety

This theme captures the strategies students use to manage or reduce their unemployment-related anxiety. It encompasses five sub-themes: *employment opportunities within the field*, *alternative job options*, *graduate education*, *Public Personnel Selection Examination (KPSS)*, and *personal motivation*.

Employment Opportunities within the Field

This sub-theme reflects students' coping by focusing on job prospects within the social work field, both in public and private sectors.

- “When I chose social work, I paid attention to the fact that there are many job opportunities both in the public and private sectors. I considered employment options in ministries, nursing homes, rehabilitation centers, and similar institutions. Now, whenever I feel anxious, I try to remind myself that there are still many institutions where I might work.” (P30)
- “Compared to other fields, I think social work offers relatively better and broader employment opportunities. That's what I try to focus on.” (P21)

Alternative Job Options

This sub-theme highlights students' consideration of career paths outside social work to manage uncertainty and anxiety.

- “I'm currently enrolled in two university programs, one of which is child development. I chose that field because if I can't get appointed through social work, maybe I can find a job in child development.” (P2)
- “I'm considering enrolling in another degree program through open education. I plan to work right after graduation and maybe secure a civil service position in a different field. I'm actively seeking alternative solutions to manage this anxiety.” (P3)

Graduate Education

This sub-theme includes pursuing master's or other academic paths to delay unemployment or enhance employability.

- “I’m planning to pursue an academic path—like enrolling in a graduate program and getting accepted by a university.” (P17)
- “A bachelor’s degree alone isn’t enough. That’s why I need to pursue a master’s, learn another language, and keep improving myself to gain a competitive edge.” (P11)

Public Personnel Selection Examination (KPSS)

This sub-theme reflects students’ coping strategies related to preparation for the government employment examination.

- “Right now, I’m focusing on KPSS. Since there will be appointments this year, I’m motivating myself by thinking about that. It helps me manage my unemployment anxiety.” (P27)
- “I’m studying for KPSS, and the thought that I might get appointed gives me hope, so I keep going.” (P15)

Personal Motivation

This sub-theme addresses maintaining a positive mindset and self-development to manage anxiety.

- “In a way, I consider this anxiety to be normal. I think to myself, ‘There will be a period of unemployment, and that’s okay.’ I keep telling myself that I’ll eventually figure it out.” (P28)
- “I’m trying to equip myself in different areas and gain new skills so I can distinguish myself from others. I read to both distract myself from this anxious moment and to improve myself.” (P30)

Discussion

This study identified two main themes related to senior social work students’ experiences of unemployment anxiety during their field training: unemployment anxiety and coping strategies. These themes are discussed in relation to existing national and international literature.

Unemployment Anxiety

Participants reported that family attitudes—especially expectations of immediate employment—exerted significant pressure, often resulting in guilt and stress. Repeated family inquiries about future plans amplified anxiety, echoing findings in previous studies³⁴. Similar patterns have been observed in European and North American contexts, where family expectations and societal pressures significantly shape youth

perceptions of employability and increase psychological strain³. These findings suggest that family influence may be a cross-cultural determinant of unemployment anxiety, emphasizing the psychosocial dimension of youth unemployment beyond economic factors.

Under the sub-theme of future anxiety, concerns were voiced about limited public-sector opportunities and increasing graduate numbers, and fear of underemployment in unrelated, low-paying jobs. These perceptions were consistent with existing research indicating a mismatch between graduate numbers and job availability³³⁻³⁶. Internationally, such mismatch contributes to “career precarity,” with studies in Europe and Asia reporting chronic anxiety and uncertainty among social work and other professional students³⁷. Overall, perceived structural labor market factors exacerbate unemployment anxiety, although mechanisms—such as state-centered examinations in Türkiye—may differ.

Regarding the anxiety formation process, students identified three phases: pre-university, undergraduate education, and field training. Early academic pressure, fear of failure, and the harsh realities encountered during internships all contributed to persistent anxiety^{38,39}. Research from the U.S. similarly highlights that internships often act as both learning opportunities and stressors, especially when job prospects are uncertain^{40,41}. While the sources of anxiety may vary by context, the psychosocial impact appears comparable across settings.

Consistent with the findings, the impact of anxiety was observed not only at the emotional and cognitive levels but also through embodied physical symptoms (e.g., insomnia, fatigue), alongside social withdrawal and psychological distress^{42,43}. Comparable outcomes have been reported internationally, indicating that unemployment anxiety among social work students is a multidimensional psychosocial phenomenon, affecting emotional, cognitive, behavioral, and physical well-being^{5,13}. This evidence underscores the importance of addressing both structural and individual factors in interventions.

Finally, in the academic program choice, students who had consciously chosen the social work program experienced less anxiety, while those who enrolled without adequate information felt more uncertain. Prior research supports the role of intrinsic motivation in shaping students’ career confidence^{44,45}. European studies similarly indicate that informed program selection is associated with lower levels of unemployment anxiety¹², highlighting the protective effect of proactive career decision-making.

KPSS was reported by participants as a coping strategy; however, it also emerged as a structural stressor. Reliance on state-centered appointments creates a dual effect: a potential solution while generating uncertainty and competitive pressure^{13,27}. This dual nature mirrors international findings, where formalized exam systems serve as both employment pathways and stressors⁴⁶.

Coping Strategies

Participants employed several coping mechanisms. Many placed their hopes in the employment potential of the social work field, reflecting optimism about public and private sector roles⁴⁷. Targeting sectors with better job prospects can provide psychological relief and inform program-level interventions⁴⁸.

Others developed alternative career plans, such as pursuing dual degrees or considering unrelated jobs, demonstrating proactive career planning as a common strategy to navigate labor market uncertainty across different countries⁴⁹. This indicates that students adopt flexible career strategies, enhancing resilience against structural uncertainties.

Graduate education was also a recurring strategy, with many planning to pursue master's degrees or academic careers as a safeguard against unemployment^{50,51}. Advanced education serves to delay immediate labor market entry—reducing short-term anxiety—and increasing long-term career resilience.

KPSS preparation was widely regarded as a structured route to stable employment⁵². Here, KPSS functions both as a coping mechanism and as a structural source of anxiety⁵³.

Finally, personal motivation played a crucial role in resilience. Participants actively seeking self-improvement and reframing challenges reported better emotional coping, highlighting the protective role of individual agency and self-efficacy.

Conclusion and Recommendations

This study explored the unemployment anxiety experienced by senior social work students during their field training. The findings highlighted the multifaceted nature of this anxiety, shaped by family expectations, future concerns, physical and emotional impacts and motivations behind academic choices. Participants reported significant psychological distress, including feelings of isolation and reduced life satisfaction.

To cope with this anxiety, students adopted several strategies: seeking employment opportunities in the field, exploring alternative careers, pursuing graduate education, preparing for the Public Personnel Selection Examination (KPSS) as a key coping strategy. These strategies reveal a combination of proactive coping and adaptation to structural constraints, highlighting the need for both individual and institutional interventions.

Recommendations

- Structured career planning support within social work programs, including individualized guidance for public, private, and NGO employment pathways.
- Workshops or sessions for KPSS preparation, focusing on study strategies, stress management, and realistic expectations.

- Group-based or individual psychological support, including mindfulness practices, cognitive-behavioral techniques, and resilience-building activities.
- Career development and diversification activities, mentorship programs, alumni networking, and practical skill-building (CV/interview preparation), internationalization, and dual-degree opportunities.
- Encouraging exploration of complementary fields, such as child development, community health, or counseling.
- Reflective practice sessions and peer support groups to discuss anxieties and enhance self-efficacy.
- Programs to strengthen personal competencies: time management, adaptive coping strategies, emotional regulation, and self-efficacy.

Limitations

First, the transferability of the findings may be limited, as the study was conducted in a single province and relied on a snowball sampling strategy. Additionally, because the interviews were carried out during the students' internship period, it is possible that situational stressors present at that time may have heightened their anxiety levels. This context may have influenced how participants expressed their concerns regarding unemployment.

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A Comprehensive Examination of YouTube Videos: Quality and Content Analysis of Occupational Therapy on Executive Functions in Children

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Abstract

Aim: The scope of this research was to examine the content analysis, quality level and credibility of occupational therapy videos on YouTube about executive functioning in the children.

Method: The research was carried out on YouTube worldwide using the keyword "pediatric occupational therapy executive functioning" with all categories filters applied. The first 200 videos were evaluated for relevance, and 35 of them were reviewed by two independent experts. The Video Power Index (VPI) was utilized to identify the video trend, the Global Quality Score (GQS) for video quality assessment Modified Discern Scoring (Mdiscern), and the JAMA Scoring System for video reliability assessment.

Results: Of the 35 videos analyzed, it was founded that 57.1% were uploaded by public healthcare institutions, while 42.9% were uploaded by independent therapists. Recordings posted by independent practitioners scored significantly higher on both the Mdiscern and JAMA scores ($p=0.003$ and $p=0.002$, respectively). However, no statistically significant group differences emerged for the VPI and the GQS ($p>0.05$).

Conclusion: This study highlights improvement of the quality level and credibility of online media health shares for the children through the availability of information about YouTube videos related to childhood executive functioning, a critical area of occupational therapy practice.

Keywords: Executive functioning, pediatric occupational therapy, YouTube videos, quality

YouTube Videolarının Kapsamlı Bir İncelemesi: Çocuklarda Yürütücü İşlevler Üzerine Ergoterapi Videolarının Kalite ve İçerik Analizi

Öz

Amaç: Bu çalışmanın amacı, YouTube'daki yürütücü işlevlerle ilgili pediatrik ergoterapi videolarının kalite ve içerik analizinin yapılmasıdır.

Yöntem: Araştırma tüm kategori filtreleri uygulanarak "pediatric occupational therapy executive functioning" anahtar kelimesi kullanılarak YouTube'da gerçekleştirildi. İlk 200 video uygunluk açısından değerlendirildi ve bunlardan 35'i iki bağımsız uzman tarafından incelendi. Video popülerliğini

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değerlendirmek için Video Güç Endeksi (VPI), video kalite değerlendirmesi için Modifiye Discern Puanlaması (Mdiscern) için Global Kalite Puanı (GQS) ve video güvenilirlik değerlendirmesi için JAMA Puanlama Sistemi kullanılmıştır.

Bulgular: Analiz edilen 35 videonun %57,1'inin sağlık kurumları tarafından, %42,9'unun ise bağımsız terapistler tarafından yüklendiği tespit edildi. Bağımsız ergoterapistler tarafından yüklenen videoların Mdiscern ve JAMA puanları sağlık kurumları tarafından yüklenenlere kıyasla daha yüksek olduğu bulundu (sırasıyla $p=0,003$, $0,002$). Ancak, VPI veya GQS için istatistiksel olarak iki grup arasında anlamlı farklar görülmedi ($p>0,05$).

Sonuç: Bu araştırma, ergoterapi uygulama alanları içerisinde kritik bir alan olan çocukluk çağı yürütücü işlevleri ile ilgili YouTube videoları hakkında bilgi sağlayarak bu popülasyon için çevrimiçi sağlık paylaşımlarının kalite ve güvenilirliğinin iyileştirilmesini vurgulamaktadır.

Anahtar Sözcükler: Yürütücü işlevler, pediatrik ergoterapi, YouTube videoları, kalite.

Introduction

Executive functions (EF) is an umbrella term referring to higher-order cognitive processes required for behavioral regulation and goal-directed behavior^{1,2}. EF include inhibitory control, which supports behavioral and impulse regulation; working memory, which enables the retention of information; and cognitive flexibility, which facilitates switching between tasks or adopting different perspectives³. Current evidence indicates that neural structures undergo significant changes in size and function during childhood. Therefore, adequate development of EF during this period is a key determinant of later life outcomes^{4,5}. EF impairments are common symptoms of many neurodevelopmental diseases, including autism spectrum or attention deficit hyperactivity disorders⁶.

EF deficits in children may contribute to difficulties in cognitive, social, behavioral, and academic domains^{7,8}. In addition, EF deficits have been identified as risk factors for adjustment problems, including substance misuse and aggression⁹. The literature also reports executive function difficulties in typically developing children, which may be associated with environmental factors such as school context and parental influences, as well as individual factors including motor competence and sensory characteristics^{10,11}. Therefore, assessment, intervention, and knowledge dissemination related to executive functions are of considerable importance for families, teachers, physicians, and therapists^{12,13}.

The number of evidence-based occupational therapy studies addressing assessment and intervention approaches related to EF is increasing. Occupational therapists have developed more than ten assessment tools related to EF and have introduced several evidence-based interventions, such as the Alert Program and Interactive Metronome training, within pediatric rehabilitation¹². Despite these advances, the concept of knowledge translation, referring to the effective transfer of research evidence into clinical practice, has gained increasing attention due to ongoing challenges in implementing evidence-based knowledge in real-world settings^{14,15}. In pediatric rehabilitation, effective knowledge translation is particularly important to enable families to access accurate

information about their children's conditions, actively participate in the rehabilitation process, and sustain motivation¹⁶. However, families increasingly turn to social media platforms, such as Instagram, YouTube, and TikTok, as sources of health-related information rather than consulting health professionals directly¹⁷. Among these platforms, YouTube is widely used by families, students, and professionals due to its audiovisual format, subtitle and translation options, broad range of content, ease of access, and capacity for information sharing¹⁸⁻²⁰. However, despite these advantages, not all information presented on YouTube is reliable or evidence-based^{21,22}.

According to the literature, studies evaluating the quality of YouTube content across various health topics have reported that the information provided ranges from low to moderate quality^{21,23,24}. To the best of our knowledge, no studies have comprehensively assessed the quality of YouTube content related to executive functions in pediatric occupational therapy. In this context, examining the quality of YouTube content is essential given the existing gap in the literature, the clinical importance of EF in pediatric occupational therapy, and the need to ensure families' access to credible information^{12,16}. Therefore, this study aimed to comprehensively evaluate the content characteristics, quality, and credibility of YouTube videos related to EF in pediatric occupational therapy.

Material and Methods

Procedures

On January 28, 2025, YouTube was searched using the English-language interface with the search term "pediatric occupational therapy executive functions." The browser search history was cleared prior to the search, and searches were conducted without logging into a user account to minimize personalization effects.

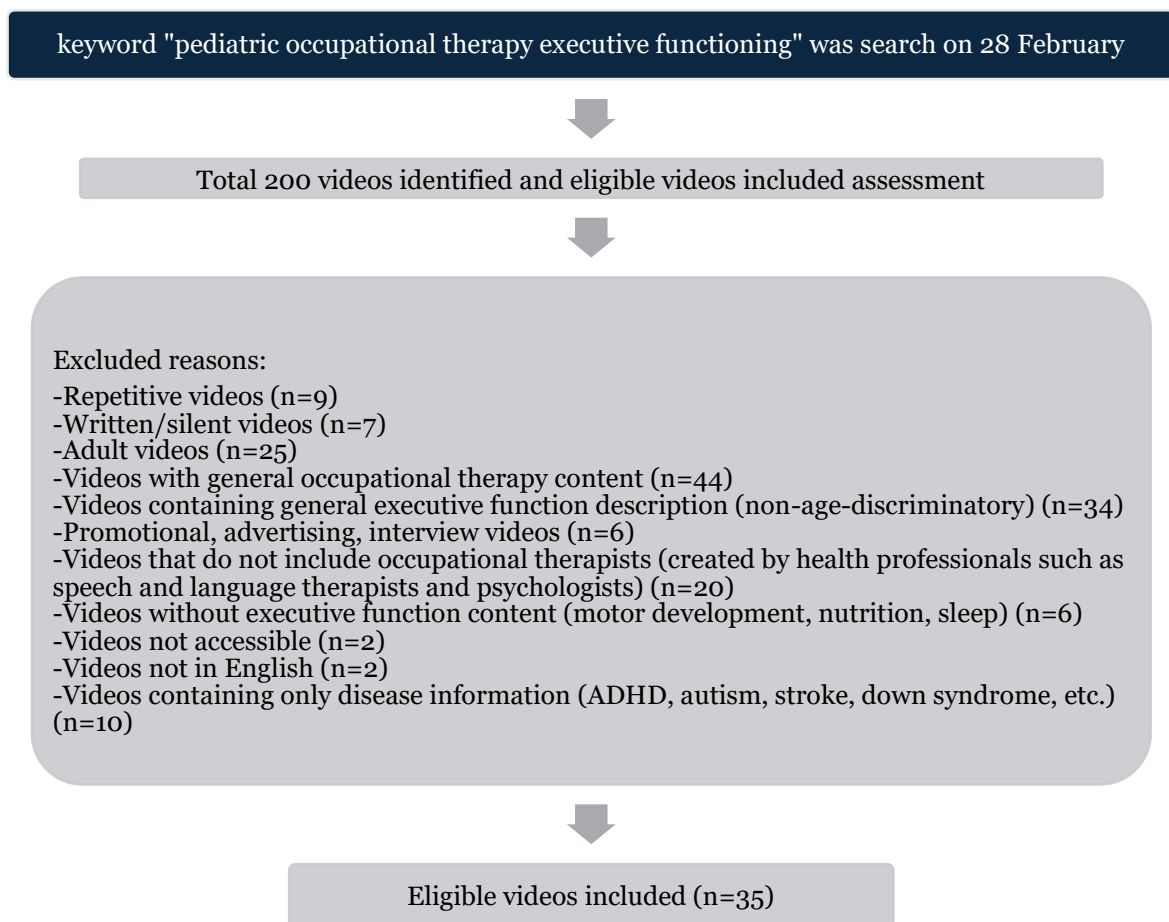
The search strategy was designed in accordance with previously published YouTube-based health information studies. Because YouTube operates using an algorithm-driven relevance system rather than Boolean logic, a single comprehensive search phrase ("pediatric occupational therapy executive functions") was used to simulate typical user search behavior. Similar single-term or limited-term strategies have been widely applied in prior YouTube quality analysis studies^{19,22,23}. To enhance reproducibility, the exact search term, search date, and sorting method are explicitly reported.

The examination was determined based on the "relevance level," and the first 200 videos were analyzed. This restriction was applied to reflect typical user behavior, as YouTube search results are algorithm-driven and users generally focus on the first pages of ranked results. Evaluating the first 200 videos allowed the analysis of the most visible and accessible content while maintaining feasibility for detailed independent scoring. Similar predefined screening limits have been widely used in previous YouTube-based health information studies^{21,24}. Evaluating the first 200 videos also ensured feasibility for detailed independent scoring while maintaining methodological consistency with prior research.

Predefined inclusion and exclusion criteria were applied to enhance methodological transparency. Videos were included if they were in English and specifically addressed pediatric occupational therapy interventions, assessments, or explanations related to executive functioning. Videos were excluded if they were repetitive, silent or text-based only, promotional or advertising in nature, not accessible, focused exclusively on adult populations, did not involve occupational therapists, or did not contain executive functioning content.

To ensure transparency, the upload date of each included video was recorded and reported. No minimum view-count threshold was established, as the objective of the study was to evaluate the overall quality and credibility of available content rather than only highly viewed videos. A total of 200 videos were initially screened based on relevance, and 35 videos met the eligibility criteria for final analysis. The detailed selection process is illustrated in Figure 1.

Figure 1. Flowchart for selecting qualified YouTube videos.



Two independent experts in pediatric occupational therapy (one specializing in pediatric occupational therapy and the other in cognitive rehabilitation) evaluated the videos. In

cases of disagreement, consensus was reached through discussion. For each video, data including upload date, number of views, video duration, number of likes and dislikes, and number of comments were collected. Since YouTube does not publicly display dislike counts, third-party browser extensions were used to obtain these data.

The Video Like Ratio (VLR) and view rate (calculated as the number of views divided by the number of days since upload) were calculated. The VLR was calculated using the formula: $100 \times [\text{likes} / (\text{likes} + \text{dislikes})]$. Video popularity was evaluated using the Video Power Index (VPI), calculated as $(\text{VLR} \times \text{view rate}) / 100$.

Assessment of Video Quality and Credibility

Video quality and reliability were assessed using the Global Quality Scale (GQS), the JAMA Scoring System, and the Modified DISCERN Scoring System (Mdiscern). These instruments are among the most widely used tools in the literature for evaluating the credibility and quality of online videos^{22,25,26}.

Global Quality Score (GQS): GQS was developed by Bernard et al. in 2007 to evaluate overall video quality based on information accuracy, flow, and usability. The scale uses a five-point Likert-type scoring system ranging from 1 to 5. A scoring of 1 shows poor/low quality level, while a scoring of 5 shows perfect quality level. Scores of 1–2 indicate low quality, a score of 3 indicates moderate quality, and scores of 4–5 indicate high quality^{27,28}.

Modified DISCERN Scoring System (Mdiscern): The Modified DISCERN was originally developed to assist healthcare consumers and information providers in assessing the quality of written information regarding treatment options for medical conditions²⁸. The original DISCERN tool was developed by Charnock et al. (1999) and later adapted by Singh et al. (2012) for evaluating the credibility of YouTube videos by converting it into a five-item format^{28,29}. Each of the five items is scored as “yes” (1 point) or “no” (0 points), with higher total scores indicating greater reliability. A score of 3 or higher is considered indicative of high reliability^{30,31}.

JAMA Scoring System: The JAMA criteria are used to evaluate quality, reliability, and accessibility of medical information on the internet³². The evaluation includes four key components: (1) authorship, (2) attribution (references and copyright information), (3) disclosure (sponsorship, advertising, and conflicts of interest), and (4) currency. Each criterion is assigned 0 points if absent and 1 point if present. A total score ≥ 3 indicates high reliability, whereas a score ≤ 2 indicates low reliability³³.

Ethical Statement

This study analyzed publicly available data from YouTube and did not involve human participants, patient records, or private information. Therefore, ethical committee approval was not required.

Statistical Analysis

Statistical analyses were performed using SPSS version 25.0. Normality was assessed visually using histograms, Q–Q plots, and detrended normal plots, and analytically using the Shapiro–Wilk test, skewness, and kurtosis values. Continuous variables are presented as medians and interquartile ranges (IQR), whereas categorical variables are expressed as frequencies and percentages.

Inter-rater reliability of the three scoring tools (GQS, Mdiscern, and JAMA) was evaluated using the intraclass correlation coefficient (ICC). An ICC value greater than 0.90 was considered indicative of excellent agreement. Correlations between the scoring tools were analyzed using Spearman's rank correlation test. The Mann–Whitney U test was used to compare videos uploaded by independent occupational therapists and official healthcare organizations. A p value < 0.05 was considered statistically significant.

Results

A total of 35 occupational therapy videos related to EF in children were included in the analysis. Of these, 57.1% were uploaded by official healthcare institutions, while 42.9% were uploaded by independent occupational therapists. Among the 35 videos, 17 focused primarily on occupational therapy interventions, 8 provided descriptive information about EF followed by occupational therapy interventions, 4 presented only EF information, 4 included assessment tools related to executive functioning, and 2 addressed EF interventions for specific conditions. The most-watched video (246,484 views) focused on occupational therapy strategies to improve attention (Video title: “8 Highly Effective Activities to Improve Concentration for Kids | How to Improve Focus and Attention”). Table 1 presents the descriptive features of the 35 videos.

Table 1. Features of YouTube videos for occupational therapy on executive functioning in children (n=35).

	Mean (SD)	Median	IQR
Video duration (minutes)	19.31 (25.76)	7.5	15.5
Time to since video upload (days)	1058.54 (718.57)	973	714
Like	150.34 (692.14)	4	16
Dislike	2.94 (14.7)	0	0
Comments	2.54 (6)	0	3
Number of views	8955 (41610)	147	1069
View ratio	7.42 (33.8)	0.2	0.97
Video like ratio	73.6 (43.9)	100	100

Video Power Index	7.3 (33.1)	0.16	0.99
Global Quality Scale	3.94 (0.8)	4	2
Modified Discern Scoring System	3.5 (1)	4	1
JAMA Scoring System	2.94 (0.9)	3	2
Video content	n	%	
-Definition of EF	4	11.4	
-Definition of EF and OT strategies	8	22.9	
-OT interventions for EF	17	48.6	
-Diseases related to EF and OT strategies	2	5.7	
-Evaluation tools	4	11.4	
Video sources			
-Official healthcare institutions	20	57.1	
-Independent occupational therapists	15	42.9	

SD: standard deviation; IQR: interquartile range; EF: executive function; OT: occupational therapy.

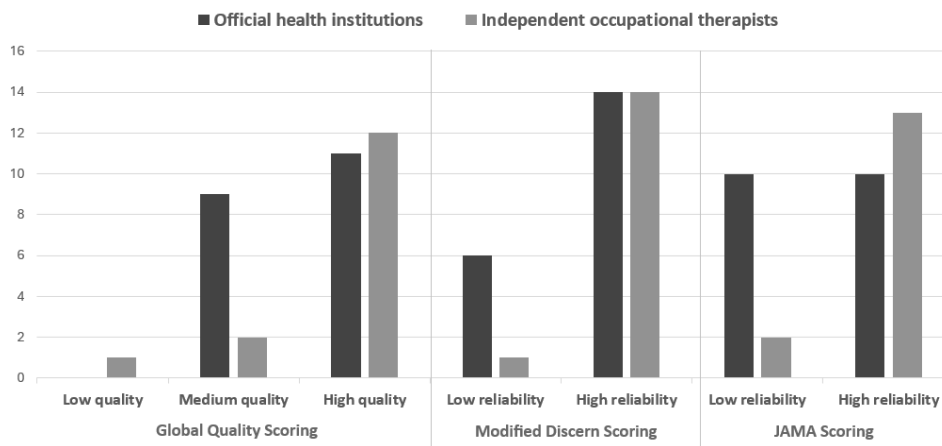
Table 2 presents the descriptive characteristics of YouTube videos according to their upload source. There were no statistically significant differences between videos uploaded by independent occupational therapists and those uploaded by official healthcare institutions in terms of number of views, comments, likes, dislikes, or view rate ($p > 0.05$). Mdiscern and JAMA scores, which assess video credibility, were significantly higher for videos uploaded by independent occupational therapists compared with those uploaded by official healthcare institutions ($p = 0.003$ and $p = 0.002$, respectively). In contrast, GQS scores, which evaluate video quality, did not differ significantly between the two groups ($p > 0.05$).

Table 2. Analyzing video qualities according to the source of uploaded videos.

Video Sources	Official Health Institutions (n=20)		Independent Occupational Therapist (n=15)		Test Statistics	
	<i>M (SD)</i>	<i>Median</i>	<i>M (SD)</i>	<i>Median</i>	<i>Z</i>	<i>p</i>
Video period/ duration (minutes)	27.16(31.45)	9.38	8.88 (8.08)	6.38	-1.867	0.062
Time to since video upload (days)	1245 (801)	1220	809.9 (516)	786	-2.150	0.032*
Like	236.6 (913)	1	35.3 (76)	12	-1.908	0.056
Dislike	4.6 (19)	0	0.7 (2)	0	-0.305	0.76
Comments	2.1 (5)	0	3.1 (6)	0	-1.340	0.18
Number of views	13888 (54890)	181.5	2377 (5891)	118	-0.57	0.57
View ratio	11.6 (44)	0.16	1.8 (3)	0.22	-1.401	0.16
VLR	59.8 (50)	99	92 (25)	100	-1.923	0.054
VPI	11.4 (43)	0.07	1.7 (3)	0.33	-1.772	0.076
GQS	3.8 (0.7)	4	4.2 (0.9)	4	-1.671	0.095
Mdiscern	3.1 (0.8)	3	4 (1)	4	-2.964	0.003*
JAMA	2.6 (0.7)	2.5	3.5 (0.9)	4	-3.082	0.002*

M: mean; SD: standard deviation; VPI: Video Power Index; GQS: Global Quality Scoring; VLR: video like ratio; JAMA: JAMA Scoring System; Mdiscern: Modified Discern Scoring System; Z: Mann Whitney U Test. *p<0.05.

According to GQS classifications, 55% of videos uploaded by official healthcare institutions were rated as high quality, whereas 80% of videos uploaded by independent occupational therapists were rated as high quality. Based on Mdiscern scores, 70% of videos uploaded by official healthcare institutions and 93% of videos uploaded by independent occupational therapists demonstrated high reliability. Similarly, according to the JAMA criteria, 50% of videos uploaded by official healthcare institutions and 87.9% of videos uploaded by independent occupational therapists were classified as highly reliable (Figure 2).

Figure 2. Rating systems and number of videos of the two groups grouped by upload characteristics.

While videos did not show significant associations with descriptive features such as video length, likes, dislikes, and VPI concerning GQS, Mdiscern, and JAMA scoring. A significant association was established between JAMA, GQS, and Mdiscern score (Table 3).

Table 3. Correlation coefficients between video characteristics and quality/reliability scores.

GQS			Mdiscern			JAMA		
	r	p		r	p		r	p
Video length/period (minutes)	0.27	0.12	Video length (minutes)	-0.03	0.88	Video length (minutes)	-0.17	0.32
Like	0.11	0.95	Like	0.28	0.10	Like	0.18	0.30
Dislike	-0.15	0.40	Dislike	-0.07	0.68	Dislike	-0.15	0.38
Comments	-0.01	0.95	Comments	0.17	0.32	Comments	0.13	0.47
View ratio	-0.05	0.76	View ratio	-0.25	0.15	View ratio	0.12	0.48
VLR	0.27	0.12	VLR	0.32	0.06	VLR	0.25	0.15
VPI	0.02	0.90	VPI	0.25	0.15	VPI	0.12	0.50
Mdiscern	0.64	0.00***	JAMA	0.83	0.00***			
JAMA	0.57	0.00***						

VPI: video power index; Mdiscern: Modified Discern Scoring System; VLR: video like ratio; JAMA: JAMA Scoring System; r: Sperman Correlation Coefficient; ***p<0.001.

Discussion

The present study aimed to comprehensively evaluate the content, quality, and credibility of YouTube videos related to EF in pediatric occupational therapy. Among the 35 included videos, 57.1% were uploaded by official healthcare institutions, whereas 42.9% were uploaded by independent occupational therapists. This distribution indicates that both institutional and individual contributors are actively involved in

disseminating information on this topic. Studies examining the quality of YouTube content within pediatric occupational therapy remain limited and relatively recent^{21,24}. While previous research has explored the use of online videos for educational purposes in occupational therapy training^{34,35}, fewer studies have specifically evaluated the quality and reliability of publicly accessible content intended for families and practitioners. Given the increasing use of YouTube as a platform for sharing health-related information³⁶, examining the quality and credibility of such content is particularly relevant.

The findings of the present study regarding the quality and credibility of YouTube videos on EF in pediatric occupational therapy are consistent with previous studies evaluating YouTube content related to cerebral palsy (CP) and autism spectrum disorder (ASD) in pediatric rehabilitation^{21,24}. Similar to those studies, engagement metrics such as views, likes, dislikes, and VPI did not significantly differ between videos uploaded by independent occupational therapists and those uploaded by official healthcare institutions. However, videos from official healthcare institutions tended to receive higher absolute numbers of views and engagement indicators. Furtado et al. (2022) reported that a substantial proportion of informative CP-related videos received institutional support²¹. This may partially explain why institution-based content often achieves greater visibility and reach. In the present study, EF-related videos uploaded by healthcare institutions also demonstrated higher view counts. This observation suggests that institutional affiliation may influence audience reach, although it does not necessarily reflect differences in content quality or reliability. Previous research has indicated that broader or more general health-related topics may attract greater public attention compared to highly specific content^{21,24,37-39}. Accordingly, the framing and presentation style of video titles and descriptions may contribute to differences in engagement metrics. However, further research is needed to better understand the factors influencing audience interaction on digital platforms.

In the present study, the mean GQS score was approximately 4, indicating that, on average, the videos demonstrated generally good quality. However, this average score does not imply uniform quality across all videos, as variability was observed within the sample. Previous studies examining YouTube content related to pediatric rehabilitation, such as those by Furtado et al. (2022) and Cortes et al. (2024), reported mean GQS scores around 3, corresponding to moderate quality^{21,24}. While the slightly higher mean observed in the current study may reflect differences in topic focus or sampling characteristics, direct comparisons should be interpreted cautiously due to methodological variations across studies.

Previous studies in pediatric occupational therapy reported mean Modified DISCERN scores of 4 and 3^{21,24}. However, these studies did not differentiate videos according to the source of upload, limiting direct comparisons regarding reliability by uploader type. In the present study, videos uploaded by independent occupational therapists demonstrated significantly higher reliability scores based on the JAMA and Modified DISCERN systems. Nevertheless, no statistically significant difference was observed in

GQS scores between the two groups. These findings suggest variability in reliability indicators depending on the uploading source rather than a definitive difference in overall video quality.

Although videos uploaded by official healthcare institutions tended to receive higher engagement metrics (e.g., views, likes, and VPI), higher engagement does not necessarily correspond to higher reliability or quality scores. Similar patterns have been reported in pediatric YouTube research, although findings across studies remain inconsistent^{22,40}. A significant positive correlation was observed between GQS, Modified DISCERN, and JAMA scores, indicating internal consistency among the applied evaluation tools. Taken together, the results highlight differences in reliability metrics across uploader types; however, these findings should be interpreted cautiously given the sample size and the cross-sectional design of the study.

This study has several limitations. First, it was not possible to determine the underlying factors contributing to variations in engagement metrics such as likes, dislikes, views, and view rates. Moreover, because YouTube content and algorithm rankings continuously change, the findings represent a cross-sectional snapshot of the most visible content at the time of data collection. Second, the evaluation of video quality and reliability relied on established but inherently subjective assessment tools, and ratings were conducted by only two independent experts. Although inter-rater agreement was high, this may limit the generalizability of the findings. Third, only English-language videos were included, which may limit the applicability of the results to other linguistic or cultural contexts. Additionally, dislike counts were obtained using a third-party browser extension, as YouTube no longer publicly displays this information. Therefore, the accuracy of these data cannot be fully guaranteed, and findings related to dislike-based metrics should be interpreted with caution. Finally, the rapidly evolving landscape of digital platforms highlights the need for future research examining other social media environments, such as Instagram and TikTok, where health-related information is increasingly disseminated.

Conclusion

This study provided a comprehensive evaluation of YouTube videos related to EF in pediatric occupational therapy, focusing on content characteristics, quality, and credibility. Overall, the mean GQS score indicated generally good video quality. However, variability in reliability scores (JAMA and Modified DISCERN) suggests that not all videos consistently met high credibility standards. Although videos uploaded by official healthcare institutions tended to achieve higher engagement metrics, higher visibility did not necessarily correspond to higher reliability scores. These findings highlight the importance of promoting transparent, evidence-based communication in digital health content, particularly for families seeking information on EF in children. Continued efforts by healthcare institutions and professionals to enhance the clarity, credibility, and accessibility of online educational materials may contribute to improving the overall quality of publicly available health information.

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Optimizing Surgical Management of Renal Hyperparathyroidism: Insights from a Single-Center Experience

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Abstract

Aim: Renal hyperparathyroidism is one of the most common complications in patients with end-stage renal disease and is often resistant to medical treatment. Surgical treatment remains the only definitive option in cases resistant to pharmacological management.

Method: We retrospectively reviewed 480 patients who underwent parathyroid surgery between June 2020 and June 2025. Among them, 26 had renal hyperparathyroidism, and after applying exclusion criteria, 14 patients were included in the final analysis. Demographics, surgical strategies, perioperative biochemical data, complications, and follow-up outcomes were assessed.

Results: The study population consisted of 14 patients, including 10 males and 4 females. Patient age ranged from 23 to 61 years, dialysis duration ranged from 2 to 21 years, and length of hospital stay ranged from 3 to 28 days. Surgical approaches included subtotal parathyroidectomy (n=5), total parathyroidectomy (n=4), and purge parathyroidectomy (n=5). Preoperatively, parathyroid hormone levels were markedly elevated and showed a substantial postoperative decline, accompanied by improvements in serum calcium and phosphorus levels. Recurrent laryngeal nerve palsy and disease recurrence were observed in none of the patients with long-term follow-up. Postoperative hypocalcemia requiring intravenous calcium therapy was observed in 5 patients, three of whom had undergone purge parathyroidectomy and two total parathyroidectomy.

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ETHICAL STATEMENT: This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of University of Health Sciences, Hamidiye Faculty of Medicine, Basaksehir Cam and Sakura City Hospital Istanbul, Türkiye (Approval No: 39, Date: 05 February 2025).

Conclusion: In this retrospective series, parathyroidectomy was associated with marked biochemical improvement in patients with renal hyperparathyroidism refractory to medical management. Surgical approaches were applied according to patient-specific clinical characteristics and intraoperative findings.

Keywords: End-stage renal disease, purge parathyroidectomy, secondary hyperparathyroidism, renal hyperparathyroidism.

Renal Hiperparatiroidizmde Cerrahi Tedavi Yaklaşımları: Tek Merkez Deneyimi

Öz

Amaç: Sekonder ve tersiyer hiperparatiroidizm, son dönem böbrek yetmezliği olan hastalarda sık görülen ve çoğu zaman medikal tedaviye dirençli olan önemli komplikasyonlardır. Farmakolojik tedaviye yanıt alınamayan olgularda cerrahi tedavi tek seçenek olmaya devam etmektedir.

Yöntem: Haziran 2020 ve Haziran 2025 tarihleri arasında paratiroid cerrahisi uygulanan 480 hasta retrospektif olarak incelendi. Bu hastaların 26'sında renal hiperparatiroidizm mevcuttu. Dışlama kriterleri uygulandıktan sonra 14 hasta çalışmaya dahil edildi. Hastaların demografik özellikleri, uygulanan cerrahi yöntemler, perioperatif biyokimyasal veriler, komplikasyonlar ve takip sonuçları değerlendirildi.

Bulgular: Çalışmaya 10'u erkek, 4'ü kadın olmak üzere toplam 14 hasta dahil edildi. Hastaların yaşları 23–61 yıl arasında değişmekte olup, cerrahi öncesi diyaliz süreleri 2–21 yıl, hastanede yatış süreleri ise 3–28 gün arasında saptandı. Uygulanan cerrahi yaklaşımlar subtotal paratiroidektomi (n=5), total paratiroidektomi (n=4) ve purge paratiroidektomi (n=5) idi. Cerrahi öncesi paratiroid hormon düzeylerinin belirgin derecede yüksek olduğu ve cerrahi sonrası dönemde anlamlı bir düşüş gösterdiği, buna eşlik eden serum kalsiyum ve fosfor düzeylerinde düzelme izlendi. Uzun dönem takibi bulunan hastaların hiçbirinde rekürren laringeal sinir paralizisi veya hastalık nüksü saptanmadı. İntravenöz kalsiyum tedavisi gerektiren postoperatif hipokalsemi beş hastada görüldü; bu hastaların üçüne purge paratiroidektomi, ikisine ise total paratiroidektomi uygulanmıştı.

Sonuç: Bu retrospektif seride, paratiroidektomi medikal tedaviye dirençli renal hiperparatiroidizm hastalarında belirgin biyokimyasal iyileşme ile ilişkili bulunmuştur. Cerrahi yaklaşımlar, hasta-özü klinik özellikler ve intraoperatif bulgular doğrultusunda uygulanmıştır.

Anahtar Sözcükler: Purge paratiroidektomi, renal hiperparatiroidizm, son dönem böbrek yetmezliği, sekonder hiperparatiroidizm.

Introduction

Renal hyperparathyroidism (HPT) is characterized by impaired calcium homeostasis and compensatory elevations in serum parathyroid hormone (PTH) levels, primarily resulting from progressive chronic kidney disease (CKD). Tertiary hyperparathyroidism refers to the autonomous development of hypercalcemia in patients with long-standing renal HPT, most commonly following kidney transplantation¹.

Secondary hyperparathyroidism (SHPT) is highly prevalent among patients undergoing dialysis, and the associated alterations in mineral and bone metabolism constitute a major, independent risk factor for all-cause mortality and adverse cardiovascular outcomes². Clinically, SHPT is associated with a wide spectrum of complications, including bone pain, cardiomyopathy, fractures, and vascular or valvular calcification,

which collectively impair quality of life and increase mortality³. Although kidney transplantation is the definitive treatment for SHPT⁴, unfortunately, a large proportion of patients do not have access to it. While medical treatment can control the disease in the early stages, surgical intervention becomes necessary in the long term because biochemical control cannot be achieved⁵.

The need for parathyroidectomy (PTX) increases over time; approximately 15% of patients require it at 10 years of dialysis, and almost 38% at 20 years⁶. PTX is known to reduce PTH and serum calcium levels and has also been shown to improve clinical symptoms and reduce the risk of stroke and cardiovascular mortality⁷.

Despite the benefits of surgery in SHPT, the most appropriate surgical strategy remains unclear. Surgical management requires striking a balance between disease control and persistent postoperative hypocalcemia. However, even after Total Parathyroidectomy (TPTX), persistent disease and recurrence rates of 2-20% have been reported within two years⁸. This may be related to continued growth of residual parathyroid tissue or the presence of ectopic or supernumerary glands resulting from embryologic migration⁹. Surgery for persistent or recurrent diseases is extremely challenging, especially due to postoperative changes, and is associated with high morbidity¹⁰.

Currently, the principal surgical strategies for SHPT include subtotal parathyroidectomy (SPTX), TPTX, and total parathyroidectomy with autotransplantation (TPTX+AT). The choice of procedure is largely determined by the surgeon's expertise, clinical judgment, and patient-specific factors¹¹.

To address these challenges, an extended surgical approach known as purge parathyroidectomy (PPTX) has been proposed. This technique involves the removal of identifiable parathyroid tissue, including potential ectopic or supernumerary glands, along with cervical fibro-fatty tissue and the thymic tongue. PPTX has been described in the literature as a feasible option in selected patients with severe secondary hyperparathyroidism¹².

Multiple surgical techniques have been described for the management of renal hyperparathyroidism; however, consensus on the optimal approach remains lacking. In real-world clinical practice, the choice of surgical procedure is rarely standardized and is often influenced by patient-specific factors, disease severity, transplant eligibility, and intraoperative findings. Rather than undertaking a formal comparison of surgical methods, this study shares our institutional experience with secondary and tertiary hyperparathyroidism and highlights how operative strategies are selected in routine practice.

Material and Methods

Study Design

This study included patients who underwent surgery for secondary and tertiary hyperparathyroidism between June 2020 and June 2025. This study was designed as a descriptive, real-world clinical series and was not intended to compare surgical techniques. During this period, 480 patients underwent parathyroid surgery at the study center and were evaluated preoperatively through multidisciplinary collaboration involving nephrology, endocrinology, and radiology specialists.

Among them, 26 patients were diagnosed with renal hyperparathyroidism. After applying predefined exclusion criteria—including age below 18 years, previous neck or parathyroid surgery, non-renal causes of hyperparathyroidism, incomplete clinical or laboratory data, and insufficient follow-up—14 patients with medically refractory symptomatic disease formed the study cohort. The primary objective of this study was to evaluate postoperative biochemical outcomes, with a particular focus on changes in parathyroid hormone (PTH) levels, in patients undergoing surgery for renal hyperparathyroidism

Preoperative Assessment

Preoperative neck ultrasonography was carried out by an experienced radiologist with concurrent evaluation for coexisting thyroid pathology. Technetium-99m sestamibi scintigraphy was used when assessing for possible ectopic parathyroid tissue, and vocal cord function was evaluated before surgery. Patients with end-stage renal disease underwent dialysis one day prior to the procedure as part of routine preparation. Baseline laboratory parameters—including serum parathyroid hormone (PTH) and calcium, phosphorus, and alkaline phosphatase (ALP) levels—along with dialysis duration, were documented.

Surgical Procedure

The operation began with a Kocher collar incision of approximately 6 cm, followed by elevation of the subplatysmal flaps. Access to the thyroid bed was achieved through the avascular midline plane between the strap muscles. During mobilization of the thyroid lobe, intraoperative nerve monitoring was applied with attention to preserving the recurrent laryngeal nerve and parathyroid glands. The contralateral side was explored using the same approach, and drain was placed routinely.

The choice among subtotal parathyroidectomy (SPTX), total parathyroidectomy (TPTX), and purge parathyroidectomy (PPTX) was guided by clinical factors such as transplant candidacy, comorbidities, and intraoperative findings. Subtotal parathyroidectomy was generally selected for patients with tertiary hyperparathyroidism or those considered likely candidates for future kidney transplantation. In these cases, part of the selected gland was preserved and marked with a metal clip for future identification. When

feasible, an inferior parathyroid gland was retained and secured to the tracheal fascia to facilitate possible reintervention.

In patients with secondary hyperparathyroidism and significant comorbid conditions, TPTX was more commonly chosen than PPTX. When parathyroid tissue could not be located within the thyroid bed, TPTX combined with bilateral cervical thymectomy was performed to address potential ectopic glands.

For patients undergoing PPTX, total parathyroidectomy was combined with bilateral central neck dissection and bilateral cervical thymectomy. The fibro-adipose tissue of the central compartment, extending from the thyroid cartilage to the innominate artery, was removed en bloc with careful hemostasis. If a suspicious thyroid nodule was identified either preoperatively or intraoperatively, thyroid lobectomy was performed concurrently¹².

Postoperative Management

Postoperatively, serum PTH, calcium, phosphorus, and ALP levels were monitored, and length of day was recorded. Complications, including bleeding, hypocalcemia, and recurrent laryngeal nerve palsy, were systematically evaluated. Serum calcium, magnesium, and PTH were measured at 6-12 hours after surgery.

Patients presenting with symptoms of hypocalcemia or with serum calcium below 7.2 mg/dL (reference: 8.6-10.0 mg/dl) received intravenous calcium gluconate infusion (1–2 mg elemental calcium/kg). In patients able to tolerate oral intake, calcium carbonate (1–2 g three times daily) with calcitriol (up to 2 µg/day) were administered, with dosages adjusted to maintain normocalcemia.

Persistent secondary hyperparathyroidism was as a serum PTH level exceeding three times the upper limit of the reference range on the third postoperative day (institutional reference range: 15–65 pg/mL). Permanent hypoparathyroidism was as persistently low PTH levels (<15 pg/mL) one-year follow-up.

Ethical Statement

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of University of Health Sciences, Hamidiye Faculty of Medicine, Basaksehir Cam and Sakura City Hospital, Istanbul, Turkey (Approval No.: 39, Date: 05 February 2025).

Statistical Analysis

Due to the limited sample size and the descriptive design of the study, analysis remained at the observational level. Continuous data are presented as intervals, and categorical variables are presented as frequencies. Since the study was not designed to compare surgical approaches, no comparative statistical analysis was performed.

Results

Patient Characteristics

A total of 14 patients were analyzed, 10 males and 4 females, with ages from 23 to 61 years. The duration of dialysis prior to surgery ranged from 2 to 21 years, and the length of day ranged from 3 to 28 days. Preoperatively, 11 patients were classified as ASA III, two as IV, and one as II (Table 1).

Table 1. Demographic and clinical data of all patients

Variable	SPTX (n = 5)	TPTX (n = 4)	PPTX (n = 5)
Sex (male/female), n	2 / 3	3 / 1	5 / 0
Age, years (range)	29–61	23–53	26–43
ASA, median (range)	3 (2–3)	3 (3–4)	3 (3–4)
Duration of dialysis, years (range)	4–21	8–14	2–10
Length of day (range)	3–7	3–15	6–28
Postoperative bleeding requiring reoperation, n	0	0	2
Recurrent laryngeal nerve palsy, n	0	0	0
Recurrence, n	0	0	0
Persistent SHPT, n	0	0	1
Intravenous calcium supplementation, n	0	2	3
Follow-up, months (range)	6–41	3–36	1–46

SPTX: subtotal parathyroidectomy, TPTX: total parathyroidectomy, PPTX: purge parathyroidectomy, ASA: American Society of Anesthesiologists, SHPT: secondary hyperparathyroidism

Surgical Outcomes and Complications

Surgical procedures included SPTX in 5 patients, TPTX in 4 patients, and PPTX in 5 patients. Among patients treated with SPTX, two had tertiary hyperparathyroidism and two were candidates for kidney transplantation. In one patient with concomitant thyrotoxicosis requiring bilateral total thyroidectomy, SPTX was performed.

Of the four patients who underwent TPTX, two had obesity and two had congestive heart failure. Purge parathyroidectomy was performed in five patients with markedly elevated preoperative PTH levels and clinical features suggesting a higher risk of persistent disease. In total, 52 parathyroid glands were evaluated histopathologically. In one patient who underwent TPTX, one ectopic parathyroid gland was identified within the

thymus. Among patients treated with PPTX, one parathyroid gland was located intrathyroidally, and incidental papillary thyroid microcarcinoma was detected in one case.

Postoperative hemorrhage occurred in two patients following purge parathyroidectomy, both of whom required reoperation. No patients with postoperative recurrent laryngeal nerve palsy were observed. Long-term follow-up was unavailable in four patients. Among those with available follow-up, no early disease recurrence was observed. Persistent secondary hyperparathyroidism was identified in one patient after purge parathyroidectomy, while permanent hypocalcemia developed in one patient. Intravenous calcium supplementation was required in three patients in the purge parathyroidectomy group and in two patients in the total parathyroidectomy group.

Biochemical Outcomes

Biochemical assessment demonstrated postoperative improvement in mineral metabolism across the study population. Preoperative parathyroid hormone levels were markedly elevated and showed a substantial decline following surgery (Table 2). In one patient who underwent purge parathyroidectomy, postoperative PTH levels failed to decrease despite histopathological confirmation of four resected parathyroid glands. No ectopic parathyroid tissue was identified intraoperatively, and additional postoperative imaging with four-dimensional computed tomography did not reveal any further parathyroid localization; therefore, the patient was managed conservatively with medical therapy.

Postoperative serum calcium and phosphorus levels demonstrated a consistent decline compared with preoperative values. Alkaline phosphatase levels showed variable postoperative changes, with an initial elevation observed in some patients, consistent with postoperative bone turnover dynamics (Table 2).

Table 2. Effect of surgical technique on laboratory parameters

Parameter	SPTX (n = 5)	TPTX (n = 4)	PPTX (n = 5)
Preoperative PTH, pg/mL (range)	1011–3463	694–4440	2065–3562
Postoperative PTH, pg/mL (range)	13–218	5.21–35.4	25–1991
Preoperative calcium, mg/dL (range)	8.01–11.62	7.40–10.63	8.52–10.02
Postoperative calcium, mg/dL (range)	8.02–10.11	7.10–9.15	6.42–9.60
Preoperative phosphorus, mg/dL (range)	2.36–6.03	4.96–6.03	3.84–7.88
Postoperative phosphorus, mg/dL (range)	1.85–5.18	1.73–4.65	3.94–6.70
Preoperative ALP, U/L (range)	177–1004	81–817	173–1546
Postoperative ALP, U/L (range)	185–973	65–1249	172–1479

PTH: parathyroid hormone, Ca: calcium, P: phosphorus, ALP: alkaline phosphatase, SPTX: subtotal parathyroidectomy, TPTX: total parathyroidectomy, PPTX: purge parathyroidectomy *Reference ranges:* PTH, 15–65 pg/mL; calcium, 8.6–10.0 mg/dL; phosphorus, 2.5–4.5 mg/dL; ALP, 35–104 U/L.

Discussion

Secondary and tertiary hyperparathyroidism remain major complications in patients with end-stage renal disease, leading to profound disturbances in mineral metabolism and increased cardiovascular morbidity and mortality. Disturbances in calcium, phosphorus, and alkaline phosphatase levels are related to poorer clinical outcomes, such as increased mortality and fracture risk. In this context, effective biochemical control achieved through parathyroidectomy plays a pivotal role in improving metabolic stability and long-term prognosis^{13,14}.

KDOQI guidelines, parathyroid hormone levels should be maintained between 150 and 300 pg/mL in patients receiving long-term dialysis¹⁵. Komaba et al. demonstrated that severe secondary hyperparathyroidism in patients is independently associated with increased cause and cardiovascular mortality, whereas this excess risk was not in patients who had undergone parathyroidectomy². These findings highlight secondary hyperparathyroidism as a systemic disorder with consequences extending beyond bone disease to cardiovascular morbidity and mortality. Elevated parathyroid hormone levels promote cardiac fibrosis and accelerate atherosclerotic processes through endothelial dysfunction¹⁶. Disturbances in mineral balance can facilitate vascular calcification and may contribute to arterial stiffness, ventricular remodeling, and compromised myocardial perfusion. By effectively reducing parathyroid hormone levels and improving calcium–phosphorus balance, parathyroidectomy may attenuate extrasosseous calcification and represent a key mechanism underlying its favorable effects on survival and cardiovascular outcomes¹⁷.

Surgical treatment is assuming an increasingly role in the management of secondary hyperparathyroidism, parathyroidectomy is recommended by most current literature for refractory disease⁵. However, the optimal surgical approach remains a matter of debate³. In the present study, we retrospectively evaluated 14 patients who underwent surgical treatment for renal hyperparathyroidism at our institution. Consistent with previous reports, surgery resulted in a marked postoperative reduction in parathyroid hormone levels, accompanied by improvements in calcium and phosphorus homeostasis. Notably, these biochemical improvements were observed across all surgical subgroups (SPTX, TPTX, and PPTX), in different clinical settings¹⁸.

The surgery for renal hyperparathyroidism should aim to balance the extent of parathyroid resection with the prevention of persistent or recurrent disease while minimizing the risk of permanent hypoparathyroidism. Regardless of the surgical approach, the primary objective remains effective elimination of parathyroid hormone excess¹. Although long-term follow-up was limited in some patients, no early disease recurrence was observed among patients with available follow-up, supporting the feasibility of surgical management in this retrospective cohort¹⁹. The relatively higher rate of postoperative bleeding observed in the PPTX group may be associated with the more extensive surgical dissection inherent to this approach. However, given the small sample size, this finding should be interpreted with caution and does not allow for definitive conclusions. Based on our clinical experience, patient-related factors—such as

comorbidities and overall disease burden—may have played a more prominent role in the development of complications. Secondary hyperparathyroidism is associated with increased fracture risk, cardiovascular morbidity, and higher all-cause and cardiovascular mortality, reflecting the substantial impact of underlying patient-related factors and overall disease burden²⁰. Postoperative bleeding is known to occur more frequently in renal hyperparathyroidism than in primary hyperparathyroidism²¹.

Reoperations for persistent or recurrent renal hyperparathyroidism are relatively common, particularly following subtotal parathyroidectomy or total parathyroidectomy with autotransplantation, and are associated with significant morbidity due to scar formation, technical difficulty, and an increased risk of recurrent laryngeal nerve injury²². Data from large cohorts, including the North American renal registry, indicate that one-year mortality rates following reoperation may approach 10%²³. Furthermore, even during total parathyroidectomy, complete identification of all parathyroid tissue may be challenging because of ectopic or supernumerary glands, which remain well-recognized obstacles in the surgical management of renal hyperparathyroidism²⁴.

Given these considerations, surgeons may be cautious about early reoperation for persistent or recurrent secondary hyperparathyroidism. In clinical practice, some centers have explored more extensive surgical clearance during the primary operation. In this context, purge parathyroidectomy combined with muscular or subcutaneous autotransplantation has been described as a feasible approach intended to address potentially unrecognized parathyroid tissue²⁵. Our experience reflects its application in selected patients with severe biochemical disease.

Histopathological examination identified a total of 52 parathyroid glands, including one ectopic intrathyroidic gland and one intrathyroidal gland. Additionally, incidental papillary carcinoma was detected in one patient, consistent with coexistence rates previously reported in the literature²⁶.

In our clinical practice, total parathyroidectomy and purge parathyroidectomy were applied in selected patients with secondary hyperparathyroidism who were not eligible for kidney transplantation. Given the relatively young age of many patients in our cohort, strategies that may provide durable biochemical control while minimizing the need for reintervention are preferred.

These findings should be interpreted with caution. The small cohort size and retrospective single-center design may limit the generalizability of the results. In addition, the limited follow-up duration and the absence of long-term data in four patients restrict the ability to accurately assess long-term recurrence. Furthermore, clinically relevant outcomes such as bone mineral density and cardiovascular parameters were not evaluated. Although the study was conducted in a high-volume center where 480 parathyroidectomies were performed, the retrospective design and limited sample size remain important limitations. Larger, prospective multicenter studies with long-term follow-up are needed to better define optimal surgical strategies.

Conclusion

Surgical techniques for treating renal hyperparathyroidism are challenging and can only be performed in experienced centers. At our clinic, we determine our surgical strategy based on individual patient comorbidities and transplant candidacy. We believe that surgical treatment can be determined on a patient-by-patient basis, and that parathyroidectomy is also an option.

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Comparing Treatment Plans for Bladder Cancer: FIF, IMRT and SIB: A Dosimetric Study

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Abstract

Aim: The purpose of this study is to compare plans for bladder cancer using field-in-field (FIF), intensity modulated radiotherapy (IMRT) and simultaneous integrated boost (SIB) technique.

Method: FIF, IMRT and SIB treatment plans were created using tomography images of 20 patients diagnosed with bladder cancer. Two separate planning target volume (PTV) were defined for each patient: PTV1 and PTV2. For the FIF and IMRT plans, PTV1 and PTV2 received treatment doses of 50.4 Gray (Gy) and 60 Gy in 33 fractions, respectively. In 28 daily fractions, the SIB method was used in which different doses were delivered simultaneously in the target volumes. In the SIB technique, the daily treatment dose was determined as 2.14 Gy. The plans were compared in terms of PTV, organs at risk (OARs) such as rectum, bowel, femoral heads, homogeneity index (HI), conformity index (CI) and monitor unit values (MU).

Results: All plans were designed to cover 95% of the dose in the target volume. The CI for SIB plans showed significantly favourable results compared to FIF and IMRT plans. The V_{45} and V_{30} doses for the rectum in the SIB plans were statistically significantly lower compared to the FIF ($p<0.05$). The biologically effective doses (BED) values of rectum V_{30} were found to be 57.01 ± 11.94 in SIB plans and 56.37 ± 10.95 in IMRT plans. MU counts were significantly lower in FIF plans ($p<0.05$).

Conclusion: The SIB technique demonstrated better sparing of critical organs compared with FIF and IMRT in bladder radiotherapy. BED analysis, however, indicated higher doses with SIB. Overall, SIB appears to be a feasible option for appropriate patients, provided that dose to critical organs is carefully monitored.

Keywords: Bladder cancer, radiotherapy, simultaneous integrated boost.

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Mesane Kanseri İçin Tedavi Planlarının Karşılaştırılması: FIF, YART ve SIB: Dozimetrik Bir Çalışma

Öz

Amaç: Bu çalışmanın amacı, alan içi alan (FIF), yoğunluk ayarlı radyoterapi (YART) ve eşzamanlı entegre boost (SIB) tekniği kullanılarak mesane kanseri için yapılan planları karşılaştırmaktır.

Yöntem: Mesane kanseri tanısı almış 20 hastanın tomografi görüntüleri kullanılarak FIF, YART ve SIB tedavi planları oluşturuldu. Her hasta için iki ayrı planlama hedef hacmi (PTV) tanımlandı: PTV1 ve PTV2. FIF ve YART planları için, PTV1 ve PTV2'ye sırasıyla 33 fraksiyonda 50,4 Gray (Gy) ve 60 Gy tedavi dozları verildi. 28 günlük fraksiyonda hedef hacimlerde farklı dozların eş zamanlı olarak verildiği SIB yöntemi kullanıldı. SIB tekniğinde günlük tedavi dozu 2,14 Gy olarak belirlendi. Planlar PTV, rektum, bağırsak, femur başları gibi kritik organlar, homojenlik indeksi (HI), konformite indeksi (HI) ve monitör unit değerleri (MU) açısından karşılaştırıldı.

Bulgular: Tüm planlar, hedef hacimdeki dozun %95'ini kapsayacak şekilde tasarlandı. SIB planlarının CI'si FIF ve YART planlarına kıyasla anlamlı derecede daha iyi sonuçlar gösterdi. SIB planlarında rektum için V45 ve V30 dozları, FIF planlarına kıyasla istatistiksel olarak anlamlı derecede daha düşüktü ($p < 0,05$). Rektum V₃₀ BED değerleri, SIB planlarında $57,01 \pm 11,94$ ve YART planlarında $56,37 \pm 10,95$ olarak bulundu. MU sayıları, FIF planlarında anlamlı derecede düşüktü ($p < 0,05$).

Sonuç: SIB tekniği, mesane radyoterapisinde FIF ve YART tekniklerine kıyasla kritik organları daha iyi korumuştur. Ancak BED analizi, SIB ile daha yüksek dozlara işaret etmektedir. Genel olarak, kritik organlara verilen dozun dikkatlice izlenmesi koşuluyla, SIB uygun hastalar için uygulanabilir bir seçenek gibi görünmektedir.

Anahtar Sözcükler: Mesane kanseri, radyoterapi, eş zamanlı integral boost.

Introduction

Bladder cancer is the second most common cancer of the urogenital system¹. It is stated that bladder cancer is associated with both genetic and environmental factors². Non-muscle invasive cancers tend to recur. The risk of death due to distant metastasis is high in muscle invasive cancers^{3,4}. More sensitive and specific imaging techniques are being developed for earlier diagnosis⁵. Multifaceted treatment applications including radiotherapy and chemotherapy are used in the treatment of bladder cancer. Radiotherapy aims to destroy cancer cells using high-energy radioactive rays. In addition, it is aimed at providing local control by giving the highest possible dose in a way that causes the least possible damage to the surrounding healthy tissues⁶. In three-dimensional conformal radiotherapy (3D-CRT), the four-field technique is generally widely used. However, with 3D-CRT, larger areas are included in the treatment area, causing healthy tissues to receive more radiation. One of the effective ways to reduce the amount of critical organ dose with 3D-CRT is the field-in-field (FIF) technique. In this technique, tissues that receive unnecessary excess dose are tried to be protected with the subfield method. Intensity modulated radiotherapy (IMRT) is one of the most frequently used modern methods in bladder cancer treatment today. IMRT treatment is an advanced form of 3D-CRT. It is a method that can make dynamic dose changes within the treatment area and allows the tumor dose to be increased without giving excessive

dose to tissues other than the target tissues. In this treatment approach, the dose distribution becomes more conformal, and normal tissues are better protected by optimally adjusting the beam intensity in each radiation field⁷. The advantage of this type of dose distribution over conventional treatments is that critical organs are better protected and higher doses can be achieved in the target^{8,9}. If all target volumes are treated simultaneously using different fraction sizes, it can become the most conformal. This treatment strategy is called simultaneous integrated boost (SIB)^{10,11}. The SIB technique has been reported to allow higher doses per fraction delivery to the target volume while maintaining lower dose levels to normal tissues from a radiobiological perspective¹². The aim of this study was to compare the dosimetric performance of FIF, IMRT, and SIB techniques in bladder radiotherapy by evaluating target coverage, organ-at-risk doses (OARs) and biologically effective dose (BED) values. This comparison was intended to clarify the relative advantages of the different techniques in clinical practice.

Material and Methods

Patient selection and Contouring

For this study, 20 bladder cancer cases who were treated at the Radiation Oncology Department of Selcuk University Faculty of Medicine Hospital between 01.01.2020 and 30.12.2021 were selected. Patient characteristics were given in Table 1. Bladder filling instructions have been standardized. Patients were instructed to drink 500 ml of water 30 minutes before simulation and treatment to comfortably achieve a full bladder. Computed tomography (CT) planning scans were performed using a CT scanner with a 3 mm slice thickness. All clinical target volumes (CTVs) were contoured according to recommendations of consensus guidelines by the same radiation oncologist using Varian Eclipse Operation version 15.1 TPS. CTV included all regions of potential microscopic disease and PTV was generated by expanding the CTV 10 mm isotropically. Normal tissues including the rectum, bowel, right femur, left femur and sacral plexus were contoured as OARs.

Table 1. Patients characteristics

Characteristics	Subgroup	Number (n)	Percentage (%)
Sex	Male	19	95
	Female	1	5
Mean age (years) (range)	67.43 (54-80)	-	-
Tumor diameter	<3 cm	8	40
	≥3 cm	12	60
Tumor grade	Low-grade	1	5
	High-grade	19	95
T category	T2	12	60
	T3	6	30

	T4	2	10
Comorbidities	No	11	55
	HT and/or DM	9	45

Treatment Planning

All plans were created using the Varian DHX linear accelerator in the Eclipse v15.1 treatment planning system (Varian Medical Systems, Palo Alto, CA, USA). FIF plans were created from four main beam fields, with subfields added to reduce temperature in hot dose regions. For each field, a corresponding multi-leaf collimator subfield was created in the beam's eye view projection. If the maximum dose was still too high, additional subfields and weights were created using the same procedure. Seven different gantry angles were used in the IMRT and SIB plans and optimized using inverse planning. For the FIF and IMRT plans, treatment doses of 50.4 Gray (Gy) and 60 Gy were administered to PTV1 and PTV2, respectively, in 33 fractions. The daily treatment dose was planned at 1.80 Gy for PTV1 and 2.00 Gy for PTV2. In SIB plans, two dose levels were defined under the same optimization weights: 2.14 Gy per fraction for high-risk volumes and 1.8 Gy for low-risk volumes. 6 MV photon energy was used in all techniques. The Anisotropic Analytical Algorithm (AAA) was selected for dose calculations, and the dose calculation grid resolution was set to 2.5 mm. During the optimization process, the same dose constraints and planning objectives were applied equally to all techniques.

For target volumes, plan acceptance requires that at least 95% of the PTV receives 95% of the prescribed dose, and the maximum dose does not exceed 107% of the prescription. The same parameters were used to evaluate all techniques: PTV coverage ratio, maximum hot spot, homogeneity index (HI), and conformity index (CI). Optimization constraints for critical organs (OARs) were set according to international guidelines in the literature. During planning, the following limits were used for the rectum: $V_{45} < 50\%$, $V_{40} < 60\%$, and $D_{\text{mean}} < 40$ Gy; for both femoral heads: $D_{\text{mean}} < 40$ Gy and $D_{\text{max}} < 50$ Gy.

Dose volume histograms (DVH) obtained from FIF, IMRT, and SIB plans were compared and doses received by PTV and OAR were evaluated. HI and CI parameters were evaluated. HI was defined according to International Commission Radiation Units (ICRU) Report No:83¹³.

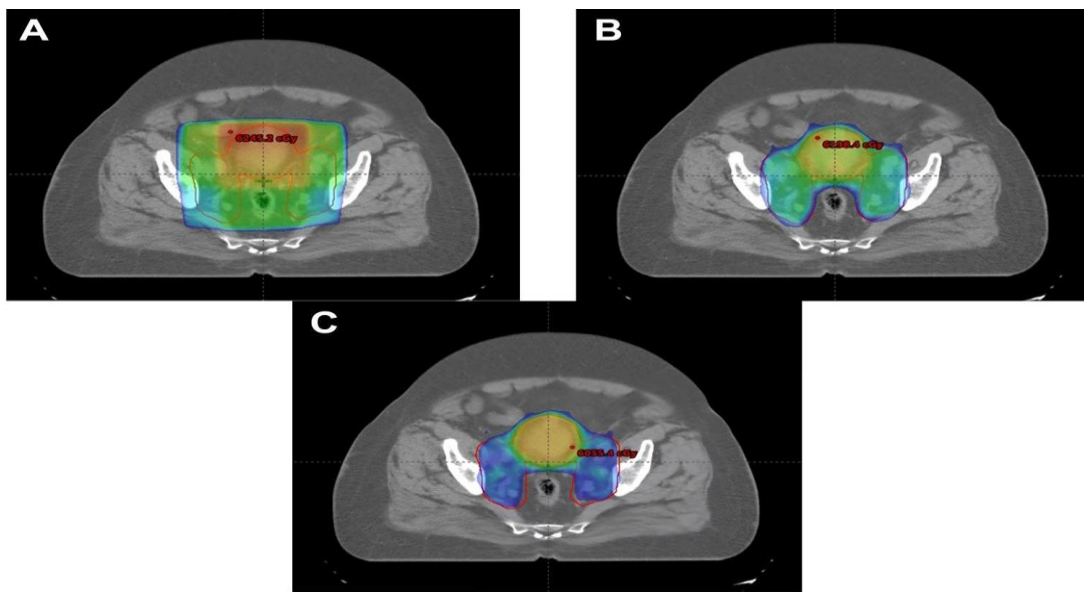
$$HI = \frac{(D_{2\%} - D_{98\%})}{D_{50\%}}$$

The formula defines the dose received by 2%, 98%, and 50% of the PTV. When the CI value is equal to 1, it defines the ideal dose distribution¹⁴. The CI index is used to estimate the suitability of the plan. CI values were automatically obtained from DVH in the Eclipse TPS. Using DVHs, D_{max} , D_{mean} , D_{98} , D_{95} , D_{50} , and D_2 data were compared in the PTV. In critical organs, D_{mean} , V_{45} , V_{30} and V_{20} for rectum, D_{mean} , V_{45} and V_{30} for bowel, D_{mean} and

V_{20} for femoral heads and D_{max} for sacral plexus were compared. Monitor unit (MU) values in the plans were compared.

The formula of the biologically effective dose (BED) used in this study was as follows: $BED = nd \times [1 + d/(\alpha/\beta)]$, which was based on the linear-quadratic (LQ) model^{15,16}. To convert the prescription dose to the BED, we set the α/β ratio= 10 for tumors and the α/β ratio= 3 for the OARs in this study. Paired samples t-test was used in the comparisons in the study, and $p < 0.05$ was considered to be significant.

Figure 1. Comparison of plans showing dose coverage of 95% of the planning target volume **A:** Field in field technique **B:** Intensity modulated radiotherapy technique. **C:** Simultaneous integrated boost technique



Ethical Statement

Ethical approval for the study was granted by the Selcuk University, Faculty of Medicine, Ethics Committee with the decision number 2022/67 dated 03 February 2022. The study adhered to the principles outlined in the Declaration of Helsinki.

Results

The doses of PTV and OAR according to plans are tabulated in Table 2. and Table 3. respectively. The mean doses for the target were 59.56 ± 0.77 , 60.18 ± 1.32 and 60.26 ± 0.60 for FIF, IMRT and SIB plans, respectively. There was not found any significant difference concerning maximum and mean doses for the target. Figure 1. shows the evaluation of the plans and Figure 2. shows DVH comparison for FIF, IMRT and SIB plans. The CI values were 1.11 ± 0.28 , 0.47 ± 0.23 and 0.26 ± 0.18 for FIF, IMRT and SIB. Although CI values are less than 1 in IMRT and SIB plans, this is expected due to the irregular geometry of the bladder PTV and the simultaneous delivery of different dose levels in the SIB technique¹⁷. The HI values for FIF was 0.09 ± 0.01 , for IMRT was 0.05 ± 0.02 and for

SIB was 0.05 ± 0.01 , respectively. The IMRT and SIB plans showed significant results because of the smaller HI, which means more homogeneous dose distribution to PTV. The MU for FIF, IMRT and SIB plans were 253 ± 9.10 , 1234 ± 74.94 and 1411 ± 142 , respectively. FIF technique delivered fewer MUs than other plans ($p < 0.05$).

The rectum D_{mean} , V_{45} and V_{30} dose were significantly lower in SIB and IMRT plans than FIF ($p < 0.05$). When the bowel was examined, V_{30} and V_{15} doses in SIB and IMRT plans were significantly lower than FIF plans ($p < 0.05$). Also concerning the femur heads D_{mean} doses were significantly lower in SIB plans ($p < 0.05$). The BED values of PTV and OARs were listed in Table 4. In SIB plans, D_{mean} , V_{45} , and V_{30} BED doses for the rectum and bowel were found to be significantly higher than in IMRT and FIF plans. When we examined the D_{mean} doses for the femoral heads, it was found to be higher in the FIF plans.

Table 2. Dosimetric values in the target

Parameters	(A) FIF	(B) IMRT	(C) SIB	p		
	(Mean $\pm$ SD)	(Mean $\pm$ SD)	(Mean $\pm$ SD)	A vs. B	A vs. C	B vs. C
PTV₆₀ D₉₈(Gy)	56.48 $\pm$ 1.24	58.21 $\pm$ 1.63	58.20 $\pm$ 0.76	0.000	0.000	0.980
PTV₆₀ D₉₅(Gy)	57.16 $\pm$ 1.10	58.94 $\pm$ 1.49	58.98 $\pm$ 0.66	0.000	0.000	0.901
PTV₆₀ D₉₀(Gy)	57.78 $\pm$ 1.02	59.42 $\pm$ 1.37	59.51 $\pm$ 0.61	0.000	0.000	0.739
PTV₆₀ D₅₀(Gy)	59.62 $\pm$ 0.77	60.16 $\pm$ 1.30	60.27 $\pm$ 0.58	0.122	0.008	0.673
PTV₆₀ D₂(Gy)	62.22 $\pm$ 0.96	61.66 $\pm$ 1.43	61.74 $\pm$ 0.82	0.167	0.135	0.792
PTV_{60max}(Gy)	62.99 $\pm$ 1.07	63.06 $\pm$ 1.59	63.02 $\pm$ 0.74	0.876	0.898	0.916
PTV_{60mean}(Gy)	59.56 $\pm$ 0.77	60.18 $\pm$ 1.32	60.26 $\pm$ 0.60	0.090	0.007	0.749
PTV ₅₀ D ₉₅ (Gy)	54.35 $\pm$ 3.41	53.84 $\pm$ 3.05	53.11 $\pm$ 3.20	0.438	0.165	0.382
CI	1.11 $\pm$ 0.28	0.47 $\pm$ 0.23	0.26 $\pm$ 0.18	0.000	0.000	0.005
HI	0.09 $\pm$ 0.01	0.05 $\pm$ 0.02	0.05 $\pm$ 0.01	0.000	0.000	0.840
MU	253 $\pm$ 9.10	1234 $\pm$ 74.94	1411 $\pm$ 142	0.000	0.000	0.000

FIF: field-in-field, IMRT: intensity-modulated radiation therapy, SIB: simultaneous integrated boost, PTV: planned target volume, CI: conformity index, HI: heterogeneity index, MU: monitor unit, SD: Standard deviation p: paired sample t-test, * $p < 0.05$

Figure 2. Dose volume histogram comparison of a patient. ▲ : FIF: field-in-field ● : SIB: simultaneous integrated boost ■ : IMRT: intensity-modulated radiation therapy (red: planned target volume, brown :rectum, yellow: sacral plexus, blue:bowel)

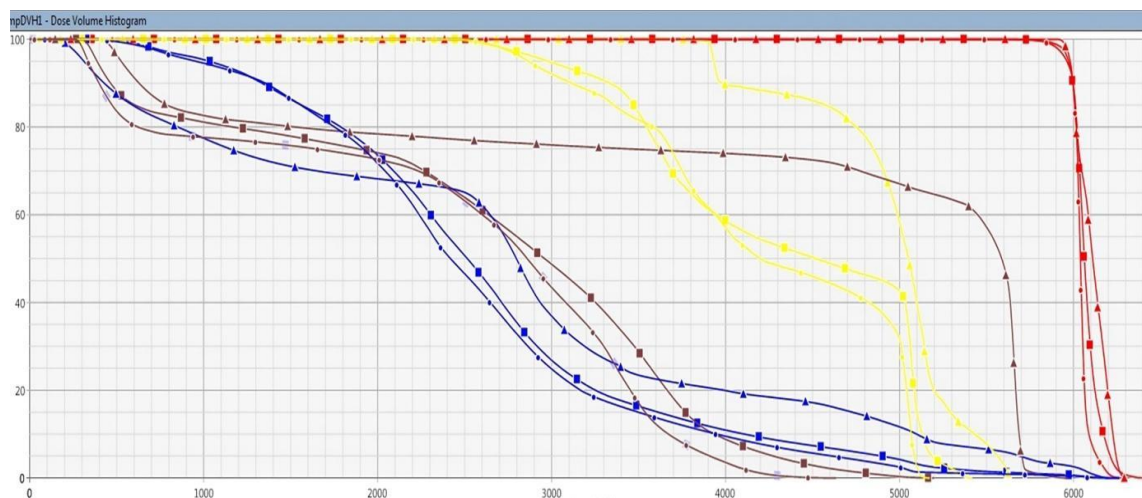


Table 3. Dosimetric values of organ at risks

Organ	Parameters	(A) FIF (Mean±SD)	(B) IMRT (Mean ±SD)	(C) SIB (Mean ±SD)		p	
					A vs. B	A vs. C	B vs. C
Rectum	D _{mean} (Gy)	41.32±8.97	26.37±5.48	26.66±4.82	0.000	0.000	0.611
	V ₄₅ (Gy)	50.17±10.06	29.76±6.80	28.60±5.65	0.000	0.000	0.524
	V ₃₀ (Gy)	54.11±5.42	35.08±6.62	33.61±6.23	0.000	0.000	0.442
	V ₂₀ (Gy)	55.70±4.78	38.23±6.69	37.16±6.31	0.000	0.000	0.624
Bowel	D _{mean} (Gy)	24.62±12.65	19.61±7.16	19.76±7.70	0.040	0.042	0.998
	V ₄₅ (Gy)	22.75±12.45	19.67±10.59	19.22±10.86	0.000	0.001	0.628
	V ₃₀ (Gy)	29.25±13.50	25.25±10.38	25.45±11.71	0.002	0.016	0.888
Right Femur	D _{mean} (Gy)	25.61±9.38	17.72±7.34	17.02±6.72	0.000	0.000	0.034
	V ₂₀ (Gy)	40.53±7.10	28.60±4.94	27.98±4.51	0.000	0.000	0.153
Left Femur	D _{mean} (Gy)	26.47±9.37	17.01±6.93	16.30±6.65	0.000	0.000	0.036
	V ₂₀ (Gy)	41.85±7.45	27.41±4.19	28.10±7.95	0.000	0.000	0.690
Sacral Plexus	D _{max} (Gy)	55.37±2.64	52.95±2.48	51.98±1.37	0.001	0.000	0.041

FIF: field-in-field, IMRT: intensity-modulated radiation therapy, SIB: simultaneous integrated boost, D_{mean}: mean dose, D_{max}: maximum dose V: Volume, SD: Standard deviation p: paired sample t-test, *p <0.05

Table 4. The biologically effective doses comparisons of target and organ at risks

Structures	Parameters	(A) FIF (Mean±SD)	(B) IMRT (Mean ±SD)	(C) SIB (Mean ±SD)		P	
					A vs. B	A vs. C	B vs. C
PTV₆₀	D₉₅	67.45±1.30	69.55±1.76	71.60±0.81	0.000	0.000	0.000
PTV₅₀	D₉₅	64.14±4.03	63.53±3.60	62.29±2.70	0.438	0.000	0.000
Rectum	D_{mean}	66.11±14.35	42.20±8.77	45.69±8.27	0.000	0.000	0.001
	V₄₅	80.28±16.11	47.61±10.89	48.46±10.61	0.000	0.000	0.000
	V₃₀	86.58±8.68	56.37±10.95	57.01±11.94	0.000	0.000	0.002
	V₂₀	89.12±7.65	61.49±11.17	63.04±12.32	0.000	0.000	0.004
Bowel	D _{mean}	39.40±20.24	31.38±11.46	33.41±13.91	0.040	0.172	0.000
	V ₄₅	36.40±19.92	31.48±16.94	32.52±19.00	0.000	0.058	0.003
	V ₃₀	46.80±21.61	40.41±16.61	43.35±20.45	0.002	0.434	0.000
Right Femur	D _{mean}	40.98±15.02	28.35±11.75	29.17±11.51	0.000	0.000	0.083
	V ₂₀	64.85±11.36	45.77±7.90	47.94±7.74	0.000	0.000	0.005
Left Femur	D _{mean}	42.36±14.99	27.22±11.09	27.93±11.40	0.000	0.000	0.188
	V ₂₀	66.97±11.93	43.85±6.70	48.14±13.63	0.000	0.000	0.156
Sacral Plexus	D _{max}	88.59±4.23	84.72±3.98	88.45±1.80	0.001	0.867	0.000

FIF: field-in-field, IMRT: intensity-modulated radiation therapy, SIB: simultaneous integrated boost, D_{mean}: mean dose, D_{max}: maximum dose V: Volume, SD: Standard deviation p: paired sample t-test, *p <0.05

Discussion

Radiotherapy applications to the bladder region may be complicated by the change in bladder volume. In order for patients to benefit from bladder radiotherapy, it is very important that the treatment as accurately and quickly as possible. The IMRT technique is an advanced form of 3D-CRT. The main beam is divided into smaller beamlets or segments that are adjusted to create different intensities in the target. In this treatment approach, which makes the PTV dose distribution more conformal and better protects normal tissues, the beam intensity in each radiation field is optimally adjusted. The advantage of this dose distribution over conventional treatments is that critical organs are better protected and higher doses can be reached in the target¹⁸.

Çelen et al. compared the sequential IMRT and SIB techniques to the whole breast and boost area in patients who underwent breast-conserving surgery¹⁹. When the SIB and

IMRT technique were applied to the ipsilateral lung, they found that the V_5 value was not statistically significant, while the V_{20} value was statistically significant. They found that V_{20} doses were lower in the ipsilateral lung with the SIB technique. Similarly, in our study, lower rectum V_{45} and bowel V_{30} dose values were observed in the SIB technique.

Nageeti et al. compared PTV and OAR in volumetric modulated arc therapy (VMAT) technique with SIB and sequential boost method for high-grade glioma²⁰. In their study, they found similar results in critical organs for all plans. They stated that the SIB technique, which provides the total dose with fewer fractions, is the best option for patients with short survival without increasing toxicity. In our study, it was found that the SIB technique is suitable for the protection of critical organs.

Christine et al. compared the sequential IMRT and SIB techniques for treating pelvic targets²¹. They found that IMRT and SIB plans were comparable PTV coverage. They stated that the SIB technique significantly reduced the hot dose areas. They found that SIB plans provided good protection for critical organs overall but only significant results for rectum and small bowel doses. They also suggested that SIB technique reduces treatment time by facilitating the planning process. In our study, bowel D_{mean} and V_{45} doses and sacral plexus D_{max} and D_{mean} doses were not found to be statistically significant between SIB and IMRT plans. However, when we compared both plans with FIF, we found that SIB and IMRT techniques were more advantageous.

Li et al. compared the conventional IMRT and SIB technique for gastrointestinal stromal tumors²². They suggested that SIB may be a potential technique for achieving objective response and prolonging survival of selected GISTs patients. Moamen et al. compared the sequential (SEQ) and SIB techniques for breast radiotherapy²³. They found that based on the DVH comparisons, the use of SIB reduced the biological breast mean dose by about 3%, the ipsilateral lung and heart by about 10%, and the contralateral breast and lung by about 7%. They suggested that SIB technique are dosimetrically more advantageous than SEQ in breast target volume and OARs. In our study, similar results were obtained with these studies.

Bakkal et al. evaluated the impact of SIB techniques on organs at risk in rectal cancer planning²⁴. In a dosimetric comparison including 3D-CRT, IMRT and SIB-IMRT, it was reported that SIB-IMRT provided favorable dose distributions with improved sparing of organs at risk compared to conventional techniques. Similarly, in the present study, lower rectum and bowel dose parameters were observed in SIB and IMRT plans compared to FIF.

This study is based on dosimetric analysis, and no clinical conclusions can be drawn. According to the DVHs obtained from the study, the rectum and bowel V_{45} and V_{30} doses are significantly lower in IMRT and SIB plans. The results of the study demonstrated improved dose conformality and more favorable OAR dose distributions in SIB and IMRT plans compared to FIF. However, BED calculations have provided an additional benefit to these results. The BED values calculated for the rectum and bowel V_{45} and V_{30} doses were found to be slightly higher in SIB plans than in IMRT. This increase is due to

the higher dose per fraction in the SIB technique. Therefore, although the SIB plans show lower doses for the rectum and bowel, biologically, these organ doses are seen to increase slightly. This indicates that although SIB plans result in higher calculated biological dose values in the target, careful attention should be paid to the biological dose received by critical organs. In addition to these results, in SIB technique, the reduction in the total number of fractions shortens the treatment time, thereby improving patient comfort, reducing the clinical workload, and increasing device utilization efficiency. This may potentially reduce overall treatment time and improve workflow efficiency, although these aspects were not directly evaluated in this study.

Conclusion

In our study, when the SIB technique was compared to other plans, it was seen that SIB had a significant advantage, especially against FIF plans. SIB plans increase biological efficacy due to their short treatment duration and high dose intensity; however, dose optimization must be performed with great care to avoid exceeding critical organ tolerances. Based on dosimetric findings, the SIB technique may be considered a feasible planning approach for bladder cancer; however, clinical outcome studies are required to confirm its safety and efficacy.

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Antibacterial Effects of Silver Nanoparticle-doped “Black Physician: Tar”

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Abstract

Aim: This study evaluated the antibacterial activity of silver nanoparticles (AgNPs) synthesized using *Juglans regia* (walnut) leaf extract and coated with *Cedrus libani* tar against Gram-positive (*Staphylococcus aureus*) and Gram-negative (*Escherichia coli*) bacteria.

Method: AgNPs were biosynthesized using walnut leaf extract as the reducing agent and subsequently coated with cedar tar. The antibacterial activities of the individual components (walnut extract and tar), uncoated AgNPs, and tar-coated AgNPs were assessed via standard disc diffusion assays and compared with conventional antibiotics.

Results: Both walnut extract and tar exhibited inherent antibacterial properties, though they were less effective than standard antibiotics. AgNPs synthesized with walnut extract showed enhanced antibacterial activity; incorporation of tar further improved performance, yielding inhibition zones comparable to those produced by antibiotics against both bacterial strains.

Conclusion: Tar coating synergistically enhanced the antibacterial efficacy of biosynthesized AgNPs without requiring higher nanoparticle concentrations. Tar-coated AgNPs synthesized using walnut leaf extract may therefore serve as promising alternative antibacterial agents.

Keywords: Silver nanoparticles, walnut leaf extract, cedar tar, antibacterial activity, biosynthesis.

Gümüş Nanopartikül Katkılı “Siyah Hekim: Katran”ın Antibakteriyel Etkileri

Öz

Amaç: Bu çalışmada, *Juglans regia* (ceviz) yaprağı ekstresi kullanılarak sentezlenen ve *Cedrus libani* katranı ile kaplanan gümüş nanopartiküllerin (AgNP'ler) Gram-pozitif (*Staphylococcus aureus*) ve Gram-negatif (*Escherichia coli*) bakterilere karşı antibakteriyel aktiviteleri değerlendirildi.

Yöntem: Gümüş nanopartiküller, indirgeme ajanı olarak ceviz yaprağı ekstresi kullanılarak biyosentezlendi ve ardından sedir katranı ile kaplandı. Bireysel bileşenlerin (ceviz ekstresi ve katran), kaplanmamış

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AgNP'lerin ve katran kaplı AgNP'lerin antibakteriyel aktiviteleri standart disk difüzyon yöntemleriyle değerlendirildi ve konvansiyonel antibiyotiklerle karşılaştırıldı.

Bulgular: Hem ceviz ekstresi hem de katran, antibakteriyel özellikler gösterdi, ancak standart antibiyotiklere göre daha az etkiliydi. Ceviz ekstresi ile sentezlenen AgNP'ler artırılmış antibakteriyel aktivite sergiledi; ancak, katranın dahil edilmesi, her iki bakteri suşuna karşı antibiyotiklere benzer inhibisyon zonları ile antimikrobiyal performansı önemli ölçüde artırdı.

Sonuç: Katran kaplamasının AgNP'ler üzerindeki sinerjik etkisi, daha yüksek nanoparçacık konsantrasyonlarına gerek kalmadan antibakteriyel etkinliği artırdı ve ceviz yaprağı ekstresi kullanılarak sentezlenen katran kaplı AgNP'lerin, alternatif antibakteriyel ajanlar olarak umut verici olabileceğini göstermektedir.

Anahtar Sözcükler: Gümüş nanopartiküller, ceviz yaprağı ekstresi, sedir katranı, antibakteriyel aktivite, biyosentez.

Introduction

Humans have long relied on plants as sources of food, materials, dyes, fuels, and medicines. Over time, specific plants have been distinguished for their distinctive properties and used to treat diseases in both humans and animals^{1,2}. The therapeutic use of tar obtained from cedar wood has persisted for centuries. In folk medicine, tar has been used for treating wounds, asthma and upper respiratory diseases³, ear pain⁴, acne⁵, hemorrhoids⁴, and ulcers³.

With the development of nanotechnology, interest in plant-derived materials has increased further. Beyond textiles, chemistry, and industrial applications, plants are now widely used in nanoparticle synthesis. In green synthesis, plant extracts act as reducing and stabilizing agents. Metal nanoparticles produced by this method have demonstrated antibacterial⁶⁻⁸, antifungal⁹, and antiviral¹⁰ activity. Numerous studies have reported antibacterial effects of nanoparticles (NPs)⁶, particularly against bacteria such as *Escherichia coli*⁷ and *Staphylococcus aureus*⁸, and antiviral and antifungal effects have also been described; for example, Lamsal et al. (2011) reported antifungal activity of AgNPs⁹.

AgNPs synthesized by green methods have been frequently explored for biomedical applications. In one study, wound dressings incorporating AgNPs were shown to promote wound healing. In parallel, tar has long been used in folk medicine for wound care^{11,12}. While the use of tar for injuries has been associated with deterring insects, worms, and other parasites, the contribution of AgNPs likely derives from their antibacterial activity.

Material and Methods

Synthesis of AgNPs

AgNPs were synthesized via green synthesis using walnut leaf extract as the reducing agent and AgNO₃ as the silver source. Formation kinetics were monitored by time-dependent UV–Vis spectroscopy, and particle morphology was characterized by transmission electron microscopy (TEM).

Preparation of cedar tar

Firewood from the resin-rich portions of cedar wood was placed in a metal container with a small hole at the base. External heating caused pyrolysis; the tar volatilized from the wood and condensed into a collecting vessel placed below.

Preparation of walnut extract

Walnut leaves (1 g) were added to 100 mL of distilled water and boiled under magnetic stirring (JKI-JK-PMS-HS-130109) for 1 hour. The mixture was filtered and centrifuged (General Purpose-17022810) at 10,000 rpm for 15 minutes to obtain a homogeneous extract.

Preparation of Walnut-AgNO₃ solutions

Equal volumes (1:1, v/v) of 2 mM AgNO₃ and walnut leaf extract were mixed to yield a final reaction mixture with 1 mM AgNO₃.

Incorporation of AgNPs into tar

After 24 hours of reaction, water from the colloidal AgNP dispersions was evaporated. The resulting dry nanoparticles were added to tar and dispersed by sonication in an ultrasonic bath for 30 minutes to minimize aggregation.

UV–Vis spectroscopy (surface plasmon resonance)

Surface plasmon resonance (SPR) of the walnut–AgNO₃ reaction mixtures was analyzed using an Eon Microplate Spectrophotometer over 200–700 nm. Samples were collected after 24 hours of exposure to sunlight. Absorbance spectra were recorded and interpreted.

Image analysis of AgNPs

For TEM, aliquots of walnut–AgNO₃ reaction mixtures collected 24 hours post-mixing were drop-cast onto carbon-coated copper grids and air-dried in a clean environment. Nanoparticles were imaged using a LEO 906E TEM.

The antibacterial activity

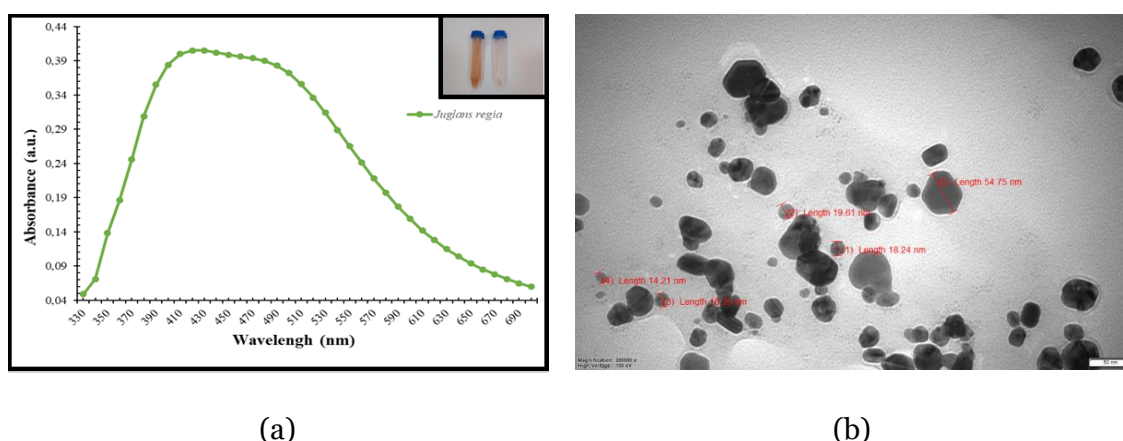
The antibacterial activities of AgNPs, walnut leaf extract, tar, and the combined tar+AgNPs formulation were evaluated against Gram-positive *S. aureus* ATCC 29213 and Gram-negative *E. coli* ATCC 25922 using the standard disc diffusion method on Mueller–Hinton agar (MHA), following established protocols^{13,14}.

Bacterial cultures were incubated for 12 hours at 37 °C in MHA medium. Suspensions were adjusted to 0.5 McFarland standard (approximately 1.5×10^8 CFU/mL) by 1:100 dilution in Nutrient Broth¹⁵. Subsequently, 100 µL of each suspension was spread onto MHA plates. Sterile 6-mm Whatman filter paper discs were placed on the agar and loaded with 50 µL of test substances: AgNPs (containing 8.5 µg Ag/disc), walnut leaf extract, tar, and tar+AgNPs. The walnut leaf extract and tar served as the negative control, and doxycycline (30 µg/disc), a broad-spectrum antibiotic, served as the positive control. Plates were incubated at 37 °C for 24 hours, and inhibition zone diameters were measured in millimeters. Each experiment was performed in duplicate.

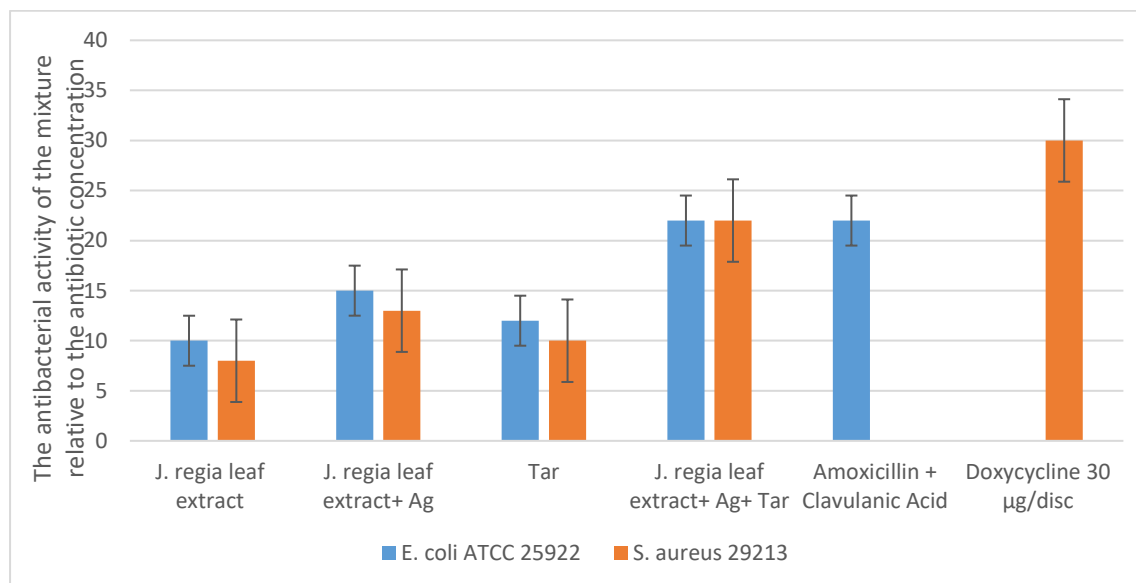
Results

In this study, the surface plasmon resonance (SPR) peaks of the synthesized AgNPs (Figure 1) were measured in the range of 200–700 nm using The Eon™ Microplate Spectrophotometer, and it was found that the SPR peaks had a broad Full Width at Half Maximum (FWHM) and peaked at 420 nm. The broad FWHM values of the SPR peaks indicate the heterogeneity in the size distribution of the nanoparticles.

Figure 1.a. SPR peaks of mixtures, **b.** TEM Images of AgNPs (Magnification: 200000x, High Voltage: 100kV)



According to transmission electron microscopy (TEM) data, the sizes of the nanoparticles were determined to be in the range of 8.25–54.75 nm and to have a circular shape (Figure 1.b.).

Figure 2. Antibacterial activity of synthesized AgNPs using the walnut leaf extract and tar.

The antibacterial activities of tar-coated silver nanoparticles (AgNPs) synthesized using walnut leaf extract were tested on Gram-positive (*S. aureus* ATCC 29213) and Gram-negative (*E. coli* ATCC 25922) bacteria. The findings indicate that the applications using walnut and tar alone exhibited antibacterial effects, but these effects were lower compared to antibiotics. However, it was determined that AgNPs synthesized using walnut extract had higher antibacterial effects compared to walnut extracts alone but were still less effective than antibiotics (Figure 2).

Discussion

The broad SPR peaks observed in UV–Vis spectra are consistent with a wide nanoparticle size distribution, as also confirmed by TEM analysis (8.25–54.75 nm, spherical morphology). Such broad absorption features are typically attributed to surface plasmon resonance damping caused by particle size heterogeneity and aggregation phenomena, both of which are common in green-synthesized nanoparticles due to the presence of multiple phytochemical reducing and capping agents. These findings are in good agreement with previous reports. For instance, Mohamad Kasim et al. (2020) reported plant-extract-mediated AgNPs with sizes of 49.26 ± 13.76 nm and predominantly spherical morphology¹⁶. Similarly, Azwatul et al. (2023) synthesized AgNPs through plant-mediated reduction with particle sizes ranging from 5 to 35 nm, showing a circular shape and homogeneous dispersion¹⁷. Such size variations are expected since biological extracts contain a variety of biomolecules (flavonoids, phenolics, terpenoids, and proteins) that simultaneously act as reducing and stabilizing agents, influencing the growth kinetics and final morphology of the nanoparticles.

The antibacterial efficacy of AgNPs has been shown to depend strongly on both particle size distribution and mass concentration. Smaller AgNPs generally display greater antibacterial activity due to their larger surface area-to-volume ratio, which enhances their interaction with bacterial membranes and facilitates silver ion release. Khan et al. (2023) demonstrated that antibacterial potency increases with higher AgNP concentrations; however, elevated concentrations are often associated with higher cytotoxicity to mammalian cells¹⁸. Therefore, identifying formulations that maintain antibacterial strength at reduced nanoparticle doses is crucial for biomedical applicability.

In this context, tar was incorporated into walnut leaf-mediated AgNPs with the aim of amplifying antibacterial effects while mitigating potential cytotoxicity. The results reveal a synergistic effect between tar and AgNPs, yielding antibacterial outcomes comparable to conventional antibiotics such as amoxicillin/clavulanic acid and doxycycline at equivalent doses. This synergy likely arises from complementary mechanisms.

These observations align with growing evidence that plant-extract-synthesized AgNPs can exhibit superior antibacterial efficacy compared to chemically synthesized counterparts¹⁹. The presence of phytochemicals on the nanoparticle surface not only enhances colloidal stability but also contributes to biological activity by providing additional functional groups capable of interacting with microbial cell walls. Moreover, combining AgNPs with other biocompatible or bioactive materials has been shown to further augment antimicrobial performance. For example, hybrid composites of AgNPs with chitosan, lignin, or phenolic-rich plant extracts have demonstrated enhanced bactericidal activity at lower silver doses, underscoring the value of synergistic formulations²⁰.

Nevertheless, while AgNPs possess remarkable antimicrobial potential, their dose-dependent cytotoxicity remains a major concern for clinical and environmental applications. Excessive release of Ag⁺ ions or accumulation of nanoparticles in tissues can trigger oxidative stress, mitochondrial dysfunction, and genotoxicity in mammalian systems²¹. Hence, optimizing concentration and exposure duration is essential to achieve an effective therapeutic window. In this study, the incorporation of tar -rich in phenolic and polyaromatic compounds- was explored as a strategy to boost antibacterial efficacy within safer dosing limits. The phenolics present in tar likely interact with AgNPs through surface adsorption, increasing their stability and enhancing ROS-mediated antibacterial mechanisms.

The present findings, demonstrating significant antibacterial activity of the AgNPs-tar composite against both Gram-positive (*S. aureus*) and Gram-negative (*E. coli*) bacteria, are consistent with previous studies reporting strong antibacterial effects of plant-synthesized AgNPs⁸. For instance, AgNPs synthesized from *Hypericum perforatum*⁸ and *Syzygium polyanthum*¹⁹ extracts have shown potent inhibitory zones against *E. coli* and *S. aureus*. Such broad-spectrum activity is attributed to multiple concurrent actions, including disruption of cell wall integrity, leakage of intracellular contents, enzyme inactivation, and induction of oxidative stress.

Mechanistically, AgNPs interact with bacterial cell membranes primarily through electrostatic attraction, resulting in structural disruption and increased membrane permeability²². The subsequent release of Ag⁺ ions allows them to bind with thiol (-SH) groups in membrane and cytoplasmic proteins, altering their tertiary structure and impairing essential enzymatic and metabolic processes²³. Moreover, silver-induced reactive oxygen species (ROS) generation contributes to lipid peroxidation, protein oxidation, and DNA damage, thereby intensifying bactericidal activity²⁴.

In parallel, tar-derived phenolic compounds may function as redox-active agents, amplifying oxidative stress and exacerbating bacterial membrane perturbation. The observed synergistic antibacterial effect suggests that tar not only complements the intrinsic antimicrobial activity of AgNPs but may also act as a mild stabilizing matrix, reducing nanoparticle aggregation and promoting prolonged contact with bacterial surfaces.

Overall, the incorporation of tar into plant-mediated AgNP systems represents a novel and eco-friendly strategy for developing next-generation antimicrobial agents. This composite approach capitalizes on green synthesis principles, reduces the dependence on high silver concentrations, and harnesses the multifunctional properties of natural compounds to enhance antibacterial efficacy. Future investigations should focus on elucidating the detailed mechanistic pathways underlying this synergism through ROS quantification, membrane integrity assays, and cytotoxicity studies on mammalian cells to validate the biosafety and therapeutic applicability of the AgNP–tar composite system.

Conclusion

In this study, the antibacterial activities of tar-doped silver nanoparticles (AgNPs) synthesized through walnut leaf extract were successfully evaluated. In tests performed against both gram-positive (*S. aureus*) and gram-negative (*E. coli*) bacteria, it was observed that walnuts and tar alone had antibacterial effects, but they showed lower effects compared to antibiotics. It was determined that AgNPs synthesized with walnut extract exhibited stronger antibacterial effects compared to walnut extracts, but were still less effective than antibiotics. Current studies in the literature report that the antibacterial activity of AgNPs depends on their mass concentration and size, but high concentrations increase the risk of cytotoxicity. For this reason, we aimed to increase the antibacterial effects of low-concentration AgNPs by adding tar, which is rich in phenolic compounds, which we think will be biocompatible in increasing the antibacterial effects of low-concentration AgNPs in terms of controlling cytotoxicity. Thus, with the addition of tar, the antibacterial activity of AgNPs was increased and results comparable to antibiotics were obtained against both bacteria. These findings indicate that walnut leaf extract and tar-doped AgNPs can be evaluated as potential antibacterial agents in the future and results should be considered preliminary, as the study was conducted exclusively under in vitro conditions, and further in vivo studies are required to confirm their practical applicability.

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Obesity Status, Mindful Eating, and Dietary Intake Among Primary School Children in Kütahya: A Cross-Sectional Study

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Abstract

Aim: This study aims to evaluate obesity status, mindful eating, and dietary intake among primary school children.

Method: This cross-sectional study included 298 children aged 10–11 years living in Kütahya. Sociodemographic data, the Mindful Eating Questionnaire for Children, and 24-hour dietary recall were collected through face-to-face surveys. The researcher took anthropometric measurements.

Results: The mean age of the participants (50% girls) was 10.3±0.4 years. The prevalence of overweight was 19.7%, and obesity was 13.7%. Obesity rates were significantly higher in boys compared to girls ($p<0.05$). Children with obese mothers or fathers with a high school education or below had higher obesity rates ($p<0.05$). Mindless eating scores were higher among boys, children whose mothers had a high school education or below, those with more than two hours of daily screen time, and those who did not bring a lunchbox to school ($p<0.05$). Dietary intake did not differ significantly according to children's mindful eating and obesity status.

Conclusion: Children's obesity status varied by gender, maternal obesity, and paternal education. Lower maternal education, longer screen time, and being male were associated with higher mindless eating scores. It is important to include family-based mindful eating practices in programs aimed at promoting healthy lifestyles in children. In this way, acquiring mindful eating from an early age can lay the foundation for the transfer of healthy eating behaviors into adulthood.

Keywords: Mindful eating, childhood obesity, dietary intake.

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ETHICAL STATEMENT: Ethical approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Kütahya University of Health Sciences (Decision No: 2025/06-53, Date: 06/05/2025).

Kütahya'da Yaşayan İlkokul Çocuklarında Obezite Durumu, Yeme Farkındalığı ve Diyet Alımı: Kesitsel Bir Çalışma

Öz

Amaç: Bu çalışma obezite durumu ile yeme farkındalığı ve diyet alımının değerlendirilmesi amacıyla yürütülmüştür.

Yöntem: Kesitsel tipte yapılan bu çalışma, Kütahya'da yaşayan 10-11 yaş grubu 298 çocuk ile gerçekleştirilmiştir. Sosyodemografik bilgiler, Çocuklar İçin Yeme Farkındalığı Ölçeği ve 24 saatlik besin tüketim kaydı, yüz yüze anket yöntemi ile elde edilmiş ve araştırmacı tarafından antropometrik ölçümler alınmıştır.

Bulgular: Yaş ortalaması $10,3 \pm 0,4$ yıl olan katılımcılarda (%50 kız) hafif şişmanlık %19,7; obezite %13,7'dir. Erkeklerde kızlara göre obezite oranı daha yüksektir ($p < 0,05$). Annesi obez, babası lise ve altı eğitim seviyesine sahip olan çocuklarda obezite oranı daha yüksek bulunmuştur ($p < 0,05$). Bilinçsiz yeme skoru erkeklerde, annesi lise ve altı eğitim düzeyine sahip, günde 2 saatten fazla ekran süresi olan ve okula beslenme çantası götürmeyen çocuklarda daha yüksektir ($p < 0,05$). Çocukların yeme farkındalığı ve obezite durumu ile diyet alımları arasında anlamlı fark yoktur.

Sonuç: Çocuklarda obezite durumu cinsiyete, anne obezitesi ve baba eğitim düzeyine göre değişmektedir. Anne eğitim düzeyinin düşük, ekran süresinin fazla olması ve erkek cinsiyeti, bilinçsiz yeme skorunu etkilemiştir. Çocuklarda sağlıklı yaşam tarzının benimsenmesine yönelik planlanan çalışmalara aile katılımlı yeme farkındalığı uygulamalarının da eklenmesi önemlidir. Böylelikle, erken yaşlardan itibaren yeme farkındalığının kazanılması, sağlıklı beslenme davranışlarının yetişkinlik dönemine aktarılmasına zemin hazırlayabilir.

Anahtar Sözcükler: Yeme farkındalığı, çocukluk çağı obezitesi, diyet alımı.

Introduction

The World Health Organization (WHO) considers childhood obesity to be one of the most serious global health challenges of the 21st century. Over the past 40 years, the prevalence of childhood obesity has increased more than eightfold. In 2020, 150 million children aged 5-19 years were classified as overweight or obese, and this number is estimated to be 254 million by 2023^{1,2}. In parallel with global trends, the prevalence of childhood obesity in Türkiye has also been steadily increasing. In a study conducted by the Türkiye Ministry of Health, which evaluated the anthropometric measurements of 3 750 999 students aged 10 to 14, the prevalence of overweight was found to be 19.6%, while the prevalence of obesity was 10.5%³. In various cross-sectional studies conducted in Türkiye, the prevalence of obesity in similar age groups has been reported to range between 15.8% and 28.4%⁴⁻⁶.

According to the WHO Childhood Obesity Surveillance Initiative (COSI 2022), the prevalence of overweight and obesity among children aged 7-8 years in Türkiye is 12.5% and 9.9%, respectively⁷. Children with obesity are highly likely to be obese in adulthood too. In addition, they are at increased risk of developing multiple non-communicable diseases. Moreover, obesity during childhood and adolescence often leads to negative experiences such as stigmatization, discrimination, and bullying, which in turn cause

psychosocial consequences that adversely affect academic performance and overall quality of life⁸. Psychological problems and the decline in quality of life further increase the burden of childhood obesity on individuals⁹.

Eating awareness is not about what is eaten, but how and why eating behavior occurs. It involves the internalization of physical hunger and satiety cues and promotes taking pleasure in food with a sense of understanding and compassion^{10,11}. In other words, it is the application of awareness to thoughts, emotions, bodily sensations, and behaviors related to eating¹².

Due to the limited success in maintaining weight loss, developing mindful eating has increasingly been emphasized in recent years as a potentially important component of treatment¹³. For this reason, there has been a growing number of studies examining the effects of mindful eating in children on the regulation of eating habits and the prevention of obesity. Mindful eating practices have been reported to increase fruit consumption and decrease the intake of unhealthy foods, total energy intake, and impulsive food choices among primary school children¹³⁻¹⁵. School-based mindfulness and cognitive-behavioral programs implemented to enhance emotional regulation in children aged 10-12 have been found to result in significant improvements both in the development of mindfulness and in the regulation of positive and negative emotional states¹⁶. In Türkiye, only a limited number of studies have examined the relationship between obesity status, mindful eating, and dietary intake in this age group¹³. Accordingly, this study aims to evaluate obesity status in relation to mindful eating and dietary intake in the Aegean Region, where the prevalence of childhood obesity is high.

Material and Methods

Study Design

A non-interventional, cross-sectional study design was employed. The study was conducted between May 10 and May 30, 2025, with children aged 10-11 residing in the Tavşanlı district of Kütahya. Announcements for the research were made via social media, as well as through family and social networks. A total of 298 children were selected using a convenience sampling method among those who volunteered to participate, ensuring a balanced distribution of boys and girls. The sample size was calculated using the statistical power analysis program G*Power, based on 85% power, an effect size of 0.5, and a significance level of $\alpha=0.05$. Children who were following a special diet were excluded from the study.

Informed consent was obtained from the parents for participation in the study, and data were collected through face-to-face interviews with a structured questionnaire. The body weight and height information of the parents was recorded based on self-reports provided by the family.

Assessment of Anthropometric Measurements

Children's body weight (kg) was measured without shoes using a professional digital scale (Seca 813) with a sensitivity of 0.1 kg. Height (cm) was measured with children standing upright in a straight position, without shoes, using a portable stadiometer (Mesilife 13539) with a precision of 0.1 cm. Waist and hip circumferences (cm) were measured using a non-elastic measuring tape with a sensitivity of 0.1 cm. Children's Body Mass Index (BMI) was calculated using the formula: body weight (kg)/ height (m)². Age- and sex-specific percentile values were determined using the WHO AnthroPlus software¹⁷. WHO age-specific BMI percentile classification was used, where <3rd percentile indicates severe underweight, 3rd to <15th percentile underweight, 15th to <85th percentile normal weight, ≥85th to <97th percentile overweight, and ≥97th percentile obesity⁸. For the assessment of parental BMI, the WHO classification was used¹⁸. For the evaluation of waist circumference, percentile curves developed specifically for Turkish children were used¹⁹. Additionally, while evaluating waist-to-height ratio (used for identifying abdominal obesity and elevated cardiometabolic risk), a value greater than 0.5 was considered at-risk²⁰.

Assessment of Mindful Eating

The validity and reliability of the Mindful Eating Questionnaire's Turkish version were established by Bozkurt et al.²¹⁻²³. The first section of the questionnaire consists of 8 items measuring mindless eating, while the second section includes 4 items assessing awareness. Scores from each section were summed and divided by the number of items to obtain two separate total scores. Higher awareness scores indicate higher awareness, whereas higher mindless eating scores reflect greater engagement in mindless eating.

Assessment of Dietary Intake

To evaluate the children's dietary intake, a retrospective 24-hour dietary recall was conducted by the researcher. A food atlas with meal and portion photographs was used to aid recall and improve the accuracy of dietary records²⁴. The collected data were analyzed using the Nutrition Information Systems software (BeBiS 9.0).

Ethical Statement

Ethical approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Kütahya University of Health Sciences (Decision No: 2025/06-53, Date: 06/05/2025). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

The data obtained were analyzed using IBM SPSS Statistics version 24.0. Continuous variables were reported as mean ± standard deviation (X±SD), while categorical variables were presented as frequency (n) and percentage (%). The Kolmogorov-Smirnov

test was used to assess the distribution characteristics of the data. For continuous variables that did not show a normal distribution, non-parametric analysis methods were applied. Children were classified as obese if BMI-for-age ≥ 85 th percentile, and non-obese if < 85 th percentile. The Chi-square (χ^2) test was used to compare categorical variables such as gender and obesity status (obese vs. non-obese), while the Mann–Whitney U test was employed for the analysis of continuous variables between two independent groups. For comparisons involving more than two independent groups, the Kruskal–Wallis test was applied. Using quartile classification, mindless eating and awareness scores were split into four groups, and the associations of energy and nutrient intakes with the lowest and highest score quartiles were analyzed. A significance level of $p < 0.05$ was considered for all statistical analyses.

Results

Table 1 presents selected descriptive characteristics of the children according to obesity status. The mean age of the participants was 10.3 ± 0.4 years. Among all children, the combined prevalence of overweight and obesity in mothers was 47.0%. The mean BMI of mothers of children with and without obesity was determined as 26.0 ± 4.4 and 24.4 ± 4.6 , respectively, and this difference was found to be statistically significant ($p=0.003$). The prevalence of obesity among the mothers of obese children (18.0%) was found to be significantly higher than that among the mothers of non-obese children (11.0%) ($p=0.045$). No statistically significant difference was found between children's obesity status and the fathers' mean BMI. Children's sleep duration and screen time did not differ significantly by obesity status ($p>0.05$).

Table 1. Selected descriptive characteristics of the children according to obesity status

Variables	Total (n:298)	Obese (n:100)	Non-obese (n:198)	p
Age (mean±SD)	10.3±0.4	10.3±0.4	10.3±0.4	0.853 ^a
Maternal BMI (kg/m²) (mean±SD)	25.0±4.6	26.0±4.4	24.4±4.6	0.003^{a*}
Paternal BMI (kg/m²) (mean±SD)	25.9±3.3	26.2±3.5	25.7±3.6	0.278 ^a
Maternal BMI (n(%))				
Underweight/Normal	158 (53.0)	44 (44.0)	116 (58.6)	0.045^b
Overweight	101 (33.9)	38 (38.0)	60 (30.3)	
Obese	39 (13.1)	18 (18.0)	22 (11.1)	
Paternal BMI (n(%))				
Underweight/Normal	129 (43.3)	42 (42.0)	87 (43.9)	0.569 ^b
Overweight	130 (43.6)	42 (42.0)	88 (44.4)	
Obese	39 (13.1)	16 (16.0)	23 (11.6)	
Maternal Education (n(%))				
Less than high school	82 (27.5)	31 (31.0)	51 (25.8)	0.339 ^b
High school or above	218 (72.5)	69 (69.0)	142 (74.2)	
Paternal Education (n(%))				
Less than high school	33 (11.1)	16 (16.0)	17 (8.6)	0.044^{b*}
High school or above	265 (88.9)	84 (84.0)	181 (91.4)	

Sleep Duration (n(%))				
Less than 8 hours	8 (2.6)	4 (4.0)	4 (2.0)	0.318 ^b
8 hours or more	290 (97.5)	96 (96.0)	194 (98.0)	
Screen Time (n(%))				
Less than 2 hours	168(56.4)	50(50.0)	118(59.6)	0.115 ^b
2 hours or more	130(43.6)	50(50.0)	80(40.4)	

p<0.05 significant level, a: Mann Whitney U test, b: Chi Square test

Table 2 presents selected anthropometric measurements and dietary habits of the children according to obesity status. The prevalence of obesity was found to be significantly higher in boys compared to girls ($p<0.05$). Among all children, the combined prevalence of overweight (19.7%) and obesity (13.7%) was found to be 33.4%. The waist-to-height ratio was significantly higher in obese children compared to non-obese children; 33% of obese children had a waist-to-height ratio greater than 0.5, whereas this rate was 4% among non-obese children ($p<0.05$).

Table 2. Selected anthropometric measurements and dietary habits of the children according to obesity status

Variables	Total (n:298)	Obese (n:100)	Non-obese (n:198)	P
Body Weight (kg) (mean±SD)	34.6±8.0	42.1±8.1	30.8±4.5	<0.001^a
Height (cm) (mean±SD)	137.7±9.0	139.5±7.9	136.8±9.4	0.023^a
BMI (kg/m²) (mean±SD)	18.3±5.0	22.2±6.9	16.3±1.7	<0.001^a
Gender (n(%))				
Girl	149 (50.0)	41(41.0)	108 (54.5)	0.036^b
Boy	149 (50.0)	59 (59.0)	90 (45.5)	
BMI Percentile (n(%))				
<15.	42 (14.0)	-	42 (22.2)	<0.001^b
15-84.9.	156 (52.3)	-	156 (77.8)	
85-96.9.	59 (19.7)	59 (59.0)	-	
≥97.	41 (13.7)	41 (41.0)	-	
Waist Circumference (cm) (mean±SD)	62.7±6.3	67.7±6.1	60.1±4.8	<0.001^a
Waist Circumference Distribution (n(%))				
< 90th percentile	256 (86.2)	68 (68.0)	188 (95.4)	<0.001
≥ 90th percentile	41(13.8)	32 (32.0)	9 (4.6)	
Waist-to-Height Ratio (mean±SD)	0.45±0.5	0.49±0.06	0.43±0.03	<0.001^a
Waist-to-Height Ratio Distribution (n(%))				
< 0.5	257 (86.2)	67(67.0)	190(96.0)	<0.001^b
≥ 0.5	41(13.8)	33(33.0)	8(4.0)	
Meal Skipping (n(%))				
Yes	111 (37.2)	34 (34.0)	77 (38.9)	0.447 ^b
No	187 (62.7)	66 (66.0)	121 (61.1)	

Number of Meals (n(%))				
3 or fewer	232 (77.8)	78(78.0)	154 (77.8)	0.965 ^b
4 or more	66 (22.2)	22(22.0)	44 (22.2)	
School Canteen (n(%))				
Available	261 (87.5)	81 (81.0)	180 (90.9)	0.024^b
Not available	37 (12.4)	19 (19.0)	18 (9.1)	
Bringing a Lunchbox to School (n(%))				
Yes	111 (37.2)	30 (30.0)	82 (41.4)	0.058 ^b
No	187 (62.7)	70 (70.0)	116 (58.6)	
Food/Beverage Purchased from School Canteen (n(%))				
Cake. Cookie. Pastry	120 (56.1)	40 (59.7)	80 (54.4)	0.722 ^b
Chocolate. Candy. Gummy	17 (7.9)	4 (6.0)	13 (8.8)	
Sandwich. Toast. Hamburger	67 (31.3)	19 (28.4)	48 (32.7)	
Juice	10 (4.7)	4 (6.0)	6 (4.1)	

BMI: Body Mass Index, $p < 0.05$ significant level, a: Mann Whitney U test, b: Chi Square test

Table 3 presents the distribution of selected characteristics of the children according to their mindful eating. The mindless eating score of boys was significantly higher than that of girls ($p < 0.05$). Although awareness scores tended to decrease as BMI percentile increased, this difference was not statistically significant. As maternal BMI increased, children's mindless eating scores tended to rise. As maternal education level increased, children's mindless eating scores significantly decreased.

Table 3. Selected characteristics of the children according to mindful eating

Variables	Mindless Eating Score (mean $\pm$ SD)	p	Awareness Score (mean $\pm$ SD)	p
Girl (n:149)	13.52 $\pm$ 3.35	0.003 ^a	12.06 $\pm$ 2.50	0.982 ^a
Boy (n:249)	15.05 $\pm$ 4.27		12.05 $\pm$ 2.57	
Total	14.29 $\pm$ 3.91		12.06 $\pm$ 2.52	
BMI Percentile				
<15. (n:44)	14.77 $\pm$ 4.04	0.845 ^c	12.39 $\pm$ 2.95	0.443 ^c
15-84.9. (n:154)	14.23 $\pm$ 3.84		12.09 $\pm$ 2.39	
85-96.9. (n:59)	14.14 $\pm$ 3.95		12.10 $\pm$ 2.47	
$\geq$ 97. (n:41)	14.20 $\pm$ 4.08		11.51 $\pm$ 2.65	
Waist Circumference				
< 90th percentile (n:256)	14.44 $\pm$ 3.90	0.139 ^a	12.07 $\pm$ 2.52	0.960 ^a
$\geq$ 90th percentile (n:41)	13.46 $\pm$ 3.90		12.05 $\pm$ 2.63	
Maternal BMI				
Underweight/Normal (n:160)	14.21 $\pm$ 3.77	0.937 ^c	11.84 $\pm$ 2.57	0.293 ^c
Overweight (n:98)	14.35 $\pm$ 4.23		12.32 $\pm$ 2.56	

Obese (n:40)	14.43 ± 3.73		12.28 ± 2.26	
Paternal BMI				
Underweight/Normal (n:129)	14.74 ± 3.98	0.200 ^c	12.03 ± 2.48	0.900 ^c
Overweight (n:130)	13.88 ± 3.73		12.12 ± 2.45	
Obese (n:39)	14.10 ± 4.21		11.92 ± 2.99	
Maternal Education				
Less than high school (n:82)	15.17 ± 4.18	0.016 ^a	11.89 ± 2.59	0.484 ^a
High school or above (n:216)	13.95 ± 3.76		12.12 ± 2.51	
Paternal Education				
Less than high school (n:33)	15.18 ± 4.17	0.163 ^a	11.58 ± 2.66	0.247 ^a
High school or above (n:265)	14.17 ± 3.87		12.12 ± 2.51	
Sleep Duration				
Less than 8 hours (n:8)	16.62 ± 4.07	0.086 ^a	10.75 ± 2.31	0.139 ^a
8 hours or more (n:290)	14.22 ± 3.89		12.09 ± 2.53	
Screen Time				
Less than 2 hours (n:168)	13.73 ± 3.77	0.005 ^a	12.11 ± 2.57	0.665 ^a
2 hours or more (n:130)	15.00 ± 3.99		11.98 ± 2.49	
School Canteen				
Available (n:264)	14.15 ± 3.81	0.102 ^a	12.15 ± 2.47	0.094 ^a
Not available (n:37)	15.27 ± 4.49		11.41 ± 2.89	
Bringing a Lunchbox to School				
Yes (n:112)	13.60 ± 3.45	0.018 ^a	12.45 ± 2.55	0.039 ^a
No (n:186)	14.70 ± 4.12		11.82 ± 2.50	

BMI: Body Mass Index, $p < 0.05$ significant level, a: Mann Whitney U test, c: Kruskal Wallis test

Table 4 presents daily energy and nutrient intakes of children according to mindless eating and awareness quartiles and obesity status. Overall, energy and most nutrient intakes did not differ significantly between obese and non-obese children ($p > 0.05$). Similarly, no statistically significant differences were observed in dietary intake across the lowest and highest quartiles of awareness scores according to obesity status ($p > 0.05$). However, within the lowest quartile of the Mindless Eating Score (Q1), obese and non-obese children differed significantly in niacin and pyridoxine intakes ($p < 0.05$).

Table 4. Daily energy and nutrient intakes of children according to mindless eating and awareness quartiles and obesity status

Energy and Nutrient Components	Total		Mindless Eating Score Q1		Mindless Eating Score Q4		Awareness Score Q1		Awareness Score Q4	
	Obese (n:100)	Non-obese (n:198)	Obese (n:100)	Non-obese (n:198)	Obese (n:100)	Non-obese (n:198)	Obese (n:100)	Non-obese (n:198)	Obese (n:100)	Non-obese (n:198)
Energy (kcal)	1275.5±373.0	1238.8±327.9	1246.8±369.4	1385.5±364.1	1292.4±347.2	1226.9±237.1	1330.6±413.8	1202.6±318.7	1348.6±391.4	1210.1±293.4
CHO (%)	43.3±10.5	42.9±10.8	42.9±10.6	42.9±9.0	43.0±10.6	43.8±12.8	42.2±11.3	43.1±12.3	41.9±9.8	44.1±11.0
Protein (%)	16.7±4.7	17.5±4.7	15.6±4.1	16.7±3.5	17.6±5.1	17.5±5.7	16.7±4.7	16.8±4.1	16.7±5.1	17.3±5.5
Fat (%)	39.8±9.9	39.3±10.8	41.6±10.2	40.2±9.4	39.1±9.9	38.5±13.8	41.2±11.6	39.9±11.5	41.3±7.7	38.3±10.4
Fiber (g)	12.5±5.8	12.3±5.0	12.5±7.1	13.5±6.4	12.2±4.4	13.7±4.6	11.7±5.4	11.9±4.6	14.3±7.2	13.7±5.8
Vit. A (µg)	710.0±82.3	747.6±599.8	766.4±678.2	810.9±662.3	666.7±484.3	811.5±651.8	666.8±574.1	736.7±478.0	788.4±498.7	775.3±512.9
Thiamin (mg)	0.64±0.27	0.66±0.22	0.6±0.2	0.6±0.2	0.6±0.2	0.7±0.2	0.6±0.2	0.5±0.2	0.7±0.3	0.6±0.2
Riboflavin (mg)	1.07±0.45	0.99±0.38	1.0±0.4	1.0±0.3	1.1±0.4	1.0±0.4	1.0±0.4	0.9±0.3	1.1±0.4	0.9±0.3
Niacin (mg)	19.6±9.4	20.8±9.0	16.9±7.9*	21.9±7.4*	21.1±9.0	20.0±8.7	21.0±10.5	19.5±9.9	19.5±9.4	20.0±8.6
Pyridoxine (mg)	0.98±0.46	0.98±0.44	0.9±0.4*	1.1±0.4*	1.0±0.4	0.9±0.4	0.9±0.4	0.9±0.4	1.0±0.5	1.0±0.3
Folate (µg)	174.4±71.1	178.8±90.4	175.1±91.1	190.8±72.3	173.6±69.6	177.6±74.3	162.4±74.4	157.8±76.1	202.5±117.2	193.0±79.6
B ₁₂ (µg)	3.59±2.59	3.98±2.44	3.1±1.4	5.7±13.1	3.5±2.2	3.2±2.1	4.7±6.5	5.4±13.1	3.1±1.5	2.8±1.4
Vitamin C (mg)	77.8±57.5	84.2±57.4	78.4±64.4	102.3±65.8	80.9±58.9	89.3±62.2	73.3±58.1	64.8±47.6	86.4±58.7	96.1±64.7
Vitamin E (mg)	9.8±5.4	9.7±5.4	10.2±5.9	10.9±4.1	9.5±5.4	9.6±7.5	8.8±5.5	8.7±6.6	11.5±6.0	10.6±4.5
Sodium (mg)	2373.1±278.2	2298.0±247.0	2070.3±918.6	2396.1±1552.7	2472.8±1346.6	2188.3±672.8	2501.3±1499.6	1962.9±986.2	2536.6±1153.4	2783.3±1615.6
Potassium (mg)	1760.5±706.5	1784.5±628.2	1723.4±778.7	1986.3±671.9	1740.1±560.5	1845.4±623.7	1669.4±621.8	1636.8±583.9	1935.9±921.2	1872.5±555.2
Calcium (mg)	555.8±641.7	518.7±225.5	529.5±253.4	552.1±192.0	508.2±230.3	514.0±234.7	471.0±206.3	465.3±226.3	568.6±262.1	511.5±183.1
Magnesium (mg)	183.2±70.22	189.2±68.9	184.7±84.2	207.8±69.6	180.0±59.4	204.7±76.3	179.1±66.7	188.5±76.3	204.5±86.0	189.5±57.9
Phosphorus (mg)	791.6±284.3	788.0±250.4	766.1±296.8	817.0±249.2	840.7±259.4	812.6±243.3	788.8±274.9	742.5±256.0	820.2±320.4	805.3±188.9
Iron (mg)	6.9±2.9	6.7±2.32	6.5±3.1	6.9±2.2	6.9±2.7	7.3±2.3	6.9±3.1	6.6±2.4	7.6±3.2	7.1±2.2
Zinc(mg)	7.04±2.6	7.01±2.4	6.8±2.4	7.2±2.2	7.1±2.3	7.4±2.5	7.3±2.6	6.8±2.3	7.5±2.8	6.7±1.8

CHO: Carbohydrate, *: $p < 0.05$, variables are presented as mean $\pm$ standard deviation ($X \pm SD$) values. All pairwise comparisons were performed using the Mann–Whitney U test.

Discussion

This study aimed to evaluate obesity status in relation to mindful eating and dietary intake among primary school children in Kütahya.

According to the World Obesity Atlas, the prevalence of obesity in the 10-19 age group in Türkiye is projected to reach 17% by 2030^{8,25}. National cross-sectional studies and screening programs indicate that the prevalence of overweight among children aged 7-14 ranges from 12.5% to 19.6%, while obesity rates vary between 10.5% and 28.4%³⁻⁷. In this study, the prevalence of overweight was 19.7%, and obesity was 13.7%. Bozkurt et al. reported that the prevalence of overweight and obesity was 45.6% among children with a mean age of 10.0 ± 0.73 years in Erzurum²⁶. In 2022, the WHO reported the global obesity prevalence among children aged 5–19 as 19% in girls and 21% in boys, noting similar increases in both sexes over the past 30 years⁸. In Türkiye, this increase has been reported as 5.8-fold in girls and 24.5-fold in boys²⁷. Similarly, in our study, the prevalence of obesity was significantly higher in boys (39.5%) compared to girls (27.5%). Metinoğlu found no association between sex and BMI (28). According to a review of cross-sectional studies from 21 European countries participating in the COSI study, the prevalence of severe obesity was higher in boys than in girls aged 6-9 years²⁸. Although national and international studies report varying results regarding obesity prevalence by sex, overweight and obesity appear to be more common in preadolescent boys than in girls^{29,30}. This may be attributed to obesogenic factors such as dietary habits, peer influence, longer screen time, and family attitudes, as well as certain genetic determinants.

According to a meta-analysis of 23 studies examining the relationship between parental and childhood obesity, children with overweight or obese parents were 1.97 times more likely to be overweight or obese compared to those with parents of a healthy weight³¹. A positive correlation between the BMI of children aged 6-10 and their parents was reported in a study conducted in Samsun³². Consistently, in our study, the prevalence of overweight (38.0%) and obesity (18.0%) was significantly higher among the mothers of obese children compared to those of non-obese children. Some studies have reported a positive association between childhood obesity and paternal BMI^{33,34}. In this study, no significant difference was found in the BMI of fathers between obese and non-obese children. However, as paternal education level increased, the prevalence of obesity among children significantly decreased. Similarly, children of fathers with low education levels in European countries have been reported to be 2.16 times more likely to be obese³⁵. In Japan, low educational attainment of both parents was found to be associated with overweight and obesity in children³⁶. In this study, the decrease in childhood obesity with higher paternal education levels may be attributed to increased nutrition and health knowledge within the family, which in turn may influence healthier food choices.

Recently, mindful eating interventions have been designed and implemented to improve eating behaviors and promote healthy dietary habits among children^{15,23}. According to a systematic review and meta-analysis, the ages of 10 to 12 are considered an optimal period for positive development through mindfulness interventions. Therefore, it is

recommended that programs targeting both emotional regulation and awareness be developed for this age group¹⁶. For example, in a randomized controlled trial by Bennett et al., a mindful eating intervention applied to children aged 10-12 was found to have potential effects in encouraging them to try new foods³⁷. Only a limited number of studies have examined whether mindful eating differs according to excess weight status in children and adolescents. A study conducted among adolescents in Türkiye reported that those with obesity had lower mindfulness³⁸. Bozkurt et al. found that children who were overweight or obese had higher mindless eating scores and lower awareness scores compared to those with a normal BMI²⁶. In our study, although awareness scores tended to decrease as BMI percentile increased among children, this difference was not statistically significant. This finding may be due to regional, sociocultural, and socioeconomic differences, as well as the importance families place on nutrition. Our observations indicate that mindless eating scores differed by sex; boys had significantly higher scores than girls. A study conducted in Türkiye with a similar age group also found that girls had higher mindful eating scores than boys²⁶. This difference may be explained by girls being more conscious about their eating habits due to concerns related to body image^{39,40}.

One of the primary recommendations for preventing childhood obesity is limiting screen time. Increased screen time in children and adolescents has been associated with a higher risk of obesity⁴¹. In our study, no significant difference was found between children's obesity status and screen time. However, when analyzed in relation to mindful eating, children with screen time of two hours or more had significantly higher mindless eating scores. In a previous study conducted in Bursa among children aged 9–12, high screen time was associated with lower levels of awareness, although it was not linked to mindful eating¹³. He et al. also stated that increased screen time in children was associated with low mindfulness⁴². Furthermore, it is known that increased screen time leads to higher snacking and disruption of hunger and satiety signals^{41,42}.

Parental education level is known to have a positive impact on a child's adoption of healthy eating behaviors⁴³. According to Dos Santos Leal et al., maternal education level is a more decisive factor than paternal education level in increasing children's fruit and vegetable consumption and decreasing their intake of energy-dense foods⁴³. In this study, children of mothers with a high school education or higher had significantly lower mindless eating scores. However, no significant differences were observed in children's awareness scores based on paternal education level. Studies examining the relationship between parental education level and mindful eating among high school students have found no significant differences in children's mindful eating based on mothers' or fathers' education levels^{39,40}. In our study, given the relatively young age of the participants, it is likely that their eating behaviors are still strongly influenced by their mothers. This could explain why children with more highly educated mothers had higher mindful eating scores.

Conclusion

According to our findings, although obesity rates were higher among boys, the overall prevalence was high across the entire population. A child's likelihood of being obese increased with maternal obesity and lower paternal education levels. Mindless eating scores were higher among boys, children whose mothers had lower education levels, and those with longer screen time. Children's dietary intake did not vary according to their mindless eating, awareness or obesity status. Integrating mindful eating practices into school-based nutrition education programs and ensuring parental involvement can help all family members develop healthy eating habits. Thus, by ensuring child–family–school collaboration, mindful eating in children can be enhanced and public health can be improved.

Limitations

Since this study was designed as a cross-sectional study, causal relationships cannot be established. Furthermore, a convenience sampling method was used. Since participation was voluntary and the sample was formed through social media and personal networks, it is unclear whether the sample fully represents the characteristics of the general population, which limits the generalizability of the findings. Another limitation of this study is that the 24-hour dietary recall may not reflect the children's routine daily dietary intake.

Conflict of Interest

There is no conflict of interest regarding the article.

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Ethical Approval

Ethical approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Kütahya University of Health Sciences (Decision No: 2025/06-53, Date: 06/05/2025). All participants provided informed consent, aligning with the Helsinki Declaration's principles.

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The Relationship between the Perception of Health News and Infodemic in Adults with Chronic Diseases

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Abstract

Aim: This study examined the relationship between the perception of health news and infodemic in adults with chronic diseases.

Method: The study was a descriptive and correlational design. The population consisted of adults with chronic illnesses, and a total of 332 participants were included in the study. Data were collected using the Descriptive Information Form, the Perception of Health News Scale, and the Infodemic Scale. Numbers, percentages, means, standard deviations, and Pearson correlation analysis were used to analyze the data.

Results: Of the participants, 59.3% were female, and the mean age was 55.05±13.42 years. The mean score on the Perception of Health News Scale was 80.67±11.35, while the mean score on the Infodemic Scale was 52.86±6.43. A statistically significant relationship was found between perception of health news and infodemic scores ($p = 0.001$), indicating that as participants' perception of health news increased, their infodemic levels also increased. The perception of health news scores accounted for 2.8% of the variance in infodemic scores.

Conclusion: The results demonstrated a relationship between participants' perception of health news and the infodemic. Individuals with chronic diseases should be educated on how to assess the reliability of information sources and avoid health news from unverified origins critically.

Keywords: Health news, infodemic, chronic patients, access to health information.

Kronik Hastalığı Olan Yetişkinlerde Sağlık Haber Algısı ve İnfodemi İlişkisi

Öz

Amaç: Bu çalışmada amaç, kronik hastalığı olan yetişkinlerde sağlık haber algısı ve infodemi arasındaki ilişkiyi değerlendirmektir.

Yöntem: Çalışma tanımlayıcı ve ilişki arayıcı türdedir. Çalışmanın evrenini yetişkin kronik hastalar oluşturmaktadır. Çalışma kapsamında 332 katılımcıya ulaşılmıştır. Çalışmada veri toplama aracı olarak

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ETHICAL STATEMENT: Ethical approval for the study was obtained from the Samsun University Non-Interventional Clinical Research Ethics Committee (No: GOKAEK 2025/2/5).

Tanıtıcı Bilgi Formu, Sağlık Haberleri Algısı Ölçeği, Infodemi Ölçeği kullanılmıştır. Çalışma verilerinin analizinde sayılar, yüzdeler, ortalama, standart sapma ve pearson korelasyon analizi kullanılmıştır.

Bulgular: Çalışmaya göre katılımcıların %59,3'ü kadın ve yaş ortalaması 55,05±13,42'dir. Katılımcıların sağlık haber algısı ölçek puanı 80,67±11,35, infodemi ölçek puanı 52,86±6,43'dür. Katılımcıların sağlık haber algısı puanı arttıkça infodemi puanı artmaktadır. Sağlık haber algısı puanı ile infodemi puanı arasında anlamlı bir ilişki bulunmuştur (p=0,001). Sağlık haber algısı puanı, infodemi puanındaki değişimin %2,8'ini açıklamaktadır.

Sonuç: Çalışma sonuçları, katılımcıların sağlık haber algısı ve infodemi arasında ilişki olduğunu göstermiştir. Kronik hastalığı olan bireyler, bilgi kaynaklarının güvenilirliğini nasıl değerlendirecekleri ve kaynağı doğrulanmamış sağlık haberlerinden nasıl kaçınacakları konusunda eğitilmelidir.

Anahtar Sözcükler: Sağlık haberleri, infodemi, kronik hastalar, sağlık bilgisine erişim.

Introduction

Chronic diseases have emerged as a major global public health concern. Conditions such as cancer, cardiovascular diseases, diabetes, and hypertension are among the leading causes of morbidity and mortality¹. With increasing life expectancy, declining birth rates, and an aging population, the prevalence of chronic diseases and consequently, the overall disease burden has continued to rise². Chronic diseases, which account for a significant proportion of premature deaths, require effective long-term management strategies³. Although health professionals often emphasize dietary adherence, increased physical activity, and reduced tobacco use in chronic disease management, these measures alone are no longer sufficient in the digital age⁴.

Information is now disseminated at an unprecedented pace, with mass media continuously diversifying and the speed of communication increasing proportionally⁵. These developments may contribute to errors in the processing and application of health information. While health promotion initiatives increasingly emphasize personal responsibility, certain population groups may be at greater risk due to the rapid spread of unverified information⁶. For individuals with chronic diseases, the uncritical use of health-related information without proper verification constitutes a significant problem. Therefore, it is essential to consider not only how information is accessed and applied but also how it is perceived and internalized. For this reason, it is essential to understand how health-related news impacts society⁷. Traditionally, people have relied on conventional media sources to receive and stay informed about health news. However, with the rise of new media platforms, the dissemination and speed of health-related information have reached unprecedented levels. In recent years, individuals have been overwhelmed with information from social media platforms daily even when they are not actively seeking news content^{8,9}. Health news constitutes a significant portion of this information flow, serving to communicate strategies for health promotion and disease prevention to the public. As a key component of health communication, such news can significantly influence individuals' health behaviors, beliefs, and attitudes¹⁰.

Conversely, the term “infodemic” refers to the rapid spread of misinformation across digital and physical platforms during crises such as disease outbreaks, natural disasters, or attacks¹¹. The concept gained prominence during the COVID-19 pandemic when fake, distorted, or incomplete news became widespread. Research has shown that in times of crisis, the public increasingly turns to social media and news sources to follow the progression of health threats^{12,13}. For individuals living with chronic illnesses, accessing accurate and reliable information is especially critical for managing their health and incorporating necessary adjustments into their daily lives. However, both health-related news and various factors contributing to the infodemic hinder access to accurate information. The literature increasingly highlights the prevalence of misinformation and fake news concerning health^{9,14}. Therefore, this study explores a relatively under-researched topic: the relationship between the perception of health news and infodemic among adults with chronic diseases.

Research Questions

1. What is the level of health news perception and infodemic among adults with chronic diseases?
2. Is there a relationship between health news perception and infodemic among adults with chronic diseases?

Material and Methods

Research Design

This study was descriptive and correlational research design. The study was conducted at a training and research hospital in the Black Sea Region of Türkiye, between January and May 2025.

Participants

The study population consisted of individuals diagnosed with chronic diseases, while the sample included those who were admitted to the hospital for chronic diseases. The required sample size was calculated using G*Power 3.1.9.4 software. Based on an effect size of 0.50, a significance level (α) of 0.05, and a power of 95%, the minimum required sample size was determined to be 300 participants¹⁵. The study used probability sampling. The study was ultimately completed with 332 participants (n=332).

Inclusion Criteria for the Study: (1) Being 18 years of age or older, (2) Having been diagnosed with a chronic disease within the last 6 months, (3) Having the communication skills necessary to complete the study questionnaire. Individuals who did not meet these criteria were excluded from the study.

Measures

Introductory Information Form: This form was developed by researchers based on relevant literature. It includes demographic information as well as questions related to health status and media usage^{5,6}.

The Perception of Health News Scale: Developed by Çınar et al. (2018), the scale is used to assess individuals' perceptions of health-related news. It consists of 26 items grouped under five sub-dimensions: behavior change, commercial anxiety and advertisement, exploitation of health behavior, promotion of consumption, and trust in health journalism. The scale is structured as a Likert-type instrument, with scores ranging from 26 to 130. All items are framed positively but have negative meanings. Higher scores indicate a more negative perception in the relevant sub-dimension, while lower scores reflect a more positive perception. The original scale reported a Cronbach's alpha of 0.84¹⁶. In this study, Cronbach's alpha coefficient was also found to be 0.84.

The Infodemic Scale: The Infodemic Scale, developed by Hendekci and Kemer (2024), assesses individuals' approaches to infodemic. The scale consists of 14 items across two sub-dimensions: awareness and literacy. It is structured as a Likert-type scale without any reverse-coded items. The total score ranges from 14 to 70, with higher scores indicating greater infodemic awareness and literacy. The original study reported a Cronbach's alpha of 0.87¹¹ while the reliability coefficient for this study was found to be 0.82.

Ethics Committee Approval

Ethical approval for the study was obtained from the Samsun University Non-Interventional Clinical Research Ethics Committee (No: GOKAEK 2025/2/5). The study was conducted following the principles of the Declaration of Helsinki. Participants were informed about the purpose and procedures of the study, and written informed consent was obtained.

Statistical Analysis

Data were analyzed using the SPSS for Windows version 22.0 software package. Descriptive statistics, including frequencies, percentages, minimum and maximum values, means, and standard deviations, were calculated, and Pearson correlation, assessing relationships between variables, was used. The normality of data distribution was evaluated using "Skewness" and "Kurtosis" coefficients (± 2). Scale reliability was assessed with Cronbach's alpha, and a significance level of $p < 0.05$ was considered statistically significant.

Table 1. Normal distribution data for continuous variables

Continuous variables	n	Skewness Coefficient		Kurtosis Coefficient	
		Statistics	SD	Statistics	SD
Commercial anxiety and advertisement	332	-0.043	0.134	-0.990	0.267
Promotion of consumption	332	-0.057	0.134	-0.668	0.267
Behavior change	332	-0.198	0.134	0.094	0.267
Exploitation of health behavior	332	-0.340	0.134	-0.272	0.267
Trust in health journalism	332	-0.047	0.134	-0.572	0.267
The Perception of Health News Scale	332	0.019	0.134	-0.452	0.267
Awareness	332	-0.502	0.134	0.522	0.267
Literacy	332	-0.850	0.134	0.373	0.267
The Infodemic Scale	332	-0.477	0.134	0.157	0.267

* All data is normally distributed. SD: standart deviation

Results

According to Table 2, 59.3% of the participants were female, 33.4% held a bachelor's degree, 71.7% were married, 31.9% were retired, and 65.1% had a moderate income level. 36.7% of the participants had hypertension, and 91.9% received information about their disease from health professionals. The news did not influence 62.7% in disease management, 40.1% spent 1-2 hours daily on the internet, 40.1% watched television 3-4 hours daily, and 56.3% described their health as moderate. The mean age of the participants was 55.05 ± 13.42 years.

Table 2. Descriptive characteristics of the participants (n=332)

		n	%
Gender	Female	197	59.3
	Male	135	40.7
Education level	Primary school	99	29.8
	Secondary/High school	71	21.4
	Bachelor's degree	111	33.4
	Postgraduate	22	6.6
	Illiterate	29	8.7
Marital status	Married	238	71.7
	Single	94	28.3
Occupation	Retired	106	31.9
	Employed	218	65.5
	Unemployed	8	2.4
Income level	Good	62	18.7
	Moderate	216	65.1
	Bad	54	16.3
Chronic disease	Diabetes	77	23.2

	Hypertension			122	36.7
	Respiratory diseases			9	2.7
	Heart disease			54	16.3
	Cancer			11	3.3
	Rheumatologic diseases			59	17.8
Source of information about chronic diseases	Social media			21	6.3
	Health professionals (physicians and nurses)			305	91.9
	Family and close friends			6	1.8
Impact of news on disease management	Yes			124	37.3
	No			208	62.7
Time spent on the internet	Less than one hour			55	16.6
	One to two hours			133	40.1
	Three to four hours			81	24.4
	More than five hours			19	5.7
	Never			44	13.3
Time spent watching television	Less than one hour			36	10.8
	One to two hours			123	37.0
	Three to four hours			133	40.1
	More than five hours			40	12.0
Health status	Good			105	31.6
	Moderate			187	56.3
	Bad			40	12.0
	n	Min.	Max.	X	SD.
Age	332	19	85	55.05	13.42

According to Table 3, participants obtained the following mean scores on the Perception of Health News Scale sub-dimensions: commercial anxiety and advertisement (22.21 ± 6.12), promotion of consumption (8.75 ± 2.55), behavior change (19.52 ± 4.03), exploitation of health behavior (20.42 ± 3.27), and trust in health journalism (9.76 ± 2.06). The total score on the Perception of Health News Scale was 80.67 ± 11.35 . For the Infodemic Scale, the participants scored 34.68 ± 4.17 in the awareness sub-dimension and 18.17 ± 3.50 in the literacy sub-dimension, with a total scale score of 52.86 ± 6.43 .

Table 3. Mean scores of participants on the perception of health news scale, infodemic scale, and their subscales

Scale and Subscales	n	Min.	Max.	Mean	SD.
Commercial anxiety and advertisement	332	9.00	35.00	22.21	6.12
Promotion of consumption	332	3.00	15.00	8.75	2.55
Behavior change	332	8.00	29.00	19.52	4.03
Exploitation of health behavior	332	12.00	28.00	20.42	3.27
Trust in health journalism	332	5.00	15.00	9.76	2.06
The Perception of Health News Scale	332	51.00	111.00	80.67	11.35
Awareness	332	21.00	45.00	34.68	4.17
Literacy	332	8.00	25.00	18.17	3.50
The Infodemic Scale	332	31.00	67.00	52.86	6.43

According to Table 4, a statistically significant and positive correlation was found between the commercial anxiety and advertisement sub-dimension and the awareness, literacy, and total infodemic scores ($p < 0.05$). This indicates that as commercial anxiety and advertisement scores increase, so do awareness, literacy, and overall infodemic scores. A statistically significant negative correlation was found between the promotion of consumption score and the awareness score ($p < 0.05$), suggesting that a higher promotion of consumption score is associated with lower awareness. There was also a statistically significant negative relationship between the behavioral change score and both the awareness sub-dimension and the total infodemic score ($p < 0.05$). In other words, as behavioral change scores increase, awareness and overall infodemic scores tend to decrease. In contrast, the exploitation of health behavior score showed a statistically significant positive correlation with both the awareness sub-dimension and the total infodemic score ($p < 0.05$), indicating that as scores related to exploitation of health behavior rise, so do awareness and total infodemic levels. A statistically significant positive correlation was also found between the trust in health journalism score and all three variables: awareness, literacy, and the total infodemic score ($p < 0.05$). This suggests that stronger trust in health journalism is associated with higher levels of infodemic awareness and literacy. A statistically significant positive relationship was observed between the total score of the Perception of Health News Scale and the awareness, literacy, and total infodemic scores ($p < 0.05$), indicating that the high Perception of Health News Scale score is associated with greater infodemic-related awareness and skills.

Table 4. Correlation between perception of health news and infodemic scale scores

		Awareness	Literacy	Infodemic Scale
Commercial anxiety and advertisement	r	0.225	0.233	0.273
	p	0.000	0.000	0.000
	n	332	332	332
Promotion of consumption	r	-0.119	0.075	-0.036
	p	0.031	0.173	0.513
	n	332	332	332
Behavior change	r	-0.162	-0.090	-0.154
	p	0.003	0.102	0.005
	n	332	332	332
Exploitation of health behavior	r	0.221	0.064	0.178
	p	0.000	0.243	0.001
	n	332	332	332
Trust in health journalism	r	0.236	0.115	0.216
	p	0.000	0.037	0.000
	n	332	332	332
The Perception of Health News Scale	r	0.144	0.150	0.175
	p	0.009	0.006	0.001
	n	332	332	332

According to Table 5, a regression analysis was conducted to examine the effect of the Perception of Health News Scale on the Infodemic Score. The analysis revealed a statistically significant relationship between the two variables ($R=0.175$, $R^2_{\text{adjusted}}=0.028$, $F(1,330)=10.416$; $p=0.001$). The Perception of Health News Scale accounted for approximately 2.8% of the variance in the Infodemic Score. A one-unit increase in the Health News Perception Score predicted a 0.099-unit increase in the Infodemic Score.

Table 5. Regression analysis showing the effect of perception of health news on infodemic

	Beta	Standard Error	Standard Beta	t	p	%95 Confidence interval	
Constant coefficient	44.869	2.500		17.949	0.000	39.951	49.787
The Perception of Health News Scale	0.099	0.031	0.175	3.227	0.001	0.039	0.159

According to Table 6, a multiple linear regression analysis was conducted to examine the effect of subscale scores from the Health News Perception Scale on Infodemic Scores.

The results revealed that the established model is statistically significant ($F(5,326)=9.45$, $p<.001$), explaining 11.3% of the variance in infodemic scores ($R^2=.113$). The results of the analysis show that the commercial concern and advertising subdimension positively and significantly predicts the infodemic score ($B=0.24$, $SE=0.06$, $\beta=.23$, $t=3.79$, $p<.001$, 95% CI [0.12, 0.36]). Conversely, the behavior change subdimension was found to negatively and significantly affect the infodemic score ($B=-0.38$, $SE=0.10$, $\beta=-.24$, $t=-3.83$, $p<.001$, 95% CI [-0.58, -0.19]).

Table 6. Regression analysis showing the effect of health news perception scale subscale scores on infodemic score

	Beta	Standard Error	Standard Beta	t	p	%95 Confidence Interval	
Constant coefficient	47.666	2.697	-	17.673	0.000	42.360	52.972
Commercial anxiety and advertisement	0.240	0.063	0.229	3.792	0.000	0.115	0.364
Promotion of consumption	0.254	0.158	0.101	1.609	0.109	-0.057	0.565
Behavior change	-0.384	0.100	-0.241	-3.831	0.000	-0.581	-0.187
Exploitation of health behavior	0.104	0.125	0.053	0.833	0.406	-0.142	0.350
Trust in health journalism	0.308	0.197	0.099	1.569	0.118	-0.078	0.695

$R^2= 0.113$ $F= 9.454$ $p=0.000$

Discussion

The results revealed that participants' perceptions of health news were above the moderate level. Given that higher scores on the Perception of Health News Scale indicate more negative evaluations of health news. It can be concluded that participants generally hold negative views toward health-related media content. Health news disseminated through media plays a crucial role in shaping how individuals with chronic conditions manage their illnesses. Access to accurate, reliable health information significantly influences disease progression, treatment adherence, and overall quality of life. Furthermore, accurate information can help reduce the psychological burden associated with chronic diseases by promoting informed decision-making and fostering a sense of control⁷. Conversely, the negative perception of health news observed in this study may hinder patients' ability to effectively manage their health, potentially leading to poorer outcomes.

The study also found that participants' infodemic scores were relatively high. This suggests that participants are actively aware of the risks of misinformation and demonstrate a cautious approach to health information during crises seeking reliable sources, adhering to expert advice, and avoiding the spread of unverified content. In this context, high infodemic awareness and literacy may serve as a protective factor, helping

individuals to resort to complex health information environments. Continuous exposure to large amounts of misinformation can contribute to high levels of anxiety, depression, and other mental health concerns. This effect was particularly evident during the COVID-19 pandemic when individuals with chronic illnesses and older adults reported symptoms of anxiety and depression due to the persistent influx of pandemic-related news¹⁸. For those already coping with chronic health conditions, the spread of inaccurate or misleading information can exacerbate psychological distress, leading to increased stress, anxiety, and concern.

In the present study, patients scored highly on the “commercial anxiety and advertisement” subscale of the Perception of Health News Scale, suggesting that participants perceive health news as being primarily driven by commercial interests and advertising motives. Moreover, a positive correlation was identified between scores on this sub-dimension and the awareness and literacy components of the Infodemic Scale. This indicates that patients who are more informed and aware of the infodemic also tend to believe that health news is heavily influenced by commercial objectives. Previous research supports this perspective, indicating that while health service advertisements may offer some educational or superficially empowering messages, they are fundamentally aimed at promoting sales. These advertisements often have a high potential to mislead consumers¹⁹. Overall, both the current findings and the current literature highlight the complex interplay between media-driven health communication and the commercialization of health-related products and services.

According to the results of this study, patients scored highly on the “promotion of consumption” sub-dimension of the Perception of Health News Scale, indicating that health news often influences or encourages individuals to purchase health-related products or services. Additionally, a negative correlation was found between the “promotion of consumption” sub-dimension and the awareness component of the Infodemic Scale. As patients are more influenced by health news to engage in consumption, their awareness of infodemic-related issues tends to decrease. The media’s tendency to emphasize individual preferences in health management may contribute to the neglect of broader personal and societal determinants of health²⁰. Research has also shown that self-efficacy and health literacy play a critical role in chronic patients’ engagement in managing their health conditions⁷. Furthermore, an analysis of health news content found that such news often promotes consumption by idealizing the lifestyles of individuals with higher income levels²¹. Based on these findings, it can be concluded that promoting awareness of accurate health information in the media may enable individuals to make more conscious decisions regarding health-related products and services. These two results obtained presented consecutively, show us that there is a positive relationship with “commercial anxiety and advertisement” and a negative relationship with “promotion of consumption”; this situation shows that the same person may both recognize the commercial purposes of the news and be open to being directed towards consumption.

The study also revealed that patients scored highly on the “behavior change” sub-dimension, indicating that they may be inclined to alter their behaviors in response to health news²². However, a negative correlation was found between the behavior change dimension and both infodemic and awareness scores. This suggests that lower awareness of infodemic content may lead to undesirable behavioral changes driven by misleading or inaccurate health news. Particularly during crises such as the COVID-19 pandemic, individuals with chronic illnesses may become more susceptible to the influence of health-related news and exhibit increased sensitivity to its content. Previous studies have demonstrated that infodemic can cause confusion in individuals’ health behaviors and impair their decision-making processes^{23,24}. It is therefore concerning when individuals with chronic conditions, especially those with limited awareness of the credibility of health news, modify their behaviors based on potentially unreliable information.

The results of this study demonstrated that patients scored highly on the “exploitation of health behavior” sub-dimension of the Perception of Health News Scale, suggesting that participants felt influenced by health news in a way that led them to perceive their health behaviors as being manipulated or exploited. A positive correlation was identified between the exploitation of health behavior sub-dimension and both infodemic and awareness scores. This implies that individuals who are more aware of infodemic content are also more likely to recognize the potential for health news to exploit health behaviors. Exposure to news about the supposed effectiveness of new treatments may prompt patients to pursue interventions that are unnecessary or inappropriate for their condition²⁵. Moreover, health information disseminated through the media has been reported to increase anxiety levels and lead individuals to adopt unnecessary and sometimes harmful practices²⁶. After all these considerations, these findings and the limited available literature suggest that patients who are actively seeking accurate information for managing their chronic conditions may still be vulnerable to making impulsive or misguided health-related decisions.

The patients' health news perception “trust in health journalism” sub-dimension score was at a moderate level in this study. The awareness and literacy levels of patients with a moderate level of belief in health news were high. Today, misinformation about health via the internet has reached undesirable levels. As a result of medical misinformation, delays in receiving health services, drug incompatibility, vaccine hesitancy, increased disease burden, and increased hospitalizations and deaths may occur²⁷. Therefore, access to accurate health-related information and belief in information are important for disease management. Because individuals with chronic diseases are expected to understand and follow health guidelines. Systems that control the accuracy of health news in the media should be developed to prevent individuals from being affected by false and negative health news.

This study found a positive correlation between scores on the Perception of Health News Scale and scores on the Infodemic Scale. Individuals who hold negative perceptions of health news tend to exhibit higher levels of awareness and literacy regarding infodemic information. In other words, patients who are more critical of health news are also more

conscious of misinformation and better equipped to navigate it. However, previous research has shown that negative attitudes toward health news can sometimes lead individuals to place greater trust in inaccurate or misleading information, which may result in harmful health behaviors and reduced adherence to public health recommendations^{28,29}. These contradictory findings underscore the complexity of the relationship between media perception and health literacy. Given the media's powerful role in shaping health behaviors, it is important to recognize that health news can contribute to misperceptions³⁰. Therefore, enhancing individuals' health, media, and digital literacy is essential to reduce the spread of health-related misinformation during times of crisis and to reduce its potential negative impact on public health.

In summary, the health news perception score in this study explains 2.8% of the variation in the infodemic score. Therefore, it can be argued that negative perceptions of health news explain only a very limited part of infodemic literacy and awareness. Although the related literature is quite limited, future studies should also assess individual characteristics, digital literacy, media literacy, and critical thinking skills, which may have much stronger effects on influencing infodemic literacy and awareness.

Conclusion

This study revealed a significant relationship between participants' perception of health news and infodemic; as the perception of health news scores increased, so did the infodemic scores. These findings highlight the importance of accurate information-seeking behavior and underscore the need for tailored approaches to support specific vulnerable groups.

Based on the study results, it is evident that at-risk populations, especially chronic patients, require greater awareness regarding the interpretation of health news and the evaluation of information credibility. To address this need, it is recommended to develop engaging and reliable social platforms in collaboration with healthcare professionals and informatics experts. Such platforms could facilitate accurate information exchange and enhance public understanding during health crises. Targeted health communication strategies should be developed to mitigate the negative impact of infodemic on individuals with chronic conditions, particularly during times of crisis. These strategies should be included in national health and communication policies. Health professionals' (doctors and nurses) skills and experience should be utilized in these policy development processes.

Limitations

The main limitation of this study is that it is based on reports from chronic patients who consulted a local health center. Therefore, including chronic patients from different centers to ensure diversity in similar studies would increase the level of evidence. Additionally, the sampling method can also be considered one of the significant limitations.

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From Behavioral Addictions to Digital Dependencies: A Bibliometric Analysis of Cryptocurrency, Online Gambling, and Gaming Disorder Research

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Abstract

Aim: This study aims to present a bibliometric mapping of three critical areas in digital addiction research (cryptocurrency, online gambling, and gaming disorder) spanning the period 2010-2025. Specifically, it aims to reveal the place of these three critical areas within academic production, their development trends, and their structural relationships.

Method: A total of 2,693 articles retrieved from the Web of Science database were examined following PRISMA guidelines, with publication trends, keyword clusters, country contributions, and co-authorship networks visualized.

Results: Digital addiction research has expanded rapidly, it has yet to achieve full theoretical and methodological maturity. The cryptocurrency domain remains relatively new and fragmented, online gambling experienced a marked increase during the COVID-19 period, and gaming disorder has emerged as the largest and comparatively more mature field. A common thread across these domains lies in shared psychodynamic processes—such as risk-taking and reward expectancy—that intersect with behavioral addictions.

Conclusion: This study underscores the need to address digital addictions not only at the individual level but also as a broader public health concern. It offers a holistic perspective on the current state and future directions of digital addictions, providing valuable implications for both policymakers and researchers.

Keywords: Behavioral addiction, digital addiction, cryptocurrency, online gambling, gaming disorder.

Davranışsal Bağımlılıklardan Dijital Bağımlılıklara: Kripto Para, Çevrimiçi Kumar ve Oyun Bozukluğu Araştırmalarının Bibliyometrik Analizi

Öz

Amaç: Bu çalışma, 2010-2025 dönemini kapsayan dijital bağımlılık araştırmalarındaki üç kritik alanın (kripto para, çevrimiçi kumar ve oyun bozukluğu) bibliyometrik haritalamasını sunmayı amaçlamaktadır. Özellikle kripto para, çevrimiçi kumar ve oyun bozukluğu olmak üzere üç kritik alanın akademik üretim içindeki yerini, gelişim eğilimlerini ve yapısal ilişkilerini ortaya koymayı hedeflemektedir.

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Yöntem: Web of Science veri tabanından alınan toplam 2.693 makale, PRISMA yönergeleri doğrultusunda incelenmiş ve yayın eğilimleri, anahtar kelime kümeleri, ülke katkıları ve ortak yazarlık ağları görselleştirilmiştir.

Bulgular: Dijital bağımlılık araştırmaları hızla artmakta, ancak henüz teorik ve metodolojik olarak tam olgunluğa ulaşmamıştır. Kripto para alanı nispeten yeni ve parçalı bir yapıdadır; çevrimiçi kumar COVID-19 döneminde belirgin bir artış göstermiştir ve oyun bozukluğu en büyük ve nispeten daha olgun alan olarak ortaya çıkmıştır. Bu alanlar arasındaki ortak nokta, davranışsal bağımlılıklarla kesişen risk alma ve ödül beklentisi gibi ortak psikodinamik süreçlerdir.

Sonuç: Çalışma, dijital bağımlılıkların yalnızca bireysel düzeyde değil, aynı zamanda daha geniş bir halk sağlığı sorunu olarak ele alınması gerektiğinin altını çizmektedir. Çalışma, dijital bağımlılıkların mevcut durumu ve gelecekteki yönleri hakkında bütünsel bir bakış açısı sunarak hem politika yapıcılar hem de araştırmacılar için değerli çıkarımlar sağlamaktadır.

Anahtar Sözcükler: Davranışsal bağımlılık, dijital bağımlılık, kripto para birimi, çevrimiçi kumar, oyun bozukluğu.

Introduction

Although the concept of addiction was for many years largely confined to substance use, this understanding has significantly evolved in recent decades. Beyond substance-related disorders, addictions characterized by an impaired ability to control the urge to repeat certain behaviors have gained increasing recognition¹. In recent years, behavioral addictions extending beyond substance use have attracted growing attention both in society and in academic contexts. Under the umbrella of “non-substance addictions” behaviors such as love, eating, physical exercise, internet use, digital gaming, social media engagement, sexual behavior, and technology use have gained prominence in the literature¹. These behavioral conditions share the core features of addiction, manifesting as repetitive patterns that impair daily functioning and give rise to symptoms resembling those of substance use disorders². Internet addiction has a heterogeneous structure and may involve gambling, gaming, social media use, and shopping³. Indeed, both scholars and the broader public increasingly acknowledge that behavioral addictions—such as gambling, internet use, and video gaming—share important similarities with alcohol and drug dependence⁴. The expanding definition of addiction, coupled with digital technologies, has introduced a new dimension to the concept. With the proliferation of digital technologies, technology-based addictions have emerged as a distinct domain.

The rapid expansion of the internet, coupled with the increased reliance on digital platforms during the COVID-19 pandemic, has turned “digital addiction” into a pressing global public health concern⁵. This accelerated transformation of digital technologies has not only facilitated the emergence of new behavioral addiction patterns—such as information-digital addiction (IDA)—but also raised concerns that interactions with innovative technologies, including artificial intelligence, digital assistants, and metaverse platforms, may acquire pathological dimensions⁶. Over the past three decades, digital technologies have reshaped access to information, communication, and everyday practices, intensifying engagement with digital platforms⁷. This process further

accelerated during the COVID-19 pandemic⁵. Yet, excessive and uncontrolled use of digital platforms—such as the internet, social media, online gaming, video streaming, and cryptocurrency trading—can generate a wide range of negative consequences, including physical and psychological health problems, diminished academic performance, workplace difficulties, and strained social relationships^{8,9}. In this context, the systematic classification and management of digital addictions through international diagnostic frameworks, such as the International Classification of Diseases (ICD-11), is of critical importance for effective prevention and treatment.

The most recent revision of the International Classification of Diseases (ICD-11) by the World Health Organization (WHO) provides a framework for defining and classifying digital addictions. These disorders are categorized under behavioral addictions, including internet gaming disorder and gambling disorder. By situating digital addictions within the broader category of addictive disorders, ICD-11 aims to regulate treatment pathways and establish a structured framework for clinical interventions. Gambling and gaming addictions are typically characterized by impulse-control difficulties and obsessive behaviors, features that facilitate the development of appropriate therapeutic approaches¹⁰. Among children, adolescents, and adults who engage heavily with technology, such conditions generate multidimensional effects—physical, cognitive, and psychological—underscoring the necessity of addressing digital addictions through a multidisciplinary lens. Although cryptocurrency trading is not formally recognized as a diagnostic category in ICD-11, it is closely associated with psychological risk factors such as high volatility, pathological trading behaviors, and impulsivity¹¹. Hence, it could be argued that cryptocurrency use should also be considered within this classificatory framework. While cryptocurrency trading may appear distinct from online gambling or gaming disorder, it is shaped by similar psychological mechanisms and behavioral dynamics. For this reason, these three domains warrant a holistic and integrated perspective.

Cryptocurrency, online gambling, and gaming disorder share common psychological processes, such as reward motivation and risk-taking tendencies. With the rapid evolution of digital technologies, both video gaming opportunities and monetary gambling options have expanded in scope and diversity¹². It has been suggested that advances in digital media technologies have enabled a wide range of online gambling and gambling-like opportunities¹³. This expansion has blurred the boundaries between online gambling and digital gaming. In particular, in-game purchases, reward systems, loot boxes, and other chance-based mechanisms have introduced gambling-like features into video games, thereby obscuring distinctions between gaming and gambling addictions¹⁴. Research further shows that problematic video gaming is positively associated with subsequent problematic gambling behaviors¹². The development of these behavioral patterns is not only driven by the increasing accessibility of digital technologies but also shaped by heightened tendencies toward risk-taking in economic decision-making. These factors fuel excessive and uncontrolled engagement in activities such as online gaming, digital gambling, and cryptocurrency trading. Digital addiction driven by motivational processes leads individuals to distance themselves from real-life

relationships. Over time, this paves the way for broader social problems such as social isolation. Such tendencies extend beyond the individual level, highlighting digital addiction as a growing psychosocial concern¹⁵. Central to this escalation is the allure of rapid financial gain, which enhances the attractiveness of risky behaviors. During the COVID-19 pandemic, social isolation further magnified the appeal of high-risk digital activities such as online gambling, reinforcing individuals' addictive engagement with digital platforms¹⁶. Moreover, the rise of virtual communities around online gambling and gaming has introduced an additional layer of risk, as these communities normalize and sustain addictive behaviors—functioning as both triggers and reinforcers¹⁴.

In recent years, research output across these three domains has grown considerably; yet the studies remain at different levels of theoretical maturity and methodological rigor, suggesting that the fields are still in a developmental stage. The literature is largely fragmented and dispersed, which makes it challenging to examine digital addictions from a holistic perspective or to develop an in-depth understanding of their underlying mechanisms.

Against this backdrop, the present study applies a bibliometric approach to analyze the scientific literature on cryptocurrency, online gambling, and gaming disorder in an integrated and comparative manner. By mapping their temporal development, country-level contributions, shared patterns, and existing research gaps, the study aims to provide a systematic and comprehensive overview of digital addiction research. In doing so, it offers not only an academic contribution to the field but also practical insights that may guide policymakers and practitioners in addressing the growing challenges posed by digital addictions.

Although previous studies have examined cryptocurrency, online gambling, and gaming disorder individually, these areas are generally addressed in isolation. As a result, the literature remains fragmented, and it is difficult to develop a more comprehensive understanding of digital addictions as an interconnected phenomenon. In particular, the shared psychological mechanisms and developmental patterns across these domains have not been sufficiently considered together. In this sense, the present study aims to contribute to the literature by bringing these three areas into a common analytical framework and offering a more integrated perspective.

Material and Methods

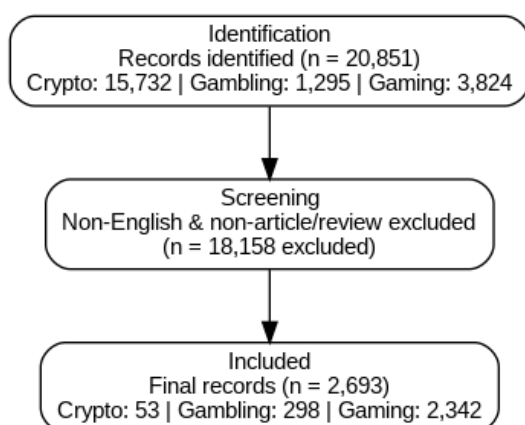
Data Source and Search Strategy

The data for this study were obtained from the Web of Science (WoS) Core Collection database. WoS was selected because it indexes high-impact journals and is widely regarded as one of the most reliable sources for bibliometric research^{17,18}. The analysis was limited to publications between 2010 and 2025, as there was little meaningful academic output on cryptocurrency, online gambling, or gaming disorder prior to 2010. The data collection process included all publications indexed in the Web of Science database up to August 30, 2025, and all data were retrieved on the same day to ensure

consistency. Three separate datasets were compiled: 53 records on cryptocurrency, 298 on online gambling, and 2,342 on gaming disorder. Only peer-reviewed journal articles and review papers were included in the analysis. Records were exported in plain text (.txt) format with complete metadata and citation information. Due to database export limitations, the records were downloaded in multiple batches and subsequently merged into a single dataset. The search strategy was developed using combinations of relevant keywords related to cryptocurrency, online gambling, and gaming disorder, applied within the “Topic” field.

The process of data selection followed the PRISMA guidelines¹⁹. Figure 1 illustrates the identification, screening, eligibility, and inclusion steps for the cryptocurrency, online gambling, and gaming disorder datasets. This procedure enhances transparency and enables researchers to reproduce the data selection process.

Figure 1. PRISMA flowchart outlining the identification, screening, eligibility, and inclusion steps for the three datasets (cryptocurrency, online gambling, and gaming disorder)



As shown in the flowchart, a substantial number of records were excluded due to language, document type, or scope limitations, and a total of 2,693 articles were ultimately included in the bibliometric analysis.

Data Processing and Analysis

Duplicate records were identified and removed during the data cleaning process. The exported records were first cleaned and standardized. Variations in author names, institutional affiliations, and keywords were consolidated. The bibliometric analysis combined performance indicators—such as annual publication trends, most prolific authors, countries, and journals—with science-mapping techniques, including co-authorship, keyword co-occurrence, and cross-country collaboration^{20,21}. For the co-authorship analysis, the full counting method was applied, limiting each publication to a maximum of 25 authors and including only researchers with at least three publications. Keyword co-occurrence analysis considered both author-supplied terms and Keywords Plus, requiring a minimum of five occurrences to ensure that only concepts representing

salient themes were retained and that weak or incidental links were minimized. The international collaboration analysis included only countries with at least three publications. Visualizations were produced with VOSviewer (v1.6.20), and descriptive statistics were generated using Microsoft Excel. The threshold values used in the analyses were selected to ensure clearer and more interpretable network structures by reducing the influence of low-frequency elements. All analytical procedures were conducted following established bibliometric practices, and the workflow is described in sufficient detail to allow replication.

Ethical Statement

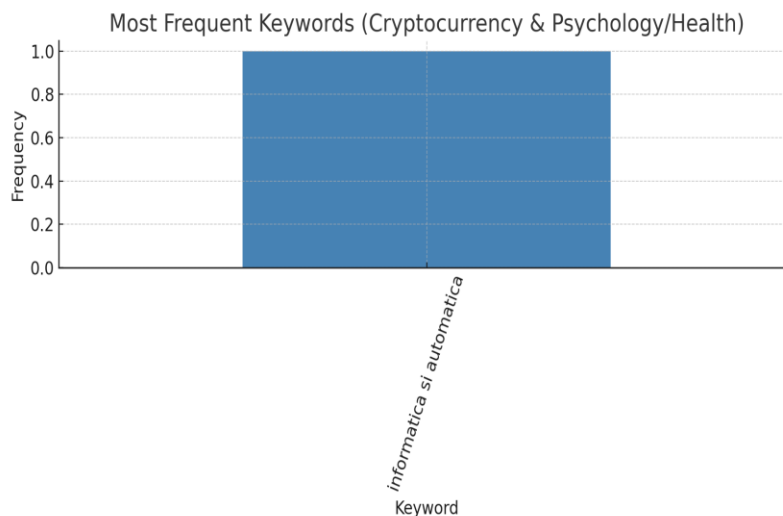
This study relied exclusively on publicly available bibliographic data. Because no human participants or personally identifiable information were involved, formal ethics committee approval was not required. The authors affirm that the data were used solely for scholarly purposes and that they have no conflicts of interest to declare.

Results

Cryptocurrency Publications

The analysis of the cryptocurrency dataset (n=53) revealed that this research field has emerged only recently. The first relevant studies appeared in 2019, with a notable increase observed in 2024 (14 publications). Although the overall number of studies remains small, the upward trend suggests growing academic attention.

Figure 2. Annual Distribution of Publications (Cryptocurrency & Psychology/Health)



Publications on the psychological and mental health aspects of cryptocurrency only emerged after 2019. Output increased after 2021, with a visible peak in 2024–2025, indicating growing scholarly attention to the behavioural and clinical consequences of crypto trading.

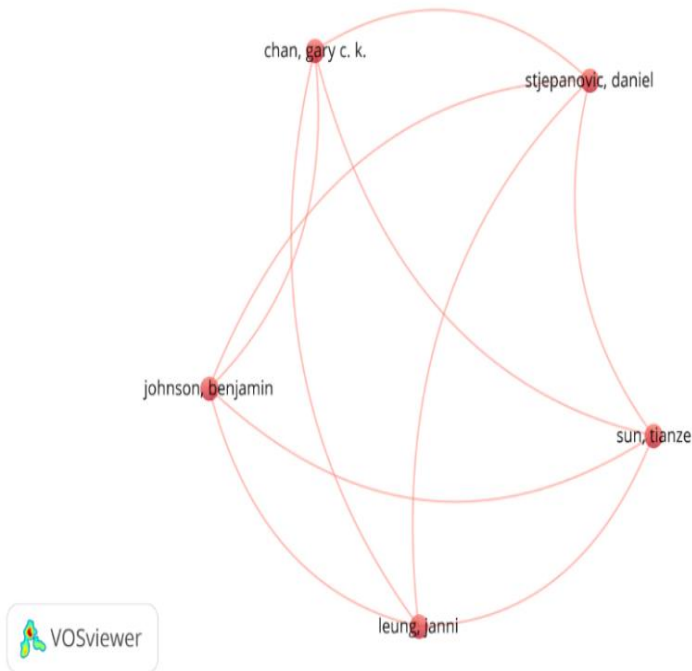
Figure 3. Most frequent keywords (cryptocurrency & psychology/health)

Figure 2. Top Keywords – Cryptocurrency & Psychology/Health

No keyword data available
for Cryptocurrency records

Keyword analysis did not yield consistent results because the majority of cryptocurrency records lacked standardized indexed terms. This limitation indicates that research in this area is still at an exploratory stage, with insufficient conceptual consolidation across studies. Instead, analysis highlighted fragmented author-level and country-level contributions, suggesting that the field is still immature and lacks consolidated research agendas.

Figure 4. Co-authorship network in cryptocurrency-related publications (VOSviewer visualization)

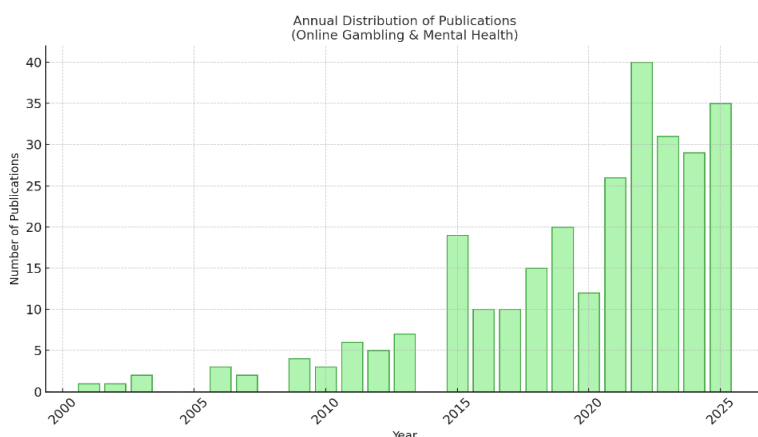


The co-authorship analysis revealed fragmented collaboration patterns among authors in the cryptocurrency and psychology/health domain. Only a few small clusters of researchers (e.g., Johnson, Chan, Leung, Stjepanovic, and Sun) were identified, indicating that the field is still emerging with limited cross-institutional collaboration. The absence of large and cohesive research networks suggests that knowledge production in crypto-psychology is highly fragmented, potentially limiting the development of cumulative scientific insights.

Online Gambling Publications

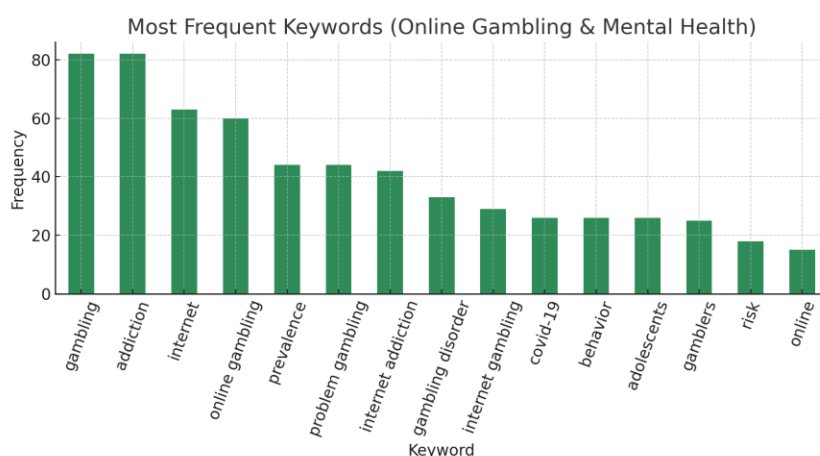
The gambling dataset (n=298) covers the years 2016–2025, with a peak observed in 2021 (40 publications). This indicates that gambling-related mental health research intensified during the COVID-19 period. The pandemic not only increased online gambling opportunities due to physical restrictions but also amplified psychological vulnerabilities, thereby accelerating scholarly attention to the topic. Keyword analysis shows strong focus on addiction, prevalence, adolescents, and public health aspects.

Figure 5. Annual distribution of publications (online gambling & mental health)



Research on online gambling has steadily increased since the mid-2010s. A sharp rise occurred during 2020–2022, coinciding with the COVID-19 pandemic, after which publication volume slightly normalized but continued on an upward trajectory.

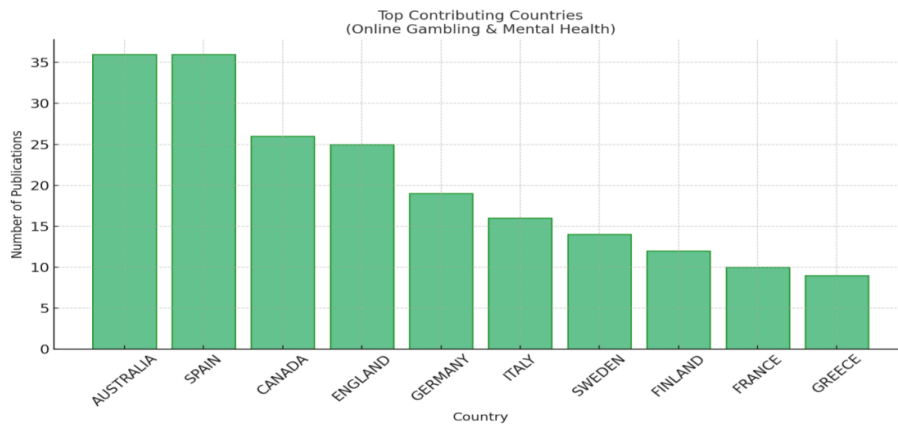
Figure 6. Most frequent keywords (online gambling & mental health)



Frequent keywords include addiction, problem gambling, prevalence, adolescents, treatment, and public health. The dominance of these keywords reflects a strong clinical orientation, highlighting concerns about prevention, early intervention, and health

policy implications. The emphasis is predominantly on clinical consequences and vulnerable groups, particularly adolescents and young adults, underscoring the need for targeted prevention efforts.

Figure 7. Top contributing countries (online gambling & mental health)



Australia, Spain, Canada, England, and Germany are among the leading contributors in this field. These countries have both active gambling markets and robust academic or regulatory interest, which likely explains their high publication output.

Figure 8. Co-authorship network of authors in online gambling research (VOSviewer visualization)

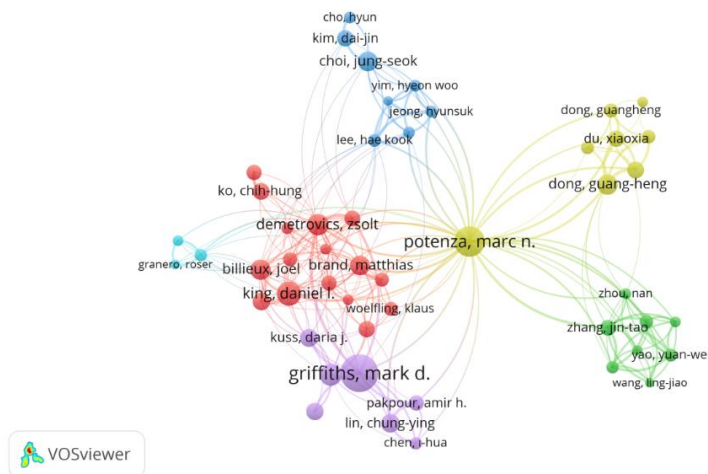


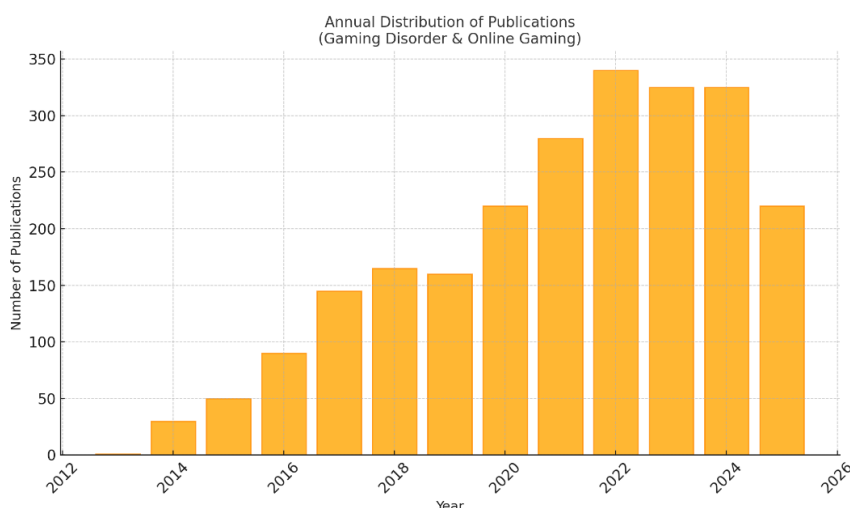
Figure 8 presents the co-authorship network of authors in online gambling research. The analysis reveals several distinct clusters of collaboration. Marc N. Potenza forms a large and highly connected cluster, while Mark D. Griffiths and Daniel L. King are also central figures, frequently co-authoring with other researchers. These findings indicate that research in this field is concentrated around a few prominent scholars and their networks. While this concentration fosters thought leadership, it also risks limiting diversity of perspectives and methodologies in the field.

The co-authorship analysis shows clusters of collaboration among leading authors in online gambling research. Larger nodes represent authors with more publications, and the links represent co-authorship connections. For example, Marc N. Potenza, Mark D. Griffiths, and Daniel L. King appear as central nodes, indicating their influential role in the field.

Gaming Disorder and Loot Box Publications

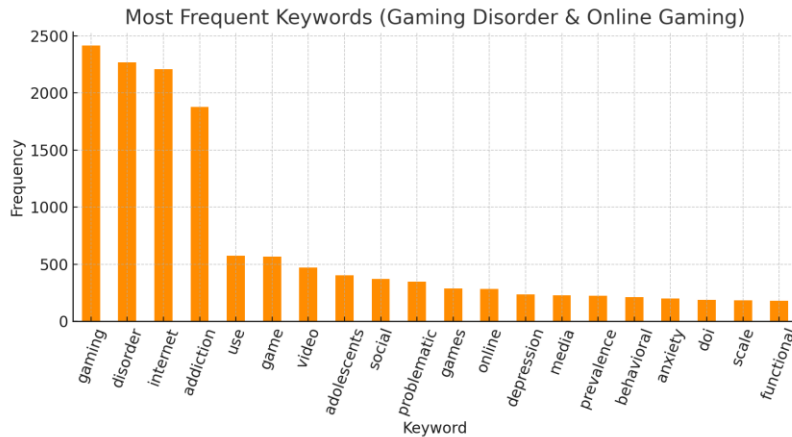
The gaming disorder dataset (n=2,342) constitutes the largest share of publications. Research has grown substantially since 2016, peaking in 2022 (339 publications). This rapid growth coincides with both the formal recognition of gaming disorder in ICD-11 and the rising prevalence of monetization mechanisms such as loot boxes, which have drawn policy and clinical attention. Thematic analysis shows two major clusters: psychological/clinical outcomes (addiction, depression, anxiety) and epidemiological/assessment aspects (prevalence, validation, scale).

Figure 9. Annual distribution of publications (Gaming Disorder & Online Gaming)



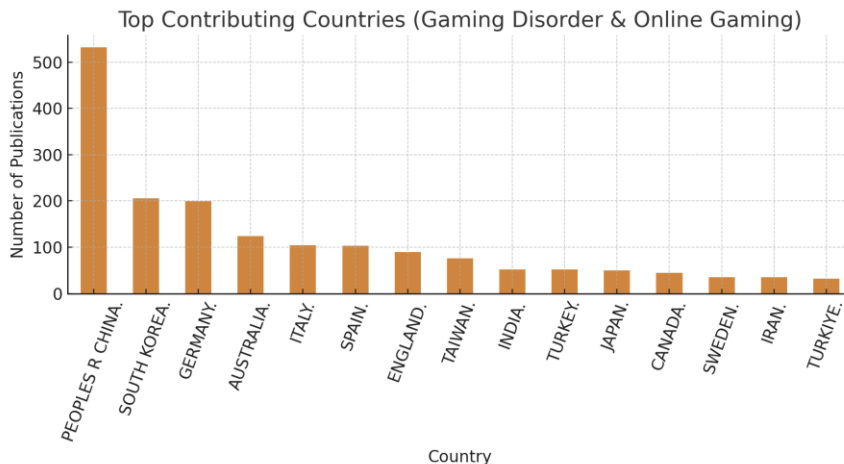
Publications on gaming disorder expanded rapidly after 2016, reaching a peak in 2022–2023 with more than 300 papers per year. The surge coincides with the formal recognition of “gaming disorder” in the ICD-11 (2018) and the increased digital engagement during the pandemic.

Figure 10. Most frequent keywords (gaming disorder & online gaming)



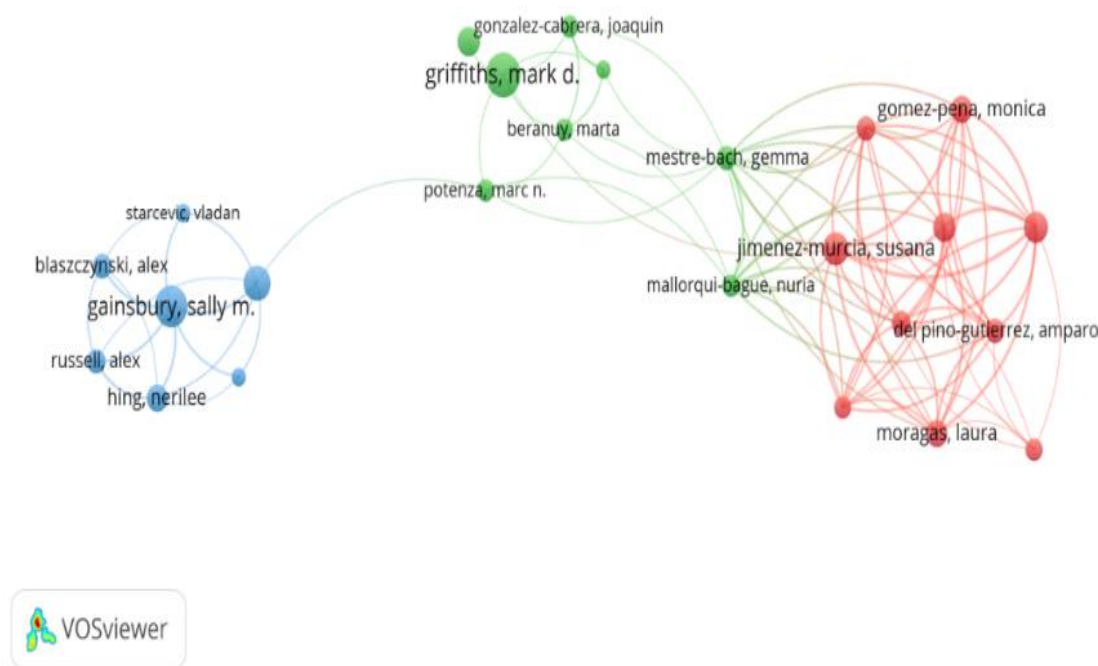
Keyword analysis indicates two dominant clusters: (i) clinical outcomes such as addiction, depression, anxiety, impulsivity, and sleep problems; and (ii) epidemiological and methodological terms such as prevalence, scale, and validation. The coexistence of these clusters suggests that the field is simultaneously addressing individual-level clinical consequences and system-level measurement challenges, indicating a maturing but still diversifying research agenda.

Figure 11. Top contributing countries (gaming disorder & online gaming)



The United States, China, the United Kingdom, Australia, and Germany dominate the field. Their leadership reflects high gaming penetration, well-established clinical research infrastructures, and strong epidemiological surveillance systems.

Figure 12. Co-authorship Network of Authors in Gaming Disorder Research (VOSviewer visualization)



The visualization shows distinct clusters of collaboration. One group is centered around Daniel King and Sally Gainsbury (Australia), another around Mark Griffiths (UK), and a third cluster around Susana Jimenez-Murcia and colleagues (Spain). The fragmented structure indicates that the field lacks a fully integrated global research network. This fragmentation may slow the consolidation of universal diagnostic criteria and hinder the development of coordinated international prevention strategies.

Discussion

This study provides a comparative assessment of bibliometric trends in cryptocurrency, online gambling, and gaming disorder research, offering a comprehensive view of the current landscape of digital-addiction scholarship. The findings demonstrate that scholarly output in all three domains has accelerated markedly over the past decade, yet each field remains in a developmental stage both theoretically and methodologically. This pattern aligns with the “early-stage” characterization frequently highlighted in the literature¹⁷. Against this backdrop, it is useful to first consider developments in cryptocurrency research.

The cryptocurrency literature has gained momentum particularly since 2019, with publications focusing on psychological and mental-health aspects becoming more visible after 2021. This trajectory suggests that cryptocurrency use is increasingly being conceptualized not merely as a financial activity but as a practice exhibiting features akin to behavioral addiction. Recent studies indicate that cryptocurrency trading may share psychological mechanisms with sports betting, high-risk stock speculation, and gambling

disorder. Among individuals heavily engaged in crypto trading, hallmark indicators of behavioral addiction—salience, mood modification, tolerance, withdrawal, and relapse—are frequently observed²². Beyond its inherently risky investment profile, cryptocurrency trading can therefore pose significant mental-health challenges over time²³. Previous research has similarly linked crypto investment to heightened risk-taking, anxiety, depression, and stress²⁴⁻²⁶.

Despite this growing body of work, the absence of a shared conceptual framework is evident, as reflected in fragmented keyword structures and limited collaborative networks identified in our analysis. However, it should also be noted that the limited number of studies in this domain may restrict the generalizability of these findings. The fragmented nature of the literature suggests that current interpretations should be approached with caution, particularly given the rapid evolution of cryptocurrency markets and user behaviors. Consequently, the cryptocurrency literature requires theoretical models that, while intersecting with gambling addiction, also establish an independent conceptual foundation^{27,28}. Following these developments in the cryptocurrency domain, notable shifts are also apparent in the field of online gambling.

In the field of online gambling, the marked increase in publication volume during the COVID-19 pandemic is particularly noteworthy. This trend aligns with the surge in digital-platform use and the heightened psychological vulnerabilities observed during the pandemic period. Existing literature consistently underscores that online gambling constitutes a high-risk behavior—especially for adolescents and young adults—and is closely linked to addiction and public-health concerns²⁹. Findings from the present study further indicate that scholarship in this area is predominantly clinical in orientation, with a strong emphasis on prevention and early-intervention strategies. As Kuss and Gainsbury (2020)²⁴ argue, online gambling and gaming behaviors warrant recognition as escalating public-health challenges that demand policy-level attention. Nevertheless, the concentration of research around a small number of leading scholars may limit methodological diversity and the breadth of theoretical perspectives in the field. In addition, this concentration may lead to a narrower range of methodological approaches and theoretical perspectives, potentially constraining the diversity of findings within the field.

Compared with this profile, the literature on gaming disorder reflects a different stage of maturity and breadth. Among the three domains examined, gaming disorder research exhibits the highest publication volume—a trend that can be attributed both to the formal inclusion of “gaming disorder” as an ICD-11 diagnostic category in 2018 and to the pandemic-driven rise in digital gaming. The evidence points to dual focal areas: clinical outcomes (e.g., depression, anxiety, impulsivity) and epidemiological or methodological issues (e.g., prevalence, scale development). This dual emphasis supports the view that gaming-disorder scholarship is maturing yet continues to diversify^{30,31}. However, the fragmented nature of global collaborations hinders the establishment of universal diagnostic criteria and impedes the development of coordinated international prevention strategies. This limitation highlights the need for more coordinated and cross-cultural

research efforts to ensure the development of more comprehensive and globally applicable frameworks.

Considering all three domains together highlights both convergent and divergent features of digital-addiction research. Common to each are problematic use patterns shaped by motivational processes such as reward anticipation, pleasure seeking, impulsivity, risk taking, social isolation, and loss of control—underscoring shared psychodynamic foundations across digital addictions³²⁻³⁴. Divergences stem from differences in conceptual frameworks, theoretical orientations, and methodological priorities. These distinctions are also evident in our findings: psychological studies on cryptocurrency remain at an early developmental stage; online gambling research occupies an intermediate, evolving phase; and gaming-disorder studies represent a comparatively mature field. Such developmental differences reflect each domain's unique methodological approaches, research priorities, and the historical contexts in which investigations have unfolded. This suggests that these differences may not only stem from theoretical variations but also from disparities in data availability and the relative maturity of each research domain. For addiction types that have yet to reach conceptual maturity, fostering interdisciplinary collaboration is critical to achieving a coherent theoretical foundation and enabling more integrated scientific progress.

As our findings indicate, one of the key factors underlying these differences is the continuing fragmentation of digital-addiction research. Many emerging subfields remain at an early stage of development and are pursued across disparate disciplines. This disciplinary dispersion and lack of collaboration impede conceptual integration and limit opportunities for mutual learning across domains¹⁷. Yet despite this fragmented landscape, several noteworthy cross-cutting themes emerge.

Among the most striking is the trend toward “gamblification”, a term denoting the incorporation of gambling-like mechanisms into non-gambling contexts such as video games³⁵. The trading of cryptocurrencies—volatile, decentralized digital assets—may meet conditions analogous to gambling³⁶. Speculative behaviors in crypto markets, the risk-taking patterns inherent in online gambling, and micro-payment features such as in-game “loot boxes” all appear to engage similar addiction mechanisms. Prior research frequently highlights the overlap between in-game reward systems, chance-based digital content, and gambling-like behaviors^{37,38}.

Recent studies reveal that (a) individuals who play video games often also engage in gambling, and (b) cryptocurrency investors exhibit a higher likelihood of gambling involvement³⁶. However, the intersection between cryptocurrency investment and gaming behaviors remains insufficiently explored, a gap partly attributable to the relatively recent emergence of cryptocurrencies and their still-limited user base.

Moreover, cryptocurrency investors have been found to exhibit higher rates of gambling, gaming, and excessive alcohol consumption than non-investors. This pattern is particularly concerning for adolescents and socially marginalized individuals, who can

access digital platforms with ease and anonymity³⁵. Indeed, moving from one digital activity to another often requires only a few clicks³⁹.

Today, many digital applications are evolving into hybrid environments in which multiple forms of addiction converge. The growing accessibility and appeal of gamblification and tokenization—especially for those under 25—suggest that these structures will become even more widespread in the future³⁹. Despite rising scholarly interest in the potential for gaming to facilitate transitions into gambling behavior, experimental studies, clinical intervention approaches, and psychological prevention strategies remain scarce⁴⁰.

The present findings enable multifaceted inferences about digital addictions. Although academic attention to this topic is steadily increasing, the protection of children and adolescents has become an urgent priority for policymakers. The accessibility of cryptocurrency platforms, in-game rewards such as loot boxes, and online gambling content to minors necessitates a thorough reevaluation of age restrictions, labeling practices, and transparency measures to ensure that vulnerable groups are adequately protected and informed⁴¹.

While the present study provides a comprehensive overview of digital addiction research, several limitations should be considered. First, the analysis was limited to the Web of Science database, which may not fully capture all relevant publications in the field. Second, the reliance on bibliometric methods restricts the interpretation to publication patterns rather than in-depth qualitative insights. Finally, the rapidly evolving nature of digital technologies means that the findings reflect a dynamic and continuously changing research landscape. Future studies may benefit from integrating multiple databases and methodological approaches to provide a more comprehensive understanding of digital addictions.

Conclusion

In sum, this study demonstrates that digital-addiction research has expanded rapidly over the past decade, reflecting the growing integration of digital technologies into everyday life. However, this expansion has not occurred uniformly across domains, resulting in notable differences in theoretical maturity and methodological consolidation. Gaming disorder research has emerged as the most developed field, characterized by a broad clinical focus and relatively coherent research agendas. In contrast, studies on online gambling occupy an intermediate position, while cryptocurrency-related research remains fragmented and conceptually underdeveloped. Taken together, these findings indicate that digital addictions constitute an interconnected yet uneven research landscape that requires stronger theoretical integration and coordinated scholarly efforts.

Future investigations should (i) clarify conceptual models, (ii) adopt interdisciplinary approaches, (iii) conduct cross-cultural and longitudinal analyses, (iv) incorporate age- and gender-based perspectives, and (v) develop targeted policy and regulatory

recommendations, particularly for youth. Within this framework, bibliometric analyses can play a vital role in illuminating emerging trends, research gaps, and future directions, thereby advancing scientific understanding of digital addictions.

AI Declaration

The authors used DeepL translation tools to support the translation of the manuscript from Turkish to English and subsequently reviewed the text carefully to ensure clarity and accuracy.

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An Investigation of Caregiver Burden and Quality of Life Among Individuals Providing Care to Patients with Alzheimer's Disease*

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Abstract

Aim: This study aimed to determine the levels of caregiver burden and quality of life among individuals providing care for patients with Alzheimer's disease and to examine the relationship between these two variables.

Method: This descriptive and correlational study was conducted between May 2024 and February 2025, starting at the neurology outpatient clinic of a private hospital located in the Black Sea Region and completed with 191 participants through snowball sampling. Participants were administered a sociodemographic information form, the Caregiver Burden Scale, and the Quality of Life in Alzheimer's Disease Scale. In addition to descriptive statistics, t-test, ANOVA, and Pearson correlation analysis were used for data analysis.

Results: Most participants were women, employed, and university graduates. Caregiver burden levels were found to be moderate, whereas quality of life levels were found to be relatively low. Differences in caregiver burden and quality of life levels were identified according to age and income levels. In addition, a significant negative relationship between caregiver burden and quality of life was identified.

Conclusion: The findings indicate that the quality of life of individuals caring for patients with Alzheimer's disease is significantly affected by their perceived caregiver burden. It is essential that nurses holistically assess the needs of caregivers, develop individualized care strategies, and expand access to support services to improve caregiver well-being.

Keywords: Alzheimer's disease, caregiver burden, quality of life, nursing.

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ETHICAL STATEMENT: This study was approved by the Ethics Committee of Istanbul Arel University on 5 April 2024 with decision number 2024/08.

Alzheimer Hastalarına Bakım Veren Bireylerde Bakım Yüğü ve Yaşam Kalitesinin İncelenmesi

Öz

Amaç: Bu çalışma, Alzheimer hastalarına bakım sağlayan bireylerin bakım yüğü ve yaşam kalitesi düzeylerini belirlemek ve aralarındaki ilişkiyi değerlendirmek amacıyla gerçekleştirilmiştir.

Yöntem: Tanımlayıcı ve ilişki arayıcı türde planlanan bu araştırma, Mayıs 2024–Şubat 2025 tarihleri arasında Karadeniz Bölgesi’nde yer alan özel bir hastanenin nöroloji polikliniğinde başlayarak Kartopu örnekleme yöntemiyle 191 katılımcıya ulaşıldı. Katılımcılara, sosyo-demografik bilgi formu, Bakım Verme Yüğü Ölçeğı ve Alzheimer Hastalığında Yaşam Kalitesi Ölçeğı uygulanmıştır. Verilerin analizinde tanımlayıcı istatistiklere ek olarak t-testi, ANOVA ve Pearson korelasyon analizi kullanıldı.

Bulgular: Katılımcıların çoğı kadın, çalışan ve üniversite mezunudur. Bakım veren yüğü düzeylerinin orta düzeyde olduğu, yaşam kalitesi düzeylerinin ise görece düşük olduğu belirlendi. Bakım veren yüğü ve yaşam kalitesi düzeylerinin yaş ve gelir düzeyine göre farklılık gösterdiği saptandı. Ayrıca, bakım veren yüğü ile yaşam kalitesi arasında anlamlı ve negatif yönlü bir ilişki olduğu belirlendi.

Sonuç: Araştırma bulguları, Alzheimer hastalarına bakım sunan bireylerin yaşam kalitelerinin, algıladıkları bakım yükünden önemli ölçüde etkilendiğini göstermektedir. Hemşirelerin bu bireyleri çok boyutlu değerlendirmesi, bireyselleştirilmiş müdahaleler planlaması ve destekleyici hizmetleri yaygınlaştırması önerilmektedir.

Anahtar Sözcükler: Alzheimer hastalığı, bakım yüğü, yaşam kalitesi, hemşirelik.

Introduction

Alzheimer’s disease (AD) is a progressive neurodegenerative disorder, predominantly observed in older adults, that leads to cognitive and functional decline¹. These impairments affect not only the individual with the disease but also significantly impact their caregivers². As the disease advances, patients lose the ability to perform daily living activities, resulting in an increasingly demanding caregiving process, typically undertaken by family members³.

Caregiving encompasses not only physical responsibilities but also psychological, social, and economic burdens¹. This multidimensional strain, defined as the “caregiver burden” can negatively affect the caregiver’s quality of life⁴. Various demographic variables such as age, gender, income level, and the caregiver’s relationship with the patient may influence both the degree of burden and the caregiver’s overall well-being⁵. Research has shown that as caregiver burden increases, quality of life decreases, and issues such as depression, anxiety, and social isolation become more prevalent^{6–9}. Recent studies have consistently demonstrated that this negative association between caregiver burden and quality of life is observed across different stages of Alzheimer’s disease and is accompanied by increased psychological distress among caregivers^{8,9}.

Quality of life, which has been conceptually defined and measured among caregivers in previous studies¹⁰, is a multidimensional concept that includes physical, psychological,

and social domains^{1,10}. The literature indicates that the presence of social support, educational interventions for caregivers, and technology-based tools such as mobile health applications are effective in reducing caregiver burden and enhancing quality of life¹¹⁻¹³. Recent evidence further suggests that educational and psychosocial support interventions enhance caregivers' coping capacity, while technology-based tools facilitate access to information, emotional support, and continuity of care^{11,12}.

Although numerous studies have explored caregiver burden and quality of life among caregivers of individuals with Alzheimer's disease¹⁴, many of these studies focus more broadly on the general dementia population^{4,6,14}. They often fail to sufficiently address the unique experiences of Alzheimer's caregivers or to examine in depth the relationships between key variables¹⁴. Moreover, sociodemographic characteristics are frequently evaluated in a limited manner, overlooking the complex dynamics that influence the caregiving process. This study aims to evaluate the relationship between caregiver burden and quality of life among individuals caring for patients with Alzheimer's disease in Türkiye and to examine how this relationship varies according to key sociodemographic factors, including age, income level, social security status, gender, and educational level^{15,16}. By focusing on an Alzheimer's-specific caregiver population within the Turkish context, where caregiving responsibilities are predominantly assumed by family members, this study seeks to provide a more comprehensive understanding of caregiving dynamics and to inform culturally appropriate nursing and public health interventions^{16,17}.

Material and Methods

Study Design

This study was designed as a descriptive and correlational study to determine the relationship between caregiver burden and quality of life among individuals providing care to patients with Alzheimer's disease.

Population and Sample

The research was conducted between March 2024 and February 2025 with caregivers of patients diagnosed with Alzheimer's disease who were admitted to the neurology department of a private hospital located in the Black Sea Region of Türkiye. Using the snowball sampling method, individuals with similar caregiving characteristics were subsequently included. The study was completed with a total of 191 participants.

The sample size power analysis was calculated using the G Power 3.1.9.2 software. To examine the difference between two dependent means, the point-biserial correlation model (Correlation: Point-Biserial) was employed, and standardized direct effect sizes were taken into account. At a 95% confidence level, with a calculated effect size of 0.324 and a sample size of $N = 191$, the statistical power of the study was found to be 0.998. This result indicates that the study has a high level of statistical power and that the sample size is sufficient.

Inclusion Criteria

- No communication barriers.
- Being 18 years of age or older.
- Currently providing care for an individual diagnosed with Alzheimer's disease.

Data Collection Tools

Three instruments were used for data collection.

Firstly, a sociodemographic data form consisting of 10 items such as age, gender, and social security status was developed by the researcher to describe the characteristics of the participants.

The Zarit Burden Interview (ZBI)¹⁸, originally developed by Zarit et al.¹⁸ and adapted to Turkish by İnci and Erdem (2008)¹⁷, was used to measure caregiver burden. It consists of 22 items in a Likert-type format. In this study, the Cronbach's alpha coefficient of the scale was found to be 0.91.

The Quality of Life in Alzheimer's Disease Scale (QOL-AD), developed by Gibbons et al.¹⁹ and adapted to Turkish by Akpınar Söylemez and Küçükgülü (2012)⁷, was used to assess the quality of life. This scale contains 13 items and is rated on a 4-point Likert scale. In the present study, the Cronbach's alpha coefficient was calculated as 0.88.

Ethical Statement

Prior to the commencement of the study, ethical approval was obtained from the Ethics Committee of Istanbul Arel University on April 5, 2024, with protocol number 2024-08. Before administering the data collection forms, participants were informed about the purpose of the study and their right to withdraw from the research at any time without providing a reason. Completion of the forms by the participants was considered an indication of their voluntary consent to participate in the study.

Data Analysis

The data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize the data, with categorical variables presented as frequencies and percentages, and continuous variables expressed as means and standard deviations. The normality of continuous variables was assessed using skewness and kurtosis values, and the data were found to be normally distributed. Accordingly, parametric tests were applied. Independent samples t-tests were used to compare scale scores across binary variables, while one-way analysis of variance (ANOVA) was conducted for variables with more than two categories. Post hoc analyses were performed using the Tukey or Games-Howell tests, as appropriate. Pearson correlation analysis was used to examine the relationship between caregiver burden and quality of life. In addition, simple linear

regression analysis was conducted to evaluate the effect of caregiver burden on quality of life among caregivers of patients with Alzheimer's disease. The assumptions of linearity and normal distribution of residuals were assessed using histogram and Q-Q plot analyses. Statistical significance was set at $p < .05$.

Results

A total of 191 caregivers of patients with Alzheimer's disease were included in the study. Participants were predominantly female, had a relatively high educational level, and were actively employed. The distribution of participants according to age groups, income levels, educational status, and caregiving relationship categories indicated a heterogeneous caregiver sample (Table 1).

Table 1. Sociodemographic characteristics of individuals providing care for patients with Alzheimer's disease (n=191)

Variables	Mean±SD	Min–Max
Age (Years)	33.72±11.62	18–82
Variables and Subgroups	Number (n)	Percent (%)
Age		
18–25 years	37	19.4
26–35 years	94	49.2
36–45 years	28	14.7
46 years and older	32	16.8
Gender		
Female	130	68.1
Male	61	31.9
Marital Status		
Married	92	48.2
Single	99	51.8
Education Level		
High school or below	52	27.2
University degree or above	139	72.8
Employment Status		
Employed	149	78.0
Unemployed	42	22.0
Occupation		
Civil servant	52	27.2
Worker	79	41.4
Retired or housewife	16	8.4
Self-employed/tradesperson	27	14.1
Not working	17	8.9

Health Insurance		
Present	176	92.1
Absent	15	7.9
Income Level		
Able to meet expenses, lives comfortably	81	42.4
Able to meet expenses, manages with difficulty	93	48.7
Unable to meet expenses, experiences hardship	17	8.9
Relationship to the Patient		
Spouse or child	21	11.0
Parent	21	11.0
Relative	125	65.4
Professional caregiver	24	12.6

Frequency Analysis and Descriptive Statistical Findings

Mean: Average; **SD:** Standard deviation; **Min:** Minimum; **Max:** Maximum

Caregiver burden scores differed significantly according to age and income level. Post hoc analyses showed that caregivers aged 46 years and older and those with lower income levels reported higher caregiver burden scores. No significant differences were observed for caregiver burden in relation to other sociodemographic variables. Regarding quality of life, income level was the only variable that demonstrated a statistically significant association, whereas differences according to education level, employment status, and social security coverage were not statistically significant (Table 2).

Table 2. Comparison of scale scores according to the socio-demographic characteristics of individuals providing care to patients with Alzheimer's disease (n = 191)

Variable	Caregiver Burden Mean				Post Hoc	QoL Mean			Post Hoc
	n	Mean±SD	Test	p	Tukey/ Games Howell	Mean±SD	Test	p	Tukey/ Games Howell
Gender									
Female	130	37.4±14.35	t=0.824	.411	-	27.6±5.27	t=1.105	.271	-
Male	61	35.5±16.92				28.7±8.53			
Age (Years)									
18–25 (A)	37	33.3±14.85	F=3.016	.031	D > A; p=.024	28.4±7.03	F=0.217	.884	-
26–35 (B)	94	36.1±15.20				28.0±6.96			
36–45 (C)	28	36.0±11.19				27.8±5.04			
46 years and older (D)	32	43.7±17.08				27.2±5.67			
Marital Status									
Married	92	38.6±14.56	t=1.524	.129	-	27.0±6.00	t=1.859	.065	-
Single	99	35.2±15.67				28.8±6.83			
Education Level									

High school or below	52	33.7±14.70	t=1.767	.079		29.3±7.30	t=1.752	.081	-
University or above	139	38.0±15.26				27.4±6.11			
Employment Status									
Employed	149	37.0±15.63	t=0.309	.757	-	27.6±6.40	t=1.264	.208	-
Unemployed	42	36.2±13.69				29.0±6.74			
Occupation									
Civil servant	52	39.6±16.13	F=1.011	.403	-	27.0±6.13	F=0.821	.514	-
Worker	79	36.0±14.67				28.0±6.43			
Retired or housewife	16	39.7±13.81				29.2±7.50			
Self-employed / tradesperson	27	33.5±17.15				29.4±7.44			
Not working	17	35.0±12.21				27.3±5.19			
Health Insurance									
Present	176	36.8±15.58	t=0.239	.812	-	27.7±6.46	t=1.330	.185	-
Absent	15	37.7±9.90				30.1±6.66			
Income Level					H > E; p=0.015				E > G; p=0.022
High(E)	81	33.5±15.21	F=4.815	.009		29.3±7.01	F=3.577	.030	
Moderate(G)	93	38.3±15.19				26.7±5.76			
Low(H)	17	44.7±11.17				28.2±6.69			
Relationship to the Patient									
Spouse or child	21	39.5±17.63	F=1.233	.299	-	27.5±4.39	F=0.730	.535	-
Parent	21	40.4±16.69				29.0±8.29			
Relative	125	36.6±14.92				27.5±6.61			
Professional caregiver	24	32.6±12.60				29.3±5.62			

N: Number of participants; **Mean:** Average; **SD:** Standard deviation; **A, B, C, D :** Group difference indicators; **Post Hoc:** Inter-group differences based on Tukey or Games–Howell method; **QoL:** Quality of Life; **A:** 18–25 years; **B:** 26–35 years; **C:** 36–45 years; **D:** ≥46 years; **E:** High; **F:** One-way ANOVA test; **G:** Moderate; **H:** Low; **t:** Independent Samples T test.

The mean, median, and interquartile range values of the caregiver burden and quality of life scales were calculated. Caregiver burden levels were found to be moderate, while quality of life levels were identified as moderate to low among the participants (Table 3).

Table 3. Levels of caregiver burden and quality of life among individuals providing care to patients with Alzheimer's disease

Scale	Observed Min-Max Values	Mean±SD	Median (IQR)
Caregiver Burden Scale	0.00–88.00	36.83±15.20	37 (20)
Quality of Life in Alzheimer's Disease Scale	13.00–51.00	27.93±6.49	27 (8)

Descriptive Statistical Analysis

Mean: Average; **SD:** Standard deviation; **Min:** Minimum value; **Max:** Maximum value; **Median (IQR):** Interquartile range.

A moderate, statistically significant negative correlation was found between caregiver burden and quality of life scores ($r = -0.324$, $p < .01$) (Table 4).

Table 4. Relationship between caregiver burden and quality of life among individuals providing care to patients with Alzheimer's disease

Variables	Correlation Coefficient (r)	(1)	(2)
(1) Caregiver Burden Scale	r	1	
	p		
(2) Quality of Life in Alzheimer's Disease Scale	r	–0.324**	1
	p	< .001	

Pearson Correlation Analysis

* $p < .05$; ** $p < .01$; **r:** Pearson correlation coefficient.

Simple linear regression analysis showed that caregiver burden was a significant predictor of quality of life among caregivers of patients with Alzheimer's disease. Higher caregiver burden scores were associated with lower quality of life scores. The model explained 10.5% of the variance in quality of life (Adj. $R^2 = 0.105$) (Table 5).

Table 5. The effect of caregiver burden on quality of life among individuals providing care for patients with Alzheimer's Disease

Variable	B	SE	β	t	p	95% CI	
						Upper	Lower
Alzheimer's Disease Quality of Life Scale (Constant)	33.020	1.170		28.213	0.000	35.328	30.711
Caregiver Burden Scale	-0.138	0.029	-0.324	-4.701	0.000	-0.080	-0.196

$R = 0.324$, Adj. $R^2 = 0.105$, $F(1,189) = 22.098$, $p = 0.000$, $p < 0.001$ **SE:** Standard error, **β :** standardized regression coefficient, **CI:** Confidence Interval.

Discussion

Caregivers of individuals with Alzheimer's disease experience considerable physical, emotional, and social burden, which has important implications not only at the individual level but also for public health^{1,3,4,14}. Previous studies have consistently shown that caregivers of patients with Alzheimer's disease commonly experience moderate levels of burden accompanied by limitations in quality of life. These findings are consistent with the results of the present study, in which caregivers reported moderate caregiver burden and moderate-to-low quality of life. A significant negative relationship was identified between caregiver burden and quality of life, indicating that increasing caregiving demands are associated with decreased well-being^{4,14,20}. This relationship may be explained by the cumulative physical strain and persistent psychological stress associated with long-term caregiving^{1,3,18}. Caregivers experiencing higher burden often report emotional exhaustion, depressive symptoms, and reduced life satisfaction, which further compromise their quality of life^{5,8,9}. Although caregiver burden explained a modest proportion of the variance in quality of life, this finding is consistent with the multifactorial nature of quality of life in caregivers of patients with Alzheimer's disease^{1,3,14}. The adjusted R^2 value indicates that caregiver burden represents a significant, yet not exclusive, determinant of quality of life, suggesting that additional psychological, social, and environmental factors also contribute to caregivers' well-being^{4,20,21}. This result supports the need for comprehensive, multidimensional nursing interventions rather than approaches targeting a single factor^{12,13}. Age emerged as a significant factor influencing caregiver burden, with higher burden observed among caregivers aged 46 years and older^{20,21}. Advancing age may be associated with declining physical capacity, increased health problems, and prolonged exposure to caregiving responsibilities, all of which may intensify perceived burden^{1,3,18}. These findings highlight the need for age-sensitive support strategies for older caregivers^{12,13,16}. Income level was another important determinant of caregiver burden and quality of life¹⁴. Caregivers with lower income levels reported higher burden and poorer quality of life^{15,16,22}. Financial difficulties may exacerbate caregiving stress by limiting access to formal care services, respite care, and supportive resources^{3,13,22}, thereby increasing both objective and perceived caregiving demands¹⁴. Although female caregivers reported higher caregiver burden scores than males, the difference was not statistically significant^{15,16}. Nevertheless, existing evidence suggests that women often assume greater caregiving responsibilities due to traditional social roles, which may increase emotional strain and stress levels^{6,7,23}. These findings underscore the importance of considering gender-related factors when designing caregiver support interventions^{12,13,24}. Social support plays a crucial protective role in the caregiving process^{1,14}. Caregivers who perceive adequate social support tend to experience lower levels of burden and better quality of life^{13,20,25}. In addition, educational and psychosocial interventions can strengthen caregivers' coping abilities and resilience^{3,12}. Recent advances in technology-based interventions, including mobile health applications and online counseling services, offer promising opportunities to reduce caregiver burden and enhance psychosocial well-being^{11,24}. From a nursing perspective, these findings emphasize the importance of a holistic and caregiver-centered approach in Alzheimer's disease care^{1,3}. Nurses are in a

key position to assess caregivers' physical, psychological, and social needs, identify high-risk groups, and facilitate access to appropriate support services^{3,12,13}. Integrating psychosocial support, caregiver education, and digital health tools into nursing practice may contribute to reducing caregiver burden and improving quality of life^{11,12,24}. One limitation of this study is the use of snowball sampling, which may limit the generalizability of the findings. However, this approach was considered appropriate due to the difficulty in accessing caregivers of patients with Alzheimer's disease^{1,3,14}. Moreover, post hoc power analysis supported the adequacy of the sample size, indicating sufficient statistical power to detect the observed relationships.

Conclusion and Recommendations

This study demonstrated that caregiver burden is a key determinant of quality of life among individuals caring for patients with Alzheimer's disease. By focusing specifically on an Alzheimer's disease caregiver population, the findings emphasize that caregiver burden should be addressed as a core component of dementia care and public health strategies, rather than as a secondary outcome.

From a nursing perspective, these findings highlight the necessity of extending care beyond a patient-centered approach to a comprehensive, caregiver-centered model. Nurses play a critical role in the early identification of caregivers at risk and in the systematic assessment of caregivers' physical, psychological, and social needs. Nurse-led psychosocial support, counseling, and referral services are particularly essential for caregivers who are vulnerable due to advanced age, limited economic resources, or prolonged caregiving responsibilities associated with the progressive nature of Alzheimer's disease.

Community-based and home care nursing practices may facilitate continuity of care and strengthen communication with caregivers throughout the disease trajectory. In addition, integrating digital health technologies into nursing practice and guiding caregivers toward technology-based support systems may contribute to reducing caregiver burden and improving quality of life. Incorporating Alzheimer's disease-specific caregiver support content into nursing education programs may further enhance nurses' capacity to support this population.

In conclusion, recognizing caregivers of patients with Alzheimer's disease as a priority group for nursing interventions is essential for improving caregiver well-being and sustaining long-term care. Future research should focus on developing and evaluating nursing-based intervention models tailored to Alzheimer's disease and examining their applicability across different care settings and regional contexts.

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Research Trends of Acupressure Applications in Surgical Nursing: A Bibliometric Analysis

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Abstract

Aim: This study intended to investigate the main research topics, evolving themes, and the development of research on acupressure applications within the domain of surgical nursing.

Method: The study included 97 articles sourced from the Web of Science database, all of which met the inclusion criteria and focused on acupressure applications in surgical nursing. Data analysis was carried out using the Bibliometrix package in the R programming environment.

Results: The findings revealed that research on acupressure in surgical nursing was conducted in 10 different countries with contributions from 411 researchers affiliated with more than 40 institutions. The earliest publication in this field was from 2002, with a significant increase in publications noted in 2021 and 2023. Yeh M.L. was recognized as the most productive author, while China, Iran, and the United States were the primary contributors to research output. The Chinese Medical University was identified as the institution with the highest activity.

Conclusion: The results highlight thematic gaps in the literature, identify prominent but under-explored areas, categorize keyword clusters, and map research collaborations. These insights also point to future research opportunities in the field of acupressure applied to surgery in nursing.

Keywords: Acupressure, bibliometric analysis, nursing, surgery.

Hemşirelik Alanında Cerrahide Akupresür Uygulamalarına İlişkin Araştırma Eğilimlerinin Bibliyometrik Bir Analizi

Öz

Amaç: Bu çalışma, hemşirelik alanında cerrahide akupresür uygulamalarına üzerine yapılan araştırmaların çalışma odağını, tematik eğilimleri ve gelişimini analiz etmek amacıyla yapıldı.

Yöntem: Çalışmanın evrenini Web of Science veritabanında araştırmanın dahil edilme kriterlerine uyan hemşirelik alanında cerrahide akupresür uygulamalarına üzerine yapılan 97 makale oluşturdu. Verilerin analizi R yazılımında Bibliometrix Paket programı kullanılarak gerçekleştirildi.

Bulgular: Cerrahi hemşirelik kapsamında akupresür uygulamalarına yönelik çalışmaların, 10 farklı ülkeden toplam 411 araştırmacı ve 40'tan fazla kurumun katkısıyla gerçekleştirildiği belirlenmiştir. İlk

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yayının 2002 yılında yayımlandığı saptanmış, yayın yoğunluğunun ise 2021 ve 2023 yıllarında zirveye ulaştığı görülmüştür. Alanda en fazla yayını bulunan yazar Yeh M.L. olurken, en üretken ülkeler Çin, İran ve Amerika Birleşik Devletleri olarak öne çıkmıştır; en aktif kurumun ise China Medical University olduğu tespit edilmiştir.

Sonuç: Elde edilen bulgular, hemşirelikte cerrahide uygulanan akupresür uygulamalarıyla ilgili literatürde mevcut tematik boşlukları, öne çıkan ve yeterince çalışılmamış alanları, anahtar kelime gruplarını, uluslararası araştırma iş birliklerini ve geleceğe dönük potansiyel araştırma fırsatlarını ortaya koymaktadır.

Anahtar Sözcükler: Akupresür, bibliyometrik analiz, hemşirelik, cerrahi.

Introduction

Around the world, traditional and complementary medicine practices are widely utilized, and in our country, they have become recognized for their safety and effectiveness in health promotion¹. These practices are employed in a variety of clinical settings, including pain management, anxiety reduction, and the enhancement of overall comfort, which positions them as an important aspect of holistic healthcare and nursing^{2,3}. In this context, acupressure has emerged as an effective treatment option that stands out as an alternative to invasive methods⁴.

Acupressure is a massage technique that involves applying pressure to specific areas of the body using the thumb or index finger, palm, hands, or a stimulating device. This technique is thought to regulate the flow of energy, help maintain homeostasis, and stimulates the body's natural healing processes^{5,6}. Acupressure is currently used by nurses in surgical clinics and is defined as a nursing intervention within the Nursing Interventions Classification (NIC)⁷. In surgical settings, this method has been reported to reduce pain, promote relaxation and comfort, prevent nausea and vomiting, and improve postoperative outcomes⁸⁻¹⁰. As a non-invasive alternative, acupressure is becoming a safer option compared to acupuncture, as it avoids adverse reactions associated with needling such as pain, bleeding, or inflammation¹¹. In recent years, acupressure has been receiving increasing attention due to its low cost, minimal side effects, and user-friendly approach⁴.

Previous studies have demonstrated the effectiveness of acupressure in various surgical populations, including reductions in postoperative pain following thoracoscopic surgery¹², decreased pain and psychological stress after perianal abscess surgery¹³, improved bowel function after coronary artery bypass graft surgery¹⁴, and enhanced sleep quality and anxiety in cardiac surgery patients¹⁵. The use of acupressure in surgical clinics and related research is steadily increasing due to its simplicity, cost-effectiveness, and non-invasive nature^{7,10}. As acupressure gains popularity, it is crucial to systematically evaluate its dissemination and impact⁴. Bibliometrics is widely used by researchers from various disciplines to improve access to knowledge and to gain deeper insight into the structure of scientific information. This analytical approach enables the systematic mapping of the development of a research field, the identification of its core knowledge sources, the detection of emerging research trends, and the evaluation of

research outputs in terms of productivity, funding, impact, and geographical distribution¹⁶. Although bibliometric analysis studies on acupressure exist in the literature⁴, no bibliometric study focusing specifically on this topic within the field of surgical nursing has been identified. Therefore, this study aims to fill this gap and provide evidence-based direction for future research, ultimately contributing to the improvement of nursing practices.

Material and Methods

Study Design

Bibliometric analysis and science mapping methods were used in this study. This study is presented in accordance with the methodological and reporting principles recommended by the EQUATOR network for bibliometric studies¹⁷.

Study Questions

- What are the annual citation and publication counts?
- What does the co-occurrence map of author keywords related to the topic reveal?
- Which journals, authors, institutions, and countries have published the most on the topic?
- Which studies have received the highest number of citations on the topic?
- What is the thematic map of keywords used in studies related to the topic?

Data Collection

The research data were obtained from the Web of Science (WoS) database on April 4, 2025. This database was preferred due to its comprehensive publication and citation history, as well as its effective access to bibliographic data¹⁸. The search strategy applied in this study was outlined as follows: [TI = ("Acupressure" OR "Self-applied acupressure" OR "Autonomous acupressure" OR "Auricular point stimulation" OR "Auricular acupoint pressure" OR "Auricular acupressure" OR "Pressure at acupoint" OR "Ear point pressure" OR "Auriculotherapy" OR "Acupoint massage" OR "Auricular point stimulation") AND ("surgery" OR "operative" OR "general surgery") AND ("nurse" OR "nursing" OR "nursing staff" OR "nurses")]. This strategy was used to scan publications from 2002 to 2025, leading to the identification of 125 relevant articles. The inclusion criteria were defined as "article" and "review article" for the type of publication, and English as the language of publication. Conversely, the exclusion criteria included studies published in languages other than English and publications categorized as "meeting abstract," "letter," and "proceeding paper". No restrictions were applied regarding WoS indexes or publication year during the search process. A total of 97 studies that met the

Results

Distribution and Key Indicators of the Publications

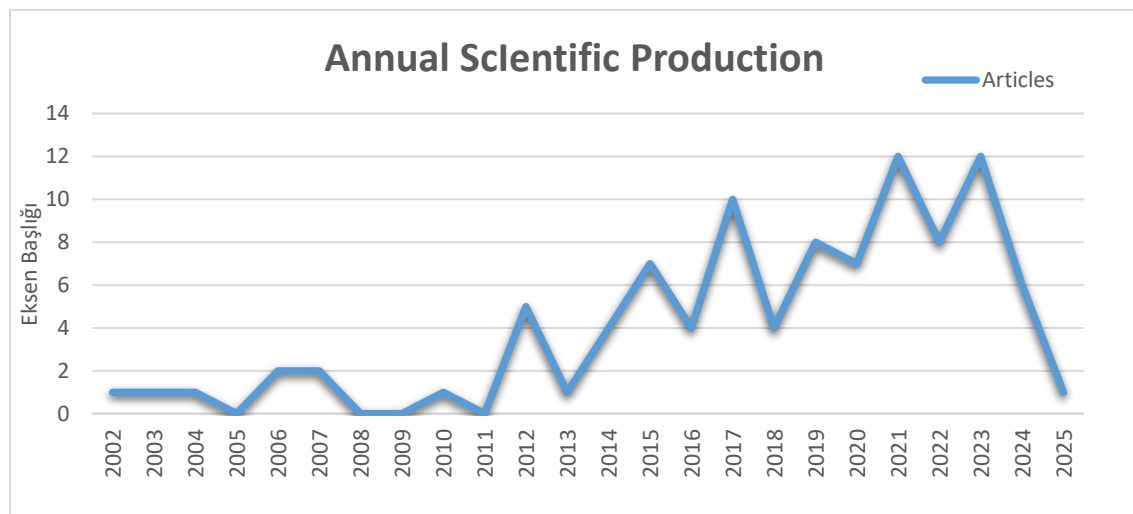
Figure 2 presents the findings obtained from the bibliometric analysis of 97 articles focusing on acupuncture in surgery in the field of nursing in the WoS database between 2002 and 2025. The analysis revealed that all the reviewed studies were in the form of journal articles (n=97), with an average of 6.96 articles published per year. Each of these articles received an average of 14.01 citations, and a total of 3,229 references were cited across the studies. Researchers used 250 different keywords in these publications, and a total of 411 authors contributed to the works. It was determined that there were no single-author articles in this field, and the average number of co-authors per publication was calculated as 4.81. Additionally, 11.34% of the studies featured international co-authorship (Figure 2).

Figure 2. Main information



Based on the search strategies employed, the first publication in this field was identified in 2002 (n=1), while the years 2021 and 2023 saw the greatest number of publications, with 12 in each year (Figure 3).

Figure 3. Annual scientific production

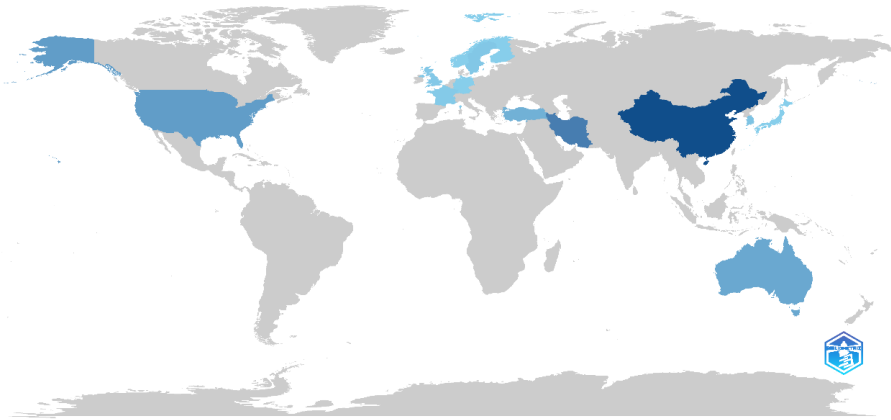


Global Analysis of Publications

Figure 4 illustrates the worldwide distribution of publications on the use of acupressure in surgical nursing. Regions with the highest number of publications are shown in darker shades, while areas where the topic has been less explored appear in light blue. Countries marked in grey indicate that the subject has not yet been addressed there. When examining the distribution of publications by country, it is observed that the highest number of publications originated from China (freq=170), Iran (freq=104), the United States of America (USA) (freq=62), Australia (freq=48), Türkiye (freq=37), South Korea (freq=15), Sweden (freq=9), the United Kingdom (UK) (freq=8), France (freq=6), and Singapore (freq=5). Additionally, no publications have been produced in the grey-marked regions (Figure 4).

Figure 4. Country scientific production

Country Scientific Production



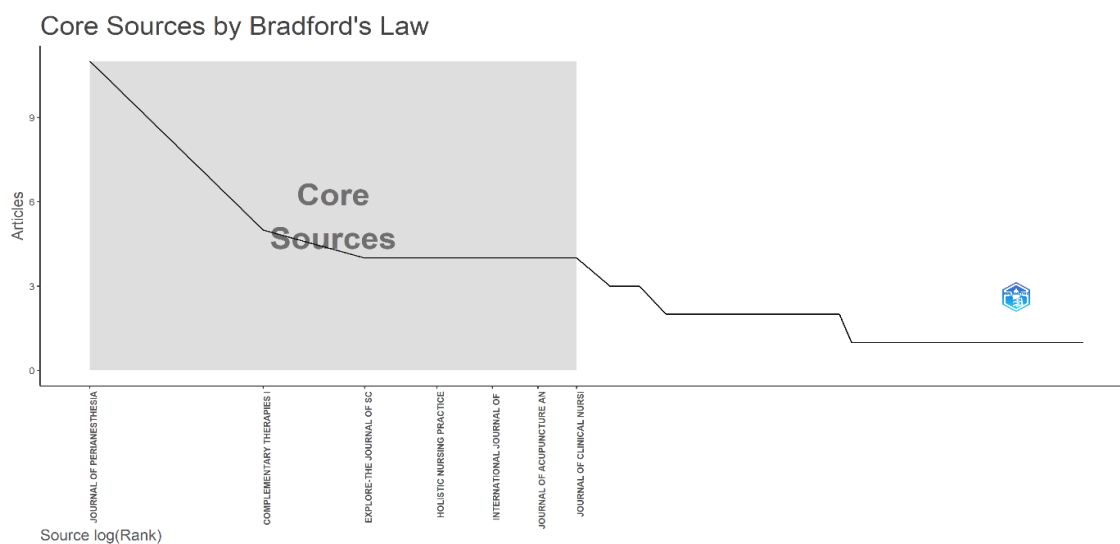
Top 5 Authors, Countries, Institutions and Journals that Contributed the Most to Field

According to Table 1, Yeh M.L. (n = 5) was the most prolific author, and, China (n = 170) ranked first in publication output. China Medical University (n = 20) was the most productive institution. Furthermore, Bradford's Law analysis identified the Journal of Perianesthesia Nursing as the core source in the field (n = 11) (Table 1, Figure 5).

Table 1. Top 5 authors, countries, institutions, and journals contributing the most to the field

Number	Author	Author- Number of Article	Country	Country- Number of Article	Affiliation	Affiliation - Number of Articles	Journals	Journal- Number of Article
1.	Yeh M.L.	5	China	170	China Med University	20	Journal of Perianesthesia Nursing	11
2.	Abadi F.	4	Iran	104	Hamadan University Medical Science	12	Complementary Therapies In Medicine	5
3.	Chen C.P.	4	USA	62	Griffith University	10	Explore-The Journal Of Science And Healing	4
4.	Liu Y.	4	Australia	48	Shiraz University Medical Science	10	Holistic Nursing Practice	4
5.	Chen H.H.	3	Türkiye	37	Mashhad University Medical Science	9	International Journal of Nursing Studies	4

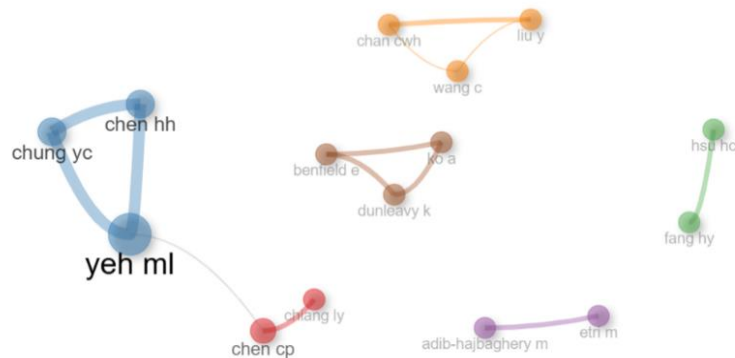
Figure 5. Bradford's Law



Co-authorship Network Map Demonstrating Collaboration between Authors

Figure 6 presents the author collaboration network analysis. The analysis is based on a total of 20 nodes, each representing a single author. The lines connecting the nodes indicate collaborative relationships between authors, with the thickness of the lines corresponding to the intensity of collaboration. In this literature review on acupressure in surgical nursing practices, six distinct clusters have been identified. The cluster represented in red occupies a central position within the network, with the author 'Yeh M.L.' playing a pivotal role in inter-author collaboration. Another author within the same cluster, 'Chen P.', maintains a direct collaborative link with 'Yeh M.L.' and constitutes a significant component of intra-cluster connectivity. In contrast, the brown, orange, purple, and green clusters demonstrate lower collaboration intensity, and there is no observed inter-cluster collaboration among the authors within these groups (Figure 6).

Figure 6. Co-authorship network map showing inter-author collaboration



Top 10 Most Local Cited Articles

Table 2 lists the top 10 most local cited articles. The article titled “The efficacy of acupressure to prevent nausea and vomiting in post-operative patients” by Ming J.L. et al., published in 2002 in the Journal of Advanced Nursing, is identified as the most cited publication (Table 2).

Table 2. Top 10 most local cited articles

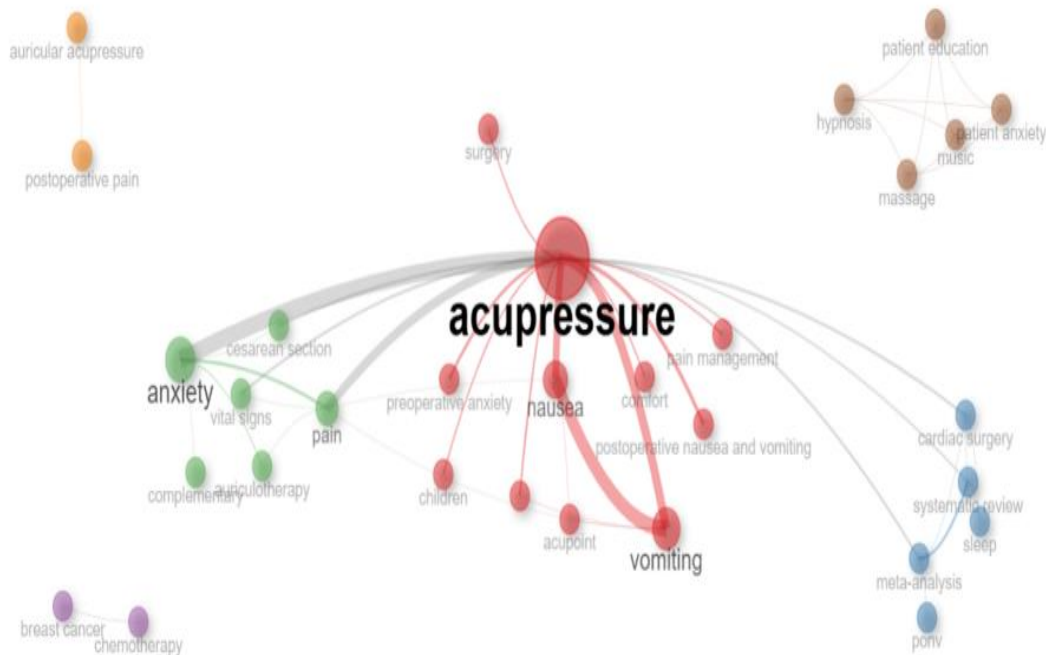
Author	Journal	Article name	Citation
Ming et al., 2002 ¹⁹	Journal of Advanced Nursing	The efficacy of acupressure to prevent nausea and vomiting in post-operative patients	6
Yılmaz Şahin et al., 2018 ²⁰	International Journal of Nursing Studies	Effect of acupressure application to the P6 acupoint before laparoscopic cholecystectomy on postoperative nausea-vomiting: A randomized controlled clinical study	6

Zhong et al., 2019 ²¹	Chinese Journal of Integrative Medicine	Effectiveness of Auricular Acupressure for Acute Postoperative Pain after Surgery: A Systematic Review and Meta-Analysis	6
Cooke et al., 2015 ²²	Complementary Therapies in Medicine	Wrist acupressure for post-operative nausea and vomiting (WrAP): A pilot study	5
Shin et al., 2004 ²³	Cancer Nursing	Effect of Acupressure on Nausea and Vomiting During Chemotherapy Cycle for Korean Postoperative Stomach Cancer Patients	4
Holmer Petterson, et al 2012 ²⁴	Journal of Clinical Nursing	Acupuncture prior to surgery to minimise postoperative nausea and vomiting: a systematic review	4
Adib-Hajbaghery, et al. 2013 ²⁵	Journal of Research Medicine	Effect of acupressure of Ex-Le7 point on pain, nausea and vomiting after appendectomy: A randomized trial	4
Chung et al., 2014 ²⁶	International Journal of Nursing Studies	Integrative acupoint stimulation to alleviate postoperative pain and morphine-related side effects: A sham-controlled study	4
Hsiung et al., 2015 ²⁷	Complementary Therapies in Medicine	Acupressure improves the postoperative comfort of gastric cancer patients: A randomised controlled trial	4
Kwon et al., 2016 ²⁸	Cancer Nursing	Effects of Nei-Guan (P6) Acupressure Wristband On Nausea, Vomiting, and Retching in Women After Thyroidectomy	4

Co-Author Occurrence

Figure 7 illustrates the application of the network analysis method based on author keywords, with studies on acupressure in surgery within nursing categorized into six clusters. This method highlights the rate at which keywords co-occur. The red cluster highlights the keywords with the highest frequency of use, whereas the green and blue clusters depict other frequently occurring terms. Within the red cluster, the keywords “acupressure,” “vomiting,” “nausea,” “postoperative nausea and vomiting,” and “preoperative anxiety” are particularly prominent in terms of usage frequency (Figure 7).

Figure 7. Co- occurrence Network



Word Cloud, Thematic Map and Trend Topic Analysis

Figure 8 displays the word cloud of the most commonly used keywords related to the topic. The cloud expands as the frequency of word usage increases. The most frequently used author keywords were acupressure (n=39), anxiety (n=18), vomiting (n=14), nausea (n=11), pain (n=11) and postoperative nausea vomiting (n=11) and meta-analysis (n=11) (Figure 8).

Figure 8. Word cloud



Figure 9 shows 16 years of trending topics related to acupressure applied in surgery in the nursing field. A minimum word frequency of 3 and an annual word count of 5 were

considered. The most frequent topics were found to be “acupressure”, “anxiety”, “vomiting”, ‘nausea’, “postoperative nausea vomiting” and “pain”. As of early 2015, the most popular topics were “nausea”, “vomiting”, and “postoperative nausea vomiting”, while in recent years the most popular topics were “auriculotherapy”, ‘pain’, “randomized control trials” and “postoperative pain” (Figure 9).

Figure 9. Trend topics

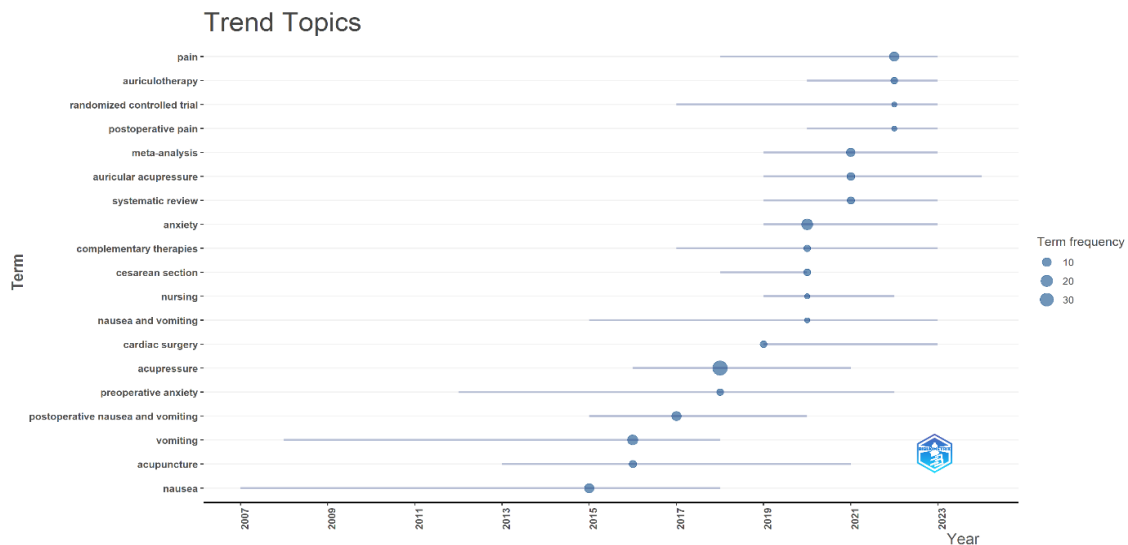
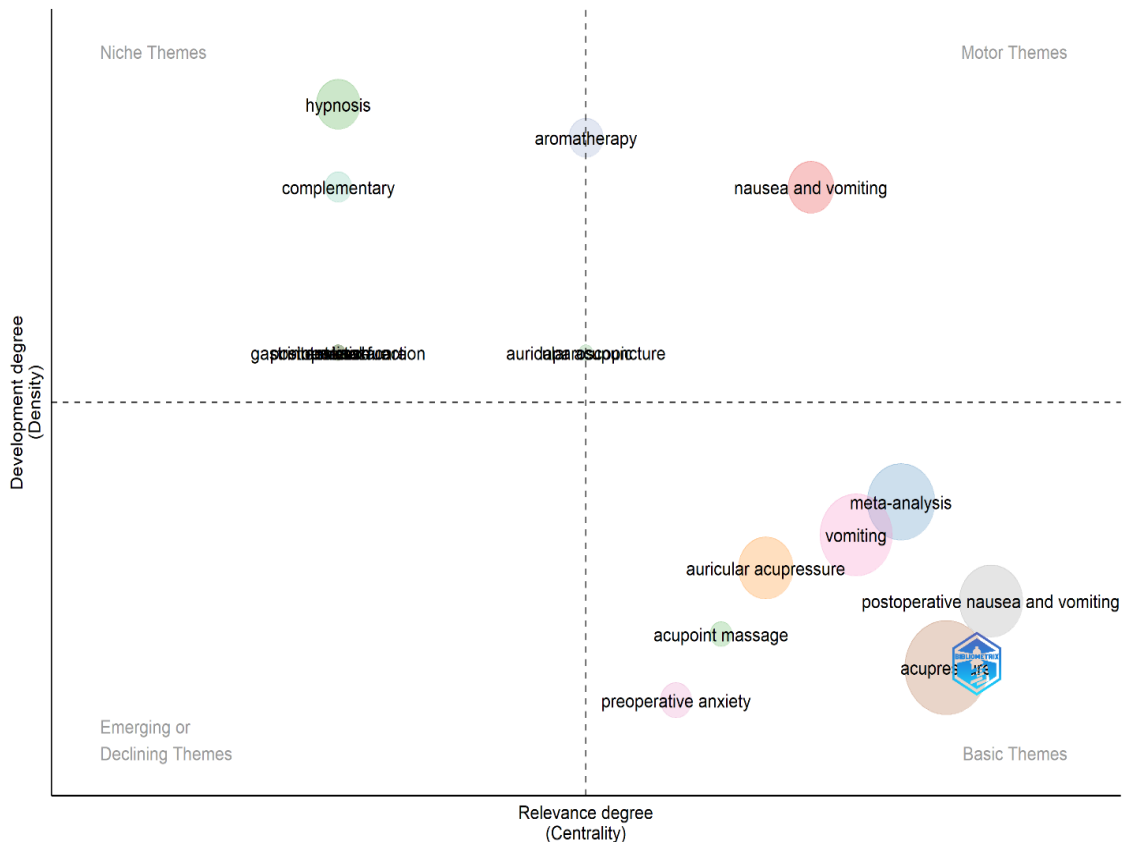


Figure 10 presents a thematic map of the studies on acupressure in surgery in the field of nursing. In this analysis, 250 keywords were considered, the minimum clustering reference value was set to 5, and only one level was used for each cluster level. The upper right quadrant of the map shows “motor themes” defined by high centrality and density, and the keywords “nausea and vomiting” are prominent in this region. The upper left quadrant contains themes defined by low centrality but high intensity, which are mostly niche areas; the terms “hypnosis”, “aromatherapy”, “complementary”, “gastrointestinal function” and “auricular acupuncture” appear in this quadrant, and these words are associated with limited external links to the study topic. The lower left quadrant contains themes that are low in both centrality and intensity and therefore have limited impact in the field. Although the word “stress” appears here, it does not appear in the thematic map. The lower right quadrant contains the main themes with high centrality but low intensity, and the keywords that stand out here are “preoperative anxiety”, acupoint massage”, “auricular acupressure”, “vomiting”, “postoperative nausea and vomiting”, “meta-analysis” and “acupressure”. This shows that the theme is central but still has room for improvement in terms of research (Figure 10).

Figure 10. Thematic map

Discussion

Many researchers from various disciplines use bibliometric analysis to gain deeper insights into the structure of knowledge. This analytical method offers an opportunity to map the development of a field, identify key information sources used within the domain, and uncover emerging trends in the research landscape. It sheds light on how scientific, evidence-based information and studies are utilized¹⁶. Bibliometrics utilizes statistical methods, such as citation and content analysis, to gain a more comprehensive understanding of the usage and impact of publications within a particular field²⁹. This bibliometric and visualized analysis examines nursing research on acupressure applications in surgical processes, revealing trends in the nursing discipline related to acupressure and identifying knowledge gaps in this area. It provides a roadmap that will guide future nursing research efforts. When we examine the nursing literature, to the best of our knowledge, no bibliometric study has specifically focused on acupressure applications within the field of surgical nursing. In this study, by accessing the WoS database, scientific collaboration networks among authors, institutions, and sources were visualized based on publications and citations in the literature. The findings obtained are of great importance for nurses who provide care and perform acupressure for patients undergoing surgical interventions. Especially, the potential effects of acupressure on reducing pain levels and postoperative nausea and vomiting in surgical

patients enable the adoption of holistic and patient comfort-oriented approaches in nursing care³⁰. This is of great importance in supporting the recovery process and improving both care and quality of life. Therefore, this study offers significant contributions to the literature by addressing the role and impact of acupressure in nursing practices from a bibliometric perspective and facilitates the strengthening of holistic care approaches in nursing science.

Based on the findings of a bibliometric analysis of 97 articles focused on acupressure in surgery published in the Web of Science (WoS) database between 2002 and 2025, a total of 411 authors contributed to the field. An examination of annual scientific output revealed that the first publication emerged in 2002, with no prior literature identified until that year. However, a significant increase in publications was observed thereafter. The highest number of publications occurred in 2021 and 2023 (n=12). In line with these findings, it has been determined that interdisciplinary studies on acupressure, particularly in fields such as nursing, physiotherapy, and pain management, have become more prevalent and that bibliometric analyses on the topic are included in current literature^{30,31}.

The increase in the number of contributing authors suggests a growing research interest in the area and indicates the adoption of an interdisciplinary approach, as experts from diverse research fields have collaborated. A review of the publication and citation trends reveals a growing number of nursing studies on acupressure in the surgical field, although the quantity remains below desirable levels. When examining publications related to acupressure in surgical contexts, China ranks first in terms of output. Notably, Iran and the United States also show a considerable number of publications. China's leadership in this area may be attributed to the diversity of its research centers and the emphasis on the topic at scientific gatherings. Additionally, the integration of modern biomedical treatments with traditional practices is supported in China³². The most locally cited article on acupressure in surgery was conducted in Taiwan by Ming J.L. et al., titled "The efficacy of acupressure to prevent nausea and vomiting in postoperative patients"¹⁹.

Bradford's Law was used to determine the most productive journals in the nursing literature on surgical acupressure. This law examines how scientific literature is distributed across different journals³³. Based on this law, the Journal of Perianesthesia Nursing was identified as the leading journal in this field. This journal provides updated knowledge in critical areas of surgical nursing, such as postoperative pain management, anxiety, and the prevention of postoperative nausea and vomiting³⁴. Given that acupressure is often studied in relation to these complications, the abundance of such publications in this journal is to be expected.

In terms of individual scholarly productivity, Yeh M.L. was identified as the most prolific author in surgical acupressure within the nursing field and also demonstrated the highest level of collaboration. However, it was observed that overall collaboration among authors remains limited. Collaborations between researchers foster the exchange of knowledge, ideas, and resources, thereby promoting innovation and enhancing research

productivity^{35,36}. Therefore, scholars seeking up-to-date and comprehensive knowledge or aiming to establish collaborations are encouraged to follow the works of these prolific authors.

Among the top ten institutions producing the most publications in this area, five are based in Iran, four in China, and one in Australia. It is recommended that multinational or multicenter studies be conducted with large sample groups and collaborative efforts across countries and institutions in order to strengthen the evidence base in healthcare^{37,38}. Researchers interested in conducting international studies on surgical acupressure in nursing are advised to collaborate with these leading institutions.

Keywords play a critical role in reflecting the central concepts of a study and provide insight into its content. Analysis of the keyword network revealed frequent use of terms such as acupressure, anxiety, vomiting, nausea, pain, postoperative nausea and vomiting, and meta-analysis. Similarly, in a bibliometric analysis that examined acupressure research trends from 2004 to 2024, the most frequently used keywords included acupuncture, management, pain, auricular acupressure, and quality of life⁴. These findings provide an understanding of trends within the field. Less frequent keywords such as acupoint, aromatherapy, and auricular acupuncture suggest that research on these topics in surgical acupressure remains limited. Researchers are therefore encouraged to address these gaps and contribute to the nursing literature. In the thematic map, the keywords nausea and vomiting, characterized by high centrality and density, emerged as prominent themes. Acupressure involves manual stimulation of specific acupuncture points on the body. One such point, Pericardium 6 (P6), has been reported to be effective in alleviating nausea and vomiting. Stimulation of this point is thought to reduce nausea through its influence on gastric motility and the central nervous system³⁹. Numerous randomized controlled trials have demonstrated that acupressure applied to the P6 point is significantly effective in reducing postoperative nausea and vomiting (PONV)^{39,40}. A meta-analysis by Lee et al. (2015) confirmed that acupressure at the P6 point significantly reduces the incidence of PONV³⁹. Similarly, in a meta-analysis evaluating the impact of acupressure on PONV in patients undergoing laparoscopic surgery, Salamah (2023) highlighted that acupressure significantly reduces nausea and vomiting in both early and late postoperative periods⁴⁰. These findings suggest that acupressure holds therapeutic potential for managing these symptoms and is increasingly being integrated into clinical nursing practice as a complementary method.

Although niche themes offer valuable contributions by providing in-depth analysis within specific disciplines or specialties, they often garner less attention than broader and more popular topics⁴¹. Terms such as hypnosis, aromatherapy, complementary, gastrointestinal function, and auricular acupuncture were identified in this study. While the keyword stress appeared in the cluster analysis, it did not feature on the thematic map. This may be due to its failure to meet threshold values for density and centrality or the lack of strong conceptual associations in the literature. Furthermore, thematic maps tend to highlight dominant and well-developed themes, which may lead to the

underrepresentation of secondary or marginal keywords. This suggests that the theme of stress is still in an emerging stage or has only been explored in limited contexts.

Conclusion

In conclusion, although the highest number of publications on acupressure in surgical nursing occurred in 2021 and 2023, the overall publication volume remains suboptimal. Furthermore, collaboration within the field appears insufficient. The analysis of keywords demonstrates a focus on the management of symptoms such as nausea and vomiting, yet complementary themes such as aromatherapy, auricular acupuncture, gastrointestinal functions, and stress remain underrepresented in the literature. This indicates a need for further research in these areas. It is essential for nurses to explore these niche topics to fill existing gaps and enhance the role of complementary methods in clinical practice. Additionally, researchers are advised to establish multicenter collaborations, particularly with prolific authors and institutions in China and Iran, to advance research in this field.

Strength and Limitations

This study has both strengths and limitations. One of its strengths is that, to the best of our knowledge, it represents the first bibliometric analysis focusing specifically on surgical acupressure within the nursing field. However, there are some limitations. All the articles used in the analysis were sourced exclusively from the Web of Science (WoS) database, meaning that significant studies from other databases or those published in different languages may have been overlooked. This could introduce a degree of bias in the findings. Additionally, since the data for this study were collected on April 4, 2025, time constraints may affect the validity and currency of the results.

Author Contribution Area and Rate: The authors contributed equally to this study.

Ethics Committee Approval: This study does not require ethical committee approval.

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Conflicts of Interest: The authors declare that there is no conflict of interest with any individual or institution in the context of this study.

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The Factors Influencing Antidepressant Use: Investigating the Relationship between Income, Alcohol Consumption and Demographic Variables

Taner ABİŞ*

Abstract

Aim: Antidepressant use has become a major problem in developed and developing countries. This research examines the economic, demographic and sociocultural determinants of antidepressant use using OECD (Organisation for Economic Co-operation and Development) and World Bank panel data covering 21 OECD countries between 2008 and 2021, comprising a total of 294 observations.

Method: Driscoll-Kraay estimator, one of the panel data analysis methods, was utilized to scrutinize the associations among the variables.

Results: The findings of the study indicate that increases in the dependent population aged 20 and under and in the urban population have decreased antidepressant use. In contrast, the dependent population aged 65 and over, household income, alcohol consumption, and population growth in large cities are found to increase antidepressant use.

Conclusion: Chronic diseases among older adults have been shown to increase the risk of developing mental disorders, such as depression and anxiety. However, lower diagnosed depression rates and more limited access to psychiatric medications may be associated with reduced antidepressant use among individuals aged 20 years and under. Furthermore, it has been highlighted that individuals with higher income levels have greater access to healthcare services and higher mental health awareness. These findings reveal that antidepressant use is linked to demographic and socioeconomic factors. Decision-makers should adopt mental health policies that take these structural differences into account.

Keywords: Antidepressant intake, income, dependent population aged 65 and over, dependent population aged 20 and under, unemployment.

Antidepresan Kullanımını Etkileyen Faktörler: Gelir, Alkol Tüketimi ve Demografik Değişkenler Arasındaki İlişkinin İncelenmesi

Öz

Amaç: Gelişmiş ve gelişmekte olan ülkelerde antidepresan kullanımı önemli bir problem haline gelmiştir. Bu araştırma, 2008 ve 2021 yılları arasında 21 OECD ülkesini kapsamakta ve toplam 294 gözlemden oluşan OECD (Ekonomik İşbirliği ve Kalkınma Örgütü) ve Dünya Bankası panel verilerini kullanarak antidepresan kullanımının ekonomik, demografik ve sosyokültürel belirleyicilerini incelemektedir.

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Yöntem: Panel veri analiz yöntemlerinden biri olan Driscoll-Kraay tahmincisi, değişkenler arasındaki ilişkileri incelemek için kullanılmıştır.

Bulgular: Araştırmanın bulguları, 20 yaş ve altındaki bağımlı nüfus ile kentsel nüfus oranındaki artışların antidepresan kullanımını azalttığını göstermektedir. Buna karşın, 65 yaş ve üstü bağımlı nüfus, hane halkı geliri, alkol tüketimi ve büyük şehirlerdeki nüfus artışının antidepresan kullanımını artırdığını ortaya koymaktadır.

Sonuç: Yaşlılarda görülen kronik hastalıkların, depresyon ve anksiyete gibi ruhsal bozuklukların gelişme riskini artırdığını göstermektedir. Ancak düşük depresyon oranlarının ve psikiyatrik ilaçlara sınırlı erişimin, 20 yaş ve altındakiler arasında antidepresan kullanımının azalması ile ilişkili olduğu düşünülmektedir. Ayrıca, yüksek gelir düzeyine sahip bireylerin sağlık hizmetlerine erişimlerinin ve ruh sağlığı farkındalıklarının daha yüksek olduğu vurgulanmıştır. Bu sonuçlar, antidepresan kullanımının demografik ve sosyoekonomik faktörlerle bağlantılı olduğunu ortaya koymaktadır. Yetkili kişilerin, ruh sağlığı politikalarını bu yapısal farklılıkları hesaba katacak şekilde uygulanabilir politikalar benimsemeleri gerekmektedir.

Anahtar Sözcükler: Antidepresan kullanımı, gelir, 65 yaş ve üstü bağımlı nüfus, 20 yaş ve altı bağımlı nüfus, işsizlik.

Introduction

In recent years, the demand for antidepressants has been increasing globally, forming a continuing trend¹. Particularly, the rising demand for antidepressants has become a significant issue affecting both individuals' mental health and the healthcare systems and economic dynamics of these countries². The increasing prevalence of mental health conditions such as depression and anxiety leads to undesirable consequences for both individuals and society. Therefore, in developed countries, the effective implementation of healthcare systems and social support mechanisms may help regulate antidepressant use by limiting inappropriate prescribing practices, ensuring equitable access to mental health services, and reducing unnecessary long-term use, which could otherwise pose a public health concern through overmedication, dependency risks, and increased healthcare costs³. The rise in antidepressant use is claimed to be influenced by various economic, demographic, and sociocultural determinants⁴. The unemployment rate, level of urbanization, proportion of the elderly population, per capita income, and alcohol consumption have influences on individuals' mental health^{5,6}. Global economic fluctuations, income inequality, labor market uncertainties, and social isolation resulting from urbanization are critical factors that adversely impact society and contribute to the rise of mental health issues^{7,8}. The purpose of this study is to analyze the economic, demographic, and socio-cultural factors affecting antidepressant use in selected OECD countries using panel data analysis. The data obtained from the OECD and the World Bank are examined using the Driscoll-Kraay estimator, one of the panel data analysis methods, and the impact of these factors on antidepressant use is evaluated. The primary motivation of this research is to facilitate the adoption of informed measures regarding mental health disorders and contribute scientifically to the literature on the importance of this issue. The findings of the study indicate that antidepressant use is significantly associated with demographic structure, socioeconomic conditions, and urbanization

dynamics. While increases in the proportion of the young dependent population and urban population growth reduce antidepressant use, increases in the proportion of the elderly dependent population, income level, alcohol consumption, and population growth in large cities exert an increasing effect on antidepressant use. In conclusion, the increasing use of antidepressants is emphasized not only as an individual health issue but also as a phenomenon closely linked to socioeconomic and demographic conditions.

Assessment of Antidepressant Intake

The literature review indicates that there are socio-economic determinants affecting antidepressant use. According to the literature presented in Table 1, the relationship between income, unemployment, alcohol consumption, and the dependency ratio with antidepressant use has been examined.

Table 1. Selected studies on factors associated with antidepressant use

Investigator/Year	Population/sample	Method	The result
Kim et al. (2024) ⁹	273,656 prescription and 78,851 non-prescription antidepressant users in South Korea	Regression methods	Cardiovascular diseases have exacerbated depression, leading to an increase in antidepressant consumption.
Öztürk et al. (2020) ¹⁰	Data for 19 OECD countries covering the period from 1997 to 2017 have been analyzed.	Panel data analysis	Income, unemployment, and the share of household debt within disposable income have increased antidepressant consumption.
Hilamo (2014) ¹¹	Municipalities in Finland from 1995 to 2010	Panel data analysis	It has been observed that in municipalities where the Gini index has increased, antidepressant use has risen among both young individuals and those aged 65 and above.
Lundin and Hansson, (2014) ¹²	Between 1998 and 2009 in Sweden	Arima analysis	The test revealed a relationship between antidepressants and unemployment.
Yang et al. (2024) ¹³	Data for 201 countries between the years 1970 and 2020 have been analyzed.	Fixed Effects Approach	It has been concluded that there is a positive relationship between unemployment and mental disorders, particularly anxiety, depression, and bipolar disorder.
Tveit et al. (2020) ¹⁴	Antidepressant use in elderly people in Norway from 2007 to 2017 was investigated.	Linear Mix-Effects Models	Over the 10-year period, the prescribed antidepressant use has slightly decreased. However, the serum antidepressant concentration remains high.
Xiang et al. (2020) ¹⁵	32,193 American residents aged 50 and over	Logistic Regression	A substantial correlation was found between people with various disabilities (excluding those with visual, hearing, mobility, etc. disabilities) and depression.

Han et al. (2011)¹⁶	In Canada, 281 patients were involved in the investigation.	Linner Regression	12 month antidepressant usage did not induce cognitive impairment.
Chavarria et al. (2021)¹⁷	In Canada between 1999 and 2017	Logistic Regression	Antidepressant uptake grew from 1999 to 2017. Individuals who drink alcohol are more likely to use antidepressants than non-drinkers.
Aslan et al. (2022)¹⁸	Turkey and Germany from 2008 to 2019	Regression, Correlation Tests	In Turkey and Germany, deaths caused by suicide, alcohol, and drug use, as well as alcohol consumption and suicide rates, have increased alongside the use of antidepressant medications.
Hall et al. (2003)¹⁹	In Australia in the period 1991-2000	Quasi-Experimental Prospective Design	A significant relationship has been found between suicide rates and antidepressant use. Particularly, suicide rates have decreased among elderly individuals using antidepressants. It has been emphasized that antidepressant use may contribute to maintaining the mental health of the population.

In the literature, antidepressant use is not limited to the health status of individuals and society. It is also a fact that antidepressant consumption is influenced by economic and social factors. Specifically, income inequality, social isolation, rising unemployment, and increased alcohol consumption are argued to be significant drivers of antidepressant use.

Material and Methods

The present study aims to analyze the economic, demographic, and socio-cultural determinants of antidepressant use by examining the relationships between income, alcohol consumption, and demographic variables using panel data from OECD countries. This section provides information on the variables used in the research and the methods applied in the study. The study includes Turkey, Germany, the United Kingdom, Italy, France, Canada, Australia, Belgium, the Czech Republic, Denmark, Estonia, Finland, the Netherlands, Spain, Sweden, Lithuania, Hungary, Norway, the Slovak Republic, Chile, and Portugal.

Table 2. The information related to the variables used in the research

Variables	Variable explanation
ln_Antideptdose	Defined daily doses per 1000 inhabitants per day (Combined Unit Measure) /OECD Data
ln_Yagedept	Young age dependency ratio (Less than 20 years) /OECD Data
ln_Oldagedept	Old age dependency ratio (65 years or over) /OECD Data
ln_Gdp	Gross domestic product, per capita (US\$) /OECD Data
ln_Alcohol	Alcohol consumption (Litres per person) /OECD Data
Unemply	Unemployment, total (% of total labor force) / World Bank
Urbanpop	Urban population (% of total population) / World Bank
Largecitypop	Population in the largest city (% of urban population) / World Bank

The findings presented in Table 2 provide information on the variables used in the study. Accordingly, the data utilized in this research cover the years 2008-2021 and were obtained from the World Bank²⁰ and the OECD database²¹. The variables included in the study—ln_Antideptdose, ln_Yagedept, ln_Oldagedept, and ln_Gdp—were calculated in unit terms. These variables were log-transformed to ensure standardization. Taking the logarithm of the variables allowed the data to achieve a more normal distribution and become more suitable for statistical analysis²².

Panel Data Analysis

It is a regression analysis method that accounts for unit- and time-dependent effects by calculating the variations in the dataset over time and across units. Panel data analysis provides more comprehensive insights by integrating cross-sectional data and time series data in a single framework²³.

Fixed Effects and Random Effects

In panel data analysis, two main methods—Fixed Effects (FE) and Random Effects (RE)—are used to determine the appropriate model. Fixed Effects in panel data analysis assess unit values independently of time effects and examine variations between units. In contrast, Random Effects estimate unit differences using a randomly distributed error term²⁴. The Fixed Effects model generalizes fixed, cross-sectional, and slope models for panel data, allowing for the effects of variables specific to individual cross-sectional units while excluding fixed terms. Dummy variables are employed to account for these effects, which remain the same across all cross-sectional units but vary across time periods. Differences in unit and time dimensions are incorporated into the error term, and the

estimated coefficient values remain constant over time. Since unit effects correlated with independent variables lead to biased estimates, the correct model selection should be made using the Hausman test²⁵. The Hausman test is used to determine whether the Fixed Effects or Random Effects model is appropriate. If the null hypothesis (Ho) is rejected, the Fixed Effects model should be applied, whereas if the null hypothesis is accepted, the Random Effects model is considered suitable²⁶.

Autocorrelation and Heteroscedasticity Issues

Longitudinal studies require a choice between static or dynamic panel data analysis estimation methods. In order to make a robust estimation, autocorrelation, heteroscedasticity, and horizontal cross-sectional dependence problems should be examined. These issues weaken the validity and reliability of the model. The autocorrelation problem refers to the correlation between the lagged values of the dependent variable and the values from previous periods. In this study, the autocorrelation issue was tested using the Wooldridge test. According to this test, the null hypothesis (Ho) indicates no autocorrelation problem. If the null hypothesis is rejected, it suggests the presence of an autocorrelation issue²⁷. Another major problem in panel data analysis is heteroscedasticity. If the distribution of error terms is not constant across units or time periods, heteroscedasticity exists in the model. To examine this issue, the modified Wald test was applied. As a result, the null hypothesis was rejected, confirming the presence of heteroscedasticity²⁸.

Driscoll-Kraay (Fixed Effects) Standard Error Estimator

In cases where cross-sectional correlation, heteroscedasticity, and autocorrelation are present, the Driscoll-Kraay (1998) Standard Errors robust estimator method is applied. Given that the number of units (N) is relatively close to the time period (T), the results obtained from the Driscoll-Kraay (Fixed Effects) standard errors test are consistent and reliable^{29,30}. The model equation for the Driscoll-Kraay (Fixed Effects) Standard Error Estimator is presented in Equation 1. In this equation, α_i represents time-invariant fixed effects related to the model. The adjusted standard error calculations are symbolized by ε_{it} , which denotes the error term.

$$\ln\_Antideptdose_{it} = \alpha_i + \beta_1 \ln\_Yagedept_{it} + \beta_2 \ln\_Oldagedept_{it} + \beta_3 \ln\_Gdp_{it} + \beta_4 \ln\_Alcohol_{it} + \beta_5 Unemploy_{it} + \beta_6 Urbanpop_{it} + \beta_7 Largecitypop_{it} + \varepsilon_{it} \quad 1$$

Results

To examine the effects of antidepressant consumption, the Driscoll-Kraay Standard Errors method, a panel data analysis technique, was applied. The obtained results are presented below.

Table 3. The descriptive statistics

Variables	Observation	Mean	Std. Dev.	Min.	Max
ln_Antideptdose	286	4.0209	0.4644	2.6741	4.9330
ln_Yagedept	294	3.6161	0.1489	3.3978	4.1009
ln_Oldagedept	294	3.3356	0.2512	2.4765	3.7062
ln_Gdp	294	10.5527	0.3282	9.6448	11.3988
ln_Alcohol	294	2.1660	0.4498	0.1823	2.6878
Unemploy	294	8.0821	3.8399	2.015	26.094
Urbanpop	294	78.0773	10.0590	53.726	98.117
Largacitypop	294	22.2246	10.5549	5.4481	48.5752

According to the descriptive values presented in Table 3, the variables ln_Antideptdose, ln_Alcohol, Unemploy, Urbanpop, and Largacitypop exhibit specific differences between their minimum and maximum values.

Table 4. Correlation matrix for variables

Variables	1	2	3	4	5	6	7	8
ln_Antidepdose (1)	1	0.1299	0.2655	0.5876	0.0402	-0.1615	0.5043	-0.1160
ln_Yagedept (2)		1	-0.6049	-0.0402	-0.6658	-0.1259	0.4079	0.1708
ln_Oldagedept (3)			1	0.5648	0.6544	-0.1505	0.1060	-0.1271
Ln_Gdp (4)				1	0.1802	-0.4913	0.5499	-0.4058
ln_Alcohol (5)					1	-0.1077	-0.0492	-0.0092
Unemploy (6)						1	-0.2921	0.0791
Urbanpop (7)							1	-0.2112
Largacitypop (8)								1

In the correlation matrix of variables, values close to 1 can affect the reliability of the analysis results³¹. According to the information presented in Table 4, no values indicate the presence of a multicollinearity issue.

Table 5. Selecting the proper model

Model	Pooled OLS (Ordinary Least Squares)	Fixed Effects	Random Effects
Variables	Antidepdose	Antidepdose	Antidepdose
Ln_Yagedept	-0.2260 (0.2221)	-0.7099*** (0.2528)	-0.2260 (0.2221)
ln_Oldagedept	0.3136** (0.1304)	0.5217*** (0.1397)	0.3136** (0.1304)
ln_Gdp	0.7235*** (0.0914)	0.6546*** (0.0969)	0.7235*** (0.0914)
ln_Alcohol	0.1063 (0.1040)	0.3075** (0.1253)	0.1063 (0.1040)
Unemploy	0.0024 (0.0036)	0.0035 (0.0036)	0.0024 (0.0036)
Urbanpop	-0.0001 (0.0062)	-0.0139* (0.0084)	-0.0001 (0.0062)
Largecitypop	0.0138* (0.0072)	0.0365*** (0.0129)	0.0138* (0.0072)
Cont.	-4.4073*** (1.2426)	-2.4910* (1.3527)	-4.4073*** (1.2426)
Obs.	286	286	286
F Test (P Value)	0.000	0.000	0.000
Hausman Test		Chi2 (4) = 16.01	
		Prob>chi2 = 0.0250	

The results of the Pooled Ordinary Least Squares (OLS), Fixed Effects, and Random Effects tests are presented in Table 5. According to these results, due to unit and time effects, the outcomes obtained from the Pooled OLS test are inconsistent³². To choose between Fixed and Random Effects, the Hausman test is applied. According to the Hausman test, when the null hypothesis (H₀) is rejected ($p < 0.05$), the results obtained from the Fixed Effects test are considered²⁶.

Table 6. Diagnostic tests

Autocorrelation Test	Modified Bhargava et al. Durbin-Watson =0.3245892 Baltagi-Wu LBI=0.74054062
Variance Test	Modified Wald Test/Chi2=2543.79 Prob>chi2= 0.000
Cross-Section Dependence Test	CD Test: CD Testi/P değeri ln_Antidepdose=42.97/0.000 ln_Yagedept=10.394/0.000 ln_Oldagedept=53.122/0.000 ln_Gdp=51.134/0.000 ln_Alcohol=16.65/0.000 Unemploy=16.05/0.000 Urbanpop=41.86/0.000 Largacitypop=6.006/0.000

According to the information in Table 6, positive autocorrelation is observed based on the Durbin-Watson (0.3245892) and Baltagi-Wu LBI (0.74054062) tests. The modified Wald test indicates the presence of heteroscedasticity ($p < 0.05$). According to the CD (Cross-Sectional Dependence) test, the null hypothesis, which emphasizes cross-sectional dependence, is not rejected for all variables, indicating the existence of cross-sectional dependence. Based on the results of the preliminary tests conducted so far, autocorrelation, heteroscedasticity, and cross-sectional dependence are present. Due to the closeness of the number of units (N) to the time period (T), the results obtained from the Driscoll-Kraay (Fixed Effects) standard errors test are consistent and reliable^{29,30}.

Table 7. Driscoll-Kraay, Pooled OLS and PCSE methods

Variables	Driscoll-Kraay (Fixed Effects)	Driscoll-Kraay (Pooled OLS)	Prais-Winsten Heteroskedastic Panel Corrected Standard Errors
ln_Yagedept	-0.7099*** (0.1694)	0.0634 (0.0948)	-0.2319 (0.3187)
ln_Oldagedept	0.5217*** (0.0752)	-0.2113*** (0.0563)	0.1713 (0.1810)
ln_Gdp	0.6546*** (0.0568)	1.0372*** (0.1032)	0.5706*** (0.0857)
ln_Alcohol	0.3075*** (0.0724)	0.0376 (0.0611)	-0.0047 (0.0877)
Unemploy	0.0035 (0.0032)	0.0272*** (0.0034)	0.0070* (0.0040)

Urbanpop	-0.0139*** (0.0042)	0.0104*** (0.0015)	0.0175*** (0.0048)
Largacitypop	0.0365*** (0.0114)	0.0081*** (0.0006)	0.0075 (0.0052)
Constant	-2.4910* (1.2071)	-7.7614*** (0.8225)	-3.3463** (1.3957)
P Value	0.0000	0.0000	0.0000
R Square	0.6899	0.4456	0.9423
The variable 'Antideptdose' has been taken as the dependent variable in the model.			

According to the findings presented in Table 7, the 20 and Under Young Dependent Population (ln_Yagedept), the 65 and Over Elderly Dependent Population (ln_Oldagedept), Income (ln_Gdp), Alcohol (ln_Alcohol), Urban Population (Urbanpop), and Population in the Largest City (Largacitypop) significantly affect the antidepressant use ($P < 0.05$). Specifically, if the 20 and Under Young Dependent Population (ln_Yagedept) increases by 1%, the antidepressant (ln_Antideptdose) use decreases by 70%. If the 65 and Over Elderly Dependent Population (ln_Oldagedept) increases by 1%, the antidepressant (ln_Antideptdose) use increases by 52%. If income (ln_Gdp) increases by 1%, antidepressant (ln_Antideptdose) use increases by approximately 65%. Similarly, if alcohol (ln_Alcohol) consumption increases by 1%, antidepressant (ln_Antideptdose) use increases by 30%. If urban population (Urbanpop) increases by 1%, antidepressant (ln_Antideptdose) use decreases by approximately 1.4%, while if the population in the largest city (Largacitypop) increases by 1%, antidepressant (ln_Antideptdose) use increases by approximately 3%.

Discussion

This study investigates the relationship between antidepressant use and economic, demographic, and socio-cultural factors by employing panel data from OECD countries for the period 2008–2021. The results emphasize that antidepressant use varies depending on multiple determinants across both countries and time. The empirical findings indicate that demographic structure plays a significant role in shaping patterns of antidepressant use. In particular, an increase in the proportion of the dependent population aged 20 years and under is associated with a reduction in antidepressant use. This association may reflect lower rates of diagnosed depression among younger populations or more restricted access to psychiatric medications. These explanations are regarded as potential reasons for the reduction in antidepressant use rather than being directly tested within the scope of the present study. However, studies conducted in the United States and Australia emphasize that antidepressant use is relatively high among adult populations. In the United States, recent evidence indicates that antidepressant use among adults aged 18 years and older has increased, with slightly higher rates observed among adult women³³. Similarly, in Australia, antidepressant use is higher among women than among men, as women are more frequently exposed to anxiety and depression³⁴. These findings indicate that antidepressant use varies across age groups

and population subgroups. In contrast, the findings of the study indicate that the increase in the elderly dependent population (aged 65 and over) has positively impacted the use of antidepressants. Studies in the literature also support this finding¹⁹. It is thought that older people are more vulnerable to psychiatric problems like depression and anxiety due to feelings of loneliness. Some antidepressants have anticholinergic effects. A study conducted in the UK found that the use of anticholinergic drugs among the elderly has doubled in the last 20 years³⁵. Socioeconomic factors also have a substantial effect on antidepressant use. There is a link between higher income levels and antidepressant use. This relationship may be explained by the fact that individuals in higher-income groups have faster access to healthcare services, greater health awareness, and a higher tendency to seek psychiatric treatment. The findings of the present study are also supported by evidence from Korea, indicating that antidepressant use is lower in low-income countries compared to high-income countries³⁶. This finding suggests that antidepressant use may reflect both underlying psychological needs and inequalities in access to healthcare services. The analysis reveals a positive association between alcohol consumption and antidepressant use, indicating that higher alcohol consumption is linked to higher antidepressant dosage. This association may suggest a co-occurrence of alcohol consumption and mental health problems; however, the direction of this relationship remains complex, as it is unclear whether alcohol consumption leads to antidepressant use or whether antidepressant use is associated with higher alcohol consumption. Chavarria et al. (2021) report that individuals who consume alcohol exhibit higher rates of antidepressant use compared to non-drinkers in Canada. Antidepressant use has been observed to be more prevalent among women than among men¹⁷. Individuals with alcohol dependence may be at a higher risk of depression, which could, in turn, be associated with increased use of psychiatric medications. According to other findings of the study, as urban population increases, antidepressant consumption slightly decreases, whereas the population growth in the largest city increases antidepressant use. Therefore, while the general increase in urban population creates advantages, it can create disadvantages for overcrowded cities. The intense work pace, stress, social exclusion, and competitive environment in large cities can increase depression levels. This situation is supported by studies in the literature. In a study conducted by Xu et al. (2023) on developed countries, it was emphasized that the increase in urban population is a significant factor driving antidepressant consumption. In contrast, the opposite effect was observed in developing countries. In other words, the growth of urban population led to a decrease in antidepressant use³⁷. According to a study by Dost et al. (2018), people living in rural areas believe that antidepressant use is unnecessary, but it is emphasized that the main reason for antidepressant use is doctor recommendations³⁸. On the other hand, the general increase in urban population, compared to rural areas, is highlighted as reducing depression risk due to easier access to healthcare services and greater social support opportunities in cities. Existing literature indicates a potential association between antidepressant use in rural and urban populations and countries' levels of development. This study has several limitations. The first limitation is that the data obtained from the countries included in the analysis focus on general health indicators over a specific time period; therefore, it does not reflect individual-level inferences regarding antidepressant use. The second limitation is that

diagnostic practices, healthcare system mechanisms across countries, and societal perceptions of mental health cannot be directly observed. Third, although the Driscoll–Kraay estimator accounts for heteroskedasticity, autocorrelation, and cross-sectional dependence, causal inferences remain contingent upon the underlying model assumptions. Despite these limitations, the study contributes to the literature by examining how demographic, socioeconomic, and urbanization-related factors are associated with antidepressant use across OECD countries.

Conclusion and Recommendations

The aim of the study is to examine the impact of economic, demographic, and socio-cultural factors on antidepressant consumption. Antidepressant use has significantly increased in recent years. The primary motivation of this research is to identify the underlying causes of antidepressant consumption within a cause-and-effect relationship. The data used in this study are panel data obtained from the OECD and the World Bank. The data for 21 OECD countries covers the period from 2008 to 2021. Reliable results were obtained using the Driscoll-Kraay (Fixed Effects) standard errors estimator, one of the methods of panel data analysis. According to the findings, the increase in the dependent population under the age of 20 and the population of individuals in urban areas reduces antidepressant consumption, while the increase in the elderly dependent population (aged 65 and above), household income, alcohol consumption, and the population growth in the largest cities of the countries included in the study significantly increases antidepressant use. Specifically, the increase in the proportion of the dependent population under 20 years of age significantly reduces antidepressant use, while antidepressant consumption is found to be high in the elderly dependent population. In conclusion, lower levels of antidepressant consumption among individuals under the age of 20 may reflect lower diagnosed depression rates or more limited access to psychiatric medications; nevertheless, these hypotheses cannot be directly examined within the scope of the present study. The presence of chronic diseases in the elderly dependent population may increase susceptibility to psychological issues such as depression and anxiety. People with higher income levels have better access to healthcare services, and it can be assumed that awareness of mental health disorders is higher among them. Access to psychiatric services should be facilitated for disadvantaged individuals. Policies should be developed considering the relationship between alcohol consumption and mental health. In particular, the overcrowded population in mega-cities should be supported by social support mechanisms.

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The Relationship between Pain, Sleep, and Nutrition During the Premenstrual, Menstrual, and Postmenstrual Phases in Women of Reproductive Age*

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Abstract

Aim: The aim of this study was to investigate the relationship between pain, sleep, and nutrition during the premenstrual, menstrual, and postmenstrual phases in women of reproductive age.

Method: This descriptive and cross-sectional study was conducted with 250 women aged 19-40 years. Data were collected using a demographic questionnaire, the Sleep Quality Scale, the Premenstrual Symptoms Coping Scale, dietary records, and the Visual Analog Scale. Data were obtained at three stages: premenstrual, menstrual, and postmenstrual. Statistical analyses were performed using SPSS 24.

Results: This rates of appetite increase were found to be 55.6% in the premenstrual phase, 45.6% in the menstrual phase, and 16.0% in the postmenstrual phase. Single women had significantly lower sleep quality scale scores and higher visual analogue scale scores in the menstrual phase compared to married women ($p<0.05$). Menstrual cycle length and duration were found to have statistically significant effects on visual analogue scale and sleep quality scale scores ($p<0.05$). Energy, carbohydrate, fiber intake were higher during the premenstrual phase compared to other phases ($p<0.05$).

Conclusion: The severity of pain in the menstrual phase may affect sleep quality and lead to changes in appetite and food consumption.

Keywords: Menstruation, nutrition, pain, premenstrual syndrome, sleep.

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ETHICAL STATEMENT: The study was approved by the Health Sciences Ethics Committee of Ankara Yıldırım Beyazıt University, under approval number 09-424, dated 23/11/2023. Each participant signed a Voluntary Consent Form, and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Üreme Çağındaki Kadınlarda Menstrüel Dönem Öncesi, Sırası ve Sonrası Ağrı ve Uyku ile Beslenme Arasındaki İlişkinin Değerlendirilmesi

Öz

Amaç: Bu çalışmanın amacı, üreme çağındaki kadınlarda menstrüel dönem öncesi, sırası ve sonrası ağrı, uyku ve beslenme arasındaki ilişkiyi incelemektir.

Yöntem: Bu tanımlayıcı ve kesitsel çalışma, 19-40 yaş arası 250 kadın üzerinde gerçekleştirilmiştir. Veriler, demografik anket, Uyku Kalitesi Ölçeği, Premenstrüel Semptomlarla Baş Etme Ölçeği, Besin Tüketim Kaydı ve Vizüel Analog Skala ile toplanmıştır. Kadınlardan menstrüasyon öncesi, sırası ve sonrası olmak üzere üç aşamada veriler alınmıştır. İstatistiksel analizlerde SPSS 24 kullanılmıştır.

Bulgular: Katılımcıların premenstrüel dönemde iştah artışı oranı %55.6, menstrüel dönemde %45.6, postmenstrüel dönemde ise %16.0 olarak saptanmıştır. Bekar kadınların menstrüel dönemde uyku puanları evli kadınlara göre anlamlı derecede düşük, ağrı skorları ise daha yüksek bulunmuştur ($p<0.05$). Menstrüasyon sıklığı ve süresinin ağrı ve uyku ölçek puanları üzerinde istatistiksel olarak anlamlı etkileri görülmüştür ($p<0.05$). Premenstrüel dönemde enerji, karbonhidrat ve posa alımı, diğer dönemlere göre daha yüksek bulunmuştur ($p<0.05$).

Sonuç: Menstrüel dönemde ağrı şiddetinin uyku kalitesini etkileyebileceği, iştah ve besin tüketiminde değişikliklerin yapabileceği belirlenmiştir.

Anahtar Sözcükler: Menstrüasyon, beslenme, ağrı, premenstrüel sendrom, uyku.

Introduction

Menstruation is a physiological process characterized by the periodic shedding and expulsion of the endometrial layer in the lining of the uterus in women of reproductive age¹. The menstrual cycle is repeated approximately every 28 days, although it varies for each individual, and its normal range can vary between 21 and 35 days¹. While environmental conditions, heat, light, stress, and nutrition affect hormone secretion, hormones also cause various changes in the body. Hormonal changes in the menstrual cycle can lead to problems such as anxiety, irritability, depressive mood, sudden mood swings, sleep disturbances, fatigue, changes in sexual desire, breast swelling and tenderness, weight gain, headaches, appetite changes, general body aches, and edema in many women².

Dysmenorrhea, also known as menstrual pain, is a condition associated with various physical symptoms that begin a few hours before or after menstruation and usually last for 24 to 48 hours³. This condition is characterized by common symptoms such as cramping, lower abdominal pain, and low back pain⁴. In a study, it has been found that pain experienced in the menstrual phase in women of reproductive age affects the quality of life and decreases sleep quality⁵. Various dietary factors can reduce the severity of menstrual pain or minimize the risk factor^{6,7}. In one study, it was reported that a reduced-fat, vegetable-based diet during the menstrual cycle decreased estrogen and progesterone levels and reduced fluid retention. The positive effects of such a diet on dysmenorrhea were emphasized⁶. Nagata et al. found that the consumption of fibrous

foods significantly reduced menstrual pain by lowering estrogen levels and regulating bowel movements⁸. Additionally, fibrous foods have been found to be effective in alleviating the severity of dysmenorrhea by partially reducing fat and sugar absorption⁸. Some studies have shown that a low-fat vegetarian diet reduces symptoms, and a diet rich in vitamin E can reduce the severity of menstrual pain^{6,7}. Studies have shown that oral intake of 1200 mg of calcium daily can significantly reduce menstrual pain and fluid retention⁷.

Sleep is one of the factors that may change across different phases of the menstrual cycle in women. Estrogen and progesterone receptors in the basal forebrain, locus coeruleus, dorsal raphe nuclei, and hypothalamus, where sleep is regulated, along with hormonal fluctuations occurring during the menstrual cycle, play important roles in affecting sleep patterns⁹. Especially in the premenstrual phase, sleep interruption and decreased sleep quality are among the most frequently encountered problems. This is thought to result from factors such as pain, physical complaints, increased internal temperature due to the release of progesterone before menstruation, and mood disturbances¹⁰. The literature shows that sleep quality decreases in women during menstruation and that there are interruptions in the frequency of sleep¹¹⁻¹³. It has been observed that sleep problems are more common in the female population, and women's sleep quality may be worse compared to men¹⁴. Significant fluctuations in estrogen and progesterone hormone levels occur during the menstrual cycle, and these fluctuations can affect sleep patterns during the luteal phase. An increase in progesterone occurs, and this increase is associated with higher body temperature, which may indirectly make it difficult for some women to fall asleep comfortably. High progesterone levels also affect neurotransmitters such as serotonin and gamma-aminobutyric acid, which play an active role in sleep regulation, and the changes caused by these effects may lead to disturbances in sleep quality¹⁵.

Food consumption is influenced by neurochemical, hormonal, psychological, and physiological factors. There are significant differences in appetite and energy intake in women during the menstrual cycle¹⁶. According to the results of a study, the increase in estrogen and progesterone hormones before menstruation compared to after menstruation suggests that progesterone may increase food consumption by interacting with estrogen. For this reason, it has been found that women experience a significant increase in appetite before menstruation, and this increase is more common in individuals with premenstrual syndrome¹⁷. During the ovulation phase, it was found that there was a decrease in portion sizes and a preference for consuming sweet foods rather than an increase in eating frequency¹⁸.

Based on the existing literature and the aim of the present study, it was hypothesized that pain severity differs across the premenstrual, menstrual, and postmenstrual phases in women of reproductive age (H1) and that sleep quality also varies significantly across these menstrual cycle phases (H2). It was further hypothesized that energy and macronutrient intake, particularly carbohydrate intake, differ between the premenstrual, menstrual, and postmenstrual phases (H3). Additionally, increased pain severity during the menstrual phase was expected to be associated with decreased sleep quality (H4),

and changes in pain severity and sleep quality were assumed to be associated with alterations in appetite and dietary intake across the menstrual cycle (H5). The aim of this study was to examine the relationship between pain, sleep, and nutrition during the premenstrual, menstrual, and postmenstrual phases in women of reproductive age. With the data obtained from this study, more effective interventions for women's menstrual health problems can be developed, and social awareness can be increased.

Material and Methods

This descriptive and cross-sectional study was conducted between 15 January and 15 April 2024 in Ankara, Türkiye, and included participants aged 19-40 years. The exclusion criteria were as follows: menopausal women, pregnant women, women with PCOS, women taking birth control pills, women with menstrual cycle irregularities, women with any chronic disease, women with psychiatric or neurological disorders diagnosed by a doctor (such as dementia or Alzheimer's disease), and women with alcohol or substance abuse. The minimum sample size was calculated using G-Power 3.1 as 93 participants, with a 5% margin of error and 80% statistical power. Initially, 295 participants were recruited, but those with missing anthropometric, demographic, or dietary data were excluded, resulting in a final sample size of 250.

Data Collection Tools

The questionnaire included questions about participants' age, gender, educational level, marital status, comorbidities, medication use, physical functioning, oral and dental health, and dietary habits. Dietary intake was assessed using the 24-hour dietary recall method, in which participants reported all foods and beverages consumed on the previous day. All measurements were obtained from the same participants during the premenstrual, menstrual, and postmenstrual phases. Thus, each participant was followed longitudinally across three menstrual cycle phases. The study was conducted in three phases:

Phase 1: Pre-menstrual phase (maximum interval of 4 days to 1 day before menstruation): During this phase, participants completed the Demographic Structure Questionnaire, the Coping with Premenstrual Symptoms Scale, the Sleep Quality Scale, the Visual Analogue Scale, and a daily food consumption record.

Phase 2: Menstrual phase: During this phase, the Sleep Quality Scale, the Visual Analogue Scale, and a one-day food consumption record were applied to the participants.

Phase 3: Postmenstrual phase (at least 1 week later): During this phase, the Sleep Quality Scale and a one-day food consumption record were applied to the participants.

Demographic Structure Questionnaire: The demographic structure questionnaire consisted of a total of 19 questions designed to obtain information about

the menstrual phase, including questions on age, body weight, height, educational status, marital status, age at menarche, and the menstrual duration.

Height (cm) and body weight (kg) were measured by the researchers. Measurements were taken while the participants were standing upright, looking straight ahead, with the top of the ears and the outer corner of the eyes aligned in a parallel plane (Frankfort Plane)¹⁹. Body weight, height, and BMI values were calculated using the following formula: $\text{Weight (kg)} / \text{height (m)}^2$ and classified according to WHO criteria.

Sleep Quality Scale: Sleep Quality Scale (SQS) was used to assess the sleep quality of women of reproductive age in all menstrual phases. It was developed by Van den Wittenboer and Meijer in 2004 and consists of 7 questions. The questions have 3 response options, and results are scored in the range of 7-21 points²⁰. The validity and reliability of the scale in Türkiye were evaluated by Önder and colleagues (Cronbach's alpha: 0.72)²¹. As the score on the scale increases, sleep quality improves. In the present study, the Cronbach's alpha coefficient of the Sleep Quality Scale during the premenstrual phase was found to be 0.780.

Premenstrual Change Coping Inventory: Premenstrual Change Coping Inventory (PCCI) was developed by Kaiser et al. in 2017 to assess women's coping methods during the premenstrual phase. It consists of 17 items and three sub-dimensions: 'Seeking Positive Influencing Behaviours,' 'Seeking Support,' and 'Health Care Utilisation Behaviour.' The items are answered using a 4-point Likert scale, and a score between 17 and 68 points can be obtained from the scale²². Its validity and reliability in Türkiye were assessed by Sarı Çetin and Erbil (Cronbach's alpha: 0.78)²³. In this study, the Cronbach's alpha coefficient of the Premenstrual Change Coping Inventory during the premenstrual phase was found to be 0.849.

Food Consumption Record: In order to determine the energy and nutrient intakes of the individuals, 24-hour food consumption records were collected during all three phases. The types and amounts of nutrients in foods and beverages prepared at home were recorded on the food consumption form, and standardized recipes were used as references for foods consumed outside the home. After determining the amounts of food consumed, the daily energy and nutrient intakes of individuals were assessed on a daily and meal basis (breakfast, lunch, dinner, and three snacks) using the Turkey-specific Computer-Assisted Nutrition Programme (BeBIS) (BeBiS 9, Ebispro for Windows; Pasifik Elektrik Elektronik Ltd. Şti., Istanbul, Türkiye, 2021)²⁴. The 24-hour dietary recalls were collected retrospectively through face-to-face interviews conducted by the researchers during each phase.

Visual Analogue Scale (VAS): The Visual Analogue Scale (VAS) is a widely used instrument for measuring pain intensity. This scale allows individuals to rate their pain on a scale from 0 (no pain) to 10 (excruciating pain). It usually consists of a 10 cm long horizontal or vertical line, and subjects indicate their pain levels by marking their position on this line²⁵.

Ethical Statement

The study was conducted in accordance with the principles of the Declaration of Helsinki, and ethical approval was obtained from the Ankara Yıldırım Beyazıt University Health Sciences Ethics Committee (approval date: 23 November 2023; decision number: 09-424). Informed consent was obtained from all participants before participation.

Data Evaluation

Statistical analyses were conducted using IBM SPSS Statistics 24. The Independent Samples t-test and Mann-Whitney U test were used for comparing two independent groups with and without normal distribution, respectively. ANOVA and Kruskal-Wallis H tests were applied for three or more groups based on distribution. The Friedman test was used to compare energy and nutrient intakes across the premenstrual, menstrual, and postmenstrual phases, as measurements were obtained from the same participants. Pearson and Spearman correlation coefficients assessed relationships between quantitative variables depending on normality. Logistic regression analysis was used to assess the factors affecting severe pain in women. Pain intensity was determined based on the VAS score obtained in the menstrual phase. Statistical significance was accepted as 0.05.

Result

The mean age of the individuals participating in the study was 25.81±5.84 years, and their BMI values were 23.2±4.16 kg/m². A total of 141 women (56.4%) reported that the duration of their menstruation was between 2-6 days. Among the participants, 45.6% stated that their appetite increased in menstrual phase, 55.6% during the premenstrual phase, and 16.0% during the postmenstrual phase (Table 1).

Table 1. Anthropometric and demographic characteristics of the participants.

		n	X± SS
Age (year)		250	25.81±5.84
Weight (kg)		250	61.67±11.51
BMI (kg/m²)		250	23.2±4.16
		n	%
Marital status	Married	181	72.4
	Single	69	27.6
Age at menarche	≤ 12 (y)	118	47.2
	≥ 13 (y)	132	52.8
Menstrual cycle length	≤ 27 days	122	48.8
	≥ 28 days	128	51.2
Menstrual duration	2-6 days	141	56.4
	≥ 7 days	109	43.6
Appetite in the premenstrual phase	Increases	139	55.6

	Decreases	20	8.0
	Remains unchanged	91	36.4
Appetite in the menstrual phase	Increases	114	45.6
	Decreases	56	22.4
	Remains unchanged	80	32.0
Appetite in the postmen. phase	Increases	40	16.0
	Decreases	34	13.6
	Remains unchanged	176	70.4
Sleep duration in the premenstrual phase	< 8 hours	167	66.8
	≥ 8 hours	83	33.2
Sleep duration in the menstrual phase	<8 hours	156	62.4
	≥8 hours	94	37.6
Sleep duration in the postmenstrual phase	<8 hours	167	66.8
	≥8 hours	83	33.2

BMI: Body mass index

The menstrual VAS score of single individuals was found to be statistically higher than that of married individuals ($p<0.05$). The premenstrual (3.7 ± 2.7) and postmenstrual (2.0 ± 2.4) VAS scores of women with a menstrual cycle length of 27 days or fewer were higher than those with a length of 28 days or more ($p<0.05$). The SQS score before, during, and after menstruation was significantly lower in women with severe pain in the menstrual phase compared to those in other phases. In women with mild pain during menstruation, the postmenstrual phase VAS score was significantly lower than in the other groups. Among the female participants, the SQS score during menstruation was found to be significantly lower in single women ($p<0.05$) (Table 2). In analyses comparing groups according to marital status (Table 2), menstrual pain intensity was higher and sleep quality during menstruation was lower in single women. However, in the multivariate logistic regression model including BMI, marital status, menstrual cycle length, and menstrual duration, only marital status remained a significant independent predictor of severe menstrual pain (Table 5).

Table 2. PCCI, SQS and VAS scores of the participants according to demographic and menstrual status variables

		PCCI		Premen. phase SQS		Men. phase SQS		Postmen. phase SQS		Premen. Phase VAS		Men. phase VAS	
		X $\pm$ SS	p*	X $\pm$ SS	p*	X $\pm$ SS	p*	X $\pm$ SS	p*	X $\pm$ SS	p*	X $\pm$ SS	p*
BMI (kg/m²)	UW	45.9 $\pm$ 9.5	0.082**	14.9 $\pm$ 2.0	0.430**	13.9 $\pm$ 1.8	0.691**	14.3 $\pm$ 1.5	0.250**	4.1 $\pm$ 3.2	0.355**	5.8 $\pm$ 3.3	0.055**
	Normal	46.8 $\pm$ 9.2		15.0 $\pm$ 2.5		14.2 $\pm$ 4.0		15.0 $\pm$ 2.7		3.1 $\pm$ 2.8		5.4 $\pm$ 3.1	
	OW/obese	44 $\pm$ 8.2		14.5 $\pm$ 2.8		13.7 $\pm$ 2.8		14.7 $\pm$ 2.4		3.3 $\pm$ 2.6		4.4 $\pm$ 3.3	
	Total	45.9 $\pm$ 9.0		14.9 $\pm$ 2.6		14.0 $\pm$ 3.6		14.9 $\pm$ 2.5		3.3 $\pm$ 2.8		5.1 $\pm$ 3.2	
Marital status	Single	46.3 $\pm$ 9.2	0.289*	14.8 $\pm$ 2.5	0.437*	13.7 $\pm$ 2.9	0.035*	14.8 $\pm$ 2.6	0.198*	3.4 $\pm$ 2.7	0.067*	5.6 $\pm$ 3.0	<0.001*
	Married	45.0 $\pm$ 8.7		14.9 $\pm$ 2.7		15.0 $\pm$ 4.8		15.1 $\pm$ 2.4		2.8 $\pm$ 2.8		3.9 $\pm$ 3.3	
Men. cycle length	$\leq$ 27 days	46.0 $\pm$ 8.3	0.863*	14.8 $\pm$ 2.4	0.480*	14.1 $\pm$ 4.0	0.863*	14.7 $\pm$ 2.2	0.207*	3.7 $\pm$ 2.7	0.007*	5.3 $\pm$ 2.9	0.588*
	$\geq$ 28 days	45.8 $\pm$ 9.7		15.0 $\pm$ 2.8		14.0 $\pm$ 3.1		15.0 $\pm$ 2.8		2.9 $\pm$ 2.8		5.0 $\pm$ 3.4	
Men. duration	2-6 days	46.5 $\pm$ 9.6	0.281*	14.8 $\pm$ 2.5	0.768*	13.7 $\pm$ 2.5	0.165*	14.8 $\pm$ 2.3	0.485*	3.7 $\pm$ 2.8	0.009*	5.5 $\pm$ 3.0	0.029*
	$\geq$ 7 days	45.2 $\pm$ 8.2		14.9 $\pm$ 2.7		14.5 $\pm$ 4.5		15.0 $\pm$ 2.8		2.8 $\pm$ 2.6		4.6 $\pm$ 3.3	
Men. phase VAS	Mild ¹	45.4 $\pm$ 9.9	0.338**	15.3 $\pm$ 2.5	0.004** [3-1.2]	15.4 $\pm$ 4.5	<0.001** [3-1.2]	15.5 $\pm$ 2.4	0.001** [3-1.2]	1.5 $\pm$ 2.3	<0.001** [1-2.3]	1.0 $\pm$ 1.2	<0.001** [1-2.3]
	Moderate ²	47.0 $\pm$ 9.5		15.1 $\pm$ 2.5		14.2 $\pm$ 2.7		15.0 $\pm$ 2.5		3.3 $\pm$ 2.2		5.9 $\pm$ 1.0	
	Severe ³	45.1 $\pm$ 7.2		14.0 $\pm$ 2.6		12.3 $\pm$ 2.7		14.0 $\pm$ 2.5		5.2 $\pm$ 2.8		8.6 $\pm$ 0.8	
Regular physical activity	Yes	45.7 $\pm$ 9.0	0.441*	14.8 $\pm$ 2.5	0.629*	14.1 $\pm$ 3.8	0.843*	14.9 $\pm$ 2.5	0.769*	3.2 $\pm$ 2.7	0.887*	5.3 $\pm$ 3.1	0.338*
	No	46.6 $\pm$ 8.9		15.0 $\pm$ 2.7		13.8 $\pm$ 3.0		14.9 $\pm$ 2.6		3.3 $\pm$ 2.8		4.8 $\pm$ 3.4	

Independent Samples T-Test ## One-way ANOVA * Mann-Whitney U test

** Kruskal-Wallis test UW: Underweight, OW: Overweight, BMI: Body mass index, Men.: Menstrual, PCCI: Premenstrual change coping inventory, VAS: Visual analogue scale

Energy intake of women in premenstrual phase was 1779 $\pm$ 861.7 kcal, 1609.6 $\pm$ 625.3 kcal in menstrual phase, and 1559.4 $\pm$ 89.1 kcal in postmenstrual phase (p<0.05). Carbohydrate intake was 186.3 $\pm$ 96.5 g before the menstrual phase, 172.8 $\pm$ 73.1 g in menstrual phase, and 162.1 $\pm$ 7.1 g in postmenstrual phase (p<0.05). The amounts of fiber, vitamin B1, vitamin B3, folate, and magnesium were found to be higher in women in premenstrual phase compared to other phases. No significant differences were found in other nutrients evaluated.

Table 3. Macro and micronutrient intakes of participants before, during, and after the menstrual phase

	Premenstrual phase	Menstrual phase	Postmenstrual phase	
	X $\pm$ SS	X $\pm$ SS	X $\pm$ SS	p*
Energy (cal)	1779 $\pm$ 861.7	1609.6 $\pm$ 625.3	1559.4 $\pm$ 589.1	0.006
Carbohydrate (g)	186.3 $\pm$ 96.5	172.8 $\pm$ 73.1	162.1 $\pm$ 70.1	0.001
Carbohydrate (%)	43.4 $\pm$ 9.3	44.4 $\pm$ 9.5	42.9 $\pm$ 8.6	0.123
Protein (g)	67.8 $\pm$ 33.1	62.7 $\pm$ 33	60.4 $\pm$ 25.2	0.058
Protein (%)	16.0 $\pm$ 4.8	16.1 $\pm$ 5.1	16.2 $\pm$ 4.3	0.434
Fat (%)	47.5 $\pm$ 21.7	48 $\pm$ 26.1	45.4 $\pm$ 16.4	0.228
Fiber (g)	23.9 $\pm$ 14.3	21.5 $\pm$ 13.1	21.9 $\pm$ 12.9	0.002
Cholesterol (mg)	327.7 $\pm$ 289.3	294.5 $\pm$ 271.8	295.7 $\pm$ 258.1	0.662
Vitamin B1 (mg)	0.9 $\pm$ 0.6	0.8 $\pm$ 0.5	0.8 $\pm$ 0.4	0.011
Vitamin B2 (mg)	1.3 $\pm$ 0.7	1.2 $\pm$ 0.6	1.2 $\pm$ 0.6	0.428
Vitamin B3 (mg)	15.3 $\pm$ 11.4	12.7 $\pm$ 9.8	11.8 $\pm$ 7.3	0.002
Vitamin B12 (µg)	4.2 $\pm$ 5.8	4.1 $\pm$ 4.5	4.6 $\pm$ 6.4	0.919
Folate (µg)	296.5 $\pm$ 205.4	267.8 $\pm$ 191.2	265.7 $\pm$ 160.9	0.009

Potassium (mg)	2328.7±1106.9	2124.2±957.4	2156.6±901.3	0.434
Calcium (mg)	611.8±258.3	575.4±258.3	604.5±268.7	0.463
Magnesium (mg)	273.2±159.6	244.2±124.4	244.1±119.3	0.043
Phosphorus (mg)	1097.7±548	989.7±448.3	971.4±410.2	0.232
Iron (mg)	10.2±5.7	9.5±5.0	9.4±4.7	0.412

* *Friedman test*

A statistically significant positive correlation was found between premenstrual sleep score and during ($r=0.695$, $p<0.001$) and postmenstrual ($r=0.800$, $p<0.001$) VAS scores. A statistically significant negative correlation was found between premenstrual ($r=-0.148$, $p=0.019$) and during ($r=-0.199$, $p=0.002$) VAS scores. A negative and statistically significant relationship was found between VAS scores during menstruation and sleep scores before, during, and after menstruation (Table 4).

Table 4. The relationship between the PCCI the relationship between pcci, sqs and vas scores of women

		PCCI	Premen. Phase SQS	Men. phase SQS	Postmen. Phase SQS	Premen. Phase VAS	Men. Phase VAS
PCCI	r	1					
	p	.					
Premen. phase SQS	r	0.074	1				
	p	0.246	.				
Men. Phase SQS	r	0.119	.695	1			
	p	0.059	<0.001	.			
Postmen. phase SQS	r	0.088	.800	.704	1		
	p	0.165	<0.001	<0.001	.		
Premen. phase VAS	r	-0.096	-.148	-0.113	-.126	1	
	p	0.128	0.019	0.074	0.047	.	
Men. phase VAS	r	-0.025	-.199	-.424	-.245	.530	1
	p	0.693	0.002	<0.001	<0.001	<0.001	.

Men: Menstrual; PCCI: Premenstrual change coping inventory; VAS: Visual analogue scale

BMI, marital status, menstrual cycle length, and menstrual duration were included in the logistic regression model examining factors associated with severe pain in women. Marital status was found to be a significant factor, and married women had 2.242 times higher odds of experiencing severe pain compared to single women. No statistically significant associations were observed for the other variables (Table 5).

Table 5. Logistic regression analysis of factors affecting severe pain[#] in women.

	B	Wald	Sig.	OR	95% C.I. for EXP(B)	
					Lower	Upper
BMI (kg/m²)						
Underweight		.076	.963			
Normal	-.061	.011	.918	.941	.296	2.995
Overweight/obese	.061	.032	.859	1.062	.545	2.070
Marital status (Married)	.807	5.725	.017*	2.242	1.157	4.343
Men. cycle length (≤27 days)	.316	1.202	.273	1.372	.780	2.414
Men. duration (2-6 days)	.538	3.605	.058	1.712	.983	2.983
Constant	.570	7.640	.006	1.768		

[#]Pain intensity was determined based on the VAS score obtained in the menstrual phase. Reference categories were: underweight for BMI, single for marital status, ≥28 days for menstrual cycle length, and ≥7 days for menstrual duration. BMI: Body Mass Index, Men: Menstrual *p<0.05

Discussion

This study aimed to examine changes in dietary intake, menstrual pain intensity, and sleep quality across different phases of the menstrual cycle in women of reproductive age. Given the potential impact of menstrual pain and sleep disturbances on daily functioning and quality of life, evaluating these factors together is of clinical and public health importance. The findings indicate that energy and carbohydrate intake were higher during the premenstrual phase, menstrual pain intensity was negatively associated with sleep quality across all phases, and marital status was associated with severe menstrual pain in multivariate analysis. These results underscore the importance of considering menstrual phase-specific variations and individual characteristics when evaluating pain, sleep quality, and nutritional behaviors in women.

Menarche, or the age of first menstruation, is considered a turning point in women's lives as it marks the onset of reproductive capacity²⁶. In this study, the proportion of women with an age at menarche of 13 years or older was found to be higher (52.8%). In other studies conducted in our country, the mean age at menarche was reported to vary between 13.1 and 13.4 years^{27,28}. This suggests that the age at menarche of the women in the present study falls within normal limits.

In this study, it was found that the majority of participants (56.4%) had menstruation duration lasting between 2-6 days. Similarly, in Kaykaç's study in 2018, it was found that

the majority of participants had a menstruation duration of 3-6 days²⁹. Among the women in this study, the proportion (51.2%) who reported menstruating every 28 days or more was higher. In Özkarslı's study examining the relationship between hedonic hunger and the menstrual cycle, the majority of participants had a menstrual cycle of 21-27 days³⁰. Excluding some conditions that are considered specific, the literature generally considers a menstrual cycle between 21-35 days, a menstrual duration between 2-7 days, and age at menarche under 15 years.

Significant differences in appetite and energy intake occur in women during the menstrual cycle. Appetite, defined as the desire for food with pleasure, can be influenced by many factors. One study states that a significant increase in appetite is experienced by women in the premenstrual phase, and this increase is encountered at higher rates, especially in individuals with premenstrual syndrome³¹. A study conducted in 2020 to determine changes in appetite and eating desires during the menstrual cycle in students concluded that the rate of appetite increase in the premenstrual phase (85.8%) was higher than in the menstrual phase (40.2%) and postmenstrual phase (3%)³². According to the results of this study, 55.6% of participants reported an increase in appetite during the premenstrual phase, which is higher than in the other two phases. These findings are consistent with previous studies and suggest that appetite may vary according to menstrual phase. This variation may be related to hormonal fluctuations, particularly increases in progesterone levels during the premenstrual phase, which have been suggested to influence energy expenditure and appetite intake (potentially through progesterone-related increases in thermogenesis and alterations in hypothalamic appetite-regulating pathways, such as neuropeptide Y)³³⁻³⁵.

Different phases of the menstrual cycle play an important role in planning nutritional and physiological studies, as well as determining daily energy requirements for individuals in this group by assessing cyclic changes in energy intake and expenditure. According to a study conducted by Çengel, energy, carbohydrate, protein, fat, saturated fat, monounsaturated fat, and fiber intakes of women were found to be statistically higher in the premenstrual and menstrual phases compared to the postmenstrual phase³⁶. In other studies on similar topics, it was found that energy and carbohydrate intake increased during the premenstrual phase^{17,30}. In this study, in line with the literature, total energy, carbohydrate, and fiber intake before menstruation was found to be significantly higher than during and after menstruation ($p=0.015$). Fluctuations in the estrogen–progesterone balance, particularly increased progesterone in the premenstrual phase, may influence metabolic rate and appetite regulation, contributing to variations in energy and macronutrient intake^{34,35}. These results support the notion that menstrual phase–related hormonal changes may be associated with variations in dietary intake rather than indicating a direct causal effect.

In the study by Çengel, it was found that the values of vitamin A, vitamin B3, vitamin B6, and iron were statistically higher in women during the premenstrual phase compared to the postmenstrual phase³⁶. In a study conducted by Güngördü on 200 women with regular menstruation, it was determined that thiamine, riboflavin, folate, potassium,

calcium, magnesium, phosphorus, and iron intake was higher in the premenstrual phase compared to the normal phase. Specifically, potassium, phosphorus, vitamin B1, and vitamin B3 intakes were found to be statistically higher in the premenstrual phase³⁷. In this study, it was found that thiamine, niacin, folate, and magnesium intakes were significantly higher before menstruation (Table 3) ($p<0.05$). These findings are largely consistent with previous literature, suggesting phase-specific differences in micronutrient intake.

Common symptoms in the menstrual phase include low back, groin, and abdominal pain, excessive fatigue, tension, restlessness, changes in appetite, and sleep disorders. These symptoms can significantly affect the quality of life of individuals and impair their daily functionality³⁸. In a study conducted by Demir and colleagues, it was revealed that the severity of pain during this phase may increasingly contribute to the deterioration of sleep quality due to symptoms experienced in the menstrual phase¹². Şahin et al. reported that sleep quality deteriorated with increasing severity of dysmenorrhea, and this relationship was statistically significant¹³. Brown et al. examined the effects of the menstrual cycle on sleep, eating habits, and health behaviors, stating that improving sleep quality during menstruation had positive effects on health and could reduce the severity of pain³⁹. In this study, a statistically significant negative correlation was found between VAS and SQS scores in all menstrual phases, including the premenstrual, menstrual, and postmenstrual phases (Table 5). These correlation analyses indicate an association between pain severity and sleep quality rather than a direct causal relationship. Additionally, the lowest SQS score was observed in the group with severe VAS scores. While the SQS score in the menstruation phase was 12.3 ± 2.7 in the severe pain group, this score was 15.4 ± 4.5 in the mild pain group. Furthermore, the postmenstrual SQS score was 14 ± 2.5 in the severe pain group and 15.5 ± 2.4 in the mild pain group (Table 3) ($p<0.05$). These findings suggest that poorer sleep quality is associated with higher pain intensity during menstruation.

In this study, univariate analyses showed that marital status was associated with menstrual pain intensity and sleep quality during menstruation (Table 2). In the multivariate logistic regression model, marital status remained the only significant predictor of severe menstrual pain after adjustment for potential confounders (Table 6). Married women were 2.242 times more likely to experience severe pain than single women ($p=0.017$). Additionally, the VAS pain score of single women was found to be higher than that of married women ($p<0.05$) (Table 3). The apparent differences between univariate and multivariate findings highlight the importance of considering confounding factors when interpreting the relationship between marital status and menstrual pain. In the study by Farahmand et al., it was observed that married individuals experienced more premenstrual syndrome symptoms than single individuals⁴⁰. It was also noted that menstrual pain in married women was much less than in single and divorced women. Furthermore, single and divorced women were reported to experience more premenstrual syndrome than married women^{41,42}. The inconsistent findings across studies may be related to differences in study design, cultural factors, and sample characteristics.

This study has several limitations that should be considered when interpreting the results. First, the cross-sectional design does not allow for causal inferences regarding the relationships between menstrual pain, sleep quality, and dietary intake. Second, dietary intake and sleep quality were assessed using self-reported measures, which may be subject to recall bias. Third, the study sample consisted of a specific population, which may limit the generalizability of the findings.

Conclusion

In conclusion, this study found a correlation between pain levels and lower sleep quality in women. Additionally, appetite was higher during the premenstrual phase and lower during the postmenstrual phase. Such studies on menstrual health can contribute to the development of effective interventions for women's health issues and help raise social awareness. Based on these findings, increased education and awareness-raising activities regarding women's diet and sleep habits during menstrual phases are crucial. Future studies using longitudinal designs and objective assessment methods are recommended to better elucidate the relationships between menstrual pain, sleep quality, and dietary intake.

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The Effect of Nutrition Education on Nutritional Knowledge Levels of Parents of Children with Cerebral Palsy*

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Abstract

Aim: This study aimed to evaluate the effectiveness of a nutrition education program on the nutritional knowledge levels of parents/caregivers and to assess the nutritional status of children with cerebral palsy (CP).

Method: The study was conducted with 19 children aged 2–18 years with CP and their parents/caregivers. Height and weight were measured using knee height (KH) and mid-upper arm circumference (MUAC) measurements. To assess nutritional status, parents completed a questionnaire, and a 24-hour dietary recall was collected and evaluated using the BeBiS 8.2 program, with reference to the Turkish Dietary Guidelines (TÜBER, 2022). Risk of nutritional impairment was assessed using the Tool for Risk of Impaired Nutritional Status and Growth (STRONGkids), and swallowing function was assessed using The Pediatric Version of the Eating Assessment Tool (PEDI-EAT-10). Nutrition education was provided to parents, and a 20-question pre- and post-education test was administered to measure changes in knowledge levels. The education was delivered via video recording. Data were analyzed using descriptive statistics and non-parametric tests, with $p < 0.05$ considered statistically significant.

Results: The average age of the 19 children in the study was 7.9 ± 3.6 years, and 10.5% were classified as having severe thinness. According to TÜBER (2022), 63.2% of children had excessive energy and fat intake, while calcium, folic acid, and vitamin D intake were insufficient. The effectiveness of the nutrition education given to the parents was analyzed. The mean pre-test score was 15.5, while the mean post-test score increased to 18.0 ($p = 0.009$).

Conclusion: The nutrition education provided significantly increased parents' nutritional knowledge. Parents of children with CP require ongoing nutritional information and support. Therefore, nutrition

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ETHICAL STATEMENT: Ethics committee permission for the study was received from the Marmara University Ethical Committee (Date: 30/11/2023, Number: 2023/106), and the principles of the Declaration of Helsinki conducted the study.

education programs should be developed and implemented by multidisciplinary teams to meet the needs of these families.

Keywords: Cerebral palsy, child, nutritional status, nutrition education.

Beslenme Eğitiminin Serebral Palsili Çocukların Ebeveynlerinin Beslenme Bilgi Düzeyine Etkisi

Öz

Amaç: Bu çalışmanın amacı, beslenme eğitimi programının ebeveynlerin/bakım verenlerin beslenme bilgi düzeyi üzerindeki etkinliğini değerlendirmek ve serebral palsili (SP) çocukların beslenme durumunu değerlendirmektir.

Yöntem: Çalışma, serebral palsili 2–18 yaş arası 19 çocuk ve ebeveynleri/bakım verenleriyle yürütülmüştür. Boy uzunluğu ve vücut ağırlığı, diz yüksekliği ve üst orta kol çevresi ölçümleriyle belirlenmiştir. Beslenme durumunu değerlendirmek amacıyla ebeveynlere anket uygulanmış, 24 saatlik besin tüketim kaydı alınarak BeBiS 8.2 programı ile Türkiye Beslenme Rehberi (TÜBER, 2022) referans alınarak değerlendirilmiştir. Beslenme bozukluğu riski Bozulmuş Beslenme Durumu ve Büyüme Riski Aracı (STRONGkids), yutma fonksiyonu ise Pediatrik Yeme Değerlendirme Aracı (PEDI-EAT-10) ile değerlendirilmiştir. Ebeveynlere beslenme eğitimi verilmiş, bilgi düzeyindeki değişimi ölçmek için eğitim öncesi ve sonrası 20 soruluk test uygulanmıştır. Eğitim, video kayıt yöntemiyle gerçekleştirilmiştir. Veriler tanımlayıcı istatistikler ve parametrik olmayan testler kullanılarak analiz edildi ve $p < 0.05$ anlamlı kabul edilmiştir.

Bulgular: Çalışmaya dahil edilen 19 çocuğun yaş ortalaması $7,9 \pm 3,6$ yıl ve çocukların %10,5'i zayıf kategorisindedir. Çocukların TÜBER (2022)'e göre %63,2'sinde aşırı enerji ve yağ alımı görülürken kalsiyum, folik asit ve D vitamininin yetersiz alındığı görülmüştür. Ebeveynlere verilen beslenme eğitiminin etkinliği analiz edilmiştir. Ön test ortalama puanı 15,5 iken son test ortalama puanı 18'e yükselmiştir ($p=0,009$).

Sonuç: Verilen beslenme eğitimi, ebeveynlerin beslenme bilgi düzeyini anlamlı şekilde artırmıştır. Serebral palsili çocukların ebeveynlerinin beslenme konusunda sürekli bilgi ve desteğe ihtiyaçları vardır. Bu nedenle, bu ailelerin gereksinimlerini karşılamak için multidisipliner ekipler tarafından beslenme eğitimi programları geliştirilip uygulanmalıdır.

Anahtar Sözcükler: Serebral palsy, çocuk, beslenme durumu, beslenme eğitimi.

Introduction

Cerebral palsy (CP) is a neurological disorder characterized by permanent impairments in movement and posture, resulting from non-progressive brain damage that occurs during the prenatal, perinatal, or postnatal periods¹. In addition to motor dysfunction in CP, gastrointestinal problems, epileptic seizures, vision, hearing, genitourinary, sucking, chewing, and dental problems, and drooling can be seen².

Nutrition in children with CP has become a developmental and health problem that can start from birth and continue throughout life³. These children are more likely to have malnutrition than their healthy peers, and the causes include gastroesophageal reflux, swallowing disorders, and regurgitation⁴. Feeding problems can occur at all stages of food preparation, including oral intake, swallowing, and digestion¹. Feeding problems in

CP significantly increase both mortality and morbidity^{5,6}. Children with CP have been found to have energy requirements that are 60-70% of those of their healthy peers due to mobility limitations⁷. There is no sufficient evidence that children with CP and other neurological disorders have different protein requirements than their healthy peers. However, those with severe malnutrition are advised to receive an additional 2 g/kg/day of protein for optimal growth⁸. In this population, where starting nutritional management as soon as possible is the basis of optimal growth, it is necessary to determine the energy requirement accurately⁹. Ensuring adequate energy and nutrient consumption improves the general health status of children¹⁰. Children with CP may have swallowing and chewing difficulties, leading to prolonged meal times. Their mothers spend 3.5 to 7.5 hours daily on feeding, while mothers of healthy children spend only 48 minutes. Muscle tone disorders, swallowing, chewing, and sucking difficulties are common in children with CP, making adequate nutrition challenging and increasing the risk of malnutrition or obesity. Digestive issues, prolonged feeding times, inappropriate positioning, and dependence on caregivers further compromise adequate nutrient intake. Educating parents on nutrition, positioning, food selection, and swallowing safety can improve nutritional status and reduce complications¹¹⁻¹³.

Nutritional knowledge, attitudes, and behaviors of parents/caregivers affect children's food choices and reduce the incidence of health problems¹⁴. Nutrition education is important for determining the types and amounts of foods consumed, processing and consuming them appropriately, meeting daily needs, and preventing problems seen in adulthood¹⁵. Children with CP face a high risk of nutritional deficiencies, requiring careful dietary monitoring. Collaboration among physicians, dietitians, and physiotherapists is essential to educate families/caregivers. Nutritional problems caused by impaired oral motor functions or the lack of nutritional knowledge of parents/caregivers should be eliminated⁴.

The objective of this study was twofold: firstly, to determine the nutritional knowledge level of parents/caregivers and to assess the effectiveness of nutrition education in improving their knowledge; and secondly, to evaluate the nutritional status of children with CP and to describe the baseline nutritional status of children with CP and to evaluate changes in the nutritional knowledge of parents/caregivers following the education program.

Material and Methods

Research type

This educational intervention study was conducted to assess the nutritional status of children with CP and to evaluate the effect of nutrition education provided to parents/caregivers on their level of nutritional knowledge.

Study design and participants

The sample size was calculated as 27 participants based on a power analysis conducted using G*Power software (version 3.1.9.7). The analysis was performed with an assumed effect size of 0.25, a Type I error rate of $\alpha = 0.05$, and a test power of $1-\beta = 0.80^{16}$. Of the 27 participants initially enrolled, 8 were excluded due to incomplete data or withdrawal from the study, primarily because of time constraints or medical reasons. Consequently, the study was completed with 19 participants (6 females, 13 males). A post-hoc power analysis using G*Power (paired t-test; $d_z=0.5$; $\alpha=0.05$; $n=19$) yielded a noncentrality parameter of 2.179, a critical t-value of 1.734 ($df=18$), and an achieved power of approximately 0.67 (67%). Therefore, the study did not reach the planned statistical power of 80%, and the non-significant results should be interpreted with caution. It included children aged 2–18 with CP and feeding difficulties, along with willing parents. Those fed non-orally, with other chronic diseases, or unwilling to participate were excluded. The study took place in a rehabilitation center in Istanbul from March to May 2024.

Data collection tools and evaluation

At the beginning of the study, the sociodemographic characteristics and dietary habits of the parents/caregivers were assessed using a questionnaire created by Sabuncular (2013)¹⁷. In addition, the questionnaire prepared by the researchers for children, which asked about age, gender, anthropometric measurements, general health status, and the child's nutritional status, was administered to parents/caregivers through face-to-face interviews.

Children's height (cm), body weight (kg), mid-upper arm circumference (MUAC) (cm), and knee height (KH) (cm) were measured or calculated by the researchers according to the standards. For mid-upper arm circumference measurement; the arm is bent at a 90-degree angle at the elbow, measured with a tape measure from the midpoint between the acromion process at the shoulder and the olecranon process at the elbow. Knee height is defined as the distance from the sole of the foot to the front surface of the thigh bone; this distance was measured with a tape measure with the ankle and knee bent at a 90° angle¹⁸. Since the children could not assume a fully horizontal position, their height was calculated using the equation $(2.69 \times KH) + 24.2$ (± 1.1 cm margin of error), which provides a height estimate based on KH developed by Stevenson¹⁹.

Body weight data for children under 6 years of age were obtained from medical records, including regular measurements taken at the rehabilitation center where they were enrolled. For males aged 6 years or older, equations based on body weight estimation from KH and MUAC were used: $(KH \times 0.68) + (MUAC \times 2.64) - 50.08$; for females, the equations developed were $(KH \times 0.77) + (MUAC \times 2.47) - 50.16^{19}$.

The body mass index (BMI) was computed using the following formula: $\text{weight (kg)} / \text{height (m)}^2$. According to the BMI percentile values (WHO MGRS, 2006/2007), which are organized by age and gender of children, <3rd percentile indicates severe

thinness, 3-15th percentile indicates at risk of thinness, 15-85th percentile indicates normal, 85-97th percentile indicates overweight, and >97th percentile indicates obesity²⁰.

The Tool for Risk of Impaired Nutritional Status and Growth (STRONGkids) is a tool designed by Hulst et al. (2010) to assess the risk of malnutrition in children. It was validated by Pars et al. (2020) in Turkey and was used. STRONGkids consists of 4 items evaluated as 1-2 points for each item; 0 points are considered low nutritional risk, 1-3 points as moderate nutritional risk, and 4-5 points as high nutritional risk^{21,22}.

The children's consumption records were obtained via a 24-h dietary recall. "Food and Nutrition Photo Catalog: Measurements and Quantities" book was used to determine the amount of food consumed²³. Food consumption was analyzed using Nutrition Information Systems Package Programs 8.2 (BeBIS 8.2)²⁴ to determine the daily energy and nutrient intake. Energy and nutrient intakes were evaluated by comparing them with the Turkish Dietary Guidelines (TUBER)²⁵ reference values. Since the daily energy and nutrient requirements of children with CP are 60-70% of those of their healthy peers, the rates of energy and nutrient intake were evaluated as inadequate (<60%), adequate (60-70%), and excessive (>70%) of their healthy peers' requirements²⁶.

The Pediatric Version of the Eating Assessment Tool (PEDI-EAT-10), which was originally designed by Belafsky et al. (2008) and later adapted from the EAT-10 by Serel Arslan et al. (2018)^{27,28}. The PEDI-EAT-10 instrument comprises 10 items, each assigned a score ranging from 0 to 4. A score of 0 indicates "No problem," while a score of 4 indicates "Severe problem". In the total score, 0-3 is categorized as no risk and 3-40 as high risk for swallowing function.

Researchers created 20 questions to assess the knowledge of CP nutrition of parents/caregivers, based on a literature review; however, formal validity and reliability analyses were not conducted^{25,29-34}. These questions were asked to the parents/caregivers before and after the training. It was determined that each correct response would be awarded 1 point, and the overall score would be determined by the sum of correct answers.

Nutrition education

Nutrition education was provided through video recordings and presentations, covering basic nutrition principles, healthy eating, CP-specific needs, and common nutritional issues. Researchers recorded three 10-minute training videos. The educational materials were developed by the authors, who are dietitians experienced in pediatric nutrition, and were delivered by the authors İ.B., E.S., and Ş.U.

Topics of the first educational video: Nutrition in CP: Definition of Nutrition, Food Groups, Nutrition in CP, What is Malnutrition, Causes and Consequences of Malnutrition, Recommended Daily Macronutrient Portions.

Topics of the second educational video: General Nutrition Recommendations: Healthy Plate Model, Foods to Increase Consumption, Foods to Reduce Consumption, Healthy Cooking Methods, Food Safety and Hygiene, Principles to Consider When Buying Food, Principles to Consider When Storing Food.

Topics of the third educational video: Nutrition in Dysphagia, Food Consistencies, and Foods that may pose a Choking Hazard.

Parents/ caregivers received the training videos after the pre-test was administered. After the parents had watched the videos, they were contacted again, and the post-test was administered.

Ethical Statement

The study was granted ethical approval by the Non-Interventional Clinical Research Ethics Committee of Marmara University's Faculty of Health Sciences (protocol number 106, dated 30/11/2023). Permission in the form of a written document was also obtained from the center where the study was conducted. TUBITAK 2209-A University Students Research Projects Support Program has funded this study. Project number: 1919B012306639.

Statistical Evaluation of Data

The study data were evaluated using SPSS (Statistical Package for the Social Sciences; SPSS Inc., Chicago) version 22. The data conformed to normal distribution, as evaluated by histogram graphs, central and prevalence criteria, and the One-Sample Kolmogorov-Smirnov Test. The Chi-Square Test was applied to examine relationships between categorical variables. The Wilcoxon Signed-Rank Test was employed to compare paired non-normally distributed data. A significance level of $p < 0.05$ was considered statistically significant for all analyses.

Results

The present study comprised 19 children aged 2-18 years with CP, along with their parents/caregivers. The study group comprised 68.4% males and 31.6% females, with a mean age of 7.9 ± 3.6 years. 57.9% of the children were born with low birth weight, and 84.2% were premature. The mean age of the mothers was 37.2 ± 8.2 years; the mean age of the fathers was 40.2 ± 7.8 years. While 47.4% of the mothers had a high school education, 31.6% of the fathers had primary education, and 36.8% had secondary education. 15.8% of the mothers and 5.3% of the fathers had chronic diseases (Table 1).

Table 1. The general characteristics of children and their parents

The General Characteristics of Children	n	%		
Gender				
Male	13	68.4		
Female	6	31.6		
Age (year)				
Mean (SD)	7.9(±3.6)			
Min-Max	2-14			
Birth weight (g)				
Low birth weight (<2500)	11	57.9		
Normal birth weight (2500-4000)	8	42.1		
High birth weight (>4000)	0	0		
Duration of Pregnancy (weeks)				
Late preterm (24-31 weeks)	5	26.3		
Moderate preterm (32-36 weeks)	10	52.6		
Preterm (36-37 weeks)	1	5.3		
Full Term	3	15.8		
The General Characteristics of Parents	Mother		Father	
	n	%	n	%
Age (year)				
Mean (SD)	37.2(±8.2)		40.2(±7.8)	
Min-Max	21-50		24-54	
Education status				
Primary education	7	36.8	6	31.6
Secondary education	1	5.3	7	36.8
High school	9	47.4	4	21.1
Higher education	2	10.5	2	10.5
Chronic disease				
Present	3	15.8	1	5.3
Absent	16	84.2	18	94.7
Inherited disease				
Present	-	-	-	-
Absent	19	100	19	100

The prevalence of severe thinness among children was 10.5%, while 47.3% were classified as normal weight. Furthermore, 15.7% were identified as overweight, and 21% were categorized as obese based on their BMIs. The mean body weight of males and females was 25.5±14.9 kg and 23.5±12.3 kg, respectively. The mean height of males and females was 114.7±24.3 cm and 110.9±24.4 cm, respectively (Table 2).

Table 2. Anthropometric measurements of children

	Male		Female		Total	
	n	%	n	%	n	%
BMI						
Severe thinness	1	7.7	1	16.6	2	10.5
Thinness	1	7.7	-	-	1	5.5
Normal	7	53.8	2	33.4	9	47.3
Overweight	1	7.7	2	33.4	3	15.7
Obesity	3	23.1	1	16.6	4	21
	Mean (SD)	Min-Max	Mean (SD)	Min-Max	Mean (SD)	Min-Max
Body weight (kg)	25.5(±14.9)	11-58	23.5(±12.3)	13-46	24.9(±13.8)	11-58
Height (cm)	114.7(±24.3)	80-168	110.9(±24.4)	83-141	113.5(±23.7)	80-168

The most common feeding problems among the children were food indifference (26.3%), followed by food refusal and cough (21%; Table 3). None of the children used medication for feeding problems.

Table 3. Frequency of occurrence of nutrition problems

	Frequently (1-3 times a day)		Rarely (1-3 times a week)		None	
	n	%	n	%	n	%
Constipation	2	10.5	2	10.5	15	79
Aspiration	1	5.3	-	-	18	94.7
Retching	1	5.3	-	-	18	94.7
Gagging	2	10.5	2	10.5	15	79
Choking	1	5.3	2	10.5	16	84.2
Cough	4	21	3	15.8	12	63.2
Indifference to food	5	26.3	3	15.8	11	57.9
Food refusal	4	21	3	15.8	12	63.2

In the STRONGkids test, 92.3% of males and all females were medium-risk, while 7.7% of males were low-risk. According to PEDI-EAT-10, 66.7% of females and 53.8% of males were at risk. No significant differences were found in STRONGkids and PEDI-EAT-10 scores by gender ($p > 0.05$). Among children without swallowing risk, 87.5% were classified as being at medium risk of malnutrition, and all children with swallowing risk were also classified as being at medium risk. No significant association was observed between malnutrition risk and swallowing function ($p = 0.421$) (Table 4).

Table 4. Comparison of malnutrition status with swallowing function

	Female		Male		
	n	%	n	%	p
STRONGkids					
Low risk (0 points)	-	-	1	7.7	1.000
Moderate risk (1-3 points)	6	100	12	92.3	
High risk (4-5 points)	-	-	-	-	
PEDI-EAT-10					
Risk absent (0-3 points)	2	33.3	6	46.2	0.659
Risk present (3-40 points)	4	66.7	7	53.8	
	PEDI-EAT 10				
	Risk absent (0-3 points)		Risk present (3-40 points)		p
STRONGkids	n	%	n	%	
Low risk (0 points)	1	12.5	-	-	0.421
Moderate risk (1-3 points)	7	87.5	11	100	
High risk (4-5 points)	-	-	-	-	

Analyses were performed using the Chi-square test.

While 63.2% of children exceeded their energy needs, 33.3% females and 23.1% of males had insufficient intake. In protein, 50% of females had excessive intake, 33.3% insufficient, while 61.5% of males had sufficient intake and 30.8% excessive intake. Excessive fat intake was seen in 83.3% of females and 53.8% of males. Fiber intake was similar, with 57.9% excessive and 36.8% insufficient. Folate deficiency affected 66.7% of females and 30.8% of males. All females and 84.6% of males lacked vitamin D (Table 5).

Table 5. The status of energy and nutrient intakes in meeting the requirements of children with CP according to gender

	Female		Male		Total		
	n	%	n	%	n	%	p
Energy							
Insufficient intake	2	33.3	3	23.1	5	26.3	0,655
Sufficient intake	-	-	2	15.4	2	10.5	
Excessive intake	4	66.7	8	61.5	12	63.2	
Carbohydrate							
Insufficient intake	2	33.3	5	38.4	7	36.8	0.682
Sufficient intake	2	33.3	6	46.2	8	42.1	
Excessive intake	2	33.3	2	15.4	4	21.1	
Protein							
Insufficient intake	2	33.3	1	7.7	3	15.8	0.214
Sufficient intake	1	16.7	8	61.5	9	47.4	
Excessive intake	3	50	4	30.8	7	36.8	
Fat							
Insufficient intake	-	-	-	-	-	-	0.333
Sufficient intake	1	16.7	6	46.2	7	36.8	

Excessive intake	5	83.3	7	53.8	12	63.2	
Fiber							
Insufficient intake	3	50	4	30.8	7	36.8	0.745
Sufficient intake	-	-	1	7.7	1	5.3	
Excessive intake	3	50	8	61.5	11	57.9	
Folate (Vit. B9)							
Insufficient intake	4	66.7	4	30.8	8	42.1	0.259
Sufficient intake	-	-	4	30.8	4	21.1	
Excessive intake	2	33.3	5	38.4	7	36.8	
Vitamin D							
Insufficient intake	6	100	11	84.6	17	89.4	1.000
Sufficient intake	-	-	1	7.7	1	5.3	
Excessive intake	-	-	1	7.7	1	5.3	
Iron							
Insufficient intake	3	50	2	15.4	5	26.3	0.246
Sufficient intake	-	-	4	30.8	4	21.1	
Excessive intake	3	50	7	53.8	10	52.6	
Calcium							
Insufficient intake	4	66.7	5	38.4	9	47.4	0.505
Sufficient intake	-	-	2	15.4	2	10.5	
Excessive intake	2	33.3	6	46.2	8	42.1	

Analyses were performed using the Chi-square test

*According to TUBER, the requirements of their peers

< %60 Insufficient intake; %60-70 Sufficient intake; >%70 Excessive intake

The mean post-test score increased significantly compared to the pre-test score (15.5 ± 2.3 vs. 18.0 ± 1.8), with 82% of participants showing an increase in their scores ($p = 0.009$) (Table 6).

Table 6. The effect of nutrition education provided to parents

Evaluation of nutrition education	n	%	p
Pre-test > Post-test	1	9	0.009
Pre-test = Post-test	1	9	
Pre-test < Post-test	9	82	
Mean (SD)			
Pre-test score	15.5(± 2.3)		
Post-test score	18(± 1.8)		

Analyses were performed using the Wilcoxon-Signed Rank Tests.* Pre-test score > Post-test score; Pre-test score = Post-test score; Pre-test score < Post-test score

Discussion

In the study, nutritional issues were examined, revealing that 26.3% of children had food indifference, and 21% experienced food refusal and coughing. The study also explored the impact of nutrition education on parents' nutritional knowledge. Results showed that the mean pre-test score was 15.5, while the mean post-test score increased to 18, indicating a statistically significant improvement in nutritional knowledge after the education.

In a study conducted by Tunç et al.³⁵, height, body weight and BMI values of 278 children with CP were 115.55 ± 21.81 cm, 23.54 ± 11.56 kg, 39.91 ± 33.53 , 160 subjects (57.6%) had a BMI under 25, 71 subjects (25.5%) had a BMI within the normal range, and 47 subjects (16.9%) had a BMI in the overweight range; A study by Wang et al.³⁶ found that 70 of the children (18.5%) had a BMI categorized as overweight or obese (11.1% and 7.4% of the children in each category, respectively). Obesity was significantly more common in the younger age group (2-12 years). In this study, according to BMI percentiles, 10.5% of the children were underweight, 5.5% were at risk of being underweight, 47.3% were normal, 15.7% were slightly obese, and 21% were obese. The height and body weight of the children who participated in the study were $113.5 (\pm 23.7)$ cm and $24.9 (\pm 13.8)$ kg, respectively. The values in our study are similar to those of other studies.

However, it has been reported that in interventions focusing solely on nutrition education, although parents' feeding practices and child-caregiver interactions improve, significant changes in children's anthropometric measurements are often not observed³⁷.

Nutritional problems in children with CP increase dependence on caregivers. Şimşek et al.³⁸ found that 46.8% had feeding problems causing growth retardation, while Güldemir et al.³⁹ reported dysphagia (76%) and constipation (60%) as the most common issues. Costa et al.⁴⁰ noted chewing disorders in 81% of children with neurological disorders. In this study, common problems included indifference to food (94.7%), food refusal (36.9%), cough (36.9%), choking (15.8%), retching (21%), and constipation (21%). Impaired chewing and swallowing lead to food refusal, and food entering the airway can cause coughing or gagging. Sedentary lifestyle and low water intake may worsen constipation and appetite loss. Gastrointestinal disorders like reflux are also linked to growth and development^{41,42}.

Education on constipation management, including dietary and physiological strategies targeting factors such as immobility, poor posture, and inadequate fiber or fluid intake, has been shown to improve caregivers' problem-solving skills regarding bowel management in children with CP. Moreover, highlighting the adverse impact of nutritional status on respiratory function, previous educational interventions have emphasized the potential role of effective nutritional management in reducing respiratory morbidity among children with CP⁴³.

Food refusal and digestive problems in children with CP cause malnutrition, leading to growth delay, poor quality of life, and early mortality. Their energy needs are 60–70% of

healthy peers. Ülker et al.¹⁸ found that 72.4% of children with CP had insufficient energy intake. In this study, 63.2% had excessive and 26.3% had inadequate energy intake, likely due to high fat consumption. However, since the 24-h dietary recall relies on memory, reported intake may not reflect usual consumption.

In a study by Örnek et al.⁴⁴ involving 200 children with neurological disorders, the STRONGkids screening test was used to assess malnutrition risk. Results showed that 45% were at low risk, 40% at medium risk, and 15% at high risk. In this study, all girls were in the medium-risk group, while 92.3% of boys were in the medium-risk group and 7.7% were in the low-risk group.

Parents influence children's eating habits through food choices and meal structure. For children with CP, nutritional difficulties underscore the importance of parental awareness. In this study, the effectiveness of nutrition education was evaluated using pre- and post-tests; 82% of parents scored higher after training. The mean score increased from 15.5 to 18.0 ($p=0.009$), showing improved nutritional knowledge. These results emphasize the need for ongoing nutrition education and support programs for caregivers of children with CP.

Previous studies have demonstrated that caregiver training-including components such as nutrition education, feeding position, and practical meal preparation-leads to improvements in feeding skills, enhanced caregiver-child interaction, and reduced caregiver stress. These interventions may improve the child's feeding experience and, in turn, reduce nutritional risk. Moreover, interventions that combine dietary modification and parental education have been associated with better nutritional outcomes (e.g., improved anthropometric measurements and reduced malnutrition rates) compared with interventions targeting feeding skills or behavioral change alone³⁰

The researchers gave parents a detailed explanation of the study's purpose, methodology, timeframe, and voluntary participation. Parents then signed the informed consent form.

Study Limitations

The sample consisted of children with CP from a single centre, and the overall number of participants was modest; therefore, the findings should be interpreted with appropriate caution. Although comprehensive baseline anthropometric and nutritional assessments were successfully completed, several families were unable to participate in the post-intervention evaluation because of the considerable caregiving responsibilities and frequent medical appointments associated with CP. Consequently, post-intervention anthropometric measurements could not be repeated, and changes in children's nutritional status, as well as their potential association with parental nutrition knowledge, could not be examined. Additionally, the malnutrition screening tool utilised in this study has not yet been specifically validated for paediatric CP populations, emphasising the importance of developing condition-specific, reliable assessment instruments. Finally, the nutrition knowledge questionnaire used in this research has not undergone formal psychometric validation. These considerations highlight areas for

refinement in future studies and support the relevance of the preliminary findings presented here.

Conclusion

The results show that, despite the problems children experience with their eating habits and nutritional status, parents rarely seek help from dietitians. This underscores the need for effective interventions and support programs to address the nutritional needs of children with CP. It is imperative that pediatric patients suffering from CP undergo regular monitoring by a multidisciplinary team of physicians, dietitians, physiotherapists, psychologists, and nurses to improve their nutrition and support their growth and development.

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Association of Diet Quality and Sleep Duration with IgG Levels and Serum Lipids in Two-Dose COVID-19 Vaccinated Volunteers*

Fatih CESUR**

Abstract

Aim: This study aimed to investigate the associations of sleep duration, diet quality, and body fat classification with IgG levels, biochemical parameters, and anthropometric measurements in volunteers who received two doses of the COVID-19 vaccine.

Method: A total of 61 volunteers participated in the study. Biomarkers, anthropometric measurements, physical activity, sleep duration, and serum IgG levels were assessed. Dietary Quality Index-2015 (DQI-2015) and nutrient intake were calculated using the CeviCal program based on food frequency data.

Results: Individuals with short sleep duration had significantly higher fasting blood sugar levels compared to those with normal sleep duration ($p<0.05$). Individuals with long sleep duration had higher serum IgG levels compared to those with normal sleep duration ($p=0.029$). LDL cholesterol levels were lower in individuals who consumed alcohol, while T3 levels were lower in smokers ($p<0.05$). Total cholesterol, non-HDL cholesterol, and waist circumference values were higher in individuals with poor diet quality ($p<0.05$). Total cholesterol and triglyceride levels were found to be higher in obese individuals ($p<0.05$). The increase in IgG levels was found to be associated with an increase in fasting serum glucose levels, and a moderate positive correlation was found between these parameters ($p<0.001$, $r=0.445$). IgG levels were significantly lower in individuals with high daily vitamin C intake ($p=0.037$). 25(OH)D levels were lower in individuals with active physical activity levels compared to inactive individuals ($p<0.05$).

Conclusion: Short sleep duration, poor diet quality, and obesity have been associated with adverse changes in glucose, lipid profile, and anthropometric measurements. Long sleep duration has been associated with higher IgG levels, while high vitamin C intake has been associated with lower IgG levels. Additionally, increased IgG levels have been associated with higher glucose levels. Larger sample studies are needed to confirm these findings.

Keywords: Diet quality, COVID-19 vaccine, serum IgG, sleep duration.

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ETHICAL STATEMENT: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Ethical Committee of Avrasya University number 2022-52. Written informed consent was obtained from all subjects.

İki Doz COVID-19 Aşısı Yapılan Gönüllülerde Diyet Kalitesi ve Uyku Süresinin IgG Düzeyleri ve Serum Lipidleri ile İlişkisi

Öz

Amaç: Bu çalışma, iki doz COVID-19 aşısı alan gönüllülerde uyku süresi, beslenme kalitesi ve vücut yağ sınıflandırması ile IgG düzeyleri, biyokimyasal parametreler ve antropometrik ölçümler arasındaki ilişkileri araştırmayı amaçlamıştır.

Yöntem: Çalışmaya toplam 61 gönüllü katılmıştır. Biyobelirteçler, antropometrik ölçümler, fiziksel aktivite, uyku süresi ve serum IgG seviyeleri değerlendirilmiştir. Besin tüketim sıklıkları kullanılarak CevCal programı aracılığıyla Diyet Kalite İndeksi-2015 (DQI-2015) ve besin öğeleri hesaplanmıştır.

Bulgular: Kısa uyku süresine sahip bireylerin açlık kan şekeri seviyeleri, normal uyuyanlara kıyasla anlamlı derecede daha yüksek bulunmuştur ($p<0,05$). Uzun uyku süresine sahip bireylerin serum IgG seviyeleri, normal uyuyanlara kıyasla daha yüksek tespit edilmiştir ($p=0,029$). Alkol kullanan bireylerde LDL kolesterol düzeyleri daha düşük, sigara içenlerde ise T3 düzeyleri daha düşük bulunmuştur ($p<0,05$). Diyet kalitesi düşük bireylerde toplam kolesterol, non-HDL kolesterol ve bel çevresi değerleri daha yüksek bulunmuştur ($p<0,05$). Obez bireylerde toplam kolesterol ve trigliserit düzeyleri daha yüksek tespit edilmiştir ($p<0,05$). IgG seviyelerindeki artış, açlık serum glukoz seviyelerinde artış ile ilişkili bulunmuş ve bu parametreler arasında orta düzeyde pozitif korelasyon saptanmıştır ($p<0,001$, $r=0,445$). Günlük C vitamini alımı yüksek olan bireylerin IgG seviyeleri anlamlı şekilde daha düşük bulunmuştur ($p=0,037$). Aktif fiziksel aktivite düzeyine sahip bireylerde, pasif bireylere kıyasla 25(OH)D düzeyleri daha düşük bulunmuştur ($p<0,05$).

Sonuç: Kısa uyku süresi, düşük diyet kalitesi ve obezite; glukoz, lipid profili ve antropometrik ölçümlerde olumsuz değişiklikler ile ilişkilendirilmiştir. Uzun uyku süresi daha yüksek IgG düzeyleri ile ilişkili bulunurken, yüksek C vitamini alımı daha düşük IgG düzeyleri ile ilişkilendirilmiştir. Ayrıca, artmış IgG düzeyleri daha yüksek glukoz seviyeleri ile ilişkili bulunmuştur. Bulguların doğrulanması için daha geniş örneklemli çalışmalara ihtiyaç vardır.

Anahtar Sözcükler: Diyet kalitesi, COVID-19 aşısı, serum IgG, uyku süresi.

Introduction

Type 2 diabetes (T2DM) and cardiovascular diseases are increasingly common public health problems. In addition to genetics, modifiable environmental factors such as diet style and physical activity play an important role in these diseases. The best strategy to slow the development of chronic diseases is to adopt healthy lifestyle factors, regular physical activity, and an adequately balanced diet¹.

In addition to type 2 diabetes and cardiovascular diseases, disorders of thyroid function are also quite common. It is known that changes in thyroid function will also affect several health problems. Therefore, it becomes important to know the associations between thyroid hormones and lifestyle².

During the COVID-19 pandemic, individuals with diabetes and cardiovascular disease may have had a weaker immune response to the vaccine. Serum IgA, IgG, and IgM levels have been measured to assess immunity post-vaccination³.

High fasting blood sugar and serum lipids may be associated with a suppressed immune response⁴. Additionally, lifestyle factors like smoking and alcohol use are known to affect serum IgG levels⁵.

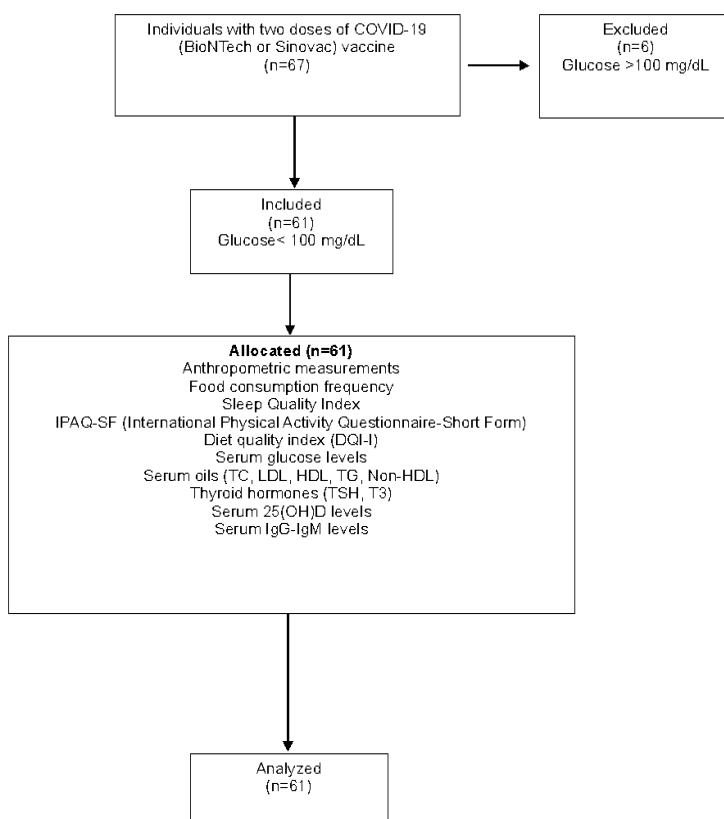
To our knowledge, while several studies have examined the relationship between lifestyle factors and biochemical findings, the association between lifestyle factors and the humoral immune response to COVID-19 vaccination, assessed by serum IgG levels, has not been sufficiently investigated. This study aimed to investigate the associations of sleep duration, diet quality, body fat percentage, smoking, alcohol consumption, physical activity, and selected nutrient intakes with serum IgG levels and metabolic parameters in individuals who received two doses of the COVID-19 vaccine.

Material and Methods

Study Population

This cross-sectional observational study included 61 healthy volunteers (49 women, 12 men, aged 19-32) in Trabzon, all having received two doses of the COVID-19 vaccine (BioNTech and Sinovac).

Figure 1. Flow chart of study



Participants with health issues were excluded. Anthropometric measurements, a food consumption frequency questionnaire, sleep hours, and the International Physical

Activity Questionnaire-Short Form (IPAQ-SF) were collected. The Diet Quality Index (DQI-I) was calculated from the food frequency forms. Biochemical data, including thyroid hormones, serum 25(OH)D, and IgG levels, were measured. All data were then analyzed (Figure 1).

In the G*Power analysis conducted on 61 people, the power was 96%. The time interval between the second vaccine dose and blood sampling was recorded and evaluated as a potential confounder.

Measurement of Serum IgG Levels

All samples were stored in serum form at -80 degrees, and then the serums were thawed, and IgG levels were measured with the SD Biosensor F200 Analyzer device's Fluorescent Immunological (FIA) method⁶. If IgG levels are less than 1, it is considered negative. Also IgG; was classified as low (0-2.99 COI), medium (3.00-3.99 COI), medium-high (4.00-4.25 COI), and high (4.26-4.75 COI), and this planning was considered according to the research reviewed⁷⁻¹⁰. The antibodies measured give IgG levels of the COVID-19 vaccine. It does not show the total IgG level. In addition, the SD F200 device expresses the measured IgG levels in COI ("cut off") units^{6,11}. IgG kits are manufactured by SD Biosensor and originate from South Korea.

Determination of Serum 25-hydroxy D Vitamin Level

SD Biosensor F200 Analyzer device was completed with the Fluorescent Immunological (FIA) method to determine the serum 25(OH)D levels of individuals¹¹. The measurement of these two parameters is identical to the method used in a previous study¹².

Measurement of Fasting Serum Glucose Level

It was noted that the individuals were fasting for at least 8-12 hours before measurement. Accu-Chek Performa Nano device was used to measure fasting serum glucose¹³.

Measurement of Serum Lipid Level

Total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and non-HDL cholesterol (non-HDL) values of the individuals were measured. For this measurement, the Standard LipidoCare Analyzer device and Lipid Profile Test Strip were used^{14,15}. The measurement of these two parameters is identical to the method used in a previous study¹².

Serum Thyroid Stimulating Hormone (TSH) Level Measurement

SD F200 Biosensor Analyzer device was used to determine serum TSH (thyroid stimulating hormone) and T3 (triiodothyronine) levels. The measurement of these two parameters is identical to the method used in a previous study¹².

Anthropometric Measurements

Using the TANITA MC-780MA device, based on the bioelectric impedance analysis (BIA) method, individuals' weight, body fat, waist circumference, waist-hip ratio, internal fat level, basal metabolic rate, protein, muscle, and mineral levels were measured. TANITA brand stadiometer was used for height measurement.

Calculation of Diet Quality and Duration of Sleep

Dietitians collected annual food consumption frequency data, and diet quality was assessed using the Diet Quality Index-2015 (DQI-I). Sleep duration was classified as low (<7 hours), normal (7-8 hours), and high (>8 hours)¹⁶.

Ethical Statements

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Ethical Committee of Avrasya University number E-69268593-050-14073 date 02.08.2022. Written informed consent was obtained from all subjects.

Statistical Analysis

Statistical analysis was performed using R language in RStudio version 0.98.501, and figures were created in Microsoft 365 Excel. The Shapiro-Wilk/Kolmogorov-Smirnov tests were used to check normality. Continuous variables are presented as mean $\pm$ SD. For normally distributed data, the independent t-test was used for independent groups, and the dependent t-test for dependent groups. For non-normally distributed data, the Wilcoxon Signed Ranks Test was used for dependent groups and the Mann-Whitney U test for independent groups. A p-value <0.05 was considered statistically significant. Post hoc power analysis was performed using G*Power (v3.1.9.7) for the primary outcome based on a two-tailed correlation test, with an effect size of 0.45, an alpha level of 0.05, and a total sample size of 61, yielding a statistical power of 0.96. The CeviCal software is a nutrition analysis program based on the Turkish food composition database and calculates energy and nutrient intake from food frequency data. Diet quality scores (DQI-I) are generated using standard scoring algorithms. The program is widely used in dietary assessment studies in adults¹⁷.

Results

This study included 61 healthy individuals (49 women, 12 men) aged 21.80 ± 2.56 years, all vaccinated with two doses of COVID-19 (BioNTech or Sinovac). No significant difference was found in vaccination times ($p > 0.05$). Socio-demographic data, anthropometric measurements, food consumption frequency, sleep duration, and IPAQ-SF were recorded. The Diet Quality Index (DQI-I) was calculated, and biochemical measures (fasting serum glucose, TC, LDL, HDL, Non-HDL, TG), thyroid hormones (TSH, T3), serum 25(OH)D, and IgG levels were assessed.

Table 1. Comparison of alcohol and cigarette use in healthy volunteers with parameters

	Alcohol Classification		p	Smoking Classification		p
	Drinking (n=30)	Non- Drinking (n=31)		Smoking (n=21)	Non- Smoking (n=40)	
Fasting serum glucose (mg/dL)	87.79±8.58	87.98±10.78	0.947*	89.95±9.12	86.93±10.47	0.275*
LDL (mg/dL)	76.18±17.05	92.80±29.67	0.038*	82.05±28.70	89.55±26.37	0.366*
HDL (mg/dL)	50.88±12.50	48.37±12.56	0.490*	46.58±12.90	50.33±12.26	0.286*
Non-HDL (mg/dL)	91.18±15.90	100.33±32.27	0.273*	93.78±28.10	99.34±28.86	0.500*
TC (mg/dL)	148.68±27.1	149.95±31.77	0.882*	144.11±29.45	152.13±30.43	0.343*
TG (mg/dL)	96.17±82.51	80.89±68.05	0.185**	71.82±18.80	92.81±87.05	0.668**
TSH (mg/dL)	1.52±0.70	1.53±0.95	0.638**	1.66±0.91	1.47±0.87	0.391**
T3 (mg/dL)	2.26±0.52	2.34±0.84	0.910**	2.03±0.40	2.45±0.84	0.039**
25(OH)D (mg/dL)	11.38±1.46	15.89±11.29	0.116**	16.62±13.08	13.44±7.32	0.957**
IgG (COI)	3.63±1.03	3.80±0.73	0.573**	3.65±1.01	3.79±0.73	0.967**
Weight (kg)	69.29±12.07	62.49±11.74	0.042*	67.488±12.64	63.21±11.83	0.201*
Height (cm)	167.47±7.28	164.05±7.22	0.092*	167.65±7.36	163.88±7.12	0.059*
BMI (kg/cm ²)	24.64±3.57	23.21±4.06	0.190*	23.95±3.79	23.51±4.05	0.688*
Waist (cm)	81.11±10.75	75.26±16.59	0.165*	79.75±11.36	75.77±16.69	0.341*
Waist/Hip (cm)	0.82±0.06	0.79±0.07	0.172*	0.82±0.07	0.79±0.06	0.227*
Mineral (%)	5.12±0.91	5.08±0.94	0.874*	5.26±0.89	5.02±0.94	0.341*
Protein (%)	15.58±1.69	16.06±1.71	0.308*	15.91±1.85	15.92±1.66	0.983*
PBF (%)	24.14±7.91	23.64±7.71	0.817*	22.41±7.91	24.46±7.62	0.333*
BMR (kcal)	1603.42±263.45	1456.26±210.04	0.023*	1594.46±290.31	1457.05±192.76	0.032*

LDL: Low density lipoprotein, HDL: High density lipoprotein, TC: Total cholesterol, TG: Triglyceride, TSH: Thyroid stimulating hormone, T3: Triiodothyronine, Immunoglobulin G: IgG, (25 (OH)) D vitamin: 25 (OH) D, Body mass index: BMI, Body fat percentage: PBF, Basal metabolic rate: BMR,

^a Data are expressed as mean ± SD.

* Independent sample t-test was used to determine p values in parametric cases, ** Mann Whitney U test was used in nonparametric cases.

While weight and BMR (Basal metabolic rate) values of alcohol users were higher than those who did not use alcohol, LDL levels were found to be lower. In smokers, the T3 level was lower than in non-smokers, but the BMR value was higher in smokers. No significant difference was observed in terms of other parameters (Table 1).

Table 2. Comparison of the diet quality index (DQI-I) of healthy volunteers with the parameters^a

DQI-I CLASSIFICATION	Low-quality nutrition (n=33)	Medium-quality nutrition (n=28)	p
Fasting serum glucose (mg/dL)	89.52±10.15	86.04±9.82	0.181*
LDL (mg/dL)	94.05±28.18	79.67±24.21	0.060*
HDL (mg/dL)	50.07±12.97	48.07±12.09	0.548*
Non-HDL (mg/dL)	105.10±30.19	89.44±24.55	0.039*
TC (mg/dL)	158.91±31.16	138.44±25.07	0.008*
TG (mg/dL)	99.29±96.91	71.28±22.38	0.250**
TSH (mg/dL)	1.41±0.82	1.65±0.94	0.487**
T ₃ (mg/dL)	2.44±0.83	2.19±0.66	0.149**
25(OH)D (mg/dL)	16.45±12.56	12.17±2.72	0.373**
IgG (COI)	3.91±0.56	3.55±1.05	0.354**
Weight (kg)	67.36±12.58	61.37±11.01	0.055*
Height (cm)	165.39±7.34	164.79±7.50	0.751*
BMI (kg/cm ²)	24.56±3.96	22.60±3.72	0.052*
Waist (cm)	81.09±12.11	72.35±17.17	0.024*
Waist/Hip	0.82±0.07	0.78±0.06	0.061*
Mineral (%)	5.09±0.88	5.11±0.98	0.936*
Protein (%)	15.52±1.57	16.38±1.77	0.051*
PBF (%)	25.23±7.15	22.09±8.13	0.114*
BMR (kcal)	1538.24±243.57	1459.50±223.53	0.197*

LDL: Low density lipoprotein, HDL: High density lipoprotein, TC: Total cholesterol, TG: Triglyceride, TSH: Thyroid stimulating hormone, T₃: Triiodothyronine, Immunoglobulin G: IgG, (25 (OH)) D vitamin: 25 (OH) D, Body mass index: BMI, Body fat percentage: PBF, Basal metabolic rate: BMR,

^a Data are expressed as mean ± SD.

* Independent sample t-test was used to determine p values in parametric cases, ** Mann Whitney U test was used in nonparametric cases.

When looking at diet quality, individuals with low diet quality were determined to have higher TC, Non-HDL levels, and waist circumference than those with normal diet quality (Table 2).

Table 3. Comparison of body fat percentages of healthy volunteers with the parameters^a

Body fat ratio classification	Obesity (n=26)	Normal-weight (n=32)	P
Fasting serum glucose (mg/dL)	89.23±9.04	86.88±10.67	0.375*
LDL (mg/dL)	87.15±25.64	86.26±27.16	0.909*
HDL (mg/dL)	51.17±12.01	47.81±12.90	0.328*
Non-HDL (mg/dL)	102.58±24.88	92.38±29.06	0.181*
TC (mg/dL)	157.69±23.21	142.10±33.00	0.049*
TG (mg/dL)	95.30±72.25	80.81±77.41	0.005**
TSH (mg/dL)	1.63±1.00	1.49±0.80	0.594**

T3 (mg/dL)	2.40±0.92	2.28±0.65	0.687**
25(OH)D (mg/dL)	16.31±11.74	13.25±7.87	0.208**
IgG (COI)	3.99±0.73	3.76±0.92	0.595**
Weight (kg)	71.19±9.09	58.91±11.12	<0.001*
Height (cm)	163.58±6.13	166.34±8.38	0.166*
BMI (kg/cm²)	26.59±2.87	21.16±2.68	<0.001*
Waist (cm)	85.92±8.36	69.40±15.34	<0.001*
Waist/Hip avg. (cm)	0.84±0.05	0.77±0.06	<0.001*
Mineral avg. (%)	4.63±0.81	5.54±0.80	<0.001*
Protein (%)	14.57±0.84	16.99±1.47	<0.001*
PBF (%)	30.57±4.06	18.12±5.31	<0.001*
BMR (kcal)	1536.19±162.32	1469.63±275.87	0.282*

LDL: Low density lipoprotein, HDL: High density lipoprotein, TC: Total cholesterol, TG: Triglyceride, TSH: Thyroid stimulating hormone, T3: Triiodothyronine, Immunoglobulin G: IgG, (25 (OH)) D vitamin: 25 (OH) D, Body mass index: BMI, Body fat percentage: PBF, Basal metabolic rate: BMR,

^a Data are expressed as mean ± SD.

* Independent sample t-test was used to determine p values in parametric cases, ** Mann Whitney U test was used in nonparametric cases.

TC and TG levels were found to be higher in individuals with obesity compared to those with normal body fat percentage. In addition, weight, BMI, waist, waist/hip ratio, and BPF values of obese individuals were determined to be higher than normal individuals. The amount of protein and minerals was higher in individuals with normal fat content. There was no difference in terms of other biochemical findings and anthropometric measurements (Table 3).

Table 4. Comparison of sleep duration of healthy volunteers with parameters^a

Sleep Duration	Low (n=17)	Normal (n=26)	High (n=17)	p ^a	p ^b	p ^c
FSG (mg/dL)	92.94±11.35	84.19±9.57	89.41±6.68	0.009*	0.057*	0.277*
LDL (mg/dL)	85.84±28.57	84.93±26.79	92.66±28.08	0.924*	0.418*	0.530*
HDL (mg/dL)	49.19±11.71	52.32±12.09	45.06±12.93	0.418*	0.076*	0.352*
Non-HDL (mg/dL)	92.63±30.79	95.13±27.52	107.20±28.02	0.790*	0.194*	0.180*
TC (mg/dL)	146.53±30.89	149.20±30.04	155.00±30.82	0.781*	0.554*	0.437*
TG (mg/dL)	99.53±90.66	83.70±83.09	76.29±19.03	0.324**	0.227**	0.793**
TSH (mg/dL)	1.68±0.99	1.42±0.77	1.61±0.96	0.394**	0.504**	0.906**
T3 (mg/dL)	2.43±1.10	2.39±0.62	2.13±0.55	0.635**	0.173**	0.649**

25(OH)D (mg/dL)	11.72±1.43	15.96±11.97	15.16±10.34	0.747**	0.833**	0.973**
IgG (COI)	3.89±0.72	3.52±0.82	4.11±0.34	0.140**	0.029**	0.683**
Weight (kg)	67.01±12.42	62.79±11.65	63.90±12.47	0.264*	0.768*	0.471*
Height (cm)	167.35±8.12	162.50±5.52	166.18±7.93	0.024*	0.080*	0.672*
BMI (kg/cm²)	23.85±3.59	23.79±4.25	23.11±4.04	0.963*	0.603*	0.577*
Waist (cm)	76.34±22.57	77.35±12.00	76.88±11.09	0.850*	0.899*	0.929*
Waist/Hip(cm)	0.82±0.08	0.79±0.06	0.80±0.07	0.136*	0.625*	0.384*
Mineral (%)	5.23±0.85	4.79±0.86	5.36±1.00	0.110*	0.055*	0.684*
Protein (%)	15.95±1.52	15.78±1.84	16.11±1.80	0.746*	0.563*	0.786*
PBF (%)	23.20±6.59	26.03±7.34	21.47±8.75	0.207*	0.073*	0.519*
BMR (kcal)	1560.82±259.16	1424.04±153.17	1527.35±270.58	0.031*	0.117*	0.710*

LDL: Low density lipoprotein, HDL: High density lipoprotein, TC: Total cholesterol, TG: Triglyceride, TSH: Thyroid stimulating hormone, T3: Triiodothyronine, Immunoglobulin G: IgG, (25 (OH)) D vitamin: 25 (OH) D, Body mass index: BMI, Body fat percentage: PBF, Basal metabolic rate: BMR,

^a Data are expressed as mean ± SD.

Differences between low sleep duration and normal sleep duration (p^a), between normal sleep duration and high sleep duration (p^b) and between low sleep duration and high sleep duration (p^c).

$p^{a,b,c}$ *Independent sample t-test was used to determine p values in parametric cases, ** Mann Whitney U test was used in nonparametric cases.

It was determined that individuals with poor sleep had higher fasting blood glucose levels and BMR values than those with normal sleep. When normal sleep and excessive sleep were compared, serum IgG levels were found to be lower in those with normal sleep. No difference was seen in the parameters when comparing low sleep with high sleep (Table 4).

Table 5. Comparison of physical activity levels of healthy volunteers with parameters^a

Physical Activity	Passive (n=8)	Middle (n=37)	Active (n=15)	p^a	p^b	p^c
Fasting serum glucose (mg/dL)	93.13±10.27	88.16±10.42	85.47±8.18	0.227*	0.375*	0.064*
LDL (mg/dL)	72.17±22.58	94.28±29.31	79.08±18.91	0.071*	0.105*	0.438*

HDL (mg/dL)	43.50±10.50	50.47±13.32	50.13±10.82	0.176*	0.932*	0.172*
Non-HDL (mg/dL)	84.25±22.70	104.24±31.25	89.93±21.47	0.098*	0.126*	0.565*
TC (mg/dL)	127.75±20.19	158.08±31.62	142.00±22.76	0.013*	0.090*	0.157*
TG (mg/dL)	73.57±16.44	97.25±91.70	66.08±16.51	0.985**	0.254**	0.302**
TSH (mg/dL)	1.59±0.53	1.56±0.94	1.48±0.91	0.628**	0.649**	0.378**
T3 (mg/dL)	2.32±0.64	2.32±0.81	2.34±0.74	0.716**	0.871**	0.672**
25(OH)D (mg/dL)	12.10±1.22	16.69±11.83	10.49±0.74	0.667**	<0.001**	0.003**
IgG (COI)	4.21±0.24	3.79±0.73	3.60±0.80	0.217**	0.298**	0.081**
Weight (kg)	72.78±14.33	62.57±10.82	64.05±12.52	0.028*	0.673*	0.144*
Height (cm)	174.38±6.16	163.19±5.94	164.13±7.23	<0.001*	0.628*	0.003*
BMI (kg/cm²)	23.91±4.45	23.52±4.05	23.68±3.74	0.809*	0.898*	0.895*
Waist (cm)	84.25±12.93	75.56±16.99	76.40±10.93	0.181*	0.861*	0.138*
Waist/Hip (cm)	0.85±0.07	0.79±0.07	0.79±0.06	0.034*	0.824*	0.046*
Mineral (%)	5.66±1.13	5.01±0.88	4.94±0.84	0.080*	0.793*	0.098*
Protein (%)	16.03±1.55	15.75±1.68	16.29±1.95	0.661*	0.315*	0.747*
PBF (%)	20.28±10.51	24.99±7.15	23.28±7.19	0.128*	0.438*	0.425*
BMR (kcal)	1738.63±277.49	1434.92±169.09	1501.53±238.49	<0.001*	0.260*	0.044*

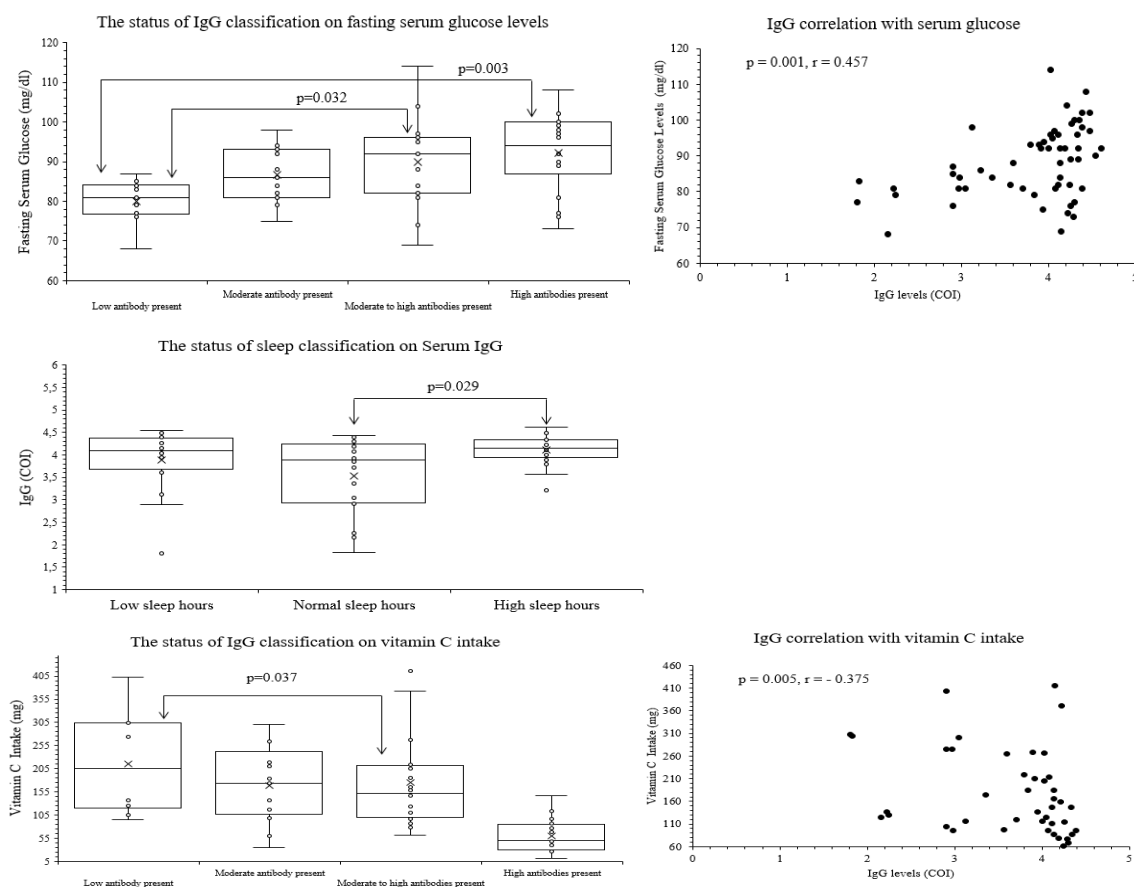
LDL: Low-density lipoprotein, HDL: High-density lipoprotein, TC: Total cholesterol, TG: Triglyceride, TSH: Thyroid stimulating hormone, T3: Triiodothyronine, Immunoglobulin G: IgG, (25 (OH)) D vitamin: 25 (OH) D, Body mass index: BMI, Body fat percentage: PBF, Basal metabolic rate: BMR,

^a Data are expressed as mean ± SD.

Differences were expressed as passive-middle differences (p^a), middle-active differences (p^b) and passive-active differences (p^c).

p^{a,b,c} *Independent sample t-test was used to determine p values in parametric cases, ** Mann Whitney U test was used in nonparametric cases.

When physical activity levels were examined, individuals with moderate physical activity had significantly higher TC levels than passive individuals. At the same time, 25(OH)D and BMR levels of active individuals were significantly lower than passive individuals. Weight and waist-hip ratio were higher in passive individuals compared to active individuals (Table 5).

Figure 2. Evaluation of IgG and sleep duration

A significant positive moderate correlation was found between fasting serum glucose and serum IgG levels ($p < 0.001$, $r = 0.445$). Fasting serum glucose levels were found to be progressively higher across low, medium, and high IgG level categories, respectively ($p = 0.032$, $p = 0.003$). It was found that vitamin C intake from foods was higher at low IgG levels than at medium-high levels ($p = 0.037$). It was analyzed that there was a moderate negative correlation between IgG and vitamin C intake ($p = 0.005$, $r = -0.375$) (Figure 2).

Discussion

Information regarding the exact time elapsed since the second vaccine dose, vaccine type distribution, and prior SARS-CoV-2 infection history was limited; therefore, these variables could not be included as covariates in the analyses and were considered as potential confounding factors. This study aimed to investigate the associations between smoking, alcohol, diet quality, body fat, sleep, physical activity, and IgG levels with biochemical and anthropometric parameters in two-dose COVID-19 vaccinated volunteers. Smoking and alcohol are known to affect metabolism both directly and indirectly. A study on Korean men found higher fasting blood glucose, LDL, and TG levels in smokers, increasing the risk of T2DM and lipid abnormalities¹⁸. Similarly, Cichosz et

al. observed high LDL and TG and low HDL in smokers, but no effect on fasting blood glucose¹⁹. In this study, smoking had no impact on fasting blood glucose or lipid profiles.

Regarding alcohol consumption, both moderate and excessive alcohol use were associated with impaired fasting blood glucose. For example, in a study of nondiabetic women, excessive alcohol consumption was associated with increased fasting blood glucose²⁰. In a large study by Sung on Korean men, alcohol drinkers were associated with higher fasting blood glucose, TG, HDL, and lower LDL levels than non-drinkers²¹. Similarly, in this study, LDL levels of those who consumed alcohol were found to be lower than those who did not consume alcohol, and there was no significant difference in fasting blood glucose, TG, HDL, and other parameters.

Alcohol and cigarette use have long been known to negatively affect vitamin D levels, with studies showing significantly lower serum 25(OH)D levels in smokers and alcohol users²². Contrary to existing literature, this study found no significant difference between smoking, alcohol consumption, and vitamin D levels.

The impact of alcohol and cigarette consumption on thyroid function remains unclear. A study by Gruppen et al. found smokers had higher T₃ and lower TSH levels, while alcohol consumption >30g/day was linked to higher TSH and T₃². However, contrary to the literature, this study showed decreased T₃ levels in smokers, with no significant effect on TSH from alcohol or cigarette consumption

Another important issue affected by smoking and alcohol consumption is serum IgG values, which are immune biomarkers in the body. It has been observed that smokers have lower IgG, and IgG levels decrease as a result of increased alcohol consumption²³. Additionally, serum IgG levels of smokers were found to be lower than those of non-smokers, but no significant difference was detected with alcohol use²⁴. In this study involving healthy individuals, no significant difference was observed between alcohol/cigarette consumption and serum IgG levels.

Dietary intake is known to affect body parameters in terms of both quantity and quality, and the DQI-I scale was used in this study. Daneshzad et al. found that individuals with high diet quality had lower fasting blood glucose, but no significant difference in HDL, LDL, TG, or TC¹. Another study showed that better diet quality lowered fasting glucose and reduced LDL, TG, and TC²⁵. Diet quality was also linked to waist circumference, with improvements correlating to smaller waist sizes in Mexican women²⁶. In contrast, Murakami's study found a positive association between lower diet quality and waist circumference²⁷. This study confirmed that poor diet quality is associated with higher non-HDL, TC levels, and larger waist circumference.

Quality and duration of sleep are crucial for normal function. Recent studies show that sleep disorders decrease insulin sensitivity, leading to higher blood sugar levels. This also affects lipid profiles. A study on diabetes patients found higher total cholesterol (TC) and fasting blood glucose levels in those with shorter sleep duration compared to those with longer or medium sleep duration. Thus, improving sleep quality may enhance glucose

control and other parameters²⁸. In one study, participants with poor sleep quality were associated with higher TC and lower HDL levels compared to those with good sleep quality²⁹. Poor sleep quality has also been associated with higher TG levels³⁰. In this study, the fasting blood glucose of those who slept poorly was found to be higher compared to those who slept normally, but no significant difference was observed in TC, TG, LDL, and HDL values.

The relationship between sleep quality and hormones has been known for many years. In a study, it was observed that TSH increased significantly in case of poor sleep³¹. In this study, no significant difference was found between sleep duration and TSH and T₃ values.

A recent study found that sleep quality does not affect IgG, and the vaccine does not impact sleep quality³². In our research, individuals with longer sleep had higher IgG levels, but no significant difference was found between those with low sleep and those with normal sleep³³. A study on stroke patients showed that 200 mg of daily vitamin C supplementation increased IgG levels, while another study with higher doses (1-3 g) found no effect³⁴. The recommended daily intake of vitamin C is 75-90 mg³⁵. In this study, low IgG levels were associated with high vitamin C intake from foods, while IgG levels were higher in individuals with vitamin C intake within reference values.

The formation of IgG due to the effect of the COVID-19 vaccine in diabetic pregnant women does not hurt glucose³⁶. Although it has been stated that IgG values investigated in diabetic patients do not pose a risk to glucose levels³⁷, there are very few studies on this subject in the literature. Therefore, in this study, a positive moderate correlation was found between fasting serum glucose and IgG levels.

A study on Malaysian adults found that those with low or moderate physical activity had higher fasting blood glucose than active individuals³⁸. Another study reported increased HDL levels after five weeks of training but no significant changes in LDL, TG, or TC³⁹. Silva et al. found that moderate and high physical activity levels were linked to higher HDL and lower TG⁴⁰. In this study, moderately active individuals had significantly higher TC than passive individuals, while no significant differences were observed in fasting glucose, LDL, HDL, or TG

Physical activity influences vitamin D levels, with studies showing more active individuals having higher 25(OH)D levels. Regular physical activity is associated with higher serum 25(OH)D⁴¹. However, in this study, moderately active and inactive individuals had higher levels than active ones. This may be due to the low vitamin D levels of most participants and their low sun exposure, but the finding aligns with existing literature.

Limitations of the study include self-reporting and questionnaire-based assessments, while strengths include the use of BIA for anthropometric data, dietitian-analyzed nutrient intake, and FIA for biochemical values.

Another important limitation is the lack of detailed data on vaccine type distribution, time since the second dose, and previous SARS-CoV-2 infection, which are known to influence post-vaccination IgG levels. Therefore, the observed associations should be interpreted with caution.

Conclusion

This study found that alcohol use and moderate physical activity were associated with higher LDL levels, while smoking was associated with lower T3 levels. Poor diet quality was associated with higher TC and non-HDL levels. Low sleep duration was associated with higher fasting blood glucose, while high sleep duration was associated with higher serum IgG levels. Passive individuals and those with moderate physical activity had higher 25(OH)D levels compared to active ones. Increased IgG levels were associated with higher glucose levels, while high vitamin C intake was associated with lower IgG levels. In conclusion, sleep quality and diet may be associated with vaccine antibody levels, though further research is needed.

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Author Declarations

None of the authors had any conflicts of interest.

Credit Author Statement

Fatih Cesur designed the study and contributed to the performance of the intervention. Fatih Cesur performed the statistical analyses, and dietitians helped to prepare the final draft and analyzed the energy values calculation. Dietitians are mentioned in the acknowledgments section.

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Does Value-Based Leadership Effect EFQM Excellence Model in Public Hospitals? The Role of Strategic Planning Awareness

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Abstract

Aim: The aim of the study is to determine the interaction between value-based leadership and the EFQM (European Foundation for Quality Management) excellence model in public hospitals. It is also aimed to reveal the role of strategic planning awareness in this effect.

Method: A quantitative questionnaire was used to gather data from 236 health care professionals working in public hospitals in Kocaeli (Türkiye). SPSS (Statistical Package for the Social Sciences) for Windows 25.0 and AMOS (Analysis of Moment Structures) 23.0 were used to examine the data. Confirmatory factor analysis was conducted in addition to reliability analysis to evaluate the scales' construct validity. The path analysis and mediator role analysis were used to test the model developed in accordance with the hypotheses.

Results: Value-based leadership was found to have a significant and positive effect on the EFQM model ($\beta=0.740$, $p<0.05$). Strategic planning awareness was found to be a partial mediator in this effect ($\beta=0.603$, $p<0.05$). The current study supports that value-based leadership is a factor that promotes EFQM and can improve outcomes in hospitals. Furthermore, by highlighting the need for strategic planning awareness, it further clarifies the connection between EFQM and value-based leadership.

Conclusion: Value-based leadership should be considered as an important premise for the EFQM model due to its sensitivity to interact with all stakeholders and inform them about the organization's strategy, values and direction. Furthermore, ensuring awareness of strategic planning among healthcare professionals should be at the top of leaders' agendas to increase the interaction between value-based leadership and the EFQM model.

Keywords: EFQM, value-based leadership, strategic planning awareness, public hospitals.

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ETHICAL STATEMENT: The research was approved by Kocaeli City Hospital Scientific Research Ethics Committee with protocol number 3 on 14.03.2024. Data were collected between 25.03.2024 and 25.05.2024.

Kamu Hastanelerinde Değer Temelli Liderlik EFQM Mükemmellik Modelini Etkiler Mi? Stratejik Planlama Farkındalığının Rolü

Öz

Amaç: Araştırmanın amacı kamu hastanelerinde değer temelli liderlik ile EFQM (Avrupa Kalite Yönetim Vakfı) mükemmellik modeli arasındaki etkileşimi belirleyerek; bu etkide stratejik planlama farkındalığının rolünü ortaya koymaktır.

Yöntem: Veriler Kocaeli ilinde faaliyet gösteren kamu hastanelerinde görev yapan 236 sağlık çalışanına anket uygulanarak toplanmıştır. Veriler SPSS 25.0 ve AMOS 23.0 programları aracılığıyla analiz edilmiştir. Ölçeklerin yapı geçerliliğini değerlendirmek için güvenilirlik analizine ek olarak doğrulayıcı faktör analizi yapılmıştır. Hipotezler doğrultusunda geliştirilen modeli test etmek için yol analizi ve aracı rol analizi kullanılmıştır.

Bulgular: Değer temelli liderliğin EFQM modeli üzerinde anlamlı ve pozitif bir etkiye sahip olduğu bulunmuştur ($\beta=0.740$; $p<0.05$). Ayrıca stratejik planlama farkındalığının bu etkide kısmi aracı rolü olduğu saptanmıştır ($\beta=0.603$; $p<0.05$). Mevcut çalışma, değer temelli liderliğin EFQM modelini destekleyen ve hastanelerde sonuçları iyileştirebilen bir faktör olduğunu desteklemektedir. Ayrıca, stratejik planlama farkındalığının gerekliliğini vurgulayarak, EFQM ile değer temelli liderlik arasındaki bağlantıya katkı sağlamaktadır.

Sonuç: Değer temelli liderlik, tüm paydaşlarla etkileşime girme ve onları kuruluşun stratejisi, değerleri ve yönü hakkında bilgilendirme konusundaki hassasiyeti nedeniyle EFQM modeli için önemli bir öncül olarak düşünülmelidir. Ayrıca değer temelli liderlik ile EFQM modeli arasındaki etkileşimin artırılması için sağlık profesyonelleri arasında stratejik planlama konusunda farkındalığın sağlanması liderlerin gündeminin başında olmalıdır.

Anahtar Sözcükler: EFQM, değer temelli liderlik, stratejik planlama farkındalığı, kamu hastaneleri.

Introduction

Leadership is the driving force behind Total Quality Management (TQM)¹. Therefore, leadership types continue to be studied not only in relation to organizational performance but also in relation to TQM². In this context, value-based leadership has gained prominence because organizational values are the core of a strong quality culture³⁻⁵. By prioritizing collective goals over individual interests, this leadership style aligns organizational systems with excellence and creates sustainable value for all stakeholders^{6,7}. Crucially, a lack of leadership commitment remains a primary barrier to achieving hospital excellence. At the same time, research highlights that quality indicators remain low across the healthcare sector⁸⁻¹⁰. Moreover, achieving TQM success requires integrating quality ideals into strategic planning, supported by effective leadership. Since excellence in TQM depends on aligning hospital operations with their mission and future goals, this integration is essential for bridging the sector's performance gap¹¹. While leadership must ensure that strategy aligns with the values and stakeholder expectations, successful implementation ultimately depends on the strategic planning awareness of healthcare professionals^{3,11}. Consequently, this study investigates the interaction between the EFQM model and value-based leadership, alongside the role of strategic planning awareness. Using a convenience sampling method, data was

collected from three public hospitals in Kocaeli (City Hospital, Education and Research Hospital, State Hospital) to represent different administrative structures.

Theoretical Framework

Value-Based Leadership and EFQM

The EFQM Excellence Model, created by the European Foundation for Quality Management (EFQM), establishes a superior system for performance management. It provides the framework for achieving excellent results using leadership, policy and strategy, staff, procedures, partnerships, and resources^{12,13}. Approximately 80% of Europe's over 30,000 public and commercial businesses are known to utilize the EFQM Excellence Model for self-assessment to monitor performance and formulate strategies¹⁴. However, research on the link between leadership styles and EFQM suggests that the right leadership style is critical to the implementation of TQM^{2,15,16}. In the health industry in particular, leadership is thought to be crucial to maintaining and ensuring advances in patient safety and service quality¹³. While quality and excellence models often focus on leadership styles such as transformational, authentic, or ethical leadership, value-based leadership offers a unique approach that directly addresses the need for self-regulation and ethical consistency in the EFQM's leadership criteria, structurally integrating strategy and values. Unlike transformational leadership, which emphasizes motivation toward a shared vision, value-based leadership prioritizes the moral principles guiding change. Without this ethical foundation, transformational efforts risk losing their effectiveness^{7,17}. Authentic leadership also emphasizes self-consistency, whereas value-based leadership ensures that a leader's inner essence serves a broader moral purpose and the needs of their followers¹⁸. Ethical leadership is driven by external rewards and rules, whereas value-based leadership embeds ethics into the organization's core purpose. The most unique aspect that conceptually distinguishes value-based leadership is its impact on organizational structure. Shared values function as a natural internal control mechanism, reducing the need for rigid hierarchy and strict formalization, thus enabling leadership to act as a structural lever supporting decentralization^{7,19}. Since it aligns with the ideals and concepts of quality management and fosters employee engagement to accomplish improvements and boost performance, value-based leadership is a leadership style that may be linked to EFQM². Indeed, Grant²⁰ reported in the Harvard Business Review that the most important factor in fostering excellence and quality inside organizations is the role of values. Employee creativity and diversity are essential for excellence and quality improvement, and they are fostered in organizations with clearly stated values. To create a quality culture, personnel must comprehend the "why" behind their work practices in addition to the "what" and "how"²¹. Given that value-based leadership traits match well with the organizational setting where business excellence is expected, Hypothesis 1 is proposed:

H1: Value-based leadership has a direct and positive impact on EFQM.

Value-Based Leadership and Strategic Planning Awareness

Strategic planning serves as a leadership instrument that directs an organization from its mission to its vision²². Moreover, strategic planning integrates operational objectives with organizational values, creating a mutual influence between the two. Fairholm²³ stated that the relationship between strategic planning and values means that strategic thinking is related to leadership. Accordingly, value-based leaders behave with awareness that the primary objective is to stay consistent to the values. By basing their vision on follower needs, value-based leaders create a shared purpose that invites contribution and fosters diverse ideas. The following briefly describes the traits of a value-based leader⁷:

Integrity: Value-based leaders lead with integrity, never compromising their core objectives. For them, fulfilling follower goals is the primary indicator of both leadership success and a consistent life purpose.

Vision: The core duty of value-based leadership is crafting a vision rooted in follower needs. This ensures the leader's goals eventually align with and become the followers' own vision.

Listening: Value-based leaders listen to their followers and encourage different ideas in the organization.

Respect for followers: Believes in the dignity of those they lead and acts accordingly. Acts with the awareness that all employees have certain rights, primarily to be respected.

Participation: Value-based leadership gives all followers a chance to contribute to the organization.

In this respect, value-based leadership is compatible with the ideas of strategic planning, which requires creating and implementing policies based on medium and long-term goals, focusing on ultimate results^{7,24}. As a result Hypothesis 2 is proposed:

H2: Value-based leadership has a direct and positive impact on strategic planning awareness.

Strategic Planning Awareness and EFQM

Strategic effectiveness is directly correlated with organizational excellence²⁵⁻²⁷. Successful strategies reduce costs and optimize efficiency while enhancing patient experience and innovation. Ultimately, these improvements bolster long-term performance and drive the hospital toward sustained excellence²⁸⁻³⁰. Achieving this synergy depends on a strategy formulation process that balances actual performance results with stakeholder requirements within the EFQM framework²⁷. Reflecting this approach, public sector reforms have formalized these strategic inputs. Consequently, strategic planning in Turkish public administration is driven primarily by²⁴: Streamlining organizational policy implementation, improving financial management

and strategic decision-making by reducing budget implementation inefficiencies, aligning planning, programming, and budgeting at the organizational level, enhancing capacity for target-based policy development and implementation, implementation of transparency and accountability, fostering a culture of engagement.

However, successful strategic planning requires employees to fully understand and implement the process. Excellence is achieved only when the workforce embraces the mission and is motivated to meet organizational targets. Therefore, Hypothesis 3 is proposed:

H3: Strategic planning awareness has a direct and positive impact on EFQM.

The Role of Strategic Planning Awareness in the Impact of Value-Based Leadership on EFQM

Literature confirms that leadership significantly impacts performance in both hospitals and other sectors³¹⁻³⁴. However, developing balanced performance evaluation systems is challenging, as these systems must be centered on strategies derived from mission, vision, and values¹⁴. At this point, value-based leadership encourages participation in decision-making by creating strategies that make work more meaningful for employees^{35,36}. Engagement is particularly vital in strategic decision-making, as employees are more committed to implementing decisions they helped create. This approach enhances performance by decentralizing collaborative decision-making across the organization³⁷. Indeed, the resource-based view, within the framework of a strategic management approach, argues that an organization's sustainable competitive advantage stems from its internal, valuable, rare, inimitable, and irreplaceable resources and capabilities. Accordingly, it focuses not only on external market positioning but also on the utilization of internal assets (tangible or intangible) to achieve superior performance. Intangible resources are generally those that enable a company to maintain its competitive advantage (people, knowledge, culture). Values, by shaping the organizational culture—the most important of these internal resources—provide a competitive advantage. This insight closely aligns with the value-based leadership style, which maximizes the values and potential of employees, creating a “rare” and “inimitable” culture within the organization^{38,39}.

Furthermore, McKinsey's 7S model focusing on ideal organizational design, also emphasizes the integration of seven main components: shared values, structure, strategy, style, skills, staff, and systems. In this model, “style” refers to the leadership approach and management style. According to this model, structure, strategy, and systems are classified as Hard S's, while style, skills, staff, and shared values are considered Soft S's. This model emphasizes focusing not only on Hard S's but also Soft S's for change management and performance optimization, ensuring the integration of the 7S's, and eliminating inconsistencies. Therefore, any change in strategy affects other sub-elements, and these also need to be consistent. In particular, the behavior and management style of leaders shape the implementation of the organization's strategy through other elements⁴⁰. Moreover, the central element of the model, shared values,

when considered within the framework of value-based leadership, ensures the cultural and operational alignment required for sustainable change and high performance. At this point, value-based leadership enhances organizational performance by making work meaningful and transforming service delivery into tangible value^{35,36}.

Consequently, leadership—as a prerequisite for achieving goals in the EFQM excellence model—gains its true meaning through the decisive support and commitment of senior management^{12,41}. Organizations successfully using EFQM derive their strategic goals from the model's key success factors, ensuring their activities and enablers are structurally linked within their strategic plans¹⁴. Complementing this structural link, strategic planning also requires a high level of employee awareness fostered by committed leadership⁴²⁻⁴⁴. Based on this background Hypothesis 4 is proposed:

H4: The strategic planning awareness plays a mediating role in the impact of value-based leadership on EFQM.

Material and Methods

Population and Sample

The population of the research consists of 4378 health professionals working in three public hospitals (City Hospital, Education and Research Hospital, and State Hospital) in Kocaeli province of Türkiye. Following ethics committee approval, institutional permissions were obtained from these hospitals. These three hospitals were selected using a convenience sampling method due to the high workload intensity of healthcare professionals and the need to obtain high-quality data by collecting voluntary responses within a specific timeframe. While Kocaeli was chosen for its accessibility to researchers, these three hospital types represent the fundamental sub-organizational structures of public healthcare services and provide a robust environment for observing the interaction of research variables.

The sample size of the study was determined as 354 with a 95% confidence interval and a 5% margin of error⁴⁵. The number of employees constituting the population was divided into strata based on their institutions and the stratum weight was found by dividing the number of personnel in each stratum by the number of personnel in the population. Thus, the stratum weights were multiplied by the total number of personnel to be sampled and the number of personnel required to be sampled from each stratum was calculated⁴⁶ (Table 1).

Table 1. Calculation of the number of personnel to be included in the sample

Stratum number	Hospital	Total personnel	Stratum weight	Personnel required to the sample	Personnel included in the sample	Response rate
1	City Hospital	2621	$2621/4378=0.60$	$0.60 \times 354=212$	140	66%
2	Education and Research Hospital	1167	$1167/4378=0.27$	$0.27 \times 354=94$	48	%51
3	State Hospital	590	$590/4378=0.13$	$0.13 \times 354=48$	48	%100
Total		4378	1.00	354	236	%67

In case the questionnaires distributed to the employees were filled out incompletely or incorrectly, a 20% loss margin was added to the number of 354 and a total of 425 questionnaires were distributed. A total response rate of 67% was obtained and 236 employees participated in the research voluntarily (Table 1).

Measures

In the study, a survey was used as a quantitative method. The questionnaires consist of demographic and occupational variables, Strategic Planning Awareness Scale, EFQM Excellence Model Scale and Value-Based Leadership Scale.

Strategic Planning Awareness (SPA) Scale: The study utilized the strategic planning awareness scale developed by Yakut and Korkmazurek⁴³. The scale was reviewed by the researchers and made suitable for use in hospitals.

EFQM Excellence Model: The EFQM scale, which was adapted into Turkish by Tutuncu and Kucukusta⁴⁷ was used in the study. The validity and reliability analyses conducted by Tutuncu and Kucukusta⁴⁷ revealed that the “Results” criterion was perceived as a single dimension instead of independent groups as in the original model. The authors explained this situation with the pragmatic approach of the Turkish society and stated that the model has this limitation for Türkiye.

Value-Based Leadership (VBL) Scale: The value-based leadership scale developed by Garg and Krishnan⁷ was used in the study. The scale was translated into Turkish by the researchers, and the statements were made suitable for use in hospitals.

Ethical Statement

The research was approved by Kocaeli City Hospital Scientific Research Ethics Committee with protocol number 3 on 14.03.2024. Data were collected between 25.03.2024 and 25.05.2024.

Results

Data analysis was done using SPSS for Windows 25.0 and AMOS 23.0 programs.

Table 2. Respondents' characteristics

Variables	Frequency	%
Profession		
Doctor	11	4.7
Nurse	83	35.2
Assistant Health Personnel	28	11.9
Support Services Personnel	75	31.8
Administrative Personnel	39	16.5
Gender		
Female	176	74.6
Male	60	25.4
Age ranges ($\bar{X} \pm SS$, 37.31 ± 8.02)		
37 and below	123	52.1
Over 37	113	47.9
Work Unit		
Clinical Unit	135	57.2
Administrative Unit	101	42.8
Total	236	100.0

Table 2 provides the participants' demographic information. It is seen that 4.7% of the participants are doctors, 35.2% are nurses, 11.9% are assistant health personnel, 31.8% are support services personnel and 16.5% are administrative personnel (Table 2).

Validity and reliability

The AMOS program was utilized to conduct Confirmatory Factor Analysis (CFA) to assess the construct validity of the scales. Cronbach's Alpha was applied to assess the scales' reliability. The scales are considered reliable provided this value is higher than 0.70⁴⁸.

Table 3. Confirmatory factor analysis of the VBL scale

Item No	Factor Loading	Standard Error	t-value	Significance
1	0.901	-	-	
2	0.809	0.046	17.422	*
3	0.864	0.048	20.086	*
4	0.871	0.047	20.476	*
5	0.903	0.046	22.453	*
6	0.919	0.045	23.538	*
7	0.914	0.048	23.213	*
8	0.932	0.045	24.515	*

9	0.886	0.046	21.377	*
10	0.866	0.050	20.197	*
11	0.923	0.044	23.854	*
12	0.875	0.046	20.718	*
13	0.884	0.048	21.262	*
14	0.905	0.043	22.593	*
15	0.920	0.046	23.613	*
16	0.777	0.048	16.150	*
17	0.882	0.045	21.104	*
18	0.937	0.042	24.905	*
19	0.883	0.047	21.186	*
20	0.893	0.046	21.799	*
Total $\alpha=0.987$				

Note(s): * $p<0.05$; α =Cronbach Alpha

All correlations are significant and the factor loadings of the VBL scale items are over 0.40 (Table 3). These demonstrate a convergent validity level that is satisfactory⁴⁹.

Table 4. Model fit indices of the VBL scale

Model Fit Indices	Reported Values	Appropriate Values and References
CMIN/DF	4.041	≤ 5 ⁵⁰
RMSEA	0.098	≤ 0.10 ⁵¹
CFI	0.930	≥ 0.80 ⁵²
TLI	0.919	≥ 0.80 ⁵³
IFI	0.930	≥ 0.80 ⁵⁴
RFI	0.896	≥ 0.80 ⁵⁵
NFI	0.909	≥ 0.80 ⁵⁶

As the reliability analysis result are given in Table 3, the internal consistency of the scale is high⁴⁸. Moreover, the fit indices provided acceptable values (Table 4).

Table 5. Confirmatory factor analysis of the SPA scale

Item No	Factor Loading	Standard Error	t-value	Significance
Knowledge ($\alpha=0.943$)				
1	0.614	-	-	-
2	0.704	0.090	13.844	*
3	0.841	0.140	10.432	*
4	0.872	0.144	10.690	*
5	0.866	0.152	10.644	*
6	0.850	0.153	10.508	*
7	0.804	0.141	10.115	*
8	0.876	0.148	10.723	*

9	0.737	0.142	9.501	*
10	0.898	0.148	10.900	*
11	0.425	0.129	6.032	*
Perception ($\alpha=0.964$)				
12	0.626	-	-	-
13	0.804	0.122	10.414	*
14	0.866	0.115	10.989	*
15	0.869	0.111	11.016	*
16	0.916	0.114	11.429	*
17	0.937	0.110	11.605	*
18	0.918	0.109	11.445	*
19	0.837	0.106	10.729	*
20	0.899	0.111	11.285	*
21	0.870	0.113	11.029	-
Process ($\alpha=0.889$)				
22	0.568	-	-	*
23	0.535	0.128	6.849	
24	0.768	0.158	8.758	*
25	0.860	0.176	9.334	*
26	0.801	0.167	8.973	*
27	0.741	0.170	8.560	*
28	0.773	0.164	8.793	*
Total $\alpha=0.964$				

Note(s): * $p<0.05$; α =Cronbach Alpha.

All correlations are significant and the factor loadings of the SPA scale items are over 0.40 (Table 5). These demonstrate convergent validity which is at a satisfactory level⁴⁹.

Table 6. Model fit indices of the SPA scale

Model Fit Indices	Reported Values	Appropriate Values
CMIN/ DF	2.870	≤ 5
RMSEA	0.089	≤ 0.10
CFI	0.902	≥ 0.80
TLI	0.892	≥ 0.80
IFI	0.902	≥ 0.80
RFI	0.843	≥ 0.80
NFI	0.857	≥ 0.80

As the reliability analysis results are given in table 5, the internal consistency of the scale is high⁴⁸. Moreover, the fit indices provided acceptable values (Table 6).

Table 7. Confirmatory factor analysis of the EFQM

Item No	Factor Loading	Standard Error	t-value	Significance
Leadership ($\alpha=0.919$)				
1	0.657	-	-	-
2	0.723	0.110	10.004	*
3	0.707	0.099	9.806	*
4	0.901	0.112	11.977	*
5	0.870	0.126	11.659	*
6	0.927	0.119	12.243	*
Policy and Strategy ($\alpha=0.944$)				
7	0.837	-	-	-
8	0.837	0.064	16.184	*
9	0.947	0.056	20.222	*
10	0.896	0.057	18.219	*
11	0.883	0.061	17.741	*
People ($\alpha=0.955$)				
12	0.873	-	-	-
13	0.929	0.050	21.811	*
14	0.909	0.054	20.755	*
15	0.847	0.055	17.865	*
16	0.892	0.053	19.884	*
17	0.863	0.061	18.544	*
Partnerships and Resources ($\alpha=0.919$)				
18	0.780	-	-	-
19	0.793	0.081	13.345	*
20	0.877	0.072	15.199	*
21	0.866	0.077	14.940	*
22	0.856	0.077	14.729	*
Processes ($\alpha=0.935$)				
23	0.765	-	-	-
24	0.764	0.032	31.130	*
25	0.948	0.075	16.525	*
26	0.959	0.078	16.768	*
Results ($\alpha=0.956$)				
27	0.806	-	-	-
28	0.821	0.068	14.832	*
29	0.824	0.068	14.896	*
30	0.860	0.076	15.878	*
31	0.826	0.079	14.951	*
32	0.898	0.067	16.950	*
33	0.868	0.067	16.101	*
34	0.827	0.065	14.982	*
35	0.838	0.065	15.274	*
Total $\alpha=0.983$				

Note(s): * $p<0.05$; α =Cronbach Alpha

All correlations are significant and the factor loadings of the EFQM scale items are over 0.40 (Table 7). These reveal a convergent validity level that is satisfactory⁴⁹.

Table 8. Model fit indices of the EFQM

Model Fit Indices	Reported Values	Appropriate Values
CMIN/DF	3.061	≤5
RMSEA	0.094	≤0.10
CFI	0.890	≥0.80
TLI	0.879	≥0.80
IFI	0.890	≥0.80
RFI	0.830	≥0.80
NFI	0.845	≥0.80

As the reliability analysis results are given in table 7, the internal consistency of the scale is high⁴⁸. Moreover, the fit indices provided acceptable values (Table 8).

Table 9. Normality analysis

Variables	Skewness	Kurtosis	Results
VBL	-0.739	-0.199	Normal
SPA	-0.706	0.549	Normal
EFQM	-0.487	-0.194	Normal

Table 9 presents the findings of the scales' normality examination. The data has a normal distribution, as indicated by the skewness and kurtosis values being within ± 3 ⁵⁷.

Common Method Bias

Harman's single-factor test was conducted to assess common method bias that might arise from collecting data from a single source and within the same time period. Items for all latent variables in the study were subjected to exploratory factor analysis, with the number of factors fixed at one. The analysis revealed that the single factor explained 44% of the total variance. Since this value is below the widely accepted 50% threshold⁵⁸, it was concluded that the risk of common method variance is low and the findings are not significantly affected by methodological bias. Therefore, these results confirm that the variance is not concentrated in a single factor, further supporting that the latent variables are empirically distinct and that multicollinearity does not undermine the structural relationships within the model.

Convergent and Discriminant Validity Values (AVE, CR, Fornell-Larcker and HTMT)

The convergent validity of the measurement model was tested using Average Variance Extracted (AVE) and Composite Reliability (CR) values, while its discriminant validity was tested through the Fornell-Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT).

Table 10. Results of convergent and discriminant validity

Variables	CR	AVE	VBL	SPA	EFQM
VBL	0.987	0.790	0.889*		
SPA	0.976	0.587	0.656	0.766*	
EFQM	0.985	0.701	0.718	0.850	0.837*

Note(s): *The bold values on the diagonal represent the square root of the AVE value of the relevant variable. The values below the diagonal represent the Pearson correlation coefficients between the variables.

Table 10 shows that all latent variables have CR values above the threshold of 0.70 and AVE values above the threshold of 0.50⁵⁹. This demonstrates that the items share a high level of common variance with the latent variable they represent, and that convergent validity is achieved. To satisfy the requirement for discriminant validity based on the Fornell-Larcker criterion, the square root of the AVE of each latent variable should exceed the correlation coefficients between that variable and all other variables in the model⁵⁹. Table 10 reveals that this requirement is satisfied for VBL (0.889 > 0.656 and 0.718) and EFQM (0.837 > 0.718). On the other hand, the high correlation between SPA and EFQM ($r=0.850$) is notably close to the square root of the AVE for EFQM (0.837). Therefore, to evaluate discriminant validity, the HTMT criterion proposed by Henseler et al.⁶⁰ was employed alongside the Fornell-Larcker criterion.

Table 11. Results of discriminant validity via HTMT

Variable Pairs	HTMT	Results
VBL - EFQM	0.782	Strong Discriminant Validity (<0.85)
VBL - SPA	0.724	Strong Discriminant Validity (<0.85)
SPA - EFQM	0.884	Acceptable Discriminant Validity (<0.90)

Table 11 shows that for all latent variable pair, the HTMT values remained below the conservative threshold of 0.85 or the more flexible threshold of 0.90⁶⁰. Specifically for the SPA-EFQM pair, the HTMT value of 0.884 confirms discriminant validity, revealing that despite their high correlation, these two latent variables represent different structures. Consequently, these two structures are closely related—as theoretically expected—yet can still be accepted as independent latent variables.

Hypothesis Testing and Statistical Power Analysis

Path and mediation analyses were conducted in line with the established model. When the effect of VBL (independent variable) on EFQM (dependent variable) is examined, it is seen that it has a significant and positive effect ($\beta=0.740$, $p<0.05$) (Table 12). Therefore, the possibility of a mediating role in this effect could be investigated. The findings indicated that there was a mediator role in the model since the values in the 95% confidence interval did not include 0 (zero) (0.495-0.721). Moreover, the role of SPA in the effect of VBL on EFQM in hospitals was found to be significant (Table 12). Since it was concluded that there was a mediator, the significance of the direct effect was examined for determining type of mediation. Consequently, it was seen that the effect of VBL on EFQM was significant, but the coefficient decreased ($\beta=0.603$, $p<0.05$). Therefore, a partial mediation decision was made (Table 12).

The adequacy of the sample size ($N=236$) was evaluated by conducting a post-hoc power analysis based on the RMSEA method⁶¹. With an observed RMSEA of 0.072 and 252 degrees of freedom (df) at an alpha level of 0.05, the statistical power was calculated as 0.999. This result exceeds the recommended threshold of 0.80⁶², confirming that the study has sufficient statistical power to provide reliable estimates for the structural model (Table 12).

Table 12. The mediating role of SPA in the impact of VBL on EFQM

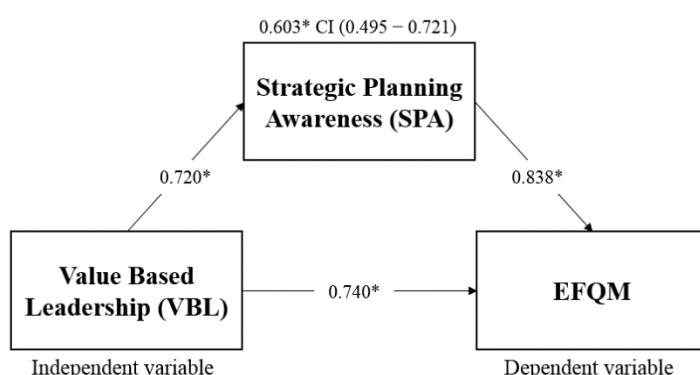
Effect		β	SE	t-value	Sig	Results
VBL → EFQM		0.740	0.051	9.199	*	H1:accepted
SPA → EFQM		0.838	0.155	6.737	*	H2:accepted
VBL → SPA		0.720	0.048	7.695	*	H3:accepted
VBL→SPA→EFQM	Direct Effect	0.135	0.034	2.587	*	H4:accepted
	Indirect Effect	0.603	Confidence Interval (0.495 – 0.721)			*
Model Fit Indices		Reported Values		Appropriate Values		
CMIN/DF		2.222		≤5		
RMSEA		0.072		≤0.10		
CFI		0.846		≥0.80		
TLI		0.841		≥0.80		
IFI		0.846		≥0.80		
RFI		0.816		≥0.80		

NFI	0.807	≥ 0.80
Statistical Power	0.999	≥ 0.80

Note(s): * $p < 0.05$; Sig=Significance; β = Coefficient; SE=Standard Error; Statistical power was calculated based on the RMSEA method for $N=236$ and $df=252$ at an alpha level of 0.05.

The model results predicting the mediating role of strategic planning awareness in the interaction between value-based leadership and EFQM are summarized in Figure 1.

Figure 1. Results on the conceptual model.



Note(s): * $p < 0.05$; CI=Confidence interval

Discussion

The current study found that EFQM was positively affected by value-based leadership. In parallel with this finding, the study conducted by Snyder et al.⁶ shows that sustainable quality improvement requires the development of value-based leadership. Similarly, the study conducted by Suarez et al.¹¹ reveals that the commitment of leaders is an important component in the success of excellence models. The responsibility of leaders is to uphold the core values of the organization and encourage the components to function for excellence⁶³ however, many leaders make the mistake of utilizing short-termism and fast successes to expedite change⁶⁴. Therefore, the only way to bring real change on the path to excellence is to adopt new ways of thinking driven by the understanding of value creation. Otherwise, improvement efforts will go no further than momentary "sugar highs" that disappear⁶⁵.

The current study found that EFQM was positively affected by healthcare professionals' awareness of strategic planning. Similarly, Alpkın and Dogan³⁷ found a positive relationship between strategic planning and quality performance. In addition, the study conducted by Zapletalová⁶⁶ determined that EFQM plays a critical role in the success of the strategic planning process. Moreover, the study by Suarez et al.¹¹ reveals that the management of EFQM enablers differs according to the degree of excellence of the

strategic planning process. Therefore, quality performance is greatly affected by the participation of all employees in activities related to gathering information during the strategic decision-making phase as well as preparing and revising plans. As a supporting example, the research conducted by Bocoya-Maline et al.⁶⁷ revealed that the success of the EFQM excellence model was due to the facilitation of knowledge and experience transfer throughout internal stakeholders.

The current study confirmed the mediating role of strategic planning awareness in the effect of value-based leadership on EFQM in hospitals. This finding aligns with the EFQM's people enablers, which emphasize the importance of how employees perform, develop, and reach their greatest potential. The research conducted by Nalci Aribas⁶⁸ supported that it is easier to adopt and implement a strategic plan prepared in a participatory manner. However, in the study conducted by Bagdigen and Avci⁶⁹ in public institutions, it was revealed that the principle of participation was not fully complied with in the strategic planning process. Allowing employees to fully engage in the strategic planning process would improve service effectiveness, create a feeling of belonging within the organization, and ensure that the strategic plan is implemented effectively.

Conclusions

This research analyzes the interaction between value-based leadership and the EFQM excellence model in public hospitals, and the critical role of strategic planning awareness in this relationship. The findings reveal that value-based leadership has a significant and positive effect on the EFQM model, and that strategic planning awareness plays a partial mediating role in this effect. Considering these empirical results, the study offers significant theoretical contributions to the literature. Firstly, while excellence models like EFQM are generally examined in the context of technical processes or transformational leadership in the current management literature, this study expands the theoretical framework by demonstrating that value-based leadership is a fundamental prerequisite for the model. The ability of value-based leaders to align the institution's vision and strategy with stakeholder needs is identified as a key driving force enabling the successful implementation of EFQM's input factors. Secondly, and most importantly, the study answers the "how" question in the relationship between leadership and excellence, introducing strategic planning awareness as a mediating mechanism explaining this interaction to the literature. This goes beyond previous research by demonstrating that leadership behaviors are transformed into excellence not through a direct reflection of organizational outcomes, but through healthcare professionals' cognitive internalization of strategic goals and their participation in these processes. Finally, a holistic model is presented on how, in organizations with high workloads and complex structures such as public hospitals, reducing strategy awareness beyond the top management level to the employee level mobilizes EFQM enablers. In conclusion, value-based leadership, with its sensitivity to engaging with all stakeholders and informing them about the organization's direction, provides an indispensable foundation for the EFQM model; while increasing awareness of strategic planning should be considered a key lever that maximizes the impact of this leadership style on excellence.

Managerial Implications

The implementation of TQM and excellence models demands collective engagement and substantial strategic effort, reflecting the transformative impact these initiatives exert on hospital operational structures. Success will be inevitable if leaders prioritize this and build a team aware of the necessity of its integration with strategic planning. While there are many alternative forms of leadership practice, a leadership style focused on human relations and values is more likely to lead to increased staff and patient satisfaction, quality of care, and improved performance outcomes. Furthermore, to achieve these outcomes, leadership should not be considered independently of policy, strategy, and process elements, as seen in EFQM. This is because the successful implementation of policies and strategies in hospitals depends on viewing these elements as an integral part of leadership's core responsibilities. The current study helps administrators identify which type of leadership can be effective in improving hospital operating outcomes and to recognize that healthcare professionals are a strategic asset using resources. Value-based leadership not only ensures internal and external communication but also gives all employees the opportunity to contribute to the hospital. This leadership style should be considered a key prerequisite for the EFQM model due to its sensitivity in engaging with and informing all stakeholders about the organization's policy, strategy, values, and direction. A key finding of the present study is that awareness of strategic planning mediates the relationship between value-based leadership and the EFQM excellence model. Consequently, a hospital's ability to achieve excellence depends not only on leadership but also on the strategic planning awareness of its healthcare professionals. Therefore, raising awareness of strategic planning among healthcare professionals should be at the top of hospital administrators' agendas.

Research Limitations

The limitation of this study is the use of a convenience sampling method within a single province (Kocaeli). While this approach allows for the collection of useful data from healthcare professionals, the findings may not be fully generalizable to different geographic regions. Future research should utilize random sampling techniques in larger populations to further validate the interactions between the research variables.

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The Effect of Cradle Cap Care Education Given to Mothers with 0-12 Months Infants on Mothers' Knowledge Levels*

Tilbe BURSALI**, Beste ÖZGÜVEN ÖZTORNACI***

Abstract

Aim: The aim of this study was to investigate the effect of cradle cap care education given to mothers with 0-12 months old infants on their knowledge levels. This age range (0-12 months) was selected because it is the period when the barrier functions of a baby's skin are most fragile.

Method: This study was quasi-experimental designed and conducted between April 2023 and July 2023 with 33 mothers of infants aged 0-12 months enrolled in a family health centre. "Cradle Cap Care in Infants" education programme prepared by the researchers was applied to the mothers. The data were collected three times: before, two weeks after, and two months after the education with the "Mother-Infant Sociodemographic Characteristics Form" and "Maternal Knowledge Assessment Form for Cradle Cap Care in Infants". Correlation and one-way analysis of variance (ANOVA) were used to evaluate the relationships between mothers' knowledge scores and maternal age and educational status. Analysis of variance for repeated measures and independent samples t-test were used to determine the differences between knowledge scores obtained from pre- and post-education tests.

Results: The maximum score that can be obtained from the 'Maternal Knowledge Assessment Form for Cradle Cap Care in Infants' is 18. The mean score of the test performed before the education was 6.73, the mean score of the test performed in the second week after the education was 10.15, and the mean score of the test performed in the second month after the education was 10.00. Accordingly, a significant difference was found between the pre- education test score and the knowledge level scores obtained from the tests after the education given to the mothers ($p < 0.05$). No statistically significant difference was found between the knowledge scores obtained two weeks and two months after the education, indicating the maintenance of knowledge over time. It was observed that the age and education level of mothers did not create a significant difference in pre-test knowledge scores. It has been determined that the majority of mothers correctly perform some basic practices related to infant cradle cap care. However, the rate of incorrect answers is high for some questions. Most incorrectly answered statements are related to cultural habits and information passed down from previous generations.

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ETHICAL STATEMENT: Ethics committee permission was obtained from İzmir Kâtip Çelebi University Non-Interventional Ethics Committee (Date: 22/09/2022, Number: 0412), and application permission was obtained from İzmir Provincial Health Directorate (Date: 13/03/2023, Number: 211227011).

Conclusion: It was determined that the knowledge level of the mothers about cradle cap care was below the average before the education. It was found that the cradle cap care education provided a significant increase in the knowledge level of the mothers. The findings suggest that structured and evidence-based cradle cap care education delivered by nurses can support appropriate infant skin care practices and ensure sustained maternal knowledge. It is recommended that cradle cap care education be integrated into routine infant follow-up visits in primary health care settings.

Keywords: Cradle cap, infant care, mothers, education, pediatric nursing.

0-12 Aylık Bebeği Olan Annelere Verilen Konak Bakımı Eğitiminin Annelerin Bilgi Düzeylerine Etkisi

Öz

Amaç: Bu çalışmanın amacı, 0-12 aylık bebeği olan annelere verilen konak bakımı eğitiminin annelerin bilgi düzeyleri üzerindeki etkisini araştırmaktır. Bu yaş aralığı (0-12 ay), bebek cildinin bariyer fonksiyonlarının en kırılgan olduğu dönem olması nedeniyle seçilmiştir.

Yöntem: Yarı deneysel türdeki bu çalışma, Nisan 2023 ile Temmuz 2023 tarihleri arasında bir aile sağlığı merkezine kayıtlı 0-12 aylık bebeği olan 33 anne ile yürütülmüştür. Annelere araştırmacılar tarafından hazırlanan “Bebeklerde Konak Bakımı” eğitim programı uygulanmıştır. Veriler eğitimden önce, eğitimden iki hafta sonra ve eğitimden iki ay sonra olmak üzere üç kez “Anne-Bebek Sosyodemografik Özellikleri Formu” ve “Bebeklerde Konak Bakımına Yönelik Anne Bilgi Değerlendirme Formu” ile toplanmıştır. Annelerin bilgi puanları ile anne yaşı ve eğitim durumu arasındaki ilişkilerin değerlendirilmesi için korelasyon ve Tek Yönlü varyans analizi (ANOVA) kullanıldı. Eğitim öncesi ve eğitim sonrası testlerden elde edilen bilgi puanları arasında farkları belirlemek için Tekrarlı Ölçümlerde Varyans Analizi ve Bağımsız Örneklem T Testi yapıldı.

Bulgular: “Bebeklerde Konak Bakımına Yönelik Anne Bilgi Değerlendirme Formu”ndan alınabilecek en yüksek puan 18’dir. Eğitim öncesinde yapılan testin puan ortalaması 6,73, eğitimden sonraki ikinci haftada yapılan testin puan ortalaması 10,15 ve eğitimden sonraki ikinci ayda yapılan testin puan ortalaması ise 10,00’dir. Buna göre, eğitim öncesi test puanı ile annelere verilen eğitim sonrası testlerden elde edilen bilgi düzeyi puanları arasında anlamlı bir fark bulunmuştur ($p<0,05$). Eğitimden iki hafta ve iki ay sonra elde edilen bilgi puanları arasında istatistiksel olarak anlamlı bir fark bulunmamıştır, bu da bilginin zaman içinde korunduğunu göstermektedir. Annelerin yaşı ve eğitim düzeyinin pre test bilgi puanlarında anlamlı farklılık yaratmadığı görülmüştür. Annelerin büyük çoğunluğunun bebek konak bakımına ilişkin bazı temel uygulamaları doğru yaptığı belirlenmiştir. Ancak bazı sorularda yanlış yanıt oranı yüksektir. Yanlış yanıtlanan ifadelerin çoğu kültürel alışkanlıklar ve önceki kuşaklardan aktarılan bilgilerle ilişkilidir.

Sonuç: Eğitim öncesi annelerin konak bakımı ile ilgili bilgi düzeylerinin ortalamasının altında olduğu belirlenmiştir. Verilen konak bakımı eğitiminin annelerin bilgi düzeyinde anlamlı artış sağladığı saptanmıştır. Bulgular, hemşireler tarafından verilen yapılandırılmış ve kanıta dayalı konak bakımı eğitiminin, uygun bebek cilt bakımı uygulamalarını destekleyebileceğini ve annelerin bu konudaki bilgilerinin kalıcı olmasını sağlayabileceğini göstermektedir. Konak bakımı eğitiminin, birinci basamak sağlık hizmetleri ortamlarında rutin bebek takip ziyaretlerine entegre edilmesi önerilmektedir.

Anahtar Sözcükler: Konak, bebek bakımı, anne, eğitim, çocuk hemşireliği.

Introduction

Cradle cap or pityriasis capitis is a type of infantile seborrheic dermatitis (ISD)^{1,2}. It is a benign, self-limiting condition characterized by inflammatory or non-inflammatory

yellow, oily scales that usually occur on the scalp^{1,3,4}. The main cause of the formation is the excessive secretion of fat as a result of the excessive functioning of the sebaceous glands in the scalp of the baby and the accumulation of these secreted fats^{5,6}. It can be found in areas of intense sebaceous gland activity, such as the scalp, the T line of the face and the outer ears. No gender or racial differences are observed. It appears between the third week and the first few months after birth. The highest incidence is in the 3rd month of life. Seborrheic dermatitis (including cradle cap) is common in early infancy with a prevalence of about 10% in first three months, and peak incidence at 3 months up to 70%. Cradle cap most commonly occurs between birth and three months, with peak incidence around 3 months of age^{2,3}. Foley et al. reported that hosts were seen in 70% of infants from three months of age, and the prevalence of hosts was 10.4% in boys and 9.5% in girls⁷. The prevalence of cradle cap formation in infants was found to be 40.3% in a study⁸ and 55% in another study⁴ conducted in Türkiye. This high early-infancy prevalence underlines why we selected the 0–12 months age range for the present study.

Although cradle cap is a benign and self-limiting skin condition, it can be a source of stress for parents. Families may make wrong applications to the baby's cradle cap area with the stress they experience. Some caregivers may rely on traditional remedies or cultural practices- such as applying butter, herbal mixtures, or heavy oils- that are not evidence-based and may worsen scaling or delay healing. Parents should be properly educated about the management and benign nature of this condition^{2,9}.

If the cradle cap is not properly cared for, it may spread from the scalp to the forehead, ears and cheeks, and may cause many negative consequences such as a high risk of developing atopic dermatitis in children at a later age⁹⁻¹¹. The main aim of cradle cap care and treatment is to soften and clean the crusts, inhibit fungal colonisation, if any (e.g. yeasts of genus *Malassezia*), and prevent secondary infection¹². The cradle cap care is often carried out by massaging pure extra virgin olive oil or baby oil onto the scalp, waiting for some minutes, then gently washing and combing the hair with a soft baby comb with a ball tip, in the opposite direction of hair growth^{2,13}. It has also been reported that in uncomplicated cases, simple emollient-based care (e.g. oils, mild shampoos) may suffice without the need for medicated creams or aggressive treatments^{9,14}.

In studies, it has been reported that mothers generally apply olive oil in cradle cap care^{4,8}. Applying mineral-containing products to the scalp during care prevents the spread of cradle cap^{5,15}. In the systematic review of randomised controlled trials, it is seen that products such as oral biotin, topical steroids, promiscuous nonsteroidal cream, lactamide monoethanolamine gel, hydrocortisone 1% lotion, lycocalcone 0.025% lotion, flumethasone pivalate 0.02% lotion, eosin 2% aqueous solution and topical gel cream containing pyroton olamine, biosaccharide gum-2 (antifungal), stearyl glycyrrhetinate (anti-inflammatory), zinc 1-pyrrolidone carboxylate (antiseborrheic) components are used in cradle cap treatment. The efficacy of a keratin-regulating formulation containing hydroxy acids, capryloyl-glycine complex, butylavocadate, aloe vera, bourrache oil was also investigated. The samples of the studies in this systematic review are quite small. Therefore, the results cannot be generalised and there is no conclusive evidence that any

specific treatment is superior. However, guidelines for infant skin care emphasize mild cleansers and emollients, and discourage harsh, irritant or potentially sensitizing topical agents in infants^{9,14}. Based on the results of this systematic review, use of shampoos and emollient agents such as baby oil is supported and reassurance that expensive treatments are unnecessary¹. In one study¹⁰ on cradle cap care, it was reported that the safest way is to care with olive oil containing 3-5% salicylic acid; in another study¹, it was reported that harmful treatments such as salicylic acid, which can be toxic when applied in high doses, should be avoided. In studies investigating the knowledge levels of mothers, it was found that 47.7% and 61.1% of mothers used olive oil in cradle cap care^{4,8}.

Among the many roles of nurses, the role of caregiver and educator is included. Nurses are obliged to provide care to the patient in line with their knowledge and experience¹⁶. In addition, nurses protect the patient's health and support their development with the role of educator, which is one of their basic roles¹⁷. Skin development in infants continues until the first year of life. Since the skin of babies is immature in the first year of life, it is among the leading duties of nurses to protect, maintain and support the development of skin integrity of babies¹⁸. Thus, the nurse emphasises the roles of caregiver and educator while providing cradle cap care to parents^{17,18}. The nurse prioritises patients during cradle cap care and education¹⁷. It is the responsibility of the nurse to recognise the babies who have started to have a cradle cap early and to plan the education about the care of the family by considering the level of education and socioeconomic status of the family and to assess maternal factors such as education level, parity, and pregnancy intention, as these are known to influence infant care practices.¹⁴. The nurse should also refer the babies who receive cradle cap care but regress to the relevant physician to investigate and treat the underlying cause and follow up during and after the treatment process^{17,18}.

In particular, the level of knowledge about cradle cap care practices of mothers who have never received cradle cap care education before should be determined. According to these results, it is extremely important and necessary to increase the knowledge and skill levels of mothers by planning education for the missing information and care practices. Given the high prevalence during early infancy and limited parental knowledge documented in literature, structured parental education on infantile skin care is strongly indicated. Based on this essence, this study was conducted to examine the effect of cradle cap care education given to mothers with infants aged 0-12 months on the mothers' knowledge levels.

Material and Methods

Study Design

This study is a quasi-experimental study in which the effectiveness of the education given is investigated, designed in pretest-posttest order. The study was conducted between April 2023 and July 2023 at Narlıdere Education Family Health Centre No.4 in Izmir Province. The population of the study consisted of 44 mothers with infants aged 0-12 months who were followed up in this centre during the period of the study.

Sample of the Study

The population of the study consisted of 44 mothers with infants aged 0-12 months who were followed up in this centre during the period of the study. Sample size was calculated using G Power 3.1.9.2 programme. The minimum sample size was found to be 27 when 95% confidence, 80% test power, effect size=0.50 and α margin of error=0.05, taking into account the direct effect sizes standardised by the difference between two dependent means test. A total of 33 mothers who consented to participate in the study and met the inclusion criteria were included in the sample. No case was lost at the end of the study. The power level of the sample was found to be 0.878.

Although cradle cap is most common between 0–3 months, the 0–12-month interval was selected because cradle cap can still occur throughout infancy and health-centre follow-up schedules include the entire first year of life. Additionally, past epidemiological studies indicate that seborrheic dermatitis may persist or recur up to 12 months of age^{2,4,8-11}.

Inclusion criteria;

- Mothers who participated in the study voluntarily, who could speak, understand, read and write Turkish, and who could be reached by phone.
- Mothers whose babies were born full-term, whose babies did not have any chronic diseases, and whose babies were between 0-12 months old were included in the study.

Data Collection Tools

The research data were collected using the Mother-Infant Sociodemographic Characteristics Form and the Maternal Knowledge Assessment Form for Cradle Cap Care in Infants.

Mother-Infant Sociodemographic Characteristics Form: The form was prepared by reviewing the literature on cradle cap care^{2-8,14,15,19}. The form contains 16 questions. The questionnaire consists of questions about mother age, mother education level, baby gender, baby age, baby weight, gestational age of the baby, mode of delivery, baby washing frequency, cleaning agents mother uses while washing, whether the cradle cap has ever occurred in the baby, and if so, when it occurred, how long it lasted, which applications were made for healing, what the care was done with, how long the product applied to the head was kept, and what kind of change occurred in the cradle cap after the applications.

Maternal Knowledge Assessment Form for Cradle Cap Care in Infants: The form was prepared by reviewing the literature on cradle cap care^{2-7,12,16-18}. The form includes 18 statements prepared to determine the level of knowledge of mothers about cradle cap care. In the study, after reading these statements, the mothers were asked to tick the “true” option if they think they are true, the “false” option if they think they are

false, and the “don't know” option if they have no information on the subject. If the answer given by the mothers for each statement was correct, “1” point was given, and if the answer was incorrect or the mother did not know the answer, “0” point was given. The minimum total score to be obtained from the information assessment form is ‘0’ and the maximum total score is ‘18’. Statements numbered 4, 5, 7, 11, 12, 14 and 16 were Reverse Coded (RC).

After the forms were prepared, they were sent to seven faculty members who are experts in the field of Child Health and Diseases Nursing and the final version of the forms was formed with the feedback received. The Kuder-Richardson values of the ‘Maternal Knowledge Assessment Form for Cradle Cap Care in Infants’ were found to be 0.76 for the pretest, 0.58 for the posttest 1, and 0.60 for the posttest 2.

The decrease in reliability coefficients in the post-tests is likely due to reduced score variability because mothers' knowledge levels increased after the education, causing restricted variance in post-intervention assessments^{20,21}.

Educational Materials of the Study

A powerpoint presentation and an educational brochure, prepared by reviewing the literature on the subject, were used as the educational material for the “Cradle Cap Care Education”^{2-8,14,15,19}. Because the education was provided online rather than face-to-face, mothers did not receive hands-on practice, which may limit skill acquisition despite increased theoretical knowledge.

Expert opinions were obtained from seven faculty members who are experts in the field of Child Health and Diseases Nursing with the "Patient Education Materials Assessment Tool for Printable Materials (HEMDA-B)" and “Patient Education Materials Assessment Tool for Audiovisual Materials (HEMDA-G/I)”²²⁻²³. As a result of the evaluations received from seven experts for the prepared education contents, the average scores of comprehensibility-applicability were calculated for both the education brochure and the powerpoint presentation. For the education brochure, the mean score of comprehensibility was found to be 72.14% and the mean score of applicability was found to be 85.71%. For the Powerpoint presentation, the mean score for comprehensibility was 85%, while the mean score for applicability was 78.57%. The mean scores of the comprehensibility-applicability of the education materials were determined to be at an acceptable level.

Variables of the Study

Dependent variable of the study; The knowledge scores of the mothers obtained from the "Maternal Knowledge Assessment Form for Cradle Cap Care in Infants".

Independent variable of the study; “Education on Cradle Cap Care for Babies” given to mothers.

Application Plan of the Study

Mothers were interviewed face-to-face at the beginning of the study and their consent was obtained before data collection. Pre-tests were applied to the mothers before the education. The administration of the pretest took approximately 15-20 minutes for each mother. The “Cradle Cap Care Education” given to mothers was planned to be carried out face-to-face by forming groups collectively, but as mothers did not want to leave their babies at home and come to the family health centre, the education was carried out online in line with the preferences of the mothers as supported by the literature. Online education may increase accessibility but may also limit hands-on demonstration opportunities²². The education was administered to each mother separately for 20 minutes each at the times and days preferred by the mothers. During the education, the prepared educational presentation was projected on the screen and the subject was explained verbally. At the end of the education, a education brochure prepared by the researchers and containing a summary of the subjects explained was sent to the mothers so that they could access the information whenever they wanted. On the 15th day after the education and at the 2nd month after the education, post-tests were administered to the mothers via an online questionnaire. During the data collection phase, it was ensured that sufficient time was given to complete the questionnaires.

Ethical Statement

Ethics committee permission was obtained from Izmir Kâtip Çelebi University Non-Interventional Ethics Committee (*Date: 22/09/2022, Number: 0412*), and application permission was obtained from Izmir Provincial Health Directorate (*Date: 13/03/2023, Number: 211227011*). Written informed consent was obtained from the mothers who participated in this study. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Analysing the Data

SPSS Statistics 24.00 programme was used for data analysis. Normality distribution, skewness and kurtosis values were examined and it was assumed to be normally distributed if they were between ± 3.29 ²⁴. Repeated Measures Analysis of Variance was performed to determine the difference between the knowledge levels of mothers before and after the education about cradle cap care in infants. Independent Sample t Test was performed to determine the difference between the pre and post-test results of the mothers whose infants had and did not have cradle cap before and after the education on the care of cradle cap in infants. Additionally, correlation and ANOVA analyses were conducted to examine relationships between maternal demographics (age, education level) and pre-education knowledge scores.

Results

Sociodemographic characteristics of mothers and infants and information on the cradle cap and cradle cap care are included in Table 1.

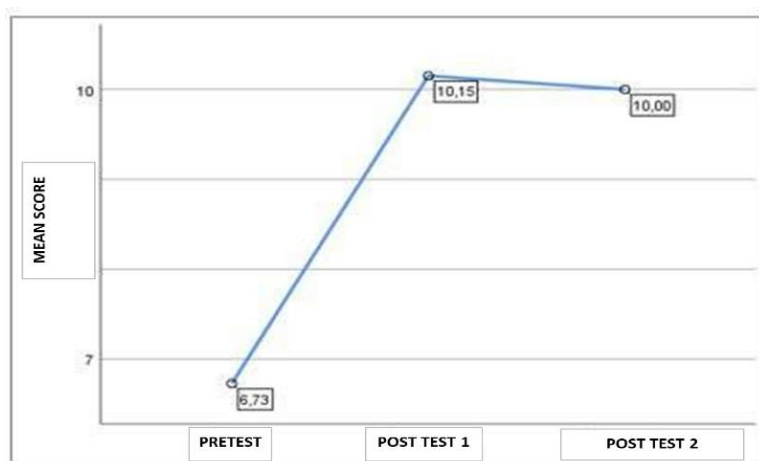
Table 1. Mother-infant sociodemographic characteristics

	Min-Max	Mean $\pm$ SD
Mother age (year) (n=33)	20-41	28.76 $\pm$ 4.64
Baby age (year) (n=33)	1-12	6.91 $\pm$ 4.57
Gestational age of the baby (month) (n=33)	8-10	9.06 $\pm$ 0.58
Baby weight (kg) (n=33)	2.30-5.30	3.29 $\pm$ 0.87
Time of occurrence of cradle cap in the baby (month) (n=11)	0.3-4	2.12 $\pm$ 1.27
Recovery period of the cradle cap (week) (n=11)	1-24	10.14 $\pm$ 8.86
Waiting time of the product applied on the baby's head (minutes) (n=9)	1-60	21.56 $\pm$ 18.49
	n	%
Mother education level (n=33)		
Secondary school graduate	2	6.1
High school graduate	10	30.3
Higher education graduate	21	63.6
Baby gender (n=33)		
Female	14	42.4
Male	19	57.6
Mode of delivery (n=33)		
Vaginal section (normal delivery)	9	27.3
Caesarean section	24	72.7
Baby Washing Frequency (n=33)		
1 time per week	4	12.1
2 times a week	8	24.2
3 times a week	11	33.3
4 times a week	1	3.0
Every day	9	27.3
Cleaning agents mother uses while washing (n=33)		
Soap and baby shampoo	8	24.2
Only baby shampoo	25	75.8
Whether the cradle cap has ever occurred in the baby? (n=33)		
Yes	11	33.3
No	22	66.7
Which applications were made for healing? (n=11)		
Not doing anything	2	18.2
Applying baby oil/olive oil	6	54.5
Other	3	27.3
What the cradle cap care was done with? (n=11)		
No product has been used	2	18.2
Baby oil	2	18.2
Olive Oil	5	45.5
Baby shampoo	2	18.2
What kind of change occurred in the cradle cap after the applications (n=11)		
Decreased	5	45.5
Healed	4	36.4
There's been no change.	2	18.2

n=number, %=percentage, Min-Max= minimum-maximum, Mean $\pm$ SD= mean $\pm$ standard deviation

The mean knowledge scores of the mothers before and after the education are given in Graph 1. The minimum score of the pre-education test for cradle cap care in infants was found to be “0” because two mothers answered all the statements “incorrectly/don't know”.

Graph 1. Mean of maternal knowledge levels regarding cradle cap care in infants



The normality assumption results of mothers' pre-education and post-education knowledge score averages regarding cradle cap care in infants are given in Table 2. Since the skewness and kurtosis values obtained from the pre and post-education tests of the mothers were within the range of ± 3 , it was determined that they showed a normal distribution (Table 2).

Table 2. Normality assumption results of mothers' pre- and post-education knowledge levels regarding cradle cap care in infants (n=33)

	Skewness	Kurtosis	Status
Pre Test	-.19	-.67	Normal
Post Test 1	-1.21	2.19	Normal
Post Test 2	-1.40	2.56	Normal

The difference between the mean knowledge scores obtained from the knowledge tests administered to the mothers before the education, two weeks after the education, and two months after the education was significant ($p < .05$) (Table 3).

Table 3. Differences between mothers' test means before and after education regarding cradle cap care in infants (n=33)

n	Mean	SD	F	p	Difference
Pre Test	6.73	3.39	14.999	.00*	Pre Test < Post Test 1
Post Test 1	10.15	2.28			Pre Test < Post Test 2
Post Test 2	10.00	2.41			

n=number, Mean=Average, SD=Standard Deviation, F: Repeated measures analysis of variance (Pillai's Trace test), *p< .05: Significance level

According to the results of the Pearson correlation analysis conducted to examine the relationship between maternal age and pre-education knowledge level presented in Table 4, no statistically significant relationship was found between them (p=.871). This result indicates that maternal age is not related to knowledge level in the study sample (Table 4).

Table 4. The relationship between mothers' age and pre-education test scores (n=33)

	Pre Test Score	
Maternal age	r	p
	.029	.871

r= Pearson correlation coefficient, p= Significance level

The one-way analysis of variance (ANOVA) examining the relationship between the mothers' educational status and their pre-training knowledge level, as shown in Table 5, revealed no statistically significant difference (p=0.407). This finding indicates that knowledge levels are similar across different maternal education groups (Table 5).

Table 5. The relationship between mothers' educational status and pre-education test scores (n=33)

Source of Variance	Sum of Squares	df	Mean Square	F	p
Between Groups	4.011	10	.401	1.096	.407
Within Groups	8.050	22	.366		
Total	12.061	32			

df= degree of freedom for each variation source, F= ANOVA F test, p= Significance level

Table 6 shows the distribution of the answers given by the mothers to the knowledge questions about cradle cap care in infants in the tests conducted two weeks after the

education and two months after the education. It was determined that 87.9% of the mothers before the education gave the correct answer at the highest rate to the statement Phrases 1, 78.8% of the mothers gave the correct answer to the statement Phrases 3 and 78.8% of the mothers gave the correct answer to the statement Phrases 4. It was found that 15.2% of the mothers gave the wrong answer at the highest rate to the statement Phrases 5; 57.6% of the mothers gave the "don't know" answer at the highest rate to the statements Phrases 7 and Phrases 14. In the tests administered in the second week and second month after the education, it is seen that all of the mothers gave the highest correct answer to the statement Phrases 1; 87.9% of them gave the highest incorrect answer to the statement Phrases 11; 24.2% of them gave the highest "don't know" answer to the statement Phrases 14 (Table 6).

Table 6. Distribution of mothers' responses to statements regarding cradle cap care in infants

Phrases for Cradle Cap Care in Infants	Pre-education Test Distribution of Responses						Post-education 1st test (after 2 weeks) Distribution of Responses						Post-education 2st test (after 2 months) Distribution of Responses					
	True		False		D K		True		False		D K		True		False		D K	
	n	%	n	n	%	n	n	%	n	%	n	%	n	%	n	%	n	%
Cradle cap is scales that usually occur on the upper layers of the scalp	29	87.9	-	-	4	12.1	33	100	-	-	-	-	33	100	-	-	-	-
The cradle cap occurs as a result of excessive functioning of the sebaceous glands in the scalp.	15	45.5	2	6.1	16	48.5	28	84.8	-	-	5	15.2	28	84.8	1	3.0	4	12.1
Cradle cap is most common in the first 3 months in infants	26	78.8	2	6.1	5	15.2	32	97.0	1	3.0	-	-	30	90.9	2	6.1	1	3.0
Cradle cap cause pain and suffering to the baby (RC).	1	3.0	26	78.8	6	18.2	2	6.1	26	78.8	5	15.2	4	12.1	25	75.8	4	12.1
The cradle cap will heal on its own without doing anything (RC).	5	15.2	17	51.5	11	33.3	1	3.0	28	84.8	4	12.1	2	6.1	29	87.9	2	6.1
If the cradle cap is not cleaned, it can cause serious problems.	10	30.3	8	24.2	15	45.5	22	66.7	4	12.1	7	21.2	25	75.8	2	6.1	6	18.2

It is sufficient to clean the cradle cap care once every 3 days (RC).	8	24.2	6	18.2	19	57.6	14	42.4	14	42.4	5	15.2	11	33.3	17	51.5	5	15.2
After a good cleaning, the cradle cap heals without the need for additional treatment.	16	48.5	9	9.1	14	42.4	27	81.8	3	9.1	3	9.1	24	72.7	7	21.2	2	6.1
If untreated, the cradle cap may spread from the scalp to the forehead and cheeks.	11	33.3	7	21.2	15	45.5	24	72.7	3	9.1	6	18.2	26	78.8	3	9.1	4	12.1
The scalp with cradle cap can be massaged by applying baby oil.	19	57.6	5	15.2	9	27.3	25	75.8	6	18.2	2	6.1	27	81.8	4	12.1	2	6.1
The scalp with cradle cap can be massaged by applying sunflower oil (RC).	1	3.0	22	66.7	10	30.3	2	6.1	29	87.9	2	6.1	2	6.1	27	81.8	4	12.1
After applying appropriate oil to the scalp with cradle cap, it should be left for 60 minutes and then cleaned (RC).	9	27.3	9	27.3	15	45.5	8	24.2	22	66.7	3	9.1	4	12.1	24	72.7	5	15.2
After applying appropriate oil to the scalp with cradle cap, it should be left for 20 minutes and then cleaned.	13	39.4	5	15.2	15	45.5	26	78.8	4	12.1	3	9.1	25	75.8	4	12.1	4	12.1
Baby shampoo should not be applied to the scalp with cradle cap to prevent irritation (RC).	4	12.1	10	30.3	19	57.6	7	21.2	18	54.5	8	24.2	7	21.2	18	54.5	8	24.2
After the formation of cradle cap, baby shampoo can be used to clean the scales on the scalp.	12	36.4	5	15.2	16	48.5	23	69.7	6	18.2	4	12.1	25	75.8	3	9.1	5	15.2

After applying baby shampoo, it can be kept for a long time to soften the scales on the scalp (RC).	3	9.1	18	54.5	12	36.4	2	6.1	27	81.8	4	12.1	5	15.2	26	78.8	2	6.1
After proper cleaning of the scalp with cradle cap, it should be combed with baby combs with a ball tip.	19	57.6	1	3.0	13	39.4	28	84.8	3	9.1	2	6.1	26	78.8	4	12.1	3	9.1
The baby's hair should be combed in the opposite direction to the direction of hair growth.	21	63.6	2	6.1	10	30.3	31	93.9	2	6.1	-	-	26	78.8	3	9.1	4	12.1

n=number, %=percentage, RC =responses were reverse coded. DK: Don't Know

Discussion

When the results of the study were examined, it was found that the average knowledge scores of the mothers in the tests conducted two weeks and two months after the cradle cap care training were higher than the average knowledge scores in the test conducted before the training. In addition, the minimum score obtained from the pre-education test was determined as “0” because two mothers answered all of the cradle cap care knowledge questions as incorrect or ‘don't know’ before the education was given. Mothers gave correct answers to these questions, which they answered incorrectly before the education, after the education. Significant differences were found between the mean scores of the information received by the mothers before and after the education on cradle cap care ($p<0.05$). This finding is consistent with studies showing that structured parent education significantly increases knowledge levels regarding infant skin care and benign dermatological conditions such as seborrheic dermatitis^{25,26}.

There was no statistically significant difference between the mean knowledge score of the mothers two weeks after the education on cradle cap care and the mean knowledge score two months later ($p=1.00$). Maintaining the level of knowledge of the mothers was linked to the fact that an educational brochure was left to the mothers for their continuous use and that the mothers consolidated their knowledge from this brochure. Similarly, it has been reported that written and visual educational materials support the retention of knowledge after training and that repeatability, especially in the home environment, reinforces learning²⁶.

In a study in which the effect of the education given on cradle cap care, umbilical cord care and breastfeeding on the knowledge level of mothers was examined, it was found

that the education given to mothers significantly increased their mean scores after the education²⁷. Although cradle cap–specific education studies are limited, a substantial body of evidence exists regarding infant skin care, seborrheic dermatitis management, and parental education interventions, which supports the findings of the present study^{7,9,28}. For this reason, the findings of the study were discussed with the studies comparing the knowledge levels of mothers after the education given for different care needs of infants. In a study in which mothers were given diaper rash and breastfeeding education and the effectiveness of the education was examined, it was determined that the education was significantly effective on the knowledge levels of mothers²⁹. In another study investigating the effect of the education given to mothers about breastfeeding and breast milk on their level of knowledge, a significant difference was observed between the mean scores before and after the education³⁰. In a study investigating the effectiveness of the education given to mothers about the complementary feeding, it was found that there was a significant difference between the mean knowledge scores of the group that received education and the group that did not receive education³¹. In a study in which the effectiveness of the education given to mothers about newborn screening tests was evaluated, the mean scores obtained from the test applied after the education increased significantly compared to the pre-education period³². In a study in which standard care and developed care education were given to mothers with premature babies during discharge and the results were compared, it was reported that the knowledge levels of the mothers after both educations were significantly higher than the results before the education was given and the advanced care education was superior to the standard care education³³. These findings indicate that parent education is effective not only in specific areas of care but also in general infant health and skin care practices.

Table 4 and Table 5 shows that there is no significant relationship between maternal age and educational level and the pre-education knowledge scores. This finding aligns with other research reporting that maternal age may not be significantly associated with health-related knowledge levels in certain populations. For example, Fegita et al. reported no significant correlation between maternal age and antenatal care knowledge³⁴. The finding that there is no significant relationship between maternal education level and knowledge scores is consistent with studies showing that formal education level is not always a strong predictor of specific health knowledge outcomes in community settings. In a study on stunting and growth knowledge, no significant correlation was observed between maternal education and knowledge level³⁵. Similarly, a study on knowledge of exclusive breastfeeding also found that maternal education did not show a significant relationship with knowledge of exclusive breastfeeding³⁶. However, there are also studies reporting a positive relationship between maternal education and general health knowledge scores. This indicates that this relationship may vary depending on the context, the type of knowledge measured, and access to information sources^{37,38}.

Table 6 shows that even after the training period, incorrect answers and “I don't know” responses regarding sunflower oil (Phrases 11) and baby shampoo use (Phrases 14) persisted, suggesting that cultural practices and traditional family knowledge may take

precedence over scientific knowledge. The literature also indicates that parents' perception of vegetable oils as "natural and harmless" can lead to incorrect practices^{2,17}. For this reason, it is recommended that nurses explicitly address misconceptions during their training and emphasize evidence-based practices. Additionally, the decrease in the reliability coefficients of the measurement tool in post-tests can be explained by the reduction in response variance due to the increase in knowledge levels after training; a similar situation has been reported in studies involving educational interventions²⁵.

Babies are defenceless and dependent on a caregiver. The health of babies depends on the knowledge of mothers, who are the primary caregivers. This study and other studies in the literature emphasise the importance of conducting education to increase the level of knowledge of mothers about infant care. However, the fact that the training was provided online in this study may have limited the acquisition of practical skills. The literature reports that face-to-face and hands-on training better supports psychomotor skill development²⁶. Therefore, it is recommended that hybrid or applied education models be evaluated in future studies.

Limitations of the Study

The limitations of the study include the inability to generalise the results due to the fact that the study was conducted in a single centre, and the inability to provide face-to-face education due to the mothers' preferred online education.

Another limitation is that variables such as parity (number of children) and whether the baby was a planned/wanted pregnancy were not evaluated. These factors may affect mothers' caregiving experience, motivation to participate in education, and responsiveness to educational interventions. Furthermore, since the study was completed, additional analyses regarding these variables could not be performed; however, acknowledging these limitations is important for the interpretation of the findings.

However, the study contributes to the field as it provides a measurement material for determining the level of knowledge of mothers about the cradle cap care of infants and the creation of educational materials to complete this missing information.

Despite these limitations, the study offers valuable evidence regarding the effectiveness of cradle cap care education and highlights the need for future studies with larger samples, multi-centre designs, and comprehensive analyses including maternal education level, parity, and pregnancy planning status.

Conclusion

As a result of the study, it was determined that the mothers' knowledge levels before the education were below average; the scores they received from the knowledge test administered two weeks and two months after the education increased; and there was a significant difference between the mean scores ($p < 0.05$). No statistically significant

difference was found between the mean knowledge score of the mothers two weeks after the education and the mean knowledge score two months after the education (p:1.00). This finding suggests that the cradle cap care education provided not only improved maternal knowledge in the short term but also ensured the maintenance of knowledge over time. It was concluded that the cradle cap care education given to the mothers was effective in increasing the level of knowledge. From a clinical and nursing perspective, structured and evidence-based cradle cap care education can support mothers in adopting appropriate infant skin care practices, prevent incorrect or potentially harmful traditional applications, and reduce parental anxiety related to benign dermatological conditions. Based on the findings of this study, it is recommended that cradle cap care education be integrated into routine infant follow-up visits in primary health care settings and delivered by nurses using standardized educational materials. Future studies should include larger and multi-centre samples, incorporate hands-on and face-to-face educational components, and examine the effects of maternal characteristics such as education level, parity, and pregnancy planning status on learning outcomes.

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Do Pregnant Women Want their Partners and Families with them at Birth?

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Abstract

Aim: This study aims to determine the person pregnant women want to be with during labor, the stage of labor at which this support is desired, how women evaluate the support provided after birth, and to identify the factors influencing these outcomes.

Method: The study included 381 pregnant women who applied to the maternity ward of Erzurum City Hospital. Data were collected through face-to-face interviews using a questionnaire form containing sociodemographic characteristics and information about the birth process and analyzed using IBM SPSS 25.

Results: 72.7% of the participants live in nuclear families, and 81.9% are unemployed. 88.6% of the pregnant women received prenatal care, and the rates of positive birth experiences were higher in this group. Spousal support during childbirth was limited (82.4% gave birth without a spouse), but family support also influenced the positive perception of the birth experience. The rate of pregnant women who wanted their partner present during childbirth was 59.3%, and the rate of those who wanted a family member present was 73.2%. The most important factor influencing the decision to have a partner (37.5%) or a family member (50.1%) present was the desire for support.

Conclusion: The study shows that prenatal care and spousal and family support have significant effects on positive birth experiences. As the level of education increases, the rate of participation in childbirth preparation classes increases. Pregnant women prefer to have their spouses or a family member present during labor and delivery.

Keywords: Family supports, midwifery, pregnancy, spouses.

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ETHICAL STATEMENT: This study was approved by Atatürk University Faculty of Medicine Clinical Research Ethics Committee (Date: 29/09/2022; Number: B.30.2.ATA.0.01.00/594) and by Erzurum City Hospital (Institutional Permission No.: E-76614443-799).

Gebeler Doğumda Eşlerini, Ailelerini Yanında İstiyor Mu?

Öz

Amaç: Bu araştırma, gebelerin doğum eylemi sırasında yanlarında bulunmasını istedikleri kişiyi belirlemeyi, bu desteğin doğumun hangi aşamasında istenildiğini, doğum sonrası sağlanan desteğin kadınlar tarafından nasıl değerlendirildiğini incelemeyi ve etkileyen faktörleri belirlemeyi amaçlamaktadır.

Yöntem: Araştırma, Erzurum Şehir Hastanesi doğumhane birimine başvuran 381 gebe kadını kapsamaktadır. Veriler, sosyodemografik özellikler ve doğum süreçleriyle ilgili bilgileri içeren bir anket formu aracılığıyla yüz yüze görüşmelerle toplanmış ve IBM SPSS 25 kullanılarak analiz edilmiştir.

Bulgular: Katılımcıların %72,7'si çekirdek ailede yaşamaktadır ve %81,9'u çalışmamaktadır. Gebelerin %88,6'sı doğum öncesi bakım almış olup, bu gruptaki olumlu doğum deneyimi oranları daha yüksektir. Doğum sırasında eş desteği sınırlı kalmış (%82,4'ü eşsiz doğum yapmıştır), ancak aile desteği doğum deneyimini olumlu algılama da etkili olmuştur. Gebelerin doğum anında eşlerini yanlarında isteme oranı %59,3, aileden birini yanlarında isteme oranı ise %73,2 olarak belirlenmiştir. Gebelerin eşlerini (%37,5) veya aileden birini (%50,1) yanında istemesinde de en önemli etkenin destek alma isteği olduğu belirlenmiştir.

Sonuç: Araştırma, doğum öncesi bakım alma ve eş ve aile desteğinin olumlu doğum deneyimi üzerinde belirgin etkileri olduğunu göstermektedir. Eğitim seviyesi arttıkça, doğuma hazırlık eğitimlerine katılma oranı artmaktadır. Gebeler doğum sürecinde ve doğum anında eşlerinin veya aileden birinin yanlarında olmasını tercih etmektedir.

Anahtar Sözcükler: Aile desteği, ebe, eş desteği, gebelik.

Introduction

The birth process is an intense and challenging experience for women, both physiologically and psychologically. Traditionally, birth has generally been viewed as a process under the responsibility and control of pregnant women. Still, this approach has led women to focus on a narrower perspective¹. Women state that they want support to have more control over the birth process². The feeling of being in control during childbirth has been defined as a subjective experience influenced by cultural norms and social practices². In this context, studies have shown that the presence of a support person during childbirth enables pregnant women to experience the birth process more healthily and positively, while also increasing their control over the birth process^{3,4}.

Support for pregnant women during childbirth is a factor that significantly affects the course of labour, and the need for support from a partner, family members, or psychological support providers stands out as an important factor in pain management, the healthy progression of labour, and a positive experience of childbirth⁵. Spousal and family support during childbirth enhances the emotional well-being of pregnant women, and it has been noted that social and cultural factors, along with the pregnant woman's expectations regarding childbirth, influence the provision of this support^{3,6-8}. The World Health Organisation (WHO) emphasises the importance of every woman in labour having a support person present and states that this practice will positively affect women's birth experiences⁹. However, this recommendation is not frequently

implemented in Turkey and many developing countries^{1,10}. One study indicated that support during childbirth is not generally a priority for health systems and is therefore not sufficiently valued as part of quality and respectful maternity care⁶.

Providing partner and family support during childbirth is hindered by differences in healthcare approaches between countries, cultural diversity, and the lack of national guidelines⁶. Although women often prefer female partner support over their spouse, the spouse's participation in childbirth has been reported to positively affect the relationship with the woman and the baby^{4,11-13}. Lack of privacy in the delivery room, uncertainties about the role of the support person, and crowded delivery rooms are among the factors limiting this support^{14,15}. Furthermore, partner and family support sometimes leads to conflicts and fails to contribute sufficiently to the process^{4,5,8}.

Birth support facilitates coping with labour pain by increasing the sense of control in pregnant women and prevents negative experiences^{10,16}. Studies have reported that partner and family support shortens the birth process, reduces the need for medical intervention, and improves the birth experience by reducing postnatal depression and anxiety^{4,17-19}. Furthermore, it has been emphasised that supportive approaches enhance well-being by reducing the risk of premature birth and low birth weight²⁰. Although women's views, preferences, and needs regarding childbirth is an indispensable element of quality, family-centred care, it has been noted that sufficient support is not provided during childbirth^{6,21}.

Sociocultural norms influence the autonomy of women and healthcare services during the birth process, shaping perceptions of support during childbirth⁴. The literature indicates that spousal or family support during childbirth varies by culture and country, and that respectful birth care positively affects maternal and newborn health. However, studies on women's expectations before, during, and after childbirth are limited^{5,6,10,15,22-24}. In this context, the research aims to determine who pregnant women want to be with them during childbirth, at which stages this support is requested, and how the support provided after childbirth is evaluated.

Material and Methods

Type of Research

This research is descriptive in nature.

Population and Sample of the Research

The research population consists of pregnant women who applied to the maternity ward of Erzurum City Hospital between January 2024 and December 2024. When determining the sample, the sampling formula was used in conditions where the population was unknown. The study included n=381 pregnant women who applied to the delivery ward using the non-probability random sampling method. Our inclusion criteria for the study included being over 18 years of age, having a single fetus, and between 32

and 40 weeks of gestation. The study did not include those who had developed any complications in the mother or baby during the prenatal or postnatal period.

Data Collection Tools

The data for the study were collected face-to-face using a questionnaire.

Personal Information Form: The form, prepared by the researcher, consisted of 31 questions about the sociodemographic characteristics of the pregnant women who applied to the maternity ward and their support systems before and after delivery^{1,25-27}.

Data Collection

Erzurum City Hospital, where the study was conducted, has Mother-Friendly Hospital status. The delivery room units where the study was conducted have TDL (Labour-Delivery-Postpartum) rooms. These rooms are single rooms, suitable for continuous companion services. The research data were collected from pregnant women through face-to-face interviews. The data collection process was conducted in two stages for each pregnant woman. The first stage was conducted during the action process, and the first 23 questions were asked of the pregnant women. The second stage was performed after delivery. The last 8 questions were asked of the postpartum women.

Ethical Statement

Ethical approval for the study was obtained from the Clinical Research Ethics Committee of Atatürk University Faculty of Medicine on 29 September 2022 (decision number B.30.2.ATA.O.01.00/594), and institutional permission was obtained from Erzurum City Hospital, where the study was conducted (number E-76614443-799). Before the researchers collected the data, the pregnant women were informed about the research, and their verbal consent was obtained; those who volunteered were included in the study. The principles of the Helsinki Declaration were adhered to at every stage of the study.

Data Analysis

The research data were evaluated using the IBM SPSS (Statistical Package for Social Sciences) 25 software package. Percentages, means, standard deviations, and chi-square tests were used to assess the data. The statistical significance level was set at $p < 0.05$ in the study.

Limitations of the Study

This study was conducted with pregnant women who applied to the maternity unit in Erzurum province, so it cannot be generalized to all pregnant women. Another limitation of the study is that data collection was conducted on days when the researchers were available.

Results

The descriptive characteristics of the pregnant women, their preferences regarding antenatal care and the delivery process, and the distribution of the pregnant women's and their families' preferences regarding the delivery process are presented in Table 1. The mean age of the pregnant women participating in the study was 29.23 ± 6.626 years. 22.1% of the pregnant women were primary school graduates, 30.4% were middle school graduates, 26.2% were high school graduates, and 21.3% were university graduates. 81.9% of the pregnant women were not working, and 72.7% lived in a nuclear family. Regarding income, 38.1% stated that their income was less than their expenses, 53.5% stated that it was equal, and 8.4% stated that it was higher. The rate of first pregnancy was 30.4%, second pregnancy 28.1%, third pregnancy 19.7%, and fourth or more pregnancies 21.8%. The rate of planned pregnancies was 64.6%, while unplanned pregnancies account for 35.4%. 88.2% of pregnant women stated that they did not experience mental health issues, 78.2% did not read books related to childbirth, and 90.6% did not participate in any education or preparation programs. 88.6% received prenatal care. 55.1% of pregnant women attended check-ups with their partner, while 11.8% did not. Similarly, 22.8% attended check-ups with a family member, while 38.3% did not. 14.2% stated that their partner was present during previous births, while 55.4% stated that a family member was present. 54.6% wanted their partner present at all stages of the birth process, while 46.5% wanted a family member present. Of those who did not want their partner present, 24.4% cited personal reasons, while 40.4% did not wish a family member present. 79.8% did not want to give birth at home.

Table 1. Distribution of pregnant women's demographic characteristics, preferences regarding prenatal care and the birth process, and preferences of the pregnant woman and her family regarding the birth process (n=381)

Variables	$\bar{x} \pm SS$		
Age	29.23 ± 6.626		
		Number (n)	Percent (%)
Employment Status	Employed	69	18.1
	Unemployed	312	81.9
Educational Status	Elementary school	84	22.1
	Middle school	116	30.4
	High school	100	26.2
	College and above	81	21.3
Family Type	Nuclear family	277	72.7
	Extended family	104	27.3
Perception of Income Status	Income is less than expenses	145	38.1
	Income is equal to expenses	204	53.5
	Income is more than expenses	32	8.4
Number of Pregnancies	One	116	30.4
	Two	107	28.1
	Three	75	19.7
	Four and above	83	21.8

Planned Pregnancy	Yes		246	64.6
	No		135	35.4
Experiencing Psychological Problems During Pregnancy	Yes		45	11.8
	No		336	88.2
Reading Status of Books etc. Related to Birth	Yes		83	21.8
	No		298	78.2
Participation in Childbirth Education or Preparation Programs	Yes		36	9.4
	No		345	90.6
Prenatal Care Status	Yes		330	86.6
	No		51	13.4
Attending Prenatal Appointments with Your Partner	Yes		210	55.1
	Sometimes		75	19.7
	No		45	11.8
	If no, the reasons	Physical separation	40	10.5
		I didn't feel the need	5	1.3
Attending Prenatal Appointments with a Family Member	Yes		87	22.8
	Sometimes		97	25.5
	No		146	38.3
	If no, the reasons	I went with my spouse	84	22
		I didn't feel the need	43	11.3
		They're out of town	19	5
Whether Your Partner Was Present During Your Previous Birth	Yes		54	14.2
	No		211	55.4
Whether a family member was present during your previous birth	Yes		222	55.4
	No		43	14.2
At what stage of the birth process would you like your partner to be with you?	During labor		43	11.3
	At the moment of birth		59	15.5
	In the postpartum period		71	18.6
	At every stage of the birth process		208	54.6
At what stage of the birth process would you like a family member to be present?	During labor		60	15.7
	At the moment of birth		44	11.5
	In the postpartum period		100	26.2
	At every stage of the birth process		177	46.5
Requesting Your Partner to Be Present During Childbirth	Yes		223	58.5
	If yes, the reasons	For support	143	37.5
		To feel safe	25	6.6
		Because I'm scared	10	2.6
		So they can understand me	45	11.8
	No		158	41.5
	If no, the reasons	I don't want him to see me like that	43	11.3
		I'd be embarrassed	50	13.1
		My husband wouldn't want that	65	17.1
Requesting a Family Member to Be Present During Childbirth	Yes		227	59.6
	If yes, the reasons	To provide support	191	50.1
		To feel safe	7	1.8
		To feel comfortable	13	3.4

		To be helpful	16	4.2
	No		154	40.4
	If no, the reasons	I don't want him to see me like that	30	7.9
		I'd be embarrassed	117	30.7
		I want my spouse	7	1.8
Your Spouse's Desire to Be Present at the Time of Birth	Yes		226	59.3
	No		155	40.7
Request for a Family Member to Be Present During Childbirth	Yes		279	73.2
	No		102	26.8
Desire to Give Birth at Home	Yes		77	20.2
	No		304	79.8

Table 2 contains information regarding the birth experience of pregnant women. 71.4% of pregnant women rated their birth experience as positive, 19.2% as negative, and 9.4% as undecided. When asked about the support needed during childbirth, 41.2% of pregnant women stated that they did not need support; 31.8% stated that they needed support from midwives, 18.6% stated that they needed support from their partner, and 8.4% stated that they needed support from a family member. 91.3% of pregnant women stated midwives provided the necessary support during childbirth. 53% of pregnant women stated that they needed psychological support during childbirth. 82.4% of pregnant women stated that their partners did not visit them at all during the birth process, and that this was due to the institution not allowing it in 78.7% of cases. 61.9% of pregnant women stated that a family member visited them four or more times during birth. When asked about their preferences for their next birth, 56.7% of pregnant women stated that they were not considering another pregnancy; 37.5% stated that they wanted to give birth in a state hospital, and 5.8% stated that they wanted to give birth in a private hospital.

Table 2. Distribution of support, experience, and future preferences of postpartum women during the birth process

Variables		Number (n)	Percent (%)
Birth Experience	Positive/Good	272	71.4
	Negative/Bad	73	19.2
	Undecided	36	9.4
The Need for Support During Childbirth	I didn't need it	157	41.2
	I needed my spouse's support	71	18.6
	I needed support from a family member	32	8.4
	I needed support from a midwife	121	31.8
The Status of Providing Necessary Support to Midwives	Yes	348	91.3
	No	33	8.7
Type of Support Needed During Childbirth	Psychological	202	53
	Psychological	91	23.9

	Other (Both)	88	23.1
Number of Visits by Spouse During Childbirth	0	314	82.4
	1	29	7.6
	2	16	4.2
	3	22	5.8
Number of Family Visits During Childbirth	0	57	15
	1	44	11.5
	2	24	6.3
	3	20	5.2
	4 and above	236	61.9
The reason why no one was with you at the time of birth	I didn't want to	32	8.4
	My spouse didn't want to	11	2.9
	The institution didn't allow it	300	78.7
	Other (My spouse is out of town)	10	2.9
Where would you like to have your next birth?	I am not considering pregnancy	216	56.7
	At a public hospital	143	37.5
	In a private hospital	22	5.8

According to the data obtained from the research, the assessment of participation and preparedness for pregnancy and childbirth according to demographic factors is presented in Table 3. As the level of education increases, the rates of reading books related to childbirth and receiving prenatal care increase ($p < 0.05$). Men who attend check-ups with their partners are more likely to want to be present during childbirth ($p < 0.05$). Younger pregnant women are more likely to have planned pregnancies and receive antenatal care ($p < 0.05$).

Table 3. Comparison of participation and preparation for pregnancy and childbirth according to certain demographic factors

	Attending a Childbirth Education or Preparation Program				X ²	p
		Yes	No	Total		
Educational Status	Literate	0	28	28	38.083	.000
	Elementary school	0	56	56		
	Middle school	5	111	116		
	High school	10	90	100		
	University and above	21	61	81		
	Reading Status of Books and Other Resources Related to Childbirth				57.731	.000
	Literate	0	28	28		
	Elementary school	3	53	56		
	Middle school	14	102	116		
	High school	27	73	100		

	University and above	39	42	81		
	Prenatal Care Status					
	Literate	19	9	28	16.946	.002
	Elementary school	44	12	56		
	Middle school	102	14	116		
	High school	88	12	100		
	University and above	77	4	81		
Accompanying Your Spouse to Medical Appointments	The Situation Where the Partner Wants to Be Present During the Birth					
		Wanting	Not wanting	Total	7.595	.0022
	Yes	146	82	228		
	No	37	25	62		
	Sometimes	43	48	91		
Age	Prenatal Care Status					
		Receiving	Not receiving	Total	69.691	.000
	19-29 years old	201	22	223		
	30-40 years old	115	17	132		
	41-53 years old	16	10	26		
Age	Whether the Pregnancy Was Planned or Unplanned					
		Planned	Unplanned	Total	57.249	.004
	19-29 years old	163	63	226		
	30-40 years old	79	53	132		
	41-53 years old	5	18	23		

According to the data obtained from the research, there is a significant relationship between pregnant women receiving antenatal care and a positive birth experience, and pregnant women who received antenatal care had a positive birth experience ($p < 0.05$). There is a significant relationship between whether pregnant women were visited by their family during childbirth and their birth experience, and the birth experiences of pregnant women whose family visited during childbirth were positive ($p < 0.05$).

Table 4. Birth experience according to receiving prenatal care and being visited by spouse and family during birth

Variables	Perceived Birth Experience					X ²	p
		Positive/ Good	Negative /Bad	Undecided	Total		
Status of receiving prenatal care	Yes	240	65	25	330	10.141	.006
	No	32	8	11	51		
Number of visits by family at birth	Never	37	12	8	57	20.021	.010
	Once	35	5	4	44		
	Twice	17	2	5	24		
	Three times	9	6	5	20		

	Four times or more	174	48	14	236		
Number of visits by spouse during childbirth	Never	227	62	25	315	6.199	.401
	Once	18	6	5	28		
	Twice	11	3	2	16		
	Three times	16	2	4	22		
	Four times or more	-	-	-	-		

Discussion

Accurately assessing pregnant women's perceptions, experiences, and expectations of childbirth is essential in providing support during birth⁷. The literature contains numerous studies on the people pregnant women prefer to have with them during the birth process, the types of support these people need, and the evaluation of birth experiences. In this study, it was observed that pregnant women had their partners or family members present during their previous birth experiences, and that they generally preferred to attend antenatal appointments with their partners rather than with their families. During the birth process, it was determined that most pregnant women wanted their spouse or family members to be present at every stage. These findings, in line with studies in the literature on spousal support during childbirth, show that women benefit from the presence of their spouses during childbirth as an essential source of confidence and support, strengthening their sense of control^{4,10}.

The literature emphasises that women's preferences regarding the person providing support during childbirth may vary^{6,7}. This study found that pregnant women wanted their partner or a family member to be present at every stage of the birth process. Similarly, studies conducted in Tanzania and Kigoma have indicated that women want their partners to be present during birth^{16,28}. However, there are also findings that some pregnant women do not want their partners to participate in the birth process. It was understood that some of the pregnant women who participated in our study wanted their partners to be present during childbirth to support them, to feel safe, and to feel understood by their partners. In contrast, others did not want their partners present because they felt embarrassed or were concerned that their partners would not want to be there. The main reasons for this may include their fear that their partners will lose sexual desire and/or their fear that their partners will not agree to this¹⁶.

This study showed that pregnant women most wanted their partners to be present during childbirth, while they needed more support from family members in the postnatal period. Furthermore, the partner's presence during childbirth is essential in meeting women's emotional needs^{1,10}. During the birth process, women's need for psychological support comes to the fore, and this support is usually provided by their partners⁷. The literature indicates that the support provided during childbirth varies regarding physical, psychological, informational, and social needs^{5,7}. This study concluded that pregnant

women need psychological support the most during childbirth. Psychological support is an essential factor that increases a woman's confidence in the birth process and positively affects the birth experience. Furthermore, it has been revealed that pregnant women want their emotional and psychological support needs to be met during childbirth, not just their physical needs^{1,10}.

Historically, women usually sought the support of another woman during childbirth, but with the advent of hospital births, the support of spouses and families has declined. However, in recent years, there has been an increase in women requesting their partners to be present during childbirth⁸. This change demonstrates the growing importance of social support during childbirth and that ensuring women's psychological security enables them to have more positive experiences during birth. The choice of who women want to be with them during the birth process is a strong call for the provision of women-friendly birth services.

This study found that women received support from healthcare professionals, particularly midwives, and their partners during childbirth. This is consistent with the literature, which indicates that midwifery services are an essential source of support during the birth process and play a significant role in meeting women's psychological and emotional needs²³. However, it has been stated that some pregnant women reported being deprived of support from healthcare personnel during childbirth, thus emphasising the importance of midwives and healthcare workers providing more emotional support to pregnant women during the birth process¹⁰. These findings demonstrate that women need not only medical assistance during childbirth but also psychological support and a sense of security.

This study found that women receiving antenatal care positively impacted their birth experience. It was determined that pregnant women who preferred to attend check-ups with their partners during pregnancy were likelier to have their partners present at the birth. The literature states that antenatal care positively affects women's birth experiences and that antenatal education is associated with partner support during childbirth^{29,30}. This study also found that receiving antenatal care increased women's preparedness for the birth process and their sense of confidence.

Limitations of the Study: The limitations of the study include the fact that the data was collected in a single city and a single hospital, that the study was conducted on healthy pregnant women, that it cannot be generalized, and that it was not possible to reach all pregnant women who applied to the delivery room.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Ethical Approval: This study was approved by Atatürk University Faculty of Medicine Clinical Research Ethics Committee (Date: 29/09/2022; Number:

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The Effect of Telephone Interventions on Individuals' Cancer Early Diagnosis and Screening Applications: A Systematic Review

Tuba ERYİĞİT*, Özlem ÖRSAL**

Abstract

Aim: Screening programmes are of great importance, aiming to detect and treat lesions at an early stage before they progress to tumours. The aim of this systematic review is to examine the effects of telephone interventions on cancer early diagnosis and screening applications.

Methods: For the study, PubMed, Cochrane, Sciencedirect, Web of Science, ProQuest Central and Google Scholar databases were searched using the identified keywords. A total of 11 randomized controlled studies that met the inclusion criteria, published in English and Turkish language, published between 2013-2023, were included in this systematic study. For quality assessments, checklists for “Randomized Controlled Studies created by the Joanna Briggs Institute” and in bias assessments, “A revised Cochrane risk-of-bias tool for randomized trials” designed by the Cochrane group were used.

Results: It is seen that the individual-specific or non-personalized reminder messages and counseling over the phone were effective in 6/9 studies with individuals between 39-7968, in 4 months-3.5 years. The telephone was used to make appointments and complete the cancer screening program for colonoscopy and colorectal screening with stool occult blood, breast and cervical cancer screening with mammography.

Conclusion: It is recommended to integrate reminder messages and telephone counseling into cancer early diagnosis and screening programs, and to conduct more studies that will lead to clinical and academic arrangements that will increase the quality of presentation and service regarding telehealth methods.

Keywords: Cancer, diagnostic screening programs, telenursing, telephone.

Telefon Müdahalelerinin Bireylerin Kanseri Erken Teşhis ve Tarama Başvurularına Etkisi: Sistemik Derleme

Öz

Amaç: Tarama programları lezyonların tümörlere ilerlemeden erken evrede saptanıp tedavisinin sağlanmasını amaçlayarak ciddi önem taşımaktadır. Bu sistemik derlemenin amacı, telefon müdahalelerinin bireylerin kanser erken teşhis ve tarama başvurularına etkisini incelemektir.

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ETHICAL STATEMENT: The research protocol was registered in the 'PROSPERO' database, which allows systematic review and meta-analysis studies to be recorded, with the registration number CRD42023432512.

Yöntem: Çalışma için PubMed, Cochrane, Sciencedirect, Web of Science, ProQuest Central ve Google Scholar veri tabanları belirlenen anahtar kelimeler kullanılarak taranmıştır. Taramalar sonunda; İngilizce dilinde, 2013-2023 yılları arasında yayınlanmış, tam metnine ulaşılan, dahil edilme kriterlerine uyan 11 randomize kontrollü çalışma araştırma kapsamına alınmıştır. Çalışmaların kalite değerlendirmeleri Joanna Briggs Enstitüsü tarafından oluşturulmuş randomize kontrollü çalışmalar için kontrol listesi; yanlışlık değerlendirmeleri ise Cochrane grubunun tasarlamış olduğu “Randomize çalışmalar için revize edilmiş Cochrane yanlışlık riski aracı (RoB 2)” kullanılarak yapılmıştır.

Bulgular: Kişiyi özgü ya da kişiyi özgü olmayan standart hatırlatma mesajları ile telefonla danışmanlığın, örneklem büyüklüğü 39 ile 7968 arasında değişen ve müdahale süresi 4 ay ile 3,5 yıl arasında olan çalışmaların 6/9’unda etkili olduğu görülmüştür. Telefon kolonoskopi ve gaitada gizli kan ile kolorektal; mamografi ile meme ve serviks kanseri tarama tetkikleri için randevu alma ve kanser tarama programını tamamlamada kullanılmıştır.

Sonuç: Hatırlatma mesajları ve telefonla danışmanlığın, kanser erken teşhis ve tarama programlarına entegre edilmesi, tele sağlık yöntemleriyle ilgili sunum ve hizmet kalitesini arttıracak klinik ve akademik boyuttaki düzenlemelere öncülük edecek daha fazla çalışma yapılması önerilmektedir.

Anahtar Sözcükler: Kanser, telefon, telefonla hemşirelik, teşhis tarama programları.

Introduction

Cancer is the second most common cause of death in the world, after cardiovascular disease¹. Early diagnosis is essential to reduce cancer deaths. Screening programmes aim to detect precancerous lesions and early-stage cancers, and to detect and treat lesions at an early stage before they develop into tumours. Awareness raising and screening programmes are therefore very important². In randomised controlled trials, community-based screening programmes have been shown to reduce breast cancer mortality by 20%³. Although the literature clearly shows that early detection of cancer through screening is an effective strategy, community participation in cancer screening is not as high as desired⁴⁻⁸.

Telehealth is defined as the use of telehealth technologies to deliver healthcare services. Developments in telehealth technologies such as remote patient monitoring and surveillance tools continue to change and facilitate the way care is delivered^{9,10}. The benefits of telehealth systems include reducing the need for specialists through remote access, reducing the cost of advanced treatment through early diagnosis and treatment options, monitoring adherence to treatment through the patient follow-up system, early assessment of treatment response, and minimising the physical requirements for health education¹¹. The aim of this systematic review is to examine the effect of telephone interventions, one of the telehealth applications, on individuals' cancer screening.

Research questions

1. For which types of cancer are telephone interventions used for early detection and screening?
2. For which types of cancer screening are telephone interventions used?

3. Are telephone interventions effective in cancer screening?
4. Are telephone interventions effective in completing the cancer screening process?

Material and Methods

Type of Study

This study is a systematic review. PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) reporting checklist¹² was utilised in writing the article.

Study Population and Sample

To reach the studies that are the subject of this study, the Cochrane Library, ProQuest Central, PubMed, Science Direct and Google Scholar databases were searched between 1 May and 1 June 2023, and research articles published between 2013 and 2023 were included in the study. Table 1 shows the identified keywords. Different combinations of these keywords were used in the search, as shown in Table 1.

Table 1. Keywords and search strategy

Database	Keywords
Search 1. Google Scholar (Turkish)	'tele sađlık' 'telefon' 'kanser' 'onkoloji' 'erken teřhis' 'tarama' 'önleme'
Search 2. Cochrane Library (English)	Record Title: Telehealth AND Cancer OR Oncology AND Early Diagnosis OR Screening Title Abstract Keyword: telephone counseling AND Prevention
Search 3. ProQuest Central (English)	noft (telehealth OR telemedicine OR telenursing OR telephone counseling OR telephone) AND title (cancer OR oncology) AND title (early detection of cancer OR early diagnosis OR screening)
Search 4. PubMed (English)	(Telephone counseling[Title/Abstract]) OR (Telephone[Title/Abstract]) AND (Cancer[Title]) OR (Oncology[Title]) AND (Early detection of cancer [Title/Abstract])
Search 5. Science Direct (English)	'Telehealth' AND 'Cancer' AND 'Early detection of cancer'

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria were set according to PICOS¹³.

Inclusion Criteria

P (Patient): People who have participated in cancer screening programmes aged 18 and over

I (Intervention): Telephone counselling

C (Comparison): --

O (Outcome): Impact on cancer screening and early detection applications

S (Study design): Randomised controlled trials

Exclusion Criteria

P (Patient): People under 18 years of age

I (Intervention): E-mail, web-based support

C (Comparison): --

O (Outcome): Psychological symptoms

S (Study design): Quasi-experimental studies, reviews of controlled clinical trials (including systematic reviews), panel presentations, meta-analyses, retrospective studies, congress abstracts, dissertations, replications/duplications.

Data Collection Tools

The findings of the studies included in this review, including imprint/country, sample/age, sample characteristics, evaluation criteria, implementation/intervention, intervention period, follow-up period, were categorised and a data extraction form was created as Table 4.

Use of Data Collection Tools

Three independent reviewers were involved in each stage of the systematic review (screening, eligibility and inclusion in the review). The search strategy was documented at each stage to record the date of searches in each database, the keyword combinations used in each database and the total number of publications found. A Prisma flowchart was created to select appropriate publications and document the total number of articles; all articles found were exported to create a Mendeley database. A data extraction tool was created in Excel, taking into account the data collection form created by the researchers.

As author and journal details are removed after duplicates are removed, only article titles and/or abstracts could be viewed during the identification phase of the studies. To filter the article titles and abstracts according to the inclusion/exclusion criteria, they were grouped into included and excluded categories by one researcher (TE). The titles and/or abstracts in the excluded category were then assessed by another researcher (ÖÖ). After this assessment, the articles that the researcher (ÖÖ) considered should be included were included in the inclusion category. Full text access was provided to all articles included in the inclusion category. The full texts were independently assessed by two researchers (TE-ÖÖ). After this stage, any excluded studies were recorded with the reasons for exclusion and this process was documented in the database and in the Prisma flowchart. The tool was approved by the members of the research team before screening began. One researcher (TE) extracted data from the included articles and finalised the database. The other researcher (ÖÖ) independently checked the accuracy of the data extraction and the database.

Analysing the Data

The articles (n=626) were then added to the Mendeley library for parsing and selection of suitable articles for the study. After the duplications were removed, the remaining articles (n=614) were first sifted by looking at the titles and abstracts (n=586), and the full texts of 28 potentially relevant articles were analysed and the articles that did not meet the inclusion criteria (n=17) were excluded from the study. The full texts (n=11), which were evaluated in terms of eligibility, were subjected to detailed examination, and finally, it was decided to include 11 studies in the synthesis. The research selection process of the systematic review is given in the PRISMA flow diagram in Table 2.

Table 2. PRISMA-P flow chart of the research

DETERMINATION	Research articles detected by database search (n=626)		
	Google Scholar= 141 Cochrane Library= 40 ProQuest Central= 126 PubMed= 56 Science Direct= 263		
SCANNING	After removing duplicates according to headings included research articles (n=614)	Excluded research articles by abstract (n=586)	
		Causes; - Thesis (n=93) - Book (n=29) - Report (n=35) - Review (n=139) - Retrospective study (n=18) - The subject is not suitable (n=272)	

SUITABILITY	For suitability included full text research articles (n=28)	Excluded full-text research articles (n=17)
		Causes; Semi-experimental (n=3) Full text not available (n=3) Not in English or Turkish (n=3) Studies out of date (n=8)
INCLUSION	Includes full-text research articles (n=11)	

Evaluation of Methodological Quality of Studies

Evaluation of the methodological quality of the studies is given in Table 3 according to the Joanna Briggs Institute (JBI).

Table 3. Quality Assessment of studies according to the JBI systematic review checklist for randomized controlled studies

Researches	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	Total (%)
Chamber(2014) ¹⁴	+	-	+	-	-	-	-	+	+	?	?	?	+	38.4% (13/5)
Clouston(2014) ¹⁵	+	?	+	-	-	-	-	+	+	+	+	?	+	53.8% (13/7)
Lowery (2014) ¹⁶	+	?	+	-	-	-	-	+	+	+	+	+	+	61.5% (13/8)
Hirst (2014) ¹⁷	+	-	+	+	+	-	+	+	+	?	?	?	+	61.5% (13/8)
Acera (2017) ¹⁸	+	-	+	-	-	-	+	+	+	+	+	+	+	69.2% (13/9)
Linde (2017) ¹⁹	+	+	+	-	+	-	-	+	+	?	?	?	+	53.8% (13/7)
Luckmann (2017) ²⁰	?	?	+	-	-	-	+	+	+	+	+	?	+	53.8% (13/7)
Bauner (2018) ²¹	+	?	+	-	-	-	+	+	+	+	+	+	+	69.2% (13/9)
Oyalowo (2022) ²²	+	-	+	-	-	-	-	+	+	+	+	+	+	61.5% (13/8)
Denis (2017) ²³	?	?	+	-	-	-	-	+	+	+	+	+	+	53.8% (13/7)
Sepucha (2023) ²⁴	+	?	+	-	-	+	-	+	+	+	+	+	+	69.2% (13/9)

C: Criterion + Yes; - No; ? Unknown/Not Applicable; Criterion 1 – 13; JBI Criteria for systematic review checklist for randomized controlled trials

Assessing the Risk of Bias

Bias evaluation of the studies according to the Cochrane Bias Assessment Tool (ROB-2) is given in Table 4.

Table 4. Revised Cochrane risk-of-bias tool for randomized trials (ROB-2)

Researches/ RoB-2 Criterion	14	15	16	17	18	19	20	21	22	23	24
Risk of bias due to randomization process	+	+	+	+	+	+	?	+	+	?	+
Risk of bias due to deviations from intended interventions (impact of assignment on intervention)	?	?	?	+	?	?	?	?	?	?	?
Risk of bias due to deviations from intended interventions (impact of adherence on intervention)	?	?	?	?	?	?	?	?	?	?	?
Risk of bias due to incomplete outcome data	?	+	+	?	+	?	+	+	+	+	+
Risk of bias in measuring the outcome	?	+	+	?	+	?	+	+	+	+	+
Risk of bias in selection of reported result	?	?	?	?	?	?	?	?	?	?	?

+ Low risk of bias, ? Suspected risk of bias, - High risk of bias

Chambers (2014)¹⁴; Clouston (2014)¹⁵; Lowery (2014)¹⁶; Hirst (2014)¹⁷; Acera (2017)¹⁸; Linde (2017)¹⁹; Luckmann (2017)²⁰; Bauner (2018)²¹; Oyalowo (2022)²²; Denis (2017)²³; Sepucha (2023)²⁴

Ethical Dimension of Research

Since the research data were obtained from publications scanned in the literature and there is no risk of material/moral harm, ethics committee approval is not required. The research protocol was registered in the 'PROSPERO' database, which allows recording systematic review and meta-analysis studies, with the registration number '32512'.

Limitations of the Research

Limitations of this study; scanning five databases and not scanning the gray literature. Since a limited number of research results, eleven articles, were included in the study, the results should be evaluated carefully and generalizations should not be made.

Results

Study Patterns

11 randomized controlled studies¹⁴⁻²⁴ published between 2013 and 2023 were included in the systematic review.

Study Location

The trials included in the systematic review were conducted in the USA, Germany, the Netherlands, France, Scotland, Canada, Spain, England, and Tanzania; in private clinics^{14,15,17,20}, in the national health systems of the countries^{16,21,22}, or in a cancer screening programme^{18,19,23,24} that was not part of a clinic or hospital.

Characteristics of Participants

The sample size of the studies included in the systematic review was found to be a minimum of 39 and a maximum of 7968. Some of the participants were people who met the criteria for cancer screening but did not participate in a screening programme^{14,15,17-20,22,23}, some were first-degree relatives of cancer patients^{16,21}, and in one study, people with no previous screening history whose colonoscopy was cancelled because of COVID-19 between March and May 2024. Other anthropometric and sociodemographic characteristics of the participants are shown in Table 5.

Table 5. Some Characteristics of the Studies Analysed in the Systematic Review

Country	Sample/ Age	Sample Characteristics	Evaluation Criteria	Intervention	Time	Follow-up Period	Telephone Intervention
Chambers et al. (2014)¹⁴ Scotland	Control: 150 Intervention 1: 150 Intervention 2: 150 Intervention 3: 150 50-70 years old	Women living in areas included in the Scottish Index of Multiple Deprivation 1-12 who do not receive services from the East of Scotland Breast Screening Centre.	Availability of a breast cancer screening appointment within three months of receiving a reminder	Control: Standard reminder sent by the East of Scotland Breast Screening Centre Intervention 1 (TEL): telephone reminder Intervention 2 (TEL-SUPP): telephone reminder + telephone counselling Intervention 3 (TEL-SUPP-AR): telephone reminder + telephone counselling + AR - expected remorse intervention	17 month	3 month	Telephone consultation
Clouston et al. (2014)¹⁵ Canada	Control: 39 Intervention: 40 50-74 years old	Individuals aged 50-74 years with a history of colorectal cancer and no symptoms, polyps or bowel disease requiring follow-up colonoscopy by family physicians in the City of Winnipeg who receive fee-for-service community-based services.	Fecal occult blood test within four months	Control: Routine care Intervention: after assessing the results of the family physicians, the individual was given a fridge magnet explaining how to access the support line telephone number and website managed by the nurse (the intervention was considered to have started when the individual reached this contact line and contacted the nurse)	4 month	8 month	Telephone consultation
Lowery et al. (2014)¹⁶ Amsterdam	Mail group: 310 Telephone group: 322	Two national cancer family registries, the Colon Cancer Family Register (C-CFR) and the Cancer Genetics	1) Colonoscopy screening within 24 months of randomisation	Intervention: Telephone counselling based on behavioural theory	24 month	6st month 12st month 24st month	Telephone consultation

	20-60 years old	Network (CGN), between February 2005 and July 2006	2) Knowledge, attitudes and beliefs about colorectal cancer screening, barriers to screening	Control Document containing general information about scanning			
Hirst et al. (2014)¹⁷ England	Control: 1600 Intervention: 1600 50-69 years old	Adults eligible for screening with a telephone number registered for 180 general examinations in London	1) Proportion of individuals providing a completed faecal occult blood test within 18 weeks of first invitation. 2) Completion of registration of mobile phone numbers at individual level in the clinical system	Control: routine care (information letter+brochure that a faecal occult blood test kit will be sent as part of the national colorectal cancer screening programme) Intervention: Routine care + text message reminder to self-complete and return faecal occult blood test kit after eight weeks	18 week	7 month	Same reminder message
Acera et al. (2017)¹⁸ Spain	Intervention 1: 1578 Intervention 2: 1367 Intervention 3: 2396 Control: 428 30-70 years old	Women who have lived in the Barcelona (Cerdanyola) area for more than six months and who have not had a cervical cytology result in their cervical cancer screening history for 3.5 years.	Cervical cancer screening	Intervention 1: Personalised screening invitation Intervention 2: Personalised screening invitation + information leaflet Intervention 3: Personalised screening invitation + information leaflet + personalised phone call Control: request for officially recommended cervical cancer screening	3,5 year	June 2011-December 2013	Telephone consultation
Linde et al. (2017)¹⁹ Tanzania	Intervention: 350 Control: 350 25-60 years old	Tanzanian women who tested positive for HR (high risk) HPV (human papilloma virus)	1) Screening programme uptake 2) Cervical cancer knowledge, estimation of cost-effectiveness of SMS intervention	Intervention: 15 one-way educational text messages + SMS reminders for appointments Control: Routine care	10 month	14 month	Same reminder message
Luckmann et al. (2017)²⁰ America	Intervention 1: 7968 Intervention 2: 7943 Intervention 3: 7876	Women who have been patients at the Fallon Clinic Centre for 24 months or more and have not had a mastectomy.	Planning mammography within two weeks after the intervention	Intervention 1: Reminder document Intervention 2: Reminder document + reminder call Intervention 3: Reminder document + telephone counselling	4 year	12st month 18st month	Telephone consultation
Bauner et al. (2018)²¹ Germany	Sample patients (IP Index patients) (n=1109) Control (n=557) Intervention (n=552) First-degree relatives (FDR) (n=261): 28-75 years old Control (n=136) Intervention (n=125)	IP: Patients with a first diagnosis of colorectal cancer at a German colorectal cancer centre and three independent gastroenterology practices between December 2012 and August 2015. FDR: No colonoscopy or CT scan in the last five years, no history of colorectal cancer, familial adenomatous polyposis or chronic inflammatory	1) Colonoscopy appointment within 30 days of intervention 2) Cancer/adenoma detection, barriers to screening colonoscopy, symptoms up to 30 days after colonoscopy	Control: hand-delivered or mailed study leaflet with information on familial risk and colorectal cancer screening Intervention: Hand delivery or postal delivery of a study leaflet with information on familial risk and colorectal cancer screening + telephone counselling	6 month	1st month 3st month 6st month	Telephone consultation

Oyalowo et al. (2022)²² America	Control: 200 Intervention 1: 200 Intervention 2: 200 50-75 yaş	Asymptomatic patients who are eligible for colorectal cancer screening or surveillance at the University of Pennsylvania Health System, have been referred for colonoscopy, and do not have a scheduled colonoscopy appointment.	1) Rate of colonoscopy within 120 days of enrolment 2) Colonoscopy appointment rate	Control: routine care (contact by post, telephone reminder for colonoscopy appointment) Intervention 1: after telephone contact and assessment, uniform non-personalised message Intervention 2: after telephone contact and assessment, personalised private message	1 year	July 2017- August 2018	Personalised reminder message/ Same reminder message
Denis et al. (2017)²³ France	Telephone counselling 1474 Motivational interviewing by telephone 1531 Control: 19.756	Individuals aged 50-74 years in the Haut-Rhin and Bas-Rhin regions	Screening for faecal occult blood one year after surgery	Control: Routine care (delivery of the faecal occult blood kit) Intervention 1: Delivery of the kit according to the results of the telephone counselling Intervention 2: Delivery of the kit according to the results of the motivational interview (to encourage screening - telephone counselling)	15 month	February 2011 April 2012	Telephone consultation
Sepucha et al. (2023)²⁴	Control: 400 Intervention: 400 45-75 yaş arası	Adults between the ages of 45 and 75 years with no previous screening history whose colonoscopy screening was cancelled due to COVID-19 between March and May 2020.	Preferred screening method (colonoscopy, delayed screening, faecal-based test, not sure)	Intervention: Sending an email explaining the option of colonoscopy, faecal occult blood testing and colonoscopy four times in two weeks, one or two weeks after the email, telephone call with non-clinical research staff who had received coaching training. Control: Routine care; scheduling by gastroenterology department	September 2020 November 2020	6 month	Telephone consultation

Type and Content of Intervention

Some of the studies included in the systematic review compared routine care with telephone counselling^{14-16,18,20,21,23,24}; others compared routine care with SMS application^{17,19,22}. Telephone interventions were non-personalised standardised reminder messages^{17,19}, telephone counselling^{14-16,18,20,21,23,24}, comparison of personalised and non-personalised standardised reminder messages.

Duration of the Intervention

In the trials included in the systematic review, the duration of the intervention ranged from a minimum of 4 months to a maximum of 3.5 years^{15,18}.

Evaluation Criteria

The evaluation criteria for the studies included in the systematic review included the effect of telephone counselling on cancer screening and screening uptake, as well as the secondary outcomes of carcinoma adenoma detection, barriers to implementation, complications, level of knowledge, attitudes and beliefs about screening methods, registration of contact information with national screening programme clinics, and cost-effectiveness of the SMS intervention.

Effects of Interventions on Cancer Screening Uptake

The effect of the telephone intervention used in the studies included in the systematic review on early diagnosis and screening referrals was compared between the intervention and control groups after the intervention and is presented in Table 6.

Table 6. The effect of telephone counselling on cancer early diagnosis and screening applications

Outcomes	14	15	16	17	18	19	20	21	22	23	24
Personalised special reminder message									+		
Uniform, non-personalised reminder message				+		+			+		
Telephone consultation	+	+	+		+		+	+		+	+
Planning-making an appointment	?						-		+		
Intervention		+	+	?	+	?		ND	+	+	+
Carcinoma/adenoma detection								ND			
Barriers to intervention								?			
Complications								?			
Information level			ND			?					
Attitudes and beliefs			ND								
Registration of National Screening Programme Clinic contact details				?							
Cost-effectiveness of SMS intervention						?					

+ : Statistically significant increase - : Statistically significant decrease

ND: No statistical difference

? : The result is unclear

Chambers (2014)¹⁴; Clouston (2014)¹⁵; Lowery (2014)¹⁶; Hirst (2014)¹⁷; Acera (2017)¹⁸; Linde (2017)¹⁹; Luckmann (2017)²⁰; Bauner (2018)²¹; Oyalowo (2022)²²; Denis (2017)²³; Sepucha (2023)²⁴

After telephone counselling, one study found a statistically significant increase between groups in the completion of screening and cancer screening in one study²², a significant decrease between groups in one study²⁰, and the results were unclear in one study¹⁴. Six trials found a statistically significant increase between groups in completing cancer screening requests after telephone intervention^{15,16,18,22-24}; one trial found no difference between groups²¹; and two trials were equivocal^{17,19}. One study found that there was no difference between groups in carcinoma/adenoma detection as a secondary outcome, and the results were unclear regarding barriers to implementation and complications²¹. Again, one study found that there was no significant difference between groups in knowledge among the secondary outcomes¹⁶ and the results of another study were equivocal¹⁹. Among the secondary outcomes, it was found that there was no difference between the groups in terms of attitudes and beliefs¹⁶. Finally, it was determined that the results of the studies on the secondary outcomes of registering contact information with national screening programme clinics¹⁷ and the cost-effectiveness of the SMS intervention¹⁹ were unclear.

Discussion

This systematic review looked at the impact of telephone counselling, one of the telehealth applications, on individuals' cancer screening. It is estimated that 30% to 50% of cancers currently seen are preventable if cancer risk factors are avoided and current evidence-based prevention strategies are implemented²⁵. This systematic review shows that telephone interventions are used in the early detection and screening of colorectal, breast and cervical cancers. For these cancers, the included studies found that telephone intervention was used in colonoscopy, faecal occult blood, mammography, and cervical screening programmes to increase uptake and completion of screening.

Telephone interventions are known to have many advantages, such as ease of use, ability to reach large groups of people and low cost effectiveness²⁶. In this systematic review, personalised reminder messages, non-personalised one-size-fits-all reminder messages and telephone counselling practices were evaluated against each other and against routine care practice in telephone interventions. In the study by Hirai et al. (2016), a personalised message intervention was reported to be more effective than routine care, but not more effective than a generic, non-personalised message²⁷. Similarly, a study included in this systematic review evaluated routine care, personalised message and uniform message practices in colorectal cancer screening. When comparing routine care and personalised messages, the study found that personalised messages increased the rate of colonoscopy appointments within 120 days of registration. However, it was found that there was no difference in uptake when personalised messaging was compared with non-personalised blanket messaging²². One of the other two trials that evaluated the effect of telephone counselling on screening uptake compared a reminder document and a reminder call with telephone counselling, and concluded that telephone counselling was less effective in increasing screening uptake²⁰. When the study was analysed, it was found that only 33.4% of the women contacted completed the telephone counselling process; the reasons for not completing the process were lack of time, reluctance to talk

about mammography or to have a mammogram, and family or personal illness. Considering that less than half of the women contacted completed the telephone counselling, it is normal that the effect of telephone counselling on making a screening appointment would be lower.

A review of the literature found that counselling changed the rates of faecal occult blood testing and sigmoidoscopy between 11% and 12%, although there were studies^{28,29} showing that telephone counselling increased knowledge of colonoscopy but did not affect the uptake of colonoscopy^{30,31}. Studies of cervical cancer reported that individuals' existing knowledge played a key role in their participation in the screening programme^{32,33}. In this systematic review, almost all studies reported that telephone counselling increased screening status^{15,16,18,22-24}. One study examined the colonoscopy status of first-degree relatives of cancer patients after telephone counselling, but reported that this had no effect on screening status²¹.

The result of the study by Bauner et al. shows that the first-degree relatives who participated in the study did not take any step towards cancer screening, despite being so close to the person with cancer, suggesting that telephone counselling is not an effective method for these individuals in this context. A study conducted in Iran involved family carers of women with breast cancer. In a randomised controlled pretest-posttest trial, women in the intervention group received education and counselling via a telephone application. In the trial, the carers were trained in telephone care. What is breast cancer? What should be done for early detection? Telephone calls were made on topics such as the importance of mammography and breast examinations. In contrast to this trial, the rate of mammography among women in the intervention group who received telephone training was about 13% before the trial, but about 78% after the trial. In the control group, the rate of mammography was not significantly different between the pre-test and post-test results³⁴.

When reviewing the studies, it is generally found that people report that the information they receive through telephone counselling is useful for early diagnosis and screening practices, but at the same time it is found that there is a focus on a single screening method and that the shared decision-making process is not implemented^{35,36}. Some studies have shown that the ideal of shared decision-making is very effective^{37,38}. One of the included studies reported an increase in screening after telephone counselling²⁴; people whose colonoscopy was cancelled due to COVID19 between March and May 2020 were asked to state their screening preferences and to use the screening method with a decision coach in the same year. The study found that most patients preferred colonoscopy after meeting with the decision coach, and only 20% wanted to use the stool-based test. Studies have also reported that stool-based tests are being used as an effective method for routine screening, especially during periods of difficult access to colonoscopy during the pandemic³⁹.

Conclusion

Telephone interventions were carried out in 397 968 people over 4 months to 3.5 years, 6 trials were effective, 2 trials were similar, 1 trial was equivocal. Telephone intervention was used to make appointments for colonoscopy and faecal occult blood testing for colorectal cancer screening, mammography for breast cancer screening, and cervical cancer screening, and to complete the cancer screening programme. The telephone intervention was found to be effective in implementing colorectal, breast and cervical cancer screening programmes.

In addition to routine practice, it is recommended that reminder messages and telephone counselling should be integrated into cancer screening programmes in order to reach more people at risk of cancer, to facilitate the cancer follow-up process of health professionals and to minimise time loss, and that more studies should be conducted to guide clinical and academic arrangements to improve the quality of presentation and service related to telemedicine methods. In addition, it is recommended that reminder messages and telephone counselling be integrated into the practices of the Cancer Department, Cancer Screening and Monitoring Unit under the Ministry of Health, Public Health Institution of Turkey (THSK), and that special reminder messages be sent to first-degree relatives of cancer patients and uniform reminder messages be sent to individuals working in high-risk professions.

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Sports Injuries in Individuals with Disabilities: A Bibliometric Analysis and Visualization

Erkan GÜLGÖSTEREN*

Abstract

Aim: Sports injuries among athletes with disabilities represent a significant public health concern, directly impacting both individual health outcomes and athletic performance. This study examines the structure and evolution of scientific research on sports injuries in disabled populations through comprehensive bibliometric analysis.

Methods: Using the Web of Science database, we identified 274 records from publications indexed in SCI-Expanded, SSCI, AHCI, and ESCI databases through predetermined keyword combinations. After applying inclusion and exclusion criteria following PRISMA guidelines, 216 articles underwent bibliometric analysis.

Results: The analysis revealed that research in this field emerged in the 1990s and accelerated significantly after 2016. Publication peaks coinciding with Paralympic Games years (2012, 2016, 2020) demonstrate the influence of major sporting events on research priorities. Word cloud analysis identified dominant themes including "prospective cohort studies," "consensus statements," and "Paralympic Games." International collaboration network analysis shows the United States, United Kingdom, and Australia leading in publication output, with South Africa emerging as an unexpected central collaborator. The field demonstrates steady growth and increasingly adopts multidisciplinary approaches.

Conclusion: The study provides one of the first comprehensive bibliometric mappings of disability sports injury literature, revealing global research networks and knowledge production centers while establishing a methodological framework for future studies. Strengthening multidisciplinary approaches and expanding international collaborations are critical for improving the health and performance of athletes with disabilities. These results could offer valuable guidance for researchers, clinicians, and sports administrators working in this specialized field.

Keywords: Disabled persons, sports injuries, Paralympic, bibliometric analysis, visualization.

Engelliler ve Spor Sakatlıkları: Bibliyometrik Analiz ve Görselleştirme

Öz

Amaç: Engelli bireylerde spor sakatlıkları hem bireysel sağlık sonuçlarını hem de sporcu performansını derinden etkileyen önemli bir halk sağlığı sorunudur. Bu kapsamda, bu çalışma engellilerde spor yaralanmaları alanındaki bilimsel üretimin yapısını ve gelişimini bibliyometrik analiz yöntemleriyle inceleyerek alana özgü bir değerlendirme sunmayı amaçlamaktadır.

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Yöntem: Web of Science veri tabanında SCI-Expanded, SSCI, AHCI ve ESCI dizinlerinde taranan yayınlardan, önceden belirlenmiş anahtar kelime kombinasyonlarıyla elde edilen 274 kayıt, PRISMA kurallarına uygun olarak dâhil etme ve hariç tutma kriterleri uygulanmış ve nihai olarak 216 makale ile bibliyometrik analiz gerçekleştirilmiştir.

Bulgular: Analiz sonuçları, engellilerde spor yaralanmalarına ilişkin araştırmaların 1990'lı yıllarda başladığını ve 2016 sonrasında belirgin bir artış gösterdiğini ortaya koymaktadır. Paralimpik Oyunlarının düzenlendiği yıllarda (2012, 2016, 2020) gözlemlenen yayın artışları, büyük spor organizasyonlarının araştırma gündemini şekillendirmedeki etkisini ortaya koymaktadır. Kelime bulutu analizleri, "prospektif kohort çalışmaları", "konsensus bildirileri" ve "Paralimpik oyunları" gibi temaların öne çıktığını göstermektedir. Uluslararası iş birliği ağları incelendiğinde, ABD, Birleşik Krallık ve Avustralya'nın en fazla yayın üreten ülkeler olduğu, Güney Afrika'nın ise beklenmedik şekilde merkezi bir rol üstlendiği görülmüştür. Bununla birlikte, genel eğilimin istikrarlı bir büyüme yönünde olduğu ve alanın multidisipliner bir yaklaşımla geliştiği anlaşılmaktadır.

Sonuç: Bu çalışma, engellilerde spor yaralanmaları literatürünün bütüncül bir bibliyometrik haritasını çıkaran ilk kapsamlı çalışmalardan biri olması nedeniyle önemli bir katkı sunmaktadır. Bulgular, küresel araştırma ağlarındaki iş birliklerini ve bilgi üretim merkezlerini ortaya koyarken, gelecek çalışmalar için metodolojik bir referans çerçevesi sağlamaktadır. Özellikle engelli sporcuların sağlık ve performansının iyileştirilmesi için multidisipliner yaklaşımların güçlendirilmesi ve küresel iş birliklerinin artırılması kritik öneme sahiptir. Bu bağlamda, çalışmanın sonuçları akademisyenler, klinisyenler ve spor yöneticileri için yol gösterici niteliktedir.

Anahtar sözcükler: Engelliler, spor sakatlıkları, paralimpik, bibliyometrik analiz, görselleştirme.

Introduction

Individuals with disabilities often lead sedentary lifestyles with reduced levels of physical activity due to their physical, sensory, or intellectual limitations. Over time, this pattern may contribute to various health risks such as increased body weight, impaired metabolic functioning, decreased cardiovascular endurance, and weakened musculoskeletal strength¹. However, contemporary approaches offer a wide range of implementation options to support the participation of people with disabilities in physical activity. These options range from low-intensity exercises involving activities of daily living to recreational activities and Paralympic sports requiring high performance^{2,3}.

The landscape of sport for individuals with disabilities has undergone a significant paradigmatic shift, evolving from its origins as a therapeutic intervention toward a sophisticated framework that emphasizes competitive excellence and athletic achievement⁴. Such a fundamental transformation represents a broader reconceptualization of disability sport as a legitimate athletic pursuit. The evolution of the Paralympic Games is a compelling testament to this change—while the inaugural 1960 Games in Rome hosted merely 400 athletes, establishing a modest foundation for a global phenomenon, the Tokyo 2020 Games attracted over 4,400 athletes, demonstrating not only exponential growth in participation but also the increasing legitimacy of Paralympic sport on the international stage (International Paralympic Committee [IPC], 2021). Indeed, this competitive focus has led to remarkable gains in athletic performance—contemporary research documents that Paralympic athletes are

now achieving performance levels increasingly comparable to those of their non-disabled counterparts, thus challenging traditional assumptions about the limitations associated with disability in competitive sport⁵.

Increased sport participation often correlates with heightened injury risk. Sports injuries may result in not only physical health complications but also disruptions to educational and occupational activities, reduced training capacity, and diminished quality of life⁶. Research indicates that injury rates and patterns among athletes with disabilities appear to be largely comparable to those of their non-disabled counterparts⁷. However, certain injuries or medical conditions may occur more frequently in specific populations, potentially due to anatomical and functional characteristics associated with particular disability types^{8,9}. For instance, wheelchair athletes commonly experience shoulder girdle injuries, rotator cuff tendinopathies, and nerve entrapments, while athletes with lower extremity amputation frequently encounter skin lesions, prosthesis-related complications, and trauma from falls^{10,11}, which suggest that disability-specific factors may influence injury susceptibility and distribution in Paralympic sport populations.

These disability-specific injury patterns carry particularly significant implications, as injuries among athletes with disabilities may impact not only athletic performance but also fundamental independent living skills and activities of daily living. This dual impact distinguishes Paralympic athletes from their non-disabled counterparts in meaningful ways. For instance, while a non-disabled javelin thrower with an upper extremity injury faces limitations primarily in training and competition, a wheelchair user with a similar injury may encounter substantial difficulties in essential daily functions such as transfers and wheelchair use^{8,9}. Given these unique considerations, comprehensive pre-participation medical evaluation is essential for athletes with disabilities. Sports physicians should conduct thorough assessments that include detailed inquiries about current health status, chronic medical conditions, medications, assistive device usage, and immunization status, particularly the tetanus vaccination¹². Additionally, obtaining informed consent from both the athlete and family members represents both an ethical and legal requirement in this population⁴. Such preventive measures may enhance participation safety while simultaneously supporting the preservation and development of independent living capabilities, thereby addressing the dual concerns inherent in disability sport participation⁶.

It is of particular importance for individuals with disabilities that sport serves not only as an activity to improve physical capacity, but also as a multidimensional tool that supports mental health, increases social participation, and reinforces individual self-confidence¹. Regular physical activity and participation in sports are reported to positively affect psychosocial well-being, self-efficacy, and social acceptance beyond improving motor skills such as muscle strength, balance, flexibility, and endurance¹³. As evidenced by Paralympic athletes, participation in sports at the professional level may offer important gains in terms of individuals' independent living skills, mental health, and social visibility^{6,9}. The effects of injuries could extend beyond the physical level, encompassing psychological and social dimensions. Damage to athlete identity, reduced

motivation, social isolation, and uncertainties during the rehabilitation process are among the potential negative psychosocial consequences^{11,12}. Therefore, developing protective strategies to reduce injury risk in disabled athletes will be an increasingly important research area in the literature⁸. However, although studies examining the performance parameters, injury mechanisms, and post-injury adaptation processes of Paralympic athletes are increasing, there is a limited number of bibliometric analyses that systematically address this field¹⁴. This study aims to examine the existing literature on sports injuries in individuals with disabilities through bibliometric analysis methods.

Material and Methods

This bibliometric study was designed and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines¹⁵⁻¹⁷. The literature selection process is visualized in a PRISMA flow diagram (see Figure 1).

Literature Search and Selection

Primary data were sourced from the Web of Science (WoS) Core Collection, encompassing the SCI-Expanded, SSCI, AHCI, and ESCI indexes. A comprehensive search was conducted on June 13, 2025, with no date restrictions. The following search string was executed in the "Topic" field, targeting titles, abstracts, and keywords: ("disability" OR "disabled persons" OR "persons with disabilities" OR "physical impairment" OR "paralympic") AND ("sports injury" OR "sports injuries" OR "athletic injuries" OR "exercise-related injuries" OR "sport-related trauma"). The initial query yielded 274 records. The results were refined by filtering for "Research Article" document types, which reduced the sample to 226. A final filter for English-language publications resulted in 216 articles that were included in the final analysis.

Eligibility Criteria

Inclusion and exclusion criteria were established to ensure the relevance and quality of the literature, guided by the Population, Intervention, Comparators, Outcomes, Study Design (PICOS) framework¹⁸.

Inclusion Criteria: (1) Original research articles; (2) Indexed within the WoS Core Collection; (3) Published in the English language; (4) Directly addressing the topic of sports injuries in individuals with disabilities.

Exclusion Criteria: (1) Non-journal documents, such as conference proceedings, book chapters, and letters; (2) Studies related to non-sports trauma or accidents (e.g., traffic accidents, congenital disorders).

Data Analysis

Bibliometric analysis was conducted via Biblioshiny, a graphical interface for the Bibliometrix package in R (Version 4.5.0)¹⁵. The analysis was structured into two components to map the field's intellectual landscape:

Performance Analysis: This involved quantifying scientific output by examining the most productive authors, journals, institutions, and countries, along with the most cited works.

Science Mapping: This involved visualizing the conceptual and social structure of the field through analyses of keyword co-occurrence, thematic evolution, author and country collaborations, and co-citation networks.

Results

The PRISMA flow diagram detailing the systematic selection process of studies from the WOS database is presented in Figure 1. The PICOS criteria were used to determine the eligibility criteria as the research strategy (Table 1).

Figure 1. PRISMA flow chart

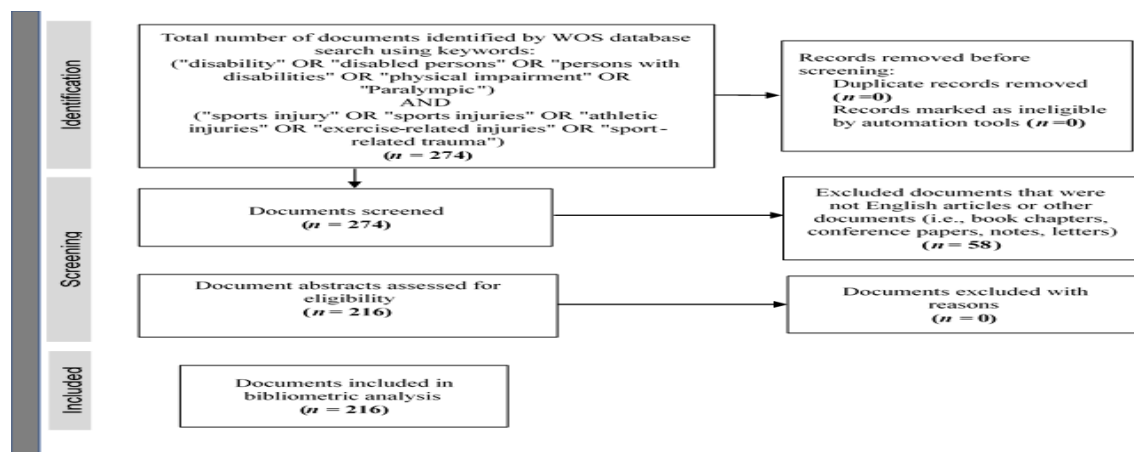


Table 1. Research Strategy Eligibility Criteria (PICOS)

PICOS	Definition
Population	Individuals with disabilities, physical disability, Paralympic athletes, sports injuries, exercise-related injuries. Studies were selected from around the world.
Intervention	Academic approaches to the diagnosis, prevention, and rehabilitation of sports injuries in individuals with disabilities, the relationship between exercise and performance.

Comparator	Only article-level data comparisons were made: Country of origin of authors, institutional affiliations, keywords, year of publication, most frequently cited journals, keyword co-occurrences, and trend topics.
Outcomes	The relationship between disability and sports injuries, scientific production density, key themes, citation networks, and bibliometric patterns were analyzed.
Study design	Only research articles were included in the analysis.

Table 2. Characteristics of the dataset used for bibliometric analysis

Description	Results
Publication Years	1992–2025
Publication Sources	114
Documents	216
Annual Growth Rate (%)	4.29
Average Document Age (Years)	10
Average Citations per Document	31.94
References Analyzed	5,596
Keywords Plus (ID) ^a	594
Author's Keywords (DE) ^b	459
Total Authors	1,062
Single-Authored Documents	13
Average Co-Authors per Document	6.24
International Co-Authorships (%)	28.7

Note. The dataset was compiled from the Web of Science Core Collection.

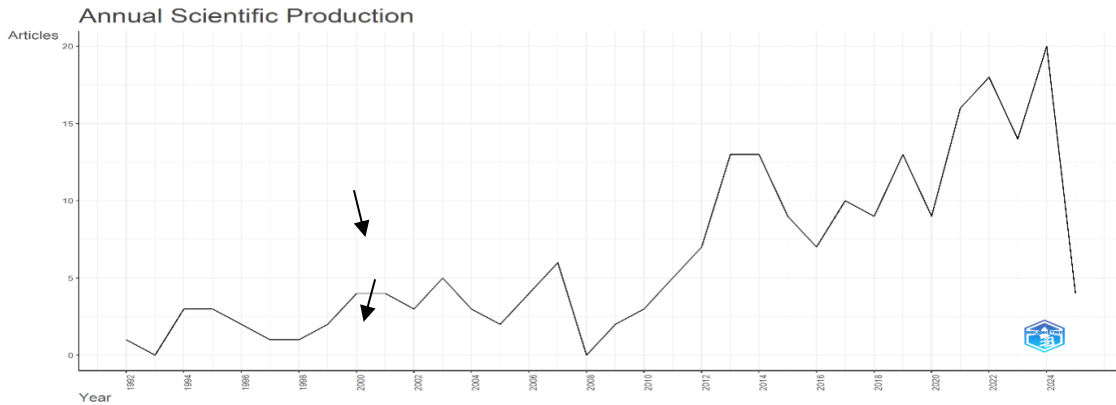
^a ID refers to "Identification" keywords indexed by the database.

^b DE refers to "Descriptor" keywords provided by the authors.

The final dataset created for bibliometric analysis, with descriptive statistics provided in Table 2, consists of 216 articles published between 1992 and 2025 from 114 different sources. The dataset includes only article-type publications ($N = 216$), showing an annual growth rate of 4.29% and an average of 31.94 citations per document. Additionally, the

articles included in the analysis contain 5,596 references, as well as 594 Keywords Plus and 459 author-specified keywords.

Figure 2. Annual scientific production



As shown in Figure 2, academic interest in sports injuries among athletes with disabilities has shown steady growth since the first publication in 1992. A total of 86% of the publications have appeared in the last decade (2014-2024), peaking in 2021 with 38 publications. This growth trend reflects increasing academic interest in the topic, triggered by the greater inclusion of para-athletes in competitive sports and the development of disability sports policies.

Figure 3. Corresponding author's countries

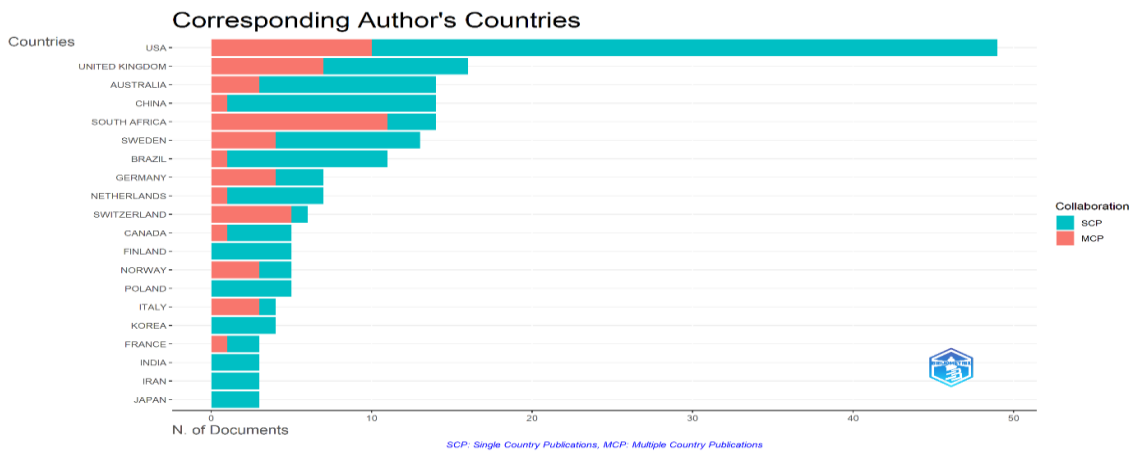
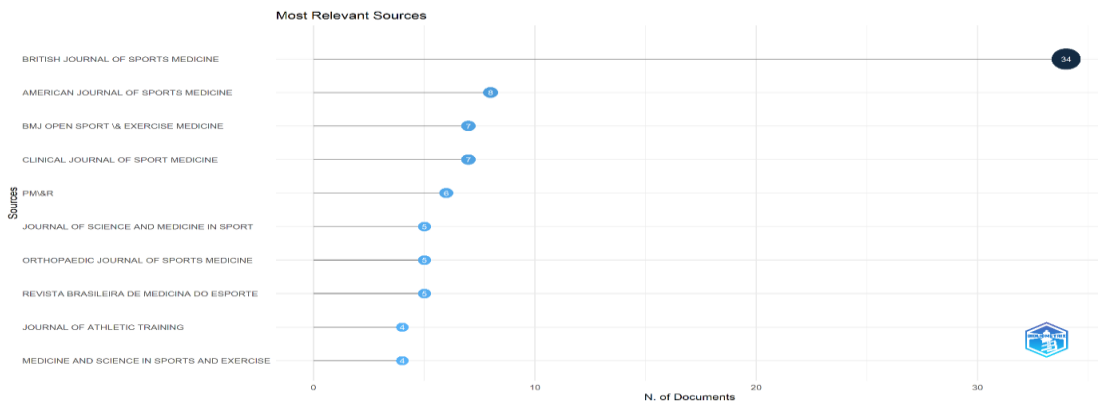


Table 3. Frequency distribution of inter-country collaborations

From	To	Frequency
USA	United Kingdom	20
South Africa	United Kingdom	14
United Kingdom	Canada	13
USA	South Africa	12
South Africa	Germany	11
USA	Germany	11
Switzerland	Norway	10
United Kingdom	Germany	10
United Kingdom	Netherlands	10

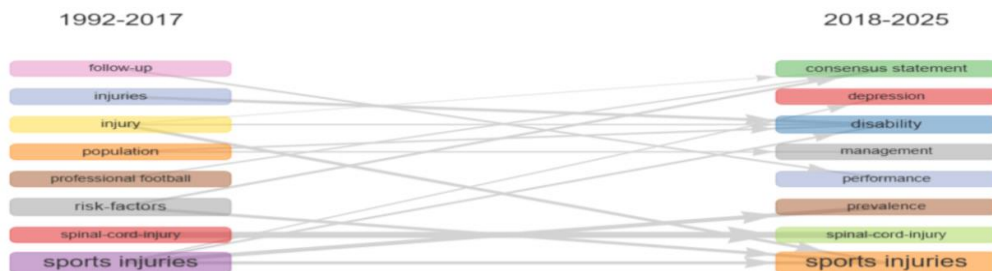
Analysis of the corresponding authors' countries (Figure 3) revealed intense academic production from developed nations. The United States (32.4%), the United Kingdom (18.1%), and Australia (11.6%) play a dominant role in this output. International collaborations account for 28.7% of the publications, while single-country publications have a 71.3% share.

Figure 4. Most relevant sources

Source analysis of academic publications in the field of sports injuries in individuals with disabilities indicates a clear concentration in knowledge production. According to the "Most Relevant Sources" data presented in Figure 4, the *British Journal of Sports Medicine*, *American Journal of Sports Medicine*, and *BMJ Open Sport & Exercise Medicine* were among the journals producing the most publications.

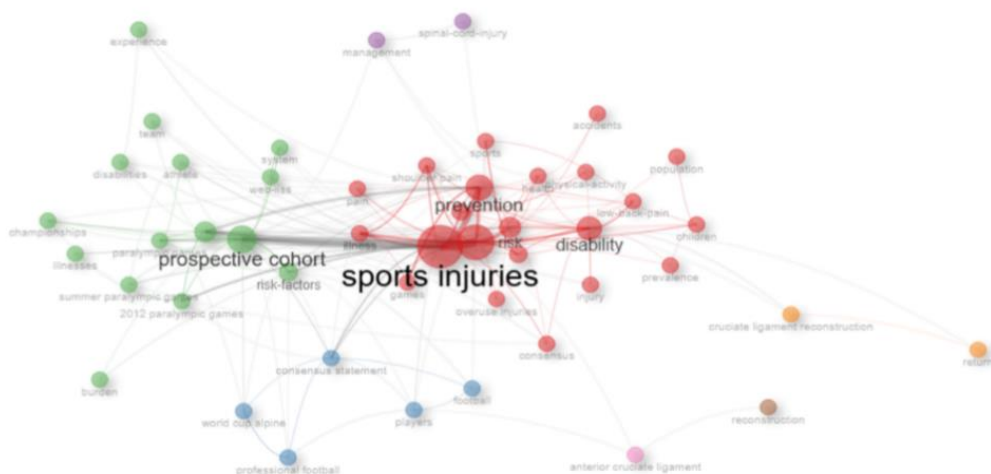
The trend analysis in Figure 8 details the prominent research trends in the field of sports injuries in individuals with disabilities in recent years. The analysis results show that major sporting events such as the "summer Paralympic games" and "professional football" provide important data sources for injury research. Data from the 2012 and 2016 Paralympic games, in particular, are frequently referenced in studies on injury epidemiology in athletes with disabilities.

Figure 9. Thematic evolution analysis



The thematic evolution analysis in Figure 9 shows how research focuses in the field of sports injuries in individuals with disabilities have changed over time. In the 1992-2017 period, research primarily focused on basic clinical topics such as "follow-up studies," "risk-factors," and "spinal-cord-injury." During this period, the intensive study of injury patterns in specific sports like "professional football" is apparent.

Figure 10. Keyword co-occurrence network



The keyword co-occurrence network analysis in Figure 10 systematically reveals the conceptual relationships in the literature. When examining the network structure, three main research clusters clearly stand out. The first, the clinical management and

rehabilitation cluster, is characterized by strong connections between the terms "anterior cruciate ligament," "ligament reconstruction," and "reconstruction." These findings reflect the central importance of the clinical management of musculoskeletal injuries in the field. The terms "management" and "prevention" within the same cluster indicate a growing academic interest in preventive strategies alongside treatment approaches.

The epidemiological and public health cluster is characterized by the co-occurrence of terms such as "prevalence," "risk factors," "overuse injuries," and "sports injuries." This structure points to the intensity of research aimed at quantitatively assessing the injury burden in athletes with disabilities. The central position of the term "prospective cohort" is an important indicator of the increasing methodological quality of studies in the field. It is also observed that research on the long-term health outcomes of athletes with disabilities is developing within this cluster.

The sports organizations and performance cluster is noteworthy for the dense network of connections formed by terms like "summer Paralympic games," "2012 Paralympic games," "championships," and "professional football." This structure highlights the critical role of major sporting events in providing research data. The terms "performance" and "team" within the cluster reflect the growing academic interest in performance optimization for athletes with disabilities. These findings are important as they show that interest extends not only to the health problems of athletes with disabilities but also to their athletic success.

Discussion

The bibliometric analysis performed in this study reveals the dynamics of scientific production in the field of sports injuries in individuals with disabilities and offers important insights into the field's development. The findings show that the first studies in this area began in the 1990s and that the number of publications has steadily increased over time, with this growth becoming more pronounced after 2016. An examination of the annual fluctuations in publication numbers shows relative increases during Paralympic years (2012, 2016, 2020)—while research in the field is influenced by major sporting events, it demonstrates more of a continuous and stable development.

Geographical distribution analyses reveal that knowledge production is centered in the USA (32.4%), the United Kingdom (18.1%), and Australia (11.6%), while also showing that South Africa unexpectedly plays a central role in international collaborations, suggesting that developing countries can make significant contributions to global research networks in specific areas of expertise. However, the 71.3% rate of single - nation publications also indicates a need to increase international collaborations.

Thematic analyses have shown that the research focus has evolved over time from a clinical perspective to more holistic approaches. Keyword co-occurrence network analyses, in particular, revealed three main research clusters: (1) The clinical management and rehabilitation cluster ("anterior cruciate ligament," "ligament reconstruction"), (2) The epidemiological and public health cluster ("prevalence," "risk

factors"), and (3) The sports organizations and performance cluster ("Paralympic games," "professional football"). This clustering reflects the multidisciplinary nature of research in the field. The central position of the term "prospective cohort" is an important indicator of increasing methodological quality.

Conclusion

This bibliometric study provides one of the first systematic mappings of the sports injury literature in individuals with disabilities, covering 216 articles published between 1992 and 2025. The findings demonstrate a field in steady growth, shaped by major Paralympic events, led by a small number of high-income countries, and organized around three coherent thematic clusters. The analysis, however, also illuminates notable research gaps. Topics such as preventive strategies, gender-specific issues, and particularly the pediatric population have been considerably under-researched, a conclusion reinforced by the thematic isolation of the keywords "disability" and "children." These findings point to several critical directions for future inquiry. Specifically, there is a need to develop and evaluate injury prevention programs tailored to athletes with disabilities through randomized controlled trials. Furthermore, detailed investigations into the unique injury risk factors for pediatric and female athletes with disabilities are required to address these demographic gaps. To ensure a more globally representative understanding, it is also essential to strengthen research capacity in developing countries and foster greater international collaboration. Finally, to bridge the gap between research and practice, efforts must be made to create and disseminate clear implementation guidelines that translate clinical findings into practical application.

By providing a detailed trajectory of research on sports injuries in individuals with disabilities, this study constitutes a structured reference point that may guide future inquiries. Fostering robust multidisciplinary and international collaborations is essential and could play a pivotal role in improving the long-term health and athletic success of this population.

Ethics Approval and Consent to Participate

The present research is based on the analysis of documents contained within a database, which is accessible online via a software program. Consequently, the protocol for obtaining Ethics Committee approval was not followed.

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High-Intensity Interval Training (HIIT) and Chronic Diseases: An Emerging Trend in the Scientific Literature? A Bibliometric Analysis

Ömer AKSOY*

Abstract

Aim: This study performs a bibliometric analysis to identify scientific trends regarding the effects of high-intensity interval training on individuals with chronic diseases.

Method: A total of 1 312 English language articles obtained from the Web of Science database and published between 1989 and 2025 were evaluated. Within the scope of the study, only “article”-type publications were included, and language and index (SCIE, SSCI, ESCI) filters were applied. Publications were analyzed using VOSviewer software in terms of distribution by year, country collaborations, keyword clusters, time trends, and citation analysis.

Results: According to the results of the analysis, a significant increase in publications on HIIT and chronic diseases was observed after 2016. Canada, the UK, Australia, and Iran are among the most productive countries, while the US, despite having a central position on the map of inter-country collaboration, did not make it to the top 10 in the number of publications.

Conclusion: Keyword clusters revealed that HIIT was intensively studied in relation to metabolic and cardiovascular disorders such as diabetes, obesity, and hypertension. Citation analysis findings show that articles on heart diseases, metabolic syndrome, and insulin resistance are prominent. The findings indicate that HIIT has been adopted not only for athletic performance enhancement but also as an effective intervention tool in the management of chronic diseases.

Keywords: High-intensity interval training, chronic diseases, physical activity, bibliometric analysis.

Yüksek Yoğunluklu Aralıklı Antrenmanlar ve Kronik Hastalıklar: Bilimsel Literatürde Ortaya Çıkan Bir Eğilim mi? Bibliyometrik Bir Analiz

Öz

Amaç: Bu çalışma, yüksek yoğunluklu aralıklı antrenmanların kronik hastalıklara sahip bireylerdeki etkilerine yönelik bilimsel eğilimleri belirlemek üzere bibliyometrik bir analiz gerçekleştirmektedir.

Yöntem: Web of Science veri tabanından elde edilen ve 1989–2025 yılları arasında yayımlanan 1,312 İngilizce makale değerlendirmeye alınmıştır. Araştırma kapsamında yalnızca “makale” türündeki yayınlar dahil edilmiş, dil ve indeks (SCIE, SSCI, ESCI) filtreleri uygulanmıştır. Yayınlar VOSviewer yazılımı

Özgün Araştırma Makalesi (Original Research Article)

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kullanılarak yıllara göre dağılım, ülke iş birlikleri, anahtar kelime kümelenmeleri, zaman trendleri ve atıf analizleri bakımından incelenmiştir.

Bulgular: Analiz sonuçlarına göre, 2016 sonrası dönemde HIIT ve kronik hastalıklar konusundaki yayınlarda dikkate değer bir artış gözlenmiştir. Kanada, İngiltere, Avustralya ve İran en üretken ülkeler arasında yer alırken, ABD ülkeler arası işbirliği haritasında merkezi bir konuma sahip olmasına rağmen, yayın sayısında ilk 10'a girememiştir.

Sonuç: Anahtar kelime kümelenmeleri incelendiğinde HIIT'in diyabet, obezite, hipertansiyon gibi metabolik ve kardiyovasküler bozukluklarla ilişkili olarak yoğun biçimde çalışıldığı tespit edilmiştir. Atıf analizi bulguları ise, kalp hastalıkları, metabolik sendrom ve insülin direnci konularındaki makalelerin öne çıktığını göstermektedir. Araştırma sonuçları, HIIT'in yalnızca sportif performans geliştirme amacıyla değil, aynı zamanda kronik hastalıkların yönetiminde etkin bir müdahale aracı olarak benimsendiğini göstermektedir.

Anahtar Sözcükler: Yüksek yoğunluklu aralıklı antrenman, kronik hastalıklar, fiziksel aktivite, bibliyometrik analiz.

Introduction

HIIT is known as an exercise/training method performed at high intensity with short rest intervals (1-4 minutes)¹. This method, which targets more than 75% of the maximal heart rate and maximal effort, which is between 80% and 95%, was created on the basis of intermittent exercises in which the training time is shortened and the intensity is increased, and it is stated to provide a strong acute physical response². In addition, the aim of this type of exercise is recognized as a time-efficient training method among most training methods to provide similar or superior adaptations compared to traditional moderate-intensity continuous training according to a range of physiological performance and health status³. In terms of chronic diseases, the positive effects of HIIT on the organism (metabolic health, cardiovascular function, and respiratory capacity) are supported by some studies.

HIIT has recently come to the forefront with its positive effects on chronic diseases and physical performance^{4,5}. Cardiovascular complications are one of the main causes of mortality, and it is stated that HIIT also accelerates recovery by adapting the cardiovascular system to high intensities with rest intervals⁶. These training methods increase maximal oxygen utilization capacity, improve aerobic and anaerobic metabolism, and improve maximal oxygen uptake by 8%, glycogen stores by 3%, and recovery heart rate by 7% in individuals with heart disease and cardio-metabolic risks. At the same time, HIIT is recommended as an effective method for the prevention of cardiovascular risk factors, especially high blood pressure⁷.

When studies conducted in this direction are examined⁸, it is observed that obese adults performed 10 sets of cycling exercise at 90% of maximum heart rate, three times per week for four weeks. When the results were evaluated, significant improvements in VO₂max and cardiorespiratory health and a decrease in resting systolic blood pressure

were observed. In addition, 58% of the participants in the study found HIIT programs more enjoyable than other training programs.

In another study, 17 participants with coronary artery disease were randomly divided into moderate (50-60% VO₂max) and high (80-90% VO₂max) intensity aerobic training programs. At the end of the 10-week program, VO₂max increased more in the high-intensity exercise group, and left ventricular diastolic strain rate also increased in this group; these changes were not observed in the moderate-intensity group⁹.

For example, in a different study, 32 women diagnosed with relapsing-remitting multiple sclerosis (RRMS) and 16 healthy individuals matched for age, gender, body weight, and height in a controlled manner performed a bicycle ergometer test. In the study, a statistically significant and strong relationship was found between the measured and predicted VO₂max values between the groups with and without MS in the tests performed to estimate the maximum work rate and VO₂max consumption. Based on linear regression analysis, it was determined that VO₂max was predicted with 10% accuracy in 95 out of every 100 individuals diagnosed with MS, within the limits of 95% confidence intervals for worst-case errors¹⁰. In addition, a study examined the effects of high-intensity interval aerobic exercise (HIIT) and moderate-intensity continuous aerobic exercise (MVCAE) programs in 28 patients with type 2 diabetes. In 6-week, 3-day-a-week programs, significant improvements were observed in aerobic capacity, cognitive function, muscular endurance and neuropathy scores in both groups. However, while FVC, FEV₁, and PEF values increased in the (HIIT) group, a significant increase was observed only in PEF values in the MVCAE group¹¹. The results suggest that both exercise programs improve physical and cognitive functions and reduce neuropathy symptoms in type 2 diabetics. A systematic review showed that high-intensity interval training in cancer patients provided more favorable effects on VO₂ peak and fat mass compared to conventional treatment. No differences were found in quality of life and fat-free mass. These results support that HIIT is an effective and time-efficient method for cancer patients¹².

In general, it is known that high-intensity interval training is only applied to improve performance in athletes. However, recent studies have shown that HIITs are also an effective and applicable method for individuals with chronic diseases. Although there are many studies on HIIT protocols in the literature, a comprehensive bibliometric analysis covering HIIT applications in people with chronic diseases has not yet been conducted. In recent years, there has been a remarkable increase in scientific publications examining the effects of high-intensity interval training (HIIT) on chronic diseases. As illustrated by the temporal distribution of publications (Figure 1), the number of studies has increased substantially, particularly after 2013, with a sharp rise observed between 2017 and 2024. This pattern indicates that research on HIIT and chronic diseases has evolved into a rapidly expanding and emerging area within the scientific literature. Despite the increasing number of studies on HIIT, there is a lack of comprehensive bibliometric analyses focusing on its application in chronic diseases. This study addresses this gap by systematically mapping research trends, key themes, and collaboration networks,

thereby providing a structured overview of the field. Therefore, the aim of this study is to examine the applications of HIIT in different chronic diseases together with a comprehensive bibliometric analysis. Thus, the multifaceted application areas of HIITs in the field of health are systematically revealed through models such as thematic maps, keyword analysis, and collaboration between countries.

Material and Methods

Research Model

This study was designed using the bibliometric analysis method. Bibliometric analysis is defined as a method that allows researchers to examine academic publications, authors, institutions, and the impact level of research outputs in a particular scientific field with quantitative data¹³. Accordingly, bibliometric indicators are among the important tools for researchers and institutions to evaluate research performance¹⁴. It is also widely used to track the transformation of scientific paradigms, identify interdisciplinary differentiation, and determine the most influential publications and researchers¹⁵. Since this study is based solely on bibliometric data analysis and does not include any human participant data, it does not require ethics committee approval.

Data Collection Process

Data were collected from the Web of Science (WoS) database by filtering only "article"-type publications written in English and indexed in SCIE, SSCI, and ESCI indexes. The method of searching for studies was made to cover the literature between 1989 and 2025, and the following Boolean logic operators were used in the search query: TS=((("high intensity interval training" OR HIIT OR "interval training" OR "intermittent training") AND ("chronic disease" OR "chronic illness" OR "obesity" OR "diabetes" OR "type 2 diabetes" OR "hypertension" OR "high blood pressure" OR "cardiovascular disease" OR "heart disease" OR "cancer") NOT ("athlete" OR "athletes" OR "performance" OR "sport" OR "football" OR "basketball" OR "soccer" OR "runner" OR "swimmer" OR "recreational")) As a result of this query, 1.775 publications were initially identified. After filtering according to publication type, index, and language criteria, the total number of publications included in the analysis was determined to be 1 312.

Ethical Statement

This study is based solely on bibliometric analysis and does not involve any data collection from human or animal participants. The data used in this research were obtained from the Web of Science database and consist of publicly accessible secondary data. Therefore, in accordance with relevant regulations and ethical guidelines, ethical approval is not required.

Data Analysis Method

The data collected from the Web of Science (WoS) database were exported in txt format and analyzed using VOSviewer (v1.6.20) software. The following techniques were used in the bibliometric analysis:

Publication Distribution by Year: Publications made between 1989 and 2025 are classified according to years. A significant increase was observed, especially after 2016.

Analysis of Cooperation between Countries: Countries with a minimum of 5 publications were included in the analysis, and 46 out of 73 countries were included in the analysis. The cooperation network created by the full counting method was visualized in network visualization mode, and the colors on the map reflected the cooperation clusters.

Number of Publications by Countries: The total number of publications of the countries was graphed by taking into account the Web of Science (WoS) database, and the scientific contribution levels of the countries were presented comparatively.

Collaboration Analysis between Authors: Authors with at least 5 publications were filtered, and 136 out of 6,248 authors were included in the analysis. Relationships based on joint publications were clustered in network visualization mode and presented as a network map.

Keyword Cluster Analysis: In the analysis performed with VOSviewer, the “all keywords” unit was selected, and 186 keywords mentioned in at least 5 studies were taken into consideration using the full counting method. However, the first 15 keywords were presented visually in order to eliminate the complex image on the map and to increase visual clarity.

Density Visualization: The density of keywords in the literature was visualized with color tones; frequently occurring terms were shown in yellow, and infrequently occurring terms were shown in blue-green tones.

Time-Based Keyword Trends: In the analysis performed in Overlay visualization mode, it is aimed to visualize the evolution of keywords over time with color transitions according to the average publication year. Although the years of this study cover the period between 1989 and 2025, the density in the network map is clustered between 2017 and 2022.

Citation Analysis: The top 1 000 most cited studies were analyzed. In the network visualization mode, node size represents the number of citations, lines represent citation relationships, and colors represent cluster structures. In the network map, it is seen that especially highly cited studies such as¹⁶⁻¹⁸ and are located in the center.

Results

Figure 1 shows the distribution of articles published in Web of Science (SCIE, SSCI, ESCI) indexes between 1989 and 2025 and written only in English. After 2020, a significant increase in the number of publications was observed. The highest number of publications was recorded in 2022 (n=156).

Figure 1. Distribution of the number of articles published in the web of science database between 1989 and 2025 by years

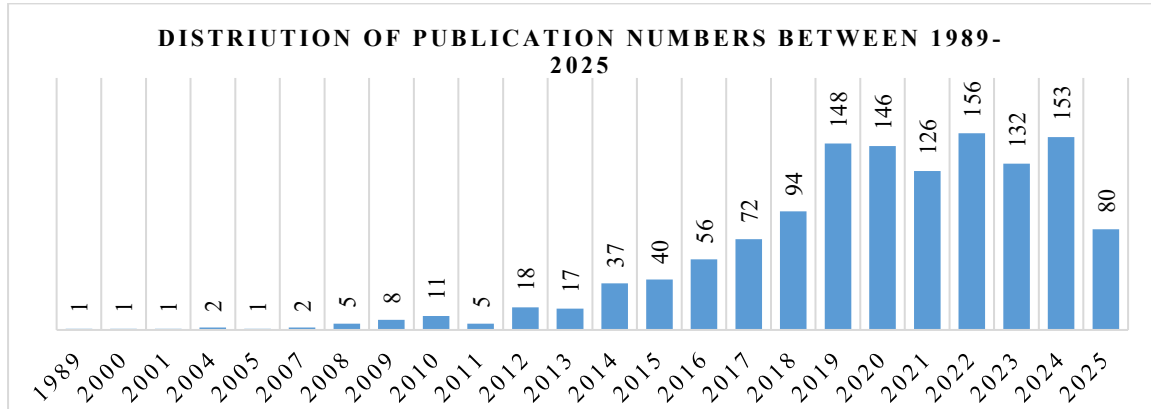


Figure 2 shows the cross-country collaborations in articles published between 1989 and 2025. The size of the nodes is scaled according to the total number of publications of each country. Colors represent countries grouped according to the clustering algorithm, while lines represent co-authorship relationships between countries. Countries such as the US, Canada, the UK, and Iran stand out with their extensive collaboration networks and centralized locations.

Figure 2. Inter-country cooperation network map

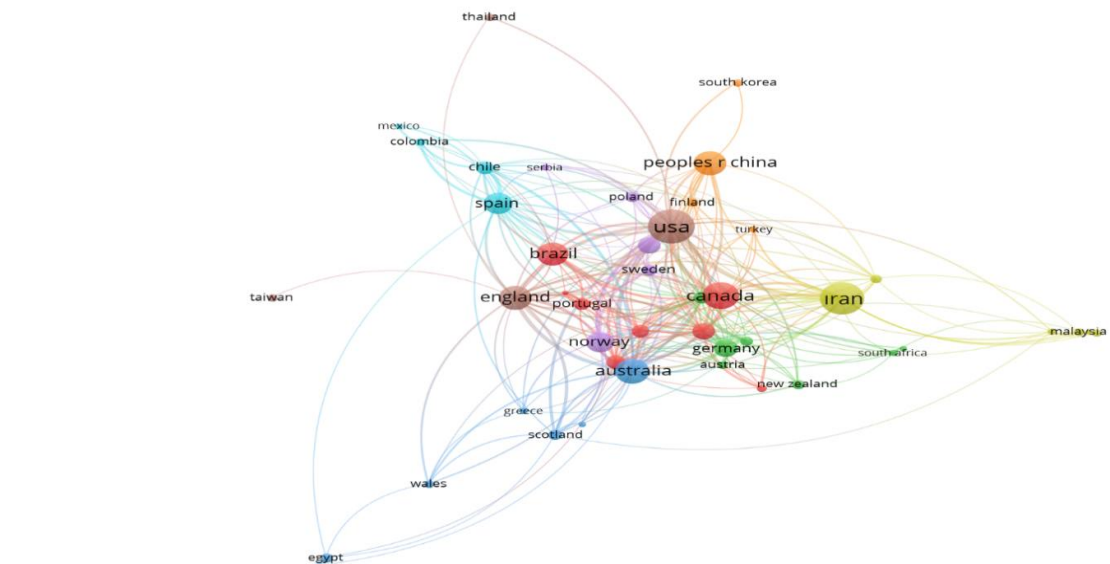
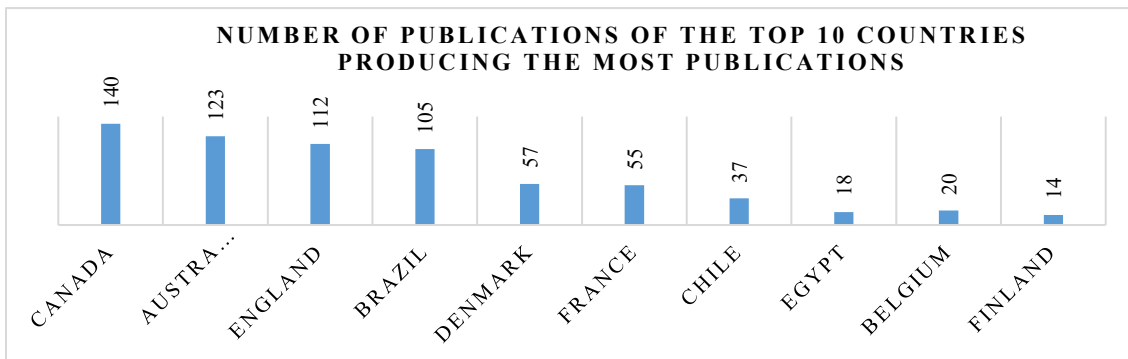


Figure 3 shows the distribution of publications on high-intensity interval training applications in chronic diseases according to countries. The 10 countries with the most publications are listed, and it is seen that countries such as Canada, Australia, and England are at the top.

Figure 3. Number of publications of the top 10 countries with the highest number of publications between 1989 and 2025



When Figure 4 is analyzed, the network map was created according to 186 keywords that were repeated at least 15 times in the studies. The colored clusters represent the keywords that are conceptually closest to each other. The terms “high-intensity interval training,” “exercise,” ‘obesity,’ and “diabetes” in the center represent the most basic research topics of the field. This clustering reveals the density of related thematic areas and their interrelationships.

Figure 4. Keyword clustering network map

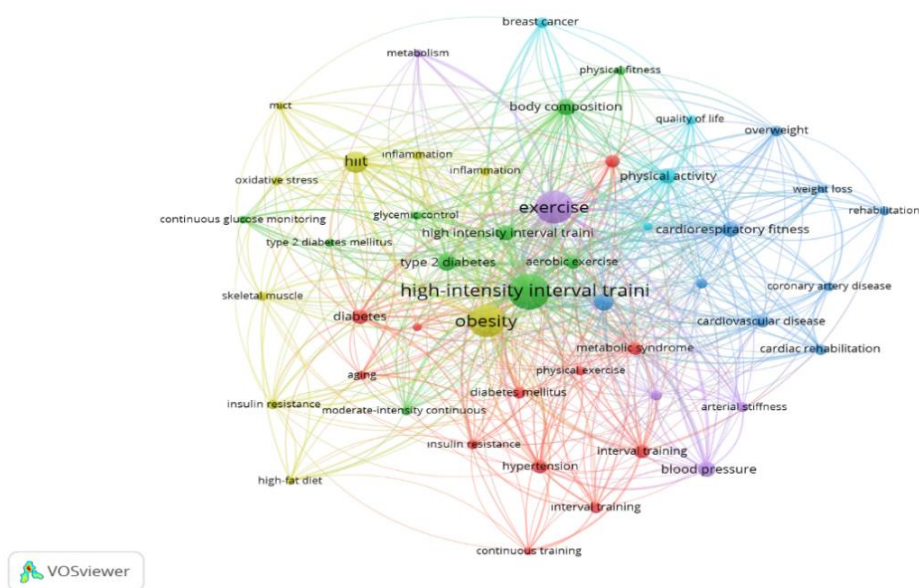
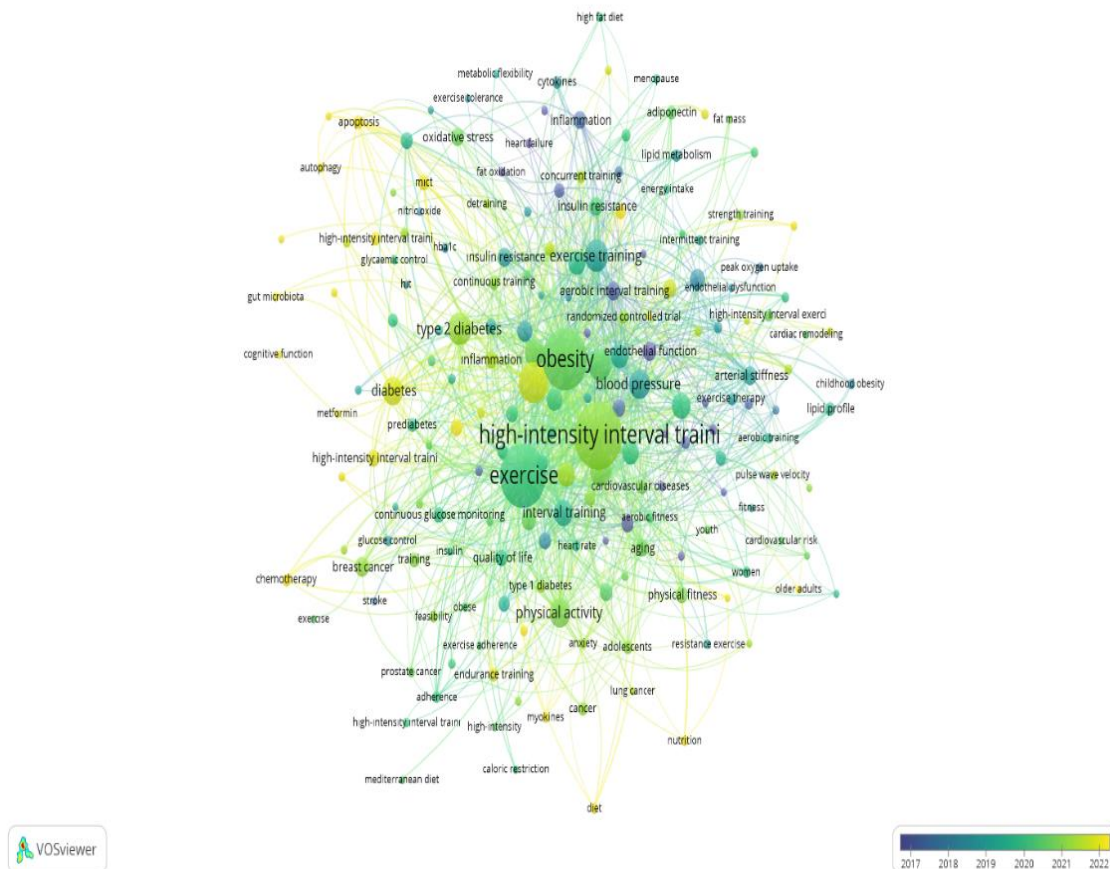


Figure 5 shows the coloring of the keywords used in the bibliometric analysis according to their average publication years over time. The resulting color scale was automatically

generated by the VOSviewer software according to the words concentrated between 2017 and 2022. This reveals that the selected keywords are mostly used in this period and that publications on the subject have increased in recent years.

Figure 5. Keyword time trend network map



*Our study covers the data between 1989 and 2025. However, since this map presents the distribution of keywords based on the average publication year, only the color scale for 2017-2022 is included in the visual. This technical limitation is due to the algorithm of the VOSviewer software and aims to more clearly emphasize the rise of time trends in recent years.

Figure 6. When analyzed, the map reveals the citation relationships between articles published between 1989 and 2025. In addition, each circle represents a publication, while the size of the circles is determined according to the total number of citations received by the relevant publication. Authors belonging to the same cluster are grouped with the same color. Highly cited pioneering studies such as “Wisløff (2007)”, “Tjønnå (2008)”, “Little (2011)” and “Gibala (2006)” are prominently featured in the map. This suggests that studies that are considered foundational in the field of high-intensity interval training (HIIT) have had a strong impact on the literature.

Figure 6. Citation analysis network map

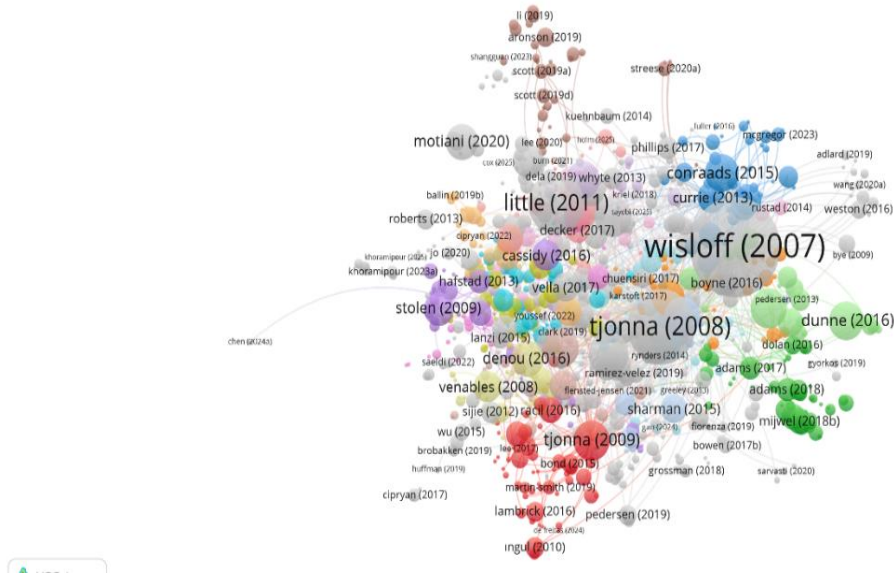


Figure 7 shows the co-authorship relationships of authors in articles published between 1989 and 2025. The circles represent authors, and the links represent co-authored articles. The map shows that researchers such as Ulrik Wisløff, Jeff S. Coombes, Shelley E. Keating, and Normand G. Boule are located in dense collaborative networks and occupy central positions. This structure indicates productive and interactive research groups in the field, while the cluster colors represent the collaborative communities to which the authors belong.

Figure 7. Collaboration Network Map by Authors

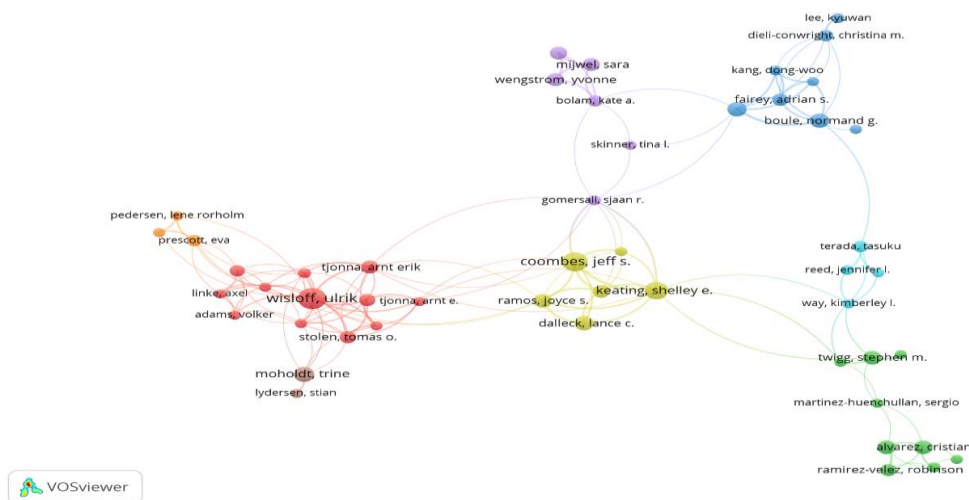
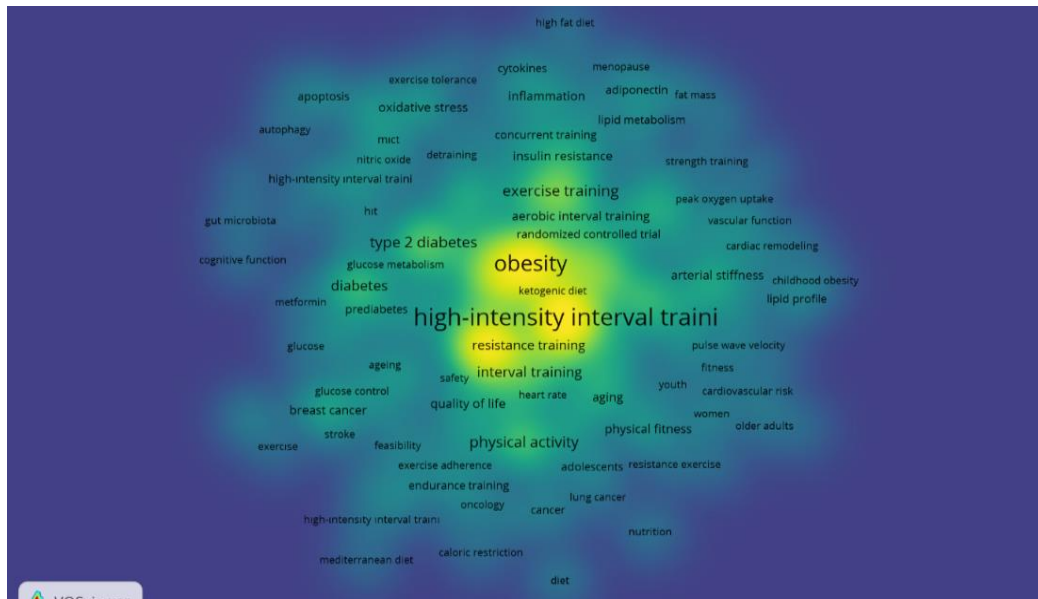


Figure 8 shows the density of the most frequently used keywords in the studies. The color transition from yellow to dark blue on the map indicates the frequency of the keyword.

The fact that terms such as “high-intensity interval training”, “exercise”, “obesity”, “interval training” and “physical activity” are located in the bright yellow region on the map reveals that these concepts are very intensively studied in the literature. This shows that HIIT practices are an important research area in the context of health and chronic diseases.

Figure 8. Keyword density network map



Discussion

In this study, it was analyzed in detail whether HIIT programs were applied to individuals with chronic diseases between 1989 and 2025 and what the general trends were. When the findings of this study were evaluated, it was determined that the number of publications in the field was low between 1989 and 2007, the number of publications started to increase since 2008, and the peak number of publications was between 2019 and 2024. This situation is thought to reveal the applicability of HIIT programs in individuals with chronic diseases.

According to the map of cooperation between countries in the study, it was found that the US is at the center of the network map and that it conducts joint studies with many countries. However, it is noteworthy that the US is not among the top 10 countries according to the analysis of the number of publications. When this situation is evaluated, it suggests that although the number of publications of the USA is low, it cooperates with other countries at the international level and supports projects in other countries as a co-author. In addition, since many of the publications to which the USA contributes point to other countries as the primary institution, this may be the reason for its lower ranking in the number of publications. Indeed, in a study¹⁹, it was stated that the USA has a high level of international cooperation with other countries in terms of contributing to the studies. In another study²⁰, stated that the USA is dominant in medical publishing with

international countries. However, countries on the map such as Canada, the UK, Iran, China, and Australia also stand out as important nodes (Figure 2). Moreover, Canada and the UK are considered to have central roles in both the number of publications produced (Figure 3) and collaborative contributions (Figure 2).

Another study²¹ reported that Canada and the UK are among the most productive countries in HIIT studies. Iran, on the other hand, has recently increased its visibility in regional and global research networks, and the number and distribution of collaborations with different continents (Figure 2) is remarkable. Other countries, such as China and Australia, have also taken an active role in HIIT studies through bidirectional cooperation with many countries (Figure 2). In conclusion, the dense clusters of connections in the map suggest that the topic of HIIT and chronic diseases is not limited to specific regions but has become a multi centered and global research area. Moreover, countries such as Brazil and Norway are located at prominent nodes on the map and contribute to HIIT research through regional collaborations. It is noteworthy that Norway is represented in the network, especially with its influential studies in sports science literature (Figure 2).

In the analysis of the number of publications by country (Figure 3), Canada has the highest number of publications, followed by Australia, England, Brazil, and France. This situation emphasizes that HIIT and chronic diseases are among the priority study areas in terms of both research funds and public health²². In particular, centers such as the University of British Columbia and McMaster University, which are leading with their studies in exercise science in Canada, may have contributed to this productivity. As mentioned earlier²¹, stated that Canada, England, and Australia are among the most productive countries in the field of HIIT as a result of the bibliometric analysis. In addition, this distribution map of the number of publications suggests that HIIT is a health-oriented research area that is adopted not only in developed countries but also in different continents such as Latin America.

According to the keyword cluster analysis (Figure 4), the concepts of “high-intensity interval training”, “exercise”, “obesity” and “diabetes” were found to be central in the literature. The fact that these terms are used together intensively shows that HIIT is mostly addressed in studies related to metabolic diseases such as obesity and diabetes. Green clusters were found to focus specifically on metabolic disorders such as obesity, type 2 diabetes, insulin resistance, and glycemic control, while blue clusters were related to cardiorespiratory fitness, rehabilitation, arterial stiffness, and heart disease. A systematic research²³ has shown that HIIT increases VO₂max more effectively than moderate-intensity continuous exercise in individuals with cardiovascular diseases²⁴. Purple clusters are linked to many health outcomes, such as quality of life, body composition, and physiological fitness. For example, the study reported that a randomized controlled HIIT program applied to patients with coronary artery disease in a study showed a significant improvement in VO₂max parameter values²⁵. In the red clusters, hypertension and blood pressure parameters are related, and as a result of a meta-analysis, revealed that HIIT practices produced a significant decrease in systolic

blood pressure and a limited but positive effect on diastolic blood pressure in individuals with hypertension²⁶.

In the yellow cluster, terms such as “oxidative stress”, “inflammation”, and “insulin resistance” indicate that HIIT interventions provide positive effects on metabolic responses, especially in obese individuals. In particular, HIIT has been reported to improve insulin sensitivity and reduce oxidative stress markers in obese individuals. In conclusion, this distribution clearly demonstrates that HIIT studies do not only focus on a single system but also have a multifaceted clinical and public health perspective, simultaneously covering metabolic, cardiovascular, and functional health dimensions²⁷.

In the keyword time trend analysis (Figure 5), it is clear that key concepts such as “high-intensity interval training”, “exercise”, “obesity” and “diabetes” have been the subject of study for a long time and that these concepts are central to research. These concepts, with their color transitions from yellow to green, show that they were intensively studied, especially in 2017-2019. In addition, more physiological terms such as “blood pressure”, “cardiovascular function”, “vascular function” and “oxidative stress” have become more prominent over time, meaning that the effects of HIIT are also being investigated in the context of physiological mechanisms. Especially in recent years (2021-2023), concepts such as “mitochondrial function”, “gut microbiota”, “autophagy”, “chemotherapy” and “cognitive function” have come to the forefront in yellow tones, and the much more systemic effects of the HIIT program are being investigated. This suggests that HIIT is being investigated not only in metabolic diseases such as obesity or diabetes, but also in different biological systems such as cancer treatment, aging, neurocognitive functions, and mitochondrial health. Recent studies suggest that research in this field is increasingly adopting multidisciplinary approaches. According to these results, it shows that HIIT programs have developed over time and are not limited to exercise physiology but have turned into a research field with a holistic approach that includes multiple systems²¹.

According to the results of the citation analysis (Figure 6), studies by authors such as¹⁶⁻¹⁸ are located in cluster centers with high centrality and high citation intake. This finding suggests that these studies are the main sources shaping the literature on HIIT and chronic diseases. This suggests that studies that emphasize the relationship between HIIT and metabolic disorders such as diabetes, hypertension, and cardiovascular diseases are of high academic and clinical value.

The collaboration network map by authors (Figure 7) shows that influential research groups in the field of HIIT and chronic diseases form distinct clusters. In particular, it is noteworthy that authors such as Wisloff, Ulrik; Tjonna, Arnt Erik; Stolen, Thomas; and Moholdt, Trine, who are in the red cluster, frequently work together and form a leading research group in this field. This group of authors has examined the effects of HIIT on cardiovascular health, especially in Norwegian clinical trials^{16,17}.

In the blue cluster, authors such as Boule, Normand G.; Faulkner, Guy E.; Lee, Soojin; Kang, Woo Hyun; and Lee, Soojin, and Kang, Woo Hyun collaborate more on the axis of

type 2 diabetes, exercise physiology, and public health. In the green cluster, authors such as Martinez-Huerta, Sergio, and Ramirez-Velez, Robinson, have come to the forefront with their collaborations examining HIIT practices related to metabolic diseases, especially in Latin America-based research. When this cluster structure is evaluated, it is seen that an academic collaboration network with geographical, thematic, and methodological diversity has been formed in the field of HIIT and chronic diseases.

The density network map (Figure 8) shows that “high-intensity interval training,” “obesity,” “exercise,” “physical activity,” and “diabetes” have the highest frequency in the literature. This density map confirms that HIIT is the main research topic related to metabolic disorders. However, the high density of concepts reflecting metabolic responses such as “insulin resistance,” “oxidative stress,” and “inflammation” indicates that scientific interest in the effects of HIIT on metabolic health is strong. Meta-analysis revealed that HIIT significantly improved insulin resistance²⁸. Furthermore, in an 8-week study in obese individuals, HIIT induced positive changes in oxidative stress markers and muscle mitochondrial function, which is reported to improve insulin sensitivity²⁷. In addition, concepts such as “resistance training,” “cardiorespiratory fitness,” “aerobic interval training,” and “quality of life” are also evident in the density map. A meta-analysis study showing that HIIT practices improve cardiorespiratory fitness and quality of life in older adults seems to confirm the clinical importance of these concepts²⁹. In conclusion, this distribution of intensity suggests that HIIT is a broad area of research that addresses not only performance but also many health outcomes, from metabolic health to psychosocial well-being.

Conclusion and Suggestions

This bibliometric analysis comprehensively reveals the general trend in the literature by revealing research trends, conceptual clusters, international collaboration networks, and the most influential publications of HIIT practices in individuals with chronic diseases. Moreover, this study, which covers the period between 1989 and 2025, has shown a significant increase in the number of publications, especially in the post-2016 period. The analyses reveal that HIIT interventions are increasingly being investigated in cardiovascular diseases, type 2 diabetes, obesity, hypertension, and some types of cancer, with both clinical effects and physiological mechanisms. Keyword analyses and citation maps show that HIIT is not only limited to its effects on metabolic responses but is also associated with multidimensional health outcomes such as cardiorespiratory fitness, inflammation, oxidative stress, mitochondrial function, and quality of life. In this context, HIIT is positioned not only as a means to improve athletic performance but also as an effective and time-efficient intervention in the management of chronic diseases.

This study provides a comprehensive bibliometric overview of the scientific production on HIIT applications in individuals with chronic diseases, including their level, geographical distribution, and thematic trends. By analyzing international publication trends in detail, priority topics for researchers, high-impact studies, and productive author-network structures were identified. For this reason, the study will be an important reference for identifying gaps in the literature, developing new research

topics, and increasing the opportunities for interdisciplinary cooperation. Particularly for researchers publishing in health sciences, physiology, exercise science, and public health, it is suggested that more focus should be placed on the effects of HIIT on cardiometabolic health, quality of life, cognitive function, and inflammatory responses. Furthermore, the low number of HIIT studies conducted in developing countries indicates an unequal distribution of scientific production at the global level. Therefore, it is suggested that more regional research on HIIT practices in different socioeconomic and cultural contexts would be important to contribute to the field.

For future studies, the effects of HIIT on different types of chronic diseases (e.g., chronic kidney disease, COPD, and rheumatic diseases) have not yet been adequately studied. Future studies should evaluate the safety and efficacy of HIIT in these patient groups. Furthermore, the majority of HIIT research in groups such as women, the elderly, and pediatrics involves adult male subjects. Given gender- and age-based physiological differences, it is important to further study HIIT protocols in women and the elderly. However, the effects of HIIT on not only physiological but also psychosocial outcomes such as anxiety, depression, stress, and cognitive functioning should also be investigated.

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Obesity and Hedonic Hunger: Associations with Healthy Eating Attitudes and Nutrition Knowledge

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Abstract

Aim: This study aims to compare the hedonic hunger, attitudes towards healthy eating, and nutritional knowledge levels of adult obese individuals with those of healthy individuals.

Method: This cross-sectional and descriptive study was conducted between November 2024 and December 2024 with 198 obese participants and 198 healthy participants with a normal body mass index residing in the Kağıthane district. The participants were administered the General Information Form, the Attitude Scale for Healthy Nutrition (ASHN), the Nutrition Knowledge Scale (NKS), and the Power of Food Scale (PFS). Data were collected through an online survey method using Google Forms and analyzed using the SPSS 25.0 software.

Results: A significant relationship was found between the total score average of the Attitudes Towards Healthy Eating Scale (ASHN) and its subdimensions—poor eating, positive eating, and emotional attitudes towards eating—in obese individuals based on hedonic hunger ($p < 0.05$). A significant relationship was also observed between hedonic hunger and the total score of the Nutrition Knowledge Scale (NKS) in obese individuals ($p < 0.05$). Among healthy individuals, significant differences were detected in the subdimensions of poor eating and emotional attitudes towards eating related to hedonic hunger ($p < 0.05$), while no significant difference was found in the total NKS scores ($p > 0.05$). In healthy individuals, participants with hedonic hunger had lower total ASHN scores and lower subdimension scores for poor eating and emotional attitudes towards eating compared to those without hedonic hunger ($p < 0.05$).

Conclusion: It was observed that the healthy eating attitudes and nutritional knowledge levels of obese individuals differed significantly from those of healthy individuals. Additionally, obese individuals were found to have higher levels of hedonic hunger, which was negatively associated with attitudes and behaviors

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supporting healthy eating and appeared to undermine healthy eating behaviors. These findings highlight that hedonic hunger is a critical factor that should not be overlooked in combating obesity and suggest that increasing knowledge alone may not be sufficient. Accordingly, interventions aimed at managing hedonic hunger levels are important for obesity prevention and management. Within the scope of obesity prevention and management strategies, it is considered beneficial to develop nutrition education programs alongside interventions targeting hedonic hunger and to establish health policies that promote healthy eating attitudes. Further research on this subject would be valuable, particularly to clarify the direction of the relationship between hedonic hunger and healthy eating and to develop effective intervention methods.

Keywords: Hedonic hunger, obesity, healthy nutrition, nutrition knowledge, eating behavior.

Obezite ve Hedonik Açlık: Sağlıklı Beslenme Tutumu ve Beslenme Bilgisi ile İlişkisi

Öz

Amaç: Bu çalışmada yetişkin obez bireylerin hedonik açlık, sağlıklı beslenmeye ilişkin tutum ve beslenme bilgi düzeyinin sağlıklı bireyler ile karşılaştırılması amaçlanmıştır.

Yöntem: Kesitsel ve tanımlayıcı tipteki bu çalışma, Kasım 2024-Aralık 2024 tarihleri arasında Kağıthane ilçesinde yaşayan 198 obez, 198 normal beden kütle indeksine sahip sağlıklı katılımcılar ile yürütülmüştür. Çalışmaya katılan katılımcılara Genel Bilgiler Formu, Sağlıklı Beslenmeye İlişkin Tutum Ölçeği (SBİTÖ), Beslenme Bilgi Ölçeği (BBÖ) ve Besin Gücü Ölçeği (BGÖ) kullanılmıştır. Veriler Google Forms ile online anket yöntemiyle toplanmıştır. Veriler SPSS 25.0 programında değerlendirilmiştir.

Bulgular: Obez hedonik açlığa göre SBİTÖ toplam puan ortalaması ve SBİTÖ alt boyutları kötü beslenme, olumlu beslenme ve beslenmeye yönelik duygu puan ortalamaları arasında anlamlı bir ilişki bulunmuştur ($p<0,05$). Obez bireylerde hedonik açlık ile Beslenme Bilgi Ölçeği (BBÖ) toplam puanı arasında anlamlı bir ilişki ($p<0,05$) bulunmuştur. Sağlıklı bireylerde ise hedonik açlık, kötü beslenme ve beslenmeye yönelik duygularla ilgili alt boyutlarda anlamlı farklar ($p<0,05$) saptanırken, BBÖ toplam puanları açısından anlamlı bir fark bulunmamıştır ($p>0,05$). Sağlıklı bireylerde hedonik açlığı olan katılımcıların SBİTÖ toplam puanı ve SBİTÖ alt boyutları kötü beslenme ve beslenmeye yönelik duygu puan ortalamaları hedonik açlığı olmayanlara göre daha düşüktür ($p<0,05$).

Sonuç: Obez bireylerin sağlıklı beslenme tutumlarının ve beslenme bilgisi düzeylerinin sağlıklı bireylerden anlamlı derecede farklı olduğu gözlemlenmiştir. Ayrıca, obez bireylerde hedonik açlık düzeylerinin daha yüksek olduğu ve hedonik açlığın sağlıklı beslenmeyi destekleyen tutum ve davranışlarla olumsuz yönde ilişkili olduğu saptanmıştır. Bu sonuç, obeziteyle mücadelede hedonik açlığın göz ardı edilemeyecek kritik bir değişken olduğunu ve yalnızca bilgi artırmanın tek başına yeterli olmayabileceğini göstermektedir. Bu nedenle obeziteyi önleme ve yönetme stratejileri kapsamında, beslenme eğitimi programlarının yanı sıra hedonik açlığı yönetmeye yönelik müdahalelerin planlanması ve sağlıklı beslenmeyi destekleyen sağlık politikalarının geliştirilmesi yararlı olacaktır. Bu konuda daha fazla çalışma yapılması, özellikle hedonik açlık ile sağlıklı beslenme arasındaki ilişkinin yönünü ve etkili müdahale yöntemlerini ortaya koymak açısından önemlidir.

Anahtar Sözcükler: Hedonik açlık, obezite, sağlıklı beslenme, beslenme bilgisi, yeme davranışı.

Introduction

Obesity has emerged as a significant public health issue in both developed and developing nations. It occurs when the energy consumed exceeds the energy expended, and the World Health Organization (WHO) defines it as an excessive accumulation of fat

that adversely affects health¹. Furthermore, obesity impacts not only physical health but also has detrimental effects on psychological and social well-being².

Numerous factors contribute to the development of obesity, with hedonic hunger emerging as a significant element³. Hedonic hunger refers to the consumption of food for pleasure rather than biological necessity⁴. This phenomenon is characterized by an individual's persistent thoughts about food, which are triggered by external stimuli (such as seeing or smelling food, advertisements) and internal stimuli (including stress, emotional fluctuations, and rewarding behaviors). The easy accessibility of high-calorie foods, particularly those rich in fats and sugars, along with large portion sizes and changes in the food environment, significantly enhances the impact of hedonic hunger and contributes to the development of obesity⁵.

An individual's attitude towards healthy eating is a significant factor that reflects how they perceive their dietary habits and food choices, as well as the importance they assign to these choices. This attitude plays a crucial role in determining their success in achieving health-related goals. A positive attitude towards healthy eating typically encourages the selection of balanced and nutritious foods, whereas negative attitudes may lead to preferences for unhealthy food options⁶.

Nutritional knowledge refers to the level of understanding individuals possess regarding proper and healthy eating. Adequate nutritional knowledge aids individuals in making appropriate food choices, thereby promoting a healthy lifestyle in the long term. Conversely, insufficient nutritional knowledge can lead to the development of poor eating habits. In this context, attitudes towards healthy eating and nutritional knowledge are significant factors that should be assessed together with hedonic hunger, as they play a crucial role in shaping individuals' healthy eating behaviors⁷.

Research suggests that eating behavior in obesity is not solely driven by energy requirements; rather, it is closely related to environmental food cues, sensory pleasure components, and reward-related processes⁵. In this context, hedonic hunger represents a construct that can increase sensitivity to the appetitive appeal of food independent of physiological energy needs and has been found to be associated with obesity status³. Heightened hedonic orientation may hinder the regulation of eating behavior, making it more difficult to sustain healthy eating and potentially contributing to an increased risk of weight gain. Moreover, hedonic hunger may be linked to cognitive processes such as perceived control and confidence regarding eating behavior; therefore, it may adversely affect not only dietary habits but also individuals' beliefs about their capacity to manage eating behavior⁵.

Hedonic hunger is a significant mechanism that directly influences individuals' eating behaviors, interacting with biological and environmental factors in the development of obesity⁶. The perceived importance of taste and pleasure in food consumption (palatability) may encourage individuals to choose energy-dense, highly palatable foods, thereby increasing energy intake and potentially contributing to the rise in obesity rates

worldwide⁷. Understanding hedonic hunger is crucial for the prevention and treatment of obesity, as it allows for the development of tailored strategies for individuals⁸.

This study aimed to compare hedonic hunger levels, attitudes toward healthy eating, and nutrition knowledge between adults with obesity and healthy individuals with a normal BMI. Accordingly, the study addressed the following research questions: (i) Do hedonic hunger, healthy eating attitudes, and nutrition knowledge differ between obese and healthy individuals? (ii) Is hedonic hunger associated with the subdimensions of attitudes toward healthy eating in both groups? (iii) Among obese individuals, is hedonic hunger associated with nutrition knowledge? Based on these questions, we hypothesized that individuals with obesity would exhibit higher levels of hedonic hunger and that hedonic hunger would be negatively associated with indicators of attitudes that support healthy eating.

Material and Methods

Research Time, Place and Sample Selection

The sample of this cross-sectional and descriptive study consists of adult participants aged 18-65 years with obesity and normal Body Mass Index (BMI) residing in the Kağıthane district between November 2024 and December 2024. In studies where the population size exceeds 20,000 or is unknown, it is acceptable to assume a population size of 20,000⁹. Therefore, when calculating the sample size for this study, the population size was set at 20,000, and the sample was determined using the digital Raosoft Sample Size Calculator with 95% power and a 5% margin of error, resulting in a required sample size of 384 participants. The study was completed with a total of 396 participants.

Individuals with severe illnesses (such as heart disease or kidney failure), psychological disorders (such as eating disorders), those who have undergone surgical or medical interventions for weight loss in the past six months, nutrition and dietetics students or dietitians, individuals using medications that affect metabolic rate, and pregnant or lactating individuals were excluded from the study. Participants were administered the General Information Form, the Attitude Scale Toward Healthy Eating (ASHN), the Nutrition Knowledge Scale (NKS), and the Power of Food Scale (PFS). Data were collected through an online survey using Google Forms.

General Information Form

This form, prepared by the researchers, includes questions regarding participants' height, weight, gender, BMI, age, marital status, education level, occupation, income status, physical activity level, alcohol and smoking habits, presence of any illness requiring treatment in the past six months, dieting history, medication use, and family history of obesity. The anthropometric measurements collected from participants following standard methods were body weight and height¹⁰. Based on these data, BMI was calculated by the researchers using the formula $[\text{body weight (kg)} / \text{height (m)}^2]$ and classified according to the World Health Organization (WHO) criteria¹¹.

Nutrition Knowledge Scale (NKS): The Nutrition Knowledge Scale (NKS) was chosen as a validated, comprehensive measure of nutrition knowledge to enable standardized group comparisons and to examine its association with hedonic hunger and healthy eating attitudes. The NKS is a 5-point Likert-type scale, where participants rated each item on a scale from "Strongly Disagree" (0 points) to "Strongly Agree" (4 points). The maximum possible score on the scale is 126, with higher scores indicating a higher level of nutrition knowledge. A score of ≤ 79 is classified as "low knowledge level," a score between 90-100 as "moderate knowledge level," and a score of ≥ 101 as "high knowledge level"^{11,12}.

Power of Food Scale (PFS): The Power of Food Scale (PFS) was used to quantify hedonic hunger and susceptibility to food cues using a validated Turkish instrument, aligning with the study's primary aim and hypotheses. The PFS, originally developed by Cappelleri et al.¹³, consists of 21 items in its original version. Following the Turkish validity and reliability study conducted by Ülker et al.¹⁴, the number of items was reduced to 15. The PFS is a 5-point Likert-type scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). It comprises three subdimensions: "Food Availability," "Food Presence," and "Food Tasting," with a total of 15 items. The scale is evaluated based on a 5-point scoring system, where an average score above 2.5 indicates the presence of hedonic hunger and susceptibility to food cues. As the total PFS score increases, the level of hedonic hunger also increases¹⁴.

Attitude Scale for Healthy Nutrition (ASHN): Standardized total and subdimension scores of healthy eating attitudes were obtained using the Attitude Scale for Healthy Nutrition (ASHN), facilitating group comparisons and correlation analyses with hedonic hunger and nutrition knowledge. This scale, developed by Demir and Cicioğlu¹⁵ in 2019, is a valid and reliable measurement tool. It consists of four subdimensions and 21 items: Knowledge About Nutrition (BHB), Emotion Toward Nutrition (BYD), Positive Nutrition (OB), and Poor Nutrition (KB). Participants responded to the scale using a 5-point Likert-type format (1: Strongly Disagree, 5: Strongly Agree). The minimum possible score on the scale is 21, while the maximum is 105. A higher score indicates a more positive attitude toward healthy eating¹⁵.

Ethical Statement

This study was reviewed and approved by the Istanbul Atlas University Non-Interventional Scientific Research Ethics Committee at its meeting dated 19 November 2024 (No: E-22686390-050.99-54955). Electronic informed consent was obtained from all participants.

Evaluation of Data

The data were analyzed using the IBM SPSS v25.0 software package. The normality of data distribution was assessed using the Kolmogorov-Smirnov test. For group comparisons, the Independent Samples T-test was used for normally distributed data, while the Mann-Whitney U test was applied for non-normally distributed data. In

correlation analyses, Pearson correlation was used for normally distributed data, whereas Spearman correlation analysis was applied for non-normally distributed data. Statistical significance was set at $p < 0.05$.

Results

In Table 1, the participants were evaluated in two groups: healthy individuals and obese individuals. Upon examining the gender distribution of the healthy individuals, it was determined that the proportion of women was 85.9% (170 individuals), while the proportion of men was 14.1% (28 individuals). According to marital status, 42.9% of healthy individuals are married, while 57.1% are single; among obese individuals, 31.8% are married and 68.2% are single. When examining the educational status of the participants, it was observed that 70.7% are university graduates, 15.7% have completed high school, 11.6% hold a master's degree, and 2% have an education at the primary school level. 42.4% of the participants reported being employed, while 57.6% indicated that they are not employed. In terms of income status, 24.2% of individuals have an income that exceeds their expenses, 24.7% have an income that is less than their expenses, and 51% have an income that is equal to their expenses. In obese individuals, the gender distribution was determined to be 78.8% female and 21.2% male. When examining the educational level, it was found that 76.8% are university graduates. With regard to income status, it was observed that 28.8% have an income that is less than their expenses. When assessing physical activity status, it was noted that 20.7% of healthy individuals reported not engaging in any physical activity, whereas this rate was 45.5% among obese individuals. In terms of alcohol consumption, 31.8% of healthy individuals reported using alcohol, compared to 12.6% of obese individuals. Additionally, smoking prevalence was reported at 30.3% for healthy individuals and 27.8% for obese individuals. The age ranges of participants were determined to be 14-69 years for healthy individuals and 19-62 years for obese individuals.

Table 1. General information about the participants

	Healthy Weight Individuals (BMI = 18.50-24.99 kg/m ²)		Obese Individuals (BMI ≥30 kg/m ²)	
	n	%	n	%
Gender				
Female	170	85.9	156	78.8
Male	28	14.1	42	21.2
Marital Status				
Married	85	42.9	63	31.8
Single	113	57.1	135	68.2
Educational Status				
Primary Education	4	2.0	11	5.6
High School	31	15.7	21	10.6
University	140	70.7	152	76.8
Postgraduate	23	11.6	14	7.1

Occupation				
Employed	84	42.4	41	20.7
Unemployed	114	57.6	157	79.3
Income Status				
Income Less Than Expenses	49	24.7	57	28.8
Income Equal to Expenses	101	51.0	81	40.9
Income Greater Than Expenses	48	24.2	60	30.3
Physical Activity Status				
None	41	20.7	90	45.5
1-2 Days a Week	98	49.5	77	38.9
3-4 Days a Week	50	25.3	25	12.6
5 or More Days a Week	9	4.5	6	3.0
Alcohol Consumption				
Yes	63	31.8	25	12.6
No	135	68.2	173	87.4
Tobacco Consumption				
Yes	60	30.3	55	27.8
No	138	69.7	143	72.2
	Min.-Max.	X$\pm$SS	Min.-Max.	X$\pm$SS
Age (year)	14-69	33.95 $\pm$ 13.89	19-62	30.12 $\pm$ 12.45

*X $\pm$ SS: Average $\pm$ Standard Deviation, Min.-Maks.: Minimum – Maximum

In Table 2, participants are divided into two groups based on BMI: “Healthy Weight (18.5-24.99 kg/m²)” and “Obese (30.0 kg/m² and >30.0 kg/m²)”. According to the data categorized into groups, the total score of the Attitude Scale Toward Healthy Eating (ASHN) for obese individuals (65.07 $\pm$ 12.90) is significantly lower than that of healthy individuals (76.22 $\pm$ 10.18) ($p < 0.001$). When examining the subdimensions of the Attitude Scale Toward Healthy Eating (ASHN), it was found that the scores of obese individuals in "Knowledge about Nutrition" (BHB) (19.92 $\pm$ 2.73), "Emotions Related to Nutrition" (BYD) (14.91 $\pm$ 6.12), "Positive Nutrition" (OB) (15.84 $\pm$ 3.41), and "Poor Nutrition" (KB) (14.38 $\pm$ 4.79) are significantly lower than the corresponding subdimension scores of healthy individuals ($p < 0.001$). Additionally, it is observed that the total score of the Nutrition Knowledge Scale (NKS) and the total score of the Power of Food Scale (PFS) for obese individuals (116.48 $\pm$ 11.40 and 44.77 $\pm$ 6.82) show a significant difference compared to healthy individuals (121.45 $\pm$ 14.04 and 40.85 $\pm$ 10.5) ($p < 0.001$). Among the subdimensions of PFS, the scores for "Food Accessibility" (BU) and "Food Availability" (BM) are higher in obese individuals, while there is no significant difference between the two groups regarding the score for "Food Tasting" (BTB) ($p = 0.424$).

In conclusion, it has been determined that obese individuals exhibit differences in healthy eating attitudes and nutrition knowledge compared to healthy individuals, particularly showing lower values in positive nutrition and knowledge levels.

Table 2. Comparison of scale scores of healthy and obese participants

		Healthy Weight Individuals (BMI=18.50-24.99 kg/m ²)		Obese Individuals (BMI ≥30 kg/m ²)		p
		X±Ss	M(Q1-Q3)	X±Ss	M(Q1-Q3)	
Total score of ASHN		76.22±10.18	77.00 (70.00-84.00)	65.07±12.90	60.00 (55.00-75.00)	<0.001*
ASHN Subdimensions	KB	19.35±3.92	19.50 (18.00-23.00)	14.38±4.79	12.00 (10.00-19.00)	<0.001*
	OB	18.11±3.51	18.00 (16.00-21.00)	15.84±3.41	15.00 (13.00-18.00)	<0.001*
	BHB	21.06±2.85	21.00 (20.00-24.00)	19.92±2.73	20.00 (19.00-21.00)	<0.001*
	BYD	17.70±4.38	17.00 (15.00-21.00)	14.91±6.12	13.00 (12.00-17.25)	<0.001*
Total score of NKS		121.45±14.04	119.00 (111.00-131.00)	116.48±11.40	113.00 (111.00-122.00)	<0.001*
Total score of PFS		40.85±10.5	41.00 (34.00-48.00)	44.77±6.82	45.00 (42.00-47.00)	<0.001*
PFS Subdimensions	BU	11.46±4.04	11.00 (9.00-14.25)	12.98±2.77	13.00 (12.00-14.00)	<0.001*
	BM	12.55±3.58	13.00 (10.00-15.00)	14.60±2.59	15.00 (13.00-16.00)	<0.001*
	BTB	16.83±4.17	17.00 (14.75-20.00)	17.18±2.84	17.00 (16.75-18.00)	0.424

* P<0.05, BHB: Knowledge about Nutrition, BYD: Emotions Related to Nutrition, OB: Positive Nutrition, KB: Poor Nutrition, BU: Food Accessibility, BM: Food Availability, BTB: Food Tasting

Table 3 presents the mean ($\bar{x}$) and standard deviation (SD) values of PFS, ASHN, and their

subdimensions based on participants' hedonic hunger and BMI. The total ASHN score for healthy individuals with hedonic hunger was found to be 74.3±9.9, with subdimension scores of 18.6±3.9 for Poor Nutrition (KB), 17.9±3.5 for Positive Nutrition (OB), 21.03±2.8 for Knowledge About Nutrition (BHB), and 16.7±3.8 for Emotions Related to Nutrition (BYD). For healthy individuals without hedonic hunger, the total ASHN score was 83.7±9.9, with subdimension scores of 22.1±2.4 for KB, 18.7±3.1 for OB, 21.1±2.8 for BHB, and 21.6±4.05 for BYD. Among obese individuals with hedonic hunger, the total ASHN score was 63.8±11.9, with 13.9±4.5 for KB, 15.5±3.1 for OB, 19.8±2.6 for BHB, and 14.4±5.9 for BYD. For obese individuals without hedonic hunger, the total ASHN score was 85.8±11.5, with subdimension scores of 21.8±2.4 for KB, 20.3±4.0 for OB, 21.09±4.0 for BHB, and 22.5±4.03 for BYD. The total NKS score was

120.5±13.8 for healthy individuals with hedonic hunger, 125.3±14.2 for those without hedonic hunger, 116±11.2 for obese individuals with hedonic hunger, and 123.3±12.6 for obese individuals without hedonic hunger.

A significant relationship was found between ASHN total score, Poor Nutrition, and Emotions Related to Nutrition subdimensions in healthy individuals based on hedonic hunger ($p < 0.01$), whereas no significant relationship was observed for NKS total scores ($p > 0.05$). Among healthy individuals, participants with hedonic hunger had lower ASHN total scores, as well as lower Poor Nutrition and Emotions Related to Nutrition subdimension scores compared to those without hedonic hunger. In obese individuals, a significant relationship was found between ASHN total score, Poor Nutrition, Positive Nutrition, and Emotions Related to Nutrition subdimensions based on hedonic hunger ($p < 0.001$). Additionally, a significant relationship was observed between the Knowledge About Nutrition subdimension and NKS total score in obese individuals with hedonic hunger ($p < 0.05$).

Table 3. Comparison of NKS, ASHN Total score, and subdimensions based on participants' hedonic hunger and BMI

		Healthy Weight (BMI=18.50-24.99 kg/m ²)					Obese Individuals (BMI ≥30 kg/ m ²)				
		Participants with Hedonic Hunger		Participants without Hedonic Hunger			Participants with Hedonic Hunger		Participants without Hedonic Hunger		
		M (Q1- Q3)	X±Ss	M (Q1- Q3)	X±Ss	p	M (Q1- Q3)	X±Ss	M (Q1- Q3)	X±Ss	p
ASHN		74 (67-82)	74.3±9.9	84 (78-89)	83.7±9.9	<0.001*	59 (55-72)	63.8±11.9	91 (79-92)	85.8±11.5	<0.001*
ASHN Subtotal	KB	19 (16-22)	18.6±3.9	23 (20-24)	22.1±2.4	<0.001*	12 (10-18)	13.9±4.5	22 (20-24)	21.8±2.4	<0.001*
	OB	18 (16-22)	17.9± 3.5	19 (17-21)	18.7±3.1	0.1	15 (13-17)	15.5±3.1	21 (18-24)	20.3±4.0	<0.001*
	BHB	21 (20-24)	21.03±2.8	21 (20-24)	21.1±2.8	0.5	20 (19-21)	19.8±2.6	22 (20-25)	21.09±4.1	0.026
	BYD	16 (14-19)	16.7±3.8	22 (19-25)	21.6±4.05	<0.001*	13 (11-16)	14.4±5.9	23 (20-25)	22.5±4.03	<0.001*
Nutrition Knowledge Scale		118 (111-129)	120.5±13.8	121 (115-139)	125.3±14.2	0.076	112 (110-119)	116±11.2	129 (114-129)	123.3±12.6	0.008

* $p < 0.05$ $M(Q1-Q3)$: Median (25th quartile -75th quartile), $x \pm SD$: Mean±Standard deviation, Emotion Towards Nutrition(BYD) Knowledge about Nutrition (BHB), Emotion Towards Nutrition (BYD), Positive Nutrition (OB), Malnutrition (KB)

In Table 4, a moderate positive correlation ($r=0.675$) was found between the ASHN Total Score and the NKS Total Score, and this correlation was statistically significant ($p=0.000$).

Additionally, a high positive correlation ($r=0.73$) was observed between the ASHN Total Score and the PFS Total Score, and this correlation was also significant ($p=0.000$). A very strong positive correlation ($r=0.823$) was determined between the ASHN Total Score and the PFS Subdimensions (BU), and this correlation was also statistically significant ($p=0.000$).

Finally, a perfect linear relationship ($r=1$) was found between the PFS Subdimensions (BU) and the PFS Subdimensions (BM), indicating that these two dimensions fully support each other. A strong positive correlation ($r=0.693$) was found between the PFS Subdimensions (BU) and the PFS Subdimensions (BTB), and this correlation was statistically significant ($p=0.000$). Additionally, a strong positive correlation ($r=0.377$) was observed between the PFS Subdimensions (BM) and the PFS Subdimensions (BTB), and this correlation was also statistically significant ($p<0.0001$).

Table 4. Correlation table

		NKS Total Score		PFS Total Score		PFS Sub-Dimensions					
		r	p	r	p	BU		BM		BTB	
						r	p	r	p	r	p
ASHN Total Score		0.675**	-	0.73	-	0.823**	<0.0001	0.86	<0.0001	0.452	<0.0001
ASHN Sub Dimensions	BHB	-	<0.0001	0.23	0.001	0.35	<0.0001	0.377**	<0.0001	-	<0.0001
	OB	-	0.730	-	0.001	-	0.312	-0.146	0.041	0.102	0.153
	KB	0.091	0.200	-	0.001	-	<0.0001	-0.066	0.358	0.100	0.160
	BYD	0.006	0.929	-	0.001	-0.14	0.041	-0.171*	0.016	0.187**	0.008
NKS Total Score		0.347**	0.001	0.535	0.001	0.477**	<0.0001	0.486*	<0.0001	0.675**	<0.0001
PFS Total Score		0.347**	<0.0001	0.513*	0.001	0.550**	<0.0001*	0.239	0.001	0.735**	<0.0001
PFS Sub-Dimensions	BU	0.535**	0.001	0.513**	0.000	1	<0.0001*	0.693**	0.001	0.353**	<0.0001
	BM	0.477	0.001	0.550**	0.000	0.693**	<0.0001*	1.000	<0.0001	0.377**	<0.0001
	BTB	0.4	0.001	0.239**	0.001	-	<0.000	0.452**	0.001	1.000	<0.0001

* $P<0.05$, r : correlation coefficient, BHB: Knowledge about Nutrition, BYD: Emotions towards Nutrition Knowledge about Nutrition (BHB), Emotions towards Nutrition (BYD), Positive Nutrition (OB), Malnutrition (KB), Food Accessibility (BU), Food Availability (BM), Food Tasting (BTB)

Discussion

In this study, when the attitudes toward healthy eating, nutrition knowledge levels, and hedonic hunger status of healthy and obese individuals were compared, significant differences were observed between the groups (Table 2). The finding that obese individuals had lower total scores on the ASHN compared to healthy individuals suggests that attitudes toward healthy eating may be weaker in obese individuals. The fact that this pattern was also evident across the ASHN subdimensions (knowledge, emotion, positive eating, and unhealthy eating) indicates that healthy eating attitudes in obese individuals may be concurrently affected at cognitive, emotional, and behavioral levels. Indeed, the literature reports that eating behaviors in obese individuals are not solely driven by physiological hunger but represent a multidimensional structure influenced by reward sensitivity, uncontrolled eating, and environmental factors^{16,17}.

Regarding the relationship between hedonic hunger and obesity, hedonic hunger has been associated with an increased desire for energy-dense, high-calorie foods and higher energy intake, which may contribute to obesity risk^{17,18}. Increased reward sensitivity to food can trigger eating behavior independently of physiological hunger, a mechanism that particularly reinforces patterns of uncontrolled eating in obese individuals. Consistently, studies using the PFS have shown that greater sensitivity to food cues is associated with uncontrolled eating behaviors^{16,19}. In the present study, obese individuals had higher PFS scores than healthy individuals, suggesting that hedonic hunger may be more pronounced in the obese group (Table 2).

In our study, obese individuals had lower total NKS scores than healthy individuals (Table 2). This finding suggests that nutrition knowledge may be more limited among obese individuals; however, it should be interpreted in light of evidence indicating that knowledge does not always translate into healthy eating behavior. When hedonic hunger is prominent, individuals may have difficulty applying their nutrition knowledge to their dietary practices^{16,20}.

Considering Tables 3 and 4 together, obese individuals with hedonic hunger appear to have markedly lower levels of both nutrition knowledge and healthy eating attitudes. In this group, lower ASHN total scores and reduced scores in the relevant subdimensions (KB, OB, and BYD) suggest that hedonic hunger may be associated not only with poorer eating-related patterns but also with a less favorable overall profile of healthy eating attitudes. Consistent with the literature, hedonic hunger has been reported to be significantly associated with obesity status independent of BMI and may particularly compromise the regulation of eating behavior among individuals with obesity³.

The lower nutrition knowledge observed in the same group provides additional support for the possibility that hedonic hunger may hinder the translation of nutrition knowledge into healthier eating practices among individuals with obesity. Indeed, the correlations presented in Table 4 indicate significant relationships between the PFS and its subdimensions and ASHN, while the ASHN total score was positively associated with the NKS. These findings support the notion that hedonic hunger reduces healthy eating attitudes by increasing reward-driven eating behaviors. Furthermore, previous research has shown that hedonic hunger is strongly associated with compulsive eating, intense food cravings, and food addiction, with these mechanisms being more pronounced in obese individuals¹⁶. Additionally, hedonic hunger has been linked to lower self-esteem and weight-related self-stigmatization in obese individuals, psychosocial processes that may further reduce motivation for healthy eating behaviors¹⁹. Evidence from structured weight management programs demonstrates that improvements in weight control behaviors are associated with reductions in hedonic hunger, highlighting its critical role in obesity management¹⁷. Similarly, studies in adolescent populations have shown that hedonic hunger negatively affects obesity-related quality of life outcomes²¹.

Conclusion

This study compared hedonic hunger, attitudes toward healthy eating, and nutrition knowledge between obese and healthy individuals. The findings demonstrated that obese individuals had significantly lower attitudes toward healthy eating and lower nutrition knowledge levels than healthy individuals. Hedonic hunger levels were higher in obese individuals and were negatively associated with all subdimensions of healthy eating attitudes, including poor nutrition, positive nutrition, emotions related to nutrition, and nutrition knowledge. In healthy individuals, hedonic hunger was primarily associated with poor nutrition and emotions related to nutrition, while no significant association was observed with nutrition knowledge. Collectively, these results suggest that nutrition knowledge alone may be insufficient to promote healthy eating behaviors in individuals with obesity and that hedonic hunger may constitute a major barrier in translating knowledge into practice.

Accordingly, obesity prevention and management strategies should extend beyond traditional nutrition education and include targeted approaches to regulate hedonic hunger and reward-driven eating. In clinical and community settings, routine screening for hedonic hunger (e.g., using the PFS) may help identify individuals who are more susceptible to food cues, and integrating cue-management strategies, cognitive-behavioral techniques, and mindfulness-based components into counseling may improve adherence to healthy eating patterns. At the policy level, improving access to healthy foods and reducing exposure to energy-dense, highly palatable foods-through measures such as clear front-of-pack labeling, healthier food environments, and restrictions on marketing, particularly in digital settings—may support healthier choices at the population level. Finally, longitudinal and intervention studies are warranted to clarify the directionality of these associations and to evaluate the effectiveness of hedonic hunger-focused interventions in obesity management.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, due to its cross-sectional design, causal relationships cannot be established, and the results are not intended to be generalized to the overall population. The sample was drawn from a specific region and consisted predominantly of women and individuals with a university-level education, which may further limit generalizability.

Second, the study relied on self-reported data, including height and body weight, which may be subject to reporting bias and measurement inaccuracies. However, this approach is commonly used in large-scale and online-based observational studies.

Third, although the measurement tools used in the study have demonstrated acceptable validity and reliability, cultural factors may have influenced the assessment of certain attitudes and behaviors. In addition, detailed information regarding participants'

underlying health conditions could not be fully obtained, which may have limited the evaluation of potential health-related factors contributing to obesity.

Finally, the lack of longitudinal follow-up prevented the assessment of changes in hedonic hunger, eating attitudes, and nutrition knowledge over time. Future studies incorporating more diverse samples, objective anthropometric measurements, and longitudinal designs are recommended to further validate and extend the present findings.

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The Relationship between Pandemic-Related Anxiety, Eating Behaviors, and Life Satisfaction

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Abstract

Aim: The objective of the study was to examine the correlation between coronavirus anxiety, healthy eating, eating attitudes, and life satisfaction among adults.

Method: The research was carried out using an online survey with 408 participants aged 18– 65 years (mean age: 34.43±9.92). It was utilized Coronavirus Anxiety Scale (CAS), Attitude Scale for Healthy Nutrition(ASHN), the Three-Factor Eating Questionnaire (TFEQ-R21), and Satisfaction with Life Scale in Adults (SWLS-A).

Results: The total scores of the CAS, ASHN, TFEQ-R21, and SWLS-A scales were found to be statistically significantly higher in women compared to men ($p<0.05$). When a cut off score of ≥ 9 was applied for the CAS, a statistically significant positive correlation was observed between the CAS and the total score of the TFEQ-R21, as well as its subscales Cognitive Restraint (CR) and Emotional Eating (EE) ($p<0.05$). In addition, weak positive correlations were detected between ASHN and SWLS-A and between CAS and TFEQ-R21 ($p<0.05$). A weak negative correlation was found between TFEQ-R21 and SWLS-A ($p<0.05$).

Conclusion: The results suggest that pandemic-related anxiety was higher particularly among women and that higher anxiety levels were linked to increased cognitive restraint and emotional eating behaviors. Moreover, healthy eating attitudes were positively related to life satisfaction, whereas problematic eating behaviors were negatively associated.

Keywords: Pandemic-related anxiety, healthy eating, eating attitudes, life satisfaction.

Pandemiye Bağlı Anksiyetenin Beslenme Davranışları ve Yaşam Memnuniyeti ile İlişkisi

Öz

Amaç: Bu çalışmada yetişkin bireylerde koronavirüs anksiyetesinin sağlıklı beslenme, yeme tutumu ve yaşam doyumu ile ilişkisinin araştırılması amaçlanmaktadır.

Yöntem: Bu çalışma 18-65 yaş arasında, yaş ortalaması 34,43±9,92 yıl olan 408 katılımcı ile çevrimiçi anket yöntemi kullanılarak gerçekleştirilmiştir. Çalışmada, Koronavirüs Anksiyete Ölçeği (CAS), Sağlıklı

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ETHICAL STATEMENT: This descriptive cross-sectional study was carried out from May to June 2021 with individuals aged 18 to 65 who voluntarily agreed to participate. Ethical approval for the research was granted by the Ethics Committee of Istanbul Okan University on April 14, 2021.

Beslenmeye İlişkin Tutum Ölçeği (SBİTÖ), Üç Faktörlü Yeme Ölçeği (TFEQ-R21), Yetişkinlerde Yaşam Doyum Ölçeği (YYDÖ) kullanılmıştır.

Bulgular: CAS, SBİTÖ, TFEQ-R21, YYDÖ ölçeklerinin tamamının toplam puanları kadınlarda erkeklerden istatistiksel olarak daha yüksek bulunmuştur ($p < 0,05$). CAS ≥ 9 kesim puan ile TFEQ-R21 puanı ve onun alt ölçekleri olan bilişsel kısıtlama (BK), duygusal yeme (DY) puanları arasındaki istatistiksel olarak pozitif yönlü anlamlı ilişki bulunmuştur ($p < 0,05$). Ayrıca hem SBİTÖ ile YYDÖ arasında hem de CAS ile TFEQ-R21 arasında zayıf düzeyde pozitif korelasyon saptanmıştır ($p < 0,05$). TFEQ-R21 ile YYDÖ arasında zayıf düzeyde negatif korelasyon tespit edilmiştir ($p < 0,05$).

Sonuç: Bu çalışmanın sonuçları, pandemi dönemine bağlı anksiyetenin özellikle kadınlarda daha yüksek olduğunu ve yüksek anksiyete düzeyine sahip bireylerde bilişsel kısıtlama ile duygusal yeme davranışlarının arttığını göstermektedir. Ayrıca sağlıklı beslenme tutumlarının yaşam memnuniyetiyle pozitif, sorunlu yeme davranışlarının ise negatif yönde ilişkili olduğu saptanmıştır.

Anahtar Sözcükler: Pandemiyle ilgili anksiyete, sağlıklı yeme, yeme tutumu, yaşam doyumu.

Introduction

During the Covid-19 period, many countries took radical measures¹. In such a situation, individuals are likely to experience fear of illness, death, helplessness, and lack of access to help². While being reasonably cautious during a pandemic can help protect individuals' health, excessive negative thoughts related to the infection can have adverse effects on well-being³.

Healthy nutrition is the intake of various nutrients required by individuals based on their age, gender, body weight, physical activity, and genetic factors. According to the Turkey Nutrition Guide (TÜBER), proper nutrition not only ensures the continuation of life but is also essential for growth, development, and productivity at all ages⁴. Healthy eating is a significant factor in preventing deaths and many chronic diseases⁵.

Nutrition is indispensable for sustaining life, and various biological, psychological, and environmental factors influence individuals' eating attitudes. As a result of these influences, behaviors such as overeating, inadequate nutrition, or eating disorders may occasionally occur^{6,7}.

Emotional eating behavior is linked to factors such as elevated dietary restraint and reduced interoceptive awareness, emotional dysregulation, and stress⁸. Emotional eating is associated with symptoms of depression, and mindfulness-based approaches have been reported to be beneficial for weight management⁸⁻¹².

Emotional eating is characterized by the inclination to consume food in response to emotional states, independent of hunger or scheduled mealtimes¹³. Cognitive restraint refers to restrictive behavior such as reducing food portions and maintaining weight control. Uncontrolled eating, on the other hand, is evaluated as excessive in reaction to negative emotions or the appeal of food^{10,11}.

Life satisfaction is the level of contentment that emerges from comparing what individuals want with what they have^{14,15}. There are many factors that affect life satisfaction. Some of these include physical well-being, social attributes to life, daily happiness, and harmony in achieving personal goals¹⁶. Although the psychological impact of the COVID-19 pandemic has been widely studied, limited research has examined its relationship with healthy eating attitudes, eating behaviors, and life satisfaction simultaneously. This study addresses this gap by exploring the associations between COVID-19–related anxiety and eating behaviors, as well as overall life satisfaction, in adults. The findings contribute to a more comprehensive understanding of the behavioral consequences of pandemic-related anxiety.

Material and Methods

Using a sampling method for an unknown population size, the minimum sample size was determined to be 377, based on a 95% confidence interval. Ultimately, 408 participants were included in the study.

The study was conducted using an online survey method administered via Google Forms, and participants were recruited using a convenience sampling method. The survey is composed of five sections. The first part of the questionnaire, which served as the instrument for data collection, consisted of questions associated with sociodemographic factors (age, educational attainment, employment status, chronic diseases, medication use, smoking, and alcohol consumption) and anthropometric measures [body mass index (BMI), height, body weight]¹⁷. BMI was calculated by the researcher using the self-reported body weight and height values provided by the participants, based on the weight/height² formula. In this study, no specific cut-off values were established or applied for BMI. The remaining parts of the survey were composed of the Coronavirus Anxiety Scale (CAS), Attitude Scale for Healthy Nutrition (ASHN), Three-Factor Eating Questionnaire (TFEQ-R21), and Satisfaction with Life Scale in Adults (SWLS-A).

Coronavirus Anxiety Scale (CAS): The Coronavirus Anxiety Scale (CAS) is a 5-item Likert-type scale developed by Lee et al. (2020)¹⁸ and adapted to Turkish by Evren et al. (2020)¹. Each item is rated from 0 (never) to 4 (almost daily), yielding a total score ranging from 0 to 20, with higher scores indicating greater anxiety related to COVID-19^{1,18}. The Turkish adaptation was conducted with 1023 native Turkish-speaking participants recruited online and demonstrated satisfactory internal consistency (Cronbach's alpha = 0.80), supporting its reliability and validity¹. In the original study, the CAS effectively differentiates individuals with dysfunctional anxiety from those without, using an optimized cutoff score of 9 (90% sensitivity and 85% specificity), and has been shown to be a valid and effective tool for both clinical research and practice¹⁸. Since no cutoff score has been established for the Turkish adaptation, the cutoff score of 9 from the original study was applied in the present research to evaluate participants' anxiety levels^{1,18}.

Attitude Scale for Healthy Nutrition (ASHN): Created by Tekkurşun Demir and Cicioğlu, (2019) the Attitude Scale for Healthy Nutrition (ASHN) is a 21-item, five-point

Likert-type scale formulated to evaluate individuals' perspectives on healthy eating. The instrument assesses four dimensions: Nutritional Knowledge (NK), Emotions Toward Nutrition (ETN), Positive Nutrition (PN), and Poor Nutrition (PN). The authors performed psychometric analyses to establish the scale's validity and reliability. The score range spans from a minimum of 21 to a maximum of 105, with interpretations as follows: 21 indicates a very low level, 23–42 reflects a low level, 43–63 denotes a moderate level, 64–84 signifies a high level, and 85–105 represents an optimally high level of healthy nutrition attitudes¹⁹.

Three-Factor Eating Questionnaire (TFEQ-R21): Created by Karakuş, Yıldırım, and Büyüköztürk (2016)⁷. This instrument evaluates eating behavior through three dimensions: Cognitive Restraint (CR), Uncontrolled Eating (UE), and Emotional Eating (EE). The Turkish version uses a four-option Likert-type scale format for all items. The subscale scores for the UE vary from 9 to 36, while the CR and EE subscales range from 6 to 24. After score transformation, TFEQ-R21 evaluates each eating behavior on a 0–100 scale. Elevated scores are associated with a greater tendency for that specific eating behavior⁷.

Satisfaction with Life Scale in Adults (SWLS-A): Created by Kaba, Erol, and Güç (2018). Satisfaction with Life Scale in Adults (SWLS-A) has been validated for measuring life satisfaction in adults. The scale consists of 21 items, one of which is reverse-coded. The scale is based on a five-point Likert-type format, yielding total scores between 21 and 105, where higher scores reflect a more positive perception of life. The assessment tool comprises five factors: The first factor was defined as general life satisfaction, the second factor as relationship satisfaction, the third factor as self-satisfaction, the fourth factor as social environment satisfaction, and the fifth factor as job satisfaction¹⁵.

Ethical Statement

This descriptive cross-sectional study was carried out from May to June 2021 with individuals aged 18 to 65 who voluntarily agreed to participate. Ethical approval for the research was granted by the Ethics Committee of Istanbul Okan University on April 14, 2021.

Statistical Analysis

The data collected in the study were analyzed using SPSS, version 25.0. Continuous variables derived from the questionnaires were presented as mean (M), standard deviation (SD), and minimum–maximum (min–max) values. Categorical variables were summarized using frequencies and percentages. The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Variables were analyzed using Independent Samples *t*-tests if normally distributed and Mann–Whitney U tests if not, as indicated in Tables 2 and 3. To investigate the associations between continuous variables, Spearman's rank-order correlation analysis was conducted. Results were considered statistically at $p < 0.05$. Regarding the internal consistency of the scales, Cronbach's alpha coefficients were calculated as follows: 0.779 for the 21-item ASHN

scale, 0.842 for the 5-item CAS scale, 0.898 for the 21-item TFEQ-R21, and 0.863 for the 21-item SWLS-A scale.

Results

Table 1. Anthropometric measurements and demographic data of the participants

		n	%	Mean ± SD	Min-Max
Gender	Female	267	65.44		
	Male	141	34.56		
Age (years)				34.43 ± 9.92	18 - 65
Weight (kg)				70.54 ± 15.10	45 - 130
Height (cm)				167.75 ± 8.52	150 - 197
BMI (kg/m²)				24.95 ± 4.34	16.98 - 47.75
	Primary school	17	4.17		
Educational attainment	High school	48	11.76		
	University	233	57.11		
	Master's/PhD	110	26.96		
Employment Status	Yes	307	75.25		
	No	101	24.75		
Diagnosed Disease	Yes	123	30.15		
	No	285	69.85		
Regular Medication	Yes	90	22.06		
Use	No	318	77.94		
Smoking	Yes	108	26.47		
	No	300	73.53		
Alcohol Use	Yes	93	22.79		
	No	315	77.21		

Data are presented as mean ± standard deviation (SD) and minimum–maximum (min–max). BMI: Body Mass Index S.D: Standard Deviation

The study comprised 408 participants, of whom 65.44% (n=267) were female and 34.56% (n=141) were male. The mean age was 34.43±9.92 years, mean body weight 70.54±15.10 kg, mean height 167.75 ± 8.52 cm, and mean Body Mass Index (BMI) 24.95±4.34. Regarding educational status, 4.17% (n=17) had completed primary school, 11.76% (n=48) high school, 57.11% (n=233) held a university degree, and 26.96% (n=110) held a graduate degree (master's or PhD). Participants were classified by employment status, with 75.25% (n=307) employed and 24.75% (n=101) not employed. Regarding health, 30.15% (n=123) reported having a diagnosed chronic illness, whereas 69.85% (n=285) reported no such condition. Additionally, 22.06% (n=90) reported regular use of medication, while 77.94% (n=318) did not. Lifestyle habits included 26.47% (n=108) smokers and 73.53% (n=300) non-smokers, while 22.79% (n=93) reported alcohol consumption and 77.21% (n = 315) reported none.

Table 2. Relationship between participants' anthropometric measurements and demographic characteristics and ASHN, CAS, TFEQ-R21, and SWLS-A Scores

	ASHN		CAS		TFEQ-R21		SWLS	
	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max
Female	80.97 $\pm$ 9.05	41 - 99	2.17 $\pm$ 3.13	0 - 17	44.74 $\pm$ 18.94	4.76-96.83	80.22 $\pm$ 9.20	50-103
Male	76.53 $\pm$ 9.68	51 - 98	1.39 $\pm$ 2.70	0 - 16	38.89 $\pm$ 16.79	4.76-98.41	77.91 $\pm$ 9.15	51-104
p	< 0.001¹		< 0.001¹		0.004¹		0.016²	
Employed	79.22 $\pm$ 9.55	41 - 99	1.96 $\pm$ 3.10	0 - 17	42.86 $\pm$ 17.94	4.76-98.41	79.30 $\pm$ 9.21	50-104
Unemployed	80.09 $\pm$ 9.36	51 - 95	1.71 $\pm$ 2.70	0 - 13	42.29 $\pm$ 19.86	4.76-96.83	79.79 $\pm$ 9.36	55-99
p	0.236 ¹		0.949 ¹		0.744 ¹		0.643 ²	
Has a diagnosed illness	80.46 $\pm$ 9.43	51 - 99	2.20 $\pm$ 3.32	0 - 16	45.55 $\pm$ 17.49	4.76-85.71	79.11 $\pm$ 8.99	50-104
Does not have a diagnosed illness	78.99 $\pm$ 9.51	41 - 98	1.77 $\pm$ 2.86	0 - 17	41.49 $\pm$ 18.70	4.76-98.41	79.55 $\pm$ 9.35	51-103
p	0.227 ¹		0.246 ¹		0.039¹		0.659 ²	
Takes medication regularly	81.17 $\pm$ 9.69	51-99	2.52 $\pm$ 3.86	0 - 16	46.17 $\pm$ 18.56	4.76-85.71	79.13 $\pm$ 9.44	50-103
Does not take medication regularly	78.94 $\pm$ 9.40	41-99	1.72 $\pm$ 2.70	0 - 17	41.74 $\pm$ 18.29	4.76-98.41	79.50 $\pm$ 9.19	51-104
p	0.093 ¹		0.433 ¹		0.030¹		0.738 ²	
Smokes	76.18 $\pm$ 9.75	41-97	1.85 $\pm$ 2.91	0 - 16	40.09 $\pm$ 19.57	4.76-80.95	78.23 $\pm$ 9.38	55-104
Does not smoke	80.61 $\pm$ 9.14	51-99	1.92 $\pm$ 3.05	0 - 17	43.66 $\pm$ 17.92	4.76-98.41	79.85 $\pm$ 9.16	50-103
p	< 0.001¹		0.963 ¹		0.101 ¹		0.119 ²	
Uses alcohol	77.05 $\pm$ 10.23	41 - 97	2.16 $\pm$ 3.50	0 - 16	41.95 $\pm$ 20.56	4.76-98.41	77.59 $\pm$ 9.61	50-98
Does not use alcohol	80.14 $\pm$ 9.17	51 - 99	1.82 $\pm$ 2.85	0 - 17	42.94 $\pm$ 17.76	4.76-96.83	79.96 $\pm$ 9.07	55-104
p	0.005¹		0.750 ¹		0.869 ¹		0.029²	
Age (years)	-0.083		-0.006		-0.213*		0.078	
Weight (kg)	-0.152*		-0.055		0.154*		-0.071	
Height (cm)	-0.143*		-0.061		-0.071		-0.059	
BMI (kg/m²)	-0.114*		-0.047		0.234*		-0.047	
Education Level	0.210*		0.015		0.083		-0.016	

Data are presented as mean $\pm$ standard deviation (SD) and minimum–maximum (Min–Max).

¹Mann–Whitney U Test (non-parametric), ²Independent Samples T-test (parametric)

BMI: Body Mass Index, CAS: Coronavirus Anxiety Scale, ASHN: Attitude Scale for Healthy Nutrition

TFEQ-R21: Three-Factor Eating Questionnaire–Revised 21, SWLS: Satisfaction with Life Scale (for Adults)

Female participants had higher mean scores than male participants for ASHN, CAS, TFEQ-R21, and SWLS, with statistically significant differences ($p < 0.05$). Participants with a diagnosed illness had higher mean TFEQ-R21 total scores than those without a diagnosed illness ($p < 0.05$), while no significant differences were observed for ASHN, CAS, and SWLS scores ($p > 0.05$). Participants reporting regular medication use had higher TFEQ-R21 scores than those not using medication regularly ($p < 0.05$). Alcohol users had lower ASHN and SWLS scores compared to non-users ($p < 0.05$), whereas no significant differences were found for CAS and TFEQ-R21 scores ($p > 0.05$). Spearman correlation analysis indicated a weak negative correlation between Body Mass Index (BMI) and ASHN scores ($p < 0.05$) and a weak positive correlation between BMI and TFEQ-R21 scores ($p < 0.05$).

Table 3. Relationship between CAS cut-off score (≥ 9) and total scores and subscales of ASHN, TFEQ-R21, and SWLS

	CAS < 9		CAS ≥ 9		p ¹
	Mean $\pm$ SD	Min-Max	Mean $\pm$ SD	Min-Max	
Knowledge About Nutrition (KAN)	21.39 $\pm$ 3.54	5 - 25	22.11 $\pm$ 2.47	18 - 25	0.654
Attitude Toward Nutrition (ATN)	19.56 $\pm$ 2.52	14 - 28	19.67 $\pm$ 2.30	16 - 25	0.912
Positive Eating Habits (PEH)	18.78 $\pm$ 3.82	5 - 25	18.44 $\pm$ 4.22	13 - 25	0.465
Poor Eating Habits (PoEH)	19.73 $\pm$ 3.79	5 - 25	18.78 $\pm$ 4.91	8 - 25	0.589
ASHN	79.45 $\pm$ 9.52	41 - 99	79 $\pm$ 9.34	66 - 94	0.737
<i>Cognitive Restraint (CR)</i>	41.18 $\pm$ 16.36	0 - 94.44	50.93 $\pm$ 20.72	11.11 - 100	0.024
Emotional Eating (EE)	46.47 $\pm$ 19.51	0 - 100	55.25 $\pm$ 16.33	22.22 - 94.44	0.045
Uncontrolled Eating (UE)	40.32 $\pm$ 21.32	0 - 96.3	48.77 $\pm$ 23.54	7.41 - 100	0.129
TFEQ-R21	42.32 $\pm$ 18.28	4.76 - 96.83	51.23 $\pm$ 19.76	12.7 - 98.41	0.040
General Life Satisfaction	20.41 $\pm$ 3.45	10 - 30	19.78 $\pm$ 4.41	10 - 30	0.298
<i>Relationship Satisfaction</i>	20.63 $\pm$ 3.10	8 - 25	20.67 $\pm$ 3.93	12 - 25	0.762
Self-Satisfaction	16.17 $\pm$ 2.40	9 - 20	16.22 $\pm$ 3.12	9 - 20	0.768
Social Environment Satisfaction	9.85 $\pm$ 2.70	3 - 15	10.83 $\pm$ 2.79	3 - 15	0.063
<i>Job Satisfaction</i>	12.36 $\pm$ 2.51	3 - 15	11.94 $\pm$ 3.04	6 - 15	0.721
SWLS	79.42 $\pm$ 9.14	51 - 104	79.44 $\pm$ 11.42	50 - 96	0.991 ²

¹Mann–Whitney U Test (non-parametric), ²Independent Samples T-test (parametric),

CAS:Coronavirus Anxiety Scale. ASHN: Attitude Scale for Healthy Nutrition

TFEQ-R21: Three-Factor Eating Questionnaire–Revised 21, SWLS: Satisfaction with Life Scale (for Adults)

Using a CAS score threshold of ≥ 9 , no statistically significant differences were observed for ASHN subscales, including Knowledge About Nutrition (KAN), Attitude Toward Nutrition (ATN), Positive Eating Habits (PEH), Poor Eating Habits (PoEH), or the total ASHN score ($p > 0.05$). Statistically significant differences were observed in Cognitive

Restraint (CR) and Emotional Eating (EE) scores ($p < 0.05$), with participants in higher CAS categories exhibiting higher mean CR and EE scores.

Table 4. Correlations among total scores of ASHN, CAS, TFEQ-R21, and SWLS

	ASHN	CAS	TFEQ-R21	SWLS
ASHN	1			
CAS	0.002	1		
TFEQ-R21	-0.012	0.185*	1	
SWLS	0.396*	-0.062	-0.154*	1

Spearman Correlation Test; $p < 0.05$ CAS: Coronavirus Anxiety Scale

CAS: Coronavirus Anxiety Scale. ASHN: Attitude Scale for Healthy Nutrition

TFEQ-R21: Three-Factor Eating Questionnaire–Revised 21, SWLS: Satisfaction with Life Scale (for Adults)

Spearman correlation analysis indicated a weak positive correlation between ASHN and SWLS scores ($p < 0.05$), while no significant correlations were observed between ASHN and CAS or TFEQ-R21 scores ($p > 0.05$). A weak positive correlation was found between CAS and TFEQ-R21 scores ($p < 0.05$), whereas no significant correlation was identified between CAS and SWLS scores ($p > 0.05$). Additionally, a weak negative correlation was observed between TFEQ-R21 and SWLS scores ($p < 0.05$).

Discussion

This study investigated the relationship between pandemic-induced anxiety and healthy eating attitudes, eating behaviors, and life satisfaction. A total of 408 participants were included, comprising 65.44% females and 34.56% males, with a mean age of 34.43 years ($SD = 9.92$) and a mean BMI of 24.95 ($SD = 4.34$), a value approaching the threshold for overweight²⁰. The gender distribution, age profile, and BMI observed in the present study are consistent with findings from other cross-sectional studies conducted during the pandemic. For instance, a large-scale online study reported that 69.6% of participants were female, with a mean BMI of 24.4 ± 4.7 (kg/m^2)²¹. Similarly, a web-based study conducted in Turkey indicated that 64.2% of participants were female, with a mean age of 33.05 years ($SD = 12.98$) and a mean BMI of 24.18 ± 3.97 (kg/m^2)²². The predominance of women in the sample may reflect greater interest in health and nutrition topics, higher health awareness, and increased willingness to participate in online surveys compared to men. The similarity in BMI and age profiles provides an important context for assessing the impact of weight status and lifestyle changes in the adult population during the pandemic.

In a pandemic-related study conducted in China, younger adults were reported to exhibit different levels of anxiety and depressive symptoms compared to older adults²³. However, the findings of the present study suggest limited concordance with these results. This discrepancy may be explained by differences in sample characteristics, cultural context, measurement instruments, and variations in pandemic conditions at the time of data collection.

Several studies have reported statistically significant differences in CAS scores between genders, with female participants exhibiting higher anxiety levels than males^{24,25}. Consistent with these findings, the present study found that females had significantly higher mean CAS scores compared to males. These results suggest that female gender may be associated with increased susceptibility to pandemic-related anxiety. This pattern could be influenced by a range of factors, including greater health-related concerns, increased caregiving responsibilities, and heightened emotional responsiveness. Such findings highlight the need to consider gender-specific differences when designing mental health interventions during public health crises.

The recurrence of fear, ambiguity, and stigma during biological crises can substantially hinder the effectiveness of public health responses, particularly in terms of providing adequate medical and mental health care²⁶. Emotional reactions in such contexts are often initially expressed as heightened psychosocial distress and uncertainty, which may be accompanied by maladaptive behaviors such as increased tobacco or alcohol use and social withdrawal²⁷. In the present study, no significant associations were observed between CAS scores and tobacco or alcohol use. In contrast, significant relationships were found between ASHN scores and both tobacco and alcohol consumption. While previous studies have reported a positive relationship between tobacco use and anxiety symptoms²⁸⁻²⁹, our findings did not support this association, suggesting that the relationship between substance use and anxiety may vary depending on the type of anxiety measured, cultural factors, or the specific context of the pandemic.

Although there is limited research directly examining the relationship between ASHN and tobacco/alcohol use, some evidence suggests that smokers tend to have lower healthy nutrition attitudes compared to non-smokers. Additionally, studies considering dietary quality and substance use have reported that tobacco and alcohol users often exhibit less healthy dietary behaviors, which may indicate a link between nutrition attitudes and substance use behaviors²⁰.

Psychological problems associated with quarantine and restrictive measures may lead to changes in eating behaviors as stress and anxiety levels increase³⁰. In the present study, eating disorder-related behaviors associated with anxiety during the pandemic were evaluated using the TFEQ. The assessment included the subdimensions of cognitive restraint, emotional eating, and uncontrolled eating, which capture different aspects of eating behavior influenced by psychological distress. Previous studies have reported an increased prevalence of eating disorder symptoms during the COVID-19 pandemic³¹⁻³⁴. In the present study, statistically significant associations were observed between high levels of pandemic-related anxiety and both the total TFEQ-R21 score and the emotional

eating subscale. Similarly, another study using the TFEQ reported a statistically significant increase in emotional eating in individuals with higher levels of pandemic-related anxiety²³.

A study conducted in the United Kingdom found that stress related to the COVID-19 pandemic increased the desire to lose weight among women and suggested that pandemic-related stress contributed to body dissatisfaction, leading to an increase in restrictive eating behaviors and unhealthy weight management practices³⁵. In line with these findings, our study demonstrated a statistically significant association between pandemic-related anxiety and cognitive restraint. However, contrary to our results, another study reported no statistically significant difference between pandemic anxiety and cognitive restraint²². Individuals with limited cognitive control over eating, particularly those who engage in restrictive eating, are known to be more susceptible to eating in response to emotional states. In such circumstances, there is a greater tendency to prefer energy-dense foods high in sugar and fat content³⁶.

Uncontrolled eating behavior is characterized by the loss of self-regulation over eating, resulting in the consumption of excessive amounts of food despite the absence of physiological hunger. Individuals exhibiting this behavior tend to overconsume food and may develop addiction-like tendencies toward specific food groups. Both uncontrolled eating and excessive weight gain share common outcomes, such as energy intake exceeding physiological requirements³⁷. While Elmacioğlu et al. reported a significant association between pandemic-related anxiety and uncontrolled eating²², no statistically significant relationship between CAS scores and uncontrolled eating was observed in the present study. These discrepancies may be attributed to differences in sample characteristics, assessment tools, or contextual factors related to the pandemic. Changes in eating behaviors during this period may also be associated with boredom, anxiety, reduced motivation for healthy eating, difficulties in food accessibility, and restrictions on store opening hours³⁴.

In the present study, a low positive correlation was observed between BMI and eating disorder-related behaviors, while a low negative correlation was identified between BMI and ASHN scores. These findings suggest that increases in unhealthy eating behaviors may contribute to weight gain and, consequently, higher BMI values. Conversely, individuals with higher ASHN scores appear to demonstrate better weight management and lower BMI levels. Supporting these results, previous studies have reported that higher levels of emotional eating are associated with increased BMI³²⁻³³. Additionally, it has been documented that the pandemic period was linked to an exacerbation of eating disorder symptoms and elevated BMI values²⁸. Anxiety and depression are thought to trigger emotional eating by increasing energy intake, which may predispose individuals to various chronic diseases³⁴.

The high ASHN scores observed in this study may reflect the potential influence of increased health-related anxiety and concerns during the pandemic on individuals' eating behaviors. During this period, heightened perceptions of health-related risks have been reported, which may enhance individuals' awareness and control over their dietary

practices³⁸. In this context, elevated ASHN scores may indicate that pandemic-related anxiety serves as an important psychosocial factor shaping eating behaviors. However, these findings do not imply a causal relationship; rather, they highlight the associative patterns between psychological factors emerging during the pandemic and changes in dietary behaviors. To better understand the potential impact of these behavioral changes on life satisfaction, future studies employing longitudinal designs and a comprehensive approach to psychological variables are recommended.

Pandemic-related anxiety is thought to have the potential to negatively affect life satisfaction. One of the primary reasons underlying this relationship is the widespread fear experienced during the COVID-19 pandemic, including concerns about infection, death, and the loss of loved ones. An increase in such fears may lead to heightened distrust toward others, avoidance behaviors, and withdrawal from daily activities³⁹. Additionally, the reduction in opportunities for interpersonal contact during the pandemic and the consequent weakening of social support networks particularly at times when individuals need them most, have been identified as important factors contributing to decreased life satisfaction⁴⁰.

A substantial body of literature supports these findings. A study conducted in Poland reported a negative association between coronavirus-related anxiety and life satisfaction⁴¹. Similarly, several studies carried out in Turkey have demonstrated that as health-related stress levels increase, life satisfaction decreases, revealing a significant negative correlation between these variables⁴². Another study conducted in Turkey found that individuals experiencing COVID-19-related anxiety reported lower levels of meaning in life, higher levels of loneliness, and consequently lower life satisfaction.

In contrast, the findings of the present study did not reveal a statistically significant relationship between pandemic anxiety and life satisfaction. This result may be explained by the relatively high levels of psychological resilience within the sample, the preservation of social support mechanisms despite the pandemic, or individuals' gradual adaptation to pandemic-related conditions over time. Moreover, it is possible that anxiety alone may not be sufficient to determine life satisfaction; rather, variables such as depression, psychological well-being, and meaning in life may play a more decisive role in this relationship.

Indeed, a study conducted in Peru reported a negative association between depression and life satisfaction, while a positive association was observed between anxiety and life satisfaction. In the same study, psychological well-being was found to play a significant mediating role in the relationship between depression and life satisfaction⁴³. These findings suggest that life satisfaction is closely related to mental health symptoms and that psychological well-being may serve as a protective factor within this relationship.

Accordingly, the early identification of risks threatening mental health and the strengthening of individuals' psychological resilience are considered effective intervention targets for maintaining and enhancing life satisfaction⁴⁴.

A negative relationship was identified between life satisfaction and TFEQ-R21 scores. Although several statistically significant correlations were identified in the present study, the strength of these associations was generally weak. From a practical perspective, these findings suggest that pandemic-related anxiety and eating behaviors may influence life satisfaction and nutrition attitudes only to a limited extent. In other words, while these variables are related, they likely represent only a small part of a broader set of psychological and behavioral determinants affecting well-being during the pandemic. Factors such as psychological resilience, social support, coping strategies, and overall mental health may play a more substantial role in shaping life satisfaction and eating behaviors. Therefore, the weak correlations observed in this study should be interpreted cautiously, emphasizing that pandemic anxiety alone may not be a strong predictor of changes in eating patterns or life satisfaction.

A study with dietetic students during the pandemic found no relationship between life satisfaction and orthorexia nervosa tendencies⁴⁵. A study examining university student populations reported decreases in life satisfaction and emotional appetite-driven eating urges⁴⁶.

The findings of the present study demonstrate that women reported higher levels of both anxiety and life satisfaction compared to men. Supporting this result, prior research has shown that although women tend to report higher levels of anxiety and stress than men, their life satisfaction scores are similar to or even higher than those of men⁴⁷.

Although this pattern may appear paradoxical, it can be explained by women's greater tendency to experience negative emotions more intensely while simultaneously placing greater emphasis on evaluating the positive aspects of life, as well as on social relationships and family bonds. Overall, these findings suggest that anxiety does not automatically lead to reduced life satisfaction and that gender-specific psychological differences may play a significant role in shaping this relationship⁴⁸.

Several limitations of the present study should be acknowledged. First, the cross-sectional design prevents any conclusions about causality. Second, data were collected online, which may introduce selection bias, and anthropometric measurements were self-reported, potentially affecting accuracy. Third, the sample included a relatively high proportion of female participants, which may limit the generalizability of the findings. Despite these limitations, our results provide valuable insights into pandemic-related anxiety and its associations with CR and EE scores. In addition, the study addresses an important gap by examining the relationships between COVID-19-related anxiety, eating behaviors, and overall life satisfaction in adults. Future research with larger, more balanced samples and face-to-face data collection could provide more robust and generalizable results. It is believed that conducting the study with a larger sample and through face-to-face interviews may yield more meaningful and generalizable results.

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The Use of Artificial Intelligence in Physiotherapy, Advantages and Disadvantages: Literature Review

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Abstract

Artificial intelligence (AI) is known as technology, computer, and machine learning based systems that produce solutions to problems that human intelligence cannot overcome. Apart from the military industry, science, and engineering, it is seen that the use of AI in different fields of health sciences is becoming increasingly widespread. There are scientific studies on AI in many health fields from orthopedics to neurology, radiology to cardiology, endocrinology to physiotherapy. Web-based systems such as wearable devices, robots, systems created with virtual reality, mobile applications, specially developed designs, gait analysis systems, tele-rehabilitation are AI-supported technologies widely used in physiotherapy services in treatment and diagnosis, evaluation, patient care and follow-up. Despite its benefits, there are also some disadvantages of AI. We think that these disadvantages are the most important reasons why qualified studies on AI in our country have not reached the required level. We believe that increasing the number of qualified personnel in the field of artificial intelligence, allocating more resources to the sector, revising the curriculum according to the developing technology, integration of information systems and health services will increase awareness of AI. We think that with the elimination of the difficulties encountered towards AI, AI-supported technologies will become widespread in the provision of physiotherapy and rehabilitation services and qualified research will increase.

Keywords: Artificial intelligence, awareness, physiotherapy and rehabilitation, advantages, disadvantages.

Yapay Zekânın Fizyoterapide Kullanımı, Avantajlar ve Dezavantajlar: Literatür İncelemesi

Öz

Yapay zekâ (YZ), insan zekasının üstesinden gelemediği sorunlara çözüm üreten teknoloji, bilgisayar ve makine öğrenimi tabanlı sistemler olarak bilinmektedir. Savunma sanayi, fen ve mühendislik bilimi dışında sağlık bilimlerinin farklı alanlarında da YZ kullanımı giderek yaygınlaşmaktadır. Ortopediden nörolojiye, radyolojiden kardiyojiye, endokrinolojiden fizyoterapiye kadar birçok sağlık alanında YZ ile ilgili bilimsel çalışmalar yapılmaktadır. Giyilebilir cihazlar, robotlar, sanal gerçeklik ile oluşturulan sistemler, mobil uygulamalar, özel geliştirilmiş tasarımlar, yürüme analiz sistemleri, tele-rehabilitasyon gibi web tabanlı sistemler fizyoterapi hizmetlerinde tedavi ve tanı, değerlendirme, hasta bakımı ve takibinde yaygın olarak kullanılan YZ destekli teknolojilerdir. Faydalarına rağmen, YZ'nin bazı dezavantajları da vardır. Bu dezavantajlar, ülkemizde YZ konusunda nitelikli çalışmaların yetersizliğinde önemli bir unsurdur. Yapay zekâ alanında nitelikli personel sayısının artırılması, sektöre daha fazla kaynak ayrılması, müfredatın gelişen teknolojiye göre yenilenmesi, bilişim sistemleri ile sağlık hizmetlerinin entegrasyonunun YZ konusunda farkındalığı artıracığına inanıyoruz. Yapay zekaya yönelik karşılaşılan zorlukların ortadan kalkması ile

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fizyoterapi ve rehabilitasyon hizmetlerinin sunumunda YZ destekli teknolojilerin yaygınlaşacağını ve nitelikli araştırmaların artacağını düşünüyoruz.

Anahtar Sözcükler: Yapay zekâ, farkındalık, fizyoterapi ve rehabilitasyon, avantajlar, dezavantajlar.

Introduction

Considering today's technological developments, the use of artificial intelligence (AI) has started to make itself felt in the field of health as in every area^{1,2}. It is possible to say that we use and spend time with AI-supported devices in our lives without being aware of it. It is seen that structures such as smartphones, tablets, smartwatches, computers, cars, avenues and streets, and even smarthomes, where we spend a considerable amount of time, are equipped with AI-supported technologies and made available to society^{3,4}.

Health is a dynamic sector that is open to development. Therefore, it is unavoidable to be affected by the advantages and disadvantages of AI. Another issue that we are not aware of is that AI has been used in healthcare services for a long time^{5,6}. Some evaluation methods used in the diagnosis and diagnosis of health services, tele-health etc. applications, which are described as telehealth services, wearable technologies, robot mannequins used in institutions providing health education, tools used in the cleaning of the health facility, elevators offered to the public in the facility, smart toilets can be listed as services supported by AI Technologies⁷⁻¹⁴. The results of a recent study on the use of AI in physiotherapy are noteworthy. This study highlighted significant gaps in physiotherapists' adoption of AI, emphasizing the need to increase awareness of AI in physiotherapy, improve access to AI, and enhance AI policies¹⁵.

Physiotherapy practices also have an important position in health services. It should be known that associating technological developments, which are in a rapid increasing trend, with physiotherapy will contribute to the provision of better quality health care, increasing patient satisfaction and treatment effectiveness. This literature review aims to systematically examine the current applications of AI in physiotherapy, highlight its advantages and disadvantages, identify gaps in the literature, and guide future research. This study provides physiotherapists with insights into topics such as the areas of use of AI in physiotherapy science, AI awareness among physiotherapists, the advantages and disadvantages offered by AI, and AI in the physiotherapy curriculum.

This review is designed as a traditional review. Traditional compilations provide a comprehensive, critical, and objective analysis of a subject. The subject is discussed within a theoretical framework, and attempts are made to identify gaps or inconsistencies in the underlying knowledge. The literature is summarized, and conclusions are drawn about the subject under review, offering readers a different perspective and highlighting important areas of research related to the subject¹⁶⁻¹⁸. The researcher conducted a literature review between June and November 2025 using the Google Scholar database, searching for the terms “artificial intelligence”, “artificial intelligence in healthcare”, “artificial intelligence in physiotherapy”, “advantages of

artificial intelligence” and “disadvantages of artificial intelligence” and “artificial intelligence in physiotherapy education.”

Artificial Intelligence and Machine Learning

Although AI has recently begun to rise in popularity, the first studies in this field were conducted in the 1960s. At that time, AI was used to support diagnosis and treatment in specialized fields such as public health and medicine⁵. In 1982, a textbook on AI was published that specifically offers physiotherapists the opportunity to evaluate biomechanics⁶.

Artificial intelligence is computer systems that specialize and come together to solve problems that the human brain cannot solve¹⁹. It is also described by scientists as “thinking machines” because it performs the tasks of human intelligence²⁰. Today, AI has become an attractive multidisciplinary area of study that uses computational, statistical, logical, mechanical, and biological concepts and tools to explain, model and reproduce information and cognitive processes²¹.

Machine learning (ML), which facilitates decision-making using data sets and enables making predictions based on patient data, forms a sub-parameter of AI^{22,23}. It can be said that the developments in the development and effectiveness of rehabilitation strategies with the integration of ML into physiotherapy are promising. Studies have emphasized that ML has the capacity to maximize the effectiveness, applicability, patient-oriented approach, and efficiency of clinical studies^{24,25}. Studies using AI techniques, including not only ML but also natural language processing, computer vision, and robotic infrastructures, have reported that AI increases the percentage of accuracy in the diagnosis of diseases, offers the opportunity to design treatment specific to the individual and predict post-treatment improvements^{26,27}. The evolving healthcare sector has also made advances in computer science essential. Therefore, it has been reported that developments such as information and communication systems, sensors, ML and AI can be used to overcome the challenges faced in the healthcare sector²⁸.

Artificial intelligence is not a stand-alone system. We can see that understanding the outputs of AI requires learning the working mechanism of machines. For this reason, the trainings to be given in health institutions by a well-equipped and professional team about what the infrastructures that make up the AI systems consist of, how they work and how they are interpreted will be able to eliminate doubts in the interpretation of AI. We think that the development of a well-equipped health team in this field will be extremely important in the dissemination of the use of AI by health professionals.

Use of Artificial Intelligence in Physiotherapy

Physiotherapy is another delivery of health services. Physiotherapy represents a professional group that is pregnant with radical changes today and in the future with the integration of advanced technologies, especially AI applications²⁹⁻³¹. Therefore, as in all areas of the health services, AI has gained an important place in the use of physiotherapy

and rehabilitation services³². It is seen that the advantages of robot use are utilized in physiotherapy practices in order to increase patient outcomes and efficiency in the rehabilitation process³³. Scientists have emphasized the importance of using AI in physiotherapy to accelerate rapid progress and recovery at every stage after stroke in the treatment of motor disorders. It is known that robots improve the patient's motor control, enhance existing functions, and provide sensory input. It has been noted that this gives the patient a subjective sense of progress³⁴. Robot-assisted therapies go beyond providing sensory and motor feedback; they are adaptable to the individual's needs and highly repeatable compared to traditional treatment approaches. Thanks to visual, auditory, and tactile feedback, they make significant contributions to the patient's progress³⁵. Robot-assisted gait training allows treatment periods to be spent more efficiently. Although it is known that robots lack the necessary notifications in patient evaluation, it has been stated that gait rehabilitation will be more enjoyable for patients thanks to robots, thus increasing the effectiveness of treatment³⁶. Electromechanically assisted robots provide the advantage of practicing without a physiotherapist, which allows for a higher number of repetitions³⁷. Dextrous (soft robot) hands are used in the treatment of musculoskeletal injuries to provide simple mobilization; however, the long-term effects of these systems are a matter of debate³⁸.

Using computer-based clinical support systems, it may be possible to detect neuropathy and neuropathy-related pain and kinesiophobic behaviors of diabetic patients. It is thought that these AI-related systems will be beneficial in terms of exercise planning in diabetic patients and the sustainability and follow-up of the exercise prescription created³⁹. On the contrary, while it was previously reported that AI was among the predictors of rehabilitation services, patients' compliance with exercise was found to be poor⁴⁰. AI has been used in the treatment of common musculoskeletal pathologies such as neck and back pain in order to monitor and improve exercise adherence of patients⁴¹.

Studies investigating the mutual effectiveness of AI and traditional physiotherapy and rehabilitation methods are found in the literature. Traditional physiotherapy and AI digitally assisted treatment sessions were compared in patients after total knee arthroplasty surgery. AI-based digital sessions were tracked with 3D motion sensors through a mobile application and a web-based website. As a result of the study, it was determined that digital intervention was effective in reducing the workload of the physiotherapist and showed a high level of improvement in increasing the functionality of the patients. The same study found that digital sessions could be effective in improving clinical outcomes in the short and medium term at the end of 8 weeks⁴². In the treatment and management of stroke, some treatment guidelines recommend the use of AI rehabilitation in addition to conventional treatment⁴³.

Technology-based applications such as mobile health (M-Health) enable physiotherapy services such as joint range of motion, posture analysis, exercise training, and monitoring⁴⁴. It is stated that the satisfaction rates of individuals using such applications are high⁴⁵. Similarly, physiotherapists also support physiotherapy services provided with M-health applications⁴⁶. Artificial intelligence-supported "ChatBot" applications

improve patients' cognitive functions, thereby increasing treatment sustainability and compliance³¹.

Another value application where AI is used in the field of physiotherapy is tele-rehabilitation or digital health systems. The use of telerehabilitation applications has increased during extraordinary periods such as the pandemic. However, it continues to exist as an area in need of further development. Therefore, it has been emphasized that it is extremely important to provide more comprehensive applications that can appeal to a wider audience and the necessary technical infrastructure in this field¹³. Today, tele-rehabilitation and home physiotherapy are successfully used to provide real-time monitoring and advice by the therapist remotely. Tele-rehabilitation services, which are expected to become even more important in the future, help patients to move and patients can be guided verbally by physiotherapists during movement¹⁴. Tele-rehabilitation is applied in physiotherapy and rehabilitation practices with the integration of AI technology and telecommunication systems with effective communication of counseling, preventive physiotherapy, diagnosis and treatment services to patients. Perhaps one of the most important advantages of tele-rehabilitation is that it provides a solution to the accessibility problem for individuals to receive physiotherapy services^{13,47}. However, virtual reality and web-based applications are also one of the approaches used in classical physiotherapy. With these applications, motor, sensory and cognitive gains are offered to patients through fun and task-based applications that provide a large number of repetitions, feedback, active participation, guidance and motivation⁴⁸. We think that AI will contribute to making the gains permanent by integrating physiotherapy, personalized cognitive behavioral therapy and virtual reality applications into their treatments in a sensitive way.

The advantages and disadvantages of AI in physiotherapy and rehabilitation have been supported by studies. It is seen that some AI-oriented simulation devices are used in physiotherapy not only to provide the care and support that patients need but also to persuade patients to move. However, it is stated that such designs minimize the workload of physiotherapists and reach more patients⁴⁹. Clinical convenience for physiotherapists in their field of work based on the morphological and anthropological characteristics of the person, genetic predisposition, dietary habits, and living standards of the population. For example, it may be possible to obtain answers to questions such as why back pain is more common or why osteoarthritis is more frequently seen in a specific population using an AI-based "predictive learning model". This provides an opportunity to make predictions based on cause-and-effect relationships¹⁴. In a study conducted in India, an AI-supported design was developed by a physiotherapist to predict the recovery process after a stroke. The system was able to predict the duration of the patient's hospitalization, the duration of the stroke, how long the patient could recover after the stroke according to the Barthel index score and the degree of recovery⁵⁰. A recent systematic analysis concluded that the inconsistency of the effects of AI-supported rehabilitation services in the clinic, technological literacy level, doubts about the reliability of AI, and user fatigue are barriers to implementation. On the other hand, the same study emphasized that AI has positive effects such as providing access to more patients, enabling remote

monitoring of patients, and reducing physiotherapist workload⁵¹. Several recent studies have also shown that AI facilitates physiotherapist work and tasks, improves performance, and is effective in treating more patients and seeing patient outcomes^{30,52}. It has been found that AI can offer significant advantages in determining disease level and treatment efficacy in clinical decision-making process^{53,54}. In one study, it was determined that the use of AI in the treatment of distal end fractures of the radius did not have a sufficient level of evidence to guide physiotherapists⁵⁵. A 2018 meta-analysis also revealed that the importance of AI-assisted therapies compared to other clinical treatment modalities is unclear³⁷.

Disadvantages of Artificial Intelligence

In the literature, it is seen that there may be some negative situations and disadvantages besides the convenience that AI will provide in health sciences. Today, it is thought that technologies developed with AI will affect the person's life in the future in terms of educational, social, economic and legal aspects⁵⁶. It is reported that AI should be sensitive to cultural and social differences and that the data entry system and algorithms used are not sufficiently understood. It is also emphasized that the options that AI puts forward or the mechanism that is effective in making this decision is not understandable, so it may be difficult to justify AI decisions. However, the possibility of AI technologies using data sets with bias is another disadvantage^{57,58}. Concerns about ethical considerations are a matter of debate in the clinical application of AI. Transfer of responsibility in any adverse situation related to AI applications is considered a primary ethical issue⁵⁹. It is unclear how and in what step-by-step manner AI achieves its outputs. We know that physiotherapists using AI should be able to articulate, explain and defend their practice without raising doubts in clinical decision-making. Therefore, it becomes extremely important that AI technologies are designed in more explainable and understandable ways⁶⁰.

It is known that it is necessary to interact with AI-based programs in a collaborative way. Therefore, computational literacy is also needed to learn the engineering language related to computer technologies and to interact with machines. Otherwise, it is stated that in the future, paramedics will not be able to go beyond a health technician who only fulfills the commands of AI^{61,62}. Therefore, learning the language of AI is essential to be able to interpret the decisions it makes. Because if AI is not understood, the possible errors that AI may exhibit in decision making and the fact that these errors may have serious consequences for patients should also be considered. Taking the right steps to improve the accuracy and reliability of AI-based systems is therefore extremely important⁶³. The fact that the participation of physiotherapists in conversations about AI in clinical practice is important should be recognized. Otherwise, physiotherapists will not be able to go beyond being managed by machine intelligence in the decision-making process and will run the risk of being subject to AI unless they learn how AI Works³⁰. Physiotherapists should be eager to understand AI technologies as they are in every field, and we should adopt and adapt ourselves to AI-related technology and data related literacy²³.

Besides the fact that AI is humanoid and lacks empathy, these vehicles are very expensive devices. Their use therefore requires advanced training⁶⁴. It should be known that healthcare organizations trying to integrate AI into their hospitals may need large expenditures and financial support for staff training and that trainings may require continuity. It is also considered that the use of AI may be limited to health facilities with large budgets and may create inequality in the allocation of resources⁶⁵. Another worrying situation in AI is the fear that with the adoption of AI, physicians will be disabled in medical practices and will be managed by computers⁶⁶.

The advantages and disadvantages of AI in health sciences are listed as follows (Table 1)^{65,67-70}.

Table 1. The advantages and disadvantages of artificial intelligence in healthcare

	Advantages	Disadvantages
1	High-level data storage capability	The idea that it will reduce the need for healthcare workers
2	Assist in analysis and interpretation	Concern that they will replace healthcare workers
3	Helping with rapid diagnosis, early diagnosis, and diagnostic accuracy	Fear and anxiety about complex tasks
4	Facilitating access to healthcare (telemedicine, etc.)	Lack of empathy
5	Reducing the workload	The high cost of artificial intelligences-based tools
6	Wearable devices enable continuous monitoring and observation of patients	Requiring advanced training for its use
7	Offering an alternative form of support for those living in peripheral regions	High cost and the need for trained personnel
8	Providing personalized care and rehabilitation support by comparing data	Challenges encountered in staff training and the sustainability of training
9	Increasing patient compliance with treatment in the clinical decision-making process	Requires high budget and resource allocation
10	Monitoring and reviewing the suitability of treatment plans based on feedback	Challenges encountered in clinical practice due to concerns such as ethics, patient privacy, and confidentiality
11	Improving communication between clinicians and patients	Concerns about data collection, social issues, and the threat of cyberattacks
12	Improving patient satisfaction	Concerns regarding the development of algorithms, data bias, and accountability
13	Assessing the patient's physical condition and recommending appropriate exercises for the patient	Overconfidence due to widespread use
14	Saving on healthcare resources by optimizing time and costs	The risk of a decline in the focus on human clinical assessments

It is understood that AI applications may raise concerns about the principles of privacy and confidentiality in the storage of data. It is necessary to learn the systems that make

up artificial intelligence, to disseminate machine learning, and to create a mechanism to question the results of artificial intelligence. It should not be forgotten that when applying the decisions of artificial intelligence, it should be acted critically and cognitively, possible damages can be minimized and risks can be reduced.

Awareness and Views on Artificial Intelligence in Healthcare Professionals and Physiotherapists

The attitudes and behaviors of healthcare professionals towards AI in different disciplines have been investigated. According to a 2020 study, it was reported that healthcare providers do not fully understand AI, that AI is not understandable, and that they have an ambivalent attitude and concern about the potential consequences of using AI in clinical practice⁷¹. In a study conducted in Saudi Arabia, it was reported that 250 healthcare professionals consisting of doctors, nurses and technicians agreed that AI would accelerate healthcare services; however, their knowledge about professional AI was moderate⁷². In another study conducted a year later in Canada, the perceptions of healthcare professionals from different disciplines about AI were investigated, and it was found that the participants had a moderate level of knowledge about the use of AI in medicine⁷³. Wong et al. In a study of 59 radiotherapy staff, 91% of respondents were interested in learning more about AI, and their biggest concern was the fear of changing jobs and a major shift in traditional practices⁷⁴.

Studies show that physiotherapists have gaps in their knowledge about AI. Although participating physiotherapists appreciated the role of AI technologies and reported their important role in practice, they reported a lack of educational resources related to the integration of AI⁷⁵. Alsobhi et al. recently investigated the opinions of physiotherapists about AI. According to the results of this study, 63.3% of physiotherapists reported that they had not experienced any AI application in their workplace before. In the same study, physiotherapists considered high AI costs and resources as the most important barrier to the acceptance and importance of AI-based applications⁷⁶. In another study conducted in Saudi Arabia with those working in the field of physiotherapy and rehabilitation, the participants were of the opinion that AI would increase productivity, reduce the need for humans, and improve the patient's quality of life⁷⁷.

In order to successfully implement physiotherapy and rehabilitation services, our colleagues need knowledge about AI, the possibility of practical application, confidence and acceptance of the use of AI technologies.

Artificial Intelligence in Physiotherapy Curriculum

Current physiotherapy education is based on rote learning. However, there is now a consensus that the physiotherapy curriculum needs to be updated and renewed according to age; it is emphasized that data, technological and human literacy should be included in the core physiotherapy curriculum⁴⁹. The characterization of physiotherapy as a once-in-a-lifetime undergraduate program should be abandoned. It has become

essential to transform the curriculum into platforms that provide a lifelong learning model with customizable modules that students need and can access⁹.

Physiotherapy education aims to develop skills such as clinical decision-making, problem-solving, and effective communication as well as imparting theoretical knowledge. For this reason, the problem-based learning (PBL) model, which has become increasingly important in recent years, has brought evidence-based and student-centered approaches to the forefront in physiotherapy education⁷⁸. However, the use of PBL may have disadvantages such as the need for technical support staff, time-consuming case creation, and access to information. Therefore, integrating AI-powered tools such as ChatGPT into PBL processes can positively contribute to student performance, learning satisfaction, student participation, and efficient use of time^{79,80}. However, it should be noted that the effectiveness of AI-supported educational models on learning outcomes is still uncertain⁸¹.

This comprehensive literature review has some limitations. The study did not focus on a specific area that was examined comprehensively. This is the most important limitation of our study. Another limitation is that the articles were searched using keywords defined in a single database. Another issue is that the articles obtained were not classified in terms of quality.

Conclusion

It is likely that there will be developments in the provision of health services and physiotherapy science with the technological developments that are in an increasing trend day by day. It is thought that the most important deficiency in qualified AI-based research is the lack of understanding of AI by healthcare professionals and the uncertainties in fully interpreting the results it reveals. This situation may directly negatively affect the trust of healthcare professionals in AI. This study discusses the advantages and disadvantages of AI. We believe that identifying disadvantages and turning them into advantages directly affects AI usage and AI awareness. Therefore, strategies should be developed for the advancement and understanding of AI.

As in healthcare, we need to prioritize certain areas to gain an edge in the field of AI. The first of these may be to increase the number of qualified personnel in AI. The central government and universities can be encouraged to allocate more resources to AI and to open bachelor's or associate's degree programs in AI. We also believe that curriculum changes in line with these developments can raise awareness about AI and make it more understandable.

We think that physiotherapy and rehabilitation services represent a favorable health field in the provision of technologically assisted health services. Therefore, it is inevitable that with the development of AI in physiotherapy science, accessibility to rehabilitation services will make a tremendous contribution to the realization of the treatment period more effectively.

With the integration of AI into physiotherapy education, future scientists who will care about this field in the coming years are extremely important for young people. With the inclusion of systems associated with technological use in the curriculum, it can be beneficial to understand anatomy, physiology, clinical symptoms, clinical tests, research, therapeutic interventions, and electrical physiotherapy modalities. The use of robotic mannequins in applied courses can improve the practical manual skills of physiotherapy students, reduce student-induced errors, and enable the recognition of incorrect applications. Therefore, physiotherapists should be willing to use AI in clinical practice, be aware of the possibilities offered by AI, and improve their level of knowledge in evaluating the recommendations of AI. The use of easily accessible software such as AI models and GhatGPT should be encouraged in physiotherapy education. AI-supported curriculum updates should be designed in line with the times to develop skills training in addition to theoretical knowledge.

Future Directions

Developments in technology have clearly increased interest in AI in society and the world of science. As physiotherapists, it is extremely important for our profession to closely follow developments in this field. There is a clear need for high-quality randomized controlled trials, comparative effectiveness studies, and cost-effectiveness analyses related to physiotherapy. We believe there is a need to develop standardized procedures for the use of AI in clinical physiotherapy. The topic of AI in physiotherapy may be an opportunity for young scientists.

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Extracorporeal Membrane Oxygenation Application in Children

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Abstract

Extracorporeal membrane oxygenation (ECMO) is an advanced treatment for patients with failing heart and lung function. Especially in cases of cardiorespiratory failure that do not respond to conventional treatment methods, ECMO can increase patients' chances of survival by supporting the function of vital organs. ECMO therapy is used in a wide range of patients from newborns to adults. In newborns, effective results can be obtained especially in cases such as respiratory distress, congenital heart diseases and meconium aspiration, while in adults, it is successfully applied in diseases such as severe cardiopulmonary failure, viral infections such as COVID-19 and severe pulmonary embolism. Over time, technological advances in ECMO devices and increased clinical experience have increased the effectiveness of the treatment and expanded its area of use. The effectiveness of ECMO depends on factors such as the general health status of the patient, the likelihood of response to treatment and the reversibility of the disease. Therefore, the success of ECMO therapy is directly related to correct patient selection and timely intervention. A multidisciplinary approach and the role of an expert ECMO team are crucial for the successful implementation of this treatment modality.

Keywords: Child, extracorporeal membrane oxygenation, cardiopulmonary support.

Çocuklarda Ekstrakorporeal Membran Oksijenasyon Uygulaması

Öz

Ekstrakorporeal membran oksijenasyonu (ECMO), kalp ve akciğer fonksiyonları yetersiz kalan hastalar için uygulanan, ileri düzey bir tedavi yöntemidir. Özellikle geleneksel tedavi yöntemlerine yanıt vermeyen kardiyorespiratuar yetmezlik durumlarında, ECMO, hayati organların fonksiyonlarını destekleyerek hastaların yaşama şansını artırabilir. ECMO tedavisi, yenidoğanlardan yetişkinlere kadar geniş bir hasta grubunda kullanılmaktadır. Yenidoğanlarda özellikle solunum distressi, konjenital kalp hastalıkları ve mekonyum aspirasyonu gibi durumlarda etkin sonuçlar elde edilebilirken, yetişkinlerde de ciddi kardiyopulmoner yetmezlik, COVID-19 gibi viral enfeksiyonlar ve ağır pulmoner emboli gibi hastalıklarda başarıyla uygulanmaktadır. Zaman içinde ECMO cihazlarındaki teknolojik gelişmeler ve klinik deneyimin artması, tedavinin etkinliğini artırmış ve kullanım alanını genişletmiştir. ECMO'nun etkinliği, hastanın genel sağlık durumu, tedaviye yanıt verme olasılığı ve hastalığın geri döndürülebilirliği gibi faktörlere bağlıdır. Bu nedenle, ECMO tedavisinin başarısı, doğru hasta seçimi ve zamanında müdahale ile doğrudan

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ilişkilidir. Bu tedavi yönteminin başarıyla uygulanabilmesi için multidisipliner bir yaklaşım ve uzman bir ECMO ekibinin rolü oldukça önemlidir.

Anahtar Sözcükler: Çocuk, ekstrakorporeal membran oksijenasyonu, kardiyopulmoner destek.

Introduction

The roots of extracorporeal life support go back to the first blood oxygen generator designed by Dr Gibbon in the 1950s. The use of the blood oxygen generator, which was first produced to provide oxygenation of patients during cardiac surgery, was limited to a few hours due to complications such as haemolysis and bleeding¹. In 1972, Dr. Hill achieved the first successful use of ECMO in a young adult who had developed severe hypoxic respiratory failure following a motorcycle accident². In that same year, Dr. Bartlett achieved the first successful VA-ECMO in an infant who developed low cardiac output syndrome following a Mustard procedure for transposition of the great arteries. Later, in 1975, Bartlett and Gazzaniga reported the first neonatal survivor a term infant with severe hypoxic respiratory failure due to meconium aspiration supported with VA-ECMO³. In 1989, the Extracorporeal Life Support Organization (ELSO) was established with the aim of organising and collecting data on patients receiving ECMO. ELSO publishes guidelines that are accepted and used by the world to support clinicians⁴.

Extracorporeal membrane oxygenation (ECMO) is a life support device targeting cardiac and pulmonary support. While ECMO cleans the venous blood of patients with severe pulmonary insufficiency by extracorporeal gas exchange, it provides circulatory support in addition to blood oxygenation in patients with severe cardiac insufficiency⁵. ECMO device is a mechanical support device that provides haemodynamic support to the patient by bypassing the cardiopulmonary system or works by regulating oxygenation and perfusion in transplantation⁶. ECMO is the only mechanical device that can provide both cardiac and pulmonary support compared to other mechanical support devices, which can be applied in intensive care with cardiopulmonary bypass support. ECMO support therapy can be applied for days or weeks depending on the patient profile. The working principle of the ECMO system is based on the logic of taking blood from the patient's venous vascular bed through a cannula and pump, oxygenating it in the membrane and reintroducing the blood to the system via arterial or venous line⁷. Currently used ECMO applications are divided into two groups as Venoarterial (VA) and Veno-venous (VV) ECMO according to the vessels used. VA- ECMO is the application in which blood taken from a vein is oxygenated and then returned through an artery, while VV-ECMO is the application in which blood taken from a vein is pumped into another vein after being oxygenated⁸. In recent years, the use of extracorporeal membrane oxygenation (ECMO) has increased markedly, particularly during the COVID-19 pandemic. Severe acute respiratory distress syndrome (ARDS) associated with COVID-19 has increased the need for advanced life support modalities such as ECMO in critically ill patients. Recent registry analyses from ELSO have demonstrated improved survival rates and expanded indications for ECMO in both pediatric and adult populations.

ECMO Circuits and Equipment

The main elements of the ECMO system are similar to the ventilation devices used in the treatment of respiratory failure. ECMO circuit consists of drainage and return cannulas, tubing system, pump system, air and oxygen mixing line, temperature regulated oxygenator, heating and cooling line and control units. The blood taken from the patient with the help of the drainage cannula passes through the pump and is returned to the patient with the help of the return cannula by regulating the temperature in the heat exchanger in the oxygenator by removing CO₂ and oxygenated by providing gas exchange in the oxygenator⁹.

Pumps

Pumps are of two types: roller and centrifugal. Roller pumps are more commonly used in standard cardiopulmonary bypass. In ECMO using a roller head, venous return depends on the position of the patient and the force of gravity¹⁰.

Oxygenator

It is the most important part of the ECMO system. It is a gas exchange unit. It is a part of the perfusion apparatus that fulfills the functions of the patient's natural lungs (except endocrine functions) during extracorporeal circulation. Modern oxygenators are produced compactly with a heater unit (heat-exchanger)¹¹.

Cannulas

In cardiopulmonary bypass, cannulas provide the connection of the patient with the perfusion circuit lines and can be categorised in three main groups as arterial cannulas, venous cannulas and cardioplegia cannulas. In addition to these; left ventricular vent, pulmonary artery vent, aortic root vent can also be used. The size of the cannulae is calculated according to the patient's body surface. The main consideration in the cannulation approach is the flexibility of the lines, which facilitates the use of ECMO¹².

Heat Exchanger

The warming unit is necessary to control the patient's body temperature and blood temperature at certain levels. The warming unit requires an external water reservoir that circulates cooled or heated water as required. In general, the temperature of the water is kept below 40 C (usually 37 C). In the presence of unexplained haemolysis, small amounts of blood and protein are assumed to be in the circulating water, although there is rarely a connection between circulating water and blood. The water in the water reservoir is not sterile and may be contaminated. Therefore, the water reservoir should be cleaned and replaced from time to time with antiseptic solutions¹³.

ECMO Team

ECMO is performed in institutions under certain standards and by a team competent in ECMO according to the guidelines published by the ELSO^{14,15}. ECMO team should consist of system team, surgical team and medical team. These teams consist of physicians, surgeons, nurses, perfusionists and other personnel from various branches⁷. Each member of the team must have received training and certificates for ECMO. The ELSO instruction requires the course to be 24-36 hours theoretical and 8-16 hours practical. If people with ECMO certificates stay away from this application for 3 months or more, their certificates should be renewed^{16,17}.

Indications and Contraindications for ECMO Support

Indications in Neonates

Respiratory Indications: Respiratory indications for neonatal ECMO involve infants who continue to experience severe respiratory failure despite optimal medical management and ventilatory support. According to the ELSO criteria, ECMO may be considered when: a) The oxygenation index remains above 40 for at least 4 hours, b) The infant cannot be weaned from 100% oxygen for more than 48 hours or the oxygenation index consistently exceeds 20 over the same period, c) Recurrent episodes of clinical deterioration occur despite maximal therapy, d) There is severe hypoxic respiratory failure with acute decline ($\text{PaO}_2 < 40 \text{ mmHg}$) unresponsive to intervention. Additionally, severe pulmonary hypertension leading to right and/or left ventricular dysfunction that does not improve with inotropic support is also an indication.¹⁸. In newborns with congenital diaphragmatic hernia, ECMO can be initiated at comparatively higher oxygenation levels to avoid ventilator-induced lung injury (barotrauma)¹⁹.

Cardiac Indications: In neonates, congenital heart disease represents the leading reason for VA-ECMO support, making up roughly 80% of cardiac-related cases. These conditions include hypoplastic left heart syndrome, cyanotic heart defects with reduced pulmonary blood flow, various septal defects, and obstructive lesions affecting either the left or right ventricular outflow¹⁸.

Indications in Children

Respiratory Indications: According to the ELSO guidelines, the most common pulmonary diseases for which there are indications include acute respiratory failure (22%), other causes (22%), bronchiolitis (10%), viral pneumonia (10%), bacterial pneumonia (8%) and non-pulmonary infections (8%)¹⁸.

Cardiac Indications: Indications For Cardiac ECMO in the paediatric population are divided into two groups: those associated with catheterisation or cardiac surgery and those associated with cardiovascular collapse for nonoperative reasons. Indications for venoarterial ECMO include preoperative stabilisation, inability to wean from

cardiopulmonary bypass, elective support in high-risk surgical procedures and decreased postoperative cardiac output⁴.

The management of ECMO in pediatric patients requires consideration of age-specific physiological characteristics and the implementation of individualized treatment approaches. Factors such as body size, blood volume, and organ maturity necessitate careful adjustment of cannula selection, blood flow rates, and anticoagulation strategies. In addition, pediatric ECMO patients require careful monitoring of anticoagulation parameters due to differences in coagulation systems compared with adults. Drug dosing, fluid balance, and hemodynamic targets must also be adjusted according to age-specific physiological characteristics.

Table 1. Indications for ECMO in neonates and children¹⁸

Patient Group	Respiratory Indications	Cardiac Indications
Neonates	Meconium aspiration, RDS, pulmonary hypertension	Congenital heart disease
Children	ARDS, pneumonia	Postoperative cardiac failure

Complications of ECMO Support

Bleeding develops between 30% and 50% in patients receiving ECMO support and is the most common complication²⁰. Approximately 50% of patients require reexploration due to haemorrhage while ECMO perfusion is ongoing²¹. Mediastinal reexploration is performed in the intensive care unit by providing sterile conditions in order to avoid the risk of cannula dislodgement and tamponade development during transport to the operating theatre. Cerebral haemorrhage is a more common complication in neonates but can also occur in older children. When it occurs, it is a complication with a poor prognosis, which is often the main cause of mortality²². In order to prevent this complication, use of heparin-coated sets and selection of a better anticoagulation management regimen (thromboelastography, platelet aggregation tests) may be recommended²³. Renal failure may be observed as a complication during the ECMO course. It is usually a rare complication²⁴. Ultrafiltration or dialysis is rarely necessary. Another complication of prolonged ECMO use is sepsis or mediastinitis. Low cardiac output, development of renal failure, presence of multiple intravascular catheters, direct relationship of ECMO cannulas with the mediastinal cavity, and revisions performed due to bleeding are the main conditions that predispose to infection in these patients²³. Nurses have a major role in the care of the patient with ECMO and in the management and early recognition of complications²⁵.

Care in ECMO Support

It is important for the nurse to make a physical assessment from head to toe in the child to be administered ECMO. Monitoring of the patient under ECMO support, vital signs of

patients (heart rate, arterial blood pressure, oxygen saturation, respiratory rate), capillary refill and peripheral circulation control, skin turgour monitoring, bleeding control, intake-output monitoring, electrocardiography, central venous pressure, pulmonary artery pressure, monitoring of mechanical ventilator settings and patient compliance, monitoring of infusion devices and control of connections, monitoring of the ECMO cycle and all potential risks that this cycle may pose should be monitored^{7,26}. The central venous pressure value should be monitored between 5-10 mmHg. High blood pressure should be avoided to prevent blood haemolysis and mean arterial pressure should be lower than 50-70 mmHg in adults^{7,27,28}. After VA-ECMO support is established after cardiac arrest, moderate hypothermia (32- 36°C) should be maintained for the first 24-72 hours and normothermia at 37°C afterwards²⁹. Respiratory support mode, tidal volume, respiratory rate and Positive End Expiratory Pressure (PEEP) values should be monitored and recorded in patients under mechanical ventilator support. Airway patency and humidification of the supplied air should be ensured in intubated patients on mechanical ventilator. Patients receiving ECMO support for a long period of time are at risk of atelectasis because they are bedridden and frequently immobile⁷.

ECMO must be continuously connected to a power source and the nurse must carefully monitor the lights, connection cables and alarms indicating low power. Care should be taken against kinks, tensions and non-contacts that may occur in the connections that provide gas exchange of ECMO. Cannulas in the entire circuit should be checked for possible obstruction, clot formation and air bubbles. The nurse should also check the colour difference between the oxygenated blood sent to the patient and the oxygen-poor blood coming from the patient. The nurse should monitor the rotations per minute (RPM) value, which indicates the number of rotations per minute, as sudden drops in this value may be an indication of hypovolaemia and a kink or break in the cannula²⁶.

ECMO is a painful procedure because it is an invasive procedure using large cannulae. After cannulation, the patient should be monitored under sedation for the first 12-24 hours. Nurses should monitor the effect of the sedative agent in this process, evaluate the sedation level of the patient and determine the possible side effects of the drug. In case the patient has pain, pain control should be provided with non-pharmacological methods and appropriate pharmacological methods according to the physician's order^{7,29}.

If appropriate, the child should be fed enteral nutrition and nutritional tolerance should be monitored by residue control. However, if the child cannot tolerate nutrition, the child should be fed parenterally with total parenteral nutrition (TPN) solutions³⁰. If oral intake is not contraindicated, the patient should be fed with an appropriate diet. Early Career Faculty The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends that parenteral nutrition should be started within 24-48 hours if enteral nutrition is not tolerated or contraindicated in all patients who are not expected to start oral intake within three days³¹.

Complete blood count, C-reactive protein (CRP), electrolytes, calcium, glucose, blood urea nitrogen (BUN), creatinine should be monitored and the relevant physician should

be informed immediately in case of any complication. In accordance with the physician's order, 2 units of erythrocyte suspension and fresh frozen plasma suspension should be kept ready for the child³⁰. Activated Coagulation Time (ACT) value should be checked every 2 hours within the first 12-24 hours after the start of ECMO application in order to detect coagulation-related complications in the early period, and Activated Partial Prothrombin Time (aPTT) value should be checked every 6 hours when ACT value stabilises after 24 hours. In addition, intravenous (IV) therapies other than heparin should be administered from the venous side of the ECMO circulation. During the procedure, the necessary treatments should be prepared and administered according to the physician's order, and appropriate procedures should be prepared for the awakening of the child in the process of leaving the procedure³⁰⁻³².

Continuous contact of the cannulas with the skin and patients staying in the same position for a long time due to the cannulas increase the risk of pressure injury. In a study, the rate of pressure injury in these patients was reported as 41-65%³³. A sufficient number of experienced nurses and personnel must be available in the positioning process²⁸. Since frequent position changes cannot be performed, it is more appropriate to use an air mattress. Infection and heparin infusion may accelerate skin erosion or facilitate haematoma formation. Oedema, especially in children with heart failure, is also a condition that should be monitored in terms of pressure sores. Oedema and the pressure created by the cannulas can easily lead to pressure sores. In addition, cannulas should be fixed with hydrocolloid-structured tools that can adhere to the skin, as cannulas may cause device-related pressure injury²⁶. Care should be taken about desaturation, hypertension, tachycardia, changes in ECMO flow during skin care procedures³³.

Patient and family education is an essential component of ECMO care. During the ECMO treatment process, families often experience significant emotional stress and uncertainty. Providing clear and understandable information about the treatment process, expected outcomes, and possible complications can help reduce families' anxiety levels and strengthen collaboration with the healthcare team. The education process should also include information about post-discharge care, rehabilitation, and long-term follow-up requirements. In addition, psychological support and family-centered care approaches play an important role in helping patients and their families adapt to the treatment process during and after ECMO therapy.

Withdrawal from ECMO

Recovery of arterial pulse pressure, decrease in the need for catecholamine infusion and improvement in myocardial function on echocardiography are necessary indicators for weaning from ECMO³⁴. Weaning should be performed at 48-72 hours and ECMO blood flow should be decreased slowly. During the weaning phase, the ECMO flow rate is usually reduced from 60-250 ml/kg/min to 25-40 ml/kg/min within hours³⁵. Arterial and venous lines are closed with a clamp and anticoagulant is given every 15-20 minutes until the child is stabilised³⁶. In order to ensure compliance with the weaning procedure, the child is usually kept awake and expected to perform his/her own respiration. This

approach has recently become the standard protocol of many centres. Although sedation policies may vary from centre to centre, the use of muscle relaxants is rarely needed in ECMO patients^{37,38}. During the weaning process, cardiac inotropic support such as dopamine is increased to the appropriate dose and ventilatory support is optimised³⁶. The amount of oxygen in the blood travelling to the coronary arteries can be increased with moderate ventilator support. For ventilator support, the fractional oxygen amount is adjusted as 40%, respiratory rate 16/min, PEEP 3-5 cm H₂O and tidal volume 10 cc/kg¹². After six hours of haemodynamic stabilisation, the child is weaned from ECMO cannulation. However, chest closure is performed later³⁶.

After successful weaning from ECMO, patients should be closely monitored due to the risk of long-term complications. These complications may include neurological deficits, impaired pulmonary function, and reduced functional capacity. Early rehabilitation, respiratory physiotherapy, and multidisciplinary follow-up programs are recommended to support the recovery process and improve quality of life. Because ECMO support may affect neurodevelopmental outcomes, long-term follow-up is particularly important in pediatric patients^{39,40}.

Conclusion

In Türkiye, ECMO services have been increasingly implemented in tertiary care centers, particularly in pediatric and cardiovascular intensive care units. The implementation of ECMO requires coordinated multidisciplinary teamwork. Nurses play a central role in managing patient care both in intensive care units and in clinical settings, as well as in the post-discharge follow-up period at home. High-quality nursing care for patients on ECMO is crucial for preventing, recognizing, and managing potential complications early, and for enhancing patient outcomes and quality of life after discharge.

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Neonatal Testicular Hemangioma: Nursing Care and Multidisciplinary Follow-Up Process After Delayed Diagnosis: A Case Report

Gülçin GÖKÇENUR KARATAŞ*

Abstract

This case report aims to describe the treatment and nursing care process of a newborn diagnosed with testicular hemangioma. Although no anomalies were detected at birth, redness appeared in the scrotal area 15 days later. Due to the initial failure to establish the correct diagnosis, the infant received inappropriate treatment, which led to impaired skin integrity and various complications. After the correct diagnosis was confirmed, a nursing care plan was developed and implemented using Gordon's Functional Health Patterns Model, with nursing diagnoses formulated according to NANDA-I. The care plan focused on areas such as health perception, skin condition, nutrition, cognitive awareness, and coping with stress. The care process continued until the child reached the age of nine, and the patient's current status was evaluated. Throughout the process, the family received education and psychological support, and complications were successfully prevented. This case highlights the importance of a holistic approach in nursing care that addresses not only physical needs but also emotional and social aspects. It also emphasizes the critical role of early diagnosis and appropriate treatment in preventing complications.

Keywords: Neonatal, testicular hemangioma, nursing care.

Neonatal Testiküler Hemanjiyom: Gecikmiş Tanı Sonrası Hemşirelik Bakımı ve Multidisipliner İzlem Süreci: Bir Olgu Sunumu

Öz

Bu olgu sunumu, testiküler hemanjiyom tanısı alan bir yenidoğanın tedavi ve hemşirelik bakım sürecini tanımlamak amacıyla hazırlanmıştır. Doğumda herhangi bir anomali saptanmamış olmakla birlikte, doğumdan 15 gün sonra skrotal bölgede kızarıklık ortaya çıkmıştır. Başlangıçta doğru tanının konulamaması nedeniyle yenidoğana uygunsuz tedaviler uygulanmış, bu durum deri bütünlüğünün bozulmasına ve çeşitli komplikasyonların gelişmesine yol açmıştır. Doğru tanının doğrulanmasının ardından hemşirelik bakımı, Gordon'un Fonksiyonel Sağlık Örüntüleri Modeli temel alınarak ve NANDA-I hemşirelik tanıları doğrultusunda planlanmış ve uygulanmıştır. Uygulanan bakım planında sağlık algısı, cilt durumu, beslenme, bilişsel farkındalık ve stresle başa çıkma gibi alanlara odaklanılmıştır. Bakım süreci hastanın 9 yaşına kadar devam etmiş ve son durumu değerlendirilmiştir. Aileye bakım süreci boyunca eğitim ve psikolojik destek sağlanmış, komplikasyonlar önlenmiştir. Bu olgu, hemşirelik bakımının sadece fiziksel değil, duygusal ve sosyal ihtiyaçları da kapsayacak şekilde bütüncül olarak ele alınmasının önemini ortaya koymaktadır. Ayrıca, erken tanı ve doğru tedavinin komplikasyonları önlemede kritik rol oynadığı vurgulanmaktadır.

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ETHICAL STATEMENT: Informed consent was obtained from the participants in accordance with the Declaration of Helsinki. The study has not been published elsewhere.

Anahtar Sözcükler: Yenidoğan, testiküler hemanjiyom, hemşirelik bakımı.

Introduction

Testicular hemangiomas are rare, benign vascular tumors typically detected in the neonatal period and often asymptomatic. In some cases, symptoms like scrotal swelling, discoloration, and pain may occur¹. While congenital vascular anomalies are more common in the skin, liver, and central nervous system (CNS) among pediatric patients, testicular involvement is exceptionally rare, with few cases reported². Diagnosis usually involves physical examination, ultrasonography, Doppler imaging, and occasionally biopsy. Management is often observational, but corticosteroids or surgery may be required if rapid growth or complications arise³. Alongside medical treatment, nursing care, education for families, psychosocial support, and long-term monitoring are vital.

Scrotal and testicular hemangiomas are extremely rare benign vascular tumors. While the incidence of infantile hemangiomas in the general neonatal population is approximately 1–3%, genital hemangiomas represent only about 2% of all cases, and scrotal or testicular involvement is exceptionally uncommon. To date, there are no population-based incidence data available, including from Western countries, and current knowledge is largely derived from isolated case reports and small case series. A review of the literature indicates that approximately 50–60 cases of scrotal and/or testicular hemangiomas have been reported worldwide, underscoring the rarity of this condition and the lack of reliable epidemiological data. The definitive treatment for scrotal hemangiomas is complete surgical excision, which allows for histopathological confirmation and effectively prevents potential complications such as bleeding, ulceration, infection, and pain; thus, surgery is considered the gold standard approach in the management of these lesions. Literature suggests that testicular hemangiomas can regress spontaneously, though some may progress, causing complications such as ulceration and skin changes. Early diagnosis and appropriate care are therefore crucial to preventing adverse outcomes⁴⁻⁷. This report presents a newborn with no initial anomalies who developed scrotal hyperemia and swelling by day 15. Misdiagnosis led to improper treatment and skin damage. Following the correct diagnosis, nursing care was structured using Gordon's Functional Health Patterns Model and supported by NANDA-I nursing diagnoses⁴, addressing health perception and health management, skin integrity, nutritional–metabolic status, cognitive–perceptual functioning, and coping–stress tolerance. Support and education were provided to the family, and care continued through age nine with long-term outcomes monitored. The case underscores the importance of early, accurate diagnosis and comprehensive nursing care in managing rare pediatric vascular tumors, offering guidance for clinical practice.

Nursing Care and Gordon's Functional Health Patterns Model

Comprehensive assessment in nursing is key to delivering quality, individualized care. Marjory Gordon's Functional Health Patterns Model supports a holistic evaluation of

individuals across physiological, psychological, sociocultural, and spiritual dimensions⁵. 11 patterns, the model guides nurses in data collection, diagnosis, care planning, and outcome evaluation⁶. For example, the Nutrition–Metabolism pattern covers intake and hydration, while the Coping–Stress Tolerance pattern addresses stress responses and coping resources⁷. This approach enables nurses to assess health issues beyond physical symptoms, promoting person-centered care⁸.

Table 1. Gordon’s 11 functional health patterns⁵⁻¹⁰

No	Health Pattern	Content and Assessment Area
1	Health Perception and Management	Individual’s perception of health, health behaviors, and use of health services
2	Nutrition – Metabolism	Daily intake of food and fluids, weight status, skin integrity
3	Elimination	Bowel, bladder, and sweating patterns
4	Activity – Exercise	Daily living activities, exercise level
5	Sleep and rest patterns	Sleep patterns and quality
6	Cognitive – Perceptual	Memory, perception, decision-making, pain sensation
7	Self-Perception – Self-Concept	Identity, body image, self-esteem
8	Role – Relationships	Family, social roles, relationships
9	Sexuality–Reproduction	Sexual function, fertility
10	Coping – Stress Management	Stressors and coping mechanisms
11	Values – Beliefs	Belief system, purpose of life, cultural values

This table provides a detailed framework for nursing care. Nursing approaches are important for informing the family, providing psychological support, and promoting adherence to treatment.

Case History

A male infant was born on June 23, 2015, at 38 weeks of gestation with a birth weight of 3800 grams. No abnormalities were observed in the testicular region at birth. However, two weeks postpartum, the parents noticed redness and swelling in the scrotal area and consulted the pediatric clinic. Physical examination revealed scrotal hyperemia without any palpable mass. Despite evaluations by pediatrics, pediatric surgery, and urology departments, no definitive diagnosis was made, and topical medications for presumed skin irritation were prescribed.

The applied treatments led to deterioration of skin integrity, resulting in erythema, exudation, and bleeding. The infant exhibited persistent crying due to severe discomfort, particularly during urination. As symptoms progressed and the risk of secondary infection increased, the infant was hospitalized. Laboratory results were within normal limits, and Doppler ultrasonography confirmed the diagnosis of testicular hemangioma.

Figure 1. Hemangioma lesion developing on the scrotum on day 15 after birth



Initial treatment was inappropriate due to insufficient clinical awareness of hemangiomas. After the correct diagnosis was made, nursing care and medical management were revised accordingly. The family received education on hygiene, trauma prevention, and bleeding risks associated with the lesion.

The infant was placed under regular follow-up. Now 9 years old, the patient is monitored annually. Although no significant regression of the hemangioma has occurred, complications have been successfully prevented through appropriate care and follow-up. Parental education regarding the long-term nature of the condition continues.

Figure 2. Hemangioma lesion progression at age 9



In this case, nursing management was evaluated using Nursing care was planned and implemented based on Gordon's Functional Health Patterns Model and the nursing process, using standardized nursing diagnoses and interventions in accordance with NANDA-I, NIC, and NOC classifications. Gordon's Functional Health Patterns Model provides a holistic framework that considers the health status of both the patient and the family by addressing physical, emotional, cognitive, and social functions, while NANDA-I nursing diagnoses offer a standardized and systematic approach for identifying patient- and family-centered care needs¹¹⁻¹³.

In this context, nursing care is explained through the assessment areas outlined in Table 2.

Table 2. Nursing Care Plan According to Gordon's Functional Health Patterns Model¹¹⁻

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Gordon's Functional Health Pattern	Nursing Diagnosis (NANDA)	Defining Characteristics / Risk Factors	Goals / Expected Outcomes	Nursing Interventions (NIC)	Evaluation (NOC)
Immunity and Skin Integrity	Impaired skin integrity	Erythema, exudation, bleeding in the scrotal area; history of inappropriate topical treatment	To maintain skin integrity and prevent secondary infection	- Assessed the scrotal area each shift for redness, exudation, bleeding, and signs of infection - Increased frequency of diaper changes to prevent trauma - Performed appropriate wound and skin care according to physician orders - Educated parents on proper scrotal care at home	- No progression of skin breakdown observed - No secondary infection developed
Cognitive–Perceptual Pattern	Acute pain	Persistent crying, increased discomfort during urination, sensitivity in the scrotal area	To reduce pain and increase infant comfort	- Assessed pain using observational neonatal pain scales - Used gentle handling during care procedures - Monitored prescribed analgesic therapy - Educated parents on comforting and positioning techniques	- Decreased frequency and intensity of crying - Improved comfort during care
Health Perception and Health Management	Risk for infection	Open lesion in the scrotal area; immature immune system of the newborn	To prevent the development of infection	- Monitored vital signs and laboratory findings - Maintained strict aseptic techniques during care - Educated parents about signs of infection - Reported suspicious findings promptly to the physician	No signs of infection during hospitalization
Coping and Stress Tolerance	Anxiety (parents)	Rare diagnosis, delayed diagnosis, fear of bleeding and long-term complications	To reduce parental anxiety and promote effective coping	- Encouraged parents to express fears and concerns - Provided clear information about the benign nature and prognosis of hemangioma - Answered questions and corrected misconceptions - Referred parents for psychological support when needed	- Reduced parental anxiety levels - Increased parental participation in care
Health Perception and Health Management	Deficient knowledge (parents)	Limited knowledge about testicular hemangioma and home care	To improve parents' knowledge and caregiving skills	- Educated parents about the nature, course, and possible complications of hemangioma - Provided instruction on home care, hygiene, trauma prevention, and bleeding management - Emphasized the importance of long-term follow-up	- Parents correctly verbalized care instructions - Appropriate home care practices maintained

Nursing care was planned and implemented in accordance with Gordon's Functional Health Patterns Model and the nursing process, including the stages of assessment, nursing diagnosis, planning, implementation, and evaluation^{11,12}.

During the assessment phase, data related to the newborn and the family were collected through clinical observation, physical examination, family interviews, and review of medical records¹². Particular attention was given to the presence of erythema, exudation, and bleeding in the scrotal area, as well as signs of discomfort such as persistent crying. Laboratory findings were within normal limits, and the diagnosis of testicular hemangioma was confirmed by Doppler ultrasonography. The family's level of knowledge, emotional responses, and coping ability were also assessed, revealing increased parental anxiety due to the rarity of the condition and delayed diagnosis. Based on the collected data, the nursing diagnosis stage identified impaired skin integrity, acute pain, risk for infection, parental anxiety, and deficient knowledge in parents, in line with NANDA-I nursing diagnoses. In the planning phase, individualized and measurable goals were established to maintain skin integrity, reduce pain, prevent infection, decrease parental anxiety, and enhance parental knowledge and participation in care. Nursing care was designed to support both the infant's comfort and the family's adaptation to the long-term management of the condition^{12,13}.

During the implementation phase, the scrotal area was regularly assessed, and appropriate skin and wound care were provided, with careful attention to preventing trauma during diaper changes. Pain indicators were closely monitored, and comfort-enhancing measures were applied. Strict aseptic principles were followed to minimize infection risk. In addition, parents received education regarding the nature of testicular hemangioma, home care practices, bleeding precautions, and the importance of long-term follow-up. Psychosocial support was also provided to address parental anxiety¹⁴.

In the evaluation phase, the effectiveness of nursing interventions was continuously assessed. No progression of skin breakdown or secondary infection was observed, the infant's discomfort and crying decreased, and parents demonstrated reduced anxiety and improved engagement in the care process. Parents were able to correctly describe and apply home care practices¹⁵.

In general, the nursing care process guided by Gordon's Functional Health Patterns Model enabled comprehensive, patient- and family-centered care¹⁶, contributing to the prevention of complications, improved infant comfort, and strengthened parental coping and caregiving competence.

Conclusion

Testicular hemangiomas are among the rare cases seen in the neonatal period. These hemangiomas are generally classified as benign vascular tumors. Although they can be present at birth or develop shortly after, delayed diagnosis and incorrect treatments can lead to complications⁹. As in this case, early diagnosis and appropriate treatment of

testicular hemangioma are considered crucial and important for improving the patient's prognosis.

The literature indicates that testicular hemangiomas are usually asymptomatic. Some hemangiomas may regress with age, while others may progress, causing complications such as scrotal skin changes, ulceration, and bleeding¹⁰. These complications can complicate the care and treatment process for patients. Early and accurate diagnosis, as demonstrated in this case report, is therefore very important. In our case, delayed diagnosis resulted in delayed initiation of proper care and treatment, and the use of incorrect pharmacological treatments caused disruption of skin integrity.

The patient and family went through difficult times due to the incorrect treatment applied to the infant. In this context, misdiagnoses and inappropriate treatments in some cases negatively affect the healing process². Furthermore, it is emphasized that treatment of testicular hemangiomas should be closely monitored with physician and nurse supervision and managed under observation³.

Gordon's Functional Health Patterns Model enables nurses to provide effective care in rare cases such as testicular hemangioma by holistically evaluating physical, psychological, and social dimensions.

The use of this model in clinical practice supports structured nursing assessment, facilitates early identification of complications, and contributes to the development of individualized and evidence-based care plans^{9,11}. From a practical standpoint, this case underscores the importance of increasing awareness among healthcare professionals, particularly nurses working in neonatal and pediatric settings, regarding rare vascular lesions such as testicular hemangioma¹⁶. Early recognition of atypical scrotal findings, timely referral, and avoidance of unnecessary or inappropriate treatments are critical to preventing complications and improving outcomes. In addition, integrating standardized nursing assessment models into routine neonatal care can help protect skin integrity, reduce the risk of secondary complications, and support holistic patient management¹⁷. Furthermore, close interdisciplinary collaboration and continuous follow-up involving physicians and nurses are essential for monitoring lesion progression, guiding timely treatment decisions, and minimizing the physical and psychological burden on both the infant and the family¹⁸⁻²⁰. These practice-oriented implications highlight the value of structured nursing care and coordinated clinical management in rare neonatal conditions.

This case highlights the importance of structured and systematic nursing assessments in neonatal care. Nurses working in neonatal and pediatric settings should incorporate standardized assessment models, such as Gordon's Functional Health Patterns, into routine practice to support early recognition of atypical findings and prevent secondary complications. Increased clinical awareness of rare vascular lesions, careful skin and scrotal assessment, timely interdisciplinary referral, and avoidance of unnecessary interventions are essential components of effective nursing care. In addition, close collaboration between nurses and physicians, ongoing follow-up, and family-centered

education play a critical role in optimizing clinical outcomes and reducing both physical and psychological burden for the infant and family.

In similar cases of neonatal hemangioma, nursing practices should prioritize systematic skin and scrotal assessment at each shift to ensure early detection of lesion progression or complications. Nursing care plans should be structured to address risks such as compromised skin integrity, infection, pain, and stress responses, while also considering the psychosocial impact on the infant and family. Regular monitoring, accurate documentation, and timely referral to relevant specialties are crucial to avoid delayed diagnosis and unnecessary interventions.

Nursing interventions should also actively involve parents in daily care by providing clear guidance on lesion observation, warning signs, and follow-up requirements. Emotional support and reassurance should be integrated into routine care to reduce parental anxiety and improve coping. Additionally, close interdisciplinary collaboration and continuity of follow-up are recommended to support timely clinical decision-making, optimize outcomes, and ensure holistic, family-centered care in neonatal settings.

Ethical Considerations

Informed consent was obtained from the patient's relative after explaining the purpose of the study. It was clearly stated that participation in the research was entirely voluntary, and permission was granted accordingly.

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 - The abbreviations used in the article should be stated clearly where it is used for the first time and their abbreviations should be indicated between parantheses and specific abbreviations should not be used.
 - The first letters of the main titles should be capital, bold and center aligned.
 - The first letters of the sub titles should be capital, bold and left aligned.
 - Paragraph indentation should not be used.
- 3) The submission process of the article and its appendices should be carried out through DergiPark online article submission system at the address of <http://igusabder.gelisim.edu.tr> or <https://dergipark.org.tr/en/pub/igusabder>. During the submission, the authors should upload the figures of the manuscript to the online manuscript submission system. First of all, if the manuscript is accepted for publication, the copyright transfer agreement form signed by all the authors should be sent to the editorial office. **“Ethical Statement and Copyright Transfer Form”** should be signed by all authors and should be loaded to the system. Studies that requiring ethics committee approval, the **“Ethics Committee Approval Document”** should also be uploaded to the system. If the article is not accepted, the related forms will be invalid. In case the article is not accepted, related form will be invalid.
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- 5) Authors should indicate the institution, date and approval number they have received in the **Ethics Committee Approval** required for the article they wish to publish, at the end of the Discussion section of the Materials and Methods section. Statement of **“Informed Volunteer Consent/Approval Form”** to participants should be included at the end of the discussion section in statements such as conflicts of interest, thanks, supporting organizations and case reports. This information should be written in text language.

6) For all articles, Turkish and English abstracts

- Should be no more than 400 words and they should be written with at least 3 keywords.
- Only the first letter of the first key word should be capital, the other key words should be written with small letters with comas between them.
- Key words in English and Turkish should be selected in accordance with the Turkish Scientific Terms. Accessed from (<http://www.bilinterimleri.com/>).
- The necessary changes recommended for authors who do not have access to the Turkish Scientific Database are made by the Editorial Office.

7) ARTICLE TYPES

7.1. Original Research Articles: Original (full-length) Articles are original and proper scientific papers based on sufficient scientific research, observations and experiments. Articles should consist of title, abstract and keywords in Turkish and title, abstract and keywords in English as well as Introduction, Material & Methods, Results, Discussion, Conclusion and References parts. Also it should not exceed 12 pages except in exceptional circumstances (including text, tables and illustrations). There is no limit for the number of references.

The abstract should include the aim, method, results and the conclusion and it should be written accordingly with the example given below.

Example:

Abstract

Aim: The research has been made descriptively in order to determine the levels of the communication skills and the related variables.

Method: The universe of the research consists of 1116 students at the School of Health Sciences of a private university. In the research the universe has not been selected and the universe consists of 615 students that has accepted to join the research. The information form and communication skills scale has been used to collect the data. The data has been evaluated with the SPSS programme.

Results: According to the research findings, the communication skills scale score average is 156.1 ± 13.5 . When the relationship between the sociodemographic characteristics and the communication skills scale and the sub dimensions score average is analyzed, in women behavioral sub dimension score average is higher at students that have taken a theoretical education about communication ($p < 0.05$). The communication skills scale of the students' whose father's education levels are literate is higher ($p < 0.05$)

Conclusion: As a result of the research it has been determined that the communication skills score average is at medium level and it can be suggested that more lessons about communication skills should be given at all departments of the School of Health Sciences.

Keywords: Health, student, communication.

Örnek:

Öz

Amaç: Araştırma, Sağlık Bilimleri Yüksekokulu öğrencilerinin iletişim becerileri düzeylerini ve ilişkili değişkenleri belirlemek amacıyla tanımlayıcı olarak yapılmıştır.

Yöntem: Araştırmanın evrenini, İstanbul'da bulunan bir özel üniversitenin Sağlık Bilimleri Yüksekokulu'nda öğrenim gören 1116 öğrenci oluşturmuştur. Araştırmada örneklem seçimine gidilmeksizin çalışmaya katılmayı kabul eden 615 öğrenci çalışma kapsamına alınmıştır. Verilerin toplanmasında, Bilgi Formu ve İletişim Becerileri Ölçeği kullanılmıştır. Veriler SPSS programı ile değerlendirilmiştir.

Bulgular: Araştırma bulgularına göre; iletişim becerileri ölçeği puan ortalaması 156,1±13,5 bulunmuştur. Öğrencilerin sosyodemografik özellikleri ile iletişim becerileri ölçeği ve alt boyutlarının puan ortalamaları ilişkisi değerlendirildiğinde; kadınlarda, odyoloji bölümünde okuyanlarda ve iletişim ile ilgili teorik eğitim alanlarda davranışsal alt boyutu puan ortalaması daha yüksek bulunmuştur ($p<0,05$). Baba eğitim düzeyi okuryazar olan öğrencilerin iletişim becerileri ölçeği puan ortalaması daha yüksek bulunmuştur ($p<0,05$).

Sonuç: Araştırma sonucunda iletişim becerileri puan ortalaması orta düzeyde olduğu saptanmış olup, iletişim becerilerinin daha da geliştirilebilmesi için Sağlık Bilimleri Yüksekokulunun tüm bölümlerinde iletişim becerileri ile ilgili derslere daha fazla yer verilmesinin faydalı olacağı düşünülmektedir.

Anahtar Sözcükler: Sağlık, öğrenci, iletişim.

7.2. Case Report: These are the articles that describe rare significant findings encountered in the application, clinic and laboratory of related fields. The reports should include the sections of Introduction, Case History, Conclusion and References and they should not exceed 6 pages. It should be declared that the "Informed Volunteer Consent / Approval Form" was signed at the end of the discussion section.

7.3. Review: These are original articles that the author reviews a current and significant subject through the results that the author obtains from his/her own point of view and research. The reviews should include the sections of Introduction, Conclusion and Suggestions and References and they should not exceed 12 pages.

- 8) Author/Authors' e-mail addresses, institutional information, ORCID information, main text file must be included as footnotes on the first page and added to relevant places in the system during online application. In addition, in research articles -as in the example- ETHICAL STATEMENT note should be included in this part. The language of the information must be the same as the language of the article. Here is an example of how the format of this information is:

(Original Research Article)

Received: & /Accepted:

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ORCID <https://orcid.org/.....>

** Prof. Dr., Kırıkkale University, Faculty of Arts and Sciences, Department of Biology, Kırıkkale, Türkiye. E-mail: **ORCID** <https://orcid.org/.....>

ETHICAL STATEMENT: This study was carried out with the approval of the Ethics Committee of University, dated .../.../..... and numbered A signed subject consent form in accordance with the Declaration of Helsinki was obtained from each participant.

- 9) The necessary descriptive information about article (thesis, project, financial supports etc.) should be explained as footnote in article title.

- 10)** If cited in the text, it should be numbered as superscript. Also, References should be listed with numerical order as they appear in the text and the reference number should be indicated inside the parentheses at the cited text place. (For instance..... has been found¹.)

References should be written by using **Journal of American Medical Association** (JAMA Citation Style). This information can be accessed from the links below.
http://guides.med.ucf.edu/ld.php?content_id=5191991
<https://med.fsu.edu/userFiles/file/AmericanMedicalAssociationStyleJAMA.pdf>

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11.1.2. More than one author (List all authors if six or less, otherwise list three followed by "et al" or "ve ark")	Author(s) last name Author(s)' first initials separated by commas. <i>Title of Book</i>. Place of publication: Publisher; year. Tayfur M, Barış O, Nazan Baştaş N. <i>Diyetisyenlik Eğitimi ve Meslek Etiği</i>. 2. baskı. Ankara: Hatiboğlu Yayınevi; 2014. Shils M, Shike M, Olson J, Ross AC. <i>Modern Nutrition in Health and Disease</i>. 9th ed. Baltimore: Lippincott Williams & Wilkins, 1998.
11.1.3. Edited book	Author(s) last name Author(s)' first initials, ed(s). <i>Title of Book</i>. Edition number. Place of publication: Publisher; year. Norman IJ, ed. <i>Mental Health Care for Elderly People</i>. New York: Churchill Livingstone; 1996.

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Author(s) last name Author(s)'s first initials. Article title. Journal Title. Year;volume(issue):Inclusive page numbers.(List all authors if six or less, otherwise list three followed by "et al" or "ve ark") Sevinç S, Yavaş Çelik M. Akriba evliliklerinin çocuk sağlığına etkisi ve hemşirelik yaklaşımı. <i>Sağlık ve Toplum</i>. 2016;2:23-28. Nabavi SM, Habtemariam S, Daglia M, et al. Neuroprotective effects of ginkgolide B against ischemic stroke: a review of current literature. <i>Curr Top Med Chem</i>. 2015;15(21):2222-2232

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11.3.4. Web pages	Author(s) or responsible body. Title of item cited. Name of website. URL. Published date. Updated date. Accessed date. World Health Organization. Philippines: Assistance and response after Typhoon Haiyan. World Health Organization. http://www.who.int/features/2013/philippinestypoonhaiyan/en/index.html. Published November 2013. Accessed November 22, 2013.

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11.4.1. Thesis	Author last name Author's first initials. Title of Thesis. [type of thesis]. Name of the place where the thesis was made, Name of the country: Name of the department, Name of the Institute; year. Undeman C. Fully Automatic Segmentation of MRI Brain Images [master's thesis]. Stockholm, Sweden: NADA, Royal Institute of Technology;2001.
11.4.2. Conference paper	Author(s) last name Author(s)' first initials. Title of conference paper. In: Title of conference; Day month, year; Name of the place where the conference was made, Name of the country. Bengtsson S, Solheim BG. Enforcement of data protection, privacy and security in medical informatics. In: Proceedings of the 7th World Congress on Medical Informatics; Sep 6-10, 1992; Geneva, Switzerland. Abstract 209.
11.4.3. Newspaper article	Author(s) last name Author(s)' first initials. Title of newspaper article. Name of the newspaper. Day month, year. Lee G. Hospitalizations tied to ozone pollution: study estimates 50,000 admissions annually. <i>The Washington Post</i>. Jun 21, 2006:A3.

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