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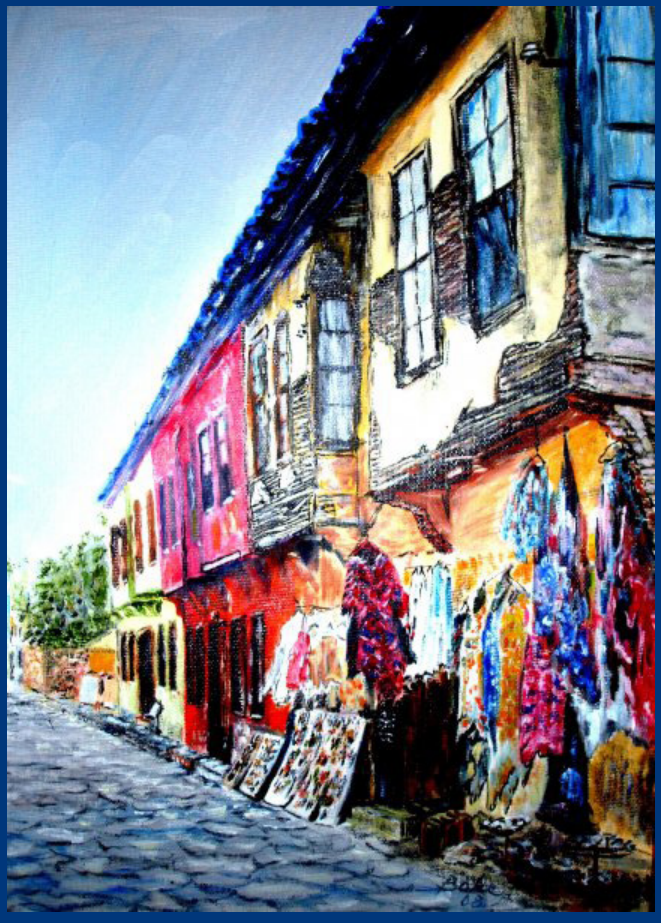

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An Examination of Five-Year Community-Based Breast Cancer Screening Results: A Retrospective Descriptive Study

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ABSTRACT

Purpose: Breast cancer is the most common type of cancer in women. The success of treatment is directly related to early detection. The importance of screening programs is significant in achieving early detection. This study aimed to examine the five-year community-based breast cancer screening results.

Methods: The study is a retrospective descriptive study. The data were obtained by analyzing the 2018 and 2022 records of the Cancer Early Diagnosis, Screening, and Education Center, where community-based screenings are conducted. According to the breast cancer screening results performed in five years, mammography results in line with BI-RADS (Breast Imaging Reporting and Dated System) scoring, women's age, and the number of women screened by year were examined.

Results: The rates of reaching the target population between the years 2018 and 2022 were 5.6%, 5.7%, 1.7%, 3.1%, and 7%, respectively. Over this five-year period, it was observed that 4.6% of the target population was reached on average. The number of women screened in 2020 and 2021 was lower compared to other years. The analysis of the distribution of mammography results across the years showed that the majority of reports were classified as BI-RADS 1-2 (94.7%, 95.7%, 91.5%, 93.6%, and 93.2%, respectively). A significant difference was observed in the age distribution of women based on the BI-RADS scoring ($F=31.918$; $P<0.001$).

Conclusion: The rate of reaching the target population over the five-year period was found to be quite low. It is essential to enhance both the quantity and quality of awareness programs conducted by public health nurses level to increase women's participation in the screening program.

Keywords: Breast cancer; cancer screening; woman

ÖZET

Amaç: Meme kanseri kadınlarda en sık görülen kanser türüdür. Tedavinin başarısı erken tanı ile doğru orantılıdır. Erken tanıda tarama programlarının önemi büyüktür. Bu çalışmada beş yıllık toplum tabanlı meme kanseri tarama sonuçlarının incelenmesi amaçlandı.

Yöntemler: Bu çalışma retrospektif tanımlayıcı bir çalışmadır. Veriler toplum tabanlı taramaların gerçekleştirildiği Kanser Erken Teşhis Tarama ve Eğitim Merkezi 2018-2022 kayıtlarının incelenmesi ile elde edildi. Beş yılda gerçekleştirilen meme kanseri tarama sonuçlarına göre BI-RADS (Breast Imaging Reporting and Dated System) skorlaması doğrultusundaki mamografi sonuçları, kadınların yaşı, yıllara göre tarama yapılan kadın sayısı incelendi.

Bulgular: Yıllara göre hedef nüfusa ulaşma oranı sırasıyla %5,6, %5,7, %1,7, %3,1, %7'dir. Beş yıllık süreçte hedef nüfusun %4,6'sına ulaşıldığı görüldü. 2020 ve 2021 yıllarında tarama yapılan kadın sayısı diğer yıllara göre daha düşüktü. Yıllara göre mamografi sonuçlarının dağılımı incelendiğinde her yıl (sırasıyla %94,7, %95,7, %91,5, %93,6, %93,2) için en çok BI-RADS 1-2 şeklinde raporlandığı tespit edildi. BI-RADS skorlamasına göre kadınların yaş dağılımının farklılık gösterdiği belirlendi ($F=31,918$; $P<0,001$).

Sonuç: Beş yıllık süreçte hedef nüfusa ulaşma oranı oldukça düşüktür. Tarama programına kadınların katılımının arttırılması için halk sağlığı hemşireleri toplumu bilinçlendirme programlarının hem nicel hem niteliğini arttırması gerekmektedir.

Anahtar Kelimeler: Meme kanseri; kanser taraması; kadın

According to the World Health Organization's 2020 cancer statistics, breast cancer is the most frequently diagnosed cancer in women, and 6.9% of cancer-related deaths are attributed to breast cancer (1). It is reported that in 2020, there were 2.3 million women diagnosed with breast cancer worldwide, and 685 000 deaths were attributed to breast cancer (2). In Turkey, according to the cancer statistics for the year 2018 published by the Ministry of Health in 2021, one in every four cancer cases in women is breast cancer. Within one year, a total of 24 518 women were diagnosed with breast cancer (3). Breast cancer ranks highest among cancer-related deaths in women in our country. Early detection can reduce breast cancer-related deaths (4). Screening programs play a vital role in early detection (5). Community-based breast cancer screening programs have been shown to reduce the specific mortality rate of breast cancer by enabling early detection (6).

Mammography is used for breast cancer screening in community-based programs. The frequency of screening and the target age group vary among countries. In Australia, mammography is performed every two years starting from the age of 40, and annual screening is targeted for women aged between 50 and 74 years. In Brazil, screening is conducted every two years for women aged between 50 and 69 years. In Canada, screening is performed by regional and provincial governments and varies between regions. Generally, women aged 50 to 74 years are screened every two years, while some programs offer screening for women aged between 40 and 49 years either yearly or every two years. In Germany, screening is done every two years for women aged between 50 and 69 years, while in Italy, screening is conducted every two years for women aged between 50 and 69 years, with annual screening for women aged between 45 and 49 years and screening every two years for women aged between 70 and 74 years. In the United States, the first mammography is done between the ages of 40 and 44 years, yearly for women aged between 45 and 54 years, and every two years or yearly for women aged 55 years and above (4).

In Turkey, breast cancer screenings are conducted through opportunistic and community-based screening, and the National Standards for Breast Cancer Screening Program state that "Screening will start at the age of 40 and end at the age of 69 in women (including ages 40 and 69). The target population to be screened should be defined based on individuals registered with family physicians, and screening should be repeated every two years using developed invitation methods" (7). Community-based screening is conducted at Cancer Early Diagnosis, Screening, and Education Centers (KETEM), while opportunistic screenings are performed at Level 2 and Level 3 hospitals. Mammography images are reported according to the American College of Radiology (ACR) BI-RADS criteria (8). Women are informed about their mammography results, and if the result is normal, they are invited for another mammography in two years. Women with BI-RADS Score 0, 4, and 5 are referred to higher-level centers for further evaluation (8, 9). The goal in cancer screenings is to reach 70% of the target population (10). However, it has been reported that this target is not fully achieved in our country (9). The aim of this study is to examine the five-year results of breast cancer screening. While there are studies examining breast cancer screening results for one or two years in the literature in our country, no studies evaluating the results over a five-year period have been found.

Material and Methods

Research Type

This is a retrospective descriptive study.

Population and Sample

The population of the study consisted of all women who underwent breast cancer screening in Afyonkarahisar province between January 1, 2018, and December 31, 2022. The study did not employ a sampling method, and all screening results were included in the study.

Procedure

The research was performed by conducting an archive search from the computer records in the Non-Communicable Diseases Unit of the Public Health Directorate, where community-based screening results are registered in the Public Health Management System (HSYS). Mammography results based on the BI-RADS (Breast Imaging Reporting and Data System) scoring system, age of women, and the number of women screened for each year between January 1, 2018, and December 31, 2022, were obtained from the records. To calculate the rate of reaching the target population, the population of women aged 40-69 in the province where the study was conducted was obtained from the publicly available records of the Turkish Statistical Institute (11). Mammography results are evaluated using the BI-RADS score categories. The explanations for this scoring system are provided below (12).

BI-RADS 0: Unclear assessment. Additional imaging evaluation is needed.

BI-RADS 1: Normal. Follow-up at regular intervals.

BI-RADS 2: Benign. Follow-up at regular intervals.

BI-RADS 3: Probably benign. Follow-up at short intervals.

BI-RADS 4: Suspicious abnormality. Biopsy should be considered.

BI-RADS 5: High probability of malignancy. Biopsy or surgical procedure should be performed.

BI-RADS 6: Histologically proven malignancy

Ethical Considerations

Ethical approval (Date/Number: 2023/174) was obtained from the ethical committee of a university. In addition, permission to access the records was obtained from the Provincial Health Directorate (E-40043106-604,01,02-213811022).

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 program. The number of women screened across the years, the rate of reaching the target population, the frequency and percentage values of the mammography results based on the BI-RADS classification, the mean age of screened women, and the mean standard deviation according to BI-RADS scoring were given. The age distribution of women based on the BI-RADS scoring was analyzed using the One-Way ANOVA test to determine if there were any differences. The Duncan test was used for multiple comparisons. The significance level was set at $P<0.05$.

Results

The mean age of women who underwent screening between the specified years is 51.16±7.75. Over the five-year period, a total of 29,547 women underwent breast cancer screening. The rate of reaching the target population each year was as follows: 5.6%, 5.7%, 1.7%, 3.1%, and 7%, respectively (Table 1). It was found that over the course of five years, only 4.6% of the target population was reached (Table 1).

Table1: Number of women screened by years, total population between the ages of 40-69 and the rate of reaching the target population

Year	Total population between the ages of 40-69	Number of women screened	The rate of reaching the target population
2018	122 682	6 898	5.6
2019	124 210	7 130	5.7
2020	126 892	2 096	1.7
2021	130 412	4 095	3.1
2022	132 799	9 328	7.0
Total	**636 995**	**29 547**	**4.6**

Upon analyzing the distribution of mammography results over the five-year period, it was evident that the majority of reports were consistently classified as BI-RADS 1-2 each year, with percentages of 94.7%, 95.7%, 91.5%, 93.6%, and 93.2%, respectively (Table 2). The rate of BI-RADS 4 scoring, which indicates suspicious abnormalities, ranged between 0.3% to 0.6%, while the rate of BI-RADS 5 scoring, indicating a high likelihood of malignancy, ranged between 0.1% to 0.3% (Table 2).

Table 2: Distribution of mammography results by years

Year	Age Mean±SD(Min-Max)	BI-RADS 0		BI-RADS 1-2		BI-RADS 4		BI-RADS 5	
		n	%	n	%	n	%	n	%
2018	51.08±7.74 (40-69)	325	4.7	6531	94.7	21	0.3	21	0.3
2019	51.06±7.64 (40-69)	264	3.7	6822	95.7	24	0.3	20	0.3
2020	50.22±7.44 (40-69)	163	7.8	1917	91.5	9	0.4	7	0.3
2021	51.06±7.85 (40-69)	221	5.4	3834	93.6	25	0.6	15	0.4
2022	51.55±7.85 (40-69)	560	6.0	8697	93.2	59	0.6	12	0.1

BI-RADS: Breast Imaging Reporting and Dated System

Based on the BI-RADS scoring, there is a significant difference in the age distribution of women (F=31.918; P<0.001). According to post hoc test analysis, the average age of women reported as BI-RADS 5 is different from BI-RADS 0, BI-RADS 1-2 and BI-RADS 4. The average age of women reported as BI-RADS 4 is different from BI-RADS 0, BI-RADS 1-2 and BI-RADS 5. The average age of women reported as BI-RADS 1-2 is different from BI-RADS 0, BI-RADS 4 and BI-RADS 5. The average age of women reported as BI-RADS 0 is different from BI-RADS 1-2, BI-RADS 4 ve BI-RADS 5. The mean age of women with a mammography result reported as BI-RADS 5 was found to be higher than those with BI-RADS 4, BI-RADS 1-2 and BI-RADS 0 results (Table 3).

Table 3: The Age Distribution of Women According to BI-RADS Scoring

BIRADS scoring result	n	Mean±SD	F/P
BI-RADS 0	1533	49.61±7.72[a]	**31.918; P<0.001**
BI-RADS 1-2	27801	51.22±7.74[b]	
BI-RADS 4	138	53.33±8.38[c]	
BI-RADS 5	75	55.27±8.15[d]	

[a,b,c,d] Means of groups followed by different letters differ; BI-RADS: Breast Imaging Reporting and Dated System

Discussion

Community-based cancer screening programs are crucial for early diagnosis. The success of a screening program is associated with the number of individuals reached during the screening process. In this study, we aimed to examine the results of breast cancer screening conducted within the scope of community-based screening program between 2018 and 2022.

The analysis of the rates of reaching the target population over the past five years showed that the rate has been low. Especially in 2020 and 2021, the rate of reaching the target population was notably low, which can be attributed to the impact of the COVID-19 pandemic. It has been reported that breast cancer screening rates decreased in many countries during the pandemic (13). In Turkey, women can undergo mammography not only within the community-based screening program but also in secondary and tertiary healthcare facilities. Considering these additional screenings, the number of women getting screened may be slightly higher. However, it remains evident that the goal of reaching 70% of the population, as set by community-based screening programs, is still far from being accomplished. In a study conducted in another province of Turkey, it was found that only 15.8% of the target population was screened in 2016 and 16.1% in 2017 (14). Another study reported that in 2018, only 12.8% of the target population was reached (9). The difference between Afyonkarahisar, where the research was conducted, and other provinces may be due to variations in the socio-demographic structure of the communities. Examples from other countries showed that in Italy, for instance, the rates of reaching the target population ranged between 37.9% to 61.8% in different regions in 2005 (15). In France, this rate was reported as 47.8% (16). In Croatia, a study analyzing national breast cancer screening results between 2006 and 2016 found that the screened population varied between 59% to 63% (17). The data obtained in our study cannot be generalized to the entire population of Turkey. The rate of reaching the target population may be higher across Turkey. Further research covering the entire country is necessary to discuss breast cancer screening rates at the national level.

The BI-RADS scoring system is a standardized terminology used worldwide for breast imaging reporting and data systems, providing a classification for breast imaging findings based on the likelihood of malignancy, ranging from 0 to 6 (12). When mammography results over the years were analyzed, it was observed that BI-RADS 1-2 reports were the most common results reported over the five-year period. The least common result was BI-RADS 5. Similar results have been reported in other studies as well (8, 14).

Advanced age is a significant risk factor for developing breast cancer (18). One study reported that breast cancer risk increased by 40% between the ages of 55-59 (19). In another study, the estimated risk of developing breast cancer was reported as 1 in 53 for ages below 49, which increased to 1 in 43 for ages between 50-59 (20). Our study's findings support these results since the mean age of women reported with a high likelihood of malignancy (BI-RADS 5) was the highest, followed by women reported with suspicious abnormalities (BI-RADS 4). These findings highlight the importance of commencing screening before the age of 50.

Conclusion

The findings obtained from the five-year community-based screening indicate that the rate of reaching the target population is significantly low. The years 2020 and 2021 had the lowest number of women screened. The most commonly reported mammography result was BI-RADS 1-2. In addition, the mammography results showed that the likelihood of malignancy increases with age. Raising awareness about screenings plays a crucial role in reaching the target population. In this regard, public health nurses should intensify awareness programs to increase the participation of women in screenings. Moreover, the reasons behind women not participating in screenings should be identified, and intervention programs tailored to these reasons should be implemented to educate and empower women.

Limitations

The research includes screening results conducted within the scope of the community-based screening program at the Cancer Early Diagnosis, Screening, and Training Center (KETEM). Records of opportunistic screenings performed at the 2nd and 3rd level healthcare services were not included. In addition, the study reflects the results from one specific province.

Declarations

Authors Disclosure (Conflict of Interest) Statement

The author does not declare any conflict of interest

Funding Statement

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Ethics Approval

Ethical approval (Date/Number: 2023/174) was obtained from the ethical committee of a university.

References

1- IARC – International Agency For Research On Cancer: https://gco.iarc.fr/today/data/factsheets/cancers/39-All-cancers-fact-sheet.pdf. (accessed 2023-06-02).

2- World Health Organization: https://www.who.int/news-room/fact-sheets/detail/breast-cancer (accessed 2023-06-02).

3- Republic Of Turkiye Ministry Of Health, Public Health General Directorate, Department of Cancer: https://hsgm.saglik.gov.tr/depo/birimler/kanserdb/Dokumanlar/Istatistikler/Kanser_Rapor_2018.pdf (accessed 2023-07-30).

4- Figueroa JD,, Gray E, Pashayan N, ..et. al. The impact of the Covid-19 pandemic on breast cancer early detection and screening. Preventive Medicine 2021; 151:106585. https://doi.org/10.1016/j.ypmed.2021.106585

5- Kwok C, Lee CF. Assessment of the validity and reliability of the Vietnamese version of the Breast Cancer Screening Beliefs Questionnaire. Asia-Pacific Journal of Oncology Nursing 2022; 9: 69–74. https://doi.org/10.1016/j.apjon.2021.11.003

6- Marinovich ML, Wylie E, Lotter W, …et. al. Artificial intelligence (AI) for breast cancer screening: Breast Screen population-based cohort study of cancer detection. eBioMedicine 2023;90: 104498 https://doi.org/10.1016/j.ebiom.2023.104498

7- Public Health General Directorate - National Standards for Breast Cancer Screening Program https://hsgm.saglik.gov.tr/tr/kanser-tarama-standartlari/listesi/meme-kanseri-tarama-program%C4%B1-ulusal-standartlar%C4%B1.html(accessed 2023-06-05).

8- Gültekin M, Özturk C, Karaca S, ….et.al. Centralization of mammography reporting with mobile trucks: Turkish experience. Preventive Medicine Reports 2018, 10: 317–322. https://doi.org/10.1016/j.pmedr.2018.04.008

9- Tuncez İH, Aksoy N, Koç M. National Cancer Screening Program Results; A City Example. Phnx Med J. 2021; 3(2): 69-73.DOI: 10.38175/phnx.922780

10- Bongaerts THG, Büchner FL, Cron, MR. …et al. Perspectives on cancer screening participation in a highly urbanized region: a Q-methodology study in The Hague, the Netherlands. BMC Public Health 2022; 22:1925 https://doi.org/10.1186/s12889-022-14312-4

11- TUİK: Türkiye İstatistik Kurumu: https://biruni.tuik.gov.tr/medas/?locale=tr(accessed 2023-06-07).

12- Boumaraf S, Liu X, Ferkous C, Ma X. New Computer-Aided Diagnosis System with Modified Genetic Feature Selection for BI-RADS Classification of Breast Masses in Mammograms. BioMed Research International 2020; 7695207. https://doi.org/10.1155/2020/7695207

13- Li T, Nickel B, Ngo P, …et al. A systematic review of the impact of the COVID-19 pandemic on breast cancer screening and diagnosis. The Breast 2023;67: 78–88. https://doi.org/10.1016/j.breast.2023.01.001

14- Akova İ, Hasdemir Ö, Türkoğlu H. Evaluation of Screening For Breast Cancer in Women of Age 40-69 in a Province. Bozok Med J 2019;9(1):89-92. DOI: 10.16919/bozoktip.450379

15- Giordano L, Giorgi D, Piccini P, .et al. Time trends of process and impact indicators in Italian mammography screening programmes – 1996-2004. Epidemiol Prev 2007; 31(2-3) Suppl 2: 21-32

16- Quintin C, Chatignoux E, Plaine J, …et al. Coverage rate of opportunistic and organised breast cancer screening in France: Department-level estimation. Cancer Epidemiology 2022;81: 102270 https://doi.org/10.1016/j.canep.2022.102270

17- Parun AŠ, Čukelj P, Tešić V, …et al. Results of the National Breast Cancer Screening Program in Croatia (2006-2016). Croat Med J. 2022;63:326-34 https://doi.org/10.3325/cmj.2022.63.326

18- Jackson EB, Gondara L, Speers C, …et al. Does age affect outcome with breast cancer?. The Breast 2023;70: 25–31

19- Balamou C, Koïvogui A, Rymzhanova R, …et al. Breast cancer incidence by age at discovery of mammographic abnormality in women participating in French organized screening campaigns. Public Health 2022; 202:121-130. https://doi.org/10.1016/j.puhe.2021.11.012

20- McGuire A, Brown JAL, Malone C, …et al. Effects of Age on the Detection and Management of Breast Cancer. Cancers 2015; 7: 908-929. doi:10.3390/cancers7020815

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Determination of Nursing Interventions For Prevention of Medication Administration Errors

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ABSTRACT

Purpose: This research was a descriptive study performed with the aim of determining nursing practices about preventing medication administration errors.

Methods: This research was completed in an education-research hospital and a private hospital located in a metropolitan city in Turkey. For collection of data, forms about descriptive characteristics, features related to medication administration errors of nurses, individual practices and institutional precautions about preventing medication errors were used. The research included 275 nurses actively administering medication. Analysis of data used percentages, mean, standard deviation, one-way ANOVA, Kruskal Wallis and correlation analysis tests.

Results: As a result of the research, 87.2% of nurses stated they always checked the patient's name, medication name, medication dose, and medication administration route, while 8% stated they very rarely researched the correct preparation form based on medication properties. Nurses with postgraduate education, choosing the profession themselves and satisfied with the profession were identified to perform more interventions about preventing medication errors ($p<0.05$). As the precautions taken by institutions in the research increased, the precautions taken by nurses about preventing medication errors reduced. Of nurses, 96.6% recommended increasing the number of nurses to prevent medication errors.

Conclusion: It is recommended to implement standards related to medication administration, develop institutional policies, use technology in the medication administration process, expand lessons and topics related to medication administration errors and precautions in the basic nursing education curriculum and increase in-service training and activities.

Keywords: nursing, medication administration, medication error, prevention

ÖZET

Amaç: Bu araştırma ilaç uygulama hatalarının önlenmesine yönelik hemşirelik girişimlerinin belirlenmesi amacıyla tanımlayıcı olarak yapılmıştır.

Yöntem: Bu araştırma Türkiye'nin bir metropol şehirlerinden bulunan bir eğitim araştırma hastanesi ve bir özel hastanesinde gerçekleştirilmiştir. Verilerin toplanmasında tanıtıcı özellikler formu, hemşirelerin ilaç uygulama hatalarına ilişkin özellikler formu, ilaç hatalarını önlemeye yönelik bireysel ve kurumsal önlemler formu kullanılmıştır. Araştırmaya aktif olarak ilaç uygulaması yapan 275 hemşire dahil edilmiştir. Elde edilen verilerin değerlendirmesinde yüzdelik, ortalama, standart sapma, Tek yönlü Anova testi, Kruskal Wallis ve korelasyon analizi kullanılmıştır.

Bulgular: Araştırma sonucunda hemşirelerin % 87,2'si hastanın ismini, ilacın ismini, ilaç dozunu, ilacın uygulama yolunu her zaman kontrol ettiğini, %8'i ise çok nadir olarak ilacı özelliklerine göre doğru hazırlama şeklini araştırdığını belirtmiştir. Lisansüstü eğitim alan, mesleğini kendi isteğiyle tercih eden ve mesleğinden memnun olan hemşirelerin diğer hemşirelere göre ilaç hatalarını önlemeye yönelik yaptıkları girişimlerin daha fazla olduğu saptanmıştır ($p<0,05$). Araştırmada kurumlar tarafından alınan önlemler arttıkça, hemşirelerin ilaç hatalarını önlemeye yönelik aldıkları önlemlerin azaldığı belirlenmiştir. Hemşirelerin % 96,6'sı ilaç hatalarının önlenmesi için hemşire sayısının artırılmasını önermiştir.

Sonuç: İlaç uygulamaları ile ilgili uygulama standartlarının, kurumsal politikaların geliştirilmesi, teknolojinin ilaç uygulama sürecinde kullanılması, hemşirelik temel eğitim müfredatında ilaç uygulama hatalarına ve önlemlere ilişkin ders veya konuların genişletilmesi hizmet içi eğitimlerin ve faaliyetlerin artırılması önerilmektedir.

Anahtar Kelimeler: Hemşirelik, ilaç uygulamaları, ilaç hataları, önlemler

Health professionals prepare medications, administer them to patients and monitor the outcomes. Medication administration has become more complicated with the development of technology, and is among complex nursing practices requiring in-depth knowledge and skills. It is not possible to reverse errors made by nurses during medication administration (1,2). For this reason, in line with the legal and ethical responsibilities of nurses, it is necessary to take the precautions required to prevent harm to the individual/family/society they serve and ensure the safety of medication administration (3).

The Institute for Safe Medication Practices (ISMP) publishes reports containing the necessary precautions to ensure medication administration can be performed in the safest way at international levels due to medication safety problems which may cause mortal harm to patients. This report includes technological systems and some practices that health organizations should implement (4). Draft guidelines developed by the ISMP include technological implementations like electronic health records (EHR), computerized provider order entry (CPOE), electronic medication administration record system (eMAR), barcode scanning systems, smart infusion devices, and electronic prescription systems and the systems developed to ensure patient safety by preventing medication administration errors with these practices (4). In spite of advanced technology and precautions, the Food and Drug Administration (FDA) reported that each year more than 100,000 errors are reported each year related to medication errors, while the Natıonal Center for Biotechnology Information (NCBI) reported that 7-9 thousand patients die due to medication errors each year in the USA and the Patient Safety Network reported 8-25% rates of medication errors during medication administration.

When the literature is investigated, studies dominantly attract attention to the causes of medication errors, reporting status of medication errors and tendency of nurses to make medical errors (5-7). However, there are very limited studies about nursing practices related to prevention of medication administration errors (8,9). This research determined precautions taken by nurses and institutions to prevent errors experienced during the medication administration process and in this context is thought to provide a significant contribution to the literature in terms of acting as a guide to resolving these deficiencies.

Material And Method

Location of The Research

The research was performed in an education-research hospital and a private hospital located in a metropolitan city in Türkiye between January 2017-June 2017.

Research Population and Sample

The population for the research comprised nurses performing active medication administration in the study hospitals. Sample selection was not performed in the research as the plan was to access the whole population. The research removed nurses on annual leave, maternity leave, etc. from the sample and was completed with 275 nurses who volunteered to participate in the research.

Data Collection Tools

The data collection forms were created by the researcher based on the literature (10-12). After creating the data collection forms, opinions were sought from five lecturers specializing in the nursing field in order to assess the content and scope of the forms. Necessary corrections (statements were changed in four items) were performed based on expert opinions.

The data collection forms comprised four sections of "Descriptive Characteristics Form", "Features related to Medication Administration Errors Form", "Nursing Practices to Prevent Medication Administration Errors Form" and "Institutional Precautions about Preventing Medication Errors Form".

The descriptive characteristics form comprised 12 questions about nurses' age, nursing program they graduated from, years of employment, clinic name, form of shift worked, number of beds in the unit, number of patients cared for, weekly mean working hours, satisfaction with the profession, willing selection of profession, working hours and educational status. The form related to features of medication administration errors was prepared based on the literature (Fisun et al., 2014; Björkstén et al., 2016; Küçükakça and Özer, 2016). This form comprised 6 questions about the basic professional training of nurses, adequacy of in-service training, witnessing medication errors during professional life, reporting medication errors during professional life and participation in a scientific program about medication errors. The form about institutional precautions to prevent medication errors comprised statements related to precautions taken by the institution to prevent medication errors (Taylor et al., 2011; Hassink et al., 2012; Zhu et al., 2014; ISMP, 2015; Biffu et al.,

2016). This form comprised 24 questions about precautions related to medication administration errors in hospitals such as requesting medications, obtaining from the pharmacy, storage conditions, medication preparation, conditions of administering medication to patients, procedures related to high-risk medications, automatic medication distribution systems, and devices used for medication administration. Nurses were requested to answer the questions with yes or no.

The form about nursing practices to prevent medication errors was prepared by the researcher using the literature (Taylor et al., 2011; Hassink et al., 2012; Zhu et al., 2014; ISMP, 2015; Biffu et al., 2016). This form included 51 questions with Likert-type rating about precautions taken to prevent medication errors.

Analysis of Data

Data obtained in the research was analyzed with a statistical program. Questions about descriptive characteristics of nurses were classified and frequency and percentage distributions were calculated. Comparison of quantitative data in two groups used the independent samples t test for comparison of parameters with normal distribution. For comparisons of quantitative data in more than two groups, one-way ANOVA and Kruskal Wallis tests were used for comparison of parameters with normal distribution, with the Tukey test used to identify the group causing differences. Correlation analysis was applied to identify correlations between scales.

Ethical Aspect of the Research

Before beginning the research, ethics committee permission (date 02.01.2018 and number 16969557-36), and institutional permission from the hospitals (date 02.03.2018 and number 14574941-605.01) were received. During the stage of implementing the research, the aim of the study was explained to nurses and their written and/or verbal consent was obtained after giving information about the research.

Results

Of nurses, 90.9% were women and 44% were 31-40 years old. Among the nurses, 68% had undergraduate degrees, 32.7% had been employed for 6-10 years and 42.5% cared for 4 to 10 patients during working hours. For medication errors, 49.4% of nurses had received partial in-service training about preventing medication errors, 87.3% had not participated in a scientific activity related to medication administration, 42.6% had witnessed medication administration errors but 87.6% had not kept medication error forms/reports (Table 1).

Table 1: Descriptive characteristics of nurses and features related to medication administration errors

Characteristic	n	%
Age		
22 Years or younger	17	6.2
23 - 30 Years	115	41.8
31 - 40 Years	121	44
41 Years or older	22	8
Gender		
Female	250	90.9
Male	25	9.1
Education		
Health Vocational High School and Associate Degree	41	14.9
Undergraduate Degree	187	68
Undergraduate Completion Program	29	10.5
Masters	18	6.5
Total employment duration as a nurse		
0-1 years	31	11.3
2-5 years	87	31.6
6-10 years	90	32.7
11-15 years	35	12.7
16 years or longer	32	11.6
Number of patients cared for during a shift		
From 1-3	37	13.5
From 4-10	117	42.5
From 11-15	99	36
16 or more	22	8
Inservice education about preventing medication errors		
Received education	86	31.3
Did not receive education	53	19.3
Partly received education	136	49.4
Witnessing medication administration errors		
Witnessed	117	42.6
Did not witness	158	57.4
Medication error form/report		
Made report	34	12.4
Did not make report	241	87.6
Participation in scientific activities related to medication administration		
Yes	35	12.7
No	240	87.3

Nurses from 23-30 years of age were identified to have higher points for general principles, (4.15±.63), medication preparation (4.75±.50), medication administration (4.66±.33) and assessment (4.61±.46) in the stages of medication administration compared to other nurses ($p<0.05$). Nurses with master's degrees were found to have higher points for general principles (3.99±.54), medication preparation (4.56±.63), medication administration (4.55±.52) and assessment (4.51±.64) compared to other nurses ($p<0.05$) (Table 2).

Nurses with total employment from 0-1 year had higher points for medication preparation (4.38±.70) and assessment (4.21±.75) compared to other nurses ($p<0.05$) (Table 2).

Table 2: Comparison of precautions during medication administration according to descriptive characteristics of nurses and medication administration

CHARACTERISTICS	MEDICATION ADMINISTRATION PROCESS						
	General principles	Diagnosis	Preparing medication	Administering medication	Assessment	Total	Institutional precautions
	$\bar{X}$ and SD	$\bar{X}$ and SD	$\bar{X}$ and SD	$\bar{X}$ and SD	$\bar{X}$ and SD	$\bar{X}$ and SD	$\bar{X}$ and SD
Age							
22 years and younger	3.41 ± .47	4.78 ± .37	4.06±.66	4.36±.46	3.78±.71	4.18±.47	1.06±.06
23-30 years*	4.15 ± .62	4.85±1.06	4.75±.49	4.66±.32	4.61±.46	4.62±.36	1.24±.17
31-40 years	3.52 ± .63	4.68 ± .42	4.05±.57	4.38±.37	3.65±.59	4.16±.37	1.27±.15
41 years and older	3.48 ± .64	4.70 ± .36	4.13±.62	4.56±.64	3.77±.74	4.25±.41	1.27±.16
Statistics	*KW=14.85 p= 0.02	KW=1.339 p=0.72	KW=18.441 p=0.000	KW=12.829 p=0.01	KW=29.832p=0.000	KW=19.328 p=0.000	KW=28.890 p=0.000
Education							
Health Vocational High School and Associate Degree	3.42 ± .64	4.66 ± .56	4.01 ± .61	4.36 ± .64	3.42 ± .64	4.17 ± .310	1.07 ± .10
Undergraduate Degree	3.73 ± .57	4.77 ± .86	4.25± .71	4.44 ± .36	3.65± .62	4.23 ± .23	1.27 ± .16
Undergraduate completion	3.50 ± .55	4.78 ± .33	3.97 ± .49	4.37 ± .43	3.50± .55	4.14 ± .42	1.29 ± .11
Masters*	3.99 ± .54	4.56 ± .33	4.56 ± .63	4.55 ± .52	4.51 ± .64	4.49 ± .49	1.27 ± .12
Statistics	KW=31.504 p=0.000	KW=1.512 p=0.680	KW=28.920 p=0.000	KW=17.754 p=0.000	KW=52.574 p=0.000	KW=31.175 p=0.000	KW=63.716 p=0.000
Total years of employment							
0-1 year*	3.89 ± .75	4.82 ± .27	4.38 ± .70	4.52 ± .43	4.21 ± .75	4.41 ± .46	1.18 ± .16
2-5 years	3.44 ± .62	4.77 ± .93	4.02± .65	4.34± .45	3.71 ± .66	4.14 ± .46	1.24± .16
6-10 years	3.46 ± .61	4.78 ± .87	4.00 ± .54	4.35 ± .37	3.56± .51	4.13± .37	1.28 ± .16
11 years or longer	3.59 ± .60	4.69±.42	4.23± .61	4.51± .48	3.94± .76	4.29 ± .41	1.23± .15
Statistics	****F=3.537 p=0.005	F=0.376 p=0.829	F=3.200 p=0.006	F=2.423 p=0.068	F=7.030 p=0.000	F=3.646 p=0.003	F=2.634 p=0.021
Thinks medication education received during professional training is adequate							
Adequate*		3.72 ± .65	4.82 ± .98	4.31 ± .60	4.48 ± .40	4.02 ± .72	4.34± .43	1.20± .16
Inadequate		3.19 ± .60	4.66 ± .49	3.94 ± .61	4.37± .58	3.52 ± .60	4.07 ± .44	1.28 ± .16
Partly adequate		3.42 ± .56	4.72 ± .43	3.89± .57	4.32 ± .41	3.54 ± .54	4.08 ± .38	1.29 ± .16
Statistics		F=13.532 p=0.000	F=0.850 p=0.429	F=15.909 p=0.000	F=3.912 p=0.021	F=18.861 p= 0.000	F=13.611 p=0.000	F=10.469 p=0.000
Opinion about adequacy of in-service training							
Received training*		3.87 ± .68	4.65 ± .49	4.51± .62	4.50± .47	4.29 ± .71	4.41 ± .47	1.13 ± .14
Did not receive training		3.35 ± .70	4.71 ± .48	3.87 ± .64	4.25 ± .47	3.50 ± .57	4.03 ± .46	1.35 ± .17
Received partial training		3.40 ± .50	4.85 ± .95	3.94 ± .49	4.40 ± .39	3.56± .51	4.14 ± .33	1.27 ± .12
Statistics		F=19.303 p=0.000	F=1.941 p=0.146	F=31.506 p=0.000	F=5.065 p=0.007	F=46.963 p=0.000	F=17.598 p=0.000	F=45.583 p=0.000
Participation in scientific activities about medication administration							
Yes		3.55 ± .56	4.74± 1.49	4.25 ± .54	4.44 ± .35	3.86 ± .69	4.26 ± .40	1.21 ± .13
No		3.53 ± .65	4.76 ± .62	4.09 ± .63	4.40 ± .45	3.76 ± .68	4.20 ± .43	1.25 ± .16
Statistics		****F=0.949 p=0.882	F=5.804 p=0.918	F=0.814 p=0.180	F=0.966 p=0.640	F=0.060 p=0.454	F=0.104 p=0.467	F=3.093 p=0.306

****One-way Anova Test* *****Independent T-Test*

Nurses considering the medication education received during professional education to be sufficient were identified to have high points for general principles (3.72±.65), medication preparation (4.31±.60), medication administration (4.48±.40), assessment (4.02±.72), and total administration (4.34±.43) ($p<0.05$). Nurses who considered in-service training to be adequate were found to have higher general principles (3.87±.68), medication preparation (4.51±.62), assessment (4.29±.71) and total administration (4.42±.47) points compared to others. Additionally, nurses who participated in scientific activities related to medication administration were found to have higher points for general principles (3.55 ± .56), medication preparation (4.25 ± .54), medication administration (4.44 ± .35), assessment (3.86 ± .69) and total administration (4.26 ± .40) compared to others (Table 2).

Among practices nurses used to prevent medication administration errors, "willing to learn new skills related to medication administration" was selected most in the general principle stage (3.99±.69). In the diagnostic stage, nurses stated they most commonly applied the "confirming records that are difficult to read" step (5.15±4.31). During the medication preparation stage, nurses mostly chose the "prepare medication card" (4.57±1.02), and "calculate medication dose" (4.57±.69) steps and chose the "compare clinician order with medication card" (4.30±1.04) step least. In the administration stage, nurses were identified to apply the "assess the region of medication administration for suitability" (4.86±.41) step most and the "administer medications prepared by others" (3.24±1.19) step least. In the assessment stage, nurses were determined to perform the "monitor behavioral response of patient to medication" (4.85±.47) step most and "report and tell clinician when side-effects specific to the medication, etc. develop" (2.11±1.63) least. The total points obtained by nurses for practices performed to prevent medication errors were 191.71 (Table 3).

Table 3: Distribution of points received by nurses about practices to prevent medication administration errors

Precautions taken by nurses	$\bar{X}$	SD
General principles		
1. Willing to learn new skills related to medication administration	3.99	.69
Diagnosis		
2. Confirming records that are difficult to read	5.15	4.30
Medication preparation		
3. Preparing medication card	4.57	1.02
4. Comparing doctor's orders with medication card	4.30	1.03
5. Calculating medication dose	4.57	.69
Medication administration		
6. Administering medication prepared by someone else	3.24	1.19
7. Assessing suitability of the region that medication will be administered to (disrupted skin integrity, ecchymosis, etc.)	4.86	.40
8. Correct identification of medication administration site (e.g., intramuscular regions)	4.73	.53
9. Administering the medication to the patient at the right time through the right route with the right technique	4.50	.59
10. Having adequate knowledge and skills about medication administration routes and methods	4.44	.67
11. Accurate and complete recording of information related to medication administration (administration time, administration region, etc.)	4.84	3.04
Assessment		
8. Monitoring patient's behavioral response to medication (anxiety level, awareness, restlessness)	4.85	.47
9. Reporting side-effects specific to medication, etc. İf they develop and telling the doctor	2.10	1.63

Significance between opinions about individual precautions taken by nurses about preventing medication errors and institutional precautions was investigated with correlation analysis. When the correlation between opinions about precautions taken by institutions and individual precautions taken by nurses is examined, there were negative and moderate-level correlations for medication preparation, (r=-.021, p=0.000), medication administration (r=-.385 p=0.000) and assessment of patient response (r=-.505 p=0.000). As the precautions taken by institutions increased, the precautions taken by nurses to prevent medication errors were determined to reduce (Table 4).

Table 4: Correlational analysis between individual precautions taken by nurses and institutional precautions to prevent medication administration errors

Precautions		General principles	Diagnosis	Medication preparation	Medication administration	Assessment	General scale	Institutional precaution
General principles	**Pea.Co *r.**	**1**						
	p.							
Diagnosis	Pea.Cor.	.137*	1					
	p.	.023						
Medication preparation	Pea.Cor.	.546**	.227**	1				
	p.	.000	.000					
Medication administration	Pea.Cor.	.467**	.340**	.643**	1			
	p.	.000	.000	.000				
Assessment	Pea.Cor.	.534**	.107	.647**	.486**	1		

medication compared to other nurses. A study of 585 nurses in Sweden found experienced nurses did not abide by procedures and standards created by institutions sufficiently and made errors (13). In the literature, some studies observed that as the total years of employment increased, nurses had reduced medication error rates and tendencies, while knowledge about medication administration increased (14). In our study, nurses with young age and less experience were determined to have high rates of taking personal precautions about preventing medication errors. This result is considered to be due to newly graduated nurses having current knowledge and being more careful during medication administration as they are newly beginning to work in clinics. Nurses with master's degrees were found to receive significantly higher points for general principles, medication preparation, medication administration and assessment of patient response stages about preventing medication errors compared to nurses with other educational levels. Another study with 279 nurses by Chang and Mark (2009) found a significant correlation between medication errors and educational level (25). As the educational level of nurses increases, medication errors were identified to reduce.

Discussion

Medical errors are a serious public health problem and a leading cause of death in the world. It is a difficult problem as it is challenging to uncover a consistent cause of errors and, even if found, to provide a consistent viable solution that minimizes the chances of a recurrent event. By recognizing untoward events occur, learning from them, and working toward preventing them, patient safety can be improved (3).

In this study with the aim of determining nursing practices about preventing medication administration errors completed with 275 nurses, nurses aged from 23-30 years and employed for 0-1 year were found to pay more attention to general principles, medication preparation, medication administration and assessment of patient response to medication administration when administering

In our research nurses were found to always check the patient's name, medication name, medication dose, medication administration route and patient allergies to the medication in the diagnostic stage to prevent medication errors. However, they occasionally took the precaution of learning the correct preparation and storage for the

medication. A study by Fisun et al. about safe medication administration including 150 nurses found 10% had poor levels of knowledge about side effects of medications, 17% had poor levels of knowledge about medication interactions and 6% had poor levels of knowledge about special situations (pregnancy, pediatrics) (15). A study by Wondmieneh (2020), it was stated that medication errors were made such as nurses not administering medications at the correct time, administering the medication in a different way than specified, and documentation and dosage violations (16). A study by Zhu et al. (2014) with 1343 nurses found 3185 effect factors about causes of medication errors (17). These factors were identified to be due to not performing routine checks like checking medication orders, knowing about side effects of medication and correct preparation according to medication properties.

Nurses were found to always prepare a medication card and calculate medication dose in the medication preparation stage. They were found to occasionally wash their hands before preparing medication, check whether it is the correct medication at least three times, check the order and prepare medications according to aseptic principles. In a study conducted in an intensive care unit, 5.8% of 237 medication errors occurred in the wrong drug administration, 19.2% in the wrong dose administration, 4.7% in the order but not in the order, and 5.3% in the following days. It was stated that mistakes were made such as not being included in the order (18). In this research, it was concluded that medication errors occurred in stages where nurses did not take precautions, and that medication administration errors would be prevented in the medication preparation stage if nurses took these precautions. In our research, nurses always monitored the patient's physical responses after medication administration during the assessment stage; however, they rarely reported the event if they made a medication administration error. A study (n=114) identified that 57.2% did not report medication errors (19). Cebeci, Karazeybek and Dağ (2014) performed a study of 324 students about medical errors witnessed in clinics and found 38% did not report errors and 23.1% reported to the responsible nurse (20). As understood from the results of the study, nurses may avoid reporting medication administration errors. Nurses may not make reports due to wanting to avoid being blamed, receiving punishments, and being perceived as an inadequate nurse (21, 22).

Increases in institutional precautions were determined to reduce individual precautions taken by nurses in our research. When the literature is examined, it was found that medication administration errors are human-sourced errors (23,24). Many studies identified that precautions taken by institutions reduce medication error rates (4,24). As precautions taken by institutions to prevent medication administration errors increase, precautions taken by nurses reduce. It is thought that medication administration errors may be prevented or lowered to minimal levels by taking both institutional and individual precautions.

Conclusion

Precautions taken by nurses to prevent medication errors differ according to total years of employment, years of employment in their current unit and educational status. Nurses who were master's graduates were identified to have higher level of participation in precautions. In line with the results obtained from the study, it is recommended to organize working durations and types to prevent medication administration errors due to tiredness, inattention, etc. of nurses; that in-service training about medication administration and preventing medication administration errors be given or increased; that protocols be created in line with international guidelines about medication preparation, administration and storage conditions; and that technology be used to minimize medication errors in institutions.

Declarations

Declarations of Interest

The authors declare no conflict of interest.

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Conflict of Interest

The author declared that there is no conflict of interest

Ethical Approval

The study was approved by the Hacettepe University Ethical Committee (date 02.01.2018 and number 16969557-36)

Availability of Data And Material

Available.

Authors' Contributions

All authors have made substantial contributions to this article being submitted for publications. All authors critically reviewed the manuscript and approved the final form.

References

1. Tang FI, Sheu SJ and Yu S. Nurses relate the contributing factors involved in medication errors. Journal of Clinical Nursing. 2007;16:447-457. DOI:10.1111/j.1365-2702.2005.01540.x
2. Sabuncu N and Akça AF. Klinik Beceriler, Sağlığın Değerlendirilmesi, Hasta Bakım ve Takibi: Parenteral İlaç Uygulamaları. İstanbul, ISBN:9754207293; 2010.
3. Korkmaz S and Çuhadar U. Sağlık hizmet kalitesi ve sağlik kurumunu tekrar tercih etme niyeti arasindaki ilişki: eğitim ve araştirma hastanesi örneği. Uluslararası Sağlık Yönetimi ve Stratejileri Araştırma Dergisi. 2017;3:72-86.
4. Institute for Safe Medication Practices (ISMP). ISMP Guidelines for Safe Electronic Communication of Medication Information. ISMP; 2019. https://www.ismp.org/node/1322
5. Holdforth CJ and Leufer T. The strategic role of education in the prevention of medication errors in nursing: Part 2. Nurse Education in Practice. 2013;13:217-220. DOI:10.1016/j.nepr.2013.01.012
6. Bifftu BB, Dachew BA, Tiruneh BT, et al. Medication administration error reporting and associated factors among nurses working at the University of Gondar referral hospital, Northwest Ethiopia, 2015. BMC Nursing. 2016;15:1–7. DOI: 10.1186/s12912-016-0165-3
7. Hassink J, Jansen M, and Helmons P. Effects of bar code-assisted medication administration (BCMA) on frequency, type and severity of medication administration errors: a review of the literature. European Journal of Hospital Pharmacy: Science and Practice. 2012;19:489-494. DOI:10.1136/ejhpharm-2012-000058
8. Çırpı F, Merih Y. and Kocabey M. Hasta güvenliğine yönelik hemşirelik uygulamalarının ve hemşirelerin bu konudaki görüşlerinin belirlenmesi. Uluslarası Sağlıkta Performans ve Kalite Kongresi Bildiriler Kitabı. 2009;Antalya
9. Özkan S, Kocaman G. and Özturk C. Efficiency of strategies for preventing medication administration errors in pediatric inpatients. Türk Pediatri Arşivi. 2013;48:299–302.
10. Harkreader H, Hogan MA, and Thobaben M. Fundamentals of Nursing: Caring and Clinical Judgment. USA, Elsevier Inc.;2007.
11. Taylor CR, Lillis C, LeMone P. et al. Fundamental of nursing. Lippincott Williams & Wilkins Philadelphia: Elsevier;2011.
12. Küçükakça G and Özer N. Cerrahi Kliniklerde Çalışan Hemşirelerin Yüksek Riskli İlaç Uygulamaları Konusundaki Bilgi Durumlarının ve İlaç Hatalarıyla İlgili Tutum ve Davranışlarının İncelenmesi. Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi. 2016;19:34-41.
13. Björkstén KS, Bergqvist M, Andersén-Karlsson E, et al. Medication errors as malpractice-a qualitative content analysis of 585 medication errors by nurses in Sweden. BMC Health Services Research. 2016;16:431. DOI:10.1186/s12913-016-1695-9
14. McClead RE, Catt C, Davis JT, et al. An internal quality improvement collaborative significantly reduces hospital-wide medication error related adverse drug events. The Journal of Pediatrics. 2014;165:1222–9. DOI:10.1016/j.jpeds.2014.08.063
15. Fisun V, Seval Ç. and Birol V. Sık karşılaşılan ilaç uygulama hataları ve ilaç güvenliği. Acibadem Univ Saglik Bilim Derg. 2014;5:271-5.
16. Wondmieneh A, Alemu W, Tadele N and Demis A. (2020). Medication administration errors and contributing factors among nurses: a cross sectional study in tertiary hospitals, Addis Ababa, Ethiopia. BMC nursing. 2020;19;1-9. DOI: https://doi.org/10.1186/s12912-020-0397-0
17. Zhu XP, Duan X, Tian MM, et al. Establishment and application of medication error classification standards in nursing care based on the international classification of patient safety. International Journal of Nursing Sciences. 2014;1:277–280. DOI:10.1016/j.ijnss.2014.05.025
18. Laher AE, Enyuma CO, Gerber L, et al. Medication errors at a tertiary hospital intensive care unit. Cureus. 2021;13;12. DOI: 10.7759/cureus.20374
19. Aydın SS, Akın S, and Işıl Ö. Bir hastanede çalışan hemşirelerin ilaç hatası bilgi düzeyi ve ilaç hatalarının raporlanması ile ilgili görüşlerinin değerlendirilmesi. Hemşirelikte Eğitim ve Araştırma Dergisi. 2017;14:14-24.
20. Cebeci F. Karazeybek E, Dağ GS. Tanık Oldukları Tıbbî Hata Durumları. Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi. 2014;3:736–748.
21. Al-Faouri IG, Hayajneh WA. and Habboush DM. A five years retrospective study of reported medication incidents at a Jordanian teaching hospital: patterns and trends. International Journal of Humanities and Social Science; 2014;4:280-7.
22. Crandall KM, Almuhanna A, Cady R, et al. 10,000 good catches: increasing safety event reporting in a pediatric health care system. Pediatric Quality & Safety. 2018;3:e072. DOI:10.1097/pq9.0000000000000072
23. Wahr JA, Abernathy JH, Lazarra EH, et al. Medication safety in the operating room: Literature and expert-based recommendations. British Journal of Anaesthesia. 2017;118:32–43. DOI:10.1093/bja/aew379
24. Douglass AM, Elder J, Watson R, et al. A Randomized Controlled Trial on the Effect of a Double Check on the Detection of Medication Errors. Annals of Emergency Medicine. 2018;71:74–82. DOI:10.1016/j.annemergmed.2017.03.022
25. Chang YK and Mark BA. Antecedents of severe and nonsevere medication errors. Journal of Nursing Scholarship. 2009;41:70-78. DOI:10.1111/j.1547-5069.2009.01253.x

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Evaluation of Pneumonia Severity and Lung Computed Tomography Findings in Covid-19 Patients

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ABSTRACT

Purpose: Examining clinical and imaging features can help deepen our understanding of the mechanisms of severe disease and improve clinical diagnosis and treatment We aimed to describe the relationship between the clinical, laboratory, and lung computed tomography (LCT) characteristics of patients with coronavirus 2019 (COVID-19) pneumonia and determine the severity of pneumonia in these patients.

Methods: The pneumonia severity index (PSI) score system, LCT images, and laboratory parameters at the time of first presentation to the emergency department were examined to assess the severity of COVID-19 pneumonia in adult patients.

Results: The sample consisted of 225 patients, 130 (57.8%) men and 95 (42.2%) women. The mean age of the sample was determined as 60.4 ± 16.04 years. 161 (71.6%) were have moderate disease, 62 (27.6) were severe disease and were followed up in the intensive care unit. Significant relationship was found between COVID-19-associated mortality and male gender ($p=0.045$), advanced age ($p<0.001$), a high neutrophil count in peripheral blood ($p<0.001$), a low eosinophil count ($p<0.001$), 5-49% lung involvement on LCT ($p<0.001$), and PSI groups IV and V ($p<0.001$). There is no statistically significant relationship increase in the CRP level with mortality ($p = 0.764$).

Conclusion: We determined the most significant factors for mortality as advanced age, low eosinophil and lymphocyte counts, increased lactate and ferritin levels, and PSI group V. In this review, we highlight the clinical evidence supporting for the risk factors for the severity and mortality of COVID-19.

Keywords: COVID-19; Pneumonia severity index; Computed tomography; Prognosis; Mortality

ÖZET

Amaç: Klinik ve görüntüleme özelliklerinin incelenmesi, ağır hastalık mekanizmalarına ilişkin anlayışımızı derinleştirmeye ve klinik tanı ve tedaviyi iyileştirmeye yardımcı olabilir. Koronavirus 2019 (COVID-19) pnömonisi olan hastaların klinik, laboratuvar ve akciğer bilgisayarlı tomografi (LCT) özellikleri arasındaki ilişkiyi tanımlamayı ve bu hastalarda pnömoninin şiddetini belirlemeyi amaçladık.

Yöntemler: COVID-19 pnömonisinin şiddetini değerlendirmek için acil servise ilk başvuru anındaki yetişkin hastaların, pnömoni şiddet indeksi (PSI) skor sistemi, LCT görüntüleri ve laboratuvar parametrelerini inceledik.

Bulgular: Örneklem 130'u (%57,8) erkek ve 95'i (%42,2) kadın olmak üzere 225 hastadan oluşuyordu. Örneklemin ortalama yaşı 60,4±16,04 yıl olarak belirlendi. Bu çalışmada 161 (%71,6) hasta orta derecede hastalık, 62 (%27,6) hasta ağır hastalıklı olup yoğun bakımda takip edildi. COVİD-19 ilişkili mortalite ile, erkek cinsiyet ($p=0,045$), ileri yaş ($p<0,001$), periferik kanda yüksek nötrofil sayısı ($p<0,001$), düşük eozinofil sayısı ($p<0,001$), LCT'de %5-49 akciğer tutulumu ($p<0,001$) ve PSI Grup IV ve V ($p<0,001$) arasında anlamlı ilişki bulundu.. CRP düzeyindeki artış ile mortalite arasında istatistiksel olarak anlamlı bir ilişkisi saptanmadı ($p=0,764$).

Sonuç: Mortalitenin en önemli faktörlerini ileri yaş, düşük eozinofil ve lenfosit sayısı, artmış laktat ve ferritin düzeyleri ve PSI Grup V olarak belirledik. Bu derlemede, COVID-19'un ciddiyeti ve mortalitesine ilişkin risk faktörlerini destekleyen klinik bulguları vurguluyoruz.

Anahtar Kelimeler: COVID-19; Pnömoni şiddet indeksi; Bilgisayarlı tomografi; Prognoz; Mortalite

Coronavirus disease 2019 (COVID-19) is an illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1). The symptoms of this disease vary from patient to patient. The most common clinical symptoms are fatigue, cough, fever, anorexia, phlegm, shortness of breath (2). Additionally, confusion, shortness of breath, sore throat, headache, hemoptysis, chest tightness, nausea, vomiting, diarrhea and gastrointestinal complaints may also occur (3, 4). Although, most patients with COVID-19 have mild symptoms and a good prognosis, this infection can cause serious illnesses, including pulmonary edema, acute respiratory distress syndrome, multiple organ failure, and even death (5). Compared to patients with other diseases, severe COVID-19 cases have a poor prognosis and high mortality. The first step in managing COVID-19 is the accurate and rapid detection of SARS-CoV-2 enabled by the real-time reverse transcriptase-polymerase chain reaction (RT-PCR) (6). RT-PCR detects SARS-CoV-2 nucleic acids present in nasopharyngeal fluids (7). Imaging method such as lung computed tomography (LCT) has played an important role in the diagnosis and treatment of COVID-19 patients (8). Early and successful treatment of severe and critical cases is the key to reducing complications and mortality. To this end, it is very important to identify factors related to disease severity in clinical practice. We consider that examining clinical and imaging features can help deepen our understanding of the mechanisms of severe disease and improve clinical diagnosis and treatment. Therefore, in this study, we aimed to describe the relationship between the clinical, laboratory, and LCT characteristics of patients with COVID-19 pneumonia and determine the severity of pneumonia in these patients.

Materials and Methods

A total of 225 patients who were consecutively diagnosed with COVID-19 pneumonia, treated, and followed up at Ağrı State Hospital between January 18,2021 and March 24,2021 were included in this study. Ethical approval was obtained from the Planning and Coordination Board of the hospital with decision number 34.

The sample consisted of patients with a positive SARS-CoV-2 nucleic acid RT-PCR reaction in the nasopharyngeal and oropharyngeal upper respiratory tracts and radiological findings in LCT. Patients with normal LCT examinations were excluded from the study.

The patients' demographic characteristics, clinical findings, laboratory results, and the distribution and morphology of the lesions detected on LCT at the time of presentation were retrospectively analyzed. Clinical parameters included age, gender, symptoms at first admission (headache and sore throat, fever over 38 °C, shortness of breath, cough, diarrhea and vomiting, and myalgia), oxygen saturation measured by pulse oximetry, comorbidities [systemic hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), chronic liver disease, and malignancy], and laboratory findings were retrospectively examined and recorded. The severity of COVID-19 pneumonia was assessed using the pneumonia severity index (PSI), which is based on comorbidities, physical examination, laboratory and radiologic data. According to the risk of death at 30 days, patients were classified as low or moderate risk (PSI I–III) or high or severe risk (PSI IV–V) and divided into five groups according to PSI score.

Patients who did not have respiratory failure at the time of first admission to the hospital, those with pneumonia findings on LCT, and those admitted to the ward were evaluated to have moderate disease. Patients who had respiratory failure at admission and were followed up in the intensive care unit due to the invasive or non-invasive mechanical ventilator requirement were evaluated to have severe disease.

LCT Evaluation

The LCT findings were evaluated by an experienced radiologist. The LCT imaging findings of the patients were recorded according to the following characteristics:

1. Lesion localization: right lung [right upper lobe apical (RUA), right upper lobe anterior (RUAN), right upper lobe posterior (RUP), right middle lobe lateral (RML), right middle lobe medial (RMM), right middle lobe anterior (RMA), right lower lobe lateral (RLL), right lower lobe posterior (RLP), right lower lobe superior (RLS), and right lower lobe medial (RLM)] and left lung [left upper lobe lingula (LUL), left upper lobe anterior (LUA), left upper lobe apicoposterior (LUAP), left lower lobe anterior (LLA), left lower lobe lateral (LLL), left lower lobe posterior (LLP), and left lower lobe superior (LLS)]

2. Involvement areas of lesions: focal (single lesion), multiple (limited to two lobes in the lung), diffuse (multilobe; i.e., involvement of more than two lobes), unilateral, and bilateral

3. Distribution characteristics of lesions: subpleural, peribronchial, and random

4. Lesion density: ground glass opacity, consolidation, or mixed type

5. Evaluation of ground glass nodules, cobblestone appearance, halo sign, reversed halo sign, and air bronchogram according to the recommendations of the Nomenclature Committee of the Fleischner Society (9)

6. Scoring for the measurement of the total size of each lobe: score 0, uptake 0%; score 1, less than 5% involvement; score 2, 5-25% involvement; score 3, 26-49% involvement; score 4, 50-75% involvement; and score 5, more than 75% involvement.

Statistical Analysis

Statistical analyses for the study were undertaken using SPSS v. 11.5 (IBM Inc., Chicago, IL, USA) software. The relationship between the variables evaluated in the study and the patients' survival status was investigated using the chi-square test. In order to determine factors affecting the risk of mortality, the logistic regression analysis was performed with the stepwise model selection algorithm, and the variables that were significant in the multivariate model were reported using the odds ratio and 95% confidence interval. A p value of <0.05 was considered statistically significant.

Results

Clinical Symptoms and Characteristics

The sample consisted of 225, patients: 130 (57.8%) men and 95 (42.2%) women. None of the patients were children or pregnant. The mean age of the sample was determined to be 60.4 ± 16.0 years.

There was a history of DM in 47 (20.9%) patients, HT in 83 (36.9%), CAD in 53 (23.6%), COPD in 36 (16.0%), CLD in four (1.8%), and malignancy in three (1.3%). The clinical symptoms of the patients at the time of first admission were as follows: fever over 38 °C in 62 (27.6%) patients, myalgia in 107 (47.6%), headache or sore throat in 73 (32.4%), cough in 144 (64.0%), shortness of breath in 163 (72.4%), and diarrhea or vomiting in 18 (8.0%).

Of these patients, 161 (71.6%) were assessed to have moderate disease while 62 (27.6%) patients were evaluated to have severe disease and were followed up in the intensive care unit. Mortality occurred in 53 (23%) patients, of whom three patients (1%) had been initially evaluated to have moderate disease. Fifty (22%) patients that were assessed to have severe disease at first admission died during intensive care follow-up. While no mortality was observed among the patients aged 18-35 years ($p < 0.001$), 48 (90.5%) of those who died were aged 60-90 years ($p < 0.001$). Thirty-seven (69%) of the patients in the mortality group were male. All the patients in this group had dyspnea symptoms at the time of first admission to the hospital ($p < 0.001$).

Oxygen saturation ranged from 40% to 98%, with a mean value of 83.88% ± 12.59%.

Laboratory Examinations

We detected an increase in C-reactive protein (CRP) levels in a total of 224 (99.6%) patients. Due to the increase in the diffuse CRP level, no statistically significant relationship could be established with mortality ($p = 0.764$). Although thrombocytopenia is common among severe viral infections, we found a decrease in platelet count in 42 (18.7%) of our patients and 10 (18.8%) of those who died ($p = 0.966$). We observed a normal international normalized ratio (INR) level in 210 (93.3%) patients and a high fibrinogen level in 152 (67.6%). Mortality had a statistically significant correlation with a low basophil count in peripheral blood ($p = 0.002$), low lymphocyte count ($p < 0.001$), low eosinophil count ($p < 0.001$), increased lactate dehydrogenase (LDH) ($p < 0.001$), and increased d-dimer ($p = 0.003$). Table 1 shows the laboratory examinations of the patients included in the study.

Table 1: Laboratory examinations of the patients			
Variable	**Survivor n (%)**	**Non-survivor n (%)**	**p**
WBC (x10^3/µL)			
<4	30 (17.4)	1 (1.9)	<0.001*
4-10	120 (69.8)	27 (50.9)	
10<	22 (12.8)	25 (47.2)	
NEU (x10^3/µL)			
<2	18 (10.5)	2 (3.8)	<0.001*
2-7	116 (67.4)	13 (24.5)	
7<	38 (22.1)	38 (71.7)	
BASO (x10^3/µL)			
0-0.01	57 (33.1)	6 (11.3)	0.002*
0.01<	115 (66.9)	47 (88.7)	
EOS (x10^3/µL)			
<0.02	86 (50.0)	43 (81.1)	<0.001*
0.02-0.5	44 (25.6)	8 (15.1)	
0.5<	42 (24.4)	2 (3.8)	
LYM (ml)			
<800	31 (18.0)	37 (69.8)	<0.001*
800<	141 (82.0)	16 (30.2)	
CRE (mg/dL)			
<0.67	37 (21.5)	4 (7.5)	<0.001*
0.67-1.17	109 (63.4)	25 (47.2)	
1.17<	26 (15.1)	24 (45.3)	
Urea (mg/dL)			
<17	9 (5.2)	0 (0.0)	<0.001*
17-43	117 (68.1)	12 (22.6)	
43<	46 (26.7)	41 (77.4)	
ALT (U/L)			
0-50	150 (87.2)	45 (84.9)	0.666
50<	22 (12.8)	8 (15.1)	
AST (U/L)			
0-50	154 (89.5)	33 (62.3)	<0.001*
50<	18 (10.5)	20 (37.7)	
POTAS (mEq/L)			
<5.1	164 (95.3)	40 (75.5)	<0.001*
5.1<	8 (4.7)	13 (24.5)	
Lactate (mmol/L)			
0.5-1.6	120 (69.8)	16 (30.2)	<0.001*
1.6<	52 (30.2)	37 (69.8)	
LDH (U/L)			
0-248	76 (44.2)	2 (3.8)	<0.001*
248<	96 (55.8)	51 (96.2)	
TROP (ng/ml)			
0-19.8	150 (87.2)	23 (43.4)	<0.001*
19.8<	22 (12.8)	30 (56.6)	
D-dimer (ng/ml)			
0-0.5	26 (15.1)	0 (0.0)	0.003*
0.5<	146 (84.9)	53 (100.0)	
Ferritin (ng/ml)			
<306	103 (59.9)	8 (15.1)	<0.001*
306<	69 (40.1)	45 (84.9)	

*WBC: White blood cell, NEU: Neutrophil, BASO: Basophil, EOS: Eosinophil, LYM: Lymphocyte, CRE: Creatinine, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, POTAS: Potassium, LDH: Lactate dehydrogenase, TROP: Troponin, *p < 0.05*

LCT Findings

Lesion localization

There were 188 (83.5%) patients with the involvement of both lungs, 36 (16%) with the involvement of one lung, 195 (87.1%) with left lung involvement, and 216 (96.4%) with right lung involvement. In the mortality group, significant uptake was observed in the RML (p = 0.004), RLP (p = 0.001), and LLP (p < 0.001) segments (Table 2).

Table 2: Lesion involvement areas of the patients on lung computed tomography

Variable	Survivor n (%)	Non-survivor n (%)	p
RUA	45 (26.2)	28 (52.8)	<0.001*
RUAN	88 (51.2)	37 (69.8)	0.017*
RUP	88 (51.2)	39 (73.6)	0.004*
RML	90 (52.3)	40 (75.5)	0.003*
RMM	59 (34.3)	31 (58.5)	0.002*
RLA	80 (46.5)	36 (67.9)	0.006*
RLL	83 (48.3)	39 (73.6)	0.001*
RLP	114 (66.3)	48 (90.6)	0.001*
RLS	99 (57.6)	41 (77.4)	0.009*
RLM	63 (36.6)	32 (60.4)	0.002*
LUL	86 (50.0)	43 (81.1)	<0.001*
LUA	69 (40.1)	36 (67.9)	<0.001*
LUAP	85 (49.4)	36 (67.9)	0.018*
LLA	70 (40.7)	31 (58.5)	0.023*
LLL	81 (47.1)	40 (75.5)	<0.001*
LLP	102 (59.3)	48 (90.6)	<0.001*
LLS	84 (48.8)	40 (75.5)	0.001*
Focal	26 (15.1)	1 (1.9)	0.010*
Diffuse, multi-lobe	127 (73.8)	49 (92.5)	0.004*
Bilateral	138 (80.2)	50 (94.3)	0.015*
Subpleural	142 (82,6)	33 (62,3)	0.002*
Peribronchial	4 (2.3)	0 (0.0)	0.339
Random	27 (15.7)	20 (37.7)	0.001*

***RUA:** Right upper lobe apical, **RUAN:** Right upper lobe anterior, **RUP:** right upper lobe posterior, **RML:** right middle lobe lateral, **RMM:** right middle lobe medial, **RIA:** right lower lobe anterior, **RLL:** right lower lobe lateral, **RLP:** right lower lobe posterior, **RLS:** right lower lobe superior, **RLM:** right lower lobe medial, **LUL:** left upper lobe lingula, **LUA:** left upper lobe anterior, **LUAP:** left upper lobe apicoposterior, **LLA:** left lower lobe anterior, **LLL:** left lower lobe lateral, **LLP:** left lower lobe posterior, **LLS:** left lower lobe superior, *p < 0.05*

Lesion Involvement Score

We found a significant correlation between the percentage of involvement on LCT and high ferritin, increased CRP, increased d-dimer, and low lymphocyte levels. In the survivor group, 88 (51.1%) patients had a score of 2.5 and five (2.9%) had a score of 5 in terms of lung involvement areas at the time of first admission. In the mortality group, LCT involvement was observed in 15 (28.3%) patients with a score of 2, 15 (28.3%) with a score of 3, and nine (16.9%) with a score of 5 (Figure 1). The risk of mortality increased as the percentage of involvement on LCT rose above 5% (p < 0.001).

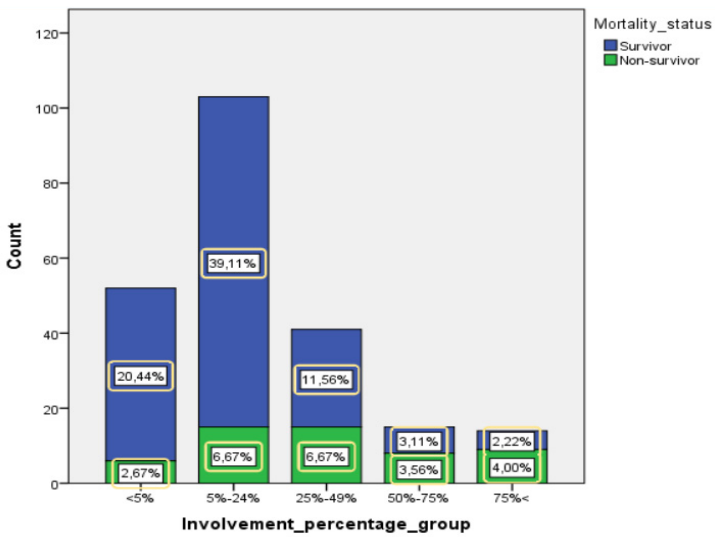

Figure 1: Percentages of lesion involvement areas on lung computed tomography for the survivor and non-survivor groups

Lesion Morphology

In our sample, 205 (91.3%) patients presented with ground glass opacities and dominant bilateral lower zone involvement, which is considered typical COVID 19 involvement. These patients were diagnosed with COVID-19 in a short time due to LCT findings at first admission. Five (2.2%) patients had pulmonary edema due to heart failure and 20 (8.8%) had atypical LCT findings. Sixteen (30%) patients had air bronchograms, 35 (66%) had a ground glass appearance, and 15 (23.3%) had a cobblestone appearance (Table 3). According to the statistical analysis, there was a significant correlation between mortality and the presence of an air bronchogram (p = 0.01) and cobblestone appearance (p < 0.001) on LCT (Table 3).

Table 3: Comparation of lung computed tomography lesion morphology of the patients			
Variable	**Survivor n (%)**	**Non-survivor n (%)**	**p**
Ground glass opacity			0.170
	130 (75.6)	35 (66.0)	
Consolidation			0.087
	2 (1.2)	3 (5.7)	
Mixed type			0.262
	36 (20.9)	15 (28.3)	
Air bronchogram			0.010*
	25 (14.5)	16 (30.2)	
Cobblestone appearance			<0.001*
	9 (5.2)	15 (28.3)	
Halo sign			0.479
	6 (3.5)	1 (1.9)	
Reversed halo sign			0.400
	7 (4.1)	1 (1.9)	
Ground glass nodule			0.059
	11 (6.4)	0 (0.0)	
**p < 0.05*			

COVID-19 PSI

We found that 64 (37.2%) of the surviving patients were in PSI group II at the time of first admission. In the mortality group, no patient was in PSI group I at admission ($p < 0.001$) (Figure 2). Of the patients who died, three (5.7%) were in PSI group II ($p < 0.001$), four (7.5%) were in PSI group III ($p = 0.046$), 21 (39.6%) were in PSI group IV ($p < 0.001$), and 25 (47.1%) were in PSI group V ($p < 0.001$).

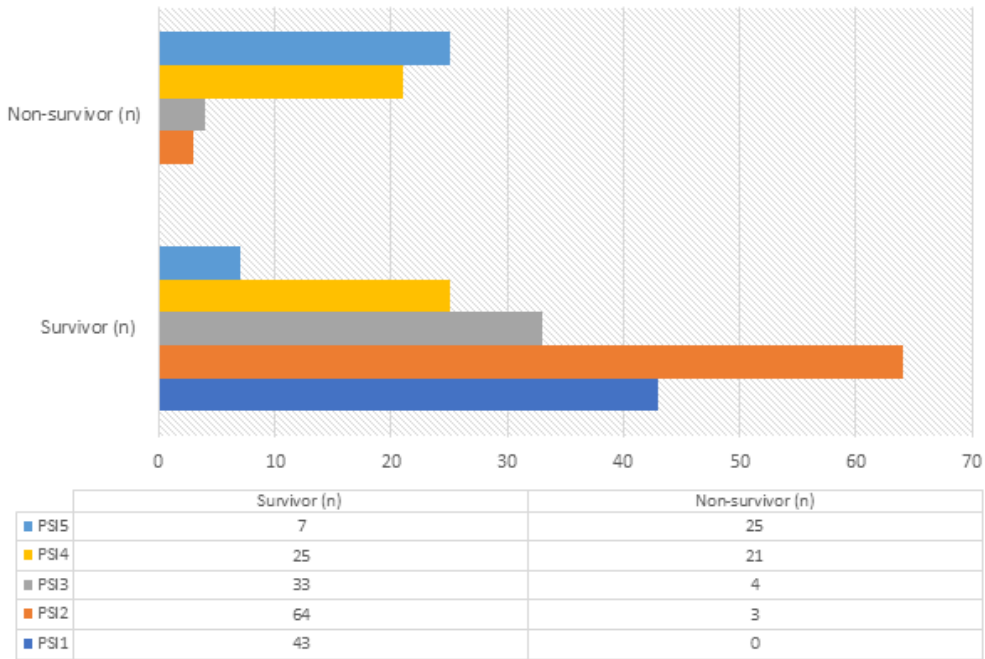

Figure 2: PSI (Pneumonia severity index) of the surviving and non-surviving patients

In this study, the relationships between parameters that were statistically significantly correlated with mortality were also examined in the logistic regression analysis by creating a multivariate model. The data are presented in Table IV (Hosmer Lemeshow Test p=0.287; Nagelkere R2=0.570).

Table 4: Results of univariate and multivariate analyses with the logistic regression

		Univariate		Multivariate	
Variable	**Non-survivor n (%)**	**Odds**	**p**	**Odds**	**p**
Gender					
Female	16 (16.8)	1			
Male	37 (28.5)	1.964 (1.017-3.796)	0.045*		
Age					
<60 years	5 (6.6)	1		1	
≥60 years	48 (37.8)	8.628 (3.254-22.879)	<0.001*	3.532 (1.130-11.037)	0.030*
PSI group V	25 (78.1)	21.046 (8.313-53.284)	<0.001*	8.393 (2.869-24.551)	<0.001*
EOS (x10^3/µL)					
<0.02	43 (33.3)	4300(2.031-9.105)		3.162 (1.141-8.759)	
≥0.02	10 (10.4)	1	<0.001*	1	0.027*
LYM (ml)					
<800	37 (54.4)	10.518(5.204-21.258)		4.049 (1.706-9.611)	
≥800	16 (10.2)	1	<0.001*	1	0.002*
Lactate (mmol/L)					
0,5-1.6	16 (11.8)	1		1	
>1.6	37 (41.6)	5.337 (2.729-10.436)	<0.001*	3.196 (1.315-7.765)	0.010*
Ferritin (ng/ml)					
<306	8 (7.2)	1		1	
≥306	45 (39.5)	8.397 (3.730-18.903)	<0.001*	4.327 (1.461-12.816)	0.008*
COPD	14 (38.9)	2.448 (1.148-5.218)	0.020*		
CAD	19 (35.8)	2.268 (1.155-4.456)	0.017*		
Bilateral involvement on LCT	50 (26.6)	4.106 (1.207-13.964)	0.024*		
Subpleural involvement on LCT	33 (18.9)	0.349 (0.176-0.689)	0.002*		
Involvement percentage					
<5% (Score 1)	6 (11.5)	1			
5-25% (Score 2)	15 (14.6)	1.307 (0.475-3.594)	0.604		
26-49% (Score 3)	15 (36.6)	4.423 (1.53-12.791)	0.006*		
50-75% (Score 4)	8 (53.3)	8.762 (2.331-32.928)	0.001*		
>75% (Score 5)	9 (64.3)	13.800 (1.233-5. 243)	<0.001*		
WBC (x10^3/µL)					
<10,000	28 (15.7)	1	<0.001*		
≥10,000	25 (53.2)	6.088 (3.021-12.268)			
NEU (x10^3/µL)					
<7000	15 (10.1)	1			
≥7000	38 (50.0)	8.933 (4.446-17.950)	<0.001*		
BASO (x10^3/µL)					
0-0.01	6 (9.5)	1			
>0.01	47 (29.0)	3.883 (1.567-9.617)	0.003*		
CRE (mg/dL)					
<1.17	29 (16.6)	1			
≥1.17	24 (48.0)	4.647 (2.347-9.201)	<0.001*		
Urea (mg/dL)					
<43	12 (8.7)	1			
≥43	41 (47.1)	9.359 (4.526-19.352)	<0.001*		
AST (U/L)					
0-50	33 (17.6)	1			
>50	20 (52.6)	5.185 (2.475-10.862)	<0.001*		
POTAS (mEq/L)					
<5.1	40 (19.6)	1			
≥5.1	13 (61.9)	6.662 (2.587-17.161)	<0.001*		
TROP (ng/ml)					
0-19.8	23 (13.3)	1			
>19.8	30 (57.7)	8.893 (4.400-17.976)	<0.001*		
PT (sec)					
<16	44 (21.2)	1			
≥16	9 (52.9)	4.193 (1.529-11.499)	0.005*		
INR					
<1.24	46 (21.7)	1			
≥1.24	7 (53.8)	4.210 (1.349-13.141)	0.013*		

COPD: *Chronic obstructive pulmonary disease,* ***CAD:*** *Coronary artery disease,* ***PSI:*** *Pneumonia severity index ,* ***WBC:*** *White blood cell,* ***NEU:*** *Neutrophil,* ***BASO:*** *Basophil,* ***EOS:*** *Eosinophil,* ***LYM:*** *Lymphocyte,* ***CRE:*** *Creatinine,* ***AST:*** *Aspartate aminotransferase,* ***POTAS:*** *Potassium,* ***TROP:*** *Troponin, PT: Prothrombin time,* ***INR:*** *International normalized ratio,* ***LCT:*** *Lung computed tomography, *p < 0.05, Hosmer Lemeshow Test p=0.287; Nagelkere R2=0.570*

Discussion

In our study, we found that severe COVID-19 was more common in patients aged 60-90 years and those with comorbidities, such as COPD, DM, HT, and CAD. When the moderate-risk patient group was compared with the severe cases, the symptoms of headache, sore throat, and dyspnea were more common in the latter. In both the survivor and mortality groups, we found a higher rate of severe disease among the male patients. In contrast, some studies reported that gender was not a risk factor for COVID-19 (5, 10).

Concerning the laboratory findings, we found that increased leukocyte-neutrophil count, lactate, LDH, troponin, and ferritin levels, decreased lymphocyte-basophil-eosinophil count were associated with mortality of COVID-19. Unlike the results of previous studies, our study showed that severe illness or an intensive care requirement due to SARS-CoV-2 pneumonia was associated with leukocytosis rather than leukopenia (11, 12). In a study by Li et al., (13) a correlation was found between severe COVID-19 and high alanine aminotransferase, aspartate aminotransferase, and creatinine levels. However, we did not observed such a relationship in our study. Qin et al. (14) suggested that lymphocyte count should be monitored in terms of a possible decrease in the early screening of severe COVID-19 and diagnosis and treatment of the disease. A decrease in basophil count was present in almost all of our patients that died. A decrease in basophil count can also assist in the early diagnosis of the disease. The significant decrease in the eosinophil level in the early period is also remarkable. Our multivariate logistic regression analysis revealed that low eosinophil and lymphocyte counts and increased lactate and ferritin levels were the most significant parameters affecting mortality. Fibrinogen is frequently elevated in patients with sepsis but may also be low in severe cases of disseminated intravascular coagulation (DIC). Decreased fibrinogen is also an important criterion for the diagnosis of overt DIC (15). Although the degree of elevation has not been shown to be consistently associated with mortality, it has been found to be strongly associated with the interleukin (IL)-6 level (16). In some studies, the progressive decrease in the fibrinogen level has been strongly associated with mortality, but this tends to occur very late in the disease course (17). In our study, increased fibrinogen was observed in 40 (75%) of the patients that died and 112 (65.1%) of the survivors. Since, the increase in fibrinogen was increased in both survivor and mortality groups, we did not find a significant relationship between this protein and mortality.

LCT findings constitute another groups of prognostic factors that directly reflect the extent of pneumonia. Diffuse pneumonia is also a previously known prognostic factor in Middle East respiratory syndrome and SARS pneumonia (17). According to a recent study, less than <73% inflated lungs was an indicator of intensive care requirement and death (18). Therefore, measuring the pneumonia burden using the LCT score and the number of lobes or segments will help classify patients according to severity (18). Previous studies reported that 56% of LCT scans were normal in the early phase (0-2 days after symptom onset) while abnormal LCT findings became more frequent six to 11 days after symptom onset (19, 20). In the current study, we examined the LCT images taken at admission in the early stage of the disease and found a significant positive correlation between the percentage of involvement on LCT and mortality. We found that LCT involvement of 5-49% at the time of admission was a significant indicator of mortality, and the number of deaths increased as the percentage of involvement increased. Although, an LCT score of 2 and above does not necessarily indicate diffuse pneumonia, it should not be overlooked, and these patients should be carefully followed up to monitor the progression of severe pneumonia.

In our study, we detected ground glass opacity appearance, bilateral, subpleural, and involvement of more than two lobes on LCT very common. In severe cases, air bronchogram and cobblestone appearance were more common than in non-severe cases. The LCT scores of the whole lung and each lobe were significantly higher in the severe group than in the non-severe group. Among the non-survivors, the involvement of the RML, RLP, RLS, LUL, LLL, LLP, and LLS segments was more frequently seen compared to the remaining patients. In a study by Chon Y et al., (21) although consolidation opacity was frequently observed in patients in the severe group, it was not found to be an indicator of poor prognosis. In our study, although consolidation was detected in a small number of patients in the whole study group, air bronchograms were significantly more common in the mortality group. Five (2.2%) patients had pulmonary edema due to heart failure and 20 (8.8%) had atypical LCT findings. These patients could not be diagnosed with COVID-19 for a long time, which caused delayed treatment and prolonged their length of hospital stay. Although the appearance of pulmonary edema is rare, it should be kept in mind in patients with COVID-19.

PSI is a well-known scoring system to assess the severity of community-acquired pneumonia and has also been validated in the practice of viral pneumonia (22). To determine whether PSI can be used to assess COVID-19 disease severity, we calculated this score for each patient. In our mortality group, 21 of the patients were in PSI group IV and 25 were in PSI group V, and we found a significant relationship between an increase in the PSI score and the number of deaths. In addition, there was a significant correlation between the PSI score and increased ferritin, increased d-dimer, decreased lymphocytes, and increased CRP levels, which are known as mortality indicators. The multivariate logistic regression analysis showed that being in PSI group V was one of the most significant factors affecting mortality.

This was a multifaceted study involving the combination of clinical, laboratory, and radiological evaluations. As a limitation, the relatively small sample size of the severe group can be considered.

Conclusion

This review summarizes the potential risk factors for COVID-19 infection, severity, and mortality in adults. In this single-center retrospective study, we determined the most significant factors for mortality as advanced age, low eosinophil and lymphocyte counts, increased lactate and ferritin levels, and PSI group V. In this review, we highlight the clinical evidence supporting for the risk factors for the severity and mortality of COVID-19. Identifying potential risk factors for COVID-19 severity and mortality may improve the management of COVID-19 patients.

Declarations

Funding
The authors declare that the study received no funding.

Conflict of Interest
The authors declare no competing interests.

Ethics Approval
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was conducted at the Ağrı State Hospital. Ethical approval was obtained from the Planning and Coordination Board of the hospital with the decision number 34.

Availability of Data and Material
All data is available

Authors' Contribution:
MC: Design the work and the acquisition, analysis, and interpretation of data for the work. Drafting the work and revising it critically for important intellectual content.

CS: Design the work and the acquisition, analysis, and interpretation of data for the work.
CT: Conception and design of the work. Final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.
MS: Conception and design of the work. Final approval of the version to be published. Revising it critically for important intellectual content.
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References

1. Loeffelholz MJ, Tang Y-W. Laboratory diagnosis of emerging human coronavirus infections–the state of the art. EMi, 2020;9(1):747-56. DOI: 10.1080/22221751.2020.1745095
2. Xu X-W, Wu X-X, Jiang X-G, et al. Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series. BMJ. 2020;368. DOI: 10.1136/bmj.m606
3. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020;323(13):1239-42. DOI: 10.1001/jama.2020.2648
4. Pan L, Mu M, Yang P, et al. Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, China: a descriptive, cross-sectional, multicenter study. The AJG. 2020;115. DOI: 10.14309/ajg.0000000000000620
5. Li K, Wu J, Wu F, et al. The clinical and chest CT features associated with severe and critical COVID-19 pneumonia. Invest Radiol. 2020. DOI: 10.1097/RLI.0000000000000672
6. Liu R, Han H, Liu F, et al. Positive rate of RT-PCR detection of SARS-CoV-2 infection in 4880 cases from one hospital in Wuhan, China, from Jan to Feb 2020. CCA. 2020;505:172-5. DOI: 10.1016/j.cca.2020.03.009
7. Control CfD, Prevention. Research use only real-time RT-PCR protocol for identification of 2019-nCoV. 2020.
8. Wang S, Kang B, Ma J, et al. A deep learning algorithm using CT images to screen for Corona Virus Disease (COVID-19). ESR. 2021;31:6096-104. DOI: 10.1007/s00330-021-07715-1

9. Hansell DM, Bankier AA, MacMahon H, et al. Fleischner Society: glossary of terms for thoracic imaging. Radiol. 2008;246(3):697-722. DOI: 10.1148/radiol.2462070712
10. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. JAMA. 2020;323(11):1061-9. DOI: 10.1001/jama.2020.1585
11. Guan W-j, Ni Z-y, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. NEJM. 2020;382(18):1708-20. DOI: 10.1056/NEJMoa2002032
12. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497-506. DOI: 10.1016/ S0140-6736(20)30183-5
13. Li J, He X, Yuan Y, et al. Meta-analysis investigating the relationship between clinical features, outcomes, and severity of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pneumonia. AJIC. 2021;49(1):82-9. DOI: 10.1016/j.ajic.2020.06.008
14. Qin C, Zhou L, Hu Z, et al. Dysregulation of immune response in patients with coronavirus 2019 (COVID-19) in Wuhan, China. CID. 2020;71(15):762-8. DOI: 10.1093/cid/ciaa248
15. Taylor Jr FB, Toh C-H, Hoots KW, et al. Towards definition, clinical and laboratory criteria, and a scoring system for disseminated intravascular coagulation. JTH. 2001;86(11):1327-30. DOI: 10.1055/s-0037-1616068
16. Tang N, Li D, Wang X, et al. Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia. JTH. 2020;18(4):844-7. DOI: 10.1111/jth.14768
17. Zou Z, Yang Y, Chen J, et al. Prognostic factors for severe acute respiratory syndrome: a clinical analysis of 165 cases. CID .2004;38(4):483-9. DOI: 10.1086/380973
18. Colombi D, Bodini FC, Petrini M, et al. Well-aerated lung on admitting chest CT to predict adverse outcome in COVID-19 pneumonia. Radiol. 2020;296(2):E86-E96. DOI: 10.1148/radiol.2020201433
19. Wang Y, Dong C, Hu Y, et al. Temporal changes of CT findings in 90 patients with COVID-19 pneumonia: a longitudinal study. Radiol. 2020;296(2):E55-E64. DOI: 10.1148/radiol.2020200843
20. Bernheim A, Mei X, Huang M, et al. Chest CT findings in coronavirus disease-19 (COVID-19): relationship to duration of infection. Radiol. 2020;295(3):685-91. DOI: 10.1148/radiol.2020200463
21. Chon Y, Kim JY, Suh YJ, et al. Adverse initial CT findings associated with poor prognosis of coronavirus disease. J Korean Med Sci . 2020;35(34). DOI: 10.3346/jkms.2020.35.e316
22. Kim M-A, Park JS, Lee CW, et al. Pneumonia severity index in viral community acquired pneumonia in adults. PONE. 2019;14(3):e0210102. DOI: 10.1371/journal.pone.0210102

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Comparative Evaluation of Knowledge, Attitudes and Hesitancies Related to Four Different Types of Vaccines: Smallpox, Influenza, Tetanus Versus Covid-19 Vaccines

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ABSTRACT

Purpose: The Covid-19 pandemic has brought the anti-vaccination problem back to the agenda. In this study, knowledge, attitudes and hesitancies related to four different types of well-publicized vaccines (smallpox, influenza, tetanus vs Covid-19) were comparatively evaluated to provide a unique understanding of vaccine hesitancy in general and distinctively for Covid-19.

Methods: A cross-sectional study was conducted face-to-face among the university students. A 26-item questionnaire was designed to collect the data. The survey covered demographics and vaccine-related sections for each of four vaccines. Vaccine knowledge, attitudes/perceptions related to vaccine hesitancy were questioned in 4 sub-sections to receive participants answers for each vaccine. Obtained data were analyzed by biostatistical methods.

Results: Covid-19 PCR positivity rate was 38.2% among the participants during study. General knowledge level score mean was 31.63/48 (65.89%) among the participants. General correct attitude score towards all vaccines mean was 70.78/104 (68.06%) among the participants. Participants have responded significantly different answers to Covid-19 vaccines in 14 of 22 questions/statements. New types of vaccines, logistics of these vaccines and severe side effects of vaccines were the parameters perceived significantly different for Covid-19 vaccines among others.

Conclusion: Our comparative analyzes have revealed that there are different points particularly for Covid-19 among others in the vaccine opposition seen in the Covid-19 pandemic.

Keywords: COVID-19, Vaccines, Vaccine hesitancy.

ÖZET

Amaç: Covid-19 salgını, aşı karşıtlığını yeniden gündeme getirmiştir. Bu çalışmada, genel anlamda ve özel olarak Covid-19 için aşı tereddütünün anlaşılmasını sağlamak amacıyla farklı bir bakış açısıyla iyi bilinen dört farklı aşı türüyle (çiçek hastalığı, grip, tetanoz ve Covid-19) ilgili bilgi, tutum ve tereddütler karşılaştırmalı olarak değerlendirildi.

Yöntemler: Üniversite öğrencileri arasında yüz yüze, kesitsel bir çalışma yapılmıştır. Verileri toplamak için 26 soruluk bir anket tasarlanmıştır. Anket, dört aşının her biri için demografi ve aşıyla ilgili bölümleri kapsamaktadır. Aşı bilgisi, aşı tereddüdüne ilişkin tutumlar/algılar, katılımcıların her bir aşı için yanıtlarını almak üzere 4 alt bölümde sorgulandı. Elde edilen veriler biyoistatistik yöntemlerle analiz edildi.

Bulgular: Çalışma süresince katılımcılar arasında Covid-19 PCR pozitiflik oranı %38,2 idi. Katılımcıların genel bilgi düzeyi puan ortalaması 31,63/48 (%65,89) idi. Katılımcıların tüm aşılara yönelik genel doğru tutum puanı ortalaması 70,78/104 (%68,06) idi. Katılımcılar, 22 sorudan/ifadeden 14'ünde Covid-19 aşılarına önemli ölçüde farklı yanıtlar verdiler. Yeni aşı türleri, bu aşıların lojistiği ve aşıların ciddi yan etkileri, diğerleri arasında Covid-19 aşıları için önemli ölçüde farklı algılanan parametrelerdi.

Sonuç: Karşılaştırmalı analizlerimiz, Covid-19 pandemisinde görülen aşı karşıtlığında Covid-19`a karşı diğerlerinden farklı noktaların olduğunu ortaya koydu.

Anahtar Kelimeler: COVID-19, Aşı, Aşı karşıtlığı.

COVID-19 pandemic caused by a new type of coronavirus namely severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is continuing which there is still no specific therapy for the infection making it easily transmittable by individuals with or without symptoms(1). This made the management of pandemic challenging. With the uneasiness caused by the pandemic, all people closely followed the daily cases, the control of the situation and the vaccination studies which creates an expectancy for the ending of pandemic.

Vaccination aims to prevent diseases with high morbidity and mortality, especially infectious diseases, and reduce the rate of harm in general(2). But if it is required to provide full immunization to the community, the first point that needs to be strengthen is the vaccine trust. During the fight against COVID-19, some pharmaceutical companies have announced that vaccine studies were completed earlier than expectations and some vaccines have had severe side effects in some populations. Speculative explanations have been developed from many different channels about the safety of these vaccines, and with these explanations, prejudice and confusion were created in the public against vaccines(3). After this type of announcements and news, the World Health Organization (WHO) has warned that we are at war with another type of epidemic called 'infodemics', which spread fake news, false information, and false scientific claims to the public all around the world(4).

Vaccine hesitancy is evaluated under three main items as: fear of vaccines, not taking the disease seriously and not needing a vaccine, and difficulty with accessing the vaccine. Based on these three items, people should be informed about the disease and the vaccine, and their hesitations should be thoroughly examined and evaluated to ensure high-rate immunization(5). Despite vaccine hesitancy there were very successful applications of vaccination campaigns which led to full eradication of such diseases such as smallpox. On the other hand, there are historical diseases which vaccination could not succeeded as expected due to various reasons. Some of the unsuccessfulness of these vaccines may be related to improper structure of vaccines and some troubles associated with campaigns. Notably, knowledge of people regarding the fact that different vaccines may have been developed for different purposes (i.e., vaccines aiming for complete immunization vs. prevention from severe disease) is questionable. So, each vaccines success is mainly related to many technical factors including the ones related to disease but also to vaccines unique nature.

In this study, it was aimed to comparatively evaluate young populations` knowledge, attitudes and hesitancies related to 4 different types of well-publicized vaccines (smallpox, influenza, tetanus vs Covid-19) to provide a complete understanding of vaccine hesitancy in general and distinctively for Covid-19 pandemic.

Material and Methods

Ethical Statement

Before reaching to participants ethical approval was received from the ethical board of Eastern Mediterranean University, Board of Scientific Research and Publication Ethics with decision number; ETK00-2022-0089. Participation in the study was voluntary and each participant signed an informed consent form before participating. Only students who are over the age of 18, studies at EMU, who voluntarily agreed to participate in the study and signed the informed consent form have participated in the study.

Study Design, Data Collection Methods and Tools

This study was designed as a cross-sectional study. Convenience sampling method is used. The sample pool was comprised of volunteer English speaking university students above age 18. Sample size was calculated with the OpenEpi program based on the number of foreign students at the university. Aiming for a 95% confidence interval, the sample was aimed to consist of 377 students.

Study was conducted face-to-face in a university in Northern Cyprus from April 2022 to May 2022. A 26-item questionnaire was designed to collect the data. The topic guide for this questionnaire was based on a review of the literature and general issues faced during the pandemic. Content validity was assessed by an expert panel consisting of two microbiologists and one specialized pediatrician. Also, a test-retest pilot study was conducted using a convenience sample of 20 students from the university. Questionnaires were delivered together with a cover letter, outlining the study objectives, and highlighting the importance of participation. The survey covered demographic characteristics and included vaccine-related sections. Vaccine related sections were about general

knowledge about vaccines and general attitudes about vaccines and each item in these sections were divided into 4 sub-sections to receive participants answers for tetanus, influenza, smallpox and covid-19 vaccines. In the demographic section age, gender, education level, previous PCR results and vaccination status were questioned. For scoring of knowledge and attitude, expected answers were graded as 2 points, unexpected answers as 0 point, and undecided ones as 1 point. These scores were then summed for both knowledge and attitudes questions and scores were obtained.

Statistical Analysis

IBM SPSS 26.0 (SPSS Inc., Chicago, IL, USA) package was used to analyze the data. Descriptive analysis was calculated, and the mean of numeric variables and frequency analysis of categorical variables were measured. Normality test was calculated to determine whether sample data has been drawn from a normally distributed population. Chi-square Tests and paired sample T tests were used to calculate associations and/or differences. The confidence level set to 95%. p <0.05 considered to be statistically significant. To validate the questionnaire, Cronbach's Alpha test was performed (Scores= 0.823 for knowledge section and 0.871 for attitudes section).

Results

In the current study, it was aimed to reach 377 people and 325 people completed the questionnaire corresponding to a response rate of 86.2%. Mean age of the participants was 21.34±2.03. There were 162 (%50) male, 150 (%46) female and 12(%4) non-binary participants and most of them were undergraduate students (%88). Covid-19 PCR positivity rate was 38.2% among the participants during study. Overall responses of participants related to demographic characteristics, vaccinations status, general knowledge and attitudes toward vaccines are shown in Table 1.

General knowledge level score mean was 31.63/48 (65.89%) among the participants. There were no significant differences among different vaccines in terms of knowledge. Females are observed to have higher knowledge and hesitancy score means than males and non-binary students for all vaccines. Knowledge scores varied among education levels. However, PhD students have the lowest knowledge score for Covid-19 vaccine, yet they are still the ones that have the most positive attitude towards Covid-19 (p<0.05).

General correct attitude score towards all vaccines mean was 70.78/104 (68.06%) among the participants. Knowledge scores, attitude scores and vaccination status of participants were moderately associated (p<0.05).

When the questions related to vaccine hesitancy were evaluated for Covid-19, percentage of participants who placed their selves in the hesitant group was highest in questions related to side effects of the vaccines (62.8%) followed by types of vaccines (47.1%), ways of gaining immunity (herd immunity vs vaccination) (42.7%) and logistics of vaccines (30.5%).

For Covid-19 vaccines, it was found that people trust the information given by doctors related to vaccination (73.6%) rather than government officials (38.1%) or usual media (17.9%) and social media (17.9%).

Responses given by participants for Covid-19 vaccines were compared with means of responses given for other types of vaccines (Tetanus, Smallpox, Influenza) by using paired sample T tests. According to this comparison participants have responded significantly different answers to Covid-19 vaccines in 14 of 22 questions/statements. In the section related to knowledge of participants (Table 2; B-H), only statement which was not significantly different for Covid-19 was "Healthy people don't need vaccination". In the section where sources of information are questioned (Table 2; I-L), it was observed that participants responses were significantly different when they are asked if they trust the information given by their doctors and government officials. Participants attitudes did not significantly differ for statements related to trust to social media and usual media. In the section covering questions/statements related to vaccine hesitancy, it was observed that participants responded significantly different to following statements; (i) i don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated, (ii) i recommend my relatives to get vaccinated for, (iii) vaccines have severe side effects that make me hesitate getting vaccinated and (iv) severity of the side effects I experienced after my previous dose/doses makes me hesitate to get my future doses. Details of these comparisons are given in Table 2.

Table 1: Descriptive statistics including demographical information of participants.

Age	**Mean**	**Median**	**Range**			
	21.34	21.00	11			
Gender	**Male (N, %)**	**Female (N, %)**	**Non-binary (N, %)**			
	162, 49.84	150, 46.15	13, 4			
Education level	**Preparatory (N, %)**	**Undergraduate (N, %)**	**Masters (N, %)**	**PhD (N, %)**		
	29, 8.92	285, 87.69	8, 2.46	3, 0.92		
Tested COVID-19 positive (PCR) previously	**Yes (N, %)**	**No (N, %)**				
	125, 38.46	200, 61.53				
Vaccination status		**Fully vaccinated (N, %)**	**Not vaccinated (N, %)**	**Unaware (N, %)**	**Missing dose/ doses (N, %)**	
	T*	234, 72	22, 6.76	53, 16.30	16, 4.92	
	I*	160, 49.23	51, 15.69	86, 26.46	28, 8.61	
	S*	226, 69.53	19, 5.84	74, 22.76	6, 1.84	
	C*	300, 92.3	7, 2.15	1, 0.3	17, 5.23	
Recently developed vaccines carry more risks than older vaccines.		**Strongly disagree (N, %)**	**Disagree (N, %)**	**Undecided (N, %)**	**Agree (N, %)**	**Strongly Agree (N, %)**
	T	57, 17.54	83, 25.54	108, 33.23	38, 11.69	39, 12
	I	52, 16	84, 25.85	112, 34.46	40, 12.31	37, 11.38
	S	51, 15.69	84, 25.85	118, 36.31	37, 11.38	35, 10.77
	C	50, 15.38	67, 20.62	88, 27.08	62, 19.08	58, 17.85
Healthy people don't need vaccination.	**T**	190, 58.46	78, 24	26, 8	23, 7.08	8, 2.46
	I	167, 51.38	72, 22.15	53, 16.31	24, 7.38	9, 2.77
	S	179, 55.08	79, 24.31	41, 12.62	18, 5.54	8, 2.46
	C	198, 60.92	73, 22.46	22, 6.77	19, 5.85	13, 4
Harmful effects (mid-term/long-term) of vaccines outweigh the benefits.	**T**	96, 29.54	89, 27.38	90, 27.69	32, 9.85	18, 5.54
	I	85, 26.15	90, 27.69	106, 32.62	31, 9.54	13, 4
	S	91, 28	86, 26.46	104, 32	29, 8.92	15, 4.62
	C	80, 24.62	81, 24.92	98, 30.15	45, 13.85	21, 6.46
A good vaccine is one that has been studied/researched for at least 5-10 years.	**T**	34, 10.46	20, 6.15	63, 19.38	117, 36	91, 28
	I	32, 9.85	26, 8	68, 20.92	113, 34.77	86, 26.46
	S	32, 9.85	22, 6.77	71, 21.85	111, 34.15	89, 27.38
	C	38, 11.69	33, 10.15	63, 19.38	105, 32.31	86, 26.46
People who had the infection do not need to get vaccinated.	**T**	108, 33.23	111, 34.15	71, 21.85	25, 7.69	10, 3.08
	I	91, 28	99, 30.46	76, 23.38	47, 14.46	12, 3.69
	S	86, 26.46	100, 30.77	77, 23.69	46, 14.15	16, 4.92
	C	99, 30.46	113, 34.77	54, 16.62	44, 13.54	15, 4.62
I have a good level of knowledge about vaccines.	**T**	30, 9.23	74, 22.77	94, 28.92	90, 27.69	37, 11.38
	I	31, 9.54	68, 20.92	96, 29.54	100, 30.77	30, 9.23
	S	31, 9.54	70, 21.54	99, 30.46	92, 28.31	33, 10.15
	C	24, 7.38	47, 14.46	67, 20.62	125, 38.46	62, 19.08
I trust the information and suggestions given by my doctor related to vaccination.	**T**	11, 3.38	17, 5.23	34, 10.46	153, 47.08	110, 33.85
	I	11, 3.38	20, 6.15	43, 13.23	151, 46.46	100, 30.77
	S	11, 3.38	20, 6.15	39, 12	143, 44	112, 34.46
	C	21, 6.46	27, 8.31	38, 11.69	139, 42.77	100, 30.77
I trust the information and suggestions available on social media (Facebook, Instagram etc.).	**T**	128, 39.38	119, 36.62	57, 17.54	18, 5.54	3, 0.92
	I	127, 39.08	116, 35.69	62, 19.08	18, 5.54	2, 0.62
	S	124, 38.15	118, 36.31	63, 19.38	19, 5.85	1, 0.31
	C	135, 41.54	111, 34.15	58, 17.85	18, 5.54	3, 0.92

I trust the information and suggestions available on usual media (TV, newspaper etc.).	**T**	74, 22.77	93, 28.62	97, 29.85	53, 16.31	8, 2.46
	I	72, 22.15	95, 29.23	95, 29.23	57, 17.54	6, 1.85
	S	68, 20.92	94, 28.92	99, 30.46	58, 17.85	6, 1.85
	C	79, 24.31	93, 28.62	95, 29.23	51, 15.69	7, 2.15
I don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated.	**T**	40, 12.31	76, 23.38	122, 37.54	55, 16.92	32, 9.85
	I	39, 12	72, 22.15	128, 39.38	56, 17.23	30, 9.23
	S	36, 11.08	76, 23.38	130, 40	53, 16.31	30, 9.23
	C	34, 10.46	70, 21.54	122, 37.54	60, 18.46	39, 12
I feel positive about getting vaccinated for infectious diseases.	**T**	14, 4.31	14, 4.31	45, 13.85	139, 42.77	113, 34.77
	I	11, 3.38	19, 5.85	65, 20	130, 40	100, 30.77
	S	9, 2.77	15, 4.62	55, 16.92	132, 40.62	114, 35.08
	C	17, 5.23	21, 6.46	52, 16	125, 38.46	110, 33.85
I would prefer to get treatment if available rather than getting vaccinated.	**T**	75, 23.08	84, 25.85	84, 25.85	45, 13.85	37, 11.38
	I	62, 19.08	88, 27.08	91, 28	50, 15.38	34, 10.46
	S	64, 19.69	89, 27.38	90, 27.69	43, 13.23	39, 12
	C	71, 21.85	75, 23.08	86, 26.46	48, 14.77	45, 13.85
I trust the information and suggestions about vaccination given by government officials.	**T**	41, 12.62	49, 15.08	80, 24.62	109, 33.54	46, 14.15
	I	41, 12.62	50, 15.38	91, 28	104, 32	39, 12
	S	40, 12.31	45, 13.85	96, 29.54	102, 31.38	42, 12.92
	C	56, 17.23	59, 18.15	86, 26.46	83, 25.54	41, 12.62
I think that herd immunity strategy is more effective than vaccination.	**T**	59, 18.15	79, 24.31	116, 35.69	42, 12.92	29, 8.92
	I	40, 12.31	72, 22.15	127, 39.08	51, 15.69	35, 10.77
	S	47, 14.46	74, 22.77	129, 39.69	47, 14.46	28, 8.62
	C	53, 16.31	78, 24	106, 32.62	57, 17.54	31, 9.54
I recommend my relatives to get vaccinated for:	**T**	16, 4.92	9, 2.77	48, 14.77	110, 33.85	142, 43.69
	I	20, 6.15	23, 7.08	64, 19.69	97, 29.85	121, 37.23
	S	16, 4.92	10, 3.08	59, 18.15	106, 32.62	134, 41.23
	C	17, 5.23	11, 3.38	41, 12.62	101, 31.08	155, 47.69
Vaccines have severe side effects that make me hesitate to get vaccinated.	**T**	69, 21.23	93, 28.62	85, 26.15	65, 20	13, 4
	I	59, 18.15	93, 28.62	94, 28.92	67, 20.62	12, 3.69
	S	62, 19.08	100, 30.77	87, 26.77	64, 19.69	12, 3.69
	C	53, 16.31	92, 28.31	72, 22.15	90, 27.69	18, 5.54
Severity of the side effects I experienced after my previous dose/ doses makes me hesitate to get my future doses.	**T**	88, 27.08	95, 29.23	77, 23.69	48, 14.77	17, 5.23
	I	78, 24	93, 28.62	92, 28.31	47, 14.46	15, 4.62
	S	78, 24	93, 28.62	89, 27.38	47, 14.46	18, 5.54
	C	80, 24.62	82, 25.23	61, 18.77	74, 22.77	28, 8.62
I prefer the vaccine having the least side effects.	**T**	18, 5.54	29, 8.92	73, 22.46	102, 31.38	103, 31.69
	I	19, 5.85	29, 8.92	76, 23.38	105, 32.31	96, 29.54
	S	18, 5.54	28, 8.62	75, 23.08	105, 32.31	99, 30.46
	C	18, 5.54	36, 11.08	63, 19.38	106, 32.62	102, 31.38
My thoughts on vaccination may change if I get more information.	**T**	11, 3.38	26, 8	61, 18.77	132, 40.62	95, 29.23
	I	9, 2.77	24, 7.38	67, 20.62	135, 41.54	90, 27.69
	S	10, 3.08	23, 7.08	70, 21.54	130, 40	92, 28.31
	C	9, 2.77	25, 7.69	59, 18.15	123, 37.85	109, 33.54
Type of vaccine (mRNA, conventional etc.) is an important determinant for me to decide for vaccination.	**T**	26, 8	36, 11.08	112, 34.46	104, 32	47, 14.46
	I	25, 7.69	40, 12.31	111, 34.15	106, 32.62	43, 13.23
	S	25, 7.69	39, 12	108, 33.23	109, 33.54	44, 13.54
	C	25, 7.69	35, 10.77	92, 28.31	110, 33.85	63, 19.38

**T:Tetanus vaccines, I: Influenza vaccine, S: Smallpox vaccines, C: Covid-19 vaccines*

Table 2: Comparisons of answers given to questions/statements for Covid-19 vaccines versus other vaccines.	
Parameters of comparison between Covid-19 vaccines vs other vaccines	**p values***
A) Vaccination status	**.000**
B) Getting vaccinated is important for the health of people around me	**.003**
C) Recently developed vaccines carry more risks than older vaccines.	**.000**
D) Healthy people don't need vaccination	.173
E) Harmful effects (mid-term/long-term) of vaccines outweigh the benefits.	**.000**
F) A good vaccine is one that has been studied/researched for at least 5-10 years.	**.002**
G) People who had the infection do not need to get vaccinated.	**.000**
H) I have a good level of knowledge about vaccines.	**.000**
I) I trust the information and suggestions given by my doctor related to vaccination.	**.000**
J) I trust the information and suggestions available on social media (Facebook, Instagram etc.).	.879
K) I trust the information and suggestions available on usual media (TV, newspaper etc.).	.109
L) I trust the information and suggestions about vaccination given by government officials.	**.000**
M) I don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated.	**.016**
N) I feel positive about getting vaccinated for infectious diseases.	.055
O) I would prefer to get treatment if available rather than getting vaccinated.	.059
P) I think that herd immunity strategy is more effective than vaccination.	.876
Q) I recommend my relatives to get vaccinated for:	**.007**
R) Vaccines have severe side effects that make me hesitate getting vaccinated.	**.000**
S) Severity of the side effects I experienced after my previous dose/doses makes me hesitate to get my future doses.	**.000**
T) I prefer the vaccine having the least side effects.	.778
U) My thoughts on vaccination may change if I get more information.	.228
V) Type of vaccine (mRNA, conventional etc.) is an important determinant for me to decide for vaccination.	**.000**
** Paired sample T test was used to analyze the differences across various parameters. Numerical means of responses to each questions/statements were used for Tetanus, Influenza, Smallpox vaccines to be compared against Covid-19 vaccines. A p value below 0.05 was considered as a significant difference between the parameters.*	

Table 3	
Statements regarding vaccine hesitancy in the survey	**Percent of Covid-19 vaccine hesitant participants***
I don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated.	30.5
I feel positive about getting vaccinated for infectious diseases.	7.4
I would prefer to get treatment if available rather than getting vaccinated.	25.2
I trust the information and suggestions about vaccination given by government officials.	26.2
I think that herd immunity strategy is more effective than vaccination.	42.7
I recommend my relatives to get vaccinated for:	8
Vaccines have severe side effects that make me hesitate to get vaccinated.	23.4
Severity of the side effects I experienced after my previous dose/doses makes me hesitate to get my future doses.	20
I prefer the vaccine having the least side effects.	62.8
My thoughts on vaccination may change if I get more information.	10.2
Type of vaccine (mRNA, conventional etc.) is an important determinant for me to decide for vaccination.	47.1

Discussion

One of the most effective public-health measures, vaccines, ensure the protection of many people from infectious diseases that can cause morbidity and mortality(6). Despite overwhelming evidence of the effectiveness and safety of vaccines, there are people who are reluctant to get vaccinated or who refuse vaccines altogether(7). Vaccine hesitancy is felt significantly during the Covid-19 pandemic. However, it is known that vaccine hesitancy exists since the introduction of first vaccines. In this study, we aimed to evaluate Covid-19 vaccine hesitancy and knowledge of younger population in a perspective that we can compare with other well-known vaccines to see if there are any differences/similarities.

In our study, general knowledge level score mean was 31.63/48 (65.89%) among the participants and there were no significant differences among different vaccines in terms of knowledge. In a study, knowledge scores were lower in contrast to our study possibly because of differences in study design and study populations(8). In studies where the students were the study population usually higher knowledge score were reported(9). In our study, four well known vaccines were included such as Influenza, Smallpox, Tetanus and Covid-19. When it comes to knowledge, it can be said that people have a good knowledge of all these vaccines as they are well-recognized throughout the public communities because of various reasons. For instance, influenza vaccines are discussed publicly each season, tetanus is well known most probably related to personal experiences, smallpox is a renowned vaccine because of its success in the eradication of disease. Finally, Covid-19 vaccine is well publicized due to pandemic setting. So, there were no significant difference in terms of knowledge which may be explained because of these similarities.

In our study, participants seem to trust the information given by their doctors mostly rather than government officials or usual media and social media regarding all types of vaccines being asked in our survey. This result may mean that family physicians play a key role in driving vaccine acceptance because of the trust of people as suggested previously. Therefore, involving family physicians more in the establishment of vaccine recommendations might be a driving force to increase vaccine acceptance(10).

In terms of Covid-19 vaccine hesitancy, side effects of the vaccines were the mostly hesitated parameter in our setting. This was followed by other parameters such as types of vaccines (mRNA, conventional, etc.), believing to herd immunity strategy and handling logistics etc.. All these parameters alongside with others are widely discussed previously(11–13). Alongside with others, our results indicate that understanding the barriers and facilitators ahead of vaccine acceptance will be a key step to attain maximum vaccine coverage. Notably, in our setting such parameters like type of vaccine, handling logistics are parameters which can be thought to be more unique for Covid-19 vaccines. This might be aroused due to popular media coverage of such issues during the pandemic in the modern times.

In our study, one of the aims was to analyze the differences of responses given by participants to questions regarding Covid-19 vaccines in contrast to other three types of vaccines questioned (tetanus, influenza, smallpox). For this purpose, reported vaccination status was investigated and found to be significantly higher for Covid-19. This was mainly due to the unique pandemic setting and also people may report their vaccination status wrongly due to the fact that they may forget/not aware their vaccination status. On the other hand, in knowledge related questions participants responses were all significantly higher in the correct side for Covid-19 vaccines. So, in our setting participants seem to be more knowledgeable for Covid-19 vaccines in contrast to other questioned vaccines. Given the fact that, the general knowledge scores were also high in our setting, it may be concluded that vaccine hesitancy is probably not all about the knowledge of people. When the information sources are questioned, participants trusting their doctors and government officials were significantly higher for Covid-19 when compared with other three vaccines covered in the study. It was previously shown that, informal COVID-19 information sources, such as social media, Internet, and friends/family, induces vaccine hesitancy and using formal sources of information, such as government guidance and medical providers is reported to be better for increasing vaccine acceptance(14).

Comparing responses given to different vaccines has also provided insights to improve the understanding of reasons for vaccine hesitancy in the Covid-19 pandemic. It seems like 4 parameters related to vaccines affected people's views to be significantly different from other vaccines in the Covid-19 pandemic. For Covid-19 vaccines, handling and logistics of the vaccines and side effects of vaccines were the two significantly different parameters related to hesitancy. Proper storage of mRNA vaccines used in the Covid-19 pandemic was questioned publicly by media as it was a new vaccine safety guideline for the community which was not aware of previously(15). Actually, many types of vaccines including conventional ones may require special storage conditions. To the best of our knowledge, handling and logistics was not

questioned before as a factor for vaccine hesitancy and our results may suggest that handling and logistics may be considered as another barrier against vaccine acceptance. The next significantly differed response for Covid-19 vaccines were the ones related to side effects of vaccines which is studied extensively. Current literature suggests the side effects experienced after the vaccines recommended during the pandemic have affected the vaccine acceptance dramatically(16, 17). Our results agree with this outcome and underlies the necessity for such studies focusing on improvement of vaccine side effects.

There were a few limitations to note for this study. The cross-sectional design restricts the ability to draw causal conclusions. The sample, may not be representative of the broader population, potentially limiting the generalizability of the findings. Additionally, self-reported data may be subject to biases. The questionnaire's design, while validated by an expert panel and a pilot study, might still have inherent limitations. The questionnaire may not capture the full complexity of vaccine hesitancy, and the differentiation between vaccines could be influenced by participants' varying exposure to information about each vaccine type. The study's focus on only four types of vaccines excludes other relevant vaccines, which might offer additional insights into vaccine hesitancy. Finally, the timing of the study might have influenced the findings, as public opinions and knowledge about COVID-19 and its vaccines were rapidly evolving during this period.

To the best of our knowledge, this study is a first to evaluate different parameters about vaccination knowledge and hesitations etc. by comparing different types of vaccines. Our results indicate that, there are significantly different points in the vaccine opposition to Covid-19 vaccines in contrast to other studied vaccines. In general, modern world living conditions, factors related to the uncertainties of the Covid-19 disease/vaccines, misinformation may be thought as the reason for this situation. Specifically, unusual new types of vaccines, logistics of these vaccines and severe side effects of these vaccines were the parameters perceived significantly different for Covid-19 vaccines among others in this study. Therefore, understanding vaccine opposition and developing specific strategies to increase vaccine acceptance remain as important challenges.

Declarations

Conflict of Interest

The authors declare no conflict of interest.

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References

1. Kim YC, Dema B, Reyes-Sandoval A. 2020. COVID-19 vaccines: breaking record times to first-in-human trials. NPJ Vaccines 5:1–3.
2. Locht C. 2020. Vaccines against COVID-19. Anaesth Crit Care Pain Med. Elsevier.
3. Broniatowski DA, Quinn SC, Dredze M, Jamison AM. 2020. Vaccine communication as weaponized identity politics. Am J Public Health 110:617.
4. Organization WH. 2021. Infodemic management: an overview of infodemic management during COVID-19, January 2020–May 2021.
5. BAŞARAN A, Barış ÇİL. 2022. Vaccine Opposal in People Over 60 Years of Age in Mardin/Turkey–A Territory with Low Rate of Vaccination. Journal of Contemporary Medicine 12:81–85.
6. Orenstein WA, Ahmed R. 2017. Simply put: Vaccination saves lives. Proceedings of the National Academy of Sciences 114:4031–4033.
7. Ryan J, Malinga T. 2021. Interventions for vaccine hesitancy. Curr Opin Immunol 71:89–91.
8. Mohamed NA, Solehan HM, Mohd Rani MD, Ithnin M, Che Isahak CI. 2021. Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: A web-based survey. PLoS One 16:e0256110-.
9. Jiang N, Wei B, Lin H, Wang Y, Chai S, Liu W. 2021. Nursing students' attitudes, knowledge and willingness of to receive the coronavirus disease vaccine: A cross-sectional study. Nurse Educ Pract 55:103148.
10. Shen S (Cindy), Dubey V. 2019. Addressing vaccine hesitancy. Canadian Family Physician 65:175.
11. Joshi A, Kaur M, Kaur R, Grover A, Nash D, El-Mohandes A. 2021. Predictors of COVID-19 Vaccine Acceptance, Intention, and Hesitancy: A Scoping Review. Front Public Health 9.
12. Hudson A, Montelpare WJ. 2021. Predictors of Vaccine Hesitancy: Implications for COVID-19 Public Health Messaging. Int J Environ Res Public Health 18.
13. Yasmin F, Najeeb H, Moeed A, Naeem U, Asghar MS, Chughtai NU, Yousaf Z, Seboka BT, Ullah I, Lin C-Y, Pakpour AH. 2021. COVID-19 Vaccine Hesitancy in the United States: A Systematic Review. Front Public Health 9.
14. Kim J, Kim Y, Li Y. 2022. Source of information on COVID-19 vaccine and vaccine hesitancy among U.S. Medicare beneficiaries. J Am Geriatr Soc 70:677–680.
15. Anand P, Stahel VP. 2021. The safety of Covid-19 mRNA vaccines: a review. Patient Saf Surg 15:20.
16. Donnelly SC. 2022. COVID-19 vaccine hesitancy after side effects to the first vaccine: what are our options? QJM: An International Journal of Medicine. Oxford University Press.
17. Paris C, Bénézit F, Geslin M, Polard E, Baldeyrou M, Turmel V, Tadié É, Garlantezec R, Tattevin P. 2021. COVID-19 vaccine hesitancy among healthcare workers. Infect Dis Now 51:484–487.

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Comparison of Single Day Versus Two and Three Day Fractionated Infusion of Peripheral Stem Cells in Autologous Transplantation

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ABSTRACT

Purpose: The aim of this study was to investigate the safety, difference in duration of engraftment and relapse rates between autologous transplant patients who had their stem cell infusions during a single day or multiple days.

Methods: In this retrospective study the clinical data of 77 ASCT patients from a single center,30 of whom were transplanted in fractionated infusions were investigated. Duration of engraftment, side effects during the transplant, progression free survival (PFS) and overall survival (OS) data of the two groups was compared.

Results: There was no statistical difference between single day and fractionated infusion patients regarding neutrophil engraftment, toxic side effects, PFS, OS and relapse rate at 18 months. Platelet engraftment was delayed for one day in the fractionated group, which did not cause prolonged hospitalization. The transplant patients who had multiple day infusion had similar engraftment duration despite their lower average $CD34^+$ cell counts.

Conclusion: Fractionated infusions lead to similar engraftment duration to single day infusion for ASCT. The higher CFU cell number seen in the poorly mobilized patients may have a key role in the adequate engraftment. The fractionated infusion approach for such patients was feasible, safe and no increase of the disease relapse was observed with this procedure.

Keywords: Autologous; hematopoietic stem cell transplantation; fractionated stem cell; infusion.

ÖZET

Amaç: Bu çalışmanın amacı otolog kök hücre nakli yapılan hastalarda tek gün ve ardışık günlerde yapılan kök hücre ürün transfüzyonların güvenliğini,engraftman sürelerindeki farkı ve nüks oranları üzerindeki etkisini araştırmaktır.

Yöntemler: Bu retrospektif çalışmada 77 OKİT hastasının tek bir merkezdeki klinik verileri incelendi. Bu hastaların içinden 30 kişiye ürün volümü yüksek olması nedeniyle fraksiyone infüzyonla transplantasyon yapıldı, geri kalan 47 kişiye tek fraksiyonda transfüzyon yapıldı. iki grup arasında, nakil sırasındaki görülen yan etkilerin sıklığı, engraftman süreleri, hastanede yatış süreleri , progresyonsuz sağ kalım (PSK) ve toplam sağ kalım (TSK) verilerin karşılaştırılması yapıldı.

Bulgular: Ortanca 18 aylık takip süresi sonunda, tek günde kök hücre infüzyonu yapılan hastalar ile fraksiyone infüzyonlu hastalar arasında,nötrofil engraftmanı, toksik yan etkiler, PSK ve TSK oranları arasında istatistiksel olarak fark saptanmadı. Fraksiyone infüzyon alan grupta trombosit engraftmanı ortalama olarak bir gün daha uzun sürdü ancak bu durum klinik olarak anlamlı bir soruna yol açmadığı ve ortalama hastane yatış süresini uzatmadığı görüldü. hastaneye kaldırılma. Birden fazla gün infüzyon uygulanan nakil hastaların ortalama CD34+ kök hücre oranlarının daha düşük olmasına rağmen diğer hastalar ile benzer engraftman ve yatış süresine sahip oldukları gözlendi.

Sonuç: Otolog kök hücre transplantasyonlarında, fraksiyone kök hücre infüzyonları, tek günlük infüzyonlara benzer engraftman sürelerine sahiplerdir. Zor kök hücre mobilizasyonu olan hastaların hücre ürünlerindeki daha yüksek koloni oluşturan birim (CFU) sayısı, başarılı engraftmanda anahtar rol oynayabilir. Bu tür hastalarda fraksiyone infüzyon yaklaşımı güvenlidir, hastalık nüksünü arttırmamaktadır ve kolay uygulanabilir bir yöntemdir.

Anahtar Kelimeler: fraksiyone, kök hücre, infüzyon.

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Failure of stem cell mobilization occurs in %14 to %30 among ASCT candidates (1,2). Recent studies show that second mobilization attempt provides sufficient stem cell quantity in only %23 of these patients (3). The common practice in such cases is to combine the cryo preserved stem cell products from both previous and the last apheresis, in order to obtain sufficient total number of $CD34^+$ cells. The end result is very high volumes of stem cell product which cannot be infused in a single day safely because of the high total dymethyl sulfoxide (DMSO) quantity in the product. To avoid DMSO toxicity and volume overload the infusion of the stem cells is compulsory divided to multiple days (4,5,6). DMSO can be potentially cardiotoxic and affects the gas exchange in the alveoli (7,8). DMSO toxicity depends on the total volume infused and patients who undergo multiple apheresis for stem cell collection are at greater risk for DMSO side affects at the time of infusion (9,10). This was recognized by Martino et al, who proposed fractionated stem cell infusion to reduce cardiac toxicity (11). Fractionated infusion of stem cells in patients with multiple apheresis was since then employed without major acute side effects.

Other concerns about the fractionated stem cell infusions are delayed engraftment and the increased possibility of circulating tumor cell (CTC) contamination which may come with the large stem cell volume infused. The latter is a matter of concern especially in patients with poorly controlled or high risk disease.(12,13,14,15)

Despite the common practice and the increasing number of ASCT worldwide there is little information regarding the effect of fractionated infusions on engraftment duration.

The aim of this study was to analyze whether there is a difference in side effects, duration of engraftment and survival between autologous transplants who had their stem cell infusion during a single day or multiple days.

Material and Methods

Patients

Hospital records of a total of 77 patients, who underwent autologous peripheral hematopoietic stem cell transplantation (ASCT) between 2011 and 2013 in Acıbadem University Hospital in Istanbul were retrospectively analyzed. Only the patients, with eligible clinical data, diagnosed with multiple myeloma (n=47), Hodgkin's disease (n=12) and Non-Hodgkin lymphoma (n=18) were included in the study, because our clinic does not perform ASCT's for other indications. Single course of stem cell mobilization and successful harvesting was performed in 47 ASCT patients and 30 patients had poor stem cell mobilization after the first course which needed a second course of stem cell mobilization 3 weeks later.

Age, gender, diagnosis, remission status, Eastern Cooperative Oncology Group (ECOG) performance status, co-morbidities, number of previous treatment lines, number of infused $CD34^+$ cells per body weight (kg), amount of infused CFU–GM per body weight (kg), number of $CD34^+$ cell, infusion days, infused volume (L) of stem cells, time–to–neutrophil (TTNE) and platelet engraftment (TTPE), hospitalization days, cardiopulmonary toxicities observed during the stem cell infusion, febrile neutropenic episodes, pre transplant disease status and post transplant patient survival data was taken for investigation from the clinical records (Table.1).

Table 1: Patient characteristics

	Infusion days		
Variables	**1 (n=47)**	**≥2 (n=30)**	**P**
Age, years, median (IQR)	53 (46–62)	61 (52–65)	0.08
Gender, male, n (%)	21 (44.7)	17 (56.7)	0.31
Diagnosis			0.82
Multiple myeloma	29 (61.7)	18 (60.0)	
Non–Hodgkin lymphoma	10 (21.3)	8 (26.7)	
Hodgkin's disease	8 (17.0)	4 (13.3)	
Status of remission, n (%)			0.14
Complete response	21 (44.7)	13 (44.3)	
Partial response	25 (53.2)	13 (44.3)	
Stable disease	1 (2.1)	4 (13.3)	
ECOG performance status, ≥2, n (%)	4 (8.5)	7 (23.3)	0.10
Comorbidities, n (%)	19 (40.4)	21 (70.0)	0.01
Previous treatment lines, median (IQR)	1 (1–2)	1 (1–2)	0.77
Infused $CD34^+$/kg ($x10^6$), median (IQR)	5.21 (3.73–7.68)	3.98 (2.74–5.22)	0.003
Infused CFU–GM/kg, median (IQR)	22.3 (13.2–39.2)	47.6 (31.0–65.3)	<0.001
Infused volume, L, median (IQR)	0.72 (0.48–0.86)	1.30 (1.15–1.70)	<0.001

Local institutional ethical committee approved the retrospective study protocol in accordance with Turkish legal regulations and Helsinki declaration. Informed consent was obtained from all patients.

Stem Cell Collection

All patients underwent stem cell mobilization with cyclophosphamide 2gr/m^2/day for one day. Those with low creatinine clearance and age over 65 years were given total dose of 2gr/day cyclophosphamide. Seven days after the cyclophosphamide infusion the patients were administered subcutaneous filgrastim injections at a dose of 10µg/kg/day for 5 to 7 days and the stem cell apheresis was started on the 3'rd day of filgrastim. $CD34^+$ stem cell were collected with Fresenius-AS-TEC 204 (Fresenius Hemocare, Redmon , WA, USA) or Cobe Spectra (Gambro BCT, MA, USA). İn cases where the count of peripheral $CD34^+$ cells was less than 10/µL on the 3'rd day after filgrastim was commenced, the apheresis was either postponed for the next day until the peripheral $CD34^+$ cells reach the sufficient number or was cancelled in patients which never achieved that . Minimum of 2.0×10^6 $CD34^+$ cells/kg body weight was aimed for apheresis. Combination of autologous plasma,6% hydroxyethyl starch (HES), and 7,5% DMSO were utilized as the cryoprotectant solution. Initially, stem cells were kept at –4°C. A vapor phase container was used to store the samples at–156°C. In patients with insufficient $CD34^+$/kg quantities after 4 days of apheresis, the procedure was cancelled and they were called after 3 weeks for second stem cell mobilization and harvesting as described above.

Conditioning Regimens

In 30 patients with Hodgkin or Non–Hodgkin's disease, BEAM (BCNU, 300 mg/m^2 on day –6; Etoposide, 200mg/m^2, on days –5 to –2; ARA–C, 200mg/m^2, on days –5 to –2; and Melphalan, 140mg/m^2 on day –1) chemotherapy was administered. High dose Melphalan, 200 mg/m^2 on day –2 was used in 39 patients with multiple myeloma. Melphalan dose was reduced to 140 mg/m^2 in 8 myeloma patients with renal failure.

Study Endpoints

Primary endpoints of the study were time to neutrophil engraftment (TTNE) ,time to platelet engraftment (TTPE) and cardiac and pulmonary side effects attributable to DMSO toxicity . Neutrophil and platelet engraftments were defined as the time between the first stem cell infusion and first day of three consecutive days with an absolute neutrophil count greater than 500/µL, and platelet count >20,000/µL without transfusion within last seven days before the reconstitution, respectively. Cardiac and pulmonary toxicity was defined according to the Common Terminology Criteria for Adverse Events (CTCAE) volume 4.0.

Secondary endpoints include duration of hospitalization, frequency of febrile neutropenia episodes, time to progression and overall survival after 18 months of median follow up. Duration of hospitalization was estimated as the time from stem cell infusion to hospital discharge. Disease progression for multiple myeloma, Hodgkin's disease, Non-Hodgkin's lymphoma, was defined according the NCCN 2015 guidelines criteria.

Statistical Analysis

Patients were divided into two groups: single day versus fractionated day (infusion for 2 or more days) stem cell rescue. Shapiro–Wilks test was used to assess the distribution normality. Continuous variables were expressed as median [interquartile range (IQR)]. Skewed data was compared by Wilcoxon rank sum test. Student's t–test was employed to compare normally distributed data. Categorical variables were compared by χ^2 test with or without Yate's correction or Fisher exact testwhere appropriate.

Engraftment was defined to be the event. TTNE, TTPE and hospitalization days were presented as median [interquartile range (IQR)]. Differences between the survival groups were assessed usingKaplan–Meier survival curves and two–tailed log–rank test. Cox proportional hazard model was used to determine the predictors of TTNE, TTPE, hospitalization days, progression free survival (PFS) and overall survival (OS) in uni and multivariate analyses. Variables were dichotomized using median values before the univariate analyses. Variables with a $p \leq 0.25$ in univariate analyses were included into the multivariate analyses. The effect size of potential predictor was expressed as hazard ratio (HR) and 95% confidential interval (95% CI). Only predictors with a $p \leq 0.10$ were reported. A two-sided p value <0.05 was considered to declare statistical significance in all analyses.

Results

Demographic Characteristics

A total of 77 patients were included into the final analysis, 47 in single–day and 30 in multi–day infusion groups. Median number of infusion days in multi–day group was 2 (2–4). Patients in multi–day infusion group had a tendency to be older and to have poorer ECOG performance status (p= 0.08 and 0.10, respectively). Accompanying comorbidity conditions were more prevalent in multi–day infusion group (p= 0.01). Infused number of $CD34^+$ cells were lower in the multi-day patients , but the CFU–GM cells per body weight (kg) and the total volume of the apheresis product were higher as expected (Table 1).

Median follow up for all the patients was 18 months (range 11 to 36 months), with no difference between the groups (median 18 months for each).

Primary Endpoints

Engraftment failure did not occur in any of the patients included in the study. TTNE was 9 (9–10) days in single– and 10 (9–10) days in multi–day infusion groups (p= 0.053, Figure 1). TTPE was shorter in patients receiving single–day infusion [10 (10–11) versus 12 (11–13) days, p=0.001, Figure 2]. Only one patient in each group had signs and symptoms of transplant related toxicity. Both of the patients had symptoms of grade 2 heart failure (CTCAE vol.4.0) related to volume overload rather than DMSO toxicity (2.1% versus 3.3%, respectively, p= 0.75)

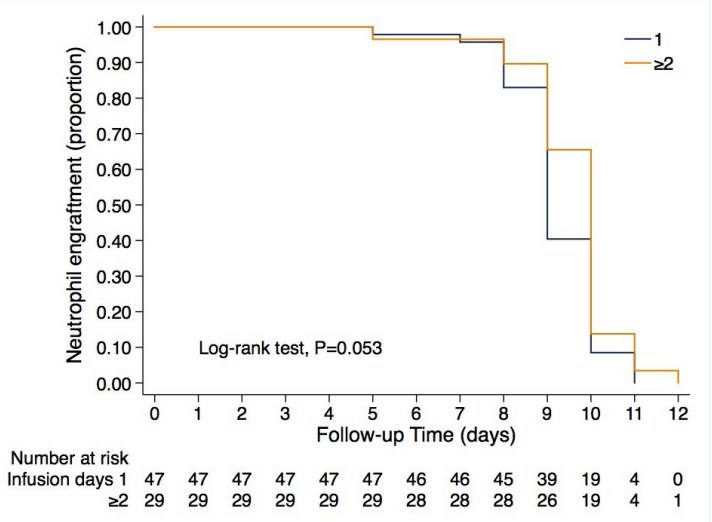

Figure 1: Time–to–neutrophil engraftment (TTNE) in patients receiving stem cells in single–day (1) and multi–day infusions (≥2).

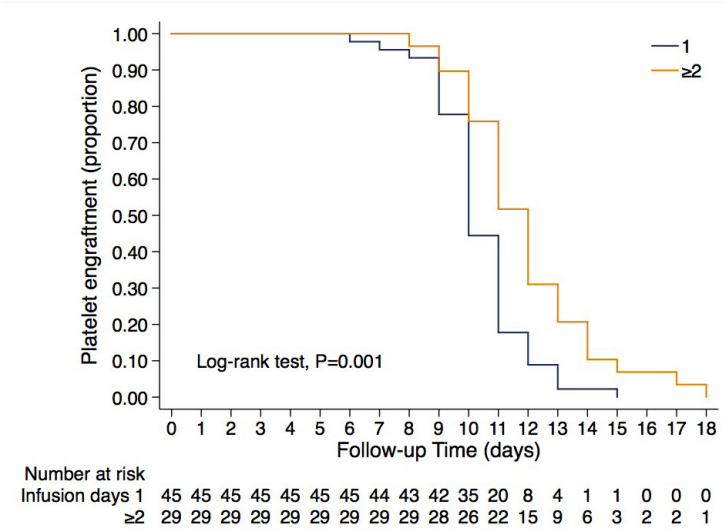

Figure 2: Time–to-platelet engraftment (TTPE)in patients receiving stem cells in single–day (1) and multi–day infusions (≥2).

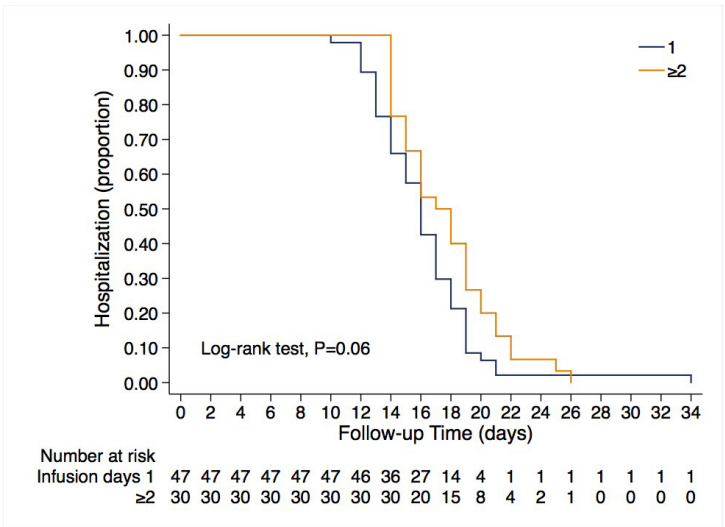

Figure 3: Duration of hospitalization in patients receiving stem cells in single–day (1) and multi–day infusions (≥2)

Secondary Endpoints

Duration of hospitalization was comparable in single– and multi–day infusion of stem cells [16 (14–18) versus 17 (15–20) days, p= 0.06, respectively, Figure 3]. Frequency of febrile neutropenia during the hospitalization in single–day infusion group was 20/47 (42.6%) and 14/30 (46.7%) in multi–day infusion group (p= 0.72). Median overall survival (OS) was not reached in both groups of patients and there was no statistical difference between them regarding OS after 18 months follow up. In the single-day group 41 of 47patients were alive at the end of the follow up and 6 died of relapsed disease. The patients of the multi-day

group had better OS - 28 /30 but this was statistically insignificant (OS single day infusion group:%88,3 *vs* OS in the fractionated infusions group:%93,1, *p*=0,85, %95 CI). The cause of death of the 2 patients in this group was progression of their primary disease.

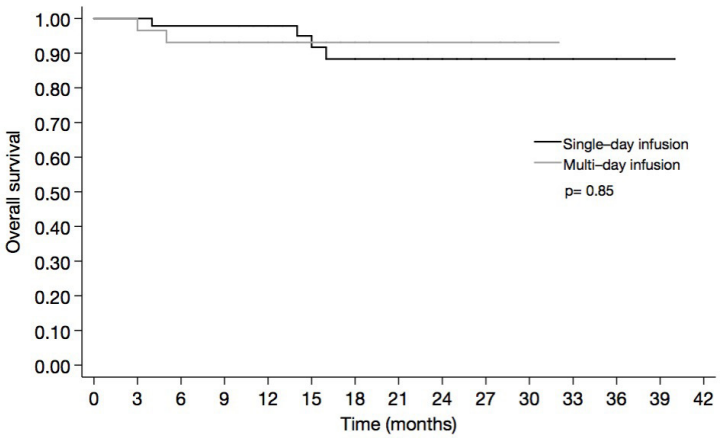

Figure 4: Overall survival (OS) of the patients receiving stem cells in single–day (1) and multi–day infusions (≥2)

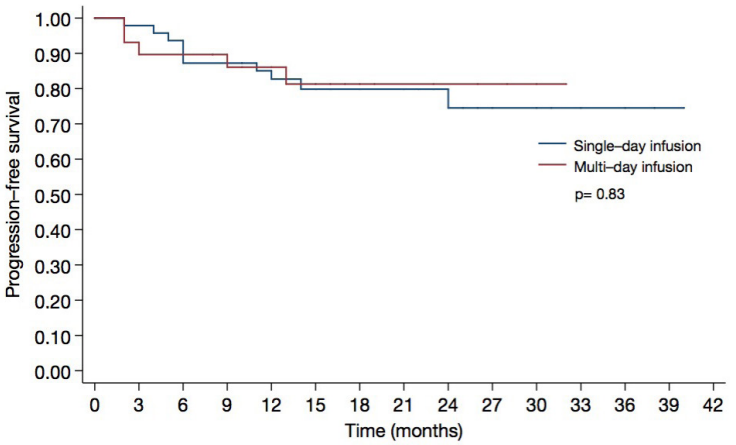

Figure 5: Progression-free survival (PFS) of the patients receiving stem cells in single–day (1) and multi–day infusions (≥2)

Progression free survival was also not reached in the patients of the two groups after the 18 months of follow up 35/47 patients in the single-day group and 24/30 patients of the multi-day group were disease free, but there was no statistical difference in the PFS between the groups (PFS in the single day infusion group:%79,8 *vs* PFS in the fractionated infusions %81,3,*p*=0,83,%95CI).

Confounding Factors

Multiple logistic regression analyses revealed that the only independent predictor of TTNE and TTPE was the infused number of $CD34^+$ cells per body weight (kg) (≥5 x 10^6) instead of number of infusion days (HR: 1.68, 95% CI 1.03 to 2.76, p= 0.04 for TTNE; and HR: 1.79, 95% CI 1.05 to 3.03, p= 0.03, for TTPE). None of the variables included into the model predicted the duration of hospitalization (HR: 1.58, 95% CI 0.96 to 2.60, p= 0.07, for $CD34^+$ cells/kg ≥5.0 x 10^6; and HR: 0.63, 95% CI 0.37 to 1.07, p= 0.09 for CFU–GM/kg ≥35)(Table 2).

Table 2: Statistical comparison of neutropenic fever episodes, hospitalization duration, cardiopulmonary side effects neutrophil engraftment, platelet engraftment time, overall survival (OS) and progression free survival (PFS) of the patients in both groups.

End points	Single day infusion group (n:47)	Fractionated infusion group (n:30)	P value
Median (IQR) neutrophil engraftment	9 days (9-10)	10 days (9-10)	0.053
Median (IQR) platelet engraftment	10 days (10-12)	12 days (10-13)	**0.001**
Median (IQR) duration of hospitalization	16 days (14-18)	17 days (15-20)	0.06
Febrile neutropenia	%42.6 (20 patients)	%46.7 (14 patients)	0.72
Cardio-pulmonary side effects	%2.1 (1 patient)	%3.3 (1 patient)	0.75
Median PFS (%95 CI)	NR	NR	-
18-month PFS	%79.8	%81.3	0.83
Median OS (%95 CI)	NR	NR	-
18-month OS	%88.3	%93.1	0.85

Discussion

High dose chemotherapy supported with autologous stem cell transplant is a well established treatment procedure used for disease consolidation especially in malignancies like multiple myeloma and lymphoma. It is a standard therapeutic modality which is included in many treatment guidelines for hematologic malignancies usually as a second line therapy. Although many years have passed since the first ASCT and the worldwide experience continues to increase, there are still some subjects of debate regarding the patients with poor stem cell mobilization.

Many transplant centers offer these patients other treatments for consolidation or just follow them up closely. The most important reason not to proceed with the stem cell harvesting is the disbelief that a subsequent mobilization cycle can provide enough quantity of stem cells. This may be true because usually the bone marrow stem cell mobilization capacity of these patients is heavily affected by the previous chemotherapies and other factors such as their age and other systemic illnesses (e.g. renal failure, liver failure and hypothyroidism). Nevertheless these patients can still provide some stem cells. This is an important point that deserves to be taken into account before excluding a patient from a possibly beneficial treatment like ASCT.

Another concern about the multiple harvested patients is the large volume of the end product which contains higher quantities of DMSO. Decreasing significantly the concentration of DMSO is not an option because it may also decrease the viability of cryopreserved stem cells which are already marginally sufficient. Thus the issue of the DMSO toxicity remains a threat especially for the patients with coexisting morbidities.

More than a decade ago Martinelli and his colleagues described a safe method for fractionated infusion of the stem cells. The pre-medications and close monitoring of the patient during the procedure reduces the side effects and toxic events. Today many transplant centers routinely perform fractionated ASCT's without major concern.

The focus of this study is to document the safety and side effects of the fractionated ASCT and to investigate the efficacy and long term effects of this type of transplant.

More than one third (%38) of patients in this study of 77 ASCT patients had fractionated transplants dispersed over 2 or more days as a result of larger stem cell volume. These patients experienced mobilization failure initially but all of them managed to provide more than $2x10^6$/kg $CD34^+$ cells after two mobilization courses with G-CSF and cyclophosphamide. None of the patients had disease progression in the gap between the two mobilizations. We think that the initial mobilization failure was due to factors such as older age and higher percentage of patients with active disease. All these factors and especially the number of previous chemotherapies have negative effect on the stem cell mobilization as described in some studies (4,16). The number of previous treatments was the same in both groups and this alone could not explain the lower levels of $CD34^+$ cells in the multi-day group. The patient number of this study is too small to make any conclusion that denies the impact of the previous chemotherapies ,given the solid data from the literature. Nevertheless it may be possible that other factors like poorly controlled disease and advanced age may have more prominent negative effect on stem cell mobilization than the previous chemotherapies. This was true for the patients in the fractionated group where the average age and the number of patients with poorly controlled disease was greater and both these factors were shown to have statistically significant effect over the stem cell mobilization in the univariate analysis. Interestingly the CFU levels were higher in the fractionated group despite lower $CD34^+$ cell levels. Generally it is assumed that the amounts of CD34 and CFU are correlated as the former is the progenitor of the latter. This can be possibly explained by longer exposure of fractionated transplant patients to G-CSF leading to shifting of $CD34^+$ cells to the committed CFU cell pool. The higher number of CFU/kg levels in the poorly harvested patients could have a positive effect on engraftment process and can compensate for the lower $CD34^+$ cell count (17).

The patients with poor mobilization in this study had median 8 apheresis cycles (7 to 9) which is twice than the normally harvested patients. Increasing the apheresis cycles could also increase the risk of apheresis complications some of which may be life threatening, but none of the patients in this study experienced major side effects. There were only 4 patients who had headache and muscle cramps, which did not mandate the cessation of the apheresis procedure.

During the fractionated infusions only 1 patient in the multi-day group had signs of grade 2 heart failure which occurred on the second day of infusions and was

managed quickly with diuretics and oxygen support. This patient did not have any other known pre existing cardiac disease except well controlled primary hypertension. The patient recovered completely and no permanent cardiac damage was seen during his long term follow up.

Overall the fractionated infusion was well tolerated and the patients remained clinically stable just as well as the single-day patients.

PFS and OS in the fractionated group was similar to the single day transfusion group patients (Table 3). A study by Kiel and his colleagues showed that extended stem cell apheresis can increase the risk of disease relapse by collecting and re infusing the circulating tumor cells (CTC) in the multiple myeloma patients(12).CTC counts prior to transplantation were not estimated in this study but relapse rate in the fractionated group during the 18 month follow up period was not statistically different from the single day infusion transplants. The reason for the lack of difference in the post transplant disease progression is the small number of patients included in this study. Another possible reason may be cyclophosphamide which was used in the mobilization regimen. Cyclophosphamide may have an in vivo purging effect on the remnant malignant cells which in turn helps the patient to enter the transplant with better controlled disease. More investigations and studies with more patients included are needed to enlighten this issue.

Table 3: Multiple logistic regression analysis of the variables and Cox proportional hazard models.

Neutrophil engraftment			
	Hazard ratio	**95% CI**	**P**
CD34 ≥5.0 x10^6	1.68	1.03–2.76	0.04
Platelet engraftment			
	Hazard ratio	**95% CI**	**P**
CD34 ≥5.0 x10^6	1.79	1.05–3.03	0.03
Hospitalization			
	Hazard ratio	**95% CI**	**P**
CD34 ≥5.0 x10^6	1.58	0.96–2.60	0.07
CFU–GM/kg ≥35	0.63	0.37–1.07	0.09

Remission status, infusion days, CD34, CFU–GM, age, ECOG, infused volume, and presence of comorbidities were included into models. Only variables with a p–value of ≤0.10 were presented here.

After almost 2 years of follow up, most of the patients in this heterogeneous group of poorly harvested ASCT patients still remain in remission and in good performance status, just like the normally harvested patients. Special medical attention, more medical interventions and expenses may be the major draw-backs when deciding to proceed with the mobilization in patients with poor stem cell harvesting, but we believe that these patients can still benefit from the ASCT just like the other patients.

The kinetics of stem cell mobilization and engraftment are still not completely understood and more studies are needed to clarify the most accurate assessment of the yield of harvesting and for predicting the successful engraftment and post transplant relapse risk.

This study shows that fractionated infusion leads to similar engraftment duration to single day infusion for ASCT and it is feasible, safe and has no adverse effects to the disease outcome. Therefore, failure to collect stem cells during the first mobilization may not be a cause for concern if it can be compensated during the second mobilization.

Conclusion

Large volumes of stem cell products that have been thawed from poorly mobilized aotulogous stem cell transplant candidates can be safely infused when fractioned in consecutive days. This approach does not compromise engraftment and does not cause additional DMSO toxicity in patients.

Declarations

Funding

Not applicable:

Conflicts of Interest

The author declares that there is no conflict of interest.

Ethics Approval

Acibadem University and Acibadem Healthcare Institutions Medical Research Ethics Committee (ATADEK)

Date: 11.02.2014. Nr: 2014-592

Availability of Data and Material

Data can be provided upon reasonable request, however, can not be public due to legislations.

Authors' Contributions

AU: Design, Data collection, Statistical Analysis, Writing of the paper.

References

1. Weaver CH, Hazelton B, Birch R, et al. An analysis of engraftment kinetics as a function of the CD34 content of peripheral blood progenitor cell collections in 692 patients after the administration of myeloablative chemotherapy. Blood. 1995; 86: 3961-3969.
2. Dreger P, Kloss M, Petersen B, et al. Autologous progenitor cell transplantation: prior exposure to stem cell-toxic drugs determines yield and engraftment of peripheral blood progenitor cell but not of bone marrow grafts. Blood. 1995; 86:3970-3978.
3. Iskra Pusic, Shi Yuan Jiang, Scott Landua, et al. Impact of Mobilization and Remobilization Strategies on Achieving Sufficient Stem Cell Yields for Autologous Transplantation, Biology of Blood and Marrow Transplantation.2008;14:1045-1056
4. Bensinger W, Appelbaum F, Rowley S, et al: Factors That Influence Collection and Engraftment of Autologous Peripheral-Blood Stem Cells. J Clin Oncol. 1995; 13:2547-2555
5. Stiff PJ, Koester AR, Weidner MK, et al: Autologous bone marrow transplantation using unfractionated cells cryopreserved in dimethylsulfoxide and hydroxyethyl starch without controlled-rate freezing. Blood 1987;70:974-978
6. Haas R, Möhle R, Frtihauf S, et al: Patient characteristics associated with successful mobilizing and autografting of peripheral blood progenitor cells in malignant lymphoma. Blood 1994; 83:3787-3794
7. Sharp JG, Vaughan WP, Kessinger A *et al*. Significance of detection of tumor cells in hematopoietic stem cell harvests of patients with breast cancer. In: Dicke KA, Armitage JO, Dicke-Evenger MJ (eds). *Autologous Bone Marrow Transplantation Proceedings of the Fifth International Symposium*. The University of Nebraska Medical Center: Omaha, 1991; pp 385–391.
8. Solano C, Badia B, Lluch A et al. Prognostic significance of the immunocytochemical detection of contaminating tumor cells (CTC) in apheresis products of patients with high-risk breast cancer treated with high-dose chemotherapy and stem cell transplantation. Bone Marrow Transplant 2001; 27: 287–293.
9. Stadtmauer EA, Tsai DE, Sickles CJ et al. Stem cell transplantation for metastatic breast cancer: analysis of tumor contamination. Med Oncol.1999; 16: 279–288.
10. O Donnell JR, Burnett AK, Sheehan T et al. Safety of dimethylsulfoxide. Lancet. 1981;1:498
11. Davis JM, Rowely SD, Braine HG, et al. Clinical toxicity of cryopreserved bone marrow graft infusion. Blood. 1990; 75:781-6
12. K Kiel, FW Cremer, C Rottenburger et al. Analysis of circulating tumor cells in patients with multiple myeloma during the course of high-dose therapy with peripheral blood stem cell transplantation. Bone Marrow Transplantation. 1999; 23: 1019–1027
13. Rowley SD. Hematopoietic stem cell cryopreservation. In:Thomas ED, Blume KG, Forman SJ, eds. Hematopoietic cell transplantation. Malden: Blackwell Science,1999:481-492
14. Galmes A, Besalduch J, Bargay J, et al. Cryopreservation of hematopoietic progenitor cells with 5- percent dimethyl sulfoxide at -80 degress C without rate controlled freezing. Transfusion. 1996; 36:794-797
15. Martino M, Morabito F, Messina G et al. Fractionated Infusions Of Cryopreserved Stem Cells May Prevent DMSO-Induced Major Cardiac Complicatıons In Graft Recipients. Haematologica. 1996; 81:59-61
16. M A Gertz , R C Wolf , Ivana N et al. Clinical impact and resource utilization after stem cell mobilization failure in patients with multiple myeloma and lymphoma Bone Marrow Transplantation. 2010; 45:1396–1403; doi:10.1038/bmt.2009.370
17. Boiron JM, Dazey B, Cailliot C, et al. Large-scale expansion and transplantation of CD34(+) hematopoietic cells: in vitro and in vivo confirmation of neutropenia abrogation related to the expansion process without impairment of the long-term engraftment capacity. Transfusion. 2006; 46: 1934-42.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Ophthalmology / Göz Hastalıkları

A Novel Surgical Approach For Upper Eyelid Blepharoplasty

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ABSTRACT

Purpose: To report the surgical results of the patients with dermatochalasis (DC) who underwent upper eyelid blepharoplasty (UEB) with the cautery method was aimed.

Materials and Methods: UEB surgery was performed by cautery method in 36 eyes of 18 patients due to DC. Pencil-tipped cautery was used to cut to sagging and marked skin area and was removed. Patients were examined preoperatively and postoperatively on the 1st day, 3rd day, 2nd week, 3rd month and 6th month.

Results: The mean age was 54.6±7.9 years (range, 46 to 67 years) and 10 of were female and 8 were male. Mean operation time (1 session for 2 upper eyelid (UE)) was 36.7 ± 5.8 minutes (range, 28 to 46 minutes). Mean wound healing time was 7.7 ± 1.6 days (range, 5 to 12 days). Skin ecchymosis persisted for approximately 24.8±3.7 days (range, 19 to 38 days). Suture marks did not appear in 34 patients (%94), they were present in 2 patients 6 months after surgery. Statistically significant change was detected in the 6-month period in terms of skin ecchymosis and suture scar disappearance ($p<0.001$). A positive correlation was found between wound healing time and suture scar ($R^2=0.879$, $p<0.001$) and also, between the duration of surgery and persistent skin ecchymosis ($R^2=0.918$, $p<0.001$).

Conclusions: Cautery with UEB is a viable technique that can be reliably used to reshape the UE. This procedure does not leave a lengthy scar, which is not possible with normal UEB, enabling patient satisfaction and post-operative recovery comfort.

Keywords: Cauterization, upper eyelid blepharoplasty, dermatochalasis, ptosis.

ÖZET

Amaç: Koter yöntemi ile üst göz kapağı blefaroplastisi (ÜGB) yapılan dermatoşalazisli (DŞ) hastaların cerrahi sonuçlarını bildirmek amaçlanmıştır.

Yöntemler: DŞ nedeniyle 18 hastanın 36 gözüne koter yöntemi ile ÜGB ameliyatı yapıldı. Sarkmış ve işaretlenmiş cilt bölgesine kalem uçlu koter uygulandı ve çıkarıldı. Hastalar ameliyat öncesi ve ameliyat sonrası 1. gün, 3. gün, 2. hafta, 3. ay ve 6. ayda muayene edildi.

Bulgular: Yaş ortalaması 54.6±7.9 yıl (dağılım, 46-67 yıl) olup, 10'u kadın, 8'i erkekti. Ortalama operasyon süresi (2 üst göz kapağı için 1 seans) 36.7 ± 5.8 dakika (dağılım, 28-46 dakika) idi. Ortalama yara iyileşme süresi 7,7 ± 1,6 gündü (aralık, 5 ila 12 gün). Deri ekimozu yaklaşık 24,8±3,7 gün (dağılım, 19 ila 38 gün) devam etti. Ameliyattan 6 ay sonra 34 hastada (%94) dikiş izi görülmezken, 2 hastada dikiş izi mevcuttu. Cilt ekimozu ve dikiş skarının kaybolması açısından 6 aylık dönemde istatistiksel olarak anlamlı değişiklik saptandı ($p<0,001$). Yara iyileşme süresi ile dikiş izi arasında pozitif bir ilişki bulundu ($R2=0.879$, $p<0.001$). Ayrıca ameliyat süresi ile inatçı cilt ekimozu arasında pozitif korelasyon saptandı ($R2=0.918$, $p<0.001$).

Sonuçlar: Üst göz kapağı blefatoplastisi ile koter, ÜG'yi yeniden şekillendirmek için güvenilir bir şekilde kullanılabilen uygulanabilir bir tekniktir. Bu işlem, normal ÜGB ile mümkün olmayan uzun bir iz bırakmaz, hasta memnuniyeti ve ameliyat sonrası iyileşme konforu sağlar.

Anahtar Kelimeler: Koterizasyon, üst göz kapağı blefaroplastisi, dermatoşalazis, pitozis.

Upper eyelid blepharoplasty (UEB) is an essential surgical method that should be documented in the archive of cosmetic and reconstructive ocular surgery. This technique has the potential to advance a person's life by improving their appearance and visual field (1).

Today, the majority of patients apply with a complaint to the surgeon with both ptosis and dermatochalasis (DC), and treating either one of these disorders can result in surgical failure and severe patient unhappiness (2,3). According to previous studies, there were less experienced oculofacial surgeons who were able to perform both operations in the same operating session, although the many patients demanded a simultaneous approach (4). Earlier UEB aimed to remove overmuch soft tissue. Until recently, surgeons were unaware of the cosmetic benefits of periorbital fat preservation (5).

In the last 2 decades, many oculoplastic surgeons have condemned the extremely aggressive performing of fat resection in the course of UEB (6). Today, the main expectation of patients in UEB surgery is aesthetic concerns and short operation time.

In this study, the advantages and surgical results of cautery excision, which is a new method in UEB, was investigated.

Methods

Medical records of 36 eyes of 18 patients who underwent UEB due to DC and ptosis in Secondary State Hospital between October 2020 and January 2022 were included in the study. It was approved by Acıbadem University and Acıbadem Healthcare Institutions Medical Research Ethics Committee (ATADEK 2023-10/395). All patients were treated in accordance with the principles of the Declaration of Helsinki.

All patients were subjected to a thorough ophthalmic examination, which included best-corrected visual acuity, slit lamp biomicroscopy, intraocular pressure evaluation, and fundoscopic inspection. Mild to moderate aesthetically bothersome DC was one of the indication to perform surgery. This study included only patients who had healthy eye examinations. Patients with conditions that impair wound healing such as keloid and hypertrophic scars, collagen tissue diseases such as psoriasis and scleroderma, and bleeding hemorrhagic were excluded from the study. Oxytetracycline for 2 weeks after surgery (until the sutures are removed) was used and then mucopolysaccharide polysulfate (chondroitin) and extractum cepae, heparin sodium, allantoin was used for 6 months along after the sutures are removed.

All procedures were conducted under local anesthetic by a single surgeon (BK) (1:200,000 adrenaline lidocaine). In all cases, the surgical method was used in the same way. The sagging skin was first marked, and after local anesthetic was administered. Pencil-tipped cautery was used to cut the skin and only the skin was removed. For hemostasis, entirely control of bleeding was achieved with bipolar cauterization and the upper eyelid (UE) skin was closed with 7-0 prolene sutures. Skin sutures were taken out on the fourteenth day after surgery. Operation time, wound healing time, skin ecchymosis and suture traces were noted. Patients were examined preoperatively and postoperatively on the 1st day, 3rd day, 2nd week, 3rd month and 6th month. Surgical procedure is showed in Figure 1. In Figure 2, surgical recovery and scar disappearance are shown according to the follow-up periods.

Figure 1: Surgical procedure with cautery method for upper eyelid blepharoplasty.

Figure 2: Surgical recovery and scar disappearance are shown according to the follow-up periods.

Statistical Analysis

The mean and standard deviation of continuous variables were used, whereas frequency and percentage were used for categorical ones. Distribution of data was determined by Kolmogorov Smirnov test. The Pearson correlation test was utilized to determine the relationship between non-parametric variables. The MANOVA test was used to show the change according to the follow-up periods. Paired sample t-test was used to compare the follow-up periods in pairs. Statistical analysis was carried out with SPSS Statistics 22.0 (IBM, Armonk, NY, U.S.A.), and p values <0.05 set out as statistically significant.

Table 1. Demographic characteristics of patients

Clinical characteristics	Study group
Eyes	36
Gender	$10^{f}8^{m}$
Age (mean ± SD) (range)	54.6 ±7.9 years (46 to 67 years)
Operation time (mean ±SD)	36.7 ± 5.8 min (28 to 46 min)
Mean wound healing time	7.7 ± 1.6 days (5 to 12 days)
Persistant skin ecchymosis	24.8 ± 3.7 days (19 to 38 days)
Suture scar (absence/presence, n)	34/2

SD: standard deviation; min: minutes; ^{f}: female, ^{m}: male; n: number

Table 2: According to the follow-up periods, changes in terms of suture scar and skin ecchymosis are presented.

	1st day	3rd day	2nd week	3rd month	6th month	p value
Persistant skin ecchymosis (absence/ presence)	0/36	4/32	8/28	28/36	32/36	<0.001*
Suture traces (absence/ presence)	0/36	0/36	2/34	30/36	34/36	<0.001*
MANOVA test*						

Results

The mean age was 54.6±7.9 years (range, 46 to 67 years) and 10 of the patients in this series were female and 8 were male. Average operation time (1 session for 2 UE) was 36.7 ± 5.8 minutes (range, 28 to 46 minutes). Mean wound healing time was 7.7 ± 1.6 days (range, 5 to 12 days). Skin ecchymosis persisted for approximately 24.8±3.7 days (range, 19 to 38 days). Suture marks did not appear in 34 patients (%94), they were present in 2 patients 6 months after surgery. Statistically significant change was detected in the 6-month period in terms of skin ecchymosis and suture scar ($p<0.001$). A positive correlation was found between wound healing time and suture scar ($R^2=0.879$, $p<0.001$). And also, a positive correlation was noted between the duration of surgery and persistent skin ecchymosis ($R^2=0.918$, $p<0.001$).

Tables 1 shows demographic characteristics of patients. Table 2 presents changes in terms of suture scar and skin ecchymosis according to the follow-up periods. There were no complications seen such as ectropion, eyelid retraction, blepharoptosis, dry eye, or retrobulbar hemorrhage.

Discussion

In reality, they have the thinnest skin on the body, as the UE are formed of exceedingly thin skin. As a result, the UE skin tends to stretch with age and may reveal the earliest indications of facial aging. Tobacco usage, prolonged sun exposure, susceptibility to allergies, frequent eyelid rubbing, and other environmental variables can all hasten the aging of the UE. It may also have an inherited compound, including prolapse UE skin, which is often observed in family members of patients with this aesthetic concern (7).

DC (extreme UE skin) or steatoblepharon (orbital fat pseudoherniation) can produce pseudoptosis in rare circumstances. DC is a condition caused by changes in collagen fibers, elastic fibers, and ground materials within the dermis and epidermis. Aging and sun exposure are among the major factors that cause apoptosis of collagen and elastic fiber cells with reducing count in the dermis that causing the formation of DC. Furthermore, epidermis atrophies, collagen ingredient diminished, and elastic fibers undergo biochemical alterations. The ensuing lack of skin elasticity causes an expanded epidermal surface area, which is required to conceal the extruding fat (8).

The route of administration and extent of soft tissue excision will differ depending on surgeon choice and training bias. The authors largely agree with the recureparative UEB surgical trend, which allows for careful excision of herniated nasal fat while minimizing skin and muscle resection. As previously stated, some surgeons suggest relocating fat to the central compartment (9,10). Periorbital fat excision was not applied to any patient in our study. Therefore, the short duration of the surgery is one of these factors.

Conclusion

Our technique can be a safe method in terms of shortening the surgical time and reducing postoperative complications by excision from the marked areas on the UEB with cautery. In fact, it may offer an advantage in terms of wound healing time as there is less bleeding. The findings showed that UEB with cautery is a viable procedure that can be used reliably. It will be a novel approach to the issue of aging UE. This method does not leave a long scar that cannot be achieved with standard UEB, thus offering comfort in terms of patient satisfaction and postoperative recovery. Our studies on this subject, which include large patient and control groups and have long follow-up periods, are also continuing.

Declarations

Funding

The authors declared that this study has received no financial support.

Conflicts of Interest/Competing Interests

The authors have no conflicts of interest to declare.

Ethics Approval

Acıbadem University and Acıbadem Healthcare Institutions Medical Research Ethics Committee. Date: 01.08.2023 Number:2023-10/395

Availability of Data and Material

The data that support the findings of this study are available on request from the corresponding author

Authors' Contributions

B.K: Perform surgeries, Interpretation of data, drafting and revising of the manuscript critically for important content. E.K: Statistical analysis, interpretation of data, literature research. A.R.C.C: Substantial contributions to conception and design, drafting and revising of the manuscript critically for important content.

References

1. Yang P, Ko AC, Kikkawa DO, Korn BS. Upper Eyelid Blepharoplasty: Evaluation, Treatment, and Complication Minimization. Semin Plast Surg. 2017 Feb;31(1):51-57. DOI:10.1055/s-0037-1598628
2. Holds JB, Nelson CC, Nerad JA. Advice for better ptosis surgery from three experts. EyeNet Magazine: American Academy of Ophthalmology; 2012:39–41.
3. Ng J, Hauck MJ. Ptosis repair. Facial Plast Surg. 2013;29(1):22-25. DOI:10.1055/s-0033-1333831
4. Bajric J, Levin JJ, Bartley GB, Bradley EA. Patient and physician perceptions of medicare reimbursement policy for blepharoplasty and blepharoptosis surgery. Ophthalmology. 2014;121(7):1475-1479. DOI:10.1016/j.ophtha.2014.01.005
5. Rohrich RJ, Coberly DM, Fagien S, Stuzin JM. Current concepts in aesthetic upper blepharoplasty. Plast Reconstr Surg. 2004;113(3):32e-42e. DOI:10.1097/01.prs.0000105684.06281.32
6. Fagien S. The role of the orbicularis oculi muscle and the eyelid crease in optimizing results in aesthetic upper blepharoplasty: a new look at the surgical treatment of mild upper eyelid fissure and fold asymmetries. Plast Reconstr Surg. 2010;125(2):653-666. DOI:10.1097/PRS.0b013e3181c87cc6

7. Prager W, Wissmüller E. Significance of blepharoplasty in dermatologic surgery. Hautarzt. 2009;60(7):550-555. DOI:10.1007/s00105-009-1718-0

8. Persichetti P, Di Lella F, Delfino S, Scuderi N. Adipose compartments of the upper eyelid: anatomy applied to blepharoplasty. Plast Reconstr Surg. 2004;113(1):373-380. DOI:10.1097/01.PRS.0000097290.64125.C3

9. Massry GG. Nasal fat preservation in upper eyelid blepharoplasty. Ophthalmic Plast Reconstr Surg. 2011;27(5):352-355. DOI:10.1097/IOP.0b013e31821524c3

10. Weissman JD, Most SP. Upper lid blepharoplasty. Facial Plast Surg. 2013;29(1):16-21. DOI:10.1055/s-0033-1333833

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Impact of the Long-Term Hydroxychloroquine Use on COVID-19 Severity in Patients with Autoimmune Rheumatic Disease

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ABSTRACT

Aim: After the numerous studies, the clinical effectiveness of hydroxychloroquine (HCQ) against SARS-CoV-2 is now accepted limited. Besides this, HCQ has still been the first option in most rheumatology practices. To evaluate the frequency, severity and complication of COVID-19 in patients with autoimmune rheumatologic disease (ARD) receiving and not receiving long-term HCQ.

Methods: A total of 309 ARD patients were retrospectively evaluated for COVID-19 disease with a SARS-CoV-2 RT-PCR and IgM/IgG antibody.Patients were grouped as HCQ or non-HCQ groups. COVID-19 clinical symptoms development of viral pneumonia, rates of hospitalization, mortality due to COVID-19 and time from initial symptom to viral pneumonia, clinical recovery and RT-PCR negativity were evaluated.

Results: During the 13 month study period, 54 (17.4%) were diagnosed with COVID-19, the frequency of COVID-19 was similar between the HCQ (17.9%) and non-HCQ groups (16.7%), p=0.793. The frequency of the myalgia, arthralgia and sore throat were higher in the non-HCQ group, the frequency of other clinical signs and symptoms were higher in the HCQ group but none of them reached statistical significance. In all patients, viral pneumonia was diagnosed in 9 (16.7%), requiring hospitalization in 8 (14.8%), requiring oxygen therapy in 4 (7.4 %) patients and these severe COVID-19 clinical features were similar between groups. COVID-19 complications were seen in 2 patients, 1 of whom was mortality due to ARDS and one was supraventricular tachycardia but thromboembolism or rheumatologic disease activation were not observed.

Conclusions: As with the frequency of COVID-19, severity of COVID19 were similar between patients with and without long-term HCQ use in ARD. COVID 19 complications were found to be rare in our study.

Keywords: Autoimmune rheumatic disease, COVID-19, hydroxychloroquine, pneumonia, mortality.

ÖZET

Amaç: Güncel çalışmaların ışığında SARS- CoV- 2 enfeksiyonlarında hidroksiklorokin (HCQ) kullanımının klinik etkisi kısıtlı olarak kabul edilmektedir. Bununla birlikte HCQ halen romatoloji pratiğinde ilk tercih olarak kullanılmaktadır. Uzun dönem HCQ kullanımının otoimmün romatolojik hastalığı olan hastalarda COVID-19 sıklığı, ciddiyeti ve komplikasyonları üzerine etkisinin değerlendirilmesi amaçlandı.

Metod: Toplam 309 otoimmün romatizmal hastalığı olan hasta retrospektif olarak COVID-19 enfeksiyonu yönünden SARS-CoV-2 RT-PCR ve IgM/IgG antikoru ile değerlendirildi. Hastalar uzun süreli HCQ alıp almamasına göre sınıflandı. COVID-19 semptomları, viral pnömoni gelişmesi, hastane yatış oranları, COVID-19'a bağlı mortalite ve viral pnömoni başlangıç semptomlarının gelişmesinden klinik düzelme ve RT-PCR negatifliği geçen süre değerlendirildi.

Bulgular: On üç aylık çalışma periyodu boyunca 54 (17.4%) COVID-19 tanısı konuldu. COVID-19 sıklığı HCQ kullanan ve kullanmayan gruplarda benzer olarak saptandı p=0.793. Miyalji, artralji ve boğaz ağrısı HCQ kullanmayan grupta daha fazla saptandı. Diğer klinik bulgu ve semptomlar HCQ grubunda daha fazla saptandı ancak istatistiksel olarak anlamlı gösterilemedi. Toplam 9 (16.7%) hastada viral pnömoni gelişti, 8 (14.8%) hastada hastane yatışı, 4 (7.4 %) hastada oksijen tedavisi gerekti. Ciddi COVID-19 klinik bulguları her iki grupta benzerdi. COVID-19 komplikasyonları 2 hastada görüldü; 1'i ARDS' ye bağlı ex oldu ve birinde supraventriküler taşikardi gelişti ama tromboemboli veya romatolojik hastalık aktivasyonu gözlenmedi.

Sonuç: COVID-19 sıklığı ve ciddiyeti uzun dönem HCQ kullanımından bağımsız olarak her iki grupta benzer olarak saptandı. COVID-19 komplikasyonları çalışmamızda nadir olarak saptandı.

Anahtar Kelimeler: Otoimmün romatizmal hastalığı, COVID-19, hidroksiklorokin, pnömoni, mortalite.

After hydroxychloroquine (HCQ) had been demonstrated to interfere with the proliferation of diverse viruses, including the severe acute respiratory syndrome coronavirus (ARDS), by inhibiting virus/cell fusion in vitro studies, it has become a subject of research in prevention and treatment of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1, 2]. Despite there being some studies supporting the use of HCQ in COVID-19 patients, after recent studies HCQ is not recommended for prophylaxis and treatment of COVID-19 [3, 4]. However HCQ concentrates in the lung one hundred times higher than the blood and the function of the pulmonary compartment could be affected due to these high concentrations [5]. Therefore, some studies also suggest HCQ might reduce morbidity in COVID-19, shorten the time to clinical recovery and promote the resolution of pneumonia [6-7].

The COVID-19 clinical course is heterogeneous. Although most patients suffer mildly, a significant portion of the patients develop fatal complications such as ARDS, multiorgan failure and a hyperimmune state so-called "cytokine storm" which is characterized by the extreme release of various cytokines and chemokines, disequilibrium in distribution of T-cell subsets and related with a poor prognosis. The true cause of this state has not yet been fully clarified. However hypothetically the underlying reasons may be a overactive immun system, prolonged immun response due to delayed viral clearence or immun dysregulation. Cytokine storm has been observed in critically ill patients with SARS-CoV-2 infection [8, 9]. HCQ is considered as an immunomodulator and can reduce inflammation and organ damage by inhibiting antigen presentation to T cells and reducing the expression of cytokines such as interleukin (IL)-1, IL-6 and tumor necrosis factor (TNF) α. Theoretically, although it could not prevent the emergence of disease, these findings support the notion that HCQ may have the ability to inhibit the production of cytokines and alleviate the clinical symptoms in patients with COVID-19 [10,11].

In rheumatology practice, HCQ has been used to treat autoimmune rheumatic diseases [12]. In the light of recent studies, the effect of HCQ on disease severity rather than protection from COVID-19 is intriguing and can be further investigated. In this study, we aimed to investigate the efficacy of long-term HCQ use in preventing viral pneumonia, admission to hospital, length of clinical-serological recovery, severity, complication and mortality in the COVID-19 patients with an autoimmune rheumatic disease.

Materials and methods

Study Design

This study was designed as a cross-sectional, retrospective cohort study with approval by Ankara Bilkent City Hospital Ethics Committee and was therefore performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments (IRB no. E1-20-683). An official permission was also obtained from the Republic of Turkey Ministry of Health, to conduct this study dated 30 September 2020.

Patients

This cohort was formed from autoimmune rheumatic disease patients who have previously been followed in Ankara Bilkent City Hospital. To collect the cumulative incidence of confirmed COVID-19, patients of this cohort were retrospectively investigated for a SARS-CoV 2 real-time reverse transcription polymerase chain reaction (RT-PCR) test result from Public Health Management System (HSYS) between March 11th 2020 and April 23th 2021. All cases with a RT-PCR test were registered in HSYS during the pandemic in Turkey. SARS-CoV-2 IgM/IgG antibodies were screened to determine COVID-19 disease in RT-PCR negative cases. Patients with a positive nasopharyngeal swab RT-PCR test or SARS-CoV-2 IgM/IgG antibodies were enrolled in the study. Subjects with age under 18 years, pregnant, lactating, receiving immunosuppressive and immunomodulatory therapy for a reason other than rheumatological disease, patients whose HCQ treatment was initiated due to COVID-19 and incomplete medical record were excluded from the study. Patients were grouped as HCQ or non-HCQ groups according to whether they received HCQ as treatment for underlying autoimmune rheumatic disease or not. According to the Republic of Turkey Ministry of Health COVID-19 protocol, Favipiravir (with 3200 mg twice daily for 1 day, followed by 1200 mg twice daily for 4 days) and/or HCQ (400 mg twice daily for 5 days) was administered to patients [13].

Main Outcomes and Other Variables

Data regarding demographics, comorbidities, medical treatments and last disease activity of underlying rheumatic disease in the last follow-up before COVID-19 diagnosis was obtained from medical records and telephone interviews. COVID-19 clinical symptoms at presentation, laboratory results, rates of viral pneumonia, hospitalization, intensive care unit (ICU) admission, 28th day mortality due to COVID-19 and time from initial symptom to viral pneumonia, clinical recovery and RT-PCR negativity were evaluated. Disease activity of patients was classified as

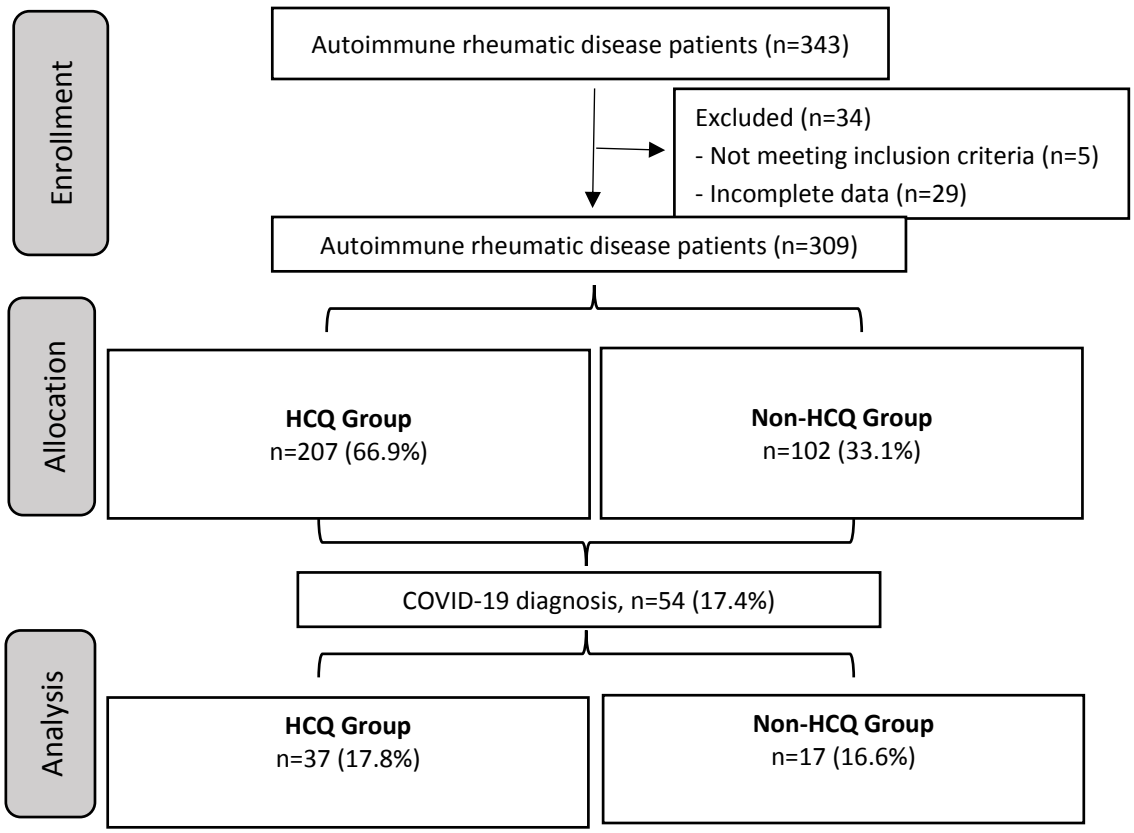
active or in remission by the rheumatologist according to clinical findings and laboratory results at the last control follow-up. COVID-19 pneumonia was diagnosed when the other causes of pneumonia ruled out with chest computed tomography scan. All demographic, laboratory, clinical data and primary outcome variables were compared between groups. The all glucocorticoid doses specified as prednisolone equivalent.

Statistical Analysis

Normality of continuous variables was evaluated with Shapiro–Wilk test and with plots and histograms visually. Continuous variables were presented as mean ± SD and median with interquartile range (IQR) (25–75%). Proportions are used as descriptive statistics for categorical variables. Comparisons between groups were done using the x^2 test or Fisher exact test in categorical and with independent sample t-test or Mann-Whitney test in continuous variables, as appropriate. $p<0.05$ was considered statistically significant. All reported p values were 2-sided. Data analysis was performed using SPSS V.24.0 software.

Results

During the study period (13 months), 17.4% (n=54/309) patients with autoimmune rheumatic diseases were diagnosed with COVID-19 which was similar between the HCQ (17.9%) and non-HCQ groups (16.7%), p=0.793. The patients' flow diagram is presented in Figure 1. Among these 54 COVID-19 patients, 22 (40.7%) were also treated with systemic prednisolone, at doses usually below 10 mg per day. Twenty-one (38.8%) patients were also taking non-HCQ disease modifying antirheumatic drugs (DMARDs); such as methotrexate in 11, leflunomide in 4, tofacitinib in 3, azathioprine in 2 and sulphasalazine, cyclophosphamide, rituximab and etanercept each in 1. Half of the patients with COVID-19 had at least one comorbidity, the most common comorbidity being hypertension.



Abbreviations: HCQ: hydroxychloroquine

Figure 1: Flow chart of the study

The demographics, baseline clinical characteristics, the frequency of comorbidity , on going treatments and disease activity of autoimmune rheumatic disease were similar between the HCQ and non-HCQ groups (Table 1).

In the HCQ group, 17 (46%) patients were receiving HCQ at a dose of 200 mg/day and 20 (54%) were receiving HCQ at a dose of 400 mg/day.

Table 1: Comparison of demographics, baseline clinical characteristics, organ involvements and current treatments of autoimmune rheumatic disease patients between hydroxychloroquine group and non-hydroxychloroquine group

	HCQ group (n=37)	Non-HCQ group (n=17)	p
Women, n (%)	35 (94.6)	13 (76.5)	0.071
Age, years, mean±SD	50.3±11.9	53.5±9.1	0.283
Duration of diagnosis, months, median (IQR)	48 (24-90)	12 (12-108)	0.072
Autoimmune rheumatic diseases			
Rheumatoid Arthritis, n (%)	11 (29.7)	8 (47.1)	0.216*
Connective Tissue Diseases except RA, n (%) -Sjögren's Syndrome, n (%) -Systemic Lupus Erythematosus, n (%) -Others, n (%)	26 (70.3) -17 (45.9) -4 (10.8) -5 (13.5)	9 (52.9) -5 (29.4) -1 (5.9) -3 (17.6)	
Comorbidity, n (%)	17 (45.9)	10 (58.8)	0.379
Multimorbidity, n (%)	4 (10.8)	4 (23.5)	0.222
Hypertension, n (%)	5 (13.5)	5 (29.4)	0.162
Diabetes Mellitus, n (%)	1 (2.7)	2 (11.8)	0.230
Chronic obstructive lung disease, n (%)	4 (10.8)	1 (5.9)	1
History of thrombosis, n (%)	2 (5.4)	2 (11.8)	0.582
Disease activity at last follow-up	6 (16.2)	0	0.161
Current or history of organ involvement			
Arthralgia/Arthritis, n (%)	27 (73.0)	13 (76.5)	0.735
Cutaneous involvement, n (%)	7 (18.9)	1 (5.9)	0.411
Any internal organ involvement, n (%)	9 (24.3)	3 (17.6)	0.584
Treatment regimens			
Prednisone use, n (%)	18 (48.6)	4 (23.5)	0.081
Prednisone ≥10 mg per day, n (%)	2 (5.4)	0	NS
Non-HCQ DMARDs, n (%)	16 (43.2)	5 (29.4)	0.333
ACE inhibitors and/or ARBs, n (%)	4 (10.8)	5 (29.4)	0.088
Non-steroidal anti-inflammatory drugs, n (%)	2 (5.4)	1 (5.9)	1
Oral anticoagulant, n (%)	1 (2.7)	1 (5.9)	0.535

HCQ: Hydroxychloroquine, RA: Rheumatoid arthritis, DMARDs: Disease modifying antirheumatic drugs, ACE: Angiotensin converting enzyme, ARBs: Angiotensin receptor blockers
**Comparison between rheumatoid arthritis and connective tissue disease except RA*

The most common initial symptoms of the COVID-19 were arthralgia in 16 (29.6%) patients, fatigue in 11 (20.3%), cough in 7 (12.9%), fever in 6 (11.1%), headache in 6 (11.1%). Comparison of clinical features, treatments and outcomes of COVID-19 between the HCQ and non-HCQ groups were shown in the table 2. The frequency of the myalgia, arthralgia and sore throat were higher in the non-HCQ group, the frequency of other clinical signs and symptoms were higher in the HCQ group but none of them reached statistical significance. None of the patients showed clinical activation signs of rheumatological disease during COVID-19 disease. Laboratory results at the diagnosis of COVID-19 disease were also similar between the groups and were shown in the supplementary table 1. After the diagnosis of COVID-19, HCQ was maintained with the same dose in 27 (73.0%) patients, whereas all other immunosuppressant drugs were cessated. In COVID-19 treatment period, HCQ was well tolerated with no side effects. Total steroid dose was needed to be increased in 3/8 (37.5%) of hospitalized patients. All patients received treatment for COVID-19 as HCQ and/or favipiravir. Antiviral treatments such as favipiravir were used in 48 (88.8%) patients and antibiotics were administered in nine (16.6%) even though no bacterial infections were shown in the cultures. No patient received additional biologic or immunomodulatory therapy other than steroids. Viral pneumonia was diagnosed in 9 (16.7%), requiring hospitalization in 8 (14.8%), requiring oxygen therapy in 4 (7.4 %) patients and one patient needed intensive care. None of the patients with viral pneumonia had more than 25% involvement on computed tomography of the chest. The median hospitalization time was 9.5 (1-20) days. Comparison of the 2 groups according to median (IQR) time from the initial symptom to viral pneumonia and time to clinical recovery, RT-PCR negativity were shown in table 3.

Supplementary Table 1: Comparison of the baseline laboratory results of COVID-19 patients at the diagnosis between with hydroxychloroquine group or non-hydroxychloroquine group

Baseline laboratory results	HCQ group, n=37	Non-HCQ group, n=17	p
White blood cell(/mm^3), mean(±SD)	6631(±2101)	6895(±1318)	0.673
Lymphocytes count, /mm^3, mean(±SD)	1644(±616)	1697 (±730)	0.810
Lymphopenia, n (%)	5 (19.2)	4 (28.6)	0.694
Hemoglobin (g/L), mean(±SD)	12.7(±1.2)	13.3(±1.3)	0.151
Platelet (/mm^3), mean(±SD)	274(±75)	268(±67)	0.821
Aspartate aminotransferase (IU/L), median (IQR)	23 (14-32)	21 (17-28)	0.887
Alanine aminotransferase (IU/L), median (IQR)	21 (18-34)	24 (14-39)	0.670
Lactate dehydrogenase, mean(±SD)	247(±79)	246(±87)	0.987
Albumin (g/L) , mean(±SD)	40.4(±9.1)	42.6(±3.6)	0.410
Creatinine kinase, median (IQR)	50 (37-80)	64 (40-106)	0.262
Creatinine (µmol/dL), mean(±SD)	0.73(±0.16)	0.76(±0.10)	0.416
D-dimer, median (IQR)	0.40 (0.23-1.05)	0.45 (0.35-0.80)	0.509
Procalcitonin, ng/mL, mean(±SD)	0.046(±0.017)	0.03(±0.004)	0.056
CRP (mg/L), median (IQR)	4 (3-14)	5 (2-19)	0.938
Ferritin, median (IQR)	38 (10-85)	50 (19-91)	0.786

HCQ: Hydroxychloroquine, CRP: C-reactive protein

Table 2. Comparison of clinical features, treatments and outcomes of COVID-19 in patient between the hydroxychloroquine and non-hydroxychloroquine groups

Signs and symptoms at baseline	HCQ group, n (%)	Non-HCQ group, n(%)	p
Fever	18 (48.6)	4 (23.5)	0.081
Cough	23 (62.2)	9 (52.9)	0.522
Sputum	4 (10.8)	2 (11.2)	1
Shortness of breath	14 (37.8)	5 (29.4)	0.547
Chest pain	15 (40.5)	3 (17.6)	0.097
Myalgia	28 (75.7)	16 (94.1)	0.105
Back pain	28 (75.7)	9 (52.9)	0.095
Arthralgia	27 (73.0)	15 (88.2)	0.210
Confusion	1 (2.7)	0	1
Headache	27 (73.0)	11 (64.7)	0.537
Sore throat	21 (56.8)	11 (64.7)	0.581
Rhinorrhea	13 (35.1)	6 (35.3)	0.991
Dysgeusia	27 (73.0)	9 (52.9)	0.147
Anosmia	25 (67.6)	9 (52.9)	0.301
Nausea and/or vomiting	12 (32.4)	2 (11.8)	0.107
Stomach ache	7 (18.9)	0	0.084
Diarrhea	6 (16.2)	2 (11.8)	0.669
Treatment			
Hydroxychloroquine	27 (73.0)	10 (58.8)	0.298
Antiviral therapy	32 (86.5)	16 (94.1)	0.652
Increase steroid dose in hospitalized patients	2/6 (33.4)	1/2 (50)	0.587
Anticoagulant therapy	10 (27.0)	4 (23.5)	0.735
Antiaggregant therapy	11 (29.7)	6 (35.3)	0.683
Antibiotic therapy	8 (21.6)	1 (5.9)	0.149
Outcomes			
Viral pneumonia	5 (13.5)	4 (23.5)	1
Hospitalization	6 (16.2)	2 (11.8)	0.669
Oxygen support	3 (8.1)	1 (5.9)	1
Mortality	1 (2.7)	0	

HCQ: Hydroxychloroquine

Table 3. Comparison of the groups according to time from the initial symptom to viral pneumonia, time from initial symptom to clinical recovery and RT-PCR negativity

	HCQ group	Non-HCQ group	p
Initial symptom to viral pneumonia, days, median (IQR)	10 (5-10)	8.5 (7-10)	1
Initial symptom to clinical recovery, days, median (IQR)	14 (10.0-15.0)	10 (7.0-12.5)	0.065
Initial symptom to RT-PCR negativity, days, median (IQR)	14 (10-14)	14 (10-16)	0.293

RT-PCR: Real-time reverse transcription polymerase chain reaction, HCQ: Hydroxychloroquine

During the follow-up, 2 patients in the HCQ group had complications due to COVID-19, 1 of which resulted in death. Supraventricular tachycardia was developed in one patient (70 years old, female, with hypertension and diabetes mellitus) in the HCQ group whose initial symptom was also palpitations. The radiofrequency ablation had to be planned for not responding to medical treatment. Another patient (74 years old, male, with hypertension and chronic obstructive pulmonary disease) whose initial symptom was unconsciousness, progressed to ARDS and died in ICU. In evaluation for acute clinical symptoms, no neurological or thromboembolic complications were detected in either patient. Except for these patients, no acute renal failure was seen and no haemodialysis or extracorporeal membrane oxygenation was required and all patients had full recovery.

Comparison of the main outcomes in 22 COVID-19 patients who received prednisone was shown in the supplementary table 2. The main outcomes were also similar between HCQ group and non-HCQ group in these subgroups of patients.

Supplementary table 2: Comparison of the main outcomes of 22 COVID-19 patients received prednisolone between with hydroxychloroquine group or non-hydroxychloroquine group

	HCQ group, (n=18)	Non-HCQ group, (n=4)	p
Viral pneumonia, n (%)	3 (16.7)	2 (50.0)	0.210
Hospitalization, n (%)	3 (16.7)	1 (25.0)	1
Oxygen support, n (%)	1 (5.6)	1 (25.0)	0.338
Mortality, n (%)	None	None	
Clinical recovery, days, median (IQR)	14.5 (10-19.3)	13.5 (6.5-23.7)	0.962
Time to RT-PCR negativity, days, median (IQR)	14 (11.5-14)	13 (10.0-16.0)	0.554

HCQ: Hydroxychloroquine, RT-PCR: Real-time reverse transcription polymerase chain reaction.

Discussion

The frequency of COVID-19 was approximately 17% in the entire cohort and was similar between HCQ and non-HCQ groups and all mortality was just 0.3%. The primary outcomes of our study, such as viral pneumonia development, hospitalization, and length of clinical and serological recovery, were similar in patients with autoimmune rheumatic diseases regardless of long-term HCQ use.

Antimalarial medications interfere with the proliferation of various viruses, including SARS-CoV-2, by inhibiting virus/cell fusion in vitro studies [1, 2]. In a study, postexposure HCQ use in COVID-19 resulted in a significant increase in SARS-CoV-2 IgG/IgM seroconversion [14]. With the current knowledge, SARS-CoV-2 could enter the cell through two different mechanisms, one endocytosis and other membrane fusion. HCQ has been shown to suppress endocytosis mediated entry into the cell [14-16]. High viral load of SARS-CoV-2, primarily by suppressing type I interferon (IFN) response, leads to progression of disease to cytokine storm and ultimately death [17]. Another point that suggests HCQ can be effective in COVID-19 disease is that it prevents suppression of the IFN pathway by blocking endocytosis. But SARS-CoV-2 also enters the cell through transmembrane serine protease 2 mediated membrane fusion and the angiotensin converting enzyme 2 receptor. Unfortunately, HCQ could only block the endosomal entry into the host cell and not membrane fusion. This probably limits the effectiveness of HCQ in treating COVID-19 [15]. But in patients currently taking HCQ it is intriguing that early activation of the innate and adaptive immune response could prevent progression of disease with reduced viral load, decreased tissue damage and blocked cytokine storm. Many studies have evaluated disease severity and mortality in COVID-19 autoimmune rheumatic diseases and found no significant association between antimalarial treatment for COVID-19 infection and hospitalisation, disease severity; after adjustment for demographic and medical characteristics [18-20]. Supporting the previous studies, we found that the long-term HCQ use in autoimmune rheumatic diseases had no effect on severity of COVID-19.

In our study, while the frequency of COVID-19 in autoimmune rheumatic diseases with HCQ indication was 17.4%, its frequency in the general population in Turkey is reported to be 5.2%. And in this study period, mortality due to COVID-19 in all patients in our country was 0.8% [21]. We had just one (1.8%) mortality among the patients with COVID-19 in our cohort. Although the number of patients and total mortality were low in our study, HCQ use had no effect on mortality. In a study with 194,637 RA or

SLE patients, COVID-19 mortality was similar in HCQ and non-HCQ groups [22]. In a recent study with rheumatic diseases, the COVID-19-related mortality rate was found 10.5% which was higher than the general population [23]. A lower mortality rate of our cohort than the above study may be related with a low inflammatory load of our patients which suggests mild illness. In addition to increased inflammatory load, increased mortality associated with disease activity [23]. In our study, 11% of the patients had active disease, all in the HCQ group. After all, in accordance with the literature, both the frequency and mortality of COVID-19 in our cohort were higher in autoimmune rheumatic diseases than the normal population. In a study from Turkey (similar ethnicity and geography with our cohort), after evaluating 167 inflammatory rheumatic patients with COVID-19 infection, the mortality rate was found 10% between April-June 2020 [24]. Although the patient populations are different, our mortality rate is lower than this study, it may be related to the fact that the studies were carried out in different time periods and, as in the whole world, the increasing knowledge about COVID-19 disease and treatment options.

In addition, it was shown that concentration of HCQ in the lung is higher than that in the blood. So it was supposed, apart from being unable to prevent disease, HCQ favorable effects could still be observed on the course and complications of COVID-19 [5]. Without statistical significance, despite the HCQ group having lower respiratory tract symptoms, the rate of viral pneumonia was lower than the non-HCQ group. In our cohort, only one patient had supraventricular tachycardia associated with COVID-19 and one had ARDS lead to death . Apart from these complications, in a median 5.7 months (4.4-6.8) of follow-up, no patients had acute or post-COVID complications such as thromboembolic and neurologic. In accordance with the severity of the disease, the frequency of COVID-19-associated thromboembolism had seen between 10-40% in the studies [25,26]. Perhaps this issue still needs to be explored in larger patient groups.

Another subject under investigation about HCQ is whether it can achieve clinical improvement by accelerating viral clearance. There were studies that both support and oppose this hypothesis. In a study, there was found that HCQ could improve the clinical outcome of patients by reducing SARS-CoV-2 viral load [27]. In a recent study evaluating a total of 393 COVID-19 patients, the addition of HCQ to the standard treatment was associated with less ICU admission, early discharge and higher CRP responses compared to the standard treatment group, but no difference was found in the 28th day mortality rate [28]. Despite these, in a randomized controlled trial, 150 patients were evaluated, and administration of HCQ did not result in better viral clearance than standard of care alone in hospitalized patients [29]. So, in our study, we could not find any positive effects of long-term HCQ use on viral clearance or outcomes in patients with autoimmune rheumatic disease.

Our study includes the first analysis of about COVID-19 patients with autoimmune rheumatic diseases with long-term HCQ use in the Turkish population. All cases were from a single center with follow-up duration longer than a year. The screening of RT-PCR negative cases with SARS-CoV-2 IgM/IgG antibodies had increased the strength of this study. On the other hand, there are important limitations. First of all, this study was conducted as a retrospective and sample size was limited. Secondly, although patients with RT-PCR and antibody positivity were included in the study, an asymptomatic group of patients may have been ignored. Thirdly, not all patients had control evaluation for RT-PCR negativity which may have caused some data to be underestimated. Lastly, activation of rheumatological disease during COVID-19 was just evaluated as clinical, without activity scores.

Conclusion

This study showed us that long-term use of HCQ in autoimmune rheumatic diseases had no effect on the development of pneumonia, clinical recovery and RT-PCR negativity on patients with COVID-19. The severity of COVID-19 was found similar between patients regardless of long term HCQ use. Although HCQ treatment in COVID-19 was seen ineffective, the absence of complications supports the continuation of the drug in patients with HCQ indication due to the underlying disease. Our study is informative, but not built to inform on potential efficacy of HCQ in terms of antiviral and/or immunomodulating in COVID-19 management. Lastly, we think that it could still be needed to evaluate the classical treatments, already in use for other reasons, for the COVID-19 disease which has novel mutations day by day and does not have a definitive treatment yet.

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Conflict of Interest

The authors have no conflicts of interest to declare.

Ethics Approval

All protocols for this study were approved by the Ankara Bilkent City Hospital Clinical Research Ethics Committee (Decree Date:30.09.2020 and No: E1-20-683)

Patient Consent for Publication

This was a retrospective study and all patients were deidentified. So, there was no need for written informed consent.

Availability of Data and Materials

All analyzed data obtained in this study are included in Table 1, Table 2, Table 3, Supplementary table 1 and Supplementary table 2.

Authors' Contributions

All authors contributed to data collection, writing the manuscript. BA has also done the statistical analysis.

References

1. Ferner RE, Aronson JK. Chloroquine and hydroxychloroquine in covid-19. BMJ 2020;369:m1432.
2. Yao X, Ye F, Zhang M, Cui C, Huang B, Niu P, et al. In Vitro Antiviral Activity and Projection of Optimized Dosing Design of Hydroxychloroquine for the Treatment of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Clin Infect Dis 2020;71:732-9.
3. Boulware DR, Pullen MF, Bangdiwala AS, Pastick KA, Lofgren SM, Okafor EC, et al. A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19. N Engl J Med 2020;383:517-25.
4. Horby P, Mafham M, Linsell L, Bell JL, Staplin N, Emberson JR, et al. Effect of Hydroxychloroquine in Hospitalized Patients with Covid-19. N Engl J Med 2020;383:2030-40.
5. Xie W, Wang Y, Zhang Z. Hydroxychloroquine reduces the risk of covid-19 in patients with rheumatic diseases: myth or reality? Ann Rheum Dis 2021;80:e6.
6. Zhu Y, Chen Y, Gong Y, Pan A, Ding H, Fang J, et al. Long-term application of hydroxychloroquine could not prevent the infection of COVID-19. J Infect Dev Ctries 2020;14:1368-73.
7. Gasmi A, Peana M, Noor S, Lysiuk R, Menzel A, Benahmed AG, et al. Chloroquine and hydroxychloroquine in the treatment of COVID-19: the never-ending story. Appl Microbiol Biotechnol 2021;105:1333-43.
8. Fajgenbaum DC, June CH. Cytokine Storm. N Engl J Med 2020;383:2255-73.
9. Tufan A, Avanoglu Guler A, Matucci-Cerinic M. COVID-19, immune system response, hyperinflammation and repurposing antirheumatic drugs. Turk J Med Sci 2020;50:620-32.
10. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020;395:497-506.
11. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. Lancet Respir Med 2020;8:420-2.
12. Schrezenmeier E, Dorner T. Mechanisms of action of hydroxychloroquine and chloroquine: implications for rheumatology. Nat Rev Rheumatol 2020;16:155-66.
13. Guidance To Covid-19 (SARS Cov2 Infection). [Accessed 21 April 2021, at https://covid19.saglik.gov.tr/TR-66299/covid-19-tedavi.html.]
14. Mitja O, Corbacho-Monne M, Ubals M, Alemany A, Suñer C, Tebé C, et al. A Cluster-Randomized Trial of Hydroxychloroquine for Prevention of Covid-19. N Engl J Med 2021;384:417-27.
15. Yang A, Guduguntla LS, Yang B. Potentials of Interferons and Hydroxychloroquine for the Prophylaxis and Early Treatment of COVID-19. J Cell Immunol 2020;2:333-40.
16. Revollo B, Tebe C, Penafiel J, Blanco I, Perez-Alvarez N, Lopez R, et al. Hydroxychloroquine pre-exposure prophylaxis for COVID-19 in healthcare workers. J Antimicrob Chemother 2021;76:827-9.
17. Ioannidis JPA. Infection fatality rate of COVID-19 inferred from seroprevalence data. Bull World Health Organ 2021;99:19-33F.
18. Gianfrancesco M, Hyrich KL, Al-Adely S, Carmona L, Danila MI, Gossec L, et al. Characteristics associated with hospitalisation for COVID-19 in people with rheumatic disease: data from the COVID-19 Global Rheumatology Alliance physician-reported registry. Ann Rheum Dis 2020;79:859-66.
19. Mathian A, Mahevas M, Rohmer J, Roumier M, Cohen-Aubart F, Amador-Borrero B, et al. Clinical course of coronavirus disease 2019 (COVID-19) in a series of 17 patients with systemic lupus erythematosus under long-term treatment with hydroxychloroquine. Ann Rheum Dis 2020;79:837-9.
20. Consortium FRSSSCI, contributors. Severity of COVID-19 and survival in patients with rheumatic and inflammatory diseases: data from the French RMD COVID-19 cohort of 694 patients. Ann Rheum Dis 2020.
21. General Coronavirus Table. 2021. [Accessed 21 April 2021, at https://covid19.saglik.gov.tr/TR-66935/genel-koronavirus-tablosu.html.]
22. Rentsch CT, DeVito NJ, MacKenna B, Morton CE, Bhaskaran K, Brown JP, et al. Effect of pre-exposure use of hydroxychloroquine on COVID-19 mortality: a population-based cohort study in patients with rheumatoid arthritis or systemic lupus erythematosus using the OpenSAFELY platform. Lancet Rheumatol 2021;3:e19-e27.
23. Strangfeld A, Schafer M, Gianfrancesco MA, Lawson-Tovey S, Liew JW, Ljung L, et al. Factors associated with COVID-19-related death in people with rheumatic diseases: results from the COVID-19 Global Rheumatology Alliance physician-reported registry. Ann Rheum Dis 2021.
24. Esatoglu SN, Tascilar K, Babaoglu H, Bes C, Yurttas B, Akar S, et al. COVID-19 Among Patients With Inflammatory Rheumatic Diseases. Front Immunol 2021;12:651715.
25. Helms J, Tacquard C, Severac F, Leonard-Lorant I, Ohana M, Delabranche X, et al. High risk of thrombosis in patients with severe SARS-CoV-2 infection: a multicenter prospective cohort study. Intensive Care Med 2020;46:1089-98.
26. Moll M, Zon RL, Sylvester KW, Chen EC, Cheng V, Connell NT, et al. VTE in ICU Patients With COVID-19. Chest 2020;158:2130-5.
27. Gautret P, Hoang VT, Lagier JC, Raoult D. Effect of hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial, an update with an intention-to-treat analysis and clinical outcomes. Int J Antimicrob Agents 2021;57:106239.
28. Omma A, Erden A, Apaydin H, Aslan M, Çamlı H, Şahiner ES, et al. Hydroxychloroquine shortened hospital stay and reduced intensive care unit admissions in hospitalized COVID-19 patients. The Journal of Infection in Developing Countries 2021.
29. Tang W, Cao Z, Han M, Wang Z, Chen J, Sun W, et al. Hydroxychloroquine in patients with mainly mild to moderate coronavirus disease 2019: open label, randomised controlled trial. BMJ 2020;369:m1849.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Urology / Üroloji

Factors Affecting Urethral Catheter Placement Following Flexible Ureterorenoscopy: RIRSearch Study Group

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ABSTRACT

Purpose: To investigate the factors affecting UC placement following flexible ureterorenoscopy (fURS) and the effect of urethral catheter (UC) placement on patient quality of life.

Methods: The present study was performed in prospective manner from 1st January 2015 to 30th December 2023, and patients with renal stones smaller than two centimeters who underwent fURS were analyzed for study inclusion. Patients' demographic characteristics, operative parameters, success of procedure, complications, and VAS score were recorded. Patients were categorized into two groups according to UC placement or not.

Results: In total, 324 patients were enrolled into the study. In the patient group with UC placement, ratio of male patients (p= 0.002), ratio of anticoagulant use (p= 0.002), preoperative creatinine level (p=0.001), stone size (p= 0.001), stone burden (p= 0.001), and ratio of multiple stones (p= 0.001) were significantly higher. Operation time was significantly longer (p= 0.003) and intraoperative complications (p= 0.045) were significantly higher in patients with UC insertion. Need for additional analgesia and VAS score was significantly lower in patients without UC placement (p= 0.004 vs. p= 0.001). Multivariate analysis revealed that male gender, higher preoperative creatinine level, higher stone size and stone burden, and longer operation time were predictive factors for UC placement following fURS (p= 0.008, p= 0.001, p= 0.001, p= 0.010, and p= 0.001, respectively).

Conclusion: Our study demonstrated that male gender, higher preoperative creatinine level, higher stone size and stone volume, and longer operation time resulted in UC insertion after fURS.

Keywords: flexible ureterorenoscopy, fURS, kidney stone, urethral catheter

ÖZET

Amaç: Fleksibl üreterorenoskopi (fURS) sonrası üretral katater (ÜK) yerleştirilmesini etkileyen faktörleri ve ÜK yerleştirilmesinin hastanın yaşam kalitesi üzerindeki etkisini araştırmak.

Yöntemler: Bu çalışma 1 Ocak 2015 ile 30 Aralık 2023 tarihleri arasında prospektif olarak gerçekleştirildi ve iki santimetreden küçük böbrek taşı olan ve fURS uygulanan hastalar çalışmaya dahil edilmek üzere analiz edildi. Hastaların demografik özellikleri, ameliyat parametreleri, işlem başarısı, komplikasyonlar ve VAS skoru kaydedildi. Hastalar ÜK yerleştirilip yerleştirilmemesine göre iki gruba ayrıldı.

Sonuçlar: Toplam 324 hasta çalışmaya dahil edildi. ÜK yerleştirilen hasta grubunda erkek hasta oranı (p= 0.002), antikoagülan kullanım oranı (p= 0.002), ameliyat öncesi kreatinin düzeyi (p=0.001), taş boyutu (p= 0.001), taş yükü (p= 0.001) ve çoklu taş oranı (p= 0.001) anlamlı olarak daha yüksekti. ÜK yerleştirilen hastalarda operasyon süresi anlamlı olarak daha uzundu (p= 0.003) ve intraoperatif komplikasyonlar (p= 0.045) anlamlı olarak daha yüksekti. Ek analjezi ihtiyacı ve VAS skoru ÜK yerleştirilmeyen hastalarda anlamlı olarak daha düşüktü (p= 0.004 vs. p= 0.001). Çok değişkenli analiz, erkek cinsiyet, ameliyat öncesi yüksek kreatinin düzeyi, daha yüksek taş boyutu ve taş yükü ve daha uzun ameliyat süresinin fURS sonrası ÜK yerleştirilmesi için öngörücü faktörler olduğunu ortaya koydu (sırasıyla p= 0.008, p= 0.001, p= 0.001, p= 0.010 ve p= 0.001).

Sonuçlar: Çalışmamız erkek cinsiyet, yüksek preoperatif kreatinin düzeyi, daha yüksek taş boyutu ve taş hacmi ve daha uzun operasyon süresinin fURS sonrası ÜK yerleştirilmesine neden olduğunu göstermiştir.

Anahtar Kelimeler: fleksibl üreterorenoskopi, fURS, böbrek taşı, üretral katater

Flexible ureterorenoscopy (fURS) is a procedure using natural orifices for diagnosis and treatment of upper urinary system pathologies, including ureteral strictures, ureteral and renal tumors, ureteral stone(s) and kidney stone(s), etc. Renal stone surgery is the most common area where fURS is performed (1). According to European Urology Association and America Urology Association guidelines, fURS is recommended as a first-line treatment option for kidney stones smaller than two centimeters in diameter (2). Chen and colleagues (3) analyzed data from 108 patients with renal stones, and the authors found 98.6% stone-free rate for renal stone located in the upper-middle calyx, and 85.7% success rate for lower calyx renal stones after one session. In a meta-analysis by De Coninck et al., (4) the authors emphasized that although complication rates after fURS vary between 1-37%, major complications such as ureteral avulsion, bleeding or sepsis are very rare. The factors affecting the patient's comfort after fURS are still under investigation.

Urethral catheter (UC) placement following fURS an issue that has not yet been fully explored. Some urologists insert UC after fURS to monitor the patient's urine volume more accurately and to avoid the risk of acute urinary retention. In addition, some authors claimed that the presence of UC following fURS may have a potential role in reducing infectious complications (5). On the other hand, the presence of UC is associated with pain and patient discomfort, and increases the risk of urethral stricture during long-term follow-up. Also, the catheter itself has a cost, and removal of the catheter after the procedure increases the workload of healthcare professionals (6).

Although previous studies about fURS mostly focused on success and complications of the procedure, a limited number of studies aimed to clarify the effect of UC following fURS on pain of patients. In this study, we aimed to investigate the factors affecting UC placement following fURS and the effect of UC placement on pain of patients.

Material and Methods

This multicentric study was performed in prospective manner from 1st January 2015 to 30th December 2023, and patients with renal stones smaller than two centimeters who underwent fURS were analyzed for study inclusion. Patients' demographic characteristics including age (years), sex, body mass index (BMI) (kg/m^2), presence of comorbidities, anticoagulant use, preoperative creatinine level (mg/dl), presence of preoperative JJ stent, stone size (millimeter), stone burden (centimeter square), number of stones (single or multiple), stone localization (ureter or kidney), Hounsfield unit, and presence of hydronephrosis were recorded. Patients with concomitant kidney and ureter stones, with nephrostomy tube, with neurologic and psychiatric disease, who were illiterate, and with drug addiction were excluded from the study.

In addition, side of operation, operation time (minutes), perioperative complications and postoperative complications, success or failure of the procedure, requirements for additional anesthesia in the postoperative period, and Visual Analogue Scale (VAS) score at postoperative 6th hour were noted.

Flexible Ureteroscopy Procedure

In lithotomy position, cystoscopy was done to identify any bladder pathology and the ureteral orifice of the operation side. Then to identify any ureteral pathology and achieve passive dilatation of the ureter, semi rigid ureterorenoscopy was performed. A ureteral access sheath (UAS) was placed two or three cm below the ureteropelvic junction under fluoroscopic guidance. Then, a flexible ureterorenoscope was inserted through the UAS, and the stone was detected by direct vision. In cases where the UAS did not pass, the procedure was performed without using the UAS. During stone fragmentation, Holmium laser with 273 microfiber was used, and stone fragments larger than 3 mm were extracted with nitinol baskets. Stone fragments smaller than 3 cm were left to spontaneously pass. Stone-free status of patients was defined by visual evaluation of all calyces and by fluoroscopy-guided evaluation. At the end of the procedure, JJ stent was inserted routinely. The decision about UC placement was made according to surgeon preference after the operation.

To clarify the factors affecting UC placement at the end of procedure and the effect of UC placement on patient quality of life, patients were categorized into two groups according to UC placement or not. These groups were compared according to preoperative parameters, intraoperative data, complications, success and VAS at postoperative 6th hour.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS IBM Corp., Armonk, NY, USA) version 27 was used. Distribution of the variables was assessed with the Shapiro-Wilk test. Independent student t-test was done for comparison of the variables. Descriptive data are summarized as mean

± standard deviation for continuous variables. Categorical variables were compared using the χ2 test. Logistic regression analysis was performed to evaluate the parameters that predicted UC insertion. The data were analyzed at 95% confidence level, and a p value of less than 0.05 was accepted as statistically significant.

Results

In total, 324 patients were enrolled into the study. UC was inserted in 170 patients following fURS and was not inserted to 154 patients. Age, BMI, preoperative JJ stent rate, stone location, Hounsfield unite, and presence of hydronephrosis were similar between the groups (p= 0.946, p= 0.319, p= 0.194, p= 0.195, p= 0.277, and p= 0.721, respectively). The ratio of male patients was significantly higher in patients with UC inserted (p= 0.002). Additionally, in the patient group with UC placement, ratio of anticoagulant use (8.2% vs. 1.9%, p= 0.002), preoperative creatinine level (1.1 mg/dl vs. 0.8 mg/dl, p=0.001), stone size (23.8 mm vs. 19.6 mm, p= 0.001), and stone burden (3.7 cm^2 vs. 30 cm^2, p= 0.001) were significantly higher. Ratio of multiple stones was significantly higher in patients with UC placement (34.1% vs. 13.6%, p= 0.001) (Table 1).

Table 1: Comparison of patient demographic data and stone characteristics according to urethral catheterization status

	Urethral Catheterization		P value
	Yes (n : 170)	No (n : 154)	
Age (years)*	42.2 ± 12.6	42.0 ± 13.0	0.946
Gender, n (%) Female Male	 78 (45.9%) 92 (54.1%)	 97 (63.0%) 57 (37.0%)	***0.002***
Body mass index (kg/m^2)*	27.2 ± 3.1	27.6 ± 3.4	0.319
Comorbidities, n (%) Hypertension Diabetes mellitus Coronary artery disease Chronic kidney disease	 32 (18.8%) 21 (12.4%) 17 (10.0%) 12 (7.1%)	 22 (14.3%) 18 (11.7%) 9 (5.8%) 1 (0.6%)	 0.274 0.854 0.169 ***0.003***
Anticoagulant use, n (%)	14 (8.2%)	3 (1.9%)	***0.011***
Preoperative creatinine (mg/dl)*	1.1 ± 0.5	0.8 ± 0.2	***0.001***
Preoperative JJ stent, n (%)	10 (5.9%)	15 (9.7%)	0.194
Stone size (mm)*	23.8 ± 7.3	19.6 ± 7.9	***0.001***
Stone burden (cm^2)*	3.7 ± 1.6	3.0 ± 1.5	***0.001***
Number of stone, n (%) Single Multiple	 112 (65.9%) 58 (34.1%)	 133 (86.4%) 21 (13.6%)	***0.001***
Stone localization, n (%) Ureter Kidney	 31 (18.2%) 139 (81.8%)	 20 (13.0%) 134 (87.0%)	0.195
Hounsfield unit*	782.0 ± 262.7	812.1 ± 231.4	0.277
Hydronephrosis, n (%) Yes No	 132 (77.6%) 38 (22.4%)	 117 (76.0%) 37 (24.0%)	0.721
**Mean ± standard deviation*			

Side, postoperative complications, and success rate were comparable between the groups (p= 0.855, p= 0.714, and p= 0.854, respectively). Operation time was significantly longer (55.0 min vs. 46.4 min, p= 0.003) and intraoperative complications (4.1% vs. 0.6%, p= 0.045) were significantly higher in patients with UC insertion. Moreover, need for additional analgesia and VAS score was significantly lower in patients without UC placement (p= 0.004 vs. p= 0.001).

Table 2: Comparison of operation features according to urethral catheterization status

	Urethral Catheterization		P value
	Yes (n : 170)	No (n : 154)	
Side, n (%) Left Right	79 (46.5%) 91 (53.5%)	70 (45.5%) 84 (54.5%)	0.855
Operation time (min)*	55.0 ± 29.9	46.4 ± 18.7	***0.003***
Perioperative complications, n (%)	7 (4.1%)	1 (0.6%)	***0.045***
Postoperative complications, n (%)	21 (12.3%)	17 (11.0%)	0.714
Success, n (%)	149 (87.6%)	136 (88.3%)	0.854
Need for additional analgesia, n (%)	42 (24.7%)	19 (12.3%)	***0.004***
VAS score*	4.2 ± 1.9	2.7 ± 1.1	***0.001***

**Mean ± standard deviation*
VAS: Visual Analog Scale

Multivariate analysis revealed that male gender and higher preoperative creatinine level were predictive factors for UC placement following fURS (p= 0.008 and p= 0.001). In contrast, anticoagulant use and presence of perioperative complication did not significantly affect UC insertion (p= 0.397 vs. p= 0.932). Moreover, higher stone size and stone burden, and longer operation time significantly increased the rate of UC insertion following fURS (p= 0.001, p= 0.010, and p= 0.001, respectively).

Table 3: Multivariate analysis evaluating risk factors for urethral catheter placement

	Odds ratio	95% CI	P value
Gender	2.078	1.213 – 3.560	***0.008***
Anticoagulant use	2.117	0.374 – 11.996	0.397
Preoperative creatinine (mg/dl)	4.835	2.051 – 11.396	***0.001***
Stone size	1.074	1.038 – 1.111	***0.001***
Number of stones	2.399	1.235 – 4.660	***0.010***
Operation time	1.019	1.008 – 1.030	***0.001***
Perioperative complications	1.125	0.076 – 16.653	0.932

Discussion

Flexible ureterorenoscopy is a common surgical procedure for proximal ureteral stone(s) and kidney stone(s). While possible factors that increase success and reduce complication rates have been extensively investigated, the number of studies identifying factors affecting quality of life after fURS is limited (7, 8). It is well known that UC placement after surgical procedures is related with pain and deterioration of quality of life. Thus, we conducted a study to identify the effect of UC on patient quality of life after fURS, and to analyze the factors affecting UC placement following fURS. Our findings revealed that male gender, higher preoperative creatinine level, higher stone size and stone volume, and longer operation time were predictive factors for UC placement following fURS.

Acute urinary retention (AUR) is simply defined as the inability to urinate, and previous reports emphasized that the risk was 13 times higher in men in comparison with women (9). In addition, due to anatomical properties,

urethral length is much longer in men which increases the risk of damage from surgical manipulations through the urethra. Hori and colleagues (10) analyzed UC placement rates after endoscopic ureteral stone surgery, and the authors concluded that being male was a predictive factor for UC insertion. Also, some male patients with fURS may have benign prostatic hyperplasia, and manipulations in this area may cause edema and bleeding that results in AUR. In the present study, we found significantly higher UC placement rate in males.

Stone size and stone volume are important parameters when selecting the type of kidney stone surgery. Majdalany and colleagues analyzed the factors affecting operation time for the fURS procedure. The authors stated that stone size was a predictive factor for prolonged operation time, not stone density (11). In another study, Akman et al. (12) analyzed safety and proficiency of fURS for kidney stone management, and concluded that with increasing stone size, requirements for second session-fURS and additional procedures increased. Also, as the size of kidney stones increases, the number of stone fragments may increase. While these stones are expelled by spontaneous passage, fragments may hit the urethra mucosa, causing pain or obstructing the urethra. We believe that due to these concerns, there were significant correlations of higher stone size and stone volume with UC placement.

Longer operation time could increase surgical morbidity and mortality. Previous studies about fURS demonstrated that longer operation time resulted in higher pelvicalyceal pressure during fURS (13). Moreover, Ozgor and colleagues (14) investigated factors affecting infectious complications after fURS. The authors stated that operation time longer than 60 minutes increased infectious complications. Also, some authors claimed that prolonged pressure on the ureteral wall significantly increased the risk of ureteral stricture (15). Similarly, prolonged pressure on the urethra or prolonged manipulation of the urethra may increase postoperative pain or cause urination difficulties. In the present study, prolonged operation time was a predictive factor for UC placement.

Although this study is one of the rare studies analyzing UC placement after fURS, the present study has some limitations. First of all, all patients with UC placement in a single group; however, we did not analyze the effect of the size of UC on the patients' quality of life. Secondly, due to the multi-centric nature of the study, operations were performed by different surgeons, so surgeon motivation to insert UC may have affected the results. In addition, we evaluated postoperative pain with a single VAS score; however, the length of hospital stay after fURS is short and frequent requests to provide VAS scores after the operation might disturb the patient. We also did not evaluate different types of urethral catheters (foley, silicon, etc.). Lastly, we did not focus on a cost analysis of UC placement.

Conclusion

The present study demonstrated that UC placement following fURS was associated with increased analgesia requirements and more pain. Moreover, our study demonstrated that male gender, higher preoperative creatinine level, higher stone size and stone volume, and longer operation time resulted in UC insertion after fURS.

Declarations

Funding

There is no funding in this study

Conflicts of Interest/Competing Interests

There is no conflicts of interesst in this study for all authors

Ethics Approval

Ethics committee approval was issued by Acıbadem University Ethics Committee Committee with decision number 3/102.

Availability of Data and Material

Appropriate

Authors' Contributions:

Hakan Cakir: Substantial contributions to the conception or design of the work, analysis, interpretation of data for the work, drafting the work or revising it critically for important intellectual content, approved the final version of manuscript..

Onder Cinar: Collected the data, approved the final version of manuscript.

Murat Akgül: Collected the data, approved the final version of manuscript.

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Kerem Teke: Performed the analysis, approved the final version of manuscript.

Eyüp Burak Sancak: Collected the data, performed the analysis, approved the final version of manuscript.

Cenk Murat Yazici: Performed the analysis, approved the final version of manuscript.

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References:

1- Torrecilla Ortiz C, Colom Feixas S. Actualización en el tratamiento de la litiasis ureteral: URS semirrígida y flexible [Update in the management of ureteral lithiasis: Semirigid and flexible ureterorenoscopy.]. Arch Esp Urol. 2017;70:124-133.

2- EAU Guidelines. Edn. presented at the EAU Annual Congress Milan 2023. ISBN 978-94-92671-19-6

3- Chen S, Xu B, Liu N, et al. Improved effectiveness and safety of flexible ureteroscopy for renal calculi (< 2 cm): A retrospective study. Canadian Urological Association Journal. 2015;9:E273.

4- De Coninck V, Keller EX, Somani B, et al. Complications of ureteroscopy: a complete overview. World journal of urology. 2020;38:2147-66

5- Kang CY, Chaudhry OO, Halabi WJ, et al. Risk factors for postoperative urinary tract infection and urinary retention in patients undergoing surgery for colorectal cancer. Am Surg. 2012;78:1100-4..

6- Pawłowska-Krajka E, Dorobek A. The impact of urinary bladder catheterisation after ureterorenoscopic stone removal on the postoperative course. Cent European J Urol. 2017;70:405-411.

7- Yuruk E, Binbay M, Ozgor F, et al. Flexible ureterorenoscopy is safe and efficient for the treatment of kidney stones in patients with chronic kidney disease. Urology. 2014;84:1279-84.

8- Tanik S, Zengin K, Albayrak S, et al. The effectiveness of flexible ureterorenoscopy for opaque and non-opaque renal stones. Urol J. 2015;12:2005-9.

9- Yavuz M, Etiler N. Addressing urinary incontinence by gender: a nationwide population-based study in Turkiye. BMC urology. 2023;23:205.

10- Hori S, Otsuki H, Fujio K, et al. Impact of eliminating urethral catheterization following ureterorenoscopic lithotripsy. International Journal of Urology. 2022;29:337-42.

11- Majdalany SE, Levin BA, Ghani KR. The efficiency of moses technology holmium laser for treating renal stones during flexible ureteroscopy: relationship between stone volume, time, and energy. Journal of Endourology. 2021;35:S-14.

12- Akman T, Binbay M, Ozgor F, et al. Comparison of percutaneous nephrolithotomy and retrograde flexible nephrolithotripsy for the management of 2-4 cm stones: a matched-pair analysis. BJU Int. 2012;109:1384-9.

13- Alkan E, Ozkanli O, Avci E, et al. Effectiveness of Flexible Ureterorenoscopy and Laser Lithotripsy for Multiple Unilateral Intrarenal Stones Smaller Than 2 cm. Adv Urol. 2014;2014:314954.

14- Ozgor F, Sahan M, Cubuk A, et al. Factors affecting infectious complications following flexible ureterorenoscopy. Urolithiasis. 2019;47:481-486.

15- Tonyali S, Pietropaolo A, Emiliani E, et al. Factors associated with ureteral strictures following ureteroscopy for impacted ureteral stones? A multicenter study by EAU-YAU endourology and urolithiasis working party. Actas Urol Esp (Engl Ed). 2023;47:631-637

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Effects of Pes Planus on Foot Pain, Low Back Pain, and Static Balance in Young Adult Individuals

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ABSTRACT

Purpose: Pes planus is the reduction or complete loss of the medial longitudinal arch height of the foot. There are conflicting results in the literature explaining the relationship between pes planus and foot pain, low back pain, and balance in young adult individuals. This study aimed to determine the effects of pes planus on foot pain, low back pain, and static balance in young adult individuals.

Methods: 59 people were examined in this cross-sectional study. Considering the homogeneity of the results, 4 people were not included in the statistical analysis. According to the analysis results, a total of 55 people was included in the study, 37 with pes planus and 18 without pes planus. Feiss line test, Foot Function Index (FFI), Visual Analog Scale (VAS), and Stork Balance Test (SBT) were used to assess pes planus, foot pain, low back pain, and static balance, respectively.

Results: There was no significant difference between FFI, VAS (resting-activity), and left foot SBT values comparisons of individuals without pes planus and with pes planus ($p>0.05$), it was found that the right SBT results were significantly higher in without pes planus than in pes planus ($p<0.05$).

Conclusion: The Static Balance scores of individuals without pes planus were found to be higher than individuals with pes planus. No significant foot or back pain was observed in the participants with and without pes planus, which consisted entirely of young individuals.

Keywords: Pes planus, pain, postural balance, young adult.

ÖZET

Amaç: Pes planus, ayağın medial longitudinal ark yüksekliğinin azalması veya tamamen kaybolmasıdır. Literatürde genç erişkin bireylerde pes planus ile ayak ağrısı, bel ağrısı ve denge arasındaki ilişkiyi açıklayan çelişkili sonuçlar bulunmaktadır. Bu çalışmada pes planusun genç erişkin bireylerde ayak ağrısı, bel ağrısı ve statik denge üzerine etkilerinin belirlenmesi amaçlandı.

Yöntem: Bu kesitsel çalışmaya 59 birey dahil edildi. Sonuçların homojenliği dikkate alınarak 4 birey istatiksel analize dahil edilmedi. Analiz sonuçlarına göre 37 pes planusu olan, 18 pes planusu olmayan toplam 55 birey çalışmaya dahil edildi. Pes planus, ayak ağrısı, bel ağrısı ve statik dengeyi değerlendirmek için sırasıyla Feiss çizgisi testi, Ayak Fonksiyon İndeksi (AFİ), Görsel Analog Skala (GAS) ve Stork Denge Testi (SDT) kullanıldı.

Bulgular: Pes planusu olan ve olmayan bireylerin AFİ, GAS (istirahat-aktivite) ve sol ayak SDT değerleri karşılaştırıldığında anlamlı bir fark olmadığı ($p>0,05$), sağ SDT sonuçlarının ise pes planusu olmayanların pes planusu olanlara göre anlamlı ölçüde daha yüksek olduğu belirlendi ($p<0,05$).

Sonuç: Pes planusu olmayan bireylerin pes planusu olan bireylere göre statik denge puanlarının daha yüksek olduğu belirlendi. Tamamı genç bireylerden oluşan, pes planusu olan ve pes planusu olmayan katılımcılarda önemli bir ayak ya da bel ağrısı gözlenmemiştir.

Anahtar Kelimeler: Pes planus, ağrı, postüral denge, genç erişkin.

Pes planus (PP) can be defined as the valgus of the hindfoot while loading, the disappearance of the medial longitudinal arch in the midfoot, and the supination of the forefoot relative to the hindfoot (1, 2). Pes planus is characterized by a lowered medial longitudinal arch (MLA), an everted hindfoot, and a dorsiflexed and abducted midfoot (3). The prevalence of pes planus in the general population has been reported to be between 2% and 23%, this rate increases up to 74% (4-6).

The most important problem related with pes planus is excessive pronation of the foot during standing and walking. This leads to impaired load distribution in gait, excessive stresses in the foot and ankle joints, compressive shearing forces in the knee joint and internal rotation in the hip joint (7-9). Also, it has been reported that in individuals with pes planus, activation of the plantar intrinsic muscles and tibialis posterior is needed more to support the MLA and stabilize the foot in weight-bearing activities, and as a result, muscle fatigue and failure may occur (10).

Pes planus may cause pain, tenderness, stiffness, kinematic changes in gait patterns, and activity limitation (11-13). Biomechanical changes resulting from pes planus may cause low back, foot, and calf pain, as well as gait disorders; therefore, they affect daily activities such as doing sports, standing for a long time and walking, and physical fitness (1). Pes planus may cause foot and leg pain, fatigue, and functional limitations, especially in elderly individuals (14, 15).

A study investigating the relationship between pes planus and pelvic inclination angle and the presence of low back pain reported that pes planus may cause an increase in pelvic inclination angle and low back pain in young sedentary individuals (16). In another study conducted in the same age group, no significant relationship was found between pes planus and pain in the lumbar region (17). When the studies examine the relationship between pes planus and balance in the literature, it has reached that contrasting results are reported. In a study conducted with young adults, it was reported that pes planus negatively affected balance (18). In another study conducted with participants in a similar age group, it was reported that individuals in the group with pes planus had decreased physical performance, but there was no difference between the group with pes planus and the control group (without pes planus) in terms of balance (19).

When the literature is analyzed, the relationship between pes planus and static balance and pain is not clear and there are studies with different results. The aim of our study is determining the effects of pes planus on foot pain, low back pain, and static balance in the young adult age group and to contribute to the literature on this subject.

Material and Methods

Participants and Ethic Approval

This cross-sectional research was conducted at KTO Karatay University between 30.09.2022 and 30.01.2023. Participants is selected among Physiotherapy and Rehabilitation students at the School of Health Sciences, KTO Karatay University with simple random sampling method.

Before starting the study, permission was obtained from KTO Karatay University Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research (Decision date: 21.09.2022 Decision No: 2022/012). Participants were informed before inclusion in the study and a written informed consent form was obtained.

Inclusion criteria:

a. Ages of 18-30,

b. No lower extremity injury in the last 6 months,

c. Individuals who did not undergo any lower extremity surgery were included in the study.

Exclusion criteria:

a. Having systemic, neurologic, and/or degenerative diseases involving the foot,

b. Having epin calcanei, hallux valgus and hallux rigitus,

c. Individuals with any systemic and/or neurologic problems that may cause low back pain were excluded from the study.

Assessments

Demographic information of the individuals participating in the study was recorded. Participants were evaluated for pes planus, pain (low back pain and foot pain), and static balance.

Demographic Information

Demographic data (age, height, body weight, body mass index (BMI), gender, dominant side) were recorded.

Pes planus Evaluation

The "Feiss line" technique was used in the evaluation of pes planus. The "Feiss line" is the line formed by connecting the medial malleolus and the center of the 1st metatarsophalangeal joint. In a normal foot, the scaphoid tubercle of the navicular bone lies on the Feiss line. PP degrees are evaluated according to the separation of the scaphoid tubercle from this line and how close to the ground. If the tubercle falls 1/3 of the distance between the Feiss line and the ground, it is interpreted as degree 1 PP; if it falls 2/3 of the distance, it is interpreted as degree 2 PP; if it completely touches the ground, it is interpreted as degree 3 PP (20). PP was evaluated on a hard ground.

Pain Assessment

In our study, participants' foot pain and low back pain were assessed. The severity of low back pain was assessed with Visual Analog Scale (VAS). The VAS is a scale that has been validated and proven to be reliable in measuring the intensity of pain (21). The VAS is an assessment criterion that is represented by a 10-centimeter line, where 0 indicates "no pain" and 10 represents "very severe pain." In our study, the individual was asked to mark the severity of pain experienced during activity (outdoor walking, cycling, gardening…) and at rest separately on the scale (22). The pain levels were determined by measuring the place where the participants were marked.

The Foot Function Index (FFI) was used for the assessment of foot pain. The FFI is a commonly used self-administered form developed to assess the effects of foot pathologies on pain, disability, and activity limitations. Our study used only the pain-related part of the FFI scale. There is nine questions within the FFI assess pain in different time periods (morning, evening), different situations (standing, walking), and different conditions (with and without shoes). They are asked to rate each question on a scale from 0 (no pain or difficulty) to 10 (most severe pain that can be felt or too difficult to do) (23, 24).

Static Balance Assessment

The Stork Balance Test (SBT) was used for static balance assessment. In the SBT, participants stand on the floor with their shoes removed and hands on their waist. The foot of the non-tested extremity is fixed medial to the knee joint of the other extremity. The participant rises on tiptoe on the support leg and is asked to maintain the position for 1 minute and the timer is started with the command to rise. If the participant fails to maintain the position of the foot fixed medial to the knee, pulls one or both hands away from the waist and the heel of the support foot touches the ground, the stopwatch is stopped, and the time is recorded. The average of the test repeated 3 times is calculated and recorded (25).

Statistics

SPSS 22.0 program was used in the statistics analysis. Fisher's exact test was used to analyse categorical data. It was determined whether the data were normally distributed or not by examining the skewness and kurtosis values. Independent Samples t-test and Mann Whitney U test were used for normally distributed data and not normally distributed data respectively. Wilcoxon Paired t-test was used to compare the data belonging to the same individuals and those that were not normally distributed. The post hoc power analysis result was found as power $(1-\beta) = 54\%$ according to SBT-right leg (G*Power 3.1.9.7).

Results

A total of 59 individuals were included in our study. The dominant side of 4 individuals was determined as left, and the dominant side of 55 individuals was determined as right. Considering the homogeneity of the results in the study, 4 individuals with the left side of the dominant were not included in the statistics. A total of 55 individuals, consisting of 43 females and 12 males, were included in the statistics. The participants diveded two group for statictical anlyses, Group 1; without pes planus and Group 2; with pes planus. The participants who have pes planus is not divided in itself according to pes planus degrees because of the insufficient participants number. The demographic information of the participants is presented in Table 1.

Table 1. Demographic Information of Participants

	Group 1 (n= 18)		Group 2 (n=37)			Total (n=55)	
Gender	Female	Male	Female	Male	p[a]	Female	Male
	13	5	30	7	0.49	43	12
	Group 1 (n= 18)		**Group 2 (n=37)**			**Total (n=55)**	
	Mean±SD		Mean±SD		p[b]	Mean±SD	
Age (year)	23.4±2.6		22±2.4		0.056	22.4±2.5	
BMI	21.9±3.1		23.7±4.5		0.14	23.1±4.2	

Group 1: without pes planus, Group 2: with pes planus, SD: standard deviation, BMI: Body Mass Index, p[a]: Fisher's exact test, p[b]: Independent Samples t-test

While 18 participants in the study did not have pes planus, it was determined that 37 participants had different degrees of flexible pes planus. Detailed information regarding the presence and degrees of pes planus in the study participants is shown in Figure 1.

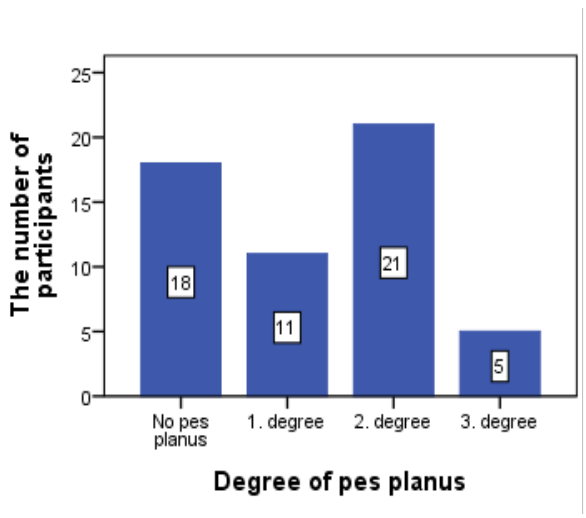

Figure 1: Pes planus evaluation results

When the pain levels of the participants in the study were assessed, no significant difference was found between individuals with pes planus and those without pes planus. Detailed information regarding the pain levels of the participants is shown in Table 2.

Table 2. Pain assessment results in individuals with and without pes planus

	Grup 1 (n= 18)	Grup 2 (n=37)	
	Mean±SD	Mean±SD	p[b]
VAS-resting	1.3±2.1	1.6±2.3	0.604
VAS-activity	1.9±2.2	2.5±2.3	0.401
	Median (Min-Max)	Median (Min-Max)	p[c]
FFI-dominant leg (right)	9 (0-44)	8 (0-52)	0.928
FFI-non-dominant leg (left)	6.5 (0-40)	8 (0-53)	0.725
FFI-total	15.5 (0-84)	16 (0-105)	0.781

Group 1: without pes planus, Group 2: with pes planus, SD: standard deviation, VAS: Visual Analogue Scale, FFI: Foot Function Index pain score, p[b]: Independent Samples t-test, p[c]: Mann Whitney U test

In the static balance evaluations of the participants in the study, it was found that individuals with pes planus had significantly lower Stork Balance Test-right results compared to those without pes planus.

There was no significant difference between the groups in the Stork Balance Test-left results. Detailed information about the results of the Stork Balance Test is shown in Table 3.

Table 3. Static balance assessment results in individuals with and without pes planus

	Group 1 (n= 18)	Group 2 (n=37)	
	Median (Min-Max)	Median (Min-Max)	p[c]
SBT-dominant leg (right) (sec)	3.0 (1.15-24.00)	2.1 (0.83-15)	**0.038**
SBT-non-dominant leg (left) (sec)	2.1 (1.05-25.33)	2.0 (1-8)	0.317

Group 1: without pes planus, Group 2: with pes planus, SBT: Stork Balance Test, sec:second, p[c]: Mann Whitney U test, Bold value indicate p < 0.05

According to the static balance evaluation results of the participants in the dominant and non-dominant legs, there was no significant difference between the static balance scores between the dominant and non-dominant sides. The static balance results in the dominant and non-dominant legs are shown in Table 4.

Table 4. Results of static balance assessment in dominant (right) and non-dominant (left) leg

	n=55	
	Median (Min-Max)	p[d]
SBT- Dominant leg (right) (sec)	2.3 (0.8-24.0)	0.836
SBT- Non-dominant leg (left) (sec)	2.0 (1.0-25.3)	

SBT: Stork Balance Test, p[d]: Wilcoxon Paired t-test, sec:second

DISCUSSION

The results of the study were examined, it was found that pes planus affected static balance negatively in young adults while did not cause low back and foot pain.

As a result of our assessments, it was found that the scores of low back pain and foot pain in the group without pes planus and in the group with pes planus were similar. In many activities such as standing, walking, and running, a kinetic chain is formed along the lower extremity and pelvis. For this reason, pes planus not only negatively affects the alignment and biomechanics of the structures in the foot but also has the potential to disrupt the alignment and biomechanics of the structures and joints located above, such as the upper body (26). Disruptions in joint alignment and biomechanics may cause pain in these areas. In a study conducted on this subject, it was reported that while there was a relationship between anterior knee pain and low back pain in individuals with moderate and severe pes planus, there was no relationship between mild pes planus and pain (27). One reason why there was no significant difference in pain parameters between individuals with pes planus and those without pes planus in our study may be that individuals with pes planus were not separated according to their degree of pes planus. Another study in the literature found that there is no relationship between pes planus and low back pain (17). In this study, the idea that the pain parameter does not cause a difference between individuals with pes planus and those without pes planus is presented because the individuals are at a young age and the possible degenerations that may cause pes planus have not yet occurred. We think that the reasons why pes planus did not cause a difference in the pain parameter in our study may be that the mild, moderate and severe degrees of pes planus were considered under one heading and the effect of degenerative changes was not sufficiently revealed due to the young age of the participants.

In our study, there was no statistically significant difference between the static balance scores of the dominant and non-dominant legs. A review study investigating the role of the dominant leg in balance assessment stated that balance performance did not change significantly between the dominant leg and the non-dominant leg (28). The result of our study is consistent with previous literatüre (28). Upon detailed examination of the results related to static balance in our study, it was found that there was a statistically significant higher balance score in individuals without pes planus in the right foot, while there was no statistically significant difference in the left foot. In a study examining the relationship between pes planus and balance in athletes from various sports disciplines, it was concluded that pes planus negatively affected balance, especially on the dominant side, but a detailed explanation for this effect was not provided (29). The results of our study are similar to this study. It has been shown in the literature that pes planus leads to postural deviations, particularly causing shortening of the gastrocnemius muscle and weakness in the tibialis posterior muscle (30). In addition, many changes such as a decrease in the cross-sectional area of the intrinsic muscles of the foot and an increase in the cross-sectional area of some eccentric muscles occur (3). We think that these pathological changes that develop as a result of pes planus also affect static balance negatively. However, in our study, the negative effect of pes planus on static balance was shown only in the dominant (right) leg. We have previously stated that there is no statistically significant difference between the static balance scores on the dominant and non-dominant legs. However, although it is not statistically significant, the balance scores in the dominant (right) leg are higher than the balance scores in the non-dominant (left) leg. The low balance scores on the non-dominant (left) leg may have limited the effect of the factors explained above that negatively reflect on balance.

The most important limitation of our study is the small number of participants. Due to the limited number of participants, the groups were formed only from individuals with and without pes planus. If the number of participants could be increased enough to allow the grouping of individuals with pes planus among themselves, more detailed results could be achieved. Another limitation of the study was that the number of participants in the group with and without pes planus was not equal. Lastly, another limitation of our study was the lack of evaluation of additional factors such as physical activity level, muscle strength, and footwear choice, which may potentially affect the pain levels of the participants.

Conclusion

According to the results of our study, the presence of pes planus negatively affects the static balance in university students between the ages of 18-30, but does not affect the levels of foot pain and low back pain.

Declerations

Funding

None.

Conflicts of Interest/Competing Interests

None.

Ethics Approval

KTO Karatay University Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research (Decision date: 21.09.2022 Decision No: 2022/012).

Availability of Data and Material

Available on request

Authorship Contributions:

Conceived and designed the analysis: E.B.; B.P.; M.S.; O.K.
Collected the data: E.B.; B.P.; M.S.
Contributed data or analysis tools: O.K.; K.Y.
Performed the analysis: O.K.; K.Y.
Wrote the paper: E.B.; B.P.; M.S.; O.K.; K.Y.
Other contribution: K.Y.

References

1. Lee MS, Vanore JV, Thomas JL, et al. Diagnosis and treatment of adult flatfoot. The Journal of Foot and Ankle Surgery. 2005;44:78-113.
2. Şenaran H. Çocuklarda pes planus tanımı, doğal seyri ve tedavi seçenekleri. Türk Ortopedi ve Travmatoloji Birliği Derneği Dergisi. 2006;5:27-33.
3. Angin S, Crofts G, Mickle KJ, et al. Ultrasound evaluation of foot muscles and plantar fascia in pes planus. Gait & posture. 2014;40:48-52.
4. Askary Kachoosangy R, Aliabadi F and Ghorbani M. Prevalence of flat foot: comparison between male and female primary school students. Iranian Rehabilitation Journal. 2013;11:22-4.
5. Banwell HA, Mackintosh S and Thewlis D. Foot orthoses for adults with flexible pes planus: a systematic review. Journal of foot and ankle research. 2014;7:1-18.
6 . Golightly YM, Hannan MT, Dufour AB, et al. Racial differences in foot disorders and foot type. Arthritis care & research. 2012;64:1756-9.
7. Jung D-Y, Koh E-K and Kwon O-Y. Effect of foot orthoses and short-foot exercise on the cross-sectional area of the abductor hallucis muscle in subjects with pes planus: a randomized controlled trial. Journal of back and musculoskeletal rehabilitation. 2011;24:225-31.
8. Tang SF-T, Chen C-H, Wu C-K, et al. The effects of total contact insole with forefoot medial posting on rearfoot movement and foot pressure distributions in patients with flexible flatfoot. Clinical neurology and neurosurgery. 2015;129:S8-S11.
9. Vulcano E, Deland JT and Ellis SJ. Approach and treatment of the adult acquired flatfoot deformity. Current reviews in musculoskeletal medicine. 2013;6:294-303.
10. Wiewiorski M and Valderrabano V. Painful flatfoot deformity. Acta Chir Orthop Traumatol Cech. 2011;78:20-6.
11. Mann RA. Acquired flatfoot in adults. Clinical Orthopaedics and Related Research®. 1983;181:46-51.
12. Dabholkar T and Agarwal A. Quality of life in adult population with flat feet. Int. J. Health Sci. Res. 2020;10.
13. Marouvo J, Sousa F, Fernandes O, et al. Gait kinematics analysis of flatfoot adults. Applied Sciences. 2021;11:7077.
14. Menz HB, Dufour AB, Riskowski JL, et al. Association of planus foot posture and pronated foot function with foot pain: the Framingham foot study. Arthritis care & research. 2013;65:1991-9.
15. Uzunca K, Taştekin N and Birtane M. Erişkin Tip Pes Planusta Ağrı ve Dizabilitenin Radyografik ve Pedobarografik Parametreler ile İlişkisi. Rheumatism. 2006;21:95-9.
16. Ünver B, Suner Keklik S, Yildirim Sahan T, et al. An investigation of the effects of pes planus on distal and proximal lower extremity biomechanical parameters and low back pain. Turkish Journal Of Physiotherapy Rehabilitation-Turk Fizyoterapi Ve Rehabilitasyon Dergisi. 2019;30.
17. Ceyhan Ç, Sanalan GB, Akkaya N, et al. Evaluation of relationship between pes planus and axial pain in medical school students. Pamukkale Medical Journal. 2017;10:158-64.
18. Aktan AK and Kutlay Ö. Sedanter Kadın ve Erkekerde Beden Kitle İndeksi ile Pes Planus, Denge, Yaşam Kalitesi ve Ağrı Düzeyleri Arasındaki İlişki. Sağlık Bilimlerinde Değer. 2022;12:58-64.
19. Şahan T, Uğurlu K, Önal B, et al. The effect of pes planus on the biomechanics of the lower extremity, balance, fall risk, and performance. Physiotherapy Quarterly. 2023;31.
20. Beynnon BD, Renström PA, Alosa DM, et al. Ankle ligament injury risk factors: a prospective study of college athletes. Journal of orthopaedic research. 2001;19:213-20.

21. Tiplady B, Jackson SH, Maskrey VM, et al. Validity and sensitivity of visual analogue scales in young and older healthy subjects. Age and ageing. 1998;27:63-6.
22. Hawker GA, Mian S, Kendzerska T, et al. Measures of adult pain: Visual analog scale for pain (vas pain), numeric rating scale for pain (nrs pain), mcgill pain questionnaire (mpq), short-form mcgill pain questionnaire (sf-mpq), chronic pain grade scale (cpgs), short form-36 bodily pain scale (sf-36 bps), and measure of intermittent and constant osteoarthritis pain (icoap). Arthritis care & research. 2011;63:S240-S52.
23. Budiman-Mak E, Conrad KJ, Mazza J, et al. A review of the foot function index and the foot function index–revised. Journal of foot and ankle research. 2013;6:1-37.
24. Budiman-Mak E, Conrad KJ and Roach KE. The Foot Function Index: a measure of foot pain and disability. Journal of clinical epidemiology. 1991;44:561-70.
25. Kranti Panta B. A study to associate the Flamingo Test and the Stork Test in measuring static balance on healthy adults. The Foot and Ankle Online Journal. 2015;8:1-4.
26. Kuhn DR, Shibley NJ, Austin WM, et al. Radiographic evaluation of weight-bearing orthotics and their effect on flexible pes planus. Journal of manipulative and physiological therapeutics. 1999;22:221-6.
27. Kosashvili Y, Fridman T, Backstein D, et al. The correlation between pes planus and anterior knee or intermittent low back pain. Foot & ankle international. 2008;29:910-3.
28. Schorderet C, Hilfiker R and Allet L. The role of the dominant leg while assessing balance performance. A systematic review and meta-analysis. Gait & posture. 2021;84:66-78.
29. Kabak B, Kocahan T, Akınoğlu B, et al. Does Pes Planus Influence Balance Performance in Athletes? Spor Hekimligi Dergisi/Turkish Journal of Sports Medicine. 2019;54.
30. Kızılcı H and Erbahçeci F. Pes planus olan ve olmayan erkeklerde fiziksel uygunluğun değerlendirilmesi. Fizyoterapi Rehabilitasyon. 2016;27:25-33.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nursing / Hemşirelik

Perceptions of Death and Attitudes Related to Death with Dignity of Health Professionals and Caregivers

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ABSTRACT

Purpose: This descriptive research was conducted to determine the death perceptions and attitudes of healthcare professionals and caregivers.

Method: As a data collection tool; descriptive characteristics form, "Attitudes Towards Death Scale", "Attitudes Evaluation Scale Towards Respectable Death Principles" were used. Data of the study; Analyzed using t test, one-way ANOVA.

Results: The average score of health professionals on the Attitudes Towards Death Scale is 4,3±1,2 and the average score of caregivers is 4,4±0,7. The average score of health professionals on the Attitude Scale towards Dignified Death Principles is 3,9±1,0 and the average score of caregivers is 3,4±1,4. Perceptions of health professionals' Attitudes Towards Death and Principles of Dignified Death; It was found that it was affected by having children, education, and the previous loss of a relative, and caregivers were affected by the frequency of thinking about death and their level of education. It was determined that there was a positive, moderate relationship between the Escape Acceptance dimension, which is one of the sub-dimensions of the Health Professionals' Attitudes Towards Death Scale, and the Attitude Towards Respectable Death Principles ($p<0.05$). It was determined that there was a positive, moderate relationship between the sub-dimensions of the Caregivers Attitudes Towards Death Scale, Fear of Death and Avoidance of Death, Neutral Acceptance and Approach Acceptance, and the Attitude Towards Respectable Death Principles of the Escape Acceptance dimensions ($p<0.05$).

Conclusion: Educational activities regarding death are recommended for healthcare professionals who provide care and treatment, as well as for relatives who care for patients.

Key words: attitude to death, palliative care, caregivers

ÖZET

Amaç: Tanımlayıcı nitelikteki bu araştırma, sağlık çalışanları ve bakım verenlerin ölüm algılarını ve tutumlarını belirlemek amacıyla yapılmıştır.

Yöntem: Veri toplama aracı olarak; tanıtıcı özellikler formu, "Ölüme Karşı Tutum Ölçeği", "Saygın Ölüm İlkelerine İlişkin Tutumları Değerlendirme Ölçeği" kullanılmıştır. Araştırmanın yapılabilmesi için etik kurul izni, kurumlardan yazılı izin, katılımcılardan yazılı veya sözel izin alınmıştır. Çalışmanın verileri; t testi, tek yönlü ANOVA kullanılarak analiz edilmiştir.

Bulgular: Sağlık profesyonellerinin Ölüme Karşı Tutum Ölçeği puan ortalamaları 4,3±1,2 bakım vericilerin puan ortalaması 4,4±0,7'dir. Sağlık profesyonellerinin Saygın Ölüm İlkelerine İlişkin Tutum Ölçeği puan ortalaması 3,9±1,0 bakım vericilerin puan ortalaması 3,4±1,4'tür. Sağlık profesyonellerinin Ölüme Karşı Tutum ve Saygın Ölüm İlkeleri algılarının; çocuk sahibi olma, eğitim, daha önce bir yakınını kaybetme durumundan, bakım vericilerin ise ölümü düşünme sıklığı ile eğitim düzeyinden etkilendiği bulunmuştur. Sağlık profesyonellerinin Ölüme Karşı Tutum Ölçeği alt boyutlarından olan Kaçış Kabullenme boyutunun Saygın Ölüm İlkelerine İlişkin Tutum arasında pozitif yönlü, orta düzeyli ilişki olduğu tespit edilmiştir ($p<0.05$). Bakım vericilerin Ölüme Karşı Tutum Ölçeği alt boyutlarından Ölüm Korkusu ve Ölümden Kaçınma, Tarafsız Kabullenme ve Yaklaşım Kabullenme ile Kaçış Kabullenme boyutlarının Saygın Ölüm İlkelerine İlişkin Tutum arasında pozitif yönlü, orta düzeyli ilişki olduğu tespit edilmiştir ($p<0.05$).

Sonuç: Ölüm konusunda bakım ve tedavi sağlayıcı sağlık profesyonellerin yanında, hastaların bakımını üstlenen yakınlarına da kapsayan eğitim etkinlikleri önerilir.

Anahtar Kelimeler: ölüme karşı tutum, palyatif bakım, bakım vericiler

Revealing the meaning attached to disease and death by health professionals is a precondition for effective health services. Nurses and doctors who cannot face their own mortality and cannot accept this reality may distance themselves from patients who are dying and their families or may reflect their fear of death onto others (1). Among nurses, 19% experienced emotional attrition while caring for dying patients, while 18% felt helpless/inadequate; additionally, half of participants stated they were negatively and badly affected by caring for dying patients (2). A study determined that nurses did not want to care for patients in their last days of life due to feeling sorrow (3). A study found 73% of nurses and midwives stated they could not easily talk to patients and families about death (4). Nurses had moderate levels of mean points on the attitude toward death scale, while they had low positive attitudes toward caring for patients who were dying (5). The aim of caring for patients who are dying is to ensure the patient's preparation for death with dignity (6,7). For this reason, nurses need to be able to talk about death, be knowledgeable about death, be aware of the mental state of the patient approaching death, and the needs of the dying patient and their family.

When national and international studies are examined, it appears that topics like death anxiety, fear of death, and emotions experienced in the process of dying were dominantly included (8, 9). Studies generally include sample groups of health professionals like doctors and nurses, or students receiving education in nursing, medicine or midwifery schools. However, when the literature related to death and dying with dignity is examined in depth, it appears studies are inadequate to a significant degree in representing the voices, statements and moods of patient relatives caring for the patient. There was no study encountered investigating the correlation between attitudes toward dying with dignity and death of health professionals and patient relatives caring for the patient. From this aspect, our study is original.

Material and Method

This research with descriptive quality was performed with the aim of determining perceptions about death and attitudes toward death with dignity of health professionals and caregivers. The population for the study comprised relatives caring for patients admitted to palliative care clinics in three hospitals located in Türkiye from February-April 2018 and nurses and doctors employed in the palliative care clinics. The research did not use any sample selection but attempted to reach the whole population. The following formula was used to calculate the sample for the research.

$$n = \frac{N.\sigma^2.Z\alpha}{(N-1).d^2}$$

As a result, n was calculated as 65 for patient relatives and 52 for health employees. The research reached 56 health employees and 65 caregivers who agreed to participate in the study.

Data Collection Forms

Data Collection Form for Health Professionals

This form comprised four sections. The first section comprised five questions about information related to sociodemographic characteristics like age, sex, occupation, educational level, experience and unit of employment. The second section included 22 questions about frequency of encountering death, personal death experiences, responses to death and concept of death. The third section comprised the Death Attitude Profile and the fourth section comprised the Attitudes to Principles about Dying with Dignity Scale.

Data Collection Form for Caregiving Relatives

This form comprised four sections. The first section comprised 5 questions about information like age, sex, occupation, educational level and marital status. The second section included 11 questions about closeness to the patient in palliative care, previous experience of caring for another patient in palliative care, personal experience of death, death concept and responses to death. The third section comprised the Death Attitude Profile and the fourth section comprised the Attitudes to Principles about Dying with Dignity Scale.

Death Attitude Profile (DAP)

The DAP was included in the Turkish literature with a study about validity-reliability for Turkish society by Işık (10). The scale comprises the subscales of neutral acceptance and approach acceptance, escape acceptance, and fear of death and death avoidance. Each subscale has 7-point Likert rating, with response points of 1 for definitely disagree and 7 for definitely agree. The maximum points on the scale are 182, with minimum points of 26. As the points obtained from the scale increase, negative attitudes toward death develop; as points reduce, positive attitudes toward death develop. The Cronbach alpha value for the whole scale was 0,81. In our study, the reliability coefficient for the scale was determined as 0,8.

Attitudes to Principles About Dying with Dignity Scale (APDDS)

The APDDS was developed by Duyan based on the 12 principles about 'dying with dignity' defined by the Debate of the Age Health and Care Study Group for the Future of Health and Care of Older People. Validity and reliability studies were completed. The APDDS comprises 12 items. Each item has a 5-point Likert rating with 1 point for completely disagree and 5 points for completely agree. High points obtained on the scale indicate high levels of adopting the principles of death with dignity, while low points show low levels of adopting the principles of death with dignity. The scale was determined to be reliable with Cronbach alpha coefficient calculated as 0.89 (9). In our study, the Cronbach alpha coefficient was calculated as 0.8.

Analysis of Data

For statistical analyses, the Statistical Package for the Social Sciences version 21.0 (SPSS) was used. When analyzing study data, descriptive statistical methods were used (frequency, percentage, mean, standard deviation). For comparison of quantitative data, if two groups contained parameters with normal distribution, comparisons used the independent samples t test. Comparisons of quantitative data in more than two groups used the one-way ANOVA test for parameters with normal distribution. To identify correlations between scales, correlation analysis was applied. Results were assessed in the %95 confidence interval at $p<0.05$ significance level.

Ethical Aspect of the Research

Before beginning the research, ethics committee permission was obtained (date: 29/01/2018 Number: 02/32). Institutional permission was obtained from the hospitals (date: 07/02/2018 Number: 69668506-799; date: 07/02/2018 Number: 0710212018; date: 02/02/2018 Number: 61660846). During the implementation of the research, patient relatives who were caregivers and health employees provided consent.

Results

The mean DAP points were 4,3±1,2 for health professionals and 4,4±0,7 for caregivers. There were no statistically significant differences found between the DAP total points and subscale points for health professionals and caregivers, with the groups similar to each other. However, when examined generally, it was identified that neutral acceptance of death and approach acceptance levels were higher (Table 1).

Table 1: DAP mean points for health professionals and caregivers

Subscales	Health professionals	Caregivers	Statistical analysis*	
	$\bar{x}$± SS		t	p
Fear of death and death avoidance	3,5±1,3	3,7±1,8	2,1	0,1
Neutral acceptance and approach acceptance	5,3 ± ,9	4,8±1,4	1,8	0,2
Escape acceptance	4,0±1,2	4,3±1,5	1,6	0,3
Total scale points	4,3±1,2	4,4 ±,7	2,2	0,1

**Independent t test*

The APDSS total points for health professionals were 3,9±1,0 while for caregivers they were 3,4±1,4 there was no difference in statistical terms between the groups and they had similar features. Highest points for the principles of death with dignity in both groups were for the '*necessary to be able to access care services not just in hospital but in different environments*' and '*necessary to have the desired spiritual or emotional support.*' The principle with lowest points in both groups was *'necessary to know when death will come and to be able to understand what to expect.*' (Table 2).

Table 2: APDDS mean points for health professionals and caregivers				
APDDS	**Groups**		***Statistics**	
	Health professionals	**Caregivers**	**t**	**p**
	$\bar{x}$ and SS	**$\bar{x}$ and SS**		
It is necessary to know when death will come and to understand what can be expected.	2.9±1.1	2.7±1.3	1.1	0.1
It is necessary to maintain control of the process or progression.	3.2±1.0	3.0±1.2	1.2	0.1
It is necessary to be able to preserve dignity and privacy.	4.3±0.7	3.7±1.3	1.3	0.2
It is necessary to be able to control pain and other symptoms.	4.2±0.7	3.5±1.3	1.4	0.3
It is necessary to be able to choose or control where death will occur (at home or elsewhere).	3.4±1.5	3.0±1.4	1.1	0.0
It is necessary to be able to obtain any and all information and expertise that will be needed	3.9±1.1	3.4±1.3	1.1	0.1
It is necessary to have the desired spiritual or emotional support.	4.4±0.7	4.0±1.3	1.3	0.2
It is necessary to be able to access care services not just in hospital but in other environments.	4.6±0.4	4.1±1.3	1.6	0.3
It is necessary to be able to determine who will be there at the last moment and the people who will share that moment.	4.2±1.0	3.7±1.3	1.3	0.2
It is necessary to be able to issue advance directives about wishes that should be fulfilled.	4.1±1.0	3.7±1.2	1.2	0.1
It is necessary to have time to say goodbye and to be able to control timing.	4.0±1.1	3.5±1.3	1.2	0.1
It is necessary to be able to go when the time comes and not have life prolonged pointlessly.	3.5±1.4	3.1±1.5	1.3	0.2
Total Points	3.9±1.0	3.4±1.4	1.1	0.1
* Independent t test				

It was identified that the DAP subscale of fear of death and death avoidance differed according to educational status of caregivers ($p<0.05$). Caregivers who were university graduates had higher levels of fear of death and death avoidance ($\bar{x}$=4,5) compared to caregivers who were secondary education graduates ($\bar{x}$=3,0). The escape acceptance subscale was determined to be different in terms of frequency of thoughts about death ($p<0.05$). Caregivers who reported thinking about their own death very frequently had higher escape acceptance levels ($\bar{x}$=4,9) than caregivers stating they thought about their own death occasionally ($\bar{x}$=3,8) (Table 3).

Table 3: Comparison of mean DAP and APDDS points of caregivers according to some characteristics

Characteristics	**Scales**				
	DAP				**APDDS**
	Fear of death	**Neutral acceptance**	**Escape acceptance**	**General attitude toward death**	
	$\bar{x}$ and SD	$\bar{x}$ and SD	$\bar{x}$ and SD	$\bar{x}$ and SD	$\bar{x}$ and SD
Educational status					
Primary education Secondary education University *Statistic	3.8±1.6 3.0±1.2 4.5±2.3 **p=0.018** F=6.7	4.7±1.7 4.8±1.4 4.9±1.0 p=0.869 F=0.1	4.1±1.6 4.3±1.5 4.4±1.5 p=0.775 F=0.9	4.5±0.6 4.5±.8 4.3±0.8 p=0.760 F=0.9	3.3±1.0 3.2±0.9 3.8±0.5 p=0.071 F=2.8
Thoughts about own death					
Very frequent Occasionally Very rare * Statistic	3.4±1.3 4.0±2.3 3.6±1.5 p=0.5 F=0.6	5.3±0.9 4.6±1.6 4.6±1.5 p=0.1 F=1.6	4.9±1.2 3.8±1.6 4.2±1.5 **p=0.041** F=3.3	4.4±0.8 4.7±0.6 4.0±0.8 **p=0.052** F=3.1	3.5±0.6 3.3±1.0 3.6±0.9 p=0.599 F=0.5
** One-way ANOVA test*					

The APDDS points of health professionals receiving special education apart from basic professional education about palliative care were identified to be at higher levels compared to health professionals who did not receive education ($p<0.05$). The points for the DAP subdimension of fear of death and death avoidance were higher for health professionals without children compared to health professionals with children. The neutral acceptance and escape acceptance levels of health professionals who had not previously lost a relative were higher, which negatively affected attitudes towards death ($p<0.05$) (Table 4).

Table 4: Comparison of mean DAP and APDDS points of health professionals according to some characteristics

Characteristics	Scales				
	DAP				APDDS
	Fear of death	Neutral acceptance	Escape acceptance	General attitude toward death	
	x̄ and SS	x̄ and SS	x̄and SS	x̄ and SS	x̄ and SS
Man	2.7±1.4	4.7±1.5	4.0±1.8	4.2±0.7	3.0±0.9
Woman	3.6±1.3	3.4±1.2	4.3±1.4	4.5±0.7	3.5±0.9
*Statistic	**p=0.05** t= 0.7	p=0.828 t=0.1	p=0.648 t=1.7	p=0.270 t=0.2	p=0.125 t=0.2
Has children					
Yes	3.2±1.3	4.79±1.5	4.1±1.5	4.5±0.7	3.5±0.9
No	4.0±1.3	5.0±1.3	4.5±1.2	4.4±0.7	3.1±0.9
*Statistic	p=**0.046** t=0.0	p=0.537 t=0.3	p=0.466 t=0.6	p=0.773 t=0.0	p=0.129 t=0.0
Received education about palliative care					
Yes	3.5± 1.6	5.2± 1.1	4.6± 1.6	4.1 ±0.8	3.9±0.5
No	3.5±1.3	4.7± 1.5	4.1 ±1.4	4.5±0 .7	3.2±0.9
*Statistic	p=0.996 t=0.342	p=0.278 t=0.1	p=0.350 t=0.0	p=0.114 t=0.2	p=**0.026** t=3.4
Previous loss of someone close					
Yes	3.5±3.1	5.0±3.7	4.4±3.0	4.4±4.4	3.4±3.2
No	1.2±2.2	1.3±1.8	1.3±2.1	0.7±0.6	0.8±1.3
*Statistic	p=0.461 t=12.51	**p=0.034** t=1.3	**p=0.023** t=2.8	p=0.994 t=0.7	p=0.626 t=3.8
**Independent t test*					

Correlation analysis between attitudes about death and attitudes about death with dignity principles of caregivers identified positive and moderate correlations between the Death Attitudes Profile subdimensions of fear of death and death avoidance, neutral acceptance and approach acceptance and escape acceptance with the APDDS ($p<0.05$) (Figure 1).

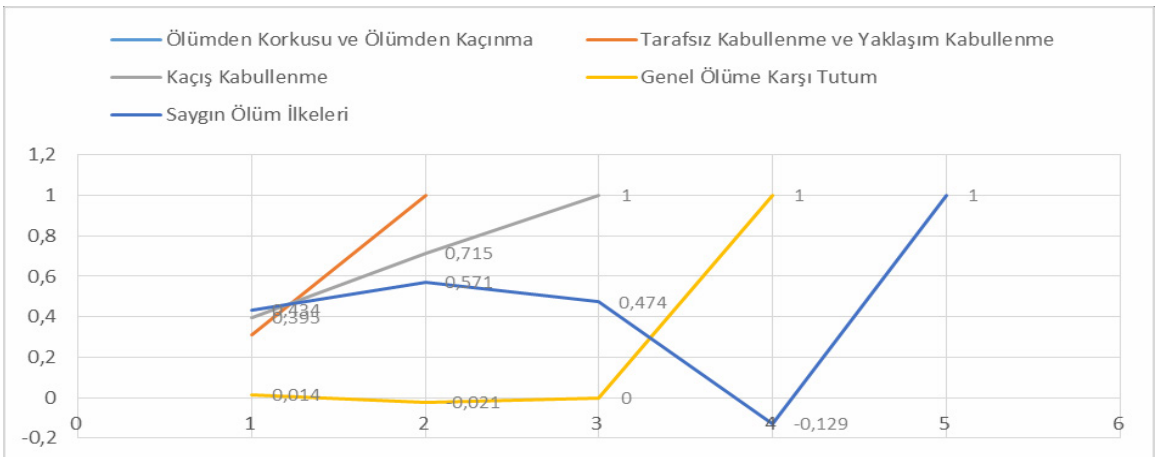

Figure 1: Correlation of DAP and APDDS for caregivers

Positive and moderate levels of correlation were identified between the DAP subdimension of escape acceptance with the APDDS ($p<0.05$). The APDDS levels of caregivers were identified to be positively and highly correlated with the general DAP levels of health professionals ($p<0.05$) (Figure 2).

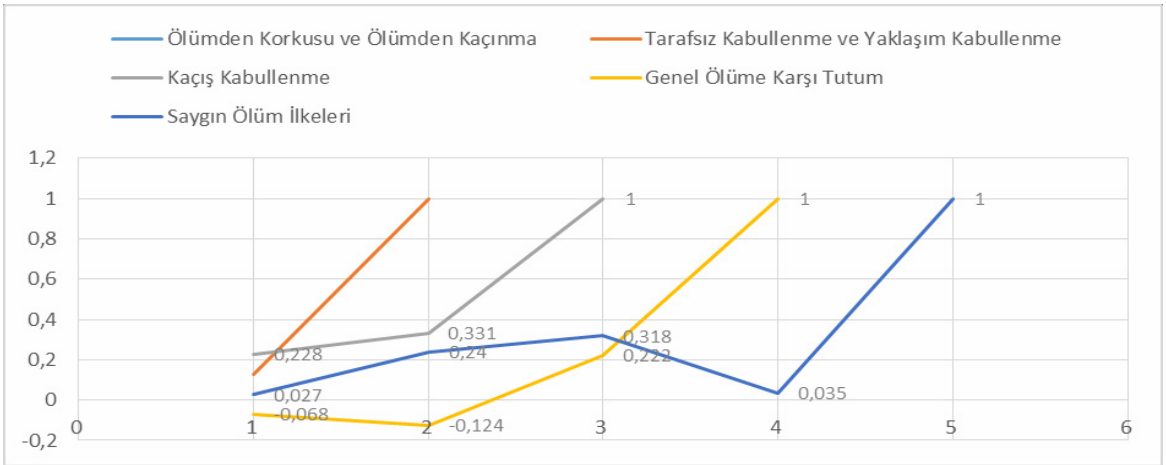

Figure 2: Correlation graph of DAP and APDDS for health professionals

Discussion

The attitudes toward death of health professionals were determined to be at moderate levels. When points obtained from subdimensions of the scale are investigated, there was a more positive approach to fear of death and death avoidance, while there was a more negative attitudes to the neutral acceptance and approach acceptance dimension. According to these results, health professionals were identified to have more negative attitudes to believing there is life after death and death being an unavoidable part of life. There were higher beliefs that avoiding talking or thinking about death would reduce the fear and anxiety caused by death (Table 1). Caregivers were identified to have moderate levels of attitudes toward death. When points obtained from the subscales are investigated, there was very little difference between the points, while caregivers who were patient relatives were identified to have more positive attitudes to the fear of death and death avoidance subscale and more negative attitudes to the neutral acceptance and escape acceptance subscale (Table 1). There may be two reasons for the mean points received from the DAP and its subscales by these two groups living in the same society being similar; the first is interactions between the perceptions of caregivers and health professionals and the second is that members of the same society have similar perceptions about death, a cultural element. In both situations, the attitudes of health professionals affect caregiving relatives and the attitudes of caregiving relatives affect the health professionals. This result shows that increasing the attitudes toward death of health professionals in a positive way will positively increase the attitudes toward death of caregiving patient relatives. It is important that health professionals are aware of this interaction. In the literature, the study by Çevik investigated the attitudes toward death and caring for dying patients among nurses and identified the points were 3,5 for the escape acceptance subdimension and 5,5 for the neutral acceptance subdimension (3). The study by Önsöz found the mean total DAP points for intensive care nurses were 4,18±0,71 with points for the DAP subdimensions of 4,77±0,89 for the neutral acceptance and approach acceptance, 3,29±1,36 for escape acceptance, and 3,87±1,18 for the fear of death and death avoidance (11). Çelik in a study of intensive care nurses found mean total DAP points were 4,14±1,02 neutral acceptance and approach acceptance mean points were 4,70±1,31 escape acceptance mean points were 3,65±1,20 and fear of death and death avoidance mean points were 3,68±1,27 (12). A study by Maria et al. found the points for escape acceptance were 2,6 while points for neutral acceptance were 5,6 in their study performed with the aim of determining the attitudes toward death of Greek nurses (13). In studies it was identified that there were more negative attitudes for the neutral acceptance and approach acceptance subscale and more positive attitudes for the escape

acceptance subscale. These research results are compatible with our study; however, in other research assessing attitudes toward death, higher points were received for fear of death and death avoidance subscale, in other words more negative attitudes were encountered (5,14). The different results obtained in the literature lead to consideration that perception of death is shaped by many parameters including socioeconomic, cultural and spiritual factors.

No assessment could be performed as no study determining the attitudes toward death of caregiving relatives and relatives accompanying patients in palliative care clinics or other clinics was available in the literature. Those accompanying patients in palliative care especially and oncology wards experience more emotional distress than relatives accompanying patients in other clinics. Considering that relatives are expecting news about patients struggling between life and death in intensive care, we can say it is necessary to focus not just on health professionals in studies but also on patient relatives.

APDDS mean total points were 3,9±1,0 for health professionals and 3,4±1,4 for caregivers (Table 2). The points in these two groups had similar qualities. Health professionals and relatives caring for patients had higher agreement with the statements *"it is necessary to be able to access care services not just in hospital but in other environments"* and *"it is necessary to have the desired spiritual or emotional support"* compared to the other statements. It was identified that the two principles with highest agreement by health professionals and caregivers were the same. Health professionals and relatives caring for patients had lowest agreement levels with the statements *"it is necessary to know when death will come and to understand what can be expected"* and *"it is necessary to maintain control of the process or progression"* compared to the other principles. Among the notable results of this study are that both groups received similar points from the DAP and APDDS scales and both groups agreed most and least with the same principles among the death with dignity principles.

Dağ performed a study about attitudes to death with dignity principles of doctors and nurses with participation of 590 subjects (15). Doctors and nurses agreed at high rates with the death with dignity principles of being able to preserve dignity and privacy, to control pain and other symptoms, to have the desired spiritual or emotional support, to access care services not just in hospital but in other environments, to determine who will be present and who to share their final moments with, and to fulfilling previously stated wishes. The findings of this research are parallel to our study. Health professionals think that dying patients should receive care not just in hospital but also in different environments like at home, etc.

In our study, health professionals had moderate levels of agreement with the APDDS item about 'it is necessary to know when death will come and to understand what can be expected' (Table 2). A study determined that most nurses did not agree that patients should be asked about their choice of location for death (3); however, another study determined that it was important for a quality end to life and death with dignity that patients be able to choose where death will occur and have their choice respected (16). A study by Thomas determined that patients' fear of loss of dignity affected their choice of death location (17). A study determined that a poor death was qualified by patient autonomy and dignity not being respected, wishes not being fulfilled, and ineffective treatments and invasive interventions with connection to life support units to extend life meaninglessly (18). İdentified that health professionals were still uncertain about delaying life while ignoring quality of life in a study with participation of 816 nurses (19). In our study, the agreement rates with the item 'it is necessary to know when death will come and to understand what can be expected', emphasizing the importance of quality of life instead of meaninglessly extended life, were at moderate levels, which is a marker that health professionals are still uncertain about this topic.

Another item with low APDDS points compared to other items was 'it is necessary to be able to choose or control where death will occur (at home or elsewhere)' (Table 2). The reason for this item being agreed with less often may be that how and in what way death occurs is more important than where death occurs. However, hospitals may be considered better sites for death due to life-limiting diseases. Reasons affecting a better and happier form of death include the disease of the individual and pain linked to disease, as much as care. Both in research about life satisfaction in Türkiye and in most national or international statistics, there is a lack of adequate information about 'place of death'. Most people with a life-limiting disease are emphasized to die in regional or local hospitals close to where they reside (20,21).

In our research, no significant difference was determined for the total DAP and subscales according to the sex of health professionals (Table 4). A study determined mean

points for the death acceptance subscale were significantly higher for women when they analyzed the DAP with the sex factor (7). A study of students who will be health professionals determined that sex did not affect DAP total points and mean points for the subscales. These studies are consistent with our study (3).

The mean points for the DAP and subscales were higher for health professionals who had received education apart from basic education about palliative care compared to those without this education; however the difference was not significant (Tablo 4). Nurses who received education about patient care in the terminal period appeared to have significantly increased mean points for fear of death and neutral approach acceptance points after training (23). Similarly, nursing students receiving education about caring for dying patients were determined to display more positive attitudes (24).

In our research, health professionals who had previously lost a relative were determined to have higher points for neutral acceptance, approach acceptance and escape acceptance subscale points ($p<0.05$) (Table 4). A study of nursing students determined that students who had encountered death in their close surroundings had significantly higher points for the escape acceptance subscale of the DAP (25). The study is similar to our study.

Correlation analysis between the attitudes toward death and attitudes about dying with dignity principles of caregivers identified positive and moderate levels of correlation between the DAP subscales of fear of death and death avoidance, neutral acceptance and approach acceptance and escape acceptance with the APDDS (Figure 1). For health professionals, there was positive and moderate level of correlation between the DAP subdimension of escape acceptance with the APDDS ($p<0.05$) (Figure 2). According to our study, as the escape acceptance (belief in the physical and psychological salvation of life through death) subscale of the DAP increases, the levels of agreement with death with dignity principles increase. As the attitudes related to the escape acceptance subscale, explained as belief in the physical and psychological salvation of life through death, increase, the adoption levels for the death with dignity principles increase. As understood from these findings, perceptions related to death affect perceptions of death with dignity. Acceptance of death by health professionals will ensure their adoption of the death with dignity principles. For this reason, it is important that health professionals be aware of their own perceptions about death in terms of the rights of patients when caring for those with mortal diseases. Positive perceptions of death by health professionals will ensure more comfortable and positive approaches toward patients. There is no study with this finding in the literature. This result is very important in terms of impacting the approach of health professionals to dying patients.

Conclusion

With this research it was determined that the death perceptions and perceptions about the dying with dignity principles of health professionals and caregivers affect each other and are similar, some individual features affect perceptions about death and dying with dignity and the perceptions related to death with dignity in both groups were affected by perceptions of death. The results of this study are considered to guide planning for activities and organizations that will strengthen health professionals caring for dying patients in providing more effective service and the more effective participation of caregivers in this process.

Declarations

Declarations of Interest

The authors declare no conflict of interest.

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This article was not funded by anyone.

Conflict of Interest

The author declared that there is no conflict of interest

Ethical Approval

The study was approved by Ankara University Non-Interventional Clinical Research Ethics Committee (date 29/01/2018 and number 02/32).

Availability of data and material

Available.

Authors' contributions

All authors have made substantial contributions to this article being submitted for publications. All authors critically reviewed the manuscript and approved the final form.

References

1. İnci F, Öz F. Palyatif bakım ve ölüm kaygısı. Psikiyatride Güncel Yaklaşımlar. 2012;4(2):178-187.
2. Ay MA. Hemşirelerin Ölüm, ölümcül hasta ve ötanaziye ilişkin tutumları. Yüksek Lisans Tezi, 2013, Hacettepe Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara.
3. Çevik B. Hemşirelerin ölüme ve ölmekte olan bireye bakım vermeye ilişkin tutumları ve deneyimleri. Yüksek Lisans Tezi. 2010, Başkent Üniversitesi, Ankara.
4. Uslu F. Ankara il merkezinde jinekolojik onkoloji ünitelerinde çalışan ebe ve hemşirelerin palyatif bakım uygulamalarının belirlenmesi. Yüksek Lisans Tezi, 2013, Hacettepe Üniversitesi, Ankara.
5. Yılmaz E, Vermişli S. Yoğun bakımda çalışan hemşirelerin ölüme ve ölmekte olan bireye bakım vermeye ilişkin tutumları. Celal Bayar Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi. 2015; 2(2):41-46). https://dergipark.org.tr/tr/download/article-file/207799
6. Han NY, et all. Perception of a good death in the elderly. Korean Journal of Family Medicine. 2002;23: 769–777. https://search.bvsalud.org/gim/resource/fr/wpr-113758
7. Toscani F, et all. Life at the end of life: Beliefs about individual life after death and good death models a qualitative study. Health and Quality of Life Outcomes. 2003;1: 1–10. https://doi.org/10.1186/1477-7525-1-65
8. Demirkol M. İntihar olasılığı: kişilik özellikleri, kontrol odağı ve ölüm algısı açısından bir değerlendirme. Yüksek Lisans Tezi, 2013, Ankara Üniversitesi, Ankara.
9. Duyan V. Saygın ölüm ilkelerine ilişkin tutumları değerlendirme ölçeği'nin geçerlik ve güvenirlik çalışması. Turkish Journal of Family Medicine and Primary Care. 2014;8(1). https://doi.org/10.5455/tjfmpc.47042
10. Işık AE. Ölüme karşı tutum ölçeğinin Türk toplumu için geçerlik ve güvenirliği. Yüksek Lisans Tezi, 2008, Ege Üniversitesi, İzmir.
11. Önsöz SB. Yoğun bakım hemşirelerin ölüme karşı tutumları ile ruhsal durumları arasındaki ilişkinin incelenmesi. Yüksek Lisans Tezi, 2013, Ege Üniversitesi, İzmir.
12. Çelik N. Yoğun bakım hemşirelerin ölüm ve saygın ölüme ilişkin tutumları. Mersin Üniversitesi Sağlık Bilimleri Enstitüsü. 2019;12(2):316-327 https://doi.org/10.26559/mersinsbd.578810
13. Maria M, et all. Grede nurse atttudes towars death. Global Journal of Health Science. 2011; 3(1):224-230. DOI:10.5539/gjhs.v3n1224
14. Mermer R. Hemşirelerin palyatif bakımla ilgili bilgi düzeyleri ve ölüme karşı tutumları. Yüksek Lisans Tezi, 2021, Nevşehir Hacı Bektaş Üniversitesi, Nevşehir.
15. Dağ A. Hekim ve hemşirelerin bazı özelliklerinin saygın ölüm ilkelerine ilişkin tutumlar üzerine etkisi. Yüksek Lisans Tezi, 2016, Koç Üniversitesi, İstanbul.
16. Işıkhan V. Terminal dönemdeki kanser hastalarının ölüm yeri tercihleri. Türk Onkoloji Dergisi. 2008;23(1):34-44.
17. Thomas C, Morris SM and Clark D. Place of death: preferences among cancer patients and their carers. Social Science & Medicine. 2004; 58(12), s: 2431-2444.
18. Ko E, Kwak J and Nelson-Becker H. What constitutes a good and bad death?: Perspectives of homeless older adults. Death Studies. 2015; 39(7):422-32. http://dx.doi.org/10.1080/07481187.2014.958629
19. Demir A, et all. İntensive Care and oncology nurses perceptions and experices with futile medicl care and principles of Good Death. Turkish Journal of Geratries. 2017; 20(2): 116-124
20. World Health Organization. Global atlas of palliative care at the end of life. https://www.thewhpca.org/resources/whpca-publications-and-reports/item/who-global-atlas-on-palliative-care-at-the-end-of-life?category_id=3 Erişim Tarihi:01.05.20018
21. Nerse S. Kırsal alandaki yaşlıların ölüm yeri ve ölüm deneyimi arasındaki ilişki. Sosyal Ve Kültürel Araştırma Dergisi. 2020;6(13):133-156. https://doi.org/10.25306/skad.808031
22. Bilge A, Embel N and Kaya FG. Sağlık Profesyoneli olacak öğrencilerin ölüme karşı tutumları, ölüm kaygıları arasındaki ilişki ve bunları etkileyen değişkenler. Journal Of Psychiatric Nursing. 2013; 4(3), s: 119-124. https://dx.doi.org/10.5505/phd.2013.08108
23. Göriş S, et all. Effect of terminal patient care training on the nurses' attitudes toward death in an oncology hospital Turkey. J Canc Educ. 2017;32:65-71. https://doi.org/10.1007/s13187-015-0929-6
24. Wang L, et all. Clinical nurses' attitudes towards death and caring for dying patients in China. International Journal of Palliative Nursing. 2018;24(1),33-39. https://doi.org/10.12968/ijpn.2018.24.1.33
25. Iranmanesh S, Dargahı H and Abbaszadeh A. Attitudes of Iranian nurses toward caring for dying patients. Palliat Support Care. 2008;6(4):363-369. https://doi.org/10.1017/s1478951508000588

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nursing / Hemşirelik

Does the Use of Online Methods in Nursing Education Affect Job Readiness?

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ABSTRACT

Aim: The aim of this study is to examine how the online education method increasingly used in the nursing education affects work readiness of students.

Background: The literature reveals that newly graduated nurses are not adequately ready for working life, the transition from student to professional nursing is stressful and exhausting, and nearly half of them intend to quit their job.

Method: Quantitative data were collected using Work Readiness Scale for Graduated Nurses (WRSGN) and General Self-Efficacy Scale (GSE). Qualitative data were collected with semi-structured questions.

Results: In the study, a negative significant correlation was found between WRSGN and GSE subscales ($p < 0.01$). There was a positive significant correlation between organizational awareness, work competence and social intelligence sub-dimensions of WRSGN and between work competence and social intelligence ($p < 0.01$). GSE initiation subscale had a negative significant correlation with work competence, social intelligence and organizational awareness sub-dimensions ($p < 0.01$) and a positive significant correlation with personal work characteristics sub-dimension ($p < 0.05$). The qualitative results also supported the quantitative results.

Conclusions: It was concluded that the students felt adequate and ready for working life in terms of theoretical knowledge, but their self-efficacy in putting the theoretical knowledge into practice was adversely affected.

Keywords: Nursing education, graduation, nurse, working life, online education .

ÖZET

Amaç: Bu çalışmanın amacı, hemşirelik eğitiminde giderek daha fazla kullanılan online eğitim yönteminin öğrencilerin işe hazır bulunuşluklarını nasıl etkilediğini incelemektir.

Arka plan: Literatür, yeni mezun hemşirelerin çalışma hayatına yeterince hazır olmadıklarını, öğrencilikten profesyonel hemşireliğe geçişin stresli ve yorucu olduğunu ve neredeyse yarısının işten ayrılma niyetinde olduğunu ortaya koymaktadır.

Yöntem: Nicel veriler Mezun Hemşireler İçin İşe Hazır Olma Ölçeği (WRSGN) ve Genel Öz Yeterlilik Ölçeği (GSE) kullanılarak toplanmıştır. Nitel veriler ise yarı yapılandırılmış sorularla toplanmıştır.

Bulgular: Çalışmada, WRSGN ve GSE alt ölçekleri arasında negatif yönde anlamlı bir korelasyon bulunmuştur ($p<0.01$). WRSGN'nin örgütsel farkındalık, iş yetkinliği ve sosyal zeka alt boyutları arasında ve iş yetkinliği ile sosyal zeka arasında pozitif yönde anlamlı bir ilişki bulunmuştur ($p<0.01$). GSE başlatma alt ölçeğinin iş yetkinliği, sosyal zeka ve örgütsel farkındalık alt boyutları ile negatif ($p<0.01$) ve kişisel iş özellikleri alt boyutu ile pozitif ($p<0.05$) anlamlı bir korelasyonu vardır. Nitel sonuçlar da nicel sonuçları desteklemiştir.

Sonuçlar: Öğrencilerin teorik bilgi açısından kendilerini yeterli ve çalışma hayatına hazır hissettikleri, ancak teorik bilgileri uygulamaya geçirme konusundaki öz yeterliliklerinin olumsuz etkilendiği sonucuna varılmıştır.

Anahtar Kelimeler: Hemşirelik eğitimi, mezuniyet, hemşire, çalışma hayatı, online eğitim.

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Work readiness is a novel concept, which has emerged as a selection criterion in determining graduation potential, and generally refers to the characteristics newly graduated individuals need to have in order to succeed in work environment (1). Work readiness requires more than a set of clinical skills such as the abilities and characteristics ensuring that a person works successfully in an organisation. It is a concept that is measurable before graduation; therefore it has been widely recognized (2). When the related studies are analysed, one comes across the studies conducted with a variety of sample groups in different sectors. The results of these studies have usually reported that in transition to work life and fulfilling the duties required by the profession, the newly recruited individuals who have competence for work readiness are more successful than those without this competence (3-4-5). While academic qualities are important for employment, individual, personal and social characteristics and self-management skills stand out more from the perspective of the employer. Work readiness is examined in four sub-dimensions. These are "social intelligence, organizational awareness, work competence, and personal work characteristics" (6).

Social Intelligence

Social intelligence refers to the skill of establishing communication with others, participating in teamwork and managing inter-personal conflicts. It is also defined as the interaction style and knowledge of strategy that are needed to reach the goal in managing human relations or others (6).

Organizational Awareness

Organizational awareness covers the professional development of individuals, their professional maturity in their fields, and their command of organizational policy and procedure knowledge. Organizational awareness is defined as the ability of an individual to generate the knowledge for adaptation to the organizational environment and to use the knowledge produced in this respect. Thanks to this ability, organizations adapt to changing environmental conditions and learn by exhibiting behavioural change (6).

Work competence

Work competence is defined as one's specialized knowledge and technical skills as well as confidence to successfully complete the work, showing high work performance and taking responsibility regarding the work. An individual with high work competence meets the expectations with respect to fulfilling the job properly and being experienced, prepared and self-confident for unexpected situations faced during the work.

Personal Work Characteristics

Personal work characteristics refer to one's flexibility, adaptation, and stress management skills in the face of unexpected situations. It is expected from an employee to be aware of what should be done in an unexpected or unfavourable situation, to be able to adapt to changing circumstances, to manage stress in both his or her business and personal lives and to establish a healthy business-personal life balance (6).

Work Readiness

Graduates start working in a work environment where the number of nurses is insufficient and which is characterized by high technology, a high level of patient potential and insufficient resources. Graduates' levels of work readiness have been recognized as an indicator of evaluating work potential in respect of work performance, promotion, career development, and success. In order to ensure a quality patient care in healthcare institutions, it is required for the newly graduated nurses to be ready for work life and to be embraced at the workplace (7). The concept of transition from being a student to a nurse was defined firstly by Kramer in 1974. Kramer calls the transition process as a reality shock. According to Kramer, reality shock includes "the differences between the nursing ideologies faced during the work life and acquired when one was a student". Transition from being a nursing student to a nurse is accepted as a challenging and stressful period when new nurses go through a socialization process in the work environment. The studies have reported that nursing graduates prepare for work life insufficiently, the transition from being a student to a nurse is stressful and backbreaking and nearly half of the nurses exhibit an intention to quit the job (8).

Newly graduated nurses bear the burden of not knowing how to cope with the discrepancies between what they have learned during their education and what they face during work life and how to manage the behaviours emerged in this respect. As they have difficulty in implementing what they have learned during their education period and come across challenges in meeting the expectations brought about by the work life, they think that they

have not been trained enough to be prepared for work environment. The perception of newly graduated nurses that they have insufficient knowledge in clinical skills might cause negative effects such as lack of self-confidence, low self-esteem and dissatisfaction. If newly graduated nurses understand the characteristics of work readiness, this will increase the quality and efficiency in healthcare services, prevent employees from being worn out and facilitate adaptation to work life (9). Another important criterion in elevating nursing to a professional status is the willingness of nurses to serve and their perception of their jobs as a significant part of their lives. The studies have demonstrated the stress of transition from the role of a student to a working nurse and it is mostly related to the discrepancies between the new nurses' expectations and the reality of the role (10). Current studies have showed that work adaptation programmes fill in the gaps between education and practice and alleviate stress of newly graduated nurses by supporting them through transition (11).

The literature on work readiness of the nurses after formal education emphasize the interaction between the teacher and the student, readiness and availability of a guiding, supportive role model (a guiding clinic nurse), sufficient clinical practice, and importance of clinical competence (9).

The undeniable effect of technological developments on educational methods also affects nursing education. At the same time, social or global events may make the use of these methods mandatory. The effects of these changes in nursing education on the educational outcomes and the work compliance and professional success of newly graduated nurses are not yet known. Moreover, the latest reports suggest that these effects on nursing labour might be at a dramatic level (12-13).

As a result of the obligation created by a pandemic, online education methods in nursing education have been used extensively and for a long time in clinical practice education as well as teaching theoretical knowledge. The results of this obligation should be considered as an important data source in order to investigate the effects of the use of the online education method on the readiness of the nurse students who are on the verge of graduation, for working life.

Purpose of the Study

The fact that the concept of work readiness has been addressed with specific emphasis on the side of employer in the current literature, and the insufficiency of evidence on how the content and quality of the professional education as well as educational methods used affect has demonstrated the importance of this subject.

The purpose of this study is to examine how the use of online education method in the nursing education affects the work readiness of nursing students. The results obtained would contribute to updating the nursing curriculum in order to support reaching curriculum outputs.

Ethical Considerations

Ethical approval for the study was obtained from Acibadem University and Acibadem Healthcare Organizations Medical Research Ethics Committee (ATADEK). (Number: 2021-08/13).

Methods

In the study, a mixed method where both qualitative and quantitative data are collected was used. In the quantitative dimension of the study, "Work Readiness Scale for Graduated Nurses (WRSGN)" and "General Self-efficacy Scale" (GSE) were used. The qualitative dimension of the study was designed as a descriptive phenomenological study.

Sampling and Recruitment

Characteristics of the Participants

The population of the study consisted of senior students enrolled in a nursing undergraduate program accredited by the National Association for Evaluation and Accreditation of Nursing Education Programs (N=77). No sample selection was made, the entire population was informed and the students who volunteered to participate in the study constituted the sample group. The students who participated in the quantitative dimension of the study were invited to participate in the qualitative dimension, and qualitative interviews were conducted with the students who volunteered. The sample of the quantitative dimension of the study consisted of 42 volunteer students, while the sample of the qualitative dimension consisted of 22 students. Data were collected between May and June 2021.

The students who constituted the population of the study were enrolled in online education in the spring semester of 2019-2020, clinical and laboratory practices were not conducted in a physical environment, but online through virtual applications. In the fall semester of 2020-2021,

theoretical courses and laboratory applications were conducted online, and for clinical applications, a four-week face-to-face application was made at the end of the theoretical courses. In the 2020-2021 Spring semester, students completed their theoretical and practical courses face-to-face.

Data Collection

The data were collected in line with the prepared hybrid education plan, after the students completed their theoretical and hands-on courses. Through "Work Readiness Scale for Graduated Nurses" and "General Self-efficacy Scale", which were used in the quantitative dimension of the study, the data were collected in electronic environment over "Google Survey" application and by being attentive to anonym nature of the participants. The call for study was sent to students via e-mail. In the invitation e-mail, the students were informed about the purpose and data collection methods of the study, as well as expectations from participants. Moreover, they were notified that they would be free to participate in or withdraw from the study, the study would not be conducted for measurement and assessment purposes and it would not have any effect on their academic success. A link for participation in the survey was included in the e-mail sent and consent of the participant was obtained by a button placed on the opening page of the link.

Qualitative data of the study were collected in line with the semi-structured qualitative interview questions prepared by the researchers and over the software "Zoom", an online meeting application. Semi-structured interview form had 6 questions on the experiences of nursing students with online education applications and how they were affected by these experiences. These questions are presented below:

1. What were your experiences about theoretical and hands-on courses during online education period?
2. How did this period affect you? (What were the positive and negative dimensions of it?)
3. Do you think that you have enough theoretical knowledge to start work life after graduation?
4. Do you think that you have enough technical application skills to start work life after graduation?
5. Do you feel yourself ready to cope with the responsibilities and liabilities to be brought about by work life?
6. Do you think that you will have any problem in adapting to work life after graduation?

For their participation approval in the qualitative dimension of the study, the students were asked to reply to the invitation e-mail by including the sentence of "I Would Like to Participate in the Qualitative Interview". The link for participation in online meeting was sent to only the volunteers who had responded to the e-mail. Moreover, at the beginning of the interview, consents were confirmed verbally, and consent of all the participants was obtained for voice and video recording. Number of participants was taken into consideration for qualitative interview. It was ensured that the number of the participants was 6 to 8 persons for each interview and thus 3 sessions were held. The sessions were completed between 60 to 90 minutes.

Data Analysis

SPSS 22.0 (Statistical Package for Social Sciences) packaged software was used for statistical analyses of quantitative data. The correlation between continuous variables was assessed by using pearson's correlation analysis. In the study, the level of statistical significance was accepted as $p<0.05$. In data analysis, Malterud's (14) content analysis method was used. In the analysis of qualitative data, the video records of the interviews made with the students who participated in the study over the Zoom platform, were transcribed word by word into word file afterwards. This text was coded by the researchers in accordance with the study's purposes. The codes generated were classified by the researchers and the appropriate theme and subtheme headings were determined. The analyses and evaluations were made within the framework of these headings.

General Self-Efficacy Scale (GSE)

This scale was developed by Sherer et al., (15) and it consists of 23 items. The version of the scale whose validity and reliability study was conducted by Yıldırım and İlhan (16) was used. In this study, the scale's internal consistency reliability coefficient (Cronbach's alpha) was found as 0.89. The scale has three subscales; "Initiation", "Effort", and "Persistence". The total score of the scale may vary between 17 and 85 points. Higher scores signify an increase in self-efficacy belief.

Work Readiness Scale for Graduate Nurses (WRSGN)

The scale was developed by Walker et al., (11) The version of the scale whose validity and reliability study was

conducted by Yıldız Keskin and Arslan (17) was used. The lowest score of the scale is 46 and the highest score is 460. The scale consists of four sub-dimensions; "Work competence", "social intelligence", "organizational awareness", and "personal work characteristics". Higher scores signify that the nurses' work readiness levels increase. The Cronbach's alpha reliability coefficient of the scale was found to be 0.94.

Results

Quantitative Data

In the study, it was found that the nursing students'"General Self-efficacy Scale (GSE) mean score was 42.80±4.95 and "Work Readiness Scale For Graduate Nurses (WRSGN)" mean score was 345.76±56.58. Table 1 shows the distribution of mean scores of the scales' subscales.

Table 1: The Distribution of Nursing Students' Mean Scores of General Self-efficacy Scale (GSE) and Work Readiness Scale for Graduate Nurses (WRSGN) and Their Sub-dimensions

Scales	Number of Items	$\bar{x}$±SD	Min. Score	Max. Score
WRSGN Work competence	14	107.88±20.79	14	140
WRSGN Social intelligence	8	65.47±13.54	8	80
WRSGN Organizational awareness	16	139.54±24.41	16	160
WRSGN Personal work characteristics	8	32.85±16.26	8	72
WRSGN Total	46	345.76±56.58	46	410
GSE Initiation	9	15.26±6.01	9	41
GSE Effort	5	15.71±1.92	12	19
GSE Persistence	3	11.83±2.40	3	15
GSE Total	17	42.80±4.95	34	61

When the correlations between the subscales of the Work Readiness Scale For Graduate Nurses and the General Self-efficacy Scale were examined, a significant negative correlation was found ($p < 0.01$). There was a high significant positive correlation between WRSGN's organizational awareness, work competence and social intelligence sub-dimensions ($p < 0.01$). Moreover, there was a high positive significant correlation between work competence and social intelligence in the same scale ($p < 0.01$).

While there was a negative significant correlation between the General Self-efficacy Scale's initiation subscale and work competence ($p < 0.01$), social intelligence ($p < 0.01$) and organizational awareness sub-dimensions ($p < 0.01$), it had a positive significant correlation with personal work characteristics sub-dimension ($p < 0.05$). A negative significant correlation was found between the General Self-efficacy Scale's effort subscale and personal work characteristics ($p < 0.05$). While there was a positive significant correlation between the General Self-efficacy Scale's persistence subscale and work competence ($p < 0.01$), social intelligence ($p < 0.01$) organizational awareness ($p < 0.01$) and effort ($p < 0.05$), it had a negative significant correlation with initiation subscale.

Qualitative Data

In the interviews made with senior students about their work readiness, the qualitative data were analysed. Eight sub-themes were determined under three main themes. (Table 3).

Table 3: Main Themes and Subthemes of Qualitative Data

Main Themes	Subthemes
Academic Challenges	The effect of online education on theoretical knowledge
	The effect of online education on practice
	Comparison with face-to-face education
Individual Effects	Positive effects of online education
	Negative effects of online education
Responsibilities and Liabilities	Work Readiness
	Team Harmony
	Completion of deficient knowledge and practices

Main Theme 1: Academic Challenges

Under this theme, the effect of the online education period on theoretical and hands-on courses as well as the comparison of online education and face-to-face education were examined.

The effect of the online education on theoretical knowledge: Senior students mentioned the technical problems they faced in theoretical courses and online exams depending on computer and internet connection, but they also stated that they got accustomed to online education in time. They stated that they preferred face-to-face education during the period when it comes to content of theoretical courses, but there was no difference between the contents of online education and theoretical courses. Most of the students stated that they regarded themselves sufficient in terms of theoretical knowledge. They stated that theoretical courses were efficient with active learning methods (role-plays, group tasks, concept maps, etc.). However, they also mentioned that group tasks were harder in online education in terms of time management and due to communication problems.

"Distant from each other and some people have work to do, they are not available. Some others may not be as active before the computer as they are in normal life" P10 (Participant).

The effect of the online education on hands-on courses: They mentioned that the online education had negative effects on the area of practice to a considerable extent. When students do not practice face-to-face at the bedside or in the laboratory, this leads them to forget their acquired skills. It was determined that when the students went out for clinical practice, though this was limited, they experienced shyness. Moreover, it was mentioned that distant provision of laboratory applications was not much effective, skill and simulation applications in the laboratory environment as well as working with a standard patient strengthened the communication of students with patients, and therefore, conducting role-plays distantly contributed to learning to a limited extent.

"When scenarios were designed through simulations, our instructors could give us instant feedback, like you are missing this point. We did not have the opportunity to do these in distant education. As there was no standard patient, I think we remained insufficient in communicating with the real patient. So, when we go to clinics, we stay behind a little bit" P3

"When we went to our internship, we realized that we forgot even our old knowledge and we had deficiencies. So, it was too bad. Online education inflicted a heavy damage on laboratory and practice section. We faced disruptions as we could not make practice. Laboratory and practice courses were nowhere near those of face-to-face education" P12

"In face-to-face education, we were making implementation in the laboratory right after the theoretical course, and we could make the practices that we hardly understand many times under the supervision of our instructors. Afterwards, we had free time and space. One could do whatever he or she wanted to do or repeat whatever he or she did not understand; and as per the nature of our profession, we would like to be, and do something, in touch with the patient." P13

Comparison of the online education with the face-to-face education; nearly all of the students stated that they preferred face-to-face education instead of online education. However, they also added to their opinions that the online education process was managed well, and theoretical courses were sufficient, and adaptation was swift. They stated that communication was stronger in face-to-face education in both classroom and laboratory environments. They explained that the questions one would like to ask could be directed to a faculty member or peers via an easier communication and this contributed learning very much. It was stated that laboratory environment caused a slight stress on students and learning was realised in its natural atmosphere. Moreover, it was stated that learning process became permanent with a successive process starting with theoretical education and being followed by skills training in laboratory and then clinical practice. Communication, planning, and learning were easier in the group tasks fulfilled face-to-face. In online education, course periods and being before the screen continuously led to attention deficit and focusing problems and this process had a negative effect on learning.

"Honestly, I think face-to-face education is more effective. Because, when we want to ask something to the instructor during the theoretical courses, a chaos breaks out. Who asked, where is he or she? The instructor tries to find the person. Other than that, there were simultaneous questions. However, when it was face-to-face, you were raising your finger or asking for the floor and were being given it. There was no chaos. Moreover, when it was face-to-face, there was much more interaction. Computer screen makes us tired. In other words, being in front of the computer for one or one and a half hours and continuously looking at the screen

negatively affected us in physical and moral terms. So, in my view, face-to-face education was more efficient" P21

Main Theme 2: Individual Effects

Positive effects of the online education: The situations such as the increase of the time spent with family, having more time for personal development (reading books, distant participation in seminars, attending an English course, watching movies, etc.), learning how to do research, easy access to databases and rest were stated as the positive effects of the online education.

"If I compare my life in online and face-to-face education, my life was always in a hurry to reach somewhere before it. To home, school, bus... My home is too far away from my school. So, it was good for me. I had a rest, I had time for myself. I joined different professional seminars and courses. I followed them from my home" P22

Negative effects of the online education: The students reported its negative effects especially in terms of socialization. They mentioned that they faced physical problems (sight problems, headache, low back pain and backache, posture disorders, etc.) arising from staying before screen/computer continuously, as well as psychological pressure and stress depending on continuously staying at home and social isolation.

"Working from home caused posture disorders, eye pain, and headaches. I suffered from so many back pain, low back pain and headaches" P12

"We could not socialise; we could not participate in activities at school.. P19

Main Theme 3: Responsibilities and Liabilities

Work readiness: Most of the students stated that they felt themselves ready for work life in terms of theoretical knowledge and practice. Work readiness varied depending on the areas of clinical experience gained from internship fields and on the area of interest. The final year students mentioned that working at a clinic for four days, working at a hospital part-time, having the responsibility of patients and feeling as a part of the team, were the factors increasing self-confidence. Moreover, feedback was received that the rules required to be observed during internships, discipline and achieving the habits such as timely arrival at the clinic, were preparing all students to professional life.

"When I started my internship at the neonatal intensive care, I told myself that perhaps this is where I belong. I can adapt faster. Because, as it is my area of interest, it becomes easier for me to learn. I ask more questions. More, I learn some things there faster than the other departments. But concerning general intensive care, for example, I have not yet seen general intensive care exactly, as well. I can certainly work there, but I think I am rather deficient. For instance, I may be deficient on such issues as crash-cart usage, emergency management or simply, simultaneous medicine effects and side effects." P4

Team Harmony: The students mentioned that they did not have any problem of communication with the team, and when they had problems, they reconciled and agreed.

"I got along with everyone in all areas where I made practice. I did not have any conflict/discussion with anyone. This shows how I can get along with people, but of course, one cannot know what will happen in the end. As I said, I feel myself comfortable in terms of harmony" P10

Completion of deficient knowledge and practices: It was mentioned that the learning process continues throughout one's whole life. Hence, when one starts working in a different clinic or encounters with a different case, there might be deficient knowledge and practice skills. It was mentioned that in such cases, they firstly asked nurses working in the field of clinic, then made research on the topic and read articles, watched practice videos and looked at old course notes and books.

"I would be performing a practice to one of my relatives for the first time (from deltoid muscle). I opened YouTube and watched. Yes, I know but if I don't feel self-confident, I certainly open and watch training videos. I have various learning methods; I try every means" P15

"On the topics that I have been deficient, I consult nurses (such as floor manager, education nurse). How can I learn this in the best manner, where can I do it? P8

Discussion

One of the most important findings attracting attention in this study is that there was a negative significant correlation between the newly graduated nurses' work readiness and general self-efficacy (*See Table 2*). This result was interpreted as the fact that the students did not regard themselves sufficient although they feel themselves ready for work life.

Table 2: The correlations between the sub-dimensions of Work Readiness Scale For Graduate Nurses (WRSGN) and General Self-efficacy Scale (GSE)

Correlation Test Results	WRSGN Work competence	WRSGN Social intelligence	WRSGN Organizational awareness	WRSGN Personal work characteristics	WRSGN Total	GSE Initiation	GSE Effort	GSE Persistence	GSE Total
WRSGN Work competence	1								
WRSGN Social intelligence	r=0.772 p=0.000	1							
WRSGN Organizational awareness	r=0.854 p=0.000	r=0.819 p=0.000	1						
WRSGN Personal work characteristics	r=0.089 p=0.574	r=-0.238 p=0.128	r=0.060 p=0.707	1					
WRSGN Total	r=0.895 p=0.000	r=0.808 p=0.000	r=0.959 p=0.000	r=0.223 p=0.1555	1				
GSE Initiation	r=-0.725 p=0.000	r=-0.734 p=0.000	r=-0.646 p=0.000	r=0.312 p=0.044	r=-0.631 p=0.000	1			
GSE Effort	r=0.187 p=0.236	r=0.025 p=0.875	r=-0.009 p=0.955	r=-0.383 p=0.012	r=-0.039 p=0.805	r=-0.237 p=0.130	1		
GSE Persistence	r=0.707 p=0.000	r=0.618 p=0.000	r=0.643 p=0.000	r=-0.111 p=0.482	r=0.653 p=0.000	r=-0.658 p=0.000	r=0.367 p=0.017	1	
GSE Total	r=-0.464 p=0.002	r=-0.581 p=0.000	r=-0.475 p=0.001	r=0.175 p=0.267	r=-0.464 p=0.002	r=0.802 p=0.000	r=0.280 p=0.073	r=-0.170 p=0.281	1

**P <0.05 **p <0.01*

When the qualitative data were analysed in line with this result, it was observed that the students supported this conclusion. Stating that they did not face so many challenges in online education's theoretical dimension other than technical problems, the students gave negative feedback on laboratory and clinical practices. The students stated that theoretical courses were sufficient, but they had deficiencies regarding practice.

This opinion was supported by the fact that students clearly mentioned their preference of face-to-face education while evaluating the process they have experienced. The students stated that they felt more self-confident about their theoretical knowledge, but also felt uneasiness, anxiety and insufficiency when they went to clinical practice.

According to the study by Sharpnack et al., (18) it is important for the students to have their instructors with sufficient practice competence together with them in performing applications and this is effective in increasing the competence of the students. In the online education, hands-on courses were performed insufficiently and distantly, and this decreased teacher-student interaction. Hence, it may be considered that the decrease in interaction negatively affected students' self-efficacy. This opinion is supported by the students' expressions, as well.

The study by Tarhan, Doğan and Kürklü (19) revealed that when preparing for practice, nursing graduates face hardships and have various deficiencies such as deficiency of clinical skills, communication problems and challenges of transition process. Laboratory and clinical practices constitute an important step in overcoming these challenges and for the students to gain self-confidence. The results of this study support the view that online education application could not help overcoming these challenges faced by students in education of nursing which is in fact a profession based on practice.

The studies of Missen et al., (20) Schwartz., (21) and Masso et al., (22) inquired whether or not nursing students were prepared during the period right before their recruitment. Most of the students participating in these studies, believed that they had enough knowledge to start their professional lives. However, they also stated that they were not sure about the clinical skills and abilities required for practice. Deficiency in self-confidence about skills and abilities shall have a negative effect on the student's work life.

Usher et al. (23) investigated nursing students' perceptions of their work readiness in two groups. A planned clinical practice training, prepared by the authors, was applied to one of the groups. As a result of the study, the students who received the planned clinical practice training had a higher level of self-confidence. Similarly, in a study conducted on nursing students' readiness for their prospective work life, Morrell and Ridgway (24) emphasised the importance of having effective advisors for students during their preparation for practice. In their study, pointed out the importance of mentoring role in preparation of students for the nursing role and suggested that peer support is ensured during the education process. It was seen during the analysis of the study's qualitative data that the opinions of the students were in this direction as well. In the online process, students attached importance to, and felt the deficiency of, peer support and the support of the nurses working in the field (25).

In the analysis of the study's qualitative interview data, it was observed that the undergraduate students who worked at a hospital as assistant nurse mentioned that they felt themselves adequate in terms of self-confidence and self-efficacy. Hence, it is seen that the study results are compatible with the literature.

In their study on the effect of COVID-19 pandemic on nurses' experiences and perceptions, Crismon et al. (9) stated that newly graduated nurses had disruptions in their clinical orientation rotations, and this might further widen the gap between the education and practice and might increase the reality shock experience of nurses. The data of this study also supports this opinion and put forward that nursing students who were about to graduate felt themselves ready for work life after the online education thanks to the adequacy of their theoretical knowledge, and however, their self-efficacy was negatively affected due to the disruptions they experienced during the application of theoretical knowledge.

Strengths and Limitations

As the study was conducted on the first nursing students who used the online education method for a long time in both theoretical and hands-on courses and graduated after this education, it is significant for the evaluation of the effect of use of online methods in nursing education on students. Moreover, the fact that the results obtained from the quantitative data of the study were supported by the findings of the qualitative research is significant in terms of the reliability of the study. The limitations of the study are that the number of participants was low in the sample, from which the study's quantitative data were collected, and data were collected from the students of only one single school.

Implications for Nursing Education

The results of the use of online education methods in nursing education should be examined in the short and long term in line with the programme outcomes. The effects of the education methods used during the education of newly recruited nurses on their work readiness is an important factor in the structuring of work compliance programmes**.** The use and effectiveness of the online education methods in education of nursing, which is a hands-on profession, as well as the sufficiency of online education methods in terms of reaching professional competencies after graduation should be inquired and assessed. Newly recruited nurses' work readiness affects individual job satisfaction and individual success and also has an important share in organizational efficiency and the success of care, so it should be taken into consideration by nurse managers.

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Conflict of Interest

The authors declare that they have no competing interests.

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References

1. Bradley, L., Barr, J.A., Finn, J. (2023). Work readiness of graduating nursing students: Case study research. Teaching and Learning in Nursing, 18 (3), 383-388, 10.1016/j.teln.2023.03.012 https://doi.org/10.1016/j.teln.2023.03.012
2. Caballero CL, Walker A, Fuller-Tyszkiewicz M. (2011). The work readiness scale (WRS): developing a measure to assess work readiness in college graduates. Journal of Teaching and Learning for Graduate Employability. 2:41-54.
3. Baumann, A., Crea-Arsenio, M., Hunsberger, M., Flemin-Carroll, B., Keatings, M. (2018). Work readiness, transition, and integration: The challenge of specialty practice Journal of Advanced Nursing, 75 (2018), pp. 823-833, 10.1111/jan.13918
4. Jamieson, I., Sims, D., A. Basu, A., Pugh, K. (2019). Readiness for practice: The views of New Zealand senior nursing students Nurse Education in Practice, 38, 27 33, 10.1016/j.nepr.2019.05.007

5. N. Mirza, N., Manankil-Rankin, L., Prentice, D., Hagerman, L.A., Draenos, C. (2019). Practice readiness of new nursing graduates: A concept analysis. Nurse Education in Practice, 37, 68-74, 10.1016/j.nepr.2019.04.009
6. Walker A, Yong M, Pang L, Fullarton C, Costa B, Dunning T. (2013). Work readiness of graduate health professionals. Nurse Education Today. 33(2):116-122.
7. AlMekkawi M, El Khalil R. (2020). New graduate nurses' readiness to practise: a narrative literature review. Health Professions Education, 6(3).
8. Kim JS. (2020). Relationships between reality shock, professional self-concept, and nursing students' perceived trust from nursing educators: A cross-sectional study. Nurse Education Today, 88-104369. doi:10.1016/j.nedt.2020.104369
9. Crismon D, Mansfield KJ, Hiatt SH, Christensen SS, Cloyes KG. (2021). COVID-19 pandemic impact on experiences and perceptions of nurse graduates. Journal of Professional Nursing. 37(5):857-865, ISSN 8755-7223, https://doi.org/10.1016/j.profnurs.2021.06.008.
10. Labrague LJ, McEnroe-Petitte DM. (2018). Job stress in new nurses during the transition period: An integrative review. International Nursing Review. 65(4):491–504. https://doi.org/10.1111/inr.12425.
11. Walker A, Storey K, Costa B, Leung R. (2015). Refinement and validation of the Work readiness scale for graduate nurses. Nursing Otlook. 63(6):632-638.
12. Ali S, Noreen S, Farooq I. (2020). COVID-19 and healthcare workers in Pakistan: Are we losing this fight? Journal of Medical Sciences. 28(2):186–188.
13. Hall H. (2020). The effect of the COVID-19 pandemic on healthcare workers' mental health. Journal of the American Academy of Pas. 33(7):45–48. doi:10.1097/01.JAA.0000669772.78848.8c.
14. Malterud K. (2012). Systematic text condensation: A strategy for qualitative analysis. Scandinavian Journal of Public Health. 40(8):795-805.
15. Sherer M, Maddux JE, Mercandante B, Prentice-Dunn S, Jacobs B, Rogers RW. (1982). The self efficacyscale: Construction and validation. Psychological Reports. 51:663-71. doi: 10.2466/pr0.1982.51.2.663.
16. Yıldırım F, İlhan Öİ. (2010). Genel öz yeterlik ölçeği Türkçe formunun geçerlilik ve güvenilirlik çalışması. Türk Psikiyatri Dergisi. 21(4):301-08.
17. Yıldız Keskin A, Aslan M. (2021). Yeni mezun hemşirelerde işe hazir olma ölçeğinin Türkçe'ye uyarlanması: Geçerlik ve Güvenirlik. Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi. 10(1):70-80
18. Sharpnack PA, Moon HM, Waite P. (2014). Closing the practice gap: Preparing staff nurses for the preceptor role. Journal for Nurses in Professional Development. 30(5), 254–260.
19. Tarhan, M., Doğan, P., Kürklü, A. (2022). The relationship between nurse–nurse collaboration and work readiness among new graduate nurses. Nurs Forum. 57: 1104-1110. doi:10.1111/nuf.12795
20. Missen, L. Mckenna, L., Beauchamp, A., Larkins, J. (2016). Qualified nurses' perceptions of nursing graduates' ability vary according to specific demographic and clinical characteristics. A descriptive quantitative study. Nurse Education Today, 45, 108-113, 10.1016/j.nedt.2016.07.001
21. Schwartz, S. (2019). Educating the nurse of the future—Report of the independent review into nursing education. https://www.health.gov.au/sites/default/files/documents/2019/12/educating-the-nurse-of-the-future.pdf
22. Masso, M., Loggie, C., Halcombe, E., & Thompson, C. (2019). Topic 1: Fit for purpose/work ready/transition to practice. Retrieved January 2022, https://www.health.gov.au/sites/default/files/documents/2019/12/topic-1-fit-for-purpose-work-ready-transition-to-practice.pdf
23. Usher K, Mills J, West C, Park T, Woods C. (2015). Preregistration student nurses' self-reported preparedness for practice before and after the introduction of a capstone subject. Journal of Clinical Nursing. 24(21e22):3245e3254.
24. Morrell N, Ridgway V. (2014). Are we preparing student nurses for final practice placement? British Journal of Nursing. 23(10):518e523.
25. Kim, J.H., Shin, S.H. (2020). Exploring barriers and facilitators for successful transition in new graduate nurses: a mixed methods study. Journal of Professional Nursing. 36(6): 560-568. doi:10.1016/j.profnurs.2020.08.006

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nursing / Hemşirelik

The Impact of the Covid-19 Pandemic on the Care and Treatment of Cancer Patients

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ABSTRACT

Purpose: It was conducted to determine the effects of the COVID-19 pandemic on the care and treatment of cancer patients.

Materials and Methods: The population of this descriptive and cross-sectional study consisted of all inpatients in a university hospital, and the sample included a total of 78 patients. Data were collected using a Patient Information Form, the Presence of Nursing Scale.

Results: The patient's mean age was 57.54±9.83 years, and 69.2% were male. The examination of the characteristics of the patients regarding cancer indicated that 50% had laryngeal cancer, the cancer diagnosis had been made an average of 19.73±26.19 months ago, most of the patients' cancer was in the second 34.6%, third 34.6% stage, and that 88.5% (n=69) of the patients did not have metastasis. Some patients stated there were no disruptions in the diagnosis, 69.2%, treatment 76.9% of their disease during the pandemic. They also stated that the pandemic did not cause the progression of the disease 69.2%, they did not delay coming to the hospital 65.4%, and they did not hesitate to come to the controls 69.2%. All patients, 100.0%, stated that they wore masks during the pandemic. In addition, they said they could contact their physicians 46.2% of the time and their nurses 7.7% of the time during the pandemic. The mean score of the Nurse Presence Scale was 110.62±14.83.

Conclusion: While the COVID-19 pandemic did not have a significant impact on the cancer care and treatment of the patients in the study, their efforts to cope with cancer continued.

Keywords: Cancer, care, COVID-19, nursing presence.

ÖZET

Amaç: Bu araştırma COVID-19 salgınının kanser hastalarının bakım ve tedavisine etkilerini belirlemek amacı ile yapıldı.

Gereç ve Yöntem: Tanımlayıcı, kesitsel türde gerçekleştirilen araştırmanın evrenini, bir üniversite hastanesinin yatarak tedavi gören tüm hastalar, örneklemini ise 78 hasta oluşturdu. Veriler Hasta Bilgi Formu ve Hemşirenin Varlığı Ölçeği kullanılarak toplandı.

Bulgular: Hastaların yaş ortalamasının 57.54±9.83 yıl, %69.2'sinin (n=54) erkek, olduğu saptandı. Hastaların kanser hastalığına ilişkin özellikleri incelendiğinde; %50'sinin (n=39) kanser bölgesinin larinx olduğu, kanser tanısının ortalama 19.73±26.19 ay önce konduğu, önemli çoğunluğunun kanserinin II. %34.6 (n=27) ve III. %34.6 (n=27) evre olduğu ve %88.5'inin (n=69) metastatik olmadığı saptandı. Hastaların %69.2'si (n=54) salgın sırasında kanser teşhisinde, %76.9'u (n=60) tedavisinde aksama olmadığını; %69.2'si (n=54) salgının, hastalığın ilerlemesine neden olmadığını; %65.4'ü (n=51) şikâyetleri olmasına karşın hastaneye gelmeyi ertelemediğini; %69.2'si (n=54) kontrollere gelmeye çekinmediğini; tümü (%100.0, n=78) salgın süresince maske taktığını ifade etti. Salgın döneminde %46.2'sinin (n=36) hekimi ile %7.7'sinin (n=6) hemşiresi ile görüşebildiklerini ifade ettiler. Hemşirenin Varlığı Ölçeği ortalaması 110.62±14.83 idi.

Sonuç: Araştırma kapsamındaki hastaların kanser bakım ve tedavisinde, COVID-19 salgını, büyük bir etki oluşturmazken, kanser ile baş etme çabaları sürmüştür.

Anahtar Kelimeler: Kanser, kulak-burun-boğaz kliniği, COVID-19, hemşirenin varlığı.

The world has been struggling with the SARS-CoV-2 (COVID-19) virus, which causes acute respiratory syndrome and has spread from Wuhan, China, since late 2019 (1). The pandemic has caused the care and treatment of many patients to be postponed. One of these postponed diseases is cancer. New regulations had to be made in health institutions during the pandemic to prevent the spread of COVID-19 in the community, reduce mortality rates, and respond to the increasing patient intensity in health services (2). It is stated that services provided in healthcare settings where services for chronic diseases of the circulatory and respiratory system, diabetes, and cancer have decreased by 69%, and the rate of disruption in cancer treatments has reached 55% (1).

Cancer is a common problem not only in our country but also in the whole world. It is a global problem, and it causes more than 18 million deaths every year and increases the risk of mortality (1,2). The nature of the disease and the treatment process of individuals with cancer adversely affect the immune system, making the individual vulnerable to infection. With COVID-19 infection, the severity of the disease increases, and thus, patients' need for treatment and care services increases (3). Comprehensive changes have been implemented in managing all types of cancer during the pandemic, including the shortening of radiotherapy, switching from intravenous to oral chemotherapy regimens, and changes in the use of immunotherapy. At the same time, individuals diagnosed with cancer state that they are afraid of contracting this disease, their anxiety levels have increased, they have isolated themselves, they are afraid to present to a health institution, and they have delayed their treatment and care processes (4).

Since cancer patients have more bio-psychosocial problems and unmet needs than other patient groups, they need more nursing assistance. Some studies in the literature show that cancer patients see nurses as close friends who are compassionate and caring and make them feel safe (5,6).

Nursing is the only profession that requires providing care for patients 24 hours a day, and it has become apparent during this pandemic that it can never be replaced (3). In the COVID-19 pandemic, nurses are at the forefront of this struggle with all their might. In the clinical setting, nurses have tried to meet the ever-increasing care needs of cancer patients while fighting against COVID-19 (4). Ear Nose Throat (ENT) clinic is one of the clinics where patients with head and neck cancer are accepted. As with other cancer types, patients with laryngeal, pharyngeal, oral cavity, and lip cancer receive radiotherapy, chemotherapy, surgical operation, or immunosuppressive treatment, and these patients need special care (6). Nurses have been under a heavy workload during the pandemic. To help the patient in the health care environment, it is necessary to know how the nurse who is with the patient the most is perceived by the patient (4,5). It is stated that nurses who provide care for patients with COVID-19 feel weak under a heavy workload in terms of benefiting patients (4,5,6). Many studies show that nurses' working hours are extended due to intense workload, they continue to provide care, and they experience symptoms such as anxiety and depression intensely. Although nurses continue to deliver care in this changing environment, there are no studies on how patients' perceptions of care change (5,6,7). Therefore, it is necessary to know the care and treatment processes of individuals with cancer during the COVID-19 pandemic and their status of feeling the presence of the nurse near them in this process. In this context, the research questions were determined as follows.

Research Questions

1. What are the individual and disease-related characteristics of cancer patients admitted to the ENT clinic during the pandemic?

2. What are the COVID-19 infection status of cancer patients admitted to the ENT clinic during the pandemic and the problems they experience regarding care and treatment?

3. What is the level of feeling the presence of the nurse by cancer patients admitted to the ENT clinic during the pandemic while they struggle with the difficulties of cancer?

Materials And Methods

Study Design

The study was conducted between March 2021 and August 2021 in Istanbul University-Cerrahpaşa, Cerrahpaşa Medical Faculty, the Department of Ear, Nose, and Throat after it had been approved by the Istanbul University-Cerrahpaşa, Non-interventional Clinical Research Ethics Committee (Date/Number: 10.03.2021-49376). The principles of the Helsinki Declaration were followed in the study. Patients who were hospitalized during this study and agreed to participate were included. The study included them by the following inclusion criteria: 1) being aged ≥18 years and 2) having been diagnosed with one

of the oral cavity, pharynx, larynx, and salivary gland cancers. The exclusion criteria were as follows: provision of the care and treatment of the patient by telephone.

Data collection tools: Data were collected using a Patient Information Form and the Presence of Nursing Scale.

The Patient Information Form: This form, which the researchers designed following a review of the literature (2,3,4,6), includes questions about age, gender, education level, marital status, income status, stage of cancer, region of cancer, the status of wearing a mask, and the history of COVID-19 infection in family members and the patient.

The Presence of Nursing Scale (PONS): This is a 28-item Likert-type scale developed by Kostovich (2012) (7). It measures the nurse's presence with 26 items and the patient's satisfaction with the last two items. Cronbach's alpha coefficient of the scale is 0.95. Kostovich defines the presence of a nurse as "being with the patient" emotionally and "doing for the patient" physically (7). The PONS was adapted into Turkish by Bozdoğan Yeşilot and Öz (2016) (8). The Turkish version of the Presence of Nursing Scale consists of 25 items and is evaluated on a 5-point scale—the minimum and maximum scores on the Turkish version of the scale range from 24 to 120. As the score obtained from the scale increases, it is interpreted that the behaviors that show the nurse's presence increase and that the patients perceive this positively (5). In this study, Cronbach's alpha coefficient was found to be 0.97.

Implementation of the Study

After the purpose of the study was explained, written and verbal consent of the patients who volunteered to participate was obtained. Data were collected from each patient by using the face-to-face interview method. The average interview time for each patient was 20-25 minutes.

Statistical Methods

Data analysis was performed on the SPSS v. 24.0 software package. In descriptive analyses, categorical variables were presented as percentages and continuous variables as mean ± standard deviation (median, min.-max.) values.

Results

When the disease and individual characteristics of the patients admitted to the Ear, Nose, and Throat Clinic were examined, it was determined that the mean age of the patients was 57.54±9.83 years, 69.2% were male, 61.5% were primary school graduates, and that 92.3% lived with their families (Table 1). Of the patients, 38.4% had a chronic disease, and 50% had a diagnosis of laryngeal cancer. The mean duration of cancer diagnosis was 19.73±26.19 months, 34.6% of patients had 2nd and 3rd stage cancer, and 11.5% had metastatic cancer. These findings regarding the disease status are given in Table 2.

Table 1: Patients' Demographic Characteristics (N=78)

Demographic Characteristics	**n**	**%**
Age [Mean±SD (Min.-Max.)]	57.54±9.83 (37-78)	
Gender		
Female	24	30.8
Male	54	69.2
Education level		
Primary education	48	61.5
Secondary education	21	26.9
Higher education	9	11.5
Marital status		
Married	72	92.3
Single/Divorced/Widowed	6	7.7
Currently living with		
Single	6	7.7
Family	72	92.3
Working status		
Yes	12	15.4
No	66	84.6
Living place		
City	48	61.5
Town	27	34.6
Village	3	3.8
Income status		
Income more than expenses	6	7.7
Income equal to expenses	42	53.8
Income less than expenses	30	38.5

S.D.:Standart Deviation
Min.=Minimum
Max.=Maximum

Table 2. Patients' disease characteristics (N=78)		
Disease Characteristics	**n**	**%**
Smoking		
Yes	9	11.5
No	69	88.5
Before smoking		
Yes	60	76.9
No	18	23.1
Time of smoking (N=60) ***Mean±S.D. (Min.-Max.) (Years)***	31.50±9.84 (15-50)	
Amount of smoking (N=60) ***Mean±SD (Min-Max) (number/day)***	39.65±20.93 (8-100)	
Alcohol		
Yes	6	7.7
No	72	92.3
Before alcohol		
Yes	30	38.5
No	48	61.5
Chronic disease		
Yes	30	38.4
No	48	61.6
Site of cancer		
Mouth and cavity	24	30.8
Pharynx	12	15.4
Larynx	39	50.0
Esophagus	3	3.8
Time of cancer diagnosis ***Mean±SD (Min-Max) (Month)***	19.73±26.19 (4-132)	
Cancer stage		
I. Stage	12	15.4
II. Stage	27	34.6
III. Stage	27	34.6
IV. Stage	12	15.4
Presence of metastatic cancer		
Yes	9	11.5
No	69	88.5

In Table 3, the effect of the COVID-19 pandemic on patients' cancer care and treatment is given. Of the patients, 69.2% stated that there was no disruption in the diagnosis of cancer, and similarly, 76.9% stated that their cancer treatment was not interrupted. Of those who stated that their treatment had been disrupted, 66.6% stated that they did not have surgery, 16.7% stated that the surgery date had been delayed, and 16.7% reported being referred to another institution. During the pandemic, 30.8% of the patients stated the course of their disease worsened, and 34.6% stated that they hesitated to go to the hospital even though they had complaints. In addition, 46.2% of the patients stated that they could contact their physicians via communication tools, but 92.3% stated that they could not contact nurses. The mean score of patients on the presence of nursing scale was 110.62 (Table 3).

Table 3: Features of the effects of the COVID-19 outbreak on cancer care and treatment (N=78)		
Category	**n**	**%**
Delayed cancer diagnosis		
Yes	24	30.8
No	54	69.2
Disruption in cancer treatment		
Yes	18	23.1
No	60	76.9
Types of delayed cancer treatments (N=18)		
I had to have surgery, I couldn't	12	66.6
My surgery date is delayed	3	16.7
Transfer from the hospital I applied to another hospital for the operation	3	16.7
Reason for changing treatment plan* (N=18)		
Worried about the risk of contracting COVID-19	12	66.7
Concerns about the availability of hospital beds and supplies	9	50.0
Hospital/clinic guidelines regarding COVID-19	3	16.7
Professional medical association or organization recommendations	3	16.7
Strict visitor policy	3	16.7
Transportation concerns	6	33.3
Out of province dispatch	6	33.3
Who made the decision about the change/postponement of the treatment plan		
I made the decision myself	3	16.7
The physician made the decision	15	83.3
The state of thinking that COVID-19 is causing the progression of the disease		
Yes	24	30.8
No	54	69.2
Delaying going to the hospital despite having symptoms		
Yes	27	34.6
No	51	65.4
Time of delay (N=27) ***Mean±SD (Min-Max) (Day)***	32.78±55.66 (3-180)	
Avoidance and extension to go to the controls		
Yes	12	15.4
No	54	69.2
First admission/New diagnosis	12	15.4
Extension time (N=12) ***Mean±SD (Min-Max) (Day)***	100.25±160.07 (2-365)	
Did you use a mask during the pandemic?		
Yes	78	100.0
Have you had a Covid-19 test during the pandemic?		
Yes	66	84.6
No	12	15.4
Number of COVID-19 tests (N=66) ***Mean±S.D. (Min.-Max.) (Times)***	4.00±2.75 (1-10)	
Result of positive COVID-19 tests (N=66)		
Yes	3	4.5
No	63	95.5
Results of positive COVID-19 tests for your family members		
Yes	21	26.9
No	57	73.1
Communication with your physician		
Yes	36	46.2
No	42	53.8
Communication with your nurse		
Yes	6	7.7
No	72	92.3
Presence of Nursing Scale Score	110.62	±14.83
Mean±S.D. (Min.-Max.)	(75.00-120.00)	

** More than one option has been ticked. Therefore, the row percentage is taken.*
SD =Standart Deviation
Min. =Minimum
Max.=Maximum

Discussion

The COVID-19 pandemic has dramatically affected oncology patients, and healthcare services have resorted to priority classification among patients to prevent hospital-acquired transmission. Therefore, many regulations have been made in the field of oncology. In some cases, the treatment and care of cancer patients have been postponed, or changes have been made in the treatment protocols (4,6).

This study was carried out to determine the use and postponement of care and treatment services by patients receiving cancer treatment in the ear, nose, and throat clinics in our country during the COVID-19 process and to reveal the results of the evaluation of nurses' presence by patients with cancer during this process.

When the individual and disease characteristics of the patients were examined, it was determined that the mean age was 57.54±9.83 years. The average age was similar in similar studies conducted with cancer patients during the COVID-19 pandemic (4,6). One of the cancers evaluated within the scope of head, neck, and throat cancers is laryngeal cancer. In the study, the majority of patients had laryngeal cancer, and oral and oral cavity cancers followed this. Larynx cancer is more common in males aged over 50 years in our country (8). According to the 2017 Turkey Cancer Report, laryngeal cancer ranks tenth among the top ten cancer types seen in males, and its incidence is 5.7% (9). It is seen that the number of other cancer types, such as the esophagus, nasopharynx, and oropharynx, is increasing gradually (10). In the study of Mahl et al., the incidence of laryngeal and mouth cancer was 19.4% and 48.4%, respectively (6). Smoking causes cancer in structures and organs that provide respiration, especially in the lungs. Smoking increases the risk of cancer 2-4 times (11). In the study, it was determined that the rate of previous smoking was 76.9%, the rate of active smokers was 11.5%, the average smoking time was 31.50±9.84 years, and the average number of cigarettes smoked daily was 39.65±20.93. In a study showing the etiological role of smoking on laryngeal cancer in the literature, "the number of cigarettes smoked a day" and "duration" were examined, and it was found that the risk of developing cancer increased as smoking and duration increased (12). Van Roekel et al. (2013) found that smokers had earlier, larger, and more advanced-stage tumors than non-smokers in their study with a relatively large sample (13). Pietzak et al. (2015) showed that cancer was more aggressive in those who smoked more than 30 packs per year than in those who smoked less than 30 packs (14). The findings of the current study support other studies showing the effect of smoking on cancer.

The measures taken at the national and international levels during the COVID-19 pandemic made it necessary to postpone the care and treatment of health problems that were not urgent within the framework of the institutional infrastructure. When the effects of the COVID-19 pandemic on cancer care and treatment were examined, it was found that some patients had disruptions in the diagnosis (30.8%) and treatment of the disease (23.1%), and 66.6% could not have a scheduled surgery on time. On the other hand, of the patients who stated that their treatment plan had changed, 66.7% feared contracting COVID-19, and 50% worried about the lack of materials. Some studies showed delays and disruptions in cancer patients' diagnosis, surgery, and treatment process (15,16,17). A study conducted in Germany showed that the number of new diagnoses decreased by 40% in April 2020 compared to April 2019 (18). In a study conducted in our country, it was stated that while the number of presentations to the ENT outpatient clinic decreased in 2020, there was an increase in the number of surgical operations performed due to malignancy and a decrease in elective surgery, biopsy, advanced diagnostic tests, and emergency surgical interventions (19). Although there was no comparison between the years in terms of the number of surgical operations performed and the postponement of treatment in our study, it is thought that some health services were postponed due to the pandemic in our country. In cancer treatment, the physician decides the treatment in accordance with the protocols specific to the individual. In the event of a pandemic, physicians decide to determine priorities for treatment. The patients in the study also stated that their physicians decided the treatment process. This suggests that the patients cooperated with their physicians during the treatment process.

When the cases of delaying treatment despite complaints were examined, it was seen that 65.4% of patients did not postpone their treatment and that it was postponed for an average of 32.78±55.66 days by others. Some studies in the literature indicated that patients' knowledge about cancer and its symptoms was low and, therefore, that they did not take these complaints into account (20,21). In a study examining the average time to present to a health institution after the complaints of colorectal cancer started, it was found that 60.6% of the patients presented to the health institution an average of 7.27±11.02 months after their complaints started. It was found that there was

a more than one-month delay in 60.6% and a severe delay in 31.6% (22). According to the study results, the mean diagnosis time was 19.73±26.19 months. Therefore, this finding showed that the COVID-19 pandemic prolonged the diagnosis time. One of the most critical factors causing the delay of surgical operations was the positive result of the patient's COVID test (23,24). According to the research findings, it was seen that 4.5% (n=3) of the patients were COVID-19 positive in this process. This finding aligns with studies showing that surgery was delayed due to a positive COVID test (2,23,25).

The pandemic process has increased the use of technology in the health field. With the pandemic, telemedicine, telehealth, and telenursing have become widespread (26). Although methods for reaching health workers remotely during the pandemic increased, according to the research result, the rate of contacting the physician using communication tools was 46.2%, and the rate of contacting the nurse was 7.7%. Lou et al. (2020) determined that 70.8% of patients without metastatic cancer contacted their physicians and that 64.7% frequently talked to their physicians on the phone (4). This finding was thought to stem from the fact that the diagnosis and treatment were under the direct responsibility of the physician, nurses spent more time in bedside nursing care, and the patient did not need to reach the nurse from a distance.

Individuals receiving cancer treatment need nursing care. During nursing care to these patients, the nurse-patient relationship should be at the forefront, and the nurse should be accessible and always with the patient. As in all clinics, nurses continued to provide 24-hour patient care in ENT clinics during the COVID-19 process. The mean score of the patients included in the study on the Presence of Nursing Scale was 110.62. Patients' score on the same scale was found as 105.83±16.05 in the study by Bozdoğan Yeşilot and Öz (2016) (5), 107.03±16.16 in Turpin (2016) (27), and 88.46±22.64 in Bozdoğan Yeşilot and Öz (2017) (28), 101.91±16.19 in Mahdavi et al. (2020) (29). When these scores were compared, it was seen that patients' perception of the nurse's presence was high in our study. Huz (2019) found the mean presence of the nurse score as 116.6 ± 7.51 (30). We thought that the data collection during the patients' hospitalization may have led to high scores on the Presence of Nursing Scale. Also, it was shown that while it was easier to reach nurses in the hospital, they had difficulty getting them outside the hospital. This is because there is no case management approach in our healthcare system. Although there is no case management, a multidisciplinary approach is essential, especially in managing chronic diseases.

Limitations

This research has several limitations. First, research findings were based on self-report. Secondly, since no sampling method was used in the study and it was conducted in a single center, the results cannot represent the whole of Turkiye.

Conclusion

As a result of the research, it was concluded that the COVID-19 pandemic negatively affected the demand for and access to health services in Turkey and the world. However, it was shown that the postponement was due to the change in the functioning of healthcare services, especially during the pandemic, and individuals' fear of contracting COVID-19. In this period, when health services have been maintained uninterruptedly and at the maximum level, the healthcare team has performed their duties at the highest level. We are proud in the name of patient care and our profession that patients have always felt nurses' presence during the pandemic, which is one of the primary purposes of the study. However, nurses are not always in the hospital. Therefore, a system should be established where the patient can call the nurse and receive counseling outside the hospital. To reveal the existence of nurses, it is necessary to create telehealth services that include nurses, not just physicians. The number of nurses needs to be increased to use these systems efficiently. At the same time, regular home visits by nurses working in the family health center and complete home health services will have positive results in terms of patient follow-up. It also requires the reorganizing of health policies, especially in the management of care and treatment of diseases such as cancer.

Declarations

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Conflict of Interest

The authors declare that no conflict of interest.

Ethics Approval

The study was approved by the Istanbul University Non-Interventional Clinical Ethical Committee (protocol no: 050.01.04.-49376, date: 10.03.2021).

References

1. World Health Organization (WHO). Pulse survey on continuity of essential health services during the COVID-19 pandemic. Interim Report 30 December 2022. Accesed November 30, 2022.
2. Aslan EÇ. COVID-19 Pandemisinin sağlık hizmetleri erişimine etkisinin değerlendirilmesi: Kesitsel bir araştırma. Turkiye Klinikleri J Health Sci, 2022;7(2):534-43.
3. Wang H, Li T, Barbarino P,et al. Mitigating strategies and nursing response for cancer care management during the COVID-19 pandemic: an Italian experience. Int Nurs Rev.? doi: 10.1111/inr.12625.
4. Lou E, Teoh D, Brown K, et al. Perspectives of cancer patients and their health during the COVID-19 pandemic. medRxiv. 2020;15(10):e0241741. doi: 10.1371/journal.pone.0241741—eCollection 2020.
5. Bozdoğan Yesilot BS, Oz F. Validity and reliability of the presence of nursing scale in patients with cancer in the Turkish language. International Journal of Caring Sciences 2016;9:443–51.
6. Mahl C, Melo LRS, Almeida MHA, et al. Delay in head and neck cancer care during the COVID-19 pandemic and its impact on health outcomes. Braz Oral Res. 2020;18(34):e126. doi: 10.1590/1807-3107bor-2020.vol34.0126.
7. Kostovich CT. Development and psychometric assessment of the Presence of Nursing Scale. Nurs Sci Q. 2012;25:167–75.
8. Çolak M, Karakuş MF, Eravcı FC, et al. Kulak Burun Boğaz Hastalıkları Polikliniğine başvuran bireylerin larinks kanseri farkındalığının değerlendirilmesi. KBB-Forum 2021;20(1):1-8.
9. T.C Sağlık Bakanlığı (SB). 2017 Yılı Türkiye Kanser İstatistikleri. https://hsgm.saglik.gov.tr/tr/kanser-istatistikleri/yillar/2017-turkiye-kanser-i-statistikleri.html. Published 2017. November 28, 2022.
10. ÖzdoğanM.TürkiyeKanserİstatistikleri2020.https://www.drozdogan.com/turkiye-kanser-istatistikleri-2020/#:~:text=Buna%20paralel%20olarak%20y%C4%B1l%C4%B1k%20yeni,ve%20kansere%20ba%C4%9Fl%C4%B1%20ya%C5%9Fam%20kayb%C4%B. Published 2021.November 28, 2022.
11. Bora İrer D, Dağ F, Aslan G. Sigara kullanım süresinin mesane kanserinin tanı anındaki klinik ve patolojik özellikleriyle olan ilişkisinin değerlendirilmesi. Bulletin of Urooncology. 2017;16:108-11.
12. Pınar T, Akdur R, Tunçbilek A. The etiological role of smoking in head and neck tumors. K.B.B. ve BBC Dergisi. 2001; (9):88-92.
13. van Roekel EH, Cheng KK, James ND, et al. Smoking is associated with lower age, higher grade, higher stage, and larger size of malignant bladder tumors at diagnosis. Int J Cancer. 2013;15;133:446-54.
14. Pietzak EJ, Mucksavage P, Guzzo TJ, et al. Heavy cigarette smoking and aggressive bladder cancer at ınitial presentation. Urology 2015;8 (5):968-73.
15. Dinmohamed AG, Visser O, Verhoeven RHA, et al. Fewer cancer diagnoses during the COVID-19 epidemic in the Netherlands. Lancet Oncol. 2020;21: 750–1.
16. Kaufman HW, Chen Z, Niles J, et al. Changes in the number of us patients with newly identified cancer before and during the coronavirus disease 2019 (COVID-19) Pandemic. JAMA Netw. Open 2020;3:e2017267.
17. Rutter MD, BrookesM, Lee TJ, et al. Impact of the COVID-19 pandemic on UK endoscopic activity and cancer detection: A National Endoscopy Database Analysis. Gut 2021;70:537–43. doi:10.1136/gutjnl-2020-322179.
18. Jacob L, Loosen SH, Kalder M, et al. Impact of the COVID-19 Pandemic on cancer diagnoses in general and specialized practices in Germany. Cancers. 2021;13:408.
19. Duran A, Ant A, Tunçcan T, et al. The Impact of the COVID-19 Pandemic on head and neck cancer practice-tertiary health care center experience. Acta Oncologica Turcica. 2021;54(3): 318-27.
20. Torosian T, Abrami EA, Massoumi RL, et al. Assessing knowledge and perceptions of colorectal cancer screening in Armenia. Journal of Surgical Research. (2021);257:616-24.
21. Al Suqri M, Al-Awaisi H, Al-Moundhri M, et al. Symptom perceptions and help-seeking behaviors of Omani patients diagnosed with late-stage colorectal cancer: a qualitative study. Asian Pacific Journal of Cancer Prevention. 2021;22(2):427.
22. Tanrıkulu UG. Kolorektal kanserli bireylerde hastalık algısı ve tanı gecikmesine yol açan bireysel faktörlerin incelenmesi. Başkent Üniversitesi Sağlık Bilimleri Enstitüsü Hemşirelik Anabilim Dalı, Yüksek Lisans Tezi, Ankara, 2020.
23. İlhan E, Oztop M, Üreyen O, et al. Covid-19 Pandemisinin genel cerrahi kliniğinde acil ve elektif cerrahi girişimlere olan etkisinin değerlendirilmesi: kesitsel çalişma. Ankara Eğitim ve Araştırma Hastanesi Tıp Dergisi. 2020;53(3):202-5.
24. Rubino F, Cohen RV, Mingrone G, et al. Bariatric and metabolic surgery during and after the COVID-19 pandemic: DSS recommendations for management of surgical candidates and postoperative patients and prioritisation of Access to surgery. Lancet Diabetes Endocrinol. 2020; 8(7): 640-8.
25. Zihni İ, Tercan M, Bodur MS, et al. Covid-19 pandemisinde bir üniversite hastanesi cerrahi onkoloji kliniğinde kanser cerrahisi deneyimi. SDÜ Tıp Fakültesi Dergisi. 2022;29(3):300-4.
26. Gök G. Covid-19 pandemisinde stratejik bir inovasyon olan tele-sağlık hizmetinin SWOT analizi ile incelenmesi. Business Economics and Management Research Journal, 2022;5(3):286-304.
27. Turpin LR. State of the science of nursing presence revisited: Knowledge for preserving nursing presence capability. International Journal for Human Caring. 2014;4:14–29.
28. Bozdoğan Yeşilot S, Öz F. Cancer patients' perceptions of nursing presence. Journal of Psychiatric Nursing. 2017;8(3):150-6.
29. Mahdavi M, Ghafourifard M, Rahmani A. Nursing presence from the perspective of cancer patients: A cross-sectional study. NPT. 2020;8(2):139-45.
30. Huz HH. Kanser hastalarında hemşirenin varlığı, hasta-hemşire güven ilişkisi ve kurum imajı algısı. Hacettepe Üniversitesi Sağlık Bilimleri Enstitüsü, Hemşirelik Hizmetleri Yönetimi Programı Yüksek Lisans Tezi, Ankara, 2019.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nursing / Hemşirelik

The Relationship Between Social Support and Breastfeeding Self-Efficacy in Primiparous Pregnant Women

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ABSTRACT

Purpose: Study was conducted to evaluate the relationship between social support and breastfeeding efficacy in primiparous pregnant women.

Methods: The study, which was carried out as a descriptive and relational screening, was completed with the participation of 350 pregnant women who met the inclusion criteria. In the collection of the study data, a questionnaire form, Prenatal Breastfeeding Self Efficacy Scale, and Multidimensional Scale of Perceived Social Support were employed.

Results: In the present study, a positive relationship was determined between the pregnant women's breastfeeding self-efficacy and perceived social support.

Conclusion: As a result of the study, it was concluded that as the social support provided to pregnant women in the prenatal period increased, their breastfeeding self efficacy also increased.

Keywords: Perceived social support, breastfeeding self-efficacy, prenatal.

ÖZET

Amaç: Çalışma, primipar gebelerde algılanan sosyal desteğin prenatal emzirme öz yeterliliği ile ilişkisini değerlendirmek amacıyla yapılmıştır.

Gereç ve Yöntem: Tanımlayıcı ve ilişki arayıcı tipte yapılan çalışma, araştırmaya alınma kriterlerini taşıyan 350 gebe ile tamamlanmıştır. Verilerin toplanmasında; anket formu, Prenatal Emzirme Öz Yeterliliği Ölçeği ve Çok Boyutlu Algılanan Sosyal Destek Ölçeği kullanılmıştır.

Bulgular: Çalışma sonucunda, prenatal emzirme öz yeterliliği ve algılanan sosyal destek arasında pozitif bir ilişki bulunmuştur.

Sonuç: Gebelere prenatal dönemde sağlanan sosyal destek arttıkça emzirme öz yeterliklerininde arttığı sonucuna ulaşılmıştır.

Anahtar Kelimeler: Algılanan sosyal destek, emzirme öz yeterliliği, prenatal.

Breastfeeding self-efficacy is defined as "an indicator of the mother's thoughts regarding breastfeeding, her decision to breastfeed, and her ability to cope with breastfeeding problems." Mother's wish to breastfed and her decision to do it in the prenatal period are very important in terms of the development of breastfeeding self-efficacy. Breastfeeding self-efficacy in the prenatal period is affected by various factors such as receiving breastfeeding consultancy, experience, and mother's educational and economic status. One of these factors is social support (1,2).

The prenatal period is one of the periods in the woman's life in which she needs social support the most. Supporting the pregnant women in the prenatal period is very important for their adaptation to this process which hosts a variety of physiological and psychological changes. Pregnant women with solid social support systems can overcome various stress factors more easily, can adapt to motherhood with less difficulty, and thus their breastfeeding self-efficacy develops in a healthy way. Pregnant women whose breastfeeding self-efficacy develops healthily experience the breastfeeding process with joy and positively (3-5). Hence, the study was conducted to evaluate the relationship between social support and breastfeeding efficacy in primiparous pregnant women.

Material and Methods

The study has a descriptive and relational screening design. The population of the study consisted of all pregnant women who presented to the pregnancy outpatient clinic of a university hospital in Turkey. In the post hoc analysis performed with 350 individuals with G*Power (3.1.9.2) software, according to R^2:0.14 value, which was obtained in the regression analysis in which four independent variables were determined to be effective on the pregnant women's Prenatal Breastfeeding Self-Efficacy Scale scores, accepted as the primary result of the study, impact size was found to be f^2=0.16 (moderate impact) and power 1.00 (100%), and the sample size of the study being considered adequate, it was decided to complete the study with 350 individuals. Pregnant women who were 18 years old and above, who were literate in Turkish, who conceived spontaneously, who had a healthy fetus, who were in the last trimester of pregnancy, and who did not have a health problem (based on self-report) were included in the study.

In collecting the study data, a questionnaire form, Prenatal Breastfeeding Self-Efficacy Scale, and Multidimensional Perceived Social Support Scale were used. Questionnaire Form consists of 15 questions inquiring about pregnant women's sociodemographic characteristics, obstetric characteristics, and social support status.

Prenatal Breastfeeding Self-Efficacy Scale (PBSES) was developed by Wells, et al. (2006) in order to determine perceived breastfeeding self-efficacy levels of pregnant women in the prenatal period (6). The Turkish validity and reliability study of the scale was conducted by Aydin and Pasinlioglu (2018). The minimum and maximum scores to be obtained from the scale are 20 and 100. A high score obtained shows high breastfeeding self-efficacy. In the study by Aydin and Pasinlioglu (2018), the Cronbach's alpha coefficient of the scale was found as 0.85 (7). In the present study, this value was determined to be 0.96.

Multidimensional Perceived Social Support Scale (MPSSS) scale was developed by Zimet, et al. in 1990 (8). The 12-item scale evaluates the adequacy of the social support received from three different sources (family, friends, and a significant other). The lowest and highest scores to be obtained from the subscales are 4 and 28. The minimum and maximum scores to be obtained from the total scale ranges between 12 and 84. A high score obtained indicates a high level of social support. In the study conducted by Eker and Arkar (2001), the Cronbach's alpha coefficient of the scale was determined to be between 0.80 and 0.95 (9). In the current study, the Cronbach's alpha coefficient of the total scale was found as 0.90, while it was found to be 0.85 for the family subscale, 0.84 for the friend subscale, and 0.93 for the significant other subscale.

The study data were collected by the researcher between 01 March 2020 – 01 June 2020 through random sampling method, which is one of improbable sampling methods. The purpose of the study was explained to the pregnant women, who came to the hospital for routine follow-up, after their examination, and their verbal consents were taken prior to data collection.

Ethical approval for the study was obtained from Necmettin Erbakan University Meram School of Medicine, Non-Drug and Non-Medical Device Research Ethics Committee (approval date/number; 23.10.2020/2872).

The data obtained from the study were analyzed in computer environment through SPSS 20 (Statistical Package for the Social Sciences) software. The descriptive statistics were presented as number, percentage, mean, and

standard deviation. The compliance of the numerical data to normal distribution was evaluated with Skewness (between -1.73 and -0.34) and Kurtosis (between -1.04 and 1.88), and it was determined to have normal distribution. In the comparison between the difference between the PBSES mean scores of the pregnant women according to independent variables, independent groups One-Way ANOVA (Advanced analysis Tukey HSD) analysis was used in variables with three or more groups.Independent variables which had an impact on the pregnant women's PBSES mean scores in the primary analysis were evaluated through multiple linear regression (backward method) analysis. Significance level was accepted as $p<0.05$.

Results

When the sociodemographic characteristics of the pregnant women were examined, it was determined that 58% were in the age range of 26-35 years, 64.9% had university education and above, and 53.7% were employed. The majorities of the pregnant women (69.4%) lived in the city center, were married for less than five years (64.3%), had a nuclear family (92.3%), and evaluated their monthly income level as "moderate" (55.4%). The pregnant women's mean week of pregnancy was 32.18±3.90, and 81.4% conceived intentionally. 75.4% of the pregnant women reported that they received social support at a sufficient level, and of these women, 88.9% received social support from their spouses, 70.6% from their families, 40.3% from their friends, 30% from physicians, and 27.4% from nurses (Table 1).

Table 1: Social Support Features during Pregnancy

Social Support Features (n= 350)	n	%
Status of receiving adequate support in pregnancy		
Yes	264	75.4
No	86	24.6
Husband support		
Yes	311	88.9
No	39	11.1
Family support		
Yes	247	70,6
No	103	29,4
Friend support		
Yes	141	40.3
No	209	59.7
Doctor support		
Yes	105	30.0
No	245	70.0
Nurse support		
Yes	96	27.4
No	254	72.6

The pregnant women's PBSES mean score was found as 73.46±17.78. Their MPSSS total scale mean score was determined to be 67.54±13.83, the family subscale mean score as 24.75±4.46, the friends subscale mean score as 22.54±5.39 and the significant other subscale mean score as 20.26±7.20 (Table 2).

Table 2. MPSSS and PBSES Scores of Pregnants

MPSSS and PBSES Scores (n= 350)	$\bar{X} \pm SS$	Max.-Min
PBSES (Total)	73.46±17.78	24-100
MPSSS (Total)	67.54±13.83	15-84
MPSSS subscale score		
Family	24.75±4.46	4-28
Friend	22.54±5.39	5-28
Significant other	20.26±7.20	4-28

It was determined that there was moderate and positive relationship between MPSSS total scale mean score and the family subscale mean score and PBSES mean score, and that the relationship was statistically very significant ($p<0.001$, Table 3). It was also determined that there was a weak and positive correlation between the pregnant women's MPSSS friends and significant other subscales and PBSES mean score, and that the relationship was very significant in the friends dimension ($p<0.001$), significant in the significant other dimension ($p<0.05$, $p<0.001$). As the pregnant women's mean scores on the subscales of friends and the significant other increased, their PBSES mean score also increased (Table 3).

Table 3: The Relationship Between PBSES Scores and MPSSS Scores of Pregnants

Scores (n= 350)	PBSES	
	r*	p
MPSSS (Total)	0,26	**0,000**
MPSSS subscale		
Family	0,30	**0,000**
Friend	0,24	**0,000**
Significant other	0,14	**0,012**

r: Pearson regression test*

As a result of the evaluation of 11 independent variables, which were determined to have an effect on the pregnant women's PBSES, through multiple linear regression analysis (backward method), a high level relationship was found between MPSSS total mean score and its subscales (r:0.69-0.86, p<0.000/total score, tolerance:0.000, VIF was not calculated). Hence, in the regression analyses, MPSSS total score was not included in the model due to autocorrelation, but subscale scores were included. Between the other independent variables included in the regression model, a high level autocorrelation was not found according to correlation analysis and collinearity statistics.

Among the variables included in the regression model, six independent variables, which are status of receiving adequate support in pregnancy, MPSSS significant other subscale score, status of receiving support from friends in pregnancy, employment status, family type, and status of receiving nurse support in pregnancy, were excluded from the regression model respectively as they did not have an adequate impact on the pregnant women's PBSES score (p>0.05).

The order of significance of the four variables which remained in the model and had a significant effect on the pregnant women's PBSES score according to β coefficient (from the most significant to the least) was found as MPSSS family support subscale score, status of receiving support from the doctor in pregnancy (p<0.01), status of receiving support from the family in pregnancy, and MPSSS friend support subscale (p<0.05). These four independent variables explain the change in PBSES score (variance) by 14% (Table 4).

One point increase in the pregnant women's in MPSSS family support subscale leads to an increase of 0.87 point in their PBSES score, and one point increase in the friend support subscale causes an increase of 0.39 point in their PBSES score. PBSES score of the pregnant women who received doctor support is 5.89 points more compared to those who did not receive doctor support and PBSES score of the pregnant women who received family support is 5.07 points higher in comparison to those who did not receive family support (Table 4).

Discussion

Pregnancy is the period in which women need social support the most. Especially the social support status of primiparous pregnant women is one of the most important factors affecting adjustment to this challenging process (10). Healthy development of breastfeeding self-efficacy in the prenatal period enables the pregnant women to manage the breastfeeding process successfully (4).

In the present study, the pregnant women stated that they received the most support from spouse, family, and friends. Similarly, Toptas, et al. (2019) also reported that pregnant women received the most support from their spouses (11). In another study, Izadirad (2017) determined that primiparous pregnant women received social support from their spouses and families the most (12).

In the present study, the pregnant women's PBSES total mean score was found as 73.46±17.78. This mean score was reported as 76.65±15.27 in another study conducted in Turkey, 70.0±11.9 in a study conducted in Malaysia, and 70±11.9 in a study conducted in Saudi Arabia (2,13,14).

Table 4: The Effects of Independent Variables on the Pregnant Women's PBSES Scores: Multiple Linear Regression Analysis Results

Independent Variables (n= 350)	**β**	**SS**	**β**	**t**	**p**	**95% Confidence Interval for B Tolerance**		**Collinearity statistics**	
								VIF	
(Sabit)	38,06	5,36		7,102	**0,000**	27,52	48,60		
MPSSS family*	0,87	0,25	0,21	3,508	**0,001**	0,38	1,35	0,688	1,453
Doctor support	5,89	1,95	0,15	3,020	**0,003**	2,05	9,73	0,954	1,048
Family support	5,07	2,06	0,13	2,459	**0,014**	1,01	9,12	0,861	1,162
MPSSS friend *	0,39	0,19	0,12	2,062	**0,040**	0,02	0,76	0,747	1,339

** subscale score*

The pregnant women's MPSSS mean score was found as 67.54±13.83 in the present study. This value was reported to be 61.77±15.06 in a study conducted in Turkey, 65.74±13.04 in a study conducted in the United Kingdom, and 66.22 ± 13.97 in a study conducted in China (15-17). Matvenko Sikar (2021) reported a significant decrease in perceived social support in pregnant women in the COVID-19 pandemic (18).

In the present study, a positive relationship was determined between the pregnant women's breastfeeding self-efficacy and perceived social support. Similarly, in studies conducted, a positive correlation was found between the pregnant women's breastfeeding self-efficacy and perceived social support (2, 19).

Limitations

The use of improbable sampling method is a limitation of the study. Due to the COVID-19 pandemic, the participants who met the inclusion criteria and volunteered to participate in the study could be selected through improbable sampling method. Another limitation of the study is that as the study was conducted as a relational screening research, it reports the relationship between breastfeeding self-efficacy and social support, but it cannot make a causal inference between these two variables. Besides, as only primiparous pregnant women who presented to the pregnancy outpatient clinic of a university hospital in Turkey participated in the study, the results cannot be generalized to all primiparous pregnant women.

Conclusions

There exists a positive relationship between pregnant women's breastfeeding self-efficacy and their perceived social support levels. MPSSS family and friend support subscales, and the variables of status of receiving physician support in pregnancy and the status of receiving support from the family affect pregnant women's breastfeeding self-efficacy. It can be recommended that nurses should create social support programs by evaluating primiparous pregnant women's opinions on breastfeeding, their expectations, their status of social support, and their prenatal breastfeeding self-efficacy while providing care for them.

Declarations

Conflict of İnterest

The authors have no conflicts of interest to declare.

Financial Disclosure

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Ethical Committee Approval

The ethics committee of the Necmettin Erbakan University approved this protocol (approval date/number; 23.10.2020/2872)

Availability of Data and Material (Data Transparency)

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

References

1. Corby K, Kane D, Dayus D. Investigating predictors of prenatal breastfeeding self-efficacy. CJNR. 2021:53(1);56-63. DOI: 10.1177/0844562119888363
2. Erkal Aksoy YE, Bay H, Yilmaz SD. Factors affecting primiparous women's breastfeeding self-efficacy levels. Clinical Lactation. 2022:13(2);100-111. DOI: 10.1891/CL-2021-0016
3. Denoual H, Dargentas M, Roudaut S, et al. Father's role in supporting breastfeeding of preterm infants in the neonatal intensive care unit: a qualitative study. BMJ Open. 2016:6(6);104-70. DOI:10.1136/bmjopen-2015-010470
4. Gumusdas M and Ejder Apay S. The relationship between the marital adjustment and social support in pregnancy. Journal of Health Scıence and Professıons. 2016:3(1);1-8. DOI: 10.17681/hsp.16572
5. Bazzano AN, Kaji A, Felker-Kantor,E, et al. Qualitative studies of infant and young child feeding in lower-income countries: a systematic review and synthesis of dietary patterns. Nutrients. 2017:9(10);1140. DOI: 10.3390/nu9101140
6. Wells KJ, Thompson NJ, Kloeblen-Tarver AS. Development and psychometric testing of the prenatal breast-feeding self-efficacy scale. Am J Health Behav. 2006:30(2);177-187. DOI: 10.5993/AJHB.30.2.7
7. Aydin A and Pasinlioglu T. Reliability and validity of a turkish version of the prenatal breastfeeding self-efficacy scale. Midwifery. 2018:64;11-16. DOI: 10.1016/j.midw.2018.05.007
8. Zimet GD, Powell SS, Farley GK, et al. Psychometric characteristics of the multidimensional scale of perceived social support. Journal of Personality Assessment. 1990:55(3-4);610-617. DOI: 10.1080/00223891.1990.9674095
9. Eker D, Arkar H, Yaldız H. Çok Factorial structure, validity, and reliability of revised form of the multidimensional scale of perceived social support. Turkish Journal of Psychology. 2001:12(1);17-25.
10. Nazari M, Ghasemi S, Vafaei H, et al. The perceived social support and its relationship with some of the demographic characteristics in Primigravida pregnant women. Int J Nurs and Midwifery. 2015;7(9):141-45. DOI: 10.5897/IJNM2015.0186
11. Toptaş B, Aksu H, Özsoy S, et al. Social support status and the affecting factors in pregnant women. International Journal of Human Sciences. 2019:16(3);736-745. DOI:10.14687/jhs.v16i3.5618
12. Izadirad H, Niknami S, Zareban I, et al. Effects of social support and self-efficacy on maternal prenatal cares among the first-time pregnant women, Iranshahr, Iran. Journal of Family & Reproductive Health, 2017:11(2);67–73.

13. Hamid SBA and Zaidi NM. Predictors of prenatal breastfeeding self-efficacy in Malaysian women: a cross-sectional study. Jurnal Gizi dan Pangan. 2020:15(1);53-62. DOI:10.25182/jgp.2020.15.1.53-62
14. Khresheh RM and Ahmed NM. Breastfeeding self efficacy among pregnant women in Saudi Arabia. Saudi Medical Journal. 2018:39(11);1116-1122. DOI:10.15537/smj.2018.11.23437
15. Alp Ylmaz F and Uzunçakmak T. Relationship between perceived social support and complaints during pregnancy and their effects on quality of life. Gevher Nesıbe Journal of Medıcal & Health Scıences, 2020:5(9);21-26. DOI: 10.46648/gnj.126
16. Harrison V, Moulds ML, Jones K. Perceived social support and prenatal wellbeing; The mediating effects of loneliness and repetitive negative thinking on anxiety and depression during the COVID-19 pandemic. Women and Birth. 2022:35(3);232-241. DOI: 10.1016/j.wombi.2020.12.014
17. Zhang L, Fu B, Xu Y, et al. Association between social support and perceived stress: a cross-sectional study on staffs of the epidemic prevention during the COVID-19 epidemic in china. Frontiers in Public Health. 2022:1-10. DOI:10.3389/fpubh.2022.844139
18. Matvienko-Sikar K, Pope J, Cremin A, et al. Differences in levels of stress, social support, health behaviours, and stress-reduction strategies for women pregnant before and during the COVID-19 pandemic, and based on phases of pandemic restrictions, in Ireland. Women and Birth, 2023:4(5);447-454. DOI:10.1016/j.wombi.2020.10.010
19. Mirghafourvand M, Malakouti J, Mohammad-Alizadeh-Charandabi S, et al. Predictors of breastfeeding self-efficacy in iranian women: A cross-sectional study. Int J Women's Health Reprod Sci. 2018:6(3);380-85. DOI: 10.15296/ijwhr.2018.62

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The Effect of Shapes of Fruits and Vegetables on Sweet Taste Perception

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ABSTRACT

Purpose: Taste and palatability of foods are important factors for food intake, while in most cases, the first sensory contact with food may occur through sight. We aimed to examine the effects of shapes, a visual factor, on the perceived sweet taste of fruits and vegetables, thus enabling visual cues to increase consumption in the community and promote healthy nutrition.

Methods: We included 30 volunteer participants from the staff of a university in Istanbul. Angular (square and star) and oval (round) shapes are created using standard patterns in six fruits and vegetables. Participants were uninformed about tasting the same fruits and vegetables in different shapes, and the tests were repeated when they were hungry and full.

Results: At varying rates, women and men were affected by differently shaped fruits ($p<0.05$). Women were affected by the shapes of the vegetables ($p<0.05$), but no significant difference was found for men ($p>0.05$). Hunger and fullness did not cause a significant difference in the perceived sweet taste ($p>0.05$). The perceived sweet taste in both fruits and vegetables was affected in the younger participants ($p<0.05$). While there was no significance in the taste scores of overweight individuals ($p>0.05$), the participants with healthy body weights were affected by the serving shapes ($p<0.05$).

Conclusion: Consumption of fruits and vegetables, one of the main contributors to a healthy diet, might be increased with sensory cues among the community. Sex, body weight status, and age group-specified studies on larger sample sizes are recommended.

Keywords: Fruits and Vegetables; Taste Perception; Visual Appearance.

ÖZET

Amaç: Besin alımında tat ve lezzet önemli faktörlerdir; ancak çoğu durumda besinle ilgili ilk duyusal etkileşim görünüş ile kurulabilmektedir. Bu çalışma, görsel bir faktör olan şekillerin meyve ve sebzelerde algılanan tatlı tada etkisini değerlendirmek, böylece toplumda sağlıklı beslenmenin teşviki için tüketimlerinin arttırılmasında görsel ipuçlarından yararlanmayı mümkün kılmaktır.

Yöntem: Çalışmaya İstanbul'da bir üniversitenin personeli olan 30 gönüllü dahil edilmiştir. Altı farklı çeşitte meyve ve sebzede standart kalıplar kullanılarak köşeli (kare ve yıldız) ve oval (yuvarlak) şekiller oluşturulmuştur. Katılımcılara, farklı şekillerde tattıkları meyve ve sebzelerin aynı meyve ve sebze olduğu bilgisi verilmemiştir. Test, katılımcılar açken ve tokken tekrarlanmıştır.

Bulgular: Farklı şekillerde sunulan meyvelerde kadın ve erkekler farklı oranlarda şekilden etkilenmiştir ($p<0,05$). Kadınlar sebzelerin şeklinden etkilenmiş ($p<0,05$), erkeklerde ise önemli bir fark saptanamamıştır ($p>0,05$). Açlık ve tokluk, algılanan tatlı tada etki etmemiştir ($p>0,05$). Hem meyvelerde hem de sebzelerde algılanan tatlı tat, daha genç katılımcılarda şekilden etkilenmiştir ($p<0,05$). Beden kütle indeksi (BKI) değeri >25 kg/m^2 olan fazla kilolu katılımcılarda tat puanlarında anlamlı fark bulunamazken ($p>0.05$), BKI değeri 18,5-24,9 kg/m^2 olan sağlıklı vücut ağırlığına sahip bireyler sunulan şekillerden etkilenmiştir ($p<0.05$).

Sonuç: Sağlıklı bir diyetin ana bileşenlerinden olan meyve ve sebze tüketimi duyusal ipuçları kullanılarak arttırılabilir. Cinsiyet, beden ağırlığı ve yaş gruplarına özelleşmiş, büyük örneklemlerle yapılacak çalışmalara gereksinim vardır.

Anahtar Kelimeler: Meyve ve Sebzeler, Tat Algısı, Görsel Görünüm.

A healthy diet is one of the main contributors to health from prenatal to death. The main purpose of adequate and balanced nutrition is to provide the macro and micronutrients and calories required to fulfill the vital needs of the body, protect and develop health, and maximize the quality of life (1,2).

There are dietary models developed to recommend the main components of a healthy diet, including the Mediterranean diet, the DASH diet, Dietary Recommendation for Americans, and Healthy Eating Plate (MyPlate), all with recommendations for sufficient fruit and vegetable consumption (3). For example, MyPlate is designed as a plate divided into four sections, consisting of 10% fruits and 40% vegetables (2,4). Similarly, the World Health Organization recommends the daily consumption of at least 400 g of fruits and vegetables (1). As fruits and vegetables are rich in fiber, vitamins, and minerals, adequate consumption of fruits and vegetables may reduce the risk of several chronic diseases, including some types of cancer, cardiovascular diseases, and gastrointestinal system diseases; strengthen the immune system; prevent the development of inflammatory diseases (5). According to the Turkey Nutrition and Health Survey (TNHS) conducted by the Turkish Ministry of Health, the rate of those aged 15 and over in Turkey who never consume green leafy vegetables is 4.5%, the rate of those who never consume other fresh vegetables is 12.3%, the rate of those who never consume citrus fruits 4.1%, the rate of those who do not consume other fresh fruits is 3.7% (6).

Food preferences form the basis of individuals' balanced and adequate nutrition. Food preferences of individuals develop depending on many factors, including cognitive, sensory, and environmental factors (7). Sensory factors affecting food preferences are taste, appearance, smell, texture, temperature, and flavor. Although the taste and flavor of foods are the most essential characteristics of individuals, the first contact with food takes place by sight (8). The shape of the food, portion size, color, and volume are the first impressions of the food, and this first impression is suggested to affect the food preferences of the individuals and the portion consumed (9). It is hypothesized that the round shape of the foods to be consumed may create a preliminary signal that the person will perceive a sweet taste at first sight and that they will perceive more bitter and sour tastes if they are in angular shapes such as squares. Thus, visual cues are suggested to increase the consumption of vegetables and fruits in adults. The aim of this study is to determine the effects of the visual appearance of fruits and vegetables on sweet taste and enable interventions to increase the consumption of vegetables and fruits.

Materials and Methods

Participants and Data Collection

This study was conducted in June 2021 with 30 voluntary individuals among the staff of a Private University in Istanbul, Türkiye. The ages of the participants ranged from 26 to 61 years. Inclusion criteria were being between 18 and 65 years of age, not having trauma after intraoral surgery that may affect the sense of taste, not having neuropathy, not using Anti-Parkinson Drugs, not smoking, not having kidney failure, not having a diagnosis of malnutrition, not receiving radiotherapy or chemotherapy treatment.

The data were collected via a face-to-face questionnaire. To make the shapes of fruits and vegetables identical, the same square, round, and star cookie cutters were used in the cutting process. Fruits and vegetables were chosen seasonally: apple, melon, and watermelon for fruits; cucumber, zucchini, and pepper for vegetables. Pieces taken from the same fruit and vegetables were given to the same participant on numbered plates when hungry (at least eight hours after the last meal) in a laboratory environment (food preparation laboratory of the Department of Nutrition and Dietetics). After tasting and scoring each fruit and vegetable, the participants consumed a variety of traditional foods prepared and served by the researchers until they felt entirely full, and the test was repeated immediately afterward. The participants were asked to drink water between the taste tests until there was no distinct taste on the palate. A Likert scale was used for the different shapes of each fruit in each section, with a score of 1 to 5 for the sweetness (1 - very tasteless, 2 - tasteless, 3 - medium, 4 - sweet, 5 - very sweet). Additionally, the sex, age, body weight, and height of the participants were collected. Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters (kg/m^2) (10).

Statistical Analysis

Analyzes were performed using the SPSS 25.0 statistical package program. Non-parametric tests were used as the data showed a non-normal distribution compared to the Shapiro-Wilk normality test. Kruskal Wallis test was performed to determine whether different shapes affect taste

perception in different vegetables and fruits in the whole population. Then, the Friedman test was performed separately according to sex, age, and BMI. The confidence interval was determined as 95%, a p-value <0.05 considered statistically significant.

Results

73.3% (n=22) of the participants were women, and 26.7% were men; 46.7% were between the ages of 26 and 36 years (grouped as young adults), and 46.7% were between 36 and 61 years. There was no significant difference in the scores for the sweet taste of apple and melon in different shapes regarding hunger or fullness (p>0.05). However, there was a statistically significant difference between the scores for the sweet taste of watermelon. Star-shaped watermelon was sweeter when the participants were hungry (p<0.05). There was no significant difference between the scores given for vegetables in different shapes when compared regarding hunger and fullness (p>0.05) (Table 1).

Table 1: Hunger - Full General Test Fruits and Vegetables

		Hungry	Full	
Fruits and Vegetables	**Shape**	Mean	Mean	p
Apple	Square	1.97	2.00	0.868
	Round	2.17	1.98	0.251
	Star	1.87	1.02	1.000
Melon	Square	2.20	2.07	0.723
	Round	1.93	1.90	0.543
	Star	1.87	2.03	0.125
Watermelon	Square	1.93	2.12	0.947
	Round	1.80	1.93	0.724
	Star	2.27	1.95	0.031*
Cucumber	Square	2.20	1.97	0.294
	Round	1.88	1.92	0.701
	Star	1.92	2.12	0.400
Zucchini	Square	2.02	1.97	0.804
	Round	2.17	2.05	0.685
	Star	1.82	1.98	0.414
Pepper	Square	2.12	2.13	0.707
	Round	1.88	1.95	0.660
	Star	2.00	1.92	0.796

*Wilcoxon test; *p<0.05*

When the scores for differently shaped fruits were analyzed regarding the age of the participants, there was a significant difference between hunger and fullness measurements in both young adult and adult groups (p<0.05). According to the scores given for vegetables by two age groups, there was a statistically significant difference in the sweetness level measurements of cucumber, zucchini, and peppers with different shapes in different shapes (p<0.05). However, there was no significant difference in the scores given for the sweet taste of different vegetables in different shapes when the participants were hungry or full for adults (36-61 years old) (p>0.05) (Table 2).

Table 2. The Effect of Shapes on Fruits and Vegetables in Different Age Groups

		Age Groups							
		Young Adult				Adult			
		Hungry		Full		Hungry		Full	
Fruits and Vegetables	**Shape**	Mean	p	Mean	p	Mean	p	Mean	p
Apple	Square	3.04	<0.001*	2.86	<0.001*	2.96	<0.001*	3.11	<0.001*
	Round	3.07		3.18		3.07		2.71	
	Star	2.89		2.96		2.71		2.96	
Melon	Square	3.21	<0.001*	3.25	<0.001*	3.18	<0.001*	2.89	<0.001*
	Round	3		2.75		2.64		3.04	
	Star	2.75		2.96		2.96		2.93	
Watermelon	Square	2.93	<0.001*	3.14	<0.001*	2.96	<0.001*	2.96	0.017**
	Round	2.86		2.86		2.46		2.79	
	Star	3.14		2.89		2.43		2.54	
Cucumber	Square	2.79	0.004**	2.64	0.008**	3.04	0.098	2.39	0.649
	Round	2.61		2.75		2.21		2.29	
	Star	2.82		2.82		2.18		2.71	
Zucchini	Square	2.89	<0.001*	2.79	<0.001*	2.36	0.773	2.29	0.698
	Round	3.29		3		2.36		2.46	
	Star	2.36		2.82		2.64		2.5	
Pepper	Square	3	0.001**	3.14	<0.001*	2.64	0.355	2.5	0.998
	Round	2.75		2.79		2.11		2.54	
	Star	2.68		2.64		2.75		2.46	

*Freidman test; *p<0.01; **p<0.05*

When the scores were evaluated regarding the BMI of the participants, there was a significant difference in the scores of the sweet taste of the differently shaped fruits when the participants were hungry and full (p<0.01). In participants with normal body weight, there was a significant difference in sweetness scores between the repeated measurements of differently shaped cucumber, zucchini, and pepper in hunger and fullness (p<0.05), while there was no significant difference in overweight individuals (p>0.05) (Table 3).

Table 3: The Effect of Shapes on Fruits and Vegetables in Normal Weight and Overweight Individuals

Fruits and Vegetables	Shape	BMI							
		Normal body weight				Overweight			
		Hungry		Full		Hungry		Full	
		Mean	p	Mean	p	Mean	p	Mean	p
Apple	Square	3.08		3.27		2.90		2.70	
	Round	3.18	<0.001*	3.00	<0.001*	3.07	<0.001*	3.00	<0.001*
	Star	2.68		2.68		2.80		3.17	
Melon	Square	3.23		3.23		3.07		2.90	
	Round	2.95	<0.001*	2.95	<0.001*	2.83	<0.001*	2.83	<0.001*
	Star	2.82		2.77		2.83		3.03	
Watermelon	Square	2.95		3.32		2.90		2.77	
	Round	2.55	<0.001*	2.82	<0.001*	2.70	<0.001*	2.87	0.001**
	Star	3.45		2.55		3.10		2.93	
Cucumber	Square	3.09		2.64		2.83		2.17	
	Round	2.59	0.001*	2.68	0.035*	2.07	0.15	2.37	0.166
	Star	2.59		2.82		2.30		2.57	
Zucchini	Square	2.95		2.82		2.40		2.20	
	Round	2.91	0.002*	2.68	0.017*	2.80	0.359	2.83	0.345
	Star	2.68		2.68		2.13		2.53	
Pepper	Square	2.86		2.68		2.77		2.80	
	Round	2.55	0.009*	2.86	0.011*	2.33	0.686	2.50	0.504
	Star	2.95		2.73		2.43		2.33	

*Freidman test; *p<0.01; since 1 of the participants was found to be below normal body mass index and 1 of them was obese, they were not included in the statistical comparative analysis. BMI; Body Mass Index*

There was a significant difference in the scores for the sweet taste of fruits in both men and women tested as hungry and full (p<0.01). For vegetables, there was a significant difference between the scores for cucumber, zucchini, and pepper in different ways in women (p<0.01). However, there was no significant difference in men (p>0.05) (Table 4).

Table 4: The Effect of Shapes on Fruits and Vegetables in Different Sex

Fruits and Vegetables	Shape	Sex							
		Women				Men			
		Hungry		Full		Hungry		Full	
		Mean	p	Mean	p	Mean	p	Mean	p
Apple	Square	2.91		3.02		3.13		2.88	
	Round	3.16	<0.001*	3.02	<0.001*	3.13	<0.001*	2.94	0.002**
	Star	2.91		2.93		2.69		3.06	
Melon	Square	3.20		3.07		3.13		3.00	
	Round	3.00	<0.001*	2.86	<0.001*	2.63	0.012	2.81	0.001**
	Star	2.80		3.02		2.88		3.00	
Watermelon	Square	2.84		3.16		3.13		2.75	
	Round	2.80	<0.001*	2.75	<0.001*	2.69	0.001**	3.13	<0.001*
	Star	3.32		2.84		3.06		3.00	
Cucumber	Square	3.02		2.75		2.56		2.25	
	Round	2.66	<0.001*	2.73	<0.001*	2.19	0.682	2.06	0.172
	Star	2.55		2.89		2.81		2.75	
Zucchini	Square	2.89		2.77		2.25		2.50	
	Round	3.09	<0.001*	2.93	<0.001*	2.38	0.591	2.31	0.921
	Star	2.57		2.77		2.44		2.56	
Pepper	Square	3.00		2.95		2.56		2.88	
	Round	2.61	<0.001*	2.91	<0.001*	2.44	0.958	2.13	0.315
	Star	2.87		2.66		2.63		2.75	

*Freidman test; *p<0.01; **p<0.05*

Discussion

Nutrition is a psychological and physiological factor for humans. The individual's first relationship with food is known as the cephalic phase. It starts with thinking, seeing, and sniffing (11-13). Various sensory cues such as appearance, taste, smell, texture, temperature, and flavor are effective at the individual's food intake level (14). Although the taste of foods is an important factor that regulates food intake, in most cases, the first sensory contact with food occurs through seeing (15). Few studies examine the effects of food's appearance during service on food acceptance and consumption.

It was thought that the round shape of the foods to be consumed could create a preliminary signal that the person would perceive a sweet taste at first sight and that they would perceive more bitter and sour tastes with angular shapes such as squares (14). In previous studies, different results were obtained regarding the effect of food shape, and each study was conducted with different groups and foods. For example, according to a survey conducted with volunteers between the ages of 20-50, it is suggested that the round shape of the foods to be consumed may create a preliminary signal that the person will perceive a sweet taste at first sight and that they will perceive more bitter and sour tastes if they are in square, angular shapes (14). In another study evaluating the relationship between basic tastes and visual cues, in an online survey with 131 eligible participants, participants were asked to rate their sweet, sour, bitter, and salty tastes on a Likert scale by showing food animations in different colors and shapes. The sweet taste and red color were paired with a round shape, while the sour and green colors matched (15). Wang et al. used different, identical dark chocolates and asked the participants to enumerate the differences between sweetness, bitterness, and creamy feel. In addition, the expectations for each chocolate were asked to be rated before tasting, and the post-taste and pre-taste expectations were compared. As a result, they concluded that the expectation and post-tasting thought were parallel, and the shape of the chocolate significantly affected the tasting. The round ones were less sweet, more bitter, and less creamy, and the square ones were sweeter and creamier than the round ones (16).

According to the study of Slavin et al., hunger and feeling of fullness affect food preferences (17), and we found that individuals were more sensitive to sweet taste perception in the case of hunger as supported by Khobragade et al. (18). To understand the effect of age groups on the perception of sweet taste in different ways, the participants were divided into two groups. Young adults aged 26 to 35 years were classified as adults aged 36 to 61 years. There was no statistically significant difference in the sweet taste level of different presentations of vegetables in both hunger and fullness states in adults. In young adults, different shapes stood out in different vegetables and fruits. This may be due to a decrease in taste sensitivity with age. In a study published by Fukunaga et al. in 2005, the change in the threshold and capacity of sweet, salty, sour, and bitter taste perceptions was investigated with 30 healthy young and adult volunteers (19). Similar to our results, it was observed that especially sweet taste perception was significantly lower in older adults. The reason for this is suggested to be the decrease in sweet taste sensitivity with advancing age, as the effects of physiological aging on the perception of taste are represented by the alterations of taste cells and the reduction of salivary production (20). Even our sample did not involve older people. The perception of salty, bitter, and sour tastes did not change as significantly as the sweet taste. Cucumber star-shaped, squash round-shaped, and pepper square-shaped in young adults were recorded as sweeter. While there was no difference in vegetables in adults, a difference was observed in fruits. This may be because vegetables have a lower sweet taste than fruits. This difference may have been seen because the sweet taste level of the fruits was more dominant. Apples were found to be sweeter in round shape in both adults and young adults when hungry and full, while the shapes of melon and watermelon varied. Young adults found square melon sweeter when hungry and full, older adults found square melon sweeter when hungry, and round melon when full. Young adults found the watermelon sweeter when starved and square when full, while adults found the square watermelon sweeter. When the fruits in every age group are examined in general, it is seen that the square shape comes to the fore. Especially for melons and watermelons, the square shape of the fruit with a softer structure caused the fruit to be perceived as sweeter.

Additionally, we evaluated the variation of the results according to body weight. Overweight participants did not report a difference in sweet taste levels in the different shapes of vegetables, as it is suggested that there might be a negative correlation between the increase in BMI and sweet taste sensitivity (21).

The sweet taste level was also affected by different shapes when analyzed regarding sex. Various results have been

obtained for different fruit shapes in both men and women. However, when vegetables were considered, there was a difference in women, while there was no difference in men. The main reason men do not differ in the sweet taste of different shapes of vegetables may be the resistance of men participants to vegetable consumption. It has been suggested that taste sensitivity is more prone to deteriorate in men than in women, which may be due not only to genetic factors but also to factors such as lifestyle-related diseases, medications for the diseases, and smoking and drinking habits (22). In the laboratory environment, men participants did not want even to taste the vegetables and had to taste them to complete the study. The dislike they felt towards vegetables may have also affected their perceived taste. Looking at the statistics, it is seen that men already give low scores to every shape of vegetable. In public health nutrition, the vegetable consumption of men in Turkey should be investigated, and this issue should be given importance in future studies. Although a recent cross-sectional study from Turkey has reported the quantities of vegetable and fruit intake were higher in men (23), regarding the results of TNHS men of the age group of 19-64 years, the frequency of those who never consumed green leafy vegetables was 5.6%, the frequency of those who consumed them every day was 21.6%, and the frequency of those who never consumed other fresh vegetables (leek, cabbage) was 19.4%, the frequency of those who consumed them every day was 1.7% (6). This prejudice of men against vegetables should be known when intervention in the consumption of vegetables and fruits in society. In women, more significant differences were seen in the fasting state, where taste sensitivity was higher for vegetables except cucumber. Cucumbers and pepper were perceived as sweeter in square shape and zucchini in round shape when hungry. This may be because cucumbers and peppers are more crunchy, firm, and chewy, while zucchini is softer. Only cucumbers gave significant results in fullness among women. Star-shaped was perceived as sweeter. In this case, it may be suggested that cucumber is perceived as sweeter in angular shapes when hungry or full, but soft foods such as zucchini are perceived as sweeter in round shapes, and women are more sensitive to vegetable taste than men.

Conclusion

Further, participants could be asked about their expectation of sweet taste when they saw different shapes of vegetables and fruits, and the result could be compared with the expectation. In this case, while the pre-tasting expectation was lacking in our study, the post-tasting evaluation was missing in most similar studies. This may be considered in future studies. Moreover, sex, body weight status, and age group-specified studies on larger sample sizes are strongly recommended.

Declarations

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Conflicts of İnterest/Competing İnterests

The authors have no conflicts of interest to disclose.

Ethics Approval

This study was performed with the ethical approval of the Research Ethics Committee of Yeditepe University with decision number 1394 dated 03/03/2021, project number 2080 (could be provided upon request). The authors declare that all experiments on human subjects were conducted under the Declaration of Helsinki and that all procedures were carried out with the subjects' adequate understanding and written consent.

Availability of Data and Material

The authors can provide the original data.

Authors' Contributions

The first author conceived and designed the analysis, collected the data, performed the data analysis, and wrote the paper. The second author conceived and designed the analysis and wrote the paper.

References

1. World Health Organization. Diet, nutrition, and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation. World Health Organization; 2003 Apr 22. https://www.who.int/publications/i/item/924120916X Accessed at: 9 June 2021.
2. Good-bye pyramid, hello food plate. USDA scraps food pyramid in favor of an easier model. Johns Hopkins Med Lett Health After 50. Dec 2011;23(10):3.
3. Locke A, Schneiderhan J, Zick SM. Diets for Health: Goals and Guidelines. Am Fam Physician. 2018 Jun 1;97(11):721-728.

4. Ruggiero L, Seltzer ED, Dufelmeier D, McGee Montoya A, Chebli P. MyPlate Picks: Development and Initial Evaluation of Feasibility, Acceptability, and Impact of an Educational Exergame to Help Promote Healthy Eating and Physical Activity in Children. Games Health J. Jun 2020;9(3):197-207. doi:10.1089/g4h.2019.0056

5. Kahlon TS, Smith GE. Health Benefits of Grains, Fruits, and Vegetables and the USDA Food Guide Pyramid1. Cereal foods world. 2004 Sep 1;49(5):288.

6. T.C. Sağlık Bakanlığı. Türkiye Beslenme ve Sağlık Araştırması (TBSA) 2017. Sağlık Bakanlığı Yayınları, Ankara. 2019. https://hsgm.saglik.gov.tr/depo/birimler/saglikli-beslenme-ve-hareketli-hayat-b/Dokumanlar/Ingilizce_Yayinlar/TBSA_RAPOR_KITAP_2017_ENG_.pdf. Accessed at: 9 June 2021.

7. Franchi M. Food choice: beyond the chemical content. International Journal of Food Sciences and Nutrition. 2012;63(sup1):17-28.

8. Wadhera D, Capaldi-Phillips ED. A review of visual cues associated with food on food acceptance and consumption. Eat Behav. Jan 2014;15(1):132-43. doi:10.1016/j.eatbeh.2013.11.003

9. Huisman G, Bruijnes M, Heylen D. A Moving Feast: Effects of Color, Shape and Animation on Taste Associations and Taste Perceptions. 2016:1-12.

10. Centers for Disease Control and Prevention. Healthy Weight, Nutrition, and Physical Activity. https://www.cdc.gov/healthyweight/assessing/bmi/index.html Accessed at: 9 June 2021

11. Özenoğlu A, Hatemi H. Obez Kadınlarda Tatlı Tad Duyusu Uyarısına Sefalik Faz İnsülin Cevabı. Beslenme ve Diyet Dergisi. 2001;30(1):4-11.

12. Mattes RD. Sensory influences on food intake and utilization in humans. Hum Nutr Appl Nutr April 41(2):77-95, 1987

13. Bruce DG, Storlien LH, Furler SM, Chisholm DJ. Cephalic phase metabolic responses in normal weight adults. Metabolism. 1987 Aug 1;36(8):721-5.

14. Wadhera D, Capaldi-Phillips ED. A review of visual cues associated with food on food acceptance and consumption. Eating behaviors. 2014;15(1):132-143.

15. Huisman G, Bruijnes M, Heylen DK. A moving feast: effects of color, shape, and animation on taste associations and taste perceptions. 2016:1-12.

16. Wang QJ, Carvalho FR, Persoone D, Spence C. Assessing the effect of shape on the evaluation of expected and actual chocolate flavor. Flavour. 2017;6(1):1-6.

17. Slavin JL, Lloyd B. Health benefits of fruits and vegetables. Adv Nutr. Jul 1 2012;3(4):506-16. doi:10.3945/an.112.002154

18. Khobragade RS, Wakode SL, Wakode NS. Effect of fasting and satiety state on taste perception among healthy male adults. World J Pharm Med Res. 2018;4(3):252-5.

19. Fukunaga A, Uematsu H, Sugimoto K. Influences of Aging on Taste Perception and Oral Somatic Sensation. The Journals of Gerontology: Series A. 2005;60(1):109-113. doi:10.1093/gerona/60.1.109

20. Alia S, Aquilanti L, Pugnaloni S, Di Paolo A, Rappelli G, Vignini A. The influence of age and oral health on taste perception in older adults: A case-control study. Nutrients. 2021 Nov 21;13(11):4166.

21Beyhan Y, Bozkurt N. Zayıf, Normal ve Şişman Bireylerin Tat Duyularının Araştırılması. Beslenme ve Diyet Dergisi. 1994;23(2):191-196.

22. Yoshinaka M, Ikebe K, Uota M, Ogawa T, Okada T, Inomata C, Takeshita H, Mihara Y, Gondo Y, Masui Y, Kamide K. Age and sex differences in the taste sensitivity of young adult, young-old and old-old J apanese. Geriatrics & gerontology international. 2016 Dec;16(12):1281-8.

23. Hizli-Guldemir H, Saleki N, Sezer FE, Yoldas-Ilktac H, Akman C, Ersoy G, Garipagaoglu M. Vegetable and Fruit Consumption and Its Relationship with Body Mass Index in Adults: A Cross-Sectional and Seasonal Research from Türkiye. International Journal of Environmental Health Research. 2023 Nov 2;33(11):1168-79.

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Validity and Reliability of 360 Degree Healthcare Leadership Model

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ABSTRACT

Purpose: Leadership assessments in the literature based on only self-assesment but this is not enough anymore. It could be evaluated by all stakeholders. The objective of this study was to investigate the goodness of fit of 360 degree healthcare leadership scale developed by National Health System Leadership Academy in Turkish population and carry out reliability and validity of the 360 degree healthcare leadership model.

Methods: This is a questionnaire validation study. Leadership skills, self-assesment of 171 healthcare managers working in 10 public hospitals; It was carried out with the evaluations made by subordinates, superiors and counterparts. Apart from the self-assesment of 171 health managers; They were also evaluated by their peers, direct reports, and managers a total of 750 people participated in the research (171 self-evaluation, 579 peers, direct reports, and managers evaluations). Validity, internal consistency and CFA was conducted in this study via SPSS and SPSS AMOS software.

Results: Item-total correlation was above 0.30. The Cronbach's α values were between 0.72 and 0.86 in sub dimensions. Construct validity scores are as follows: CMIN/DF: 2.32; CFI: 0.89; GFI: 0.77; NFI: 0.83; IFI: 0.90.

Conclusion: Turkish version of 360 degree healthcare leadership model which included 9 dimensions was approved its applicability in Turkish healthcare organizations and it could be a valuable measurement tool for effective leadership.

Keywords: Healthcare Leadership. 360 Degree Evaluation. Reliability. Validity.

ÖZET

Amaç: Literatürdeki liderlik çalışmaları yalnızca öz değerlendirmeye dayalıdır ancak bu artık yeterli değildir. Liderlik becerilerinin tüm paydaşlar tarafından değerlendirilmesi gerekir. Bu çalışmanın amacı, İngiltere Ulusal Sağlık Sistemi Liderlik Akademisi tarafından geliştirilen 360 derece sağlık liderliği ölçeğinin uyarlamasını yapmak ve 360 derece sağlık liderliği modelinin güvenirlik ve geçerliliğini ortaya koymaktır.

Yöntem: Bu bir geçerlilik güvenilirlik çalışmasıdır. 10 kamu hastanesinde görev yapan 171 sağlık yöneticisinin liderlik becerileri, öz değerlendirme; astların, üstlerin ve mevkidaşların yapmış oldukları değerlendirmelerle gerçekleştirilmiştir. 171 sağlık yöneticisi öz değerlendirmeleri haricinde; astları, üstleri ve mevkidaşları tarafından da değerlendirilmiştir ve toplamda 750 kişi araştırmaya katılmıştır (171 öz değerlendirme, 579 ast, üst ve mevkidaş değerlendirmesi). Bu çalışmada geçerlik, iç tutarlılık ve DFA (Doğrulayıcı Faktör Analizi), SPSS ve SPSS AMOS yazılımları kullanılarak yapılmıştır.

Bulgular: Madde-toplam korelasyonu 0,30'un üzerindedir. Alt boyutlarda Cronbach α değerleri 0,72 ile 0,86 arasında bulunmuştur. Yapı geçerliliği puanları şu şekildedir: CMIN/DF: 2,32; CFI: 0,89; GFI: 0,77; NFI: 0,83; IFI: 0,90.

Sonuç: 9 boyutu içeren 360 derece sağlık liderliği modelinin Türkçe versiyonunun Türk sağlık kuruluşlarında uygulanabilirliği onaylanmıştır ve etkili liderlik için değerli bir ölçüm aracı olması beklenmektedir.

Anahtar Kelimeler: Sağlık Hizmetlerinde Liderlik. 360 Derece Değerlendirme. Güvenilirlik. Geçerlilik.

Leadership is one of the most important components of the organizational process and plays a key role in improving the performance of health systems and units (1). Accordingly, leadership development is widely recognized around the world as a critical activity for improving healthcare outcomes (2). Leadership must implement policies, practices and systems that affect the behavior, attitudes and performance of its members in the organization in order to increase its competitiveness and learning capacity and to develop the organization in a sustainable way over time (3).

Today, health systems are considered as complex systems and are often described as unpredictable. Therefore, it requires effective leaders who can drive team, organization and system dynamics (4, 5). Health systems are structures that are undergoing major changes. Structures that are under pressure to increase quality and access while also having to meet cost efficiency targets (6). This situation is valid in all health systems, but low- and middle-income countries are more affected by this situation. Resource scarcity and crises in countries make it even more important to develop leadership in healthcare workers (7). In particular, the current COVID-19 pandemic has demonstrated how important leadership is for healthcare businesses (8).

Technological, political and economic developments have advanced leadership approaches towards more collaborative and sharing leadership. Differentiating human expectations also played an important role in this change (9). In a report published by the World Health Organization, it was stated that the health worker shortage is 2.7 million and this shortage is expected to be around 12.9 million by 2035 (10). Despite the limited resources and the shortage of health professionals, the pressure to improve the quality of health services, the ever-increasing demand for health, the need for efficiency and productivity are increasing day by day. Meeting expectations within the modern healthcare system requires effective leadership of healthcare professionals (11). As the need for leadership for a strong health system increases, health policy and systems researchers are working on how to support leadership development (7).

360-degree assessments are becoming increasingly popular in organizations as a component of performance appraisal. 360-degree assessments reflect not only individuals' perspectives on their own leadership skills, but also the perspectives of their colleagues, managers, and direct reports. One assumption behind 360-degree assessments is that individual perceptions are likely to differ from those of colleagues, and these inconsistencies provide valuable feedback to the leader (12). Therefore, traditional approaches to leadership training and leadership practices in health care are no longer sufficient to address the problems leaders face in the contemporary health environment (13).

The basic premise behind 360-degree feedback is that it receives feedback from managers, direct reports, and peers on leader effectiveness. The 360-degree feedback process, which has recently been used frequently in leadership development, provides benefits in understanding other stakeholders. It can be said that organizations are now more inclined to use 360-degree feedback or multi-rater tools to identify differences in leadership perception (14). In essence, 360-degree feedback tools are considered useful because of the assumption that different groups of evaluators each offer unique and meaningful perspectives on the performance of a goal (15).

Material and Methods

Study Design and Ethical Considerations

The aim of this research is to adapt the "360 Degree Healthcare Leadership Model" developed by the NHS Leadership Academy to the Turkish Health System and to test its validity and reliability. This study designed as quantitative cross-sectional study. The research was carried out between December 2020 and March 2021. Ethics committee approval was received from Istanbul University Social and Human Sciences Research Ethics Committee for the research.

Participants and Study Size

The population of the research consists of health professionals who are in charge of management in 10 public hospitals. Hospitals were determined by statistical draw method. The names of the hospitals were written in a bag and the hospitals were determined as a result of a draw. In the study, convenience sampling method was used. 750 health managers participated in the research. As a result of the matching, it was determined that the 360-degree evaluation of 171 health managers completed. Response rate was 92%.

Study Protocol

Managers started by completing a self-assessment form. Afterwards, the peers evaluated each other. The managers, who were evaluated by their managers, were also evaluated by their direct reports, and finally the 360-degree evaluation was completed. In 360-degree evaluation, the evaluations of self-assessment, line manager, peers and direct reports have the same weight. They all 25% effect on total score. The most important inclusion criterion for the research was determined to be in a managerial position.

Assessment Tool

The Healthcare Leadership Model Assessment Tool, which was developed by NHS Leadership Academy and The Open University Business School, was used as a data collection tool in the research.

The scale consists of 9 dimensions and 27 questions. Along with the scale, the demographic information of the self-assessed managers were also collected. Language and content validity of the scale form was made, and then construct validity and reliability analyzes were carried out. Dimensions of the scale are: Inspiring shared purpose, Leading with care, Evaluating information, Connecting our service, Sharing the vision, Engaging the team, Holding to account, Developing capability, Influencing for results.

Statistical Analysis

In the research, the data were evaluated using statistical package programs such as SPSS 20, SPSS AMOS Graphics 26 and Microsoft Excel. Frequency analysis, confirmatory factor analysis, Kaiser-Meyer-Olkin Sample Adequacy and Bartlett Test, SEM goodness of fit indexes was used in data analysis. Cronbach's Alpha coefficient and item-total correlation were used for the reliability analysis and the Lawshe technique was used to test the content validity index.

Results

Demographic Characteristics

The research was carried out with managers working in 10 public hospitals in Istanbul. The median age of those who support the research is 40. Of the 171 healthcare manager 60% was women and of the managers 45% have postgraduate education degree. The rate of participants with a bachelor's degree is approximately 42% (n=72). When the duties of the managers participating in the research were examined, approximately 65% of them were unit managers, approximately 20% were managing director and assistant managers, and the remaining 15% were head physician and unit coordinators. While 83.6% (n=143) of the participants stated that they were satisfied with their work, 3.5% (n=6) stated that they were not satisfied and 12.9% (n=22) stated that they were undecided on this issue.

Translation and Cross-Cultural Adaptation of 360 Degree Healthcare Leadership Questionnaire

The scale used in the research is in English. Firstly researchers translated the original version into Turkish. Later, translations from English to Turkish and from Turkish to English were made by academics who are experts in the field of health management and management organization. Finally, linguists joined the team and the questions were finalized. Scale statements were applied to 10 health professionals and a questionnaire form was created with their feedback. There was no change in the translation of items based on feedbacks.

Content Validity

The Lawshe technique was used to test the content validity of the scale form. While Lynn (1986) emphasizes that the content validity index (CVI) value should be at least 83%, Büyüköztürk (2012) states that it should be between 90%-100%. In this context, 6 academicians who are experts in the field of health management and 2 health administrators were asked for their opinions on the scale expressions as "Necessary-Useful/Insufficient-Unnecessary". Content validity index was calculated with the formula "CVI=[N/(n/2)]-1" (16). According to the data, it was concluded that the CVI was 0.93 and it was decided that all items in the scale should remain

Construct Validity

In the scale, 360 degree evaluation results were obtained by using the averages of the answers, all of which were considered equally important in self-evaluation, evaluation of direct reports, evaluation of line managers and evaluation of peers.

The suitability of the tested structure for factor analysis even only confirmatory factor analysis was applied was evaluated with the Kaiser-Meyer-Olkin Sample Adequacy and Bartlett Test. According to the test result, values above 0.90 indicate perfect fit. In the research carried out, it was concluded that this value was 0.95. The result of the Barlett test was also less than 0.05, indicating that it is suitable for factor analysis. Since the scale's dimensions were previously determined by the NHS Leadership Academy, only confirmatory factor analysis was applied (17). All factor loads were above 0.70.

When the values in the model are examined within the scope of confirmatory factor analysis, CMIN/DF value is 2.07; the CFI value is 0.95; the GFI value is 0.86; NFI value is 0.90; IFI 0.94; It was observed that the RMR value was 0.00 and the RMSEA value was 0.08 (Table 1). Based on these results, it was concluded that the data obtained within the scope of the research were compatible with the tested model.

Table 1: 360 Degree Healthcare Leadership Model Goodness of fit indexes

CMIN/DF	CFI	GFI	NFI	IFI	RMR	RMSEA
(≤3-5)	**(≥0,95)**	**(≥0,90)**	**(≥0,90)**	**(≥0,90)**	**(≤0,05)**	**(≤0,08)**
2,07	0,95	0,86	0,90	0,94	0,00	0,08

In the first analysis, the values of goodness of fit were Chi-square/SD (CMIN/DF): 2.32; The CFI value is 0.89; The GFI value is 0.77; The NFI value is 0.83; IFI 0.90; It was observed that the RMR value was 0.01 and the RMSEA value was 0.08. In this context, modifications were made to the model and outliers were excluded. Then, the factor loads of S7 and S24, which were below 0.70, were removed from the model. As a result of the evaluations, the questions S1, S12, S13 and S25 were also removed from the scale due to the decrease in model fit (acting differently from the general distribution) and the scale took its final form.

Standardized factor loads, standard error values, t values and significance (p) values for factor analysis are given in Table 2. According to the results of the analysis, it was concluded that the t values were significant (p<0.05).

Table 2: Confirmatory factor analysis results of 360 degree leadership scale

Sub Dimensions	Items	Standardized Regression Weigths	Standart Error	t	p
Inspiring shared purpose	S2	0.860	0.069	13.685	***
	S3	0.874	*	*	*
Leading with care	S4	0.855	0.097	11.404	***
	S5	0.814	0.072	12.934	***
	S6	0.873	*	*	*
Evaluating information	S8	0.826	0.063	13.579	***
	S9	0.873	*	*	*
Connecting our service	S10	0.805	0.075	12.154	***
	S11	0.817	*	*	*
Sharing the vision	S13	0.760	0.089	11.357	***
	S14	0.747	0.095	11.098	***
	S15	0.809	*	*	*
Engaging the team	S16	0.831	0.085	11.931	***
	S18	0.766	*	*	*
Holding to account	S19	0.747	*	*	*
	S20	0.815	0.138	11.149	***
Developing capability	S22	0.875	0.078	13.369	***
	S23	0.810	*	*	*
Influencing for results	S25	0.855	0.11	12.676	***
	S26	0.832	0.125	12.233	***
	S27	0.824			

**** p<0.001, * Standard error, t and p values are not calculated in expressions whose regression coefficient is equal to 1.*

As a result of the analyzes made, the 360 degree healthcare leadership scale model, which has a 9 dimensions structure, provided construct validity and the final version of the model is presented in Figure 1.

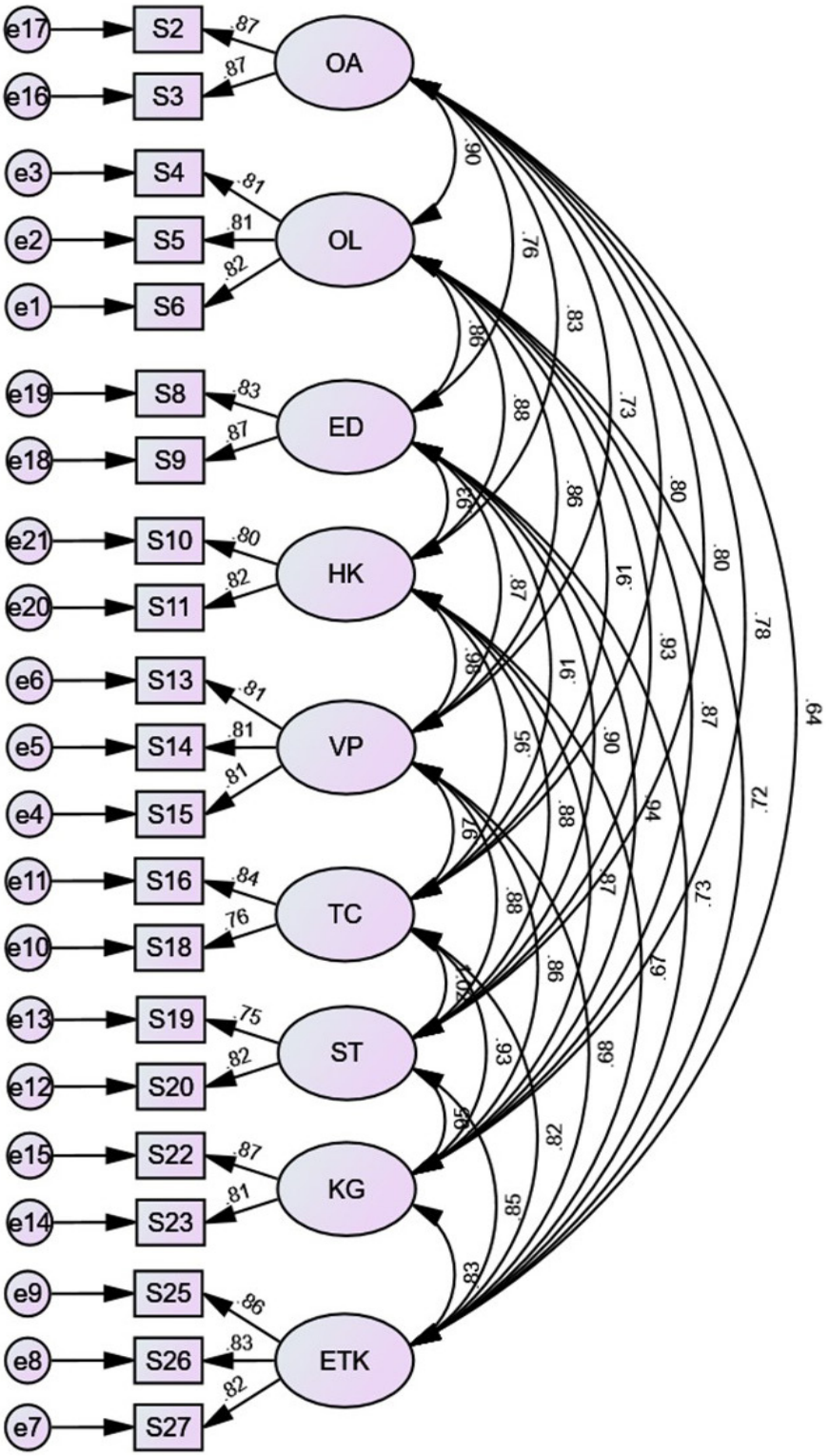

Figure 1: Final Version of Model

Appendix A. Final Turkish Version of the scale						
1	Ekibim, yaptıkları işin, hasta hizmeti ve diğer sağlık hizmet kullanıcıları üzerindeki etkilerini açık bir şekilde anlayabilir	1	2	3	4	5
2	Ekibim, sağlık hizmetini geliştirmek konusunda engellerle başa çıkmak için desteklediğini düşünür	1	2	3	4	5
3	Ekibim işinde kendilerine değer verildiğini hisseder	1	2	3	4	5
4	Çalıştığım ekip, karşılıklı olarak birbirlerine önem ve destek verir	1	2	3	4	5
5	Çalıştığım ekip, üzüntü veren duygularla baş ederken birbirlerini desteklerler	1	2	3	4	5
6	Ekip içindeki kararlar araştırmalara ve kanıta dayalı olarak alınır	1	2	3	4	5
7	Bu ekipte mevcut çalışma şeklini geliştirmek için yaratıcı yeni uygulamalar kullanılırız	1	2	3	4	5
8	Hizmetimizi alanlardan düzenli olarak geri bildirimleri toplar ve harekete geçiririz	1	2	3	4	5
9	Ekibim, yaptığı işlerin takımın ötesinde bir katkı sağladığını düşünmeye teşvik edilir	1	2	3	4	5
10	Ekibim, sağlık hizmetinin tüm bileşenlerini etkili bir şekilde birbirine bağlar	1	2	3	4	5
11	Ekibim gelecek için açıkça tanımlanan vizyona hizmet ettiğini düşünür	1	2	3	4	5
12	Ekibim geleceğe ilişkin belirlenmiş bir vizyona ulaşmak için nasıl çalışacağı konusunda iyimserdir	1	2	3	4	5
13	Ekibim anlaşmazlığa neden olan karmaşık değişim süreçlerinde, iyi liderlikle güvence ve ilham alır	1	2	3	4	5
14	Ekibim, yaptığı işlere katkılarının değerli olduğunu hisseder	1	2	3	4	5
15	Takımın amaçları ve kişisel hedefler arasında denge kurma hususunda ekibim desteklenir	1	2	3	4	5
16	Ekibim, işinde kendilerinden ne beklendiğini bilir	1	2	3	4	5
17	Ekibim, performanslarını yükseltmeye yardımcı olması için yapıcı geri bildirimler alır	1	2	3	4	5
18	Bu ekibin yüksek beklentileri vardır. Sıradanlık fark edilir ve sıradanlıkla mücadele edilir	1	2	3	4	5
19	Ekibime işini öğrenmesi ve işinde gelişmesi için fırsatlar verilir	1	2	3	4	5
20	Ekibim güçlü ve zayıf yanlarının neler olduğunu bilir	1	2	3	4	5
21	Ekibim, örgütsel amaçlara ulaşmak için hem ekip içinde, hem de ekip dışında ilişkiler kurmaya teşvik edilir	1	2	3	4	5
22	Ekibimizde, işimizi yaparken semboller ve hikayeler gibi farklı iletişim yöntemleri kullanırız	1	2	3	4	5
23	Resmi ve resmi olmayan iki yönlü iletişim kanalları bu ekibin normlarındandır	1	2	3	4	5

Cronbach's Alpha coefficient and item-total correlation were used for the reliability analysis of the 360 degree leadership scale. According to the results obtained, the Cronbach's Alpha coefficient of the 360 degree leadership scale was determined as 0.96. This value indicates that the reliability of the scale is extremely high. As a result of the reliability analysis for the sub-dimensions, Cronbach's Alpha coefficients are presented in Table 3. Accordingly, it is seen that all factor loads are above 0.70.

Table 3: Reliability and Inter Item Correlations

Items	Inter Item Correlations	Sub-Dimensions	Cronbach's Alpha	Mean Score
S2	.722	Inspiring shared purpose	0.86	4.54
S3	.730			
S4	.759	Leading with care	0.84	4.44
S5	.690			
S6	.751			
S8	.767	Evaluating information	0.84	4.22
S9	.784			
S10	.752	Connecting our service	0.80	4.35
S11	.739			
S13	.725	Sharing the vision	0.85	4.37
S14	.704			
S15	.778			
S16	.814	Engaging the team	0.76	4.51
S18	.735			
S19	.731	Holding to account	0.72	4.51
S20	.767			
S22	.772	Developing capability	0.80	4.43
S23	.743			
S25	.692	Influencing for results	0.86	4.13
S26	.685			
S27	.690			

When the item-total correlations in which the consistency of the items with the scale are examined, it is concluded that the correlation values of each of the statements with the scale are above 0.30 (Table 3).. On the other hand inter item correlations ranged from 0.68 to 0.81, which exceed the lower limit of 0.30 proposed by Cortina (1993), using SPSS version 20. Thus, scale shows a significant level of consistency, or internal reliability (18).

On the other hand mean scores of the assessment was as follows: Mean score of the self-assessment was 4.31±0.55, peers' assessment score was 4.37±0.58, direct reports' assessment score was 4.38±0.49, and managers' assessment score was 4.53±0.48. Mean scores of the factors were given in the Table 3.

Discussion

A validity and reliability study must have internal consistency and construct validity (19). In this study language validity, content validity, internal consistency and construct validity were tested.

360 degree healthcare leadership Turkish version showed an adequate level of understanding according to the study sample. The values for validity, and reliability proved to be acceptable. According to the literature, It is stated that 0.30 and above are accepted for item-total correlation (20). In this study all items are above 0.30 (0.68-0.81). Additionally, the Cronbach's α coefficients are between 0.72-0.86. As a result of the reliability analysis, researchers concluded that removing any item would not make a positive contribution and the internal consistency coefficient values in all sub-dimensions were above 0.70. As the conditions are met no item excluded from the scale in this stage. It shows a significant level of internal consistency. The results are compatible with the literature.

The factor loadings found in the Turkish version of the 360 degree healthcare leadership scale were higher than 0.74 (0.74-0.87) according to the confirmatory factor analysis, which is considered adequate in the literature (21).

When the validity and reliability studies carried out in the field of healthcare leadership in the national and international literature are examined, it is seen that the findings we obtained for construct validity in our research (CMIN/DF: 2.32; CFI: 0.89; GFI: 0.77; NFI: 0.83; IFI: 0.90) are similar to the results of the published study (1, 22, 23). When the findings from the literature on leadership and our findings are evaluated together, it is concluded that the results obtained meet the sufficient requirements.

Conclusions

In the present study, the leadership skills of 171 healthcare managers were evaluated by all stakeholders, including self-reports, peers, managers, and direct reports. Some healthcare professionals have been evaluated by more than one peer and/or direct report. In this case, while the number of evaluations was expected to be 171*4 = 684, a total of 750 people participated in the research because of some managers evaluated more than one direct report or peer. In this case, the mean score of the responses evaluated to obtain a more accurate score.

As a result of the research, it has been determined that the 360 degree healthcare leadership Turkish version is an adequate and reliable measurement tool. In future studies, the skills of leaders working in the field of health can be evaluated in a 360-degree manner, not only based on self-assessment or the assessment of their manager. With this scale, leadership skills can be determined more accurately and leaders can find an opportunity to improve their shortcomings. In the model, the opinions of patients receiving health care services were not consulted. Including the service recipients in the model in future studies may help to get more effective results.

Limitations

First, Test-retest method was not used in this study. Second, peers and direct reports were chosen from those who know the manager best. For this reason, it is possible to score their team mate high. Lastly, COVID-19 was a big problem while data collection process. Without such a process, more data could have been collected from hospitals.

Declarations

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Conflict of Interest

None declared.

Ethical Approval

Approval of ethics committee gathered from the ethics committee of a Istanbul University with 31.05.2018, 59480 date and number. The study carried out in accordance with Declaration of Helsinki.

References

1. Mandrou E, Tsounis A and Sarafis P. Validity and reliability of the Greek version of Implementation Leadership Scale (ILS). BMC psychology. 2020;8:1-7.
2. Leach L, Hastings B, Schwarz G, et al. Distributed leadership in healthcare: leadership dyads and the promise of improved hospital outcomes. Leadership in Health Services. 2021;34:353-74.
3. Chan S. Burnout, engagement & leadership. Revista da Associação Médica Brasileira. 2021;67:1217-20.
4. Belrhiti Z, Giralt AN and Marchal B. Complex Leadership in Healthcare: A Scoping Review. Int J Health Policy. 2018;7:1073-84. DOI:10.15171/ijhpm.2018.75
5. Parker G, Smith T, Shea C, et al. Key Healthcare Leadership Competencies: Perspectives from Current Healthcare Leaders. Healthcare Quarterly (Toronto, Ont.). 2022;25:49-56.
6. Wikström E and Dellve L. Contemporary leadership in healthcare organizations. J Health Organ Manag. 2009;17:931-41.
7. Cleary S, Du Toit A, Scott V, et al. Enabling relational leadership in primary healthcare settings: lessons from the DIALHS collaboration. Health Policy Plann. 2018;33:65-74. DOI:10.1093/heapol/czx135
8. Crain MA, Bush AL, Hayanga H, et al. Healthcare leadership in the COVID-19 pandemic: from innovative preparation to evolutionary transformation. Journal of Healthcare Leadership. 2021;13:199.
9. Yüksel M and Genç KY. Endüstri 4.0 ve Liderlik. 2nd International Symposium on Innovative Approaches in Scientific Studies; 2018. p. 338-41.
10. Dinc MS, Kuzey C and Steta N. Nurses' job satisfaction as a mediator of the relationship between organizational commitment components and job performance. Journal of Workplace Behavioral Health. 2018;33:75-95.
11. Kumar RDC and Khiljee N. Leadership in healthcare. Anaesth Intensiv Ca. 2016;17:63-5. DOI:DOI 10.1016/j.mpaic.2015.10.012
12. Solansky ST. The evaluation of two key leadership development program components: Leadership skills assessment and leadership mentoring. The Leadership Quarterly. 2010;21:675-81.
13. Ackerman M, Malloch K, Wade D, et al. The Master in Healthcare Innovation: A New Paradigm in Healthcare Leadership Development. Nurse Lead. 2019;17:49-53. DOI:10.1016/j.mnl.2018.09.010
14. Testa MR. A model for organization-based 360 degree leadership assessment. Leadership Org Dev J. 2002.
15. Denison DR, Kotrba LM and Castano N. A cross-cultural perspective on leadership assessment: Comparing 360-degree feedback results from around the world. Advances in global leadership: Emerald Group Publishing Limited; 2012.
16. Budak F. Sağlık yönetiminde klinik liderlik. Ankara: Siyasal Kitabevi. 2018.
17. Durmuş B, Yurtkoru ES and Çinko M. Sosyal bilimlerde SPSS'le veri analizi. İstanbul: Beta Basım Yayım Dağıtım A.Ş.; 2013.
18. Cortina JM. What is coefficient alpha? An examination of theory and applications. Journal of applied psychology. 1993;78:98-104.
19. İncekar MÇ, Öğüt NU, Mutlu B, et al. Turkish validity and reliability of the COVERS pain scale. Revista da Associação Médica Brasileira. 2021;67:882-8.
20. Cristobal E, Flavian C and Guinaliu M. Perceived e-service quality (PeSQ): Measurement validation and effects on consumer satisfaction and web site loyalty. Managing service quality: An international journal. 2007;17:317-40.
21. Prinsen CA, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. Quality of life research. 2018;27:1147-57.
22. Budak F. Klinik liderlik ölçeğinin Türkçe geçerlik güvenilirlik çalışması: Kamu hastaneleri örneği. Acıbadem Üniversitesi Sağlık Bilimleri Dergisi. 2017:85-91.
23. Joon Yoon H, Hoon Song J, Donahue WE, et al. Leadership competency inventory: A systematic process of developing and validating a leadership competency scale. Journal of Leadership Studies. 2010;4:39-50.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Healthcare and Systems / Sağlık Hizmetleri ve Sistemler

Determination of Nutrient Density in Dormitory Menus: Samples of State, Private, and Semi-Private Dormitories

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ABSTRACT

Purpose: This study aimed to evaluate the menus of university dormitories in Istanbul according to nutrient profiling and to determine whether energy and other nutrients meet the needs of students.

Methods: The lunch menus served in winter in three different dormitories (state, private, and semi- private) in Istanbul were examined according to the nutrient profiling (Nutrient Rich Foods NRF9.3 and 15.3 indexes). The energy and nutrient contents of the menus were compared with national and international references values according to the Turkey Nutrition Guide-2022.

Results: The highest NRF9.3 ve 15.3 score was found in private dormitory menus (70.99 ± 47.80, 75.50 ± 52.40), followed by state dormitory menus (63.80 ± 23.71, 67.09 ± 23.73) and semi-private dormitory menus (58.79 ± 38.32, 62.51 ± 41.62). There were no statistically significant differences for NRF9.3 and 15.3 scores between the dormitory menus. Additionally, total fat, saturated fat, and sodium contents were higher in the menus of dormitories, especially state dormitories menus. A significant difference was found between the menus of state and semi-private dormitories for total fat, and saturated fat (p:0.003, p: 0.015), whereas a statistical difference was found between state and private dormitories for sodium (p: 0.007).

Conclusion: Considering the high sodium, total and saturated fat contents of dormitory menus, the standard recipes applied should be improved in terms of salt and fat contents. Therefore, it is of great importance that menus are prepared by dietitians who have been trained in this field and have sufficient knowledge, skills, and equipment.

Keywords: Nutrient profiling; Food service; Menu; University students; Student dormitories.

ÖZET

Amaç: Bu çalışmanın amacı, İstanbul'daki üniversite yurtlarının menülerini besin ögesi profiline göre değerlendirmek ve enerji ve diğer besin öğelerinin öğrencilerin ihtiyaçlarını karşılayıp karşılamadığını belirlemektir.

Yöntemler: İstanbul'daki üç farklı yurtta (devlet, özel ve yarı özel) kış aylarında sunulan öğle yemeği menüleri besin profili (Nutrient Rich Foods Index NRF9.3 ve 15.3) açısından incelenmiştir. Menülerin enerji ve besin öğesi içerikleri, Türkiye Beslenme Rehberi-2022'ye göre ulusal ve uluslararası referans değerlerle karşılaştırılmıştır.

Bulgular: En yüksek NRF9.3 ve 15.3 puanı özel yurt menülerinde (70.99 ± 47.80, 75.50 ± 52.40) bulunurken, bunu devlet yurdu menüleri (63.80 ± 23.71, 67.09 ± 23.73) ve yarı özel yurt menüleri (58.79 ± 38.32, 62.51 ± 41.62) izlemiştir. NRF9.3 ve 15.3 puanları açısından yurt menüleri arasında istatistiksel olarak anlamlı bir fark bulunmamıştır. Ayrıca, toplam yağ, doymuş yağ ve sodyum içerikleri yurt menülerinde, özellikle de devlet yurdu menülerinde daha yüksektir. Toplam yağ ve doymuş yağ açısından devlet ve yarı özel yurt menüleri arasında anlamlı bir fark bulunurken (p: 0.003, p: 0.015), sodyum açısından devlet ve özel yurtlar arasında istatistiksel bir fark bulunmuştur (p: 0.007).

Sonuç: Yurt menülerinin yüksek sodyum, toplam ve doymuş yağ içerikleri göz önünde bulundurulduğunda, uygulanan standart reçetelerin tuz ve yağ içerikleri açısından iyileştirilmesi gerekmektedir. Bu nedenle menülerin bu alanda eğitim almış, yeterli bilgi, beceri ve donanıma sahip diyetisyenler tarafından hazırlanması büyük önem taşımaktadır.

Anahtar Kelimeler: Besin profili; Yemek servisi; Menü; Üniversite öğrencileri; Öğrenci yurtları.

Nutrition is the behaviour of using sufficient nutrients and bioactive compounds needed by the body to maintain and improve health and quality of life. One of the protective factors that play a role in minimising diet-related health problems is an adequate and balanced diet (1).

Youth is a stage of transition from childhood to adulthood, with rapid changes in physical growth, psychosocial development and behavioural changes. Habits, including eating habits, adopted at this age can last a lifetime (2). The need for energy and nutrients increases during these periods when growth and development accelerates, the individual develops mentally and gains gender characteristics (3). In terms of nutrition, as in many other areas, university life, the transition from adolescence to adulthood, marks the beginning of a new phase in young people's lives (4). Therefore, university students are among the risk groups in terms of adequate and balanced nutrition problems. In this period, newly established friendships, economic problems, and accommodation conditions bring unhealthy and irregular eating habits. Inadequate and unbalanced nutritional habits increase the risk of many diseases in adulthood (4,5).

Studies conducted on university students have shown that students frequently skip meals (4,6-8), are malnourished due to economic difficulties (4,7,9), and take inadequate fluids (10). Additionally, it has been reported that students living in dormitories cannot have adequate and balanced nutrition due to dormitory conditions (8,11).

Poor dietary patterns and inadequate intake of nutrients may lead to problems later on in life such as non-communicable diseases (NCDs), as well as osteoporosis, sexual maturation delays, etc. (12,13). Nutrient profiling methods are systems for rating the healthfulness of a food, menu, or diet quality (14). A nutrient-dense food is defined as a food that contains more nutrients than the energy it provides. The method of calculating the nutrient density of each food is known as nutrient density measures (15). Nutrient Rich Foods (NRF) index is a validated international measure that reflects diet quality by measuring nutrient density through a nutrient density measure (16). NRF index scores positively correlate with the 2005 Healthy Eating Index (HEI), a diet quality scale developed by the United States Department of Agriculture (USDA). Five different versions of the NRF index have been published, namely NRF6.3, 9.3, 10.3, 11.3, and 15.3 (17,18). The main difference between these versions is the number of "nutrients to be promoted" that are considered. The number of 'nutrients to promote' is indicated by the first number in the index names (i.e. 6, 9, 10, 11, and 15) (18). It has been shown that the NFR9.3 index scores gives consistent results in the evaluation of menus and is a suitable model for menu evaluations according to a Turkey study (14). The NRF9.3 index score has the highest correlation with the HEI score (17), and the NRF15.3 index score includes all the nutrients of public health concern, such as calcium, potassium, fiber, and vitamin D (19).

The energy and nutrient contents of the menus served in student dormitories are among the important factors affecting the cognitive performance and health status. To the best of our knowledge, there is no study in the literature evaluating the nutrient profiling of menus served in different student dormitories. Therefore, this study aimed to evaluate the menus of university dormitories in Istanbul according to the nutrient profiling and to determine whether energy and other nutrients meet the needs of students.

Methods

This study evaluated the lunch menus of three different dormitories, namely private, semi-private and state dormitories serving university students in Avcılar, Istanbul, which produce traditional cuisine in December 2023.

Determination of Energy and Nutrient Content of Menus

The energy and nutrient contents (protein, carbohydrate, fat, saturated fatty acids, cholesterol, omega-3, omega-6, polyunsaturated fatty acids, fiber, added sugar, vitamins A, D, E, K, B_1, B_2, B_5, B_6, B_{12} and C, niacin, biotin, folic acid, sodium, potassium, calcium, magnesium, iron, zinc, selenium, copper, phosphorus, iron, zinc, selenium, magnesium, iron, zinc, selenium, selenium, copper, phosphorus) were determined using standardized recipes used in public nutrition services (20). According to these recipes, the contents of the nutrients in the meals included in the menus were calculated with the Nutrition Information System (BEBIS) 9 program. Energy and nutrient calculations included 1 roll white bread (50 grams) and the amount of salt used in the meals.

Determination of Menus in terms of Meeting Requirements

In the evaluation of the adequacy of the menus to meet the daily energy and nutrient requirements of students, daily mean energy, protein, carbohydrate, saturated fat, cholesterol, fiber, vitamins A, D, E, K, B_1, B_2, B_5, B_6, B_{12}, C, niacin, biotin, folic acid, sodium, potassium, calcium, magnesium, iron, zinc, selenium and copper for requirement quantities (1), The amounts of saturated fatty acids and added sugars were obtained from the European Food Safety Authority (EFSA), and the amounts of soluble and

insoluble fiber were obtained from the U.S. Food and Drug Administration (FDA) (21,22). As the dormitories provide a single meal service, it was considered sufficient for the contents of the menus to meet 2/5 of the reference values determined for men and women aged 19-24, moderate active group (14).

Determination of Menus According to Nutrient Profiling Models

NRF9.3 and 15.3 indexes were used to determine the nutrient density of menus since NRF9.3 index scores have the highest correlation with the HEI-2005, a diet quality scale developed by the USDA (17), and NRF15.3 includes all nutrients of public health concern (calcium, potassium, fiber, and vitamin D) (19).

NRF9.3 index was developed by Drewnowski et al. (23). NRF9.3 is based on a scoring system. It ranks foods according to their nutrient content. The NRF9.3 index includes protein, fiber, calcium, iron, magnesium, potassium and vitamins A, C, and E as positive nutrients, whereas saturated fat, added sugar, and sodium are considered negative nutrients, per 100 kcal or serving size of food (23).

NRF15.3 index has a similar list of nutrients, but includes some additional nutrients (monounsaturated fat, vitamin D, thiamin, riboflavin, B_{12} and folate) and excludes magnesium (17). Saturated fat, added sugar and sodium are the same for all NRF indices and are nutrients that should be limited (15).

NRF index scores were calculated per 100 kcal of food (15). High scores indicate high nutrient density and low scores indicate poor nutrient density. The requirements determined for Turkey for males and females aged 19-24 years in the moderately active group were used as the reference for the mean daily requirements of the nutrients used to calculate the NRF scores (1). The EFSA values were used as the reference for saturated fat, and added sugar (21), and FDA values were used as the reference for soluble, and insoluble fiber (22).

Statistical Analysis

Data were analyzed using SPSS 24.0. The normality of the data was evaluated with the Kolmogorov-Smirnov test. ANOVA test was used in the statistical evaluation of the difference between the dormitories in the energy, nutrients, and NRF scores of the menus, and the difference between the groups was determined by the Tukey test. A value of $p<0.05$ was considered statistically significant.

Results

The mean percentage of energy from macronutrients in the lunch menus of the dormitories is given in Figure 1. The percentage of energy from carbohydrates was 50% in semi-private dormitory, 46% in private dormitory and 42% in state dormitory. Proteins accounted for 16%, 16% and 15% of energy, respectively. The percentages of fats were 34%, 38%, and 43%, respectively.

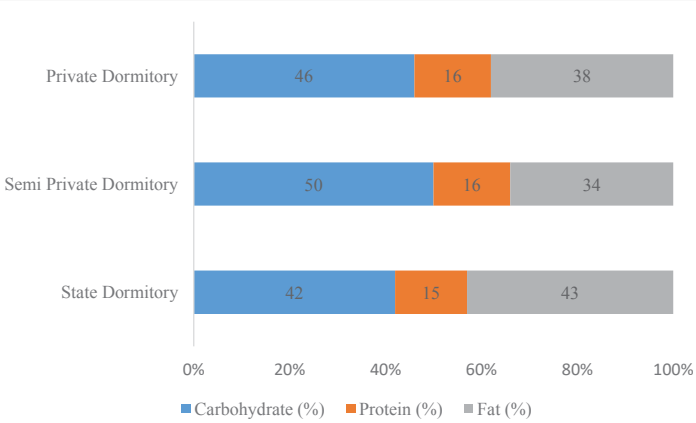

Figure 1: Percentage of mean energy from macronutrients in the lunch menus of different dormitories

Table 1 shows the NRF9.3, NRF15.3 scores, and mean energy and nutrient values of menus. The highest NRF9.3 score was found in private dormitory menus (70.99 ± 47.80), followed by state dormitory menus (63.80 ± 23.71) and semi-private dormitory menus (58.79 ± 38.32). There was no statistically significant difference between the NRF9.3 scores of the dormitory menus (p: 0.461). Similarly, NRF15.3 scores were highest in private dormitory menus (75.50 ± 52.40), followed by state dormitory menus (67.09 ± 23.73) and semi-private dormitory menus (62.51 ± 41.62); and there were no statistical differences (p: 0.468). According to the energy and macronutrient values, the carbohydrate percentages, fat amounts and percentages, and saturated fat amounts were statistically different between semi-private and state dormitory menus (p: 0.003, p: 0.004, p< 0.001, and p: 0.015, respectively). Additionally, the saturated fat percentages and monounsaturated fatty acids amounts were significantly different between the menus of state dormitories and private and semi-private dormitories (p: 0.004, and p< 0.001, respectively). Furthermore, vitamin B_1 and magnesium were significantly different between state and semi-private dormitory menus (p: 0.015, and p: 0.031), whereas sodium and copper were significantly different between state and private dormitory menus (p: 0.007, and p: 0.041).

Table 1: NRF9.3, NRF15.3, and mean energy and nutrient values of menus

	State Dormitory	Private Dormitory	Semi Private Dormitory	p-value†
NFR9.3	63.80 ± 23.71	70.99± 47.80	58.79 ± 38.32	0.461
NRF15.3	67.09 ± 23.73	75.50 ± 52.40	62.51 ± 41.62	0.468
Energy and Macronutrients				
Energy (kcal)	1075.78 ± 217.89	1074.72 ± 169.12	1062.18 ± 121.12	0.945
Protein (g)	38.30 ± 10.27	42.24 ± 10.81	41.24 ± 10.62	0.342
Protein (%)	14.75 ± 3.75	16.22 ± 3.75	15.86 ± 3.72	0.299
Carbohydrate (g)	111.42 ± 36.50	121.90 ± 33.88	128.61 ± 27.14	0.138
Carbohydrate (%)	41.96 ± 7.96[a]	46.16 ± 7.87	49.63 ± 8.68[a]	**0.003***
Fat (g)	52.19 ± 13.27[a]	45.33 ± 11.70	41.34 ± 11.50[a]	**0.004***
Fat (%)	43.39 ± 8.53[a]	37.61 ± 7.88	34.53 ± 7.89[a]	**<0.001****
Saturated fatty acids (g)	15.97 ± 5.80[a]	12.79 ± 4.15	12.12 ± 5.74[a]	**0.015***
Saturated fatty acids (%)†††	13.28 ± 3.98[a,b]	10.77 ± 3.22[b]	10.10 ± 3.85[a]	**0.004***
Omega-3 (g)	0.84 ± 0.98	0.61 ± 0.30	0.69 ± 0.54	0.397
Omega-3 (%)†††	0.64 ± 0.82	0.45 ± 0.50	0.40 ± 0.62	0.343
Omega-6 (g)	13.36 ± 5.57	13.50 ± 5.42	11.69 ± 5.00	0.348
Omega-6 (%)†††	11.10 ± 4.18	11.22 ± 4.11	9.93 ± 4.00	0.406
Polyunsaturated fatty acids (g)	14.37 ± 5.57	14.28 ± 5.41	12.56 ± 5.32	0.355
Monounsaturated fatty acids (g)	16.63 ± 5.02[a,b]	13.34 ± 3.04[b]	12.51 ± 3.49[a]	**<0.001****
Cholesterol (g)	129.01 ± 55.33	121.19 ± 64.23	98.67 ± 78.83	0.204
Fiber (g)	11.13 ± 4.01	14.09 ± 7.21	14.66 ± 6.53	0.069
Soluble fiber (g)	4.11 ± 1.47	5.10 ± 3.05	5.16 ± 3.03	0.248
Insoluble fiber (g)	7.18 ± 2.81	8.68 ± 4.69	9.00 ± 3.76	0.170
Added sugar (g)	14.58 ± 26.14	11.49 ± 18.16	10.88 ± 14.56	0.755
Added sugar (%)††††	4.59 ± 7.09	3.70 ± 5.03	3.95 ± 4.98	0.833
Vitamins				
Vitamin A (mcg)	593.77 ± 426.29	1612.83 ± 4449.27	1039.76 ± 3252.36	0.483
Vitamin D (mcg)	1.09 ± 1.84	1.20 ± 4.12	0.54 ± 0.87	0.600
Vitamin E (mg)	17.17 ± 7.19	16.67 ± 6.53	14.35 ± 5.55	0.206
Vitamin K (mcg)	89.85 ± 155.47	65.07 ± 108.54	57.62 ± 78.49	0.554
Vitamin B_1 (mg)	0.48 ± 0.11[a]	0.57 ± 0.21	0.61 ± 0.18[a]	**0.015***
Vitamin B_2 (mg)	0.61 ± 0.28	0.79 ± 0.90	0.68 ± 0.59	0.567
Niasin (mg)	16.28 ± 7.43	19.13 ± 11.25	17.33 ± 6.48	0.445
Vitamin B_5 (mg)	2.68 ± 1.15	3.58 ± 3.84	3.22 ± 1.59	0.398
Vitamin B_6 (mg)	0.85 ± 0.34	0.92 ± 0.31	0.92 ± 0.21	0.594
Biotin (mcg)	19.52 ± 9.15	30.64 ± 36.89	23.64 ± 19.77	0.232
Folic acid (mcg)	152.17 ± 61.29	199.44 ± 151.59	200.98 ± 125.95	0.224
Vitamin B_{12} (mcg)	3.05 ± 2.14	7.08 ± 15.58	4.81 ± 11.66	0.404
Vitamin C (mg)	68.11 ± 44.47	62.88 ± 48.34	70.86 ± 58.33	0.824
Minerals				
Sodium (mg)††	1892.82 ± 594.41[b]	1511.93 ± 228.68[b]	1651.61 ± 483.06	**0.007***
Potassium (mg)	1426.13 ± 455.96	1544.34 ± 748.81	1490.42 ± 369.95	0.716
Calcium (mg)	256.19 ± 132.75	195.94 ± 82.17	245.90 ± 113.75	0.084
Magnesium (mg)	135.36 ± 42.85[a]	158.80 ± 54.47	168.14 ± 44.28[a]	**0.031***
Iron (mg)	5.63 ± 2.24	7.12 ± 2.91	6.88 ± 2.22	0.056
Zinc (mg)	5.59 ± 2.44	6.90 ± 1.82	6.88 ± 3.13	0.084
Selenium (mg)	2.40 ± 3.18	4.06 ± 3.66	3.06 ± 4.20	0.232
Copper (mg)	0.67 ± 0.23[b]	1.11 ± 0.97[b]	0.99 ± 0.56	**0.041***
Phosphorus (mg)	539.19 ± 142.45	616.90 ± 256.95	615.38 ± 148.59	0.220

*†One-way ANOVA, and posthoc TUKEY were used. ††Including sodium from salt added to food. *p<0.05, **p<0.01. Different letters (a-c) in the same row are statistically different from each other (p<0.05). †††1 g fat = 9 kcal, †††† Calculated as 1 g sugar = 4 kcal.*

The percentages of the mean energy and nutrient contents of the menus meeting the mean daily requirements for men and women are given in Table 2. All dormitory menus meet more than 2/5 of the energy and macronutrient requirements for both genders. Vitamin D, potassium, calcium and selenium were below 2/5 of the requirements for both genders in all dormitory menus. Insoluble fiber were below the requirement for both genders in the state dormitory menus (94.53 ± 37.08%). Zinc was below the requirement in state dormitory menus only in men (85.85 ± 37.44%).

Table 2: Percentage of men and women meeting the mean daily energy and nutrient requirements of menus

Energy and nutrients	Gender	Daily mean requirement	Amount to be covered at the dormitory	State Dormitory	Private Dormitory	Semi Private Dormitory
Energy (kcal)	**Male**	2600	1040	103.44 ± 20.95	103.34 ± 16.26	102.13 ± 11.65
	Female	1800	720	149.41 ± 30.26	149.27 ± 23.49	147.53 ± 16.82
Protein (g)	**Male**	63.1	25.2	151.39 ± 40.60	166.97 ± 42.75	163.66 ± 42.16
	Female	55.2	22.1	173.31 ± 46.48	191.14 ± 48.94	186.62 ± 48.07
Carbohydrate (g)	**Male**	130	52	214.28 ± 70.20	234.43 ± 65.16	247.34 ± 52.19
	Female	130	52	218.28 ± 70.20	234.43 ± 65.16	247.34 ± 52.19
Fat (g)	**Male**	82.7	33.1	157.70 ± 40.10	136.97 ± 35.37	124.91 ± 34.77
	Female	66.1	26.4	197.72 ± 50.27	171.73 ± 44.35	156.61 ± 43.60
Saturated fatty acids (g)	**Male**	20	8	199.71 ± 72.50	159.97 ± 51.92	151.60 ± 71.85
	Female	20	8	199.71 ± 72.50	159.97 ± 51.92	151.60 ± 71.85
Cholesterol (g)	**Male**	300	120	107.51 ± 46.11	100.99 ± 53.53	82.23 ± 65.60
	Female	300	120	107.51 ± 46.11	100.99 ± 53.53	82.23 ± 65.70
Fiber (g)	**Male**	25	10	111.30 ± 40.10	140.92 ± 72.10	146.65 ± 65.38
	Female	25	10	111.30 ± 40.10	140.92 ± 72.10	146.65 ± 65.38
Soluble fiber (g)	**Male**	6	2.4	171.56 ± 61.40	212.69 ± 127.20	215.31 ± 126.50
	Female	6	2.4	171.56 ± 61.40	212.69 ± 127.20	215.31 ± 126.50
Insoluble fiber (g)	**Male**	19	7.6	94.53 ± 37.08	114.30 ± 61.83	118.46 ± 49.59
	Female	19	7.6	94.53 ± 37.08	114.30 ± 61.83	118.46 ± 49.59
Added sugar (g)	**Male**	50	20	72.91 ± 130.73	57.47 ± 90.81	54.43 ± 72.82
	Female	50	20	72.91 ± 130.73	57.47 ± 90.81	54.43 ± 72.82
Vitamin A (mcg)	**Male**	750	300	197.93 ± 142.10	537.61 ± 1483.09	346.59 ± 1084.12
	Female	650	260	228.38 ± 162.96	537.61 ± 1483.09	346.59 ± 1084.12
Vitamin D (mcg)	**Male**	15	6	18.26 ± 30.83	20.10 ± 68.73	9.13 ± 14.59
	Female	15	6	18.26 ± 30.83	20.10 ± 68.73	9.13 ± 14.59
Vitamin E (mg)	**Male**	13	5.2	330.23 ± 128.30	320.63 ± 125.60	275.98 ± 106.89
	Female	11	4.4	390.27 ± 163.45	378.92 ± 148.44	326.16 ± 126.32
Vitamin K (mcg)	**Male**	120	48	187.20 ± 323.91	135.57 ± 226.14	120.05 ± 163.53
	Female	90	36	249.60 ± 431.88	180.75 ± 301.51	160.07 ± 218.03
Vitamin B_1 (mg)	**Male**	1.2	0.48	100.00 ± 24.33	118.95 ± 44.02	128.47 ± 39.25
	Female	1.1	0.44	109.09 ± 26.54	129.77 ± 48.02	140.15 ± 42.85
Vitamin B_2 (mg)	**Male**	1.3	0.52	118.27 ± 54.81	152.98 ± 173.98	131.41 ± 115.08
	Female	1.1	0.44	139.77 ± 64.77	180.79 ± 205.59	155.30 ± 136.00
Niacin (mg)	**Male**	6.7	2.68	607.62 ± 277.40	714.09 ± 419.93	646.94 ± 94
	Female	6.7	2.68	607.62 ± 277.40	714.09 ± 419.93	646.94 ± 94
Vitamin B_5 (mg)	**Male**	5	2	134.23 ± 57.75	179.19 ± 192.45	161.25 ± 79.63
	Female	5	2	134.23 ± 57.75	179.19 ± 192.45	161.25 ± 79.63
Vitamin B_6 (mg)	**Male**	1.3	0.52	164.63 ± 65.73	177.61 ± 61.09	178.14 ± 40.62
	Female	1.3	0.52	164.63 ± 65.73	177.61 ± 61.09	178.14 ± 40.62
Biotin (mcg)	**Male**	40	16	122.03 ± 57.24	191.56 ± 230.58	147.77 ± 123.57
	Female	40	16	122.03 ± 57.24	191.56 ± 230.58	147.77 ± 123.57
Folic acids (mcg)	**Male**	330	132	115.29 ± 50.27	151.09 ± 114.85	152.26 ± 95.42
	Female	330	132	115.29 ± 50.27	151.09 ± 114.85	152.26 ± 95.42
Vitamin B_{12} (mcg)	**Male**	4	1.6	190.83 ± 133.99	443.00 ± 974.15	300.77 ± 728.97

	Female	4	1.6	190.83 ± 133.99	443.00 ± 974.15	300.77 ± 728.97
Vitamin C (mg)	**Male**	110	44	154.80 ± 101.08	142.91 ± 109.87	161.05 ± 132.58
	Female	95	38	176.24 ± 117.04	165.48 ± 127.21	186.47 ± 153.51
Sodium (mg)	**Male**	2300	920	205.05 ± 64.61	195.65 ± 24.86	180.83 ± 51.52
	Female	2300	920	205.05 ± 64.61	195.65 ± 24.86	180.83 ± 52.51
Potassium (mg)	**Male**	4700	1880	79.23 ± 25.33	85.80 ± 41.60	82.80 ± 20.55
	Female	4700	1880	79.23 ± 25.33	85.80 ± 41.60	82.80 ± 20.55
Calcium (mg)	**Male**	1000	400	64.05 ± 33.19	48.99 ± 20.54	61.48 ± 28.44
	Female	1000	400	64.05 ± 33.19	48.99 ± 20.54	61.48 ± 28.44
Magnesium (mg)	**Male**	350	140	96.69 ± 30.61	113.43 ± 38.91	120.10 ± 31.63
	Female	300	120	112.80 ± 35.71	113.43 ± 38.91	140.12 ± 36.90
Iron (mg)	**Male**	11	4.4	128.00 ± 51.13	161.95 ± 66.31	156.48 ± 50.50
	Female	16	4.4	128.00 ± 51.13	161.95 ± 66.31	156.48 ± 50.50
Zinc (mg)*	**Male**	16.3	6.52	85.85 ± 37.44	105.95 ± 27.99	105.62 ± 48.15
	Female	12.7	5.08	110.19 ± 48.06	135.99 ± 35.92	135.56 ± 61.80
Selenium (mcg)	**Male**	70	28	8.61 ± 11.39	14.51 ± 13.10	10.95 ± 15.00
	Female	70	28	8.61 ± 11.39	14.51 ± 13.10	10.95 ± 15.00
Copper (mg)	**Male**	1.6	0.64	105.47 ± 36.15	174.70 ± 152.20	154.74 ± 88.34
	Female	1.3	0.52	129.81 ± 44.50	215.01 ± 187.23	190.45 ± 108.72
Phosphorus (mg)	**Male**	550	220	245.09 ± 64.75	280.41 ± 116.80	279.72 ± 67.54
	Female	550	220	245.09 ± 64.75	280.41 ± 116.80	279.72 ± 67.54

The values given in the table are the Mean±Standard deviation values of the percentages of meeting the mean daily requirements. The mean daily energy, protein, carbohydrate, fat, cholesterol, fiber, vitamins A, D, E, K, B_1, B_2, B_5, B_6, B_{12}, niacin, biotin, folic acid, sodium, potassium, calcium, magnesium, iron, zinc, Selenium, copper and phosphorus requirements were taken from TUBER-2022 (19-24 years old, moderately active group requirements) (1), saturated fatty acids and added sugars from EFSA (21), soluble and insoluble fiber from FDA (22).
** Based on a mixed diet containing 600 mg phytate (1)*

Discussion

At all ages, especially during adolescence, nutrition is crucial (13,24). Nutrient profiling methods have been shown to be an objective, science-based tool for the evaluation and labelling of menus (14,25). In this study we determined the NRF9.3 and 15.3 scores, and energy, macro and micronutrient contents of state, private and semi-private dormitories. According to our results, the highest NRF9.3 and NRF15.3 scores were found in private dormitory menus, followed by state dormitory menus, and semi-private dormitory menus. There was no statistically significant difference for NRF9.3 and NRF15.3 scores for dormitory menus. Furthermore, the energy, macronurients, and most micronutrients amounts of the lunch menus of state, private, and semi-private dormitories met the needs of both genders. Additionally, total fat, saturated fat, and sodium contents were higher in all dormitory menus, especially state dormitories.

The nutrient profiling methods should fully reflect the nutrient pattern of foods, meals and a total diet (25). NRF score can be a helpful tool for consumers to make healthier food choices and improve diet quality. Vegetables, fruits, milk, and dairy products contribute to a high NRF score, while ultra-processed foods, cakes, cookies, pastries, and desserts contribute to a low NRF score (26,27). In a study conducted in Turkey, the highest NRF9.3 index score was found in public institution menus (85.7 ± 18.9), followed by semi-private institution menus (73.8 ± 8.8) and the lowest in private institution menus (38.6 ± 16.6) and a statistical difference was found (28). In another study in which one-month menus served in the cafeterias of 3 private and 2 public universities providing mass catering services in Ankara, NRF9.3 index scores were higher in public universities, with a mean of 16.50 ± 7.17 and 19.79 ± 7.54, respectively, while 16.30 ± 4.03, 16.26 ± 5.79 and 12.28 ± 9.00 were found in private universities (14). In this study, NRF9.3 and 15.3 index scores were highest in private dormitory menus (70.99 ± 47.80 and 75.50 ± 52.40), followed by state dormitory menus (63.80 ± 23.71 and 67.09 ± 23.73) and semi-private dormitory menus (58.79 ± 38.32 and 62.51 ± 41.62). The results emphasize that menus in mass nutrition systems should improve nutrition and health and the importance of dieticians.

Adequate nutrition, particularly in adolescent years, is critical for rapid physiological growth and development as well as for laying the foundation for good health in later years (13). Poor diet is one of the largest contributors to the global burden of NCDs and is recognized as a major modifiable risk factor for chronic disease (24). In a study evaluating the lunch menus of 5 university cafeterias over

one month, it was observed that all menus met the energy needs of female students, while only two menus met the energy needs of male students. It was also reported that the mean total fat content and percentages were high, the mean fiber content was low, and the menus were inadequate in terms of composition (14). In another study, no difference was observed between the energy contents of the menus of state, private, and semi-private institutions, and it was found that the daily requirement was met in both genders. While the menus served in these institutions generally met the energy and nutrient requirements, total fat, saturated fatty acids, and sodium contents of the menus were found to be above the recommendations (28). Similarly, we found that the energy, macronutrients, and most micronutrients of the lunch menus of state, private, and semi-private dormitories met the needs of both genders. Additionally, total fat, saturated fat, and sodium contents were higher in all dormitory menus, especially state dormitories, and a significant difference was found between the menus. This may be due to the high fat and salt content of the standard recipes used in mass nutrition systems (28).

High sugar consumption is associated with NCDs as well as dental caries. The World Health Organization (WHO) strongly recommends that free sugars should be consumed sparingly throughout life and that dietary consumption of free sugars should be less than 10% of total energy intake in children and adults. WHO further recommends that sugar consumption should be reduced to less than 5% of energy if possible (29). In our country, a guideline was published in 2021 to reduce sugar consumption. These guideline recommendations are similar to WHO, and it is recommended that the energy from sugar should not exceed 10% of daily energy and should be below 5% (30). It was reported that the sugar content in the menus of state, private, and semi-private institutions was above 5%. The reason for this was attributed to the frequent use of carbonated drinks, ready-made fruit juices, and desserts in institutions (28). In this study, the ratio of sugar to energy in the menus of all dormitories was below 5%. When the menus were analyzed, it was found that the frequency of desserts was quite low, no ready-to-drink beverage other than ayran was provided, and the menus were prepared under the supervision of a dietician.

Conclusion

University life is the beginning of a new period in the lives of young people in terms of nutrition, as in many areas. Since it plays an important role in contributing to the adequate and balanced nutrition of adolescents in this period, the menus offered in public nutrition systems should be of high dietary quality to meet the energy and nutrient requirements of this age group. Considering the high sodium and total and saturated fat contents of dormitory menus, the standard tariffs applied should be improved in terms of salt and fat contents. Therefore, it is of great importance that menus are prepared by dieticians who have been trained in this field and have sufficient knowledge, skills, and equipment.

Declarations

Ethical Statement

The ethics committee of Istanbul Gelisim University Non-Interventional Clinical Research Ethics Committee [Number:2023-09, date: 20.11.2023] approved the study, which followed the principles of the Declaration of Helsinki.

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Authors Contribution

HMB: Study design, data collection, analysis of data, literature search, wring of the manuscript.

AÖ: Study design, literature search, editing of the manuscript.

References

1. Republic of Turkiye Ministry of Health General Directorate of Public Health. Türkiye Beslenme Rehberi. Publication No: 1031, Ankara; 2022.
2. Peltzer K, Pengpid S, Samuels TA, et al. Prevalence of overweight/obesity and its associated factors among university students from 22 countries. Int J Environ Res Public Health. 2014;11:7425–7441. DOI: 10.3390/ijerph110707425.
3. Kalkan I. The impact of nutrition literacy on the food habits among young adults in Turkey. Nut Res Pract. 2019;13(4):352-357. DOI: 10.4162/nrp.2019.13.4.352.
4. Ermiş E, Doğan E, Erilli NA, et al. An examination of nutritional habits of university students: the model of Ondokuz Mayis University. Spor ve Performans Araştırmaları Dergisi. 2015;6(1):30-40. DOI: 10.17155/spd.67561.

5. Kürklü NS, Aloğlu B, Ünal E, et al. The relationship of housing status, nutritional habits and food consumption with constipation in university students. Karya Journal of Health Science. 2023;4(2):121-126. DOI: 10.52831/kjhs.1294058.
6. Arslan SA, Daşkapan A and Çakır B. Üniversite öğrencilerinin beslenme ve fiziksel aktivite alışkanlıklarının belirlenmesi. TAF Prev Med Bull. 2016;15(3):171-180
7. Kabir A, Miah S and Islam A. Factors influencing eating behavior and dietary intake among resident students in a public university in Bangladesh: A qualitative study. PLoS One. 2018;13(6):e0198801. DOI: 10.1371/journal.pone.0198801.
8. Köybaşı GB. Bir yurtta kalan üniversiteli kız öğrencilerin uyku kalitesi, depresyon ve beslenme durumunun incelenmesi. Yüksek Lisans Tezi. Hasan Kalyoncu Üniversitesi Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Anabilim Dalı, Gaziantep; 2020.
9. Doğan H and Akçalı G. An analysis on socio-economic problems of University Students. Üniversite Araştırmaları Dergisi. 2021;4(3):309-316. DOI: 10.26701/uad.903559.
10. Kalkan İ, Pehlivan M, Andaç Öztürk S, et al. Evaluation of nutritional habits and physical activity level of first year nutrition and dietetics students at Istanbul Aydin University. Aydın Sağlık Dergisi. 2018;4(1):45-60
11. Yaman ZA and Ünal E. Evaluation of the nutritional knowledge level and the frequency of obesity/overweight of university students living in dormitories afiliated to The Ministry of Youth and Sports in Bolu city center. Estüdam Halk Sağlığı Dergisi. 2021;6(3):296-309. DOI: 10.35232/estudamhsd.929986.
12. Cena H, Porri D, De Giuseppe R, et al. How healthy are health-related behaviors in university students: The HOLISTic Study. Nutrients. 2021;13(2):675. DOI: 10.3390/nu13020675.
13. Heslin AM and McNulty B. Adolescent nutrition and health: Characteristics, risk factors and opportunities of an overlooked life stage. Proc Nutr Soc. 2023;82(2):142-156. DOI: 10.1017/S0029665123002689.
14. Dikmen D and Pekcan G. Nutrient Profiling: Evaluation of Menus Served in Institutional Food Service Systems. Bes Diy Derg. 2013;41(3):234-241.
15. Drewnowski A. Defining Nutrient Density: Development and Validation of the Nutrient Rich Foods Index. J Am Coll Nutr. 2009;28(4):421S-426S. DOI: 10.1080/07315724.2009.10718106.
16. Katz DL, Njike VY, Faridi Z, et al. The stratification of foods on the basis of overall nutritional quality: the overall nutritional quality index. Am J Health Promot. 2009;24: 133-143. DOI: 10.4278/ajhp.080930-QUAN-224.
17. Fulgoni VL, Keast DR and Drewnowski A. Development and validation of the nutrient-rich foods index: a tool to measure nutritional quality of foods. J Nutr. 2009;139:1549–1554. DOI: 10.3945/jn.108.101360.
18. Hess J, Rao G and Slavin J. The Nutrient Density of Snacks. Glob Pediatr Heal. 2017;4: 2333794X17698525. DOI: 10.1177/2333794X17698525.
19. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015–20 Dietary guidelines for Americans. Washington, DC: U.S. Government Printing Office; 2015.
20. Merdol T. Standart Yemek Tarifeleri. Hatipoğlu Yayınları: Ankara; 2020.
21. EFSA. European Food Safety Authority. Review of labelling reference intake values-Scientific Opinion of the Panel on Dietetic Products, Nutrition and Allergies on a request from the Commission related to the review of labelling reference intake values for selected nutritional elements. EFSA J. 2009;1008:1-14. DOI: 10.2903/j.efsa.2009.1008.
22. U.S. Food and Drug Administration (2023). Food Labeling. [Cited: December 23, 2023]. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=101.
23. Drewnowski A. Concept of a nutritious food: toward a nutrient density score. Am J Clin Nutr. 2005;82(4):721-732. DOI: 10.1093/ajcn/82.4.721.
24. Green R, Sutherland J, Dangour AD, et al. Global dietary quality, undernutrition and non-communicable disease: a longitudinal modelling study. BMJ Open. 2016;6(1):e009331. DOI: 10.1136/bmjopen-2015-009331.
25. Roodenburg AJ, Schlatmann A, Dötsch-Klerk M, et al. Potential effects of nutrient profiles on nutrient intakes in the Netherlands, Greece, Spain, USA, Israel, China and South-Africa. PLoS One. 2011;6(2):e14721. DOI: 10.1371/journal.pone.0014721.
26. Hess JM and Slavin JL. Healthy snacks: using nutrient profiling to evaluate the nutrient-density of common snacks in the United States. J Food Sci. 2017;82(9):2213-2220. DOI: 10.1111/1750-3841.13819.
27. Gupta S, Hawk T, Aggarwal A, et al. Characterizing ultra-processed foods by energy density, nutrient density, and cost. Front Nutr. 2019;6:70. DOI: 10.3389/fnut.2019.00070.
28. Sevim S, Gümüş D, Topal GG, et al. Evaluation of the Menus of Food Service Systems of Different Institutions During COVID-19 Pandemic. Bes Diy Derg. 2021;49(3):7-18. DOI: 10.33076/2021.BDD.1484.
29. World Health Organization. Guideline: sugars intake for adults and children, 2015.
30. Republic of Turkiye Ministry of Health General Directorate of Public Health. Sağlıklı Beslenme ve Hareketli Hayat İşbirliği Platformu Türkiye Şeker Tüketimini/Kullanımını Azaltma Rehberi. Publication no: 1201, Ankara; 2021.

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Investigation of Metaverse Knowledge Attitude and Awareness Levels of Students Studying in the Faculty of Health Sciences of a University According to Variables

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ABSTRACT

Purpose: This study was conducted as a descriptive study to investigation of metaverse knowledge, attitude and awareness levels of health sciences students according to variables.

Methods: The research was completed with a total of 334 students who agreed to participate in the research between April and May 2023 at the Faculty of Health Sciences of a University in a metropolitan city in Turkey. Introductory Characteristics Form and Metaverse Scale were used for data collection.

Results: Metaverse total score average of the students was 48.5±12.45, and the mean scores of sub-dimensions were respectively; Technology Dimension is 22.8±6.04, Digitization Dimension is 8.8±3.48, Life Dimension is 10.3±3.27, Social Dimension is 6.6±2.34. It was found that Metaverse knowledge, attitude and awareness levels of the students who were married, living in a dormitory, having a high income level, studying in the 4th grade, studying in the department of nursing and audiology, having heard the concept of metaverse before, experienced virtual reality, and defined their internet usage skills as high ($p<0.05$). A significant positive correlation was found between age and digitalization sub-dimension ($r=0.179;p=0.001$).

Conclusion: As a result, it can be said that the students studying in health sciences do not have a comprehensive knowledge of the concept of metaverse and that their knowledge, attitude and awareness levels of the metaverse are affected by some socio-demographic variables and variables such as the department they studied, hearing the concept of metaverse before, experiencing virtual reality, and internet use skills.

Keywords: Augmented reality, educational technology, students, health education, virtual reality.

ÖZET

Amaç: Bu araştırmada sağlık bilimleri fakültesi öğrencilerinin metaverse bilgi tutum ve farkındalık düzeylerinin belirlenmesi amacıyla tanımlayıcı olarak yapılmıştır.

Gereç ve Yöntem: Araştırma Türkiye'nin metropol bir kentindeki bir Üniversitesinin Sağlık Bilimleri Fakültesi'nde Nisan-Mayıs 2023 tarihleri arasında araştırmaya katılmayı kabul eden toplam 334 öğrenci ile tamamlanmıştır. Verilerin toplanmasında Tanıtıcı Özellikler Formu ve Metaverse Ölçeği kullanıldı.

Bulgular: Öğrencilerin Metaverse toplam puan ortalaması 48.5±12.45 olup, alt boyutlarının puan ortalaması sırasıyla; Teknoloji Boyutu 22.8±6.04, Dijitalleşme Boyutu 8.8±3.48, Yaşam Boyutu 10.3±3.27, Sosyal Boyutu 6.6±2.34'dür. Çalışmada evli olan, yurtta yaşayan, gelir düzeyi fazla olan, 4.sınıfta öğrenim gören, hemşirelik ve odyoloji bölümünde okuyan, metaverse kavramını daha önce duyan, sanal gerçeklik deneyimleyen, internet kullanım becerisini yüksek olarak tanımlayan öğrencilerin Metaverse bilgi tutum ve farkındalık düzeylerinin anlamlı şekilde yüksek olduğu bulunmuştur ($p<0.05$). Ayrıca yaş ile dijitalleşme alt boyutunda pozitif yönde anlamlı bir ilişki bulunmuştur ($r = 0.179$; $p = 0.001$).

Sonuç: Sonuç olarak sağlık bilimlerinde eğitim gören öğrencilerin metaverse kavramı hakkında kapsamlı bir bilgiye sahip olmadıkları ve metaverse bilgi, tutum ve farkındalık düzeylerinin bazı sosyo-demografik değişkenlerden ve okuduğu bölüm, metaverse kavramını daha önce duyma, sanal gerçeklik deneyimi yaşama, internet kullanım becerisi gibi değişkenlerden etkilendiği söylenebilir.

Anahtar Kelimeler: Arttırılmış gerçeklik, eğitim teknolojisi, öğrenciler, sağlık eğimi, sanal gerçeklik.

The importance of the metaverse concept, which we have started to hear in technological developments in recent years, has increased even more with the COVID 19 pandemic process. It is thought that the importance of this concept will gradually increase all over the world (1).

Metaverse consists of the words "meta" meaning beyond and "verse" meaning universe (2,3). Metaverse is defined as a three-dimensional virtual world where all transactions can be performed with the help of virtual reality and augmented reality technologies (4). Today, it is mostly used for gaming, marketing, shopping, economy, advertising, social communication, and education. It is also seen that the concept of metaverse is used in sectors such as health, tourism, military and real estate (5).

The basis of metaverse technology is virtual reality or augmented reality and simulations. While virtual reality has actually been used for military and space studies, which are costly technologies, for many years; in recent years, there has been an increase in its use in the fields of health, education, gaming, libraries, museums and industrial design (6). Metaverse technology can also be used to prepare professionals in many fields for different situations or to improve their skills and competencies. Digitalized health and education fields are considered to be important and distinctive areas where this technology is used extensively (7).

Car et al. sub-contents of the metaverse used in the field of education;

- Online and Offline Computer Based Education,
- Open and Online Course,
- Virtual Reality (VR),
- Augmented Reality (AR),
- Mobile Learning,
- Gamification and Psychomotor Skills Training (7).

In education, it is stated that classical techniques are no longer sufficient to realize education by keeping educators and students in interaction. This situation has led to the need to create new educational methods with the developing technology. Today, different metaverse technologies are used in the education sector. These technologies include personalization of medicine, nanotechnology, the use of 3D printers, mobile health technologies, artificial intelligence, virtual reality and simulations (8).

Virtual reality, which is frequently used in the field of education, is defined as a simulated world run by a computer system. In this world, the person is enabled to interact between real life and emotions. It is stated that this is the feature that distinguishes virtual reality from other different technologies such as television (7). Virtual reality is an illusion that makes a person feel as if they are there, even though they are not actually there (9). In another definition, virtual reality or augmented reality is defined as "an experience in which a user enters a virtual world (consisting of three-dimensional objects) using a computer or mobile device while physically remaining in their real world" (10).

Simulation is defined as "a form of learning that mimics and explains real-life clinical situations". Simulation is a method in which students gain experience in an environment or situation that reflects reality, without the risk of harming the patient, and provides the opportunity to think logically and make decisions in a clinical setting (11).

It reveals the need to make more use of virtual reality technologies and simulations in order to improve the education and practice process of healthcare and professional professionals. These technologies provide a comprehensive teaching model in the field of education and help students develop new ideas and problem-solving skills (12). This new educational model creates an accessible learning space for all students in a virtual environment with technologies combined with interactive, imagery and three-dimensional visualization techniques and allows them to use it at any time (12). The use of simulation is recommended to avoid harming patients, reduce errors, increase the quality of education, the number of applications and student satisfaction. These technologies reduce the student's stress, increase self-confidence, improve clinical decision-making skills and provide permanent learning by giving feedback to the student at the end of the application by allowing the scenarios to be applied as much as desired in a clinical environment that is not risky for the student. In this respect, the importance of virtual reality applications in health education is increasing (12,13). There are many different types of simulations used in health education, ranging from simple to complex.

Simulation types;

a. Mannequins or models with low technological features,

b. Standardized/simulated patient role plays

c. Computer-aided simulation

d. Simulations for learning complex functions

e. Integrated, hybrid simulations, implemented in five different ways (14).

Although virtual reality applications have many positive features, they also have some negative features that have been criticized. Although virtual reality is very close to real situations, it is stated as an important point that it cannot replace learning in a one-to-one clinical environment. It is seen that students cannot adapt to the virtual environment and practice more insensitively in the virtual environment because they cannot receive feedback like a real patient. It is thought that abnormal practices will make it difficult to evaluate the student's real knowledge-skills and approach, and at the same time cause time losses in education. In addition, it causes students who encounter this method for the first time to experience stress while practicing and negatively affects the learning process (15).

The use of metaverse technology, which is being used in every field today, is becoming increasingly widespread in the field of health. Metaverse has a high potential to bring new directions to the future of healthcare services with the effective use of the technologies it covers. Technologies that will enable the metaverse in healthcare (artificial intelligence, virtual reality, augmented reality, edge computing, etc.) have started to be used in many areas such as education, research, patient care, rehabilitation services and clinical applications. In addition, potential improvements are expected in many areas such as treatment effectiveness, cost, health workforce, education and patient satisfaction in healthcare services with metaverse. Metaverse technology has brought important innovations in the training of health manpower, especially in applied training. The use of metaverse technology in the education of students receiving health education increases the quality of education and provides students with the opportunity to practice in a safe area without fear of negative consequences. The use of metaverse technology for nurse, physiotherapist, dietician, audiologist, audiologist, sports specialist and social worker candidates, who will have an important place in the workforce planning of health services, will contribute to the acquisition of the necessary application skills and the development of clinical decision-making skills. Health sciences students need to be equipped with the necessary knowledge to adapt to and leverage these technological advancements in their future careers. Studying health sciences students can provide insights into how these applications may impact their future practices. Understanding how students in this specific field perceive and engage with the metaverse is important for aligning education and training with evolving technological landscapes. Health sciences students may encounter unique ethical challenges when dealing with virtual environments, such as issues related to patient privacy, data security, and the ethical use of virtual technologies in medical settings. Examining their knowledge, attitudes, and awareness levels can shed light on these ethical considerations (6-8,10,11). When we look at the literature, we see that there are limited studies examining the knowledge, attitudes and behaviors of students studying in the field of health about the concept of metaverse, which shapes the future (16,17). The aim of this study is to examine the metaverse knowledge, attitudes and awareness levels of students studying in the faculty of health sciences of a university according to various variables and to provide guidance in determining the requirements for studies to be conducted in the field of metaverse, which is a developing technology. It is thought that this study will contribute to the literature in this respect.

Materials and Methods

Purpose of the Study

The aim of this study is investigation of metaverse knowledge attitude and awareness levels of students studying in the faculty of health sciences of a university according to variables.

This research is a descriptive and quantitative study.

Time and Settings

This study was conducted with students enrolled in the Faculty of Health Sciences of a Foundation University in the spring semester of the 2022-2023 academic year. Immediately after the 17.03.2023 dated permission letter, the questionnaires were sent to the students' personal cell phones. The research was conducted between March and May 2023.

Population and Sample of the Study

The population of the study consists of 1301 students enrolled in undergraduate programs in the spring semester of 2022-2023 at the Faculty of Health Sciences of a Foundation University. The sample of the study was determined according to the formula for the number of individuals in the population (Formula 1). The population of the study consisted of 1301 students.

$$n = \frac{(1301)\times(1.96)^2\times(0.5)\times(0.5)}{(0.05)^2\times(1301-1)+(1.96)^2\times(0.5)\times(0.5)} = 297$$

Number of students to be sampled by departments		
Department	**Total Number of Students**	**Minimum number of students**
Nursing	280	64
Audiology	136	31
Nutrition and Dietetics	301	68
Physiotherapy and Rehabilitation	262	60
Exercise and Sport Science	104	24
Healthcare Management	66	15
Social Work	152	35
Total	**1301**	**297**

In total, a minimum of 297 students were planned to be included in the sample. The number of students to be included according to departments was shown by stratified sampling method. The research was completed with 334 students.

Measurements

In order to collect the data in the study, the "Introductory Characteristics Form" and the "Metaverse Scale" were used to question the socio-demographic characteristics of the students, which were created by utilizing the literature.

Introductory Characteristics Form: This form includes 21 questions about individual characteristics, social media use and frequency, and access to developing technology (14-18).

Metaverse Scale: The metaverse scale developed by Süleymanoğulları et al. in 2022 consists of 15 items and four sub-dimensions: technology, digitalization, social and lifestyle. The scale is 5-point Likert type. It is scored as 1=Disagree and 5=Agree. The lowest score is 15 and the highest score is 75. The higher the scores obtained from the scale, the higher the level of knowledge, attitude and awareness of the metaverse concept. It is stated that this scale is an effective scale related to the metaverse concept and can be used to determine the knowledge, attitudes and awareness of individuals about the metaverse, which is an important issue of recent times. Cronbach's alpha reliability coefficient value is 0.813 (18)**.** In this study, Cronbach's alpha was 0.807.

Data Collection Process

After obtaining the necessary permissions for the research, the purpose of the research was explained to the participants and the data collection form created in electronic environment was sent to their smart phones to those who agreed to participate in the study. The completion time of the forms was approximately 10 minutes. Link to the form:https://docs.google.com/forms/d/1PzXcBd-qICpF0N85okZPLBm9lz1Im5CiSjgWZrVAYcIk/edit . If no response was received after one week, the same e-mail was sent to the participants two more times at three-day intervals.

In order to check the comprehensibility of the questions in the questionnaire, a pre-application was made to 30 students studying at the Faculty of Health Sciences of the University where the study was conducted. Since no changes were made to the questions, the students who were pre-applied were included in the sample.

Statistical Analysis

Statistical Package for Social Science (SPSS 25 for Windows) package program was used to evaluate the data. The data were first evaluated with the Kolmogorov-Smirnov test, kurtosis and skewness coefficients and histograms for conformity to normal distribution. Since the kurtosis and skewness values of the data showed normal distribution, parametric tests were used in the analysis. Independent Sample T-Test was used for the comparison of binary variables and One Way Anova test was used for the comparison of three or more variables.

Ethical Process

The necessary permissions were obtained from the Social and Human Sciences Research Council of the University where the research was conducted, the letter dated 17/03/2023 and numbered 215658, and from the Dean of the Faculty of Health Sciences of the university where the research was conducted, from the students who agreed to participate in the research. In addition, the necessary permissions were obtained by e-mail from the people who performed the validity and reliability of the scales. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Table 1: Descriptive Characteristics of Students (n=334)

	n	%
Mean Age = 21.5±2.86		
Gender		
Female	269	80.5
Male	65	19.5
Marital Status		
Single	327	97.9
Married	7	2.1
Class		
1	100	29.9
2	79	23.7
3	78	23.4
4	77	23.1
Place where he/she spends most of his/her life		
Village	8	2.4
District	45	13.5
Province	281	84.1
Place of Stay		
Dormitory	48	14.4
With family	247	74.0
Home alone	18	5.4
At home with friend	21	6.3
Completing a Higher Education Program Before		
Finished	7	2.1
Did not finish	327	97.9
Family Income Level		
Income less than expenditure	32	9.6
Income equal to expenditure	193	57.8
Income more than expenditure	109	32.6
Internet Access Tool*		
Wi-Fi	287	85.9
Mobile data	82	24.6
Time Spent on the Internet		
Less than 1 Hour	5	1.5
1-3 Hours	65	19.5
3-5 Hours	155	46.4
5 Hours and Over	109	32.6
Internet Use Skills		
Low	11	3.3
Middle	183	54.8
High	140	41.9
Technological Tools Used to Use the Internet*		
Telephone	318	95.2
Computer	149	44.6
Tablet	35	10.5
Previous Participation in Online Training		
Yes	325	97.3
No	9	2.7
Finding Online Education Useful		
Yes	113	33.8
No	221	66.2
Hearing the Definition of Metaverse Before		
Yes	156	46.7
No	178	53.3
Virtual Reality Experience Status		
Yes	59	17.7
No	275	82.3
Experiencing Virtual Reality with Games		
Yes	108	32.3
No	226	67.7
Avatar Creation Status		
Yes	147	44.0
No	187	53.3
**More than one option was selected.*		

Results

The mean age of the students participating in the study was 21.5±2.86 years, 80.53% (n=269) were female and 19.5% (n=65) were male. 29.9% (n=100) of the students were in 1st grade, 23.7% (n=79) were in 2nd grade, 23.4% (n=78) were in 3rd grade, and 23.1% (n=77) were in 4th grade. Most of the students are single (97.9%), have spent most of their lives in the province (84.1%), currently live with their families (74.0%) and have not completed any higher education program before (97.9%). Regarding family income levels, 57.8% (n=193) of the students stated that their income was equal to their expenses (Table 1).

Among the students who participated in the study, 85.9% (n=287) stated that they use wifi for internet access, 46.4% (n=155) stated that they spend 3-5 hours a day on average on the internet, 54.8% (n=183) defined their internet usage skills as average, 97.3% (n=325) stated that they had participated in online education before, 66.2% (n=221) stated that they did not find online education useful. 53.3% (n=178) of the students stated that they had not heard of the concept of metaverse before, 82.3% (n=275) had not experienced virtual reality before, 67.7% (n=226) had not experienced a game involving virtual reality before, and 53.3% (n=187) had not created a virtual avatar before (Table 1).

The mean total score of the Metaverse of the students participating in the study was 48.5±12.45, and the mean scores of the sub-dimensions were; Technology Dimension 22.8±6.04, Digitalization Dimension 8.8±3.48, Lifestyle Dimension 10.3±3.27, Socialization Dimension 6.6±2.34 (Table 2).

When the relationship between the descriptive characteristics of the students and the Metaverse scale was compared, a statistically significant difference was found between the digitalization sub-dimension and marital status (p=0.000). The mean score of the digitalization sub-dimension of those who were married was found to be higher than those who were single (Table 3).

Place of stay was found to have a significant difference with the socialization sub-dimension (p=0.030). The mean socialization sub-dimension score of the students staying in dormitories was higher than the students staying with their families or living alone and with friends at home (Table 3).

A significant relationship was found between students' income levels and the digitalization sub-dimension (p=0.034). The average of the digitalization sub-dimension of the students who defined their income as more than their expenses was higher than the students who defined their income as less than or equal to their expenses (Table 3).

A significant difference was found between the grade levels of the students participating in the study and the total sub-dimensions of technology, digitalization, lifestyle and metaverse (p=0.000; p=0.036; p=0.000; p=0.002, respectively). While the mean scores of 4th graders were higher in technology, lifestyle and metaverse total sub-dimensions, the mean scores of 3rd graders were higher in digitalization sub-dimension (Table 3).

Table 2: Distribution of Metaverse Scale Item Total and Subscale Score Averages

	n	Mean±Sd	Min-Max
Technology	334	22.8±6.04	7-35
Digitalization	334	8.8±3.48	3-39
Lifestyle	334	10.3±3.27	3-15
Socialization	334	6.6±2.34	2-10
Metaverse Total	334	48.5±12.45	5-75

Table 3: Comparison of Students' Descriptive Characteristics and Metaverse Scale Item Total and Subscale Scores

	N	Technology			Digitalization			Lifestyle			Socialization			Metaverse Total		
		X±Sd	Test	p	X±Sd	Test	p	X±Sd	Test	p	X±Sd	Test	p	X±Sd	Test	p
Marital Status																
Single	327	22.9±6.09			8.7±3.07	-4.213	**0.00**	10.3±3.30	0.707	0.480	6.6±2.35	0.676	0.499	48.5±12.46	-0.441	0.660
Married	7	21.0±2.08	.817	0.414	**14.1±11.24**			9.4±1.90			6.0±1.73			50.6±12.62		
Place of Stay																
Dormitory	48	22.6±6.31			8.7±3.27			10.0±3.62			**7.4±2.11**			48.7±12.94		
With family	247	22.9±6.10			8.8±3.621			10.3±3.27			6.4±2.37			48.4±12.62		
Home alone	18	22.8±4.53	0.072	0.975	8.6±1.88	0.084	0.969	10.7±2.71	0.320	0.811	6.4±2.14	3.019	**0.030**	48.5±8.54	.057	0.982
At home with friend	21	23.3±6.11			8.5±3.60			10.6±3.13			7.1±2.19			49.5±12.89		
Family Income Level																
Income less than expenditure	32	20.8±6.41	2.288	0.103	7.3±3.14	3.414	**.034**	9.6±4.09	1.218	0.297	7.3±2.10	1.685	0.187	45.0±12.50	1.661	0.192
Income equal to expenditure	193	22.9±6.19			8.8±3.74			10.2±3.24			6.5±2.43			48.5±12.99		
Income more than expenditure	109	23.3±5.56			**9.1±2.98**			10.6±3.05			6.5±2.22			49.5±11.33		
Class																
1	100	22.5±6.39			8.8±3.09			10.3±3.31			6.4±2.39			48.0±13.20		
2	79	20.9±6.72			7.9±3.26			9.1±3.72			6.7±2.44			44.5±13.90		
3	78	23.4±4.89	5.945	**0.001**	**9.3±4.37**	2.871	**0.036**	10.6±2.66	6.341	**0.000**	6.5±2.13	.303	0.824	49.9±9.67	5.134	**0.002**
4	77	**24.8±5.30**			9.2±3.03			**11.2±2.96**			6.7±2.38			**51.9±11.35**		
Department																
Nutrition and Dietetics	82	22.5±6.55			8.9±3.13			10.2±3.51			6.6±2.55			48.3±13.82		
Exercise and Sport Sciences	25	21.0±5.38			8.3±2.50			9.4±3.27			6.5±2.02			45.2±11.24		
Physiotherapy and Rehabilitation	58	22.0±6.10	1.394	0.216	8.8±5.00	0.548	0.772	9.3±3.05	2.218	**0.041**	5.8±2.51	2.793	**0.012**	46.0±13.04	1.367	0.227
Nursing	79	24.0±5.83			9.0±2.87			**11.2±2.93**			6.5±2.20			50.7±11.44		
Audiology	34	23.2±5.76			8.7±3.73			10.2±3.27			**7.8±2.02**			49.9±11.56		
Healthcare Management	20	24.5±5.01			9.3±2.79			10.8±2.51			7.0±2.06			51.5±10.05		
Social Work	36	22.4±6.13			8.0±3.31			10.5±3.79			6.9±2.10			47.7±12.66		

When the departments in which the students were studying were compared, the mean score of the lifestyle sub-dimension was found to be significantly higher in nursing department students than in other departments (p=0.041). The mean score of the socialization sub-dimension was significantly higher in audiology department students than in other department (p=0.012) (Tablo 4).

A significant difference was found in the technology (p=0.013), lifestyle (p=0.002), and metaverse total mean score (p=0.024) with whether the students had heard of the concept of Metaverse before or not. Those who had heard of the concept of Metaverse before had higher technology, lifestyle, and metaverse total mean scores (Table 4).

The mean scores of technology (p=0.004; p=0.009), lifestyle (p=0.037; p=0.032) sub-dimensions and metaverse total mean scores (p=0.010; p=0.031) of those who had experienced virtual reality and games involving virtual reality were significantly higher than those who had not (Table 4).

When asked about Internet use skills, a significant difference was found with the lifestyle sub-dimension (p=0.003). The life style sub-dimension mean score of the students who defined their Internet use skills as high was found to be higher than the students who defined their Internet use skills as low or average (Table 4).

Table 4: Comparison of Students' Introductory Characteristics Related to Technology and Metaverse Scale Item Total and Subscale Scores

	N	Technology			Digitalization			Lifestyle			Socialization			Metaverse Total		
		X±Sd	Test	p	X±Sd	Test	p	X±Sd	Test	p	X±Sd	Test	p	X±Sd	Test	p
Hearing the Definition of Metaverse Before																
Yes	156	**23.7±5.33**			8.9±2.77			**10.9±2.81**			6.6±2.23			**50.2±10.74**		
No	178	22.1±6.51	2.504	**0.013**	8.7±4.01	0.583	0.560	9.8±3.56	3.179	**0.002**	6.6±2.44	0.305	0.761	47.1±13.65	2.265	**0.024**
Virtual Reality Experience Status																
Yes	59	**24.9±4.91**	2.882	**0.004**	9.3±2.58	1.279	0.202	**11.1±2.6**1	2.090	**0.037**	7.0±2.38	1.4740	0.141	**52.3±10.22**	2.586	**0.010**
No	275	22.4±6.17			8.7±3.64			10.1±3.38			6.5±2.32			47.7±12.75		
Experiencing Virtual Reality with Games																
Yes	108	**24.1±5.96**	2.628	**0.009**	9.1±2.89	1.037	0.300	**10.9±3.080**	2.152	**0.032**	6.6±2.13	.198	0.843	**50.6±12.21**	2.166	**0.031**
No	226	22.5±5.99			8.6±3.73			10.0±3.34			6.6±2.43			47.5±12.64		
Internet Use Skills																
Low	11	20.9±7.48			7.8±4.49			7.45±4.50			5.45±2.54			41.63±18.40		
Middle	183	22.5±6.22	1.818	0.164	8.7±3.84	0.739	0.478	10.10±3.42	6.098	**0.003**	6.7±2.43	1.556	0.213	47.9±13.17	2.652	0.072
High	140	23.5±5.63			9.0±2.86			**10.8±2.83**			6.5±2.19			49.8±10.67		

There is a significant positive relationship between the digitalization sub-dimension and the age of the students. As the age of the students increased, the mean item total scores of the digitalization subscale increased (r=0.179; p=0.001) (Table 5).

Table 5: Correlation between Age and Digitalization Subdimension (n=334)

		Digitalization
Age	r	0.179
	p	**0.001**

Discussion

In this section, the findings are discussed in line with the literature. In the study, it was aimed to examine the metaverse knowledge, attitudes and awareness levels of students studying in the faculty of health sciences of a university according to various variables

When students' metaverse knowledge, attitudes and awareness levels were compared according to their gender, no significant relationship could be established with any of the sub-dimensions. This may be due to the development of technology without gender discrimination. In addition, Turan et al. (17) found that gender had no effect on metaverse knowledge attitude and awareness level in their study in which metaverse knowledge levels were examined according to some variables. Unlike the study, in a study conducted by Savaş et al. (16) it was determined that the mean score of the digitalization sub-dimension of males was significantly higher than females. It may be due to the fact that men are more involved in the digital world (games, inventions, etc.) and women approach new virtual environments more cautiously due to the thought that they cannot adapt to this world.

Looking at the total score comparison of the sub-dimensions in the metaverse knowledge levels of the students regarding their marital status; a significant difference was found with the digitalization sub-dimension and no significant difference was found in other sub-dimensions. In the digitalization sub-dimension, the average score of the married students was found to be higher. Unlike this study, in a study conducted by Turan et al. (17), the mean score of the social sub-dimension of singles was found to be significantly higher than marrieds. No significant difference was found in other sub-dimensions and total scores. In this study, married students' high scores in the digitalization subscale may be related to greater exposure to technology and virtual environments in more social or family environments. These findings align with studies suggesting that social contexts can influence one's familiarity and comfort with emerging Technologies (19,20).

When the total score comparison of the sub-dimensions of the metaverse knowledge levels of the students participating in the study was examined, a significant difference was found in all sub-dimensions except the socialization sub-dimension. In this study, it was determined that the mean scores of the students increased as the grade level increased. Suh and Seongjin (21) reported in a study that as the grade level increases, students can use metadata products more easily and their motivation to use them increases. Fourth-grade students, and specifically those in nursing and audiology departments, showing higher metaverse knowledge, attitudes, and awareness levels could indicate that more advanced students or those in certain disciplines may have encountered or integrated metaverse-related concepts into their coursework. Different departments may have varying degrees of integration of emerging technologies into their curriculum. As the education level of students increases, they tend to research and use more information professionally. In addition, as the grade increases, health sciences students may have the opportunity to experience in digital environments before these applications, as they go to clinical and field applications. Unlike this study, Savaş et al. (16) found no statistically significant difference in the sub-dimensions and total scores of students' metaverse knowledge levels according to their grade levels.

In this study, a significant positive relationship was found between age and digitalization sub-dimension. In a study conducted in Singapore, it was determined that 77.0% of young Singaporeans between the ages of 18-35 were interested in the metaverse (21). Unlike this study, Statista (22) found that the older the age, the less knowledge about the metaverse concept. It was determined that 18.0% of Generation Z (born between 1996 and 2015) had heard a lot about the metaverse and 16.0% of Generation Y (born between 1977 and 1995) were aware of the virtual reality environment (22). In Newzoo's (23) "Decade of Gamer Consumer Research" report, it was stated that Generation Z plays online games in 25.0% of their free time, 81.0% of gamers play digital games, and more than half of gamers under the age of 50 want to continue to be in the gaming world.

Comparisoning of metaverse knowledge level and total score of sub-dimensions according to where the students participating in the study are currently staying, a significant difference was found with the socialization sub-dimension. It is thought that this may be due to the fact that students living in dormitories have more peer groups around them, are in more social environments and transfer information more easily compared to students living at home.

When the income level of the students was questioned, a significant difference was found in the digitalization sub-dimension when the metaverse knowledge level and the total scores of the sub-dimensions were compared. The digitalization sub-dimension of the students who marked their income level as "my income is more than my expenses" was found to be higher.

The association between higher metaverse knowledge, attitudes, and awareness levels with a self-defined high income level may suggest that individuals with more financial resources are better equipped to access and engage with technology, including the metaverse. This aligns with a common trend where higher socioeconomic status is linked to greater access to digital tools and experiences (19,20).

When the students' internet usage skills were questioned, a significant difference was found in the lifestyle sub-dimension when looking at the comparison of the metaverse knowledge level and the total score of the sub-dimensions. The life style sub-dimension of the students who defined their internet use skills as high was higher than the other dimensions and the total score. This variable means that students with high Internet use skills hear and use the concept of metaverse in their lives. In a similar study conducted by Savaş et al. (16), when the level of internet usage of the participants and the sub-dimensions and total mean scores of the metaverse knowledge levels were compared, it was observed that the mean score of the digitalization sub-dimension of the participants with high internet usage skills was significantly higher. The association between high internet usage skills and higher metaverse knowledge, attitudes, and awareness levels suggests that proficiency in navigating online platforms is a relevant factor. This aligns with the broader concept that digital literacy and skills contribute to effective engagement with emerging technologies.

When the mean scores of the total score of metaverse and its sub-dimensions were compared with the students' having heard the concept of metaverse before, a significant difference was found in the technology sub-dimension, lifestyle sub-dimension and metaverse total score sub-dimension. The mean score was found to be higher in those who had heard the concept of metaverse before. This can be interpreted as an expected situation that students who have heard the definition of metaverse before have higher levels of knowledge. In a study (16), it was found that those who had heard the concept of metaverse before had a significantly higher difference in all sub-dimensions except the social sub-dimension and in the total score. In parallel with this study, Statista (22) found that 14% of adults knew the concept of metaverse very well, 31.0% had heard of metaverse but had no idea about the concept, and 31% had never heard of metaverse. In a similar study conducted by Sayımer and Küçüksaraç (24) with communication faculty students, 52.0% of the students stated that they knew about augmented reality applications, and Uygur et al. (25) stated that 50.9% of the candidates had heard of augmented reality applications in their study with prospective teachers. In a study conducted by Talan and Kalınkara (26) with second-year students studying in the department of computer engineering, it was found that 70.6% of the students had not used metaverse technology before. Similarly, in the study conducted by Turan et al. (17) it was determined that the mean scores of the digitalization and lifestyle sub-dimensions and total scores of those who had heard of the concept of metaverse before were significantly higher. The positive association between having heard the concept of the metaverse before and higher knowledge levels aligns with the general principle that prior exposure fosters understanding. This finding supports the idea that early education or awareness campaigns about the metaverse could positively impact students' knowledge and attitudes.

The mean scores of the technology, lifestyle sub-dimension and total metaverse sub-dimension of the students who had previously experienced virtual reality and virtual reality through games were found to be significantly higher. This situation can be interpreted as an expected situation that students who have experienced virtual reality, which is an important component of the metaverse technology, and this reality through games, have a high level of knowledge about the metaverse. Those who have engaged with similar technologies may have a more solid foundation for understanding the metaverse. This supports the idea that hands-on experience with related

technologies contributes to a more positive attitude and higher awareness.

Conclusion

In this study, the metaverse knowledge, attitudes and awareness characteristics of students studying in the faculty of health sciences of a university were examined and it was determined that metaverse knowledge, attitudes and awareness levels were higher in: those who lived in dormitories, those who were married, those who defined their income level as high, 4th grade students, nursing and audiology department students, those who stated that they had heard the concept of metaverse before, those who experienced virtual reality and virtual reality games, and students who defined their internet usage skills as high. The reason why students' knowledge, attitude and behavior levels about metaverse are variable may be due to the fact that many students have not yet experienced the metaverse application since the concept of metaverse is still developing. Metaverse applications are not yet widely used in health education and research on its effectiveness in the learning-teaching process has only recently begun. With the changing and developing technology, it is predicted that young generations born into this technology will use the concept of metaverse more advanced and widespread in the future, and as the researches revealing the benefits of this concept on students in the field of health education increase, it will become more widespread in many fields.

In this context;

- Providing health education professionals with the opportunity to offer students the opportunity to experience this technology by including topics that include the concept of metaverse in courses within the university curriculum,
- Since metaverse is a concept that is just beginning to be explored, in future studies, determining metaverse knowledge, attitude and awareness levels in larger samples and students studying in different departments,
- Examining the causes of students' metaverse attitudes and behaviors using different models,
- Examining the relationships of students' metaverse attitudes and behaviors with different concepts that may affect technology addiction, academic achievement, social support perception, happiness and fear,
- Researchers examine how these findings compare or differ from similar studies, taking into account cultural, educational, and technological contexts,
- Conducting research with experimental design within the scope of metaverse supported education modules or similar metaverse online courses,
- Additionally, it explores the potential implications of these findings for curriculum development, educational strategies, and future research directions at the intersection of health sciences and metadata,
- Multidisciplinary projects and collaborations with research groups in fields involving different technological disciplines are recommended.

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Conflict of Interest

There is no conflict of interest between the authors.

Ethics approval

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Availability of data and material

Research data is available upon request.

Authors' Contributions

SAI: Design, data collection, analysis and writing.

INK: Design, data collection, and writing.

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References

1. Kim J. Advertising in the metaverse: Research agenda. J. Interact. Advert. 2021;21(3):141-44. DOI: 10.1080/15252019.2021.2001273
2. Lee JY. A study on metaverse hype for sustainable growth. Int. J. Adv. Smart Converg. 2021;010(3):72-80.
3. Mystakidis S. Metaverse. Encyclopedia. 2022; 2(1):486-497. DOI: 10.3390/encyclopedia2010031
4. Damar M. Metaverse shape of your life for future: A bibliometric snapshot. Journal of Metaverse. 2021;1(1):1-8.
5. Fernandez, CB and Hui P. Life, the metaverse and everything: An overview of privacy, ethics, and governance in Metaverse. Paper presented at the 2022 IEEE 42nd International Conference on Distributed Computing Systems Workshops (ICDCSW).
6. Mccarthy CJ and Uppot RN. Advances in virtual and augmented reality exploring the role in health-care education. J. Radiol. Nurs. 2019;38(2):104-5. DOI: 10.1016/j.jradnu.2019.01.008
7. Car J, Carlstedt-Duke J, Tudor Car L, et al. Digital education in health professions: The need for overarching evidence synthesis. J. Med. Internet Res. 2019;21(2):e12913. DOI:10.2196/12913.
8. Zhang X, Chen Y, Hu L, et al. The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics. Front Psychol. 2022 Oct 11;13:1016300. DOI: 10.3389/fpsyg.2022.1016300
9. Khadra C, Ballard A, Paquin D, et al. Effects of a projector-based hybrid virtual reality on pain in young children with burn injuries during hydrotherapy sessions: A within-subject randomized crossover trial. Burns. 2020 Nov;46(7):1571-84. DOI: 10.1016/j.burns.2020.04.006.
10. Lessick S and Kraft M. Facing reality: the growth of virtual reality and health sciences libraries. J Med Libr Assoc. 2017 Oct;105(4):407-17. DOI: 10.5195/jmla.2017.329.
11. Sarı D and Erdem H. The use of high fidelity simulation in nursing education: A literature review. J. Hum. Sci. 2017;14(4):3690-707. DOI: 10.14687/jhs.v14i4.4882
12. Bhugaonkar K, Bhugaonkar R and Masne N. The trend of metaverse and augmented & virtual reality extending to the healthcare system. Cureus. 2022 Sep 12;14(9):e29071. DOI: 10.7759/cureus.29071.
13. Ahuja AS, Polascik BW, Doddapaneni D, et al. The Digital metaverse: Applications in artificial ıntelligence, medical education, and ıntegrative health. Integr Med Res. 2023 Mar;12(1):100917. DOI: 10.1016/j.imr.2022.100917.
14. Kononowicz AA, Woodham LA, Edelbring S, et al. Virtual patient simulations in health professions education: systematic review and meta-analysis by the digital health education collaboration. J Med Internet Res. 2019 Jul 2;21(7):e14676. DOI: 10.2196/14676.
15. Koukourikos K, Tsaloglidou A, Kourkouta L, et al. Simulation in clinical nursing education. Acta Inform Med. 2021 Mar;29(1):15-20. DOI: 10.5455/aim.2021.29.15-20.
16. Savaş BÇ, Karababa B and Turan M. Metaverse bilgi düzeyi: beden eğitimi ve spor öğretmeni adayları üzerine bir incelenme. Uluslararası Egzersiz Psikolojisi Dergisi, 2022;4 (1),18-29. DOI: 10.51538/intjourexerpsyc.1140511
17. Turan M, Mavibaş M, Savaş BÇ, et al. Beden eğitimi öğretmenlerinin metaverse bilgi düzeylerinin çeşitli değişkenlere göre incelenmesi. TOJRAS, 2023;12(1):25-42. DOI: 10.22282/tojras.1201104.
18. Süleymanoğulları M, Özdemir A, Bayraktar G, et al. Metaverse scale: Study of validity and reliability. Anatolia Sport Research. 2022;2757-6485:47-58. DOI: 10.29228/anatoliasr.25
19. Ali S, Wang D, Hussain T, et al. The ımpact of virtual society on social capital formation: a comparative analysis of facebook and whatsapp. *SAGE Open*; 2023, *13*(4). DOI: 10.1177/21582440231210077
20. Benvenuti M, Cangelosi A, Weinberger A, et al. Artificial intelligence and human behavioral development: A perspective on new skills and competences acquisition for the educational context. Comput. Hum. Behav. 2023;148(3):107903. DOI: 10.1016/j.chb.2023.107903
21. Suh W and Ahn S. Utilizing the metaverse for learner-centered constructivist education in the post-pandemic era: An analysis of elementary school students. J Intell. 2022 Mar 7;10(1):17. DOI: 10.3390/jintelligence10010017.
22. Statista. [İnternet]. Interest in the metaverse in Singapore in 2022, by age group. 2022. [Available date: 28 May 2023]. Available from: https://www.statista.com/statistics/1300559/singapore-interest-inmetaverse-by-age-group
23. Newzoo. [İnternet]. Newzoo's generations report: How different generations engage with games. 2021. [Available date: 30 Mayıs 2023]. Available from: https://newzoo.com/insights/trend-reports/newzoosgenerations-report-how-different-generations-engage-with-games
24. Sayımer İ and Küçüksaraç B. Contribution of new technologies to university education: Opinions of communication faculty students on augmented reality applications<p>Yeni teknolojilerin üniversite eğitimine katkısı: İletişim fakültesi öğrencilerinin artırılmış gerçeklik uygulamalarına ilişkin görüşleri. Int. J. Hum. Sci. 2015; 12(2):1536-54. DOI: 10.14687/ijhs.v12i2.3488
25. Uygur M, Yelken TY and Akay C. Analyzing the views of pre-service teachers on the use of augmented reality applications in education. European J. Ed. Res. 2018;7(4):849-60. DOI: 10.12973/eu-jer.7.4.849.
26. Talan T and Kalınkara Y. Students' opinions about the educational use of the metaverse. IJTES, 2022;6(2):333-46. DOI: 10.46328/ijtes.385.

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A Study on the Utility of Screening Tests in Squamous Cell Carcinoma (SCC) and High-grade Intraepithelial Lesions (HSIL) of the Cervix: Evaluation of 447 Cases with Histopathological Diagnosis

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ABSTRACT

Introduction: Cervical cancer is one of the most common cancers in women. Precancerous lesions of the cervix can be detected with the combined use of smear testing and HPV (Human Papillomavirus) testing. International guidelines have been developed to indicate at what intervals and in which situations the tests should be performed. In this study, we examined the clinical utility of screening tests in patients with histopathological diagnosed SCC (squamous cell carcinoma) and HSIL.

Methods: Between January 2022 and June 2023, 447 patients aged 19-73 years (mean 37) with cervical biopsy results of SCC and HSIL were evaluated for the use of diagnostic tests (PAP smear and HPV test).

Results: PAP smears were performed in 98.2% and HPV tests in 39.1% of all cases before histopathologic diagnosis. The most frequently detected high-risk HPV (hrHPV) was type 16. HPV testing significantly decreased with age. HPV testing was not performed in 74.2% of patients aged 51-60 years and 80.9% of patients over 60 years.

Conclusion: These cases the clinical utility and pathologic evaluation of the PAP smear were optimal. However, HPV testing practice was decreasing, especially with age. Cytologic evaluation may be misleading due to age-related hormonal withdrawal, difficulty in obtaining adequate smears, and atrophic changes. Our recommendation is to use HPV testing in all age groups, but especially in the population over 50 years of age, where cytologic difficulties may occur, HPV testing should be performed optimally until 65 years of age.

Keywords: HSIL, SCC, HPV, hrHPV, PAP smear, elderly woman.

ÖZET

Giriş: Serviks kanseri kadınlarda en sık görülen kanserlerden biridir. Serviksin prekanseröz lezyonları smear ve HPV (Human Papillomavirus) testlerinin kombine kullanımı ile saptanabilir. Uluslararası kılavuzlar, testlerin hangi aralıklarla ve hangi durumlarda yapılması gerektiğini belirtmek için geliştirilmiştir. Bu çalışmada, histopatolojik olarak SCC (skuamöz hücreli karsinom) ve HSIL (yüksek dereceli skuamöz intraepitelyal lezyon) tanısı alan hastalarda tarama testlerinin klinik yararlanımını inceledik.

Yöntem: Ocak 2022 ile Haziran 2023 arasında, yaşları 19-73 arasında değişen (ortalama 37), servikal biyopsi sonuçları SCC ve HSIL olan 447 olgu üzerinde, tanı testlerinin (PAP smear ve HPV testi) kullanımını değerlendirildi.

Bulgular: Histopatolojik inceleme öncesinde tüm olguların %98,2'sine PAP smear ve %39,1'ine HPV testi yapılmıştı. En sık tespit edilen yüksek riskli HPV (hrHPV) tipi; HPV 16 idi. HPV testinin yapılma oranı yaşla birlikte önemli ölçüde azalmaktaydı. 51-60 yaş arası hastaların %74,2'sine, 60 yaş ve üstü hastaların %80,9'u HPV testi yapılmamıştı.

Sonuç: Çalışma olgularında PAP smearın klinik yararlanımı ve patolojik değerlendirmesi optimaldi. Ancak, HPV testi uygulaması özellikle yaşla birlikte azalmaktaydı. Sitolojik değerlendirme, yaşa bağlı hormonal geri çekilme, yeterli yayma elde etme zorluğu ve atrofik değişiklikler nedeniyle yanıltıcı olabilir. Önerimiz HPV testinin tüm yaş gruplarında kullanılması, ancak özellikle sitolojik zorlukların yaşanabileceği 50 yaş üstü popülasyonda HPV testinin 65 yaşına kadar yapılmasıdır.

Anahtar Kelimeler: HSIL, SCC, HPV, hrHPV, PAP smear, ileri yaş kadın.

Although screening tests for the detection of precancerous lesions of the cervix are now more widely used, cervical cancer is still one of the most common cancers in women[1-7]. More than 90% of cervical cancers and precancerous lesions are caused by HPV infection[1,8-10]. More than 450 HPV types have been reported[1]. However, 15 genotypes are carcinogenic and considered as high-risk HPV subtypes (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 68, 73, and 82)[9,11]. HPV, a DNA virus, activates the cell cycle with its oncoproteins and inhibits apoptosis, a programmed cell death that allows the damaged cell to die[1,8-10]. HPV infection can cause permanent or recurrent infections by settling in the reserve cells in the basal layer in the squamocolumnar zone of the cervix[1,12]. Cervical cancer is a preventable disease due to the protective effect of the HPV vaccine from high-risk HPV subtypes for cancer and the long period of transition from dysplasia to invasive tumor[13,1,14]. The Papanicolaou (PAP) smear test is an easy-to-administer, low-cost, non-invasive screening test that aims to detect cervical dysplasia and early detection of cancer[15]. The Bethesda system for reporting cervical cytology was first developed in 1988, and different versions were published in the following years, increasing the clinical utility of the cervical screening test[16,17]. The major innovation of the Bethesda system is the classification of cervical dysplasia into two main groups according to the risk of malignancy development: high-grade and low-grade intraepithelial lesions. According to this classification, moderate to severe dysplasia is considered a high-grade cervical intraepithelial lesion (HSIL), and mild dysplasia is considered a low-grade cervical intraepithelial lesion (LSIL). In addition, this system introduces ASC-H (Atypical squamous cells -cannot exclude high grade squamous intraepithelial lesion) and ASCUS (Atypical squamous cells of undetermined significance) into cervical cytology reports. While the new terminology and classification made it easier for cytopathologists to identify atypical cells, it also led to the need to update clinical practices. For a standardized practice all over the world, the post-Bethesda terminology clinical practice guideline was updated according to the new terminology and announced as a consensus in 2012 with risk calculations[18]. This consensus provides road maps by evaluating the clinical approach to the cases and how to follow up the cases, especially according to age and abnormal cytology results, by evaluating the risk rates. 2019 American Society for Colposcopy and Cervical Pathology (ASCCP) updated the guidelines for clinical approach to cases with the joint use of HPV testing and HPV/cytology tests[19]. Risk analyses and the Bethesda system have contributed to the standardization of rapid intervention, colposcopy examination, and Loop electrosurgical excision (LEEP) after examination for lesions cytologically diagnosed as HSIL or ASC-H. Studies have shown that the HPV test is more effective (with higher sensitivity) in detecting high-grade dysplasia precancerous lesions, than the PAP test[4]. While the PAP test has a detection rate of 50-70% for precancerous lesions, the HPV test has a rate of over 90%[1,10.] The HPV test is considered more advantageous due to its high sensitivity in detecting precancerous lesions, the ability to extend the control interval to 5 years after a negative test result, and the ability to perform the test on oneself [4]. The PAP smear test, on the other hand, is advantageous over the HPV test because of its shorter turnaround time and lower cost[4]. The combined use of both tests in the diagnosis of HSIL cases has a higher success rate than the use of the HPV test alone and therefore the combined use of both tests is recommended[10]. Algorithms are based on the advantages and disadvantages of both tests, the patient's clinical history, and risk analysis. The requirement is to repeat negative HPV tests at 5-year intervals and negative cervical smears at 3-year intervals[1]. It is said that there is no need for screening tests in women over 65 years of age when both tests are negative[1,19]. Despite the cervical screening test and HPV test, histopathology is still the standard diagnostic method for the definitive and final diagnosis of cervical dysplasia and invasive tumors[20-22]. In cases with smear results reported as HSIL, ASC-H, ASCH+LSIL, and HPV high-risk positive cases, the biopsy is indicated and histopathological examination is absolutely necessary[1,18,19]. With histopathology, tissue integrity can be seen, immunohistochemical studies can be performed and differential diagnosis can be made more easily. Histopathologic sampling is invasive and is never used as the first choice for diagnosis because of the desire to preserve cervical tissue, especially in young women. Standardized guidelines have established waiting periods and conditions after cervical cytology and HPV testing before invasive intervention, especially in women expecting pregnancy.

In this study, we aimed to evaluate how effectively screening tests are used in routine practices in line with the literature. Are cervical cytology results and practices in the light of common guidelines sufficient to catch HSIL and early invasive tumors? What are the preanalytical rates of HPV testing in precancerous or precursor lesions and cancer cases? Most studies to date have focused on the

effectiveness of cervical cytology and HPV tests. In this study, we aimed to analyze the clinical use of screening tests in patients diagnosed with HSIL and invasive tumors based on histopathological specimens in our center and to analyze the results comparatively with the data in the literature.

Material and Method

Study Population and Ethics Approval

This retrospective study was approved on 17.08.2023 by Acıbadem University Clinical Research Ethics Committee under study number 2023-13/455.

Between the dates of January 2022 and June 2023, 447 cases between the ages of 19-73 (mean 37) with high-grade intraepithelial lesion (HSIL/CIN 2-CIN3) and squamous cell carcinoma on cervical biopsy were included in our study population. Smear results, HPV co-test results, HPV subtypes, and additional immunohistochemical studies utilized in the diagnostic phase were analyzed in each case before histopathologic diagnosis.

Histopathological Samples and Immunostaining

All samples were fixed in a 10% neutral-buffered formalin solution and processed with a Tissue-Tek Vip® 6 AI device (Sakura Finetek Japan Co., Ltd., Tokyo, Japan) to prepare paraffin blocks. Three-µm-thick sections were prepared from all the blocks and stained with hematoxylin and eosin (H&E) using a Shandon Gemini stainer. Immunohistochemical staining was performed using antibodies against P-16 (805-4713 Monoclonal Mouse-anti-Human, clone: E6H4, Ventana) and Ki-67 (Monoclonal Mouse anti-Human Clone MIB-1, Dako) using a Ventana Benchmark XT device (Roche Diagnostics, Basel, Switzerland)[23]. All the slides were morphologically evaluated and reported by pathologists who were experienced in the field of gynecological pathology using a light microscope (LM) (Olympus BX51) and digital pathology.

Cytopathologic Sampling and HPV Co-Test

The Thinprepprocessuses Preserv Cytand Cyto Lytsolutions (Aptima, Canada). Cytology preparations were prepared by Thinprep (Cytyc Corp., Boxborough, MA, USA) technique. ThinPrep5000 automated processor was used for preparation. The reserve materials were stored in Thinprepsolution (Cytyc's ThinPrep PreservCytmedium). Aptima Panther test was used as an HR-HPV co-test. The Aptima Panther test detects a total of 14 hrHPV (high-risk Human Papillomavirus) types (31, 33, 35, 39, 51, 52, 56, 58, 59, 66, 68) with type 16 alone, 18/45 in a mixture of two, and the remaining 11 types together.

All of the slides were reevaluated and reported by cytopathologists who are experienced in the field of gynecological cytopathology using a light microscope (LM) (Olympus BX51). PAP smears were reported according to the 2016 version of the Bethesda system[24,25].

Statistical Analysis

Statistical analyses were conducted using SPSS 21.0 software (IBM Corp., Armonk, NY, USA; licensed to Istanbul University). Pearson's χ2 test or Fisher's exact test was used to compare categorical data. Results were presented as frequency and percentage and a p-value of <0.05 was considered significant.

Results

Biopsy Results

The patients in our study group were between 19-73 years of age (mean 37), 393 (87.9%) were 49 years and younger, and 54 (12%) were 50 years and older. 37 of 447 cases (8.3%) were squamous cell carcinoma (SCC). 410 of them were HSIL cases. Of the HSIL cases, 254 (62%) had CIN3 or CIN3 accompanied by CIN2 and/or CIN1. 156 cases (38%) had CIN2 or CIN1 accompanying CIN2. 8 patients had no smear and HPV test before biopsy. These 8 cases were 51 years of age or older (mean 65.5) and 5 cases had hysterectomy for prolapse or myoma uteri and were incidentally diagnosed with HSIL. 3 cases were SCC cases who underwent urgent cervical biopsy due to clinical history and findings. P-16 immunohistochemistry was utilized in 33.2%, and P-16 and Ki-67 were utilized in 21.7% of HSIL cases (Figure 1,2).

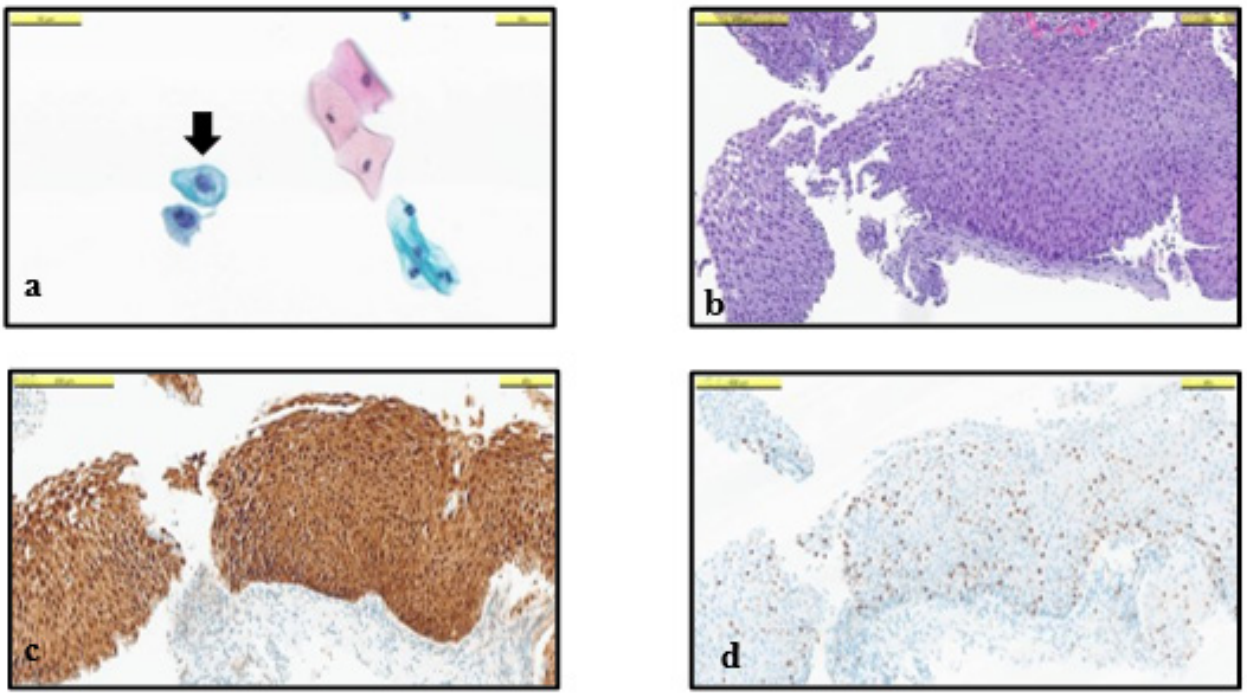

Figure 1: 29 y, HPV 16 (+), smear result LSIL, biopsy result HSIL (CIN 3). a: 2 dysplastic intermediate cells (50 µm PAP) evaluated as LSIL, b: Squamous epithelium with severe dysplasia (200µm H&E), c: same area P-16 cytoplasmic full- thickness strongly positive (200µm), d: same area Ki-67 full-thickness nuclear positive (200µm).

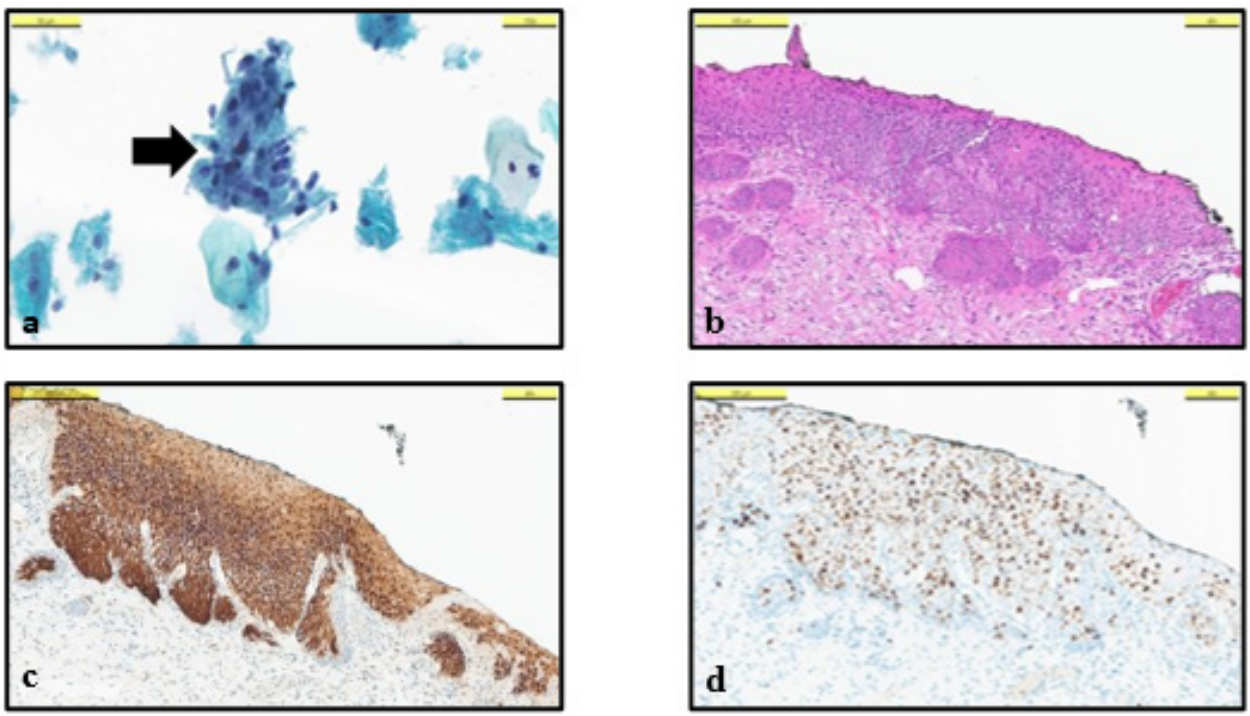

Figure 2: 30 y, HPV 16 (+), smear result HSIL, biopsy result HSIL (CIN 3) a: Dysplastic cell group with large hyperchromatic nuclei and irregular nuclear membrane (50 µm PAP). b: Squamous epithelium with severe dysplasia (200µm H&E), c: same area P-16 cytoplasmic full-thickness strongly positive (200µm), d: same area Ki-67 full-fold nuclear positive (200µm).

Smear Test Results

The smear test was not performed in 8 cases with an age range of 51-73 years (mean 65.5). Of the 439 smears, there were 33 (7.5%) NILM, 76 (17.3%) LSIL, 141 (32.5%) HSIL, 71 (16.1%) ASC-US, 116 (26.4%) ASC-H and ASC-H+LSIL, 2 (0.5%) AGC.

Table 1 shows the distribution of smear results according to biopsy results.

Table 1: Distribution of smear results and biopsy results

	CIN2	CIN3	SCC	Total
NILM	13 (39.4%)	16 (48.5)	4 (12.1%)	33 (100%)
LSIL	43 (56.6%)	32 (42.1%)	1 (1.3%)	76 (100%)
HSIL	28 (19.9%)	99 (70.2%)	14 (9.9%)	141(100%)
ASC-US	39 (54.9%)	29 (40.8%)	3 (4.2%)	71 (100%)
ASC-H	19 (25.3%)	46 (61.3%)	10 (13.3)	75 (100%)
ASC-H+LSIL	13 (31.7%)	27 (65.9%)	1 (2.4%)	41 (100%)
AGC	0	1 (50%)	1 (50%)	2 (100%)
No test	1 (12.5%)	4 (50%)	3 (37.5)	8 (100%)
Total	156 (34.9%)	254 (56.8%)	37 (8.3%)	447 (100%)

NILM *(Negative for intraepithelial lesion or malignancy),* ***LSIL*** *(Low grade squamous intraepithelial lesion),* ***HSIL*** *(High grade squamous intraepithelial lesion),* ***ASC-US*** *(Atypical squamous cells of undetermined significance),* ***ASC-H*** *(Atypical squamous cells – cannot exclude high grade squamous intraepithelial lesion),* ***AGC*** *(Atypical Glandular Cell),* ***CIN2:*** *Cervical moderate dysplasia,* ***CIN3:*** *severe dysplasia and carcinoma in situ,* ***SCC:*** *squamous cell carcinoma*

According to the guidelines, the biopsy was indicated in cases with smear results of HSIL, ASC-H, and AGC regardless of HPV testing. Smear results of NILM, ASCUS, and LSIL could have followed up with smear controls. In our study, when the smear results were analyzed according to the indication for biopsy, the indication for biopsy increased with the smear result as the degree of dysplasia increased. The distribution of biopsy-indicated smear results and cases that could have followed up with smear control according to biopsy results is presented in Table 2.

Table 2: Distribution of smear results to biopsy results according to biopsy indication

	NILM, ASCUS, LSIL	HSIL, ASC-H, AGC (biopsy indication+)	Total
CIN2	95 (61.3%)	60 (38.7%)	155 (100%)
CIN3	77 (30.8%)	173 (69.2%)	250 (100%)
SCC	8 (23.5%)	26 (76.5%)	34 (100%)
Total	180 (41%)	259 (59%)	439 (100%)

NILM *(Negative for intraepithelial lesion or malignancy),* ***LSIL*** *(Low grade squamous intraepithelial lesion), 2:* ***HSIL*** *(High grade squamous intraepithelial lesion),* ***ASC-US*** *(Atypical squamous cells of undetermined significance),* ***ASC-H*** *(Atypical squamous cells – cannot exclude high grade squamous intraepithelial lesion),* ***AGC*** *(Atypical Glandular Cell),* ***CIN2:*** *Cervical moderate dysplasia,* ***CIN3:*** *severe dysplasia and carcinoma in situ,* ***SCC:*** *squamous cell carcinoma*

HPV Test Results

HPV test was performed together with cytology in only 39.1% of the cases (175 cases). Of the 175 patients who underwent HPV testing, only 5 cases were found to be negative for high-risk HPV despite the biopsy result of HSIL. HPV was tested in only 33.6% (138 cases) of HSIL cases and only 27% (11 cases) of SCC cases. HPV testing was significantly decreasing especially in cases over 40 years of age. The distribution of HPV testing according to age is presented in Table 3. HPV testing was particularly high in cases with negative smear results (63.6%) and ASCUS (60.6%). The distribution of HPV testing according to smear results is summarized in Table 4.

Table 3: Distribution of HPV testing by age

Age	hrHPV(-)	hrHPV(+)	HPV no test	Total
19-29	1 (1%)	49 (49.5%)	49 (49.5%)	99 (100%)
30-39	0	81 (39.5%)	124 (60.5%)	205 (100%)
40-49	2 (2.2%)	29 (32.6%)	58 (65.2%)	89 (100%)
50-59	1 (3%)	8 (24.3%)	24 (72.7%)	33 (100%)
60 ≤	1 (4.8%)	3 (14.2%)	17 (81%)	21 (100%)
Total	5 (1.1%)	170 (38%)	272 (60.9%)	447 (100%)

hrHPV *(high-risk Human Papillomavirus)*

Table 4: Distribution of HPV test according to smear results

Smear	hrHPV(-)	hrHPV(+)	HPV no test	Total
NLIM	0	21 (63.6%)	12 (34.6%)	33 (100%)
LSIL	1 (1.3%)	30 (39.5%)	45 (59.2%)	76 (100%)
HSIL	1 (0.8%)	37 (26.2%)	103 (73%)	141 (100%)
ASC-US	2 (2.8%)	43 (60.6%)	26 (36.6%)	71 (100%)
ASC-H/ ASC-H +LSIL	1 (0.9%)	39 (33.6%)	76 (65.5%)	116 (100%)
AGC	0	0	2 (100%)	2 (100%)
Total	5 (1.2%)	170 (38.7%)	264 (60.1%)	439 (100%)

hrHPV *(high-risk Human Papillomavirus),* ***NILM*** *(Negative for intraepithelial lesion or malignancy),* ***LSIL*** *(Low grade squamous intraepithelial lesion), 2:* ***HSIL*** *(High grade squamous intraepithelial lesion),* ***ASC-US*** *(Atypical squamous cells of undetermined significance),* ***ASC-H*** *(Atypical squamous cells – cannot exclude high grade squamous intraepithelial lesion),* ***AGC*** *(Atypical Glandular Cell).*

Of the 439 patients who underwent smear testing, 175 (39.9%) were also tested for hrHPV. Biopsy was also indicated in 170 cases with a positive high-risk HPV test regardless of the smear result. In 2 cases with NILM smear result, biopsy was indicated due to HPV high-risk positivity. In 94 cases, although the smear result was not an absolute indication for biopsy, biopsy was indicated due to HPV high-risk positivity. In 83 cases (20.7%), HPV test was not performed and smear results did not require absolute biopsy. Among these 83 cases, 12 were NILM, their cases could be followed up with smear controls. Biopsy was performed in these cases due to clinical findings and clinical approach.

Evaluation of SCC Cases

The age range of 37 cases with SCC biopsy results was 31 and 73 years with a mean age of 58.1 years. When SCC cases were evaluated by P-16 expression, 35 were associated with HPV and 2 were negative. HVP. Smear test was not performed in 3 cases (8.1%) and hrHPV test was not performed in 26 cases (70.7%). The result was NLIM in 4 of 34 patients who underwent smear test (Figure 3). Of these cases, 2 of 11 patients who underwent HPV testing were negative. HPV test and Smear test results of SCC cases are presented in Table 5.

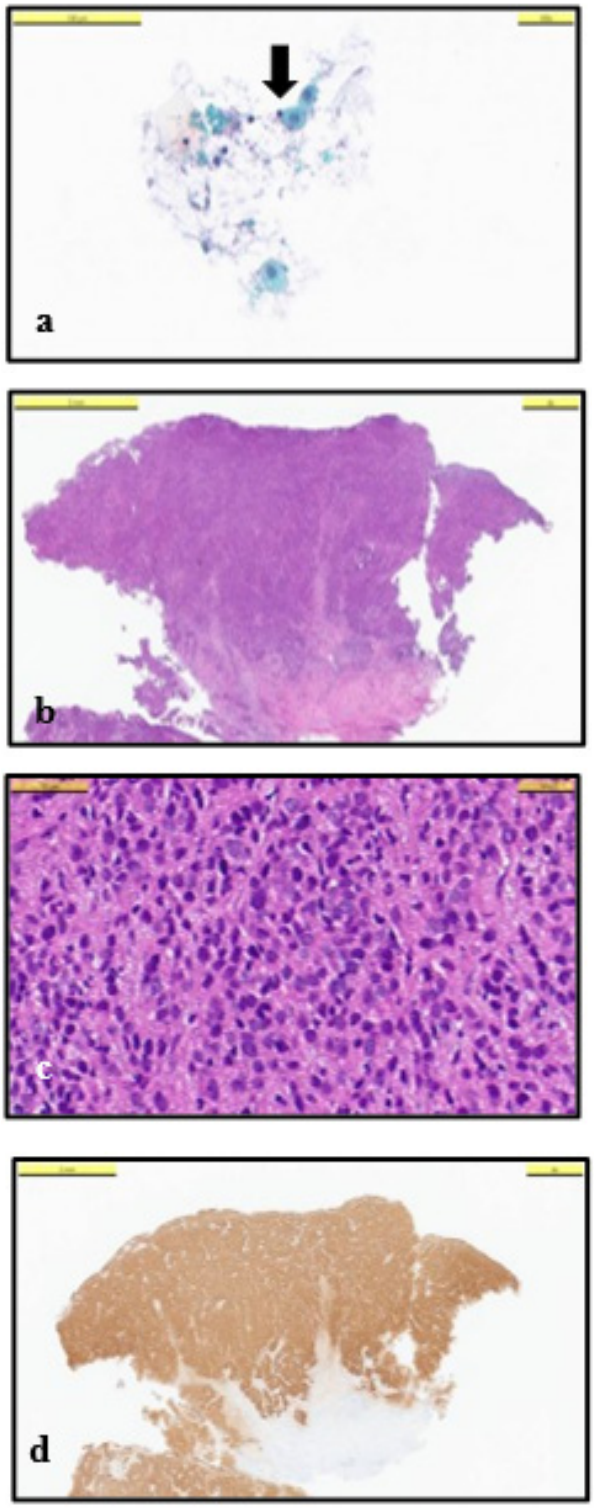

Figure 3: 73 y, smear result NILM, biopsy result SCC. a: Few squamous cells in smear without transformation zone, (arrow) parabasal cells (100 µm PAP). b: HPV-associated SCC (2mm H&E), c: Magnification of area b, hyperchromatic, pleomorphic small nucleated tumor cells d: Same area in b, P-16 cytoplasmic full-fold strongly positive (2mm).

Table 5: Distribution of SCC cases according to smear and hrHPV test results

Smear	hrHPV (+)	HPV no test	hrHPV (-)	Total
NLIM, ASC-US, LSIL	2	5	1	8
HSIL, ASC-H, AGC	7	18	1	26
Smear no test	0	3	0	3
Total	9	26	2	37

hrHPV *(high-risk Human Papillomavirus),* ***NILM*** *(Negative for intraepithelial lesion or malignancy),* ***LSIL*** *(Low grade squamous intraepithelial lesion),* ***HSIL*** *(High grade squamous intraepithelial lesion),* ***ASC-US*** *(Atypical squamous cells of undetermined significance),* ***ASC-H*** *(Atypical squamous cells -cannot exclude high grade squamous intraepithelial lesion),* ***AGC*** *(Atypical Glandular Cell)*

Discussion

In our study, we found that cervical smear was used as a screening test for precancerous lesions of the cervix in 97.5% (439 cases). Only 8 cases did not have a smear test and these 8 cases were aged 50 years or older (mean 65.6). The detection rate of a precancerous lesion was 56% (259 cases including HSIL, ASC-H, and AGC) and the detection rate of a cytologic abnormality was 92.4% (406 cases). In a study by Perkins et al. in which a large number of studies were analyzed, the rate of detection of precancerous lesions by smear was reported to be 50-70% and 53% in the study by Bhatla et al.[1,10]. Cox et al. and Hogarts et al. reported that the smear may also give false negativity at a rate of 15-50%[10,26]. Of the 33 cases in which cytologic evaluation was reported as NILM, 3 had no transformation zone, 2 had a small number of squamous cells that were not sufficient for diagnosis and these 5 cases were insufficient for evaluation. The 28 NILM cases, which we will consider as false negatives, were 6.4% of all smears. Crothers et al. reported a false negative rate of 4.7%-7.8% and infections, reactive changes due to repair, and/or atrophic changes were shown as conditions affecting false negativity[27]. In our cases, 8 out of 28 NILM cases had atrophic findings, trichomonas vaginalis and candida infection were detected in 10 cases, and in the other 10 cases, smears containing reactive changes with inflammatory cell predominance were seen. The utilization rate, precancerous lesion detection rate, and false negativity rate of the smear test in our cases were within the values presented in the literature, and in line with these results, the clinical use and pathology evaluation of the smear test was at an optimal level.

The rate of HPV testing as a screening test was very low at 39.1%. The rate of HPV test utilization was highest in the 19-29 age group with 55.5%, while this rate decreased to 27.3% in women aged 50-59 years and to 19% in women over 60 years, and the rate of HPV test utilization decreased dramatically with increasing age.

Only 5 of 175 cases of HSIL and SCC who underwent HPV testing were hrHPV negative. The detection rate of HPV test for precancerous lesions was reported to be 90% in the study by Perkins et al. and 93.1% in the study by Bhatla et al.[1,10]. In our patients who underwent HPV testing, 97.1% were positive for high-risk HPV. The reason why the hrHPV test was not positive in all precancerous lesions and squamous cell carcinomas in our study and in the literature is that hrHPV has not yet been defined all types or there may be technical deficiencies. Among the high-risk HPV subtypes, HPV type 16 was the most common type with a rate of 42.4%. HPV 16 was again the most common subtype in 6 (54.5%) of 11 SCC cases who underwent HPV testing. In the study of Guan et al. including a large case series, the most common subtype in HSIL cases was HPV 16 and the percentage of HPV 16 increased in the increase of lesions from CIN2 (40-47%) to invasive tumor (58-63%) as in our study[8]. In the study of Dursun et al., the most common hrHPV type in Turkish women was HPV type 16 (36%), which is consistent with our study[28].

The most problematic group among our cases was 83 cases in which HPV testing was not performed and biopsy was not indicated according to smear results (12 NILM, 45 LSIL, 26 ASCUS). In these cases, biopsy sampling was performed with the right clinical approach.

In summary, we can say that the smear test was used effectively in the detection of cervical precancerous lesions in our study, the smear results were as accurate as expected, and the false negativity rate was lower than acceptable rates. The use of HPV test was remarkably low (34.1%). This rate was significantly lower, especially in patients over 50 years of age. Paradoxically, while the risk of cervical cancer increased with age[22,29,30], the rate of HPV

test utilization decreased. Atrophic changes after menopause, sampling, and cytologic evaluation difficulties decrease the sensitivity of PAP smear in detecting percutaneous lesions [29,31]. In our study, the smear was reported as NILM in 4 (10.8%) SCC cases aged 61-73 years (mean 65.7). In addition, 8 cases without smear were in the age range of 51-73 years (mean 65.5). In conclusion, while the incidence of SCC was higher in patients aged 50 years and older, according to our results, the rates of smear and HPV test were decreasing, and the predictive power of smear for cellular abnormality was decreasing if only smear was performed. The highest prevalence of high-risk HPV was reported in women aged 20-23 years (46%) and the lowest in women aged 65 years and older (5.7%) in the study by Kjar et al[2]. In the HPV prevalence study of Dursun et al. in Turkish women, HPV positivity was high before the age of 30 years and decreased after menopause[28]. It has been reported that HPV infection decreases with age and there is a change in the incidence of hrHPV types after menopause. However, in our cases, more careful screening tests should be performed especially in patients over 50 years of age to detect precancerous lesions of cervical cancer, which is among the preventable cancers after HPV vaccination. Because this age group has lost the chance of vaccination. In addition, considering that HPV infection is the most common sexually transmitted infection (70-85% in all age groups)[11,32] women aged 50 years and older have most likely been latently exposed to HPV infection for many years. Cervical cancer is said to develop in 5% of the population without screening tests and effective use of screening tests is said to reduce this risk to less than 0.05% [1]. Recent studies on the implementation of tests recommend the effective use of both tests up to the age of 65 years. 2 negative HPV results or 3 negative smear results in the last 10 years are emphasized as conditions for discontinuation of testing in women over 65 years[1]. In our study, the smear screening test was 100% (393) in the group under 50 years of age and 85.2% (46 cases) in the group aged 50 years and over, and the HPV test was 41.2% in the group under 50 years of age and 24% in the group aged 50 years and over.

Our recommendation and hope is that HPV vaccination should be provided free of charge to the entire population, both male and female, under the age of 25 years to prevent cervical cancer and other HPV-associated cancers. The HPV test, which is an effective test in detecting precancerous lesions, should be performed on all women, and both tests should be used effectively, especially in women aged 50 and over.

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Conflicts of Interest

The authors declare no conflict of interest.

Author Contribution

SE designed the study. SE and DS evaluated and prepared the data. SE, MA, and EB ensured the data collection and the accuracy of the information. ST performed the statistical analysis. DS, UI, and SEr contributed critical comments on the interpretation of the study. SE wrote the manuscript. All authors read and approved the final version of the article.

Data Availability Statement

The data supporting this study's findings are available at a reasonable request from the corresponding author, SE.

References

1. Perkins RB, Wentzensen N, Guido RS, Schiffman M. Cervical Cancer Screening. *JAMA*. 2023;330(6):547. doi:10.1001/jama.2023.13174
2. Kjær SK, Munk C, Junge J, Iftner T. Carcinogenic HPV prevalence and age-specific type distribution in 40,382 women with normal cervical cytology, ASCUS/LSIL, HSIL, or cervical cancer: What is the potential for prevention? *Cancer Causes and Control*. 2014;25(2). doi:10.1007/s10552-013-0320-z
3. Quinn BA, Deng X, Colton A, Bandyopadhyay D, Carter JS, Fields EC. Increasing age predicts poor cervical cancer prognosis with subsequent effect on treatment and overall survival. *Brachytherapy*. 2019;18(1). doi:10.1016/j.brachy.2018.08.016
4. Wentzensen N, Clarke MA. Cervical cancer screening - Past, present, and future. *Cancer Epidemiology Biomarkers and Prevention*. 2021;30(3). doi:10.1158/1055-9965.EPI-20-1628
5. Bamanikar S, Baravkar D, Chandanwale S, Dharwadkar A, Paranjape S. Study of cervical cytology and its correlation with clinical and histopathological findings. *Clin Cancer Investig J*. 2016;5(5). doi:10.4103/2278-0513.197869
6. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018;68(6). doi:10.3322/caac.21492
7. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin*. 2021;71(3). doi:10.3322/caac.21660
8. Guan P, Howell-Jones R, Li N, et al. Human papillomavirus types in 115,789 HPV-positive women: A meta-analysis from cervical infection to cancer. *Int J Cancer*. 2012;131(10). doi:10.1002/ijc.27485

9. Aggarwal P. HPV Infection: Pathogenesis and Detection. In: *Preventive Oncology for the Gynecologist*. ; 2019. doi:10.1007/978-981-13-3438-2_9
10. Bhatla N, Singhal S. Primary HPV screening for cervical cancer. *Best Pract Res Clin Obstet Gynaecol*. 2020;65. doi:10.1016/j.bpobgyn.2020.02.008
11. Yousefi Z, Aria H, Ghaedrahmati F, et al. An Update on Human Papilloma Virus Vaccines: History, Types, Protection, and Efficacy. *Front Immunol*. 2022;12. doi:10.3389/fimmu.2021.805695
12. Gutiérrez J, García-Villa E, Ocadiz-Delgado R, et al. Human papillomavirus type 16 E7 oncoprotein upregulates the retinoic acid receptor-beta expression in cervical cancer cell lines and K14E7 transgenic mice. *Mol Cell Biochem*. 2015;408(1-2). doi:10.1007/s11010-015-2504-1
13. Allahqoli L, Laganà AS, Mazidimoradi A, et al. Diagnosis of Cervical Cancer and Pre-Cancerous Lesions by Artificial Intelligence: A Systematic Review. *Diagnostics*. 2022;12(11). doi:10.3390/diagnostics12112771
14. Canfell K. Towards the global elimination of cervical cancer. *Papillomavirus Research*. 2019;8. doi:10.1016/j.pvr.2019.100170
15. Kim SI, Kim SJ, Suh DH, Kim K, No JH, Kim YB. Pathologic discrepancies between colposcopy-directed biopsy and loop electrosurgical excision procedure of the uterine cervix in women with cytologic high-grade squamous intraepithelial lesions. *J Gynecol Oncol*. 2020;31(2). doi:10.3802/jgo.2020.31.e13
16. Solomon D, Davey D, Kurman R, et al. The 2001 Bethesda System: Terminology for reporting results of cervical cytology. *J Am Med Assoc*. 2002;287(16). doi:10.1001/jama.287.16.2114
17. Nayar R, Wilbur DC. The bethesda system for reporting cervical cytology: A historical perspective. *Acta Cytol*. 2017;61(4-5). doi:10.1159/000477556
18. Massad LS, Einstein MH, Huh WK, et al. 2012 updated consensus guidelines for the management of abnormal cervical cancer screening tests and cancer precursors. *Obstetrics and Gynecology*. 2013;121(4). doi:10.1097/AOG.0b013e3182883a34
19. Perkins RB, Guido RS, Castle PE, et al. Erratum: 2019 ASCCP risk-based management consensus guidelines for abnormal cervical cancer screening tests and cancer precursors (Journal of Lower Genital Tract Disease (2020) 24 (102-131) DOI: 10.1097/LGT.0000000000000525). *J Low Genit Tract Dis*. 2021;25(4). doi:10.1097/LGT.0000000000000628
20. Schulmeyer CE, Stübs F, Gass P, et al. Correlation between referral cytology and in-house colposcopy-guided cytology for detecting early cervical neoplasia. *Arch Gynecol Obstet*. 2020;301(1). doi:10.1007/s00404-019-05389-1
21. Anschau F, Guimarães Gonçalves MA. Discordance between cytology and biopsy histology of the cervix: What to consider and what to do. *Acta Cytol*. 2011;55(2). doi:10.1159/000320911
22. David J, Joshi V, Jebin Aaron D, Baghel P. A Comparative Analysis of Visual Inspection With Acetic Acid, Cervical Cytology, and Histopathology in the Screening and Early Detection of Premalignant and Malignant Lesions of the Cervix. *Cureus*. Published online 2022. doi:10.7759/cureus.29762
23. Ekemen S, Comunoglu C, Kayhan CK, et al. Endometrial Staining of CD56 (Uterine Natural Killer), BCL-6, and CD138 (Plasma Cells) Improve Diagnosis and Clinical Pregnancy Outcomes in Unexplained Infertility and Recurrent IVF Failures: Standardization of Diagnosis with Digital Pathology. *Diagnostics*. 2023;13(9). doi:10.3390/diagnostics13091557
24. Davey DD, Souers RJ, Goodrich K, Mody DR, Tabbara SO, Booth CN. Bethesda 2014 implementation and human papillomavirus primary screening practices of laboratories participating in the College of American Pathologists PAP education program. *Arch Pathol Lab Med*. 2019;143(10). doi:10.5858/arpa.2018-0603-CP
25. Sahin D. Effects of an Additional Liquid Based Cytology Prepate on Cytological Diagnosis in High Risk HPV Positive, PAP Test Negative Cases. *SiSli Etfal Hastanesi Tip Bulteni / The Medical Bulletin of Sisli Hospital*. Published online 2019. doi:10.14744/semb.2019.23434
26. Cox T, Cuzick J. HPV DNA testing in cervical cancer screening: From evidence to policies. *Gynecol Oncol*. 2006;103(1). doi:10.1016/j.ygyno.2006.07.030
27. Crothers BA, Booth CN, Darragh TM, et al. False-Positive papanicolaou (pap) test rates in the college of american pathologists pap education and pap proficiency test programs : Evaluation of False-Positive responses of high-grade squamous intraepithelial lesion or cancer to a negative reference diagnosis. *Arch Pathol Lab Med*. 2014;138(5). doi:10.5858/arpa.2013-0083-CP
28. Dursun P, Ayhan A, Mutlu L, et al. HPV types in Turkey: multicenter hospital based evaluation of 6388 patients in turkish gynecologic oncology group centers. *Turkish Journal of Pathology*. 2013;29(3). doi:10.5146/tjpath.2013.01188
29. Koc S, Yuksel D, Kayikcioglu F. Colposcopic histopathology results of patients over 50: Is HPV genotyping useful? *Curr Probl Cancer*. 2022;46(1). doi:10.1016/j.currproblcancer.2021.100764
30. Kissel M, Rambeau A, Achkar S, Lecuru F, Mathevet P. Challenges and advances in cervix cancer treatment in elder women. *Cancer Treat Rev*. 2020;84. doi:10.1016/j.ctrv.2020.101976
31. Bergengren L, Lillsunde-Larsson G, Helenius G, Karlsson MG. HPV-based screening for cervical cancer among women 55-59 years of age. *PLoS One*. 2019;14(6). doi:10.1371/journal.pone.0217108
32. Perez-Campos Mayoral E, Mayoral-Andrade G, Pérez-Campos Mayoral L, et al. Diagnosis of Transient/Latent HPV Infections - A Point of View! *Arch Med Res*. 2018;49(5). doi:10.1016/j.arcmed.2018.10.004