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Hakemli Süreli Yayın
(Dergi, yılda 4 sayı olarak Ocak, Nisan, Temmuz, Ekim aylarında yayımlanır)

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Kapak resmi: Prof. Dr. Erkmen Böke (1939-2014):

İzmir'de 1939 yılında doğdu. 1962 yılında Ankara Üniversitesi Tıp Fakültesi'ni bitirdi. 1970 yılında Almanya Heidelberg Üniversitesi'nden Genel Cerrahi uzmanlığını aldı. Türkiye'ye döndükten sonra Hacettepe Üniversitesi'nde 1970 yılında Genel Cerrahi Uzmanı, 1973 yılında da Göğüs ve Kalp-Damar Cerrahisi Uzmanlığını aldı. Aynı üniversitede 1976 yılında Doçentliğe, 1982 yılında da Profesörlüğe atandı. 1982-1988 yılları arasında Hacettepe Üniversitesi Hastaneleri Başhekimliği görevinde bulundu. Almanca ve İngilizce bilen Prof. Dr. Böke, evli ve iki çocuk babasıdır.

Resim çalışmalarına 2003 yılından beri yoğun olarak devam etmiş olan Prof. Dr. Böke, ilk iki yağlıboya kişisel resim sergisini Hacettepe Üniversitesi Ahmet Göğüş Sanat Galerisi'nde 2005 ve 2007 yıllarında, üçüncü kişisel sergisini Arsuz İskender Sayek Evi'nde "Füsun'un Çiçekleri" adıyla ve dördüncü sergisini de 2011 yılında Ankara Elele Sanat Galerisi'nde açmıştır. Prof. Dr. Erkmen Böke, yedi karma sergiye katılmıştır.

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Cover image: Prof. Dr. Erkmen Böke (1939-2014):

He was born in Izmir in 1939. He graduated from Ankara University Faculty of Medicine in 1962. In 1970, he received his General Surgery specialty from Heidelberg University, Germany. After returning to Turkey, General Surgeon at Hacettepe University in 1970, also in 1973, took/finished the Thoracic and Cardiovascular Surgery Specialty. He was appointed Associate Professor in 1976 and Professor in 1982 at the same university. Between 1982-1988, he worked as the Chief Physician of Hacettepe University Hospitals. Speaking German and English, Prof. Dr. Böke is married and has two children.

Prof. Dr. Böke opened his first two personal oil painting exhibitions at Hacettepe University Ahmet GÖĞÜŞ Art Gallery in 2005 and 2007, the third one at the Arsuz İskender Sayek House under the name "Flowers of FÜSUN" and the fourth one at the Ankara Elele Art Gallery in 2011. Prof. Dr. Erkmen Böke participated in seven group exhibitions.

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The Change in tPSA, fPSA and f/tPSA Levels in Men Undergoing Hemodialysis Effect of Hemodialysis on Serum PSA Levels

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ABSTRACT

Purpose: This study aimed to assess the impact of hemodialysis treatment and different dialysis membranes with varying surface areas on serum levels of total prostate-specific antigen (tPSA), free prostate-specific antigen (fPSA), and the fPSA/tPSA ratio in patients undergoing hemodialysis treatment.

Material and Methods: The study was conducted at the Central Laboratory of....Hospital in May, June, and July 2020. tPSA, fPSA, and fPSA/tPSA ratios measured in pre-dialysis and post-dialysis samples were determined. Correlation between pre-dialysis and post-dialysis of fPSA and tPSA levels and patients' ultrafiltrates were evaluated. The fPSA, tPSA, and fPSA/tPSA measured in pre-dialysis and post-dialysis samples grouped according to membrane type were compared.

Results: The fPSA levels and fPSA/tPSA ratios of pre-dialysis samples were significantly lower than post-dialysis samples. tPSA values were not significantly different in pre-dialysis and post-dialysis samples. According to membrane types, it was found that pre-dialysis and post-dialysis tPSA, fPSA, and fPSA/tPSA were not significantly different. There was a positive correlation between difference in fPSA concentrations measured in pre-dialysis and post-dialysis samples and ultrafiltrate (rho=0.380). A positive correlation was found between difference in tPSA concentrations measured in pre-dialysis and post-dialysis samples and ultrafiltrate (rho=0.562).

Conclusion: Post-dialysis fPSA values and fPSA/tPSA ratios were found to be elevated in patients receiving hemodialysis treatment due to hemoconcentration and other potential effects of dialysis. Therefore, interpreting fPSA values and fPSA/tPSA ratios in patients undergoing hemodialysis treatment according to current clinical decision limits may lead to misinterpretation. In this group of patients, the use of tPSA testing is safe as it remains unaffected by dialysis treatment.

Keywords: Prostate Specific Antigen, Biological Tumour Markers, Dialysis

Hemodiyaliz Uygulanan Erkeklerde tPSA, fPSA ve f/tPSA Düzeylerindeki Değişim Hemodiyalizin Serum PSA Düzeylerine Etkisi

ÖZET

Amaç: Çalışmanın amacı hemodiyaliz tedavisinin ve değişen yüzey alanlarına sahip farklı diyaliz membranlarının total prostat spesifik antijen (tPSA), serbest prostat spesifik antijen (fPSA) ve fPSA/tPSA serum seviyelerine olan etkisini değerlendirmektir.

Gereç ve Yöntemler: Çalışma Mayıs, Haziran ve Temmuz 2020 tarihlerinde Kemalpaşa Devlet Hastanesi Merkez Laboratuvarında gerçekleştirildi. Diyaliz öncesi ve diyaliz sonrası örneklerde ölçülen tPSA, fPSA ve fPSA/tPSA oranları belirlendi. Diyaliz öncesi ve diyaliz sonrası fPSA ve tPSA seviyeleri ile hastaların ultrafiltratları arasındaki korelasyon değerlendirildi. Örnekler diyalizde kullanılan membran tipine göre gruplandırılarak diyaliz öncesi ve diyaliz sonrası fPSA, tPSA ve fPSA/tPSA düzeyleri karşılaştırıldı.

Bulgular: Diyaliz öncesi numunelerde fPSA seviyeleri ve fPSA/tPSA oranları, diyaliz sonrası numunelerdeki düzeylere göre anlamlı derecede düşüktü. tPSA değerleri diyaliz öncesi ve diyaliz sonrası örneklerde anlamlı farklılık göstermedi. Membran tiplerine göre gruplandırıldığında diyaliz öncesi ve diyaliz sonrası tPSA, fPSA ve fPSA/tPSA düzeylerinde anlamlı farklılık olmadığı bulundu. Diyaliz öncesi ve diyaliz sonrası örneklerde ölçülen fPSA değişimi ile ultrafiltrat arasında pozitif bir korelasyon vardı (rho=0.380). Diyaliz öncesi ve diyaliz sonrası numunelerde ölçülen tPSA konsantrasyonlarındaki değişim ile ultrafiltrat arasında pozitif bir korelasyon bulundu (rho=0,562).

Sonuç: Hemodiyaliz tedavisi alan hastalarda hemokonsantrasyon ve diyalizin diğer potansiyel etkilerinden dolayı diyaliz sonrası fPSA değerlerinin ve fPSA/tPSA oranlarının diyaliz öncesi düzeylere göre yüksek olduğu bulunmuştur. Hemodiyaliz tedavisi gören hastaların fPSA değerlerinin ve fPSA/tPSA oranlarının hasta grubuna özel olmayan karar limitlerine göre değerlendirilmesi yanlış klinik yorumlara yol açabilir. Çalışmamız verilerine göre hemodiyaliz tedavisi gören hastalarda tPSA testinin kullanımı fPSA testine göre daha güvenilirdir.

Anahtar Kelimeler: Prostat Spesifik Antijen, Biyolojik Tümör Belirteçleri, Diyaliz

Most patients receiving treatment for end-stage renal disease reside in countries with aging populations. As a result, the increase in the geriatric population, particularly in developing nations, is likely to lead to a rise in end-stage renal disease (1, 2).

The incidence of malignancy among hemodialysis patients is higher compared to the general population. This situation is related to prostate cancer (PCa), which involves one-third of older men (3, 4). Based on the 2020 GLOBOCAN estimates of cancer incidence and mortality by the International Agency for Research on Cancer, prostate cancer is the second most prevalent type of cancer in Turkey (5). In this context, PCa is a problem in patients receiving hemodialysis due to end-stage renal failure.

Prostate-specific antigen (PSA) is a glycoprotein produced in the secretory epithelium of the prostate gland which enables liquefaction of semen fluid. It is synthesized in the prostatic duct epithelial cell and released into the seminal lumen by exocytosis. PSA is bound to the protease inhibitor alpha1-antichymotrypsin or alpha2-macroglobulin, making it a complex molecule. Only a small fraction of PSA is present in free form in the serum. In prostate diseases where there is damage to the basal membrane and lumen structure, PSA leaks into the bloodstream at a higher rate, leading to an increase in serum PSA levels (6).

PSA is commonly utilized as a screening test for the early detection and follow-up of PCa. The guidelines on PCa by the European Association of Urology (EAU) recommend that an increase in PSA level and persistently high serum PSA concentration are adequate indicators for deciding on a biopsy (7). Patients receiving hemodialysis treatment often have oliguria or anuria. As a result, patients in this group may experience minimal or no symptoms of prostatism. Therefore, determining the serum PSA levels in these patients becomes more crucial. However, it remains uncertain whether hemodialysis treatment affects total PSA (tPSA) and free PSA (fPSA) levels, which are utilized as markers for PCa, and whether their use is valuable for patients undergoing hemodialysis treatment (8, 9).

The aim of this study was to assess the impact of hemodialysis and dialysis membranes with varying surface areas on the levels of tPSA, fPSA, and the free PSA/total PSA ratio (f/tPSA ratio) in patients undergoing hemodialysis treatment.

Material and Methods

The study was conducted at the Central Laboratory of the İzmir Kemalpaşa State Hospital in May, June, and July of 2020. The fPSA and tPSA tests were performed in the ADVIA Centaur XP Immunoassay System (Siemens Diagnostics, Tarrytown, NY, USA) in our laboratory and the chemiluminometric method was used for both tests. The f/tPSA ratio was calculated by dividing the fPSA value by that of tPSA. The tPSA measurement procedure detects fPSA and PSA - α1 antichymotrypsin complex. Internal quality control of tPSA and fPSA tests is performed daily. The analytical variation (CVa) of tPSA and fPSA tests in May, June and July was calculated with the formula "Standard Deviation × 100 / laboratory mean of internal quality control result".

Blood samples that were accepted to our laboratory for routine biochemistry tests before and after hemodialysis treatment of male patients undergoing hemodialysis treatment for end-stage renal failure were included. Patients with PCa, suspected PCa on rectal examination, transurethral endoscopic intervention in the past month, and urinary tract infection (>5 white blood cells in high magnification area) were excluded. The fPSA, tPSA levels and f /tPSA ratio measured in pre- and post-dialysis serum were compared. Type of membrane used in hemodialysis and the amount of fluid lost by the patients after dialysis (ultrafiltrate) were obtained retrospectively.

The study evaluated the correlation between the differences in pre- and post-dialysis concentrations of fPSA and tPSA tests and patients' ultrafiltrates. The serum samples were categorized based on the type of dialysis membrane used during the dialysis process. The fPSA, tPSA, and f/tPSA ratios measured in pre-dialysis and post-dialysis samples were compared based on the type of membrane used.

Statistically Analysis

SPSS 23.0 (IBM, Chicago, USA) package program was used for statistical evaluation of the data. The normality of variables was determined by the Kolmogorov-Smirnov and Shapiro-Wilk tests.

The difference between the nonparametric variants was determined using Wilcoxon signed-rank test. Values were defined as the median and 25 – 75th percentile. The number of negative, positive differences and ties between pre- and post-dialysis values was analysed. Spearman's test was used for correlation analysis. Correlation coefficient

(rho) value was accepted as weak correlation between 0.000-0.49, moderate correlation between 0.50-0.69 and strong correlation ≥0.70. A p value of <0.05 was considered significant.

Results

To ensure that the data obtained were not significantly impacted, we calculated the analytical variation of the fPSA and tPSA tests for the months during which the tests were conducted. The mean, standard deviation and CVa values calculated for internal quality control levels in May, June and July 2020 and manufacturer's declared CV values are presented in Table 1. We found that the analytical CV values we calculated for the fPSA and tPSA tests were below the values declared by the manufacturer.

The number of serum samples included in the study before and after hemodialysis treatment during this period was 51. Analysis of pre-dialysis and post-dialysis samples revealed that fPSA levels (p = 0.000 for both parameters), tPSA levels (p = 0.000 for both parameters), and f/tPSA ratios (p = 0.001 and p = 0.005, respectively) were not normally distributed.

The median age (25 – 75th percentile) of the patients was 68 (62 - 74). The reason for dialysis treatment was idiopathic in 33 patients and diabetes mellitus in 18 patients. Patients receive dialysis treatment twice a week (n=12) and three times a week (n=39).

The median values (25th and 75th percentile) of tPSA, fPSA and f /tPSA of pre- and post-dialysis were presented in Table 2. tPSA values were not significantly different in pre- and post-dialysis (p= 0.567). The median value of the fPSA levels of the pre-dialysis samples was significantly lower than the fPSA levels of the post-dialysis samples (p = 0.009). The median value of f /tPSA of the pre-dialysis samples was significantly lower than f /tPSA of the post-dialysis samples (p = 0.001) (Figure 1).

The patients were divided into two groups according to the dialysis membrane used. The first group was of serum samples of patients undergoing hemodialysis using a high-flux polyethersulfone membrane with a surface area of 1.9m2 and an ultrafiltration coefficient (KUF) of 76 mL / h / mmHg. In the second patient group, a high flow membrane with a surface area of 1.7m2 and KUF of 74 mL /hr /mmHg was used for hemodialysis. The numbers of patients in the first and second groups were 27 and 24, respectively.

When analyzed according to the membrane types used, it was found that pre- and post-dialysis fPSA, tPSA and f / tPSA levels were not different according to membrane type. The p values for "High-flux membrane with a surface area of 1.7m2" were 0.977, 0.985, 0.845, and the p values for "High-flux membrane with a surface area of 1.7m2" were 0.06, 0.71, and 0.912, respectively. The median and 25th - 75th percentile of fPSA, tPSA and f /tPSA in pre- and post-dialysis samples grouped by membrane type are presented in Table 3.

Table 1. Mean, standard deviation, and coefficient of variation values for the levels of internal quality control during May, June, and July 2020

	tPSA				fPSA			
Internal quality control	Mean (ug/L)	SD (ug/L)	CV (%)	Manufacturer's declared CV (%)	Mean (ug/L)	SD (ug/L)	CV (%)	Manufacturer's declared CV (%)
Level 1	0,35	0,01	2,02	5.97	0,16	0,005	3,33	4.3
Level 2	3,42	0,04	1,22	2.60	1,73	0,05	2,94	3.5

SD: Standard deviation
CV: Coefficient of variation

Table 2. Median and 25th - 75th percentile values of tPSA, fPSA, and f /tPSA in pre-dialysis and post-dialysis serum samples

	Before Dialysis		After Dialysis		P Value
Parameters	Median	25 – 75th percentile	Median	25 – 75th percentile	
tPSA (ug/L)	1,02	0.17 – 1.03	1,08	0.21 – 1.31	0.567
fPSA (ug/L)	0,75	0.13 – 0.91	0,81	0.17 – 1.03	0.009
f /tPSA (%)	0.705	0.44 – 0.75	0.706	0.43 – 0.81	0.001

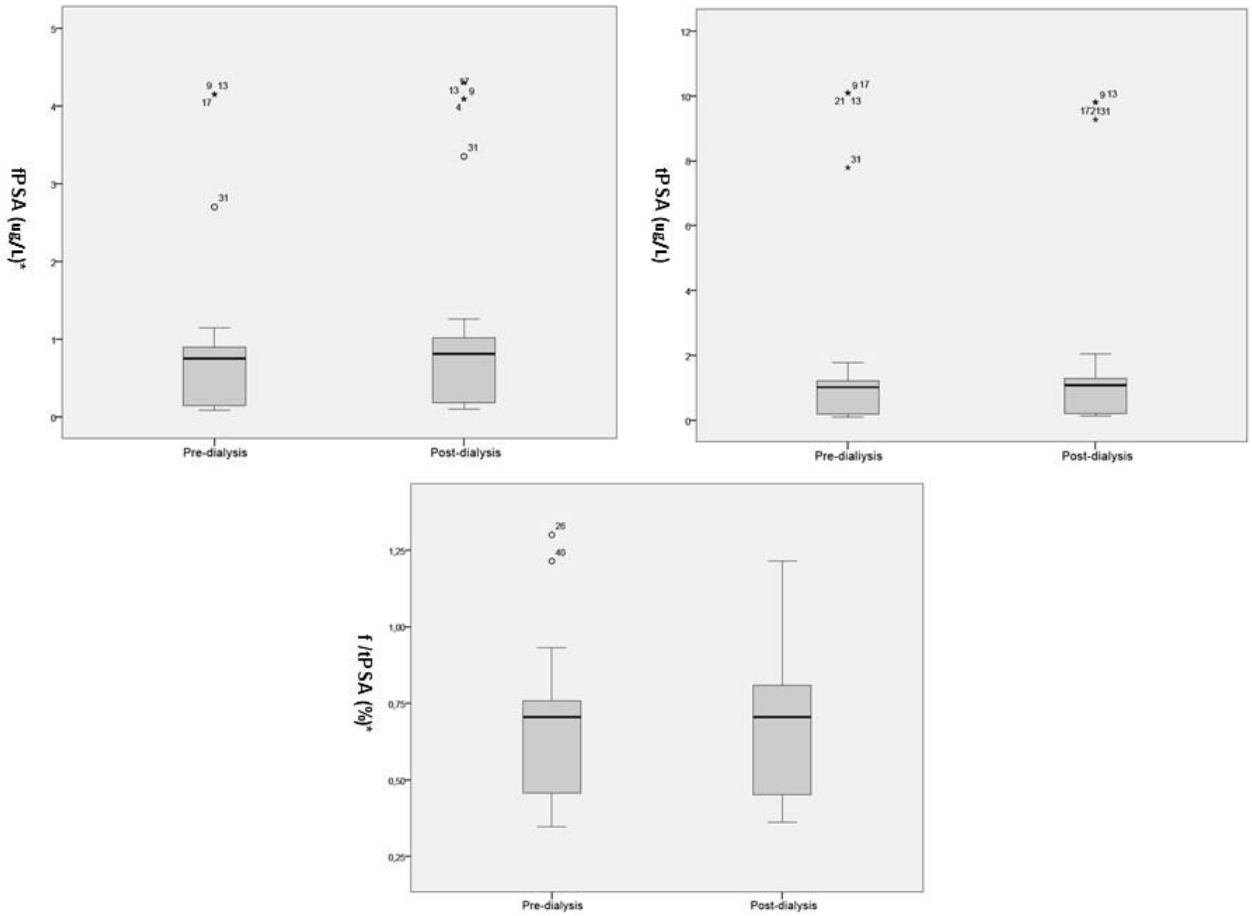

Figure 1. *Box-plots of pre and post-dialysis concentrations of tPSA, fPSA levels, and f /tPSA ratio. Post-dialysis fPSA and f /tPSA levels are significantly higher than pre-dialysis levels. * = Significant difference (p<0.05)*

Table 3. The median and 25th - 75th percentile values of fPSA, tPSA, and f /tPSA in pre-dialysis and post-dialysis samples grouped according to membrane type

Tests	High-flux membrane with a surface area of 1.7m2, KUF of 74 mL/hr/mmHg				P Value	High-flux membrane with a surface area of 1.9m2 KUF of 76 mL/h/mmHg				P Value
	Pre-Dialysis		Post-Dialysis			Pre-Dialysis		Post-Dialysis		
	Median	25 – 75th percentile	Median	25 – 75th percentile		Median	25 – 75th percentile	Median	25 – 75th percentile	
fPSA (ng/mL)	0,63	0,22 - 0,75	0,59	0,26 - 0,89	0.977	0,88	0,13 - 0,91	0,93	0,15 - 1,06	0.06
TPSA (ng/mL)	1,11	0,375 - 1,43	1,06	0,42 - 1,31	0.985	1,12	0,16 - 1,22	1,14	0,17 - 1,27	0.71
f /t PSA (%)	0,59	0.42- 0.74	0,63	0.41 – 0.80	0.845	0.73	0.64 – 0.94	0,71	0.64 – 0.90	0.912

KUF: Ultrafiltration coefficient

There was a positive correlation between the difference in fPSA concentrations measured in the pre- and post-dialysis samples and the ultrafiltrate (rho = 0.380) (p=0.01). A positive correlation was determined between the difference in tPSA concentrations measured in pre- and post-dialysis samples and the ultrafiltrate (rho = 0.562) (p=0.002).

Discussion

There are uncertainties regarding the clinical use of the PSA test in patients undergoing hemodialysis (10). Although serum PSA levels are considered a useful serum marker for the early detection of PCa in patients receiving long-term hemodialysis treatment (3, 11), controversial reports about PSA levels in patients receiving hemodialysis have also been presented. According to the data of patients undergoing hemodialysis treatment and diagnosed with prostate cancer by PSA screening, it has been reported that the PSA test is useful in middle-aged and older hemodialysis patients. However, it has been reported that diagnosis and treatment should be considered according to the patient's clinic after the PSA test was measured high (3). Majoud et al. reported that post-dialysis PSA levels were higher than pre-dialysis significantly (12). There are also studies reporting that there is no significant difference in serum PSA levels analysed before and after hemodialysis (13, 14).

In our study, post-dialysis fPSA results were significantly higher than pre-dialysis fPSA. In the correlation analysis, we found a weak correlation between the amount of ultrafiltrate and the difference in fPSA levels before and after dialysis (rho = 0.380). This shows that the significantly higher post-dialysis fPSA levels in our study than predialysis fPSA levels cannot be attributed only to hemoconcentration. The active fraction of tPSA is in complex with alpha2-macroglobulin or alpha1-antichymotrypsin while a small amount is found in serum as unbound (6). The decrease in plasma alpha1-antichymotrypsin or alpha2-macroglobulin proteins after dialysis treatment may be one of the factors contributing to the increase in plasma fPSA values after dialysis. In the study, the hemoconcentration status of the patients was not evaluated according to the haematocrit values. This is one of the limitations of the study.

When serum samples were grouped according to the type of high-flux membrane used in dialysis, there was no significant difference in fPSA and tPSA values before and after dialysis (Table 2).

Diabetes was found to be the cause of chronic renal failure in the 18 patients we examined. The transportation of proteins across the glomerular barrier is dependent on the physical properties of the molecules, as well as the charge and pore size of the glomerular capillary wall. Molecules with a molecular weight of 40-50 kDa are eliminated through glomerular filtration, reabsorption, and catabolism. The excretion of low molecular weight molecules decreases as the severity of renal failure increases. It has been reported that fPSA levels of patients with chronic kidney disease are higher than the healthy population (15). In diabetic nephropathy, the decrease in heparan sulfate content of the glomerular basement membrane results in reduced permeability to negatively charged macromolecules, such as albumin. While complex PSA (90 kDa) is not excreted by the kidneys, fPSA (a 28 kDa protein) is primarily eliminated through glomerular filtration (16, 17). As a result, the renal clearance of fPSA could potentially vary in patients with diabetic chronic renal failure. However, in our study, the samples were not categorized based on the etiology of chronic renal failure, which represents a limitation of our research.

In conclusion, our study data revealed that fPSA values and f/tPSA ratios were elevated in patients receiving hemodialysis treatment due to hemoconcentration and other potential dialysis effects. Therefore, interpreting fPSA values and f/tPSA ratios in patients undergoing hemodialysis according to current clinical decision limits may lead to misinterpretation. However, the use of tPSA concentrations in patients undergoing hemodialysis treatment is safe as it remains unchanged with dialysis treatment.

Declarations

Funding

The present study was not funded by any corporation.

Conflicts of Interest

The authors declare no conflict of interest.

Ethics Approval

All protocols for this study were approved by the Harran University Clinical Research Ethics Committee (Decree Date and No: 22 June 2022 / HRÜ.22/06/2022)

Availability of Data and Material

All data is available

References

1. Saran R, Robinson B, Abbott KC, Agodoa LYC, Bragg-Gresham J, Balkrishnan R, et al. US Renal Data System 2018 Annual Data Report: Epidemiology of Kidney Disease in the United States. Am J Kidney Dis. 2019;73(3 Suppl 1):A7-A8.
2. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, et al. Chronic kidney disease: global dimension and perspectives. Lancet. 2013;382(9888):260-72.
3. Yokota N, Takahashi M, Nishitani M, Minakuchi J, Kanayama HO. Long-term outcomes of the Japanese hemodialysis patients with prostate cancer detected by prostate-specific antigen screening. J Med Invest. 2021;68(1.2):42-47.
4. Kensler KH, Rebbeck TR. Cancer Progress and Priorities: Prostate Cancer. Cancer Epidemiol Biomarkers Prev. 2020;29(2):267-277.
5. GLOBOCAN 2020: New Global Cancer Data. Available from: https://gco.iarc.fr/today/data/factsheets/populations/792-turkey-fact-sheets.pdf. Accessed: January 2021
6. Birkenmeier G, Struck F, Gebhardt R. Clearance mechanism of prostate specific antigen and its complexes with alpha2-macroglobulin and alpha1- antichymotrypsin. J Urol. 1999;162:897–901.
7. Mottet N, Bellmunt J, Bolla M, Briers E, Cumberbatch MG, De Santis M, et al. EAU-ESTROSIOG Guidelines on Prostate Cancer. Part 1: Screening, Diagnosis, and Local Treatment with Curative Intent. Eur Urol. 2017;71(4):618-629.
8. Sasagawa I, Kubota Y, Hayami S, Adachi M, Nakada T, Miura H, et al. Serum levels of total and free prostate specific antigen in men on hemodialysis. J Urol. 1998;160:83–85.
9. Horinaga M, Kitamura K, Saito S, Ukimura O, Nakanoma T, Okihara K, et al. Prostate cancer screening with prostate-specific antigen in hemodialysis patients. Urol Int. 2007;78(4):334-7.
10. Tzanakis I, Kazoulis S, Girousis N, Kagia S, Spandidakis V, Karefillakis N, et al. Prostate-specific antigen in hemodialysis patients and the influence of dialysis in its levels. Nephron. 2002;90(2):230-3.
11. Wolff JM, Ting O, Borchers H, Rohde D, Jakse G. Serum levels of prostate-specific antigen in men on hemodialysis. Anticancer Res. 2000;20:5191–5193.
12. Maoujoud O, El Machtani S, Asseraji M, Atbib Y, Zajjari Y, Taoufik A, et al. Serum tumor markers in hemodialysis patients. Int J Artif Organs. 2014;37(2):126-32.
13. Kabalin JN, and Hornberger JC. Prostatic specific antigen is not excreted by human kidney or eliminated by routine hemodialysis. 1991;37(4):308-10.
14. Monath JR, Burkart JM, Freedman BI, Pittaway DE, Russell GB, Assimos DG. Effects of hemodialysis on prostate-specific antigen. Urology. 1993;42(4):398-400.
15. Bruun L, Savage C, Cronin AM, Hugosson J, Lilja H, Christensson A. Increase in percent free prostate-specific antigen in men with chronic kidney disease. Nephrol Dial Transplant. 2009;24(4):1238-41.
16. Aminsharifi A, Simon R, Polascik TJ, et al. Evaluation and Active Treatment versus Active Surveillance of Localized Prostate Cancer in Renal Transplant Patients in the Era of Low and Very Low Risk Prostate Cancer. J Urol. 2019;202(3):469-474.
17. Bruun L, Björk T, Lilja H, Becker C, Gustafsson O, Christensson A. Percent-free prostate specific antigen is elevated in men on hemodialysis or peritoneal dialysis treatment. Nephrol Dial Transplant. 2003;18(3):598-603.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

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Serologic Response to SARS-CoV-2 Vaccine in Patients with Breast Cancer

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ABSTRACT

Background: Our study aimed to measure effectiveness of Anti-S1 RBD (receptor binding domain) IgG Antibody levels against SARS (severe acute respiratory syndrome) Cov-2 in breast cancer patients and compare them with healthy participants.

Methods: This prospective cross-sectional, single-center study was designed to evaluate Anti-S1 RBD IgG antibody levels following SARS-CoV-2 vaccination in 54 breast cancer patients and 56 healthy controls without cancer diagnosis.

Results: Anti-S1 RBD IgG antibody test was positive in 79.6% (43/54) of breast cancer patients, in 92.9% (52/56) of participants in the control group (p=0.054) and, 63.3% in breast cancer patients who were on chemotherapy+/- molecularly targeted therapy following at least two doses of vaccinations. Hybrid vaccination (use of two different types of vaccines) and more than two doses of vaccinations were associated with higher antibody titers both in patient and control groups. Median time to vaccination was 123 days (8-427) in the entire group and was significantly associated with antibody titer. Among breast cancer patients, type and frequency of vaccination, age and use of cytotoxic therapies were significantly associated with the magnitude of antibody response to SARS-CoV-2 vaccination in our study.

Conclusion: Breast cancer patients developed a lower antibody response to vaccination against COVID-19 in comparison to healthy subjects. Clinical and treatment related factors might help in tailoring future vaccination strategies for specific subsets of breast cancer patients.

Keywords: Breast cancers, COVID-19, Anti-S1 RBD IgG Antibody, SARS-Cov-2 vaccine.

Meme Kanseri Hastalarında SARS-CoV-2 Aşısına Karşı Oluşan Serolojik Yanıtın Gösterilmesi

ÖZET

Giriş/Amaç: Çalışmamızın amacı, meme kanseri hastalarında yapılan SARS Cov-2 aşılarına karşı gelişen Anti-S1 RBD (reseptör bağlama alanı) IgG antikor düzeylerini ölçmek, etkinliğini değerlendirmek ve sağlıklı grup ile karşılaştırmaktı.

Yöntemler: Bu prospektif kesitsel, tek merkezli çalışmada, 54 meme kanseri hastası ve 56 sağlıklı bireylere SARS-CoV-2 aşılamasını takiben Anti-S1 RBD IgG antikor düzeylerini değerlendirmek amacı ile yapıldı.

Bulgular: Anti-S1 RBD IgG antikoru düzeyi meme kanseri hastalarının %79,6 (43/54)'da pozitifti, kontrol grubunda bu oran %92,9 (52/56) (p=0.054) idi, kemoterapi ve /veya hedefe yönelik tedavi alan ve en az iki doz aşı olmuş grupta ise %63,3. İki farklı aşı tipinin kullanılması ve iki dozdan fazla aşılanma hem hasta hem de kontrol grubunda daha yüksek antikor seviyesi ile ilişkiliydi. Medyan aşılama süresi tüm grupta 123 gündü (8-427) ve bu durum antikor seviyesi ile önemli ölçüde ilişkiliydi. Bu çalışmada meme kanseri hastalarında, aşı türü, aşı yapılış süreleri, yaş, sitotoksik tedavilerin kullanımı SARS-CoV-2 aşısına karşı gelişen antikor cevabı ile anlamlı bir ilişki olduğu görüldü.

Sonuç: Meme kanseri hastalarında COVID-19 aşılarına karşı gelişen cevap sağlıklı kontrol grubuna kıyasla daha azdı.

Anahtar kelimeler: Meme Kanseri, COVID-19, Anti-S1 RBD IgG Antikoru, SARS-Cov-2 aşısı

COVID-19 global pandemic had devastating effects on many people. The effect was even more severe in immunosuppressed patients. Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV) (1). The most common symptoms of COVID-19 infection are fever, cough and shortness of breath. The primary mode of transmission for the COVID-19 virus is through respiratory droplets and close contact (1). The virus can cause serious respiratory complications, including pneumonia, especially in elderly patients and those with pre-existing diseases such as cancer (1).

Both cancer and antineoplastic treatments can cause immunosuppression therefore patients with cancer are considered to have a significantly higher risk for COVID-19 infection (2). Several studies suggested that cancer patients with COVID-19 have poor clinical outcomes (3). Therefore, patients with cancer have been prioritized in COVID-19 vaccination programs globally. However, as they were excluded from pivotal vaccine studies, the data on efficacy or immune response to COVID-19 vaccines in cancer patients were limited to a number of small prospective cohort studies (4). Vaccines are needed to prevent coronavirus disease 2019 (Covid-19) and protect people who are at high risk for complications. BNT162b2 (Pfizer-BioNTech) vaccine is a lipid nanoparticle–encapsulated mRNA-based vaccine that encodes the prefusion stabilized full-length spike protein of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19 (5). Sinovac (CoronaVac) is a traditional inactivated virus vaccine against COVID-19. Since it is inactivated, the virus cannot replicate, but it keeps the surface spike protein intact to trigger an immune response for protection against the live virus in infected individuals.

It has been shown that there is a robust correlation between antibody titers and efficacy across seven different vaccines against SARS-CoV-2, higher titers were associated with higher vaccine efficacy, despite uncontrolled variables across the studies (6, 7). Vaccination can produce long lasting immunity and protect people from SARS-CoV-2 variants (8). It has been shown that antibody response is generally higher after second dose of COVID-19 vaccination (9). A third dose of vaccination has only been offered in organ transplantation and in severely immunocompromised patients (10, 11).

In Turkey, initial vaccination has been performed with Sinovac in January 2021, mRNA-based vaccine was available after May 2021. Health-care providers and older people (>65 years of age), patients with chronic diseases were prioritized in the vaccination strategy. Most people, including health care providers and patients with cancer had two initial Sinovac and then two subsequent doses of mRNA-based vaccine. Those people who did not receive Sinovac as their first vaccine, had three doses of mRNA-based vaccine when it was available for vaccination.

This study aims to assess the impact of vaccination against COVID-19 in breast cancer patients who were on different treatment modalities compared to a control group of participants without cancer.

Materials and Method

This single-center prospective cohort study was conducted to evaluate the efficacy of vaccination (with Sinovac or BioNTech or hybrid with both) in patients with breast cancer. Study population included breast cancer patients and healthy controls who had at least two vaccinations with one of the approved COVID-19 vaccine. All participants underwent serologic Anti-S1 RBD Antibody test. The plasma samples of all participants were collected and kept at -20 ºC until analysis at our Medical Laboratory. The Atellica ® IM SARS-CoV-2 IgG Assay was used to quantitate IgG antibodies including neutralizing antibodies against SARS-CoV-2 (Siemens Healthcare Diagnostics Inc., Tarrytown, USA). The SARS-CoV-2 IgG assay detects antibodies to receptor binding domain (RBD) of the S1 spike antigen. The analytical measurement interval is 0,50 – 150,00 U/ml (index). The result <1,00 U/ml is accepted as nonreactive whereas >1.00 U/ml as reactive. A quantitative correlation of Atellica ® IM SARS-CoV-2 IgG Assay versus 50% of Plaque Reduction Neutralization Test ($PRNT_{50}$) was determined by linear regression and Pearson correlation, demonstrating a strong relationship with the correlation coefficient of 0,810. Since 1:80 $PRNT_{50}$ is a common benchmark for significant neutralization titers in convalescent plasma, Atellica ® IM SARS-CoV-2 IgG Assay values of 7 U/ml produce PRNT50 titers greater than 1:80 dilution with a 100% PPV and 99% prediction interval of 1:83 – 1:270 (12, 13). Vaccination information and the history of COVID-19 infection were checked from the national health record database for both patients and control groups.

Statistical Analysis

Descriptive statistics are performed as median (minimum to maximum) for non-normal distributions,

number of cases and percentage (%) for nominal variables. Comparison of characteristics between two group was performed with chi-square for parametric and Mann-Whitney U test for non-parametric variables. A p-value of <0.05 was considered statistically significant. SPSS for Windows (v. 22; IBM Corp., NY, USA) was used to analyze the data.

Results

Between July 2021 and December 2021, 54 consecutive patients with breast cancer and 56 healthcare providers without cancer were enrolled. All participants were female. Clinical, treatment characteristics and vaccination schema of enrolled patients are summarized in table 1. Median age was older in the patient group in comparison to the control group (49 vs 46 years in the patient and control groups respectively). Thirty-one patients and 38 healthy participants were younger than 50 years of age in the patient and control group respectively. Hybrid vaccination was more common in the control group (85 %) compared to the patient group (57.4 %). Forty-three % patients with breast cancer and 14 % of participants in the control group had vaccination with either BioNTech or Sinovac. Anti-S RBD IgG antibody test was positive in 79.6% (43/54) of patients with breast cancer, and in 92.9 % (52/56) of participants in the control group which was numerically higher in the control group (p=0.054).

Median IgG levels were similar in the patient and the control groups. Hypertension was the most common chronic disease in both groups (12.5% in breast cancer patients and 8.8% in the control group). Time to test (TTT: median time from last vaccination to the date of blood sampling) was 123 days (8-427) in the entire study population, it was not significantly different between the patient and control groups, 107 days (8-247) for the patient group and 145 days (36-427) for the control group, it is defined as the period between the last vaccination and antibody testing. One participant in the control group was enrolled in the clinical study evaluating the efficacy of BNT162b2 vaccine). Smoking history and comorbidities rates were also similar between the patient and control groups.

In the patient group, 37 (68.5%) patients had early stage, and 17 (31.4%) had metastatic breast cancer. Thirty patients (55.6%) were on CT+/-targeted therapy, 24 (44.4%) were on HT+/- targeted therapy at the time vaccination and blood sampling. Among patients with breast cancer, age, type of therapy, time to test, type and frequency of vaccination were significantly associated with antibody response to vaccination in univariate analysis (Table 2). Among 31 patients who were on chemotherapy 19 (63%) had seropositivity following at least two doses of vaccination.

Table 1. Characteristics of study population

Characteristics	Total (n=110)	Patients (n=54)	Controls (n=56)	p-value
Seropositivity rate %	95 (86.4)	43 (79.6)	52 (92.9)	0.054
Age(years), median (range)	48 (30-77)	49 (36-77)	46 (30-69)	0.000
TTT, Median (range) days	123 (8-427)	107 (8-247)	145 (36-427)	0.078
IgG, Median (range) U/mL	101 (0-150)	76(0-150)	95 (2-150)	0.061
Age				
≤50 years	69 (62.7)	31 (57.4)	38 (67.9)	0.325
>50 years	41 (37.2)	23 (42.6)	18 (32.1)	
Smoking status				
Never smoker	24 (21.8)	15 (26.8)	8 (15.7)	0.069
Smoker	86 (78.1)	41 (75.9)	45 (80.3)	
Comorbidities				
Yes	27 (24.5)	16 (29.9)	11 (19.6)	0.259
No	83 (75.5)	38 (70.4)	45 (80.4)	
Type of vaccine				
Only BTN162b2	22 (20)	19 (35.2)	3 (5.4)	0.000
Only Sinovac	9 (8.2)	4 (7.4)	5 (8.9)	
Both of them	79 (71.8)	31 (57.4)	48 (85.8)	

**Abbreviations: TTT: time to test*

Table 2. Impact of clinical and treatment related factors on seropositivity in the patient group by univariate analysis

Parameters	Seropositive n (%)	Seronegative n (%)	p- value
Age			
≤50 years	21 (67.7)	10 (32.2)	**0.016**
>50 years	22 (95.7)	1 (4.3)	
Type of treatment			
CT +/- Targeted Th	19 (63.3)	11 (36.7)	**0.001**
HT+/- Targeted Th	24 (100)	0	
Smoking status			
Never smoker	23 (74.2)	8 (25.8)	0.319
Smoker	20 (87)	3 (13)	
Breast cancer stage			
Early	28 (75.7)	9 (24.3)	0.470
Metastatic	15 (88.2)	2 (11.8)	
Comorbidities			
Yes	5 (83.3)	1 (16.7)	0.708
No	1 (100)	9 (23.7)	
Type of vaccination			
Monotype vaccination (BTN162b2 or Sinovac)	12 (52.2)	11 (47.8)	**0.000**
Hybrid vaccination (BTN162b2 + Sinovac)	31 (100)	0	
Time to test			
<107 days	25 (92.6)	2 (7.4)	**0.039**
≥107 days	18 (66.7)	9 (33.3)	
Frequency of vaccination			
Two dosses	21 (38.9)	47.6	**0.000**
>Two dosses	33 (61.1)	100	

Abbreviations: CT: Chemotherapy, HT: Anti-hormone therapy, Th: therapy.

All patients who were on endocrine therapy had seropositivity. Seropositivity was higher in patients younger than 50 years of age (p=0.016). Antibody titer dynamics was significantly associated with the time to test in the patient group, patients with shorter TTT had higher titers (p= 0.039). Patients who had hybrid vaccination and patients who received >2 doses of vaccination had higher antibody titers (p=0.000, p=0.000 respectively) Presence of comorbidities, stage of disease and smoking history did not have any impact on the magnitude of antibody response.

Four patients (7.4%) in the breast cancer group (all after vaccination), and 9 (16%) participants in the control group (7 participants before vaccination and 2 participants after vaccination) had a history of COVID-19 infection.

Discussion

In this cross-sectional cohort study, we presented the level of antibody responses to SARS-CoV-2 vaccination among patients with breast cancer in comparison to healthy controls. Seropositivity rate was numerically lower in the patient group in comparison to healthy control group. It should be noted that 55.5% of patients were on chemotherapy at the time of vaccination in the patient group, potentially responsible from the attenuated immune response to vaccination. Several studies explored the immunogenicity after different types of COVID-19 vaccines in patients with cancer. All of these studies included patients with various types of solid tumors who were on different types of antineoplastic therapies. A multicenter, prospective observational study from Turkey evaluated the immunogenicity of Sinovac in 47 patients with solid tumors. Majority of the patients had cytotoxic chemotherapy, median age was 73 (64-80), none of them had previous COVID infection and serum samples were taken 4 weeks after the second dose of vaccination. SARS-COV-2 antibody was evaluated by SARS-CoV-2 total ELISA kits. Seroconversion (immunogenicity) was defined as post-vaccination positivity of SARS-COV-2 antibody (≥1 IU) that was negative (<1 IU) before vaccination. Immunogenicity rate was 63.8% in entire patient group and significantly associated with younger age (14). Another prospective, multicenter Turkish study compared the seropositivity rate of 776 cancer patients with 715 non-cancer controls after inactive CoV-2 vaccination. IgG level of >50 AU/ml was defined as seropositivity. Median age was 64 years in the patient and 50 in the control group, 39.8 % patients were on active chemotherapy, serum samples were taken 4-6 weeks from all second dose of inactive vaccine. The most common type of cancer was breast cancer (% 32). Seropositivity was lower in the patient group (p<0.001) compared to control group. Older age and chemotherapy were significantly associated with lower seropositivity (15).

A prospective observational cohort study from Hellenic Cooperative Oncology group has reported the rate of seropositivity measured 2-4 weeks after two doses of three different vaccines (BNT162b2, mRNA-1273 or AZD1222) in 189 patients with solid tumors compared to 99 healthy volunteers. Sixty-four percent of patients and 17% of healthy participants were older than 60 years of age. The seropositivity rate in patients with solid tumors was significantly lower than the control group (91% vs 98%). Forty-seven percent of the patient group were on chemotherapy at the time of vaccination.

Older age, poor performance status, active treatment, certain cancer types (pancreatic cancer, SCLC), male gender and smoking status were significantly associated with lower immunogenicity (16). A single center prospective study from Israel investigated the serologic response to COVID-19 infection and/or vaccination with BTN162b2 mRNA vaccine in 202 cancer patients and, 30 healthy controls. The median age was 62, 44% were male, 33% had breast cancer. Blood samples to analyze antibodies against spike protein were collected at a median of 77 days after the second vaccine. Fifteen % of patients had COVID infection before vaccination. Ninety-six (47.5%) patients were on chemotherapy and 19% patients were on surveillance without any therapy. Serologic response rates were 85.6% in the entire patient population, 77.5 % among patients on chemotherapy, 87.2% in patients without history of COVID infection and 100% in the control group. Chemotherapy administration was significantly correlated with lower response rate to vaccination (17). This study underscored the need for close serological surveillance and potential need for booster doses in patients with cancer. Three other studies reported >95% seropositivity rates in patients with cancer. The percentage of patients with breast cancer were in the range of 24-25%. These studies included also patients with hematological malignancies. Importantly most patients with solid tumors were on hormonal therapies and surveillance, suggesting that serologic response is higher in patients who are not on chemotherapy (18, 19, 20).

Two prospective studies from Israel reported the rate of seropositivity measured by IgG Abs against spike RBD following two doses of vaccination with BNT162b2 vaccine in the range of % 86-90. Eighteen % of patient population were patients with breast cancer in both studies and 30-58% of all patients were on CT. Chemotherapy was associated with reduced immunogenicity similar to other studies from other countries (6, 20).

Our study included a specific group of cancer patients in contrast to other reports including all types of cancers. Seropositivity was lower in breast cancer patients receiving chemotherapy +/-targeted therapy in comparison to endocrine therapy despite this difference was not statistically significant (p: 0.054). Four patients and nine participants in the control group had COVID-19 infection before blood sampling might be a potential confounder but the seropositivity rate in the control group was numerically higher than the patient group. More than half of our patients were on active chemotherapy during vaccination. This might be one of the most important reasons why seropositivity was lower in the patient group (p=0.054). Patients who were on chemotherapy were not permitted to have vaccination if they have lymphopenia (<1000) and neutropenia (<1500) at our outpatient clinics. The number of patients receiving only targeted therapy was very few to be analyzed separately. Our country's COVID-19 pandemic management policy allowed the use of two types of vaccines. Thirty-one patients (57.4%) and 48 (85.8%) healthy controls received both types of vaccination in our study. Previous studies including patients with all types of solid tumors did not have such a vaccination policy. In addition, vaccination schema was different from other countries, hybrid vaccination was most common type of vaccination schema in our study. All serological antibody measurements were performed centrally at our University Virology Laboratories. Measurement of only spike Anti-S1 RBD IgG antibody level, imbalances between the two groups in vaccination doses, presence of few patients with prior COVID infection in both cohorts and small sample size are the potential limitations of our study. Despite these limitations, our study has shown that seropositivity rate was numerically lower in patients with breast cancer compared to healthy controls in line with other studies including all types of solid tumors. Twenty percent of the patients were seronegative following at least two doses of vaccination which is little higher than reported (6-14%) in other studies (6, 19, 21). It should be noted those studies included all tumor types where the proportion of breast cancer patients was low and the seropositivity analysis based on given therapy was not reported for only breast cancer patients. In addition, the time between last vaccination and blood sampling for antibody measurement were 4-6 weeks in all other studies and it is ≥ 3months in our study. Seropositivity rate in patients and control group is in the range of seropositivity reported in other studies including all types of solid tumors and healthy controls. Chemotherapy and older age were associated with a lower antibody response following vaccination similar to other studies. Of note, hybrid vaccination and more than 2 doses of vaccination were associated with higher antibody titers both in patient and control groups.

Conclusion

Our findings point out that specific subsets of breast cancer patients might need a different vaccination strategy. Adjustments based on patient and treatment related factors might be necessary for future vaccination policies in breast cancer patients.

Declaration

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Statement of Ethics

The study was performed with the permission of the Turkish Ministry of Health and was approved by the local ethics committee (2021/13).

Informed Consent Addressed

All participants signed a written informed consent form.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contribution

Ozde Melisa Celayir, Gulcin Kahraman, Jameela Somanje, Semra Oyku Colak: collected the data. Aysun Isiklar: analyzed the data. Aysun Isiklar and Gul Basaran: wrote the study. Gul Basaran: designed the manuscript. Gul Basaran, Mustafa Serteser and Nurdan Tozun read and revised the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

References

1. WHO (Internet). Available form: https://www.who.int/westernpacific/health-topics/detail/coronavirus? (Accessed 06 June 2021)
2. Citgez B, Yigit B, Capkinoglu E, Yetkin SG. Management of Breast Cancer during the COVID-19 Pandemic. Sisli Etfal Hastan Tip Bul. 2020;54(2):132-135. Available from: doi:10.14744/SEMB.2020.23326
3. Kuderer, NM, Choueiri TK., Shah, DP, Shyr Y, Rubinstein SM, Rivera DR et al. Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study (published correction appears in Lancet. 2020 Sep 12;396(10253):758). Lancet. 2020;395(10241):1907-1918. Available from: doi:10.1016/S0140-6736(20)31187-9
4. Fendler A, Shepherd S, Au L, Wilkinson KA, Wu M, Byrne F et al. Adaptive immunity and neutralizing antibodies against SARS-CoV-2 variants of concern following vaccination in patients with cancer: The CAPTURE study. Nat Cancer. 2021;2:1321-1337. Available from: doi:10.1038/s43018-021-00274-w
5. Thomas SJ, Moreira ED Jr, Kitchin N, Absalon J, Gurtman A, Lockhart S et al. Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine through 6 Months. N Engl J Med. 2021;385(19):1761-1773. Available from: doi:10.1056/NEJMoa2110345
6. Massarweh, A, Eliakim-Raz N, Stemmer A., Levy-Barda A, Yust-Katz S, Zer A et al. Evaluation of Seropositivity Following BNT162b2 Messenger RNA Vaccination for SARS-CoV-2 in Patients Undergoing Treatment for Cancer. JAMA Oncol. 2021;7(8):1133-1140. Available from: doi:10.1001/jamaoncol.2021.2155
7. Earle KA, Ambrosino DM, Fiore-Gartland A, Goldblatt D, Gilbert PB, Siber GR et al. Evidence for antibody as a protective correlate for COVID-19 vaccines. Vaccine. 2021;39(32):4423-4428. Available from: doi: 10.1016/j.vaccine.2021.05.063
8. Tian X, Jiang W, Zhang H, Lu X, Li L, Liu W et al. Persistence of the SARS-CoV-2 Antibody Response in Asymptomatic Patients in Correctional Facilities. Front Microbiol. 2021; 12:789374. Available from: doi:10.3389/fmicb.2021.789374
9. Lee A, Wong SY, Chai L, Lee SC, Lee MX, Muthiah MD et al. Efficacy of covid-19 vaccines in immunocompromised patients: systematic review and meta-analysis. BMJ. 2022;376: e068632. Available from: doi:10.1136/bmj-2021-068632
10. Del Bello A, Abravanel F, Marion O, Couat C, Esposito L, Lavayssière L et al. Efficiency of a boost with a third dose of anti-SARS-CoV-2 messenger RNA-based vaccines in solid organ transplant recipients. Am J Transplant. 2022;22(1):322-323. Available from: doi:10.1111/ajt.16775
11. Wise J. Covid-19: UK will offer third vaccine dose to severely immunosuppressed people. BMJ. 2021; 374: n2160. Available from: doi: 10.1136/bmj.n2160
12. Irsara C, Egger AE, Prokop W, Nairz M, Loacker L, Sahanic S et al. Clinical validation of the Siemens quantitative SARS-CoV-2 spike IgG assay (sCOVG) reveals improved sensitivity and a good correlation with virus neutralization titers. Clin Chem Lab Med. 2021;59(8):1453-1462. Available from: doi:10.1515/cclm-2021-0214
13. National Institutes of Health. COVID-19 Treatment Guidelines. Anti-SARS-CoV-2 Antibody Products. Convalescent Plasma. Last update: October 9, 2020. Available from: https://www.covid19treatmentguidelines.nih.gov/anti-sars-cov-2- antibody-products/convalescent-plasma. (Accessed 06 June 2021)
14. Karacin C, Eren T, Zeynelgil E, Imamoglu GI, Altinbas M, Karadag I, et al. Immunogenicity and safety of the CoronaVac vaccine in patients with cancer receiving active systemic therapy. Future Oncology 2021 17:33, 4447-4456. Available from: doi:10.2217/fon-2021-0597
15. Yasin AI, Aydin SG, Sümbül B, Koral L, Şimşek M, Geredeli Ç et al. Efficacy and safety profile of COVID-19 vaccine in cancer patients: a prospective, multicenter cohort study. Future Oncol. 2022;18(10):1235-1244. Available from: doi:10.2217/fon-2021-1248
16. Linardou H, Spanakis N, Koliou GA, Christopoulou A, Karageorgopoulou S, Alevra N et al. Responses to SARS-CoV-2 Vaccination in Patients with Cancer (ReCOVer Study): A Prospective Cohort Study of the Hellenic Cooperative Oncology Group. Cancers (Basel). 2021;13(18):4621. Available from: doi:10.3390/cancers13184621
17. Grinshpun A, Rottenberg Y, Ben-Dov IZ, Djian E, Wolf DG, Kadouri L. Serologic response to COVID-19 infection and/or vaccine in cancer patients on active treatment. ESMO Open. 2021;6(6):100283. Available from: doi:10.1016/j.esmoop.2021.100283
18. Thakkar, A., Gonzalez-Lugo, J. D., Goradia, N., Gali, R., Shapiro, L. C., Pradhan, K., et al. Seroconversion rates following COVID-19 vaccination among patients with cancer. Cancer Cell. 2021;39(8):1081-1090.e2. Available from: doi:10.1016/j.ccell.2021.06.002
19. Addeo A, Shah PK, Bordry N, Hudson RD, Albracht B, Marco MD, et al. Immunogenicity of SARS-CoV-2 messenger RNA vaccines in patients with cancer. Cancer Cell. 2021;39(8):1091-1098.e2. Available from: doi:10.1016/j.ccell.2021.06.009

20. Barrière, J., Carles, M., Audigier-Valette, C., Re, D., Adjtoutah, Z., Seitz-Polski, B., Gounant, V., et al. Third dose of anti-SARS-CoV-2 vaccine for patients with cancer: Should humoral responses be monitored? A position article. Eur J Cancer. 2022; 162:182-193. Available from: doi:10.1016/j.ejca.2021.12.011

21. Goshen-Lago T, Waldhorn I, Holland R, Szwarcwort-Cohen M, Reiner-Benaim A, Shachor-Meyouhas Y et al. Serologic status and toxic effects of the SARS-CoV-2 BNT162b2 vaccine in patients undergoing treatment for cancer. JAMA Oncol. 2021: e212675. Available from: doi:10.1001/jamaoncol.2021.2675

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Biophysics / Biyofizik

Poor Concordance Between Remote Neurocognitive Testing and Face-to-Face Testing of Verbal Memory Processes in Young Healthy Volunteers

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ABSTRACT

Purpose: Recently published studies indicate increased interest in remote health services that have expanded greatly with digitalization and whether they can be implemented into neuropsychological testing. Remote neurocognitive testing has become a frequently used approach today. The current study examines the concordance between the face-to-face and remote Oktem Verbal Memory Processes Test results of healthy young participants.

Method: A total of 45 healthy young participants with a mean age of 23.41 were invited to participate in the study. Participants were 42.2% of male and 57.8% female. The Öktem Verbal Memory Processes Test was administered to participants. There was at least one week between face-to-face and remote testing. The results were compared with paired t-tests and Lin's Concordance Correlation analysis. Reliability was analyzed by examining the Intraclass Correlation Coefficient.

Results: For immediate memory score, ICC was 0.286 (95% CI: 0.016-0.524). ICC of total learning score was calculated as 0.665 (95% CI: 0.465-0.801). The highest learning score had an ICC of 0.868 (95% CI: 0.773-0.926). ICC of the total inconsistency score was 0.639 (95% CI: 0.414-0.79). Finally, the score for reaching the criterion displayed an ICC of 0.253 (95% CI: 0.079-0.535).

Conclusions: The findings demonstrate that there is poor concordance between the results obtained with remote and face-to-face application of the Öktem Verbal Memory Process Test. As a result, using it remotely is not recommended at this stage.

Keywords: Digital Neuropsychology, Memory, Remote Neurocognitive Testing, Technology

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Genç Sağlıklı Gönüllülerin Sözel Bellek Süreçlerinin Uzaktan Nörobilişsel Test ve Yüz Yüze Testi Arasındaki Uyum Zayıftır

ÖZET

Amaç: Son zamanlarda yayınlanan araştırmalar, dijitalleşmeyle birlikte büyük ölçüde genişleyen uzaktan sağlık hizmetlerine olan ilginin arttığını ve bunların nöropsikolojik testlere uygulanıp uygulanamayacağının ilgi konusu olduğunu göstermektedir. Uzaktan nörobilişsel testler günümüzde sıklıkla kullanılan bir yaklaşım haline geldi. Mevcut çalışmanın amacı, sağlıklı genç katılımcıların yüz yüze ve uzaktan Öktem Sözel Bellek Süreçleri Testi sonuçları arasındaki uyumunu incelemekdir.

Yöntem: Yaş ortalaması 23.41 olan 45 sağlıklı genç katılımcı çalışmaya davet edildi. Katılımcıların %42,2'si erkek, %57,8'i kadındı. Katılımcılara Öktem Sözel Bellek Süreçleri Testi uygulandı. Yüz yüze ve uzaktan test arasında en az bir hafta vardı. Sonuçlar, eşleştirilmiş t-testleri ve Lin'in Uyum Korelasyon analizi ile karşılaştırıldı. Güvenilirlik, Sınıf İçi Korelasyon Katsayısı incelenerek analiz edildi.

Bulgular: Anlık bellek puanı için ICC 0,286 (%95 GA: 0,016-0,524). Toplam öğrenme puanı ICC 0,665 (%95 GA: 0,465-0,801) olarak hesaplandı. En yüksek öğrenme puanının ICC değeri 0,868'dir (%95 GA: 0,773-0,926). Toplam tutarsızlık puanının ICC'si 0,639'du (%95 GA: 0,414-0,79). Son olarak, kritere ulaşma puanı 0,253'lük bir ICC gösterdi (%95 GA: 0,079-0,535).

Sonuç: Bulgular, Öktem Sözel Bellek Süreç Testi'nin uzaktan ve yüz yüze uygulanması ile elde edilen sonuçlar arasında zayıf bir uyum olduğunu göstermektedir. Sonuç olarak, bu aşamada uzaktan kullanılması önerilmez.

Anahtar Sözcükler: Dijital Nöropsikoloji, Bellek, Uzaktan Nörobilişsel Test, Teknoloji

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Worldwide increase in digitalization during the 21st century has allowed development of new tools that enable neuropsychological assessment of cognition and behavior, sometimes referred to as digital neuropsychology (1). Developing alternatives to face-to-face practices in health care delivery has come to the fore due to the COVID-19 pandemic and with attempts to eliminate inequality in access to health services at the international level (2,3). Therefore, remote neurocognitive testing (RNCT) via video interview has gained momentum.

Memory consists of several components, including a primary act of learning which, via the continuity assumed vital and supplied by the storage mechanism, happens in the act of retrieval (4). Verbal memory is a relatively general concept that refers to memory for verbally delivered information. A variety of tasks, including learning word list tasks, story recall, and learning of sequences of paired words, can measure verbal memory ability (5). The Öktem Verbal Memory Processes Test is a valid and reliable test that was developed by the Istanbul University Neuropsychology Laboratory (Turkey) and examines verbal memory (6). This test can be applied to patient groups for diagnostic purposes, as well as to healthy individuals in neurocognitive studies. Memory tests are often administered to elderly people. When memory tests are used in the follow-up of the course of the disease, they can also be applied repeatedly at certain time intervals. This may require many additional hospital visits in a year. The frequent visits of elderly individuals to the hospital for neurocognitive evaluation is a challenge due to the high risk of infection during the pandemic and the difficulty and cost of access to the hospital for elderly individuals.

Studies have examined whether face-to-face and remote applications of many different scales affect the results for similar reasons (7,8). If there is no significant difference between the results obtained by the two application methods, it can be concluded that the scales/tests can be administered via remote access, creating a safe and easy alternative both in the provision of health services and in use for research purposes.

This study aims to examine the concordance between the face-to-face and remote Oktem Verbal Memory Processes Test results of healthy young individuals.

MATERIALS AND METHODS

This study has been approved by the Local Ethics Committee (2021/3369). Informed consent was obtained from all individual participants included in the study. The Öktem Verbal Memory Processes Test was administered to individuals who volunteered to participate in the study, once face-to-face and once remotely (6). It was ensured that there was at least one week and at most two weeks between the two tests. During the online tests, participants were asked to use their own smartphones which they use daily. Online tests were conducted in the format of videoconferencing via a WhatsApp videocall. All tests were administered by a single, experienced and trained researcher.

Healthy individuals between the ages of 18 and 50 were invited to the study. Being diagnosed with a neurological or psychiatric disease, using drugs that may affect memory functions, and having hearing loss at any level were exclusion criteria.

A randomized cross-over design was used to determine whether the participants would receive the face-to-face or videoconferencing testing first.

Masks were worn during face-to-face application due to the COVID-19 pandemic. Practitioners also wore masks during the test performed remotely in order to avoid an advantage due to lip reading which might provide additional cues.

Implementation of Öktem Verbal Memory Processes Test (ÖVMPT) and Scoring

One of the word sets consisting of 15 words is read clearly at a constant speed (1 second per word), and then the participant is asked to repeat the words that he/she could remember to the practitioner. Then this is repeated for 10 trials. The words remembered in each round are recorded in order. Standard sentences are used to instruct the participant during test administration. The tests were carried out with different word sets during remote and face-to-face application. Word sets were shown to deliver similar results in previous studies by Öktem (6).

After the test is completed, various scores are calculated from the data. The number of words remembered in the first attempt constitutes the "immediate memory score". The sum of the words remembered in ten trials constitutes the "total learning score". Whichever of the ten repetitions

the participant was able to remember the largest number of words was recorded as the "highest learning score". If the participant succeeded in remembering all the words, the trial during which he/she succeeded in remembering all words was considered "reaching the criterion". For example, if the participant successfully repeated all 15 words in the third trial, reaching the criterion score was noted as 3. In addition, if participant is not able to remember a word that he/she had remembered twice in a row, or if he/she cannot remember a word that he/she had remembered three times in total even if not consecutively, one inconsistency point is given and the "total inconsistency score" of the person in the ten rounds is calculated.

Statistical Analysis

The Shapiro-Wilk test was used to evaluate whether the data show a normal distribution. Then, the results of the two applications were compared with paired t-test and Lin's Concordance Correlation analysis. Further, reliability was analyzed by examining the Intraclass Correlation Coefficient (ICC) for each score. Lin's concordance correlation coefficient was interpreted according to McBride's (2005) suggestions: <0.90: poor; 0.90 to 0.95: moderate; 0.95 to 0.99: substantial; >0.99 almost perfect. ICC levels were interpreted as follows: < 0.5 poor reliability, 0.5 to 0.75 moderate reliability, 0.75 to 0.9 good reliability, and > 0.90 excellent reliability (9). Alpha level was set at 0.05. Analyses were done using the R Studio program (10,11).

RESULTS

Participants (n=45) were between the ages of 18-45, with a mean age of 23.31 (SD: 6.47). Of the participants, 19 were male (42.2%) and 26 were females (57.8%). All participants had graduated at least from high school. 37 were university graduates (82.2%) and there 8 people who graduated from high school only (17.8%).

Results of the memory process tests are calculated in five different scores. Table 1 summarizes these scores, including the p values obtained from paired t tests.

Lins Concordance Coefficients were evaluated as poor for all scores: ρ_c(Immediate Memory Score)=0.28, ρ_c(Total Learning Score)=0.66, ρ_c(Highest Learning Score)=0.86, ρ_c(Reaching the Criterion)=0.65, ρ_c(Total Inconsistency Score)=0.60.

Correlation plots of two methods (online vs. face-to-face) can be observed in Figure 1 for Immediate Memory score, Total Learning score, Highest Learning score, Reaching The Criterion, and Total Inconsistency score.

Table 1. Results of the Verbal Memory Processing Test (n=45)

	Face-to-face (mean ± SD)	Online (mean ± SD)	p	(95% CI)
Immediate Memory Score	8.15 ± 2.30	7.22 ± 1.79	0.013	(-1.66; -0.20)
Total Learning Score	128.42 ± 16.58	124.77 ± 17.17	0.078	(-7.72; 0.43)
Highest Learning Score	14.57 ± 1.13	14.6 ± 1.11	0.799	(-0.15; 0.19)
Reaching the Criterion	5.11 ±2.26	5.67 ± 2.33	0.272	(-1.45; 0.42)
Total Inconsistency Score	3.04 ± 3.36	2.87 ± 3.00	0.692	(-0.69; 1.03)

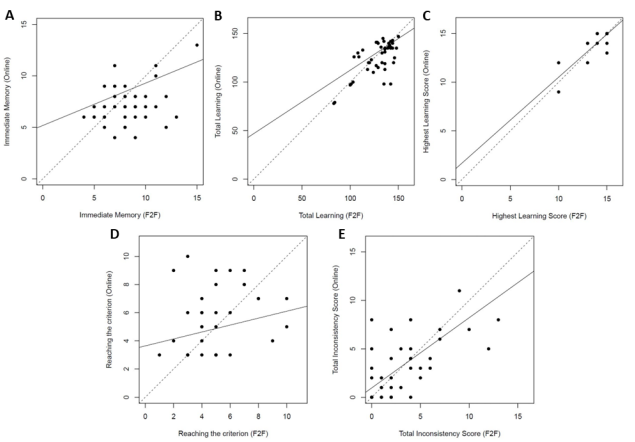

Figure 1. *Correlation plots of memory scores obtained by two methods (face-to-face vs. online). A-Immediate Memory Score B-Total Learning Score C-Highest Learning Score D-Reaching the Criterion E-Total Inconsistency Score (F2F: Face-to-face)*

Intraclass correlation coefficient estimates and their 95% confident intervals were calculated based on a single-rating, absolute-agreement, 2-way mixed-effects model. For immediate memory score, ICC was 0.286 (95% CI: 0.016-0.524). ICC of total learning score was calculated as 0.665 (95% CI: 0.465 -0.801).

The highest learning score had an ICC of 0.868 (95% CI: 0.773 -0.926). The ICC of the total inconsistency score was 0.639 (95% CI: 0.414 -0.79). Finally, the score for reaching the criterion displayed an ICC of 0.253 (95% CI: 0.079 -0.535). Consequently, immediate memory and reaching the criterion scores had poor reliability, total learning score and total inconsistency score had a moderate reliability, and only the highest learning score had a good reliability.

DISCUSSION

Many characteristics related to memory, such as immediate memory and the process of learning or acquiring knowledge, may be distinguished using verbal memory processes testing. It's particularly useful to help distinguish mild forms of cognitive impairment from dementia (12). The Öktem Verbal Memory Processes Test can identify various parameters associated with memory, such as immediate (sensory) memory, attention, and (short-term) working memory.

Remote neurocognitive testing has been implemented to evaluate immediate memory, semantic memory, working memory, immediate free recall, recognition, and delayed recall in various populations (13). The advantage of remote testing of verbal memory processes is that it increases the possibility of identifying minor cognitive changes over time in the natural context of a person's home setting (14). Therefore, the potential use of remote neurocognitive testing is exciting for clinicians and researchers. Sharing that motivation, we compared the agreement between the results obtained by online and face-to-face testing of verbal memory processes in this study. Although a significant difference was observed only between the immediate memory scores in the dependent variables t test; Lin's concordance correlation results, which is a superior analysis method in many respects in showing the compatibility of the two methods, showed that all the scores obtained in the verbal memory processes test were in poor concordance. Additionaly, ICC values showed that most domains of the ÖVMPT displayed poor to moderate reliability between face-to-face and remote administration, whereas only the highest learning score had good reliability. These results show us that the use of ÖVMPT via videoconferencing does not give comparable results to face-to-face administration and the two methods cannot be used interchangeably. This reminds us once again that it is necessary to be cautious when switching to online administrations of traditional test batteries.

Many researchers have studied the agreement between online vs. remote neurocognitive testing via a number of test batteries and reported positive results. One study compared the remotely conducted Montreal Cognitive Assessment (MoCA) scores of patients with Parkinson's Disease and obstructive sleep apnea to those which were done in person. They concluded that two methods were in good agreement. However, this study examined only seven participants remotely (15). A similar study with seventeen participants examined the reliability of the MoCA using telehealth in a rural setting with veterans and reported ICC levels >0.98 (16). Another study tested the feasibility and reliability of the Wechsler Adult Intelligence Scales - 4th Edition (WAIS-IV) when administered via home-based videoconferencing (17). Similar to our study, they have selected a nonclinical cohort. The results have demonstrated that WAIS-IV can be effectively administered through videoconferencing. Additionally, results of a recent study have shown that video-conference calls to complete cognitive assessments during the COVID-19 pandemic was feasible and acceptable (18). However, it should be noted that this study reports only the subjective experience of clinicians and service-users, but lacks any objective comparisons between videoconferencing and face-to-face assessments. Additionally, one study has even shown that the type of the platform used, such as the browser, an iPad or an iPhone, can also significantly affect the results of neurocognitive tests when administered remotely (21). This finding shows that the type of platform used in remote applications is also an important variable and should be taken into account in research.

Our study results, in contrast to many positive reports, have shown that online and face-to-face administration of ÖVMPT provide different results. However, similar to our study findings, there are other studies in the literature that show that reliability is very low when some neurocognitive tests applied with traditional paper and pencil are applied remotely. One important example would be the study by Zeghari et. Al, that compared face-to-face and online administration of several neurocognitive test batteries on 50 participants (aged 55 and older). Results showed that Mini Mental State Test total score ICC was only 0.371, The Free and Cued Selective Reminding Test total recall score, delayed recall score and recognition score ICC values were all below 0.5, and verbal fluency test semantic and phonological z-score ICC values were below 0.5 (19). It is well established that, ICC values below 0.5 indicate poor reliability. However, when a similar study was conducted with a larger cohort (202 adult subjects, including 83 with cognitive impairment and 119 healthy

controls) by Cullum et al, ICC for the total score of MMSE was found 0.905. This once again shows the importance of the high number of participants in the studies in the results (20) and the limited number of participants is an important limitation in our study. Nevertheless, the number of participants in our study exceed that of many similar studies.

In conclusion, remote neurocognitive assessment is becoming more and more widespread, which benefits from the point of view of convenience and elimination of inequalities in access to health. In this context, the question of whether traditional assessment tools give valid results when applied with remote access has also been a common research question. Although remote use has yielded valid results for different test batteries in the literature, as a result of this research, it has been determined that there is poor concordance between the results obtained with remote and face-to-face application of the Öktem Verbal Memory Process Test. Therefore, using this test with a remote application is not recommended at this stage. A similar study can be repeated by increasing the number of participants.

DECLERATIONS

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None.

Conflicts of Interest/Competing Interests

None.

Ethics Approval

Necmettin Erbakan University Non-Pharmaceutical and Medical Device Research Ethics Committee (2021/3369).

Availability of Data and Material

Available on request

Authors' Contributions

All authors (MCC, NK, YKA, SK, MPY) contributed to conceptualisation, data collection, writing the manuscript. MPY has also done the statistical analysis.

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REFERENCES

1. Germine L, Reinecke K, Chaytor NS. Digital neuropsychology: Challenges and opportunities at the intersection of science and software. Clin Neuropsychol 2019;33:271–86.
2. Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. BMC Public Health 2020;20:1–9.
3. Wosik J, Fudim M, Cameron B, Gellad ZF, Cho A, Phinney D, et al. Telehealth transformation: COVID-19 and the rise of virtual care. J Am Med Informatics Assoc 2020;27:957–62.
4. Klein SB. What memory is. Wiley Interdiscip Rev Cogn Sci 2015;6:1–38. https://doi.org/10.1002/WCS.1333.
5. Tatsumi IF, Watanabe M. Verbal Memory. Encycl Neurosci 2009:4176–8. https://doi.org/10.1007/978-3-540-29678-2_6266.
6. Öktem Ö. Öktem Verbal Memory Processes Test (ÖKTEM-VMPT) Manuel book. Ankara: Turkish Psychologist Society Publish; 2011.
7. Pietkiewicz IJ, Helka AM, Tomalski R. Validity and reliability of the Polish online and pen-and-paper versions of the Somatoform Dissociation Questionnaires (SDQ-20 and PSDQ-5). Eur J Trauma Dissociation 2019;3:23–31.
8. de Brito Silva B, de Brito A, Monteiro EP, Mondelo GP, Remor E. Evidence of validity for the online version of the Assessment of Adherence to Antiretroviral Therapy Questionnaire. SAGE Open 2019;9:2158244019877201.
9. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med 2016;15:155–63.
10. Steichen TJ, Cox NJ. A note on the concordance correlation coefficient. Stata J 2002;2:183–9.
11. McBride GB. A proposal for strength-of-agreement criteria for Lin's concordance correlation coefficient. NIWA Client Rep HAM2005-062 2005;45:307–10.
12. Şair A, Şair YB, Ayar S. Differentiating Mild Forms of Cognitive Impairment and Dementia: Where Other Tests Fail, Verbal Memory Assessment May Prove Critical. Meandros Med Dent J 2021;22:187.
13. Moore RC, Swendsen J, Depp CA. Applications for self-administered mobile cognitive assessments in clinical research: A systematic review. Int J Methods Psychiatr Res 2017;26:e1562.
14. Resnick HE, Lathan CE. From battlefield to home: a mobile platform for assessing brain health. Mhealth 2016;2.
15. Lajoie AC, Crane J, Robinson AR, Lafontaine AL, Benedetti A, Kimoff RJ, et al. Feasibility of remote neurocognitive assessment: pandemic adaptations for a clinical trial, the Cognition and Obstructive Sleep Apnea in Parkinson's Disease, Effect of Positive Airway Pressure Therapy (COPE-PAP) study. Trials 2021;22:1–9. https://doi.org/10.1186/S13063-021-05879-1/TABLES/3.
16. DeYoung N, Shenal B V. The reliability of the Montreal Cognitive Assessment using telehealth in a rural setting with veterans. J Telemed Telecare 2019;25:197–203. https://doi.org/10.1177/1357633X17752030.
17. Mahon S, Webb J, Snell D, Theadom A. Feasibility of administering the WAIS-IV using a home-based telehealth videoconferencing model. Https://DoiOrg/101080/1385404620211985172 2021;36:558–70. https://doi.org/10.1080/13854046.2021.1985172.
18. Sumpter R, Camsey E, Meldrum S, Alford M, Campbell I, Bois C, et al. Remote neuropsychological assessment: Acceptability and feasibility of direct-to-home teleneuropsychology methodology during the COVID-19 pandemic. Https://DoiOrg/101080/1385404620222056922 2022:1–16. https://doi.org/10.1080/13854046.2022.2056922.

19. Zeghari R, Guerchouche R, Tran-Duc M, Bremond F, Langel K, Ramakers I, et al. Feasibility Study of an Internet-Based Platform for Tele-Neuropsychological Assessment of Elderly in Remote Areas. Diagnostics 2022, Vol 12, Page 925 2022;12:925. https://doi.org/10.3390/DIAGNOSTICS12040925.
20. Cullum CM, Hynan LS, Grosch M, Parikh M, Weiner MF. Teleneuropsychology: Evidence for video teleconference-based neuropsychological assessment. J Int Neuropsychol Soc 2014;20:1028–33.
21. Ye S, Sun K, Phi H, Hosseini Ghomi R, Ghomi RH. Validation of Remote Testing using BrainCheck, a Computerized Neurocognitive Test. MedRxiv 2020:2020.06.01.20119289. https://doi.org/10.1101/2020.06.01.20119289.

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A Bibliometric Study of Articles on Laparoscopic Sleeve Gastrectomy Published in Science Citation Index Expanded Journals: Analysis of 4269 Articles Published Between 1998-2020

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ABSTRACT

Purpose: In the last decade, the popularity of laparoscopic sleeve gastrectomy (LSG) among surgeons has increased, and the desire to get information has been accelerated. Holistic evaluation of scientific publications, including publication and citation metrics, is the definition of "Bibliometrics". In the present study, we aimed to analyze the top-cited articles about LSG, published between the years 1998-2020, according to the database of Web of Science.

Methods: We used the search engine of Thomson Reuters®, Web of Science Core Collection, by using the keyword "Laparoscopic sleeve gastrectomy", and by choosing the "Topic" section on December 1, 2020. Only "Articles" in "English" were included in the study protocol. The publication rates according to years, countries, journal categories, organizations and authors, publication number, citation, and h-index data were evaluated. Also, publication metrics were evaluated in terms of Gross Domestic Product (GDP), Gross Domestic Product per capita (GDPpp), and Human Development Index (HDI) of the countries.

Results: The most productive countries, scientific journals, and authors are USA, Obesity Surgery, and Schauer PR, respectively. There was a positive correlation between publication numbers and GDP ($r=0.370$, $p<0.05$), also a weak positive correlation between GDPpp and HDI ($r=0.359$, $p>0.05$; $r=0.603$, $p>0.05$; respectively).

Conclusion: The present study proves the avalanching publication productivity concerning LSG, over the last twenty years. Our outcomes show that researchers have an increasing interest in morbid obesity and LSG procedure. This progression highlights the value of bibliometric analysis, which facilitates the process of research in further studies.

Keywords: Bariatric surgery ,Bibliometrics, Laparoscopic sleeve gastrectomy, obesity, scientific publications

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Science Citation Index Expanded Journals'da yayınlanan laparoskopik sleeve gastrektomi makalelerinin bibliyometrik çalışması: 1998-2020 yılları arasında yayınlanan 4269 makalenin analizi

ÖZET

Amaç: Son on yılda cerrahlar arasında laparoskopik sleeve gastrektominin (LSG) popülaritesi artmış ve bilgi alma isteği hızlanmıştır. Yayın ve atıf ölçümleri de dahil olmak üzere bilimsel yayınların bütüncül değerlendirmesi, "Bibliyometri"nin tanımıdır. Bu çalışmada 1998-2020 yılları arasında yayınlanan LSG ile ilgili en çok atıf alan makaleleri Web of Science veri tabanına göre incelemeyi amaçladık.

Yöntemler: Çalışma protokolünde 1 Aralık 2020 tarihinde "Konu" bölümünü seçerek Thomson Reuters®, Web of Science Core Collection arama motorunda "Laparoskopik sleeve gastrektomi" anahtar kelimesini kullandık ve sadece "İngilizce" dilindeki "Makaleler" dahil edildi. Yıllara, ülkelere, dergi kategorilerine, kuruluşlara ve yazarlara göre yayın oranları, yayın sayısı, atıf ve h-index verilerine göre değerlendirildi. Ayrıca yayın ölçütleri ülkelerin Gayri Safi Yurtiçi Hasıla (GSYİH), kişi başına Gayri Safi Yurtiçi Hasıla (GSYİH) ve İnsani Gelişme Endeksi (İGE) açısından değerlendirildi.

Bulgular: En üretken ülkeler, bilimsel dergiler ve yazarlar sırasıyla ABD, Obezite Cerrahisi ve Schauer PR'dir. Yayın sayısı ile GSYİH arasında pozitif bir korelasyon ($r=0,370$, $p<0,05$), ayrıca GDPpp ile İGE arasında zayıf bir pozitif korelasyon vardı (sırasıyla $r=0,359$, $p>0,05$; $r=0,603$, $p>0,05$).

Sonuçlar: Bu çalışma, son yirmi yılda LSG ile ilgili çığ gibi büyüyen yayın verimliliğini kanıtlamaktadır. Sonuçlarımız, araştırmacıların morbid obezite ve LSG prosedürüne artan bir ilgi duyduğunu göstermektedir. Bu ilerleme, daha sonraki çalışmalarda araştırma sürecini kolaylaştıran bibliyometrik analizin değerini vurgulamaktadır.

Anahtar Kelimeler: Bariatrik Cerrahi ,Bibliometrik, Laparoscopic Sleeve Gastrektomi, Obezite, Bilimsel çalışmalar

Obesity remains a major public health concern due to its association with severe comorbidities and high mortality rates. Surgery has been widely accepted as the most effective approach for reducing obesity and its related illnesses (1). As bariatric surgical procedures have risen in popularity, an increasing number of patients are seeking surgical treatment (2). Among the various surgical techniques available, laparoscopic sleeve gastrectomy (LSG) has emerged as a viable and effective method for treating morbid obesity (3).

However, the 1991 National Institutes of Health (NIH) consensus statement on body mass index and bariatric surgery exclude some recent advancements, including LSG (4). It was only in 2009 that the American Society for Metabolic and Bariatric Surgery (ASMBS) recognized LSG as a suitable alternative for the surgical therapy of morbid obesity. This declaration led to insurance coverage for LSG and the establishment of the International Classification of Diseases, 9th Revision, Clinical Modification code for the procedure in 2011(5, 6). As a result, the reputation of LSG among surgeons has grown, and there has been an increase in demand for LSG information (4).

The term "Bibliometrics" refers the holistic assessment of scientific publications (7). This assessment involves examining citations among scientists, publications, organizations, and nations (8). The internet has made it easier to access scientific publications and databases online, resulting in a significant increase in the volume of publications available in online database (9). The importance of bibliometric research has grown steadily due to its ability to conduct an in-depth analysis of scientific research, allowing for a better understanding of the leading publications, authors, popular journals, and international collaborations (8).

Despite the growing demand for information on the LSG procedure among bariatric surgeons, there is a lack of complete bibliometric research analyzing publications on LSG. Furthermore, no studies have been conducted to measure the productivity of scientific articles on obesity treatment methods using markers and scales that reflect the socioeconomic well-being of countries producing scientific publications on LSG.

This study aims to examine the top-cited articles on LSG published in the Web of Science Core Collection database between 1998 and 2020. It also aims to assess citation collaboration among articles to identify collaborations between countries and journals and report the latest developments and trending topics in this field.

Materials and Methods

In this study, we used the search engine of Thomson Reuters®, Web of Science Core Collection (http://apps.webofknowledge.com) as our database. This database is considered the leading source of citation and other academic impact information globally (10). On December 1, 2020, we searched using the keyword "laparoscopic sleeve gastrectomy" in the "Topic" section. We included publications with the document type "Article " in English that were published between 1998-2020 and were indexed in the Web of Science Core Collection. Other type of publications were not included in this study. We evaluated the collected data using the analysis function of the Web of Science database. We examined publication rates by year of publication, country, journal category, organization, and author. We also evaluated publication metrics such as publication numbers, citations, and h-index data. Furthermore, we evaluated publication metrics based on the countries' Gross Domestic Product (GDP), Gross Domestic Product per capita (GDPpp), and Human Development Index (HDI) .

The data for GDP and GDPpp were obtained from The World Bank's 2018 statistics (https://data.worldbank.org/indicator). Data for HDI were collected from the United Nations "Human Development Indices and Indicators 2018 Statistical Update."

For statistical analysis we used the Number Cruncher Statistical System 2007® (Kaysville, Utah) . We used descriptive statistical methods such as mean, standard deviation, median, first and third quartiles, frequency, percentage, minimum, and maximum to analyze the data. Furthermore, we used Spearman correlation analysis to investigate the relationships between quantitative variables. In this analysis, we classified a correlation coefficient between 0.26 and 0.49 as a low correlation, 0.50 and 0.69 as moderate correlation, 0.70 and 0.89 as high correlation, and 0.90 and 1.00 as very high correlation. A p-value of < 0.05 was considered statistically significant .

The difference between the number of articles and citations given in the title and the numbers in the tables is due to the fact that an article might be classified in more than one subclass in the Web of Science subclassification. An article on obesity surgery , for example, is indexed under the headings of Anatomy, Surgery, and Endocrinology/Metabolism.

Results

Publication Development: From 1998 to present, a total of 4681 publications on LSG have been published, of which 4396 (93.91%) were articles, 205 (4.37%) were proceedings papers, 79 (1.68%) were early access articles, and 1 (0.02%) was a book chapter. This study focused on the 4396 articles only.

Language: Of the 4396 articles, 4269 (97.11%) were in English, 47 (1.06%) were in German, 41 (0.93%) were in Spanish, 27 (0.61%) were in French, 3 (0.06%) were in Korean and Polish, 2 (0.04%) were in Hungarian, and 1 (0.02%) was in Italian or Slovenian. For the purposes of this study, only English-language articles were included.

Citation Development: The H-index of the 4269 English-language articles was 107. The number of publications and citations has been increasing steadily since 1998, as shown in Figure 1. The top five countries with the most publications in 5-year intervals were: USA, Austria, Australia, Canada, Switzerland (1998-2004); USA, France, Germany, Greece, Spain (2004-2009); USA, Italy, France, Spain, Germany (2009-2014); and USA, France, Italy, Turkey, China (2014-2019).

Table 1. Publication and citation metrics according to top ten countries

Country	Publication n (%)	Citation n (%), Mean±SD (min-max)	h-index
USA	1440 (33.73)	7159 (35.19) 21.72±66.01 (0-1201)	150
France	334 (7.82)	1143 (5.61) 14.26±24.15 (0-212)	35
Italy	280 (6.55)	1232 (6.05) 20.47±52.02 (0-695)	38
Spain	238 (5.57)	956 (4.7) 19.57±34.74 (0-313)	35
The UK	209 (4.89)	1485 (7.3) 16.04±32.89 (0-289)	31
PRC	202 (4.73)	1250 (6.14) 9.82±24.62 (0-270)	23
Germany	185 (4.33)	1154 (5.67) 19.24±31.32 (0-260)	32
Turkey	176 (4.12)	442 (2.17) 4.2±17.3 (0-203)	10
Canada	156 (3.65)	908 (4.46) 16.9±43.3 (0-407)	50
Israel	146 (3.42)	304 (1.49) 14.5±25.7 (0-187)	23

USA: United States of America, UK: United Kingdom, PRC: People's Republic of China
SD: Standard deviation

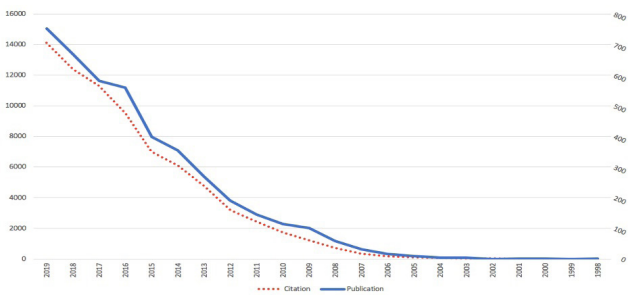

Figure 1. *Publication and citation metrics according to years*

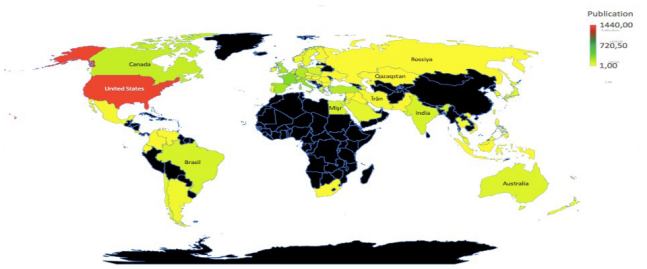

Figure 2. *Publication density of world countries on laparoscopic sleeve gastrectomy (Black countries indicates no publication)*

The articles on LSG have been cited a total of 20,339 times, including self-citations, since 1998 (Table 1). Figure 2 shows that publications focusing on LSG are limited in Africa, South Asia, and Middle Asia. The Web of Science categorization indicates that surgery and endocrinology-metabolism journals are the most specialized in LSG. (77.4% and 9.44%, respectively), and they are also the most cited journals on LSG (74% and 22.7%, respectively) (Table 2).

Most Active Journals: The top ten journals that focus on LSG are all surgery journals. Obesity Surgery is the most productive/active journal in all evaluation categories, as shown in Table 3.

Most Active Authors: Nine of the ten most productive authors are surgeons, as shown in Table 4.

Table 2. Publication and citation metrics of top ten category according to Web of Science

Journal Category	Publication n (%)	Citation n (%), Mean±SD (min-max)
Surgery	3303 (77.4)	15085 (74), 17.4±42.68 (0-793)
Endocrinology Metabolism	403 (9.44)	4633 (22.7), 16.83±39.91 (0-496)
Gastroenterology Hepatology	274 (6.41)	2708 (13.2), 13.09±24.07 (0-172)
Nutrition Dietetics	217 (5.08)	2667 (13), 15.53±40.17 (0-496)
Medicine General Internal	203 (4.75)	3684 (18), 23.07±112.14 (0-1201)
Nursing	94 (2.2)	136 (0.6), 1.51±3 (0-15)
Medicine Research Experimental	73 (1.7)	393 (1.9), 5.53±12.79 (0-98)
Pediatrics	49 (1.1)	439 (2.1), 12.67±22.81 (0-129)
Pharmacology Pharmacy	49 (1.1)	381 (1.8), 8.39±12.15 (0-63)
Multidisciplinary Sciences	48 (1.1)	740 (3.6), 16.48±63.51 (0-442)

SD: Standard deviation

Most Active Organizations: The most active organizations on the LSG topic are the Cleveland Clinic Foundation, Assistance Publique Hospitaux Paris APHP, and Harvard University. Seven of the fifteen most productive organizations are health providers from the USA. Israel, England, and France are also productive countries in this field (Table 5).

Analysis of Correlation: The results presented in Table 6 demonstrate a direct relationship between the number of publications and GDP. ($r=0.370$, $p<0.05$). The study also found a weak positive correlation between publication numbers and GDPpp and HDI ($r=0.359$, $p>0.05$; $r=0.603$, $p>0.05$; respectively). Moreover, the research revealed a weak negative correlation between publication numbers and obesity incidence of the countries ($r= -0.151$, $p>0.005$).

Repeated publication and citation numbers in database research due to duplicated subclass classifications are 444 and 10527 , respectively.

Table 3. Publication and citation metrics of top ten journals

Journal	Publication n (%)	Citation n (%), Mean±SD (min-max)	h-index
Obesity Surgery	1372 (32.1)	9771 (47.9), 20±50.37 (0-793)	72
Surgery for Obesity and Related Diseases	663 (15.5)	5538 (27.1), 15.3±29.9 (0-471)	47
Surgical Endoscopy and Other Interventional Techniques	248 (5.8)	3851 (18.8), 23.6±41.9 (0-416)	38
Bariatric Surgical Practice and Patient Care	83 (1.9)	116 (0.56), 1.4±2.7 (0-15)	6
Journal of Laparoendoscopic Advanced Surgical Techniques	69 (1.6)	438 (2.14), 6.7±10 (0-44)	13
Annals of Surgery	50 (1.1)	2801 (13.7), 79.7±118.5 (0-539)	28
Journal of Gastrointestinal Surgery	45 (1)	730 (3.58), 17.4±28.1 (0-118)	15
Surgical Laparoscopy Endoscopy Percutaneous Techniques	44 (1)	425 (2.08), 10.8±15.9 (0-72)	11
American Surgeon	40 (0.9)	221 (1.08), 5.8±7.9 (0-28)	11
Videosurgery and Other Miniinvasive Techniques	40 (0.9)	238 (1.16), 7.9±11.5 (0-61)	10

SD: Standard deviation

Table 4. Publication and citation metrics of top ten authors

Author name	Publication n (%)	Citation n (%) mean±SD (min-max)	Nation	Institution	Expertise	h-index
Schauer PR	75 (1.75)	3250 (15.97) 59.37±179.8 (0-1201)	USA	Cleveland Clinical Foundation	Surgery	25
Brethauer SA	64 (1.49)	2952 (14.51) 59.53±191.8 (0-1201)	USA	Cleveland Clinical Foundation	Surgery	22
Lee WJ	57 (1.33)	1107 (5.44) 28.84±42.36 (0-263)	Taiwan	Min-Sheng General Hospital	Surgery	22
Aminian A	55 (1.28)	1765 (8.67) 39.95±135.79 (0-845)	USA†	Cleveland Clinical Foundation	Surgery	16
Gagner M	46 (1.07)	1832 (9) 62.59±95.35 (0-501)	Canada	University of Montreal	Surgery	25
Seeley RJ	43 (1)	1059 (5.2) 40.93±75.17 (0-442)	USA†	University of Cincinnati	Surgery	19
Szomstein S	41 (0.96)	1018 (5) 30.59±41.28 (0-168)	USA†	Cleveland Clinical Foundation	Surgery	18
Regimbeau JM	39 (0.91)	493 (2.42) 17±27.28 (0-154)	France	University of Picardie Jules Verne	Surgery	15
Rosenthal RJ	39 (0.91)	1426 (7.01) 47.05±85.6 (0-471)	USA	Cleveland Clinical Foundation	Surgery	18
Le Roux CW	37 (0.86)	662 (3.25) 20.19±35 (0-184)	Ireland	University College of Dublin	Pathology	14

USA: United States of America, SD: Standard deviation

Table 5. Publication and citation metrics of most productive organizations

Organization	Publication n (%)	Nation
CLEVELAND CLINIC FOUNDATION	172 (3.71%)	USA
ASSISTANCE PUBLIQUE HOPITAUX PARIS APHP	121 (2.61%)	FRANCE
HARVARD UNIVERSITY	108 (2.33%)	USA
INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE	90 (1.94%)	FRANCE
UNIVERSITY OF CALIFORNIA SYSTEM	90 (1.94%)	USA
CENTRO DE INVESTIGACION BIOMEDICA EN RED	82 (1.77%)	SPAIN
SACKLER FACULTY OF MEDICINE	73 (1.57%)	ISRAEL
TEL AVIV UNIVERSITY	73 (1.57%)	ISRAEL
SAPIENZA UNIVERSITY ROME	72 (1.55%)	ITALY
IMPERIAL COLLEGE LONDON	69 (1.49%)	ENGLAND
UNIVERSITY OF MICHIGAN	68 (1.46%)	USA
UNIVERSITY OF MICHIGAN SYSTEM	68 (1.46%)	USA
UNIVERSITY OF LONDON	64 (1.38%)	ENGLAND
UNIVERSITY OF CINCINNATI	61 (1.31%)	USA
CORNELL UNIVERSITY	60 (1.29%)	USA

USA: United States of America

Table 6. Publication numbers and gross domestic product/ human development index relation

Nation	Article n (%)	GDP* ($)	GDPpp** ($)	Population (n)	HDI***	Incidence of obesity (%)	Average BMI (kg/m²)
USA	1440 (33.77)	20544	62694	329064917	0.924	36.2	28.8
FRANCE	334 (7.8)	2778	41463	65129728	0.901	21.6	25.3
ITALY	280 (6.5)	2084	34483	60550075	0.880	19.9	26
SPAIN	238 (5.5)	1419	30370	46736776	0.891	23.8	26.7
UK	209 (4.9)	2855	42943	67530172	0.922	27.8	27.3
PRC	202 (4.7)	13608	9770	1433783686	0.752	6.2	23.9
GERMANY	185 (4.3)	3948	47603	83517045	0.936	22.3	26.3
TURKEY	176 (4.1)	771	9370	82319724	0.791	32.1	27.8
CANADA	156 (3.6)	1713	46232	37411047	0.926	29.4	27.2
ISRAEL	146 (3.4)	370	41715	8883800	0.903	26.1	26.3

**GDP: Gross domestic product, **GDPpp: Gross domestic product per capita,*
**** HDI: Human development index*
USA: United States of America, UK: United Kingdom, PRC: People's Republic of China
BMI: Body mass index

Discussion

Since the implementation of insurance coverage in the late 2000s, the number of scientific articles related to LSG has rapidly increased, particularly in the United States. France, Italy, Spain, and the United Kingdom have also shown high productivity in LSG research, following the United States (11). This is not surprising given the large amount of funding and the number of research centers in the United States. However, it is noteworthy that developing countries such as China and Turkey have also shown significant progress in this area. In 2019, Chinese scientists launched an "Obesity Prevention Program" to combat China's upcoming obesity epidemic and related chronic diseases (12). Similarly, in 2010, the Turkish Ministry of Health introduced the "Fighting Obesity and Control Program" to combat the obesity epidemic (13). Although the growing awareness of developing countries of this issue has drawn scientific attention, but it is still evident that scientific publication activity on LSG is limited in Africa, South Asia, and the Middle East, as previous studies have indicated (8, 14). This is most likely due to the low socioeconomic status in these regions.

We believe that the increasing number of scientific articles focusing on LSG is also directly related to the introduction of long and mid-term national health programs that recognize obesity as a severe life-threatening condition. Many European countries, including Turkey and the People's Republic of China, have developed programs to raise awareness and fight obesity (15, 16). However, society found it challenging to accept these programs. For example, in the "Fighting Fat, Fighting Fit" campaign conducted in Britain, only 30% of participants acknowledged healthy lifestyle messages, and less than 1% adopted the recommended behavioral changes by medical professionals (15). Despite these unfavorable conditions, we believe that both the number of obesity-related campaigns against obesity and scientific publications will gradually increase. The literature suggests that raising general awareness and knowledge about potential health risks is the first step in preventing the spread of diseases such as obesity (13, 17).

Based on a journal analysis, Obesity Surgery has been identified as the most productive journal in LSG since 1991, and it serves as the official publication of the "International Federation for the Surgery of Obesity and Metabolic Disorders." The journal has consistently performed well in bibliometric studies, boasting a large number of publications and citations (8, 18). Obesity Surgery provides a wide variety of contents,including original research, clinical reports, guidelines, historical notes, commentaries, letters to the editor, medicolegal issues, meeting abstracts, technical innovations, new concepts, reviews, scholarly presentations, and opinions on topics related to the treatment options, comorbidities, and overall aspects of obesity.

P.R. Schauer is the most prolific author in the field of LSG, with his study "Bariatric Surgery versus Intensive Medical Therapy in Obese Patients with Diabetes" being the most cited article per year since its publication in 2012 (Total citation: 1167, Citation per year: 145.8) (19). In this study, P.R. Schauer et al. compared intensive medical therapy with surgical treatment in improving glycemic control in 150 obese patients with type 2 diabetes. Surgical treatments for morbid obesity were disregarded until the later half of the 20th century, despite the fact that the problem has long been considered within the realm of endocrinology. While changes to bariatric procedures were reported from the 1950s to the 1990s (20-22), Alan Wittgrove performed the first laparoscopic gastric bypass surgery in 1994 (23). Due to its low perioperative morbidity, maintained digestive continuity, and easy conversion to other bariatric surgeries, LSG gained acceptance as a surgical technique for morbid obesity treatment in the first decade of the 21st century, (24).

The Gross Domestic Product (GDP) is a widely used indicator for assesing a nation's economic status. It is calculated by taking into account various factors such as consumption, investment, and production, and represents the total monetary value of goods and services produced over a certain period. Several studies on the relationship between GDP and obesity, as well as surgical interventions have been conducted. Cazzo et al. (25) found a direct correlation between GDP and the number of bariatric procedures performed. Norte et al. observed that adverse economic conditions could lead to poor diet quality and an increased risk of obesity, which was also supported by the findings of Oddo et al. (26, 27). On the other hand, the Human Development Index (HDI) was introduced to emphasize that people's well-being and capabilities ,rather than only financial growth, should be the primary criteria for evaluating a country's progress. Gupta et al. (28) revealed a significant correlation between HDI and obesity rates, whereas Yach et al. (29) showed that developing countries are experiencing rapid "obesogenic" changes. However, no previous studies have examined the relationship between socioeconomic parameters and publishing productivity. The study found a positive correlation

exists between the rate of articles published on LSG and GDP, GDP per capita, and HDI. In a similar study, Gehanno et al (30) found a significant relationship between publication productivity and HDI in childhood obesity. These results suggest that higher socioeconomic levels may lead to increased government funding for scientific research and programs.

This is the first study to focus specifically on LSG articles published in SCIE journals in English. This study is limited to using the Web of Science database, which is widely recognized as a reliable source of scientific papers. It should be noted that our analysis included only articles written in English, which may be considered a limitation. However, because of the difficulties in accurately analyzing articles in lesser-known languages, these were excluded from the study.

Conclusion

Morbid obesity and its associated comorbid diseases have inflicted and will continue to afflict a large number of people, for which surgical interventions are the only effective treatment. Therefore, it is imperative to promote collaborations, multidisciplinary investigations, and the development of novel scientific perspectives and treatment strategies to address obesity on a global scale. Scientific publications are a crucial weapon in the fight against the obesity epidemic, and our study highlights the increase in publication productivity regarding for LSG, a common treatment method for morbid obesity, over the past 2 decades. This progress emphasizes the significance of bibliometric analysis, which can facilitate research in future studies. The study should stimulate developing and underdeveloped nations, in particular, to publish scientific studies on obesity, its comorbidities, and treatment strategies.

Declarations

Ethical Approval Statement

All procedures performed in studies were following the Helsinki declaration and its later amendments or comparable ethical standards.

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.

Competing Interests

No conflict of interest was declared by the authors.

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Availability of Data and Material

Available.

References

1. Berrington De Gonzalez A, Hartge P, Cerhan JR, et al. Body-mass index and mortality among 1.46 million white adults. N Engl J Med. 2010;363:2211-9. DOI:10.1056/NEJMoa1000367
2. Mechanick JI, Youdim A, Jones DB, et al. Clinical practice guidelines for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient--2013 update: cosponsored by American Association of Clinical Endocrinologists, the Obesity Society, and American Society for Metabolic & Bariatric Surgery. Endocr Pract. 2013;19:337-72. DOI:10.4158/ep12437.Gl
3. Sowier A, Pyda P, Borucka AM, et al. Initial experience with endoscopic sleeve gastroplasty in Poland. Pol Przegl Chir. 2018;90:16-22. DOI:10.5604/01.3001.0011.7488
4. Ekici U and Ferhatoglu MF. Perioperative and Postoperative Effects of Preoperative Low-Calorie Restrictive Diets on Patients Undergoing Laparoscopic Sleeve Gastrectomy. J Gastrointest Surg. 2020;24:313-9. DOI:10.1007/s11605-019-04157-5
5. Anonymous. Updated position statement on sleeve gastrectomy as a bariatric procedure. Surg Obes Relat Dis. 2012;8:e21-6. DOI:10.1016/j.soard.2012.02.001
6. Ferhatoglu MF, Kartal A, Filiz A, et al. Comparison of New Era's Education Platforms, YouTube® and WebSurg®, in Sleeve Gastrectomy. Obes Surg. 2019;29:3472-7. DOI:10.1007/s11695-019-04008-x
7. Demir E. The Evolution of Spirituality, Religion and Health Publications: Yesterday, Today and Tomorrow. J Relig Health. 2019;58:1-13. DOI:10.1007/s10943-018-00739-w
8. Ozsoy Z and Demir E. Which Bariatric Procedure Is the Most Popular in the World? A Bibliometric Comparison. Obes Surg. 2018;28:2339-52. DOI:10.1007/s11695-018-3163-6
9. Aronsky D, Madani S, Carnevale RJ, et al. The prevalence and inaccessibility of Internet references in the biomedical literature at the time of publication. J Am Med Inform Assoc. 2007;14:232-4. DOI:10.1197/jamia.M2243
10. Li L, Ma X, Pandey S, et al. The Most-Cited Works in Severe Traumatic Brain Injury: A Bibliometric Analysis of the 100 Most-Cited Articles. World Neurosurg. 2018;113:e82-e7. DOI:10.1016/j.wneu.2018.01.164
11. Zhao N, Tao K, Wang G, et al. Global obesity research trends during 1999 to 2017: A bibliometric analysis. Medicine. 2019;98.
12. Wang Y, Xue H, Sun M, et al. Prevention and control of obesity in China. The Lancet Global Health. 2019;7:e1166-e7.
13. Arikan I, Karakaya K, Erata M, et al. Fighting obesity campaign in Turkey: evaluation of media campaign efficacy. Central European Journal of Public Health. 2014;22.
14. Perez-Iratxeta C and Andrade MA. Worldwide scientific publishing activity. Science. 2002;297:519-.
15. Wardle J, Rapoport L, Miles A, et al. Mass education for obesity prevention: the penetration of the BBC'sFighting Fat, Fighting Fit'campaign. Health Education Research. 2001;16:343-55.
16. Schwarzer R. Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. Applied psychology. 2008;57:1-29.

17. Nichols MS, Reynolds RC, Waters E, et al. Community-based efforts to prevent obesity: Australia-wide survey of projects. Health Promotion Journal of Australia. 2013;24:111-7.
18. Dabi Y, Darrigues L, Katsahian S, et al. Publication trends in bariatric surgery: a bibliometric study. Obesity surgery. 2016;26:2691-9.
19. Schauer PR, Kashyap SR, Wolski K, et al. Bariatric surgery versus intensive medical therapy in obese patients with diabetes. New England Journal of Medicine. 2012;366:1567-76.
20. Kremen AJ, Linner JH and Nelson CH. An experimental evaluation of the nutritional importance of proximal and distal small intestine. Annals of surgery. 1954;140:439.
21. Mason EE and Ito C. Gastric bypass in obesity. Surgical Clinics of North America. 1967;47:1345-51.
22. Capella RF, Capella JF, Mandac H, et al. Vertical Banded Gastroplasty--Gastric Bypass: preliminary report. Obesity Surgery. 1991;1:389-95.
23. Wittgrove AC, Clark GW and Tremblay LJ. Laparoscopic gastric bypass, Roux-en-Y: preliminary report of five cases. Obesity surgery. 1994;4:353-7.
24. Faria GR. A brief history of bariatric surgery. Porto biomedical journal. 2017;2:90-2.
25. Cazzo E, Ramos AC and Chaim EA. Bariatric surgery offer in Brazil: a macroeconomic analysis of the health system's inequalities. Obesity Surgery. 2019;29:1874-80.
26. Norte A, Sospedra I and Ortíz-Moncada R. Influence of economic crisis on dietary quality and obesity rates. International journal of food sciences and nutrition. 2019;70:232-9.
27. Oddo VM, Nicholas LH, Bleich SN, et al. The impact of changing economic conditions on overweight risk among children in California from 2008 to 2012. J Epidemiol Community Health. 2016;70:874-80.
28. Gupta R, Gaur K, Mohan I, et al. Urbanization, Human Development and Literacy and Syndemics of Obesity, Hypertension and Hyperglycemia in Rajasthan: National Family Health Survey-4. The Journal of the Association of Physicians of India. 2018;66:20-6.
29. Yach D. Stuckler D, Brownell KD. Epidemiologic and economic consequences of the global epidemics of obesity and diabetes. Nat Med. 2006;12:62-6.
30. Gehanno J-F, Gehanno B, Schuers M, et al. Analysis of publication trends in childhood obesity research in PubMed since 1945. Childhood Obesity. 2019;15:227-36.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Infectious Diseases / Bulaşıcı Hastalıklar

Comparison of Adverse Effects of COVID-19 Vaccines Among Elderly: Pfizer/BioNTech Versus CoronaVac

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ABSTRACT

Purpose: The SARS-CoV-2 infection has triggered the COVID-19 pandemic with enormous public health and economic consequences. The safety and efficacy of currently available COVID-19 vaccines have been demonstrated in few studies; however, further information on specific high-risk groups like the elderly with comorbidities is needed. In this cross-sectional study, we aimed to compare the adverse side effects of two different COVID-19 vaccines (RNA-based Pfizer/BioNTech and inactivated CoronaVac) among the elderly with comorbidities.

Methods: We selected a total of 800 participants 65 years or older from Turkish Republic of Northern Cyprus who received either one of the vaccines. We collected data on the possible side effects that have been previously attributed to coronavirus vaccination via quantitative telephone interviews.

Results: We found that both CoronaVac and Pfizer/BioNTech were safe in adults over 65 years old, even with comorbidities. The most common side effects were pain on the injection site and fatigue. Adverse effects, particularly allergic reactions, were higher in Pfizer/BioNTech vaccinated group compared with the CoronaVac group.

Conclusion: In conclusion, both vaccines were well tolerated and safe among the elderly even with comorbidities, As this specific group was largely excluded from the previous trials, we believe that this study may have a contributing impact on vaccine acceptance and health policy decision-making.

Keywords: adverse effects, COVID-19, SARS-CoV-2, elderly, vaccination

İleri Yaş Grubunda Uygulanan Pfizer/Biontech Ve Coronavac Aşılarının Yan Etkilerinin Karşılaştırılması

Amaç: SARS-CoV-2'nin neden olduğu COVID-19 pandemisi tüm dünyada çok büyük bir halk sağlığı sorunu olmaya devam etmektedir. Mevcut COVID-19 aşılarının spesifik gruplardaki güvenliği ve etkinliği ile ilgili çok az sayıda çalışma mevcuttur. Özellikle ileri yaşta ve ek hastalığı olanlarda bu tür çalışmalara ihtiyaç vardır. Biz bu kesitsel çalışmada RNA bazlı Pfizer/BioNTech ile CoronaVac inaktif virus aşılarının ek hastalığı olan yaşlı popülasyondaki yan etkilerini karşılaştırmayı amaçladık.

Metodlar: Kuzey Kıbrıs Türk Cumhuriyeti'nde aşılanmış olan 65 yaş üstü toplam 800 gönüllü kişi çalışmamıza dahil edildi. Telefon yoluyla katılımcılara ulaşıldı ve COVID-19 aşılarının yol açabileceği olası yan etkiler açısından sorgulandı.

Bulgular: Çalışmamızın sonuçlarına göre hem CoronaVac hem de Pfizer/BioNTech 65 yaş üstü kişilerde ek hastalık varlığında bile güvenli olduğu görüldü. En sık görülen yan etkiler aşı uygulanan bölgede ağrı ve halsizlik olarak raporlandı. Yan etkilerden biri olan allerjik reaksiyonlar Pfizer/BioNTech grubunda CoronaVac grubuna göre daha yüksek oranda saptandı.

Sonuç: Sonuç olarak yaşlı ve kronik hastalığı olan kişilerde her iki aşının da tolere edildiği ve güvenli olduğu görüldü. Spesifik bir grup üzerinde yapılmış bu çalışmanın sonuçları COVID-19 aşılama programlarına ve geliştirilecek sağlık politikasına katkıda bulunabileceğini düşünüyoruz.

Anahtar Kelimeler: ileri yaş, yan etki, SARS-CoV-2, COVID-19, aşılama

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection triggered a coronavirus disease (COVID-19) pandemic with an unprecedented burden to healthcare and the global economy (1). Although containment strategies of isolation, quarantine, and physical distancing have been effective in limiting the spread of infection in the short term in many countries, the absence of population immunity and the absence of an effective treatment has left the global population susceptible to continuing waves of the infection. Furthermore, the initial expectations of wide population herd immunity or probable less virulent virus variants have not been materialized. Therefore, global mass vaccination appears to be the key to fighting against COVID -19 pandemic.

Researchers worldwide have taken quick action in developing vaccines for COVID-19 with more than 198 vaccine candidates in preclinical and clinical trials (2). Based on the current literature, there is reasonable evidence that COVID-19 vaccines may be the key to combating the pandemic; however, there have been concerns about vaccine side effects. Public perception of vaccine effectiveness and the possible side effects are leading challenges in accepting the vaccination (3). Data about the side effects of vaccination in specific groups such as the elderly and those with comorbidities remains lacking (4-6). In addition, the safety of different vaccines, such as mRNA-based and inactivated vaccines, has not been compared previously.

Mass vaccination is the safest way to reach population-based immunity (7). As the vaccines are administered to millions of people in the upcoming months, more data will become available to analyze the vaccine side effects more accurately. As of January 2021, both mRNA-based Pfizer/BioNTech and inactivated virus CoronaVac vaccines are available for healthcare workers and the elderly in the Turkish Republic of Northern Cyprus (TRNC). This study aimed to compare the adverse side effects of these vaccines among the elderly with comorbidities.

MATERIAL AND METHODS

In this cross-sectional study, 800 elderly individuals, 65-year-old or older, who received Pfizer/BioNTech or CoronaVac vaccines were invited to participate. Individuals were identified from the Ministry of Health of the Turkish Republic of Northern Cyprus vaccine registry. In addition to demographic information and comorbidities, the questionnaire was designed to inquire about the self-identified common side effects, such as fever, chills, pain at the injection site, swelling and redness, lymphadenopathy, fatigue, headaches, muscle and joint pain, diarrhea, nausea, and vomiting, that have been previously attributed to coronavirus vaccinations.

The Study Sample and Data Collection

Using WinPepi statistical calculator (ver. 11.65; http://www.brixtonhealth.com), we estimated the minimum sample size with the expected prevalence of 10% for side effects and the confidence interval of 95%. With the 10% loss to follow-up, the minimum estimated sample size was 396 for each vaccine group. Accordingly, we decided to include a total of 800 consenting participants (400 mRNA +400 inactive vaccine groups) for the study. We called eligible participants by phone and collected their informed consent before requesting their response to the questionnaire.

Statistical Analyses

Statistical analyses were performed on IBM SPSS, ver. 20.0 (Chicago, IL, USA). The categorical variables were expressed as counts (percentages), and the continuous variables were expressed as median, mean ± 2 standard deviation (SD). Comparisons of categorical variables between the groups were performed using Yates's corrected chi-square test and the continuous variables were compared using student-t test. A two-sided p-value of 0.05 was considered as the cut-off value for statistical significance.

RESULTS

Of the 800 participants, 423 (52.9%) were female, and 377 (47.1%) were male. The mean age of the CoronaVac group was significantly higher than the Pfizer/BioNTech group (71.7 ± 6.1 years vs 70.85 ± 5.5 years; p=0.002). There were 398 patients (49.8%) with at least one comorbidity in the general study population. Of these, 208 (52.3%) were in the CoronaVac group, and 190 (47.7%) were in the Pfizer/BioNTech group. There was no statistically significant difference between the groups in terms of presence of a comorbidity. Chronic heart diseases (37.0%), diabetes mellitus (16.0%), and chronic lung diseases (9.0%) were the most common comorbidities. The demographic characteristics of participants were presented in Table 1.

The prevalence of chronic heart disease in women was higher than in men (40.4% vs. 33.2%, p=0.03); frequencies of other comorbidities were similar between male and female participants.

Table 1: Demographic characteristics of the individuals according to vaccine groups			
	CoronaVac n=400	Pfizer/ BioNTech n=400	P
Age, years (mean ± standart deviation)	71.7 ± 6.1	70.85 ± 5.5	0.002
Sex (%)			
Woman (n=423)	57.5	48.2	0.009
Male (n=377)	42.5	51.8	
Presence of at least one comorbidity (%)			
No	48	52.5	0.203
Yes	52	47.5	
Comorbidities (%)			
Chronic heart diseases (n=296)	41.2	32.8	0.013
Chronic lung diseases (n= 72)	9.0	9.0	1
Chronic liver diseases (n=6)	0.5	1.0	0.4
Chronic kidney diseases (n=24)	2.8	3.3	0.7
Diabetes mellitus (n=128)	17.5	14.5	0.2
Rheumatic diseases (n=10)	0.8	1.8	0.2
Cancer (n=22)	2.2	3.2	0.4

Side Effects

The most common side effect for both vaccine groups was pain on the injection site. All side effects except headache were lower after the second dose of the vaccine (Figure 1). The incidence of side effects of swelling and redness (5.1% vs. 0.63%; p<0.001), chills (1.13% vs. 0.25%; p=0.034), allergic reaction (3.38% vs. 0.75; p<0.001), and fatigue (12.0% vs. 6.63; p<0.001) was higher after the first dose compared to the second dose. Only one recipient of the Pfizer/BioNTech vaccine complained of post-vaccination axillary lymphadenopathy. There was no statistical difference in side effects after the first and second doses of vaccination between the sex groups.

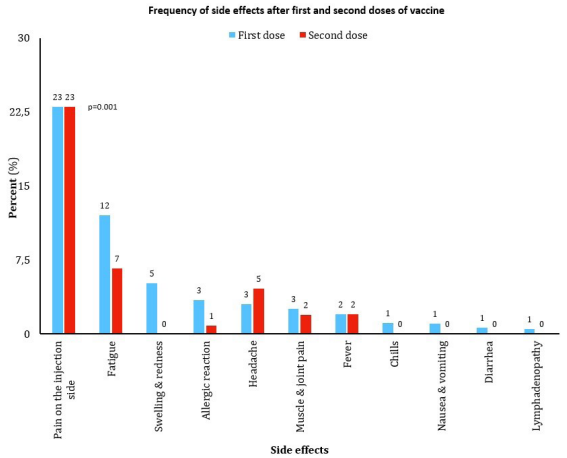

Figure 1: *Frequency of side effects after first and second doses of vaccine in the general population*

After the first dose, pain on the injection site (23.3% vs. 19.2%, p=0.007), and fever (3.0 % vs. 1%, p=0.043) were significantly higher in those who received Pfizer/BioNTech vaccine (Figure 2). After the second dose, pain on the injection site (27.3% vs. 17.8%, p=0.001) and fatigue (8.5% vs. 4.8%, p=0.03) were significantly higher in the same group (Figure 3).

When we re-examined the study population as ≤ 70 years (n=384, 48%), and >70 years of age (n=416, 52%), where sex and vaccine distributions were similar, we observed other differences. Pain on the injection site (p=0.014), was higher after the first (27.1% vs 19.7%, p=0.014) and the second dose (28.4% vs 17.1%, p=0.000) of vaccination among the ≤70 age group. Fatigue was also higher in the same age group (8.6% vs 4.8%, p=0.03). However, swelling and redness (2.6% vs 7.5%, p=0.002) were significantly higher in the >70 age group (Figure 4).

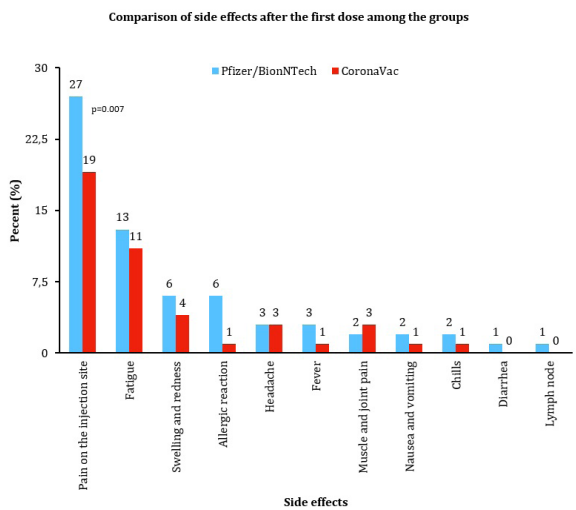

Figure 2: *Comparison of side effects after the first dose among the Pfizer/BioNTech and Coronovac groups*

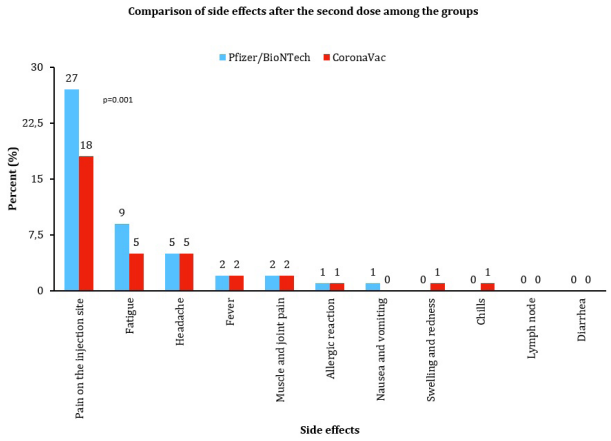

Figure 3: *Comparison of side effects after the second dose among the groups Pfizer/BioNTech and Coronovac groups*

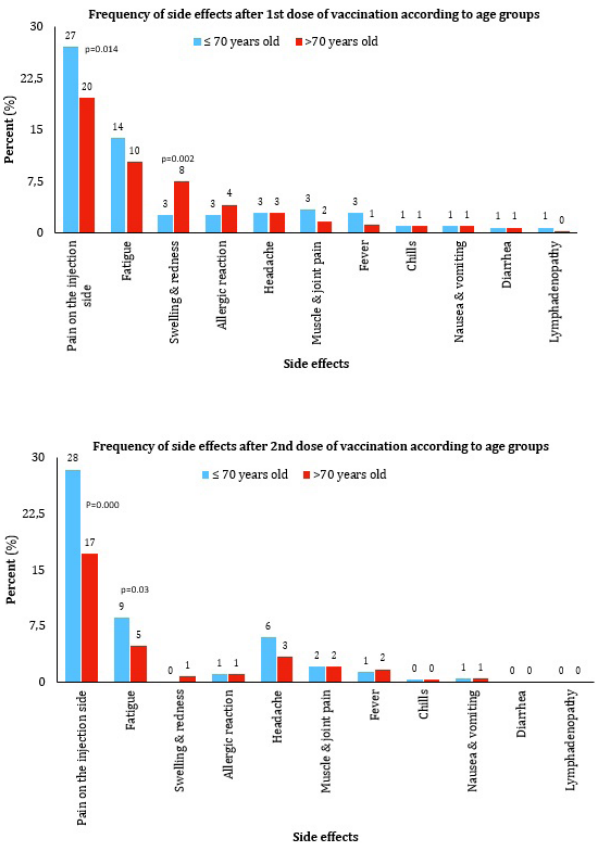

Figure 4: *Comparison of side effects after 1st and 2nd dose of vaccination among the study populations ≤ 70 and >70 years of age*

The pain on the injection site (p=0.002), swelling and redness (p=0.001), fever (p=0.04), and allergic reaction (p=0.000) after first dose of vaccination were higher in patients with any comorbidity. The pain on the injection site (p=0.009) were also high in these patients after second dose of vaccination . Side effects after the 1st and 2nd dose vaccine according to the presence of at least one comorbidity were shown in Figure 5. Some of the post-vaccination side effects demonstrated significant differences by the distribution of comorbidities such as chronic heart and liver diseases, diabetes mellitus, and cancer. Side effects after both the first and the second dose vaccines based on the distribution of comorbidities were presented in Table 2. While sex and age distribution did not pose a risk, the type of vaccine and presence of some comorbidities were found to be related to allergic reactions. Allergic reactions were significantly higher in Pfizer/BioNTech group compared to the CoronaVac group (p=0.000). The frequency of allergic reactions after the first dose in patients with chronic kidney disease was found to be significantly higher than those without chronic kidney disease (29.2% vs. 2.6%; p = 0.000). Although the frequency of allergic reactions after the second vaccine doses was lower than the first vaccine doses, allergic reactions were higher in patients with chronic kidney disease than those without chronic kidney disease (4.2% vs. 0.6%; p = 0.049). However, the frequency of allergic reactions after the second vaccination was higher in patients with malignancy compared to those without it (4.5% vs 0.6%; p = 0.04).

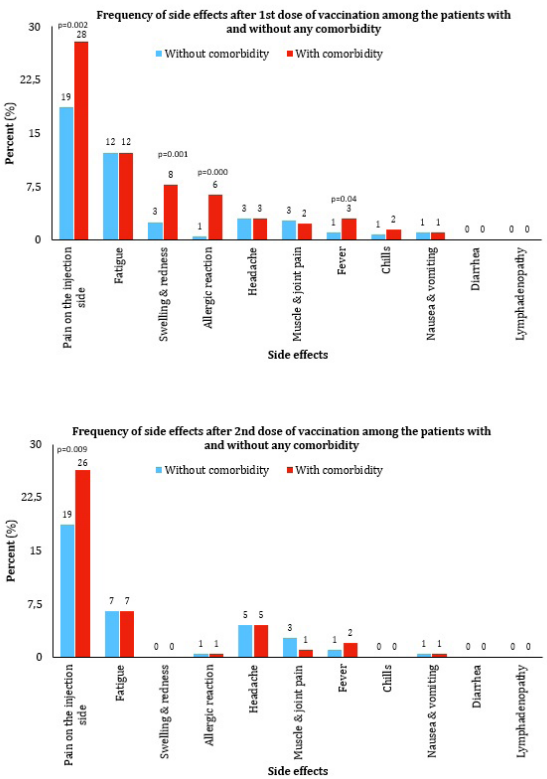

Figure 5: *Comparison of side effects after 1st and 2nd dose of vaccination among the patients with and without any comorbidity*

Table 2: Comparison of vaccine-related side effects in the distribution of comorbidities

Vaccine-related side effects		After the first dose				After the second dose			
		Pain on the injection site (n=186)	p	Fever (n=16)	p	Pain on the injection site (n=180)	p	Fever after (n=12)	p
Chronic Heart Diseases (n=296)	(-) (+)	94 (18.7%) 92 (31.1%)	0.000	5 (1%) 11 (3.7%)	0.008	101 (20.1%) 79 (26.7%)	0.03	5 (1%) 7 (2.4%)	0.1
Chronic Lung Diseases (n=72)	(-) (+)	167 (22.9%) 19 (26.4%)	0.51	15 (2.1%) 1 (1.4%)	0.7	165 (22.7%) 15 (20.8%)	0.7	8 (1.1%) 4 (5.6%)	0.003
Chronic liver disease (n=6)	(-) (+)	186 (23.4%) 0 (0%)	0.2	13 (1.6%) 3 (50%)	0.000	179 (22.6%) 1 (16.7%)	0.7	12 (1.5%) 0 (0%)	0.8
Chronic kidney disease (n=24)	(-) (+)	181 (23.4%) 5 (20.8%)	0.8	16 (2.1%) 0 (0%)	0.5	171 (22.2%) 9 (37.5%)	0.07	12 (1.6%) 0 (%)	0.5
DM (n=128)	(-) (+)	151 (22.5%) 35 (27.3%)	0.2	15 (2.2%) 1 (0.8%)	0.3	140 (20.9%) 40 (31.2%)	0.01	11 (1.6%) 1 (0.8%)	0.5
Rheumatic diseases (n=10)	(-) (+)	184 (23.3%) 2 (20%)	0.8	16 (2%) 0 (0%)	0.7	177 (22.4%) 3 (30%)	0.6	12 (1.5%) 0 (0%)	0.7
Cancer (n=22)	(-) (+)	182 (23.4%) 4 (18.2%)	0.6	6 (2.1%) 0 (0%)	0.5	171 (22%) 9 (40.9%)	0.04	12 (1.5%) 0 (0%)	0.6

DM : Diabetes Mellitus
(-) : absent (+) : Present

DISCUSSION

In this study, we found that two doses of both CoronaVac and Pfizer/BioNTech vaccines had mild and similar adverse effects which were tolerated in adults over 65 years and older, even with certain comorbidities. The most common side effects of both vaccines were pain on the injection site and fatigue. While there was no significant difference between the male and female participants, age distribution, presence of comorbidities, and the type of vaccination was related to some adverse effects. The incidence of adverse side effects, especially allergic reactions, in the Pfizer/BioNTech group was higher than that of the CoronaVac group.

COVID-19 vaccines are among the most remarkable achievements in modern medical history. The vaccine gave real hope for ending the fight against the COVID-19 pandemic. The FDA has authorized the mRNA-based Pfizer/BioNTech vaccines on December 11, 2020 (7); an inactivated virus vaccine CoronaVac was approved for emergency use in China and phase three clinical trials that are ongoing in Brazil, Turkey, and Indonesia (2). Both vaccines were available in TRNC in mid-January. Healthcare professionals and individuals ≥ 65 years old were the first to be vaccinated. We aimed to evaluate and compare the side effects of these vaccines, especially in the presence of age and age-related comorbidities.

Previous clinical data showed that vaccine-induced immune responses and side effects were different by age groups and sex (8-10). It has been reported that both antibody response and also side effects after vaccination are higher in women (9, 10). In this study, the mean age and the presence of comorbidities other than chronic heart disease were similar in both sexes. Unlike the previous literature, there was no statistically significant difference between the male and female participants in terms of side effects after both the first and the second vaccination doses. Since we included only the elderly population, we also wanted to evaluate the effect of age categories on side effects. We observed that pain on the injection site and fatigue were higher in the ≤70 age group. However, swelling and redness were significantly higher in the >70 age group.

Both CoronaVac and Pfizer/BioNTech vaccines were tolerated by elderly patients with comorbidities. No severe, life-threatening side effects were observed. The most common side effects for both vaccines were local reactions such as pain on injection site, and fatigue which were similar to the previous study of another inactivated COVID-19 vaccine from Sinopharm (Beijing China) (11). The incidence of adverse reactions in the Pfizer/BioNTech group was significantly higher compared to the CoronaVac group.

Allergic reactions, which have a broad spectrum from local reactions to anaphylaxis, are among the most serious side effects of the vaccines(12). Clinical signs of allergic reactions linked to antigen, animal proteins, preservatives, stabilizers, egg proteins, gelatin, and other additives tend to be more severe in the elderly. The Pfizer/BioNTech vaccine is an mRNA-based vaccine, which was produced with new technology; the mRNA is surrounded by lipid nanoparticles to allow it to be delivered to cells. These lipid nanoparticles and additive polyethylene glycol are suspected to be responsible for allergic reactions; however, The anaphylactic reaction to the mRNA-based vaccine is extremely rare (12). It is recommended to inform patients about the possible allergic reactions before vaccination with Pfizer/BioNTech and to administer for those with a history of anaphylaxis or serious allergic reactions with necessary clinical precautions (12). There were no reported serious allergic side effects with the inactivated vaccine (13). Although there is no previous study comparing Pfizer/BioNTech and CoronaVac in terms of side effects and allergic reactions, as we observed, the data in the literature suggests that the risk of allergic reactions is likely to be higher with Pfizer/BioNTech (12, 13).

The fear of side effects, particularly among the elderly and patients with comorbidities and prior history of allergic reactions, may lead to unnecessary vaccine hesitancy. As older age people and people with comorbidities were largely excluded from the previous vaccine trials, the efficacy of vaccines and possible side effects in this population has not been fully assessed. For the first time, this study demonstrates a significant association between preexisting comorbidities and a higher incidence of self-reported, non-life-threatening, side effects after two types of vaccinations. From this aspect, people over 65 years old with comorbidities are no different from healthy and younger participants who reported similar incidences of adverse reactions in previous studies (2, 7). We believe that the findings of our study will contribute to the selection of appropriate vaccines and evidence-informed health policy decision-making (7, 14).

The main strength of our study was the study population of people 65 years or older, with preexisting diseases. To our knowledge, this is the first study to examine and compare the adverse side effects from Pfizer/BioNTech and CoronaVac vaccines in this specific group. Given that older people may have reported side effects less frequently, potential selection bias due to the specific age bracket of the participants is the main limitation of the study.

In conclusion, both CoronaVac and Pfizer/BioNTech vaccines were safe in the elderly, even with comorbidities. The most common side effects of both vaccines were pain on the injection site and fatigue. There was no significant difference in side effects between the male and female participants. Although the age distribution, presence of comorbidities, and the type of vaccine were related to some adverse effects, all of them were mild to moderate local reactions. The side effects, especially allergic reactions, were more frequent in Pfizer/BioNTech group compared to the CoronaVac group.

DECLARATIONS

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

Conflicts of Interest/Competing Interests

The authors declared no potential conflicts of interest concerning the research, authorship, and publication of this article.

Ethics Approval

The study was approved by the Ministry of Health, Dr. Burhan Nalbantoglu State Hospital, Institutional Ethics Committee (ref no:12/21).

Availability of Data and Material

We can provide all the original data.

Authors' Contributions

HE: Study design, literature search, writing of the manuscript; EUE: Study design, data collection, literature search; SAB: Data collection, writing of the manuscript FGI: Data collection; literature search CS: Analysis of data, writing of the manuscript; OCE: Analysis of data, writing of the manuscript FY: Design of the study, writing of the manuscript

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REFERENCES

1. Tangcharoensathien V, Bassett MT, Meng Q, et al. Are overwhelmed health systems an inevitable consequence of covid-19? Experiences from China, Thailand, and New York State. bmj. 2021;372.
2. Zhang Y, Zeng G, Pan H, et al. Safety, tolerability, and immunogenicity of an inactivated SARS-CoV-2 vaccine in healthy adults aged 18–59 years: a randomised, double-blind, placebo-controlled, phase 1/2 clinical trial. The Lancet infectious diseases. 2021;21:181-92.

3. Malesza M and Wittmann E. Acceptance and intake of COVID-19 vaccines among older Germans. Journal of Clinical Medicine. 2021. Mar 30;10(7):1388.
4. Baden LR, El Sahly HM, Essink B, et al. Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. New England Journal of Medicine. 2021;384:403-16.
5. Ramasamy MN, Minassian AM, Ewer KJ, et al. Safety and immunogenicity of ChAdOx1 nCoV-19 vaccine administered in a prime-boost regimen in young and old adults (COV002): a single-blind, randomised, controlled, phase 2/3 trial. The Lancet. 2020;396:1979-93.
6. Polack FP, Thomas SJ, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. New England Journal of Medicine. 2020;383:2603-15.
7. Meo S, Bukhari I, Akram J, et al. COVID-19 vaccines: comparison of biological, pharmacological characteristics and adverse effects of Pfizer/BioNTech and Moderna Vaccines. European Review for Medical and Pharmacological Sciences. 2021;25:1663-9.
8. Li X, Ostropolets A, Makadia R, et al. Characterizing the incidence of adverse events of special interest for COVID-19 vaccines across eight countries: a multinational network cohort study. medRxiv. 2021.03. 25.21254315.
9. Flanagan KL, Fink AL, Plebanski M, et al. Sex and gender differences in the outcomes of vaccination over the life course. Annual review of cell and developmental biology. 2017;33:577-99.
10. Fink AL and Klein SL. Sex and gender impact immune responses to vaccines among the elderly. Physiology. 2015; 30,6 Nov: 408-416
11. Xia S, Duan K, Zhang Y, et al. Effect of an inactivated vaccine against SARS-CoV-2 on safety and immunogenicity outcomes: interim analysis of 2 randomized clinical trials. Jama. 2020;324:951-60.
12. Klimek L, Novak N, Hamelmann E, et al. Severe allergic reactions after COVID-19 vaccination with the Pfizer/BioNTech vaccine in Great Britain and USA. Allergo journal international. 2021;30:51-5.
13. Wu Z, Hu Y, Xu M, et al. Safety, tolerability, and immunogenicity of an inactivated SARS-CoV-2 vaccine (CoronaVac) in healthy adults aged 60 years and older: a randomised, double-blind, placebo-controlled, phase 1/2 clinical trial. The Lancet Infectious Diseases. 2021. Jun 1;21(6):803-12.
14. Mathioudakis AG, Ghrew M, Ustianowski A, et al. Self-reported real-world safety and reactogenicity of COVID-19 vaccines: An international vaccine-recipient survey. Life. . 2021. Jan 1.

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Pediatricians' Approach to Eye Diseases in Balıkesir province,Turkey

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ABSTRACT

Objectives: Evaluate the approaches of pediatricians and their assistants who work in Balikesir province,Turkey to eye diseases and their applications in this field.

Materials and Methods: 39 pediatricians and 9 specialty students were working in Balikesir, and its districts were reached. The data were collected using a 21-question questionnaire. SPSS 21.0 program was used to evaluate the data.

Results: 39 specialists and 9 physician assistants completed the questionnaires and participated in our study. 68.8% of respondents know the Brückner test. 33.3% apply the Brückner test, 45.8% no, 4.2% frequently, and 16.7% rarely. Direct ophthalmoscope examination on pediatric patients was not performed by 62.5% and when needed in 33.3%. 16.7% of doctors considered that the internship training on eye diseases received at the Faculty of Medicine was sufficient, no 37.5%, and 45.8% partially. When the physicians who answered no or partially were asked about the reason for this, the most common reason was that they had less opportunity to practice during the internship (87.5%).

Conclusions: Evaluating eye health is part of routine health checks in newborns and childhood shared by pediatricians. Therefore, it is necessary to ensure that pediatricians have sufficient equipment and knowledge about the basic screening tests.

Keywords: Pediatricians, survey, eye diseases

Balıkesir İlindeki Çocuk Hekimlerinin Göz Hastalıklarına Yaklaşımı

ÖZET

Amaç: Balıkesir ilinde çalışan çocuk hekimi ve asistanlarının göz hastalıklarına yaklaşımlarını ve bu alandaki uygulamalarını değerlendirmek amaçlanmıştır.

Gereç ve Yöntem: Balıkesir ili ve ilçelerinde çalışan 39 çocuk hastalıkları uzmanı ve 9 uzmanlık öğrencisine ulaşıldı. Veriler hekimlerin kendilerinin doldurduğu 21 soruluk anket formu ile toplandı. Verilerin değerlendirilmesinde SPSS 21.0 programı kullanıldı.

Bulgular: Çalışmamıza 39 uzman ve 9 asistan hekim anketleri doldurarak katıldı. Brückner testini biliyor musunuz sorusuna 33 hekim evet (%68,8) 15'i hayır (%31,2) yanıtını vermiştir. Brückner testi uyguluyor musunuz sorusuna ise, 16 hekim evet (%33,3), 22'si hayır (%45,8), 2'si sıklıkla (%4,2), 8'i nadir (%16,7) olarak uyguladığını belirtti. Çocuk hastalara direk oftalmoskop muayenesi yapıyor musunuz sorusuna hekimlerin 30'u hayır (%62,5), 16'sı (%33,3) ise ihtiyaç halinde uyguladığı yanıtını vermiştir.. Tıp Fakültesinde aldığınız göz hastalıkları staj eğitiminin yeterli olduğunu düşünüyor musunuz? sorusuna 8 hekim (%16,7) evet, 18'i hayır yanıtını verirken 22'si kısmen yanıtını vermiştir. Tıp Fakültesindeki göz hastalıkları staj eğitimi yeterli mi sorusuna sadece 8 hekim (%16,7) evet yanıtını vermiş, hayır ya da kısmen diye cevaplayan hekimlere bunun nedeni sorulduğunda ise en sık neden olarak staj süresince pratik yapma imkanının az olması (%87,5) gösterilmiştir.

Sonuç: Yeni doğan ve çocukluk döneminde rutin sağlık kontrollerinin bir parçası olan göz sağlığını değerlendirmek çocuk hekimlerinin de sorumluluğundadır. Bu nedenle çocuk hekimlerinin göz sağlığını değerlendirmede kullanılan temel tarama testleri hakkında yeterli donanım ve bilgiye sahip olmalarını sağlamak gerekir.

Anahtar Kelimeler: Pediatrist, anket, göz hastalıkları

Early detection and treatment of ocular diseases in childhood are important to prevent lifelong visual problems. Examination of the visual system begins in the newborn period, and all routine checks of the infant also include an assessment of eye health (1). Pediatricians are the first doctors to perform a newborn examination after childbirth, and it is critically important for the health of the newborn that they notice and direct the eye pathologies during this period. To have a healthy visual system, a visual stimulus is needed beginning from birth. Receiving sufficient visual stimuli in the first years of life is necessary for the maturation of the visual system and healthy vision. The sense of sight is of critical importance in the development of the child (2). A healthy sense of vision enables the child to relate to the social environment, and notice and evaluate the education and training opportunities around him/her.

The American Academy of Pediatrics recommends external inspection of the eyes and adnexa, vision examination, the red reflex test, pupil examination, and evaluation of eye movements for the eye health of infants according to the developmental stage from birth in the routine examinations of pediatricians. In this way, it may be possible to detect and treat diseases that may cause serious vision loss such as congenital cataracts, congenital glaucoma, retinoblastoma, and strabismus that may be encountered in early childhood at an early stage (3,4).

The red reflex test is a basic eye screening test that can also be applied by pediatricians and family doctors and is accepted by the American Academy of Pediatrics as part of the newborn, infancy, and childhood physical examination. The red reflex test is vital for the early detection of some diseases that may be vision- and life-threatening such as cataracts, glaucoma, retinoblastoma, retinal problems, eye signs of systemic diseases, and high refractive defects (1). It is applied by evaluating the light reflected from the ocular media at a certain distance with the help of a direct ophthalmoscope.

The study aims to evaluate the approaches of pediatricians who follow up on infant and child patients from the newborn period to children's eye health using a questionnaire.

Materials and Methods

The study was conducted in Balıkesir as a cross-sectional survey between October - November 2020. It was aimed to reach 62 pediatricians who are actively working in Balıkesir province and districts. However, 14 physicians could not be reached and 39 specialist pediatricians and 9 research assistants (specialist students) from the Department of Pediatrics at Balıkesir University's Faculty of Medicine participated in the study. Participation in the study was based entirely on volunteerism. During the data collection period, after the participants read the voluntary participation form and agreed to participate in the study, the questionnaires were applied by face-to-face interview. In addition, questionnaires were sent to 2 physicians via e-mail.

The completed questionnaires were evaluated for the study. Approval was received from the Balıkesir University Faculty of Medicine Clinical Research Ethics Committee (dated 19.08.2020 and numbered 2020/117) for the questionnaire study. In the creation of the questions in the questionnaire form, recommendations of The American Academy of Pediatrics for pediatricians and family physicians were used as a base, and some examples of questions from the study conducted by Can and Erbaydar in 2009 were also used (1,5). Since the majority of the physicians participating in our questionnaire were working at the 2nd level and as self-employed, no questions about retinopathy of prematurity were added to the questions in the questionnaire.

The data were analyzed using the IBM SPSS statistical program (Version 25). Descriptive (numerical) data were expressed as Mean+-Standard Deviation (Mean+-SD). Categorical data were expressed as frequency and percentage (%).

Findings

39 specialists (81.3%) and 9 research assistants (specialty students) (18.8%) participated in our study by filling out the questionnaires. The physicians' working time as pediatricians ranged from 0.3 years to 41. 24 physicians were working at the 2nd level (50%), 13 physicians were working in the private sector (27.1%) and 11 physicians were working at the 3rd level (22.9%). Some examples of questionnaire questions are given in Table 1. When asked about the number of pediatric patients presenting with eye complaints in a month, it was seen that there were 32 physicians (66.7%) with 10 or fewer patients, 7 physicians (14.6%) with 11-20 patients, 6 physicians (12.5%) with 21-30 patients, 1 physician (21.1%) with 31-40 patients, 2 physicians (4.2%) with 41 and above patients per physician. 68.8% knew the Brückner test. But 45.8% do not apply the Brückner test, 33.3% apply it, only 4.2% frequently, and 16.7% rarely. Direct ophthalmoscope examination on

pediatric patients was not performed by 62.5% and when needed in 33.3%. Data on the approach to eye scanning test are given in Table 2. 37.5% knew how to apply the Hirshberg test, but only 2.1% applied the Hirshberg test. The age periods doctors recommended an ophthalmologist examination for children were 75% for 0-3 months, 16.7% for 1-year-old, 12.5% for 3-year-old, and 10.4% for 6-year-old (more than one choice was possible). The child's vision was examined by 31.3%, rarely 37.5% and not by 29.2%. Strabismus examination was performed by 37.5% of doctors, only when needed in 35.4% and not in 27.1%. Data on the approach to children presenting with eye complaints are given in Table 3. 19 physicians (39.6%) stated that they gave massage + antibiotic drops to patients with lacrimation complaints, and 3 physicians (6.3%) did not answer this question.

Table 1. Examples from questionnaire questions

How many years have you been working as a pediatrician?
How many children are admitted to the health institution where you work due to eye complaints in a month?
Do you know how to apply the red reflex test (Brückner) to pediatric patients (0-2 years old)?
Do you apply a red reflex test to children 0-2 years old?
Do you know how to apply the Hirshberg test (lantern) to pediatric patients?
Do you conduct fundus examination with an ophthalmoscope directly on pediatric patients?
Do you apply the Hirshberg test (lantern test) to pediatric patients?
Do you examine pediatric patients for strabismus?
Do you have a patient under the age of one, who has been complaining of lacrimation since birth?
If yes, what is your approach?
How do you evaluate vision problems in children with whom you have detected developmental retardation?
In which period do you recommend an ophthalmologist examination for children who have no/unreported eye complaints?
If there are no complaints, do you examine the child's vision problems?
How often do you need to consult an ophthalmologist for pediatric patients?
What are the situations when you feel the need to consult an ophthalmologist?

Table 2. Approach to eye scanning tests

Do you know the Brückner test?	n	%
Yes	33	68.8
No	15	31.3
Total	48	100
Do you apply the Brückner test?	n	%
Yes	16	33.3
No	22	45.8
Frequently	2	4.2
Rarely	8	16.7
Total	48	100
Do you perform direct ophthalmoscope examination?	n	%
Yes	2	4.2
No	30	62.5
When needed	16	33.3
Total	48	100
Do you know the Hirsberg test?	n	%
Yes	18	37.5
No	30	62.5
Total	48	100

Table 3. Approach to children with eye problems

Do you examine pediatric patients for strabismus?	n	%
Yes	18	37.5
No	13	27.1
I apply when needed	17	35.4
Total	48	100
Do you have a patient under the age of one, who has been complaining of lacrimation since birth?	n	%
Yes	43	89.6
No	5	10.1
If yes, what is your approach?	n	%
Referring	4	8.3
Massage	22	45.8
Massage+Antibiotics	19	39.6
How do you assess the problem of vision in children with developmental disabilities?	n	%
I treat them myself	3	6.3
Referral to the ophthalmologist	42	87.4
Massage+Antibiotics	3	6.3
*What are the conditions that you refer to the ophthalmologist?	n	%
Vision problems	42	87.5
Strabismus	29	60.4
Infantilism	29	60.4
Headache	15	31.3
Other	11	22.9
(more than 1 option is selected)		

Ophthalmologists are consulted most often due to vision problems (87.5%). The evaluations of the physicians about the ophthalmology internship training received at the Faculty of Medicine and the approaches to eye diseases are given in Table 4. 16.7% considered that the internship training in ophthalmology at the Faculty of Medicine was sufficient, and when the physicians who answered no or partially were asked about the reason for this, the most common reason was the low opportunity to practice during the internship (87.5%). The most common recommendation to overcome the lack of training in eye examination of pediatric patients is practical training, with a rate of 56%. Only 6 physicians (12.5%) were trained for pediatric eye diseases as assistants.

Table 4. Training and Approach to Eye Diseases

Is the eye internship in medical training sufficient?	n	%
Yes	8	16.7
No	18	37.5
Partially	22	45.8
Total	48	100
*If your answer is no, what are the reasons?	n	%
The short duration of the internship	13	32.5
Insufficient theoretical training	2	5
Limited opportunity to practice in the internship	35	87.5
Total	48	100
Have you received any training for children's eye diseases as an assistant?	n	%
Yes	6	12.5
No	42	87.5
Total	48	100
*What kind of approach is appropriate for the lack of an eye examination in children?	n	%
Theoretical training	14	29.2
Practical training	27	56.5
Distance training	6	12.5
Congresses	8	16.7
Other	6	12.5
Total	48	100
*(more than 1 option is selected)		

Discussion

The red reflex test is an eye screening test used in infancy and early childhood and is an obligatory part of the newborn examination and is used to detect many pathologies, including cataract, corneal opacity, retinoblastoma, and retinal detachment that may be involved in the visual axis (1). The American Academy of Pediatrics recommends the red reflex test in the examination of children aged 0-6 months, 1 year, 3 years, and 6 years. The test is performed with the help of an ophthalmoscope in a dim environment. The ophthalmoscope focuses on the child's pupil at about 45-90 cm. The color, intensity, and transparency of the light reflected from both eyes are evaluated (1).

The American Academy of Pediatrics recommends that all newborns undergo a red reflex test by pediatricians or other primary-level physicians. For the reflectance received from both eyes to be considered normal, it must be bright, symmetrical, of equal density, and should contain no spots and opacity. In case abnormal red reflex detection, it recommends that the baby be directed to a pediatric ophthalmologist (1-4).

Regardless of the the red reflex test result, if the baby or child has a positive family history of retinoblastoma, strabismus, congenital cataract, or congenital glaucoma, they should be directed to an ophthalmologist for a detailed eye examination.

To reduce or prevent permanent vision loss caused by congenital cataracts, it is important to detect it as early as possible and operate within the first 6 weeks (6). In this way, irreversible amblyopia associated with congenital cataracts can be prevented with timely diagnosis and appropriate closure treatment after surgery. In the study of Yazgan et al., a double-sided congenital cataract was detected in 2 infants and retinoblastoma in one infant during the examination of 2718 newborns with a red reflex test by pediatricians (7).

Eye scanning with a red reflex is performed by more than 90% in maternity and pediatric clinics in Sweden, and a significant increase in the early detection of congenital cataracts by 50% versus 64% was found compared to the period when it was not performed. Again, in a study in which two Northern European countries are compared, the detection rate of congenital cataracts at an early stage in Sweden, where the red reflex test is routinely performed, was found to be higher than in Denmark, where the test was not performed (8,9).

In a study conducted by Özkurt et al. on eye screening tests for family doctors in and around Diyarbakır, 52% of the participants stated that they performed the red reflex

test, 36% knew about the test but had not performed it, and 12% never heard of the red reflex test. In our study, 31.3% of pediatricians stated that they did not know about the red reflex test, while 68.8% said that they did. The rate of physicians who routinely perform the red reflex test is 33.3% (10).

As part of the National Vision Program launched by the Ministry of Health in 2015, eye screening is performed by family doctors from 0-3 months. Thanks to this program, it is aimed to discover the diseases that will cause vision loss in early childhood early and prevent vision loss (11).

In the eye scan conducted by Toygar et al. on 3568 6-14-year-old primary school students in Istanbul, it was found that 41.2% of cases developing amblyopia were detected during the scan (12).

The Hirshberg test (light reflection test from the cornea) is used to assess the parallelism of the eyes. A light source is held at 50 cm from the child so that the light is in the center of both eyes. It can be used for screening purposes in strabismus examination (13). 37% of the physicians participating in our study stated that they knew about the Hirshberg test, but one of them stated that s/he applied it routinely, while 13 physicians (27.1) stated that they applied it when needed.

Although the eye examination is part of the general health examination, the rate of physicians who routinely examine vision problems is 31.3%.

In the study in which Regassa et al. evaluated the knowledge and approaches of pediatricians to children's eye diseases, 86.1% of the participants performed an eye examination, while the rate of its application at each visit was 36.7% (14).

In the questionnaire study conducted by Biten et al. on family physician assistants in Ankara, only 12.8% of the participants think that the eye diseases training given in the medical faculty is sufficient. In comparision, 54.1% do not find it sufficient. 75.4% of those who think that the eye diseases internship given in the medical faculty is not sufficient to think that the most common reason for this is the lack of practice opportunities (15). Similarly, in our study, 37.5% of the physicians think that the internship training in eye diseases is insufficient, 45.8% think that it is partially sufficient, and the most important reason for this is the lack of practice opportunities (87.5%). In the studies of Can and Erbaydar for family physicians in Van, it was observed that physicians mostly referred to general medicine books (83.3%) and specialist physician friends (37.9%) as the information source about eye diseases (5).

Pediatricians having sufficient knowledge and skills about the application of basic screening tests will also increase the applicability of the tests (14). During the internship period of the faculty of medicine and then during the specialty training, it is necessary to organize training that is predominantly about practical applications. As part of the National Vision Program, carrying out practices such as training provided to family doctors abroad on eye screening tests for pediatricians will increase awareness about this issue. Due to the simple and easy applicability of the red reflex test, and its high sensitivity, it should be part of the newborn examination and included in the pediatric specialty training (16,17).

Since pediatricians are the first physicians to encounter newborns, our study aimed to identify the missing approaches and provide recommendations on this issue.

Limitations of the Study

Although questionnaire questions about follow-ups for Premature retinopathy of vision (ROP) were not included because it also includes self-employed physicians, ROP follow-up is also within the responsibility of pediatricians, and the lack of questions about it is one of the missing aspects of the study. Other limited aspects of our study are that since it only covers the province of Balıkesir, it does not reflect all the pediatricians in our country and their evaluations. Since it is a questionnaire study, it only covers the opinions and statements of the participants.

Conclusion

The ability of pediatricians to perform screening tests for the eye health of infants during the newborn period is significant for the early detection of eye pathologies that may affect the child's entire life. Therefore, pediatricians should be adequately equipped with screening tests critical for evaluating newborn eye health. It is important to include the regulations for providing the necessary knowledge and skills to physicians for these basic screening tests in the training program, both in the eye health internship training program at the faculty of medicine and in the child health specialty training.

Declarations

Ethical Approval

This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Balikesir Faculty of Medicine Ethics. (date: august 19, 2020; no:2020/117)

Author Contribution

Hümeyra Yıldırım: Conceptualization, data curation, project administration, formal analysis, writing – original draft, writing – review and editing.

Selçuk Yazıcı: Data curation, project administration, formal analysis, writing – review and editing

Conflict of Interest/Competing Interests

The authors declare that they have no conflict of interest

Availability of Data and Material

The dataset of this study are available from the corresponding author on reasonable request

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References

1. American Academy of Pediatrics; Section on Ophthalmology;American Association for Pediatric Ophthalmology and Strabismus; American Academy of Ophthalmology; American Association of Certified Orthoptists. Red reflex examination in neonates, infants, and children.Pediatrics2008; 122: 1401–4
2. Bremond-Gignac D, Copin H, Lapillonne A, Milazzo S;European Network of Study and Research in Eye Development. Visual development in infants: physiological and pathological mechanisms. Current Opin Ophthalmol .2011.Apr;22Supp:S1-8.
3. Committee on practice and ambulatory medicine; section on ophthalmology; American association of certified orthoptists; American association for pediatric ophthalmology andstrabismus; American Academy of ophthalmology. Visual System Assessment in Infants,Children, and Young Adults by Pediatricians. Pediatrics. 2016;137:1-3.
4. Balmer A, Munier F. Differential diagnosis of leukocoria and strabismus, first presenting signs of retinoblastoma. Clin Ophthalmol 2007; 1: 431-43
5. Can Yıldırım H, Erbaydar T. Van'da birinci basamakta çalışan hekimlerin göz hastalıklarına yaklaşımı ve uygulamaları. Türk Oftalmoloji Dergisi.2009.164-171.
6. Birch EE, Stager DR. The critical period for surgical treatment of dense congenital unilateral cataract. Invest Ophthalmol VisSci1996; 37: 1532–1538.
7. Yazgan H, Yıldırım A, Keleş E, et al. Assessing The effectiveness of the red reflex test (Brückner) in early diagnosis of congenital eye disorders. Turk Arch Ped 2012; 47: 163-164.
8. Magnusson G, Bizjajeva S, Haargaard B, et al. Congenital cataract screening in maternity wards is effective: evaluation of the Paediatric Cataract Register of Sweden. Acta Paediatr. 2013:102: 263–267.
9. Haargaard B, Nystrom, Rosensvard A, Tornqvist K, Magnusson G. The Paediatric Cataract Register (PECARE): analysis of age at detection of congenital cataract. Acta Ophthalmol. 2015: 93:24-26.
10. Özkurt Gürsel Z, Balsak S, Çamci MS, et al. Approach of family physicians to pediatric eye screening in Diyarbakır. Turk J Ophthalmol 2019;49:25-29
11. https://hsgm.saglik.gov.tr/depo/birimler/cocuk_ergen_db/dokumanlar/yayinlar/Kitaplar/02.08.2019_ULUSAL_GORME_TARAMASI_REHBERI.pdf
12. Toygar O, Öğüt MS, Kozakoğlu H. İstanbul'da İlköğretim çağı çocuklarında yapılan göz taraması sonuçları. Türk Oftalmoloji Dergisi.2003;33:585-591.
13. E.C Şener. Çocuk Göz Hastalıkları ve Şaşılık "Soruna yönelik".Güneş Tıp Kitabevi.2009.S:11-13.
14. Regassa TT , Daba TK , Fabian DI and Mengasha AA. Knowledge, attitude and practice of Ethiopian pediatricians concerning childhood eye diseases. BMC Ophthalmology.2021:21:91
15. Biten H, Koç EM, Özçelik DÇ, Kahveci R, Kasım İ, Şencan İ, Özkara A. Birinci basamakta göz hastalarına yaklaşımla ile ilgili aile hekimliği asistanlarının değerlendirilmesi. J Clin Exp Invest.2015;6(4):363-374
16. Toli A, Perente A, Labiris G. Evaluation of the red reflex: An overview for the pediatrician. World J Methodol 2021 September 20; 11(5): 263-277.
17. Eventov-Friedman S, Leiba H, Fiedel-Rimon O, Juster-Reicher A, Shinwell ES. The red reflex examination in neonates: an efficient tool for early diagnosis of congenital ocular diseases. IMAJ Isr Med Assoc J. 2010;12:259-261.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Orthopaedics / Ortopedi

Opinions of Medicine Students in Turkey on Orthopedics and Traumatology Residency and Their Expectations from the Future: National Survey Results

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ABSTRACT

Aim: The primary purpose of our study is to assess the future expectations of physicians about to graduate from medical school and their views on orthopaedics and traumatology. Secondly, determine why women are less likely to attend orthopaedic residency training and provide suggestions for overcoming gender discrimination.

Methods: An online survey was conducted on sixth- or fifth-year medical students who had completed orthopaedics internships. Demographic information; the reasons for receiving medical education; plans for the future, factors that will cause women not to prefer orthopaedics and traumatology; and the evaluation of the Orthopaedics and Traumatology education they receive were questioned.

Results: A total of 125 students participated in the study. Of these, 52 (42.6%) were male, and 73 (58.4%) were female. 64.8% of the participants had insufficient confidence to work as a physician. 45.2% of students studying at private medical schools felt sufficient, this percentage was 27.7% in the state group, and the difference was statistically significant (p=0.048). 83.2% of students felt that the education they received needed to be improved in a practical sense. 39% of the students would not prefer any medical school if they had the choice again. Most participants thought that orthopaedics was more suitable for men. They pointed out that the most crucial factor preventing women from choosing was the excess of interventions that require strength.

Conclusion: Health management plans should be developed to ensure medical school students have a positive outlook on our country's future and increase women physicians' participation in Orthopaedics and Traumatology.

Keywords: Medicine, Education, Orthopedics, Residency, Gender, Career

Türkiye'de Tıp Fakültesi Öğrencilerinin Ortopedi ve Travmatoloji Uzmanlığı Hakkındaki Görüşleri ve Gelecekten Beklentileri: Ulusal Anket Sonuçları

ÖZET

Amaç: Çalışmamızın temel amacı, tıp fakültesinden mezun olmak üzere olan hekimlerin gelecekten beklentilerini, ortopedi ve travmatoloji eğitimi hakkında görüşlerini değerlendirmektir. İkinci olarak ise, kadınların ortopedi uzmanlık eğitimine daha az katılmalarına neden olan faktörleri değerlendirmek ve kadınların katılımını artırmaya yönelik öneriler geliştirebilmektir.

Yöntemler: Ortopedi stajlarını tamamlamış olan altıncı veya beşinci sınıf tıp öğrencileri üzerinde çevrimiçi bir anket yapıldı. Demografik bilgiler; tıp eğitimi alma nedenleri; gelecek planları, kadınların ortopedi ve travmatolojiyi tercih etmemesine neden olabilecek faktörler; ve aldıkları Ortopedi ve Travmatoloji eğitimleri sorgulanmıştır.

Bulgular: Çalışmaya toplam 125 öğrenci katılmıştır. Katılımcıların 52'si (%42,6) erkek, 73'ü (%58,4) kadındı. Katılımcıların %64,8'i hekim olarak çalışmaya başlamak için yeterli özgüvene sahip hissetmiyordu. Özel tıp fakültelerinde okuyan öğrencilerin ise %45,2'si kendini hazır ve yeterli hissediyordu, bu oran devlet grubunda %27,7 idi ve bu farkın istatistiksel olarak anlamlı olduğu görüldü (p=0,048). Öğrencilerin %83,2'si aldıkları eğitimin pratik anlamda iyileştirilmesi gerektiğini düşünüyordu. Öğrencilerin %39'u tekrar seçme şansları olsa yine tıp fakültesini tercih etmeyeceklerini ifade ettiler. Katılımcıların çoğu ortopedinin erkekler için daha uygun olduğunu düşünmektedir. Kadınları seçim yapmaktan alıkoyan en önemli faktörün de güç gerektiren müdahalelerin sık olması olarak öngörülmüştür.

Sonuç: Ülkemizde, tıp fakültesi öğrencilerinin geleceğe olumlu bakışlarını sağlamak ve kadın hekimlerin Ortopedi ve Travmatoloji alanına katılımını artırmak için sağlık yönetim planlamaları geliştirilmelidir.

Anahtar Sözcükler: Tıp, Eğitim, Ortopedi, Uzmanlık, Cinsiyet, Kariyer

Although choosing a profession is one of the most critical decisions in the lives of young people, it is a complex process influenced by many factors (1). The individual is affected by several value judgments, interests, and beliefs in this decision process (2). The knowledge available in the literature shows that the individuals' characteristics are also influential in this decision, their interest in the profession, their values, and the satisfaction they will obtain (3). On the other hand, socioeconomic status and family influence also play an essential role in choosing a profession, although they differ between countries and cultures. Because violence in health has increased in recent years and deterrent measures have not been taken, medical school students feel severe reservations about starting medical practice and maintaining the profession in the conditions in our country. This study aims to put the finger on the problems experienced by the members of a strategically critical professional group who want to serve their country as physicians and to raise awareness for the development of measures and corrective policies by being aware of the seriousness of the situation.

MATERIAL AND METHODS

Sixth- or fifth-year medical students who completed orthopaedics internships from different medical schools were included in this study. The questionnaire prepared by our clinic was conducted online for six months between June and December 2021 (Microsoft Forms). Responses were collected voluntarily. The survey consists of 5 sections: firstly, demographic information; secondly, the reasons for receiving medical education; thirdly, plans for the future; fourthly, factors that will cause women not to prefer orthopaedics and traumatology; and finally, the evaluation of the Orthopaedics and Traumatology education they receive.

Statistical Analysis

Complete data from 125 students were entered into Microsoft Forms and later analysed using Microsoft Excel and SPSS version 27. The Chi-Square test was used to compare between and among different categorical variables. A p-value of < 0.05 was considered statistically significant.

RESULTS

125 students from 6 different medical schools in Istanbul participated in the study. Of these, 52 (42.6%) were male, and 73 (58.4%) were female. The type of participants' schools was 72 (57.6%) state and 53 (42.4%) private (Figure 1-2). 79% of students in state medical schools and %55 in private medical schools had chosen to study medicine because of their ideals (Figure 1-2). Also %43 students at private schools decided based on the scores they obtained in the college examination, but this percentage was lower for state schools (20%). Also, 64.8% of the participants needed more confidence to work as a physician. However, while 45.2% of students studying at private schools felt sufficient, this percentage was 27.7% at state schools, and the difference was statistically significant (p=0.048). When asked about their confidence in practice, the scores were similar in both groups, and no statistically significant difference was found (p=0.963). 83.2% of students felt that the education they received needed to be improved in a practical sense. 39% of the students would not prefer any medical school if they had the choice again. The future plans of 83.2% of the participants want to specialise in medicine, and 44.8% want to continue working as a physician abroad (Figure 3-4). 46% want to specialise in surgery, 52% in internal medicine, and 2% in basic medical research. When we look at the factors influencing the decision to specialise in medicine, 59% want high professional satisfaction, and 36% want financial satisfaction (Figure 5).

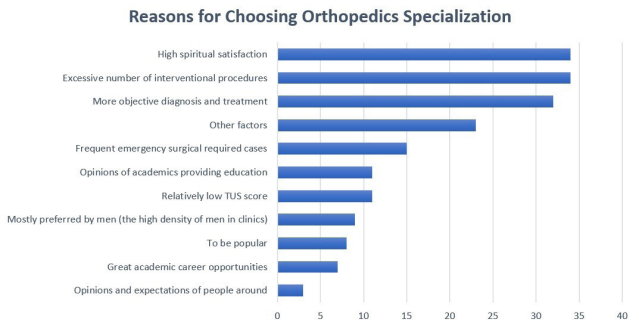

Figure 1. *Reason for choosing Orthopedics Residency*

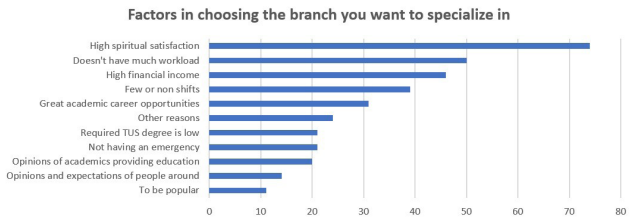

Figure 2. *Factors influencing the decisions for specialisation in medicine*

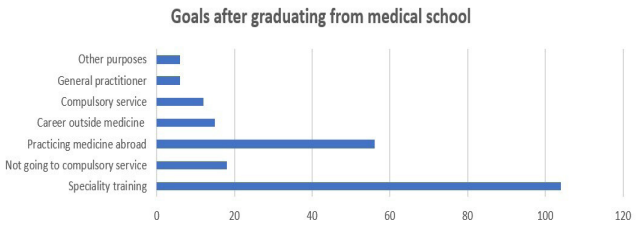

Figure 3. *Future Plans of the students*

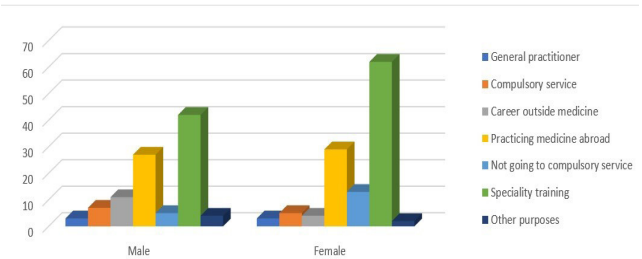

Figure 4. *Future plans by gender*

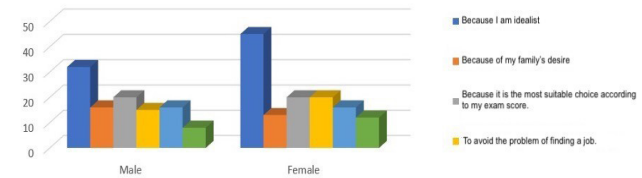

Figure 5. *Reasons for choosing Medicine School by Gender*

In comparison, 40% want to choose a specialisation with a low workload. 46.4% of participants said they would never prefer the speciality of orthopaedics, 24.8% might prefer it, and 28.8% would absolutely prefer it. When asked about female preference for orthopaedics, 75.2% stated that gender was not a factor, 20% said it was more appropriate for men, and 4.8% said those female orthopaedic surgeons were needed and should be preferred more often (Figure 6). It was seen that the interventions requiring strength, the number and intensity of duties were high, and the strenuous training process were the main factors that may cause women not to prefer orthopaedic residency (Figure 7).

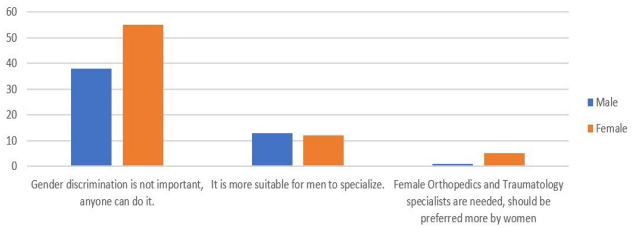

Figure 6. *Opinions about the Gender Discrimination in Orthopedics Residency*

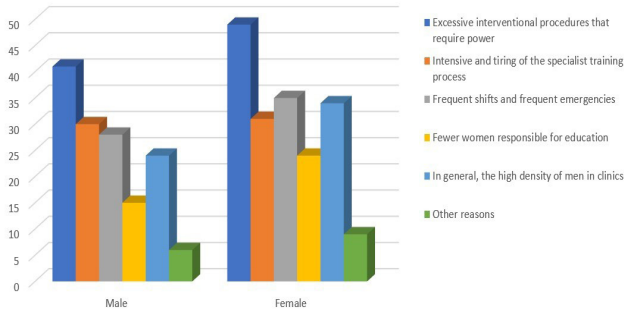

Figure 7. *Answers for why women intend less to have an Orthopedic Surgery Education*

DISCUSSION

We have shared an indigenously designed questionnaire with 5th and 6th-semester medical students. 57% of them were female and from different universities, and 59% of the participants were in the 5th semester.

According to our survey, 64.8% of the participants had insufficient confidence to work as a physician. The study by Kathamandu (4) has shown that female physician candidates have less confidence than males. This may lead female physicians to choose areas that require less attention, which may keep them away from surgical fields, even if they have experienced them. An article by Stacia Dearmin stated that the physician's confidence is essential to promote the patient's trust. After all, when we need treatment, we prefer the doctor who seems to know what he is doing (5). Research in India had shown that most medical students feel their expectations before medical school were unmet. In Turkey, on the other hand, most medical students enter medical school because they believe they have the best qualifications to become a doctor (6). Our study found that a family member's influence on the decision to have a medical education is also more significant than in other countries. Our cultural structure may have influenced this result, as students may believe taking up a medical profession gives higher prestige to their families.

According to a meta-analysis, the most crucial factor in physicians' decision to study medicine in 1988, 1998 and 2008 was "interest in people" and "the presence of a physician in the family or close relatives", which ranked only seventh compared to other factors. Still, it was constantly on the rise, so today, we can see that it has a noticeable impact on the decision of physician candidates (7). 65% of respondents believe they do not have an excellent education to become a doctor, and most medical students do not consider themselves ready to become a doctor. Many factors could cause this; Buja et al. mentioned the risk that the new integrated curricula would produce graduates who lack the qualities distinguishing physicians from other health professions (8). That could result in some newly trained physicians working in other occupations and being useless in the health sector. This could affect the substructure of the health care organisation because of the shortage of physicians in most countries when most students refer to the loss of self-confidence and education, which leads us to some problems that need to be fixed in how medicine is taught in different countries.

46% of medical students want to specialise in surgery, 52% in internal medicine, and 2% in basic medical research. Medical students prefer internal medicine specialities more than surgical specialities because internal medicine specialities have fewer work hours and fewer emergencies. Still, on the other hand, surgical specialities offer better income. In an article from Germany, most students preferred internal medicine specialities. The factors influencing students' preferences for a speciality were frequently work-life balance, career goals, and expected workload (9). According to these articles, most physicians would work in a speciality offering a higher quality of life. However, to balance the distribution of physicians, higher salaries are provided in surgical specialities.

According to survey research in Turkey, 13 factors affect the doctor candidate's decision about their future preference career; these are interest, ability, money (guaranteed job-job security, high-income opportunity, expenses), influencer (family, colleague), reputable status, acceptable and manageable working conditions, narrow and focused/general application area, speciality on medicine (TUS) examination score, professional satisfaction, relations with patients and their relatives, ethical relations (mobbing), abroad career counselling. (10) Young physician candidates have expectations and demands regarding personal life and career planning. Regarding work-life balance, career choice is the most critical factor for the student generation. Of course, work-life balance is based on subjective perceptions and may vary from person to person. However, it is generally true that "work and private life can be balanced." causing Less interest in specialities that are considered very labour-intensive or high-risk, especially surgical specialities that require more extended training. This situation may cause deficiencies in students' career planning according to their skills and interests.

In health and social care, positive professional training and guidance models are becoming increasingly important to ensure a balanced distribution of services and regulate working conditions and pre-service training. During medical school, we must provide career guidance to students and be positive role models. (10)

Most participants believe the main reason for the shortage of female physicians in orthopaedic and traumatology surgery is that it requires much strength and involves long working hours. Hence, most women prefer to specialise in other specialities that offer more comfort and quality of life, such as dermatology or radiology. However, 75.2% of respondents believe women can work in orthopaedic surgery. In addition, according to a study made in the UK in 2019, myriad factors affect women's decisions about being an orthopaedist and the "Hidden Curriculum" is one of them (11). The Hidden Curriculum shows the misconception of orthopaedic surgeons that orthopaedics is a speciality for men and that orthopaedic surgeons are old-fashioned, big men with hammers, etc. The article shows how these perceptions negatively impact candidate decision-making. This causes us to lose good orthopaedic candidates, has more impact on female candidates, and lowers the percentage of female orthopaedic surgeons. And even if orthopaedic candidates say that women can become orthopaedic surgeons, the hidden curriculum could unconsciously affect the female candidates.

According to a study, It will take more than 200 years to achieve gender balance in all medical professions, but orthopaedic surgery increased by 2% between 2010 and 2019 (12). The subspecialties of foot and ankle surgery (2%) and pediatric orthopaedics (2%) experienced the highest growth in achieving gender balance. Conversely, adult reconstruction (0%) and spine surgery (1%) experienced the most nominal growth. However, the increasing rate will take a long time to reach parity. And this is because orthopaedic surgery primarily requires forcing interventions in operations such as extracting an intramedullary nail.

Health management plans should be developed to ensure medical school students have a positive outlook on our country's future and increase women physicians' participation in Orthopaedics and Traumatology.

DECLARATIONS

Ethics Approval and Consent to Participate

Ethical approval was taken from the Istinye University Ethics Committee for Social and Human Sciences Research (date: 09.06.2022, no: 2022/06.06). The consent to participate was obtained in the digital platform over the online survey service.

Availability of Data and Materials

This study does not contain any third material.

Competing Interests

The authors declare that they have no competing interests.

Funding

There is no funding source.

Authors' Contributions

KT and TE designed the study and wrote the paper. BN has collected the data and analysed the results, and HÇ has drafted the work and revised the manuscript.

REFERENCES

1. Bozionelos N. Managing Careers: Theory and Practice. Acad Manag Perspect. 2007 Aug 1;21:110–1.
2. Mignonac K, Herrbach O. Managing individual career aspirations and corporate needs: a study of software engineers in France. J Eng Technol Manag. 2003 Sep 1;20(3):205–30.
3. Genç G, Kaya A, Genç M. İnönü üniversitesi tıp fakültesi öğrencilerinin meslek seçimini etkileyen faktörler. İnönü Üniversitesi Eğitim Fakültesi Derg. 2007;15.
4. Shrestha B, Yadav S, Dhakal S, Ghimire P, Shrestha Y, Singh Rathaure E. Status of self-esteem in medical students at a college in Kathmandu: A descriptive cross-sectional study. F1000Research. 2021;10:1031.
5. Physician self-confidence: Why it matters and how to build it [Internet]. [cited 2022 Aug 1]. Available from: https://www.wolterskluwer.com/en/expert-insights/physician-selfconfidence-why-it-matters-and-how-to-build-it
6. Pruthi S, Pandey R, Singh S, Aggarwal A, Ramavat A, Goel A. Why does an undergraduate student choose medicine as a career. Natl Med J India. 2013 Jun;26(3):147–9.
7. Heikkilä TJ, Hyppölä H, Vänskä J, Aine T, Halila H, Kujala S, et al. Factors important in the choice of a medical career: a Finnish national study. BMC Med Educ. 2015 Oct 5;15:169.
8. Buja LM. Medical education today: all that glitters is not gold. BMC Med Educ. 2019 Apr 16;19(1):110.
9. Grasreiner D, Dahmen U, Settmacher U. Specialty preferences and influencing factors: a repeated cross-sectional survey of first- to sixth-year medical students in Jena, Germany. BMC Med Educ. 2018 May 9;18(1):103.
10. Tengiz Fİ, Babaoğlu AB. Tıp Fakültesi Son Sınıf Öğrencilerinin Kariyer Tercihleri ve Bu Tercihleri Etkileyen Faktörler. SDÜ Tıp Fakültesi Derg [İnternet]. 2021 Sep 1 [cited 2022 Jul 13]; Available from: https://dergipark.org.tr/tr/doi/10.17343/sdutfd.560350
11. Howieson W, Cloke D. The hidden curriculum and its implications for surgical specialties. Bull R Coll Surg Engl. 2019 Nov;101(7):282–4.
12. Acuña AJ, Sato EH, Jella TK, Samuel LT, Jeong SH, Chen AF, et al. How Long Will It Take to Reach Gender Parity in Orthopaedic Surgery in the United States? An Analysis of the National Provider Identifier Registry. Clin Orthop. 2021 Jun;479(6):1179–89.

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The Effects of Mode of Delivery on Neonatal Screening Evaluated by Automated Auditory Brainstem Response

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ABSTRACT

Background/Purpose: This study aimed to investigate the role of method of delivery in neonatal hearing by comparing the automated auditory brainstem response (AABR) results of newborns born by vaginal delivery (VD) or cesarean section (CS) and to identify perinatal and neonatal factors associated with the failure of the first neonatal hearing screening test results.

Methods: This retrospective case-control study was conducted at an obstetrics clinic in Istanbul/Türkiye. Following the exclusion of newborns with incomplete data, with congenital and chromosomal anomalies, with CMV infection, and who received their hearing screening <12 h postpartum, a total of 300 newborns, 176 of whom were born by VD and 124 were born by CS were included in this study. The neonatal hearing screening was performed with AABR.

Results: A total of 181 newborns (60.3%) did not have hearing loss, whereas, in 39.7%, hearing loss was detected. A 57.4% hearing loss was reported in the VD group and 64.5% in the CS group. The difference between the groups was not significant (p = 0.13). The groups were also statistically similar in terms of family history of hearing loss, neonatal intensive care unit stay, maternal morbidity, and pregnancy complications, p values being 0.58, 0.09, and 0.14, respectively.

Conclusion: National hearing screening programs are essential for detecting hearing failure in newborns in time for a prompt diagnosis and appropriate management. Our results indicate that the method of delivery does not significantly affect newborn hearing. However, further studies are needed to resolve the conflicting findings in the literature.

Keywords: Newborn hearing screening, Automated auditory brainstem response, Mode of delivery, Vaginal delivery, Cesarean delivery

Doğum Şeklinin Yenidoğan İşitme Sonuçları Üzerindeki Etkisinin İşitsel Beyin Sapı Yanıtı ile Değerlendirilmesi

ÖZET

Amaç: Bu çalışma, vajinal doğum (VD) veya sezaryen (CS) ile doğan yenidoğanların otomatik işitsel beyin sapı yanıtı (AABR) sonuçlarını karşılaştırarak yenidoğan işitmesinde doğum şeklinin rolünü araştırmayı ve ilk yenidoğan işitme tarama testi sonuçlarının başarısızlığı ile ilişkili perinatal ve neonatal faktörlerin tanımlanmasını amaçlamıştır.

Yöntemler: Bu retrospektif vaka-kontrol çalışması, İstanbul'da bir kadın doğum kliniğinde yapılmıştır. Verileri eksik, konjenital ve kromozomal anomalileri olan, CMV enfeksiyonu olan ve postpartum 12. saatten önce işitme taraması yapılan yenidoğanların dışlanmasının ardından 176'sı VD, 124'ü CS ile doğmuş olmak üzere toplam 300 yenidoğan bu çalışmaya dahil edilmiştir. AABR ile yenidoğan işitme taraması yapılmıştır.

Bulgular: Toplam 181 yenidoğanda (%60,3) işitme kaybı görülmezken, %39,7'sinde işitme kaybı saptanmıştır. VD grubunda %57,4 ve CS grubunda %64,5 işitme kaybı bildirilmiştir. Gruplar arasındaki fark anlamlı değildir (p = 0.13). Gruplar ayrıca ailede işitme kaybı öyküsü, yenidoğan yoğun bakımda kalış süresi, annede hastalık ve gebelik komplikasyonları açısından da istatistiksel olarak benzer görülmüştür; p değerleri sırasıyla 0.58, 0.09 ve 0.14'tür.

Sonuç: Ulusal işitme tarama programları, erken tanı ve uygun tedavi için yenidoğanlarda işitme yetersizliğini zamanında tespit etmek açısından gereklidir. Sonuçlarımız, doğum şeklinin yenidoğan işitmesini önemli ölçüde etkilemediğini göstermektedir. Bununla birlikte, literatürdeki çelişkileri gidermek için daha fazla çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: Yenidoğan işitme taraması, Otomatik işitsel beyin sapı yanıtı, Doğum şekli, Vajinal doğum, Sezaryen doğum

Neonatal hearing loss is a birth abnormality common in infants, but, being hidden, is difficult to diagnose. Early diagnosis allows early intervention and rehabilitation of language and communication skills, minimizing the effects of hearing loss on development (1). The National Newborn Hearing Screening Program, initiated in 2004, is a nationwide program to detect hearing loss in newborns in Turkey. Otoacoustic emission (OAE) testing and automated auditory brainstem response (AABR) are commonly used screening methods in newborns (2). On average, a hearing loss of 30 to 40 decibels (dB) can be detected with both methods (3). An incidence of 0.1–0.3% has been reported in the literature for neonatal hearing impairment (4, 5).

There are many factors associated with hearing screening failure in newborns. Among these are facial/auricular malformations, external ear canal secretions, middle ear effusion, familial deafness, use of epidural anesthesia in cesarean deliveries, vaginal delivery, emergency cesarean section, 5 minute Apgar score <5, neonatal intensive care unit (NICU) stay, hyperbilirubinemia, and OAE test performed within the first postpartum 24 h (6-8). In an observational retrospective study, it was reported that hearing screening test failure was higher in babies born by cesarean section (CS) than in babies born vaginally (VD) (9). This led to a higher need for repeated testing, resulting in increased parental anxiety, mental stress, and increased medical costs (9). Therefore, it is of great importance to identify the factors that adversely affect newborn hearing screening tests.

Inconsistent findings regarding the effects of the method of delivery on the hearing screening results were reported in the literature. This was primarily due to a high rate of false positives (FP). A high FP rate was observed in most studies, where a higher rate of hearing screening failure was associated with CS delivery. However, the real reason for hearing failure was ear debris and/or effusion, not CS delivery (7, 9, 10). On the other hand, other studies evaluating VD and neonatal hearing loss reported higher FP rates (11).

In this study, we aimed to investigate the role of the method of delivery in neonatal hearing by comparing the AABR results of newborns born by VD or CS and identifying perinatal and neonatal factors associated with failure of the first neonatal hearing screening test results.

Material and Methods

This retrospective case-control study was conducted at the Department of Obstetrics and Gynecology of the University of Health Sciences Turkey, Istanbul Kanuni Sultan Suleyman Training and Research Hospital between December 2018 and June 2019. The study protocol was approved by the institution's Ethics Committee (KAEK/2018.9.16) and registered to ClinicalTrials.gov (NCT03881514). Written informed consent was obtained from all subjects.

Following ethical approval, the hospital's electronic database was searched for the results of all births within the study period. Out of the >10,000 women who gave birth at our clinic during the study period, the data from 3000 women who had their prenatal follow–ups at our hospital, with available complete records, whose newborns' hearing screening results could be acquired from the database, and who consented were retrieved from the database. Then, newborns with congenital and chromosomal anomalies, with CMV infection, with anatomical deformities involving the face and the ears, and who received their hearing screening <12 hours postpartum were excluded. A further exclusion was undertaken based on maternal history, including maternal infections, recurrent pregnancy loss, smoking, and alcohol abuse. Following the exclusion, a total of 300 newborns, 176 of whom were born by VD and 124 by CS, were included in this study (Figure 1).

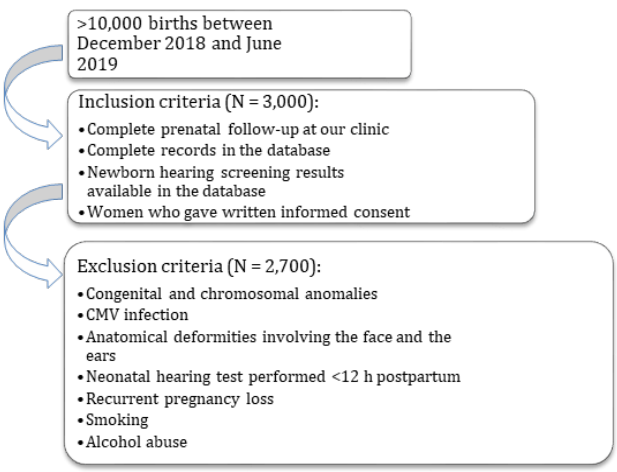

Figure 1. *Study cohort selection with inclusion and exclusion criteria.*

According to the Turkish Ministry of Health's Newborn Hearing Screening Program, all newborns should be screened with AABR before discharge from the hospital. According to our hospital's policy, all mothers and newborns without complications are discharged after 24 h of VD and 48 h of CS, and all newborns receive their hearing screening tests between 24-32 h postpartum. In cases of complications and discharge on weekends, the hearing tests are delayed to the earliest possible day thereafter. The test is performed in a quiet room by an audiologist. The newborn should be quiet (preferably asleep or while breastfeeding), and ambient noise should be kept as low as possible. The test can be done without sedation, and lasts 5-15 min. A Madsen AccuScreen (GN Otometrics A/S, Taastrup, Denmark) device was used in this present study.

The test results of the newborns were recorded as fail-pass separately for the right and left ears. Additionally, newborns' perinatal and postnatal evaluations, need for care in thee NICU following birth, delivery method, gestational age at birth, birth weight, sex of the newborn, Apgar scores (1-5 min), hyperbilirubinemia, maternal comorbidities and pregnancy complications including type 1 and type 2 diabetes mellitus, gestational diabetes mellitus, intrauterine growth retardation, gestational hypertension, hypothyroidism, and placenta previa, and time of the first AABR were retrieved from the database.

The Statistical Package for the Social Sciences version 20 (SPSS, Inc., Chicago, IL, USA) was utilized in data analysis. Continuous variables were reported as mean ± standard deviation. Percentages and values as numbers were given for categorical variables. Data distribution was assessed with the Kolmogorov–Smirnov test. Means were compared either with the Mann–Whitney U or the Student's t-test. Chi-square and Fisher's exact tests were used to compare categorical variables. A p-value of <0.05 was considered statistically significant.

Results

A total of 300 newborns, 176 (58.7%) in the VD group and 124 (41.3%) in the CS group, were included in this study. The demographic characteristics of all the newborns are displayed in Table 1. The mean maternal age was 26.7 years. The mean gestational age at birth was calculated to be 37.8 weeks. The median 1 min Apgar score was 8 and the 5 min Apgar score was 10. Of the newborns, 55.3% of the newborns were boys, and 44.7% were girls. A failed test result was detected in 31.3% of the newborns in the right ear and 32.7% in the left ear. A total of 181 newborns (60.3%) did not have a hearing loss, whereas, in 39.7%, hearing loss was detected.

Table 1. Demographic characteristics of all newborns

		All Newborns (n=300)
Age (mean± SD)		26.7 ±6.1
Gravidity (mean± SD)		2.6±1.4
Parity (mean± SD)		1.4±1.1
Weeks of gestation at birth (mean± SD)		37.8±2.2
Apgar 1 (median (min-max))		8(3-9)
Apgar 5 (median (min-max))		10(6-10)
Test timing (mean± SD)		6346.66±31248.68
Birth weight (g) (mean± SD)		3100±500
Maternal morbidity and pregnancy complications	None	267(%89)
	Present	33(%11)
Mode of delivery	VD	176(%58.7)
	CS	124(%41.3)
Sex	Boy	166(%55.3)
	Girl	134(%44.7)
ABR fail	Right	94(%31.3)
	Left	98(%32.7)
Hearing loss	No	181(%60.3)
	Yes	119(%39.7)
NICU stay	No	262(%87.3)
	Yes	38(%12.7)
Hyperbilirubinemia	No	297(%99)
	Yes	3(%1)
Family history of hearing loss	No	299(%99.7)
	Yes	1(%0.3)

The mean gravidity and parity were reported to be similar between the VD and the CS groups (Table 2). However, the mean weeks of gestation at birth (p = 0.02), 1 min Apgar score (p = 0.007), and 5 min Apgar score (p = 0.005) were significantly lower in the CS group. A 57.4% hearing loss was reported in the VD group and a 64.5% hearing loss in the CS group. The difference between the groups was not significant (p = 0.13). The groups were also statistically similar in terms of family history of hearing loss, NICU stay, maternal morbidity, and pregnancy complications, p values being 0.58, 0.09, and 0.14, respectively.

Table 2. Comparison between VD and CS Groups				
		VD Group (n=176)	CS Group (n=124)	p–value
Age (mean±SD)		25.6±6.03	28.3 ±6.02	<0.001
Gravidity (mean±SD)		2.5±1.4	2.8±1.4	0.15
Parity (mean±SD)		1.3±1.1	1.4±1.1	0.37
Weeks of gestation at birth (mean± SD)		38.1±1.4	37.5±3.04	0.02
Apgar 1 (median (min-max))		8(6-9)	8(3-9)	0.007
Apgar 5 (median (min-max))		10(8-10)	10(6-10)	0.005
Test timing (mean± SD)		3612.45± 5379.92	10291.09± 48253.43	0.13
Birth weight (g) (mean± SD)		3100±400	3100±500	0.83
Maternal morbidity and pregnancy complications	No	160(%90.9)	107(%86.3)	0.14
	Yes	16(%9.1)	17(%13.7)	
Sex	Boy	99(%56.3)	67(%54)	0.39
	Girl	77(%43.8)	57(%46)	
Hearing Loss	No	75(%42.6)	44(%35.5)	0.13
	Yes	101(%57.4)	80(%64.5)	
NICU stay	No	158(%89.8)	104(%83.9)	0.09
	Yes	18(%10.2)	20(%16.1)	
Hyperbilirubinemia	No	174(%98.9)	123(%99.2)	0.62
	Yes	2(%1.1)	1(%0.8)	
Family history of hearing loss	No	175(%99.4)	124(%100)	0.58
	Yes	1(%0.6)	0(0)	

Discussion

For the first time, in 1999, the American Academy of Pediatrics recommended the implementation of a screening methodology to assess newborn hearing. Since then, the screening program has been proven to be safe and effective in the early detection of newborn hearing impairment (12-14). However, the implementation of proper neonatal hearing screening remains a challenge in developing countries. In developed countries, screening is performed in obstetrics clinics before newborns are discharged from hospital (15). During hospitalization, tests may be repeated up to three times in case of failure at the initial screening. If a failed result is obtained from the last test before discharge, a routine follow-up examination, including OAE testing and automated ABR, is performed after 30-42 days (16).

Conflicting results regarding the role of mode of delivery in hearing screening have been reported in the literature. In a study conducted in China that included 1,460 newborns, newborns born by CS were shown to have three times higher failure rates on the OAE test than newborns born by VD (16). Smolkin et al. reported a 3.2-fold higher failure rate in the first OAE of babies born by CS when compared to VD (9). Furthermore, they observed that the difference was found at 42-47.9 h after birth (9). Accordingly, they suggested that the hearing screening test should be performed after 48 h of birth to minimize the failure rates (10). The high test failure rate may be due to the short hospital stay of the mothers and, accordingly, the early testing after delivery (10). On the other hand, Al-Balas et al. reported higher failure rates with VD, and Güven reported no difference between the groups (17, 18). In our study, we observed no difference between the CS group and the VD group regarding hearing screening results.

One of the major reasons for this discrepancy in the literature is high FP rates. However, authors have reported different FP rates for both groups. Farahani et al. reported a significantly higher rate of FP in the VD group in the first screening tests than the CS group, whereas Olusanya et al. reported a higher rate of FP in the latter group (11, 19). One of the causes of high FP rates is the presence of ear canal effusion. Balkany et al. examined 50 term newborns in the first 24 h postpartum and reported that 30% of the babies who were being cared for in the NICU had middle ear effusions (20). Another study showed that, following the removal of secretions from the external auditory canal, the success rate of screening increased from 76% to 91% (6).

The effect of additional factors such as low Apgar scores, gender of the newborn, weeks of gestation at birth, and birthweight of the newborns on hearing screening test results have also been evaluated in the literature and in our study. Smolkin et al. reported no correlation between Apgar scores and hearing screening test failure (9). Again, in the same study, male gender was associated with an increased risk (1.4 times) of failure in the first screening test (9). When the OAE test results of female newborns were compared with males, better results were reported in terms of whole-wave reproducibility, response level, band reproducibility, and signal-to-noise ratio (21). There were no significant differences between our study groups in terms of newborn birthweight and gender of the newborns indicating that birthweight and gender do not significantly affect hearing screening. Additionally, although the CS group had significantly lower Apgar scores

and weeks of gestation at birth, since there were no differences between the groups in terms of hearing screening results, we could conclude that these factors did not play a significant role in the hearing of the newborns.

The adverse effect of a failed first OAE on maternal anxiety has already been documented (22). Although maternal knowledge and awareness of hearing screening have increased, the degree of maternal anxiety has been reported to be higher in the retest than in the first hearing test (23). Minimizing neonatal FP rates is also important in allaying parental concerns. Delaying the timing of the screening has been shown to decrease the FP rates in some studies (24). Vernix and middle ear effusions are the most critical factors affecting FP rates in the screening test. Cleaning the ear canal and facilitating maneuvers to reduce middle ear effusions can reduce the rate of FP (25). In addition, performing the screening test in a separate room and postponing it until discharge from the hospital can reduce the rate of FP in the first screening test (19). Thus, the cost and stress for families can be reduced.

This study has some limitations. First, the study was retrospective in design, and the authors did not consider possible changes in temporally induced screening tests in the first month of life. Additionally, we were only able to observe the factors associated with screening failure, not to evaluate the exact mechanisms involved. Second, an otoscopic examination of newborn infants was not performed to clear external ear secretions or exclude middle ear effusions. However, there are conflicting results regarding the effects of the mode of delivery on the hearing screening of newborns. Recent studies such as ours suggest that the method of delivery does not play a significant role in the results of hearing screening. Randomized controlled studies with larger cohorts are needed to arrive at a conclusion.

Conclusion

National hearing screening programs are essential for detecting a hearing failure in newborns in time for a prompt diagnosis and appropriate management of the newborns. However, it is also essential to understand which factors affect newborn hearing, and to achieve accurate results to minimize FP. Our results indicate that the method of delivery does not significantly affect newborn hearing. However, further studies are needed to resolve the conflicting findings in the literature.

Declarations

Ethical Approval

Kanuni Sultan Suleyman Training and Research Hospital Ethics Committee, (KAEK/2018.9.16)

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Data Availability Statement

Research data is available upon request.

Conflict of Interest

The authors declare that they have no conflict of interest.

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References

1. Jakubíková J, Kabátová Z, Pavlovcinová G, Profant M. Newborn hearing screening and strategy for early detection of hearing loss in infants. Int J Pediatr Otorhinolaryngol. 2009;73(4):607-12.
2. Patel H, Feldman M. Universal newborn hearing screening. Paediatr Child Health. 2011;16(5):301-10.
3. Watkin PM. Neonatal screening for hearing impairment. Semin Neonatol. 2001;6(6):501-9.
4. Pourarian S, Khademi B, Pishva N, Jamali A. Prevalence of hearing loss in newborns admitted to neonatal intensive care unit. Iran J Otorhinolaryngol. 2012;24(68):129-34.
5. Thompson DC, McPhillips H, Davis RL, Lieu TL, Homer CJ, Helfand M. Universal newborn hearing screening: summary of evidence. Jama. 2001;286(16):2000-10.
6. Chang KW, Vohr BR, Norton SJ, Lekas MD. External and middle ear status related to evoked otoacoustic emission in neonates. Arch Otolaryngol Head Neck Surg. 1993;119(3):276-82.
7. Khoza-Shangase K, Joubert K. The influence of epidural anesthesia on new-born hearing screening: A pilot study. J Pharm Bioallied Sci. 2011;3(1):135-41.
8. Owen M, Webb M, Evans K. Community based universal neonatal hearing screening by health visitors using otoacoustic emissions. Arch Dis Child Fetal Neonatal Ed. 2001;84(3):F157-62.
9. Smolkin T, Mick O, Dabbah M, Blazer S, Grakovsky G, Gabay N, et al. Birth by cesarean delivery and failure on first otoacoustic emissions hearing test. Pediatrics. 2012;130(1):e95-100.
10. Smolkin T, Awawdeh S, Blazer S, Mick O, Makhoul IR. Delayed first otoacoustic emissions test decreases failure on neonatal hearing screening after caesarean delivery. Acta Paediatrica. 2013;102(5):e194-e9.
11. Olusanya BO, Bamigboye BA. Is discordance in TEOAE and AABR outcomes predictable in newborns? Int J Pediatr Otorhinolaryngol. 2010;74(11):1303-9.
12. Cunningham M, Cox EO. Hearing assessment in infants and children: recommendations beyond neonatal screening. Pediatrics. 2003;111(2):436-40.

13. Casali RL, Santos MF. Auditory Brainstem Evoked Response: response patterns of full-term and premature infants. Braz J Otorhinolaryngol. 2010;76(6):729-38.
14. Force UPST. Universal screening for hearing loss in newborns: US Preventive Services Task Force recommendation statement. Pediatrics. 2008;122(1):143-8.
15. McPherson B. Newborn hearing screening in developing countries: needs & new directions. Indian J Med Res. 2012;135(2):152-3.
16. Xiao T, Li Y, Xiao L, Jiang L, Hu Q. Association between mode of delivery and failure of neonatal acoustic emission test: a retrospective analysis. Int J Pediatr Otorhinolaryngol. 2015;79(4):516-9.
17. Al-Balas HI, Nuseir A, Zaitoun M, Al-Balas M, Khamees A, Al-Balas H. The effects of mode of delivery, maternal age, birth weight, gender and family history on screening hearing results: A cross sectional study. Ann Med Surg (Lond). 2021;64:102236.
18. Güven SG. The Effect of Mode of Delivery on Newborn Hearing Screening Results. Turk Arch Otorhinolaryngol. 2019;57(1):19-23.
19. Farahani F, Hamidi Nahrani M, Seifrabiei MA, Emadi M. The Effect of Mode of Delivery and Hospital Type on Newborn Hearing Screening Results Using Otoacoustic Emissions: Based on Screening Age. Indian J Otolaryngol Head Neck Surg. 2017;69(1):1-5.
20. Balkany TJ, Berman SA, Simmons MA, Jafek BW. Middle ear effusions in neonates. Laryngoscope. 1978;88(3):398-405.
21. Shulman S, Besculides M, Saltzman A, Ireys H, White KR, Forsman I. Evaluation of the universal newborn hearing screening and intervention program. Pediatrics. 2010;126 Suppl 1:S19-27.
22. Mohd Khairi MD, Rafidah KN, Affizal A, Normastura AR, Suzana M, Normani ZM. Anxiety of the mothers with referred baby during Universal Newborn Hearing Screening. Int J Pediatr Otorhinolaryngol. 2011;75(4):513-7.
23. Vohr BR, Letourneau KS, McDermott C. Maternal worry about neonatal hearing screening. J Perinatol. 2001;21(1):15-20.
24. Lupoli Lda M, Garcia L, Anastasio AR, Fontana AC. Time after birth in relation to failure rate in newborn hearing screening. Int J Pediatr Otorhinolaryngol. 2013;77(6):932-5.
25. Doyle KJ, Burggraaff B, Fujikawa S, Kim J, MacArthur CJ. Neonatal hearing screening with otoscopy, auditory brain stem response, and otoacoustic emissions. Otolaryngol Head Neck Surg. 1997;116(6 Pt 1):597-603

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Pediatrics / Çocuk Sağlığı ve Hastalıkları

Thyroid Dysfunction in Beta-Thalassemia Major: Is It Related to Autoimmunity or Iron Overload?

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ABSTRACT

Purpose: Thyroid dysfunction is an important complication of beta-thalassemia major (β-TM). Iron overload is the most important cause of thyroid dysfunction in this patient group. However, it has been investigated in various studies whether autoimmunity can also cause thyroid dysfunction. This study aimed to determine the frequency of thyroid dysfunction in β-TM and investigate whether the underlying disorder causing thyroid dysfunction is iron overload or autoimmunity.

Methods: This study analyzed 129 patients with β-TM. Free thyroxine (fT4), thyroid-stimulating hormone (TSH), antithyroid peroxidase, antithyroglobulin, and ferritin levels were measured. As the control group, 49 patients who applied to the hospital and requested TSH and fT4 were randomly selected. Both groups were compared in terms of thyroid dysfunction. In the β-TM group, patients with thyroid dysfunction were evaluated for underlying hyperferritinemia and autoimmune susceptibility.

Results: In the β-TM group, overt and subclinical hypothyroidism were detected in 11 (8.5%) and 3 (2.4%) patients, respectively. The ferritin levels of those with hypothyroidism were higher than those with normal thyroid dysfunction ($p = 0.006$, $z = -2.734$). Levels of antithyroid antibodies did not increase in any of the patients with thyroid dysfunction. In the control group, 1 (2%) patient had central hypothyroidism, and 6 (12.2%) had subclinical hypothyroidism. The number of overt hypothyroidism in thalassemia cases was statistically higher than that in the control group ($p = 0.002$).

Conclusion: The results suggest that autoimmunity may not pose a risk factor for the development of hypothyroidism in patients with β-TM, but high ferritin levels may be a reason.

Keywords: Thalassemia major; thyroid disease; autoimmunity; iron overload

Beta-Talasemi Majör hastalarında tiroid disfonksiyonu: Otoimmünite ile mi demir birikimi ile mi ilgili?

ÖZET

Amaç: Beta-talasemi major (β-TM) hastalarında gelişen en önemli komplikasyonlardan biri tiroid disfonksiyonudur. Bu hasta grubunda tiroid disfonksiyonunun en önemli nedeni vücut demir birikimi olarak düşünülmektedir. Ancak otoimmünitenin de tiroid disfonksiyonuna neden olup olmadığı çeşitli çalışmalarda araştırılmıştır. Bu çalışmada, β-TM'de tiroid disfonksiyonu sıklığının belirlenmesi ve tiroid disfonksiyonuna neden olan altta yatan bozukluğun aşırı demir yükü mü yoksa otoimmünite mi olduğunu araştırmak amaçlanmıştır.

Gereç ve Yöntem: Bu çalışmaya, 129 β-TM hastası dahil edildi. Hastaların serbest tiroksin, tiroid stimülan hormon (TSH), anti-tiroid peroksidaz, anti-tiroglobulin ve ferritin seviyeleri ölçüldü. Kontrol grubu olarak, hastaneye herhangi bir nedenle başvurmuş; TSH ve serbest tiroksin seviyeleri istenmiş olan hastalar rastlantısal olarak seçildi. Her iki grup, tiroid disfonksiyonu açısından karşılaştırıldı. Ayrıca β-TM grubundaki hastalar tiroid disfonksiyonuna neden olabilecek hiperferritinemi ve otoimmün yatkınlık açısından araştırıldı.

Bulgular: β-TM grubunda; 11 hastada (%8.5) aşikar, 3 hastada (%2.4) ise subklinik hipotiroidi saptandı. Hipotiroidisi olan hastaların ferritin seviyeleri, hipotiroidisi olmayan hastalara göre anlamlı olarak daha yüksekti ($p=0.006$, $z=-2.734$). Tiroid disfonksiyonu olan hiçbir hastada anti-tiroid antikorlar yükselmemişti. Kontrol grubunda ise bir hastada (%2) santral hipotiroidi, 6 hastada ise (%12.2) subklinik hipotiroidi mevcuttu. Aşikar hipotiroidisi olan hastaların oranı talasemi grubunda, kontrol grubuna göre anlamlı olarak daha yüksek bulundu ($p=0.002$).

Sonuç: Bu çalışmadaki bulgular, β-TM olgularındaki hipotiroidinin nedeninin otoimmün yatkınlıktan çok, hiperferritinemi olduğunu göstermektedir.

Anahtar Kelimeler: Beta-talasemi major, tiroid disfonksiyonu, otoimmünite, demir birikimi

Beta-thalassemia major (β-TM) is a disease that occurs due to a disorder in the hemoglobin synthesis chain, and patients become erythrocyte transfusion-dependent, usually after the sixth month. In Turkey, approximately 5500 patients have thalassemia. It is autosomal recessive; thus, the incidence increases in places where consanguineous marriages are frequent. Therapeutic advances in the management of thalassemia with regular erythrocyte transfusion and iron chelation have extended the life expectancy of these patients. However, chronic anemia and repeated blood transfusions may lead to endocrine complications, such as thyroid dysfunction (1-3).

Although the toxic effect of excess unbound iron in the cell is the main cause of thyroid dysfunction by generating reactive oxygen radicals, many other factors are known, such as chronic hypoxia due to anemia (4-6). In the literature, publications are conflicting regarding the predisposition of patients with thalassemia for autoimmune diseases. The beta-globin gene, which is located in the p15.5 locus of chromosome 11, and immune regulatory genes are located very close to each other; thus, patients with thalassemia minor may have a predisposition for autoimmunity. In addition, the level of hemorphin, which is a protein that suppresses the inflammatory process, decreases with the reduction of the beta-globin chain of hemoglobin, causing a predisposition for autoimmunity (7). Thus, this study aimed to determine the frequency of thyroid dysfunction in β-TM cases and investigate underlying conditions, such as autoimmunity and iron overload, which may cause thyroid impairment.

MATERIAL AND METHODS

Patient Population

This study enrolled 129 patients who had β-TM, aged 6–18 years, and were regularly transfused at the Pediatric Hematology outpatient clinic between May 2016 and May 2017. Informed consent was obtained from the children's legal guardians. The study was performed according to the Helsinki Declaration and was approved by the Harran University Ethics Committee (17/07/12).

Genetic analysis of all of the patients had been performed at the time of diagnosis. They received regular transfusion with erythrocyte suspensions every 2–4 weeks to maintain pre-transfusion hemoglobin levels >9 g/dL. According to their ferritin levels, they were using deferasirox, deferiprone, or a combination of both in different doses as iron chelation treatment. Patients with acute illness or any inflammatory process were excluded from this study. In the control group, 49 patients who applied to the hospital for a routine pediatric examination and were requested thyroid-stimulating hormone (TSH) and free thyroxine (fT4) tests were randomly selected by examining the file records. Both groups were compared in terms of thyroid dysfunction. In the thalassemia major group, patients with thyroid dysfunction were evaluated for the presence of underlying hyperferritinemia and autoimmune susceptibility.

Blood Sample Collection

Before erythrocyte transfusion, blood samples for serum TSH, fT4, antithyroglobulin (anti-TG), antithyroid peroxidase (anti-TPO), and ferritin tests were taken with the other routine tests (complete blood count and biochemistry) on the day of regular admission to the outpatient clinic. The normal values for fT4 and TSH were 0.59–1.7 ng/dL and 0.27–4.2 μIU/L, respectively, according to our laboratory reference range. The positive values for antibodies were accepted as >115 IU/mL for anti-TG and >34 IU/mL for anti-TPO according to our laboratory reference range and the literature (8).

Definitions

Primary hypothyroidism was defined as high TSH levels. It is divided into two:

- Subclinical hypothyroidism: High TSH and normal fT4 levels.
- Overt hypothyroidism: High TSH and low fT4 levels.

Secondary or central hypothyroidism was defined as low TSH and fT4 levels.

Primary hyperthyroidism was defined as low TSH levels. It is divided into two:

- Subclinical hyperthyroidism: Low TSH and normal fT4 levels.
- Overt hyperthyroidism: Low TSH and high fT4 levels.

Secondary or central hyperthyroidism: High TSH and fT4 levels (8,9).

Statistical Analysis

Clinical data were analyzed using IBM SPSS Statistics for Windows version 22 (SPSS Inc., Chicago, IL, USA).

Numerical variables were represented as mean ± standard deviation, and categorical variables were represented as a percentage. The compliance of the variables to normal distribution was examined using the histogram and Kolmogorov–Smirnov test. In comparing two independent groups, the Fisher's exact and Pearson chi-square tests were used for categorical data, and the Mann–Whitney U test was used for continuous variables. The Spearman correlation test was used to evaluate the relationship between continuous variables. Results were evaluated using a 95% confidence interval. P-values of <0.05 showed statistical significance.

RESULTS

This study enrolled 129 (51 female and 78 male) patients with β-TM. The mean patient age was 10.6 ± 3.4 (6–17.8) years. However, the mean age of the control group (n = 49) was 11.3 ± 3.3 years, which ranged from 6 to 18 years, and the female/male ratio was 0.88. No difference was found between the β-TM and control groups concerning age and sex.

In the β-TM group, overt hypothyroidism and subclinical hypothyroidism were detected in 11 (8.5%) and 3 (2.4%) patients, respectively, whereas the other 115 (89.1%) patients had normal thyroid function. Central hypothyroidism and hyperthyroidism were not detected. The mean age of those with hypothyroidism in the β-TM group was 10.9 ± 3.8 (6–17.7) years, and the female/male ratio was 0.55. In the same group, nine of the patients with hypothyroidism were between 6 and 12 years old and five were between 12 and 18 years old (p = 0.842, x2 = 0.04). In the control group, 1 (2%) patient had central hypothyroidism, and 6 (12.2%) had subclinical hypothyroidism. The mean age of those with hypothyroidism in the control group was 11 ± 3.4 (6–16) years, and the female/male ratio was 1.3. No sex difference was found between patients with hypothyroidism in the β-TM and control groups (p = 0.397). The number of overt hypothyroidism in the β-TM group was statistically higher than that in the control group (p = 0.002). The mean TSH and fT4 levels in the β-TM and control groups are demonstrated in Table 1. No difference in TSH levels was found between the β-TM and control groups (p > 0.05, z = –0.013); however, a significant difference in fT4 levels was found (p < 0.001, z = –9.085).

Table 1: Level of TSH and fT4

	Serum TSH (μIU/L)	Serum fT4 (ng/dL)
Thalassemia patients		
All	2.8±2.4 (0.63-13.08)	0.85±0.15 (0.6-1.51)
Subclinical hypothyroidism	4.5±0.14 (4.3-4.6)	1.27±0.08 (1.18-1.34)
Overt hypothyroidism	6.3±2.7 (4.1-13.08)	0.73±0.079 (0.63-0.89)
Normal thyroid function	2.4±0.9 (0.63-6.09)	0.85±0.14 (0.6-1.5)
Control Group		
All	2.7±1.27 (0.6-6.17)	1.25±0.22 (0.1-1.66)
Subclinical hypothyroidism	5.2±0.5 (4.6-6.17)	1.26±0.15 (1.09-1.46)
Normal thyroid function	2.3±0.9 (0.6-4.07)	1.27±0.15 (0.96-1.66)

The mean ferritin level in the β-TM group was 2749 ± 2006 (691–12468) ng/dL, the mean ferritin level of patients with hypothyroidism was 3924 ± 1955 (1581–7220) ng/dL, and those of patients with normal thyroid function was 2606 ± 1973.5 (691.1–12468) ng/dL. A significant difference was found between the ferritin levels of those with and without hypothyroidism (p = 0.006, z = –2.734).

A weak positive linear correlation was found between TSH and ferritin levels in the β-TM group (r = 0.235, p = 0.007); however, no relationship was found between fT4 and ferritin levels (r = –0.151, p = 0.087). In the β-TM group, anti-TPO in 1 (0.8%) patient and anti-TG in 5 (3.9%) patients were high. Thyroid dysfunction was not detected in any of the patients with a positive antithyroid antibody. The mean anti-TG level of the patients was 18.66 ± 35.38 (10–231) IU/mL, and the mean anti-TPO level was 14.04 ± 5.15 (5–34) IU/mL. No difference in anti-TG and anti-TPO levels was found between patients with and without hypothyroidism (p = 0.579 and p = 0.601, respectively). A weakly positive correlation was found between ferritin increase and anti-TG level (p = 0.02, r = 0.204), whereas no significant correlation was found between ferritin levels and anti-TPO levels (p = 0.76, r = 0.157).

DISCUSSION

Early recognition and management of endocrinological complications in patients with thalassemia are one of the important factors affecting the disease course. Hypothyroidism is a common endocrinological complication in this patient group, and its frequency has been reported as 4%–30% in various publications (10,11). In this study, the frequency of primary hypothyroidism was 10.9%, similar to the literature. Subclinical hypothyroidism and overt hypothyroidism constituted 2.4% and 8.5%, respectively, of the primary hypothyroidism group. In addition, the frequency of hypothyroidism was significantly higher in the β-TM group than in the control group. Unlike some other studies, no central hypothyroidism was detected (12,13).

Despite conflicting publications on the relationship between thyroid dysfunction and sex, a higher incidence of subclinical hypothyroidism has been reported in female patients than than males (14). No relationship was found between hypothyroidism and sex. As with all endocrinologic complications, thyroid dysfunction is expected to be more common in older individuals. However, conflicting results have been reported in the literature. For example, in the study conducted by Saleem et al. (15), hypothyroidism was reported as more frequent in the group aged 5–10 years (76.2%) than in the group aged 11–16 years (23.8%). In this study, no difference in the frequency of hypothyroidism was found between the groups aged 6–12 and 12–18 years.

Compared with the general population, patients with thalassemia were thought to have different causes of thyroid disorders. Iron can accumulate in the thyroid gland, pituitary gland, and rarely in the hypothalamus. Compared with other parts of the hypothalamus–pituitary axis, the thyroid gland appears to be more susceptible to iron deposition (16,17). Currently, the most simple and reliable method of measuring body iron accumulation is serum ferritin. In a previous study, patients with a serum ferritin level ≤ 1000 ng/mL were 3.25 times less likely to have hypothyroidism than those with a serum ferritin level >2500 ng/mL (18). In another report, the cut-off ferritin level for the risk of hypothyroidism development was 2000 ng/mL (19). In another study, all children with thyroid impairment had high serum ferritin levels (mean value, 3983 ng/mL); however, no statistical significance was found between thyroid dysfunction and serum ferritin levels (20). In the present study, the mean ferritin level of the patients was 2749 ng/mL; thus, despite intensive chelation therapy recommended for our patients, the poor treatment compliance of patients remains a problem. In this study, the ferritin level of patients with hypothyroidism was higher than those with euthyroidism, and a reasonable relationship was noted between them ($p = 0.006$, $z = -2.734$).

Correlation studies examining the relationship between hyperferritinemia and TSH and fT4 levels were also conducted. Yassouf et al. (11) declared that high serum ferritin levels were directly related to high TSH levels; however, no correlation was found between fT4 and ferritin. In this study, serum ferritin levels correlated with TSH levels ($r = 0.235$, $p = 0.007$), which coincides with the results of Chirico et al. (21).

In the literature, publications on the effects of autoimmunity on thyroid dysfunction in patients with thalassemia are conflicting. In a previous study, the prevalence of autoimmunity was 1.6% in 364 patients with thalassemia, and a limitation of the study was the absence of a control group (22). In a study performed by Zervas et al. (23), antithyroid antibodies were found in 4.5% of patients with thalassemia major, consistent with our findings. In another study, serum ferritin levels were significantly higher in patients with β-TM with positive antithyroid antibodies than in those negative for them, and the authors concluded that iron deposition was responsible for it rather than an autoimmune process of the thyroid gland (24). Interestingly, in another report, antithyroid antibodies in patients with thalassemia were much lower than in those with euthyroidism (9.2% vs 20%), suggesting that iron accumulation may inhibit autoimmunity rather than trigger it (25). In the present study, none of our patients with hypothyroidism had a high antithyroid antibody level. In addition, no significant difference was found between the mean anti-TPO and anti-TG levels in the groups with and without hypothyroidism.

This study had some limitations. In this study, only serum ferritin level was used as an indicator of body iron accumulation. Although ferritin is still the most common parameter used to monitor body iron accumulation in patients with thalassemia, it may not be a sufficient indicator for the hypothalamus–pituitary–thyroid axis. In addition, the number of people in the control group was less than that in the patient group, and parameters related to autoimmunity have not been studied in the control group. Thus, no comparison could be made.

CONCLUSION

In summary, our findings suggest that autoimmunity may not pose a risk for the development of hypothyroidism in patients with β-TM but high ferritin levels may be responsible. Prospective, randomized studies with many patients are needed to associate the relationship between autoimmunity and thyroid dysfunction in β-TM.

DECLARATIONS

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

Conflicts of Interest

The authors declare no conflict of interest.

Ethics Approval

The study was approved by the local ethic committee of Harran University (17/07/12).

Availability of Data and Material

The authors verify data transparency.

Authors' Contributions

Conceived and designed the analysis: Burcu Akıncı, Fatma Demir, Ala Üstyol and Deniz Ökdemir

Collected the data : Burcu Akıncı, Fatma Demir, Ala Üstyol and Deniz Ökdemir

Contributed data and analysis tools: Burcu Akıncı, Fatma Demir, Ala Üstyol and Deniz Ökdemir

Performed the analysis: Burcu Akıncı, Ala Üstyol

Wrote the paper: Burcu Akıncı

REFERENCES

1. Fibach E, Rachmilewitz EA. Pathophysiology and treatment of patients with beta-thalassemia - an update. F1000Res. 2017;6:2156. DOI:10.12688/f1000research.12688.1.
2. Canatan D. Thalassemias and hemoglobinopathies in Turkey. Hemoglobin. 2014;38:305-7. DOI:10.3109/03630269.2014.938163.
3. Cappellini MD, Cohen A, Porter J, et al. Viprakasit V. Guidelines for the management of transfusion-dependent thalassaemia (TDT), 3rd ed. Nicosia (Cyprus): Thalassaemia International Federation, 2014.
4. De Sanctis V, Soliman AT, Canatan D, et al. Thyroid disorders in homozygous β-thalassemia: current knowledge, emerging issues, and open problems. Mediterr J Hematol Infect Dis. 2019;11:e2019029. DOI: 10.4084/MJHID.2019.029.
5. Magro S, Puzzonia P, Consarino C, et al. Hypothyroidism in patients with thalassemia syndromes. Acta Haematol. 1990;84:72–6. DOI: 10.1159/000205032.
6. Soliman AT, De Sanctis V, Yassin M, et al. Chronic anemia and thyroid function. Acta Biomed. 2017;88:119-27. DOI:10.23750/abm.v88i1.6048.
7. Altinoz MA, Gedikoglu G, Deniz G. β-Thalassemia trait association with autoimmune diseases: β-globin locus proximity to the immunity genes or role of hemorphins? Immunopharmacol Immunotoxicol. 2012;34:181-190. DOI:10.3109/08923973. 2011.599391.
8. Głowinska-Olszewska B, Borysewicz-Sanczyk H, Sawicka B, et al. Does hashimoto's thyroiditis increase the risk of cardiovascular disease in young type 1 diabetic patients? Front Endocrinol. 2020;11:431. DOI: 10.3389/fendo.2020.00431.
9. Hirtz R, Keesen A, Hölling H, et al. No Effect of thyroid dysfunction and autoimmunity on health-related quality of life and mental health in children and adolescents: results from a nationwide cross-sectional study. Front Endocrinol. 2020;11:454. DOI: 10.3389/fendo.2020.00454.
10. De Sanctis V, Soliman A, Campisi S, et al. Thyroid disorders in thalassaemia: An update. Curr Trends Endocrinol. 2012;6:17-27.
11. Yassouf MY, Alquobaili F, Kabalan Y, et al. Compliance with deferoxamine therapy and thyroid dysfunction of patients with β-thalassemia major in Syria. Hemoglobin 2019;43:218-21. DOI:10.1080/03630269.2019.1639517.
12. De Sanctis V, Soliman A, Candini G, et al. High prevalence of central hypothyroidism in adult patients with β-thalassemia major. Georgian Medical News. 2013;222:88–94.
13. Soliman AT, Al Yafei F, Al-Naimi L, et al. Longitudinal study on thyroid function in patients with thalassemia major: High incidence of central hypothyroidism by 18 years. Indian J Endocrinol Metab. 2013;17:1090-95. DOI: 10.4103/2230-8210.122635.
14. De Sanctis V, De Sanctis E, Ricchieri P, et al. Mild subclinical hypothyroidism in thalassaemia major: prevalence, multigated radionuclide test, clinical and laboratory long-term follow-up study. Pediatr Endocrinol Rev. 2008;6:174-80.
15. Saleem M, Ghafoor MB, Anwar J, et al. Hypothyroidism in beta-thalassemia major patients at Rahim Yar Khan. JSZMC. 2016;7:1016-19.
16. Christoforidis A, Haritandi A, Tsitouridis I, et al. Correlative study of iron accumulation in liver, myocardium, and pituitary assessed with MRI in young thalassemic patients. J Pediatr Hematol Oncol. 2006;28:311-5. DOI: 10.1097/01.mph.0000212915. 22265.3b.
17. Christoforidis A, Haritandi A, Perifanis V, et al. MRI for the determination of pituitary iron overload in children and young adults with -thalassaemia major. Eur J Radiol. 2007;62:138–42. DOI: 10.1016/j.ejrad.2006.11.016.
18. Belhoul KM, Bakir ML, Saned MS, et al. Serum ferritin levels and endocrinopathy in medically treated patients with β thalassemia major. Ann Hematol. 2012;91:1107-14. DOI: 10.1007/s00277-012-1412-7.
19. Baghersalimi A, Rad AH, Koohmanaee S, et al. The cutoff of ferritin for evaluation of hypothyroidism in patients with thalassemia. J Pediatr Hematol Oncol. 2019;41:515–8. 10.1097/MPH.0000000000001489.
20. Upadya SH, Rukmini MS, Sundararajan S, et al. Thyroid function in chronically transfused children with beta-thalassemia major: a cross-sectional hospital-based study. Int J Pediatr. 2018;2018:9071213. DOI:10.1155/2018/9071213.
21. Chirico V, Antonio L, Vincenzo S, et al. Thyroid dysfunction in thalassaemic patients: Ferritin as a prognostic marker and combined iron chelators as an ideal therapy. Eur J Endocrinol. 2013;169:785–93. DOI: 10.1530/EJE-13-0627.

22. Delaporta P, Maria Karantza M, Sorina Boiu S, et al. Thyroid function in Greek patients with thalassemia major. Blood. 2012;120:5176. DOI: 10.1182/blood.V120.21.5176.5176

23. Zervas A, Katopodi A, Protonotariou A, et al. Assessment of Thyroid Function in Two Hundred Patients with b-Thalassemia Major. Thyroid. 2002;12:151-4. DOI: 10.1089/ 105072502753522383.

24. Pes GM, Tolu F, Dore MP. Anti-thyroid peroxidase antibodies and male gender are associated with diabetes occurrence in patients with beta-thalassemia major. J Diabetes Res. 2016;2016:1401829. DOI: 10.1155/2016/1401829.

25. Mariotti S, Pigliaru F, Cocco MC, et al. B-thalassemia and thyroid failure: is there a role for thyroid autoimmunity? Pediatr Endocrinol Rev. 2011;8:307-9.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI Physical Medicine and Rehabilitation / Fiziksel Tıp ve Rehabilitasyon

Neuropathic Pain and Related Factors in Female Patients with Rheumatoid Arthritis

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ABSTRACT

Purpose: Neuropathic pain (NP) can accompany Rheumatoid arthritis (RA) like many other diseases. The aim of our study was to investigate the frequency of NP and related factors in female patients with RA.

Methods: Age, disease duration, body mass index (BMI) and erythrocyte sedimentation rate (ESR) were recorded. A pain visual analog scale (VAS) was used to record pain intensity and a pain-detect questionnaire (PDQ) was used to record NP score. RA disease activity was calculated with DAS28 score. Health Assessment Questionnaire (HAQ) was used for functional status.

Results: NP scores of the patients were high. A significant correlation was found between PDQ and VAS, BMI and HAQ values. The correlation value between PDQ and disease duration, age, inflammation and disease activity was not significant.

Conclusion: All of the patient's pain may not be caused by inflammation. If this is the case, treatment can change. If the pain pattern is questioned and treated, unnecessary use of anti-inflammatory drugs can be prevented.

Keywords: inflammation, pain, rheumatoid arthritis

Halime KİBAR

Romatoid Artritli Kadın Hastalarda Nöropatik Ağrı ve İlişkili Faktörler

ÖZET

Amaç: Nöropatik ağrı (NP), diğer birçok hastalık gibi Romatoid artrite (RA) de eşlik edebilir. Çalışmamızın amacı, RA'lı kadın hastalarda NP sıklığını ve ilişkili faktörleri araştırmaktır.

Yöntem: Yaş, hastalık süresi, vücut kitle indeksi (VKİ) ve eritrosit sedimantasyon hızı (ESR) kaydedildi. Ağrı şiddetini kaydetmek için bir ağrı görsel analog skalası (VAS) kullanıldı ve NP skorunu kaydetmek için ağrı algılama anketi (PDQ) kullanıldı. RA hastalığı aktivitesi DAS28 skoru ile hesaplandı. Fonksiyonel durum için Sağlık Değerlendirme Anketi (HAQ) kullanıldı.

Bulgular: Hastaların NP skorları yüksekti. PDQ ile VAS, BMI ve HAQ değerleri arasında anlamlı bir korelasyon bulundu. PDQ ile hastalık süresi, yaş, inflamasyon, ve hastalık aktivitesi arasındaki korelasyon değeri anlamlı değildi.

Sonuç: RA hastalarının tamamında ağrı nedeni inflamasyon olmayabilir. Bu durumda tedavi değişebilir. Ağrı paterni sorgulanıp tedavi edilirse gereksiz antiinflamatuar ilaç kullanımının önüne geçilebilir.

Anahtar kelimeler: İnflamasyon, ağrı, romatoid artrit

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As a chronic, inflammatory condition that mostly affects the synovial joints, rheumatoid arthritis (RA) is known (1). The main complaint of patients with RA is pain. It has been reported that the improvement in pain is the most important parameter for the patient (2).

Activation of inflammatory cytokines and sensitization of peripheral nerve endings cause pain (3). Synovial inflammation causes the release of bradykinin and prostaglandins, thus, the thin C fibers in the synovium are stimulated (4,5). Because RA is an inflammatory disease, treatment is aimed at suppressing inflammation. Complaints are expected to decrease as inflammation is suppressed. However, it is difficult to fully control the pain even in RA patients who are under close follow-up. In a study, evaluating patients who were in remission for more than a year, it was concluded that 12.5% of patients had significant pain complaints. It has been reported that pain control remains inadequate even if inflammation is controlled (6).

These results brought to mind the idea that there are other pain mechanisms in the pathogenesis of pain. Questioning the character of pain has revealed that different mechanisms also cause pain in inflammatory diseases. The frequency of neuropathic pain (NP) was investigated and important results were obtained in studies conducted with female and male RA patients (7,8).

The aim of our study was to investigate the frequency of NP and related factors in female patients with RA.

MATERIALS AND METHODS

104 patients with RA who were admitted to the outpatient clinic were included consecutively in this cross-sectional observational study. 2 patients were missing data. We performed a face to face interview and physical examination.

All patients were previously diagnosed according to the ACR 1987 or 2010 diagnostic criteria. All patients were followed up regularly.

1987 ACR Classification criteria for RA (It is necessary for the patient to have at least 4 criteria for the diagnosis of RA.)

A. Morning stiffness in and around joints lasting at least one hour before maximal improvement,

B. Soft tissue swelling of three or more joint areas observed by a physician

C. Swelling (arthritis) of the proximal interphalangeal, metacarpophalangeal, or wrist joints

D. Symmetric joint swelling

E. Rheumatoid nodules

F. The presence of rheumatoid factor in blood tests

G. Radiographic erosions and periarticular osteopenia in hand or wrist joints or both

2010 ACR/EULAR Classification criteria for RA (A score of ≥ 6/10 is needed for a definite classification of a patient with RA.)

A. Joint involvement: Large joint 0, 2-10 large joints 1, 1-3 small joints (with or without involvement of large joints) 2, 4-10 small joints (with or without involvement of large joints) 3, >10 joints (at least one small joint) 5

B. Serology (at least one test result is needed for classification): Negative RF and negative ACPA 0, Low positive RF or low positive ACPA 2, High positive RF or high positive ACPA 3

C. Acute Phase Reactans (at least one test result is needed for classification): Normal CRP and normal ESR 0, Abnormal CRP or abnormal ESR 1

D. Duration of symptoms: < 6 weeks 0, ≥ 6 weeks 1

Patients with diabetes were not included in the study. Patients who were using regular nonsteroidal anti-inflammatory drugs (NSAID) were excluded from this study. It was questioned whether the patients had previously received pregabalin, gabapentin, amitriptyline, duloxetine or another medical treatment for NP. Patients who use these drugs were not included in the study. Patients with a history of NP, neurological disease, spinal surgery or a history of spinal disease were excluded.

Age, disease duration, body mass index (BMI) and medication were recorded. Tenderness and swelling in the joints were evaluated by the physiatrist. DAS28 score was calculated with an erythrocyte sedimentation rate (ESR). A patient with a DAS28 score of less than 2.6 is in remission; a score greater than or equal to 2.6 and less than 3.1 indicates low activity; a score greater than or equal to 3.1 and

<5.1 indicates moderate activity and a score of 5.1 or more indicates high activity (9).

A visual analog scale (VAS, 0-100 mm) was used for the pain assessment of the patients.

The Turkish version of the pain-detect questionnaire (PDQ) was used for the evaluation of NP (10). The severity, location, spread, course and pattern of the pain are evaluated with the PDQ. Patients are asked to rate the questions between 0-10. The score is calculated in the range of 0-38.

12 Unlikely neuropathic pain

13–18 Possible neuropathic pain

19 Likely neuropathic pain is defined.

Alkan H et al. (10) performed the Turkish validity and reliability PDQ. When the cut-off value was accepted as 19 or below, the sensitivity was 77.5 % and the specificity was 82.5%. Hallström et al. (7) determined its sensitivity as 68 % and specificity as 83%. In Hallström's study, the sensitivity of the DN4 questionnaire was 93%, and the specificity was 75%; The sensitivity of the LANSS questionnaire was 36% and the specificity was 100% (11).

Functions were measured by Health Assessment Questionnaire (HAQ). HAQ has been developed by Fries et al. (12). It has been adapted for the Turkish people (13).

The study protocol was approved by the Istanbul Kanuni Sultan Suleyman Training and Research Hospital ethics committee (KAEK/2022.12.235). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Written informed consent was obtained from the patients.

STATISTICS

Utilizing the package application SPSS version 22.0, statistical analyses were performed. The four main components of descriptive statistics were number, percentage, mean, and standard deviation. Utilizing both mathematical and visual techniques (such as probability graphs and histograms), the appropriateness of variables to the normal distribution was evaluated (Shapiro-Wilk test). The Levene test was used to assess the homogeneity of the variances.

Descriptive statistics were used to show the nonparametric data, and the chi-square test was used to assess them. Both numbers (n) and percentages (%) were used to represent the categorical variables.

Pearson correlation test was used in correlation. Multiple Regression Analysing was used. In the statistical analyzes in the study, values (p) below 0.05 were considered significant.

RESULTS

102 patients completed in the study. The characteristics of the patients are presented in Table 1. The mean age of patients was 55.01 ± 12.55 (Minimum 23, Maximum 78, Median 54.5). The mean disease duration was 10.87 ± 7.9 years (Minimum 1, Maximum 35, Median 8). The mean BMI of the patients was 28.9 ± 5.92 (Minimum 17.7, Maximum 44.4, Median 27.95). The mean VAS of the patients was 40.89 ± 22.9 (Minimum 0, Maximum 95, Median 50). The mean ESR value of the patients was 23.8± 16.8 (Minimum 3, Maximum 81, Median 21). The disease activity score was calculated by ESR value, swelling and tenderness of 28 joints and general health evaluation score of the patient with 0-100 mm, and the mean DAS28 value was 3.3 ± 1.12 (Minimum 1, Maximum 5.7, Median 3.3). The mean HAQ score was 0.94 ± 0.78 (Minimum 0, Maximum 3, Median 0.72).

The mean PDQ was 14.2 ± 7.83 (Minimum 0, Maximum 32, Median 15). PDQ evaluation results of the patients were recorded in 3 groups. Most patients were identified in the possible neuropathic pain group (40%). Possible and likely neuropathic pain was detected in 61.43% of the patients.

24.5% of patients were normal weight, 36.2% were overweight, and 39.3% were obese. 19.6% of the patients were in remission, 38.4% had low disease activity, 35% had moderate disease activity, and 7% had high disease activity.

Considering the drugs used by the patients, 47.1% were disease-modifying antirheumatic drug (DMARD) therapy (88% methotrexate, 9% leflunomide, 2% hydroxikhlorokin, 1% sulfasalazine), 25% DMARD + glucocorticoid therapy, 10.57% was only biological therapy, 8.68% was biological therapy + glucocorticoid, 8.65% was DMARD + biological therapy.

Table 1

Characteristics of Patients	Mean ± SD	Min-Max	Median
Age (years)	55.01 ± 12.55	23-78	54.5
Disease duration (years)	10.87 ± 7.9	1-35	8
BMI (kg/m^2)	28.9 ± 5.92	17.7-44.4	27.95
VAS (0-100 mm)	40.89 ± 22.9	0-95	50
DAS28	3.33 ± 1.12	3.3-5.7	3,3
ESR	23.8 ± 16.8	3-81	21
HAQ	0.94 ± 0.78	0-3	0.72
PDQ	14.2 ± 7.83	0-32	15
PDQ1 (%)	38.57		
PDQ 2 (%)	40		
PDQ3 (%)	21.43		
Medical therapy (%)			
DMARD	47.1		
DMARD+gc	25		
Biological therapy	10.57		
Biological therapy+gc	8.68		
Biological therapy+DMARD	8.65		
Disease activity (%)			
Remission	19.6		
Low activity	38.4		
Moderate acvtivity	35		
High activity	7		

Data are means , BMI: body mass index, VAS: visual analog scale (0-100 mm), HAQ: health assessment questionnaire , ESR: erythrocyte sedimentation rate, PDQ: painDETECT quastionnare

Table 2

Multiple Regression Analysis

Method

Categorical predictor coding (1, 0)
Rows unused 1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	11	1069.44	97.222	2.46	0.010
Age	1	2.90	2.902	0.07	0.787
BMI	1	354.71	354.71	9.06	0.003
Disease duration	1	80.53	80.533	2.03	0.157
ESR	1	5.66	5.664	0.14	0.706
Das28	1	32.51	32.511	0.82	0.367
HAQ	1	517.18	517.18	13.21	<0.001
VAS	1	1200.41	1200.41	30.67	<0.001
Medication 1- syn DMARD 2-syn D	4	55.15	13.787	0.35	0.845
Error	91	3602.52	39.588		
Total	102	4671.96			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
6.25599	37.63%	36.26%	33.42%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-1.80	2.72	-0.66	0.509	
BMI	0.2714	0.0901	3.01	0.003	1.02
HAQ	2.648	0.729	3.64	<0.001	1.14
VAS	0.1381	0.0249	5.54	<0.001	1.16

Regression Equation

pDQ = -1.80 + 0.2714 BMI + 2.648 HAQ + 0.1381 VAS

Table 3

Correlations Between Characteristics of Patients

	Age (p)	BMI (p)	VAS (p)	DAS28 (p)	Disease duration (p)
BMI	0.320	-	0.363	0.986	0.760
VAS	0.825	0.363	-	<0.001	0.643
Disease duration	<0.001	0.760	0.643	0.160	-
DAS28	0.453	0.986	<0.001	-	0.160
HAQ	0.847	0.924	0.173	0.522	0.359

Data are means , BMI: body mass index, VAS: visual analog scale (0-100 mm), HAQ: health assessment questionnaire

The multi-regression analysis is presented in Table 2. A significant correlation was found between PDQ and VAS, BMI and HAQ values (Figure 1,2,3 respectively). The correlation value between PDQ and disease duration, age and DAS28 was not significant. There was no relationship between the drugs used by the patients and NP.Correlations between patient characteristics are presented in Table 3. The relationship between age, BMI, VAS, HAQ and disease duration was investigated. A significant correlation was found between age and disease duration. In addition, a significant correlation was found between DAS28 and VAS. There was no correlation between other parameters.

DISCUSSION

The purpose of this study was to determine the prevalence of NP in female patients with RA and to evaluate the associations between NP and the patient's age, disease duration, disease activity, inflammation, BMI, pain intensity, functional status, and medication use.

NP unpossible was 38.57%, NP possible was 40%, and likely NP was 21.43% of the patient with RA.

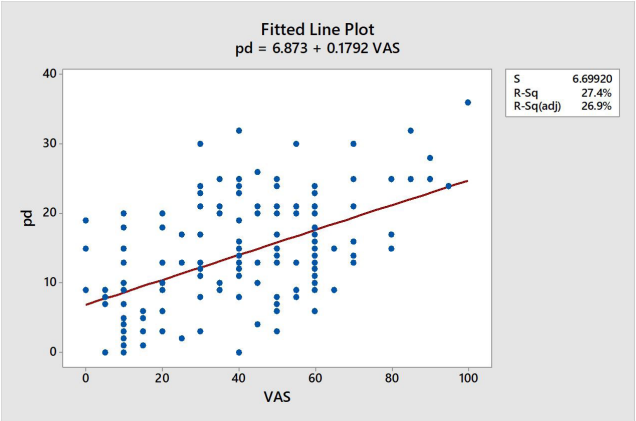

Figure 1. *The Relationship Between PDQand VAS.*

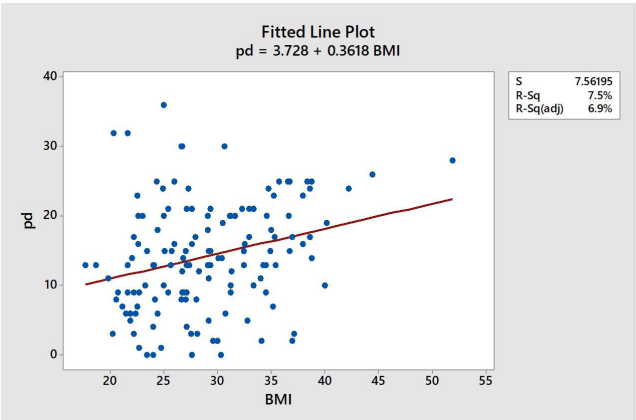

Figure 2. *The relationship Between PDQ and BMI.*

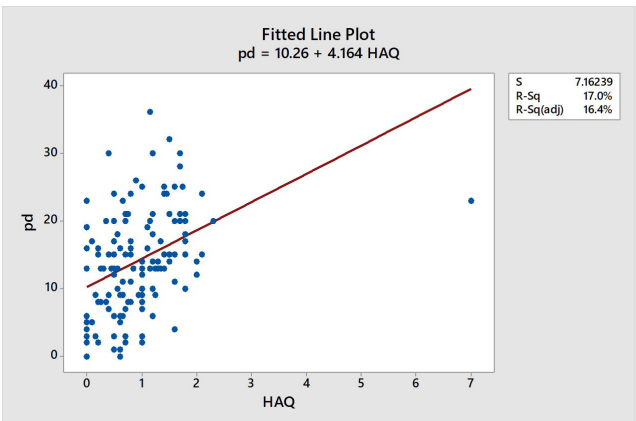

Figure 3. *The relationship Between PDQ and HAQ.*

The factors associated with NP were BMI, pain severity and functionality. There was no relationship between NP and age, disease duration, disease activity, and inflammation.

Pain is one of the most common complaints in RA. 68% of RA patients identified a reduction in pain as their first priority (14). McWilliams et al. (15) evaluated patients with RA after one year of DMARD therapy and did not determine a significant difference in pain levels. Patients are asked to score their pain levels, but the pain character is not questioned in pain assessment with VAS. The pain score may be affected by NP.

Ahmed et al. (8) found a correlation between PDQ score and pain severity. This result supports the idea that pain character should be questioned before treatment. Only patient-reported poor health scores may lead to failure to achieve remission in some patients (16,17). It was reported that the patient's global assessment correlated with the patient's pain score (18). Health scores can be affected by pain. This may lead to a high account of disease activity. Although DAS28 is associated with inflammatory activity, it has been shown to be affected by factors such as chronic pain (19). In our study, there was a relationship between DAS28 and pain severity, but no relationship was found between DAS28 and disease duration. This result does not support that disease activity is associated with chronic pain.

Koop et al.(7) reported that although 75% of patients were in remission, 44% had significant pain. According to PDQ, they found likely NP in 17% of patients and possible NP in 21%. We detected a higher rate of NP in our patients compare with previous studies (7, 20, 21). We think that this result may be due to two reasons. First, there may be differences in the perception of pain between societies. Second, our study was conducted with only female patients.

Previously, obesity has been identified as a risk factor for chronic pain (22, 23, 24). Fantuzzi (25) reported that white adipose tissue plays an active role in the regulation of physiological and pathological processes, including immunity and inflammation. It was determined a significant difference between normal, overweight and obese patients in pain scores evaluated with the VAS in patients with RA in another study (8). In our study, there was no relationship between VAS and BMI, but there was a relationship between NP and BMI. The increase in BMI may increase NP not only by mechanical factors but also by different mechanisms.

Schaefer et al. (26) observed that high pain levels were associated with functionality in patients with NP. Doth et al. (27) stated that neuropathic pain negatively affects the quality of life, and this effect increases with the severity of the pain. Rocha et al. (20) reported an association between NP and functional score (HAQ).

Noda et al.(18) investigated the characteristics of pain and the impact of NP-like symptoms (with PDQ) on health-related quality of life (HRQoL) with RA. They detected how the HRQoL of RA patients was effected by NP-like symptoms. In patients with NP-like symptoms, they discoveredinconsistencies between the overall assessments provided by patients and raters. Consequently, they have suggested that more attention should be paid to NP-like symptoms when treating patients with RA. A measure called HRQoL is used to assess a patient's level of pain and physical and mental health. In our study, we did not assess mental health. We discovered a connection between NP and the functionality of the patients consistent with the literature. While no relationship was found between pain and functionality in our study, there was a relationship between NP and functionality. We care about this result for RA. Any condition that may contribute to increased functionality, especially in RA patients, should be evaluated for treatment.We have not found a relationship between NP and disease activity and ESR value. Previously, no relationship was found between NP and DAS28, CRP and ESR (7). This indicates that NP is not associated with inflammation. The mean disease activity levels of our patients were also higher than we expected. This may be related to the high NP scores of our patients. NP may have affected the general health score in the disease activity calculation. In our study, a relationship was also found between DAS28 and VAS. While there is a relationship between NP and VAS, it is contradictory that there is no relationship between DAS28. This situation can only be clarified by controlled studies in which patients are re-evaluated with DAS28 after NP treatment.

NP and disease duration had no correlation. This result was compatible with previous studies (7,20,21). It has been discussed that pain persists with central sensitization mechanisms in tissues without inflammation in patients with chronic pain (28). According to this hypothesis, chronic pain and NP are expected to be associated. However, the fact that disease duration is not associated with NP confirms the need for further investigation. The gold standard diagnostic method for central sensitization does not exist, but there are studies that found a relationship between an increase in the 'PainDetect' pain score and central sensitization (21,29,30).

We also recorded the drugs used by the patients in the study. Patients are not homogeneous in terms of the drug therapy they use for RA. We also included patients using glucocorticoids in our study. There was no relationship between drugs and NP. This result showed that NP could not be controlled with RA treatment.

This study has some strengths and limitations. The strength is that all evaluations were made by the same researcher. The first limitation is a single method was used for NP assessment. Secondly, a cause and effect relationship cannot be established because of the cross-sectional design.

As a result, pain should be questioned in detail when evaluating RA patients. The presence of a neuropathic component must be investigated. Thus, the treatment approach of patients may change. Weight control might also decrease NP. However, controlled studies are needed to prove this possibility. Weight control of all RA patients should be considered and followed. Besides its beneficial effects on the heart and joints, it may also be effective in reducing NP. This should be taken into account, especially in drug dosing and switching decisions i. NP affects daily life functions. Controlling pain and improving the patient's functionality increase the quality of life. More studies on this subject will be beneficial for patients and professionals.

DECLARATIONS

Ethics Committee Approval

The Istanbul Kanuni Sultan Suleyman Training and Research Hospital ethics committee (KAEK/2022.12.235) gave its approval to the study protocol. The Declaration of Helsinki's guiding principles were followed in conducting the study.

Patient Consent for Publication

Each patient provided written, fully informed consent.

Data Disclosure Statement

Upon a reasonable request, the corresponding author will provide the data that underpin the study's conclusions.

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Conflict of Interest

There were no declared conflicts of interest that would have affected this article.

REFERENCES

1. Brasington RD. Hochberg MC, Silman AJ et al. Clinical features of rheumatoid arthritis. Rheumatology. Fourth ed. New York: Mosby;2008:763-764.
2. Ten Klooster PM, Veehof MM, Taal E et al. Changes in priorities for improvement in patients with rheumatoid arthritis during 1 year of anti-tumour necrosis factor treatment. Ann Rheum Dis. 2007;66:1485–90.
3. Kidd BL, Urban LA. Mechanisms of inflammatory pain. British Journal of Anaesthesia. 2001;87(1):3-11.doi: 10.1093/bja/87.1.3.
4. Schaible H-G, Ebersberger A, Von Banchet GS. Mechanisms of pain in arthritis. Ann N Y Acad Sci. 2002;966:343–354. 24.
5. Lee YC, Nassikas NJ, Clauw DJ. The role of the central nervous system in the generation and maintenance of chronic pain in rheumatoid arthritis, osteoarthritis and fibromyalgia. Arthritis Res Ther. 2011;13(2):211.
6. Lee YC, Cui J, Lu B, Frits ML, Iannaccone CK, Shadick NA, et al. Pain persists in DAS28 rheumatoid arthritis remission but not in ACR/EULAR remission: a longitudinal observational study. Arthritis Res Ther 2011;13:R83.
7. Koop SMW, Klooster P M, Harald E et al. Neuropathic-like pain features and cross-sectional associations in rheumatoid arthritis. Arthritis Research & Therapy. 2015;17:237.
8. Ahmed S, Magan T, Vargas M et al. Use of the painDETECT tool in rheumatoid arthritis suggests neuropathic and sensitization components in pain reporting. J Pain Res 2014 Oct 14;7:579-88.
9. Fransen J, van Riel PL. The Disease Activity Score and the EULAR response criteria. Clin Exp Rheumatol. 2005;23:S93–9.
10. Alkan H, Ardic F, Erdogan C et al. Turkish Version of the painDETECT Questionnaire in the Assessment of Neuropathic Pain: A Validity and Reliability Study. Pain Med. 2013 Dec;14(12):1933-43.
11. Hallström H, Norrbrink C. Screening tools for neuropathic pain: Can they be of use in individuals with spinal cord injury? Pain 2011;152(4):772-9
12. Fries JF, Spitz P, Kraines G et al. Measurement of Patient Outcome in Arthritis, Arthritis and Rheumatism, 1980, 23:137-145.
13. Kucukdeveci AA, Sahin H, Ataman S et al. Issues in crosscultural validity: example from the adaptation, reliability and validity testing of a Turkish version of the Standford Health Assessment Questionnaire. Arthritis Care Res 2004; 51(1): 14-19.
14. Heiberg T, Finset A, Uhlig T et al. Seven year changes in health status and priorities for improvement of health in patients with rheumatoid arthritis. Ann Rheum Dis. 2005;64:191–195.
15. McWilliams DF, Zhang W. Mansell JS et al. Preddictors of change in bodily pain in early rheumatoid arthiritis: an inception cohort study. Arthiritis Care Res. 2014:64 (10): 1505-1513.
16. Vermeer M, Kuper HH, van der Bijl AE et al. The provisional ACR/EULAR definition of remission in RA: a comment on the patient global assessmentcriterion. Rheumatol. 2012;51:1076–80.
17. Masri KR, Shaver TS, Shahouri SH et al. Validity and reliability problems with patient global as a component of the ACR/EULAR remission criteria as used in clinical practice. J Rheumatol. 2012;39:1139–45.
18. Noda K, Saitou M, Matsushita T et al. How do central ensitization features affect symptoms among patients with rheumatoid arthritis? Analysis of pain descriptors and the effect of central sensitivity syndrome on patient and evaluator global assessments . Clin Exp Rheumatol. 2022 Nov;40(11):2119-2124.
19. Ranzolin A, Brenol JC, Bredemeier M, et al. Association of concomitant fibromyalgia with worse disease activity score in 28 joints, health assessment questionnaire, and short form 36 scores in patients with rheumatoid arthritis. Arthritis Rheum 2009;61:794–800.
20. Rocha TM, Pimenta S, Bernardo A et al. Determinants of non-nociceptive pain in Rheumatoid Arthritis. Acta Reumatol Port 2018 Oct-Dec;43(4):291-303.
21. Christensen AW, Rifbjerg-Madsen S, Christensen R et al. Non-nociceptive pain in rheumatoid arthritis is frequent and affects disease activity estimation: cross-sectional data from the FRAME study. Scand J Rheumatol.2016 Nov;45(6):461-469.
22. Bigal ME, Liberman JN, Lipton RB. Obesity and migrane: apopulation study. Neurology, 2006;(4):545-550.
23. Lake JK, Power C, Cole TJ. Back pain and obesity in the 1958 British birth cohort. Cause or effect? J Clin Epidemiol. 2000;53(3):245–250.
24. Peres MF, Lerario DD, Garrido AB. Primary headaches in obese patients. Arq –Neuropsiquiatr. 2005;63 (4):931-933
25. Fantuzzi G. Adipose tissue, adipokines, and inflammation. J Allergy Clin Immunol. 2005;115: 911–9.
26. Schaefer C, Mann R, Sadosky A et al. Burden of Illness Associated with Peripheral and Central Neuropathic Pain among Adults Seeking Treatment in the United States: A Patient-Centered Evaluation. Pain Medicine 2014;15(12): 2105-2119. 216.
27. Doth AH, Hansson PT, Jensen MP. The burden of neuropathic pain: a systematic review and meta-analysis of health utilities. Pain 2010;149(2): 338-344.
28. Pollard LC, Ibrahim F, Choy EH. Pain thresholds in rheumatoid arthritis: the effect of tender point counts and disease duration. J Rheumatol. 2012; 39(1):28–31.
29. Amris K, Jespersen A, Bliddal H. Self-reported somatosensory symptoms ofneuropathic pain in fibromyalgia and chronic widespread pain correlatewith tender point count and pressure-pain thresholds. Pain. 2010;151:664–9.
30. Hochman JR, Davis AM, Elkayam J et al. Neuropathic painsymptoms on the modified painDETECT correlate with signs of centralsensitization in knee osteoarthritis. Osteoarthritis Cartilage. 2013; 21:1236–42.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Psychiatry / Psikiyatri

Fetal Echocardiography: Is an Anxiety and Stress Factor for Mother and Fetus?

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ABSTRACT

Purpose: There are conflicting data about the effects of fetal echocardiography on the psychiatric symptoms of the mother and cardiac evaluation of the fetus. Based on this, the aim of the study is to investigate maternal anxiety and stress levels before undergoing fetal echocardiography and its possible effect on fetal cardiac measurements.

Methods: This study included 119 pregnant women who evaluated using fetal echocardiography as the study group and 65 healthy pregnant women who evaluated using ultrasonography for routine screening as the control group. All participants filled out State and Trait Anxiety Inventory (STAI), Perceived Stress Scale (PSS), and Beck Depression Inventory (BDI) before assessment. Mitral flow velocity, tricuspid flow velocity, aorta flow velocity, pulmonary artery flow velocity, and fetal heart rate was evaluated by fetal echocardiography.

Results: STAI-S, STAI-T, and PSS scores of women who were evaluated by using fetal echocardiography were higher than the control group. In the fetal echocardiography group, the aorta flow velocity values of pregnant women with high STAI-S scores were higher than those with low STAI-S scores. Fetal heart rate was higher in pregnant women with low STAI-T scores compared to pregnant women with high STAI-T scores. Correlation analyses showed that STAI-S scores and aorta flow velocity values and the number of pregnancies were positively correlated. In addition, fetal heart rate was found to be negatively correlated with STAI-S, STAI-T, and PSS scores.

Conclusion: Fetal echocardiography can cause anxiety and stress in pregnant women and may have negative effects on fetal cardiac evaluation.

Keywords: anxiety, depression, echocardiography, pregnancy

Fetal Ekokardiyografi: Anne ve Fetüs için Kaygı ve Stres Faktörü müdür?

ÖZET

Amaç: Fetal ekokardiyografinin annenin psikiyatrik semptomları ve fetüsün kardiyak değerlendirmesi üzerindeki etkileri hakkında çelişkili veriler vardır. Buradan yola çıkarak çalışmanın amacı fetal ekokardiyografi yapılmadan önce maternal kaygı ve stres düzeylerini ve bunun fetal kardiyak ölçümler üzerine olası etkisini araştırmaktır.

Yöntem: Bu çalışmaya, çalışma grubu olarak fetal ekokardiyografi kullanılarak değerlendirilen 119 gebe ve kontrol grubu olarak rutin tarama için ultrasonografi kullanılarak değerlendirilen 65 sağlıklı gebe dahil edildi. Tüm katılımcılar, ultrasonografi değerlendirmesinden önce durumluk ve sürekli kaygı envanteri (STAI), algılanan stres ölçeği (PSS) ve beck depresyon envanteri'ni (BDI) doldurdu. Mitral akış hızı, triküspit akış hızı, aort akış hızı, pulmoner arter akış hızı, fetal kalp hızı fetal ekokardiyografi ile değerlendirildi.

Bulgular: Fetal ekokardiyografi ile değerlendirilen gebelerin STAI-S, STAI-T ve PSS puanları kontrol grubuna göre daha yüksekti. Fetal ekokardiyografi grubunda STAI-S skoru yüksek olan gebelerin aort akış hızı değerleri, STAI-S skoru düşük olanlara göre daha yüksekti. STAI-T skoru düşük olan gebelerde fetal kalp hızı, STAI-T skoru yüksek olan gebelere göre daha yüksekti. Korelasyon analizleri, STAI-S skorları ile aort akım hızı değerleri ve gebelik sayısı arasında pozitif korelasyon olduğunu gösterdi. Ayrıca fetal kalp hızının STAI-S, STAI-T ve PSS puanları ile negatif korelasyon gösterdiği bulundu.

Sonuç: Fetal ekokardiyografi, gebelerde anksiyete ve strese neden olabilir ve fetal kardiyak değerlendirmeyi olumsuz etkileyebilir.

Anahtar Kelimeler: anksiyete, depresyon, ekokardiyografi, gebelik

Fetal echocardiography is a detailed sonographic evaluation tool used to assess prenatal fetal cardiac structure and function, and detect fetal heart abnormalities (1). Fetal echocardiography, which was used to be mainly used for evaluating congenital heart disease (CHD), is now routinely required in cases such as having a family history of CHD, as a screening test to detect abnormalities (2). In addition, the guidelines recommend fetal echocardiography if the mother has a metabolic disease such as diabetes, or if she has a history of in vitro fertilization and multiple pregnancies (3). Fetal echocardiography has been shown in many studies to reduce neonatal morbidity and possible CHD-related mortality (4). It has been noted that most cases of CHD diagnosed before the delivery are seen in pregnancies without a defined risk factor (5). For these reasons, the number of pregnant women referred for fetal echocardiography for routine control without any risk factors is increasing. Although fetal echocardiography imaging is increasing, there are limited data on the effect of its application on the psychological well-being of the mother and on the cardiac evaluation of the fetus. Studies on this subject have reported that normal fetal echocardiography results reduce anxiety (6). However, the anxiety of pregnant women was retrospectively evaluated in studies long after fetal echocardiography imaging and studies that evaluated the mother's anxiety levels before the fetal echocardiography are rare. In a study that evaluated maternal anxiety before fetal echocardiography, high levels of anxiety were reported in pregnant women admitted for fetal echocardiography compared to women who did not (7). For this reason, clinicians should consider psychiatric symptoms in women undergoing prenatal diagnostic procedures.

Routine obstetric ultrasonography assessments have been shown to be a positive and quite a desirable experience for most pregnant women (8). However, detection of unexpected conditions, such as suspected chromosomal abnormalities and fetal structural abnormalities, during a routine USG scan has been reported to lead pregnant women to think negatively and experience intense anxiety (9). Prenatal screening experience, including fetal echocardiography, has been found to be a factor of stress for mothers and their partners due to the fear of diagnosis about their babies during pregnancy (10). In addition, waiting for a prenatal diagnosis can cause a depressed mood, guilt, lack of motivation, and feelings of helplessness (11). Data from all these studies support the idea that more attention should be paid to the psychological state of the mother during the evaluation of pregnancy-related medical conditions.

A referral to a specialist for fetal echocardiography for a suspected fetal anomaly or for routine control can be a source of anxiety and stress for an expectant mother. Based on this, the aim of the study is to investigate maternal anxiety and stress levels before undergoing fetal echocardiography and its potential effect on fetal cardiac measurements. We hypothesize that fetal echocardiography is an imaging tool that can lead to anxiety and stress in pregnant women, and anxiety that occurs before the procedure can have a negative impact on fetal cardiac evaluation.

Materials and Methods

Procedure

This cross-sectional study was conducted with pregnant women admitted to a maternity and child hospital. Women who were evaluated with fetal echocardiography for the first time were included in the study as the study group. As a control group, healthy pregnant women who have no problems related to pregnancy and fetuses and who did not undergo fetal echocardiography were included. Participants' anxiety, stress, and depression levels were evaluated using various scales. The scales were filled in by participants half an hour before fetal echocardiography. All participants gave their written informed consent after the investigators had explained the aim and course of the study. Oral assent was also obtained from all participants.

Materials

State-Trait Anxiety Inventory (STAI)

STAI is a 40-item self-report scale, developed by Spielberger to measure an individual's state and trait anxiety levels (12). The scale has two different forms consisting of 20 items, measuring state anxiety (STAI-S) and trait anxiety (STAI-T). The score ranges from 20 to 80 on the 4-point Likert-type scale, which is rated from 1 (never) to 4 (completely). The validity and reliability study of the scale for our country was conducted by Oner and Le Compte (13). STAI is widely used to assess anxiety during pregnancy, and the cut-off score was taken as 40 (high anxiety) in the studies conducted so far (14).

Perceived Stress Scale (PSS)

PSS has been designed to measure the degree of perceived stress in an individual's life caused by some circumstances (15). Participants evaluate 10 items on the scale on a five Likert-type scale, which ranges from never (0) to very often (4). The validity and reliability study of the scale for our country was conducted by Eskin et al. (16). Cut-off score of PSS was taken as 15 (high stress) in the studies conducted so far (17).

Beck Depression Inventory (BDI)

BDI is a 21-item self-report scale designed to assess the severity of depressive symptoms (18). BDI is the most widely used depression measurement tool around the world. The validity and reliability study of the scale for our country was conducted (19).

Fetal Echocardiography

Fetal echocardiography was performed with Philips Affiniti 50 (Philips Healthcare, Andover, Netherlands) by the same observer and an echocardiographic scanner with 2.5-5 MHz transducers was used. The fetal examination included the standard techniques to evaluate the position and axis of the heart and for scanning plans and conventional Doppler and M-mode measurements (20). The structural disorders of the heart were evaluated by a two-dimensional ultrasound imaging technique and the rhythm and dimensions of the heart were evaluated by the M-mode technique (21).

Statistical Analysis

The data were analyzed using SPSS 20 software (IBM Corporation, Armonk, NY, USA). The data were presented as mean (standard deviation [SD]) for numerical variables and percentages for categorical variables. The Kolmogorov-Smirnov normality test was used to determine whether the variables have a normal distribution. Chi-square (χ^2) test was used to compare categorical variables and frequencies. Continuous variables were expressed by means (SD). Student's t-test was used to compare the variables with normal distribution between the two groups. The Mann-Whitney U test was used to analyze non-normally distributed variables. Bivariate correlations were evaluated using Pearson's correlation analyses to determine the association between psychiatric variables and fetal echocardiography measurements. All statistical analyses were performed within a 95% confidence interval, and a p-value of <0.05 was considered statistically significant.

Results

This study was conducted with 119 pregnant women in the study group who were assessed with fetal echocardiography, and 65 healthy pregnant women who were assessed with routine USG screening in the control group. The sociodemographic and clinical characteristics of the women are presented in Table 1. The mean age of the women who were assessed with fetal echocardiography was 26.34±4.8, and 26.89±4.32 in the control group (p=0.293). There was no statistically significant difference between the two groups in terms of participants' educational level and family income (p>0.05). The mean gestational age of the women who were assessed with fetal echocardiography was 25.47±4.95, and 26.56±8.65 in the control group (p=0.107). Of the women who were assessed with fetal echocardiography, 40 (33.6%) had their first pregnancy, 79 (66.4%) had their second or later pregnancies. In the control group, 17 (26.1%) had their first pregnancy, 48 (73.9%) had their second or later pregnancies (p=0.296). In the fetal echocardiography group, 92 (77.3%) had no history of miscarriage, while 19 (15.9%) had one miscarriage, and 8 (6.8%) had a history of two or more miscarriages. In the control group, 44 (67.6%) had no history of miscarriage, 11 (16.9%) had one miscarriage, and 10 (15.5%) had a history of two or more miscarriages (p=0.152).

A comparison of the psychiatric variables between the study groups is shown in Table 2. STAI- S and STAI-T scores of the women who were assessed with fetal echocardiography were statistically significantly higher than in the control group (p=0.001 and p=0.006, respectively). In addition, PSS scores were statistically significantly higher in the fetal echocardiography group than in the control group (p=0.002).

A comparison of mitral flow velocity (MFV), tricuspid flow velocity (TFV), aorta flow velocity (AFV), pulmonary artery flow velocity (PFV), and fetal heart rate (FHR) measured in fetal echocardiography according to the STAI-S, STAI-T, and PSS groups is shown in Table 3. AFV values (0.765, vs. 0.683 cm/sec) of the women with high STAI-S scores compared to women with low STAI-S scores were statistically significantly higher (p=0.014). FHR (150.2/min vs. 147.1/min) was statistically significantly higher in pregnant women with low STAI-T scores than in pregnant women with high STAI-T scores (p=0.016).

Correlation analyses between psychiatric variables and fetal echocardiography parameters are shown in Table 4. A positive correlation was found between AFV and STAI-S scores (r=.186, p=0.043). In addition, a negative correlation was found between FHR and STAI-S (r= -.235, p = 0.014), STAI-T (r=-.222, p=0.021), and PSS (r=-.220, p=0.021) scores.

Table 1. Demographic and clinical characteristics of the participants

Variables		Fetal echocardiography (n: 119)	Control (n: 65)	t/z/x²	p
Age (years), mean+sd		26.34±4.80	26.89±4.32	0.917[c]	0.293
Gestational age (weeks), mean+sd		25.47±4.95	26.56±8.65	0.125[b]	0.107
Previous miscarriage, n (%)		27 (22.7)	21 (32.4)	1.064[a]	0.152
Number of pregnancies, n (%)	Primigravida	40 (33.6)	17 (26.1)	1.942[a]	0.296
	Multigravida	79 (66.4)	48 (73.9)		
Education level, n (%)	Primary School	15 (8.2)	11 (6)	0.657[a]	0.190
	Middle School	44 (23.9)	32 (27.4)		
	High School	33 (17.9)	13 (7.1)		
	University	27 (14.7)	9 (4.9)		
Family income, n (%)	Not regularly	32 (17.4)	19 (10.3)	1.160[a]	0.694
	Low	33 (17.9)	22 (12)		
	Middle	48 (26.1)	22 (12)		
	High	6 (3.3)	2 (1.1)		

Sd: standard deviation
[a]Chi square test
[b]Mann–Whitney U test
[c]Student T test

Table 2. Comparison of psychological variables among study groups

Variables	Fetal echocardiography (n: 119)	Control (n: 65)	t/z/x²	p
STAI-S	38.82±10.34	33.65±7.03	2.561[c]	**0.001**
STAI-T	39.78±8.85	35.97±7.29	2.127[c]	**0.006**
PSS	14.95±5.49	12.34±4.72	2.369[c]	**0.002**
BDI	8.43±8.66	9.40±7.29	1.636[b]	0.103

STAI-S: State and trait anxiety inventory – state anxiety form
STAI-T: State and trait anxiety inventory – trait anxiety form
PSS: Perceived stress scale
BDI: Beck depression inventory
[a]Chi square test
[b]Mann–Whitney U test
[c]Student T test

Table 3. Comparison of psychological variables and fetal echocardiography parameters among study groups

Variables		MFV	TFV	AFV	PFV	FHR
STAI-S	High	0.482±0.061	0.492±0.040	0.765±0.242	0.672±0.079	147.1±7.1
	Low	0.474±0.062	0.478±0.057	0.683±0.115	0.641±0.083	149.6±6.5
	p	0.517[b]	0.214[b]	**0.014[c]**	0.064[b]	0.091[c]
STAI-T	High	0.486±0.056	0.490±0.048	0.726±0.118	0.661±0.082	147.1±6.5
	Low	0.469±0.065	0.476±0.057	0.691±0.190	0.642±0.082	150.2±6.6
	p	0.165[b]	0.169[b]	0.257[c]	0.219[b]	**0.016[c]**
PSS	High	0.481±0.055	0.487±0.050	0.719±0.208	0.645±0.077	147.8±6.4
	Low	0.472±0.067	0.477±0.056	0.694±0.117	0.654±0.086	149.8±6.9
	p	0.438[b]	0.330[b]	0.409[c]	0.580[b]	0.127[c]

STAI-S: State and trait anxiety inventory – state anxiety form
STAI-T: State and trait anxiety inventory – trait anxiety form
PSS: Perceived stress scale
MFV: Mitral flow velocity (cm/sn)
TFV: Tricuspid flow velocity (cm/sn)
AFV: Aorta flow velocity (cm/sn)
PFV: Pulmonary artery flow velocity (cm/sn)
FHR: Fetal heart rate (rate/dk)
High: High anxiety levels
Low: Low anxiety levels
aChi square test
bMann–Whitney U test
cStudent T test

Table 4. Correlation analyses between psychiatric variables and fetal echocardiography parameters

Variables	STAI-S		STAI-T		PSS	
	r	p	r	p	r	p
AFV	.186	**0.043**	.123	0.181	.001	0.989
FHR	-.235	**0.014**	-.222	**0.021**	-.220	**0.021**

Bold values indicate statistically significant correlations (p < 0.05)
r: Pearson's correlation
STAI-S: State and trait anxiety inventory – state anxiety form
STAI-T: State and trait anxiety inventory – trait anxiety form
PSS: Perceived stress scale
AFV: Aorta flow velocity
FHR: Fetal heart rate

Discussion

This study investigated depression, anxiety, and perceived stress levels in pregnant women who were assessed with fetal echocardiography by comparing them with the pregnant women who were assessed with routine USG. The study also evaluated the relationship of depression, anxiety, and perceived stress levels with fetal echocardiography parameters. As a result of the study, it was found that STAI-S, STAI-T, and PSS scores were statistically significantly higher in the fetal echocardiography group than in the control group. In addition, AFV values in the fetal echocardiography group were statistically significantly higher in women with a high STAI-S score than in women with a low STAI-S score. However, it was found that women with a low STAI-T score had a statistically significantly higher FHR compared to those with a high STAI-T score. Moreover, determining the maternal anxiety, stress, and depression levels, as well as evaluating the effect of these levels on the fetus in this study makes important contributions to the literature.

USG, which is often used since the first trimester in pregnancy follow-up, it allows pregnant women to adapt psychosocially to the pregnancy process, identify with the role of motherhood and establish positive relationships with their close circle (22). Besides their positive contribution, a negative finding that can be observed at the USG and requires further research becomes a very important source of stress for pregnant women and their families (23). A study conducted on pregnant women referred to fetal echocardiography found that the state anxiety of the pregnant women before the procedure was high, and the that the fetal echocardiography process was an important source of anxiety (7). Another study conducted on this subject found that pregnant women had high state anxiety before the fetal echocardiography and that those with abnormal fetal echocardiography results had higher anxiety levels than those with normal fetal echocardiography results (24). In our study, we found that pregnant women referred for fetal echocardiography had high levels of both state and trait anxiety, before the procedure, compared to the pregnant women who would undergo a routine normal USG procedure. In this study, which is similar to the literature in this respect, it was also found that perceived stress levels were high in the pregnant women who assessed with fetal echocardiography compared to pregnant women who would have normal USG. In their research, Rosenberg et al. (7) studied 40 pregnant women, who were assessed with fetal echocardiography, and found that state anxiety levels were high, but trait anxiety levels and perceived stress levels were normal. In our study, it was found that both state and trait anxiety and perceived stress levels were high in pregnant women who were assessed with fetal echocardiography. However, in our study, state anxiety levels and trait anxiety levels were found to be positively correlated in pregnant women who underwent fetal echocardiography. This finding suggests that individuals with high-state traits may be more affected by further examinations due to a sense of uncertainty or a possibility of negative results. In addition, in our study, the perceived stress levels in pregnant women who assessed with fetal echocardiography were found to have a positive correlation with both state and trait anxiety scores. This result shows that both state and trait anxiety are an important source of stress for pregnant women.

Mental problems during the pregnancy can have long-term effects on both the mother and fetus, as well as their immediate effects. Antenatal maternal stress and anxiety can affect the functioning of the hypothalamo-pituitary-adrenal (HPA) axis, negatively affecting children both in the fetal period and later in life (25). Antenatal maternal stress and anxiety, which often cause HPA axis activation, affect FHR in the fetal period and increase fetal heart rate variability and fetal movements (25, 26).

Although there is no clear information about the short- and long-term consequences of maternal state and trait anxiety, it is known that maternal anxiety and stress affect infants in the postpartum process. Studies have mostly focused on baby development and delivery and postpartum outcomes. However, in the shorter term, data on the fetal echocardiography parameters and hence the effects of antenatal maternal anxiety and stress on the fetus are quite limited. In our study, antenatal maternal anxiety and stress were found to have various effects on fetal echocardiography parameters. In our study, AFV was found to be higher in pregnant women with high-state anxiety than in those with low-state anxiety. We also found that state anxiety scores have a positive correlation with AFV. These results suggest that antenatal maternal state anxiety caused by fetal echocardiography and high levels of anxiety may affect the cardiac function of the fetus. Moreover, FHR was found to be lower in pregnant women with high trait anxiety than in pregnant women with low trait anxiety. However, a small number of studies on this subject have obtained contradictory results. In their study, Monk et al. (27) reported that, high maternal state anxiety increases FHR, while Sjöström et al. (28) reported that, both state and trait anxiety had no effect on FHR. A study conducted in hospitalized high-risk pregnant women also found that maternal state anxiety was high compared to the control group, but there was no difference between the study groups in terms of FHR (29). In our study, no relationship was found between increased maternal state anxiety and FHR. In this respect, it shares similar results with the literature. Moreover, Lobmaier et al. (30) suggested that, perceived stress may affect FHR. In our study on this subject, which has quite limited data, no association was found between perceived stress and fetal HR, unlike the literature. Acute anxiety is known to cause increased cortisol secretion by enabling HPA axis activation (31). Different studies on this subject suggest that chronic stress and anxiety affect HPA axis activity, causing a decrease in cortisol secretion (31, 32). For this reason, the fact that maternal trait anxiety is associated with low FHR suggests that long-term anxiety disrupts the functioning of the HPA axis, causing a decrease in FHR.

Our research has a number of limitations. The most important limitation of the study is the screening of psychiatric symptoms through scales without performing psychiatric interviews with the patients who were assessed with fetal echocardiography. Second, in this cross-sectional study, stress and anxiety assessment could not be evaluated in the short and long term after fetal echocardiography assessment.

Conclusion

Fetal echocardiography is an important imaging tool that can lead to anxiety and stress in pregnant women. In addition, anxiety that occurs before the procedure can have a negative impact on fetal cardiac evaluation. For this reason, psychosocial interventions to reduce anxiety and stress in pregnant women who were assessed with fetal echocardiography imaging may be important for fetal and maternal health. A small number of previous studies on this subject have quite contradictory results. For this reason, further studies with larger samples are needed to illuminate the relationship between maternal anxiety and stress with fetal health.

Declarations

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Conflicts of Interest/Competing Interests

No conflicting relationship exists for any author.

Ethics Approval

This study was approved by the Ethics Committee of KTO Karatay University School of Medicine (22.05.2020; decision number 2020/020). 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.

Availability of Data and Material

The data that support the findings of this study are available from the corresponding author, [MAA], upon reasonable request.

Authors' Contributions

MAA: Designed the study, performed the analysis, wrote the paper. NU: Designed the study, wrote the paper. HA: collected the data. MK: collected the data.

References

1. Zhang YF, Zeng XL, Zhao EF, et al. Diagnostic Value of Fetal Echocardiography for Congenital Heart Disease: A Systematic Review and Meta-analysis. Medicine (Baltimore). 2015;94(42):e1759.
2. Small M, Copel JA. Indications for fetal echocardiography. Pediatr Cardiol. 2004;25(3):210-22.
3. Rychik J, Ayres N, Cuneo B, et al. American Society of Echocardiography guidelines and standards for performance of the fetal echocardiogram. J Am Soc Echocardiogr. 2004;17(7):803-10.

4. Donofrio MT. Predicting the Future: Delivery Room Planning of Congenital Heart Disease Diagnosed by Fetal Echocardiography. Am J Perinatol. 2018;35(6):549-552.
5. Achiron R, Glaser J, Gelernter I, et al. Extended fetal echocardiographic examination for detecting cardiac malformations in low risk pregnancies. BMJ. 1992;304(6828):671-4.
6. Sklansky M, Tang A, Levy D, et al. Maternal psychological impact of fetal echocardiography. J Am Soc Echocardiogr. 2002;15(2):159-66.
7. Rosenberg KB, Monk C, Glickstein JS, et al. Referral for fetal echocardiography is associated with increased maternal anxiety. J Psychosom Obstet Gynecol. 2010;31(2):60-9.
8. Eurenius K, Axelsson O, Gällstedt-Fransson I, et al. Perception of information, expectations and experiences among women and their partners attending a second-trimester routine ultrasound scan. Ultrasound Obstet Gynecol. 1997;9(2):86-90.
9. Cristofalo EA, Dipietro JA, Costigan KA, et al. Women's response to fetal choroid plexus cysts detected by prenatal ultrasound. J Perinatol. 2006;26(4):215-23.
10. Leuthner SR, Bolger M, Frommelt M, et al. The impact of abnormal fetal echocardiography on expectant parents' experience of pregnancy: a pilot study. J Psychosom Obstet Gynecol. 2003;24(2):121-9.
11. Kowalcek I, Huber G, Bieniakiewitz I, et al. The influence of gestational age on depressive reactions, stress and anxiety of pregnant women and their partners in relation to prenatal diagnosis. J Psychosom Obstet Gynecol. 2003;24(4):239-45.
12. Spielberger CD, Gorsuch RL, Lushene R, et al. State-trait anxiety inventory. Palo Alto. CA: Mind Garden. 1983.
13. Öner N, Le Compte A. State-trait anxiety inventory handbook. Bogazici University, Istanbul, Turkey. 1985.
14. Tendais I, Costa R, Conde A, et al. Screening for depression and anxiety disorders from pregnancy to postpartum with the EPDS and STAI. Span J Psychol. 2014;17:E7.
15. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983;24(4):385-96.
16. Eskin M, Harlak H, Demirkıran F, et al. Algılanan stres ölçeğinin Türkçeye uyarlanması: güvenirlik ve geçerlik analizi. New/Yeni Symposium Journal. 2013;51(3):132-140.
17. Gholipoor P, Saboory E, Ghazavi A, et al. Prenatal stress potentiates febrile seizure and leads to long-lasting increase in cortisol blood levels in children under 2 years old. Epilepsy Behav. 2017;72:22-27.
18. Beck AT, Ward C, Mendelson M, et al. Beck depression inventory (BDI). Arch Gen Psychiatry. 1961;4(6):561-71.
19. Hisli N. Beck Depresyon Envanterinin gecerliligi uzerine bir calisma (A study on the validity of Beck Depression Inventory.). Psikoloji Dergisi. 1988;6:118-22.
20. Wright L, Stauffer N, Samai C, et al. Who should be referred? An evaluation of referral indications for fetal echocardiography in the detection of structural congenital heart disease. Pediatr Cardiol. 2014;35(6):928-33.
21. Alp H, Küçükosmanoğlu M, Sever B, et al. Congenital Heart Diseases Detected by Prenatal Fetal Echocardiography and Associated Extracardiac Anomalies. J Pediatr Res. 2019;6(4):280-5.
22. Simó S, Zúñiga L, Izquierdo MT, et al. Effects of ultrasound on anxiety and psychosocial adaptation to pregnancy. Arch Womens Ment Health. 2019;22(4):511-518.
23. Hoskovec J, Mastrobattista JM, Johnston D, et al. Anxiety and prenatal testing: do women with soft ultrasound findings have increased anxiety compared to women with other indications for testing? Prenat Diagn. 2008;28(2):135-40.
24. Channing A, Rosenberg K, Monk C, et al. Maternal anxiety associated with fetal echocardiography. Open J Pediatr. 2012;2:143-49.
25. Talge NM, Neal C, Glover V, et al. Antenatal maternal stress and long-term effects on child neurodevelopment: how and why? J Child Psychol Psychiatry. 2007;48(3-4):245-61.
26. Van den Bergh BR, Mulder EJ, Mennes M, et al. Antenatal maternal anxiety and stress and the neurobehavioural development of the fetus and child: links and possible mechanisms. A review. Neurosci Biobehav Rev. 2005;29(2):237-58.
27. Monk C, Fifer WP, Myers MM, et al. Maternal stress responses and anxiety during pregnancy: effects on fetal heart rate. Dev Psychobiol. 2000;36(1):67-77.
28. Sjöström K, Valentin L, Thelin T, et al. Maternal anxiety in late pregnancy and fetal hemodynamics. Eur J Obstet Gynecol Rep Biol. 1997;74(2):149-55.
29. Kim YJ, Park YJ. Effect of Structured Bed Exercise on Uterine Contractions, Fetal Heart Rate Patterns, and Maternal Psychophysical Symptoms of Hospitalized High-Risk Pregnant Women: A Randomized Control Trial. Asian Nurs Res. 2018;12(1):1-8.
30. Lobmaier SM, Müller A, Zelgert C, et al. Fetal heart rate variability responsiveness to maternal stress, non-invasively detected from maternal transabdominal ECG. Arch Gynecol Obstet. 2020;301(2):405-414.
31. Faravelli C, Lo Sauro C, Lelli L, et al. The role of life events and HPA axis in anxiety disorders: a review. Curr Pharm Des. 2012;18(35):5663-74.
32. Steudte S, Stalder T, Dettenborn L, et al. Decreased hair cortisol concentrations in generalised anxiety disorder. Psychiatry Res. 2011;186(2-3):310-4.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Psychiatry / Psikiyatri

Investigation of the Relationship Between the Levels of Nicotine Addiction and Depression Levels of University Students

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ABSTRACT

Purpose: The study was conducted to be cross-sectional in order to determine the relationship levels between smoking and depression and to define the sociodemographic characteristics that make a significant difference.

Methods: The study was conducted with 280 students who agreed to participate in the study and stated that they smoke. The research data were conducted with university students who met the sampling inclusion criteria, and students with medium and high cigarette addiction levels who agreed to participate in the study. In the study, the "Psychological Addiction Assessment Test" and "BURNS Depression Scale" were used to evaluate the personal and addiction-related characteristics of cigarette addicts.

Results: The participants of 66.3% are between the ages of 19 and 22 and 64.2% are women. Findings of the answers given to the questions directed to the smoking variable; 29.8% started smoking before the age of 17, 70.2% after the age of 18, 23.8% smoked for more than 4 years, 37.6% used 1 pack of cigarettes a day, 51.1% of them stated that they had never tried to quit smoking before, 33.3% of their mothers and 75.2% of them their fathers were smoking A statistically high positive correlation was obtained between the BDI total score and the SBBT scale score ($p<0.001$).

Conclusion: It is clearly seen in the research results that there is a relationship between smoking addiction, some sociodemographic characteristics and depression. In order to increase the fight against addiction and addiction, it may be recommended to organize trainings for students or to add courses on addiction to the curriculum.

Keywords: Depression, smoking, addiction.

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Üniversite Öğrencilerinin Nikotin Bağımlılığı Düzeyleri ile Depresyon Düzeyleri Arasındaki İlişkinin İncelenmesi

ÖZET

Amaç: Araştırma, sigara kullanımı ile depresyon arasındaki ilişki düzeylerini belirlemek ve anlamlı fark yaratan sosyodemografik özellikleri belirlemek amacıyla kesitsel olarak yapılmıştır.

Yöntem: Çalışma, araştırmaya katılmayı kabul eden ve sigara içtiğini belirten 280 öğrenci ile yürütülmüştür. Araştırma verileri, örneklem alınma ölçütlerini karşılayan üniversite öğrencileri ile araştırmaya katılmayı kabul eden orta ve yüksek sigara bağımlılık düzeyine sahip öğrencilerle gerçekleştirilmiştir. Araştırmada sigara bağımlılığı ve depresyonla ilgili özellikleri değerlendirmek için "Psikolojik Bağımlılık Değerlendirme Testi" ve "BURNS Depresyon Ölçeği" kullanılmıştır.

Bulgular: Katılımcıların %66,3'ü 19-22 yaş arasındadır ve %64,2'si kadındır. Sigara içme değişkenine yönelik sorulara verilen cevaplara ilişkin bulgular; %29,8'i 17 yaşından önce sigaraya başladığını, %70,2'si 18 yaşından sonra, %23,8'i 4 yıldan fazla sigara içtiğini, %37,6'sı günde 1 paket sigara kullandığını, %51,1'i sigarayı hiç bırakmayı denemediğini belirtti. Katılımcıların annelerinin %33,3'ü, babalarının %75,2'si daha önce sigara kullanmaktaydı. BDE toplam puanı ile SBBT ölçek puanı arasında istatistiksel olarak yüksek pozitif korelasyon elde edildi ($p<0,001$).

Sonuç: Sigara bağımlılığı, bazı sosyodemografik özellikler ve depresyon arasında ilişki olduğu araştırma sonuçlarında açıkça görülmektedir. Bağımlılık ve bağımlılıkla mücadeleyi artırmak için öğrencilere yönelik eğitimler düzenlenmesi veya müfredata bağımlılıkla ilgili derslerin eklenmesi önerilebilir.

Anahtar Sözcükler: Depresyon, sigara, bağımlılık.

Cigarette addiction is a common type of addiction, as it is easily accessible and legal to use, and has effects on affective, physical, and psychomotor functions of the central nervous system (1,2). Nicotine use affects cognitive functions both positively and negatively, as shown in various studies (3,4). Furthermore, a significant relationship has been reported between smoking addiction and mental disorders, with smokers who are addicted to cigarettes exhibiting more symptoms of depression than healthy individuals (5,6). According to the report by the Organization for Economic Cooperation and Development (OECD), in which the health indicators of 35 countries are compared, Turkey is among the countries with the highest smoking rate (7). Regardless of age distribution, daily cigarette use in Turkey is 27.3%, and according to the results of the Global Tobacco Survey (2019), 29.6% of the population smokes every day (7,8). Smoking is influenced not only by socioeconomic factors, but also by psychological issues such as stress, anger, anxiety, and depression (9,10). The World Health Organization reports that over 300 million people worldwide suffer from depression, with this figure increasing by 25% due to the Covid-19 pandemic (11). Depression can be a risk factor for smoking, and major depression has been associated with neuroticism and nicotine addiction (12,13).

Studies show a strong relationship between young people's smoking and depression, anxiety, and stress (14). It is crucial to determine the relationship between smoking addiction and depression levels in university students, particularly after the pandemic, as studies suggest an increase in smoking among young people with depressive symptoms (12). Therefore, whether smoking increases in young people especially after the pandemic and its relationship with depression brings to mind. It has been suggested that there is an increase in smoking among young people with depressive symptoms and that smokers constitute a higher risk group for depression compared to healthy individuals (13,14). There are also studies in Turkey showing that university students' smoking and depression levels are quite significant (2,9,10,15). Teenagers who use multiple tobacco products are at higher risk of developing addiction and are more likely to continue using tobacco into adulthood. Therefore, this study aims to determine the relationship between smoking addiction and depression levels, as well as some sociodemographic variables, in university students. The study will provide important data on the symptom status of university students who have both smoking addiction and depressive symptoms after the pandemic. For this reason, it is anticipated that the study will contribute to the relevant literature. The study seeks to answer the following questions:

- What are the sociodemographic characteristics and cigarette addiction levels of university students?
- What are the sociodemographic characteristics and depression levels of university students?
- What is the relationship between smoking addiction and depression in university students?

METHODS

Purpose and type of the research

The study was designed as a cross-sectional research to determine the relationship between smoking and depression levels, as well as to identify significant sociodemographic characteristics.

The population and sample of the research

The target population of this research is comprised of students who are currently enrolled at a state university. In order to calculate the sample size, the G Power 3.0.10 program was used to perform an ANOVA test, with a 95% confidence interval (1-α), 95% test power (1-β), f=0.20 effect size, and α =0.05 margin of error. Based on these parameters, the required sample size was determined to be 280 individuals. The survey questions were adapted to an online survey program called "Survey," and the research team contacted university students through various social media platforms and email groups, inviting them to participate in the study by providing a survey link. The introductory page of the survey link presented a brief summary of the study, and participants were asked to declare their willingness to participate after reading and understanding the information. By marking a button, participants were able to access the remaining sections of the survey. The study was completed with 280 student participants who declared their willingness to participate and reported that they were smokers.

Inclusion criteria

- Being a university student
- Being a current smoker
- Voluntarily agreeing to participate in the study
- Having the ability to complete the survey in Turkish

- Being 18 years old or older
- Having no history of psychiatric disorders or cognitive impairments that may affect the validity of the survey responses.

Data collection and tools for data collection

The research data were conducted with university students who met the sampling inclusion criteria, and students with medium and high cigarette addiction levels who agreed to participate in the study. In the study, the "Psychological Addiction Assessment Test" and "BURNS Depression Scale" were used to evaluate the personal and addiction-related characteristics of cigarette addicts.

Psychological Addiction Assessment Test (PSAAT)

The first version was used by Ponciano Rodriguez et al. in the long version of 25 questions to assess cigarette addiction. The items in the scale are a 3-point Likert-type rating scale with "Frequently: 3 points, Rarely: 2 points, Never: 1 point". The minimum score that can be obtained from the scale is 8, and the maximum score is 24. The total score evaluation is as follows; 8-13: Slightly dependent; 14-19: Intermediate dependent; 20-24: Seriously addicted. In the adaptation study of the scale, the Cronbach's Alpha coefficient was determined to be 0.847 (16,17). In this study, Cronbach's Alpha coefficient was calculated as 0,959.

BURNS Depression Scale (BDS)

BDS is a 5-point Likert-type scale consisting of 25 items and 4 sub-dimensions, adapted into Turkish by Dikmen and Tuncer (2019) to examine depressive symptoms. The first 10 of the items are the feelings and thoughts of the person, 11-17. questions activity and personal relationships, 18-22. questions physical symptoms, 23-25. The questions measure suicidal desire. The total score of the answers given by the participants to all items from 1 to 25 is evaluated. According to the score obtained; It is evaluated as 0-5: No depression, 6-10: Normal but unhappy, 11-25: Mild depression, 26-50: Moderate depression, 51-75: Severe depression, 76-100: Extreme depression. In the adaptation study of the scale, the Cronbach's Alpha coefficient was determined to be 0.92 (18). In this study, Cronbach's Alpha coefficient was calculated as 0.961.

Statistical Analysis

The data were analyzed with the IBM SPSS Statistics 25.0 package program. Significance level was accepted as $p<0.05$. In the analysis of the data, the "Normality Test" was performed to determine whether the data were normally distributed, and the "MannWithney U" and "Kruskal-Wallis" tests, which were used in the "Non-Parametric" tests, were used for the data that were determined not to be normally distributed. Mann-Withney U test was used to compare the means of two independent groups in a distribution that did not show normal distribution. "Frequency" analysis was conducted to determine the socio-demographic characteristics of the individuals forming the sample. Correlation analysis (Spearman Rank Correlation Coefficient) was used to examine the hypotheses of the research. The absolute value in the correlation coefficient shows the strength of the relationship. The larger the value, the stronger the relationship is considered. In the study, the r value was accepted as 0-0.3 weak, 0.3-0.5 moderate, 0.5-0.7 high, and 0.7-1 quite high (19).

Limitations of the research

The data obtained in this study is limited to the data obtained from the statements given by the participants.

RESULTS

Data on the sociodemographic and smoking characteristics of the participants

66.3% of the participants are between the ages of 19 and 22 and 64.2% are women. While those studying in Health Sciences are 33.3%, those studying in Sciences constitute 18.8% of the participants. According to the variables of mother and father education level, 30.5% of the participants' mothers graduated from primary school and 27.7% of them were high school graduates from their fathers. 56% of the participants stated that their mother was a housewife and 40% stated that their father was a worker. 68.1% of the participants are not satisfied with the department they read. While 57.1% of the socioeconomic status is medium, 19.5% of the poor socioeconomic status is. 67.4% of the participants stated that they did not work in any job other than school (Table 1). Findings of the answers given to the questions directed to the smoking variable; 29.8% started smoking before the age of 17, 70.2% after the age of 18, 23.8% smoked for more than 4 years, 37.6% used 1 pack of cigarettes a day, 51.1% of them stated that they had never tried to quit smoking before, 33.3% of their mothers and 75.2% of them their fathers were smoking (Table 2).

Table 1. Data on the general characteristics of the participants

Variable	Frequency	%
Age		
16-19	42	14,9
19-22	187	66,3
22-25	53	18,8
Gender		
Male	101	35,8
Female	181	64,2
Academic Branch		
Health Scinces	94	33,3
Social Scinces	57	20,2
Physical Scinces	53	18,8
Educational Sciences	78	27,7
Mother education status		
Primary School	86	30,5
Middle School	78	27,7
Senior School	67	23,8
Associate Degree	31	11
Bachelor's Degree	20	7,1
Father education status		
Primary School	57	20,2
Middle School	76	27
Senior School	78	27,7
Associate Degree	37	13,1
Bachelor's Degree	34	12,1
Mother's profession		
Housewife	158	56
Public Servant	60	21,3
Worker	64	22,7
Father's profession		
Public Servant	87	30,9
Worker	114	40,4
Self employment	81	28,7
Are you satisfied with the section you read?		
Yes	192	68,1
No	90	31,9
Where are you staying?		
House friends	33	11,7
Dorm	107	37,9
Family	107	37,9
Other	35	12,4
How to assess your socioeconomic status?		
Good	66	23,4
Middle	161	57,1
Bad	55	19,5
Do you work outside of school?		
Yes	92	32,6
No	190	67,4

Table 2. Data on smoking of participants

Variable	Frequency	Percent
What is your age to start smoking?		
17 years and under	84	29,8
18 years and over	198	70,2
How long do you use smokıng?		
0-1 month	20	7,1
1-6 month	45	16
6 month-1 year	42	14,9
1-2 year	51	18,1
3-4 year	57	20,2
4 more year	67	23,8
How much do you smoke per day?		
1 poket less	96	34
1 poket	106	37,6
1-2 poket	61	21,6
2 more poket	19	6,7
Have you tried to quit smoking?		
Yes	138	48,9
No	144	51,1
Does your mother smoke?		
Yes	94	33,3
No	188	66,7
Does your father smoke?		
Yes	212	75,2
No	70	24,8

Findings of the comparison of the sociodemographic characteristics of the participants with the smoking psychological addiction assessment test scores

There was no statistically significant difference between the participants' age, gender, academic branch, father's occupation, housing and employment status and the median scores of PSAAT Scale scores (p>0.005). A statistically significant difference was found between the education levels of the parents and the median scores of PSAAT Scale scores (p=0.005; p=0.004). As the mother's education level increases, the median score also increases. When the father's education level is examined, the PSAAT scale median value of those whose fathers are associate degree students is 53, while this value is 40 for those who are primary school graduates. A statistically significant difference was found between the mother's occupation and the median values of the PSAAT Scale score (p=0.031). While the median value of PSAAT scale was 51.5 for those whose mothers were a worker, this value was 43.5 for

those whose mothers were a housewife. A statistically significant difference was found between the level of satisfaction with the department and the median scores of the PSAAT Scale score (p<0.001). While the median value of PSAAT scale was 52 for those who were not satisfied with their department, this value was 43 for those who were satisfied. A statistically significant difference was found between the socioeconomic status and the median values of the PSAAT Scale score (p=0.001). While the median value of PSAAT scale was 53 for those who expressed their socioeconomic status as poor, this value was 44 for those who expressed it as moderate. There was no statistically significant difference between the participants' age at onset of smoking, duration of smoking, previous experience of quitting smoking, and the father's smoking status, and the median scores of PSAAT Scale scores (p>0.005). A statistically significant difference was found between the amount of cigarette smoking that the participants used daily and the median values of the PSAAT Scale score (p<0.001). While the median value of PSAAT scale was 56 for those who stated that they used more than 2 packs of cigarettes a day, this value was 40 for those who stated that they used less than 1 pack. A statistically significant difference was found between the amount of maternal smoking and the median values of the PSAAT Scale score (p=0.008). While the median value of PSAAT scale was 50.5 for those who stated that their mothers smoked, this value was 44 for those who stated that they did not (Table 3).

Findings of the comparison of the sociodemographic characteristics of the participants with the depression scale scores

No statistically significant difference was found between the participants' age, gender, academic branch, father's occupation, housing status, smoking cessation experience, father's smoking status and the mean BDS score (p>0.005). The mean value of BDS score for women was 63.7, and this value was 58.1 for men, and these values differed statistically between the groups (p=0.004). The mean value of the BDS Emotion and Thought sub-dimension score was 25.9 for women and 23.4 for men, and these values differ statistically between the groups (p=0.003). The mean value of the BDS Physical Symptoms sub-dimension score was 13.6 for women and 12.3 for men, and these values differed statistically between the groups (p=0.039). There is a statistical difference between maternal education level and BDS Emotions and Thoughts, and Suicide Desire subscale scores (p=0.05; p <0.001). Emotions and Thoughts (20.1) and Suicidal Ideas (7.3) sub-dimensions of those who stated that their mother was an associate degree graduate were higher than the others. There was a statistically significant difference between father's education level and BDS total score, and Suicide Desire subscale mean scores (p=0.03; p<0.001).

Those who stated that their fathers were associate degree graduates had higher BDS mean scores (72) and Suicidal Ideation (7.5) sub-dimensions score averages than others. There is a statistical difference between maternal occupational status and BDS total score and mean score of all subscales (p <0.005). The average score of those whose mothers are workers is higher than the others. There is a statistically significant difference between the level of satisfaction with the reading and the BDS total score and mean scores of all subscales (p <0.001). The average score of those who are not satisfied with their department is higher than those who are satisfied. There is a statistically significant difference between socioeconomic status and BDS total score and the mean scores of Emotions and Thoughts, Suicidal Ideas (p <0.05). The mean scores of those with poor socioeconomic status are higher than the others. There is a statistically significant difference between working status out of school and the mean scores of all subscales except the BDS total score and the Emotion and Thought subscale (p <0.05). The average score of students working outside of school time is higher than the others. There is a statistically significant difference between the age of starting smoking and the mean scores of the emotion and thought sub-dimensions (p= 0.039). While the average score of those who started smoking after the age of 18 was 25.8, the average of those who started before the age of 17 was 23.2. There was a statistically significant difference between the duration of smoking and the BDS total score and mean scores of all subscales (p <0.05). Those who have been smoking for 6 months had higher BDS total score, emotion and thought, activity, and physical symptoms sub-dimension averages. Those who stated that they had been using cigarettes for 1 month had higher suicidal ideation subscale score averages. There is a statistical difference between daily cigarette consumption and BDS total score and mean score of all subscales (p <0.05). Those who smoke more than 2 packs a day have higher mean scores. There was a statistically significant difference between maternal smoking and all other subscale mean scores except BDS total score and Physical Symptoms subscale mean score (p <0.05). Those whose mothers smoked have a higher mean score (Table 4).

Table 3. Data on the comparison of the sociodemographic characteristics of the participants and the scores of the Evaluation of Psychological Addiction of Smoking Scale scores

Variable	N	Median (Min-Max.)	Test Ist.	p
Age				
16-19	42	45 (25-68)	*1,529	0,466
19-22	187	46 (24-75)		
22-25	53	46 (25-68)		
Gender				
Male	101	46 (24-75)	**9170,5	0,963
Female	181	46 (25-73)		
Academic Branch				
Health Scinces	94	47 (24-70)	*1,203	0,752
Social Scinces	57	48 (25-73)		
Physical Scinces	53	45 (25-70)		
Educational Sciences	78	43 (24-75)		
Mother education status				
Primary School	86	40 (24-73)	*14,662	**0,005**
Middle School	78	47 (24-68)		
Senior School	67	48 (25-75)		
Associate Degree	31	53 (25-75)		
Bachelor's Degree	20	54 (25-68)		
Father education status				
Primary School	57	40 (24-73)	*15,447	**0,004**
Middle School	76	45,5 (25-75)		
Senior School	78	46 (24-68)		
Associate Degree	37	54 (25-66)		
Bachelor's Degree	34	49,5 (25-70)		
Mother profession				
Housewife	158	43,5 (24-75)	*6,949	**0,031**
Public Servant	60	47,5 (25-68)		
Worker	64	51,5 (25-63)		
Father's profession				
Public Servant	87	44 (25-73)	*1,885	0,39
Worker	114	46 (24-75)		
Self employment	81	48 (24-68)		
Are you satisfied with the section you read?				
Yes	192	43 (24-70)	**11,57	**<0,001**
No	90	52 (24-75)		
Where are you staying?				
House friends	33	44 (25-67)	*5,724	0,126
Dorm	107	47 (24-75)		
Family	107	45 (24-68)		
Other	35	53 (25-68)		
How to assess your socioeconomic status?				
Good	66	46 (24-73)	*13,994	**0,001**
Middle	161	44 (24-68)		
Bad	55	53 (25-75)		
Do you work outside of school?				
Yes	92	46,5 (25-75)	**8,195	0,395
No	190	46 (24-73)		
What is your age to start smoking?				
17 years and under	84	47,5 (25-68)	**8162,5	0,806
18 years and over	198	46 (24-75)		
How long do you use smoking?				
0-1 month	20	46,5 (25-65)	*10,422	0,064
1-6 month	45	52 (25-65)		
6 month-1 year	42	53,5 (25-70)		
1-2 year	51	41 (25-68)		
3-4 year	57	43 (24-70)		
4 more year	67	45 (24-75)		
How much do you smoke per day?				
1 poket less	96	40 (25-68)	*20,754	**<0,001**
1 poket	106	47 (24-70)		
1-2 poket	61	52 (25-75)		
2 more poket	19	56 (25-73)		
Have you tried to quit smoking?				
Yes	138	46 (25-73)	**10235,5	0,661
No	144	47 (24-75)		
Does your mother smoke?				
Yes	94	50,5 (25-75)	**7136,5	**0,008**
No	188	44 (24-73)		
Does your father smoke?				
Yes	212	46 (24-75)	**7043	0,523
No	70	45 (24-70)		

** Kruskal-wallis Test, ** Mann-Whitney U Test, Median (Min-Max.)*

Table 4. Data on the comparison of participants' sociodemographic characteristics and BDS Scale scores

		Total BDS	BDS Emotion and Thought Sub-Dimension	BDS Activity and Personal Relationships Sub-Dimension	BDS Physical Symptoms Sub-Dimension	BDS Suicide Request Subdimension
Variable	**N**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**
Age						
16-19	42	56,1 ± 20,3	22,5 ± 8,7	16,3 ± 6,5	11,9 ± 4,2	5,5 ± 3,1
19-22	187	63,3 ± 23,5	25,5 ± 9,9	18,6 ± 7,6	13,4 ± 5	5,7 ± 3,2
22-25	53	60,6 ± 20,4	25,3 ± 9	17 ± 6,8	13,1 ± 4,9	5,2 ± 3,1
Total	282	61,7 ± 22,6	25 ± 9,6	18 ± 7,3	13,1 ± 4,9	5,6 ± 3,2
Test Ist.		F= 1,825	F=1,763	F= 2,414	F= 1,669	F= 0,643
p		0,163	0,173	0,091	0,190	0,526
Gender						
Male	101	58,1 ± 22,2	23,4 ± 9,2	17,1 ± 7,2	12,3 ± 5	5,3 ± 3,1
Female	181	63,7 ± 22,5	25,9 ± 9,7	18,5 ± 7,4	13,6 ± 4,8	5,7 ± 3,2
Test Ist.		t=-2,03	t=-2,185	t=-1,567	t=-2,078	t=-1,054
p		**0,004**	**0,003**	0,118	**0,039**	0,293
Academic Branch						
Health Scinces	94	62,3 ± 23,4	24,9 ± 9,8	18,6 ± 7,6	13 ± 5	5,8 ± 3
Social Scinces	57	63,9 ± 20,9	26,3 ± 8,9	17,6 ± 7	13,8 ± 4,6	6,1 ± 3,5
Physical Scinces	53	63,3 ± 22	26 ± 10,1	18,7 ± 6,8	13,4 ± 4,8	5,2 ± 3,1
Educational Sciences	78	58,3 ± 23,1	23,5 ± 9,4	17 ± 7,5	12,6 ± 5,1	5,2 ± 3,2
Test Ist.		F= 0,891	F=1,222	F= 0,938	F= 0,786	F= 1,291
p		0,446	0,302	0,423	0,503	0,278
Mother education status						
Primary School	86	58 ± 21,1	23,9 ± 8,8	16,8 ± 6,9	12,8 ± 4,8	4,6 ± 3
Middle School	78	60 ± 22,4	24,4 ± 10	17,4 ± 7,4	12,7 ± 4,7	5,5 ± 3,1
Senior School	67	66,5 ± 21,5	27 ± 9,1	19,6 ± 7,1	13,9 ± 4,8	6,1 ± 3,1
Associate Degree	31	67,5 ± 23,5	26,3 ± 9,7	20,1 ± 7,4	13,7 ± 5,2	7,3 ± 3,2
Bachelor's Degree	20	59 ± 28,3	23,6 ± 11,5	17 ± 8,8	12,7 ± 5,7	5,8 ± 3,4
Test Ist.		F= 2,034	F=1,310	F= 2,296	F= 0,783	F= 5,235
p		0,090	0,267	**0,050**	0,537	**<0,001**
Father education status						
Primary School	57	57,3 ± 21,9	23,3 ± 9,1	16,3 ± 7,2	12,9 ± 4,8	4,8 ± 3,3
Middle School	76	60 ± 23,4	24,7 ± 9,9	17,4 ± 7,3	12,6 ± 5,3	5,3 ± 2,9
Senior School	78	61 ± 20,7	24,9 ± 9,4	18,2 ± 6,9	12,8 ± 4,6	5,2 ± 2,8
Associate Degree	37	72 ± 18,9	29 ± 8,1	20,8 ± 6,1	14,8 ± 4	7,5 ± 3
Bachelor's Degree	34	63,1 ± 26,9	24,7 ± 10,8	18,5 ± 8,9	13,6 ± 5,5	6,3 ± 3,8
Test Ist.		F= 2,695	F=2,104	F= 2,294	F= 1,441	F= 5,412
p		**0,031**	0,081	0,060	0,221	**<0,001**
Mother profession						
Housewife	158	58,8 ± 23,6	24 ± 9,9	17,3 ± 7,8	12,6 ± 5,2	4,9 ± 3,2
Public Servant	60	62,2 ± 22	25 ± 9,3	17,8 ± 7	13,2 ± 4,8	6,2 ± 3,2
Worker	64	68,5 ± 19	27,6 ± 8,6	19,9 ± 6,2	14,4 ± 4	6,6 ± 2,9
Test Ist.		F= 4,370	F=3,428	F= 3,050	F= 3,057	F= 7,713
p		**0,014**	**0,034**	**0,049**	**0,049**	**0,001**

Table 4. Data on the comparison of participants' sociodemographic characteristics and BDS Scale scores (Continued)

		Total BDS	BDS Emotion and Thought Sub-Dimension	BDS Activity and Personal Relationships Sub-Dimension	BDS Physical Symptoms Sub-Dimension	BDS Suicide Request Subdimension
Variable	**N**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**
Father's profession						
Public Servant	87	59,9 ± 23,8	23,8 ± 10	17,5 ± 7,8	12,9 ± 4,9	5,7 ± 3,4
Worker	114	62 ± 21,9	25,1 ± 8,9	18 ± 6,8	13,3 ± 5	5,6 ± 3,3
Self employment	81	63,2 ± 22,2	26,2 ± 9,9	18,5 ± 7,5	13,2 ± 4,9	5,3 ± 2,8
Test Ist.		F= 4,67	F=1,325	F= 0,353	F= 0,152	F= 0,296
p		0,627	0,267	0,703	0,859	0,744
Are you satisfied with the section you read?						
Yes	192	57,1 ± 22,6	23 ± 9,5	16,7 ± 7,6	12,4 ± 4,9	4,9 ± 3
No	90	71,6 ± 19	29,3 ± 8,2	20,7 ± 6	14,8 ± 4,5	6,9 ± 3,1
Test Ist.		t=-5,276	t=-5,349	t=-4,325	t=-3,924	t=-5,029
p		**<0,001**	**<0,001**	**<0,001**	**<0,001**	**<0,001**
Where are you staying?						
House friends	33	57,9 ± 23,3	22,7 ± 9,7	17 ± 8,1	13,1 ± 5,5	5,2 ± 3,1
Dorm	107	60,3 ± 21,8	24,7 ± 9,2	17,4 ± 7	12,8 ± 4,7	5,4 ± 3,2
Family	107	63 ± 23,6	25,5 ± 10	18,4 ± 7,7	13,3 ± 5	5,7 ± 3,3
Other	35	65,9 ± 21	27 ± 8,9	19,2 ± 6,5	13,6 ± 4,6	6,1 ± 3
Test Ist.		F= 0,966	F=1,269	F= 0,838	F= 0,341	F= 0,752
p		0,409	0,285	0,474	0,796	0,522
How to assess your socioeconomic status?						
Good	66	62,7 ± 25	25,2 ± 10,4	18,2 ± 7,8	13,1 ± 5,3	6,2 ± 3,4
Middle	161	59 ± 21,5	24 ± 9,3	17,3 ± 7,2	12,7 ± 4,8	5 ± 2,9
Bad	55	68,4 ± 21,4	27,8 ± 8,9	19,7 ± 6,9	14,3 ± 4,7	6,6 ± 3,3
Test Ist.		F= 3,730	F=3,222	F= 2,412	F= 2,214	F= 7,431
p		**0,025**	**0,041**	0,092	0,121	**0,001**
Do you work outside of school?						
Yes	92	66,1 ± 22	26,6 ± 9,5	19,3 ± 7,2	14 ± 4,9	6,2 ± 3,1
No	190	59,6 ± 22,5	24,3 ± 9,5	17,3 ± 7,3	12,7 ± 4,9	5,3 ± 3,2
Test Ist.		t=2,295	t=1,909	t=2,175	t=1,995	t=2,419
p		**0,022**	0,057	**0,03**	**0,047**	**0,016**
What is your age to start smoking?						
17 years and under	84	59 ± 20,4	23,2 ± 8,3	17,5 ± 6,6	12,6 ± 4,7	5,7 ± 3,4
18 years and over	198	62,9 ± 23,4	25,8 ± 10	18,2 ± 7,6	13,3 ± 5	5,5 ± 3,1
Test Ist.		t=-1,336	t=-2,079	t=-0,737	t=-1,181	t=0,275
p		0,183	**0,039**	0,462	0,239	0,783

Table 4. Data on the comparison of participants' sociodemographic characteristics and BDS Scale scores (Continued)						
		Total BDS	BDS Emotion and Thought Sub-Dimension	BDS Activity and Personal Relationships Sub-Dimension	BDS Physical Symptoms Sub-Dimension	BDS Suicide Request Subdimension
Variable	**N**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**	**Mean ± Std.**
How long do you use smokıng?						
0-1 month	20	70,1 ± 17,9	28 ± 7,6	20,4 ± 6,6	14,1 ± 4,1	7,7 ± 2,4
1-6 month	45	69,1 ± 19,3	27,6 ± 8,1	20,6 ± 5,9	14,6 ± 4,6	6,2 ± 3
6 month-1 year	42	67 ± 20,4	27 ± 8,3	19,9 ± 6,6	13,5 ± 4,7	6,5 ± 3,1
1-2 year	51	54,2 ± 19,7	22,7 ± 9,1	15,3 ± 6,6	11,6 ± 4,1	4,6 ± 2,7
3-4 year	57	57,5 ± 24,4	23,4 ± 10,4	16,9 ± 7,9	12,4 ± 5,4	4,8 ± 2,9
4 more year	67	60,2 ± 25,1	24,4 ± 10,7	17,2 ± 7,9	13,3 ± 5,3	5,3 ± 3,6
Test Ist.		F= 3,701	F= 2,441	F= 4,165	F= 2,289	F= 4,880
p		**0,003**	**0,035**	**0,001**	**0,046**	**<0,001**
How much do you smoke per day?						
1 poket less	96	56,2 ± 22,1	22,9 ± 9,7	16,4 ± 7,4	12,1 ± 4,8	4,7 ± 2,7
1 poket	106	60,5 ± 19,9	24,6 ± 8,7	17,8 ± 6,4	13 ± 4,6	5,2 ± 2,9
1-2 poket	61	67,7 ± 23,7	27,4 ± 9,8	19,4 ± 8	14 ± 5	6,9 ± 3,5
2 more poket	19	77,1 ± 25	30,6 ± 10	22,4 ± 7,6	16,2 ± 5,5	7,9 ± 3,7
Test Ist.		F= 6,784	F=5,369	F= 4,585	F= 4,702	F= 10,582
p		**<0,001**	**0,001**	**0,040**	**0,003**	**<0,001**
Have you tried to quit smoking?						
Yes	138	61,5 ± 23	25 ± 9,9	17,9 ± 7,6	13,1 ± 5	5,5 ± 3,2
No	144	61,9 ± 22,2	25,1 ± 9,3	18,1 ± 7,1	13,1 ± 4,8	5,7 ± 3,2
Test Ist.		t=-0,158	t=-0,061	t=-0,252	t=0,70	t=-0,458
p		0,875	0,951	0,801	0,944	0,647
Does your mother smoke?						
Yes	94	66,3 ± 21,4	26,8 ± 8,9	19,3 ± 6,7	13,9 ± 4,9	6,2 ± 3,2
No	188	59,4 ± 22,8	24,1 ± 9,8	17,3 ± 7,5	12,7 ± 4,8	5,2 ± 3,1
Test Ist.		t=2,424	t=2,208	t=2,181	t=1,925	t=2,522
p		**0,016**	**0,028**	**0,03**	0,05	**0,012**
Does your father smoke?						
Yes	212	62,9 ± 21,8	25,5 ± 9,2	18,3 ± 7,1	13,4 ± 4,8	5,7 ± 3,2
No	70	57,9 ± 24,4	23,5 ± 10,5	17,1 ± 7,9	12,2 ± 5	5,2 ± 3,2
Test Ist.		t=1,619	t=1,510	t=1,219	t=1,855	t=1,266
p		0,106	0,132	0,224	0,065	0,207
** One way ANOVA, ** Independent Sample t Test*						

Findings on the relationship between participants' smoking addiction and depression scale scores

A statistically high positive correlation was obtained between the BDS total score and the PSAAT scale score (r=0.638; p<0.001). There was a statistically positive correlation between PSAAT score and BDS Emotion and Thought (r=0.612; p<0.001), Activity and Personal Relationships (r=0.588; p<0.001), Physical Symptoms (r=0.578; p<0.001) subscale scores. A high correlation was obtained. A statistically positive moderate correlation was obtained between the PSAAT score and the Suicide Desire subscale scores (r=0.468; p<0.001) (Table 5).

Table 5. The relationship PSAAT and BDS Scale Score

		PSAAT	BDS	BDS Emotion and Thought Sub-Dimension	BDS Activity and Personal Relationships Sub-Dimension	BDS Physical Symptoms Sub-Dimension
BDS	r*	0,638				
	p	**<0,001**				
BDS Emotion and Thought Sub-Dimension	r	0,612	0,947			
	p	**<0,001**	**<0,001**			
BDS Activity and Personal Relationships Sub-Dimension	r	0,588	0,935	0,83		
	p	**<0,001**	**<0,001**	**<0,001**		
BDS Physical Symptoms Sub-Dimension	r	0,578	0,872	0,76	0,781	
	p	**<0,001**	**<0,001**	**<0,001**	**<0,001**	
BDS Suicide Request Subdimension	r	0,468	0,719	0,614	0,612	0,582
	p	**<0,001**	**<0,001**	**<0,001**	**<0,001**	**<0,001**

** Spearman's rho correlation coefficient*

DISCUSSION

The research was conducted as a cross-sectional and correlation study in order to investigate the relationship between cigarette addiction and depression levels among university students and to identify significant sociodemographic characteristics. The study aimed to answer the following questions: What is the relationship between sociodemographic characteristics and depression levels? What is the relationship between cigarette addiction and depression? The participants' responses to the questions were analyzed, and the findings were evaluated.

Statistically significant differences were found between the participants' parents' education level, mother's occupation, satisfaction with the department, socioeconomic status, amount of cigarettes consumed daily, mother's smoking status, and PSAAT scores. These results suggest that smoking addiction can be influenced by various factors, such as the mother's occupation, education level, and smoking status, which may serve as risk factors for negative behavior. The study found that the PSAAT scores of participants whose parents had higher education levels were higher than those whose parents had lower education levels. However, this result is not consistent with the literature, which suggests that higher parent education has a protective effect against tobacco use (20,21). This discrepancy may be due to the parents' work outside their area of expertise, stress factors, and socioeconomic status.

Furthermore, the PSAAT scores of participants whose mothers were workers were significantly higher than those whose mothers were housewives or civil servants. This finding may be attributed to the insufficient time spent by working parents with their children and the stress factors associated with their job. Moreover, the study found that participants whose mothers smoked had significantly higher PSAAT scores than those whose mothers did not smoke. These results suggest that parental smoking may facilitate a young person's preference for smoking as a coping mechanism.

The study also found that the PSAAT scores of participants who smoked more than two packs of cigarettes per day were significantly higher than those who smoked less than two packs per day. This finding indicates that the frequency of smoking may be a predictor of addiction strength, and increasing attitudes towards addiction may lead to ignoring the harmful effects of smoking.

Additionally, the study found statistically significant differences between the participants' depression levels and their sociodemographic characteristics, such as gender, parents' education level, mother's occupation, satisfaction with the department, socioeconomic status, working in a job other than school, age of starting smoking, duration of smoking, daily smoking amount, maternal smoking status, and BDS mean score. Although the study found that university students were moderately depressed, some participants had severe depression symptoms. These findings are consistent with previous studies in the literature (22), which suggest that mental health significantly deteriorates among university-age youth.

The study findings are consistent with previous research on the relationship between smoking addiction and depression (23). The literature also suggests that higher parental education has a protective effect against tobacco use among young people (24). However, in this study, the results regarding parental education were not consistent with previous research, which may be due to factors such as the parents' occupation and socioeconomic status. The study's findings also indicate that the depression levels of university students are a predictor of their cigarette addiction. These findings are in line with other studies that have investigated the relationship between mental distress and smoking (23).

In addition, a recent study conducted by Bahrami et al. (2021) found that individuals who reported higher levels of stress were more likely to smoke cigarettes. This suggests that mental health and stress management may be important factors to consider in smoking cessation programs for university students (25). Furthermore, a meta-analysis by Taylor et al. (2014) indicated that smoking cessation interventions that target depression and anxiety symptoms can be effective in promoting smoking cessation among individuals with mental health problems (26).

Overall, this study adds to the growing body of research on the relationship between smoking addiction, depression, and sociodemographic factors among university students. The findings underscore the need for tailored prevention and intervention efforts that take into account these important factors. Future research should continue to investigate the complex interactions between these variables to inform effective public health strategies aimed at reducing the prevalence of smoking and improving mental health outcomes among young adults.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The findings of this study suggest that there is a relationship between smoking addiction, some sociodemographic characteristics, and depression among university students. Specifically, a highly positive and significant correlation was found between the level of depression and cigarette addiction. In addition, significant differences were found in terms of gender, education level of the parents, mother's occupation, department studied, satisfaction, socioeconomic status, working in any job other than school, age of starting smoking, duration of smoking, daily smoking amount, and mother's smoking status. However, it should be noted that the limited sample size may limit the generalizability of the results. To enhance the generalizability of the findings, future studies could use larger and more diverse samples that represent different demographic variables.

Recommendations

The results of this study have implications for university administrators and policymakers in their efforts to address smoking addiction among university students. Based on our findings, we suggest the following recommendations:

Offer educational programs and courses on addiction: Educational programs and courses on addiction can increase students' awareness of the harmful effects of smoking and addiction, and provide them with the necessary skills to resist peer pressure and avoid addiction.

Provide counseling services for students: Counseling services that focus on addiction prevention and intervention can help students who are struggling with addiction to overcome their addiction and improve their mental health.

Increase support for students from lower socioeconomic backgrounds: Given that socioeconomic status was found to be a significant factor in smoking addiction, it is important to provide additional support and resources for students from lower socioeconomic backgrounds to prevent and intervene in addiction.

Collaborate with parents and families: Given that parental education and occupation were found to be significant factors in smoking addiction, university administrators and policymakers could collaborate with parents and families to promote healthy behaviors and prevent addiction among their children.

In summary, this study sheds light on the relationship between smoking addiction, some sociodemographic characteristics, and depression among university students. The findings provide useful information for policymakers and university administrators who seek to prevent and intervene in smoking addiction among university students.

DECLARATION

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Conflict of Interest

The author declare that have no conflict of interest.

Ethical Approval

This study was approved by the Ethics Committee of Kastamonu University Ethics Commission with the decision dated 09.06.2022 and numbered 6/13. In order to carry out the research, written permission from the relevant institution and informed voluntary online consents from the participants were obtained. 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.

Availability of Data and Material

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

Authors' Contributions

YÖ: Design, data collection, analysis and writing.

REFERENCES

1. Koob GF and Volkow ND. Neurobiology of addiction: a neurocircuitry analysis. The Lancet Psychiatry. 2016;3(8):760-77.
2. Oğuz S, Çamcı G and Kazan M. The frequency of smoking among university students and their knowledge of diseases caused by smoking. Van Medical Journal. 2018; 25(3):332-337.
3. Wittenberg RE, Wolfman SL, De Biasi M, et al. Nicotinic acetylcholine receptors and nicotine addiction: A brief introduction. Neuropharmacology. 2020;177:108256.
4. Bajrektarevic D, Corsini S, Nistri A, et al. In Neuroscience of Nicotine. Nicotine neuroprotection of brain neurons: the other side of nicotine addiction. Academic Press;2019. p. 79-86.
5. Audrain-McGovern J, Rodriguez D and Kassel JD. Adolescent smoking and depression: evidence for self-medication and peer smoking mediation. Addiction. 2009;104:1743-1756.
6. Dierker L and Donny E. The role of psychiatric disorders in the relationship between cigarette smoking and DSM-IV nicotine dependence among young adults. Nicotine Tob Res. 2008;10:439-446.
7. Organisation for Economic Co-operation and Development (OECD). Health at a Glance 2017: OECD Indicators, OECD Publishing, Paris, 2017. p. 23-24. (updated; 2023). Accessed: 03.01.2023. doi: 10.1787/health_glance-2017-en.
8. Öntaş E and Aslan D. Global Adult Tobacco Survey Turkey 2016 - HUTF Public Health Department Public Information Series-(2018/2019-63) http://www.halksagligi.hacettepe.edu.tr/ Accessed: 06 January 2023.
9. Sağar ME. Examination of university students' attitudes towards cigarette addiction according to their smoking frequency. Gumushane University Journal of Health Sciences. 2017;6(3):41-49.
10. Şahiner NC, Şahin A and Akbağ NNA. University students' smoking status and their attitudes towards cigarette addiction. Bandırma Onyedi Eylül University Journal of Health Sciences and Research. 2020;2(2):64-79.
11. WHO. COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide. Accessed: https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide. 01 January 2023.
12. Mendelsohn PC. Smoking and depression: a review. Aust Fam Physician. 2012;1:304-307.
13. Jacobsen LK, Krystal JH, Mencl WE, et al. Effects of smoking and smoking abstinence on cognition in adolescent. Biol Psychiatry. 2005;57:56–66.
14. Substance Abuse and Mental Health Services Administration. 2018 National Survey on Drug Use And Health: Detailed Tables. Substance Abuse and Mental Health Data Archive [accessed 04 January 2023.].
15. Bayar BD, Can SY, Erten M, et al. Determination of depression and stress levels of university students during the Covid-19 pandemic process. Journal of Paramedic and Emergency Health Services. 2021;2(1):12-25.
16. Kutlu R. Evaluation of the effects of psychological dependence and desire to smoking on the success of quitting in smokers. Selcuk Medical Journal. 2021;37(3):231-237.
17. Hezer H and Karalezli A. The effect of psychological dependence on cigarettes on smoking desire and nicotine withdrawal symptoms. Ankara Medical Journal. 2019;19(4):700-707.
18. Dikmen M and Tuncer M. The validity and reliability study of the Turkish version of the Burns depression scale. International Journal of Social and Human Sciences Research. 2019;6(42):2848-2857.
19. Bhandari P. Correlation Coefficient Types, Formulas, Examples. Accessed: https://www.scribbr.com/statistics/correlation-coefficient/. 01 January 2023.
20. Öztürk M, Yücel A. The effects of sociodemographic factors on smoking behavior of university students. TAF Prev Med Bull. 2012;11(2):179-186.
21. Kaya M, Genç M, Kırcı K, Yalçın Ö. The relationship between depression, anxiety and stress levels and suicidal ideation among university students. Anatolian Journal of Psychiatry. 2019;20(4):367-374.
22. Assari S, Boyce S, Caldwell CH, et al. Parent education and future transition to cigarette smoking: Latinos' diminished returns. Frontiers in Pediatrics. 2020;8:457.
23. Fluharty M, Taylor AE, Grabski M, et al. The Association of Cigarette Smoking With Depression and Anxiety: A Systematic Review. Nicotine & Tobacco Research. 2017;19(1):3-13.
24. Hu L, Sekine M, Gaina A, et al. Association of parental smoking and depression with adolescent smoking and depressive symptoms: findings from cross-sectional and longitudinal analyses of the child and adoescent behaviors in long-term evolution study in Japan. Journal of Adolescent Health. 2015;56(2):209-215.
25. Bahrami S, Mohammadi R, Barati M, et al. Association between perceived stress and cigarette smoking: A systematic review and meta-analysis. Nicotine & Tobacco Research. 2021;23(1):17-25.
26. Taylor G, McNeill A, Girling A, et al. Change in mental health after smoking cessation: Systematic review and meta-analysis. British Medical Journal. 2014;348:g1151.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

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Distress Tolerance in Patients with Metastatic and Non-metastatic Breast Cancer: A Single-center Experience

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ABSTRACT

Purpose: Psychosocial difficulties occur in patients with breast cancer for many reasons including long-term treatments, organ loss, or deformity. Accordingly, we aimed to compare differences in distress tolerance levels between metastatic and non-metastatic female patients diagnosed with breast cancer and receiving chemotherapy. We also evaluated the possible relationship between distress tolerance levels and with background and clinical characteristics of the patients.

Methods: 208 eligible female patients with breast cancer who received at least three chemotherapy sessions were included in our study. According to the presence of metastasis, the patients were divided into two groups those receiving palliative (metastatic, n=126) and adjuvant (non-metastatic, n=82) chemotherapy. Besides the study-specific data form, the Distress Tolerance Scale (DTS) was applied to patients to assess distress tolerance levels.

Results: The age of participants was statistically significant between the non-metastatic and metastatic patients($p<0.05$). There was no significant statistical difference in DTS scores between non-metastatic and metastatic patients. DTS levels were significantly correlated with the presence of inpatient admission. Multiple linear regression analysis indicated that the absence of inpatient admission was significantly associated with DTS levels in patients with breast cancer (B:-13.792, $p<0.01$).

Conclusion: Distress tolerance is important in such a long-term illness to cope with the difficulties in the treatment. Distress tolerance may not be directly related to the stage of illness. Since inpatient admission reduces distress tolerance, it may be important in the treatment processes of these patients. Preventing possible causes of hospitalization may have positive effects on the capacity of these patients to cope with stress.

Keywords: Breast cancer; Distress; Distress tolerance; Hospitalization; Metastasis

Metastatik ve Metastatik Olmayan Meme Kanserli Hastalarda Sıkıntı Toleransı: Tek Merkez Deneyimi

ÖZET

Amaç: Meme kanseri tanılı hastalar uzun süreli tedaviler, organ kaybı ya da deformite gibi birçok nedenden dolayı psikososyal zorluklar yaşamaktadır. Çalışmamızda meme kanseri tanısı almış ve kemoterapi alan metastatik ve metastatik olmayan kadın hastaların sıkıntı tolerans seviyelerindeki farklılıkların karşılaştırılması amaçlanmıştır. Ayrıca, sıkıntı tolerans düzeyleri ile hastaların klinik özellikleri arasındaki olası ilişkinin değerlendirilmesi amaçlanmıştır.

Yöntemler: Çalışmamıza meme kanseri tanılı, en az üç kemoterapi seansı almış 208 kadın hasta dahil edildi. Metastaz varlığına göre hastalar palyatif (metastatik, n=126) ve adjuvan (non-metastatik, n=82) kemoterapi alanlar olarak iki gruba ayrıldı. Çalışmaya özgü veri formunun yanı sıra, hastalara sıkıntı tolerans düzeylerini değerlendirmek için Sıkıntı Tolerans Ölçeği (DTS) uygulandı.

Bulgular: Metastatik olmayan ve metastatik hastalar arasında katılımcıların yaşı istatistiksel olarak anlamlı saptandı ($p<0.05$). Metastatik olmayan ve metastatik hastalar arasında DTS skorlarında anlamlı bir istatistiksel fark bulunmadı. DTS seviyeleri, yatarak tedavi görmüş olmak ile anlamlı bir şekilde ilişkiliydi. Çoklu lineer regresyon analizi, meme kanserli hastalarda yatarak tedavi olmamasının DTS düzeyleri ile anlamlı şekilde ilişkili olduğunu gösterdi (B:-13.792, $p<0.01$).

Sonuç: Bu uzun süreli hastalıkta, tedavideki zorluklarla baş edebilmek için sıkıntı toleransı önem arz etmektedir. Sıkıntı toleransı, hastalığın evresi ile doğrudan ilişkili olmayabilir. Ancak yatarak tedavi görmüş olmak sıkıntı toleransını azalttığının saptanması, bu hastaların tedavi süreçlerinde önemli olabilir. Olası hastaneye yatış nedenlerinin önlenmesi, bu hastaların stresle baş etme kapasitelerini olumlu yönde etkileyebilir.

Anahtar Kelimeler: Meme kanseri; sıkıntı; sıkıntı toleransı; hastane yatışı; metastaz

Female breast cancer is the most commonly diagnosed cancer with an estimated 2.3 million new cases, representing 11.7% of all cancer cases in 2020 (1). Breast cancer has several negative results such as worse body image and disturbances in sexual life as a result of treatment including mastectomy or breast-conserving surgery (2). Menopause caused by the treatments like chemotherapy, hormonal therapies that cause ovarian function suppression or surgery can be an obstacle in front pregnancy since this cancer is common in women of reproductive age (3). The outcomes of treatment and the process of the disease have been found to be related to depressive symptoms (3). In addition, psychosocial distress has long been identified as a significant issue for breast cancer patients who come up against difficulties in many different areas.

Distress has been defined by the National Comprehensive Cancer Network as an unpleasant experience of a mental, physical, social, and spiritual nature that can affect the way of thought, feelings, or acts (4). It is a complex psychosocial phenomenon that include certain emotions such as sadness, fear, and helplessness. Although distress is an expected reaction during cancer care, it may result in difficulties in coping with cancer. Carlson et al. (2004) stated that 37.8% of 3095 patients diagnosed with different kinds of cancer had distress in the clinical range (5). Pain and distress have been defined as the '5th and 6th vital signs' respectively in cancer patients alongside the four vital signs that are standard in medical settings body temperature, heart rate, blood pressure, and respiratory rate (6). This conceptualization of distress as the 6th vital sign provided a framework for care providers to understand the emotional difficulties in cancer patients. In addition, the definition of distress drew attention to the early identification and treatment of emotional distress in cancer and many cancer centers have developed screening programs aimed at identifying distress in patients early in their cancer trajectory like in Canada (7). Numerous studies have reported that different distresses cause depression and anxiety disorders. Also, depression and anxiety have been associated negatively with treatment adherence, quality of life, and poorer survival (5,6). Distress tolerance is defined as the perceived capacity to endure and cope with negative physical or emotional states (8,9). Distress tolerance is conceptualized as a transdiagnostic risk factor in the onset and maintenance of a wide range of psychiatric disorders including depression and anxiety (10,11). Research has demonstrated that reduced distress tolerance significantly causes the use of maladaptive emotion regulation strategies including suppression of feelings, avoidance, and rumination. In addition, low distress tolerance has been associated with both poorer quality of life and reduced life satisfaction (12,13). It has also been suggested that patients with a cancer diagnosis have a negative effect in terms of distress tolerance (14).

Previous studies reported that patients with breast or other types of cancer suffer from significant psychological distress at all stages of illness (15). However, distress tolerance has not been sufficiently examined in this patient population, in those with breast cancer, particularly. The primary aim of this study was to define distress tolerance levels in breast cancer patients and compare them between metastatic and non-metastatic patients. The possible relationship between distress tolerence levels and background/clinical characteristics of the patients was also examined. We hypothesized that patients with metastatic breast cancer would have reduced distress tolerance and several clinical factors such as duration of illness, and the total number of chemotherapy sessions is correlated with distress tolerance levels

Methods

Participants and study procedure

In this cross-sectional study, female patients who received chemotherapy in the outpatient clinic of the Medical Oncology Department at Bakirkoy Dr. Sadi Konuk Training and Research Hospital (Istanbul, Turkiye), between September 2022 and November 2022, were initially screened for the study. The patients were independently evaluated in terms of a possible diagnosis independently by two senior psychiatrists. Inclusion criteria for all participants were as follows: 1) over 18 years old; 2) receiving chemotherapy at least three cycles. Presence of illiteracy, a comorbid psychiatric/neurologic disorder and not giving a consent to participate to the study were set as exclusion criteria. After applying inclusion/exclusion criteria, 208 eligible patients were enrolled. The study was approved by the Bakirkoy Dr. Sadi Konuk Training and Research Hospital Ethics Committee [IRB:19.09.2022 - 2022/299] and conducted according to the Helsinki Declaration. Written informed consent was obtained from all participants following a thorough explanation of the study procedure. A semi-structured background data form including sociodemographic and clinical information of the patients was filled whereas Distress Tolerance Scale (DTS) were administered to all participants.

Assessment of distress tolerance

Distress tolerance was assessed with the DTS a self-report questionnaire that aims to measure individual differences in the capacity of distress tolerance (8). This scale was designed to withstand negative affect or other aversive psychological and/or physical states. Items are rated on a 5-point Likert scale (5=Strongly disagree to 1=Strongly agree). A participant could have a score between 15-75 and higher scores were considered to correspond to greater levels of distress tolerance. The Turkish version of DTS has been validated in a Turkish sample (16).

Statistics

The data were analyzed using the Statistical Package for Social Sciences for Mac OS, Version 25.0 software (Armonk, NY: IBM Corp.). After analysis of the descriptive data, Skewness and Kurtosis are used to describe the spread and height of the normal distribution of the numeric data before running analyses. Accordingly, independent samples t-test was used as a parametric test for continuous variables. Either Spearman's rho test or Pearson's correlation test was used to evaluate the relationships between quantitative variables. Multiple linear regression analysis was used to determine the predictive power of sociodemographic and clinical factors on the level of DTS. Significance was evaluated at p <0.05 levels.

Results

The study population (n=208) consisted of 126 patients with non-metastatic breast cancer (60.6%) and 82 patients with metastatic breast cancer (39.4%). The mean age of the sample was 50.95 (SD=11.32). The mean age of the non-metastatic patient group was 48.69±11.2 years and 54.41±10.67 years for the metastatic group. The mean age was significantly higher in metastatic patient group (t= -3.662, p<0.001). Duration of illness (months) was significantly longer in patients with metastatic breast cancer (t= -22.650, p<0.001). The total number of chemotherapy sessions was significantly higher in metastatic patients (t= -20.930, p<0.001). The presence of a systemic disease including diabetes mellitus, hypertension, coronary artery disease, and chronic renal failure was significantly prevalent in the metastatic patient group ((χ2 =12.640, p<0.001). There was no significant statistical difference in DTS scores between non metastatic and metastatic breast cancer patients (t= 0.993, p=0.322). Comparisons of descriptive and clinical characteristics according to the presence of metastasis were presented in Table 1.

Table 1. Descriptive variables of the patients diagnosed with breast cancer according to presence of metastases

	Non-metastatic (n=126)	Metastatic (n=82)		
	Mean±SD/ n(%)	Mean±SD/ n(%)	t/X^2	p
Age	48.69±11.2	54.41±10.67	-3.662	**<0.001**
Marital status				
Unmarried/ single	12 (9.5)	10 (12.2)	.375	.540
Married	114 (90.5)	72 (87.8)		
Education				
≤ 8 years	63 (50)	41 (50)	.000	1.000
> 8 years	63 (50)	41 (50)		
Employment				
Unemployed/ irregular	97 (77)	60 (73.2)	.390	.532
Regular	29 (23)	22 (26.8)		
Inpatient admission				
Absent	125 (99.2)	66 (80.5)	23.190	**<0.001**
Present	1 (0.8)	16 (19.5)		
Duration of illness (months)	5.76±1.49	41.4±14.19	-22.650	**<0.001**
Total number of chemotherapy session	4.73±1.49	15.45±4.47	-20.930	**<0.001**
Comorbidity				
Absent	96 (76.2)	43 (52.4)	12.640	**<0.001**
Present	30 (23.8)	39 (47.6)		
DTS score	47.12±12.43	45.58±9.84	0.993	0.322

DTS: Distress tolerance scale
t: Independent samples t test
χ^2: Chi-square for categorical variables
SD: Standart deviation
p<0.05 statistically significant

We further evaluated the correlation between sociodemographic and clinical features (Table 2). Age was significantly correlated with the duration of illness (r=.209, p<0.01), the total number of chemotherapy sessions (r=.223, p<0.01), the presence of comorbidity (r=.740, p<0.01), and the presence of metastasis (r=.247, p<0.01). DTS scores of patients were significantly correlated with the presence of inpatient admission which means patients with the absence of inpatient admission have higher levels of distress tolerance (r= -0.270, p<0.01). Other correlations were presented in Table 2.

Table 2. Correlations between clinical features and DTS in all participants

r	Age	DTS	Duration of illness (months)	Total number of chemotherapy session	Presence of comorbidity	Presence of inpatient admission	Presence of metastases
Age	1	-.034	.209**	.223**	.740**	.113	.247**
DTS		1	-.021	-.060	.013	-.270**	-0.88
Duration of illness (months)			1	.972**	.188**	.332**	.850**
Total number of chemotherapy session				1	.200**	.370**	.846**
Presence of comorbidity					1	.163*	.247**
Presence of inpatient admission						1	.334**
Presence of metastases							1

Note: r: Spearman's rho correlation coefficient
**p<0.05 and **p<0.01 statistically significant*

The putative relationship between clinical variables and DTS was further tested in a linear regression analysis. Age, duration of illness, total number of chemotherapy session, presence of comorbidity, presence of inpatient admission, and presence of metastasis were entered in the regression model and stepwise method was used. The analysis indicated that absence of inpatient admission (β-13.792, p<0.01) was significant predictor of higher levels of DTS scores in patients (Table 3).

Discussion

This study is the first to evaluate distress tolerance with DTS in patients with breast cancer according to the presence of metastasis. According to our results, presence of inpatient admission has been found related with low DTS scores. In addition, we found that presence of inpatient admission increased the probability of low DTS in 13 times. Herschbach et al. defined that the most distressed diagnostic subgroups are patients with soft tissue tumours and breast cancer patients (17). However, Carlson et al. determined that being female and having diagnoses of pancreatic or lung cancer were related to the increased likelihood of distress through distress thermometer (18).

Table 3. Results of Linear Regression for high DTS score's predictors

	B	S.E.	p	95% CI
Total number of chemotherapy session	0.228	0.346	0.511	-0.455 — 0.911
Duration of illness (months)	0.152	0.114	0.181	-0.072 — 0.376
Presence of comorbidity	3.619	2.512	0.151	-1.334 — 8.572
Presence of inpatient admission	-13.792	3.217	**<0.001**	-20.136 — -7.449
Marital status (single)	0.239	2.885	0.934	-5.450 — 5.928
Education (≤8 years)	-0.551	2.320	0.813	-5.125 — 4.024
Employment (Unemployed/irregular)	0.819	2.343	0.727	-3.801 — 5.440
Presence of metastases	-6.890	3.697	0.064	-14.179 — 0.400
Age	-0.144	0.135	0.285	-0.410 — 0.121

Note: Adjusted R2=0.065
dependent variable: DTS score,
S.E: standart error
CI: confidence interval
p<0.05 statistically significant

We have found that age significantly differs between the metastatic and non-metastatic groups consistent with the literature (19). Naik et al. determined that younger adults with cancer experience higher rates of depression and anxiety symptoms after diagnosis (20). However, they reported that young adults had more metastatic disease at diagnosis which may affect their distress level. Another finding of this study is that the presence of inpatient admission, longer duration of illness, and the higher total number of chemotherapy sessions were more prevalent and statistically significant between the groups in terms of metastasis. However, DTS scores did not differ significantly between the groups. Although it is expected that metastatic patients will have less distress tolerance, this finding may be interpreted as patients with metastases may develop an endurance to manage distress in the treatment process. Psychological resilience is generally known as a phenomenon with multifactorial components, resilience is often defined as positive responses or outcomes in the face of significant risk or adversity (21). The lack of difference in distress tolerance levels between metastatic and non-metastatic patients may be due to the compensatory development of metastatic patients' resilience in the process.

Our findings indicated no statistical significance of the correlation between age and DTS scores which means distress tolerance did not differ according to age. However, emotional distress has been found more common in younger versus older patients with cancer (22). In addition, this study found that high DTS scores which mean a high capacity of distress tolerance are related to the absence of inpatient admission. This result may be interpreted as the possible effects of distress on the treatment as seen in the previous studies (1,2). Another important finding of our study is that the absence of hospitalization predicts a high DTS score and increases a high DTS score 13.7 fold. In previous studies, it has been shown that the follow-up of cancer patients, predominantly in outpatient clinics, significantly reduces hospitalizations due to chemotherapy-related side effects (23). Considering that the absence or minimization of inpatient admissions in cancer treatment is a trend, it can be concluded that continuing therapy outside increases the tolerance of distress.

Considering the close relationship between distress tolerance and psychiatric diseases, it is important to measure tolerance in groups with increased distress (10,11). These findings give clinicians a clue about the careful psychological assessment needed for patients. Although the psychosocial effects of each type of cancer on the person are different, many factors such as ethnicity, socioeconomic status, and education level can also affect the psychosocially to patients (18). We should avoid generalizations and adopt personalized approaches in psychosocial evaluations and referrals for cancer patients, just as personalized approaches come to the fore in current cancer treatment.

Some of limitations of the current study were its relatively small sample size and patients from a single department of oncology. Also, application of limited psychometric research tools may preclude the generalizability of our findings. We may recommend including inventories for evaluating depression, anxiety, and other symptom screening scales. In addition, it can be stated as another limitation that we did not specify whether patients received previous psychological support or what the patients' social support systems were like.

Conclusion

In conclusion, this study demonstrates the levels of distress tolerance did not differ between the breast cancer patients with or without metastasis. This result may be a finding showing that the resistance of metastatic patients gradually increases in the treatment process. Another important result of our study is the demonstration that distress tolerance is higher in people who are not hospitalized. Continuation of outpatient treatment has been shown in previous studies to reduce other chemotherapy-related side effects. Similarly, the absence of hospitalization may have a positive effect on treatment by increasing distress tolerance. This study managed to highlight not only the comparison of DTS scores in patients with breast cancer but also the other possible factors that could affect distress tolerance. We emphasize the DST, a feasible and readily available tool assessing distress tolerance, which every clinician can utilize before starting treatment in patients with breast cance to consider possible predisposition psychiatric disorders in their patients. Further research is required to measure distress and distress tolerance with a wider spectrum of effects.

Declarations

Ethical Statement

The study was approved by the local ethics committee [IRB: 19.09.2022 - 2022/299]. Following a thorough explanation of the study procedure, all participants or (where necessary) their legal representatives/guardians provided written informed consent for participation in the study. The study was conducted according to the Helsinki Declaration. The current paper is has not been published or presented previously.

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Disclosures of Financial or Other Potential Conflicts of Interest

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Authors Contribution

GSE: conceived and design the analysis, collected the data.

SSKB: contributed data and analysis tools, performed the analysis, wrote the paper.

MNN: conceived and design the analysis, collected the data.

References

1. 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):209–49.
2. Mokhatri-Hesari P, Montazeri A. Health-related quality of life in breast cancer patients: Review of reviews from 2008 to 2018. Health Qual Life Outcomes 2020;18(1):1–25.
3. Jiang J, Xu J, Cai L, et al. Major depressive symptoms in breast cancer patients with ovarian function suppression: a cross-sectional study comparing ovarian ablation and gonadotropin-releasing hormone agonists. BMC Psychiatry 2021;21(1).
4. NCCN Guidelines for Patients Distress During Cancer Care https://www.nccn.org/patients/guidelines/content/PDF/distress-patient.pdf. Accessed March 11, 2020
5. Carlson LE, Angen M, Cullum J, et al. High levels of untreated distress and fatigue in cancer patients. Br J Cancer 2004 9012 2004;90(12):2297–304.
6. Bultz BD, Groff SL, Fitch M, et al. Implementing screening for distress, the 6th vital sign: a Canadian strategy for changing practice. Psychooncology 2011;20(5):463–9.
7. Linden W, Vodermaier AA, McKenzie R, et al. The Psychosocial Screen for Cancer (PSSCAN): Further validation and normative data. Health Qual Life Outcomes 2009;7(1):1–8.
8. Simons JS, Gaher RM. The Distress Tolerance Scale: Development and Validation of a Self-Report Measure. Motiv Emot 2005 292 2005;29(2):83–102.
9. Leyro TM, Zvolensky MJ, Bernstein A. Distress Tolerance and Psychopathological Symptoms and Disorders: A Review of the Empirical Literature Among Adults. Psychol Bull 2010;136(4):576–600.
10. Brown RJ, Burton AL, Abbott MJ. The relationship between distress tolerance and symptoms of depression: Validation of the Distress Tolerance Scale (DTS) and short-form (DTS-SF). J Clin Psychol 2022;78(12):2609–30.
11. Norr AM, Allan NP, Macatee RJ, et al. The effects of an anxiety sensitivity intervention on anxiety, depression, and worry: Mediation through affect tolerances. Behav Res Ther 2014;59:12–9.
12. Jeffries ER, McLeish AC, Kraemer KM, et al. The Role of Distress Tolerance in the Use of Specific Emotion Regulation Strategies. 2015;40(3):439–51.
13. Lass ANS, Winer ES, Collins AC, et al. The Associations among Distress Tolerance, Unhelpful Coping Behaviors, and Symptoms of Depression: A Network Analysis. Cogn Ther Res 2020 446 2020;44(6):1077–90.
14. Baník G, Gajdošová B. Positive changes following cancer: Posttraumatic growth in the context of other factors in patients with cancer. Support Care Cancer 2014;22(8):2023–9.
15. Bultz BD, Groff SL, Fitch M, et al. Implementing screening for distress, the 6th vital sign: a Canadian strategy for changing practice. Psychooncology 2011;20(5):463–9.
16. Sargin AE, Ozdel K, Utku C, et al. Distress tolerance scale: a study of reliability and validity. J Cogn-Behav Psychother Res 2012; 152-161.
17. Herschbach P, Keller M, Knight L, et al. Psychological problems of cancer patients: a cancer distress screening with a cancer-specific questionnaire. Br J Cancer 2004 913 2004;91(3):504–11.
18. Carlson LE, Zelinski EL, Toivonen KI, et al. Prevalence of psychosocial distress in cancer patients across 55 North American cancer centers. 2018;37(1):5–21.
19. Sighoko D, Hunt BR, Irizarry B, et al. Disparity in breast cancer mortality by age and geography in 10 racially diverse US cities. Cancer Epidemiol 2018;53:178–83.
20. Naik H, Leung B, Laskin J, et al. Emotional distress and psychosocial needs in patients with breast cancer in British Columbia: younger versus older adults. Breast Cancer Res Treat 2020;179(2):471–7.
21. Vella S-LC, Pai NB. A theoretical review of psychological resilience: Defining resilience and resilience research over the decades. Arch Med Heal Sci 2019;7(2):233.
22. Champion VL, Wagner LI, Monahan PO, et al. Comparison of younger and older breast cancer survivors and age-matched controls on specific and overall quality of life domains. Cancer 2014;120(15):2237–46.
23. Goyal RK, Wheeler SB, Kohler RE, et al. Health care utilization from chemotherapy-related adverse events among low-income breast cancer patients: effect of enrollment in a medical home program. N C Med J 2014;75(4):231–8.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Psychiatry / Psikiyatri

Understanding Suicide: Do Social Support and Problem-solving Skills Really Matter?

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ABSTRACT

Purpose: How the perception of social support and all dimensions of problem-solving skills affect suicidal behavior in individuals with suicidal ideation or intention was evaluated.

Methods and Materials: A total of 150 individuals including 75 individuals who had attempted suicide and 75 individuals who had not attempted suicide were evaluated. Sociodemographic Data Form, Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Beck Anxiety Inventory, Beck Depression Inventory, Problem Solving Inventory (PSI), Multidimensional Perceived Social Support Scale (MPSSS) and Suicide Intent Scale (SIS) were administered to participants.

Results: The anxiety and depression scores of the suicide attempt group (SAG) were found to be higher compared to the no suicide attempt group. The total and subscale scores of the MPSSS were lower in the SAG group compared to the no suicide attempt group. Also, the SAG group felt significantly more inadequate in problem-solving compared to the non-attempters. The PSI-Approach-Avoidance scores were statistically significantly higher in individuals under 30 years of age.

Conclusion: When suicide remains an important public health issue worldwide, identifying and modifying suicide risk factors is crucial in suicide prevention efforts. In suicide prevention, the individual's relationships with their family, friends, and individuals with whom they share emotional connections should be taken into account. Increasing perceived social support and improving problem-solving skills should be included in suicide intervention programs.

Keywords: Suicide, intervention, social support, problem solving

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İntiharı Anlamak: Sosyal Destek ve Problem Çözme Becerileri Gerçekten Önemli mi?

ÖZET

Amaç: İntihar düşüncesi veya niyeti olan bireylerde sosyal destek algısının ve problem çözme becerilerinin tüm boyutlarının intihar davranışını nasıl etkilediği değerlendirilmiştir.

Yöntem ve Gereçler: İntihar girişiminde bulunan 75 kişi ve intihar girişiminde bulunmamış 75 kişi olmak üzere toplam 150 kişi değerlendirildi. Katılımcılara sosyodemografik Veri Formu, DSM-IV Eksen I Bozuklukları için Yapılandırılmış Klinik Görüşme (SCID-I), Beck Anksiyete Envanteri, Beck Depresyon Envanteri, Problem Çözme Envanteri (PÇE), Çok Boyutlu Algılanan Sosyal Destek Ölçeği (ÇBASDÖ) ve İntihar Niyeti Ölçeği (İNÖ) uygulanmıştır.

Bulgular: İntihar girişimi olan grubun anksiyete ve depresyon puanları intihar girişimi olmayan gruba göre daha yüksek bulundu. ÇBASDÖ toplam ve alt ölçek puanları intihar girişimi olmayan gruba göre, intihar girişimi olan grupta daha düşüktü. Ayrıca intihar girişimi olan grubun, girişimi olmayan gruba göre problem çözme becerisi önemli ölçüde daha yetersizdi. PÇE-Yaklaşma-Kaçınma puanları 30 yaş altı bireylerde istatistiksel olarak anlamlı derecede yüksekti.

Sonuç: İntihar dünya çapında önemli bir halk sağlığı sorunu olmaya devam ettiğinden, intihar risk faktörlerini belirlemek ve değiştirmek intiharı önleme çabalarında çok önemlidir. İntiharı önlemede kişinin ailesi, arkadaşları ve duygusal bağlarını paylaştığı kişilerle olan ilişkileri dikkate alınmalıdır. Algılanan sosyal desteğin artırılması ve problem çözme becerilerinin geliştirilmesi de intihar müdahale programlarına dahil edilmelidir.

Anahtar Sözcükler: İntihar, müdahale, sosyal destek, problem çözme

Suicide is a significant public health problem on a global scale and it is estimated 700,000 people dying by suicide each year and 10-20 times of that people attempting suicide (1). Suicide does not only affect the individual but also their family, friends, and the community they live in. Identifying the predictors and risk factors of suicide behavior is important in preventing suicide and developing intervention plans for individuals with suicidal thoughts.

The reasons for suicide, which seem to be a highly individual phenomenon, can be traced back to irregularities and fluctuations in an individual's relationship with society (2). Suicide is driven by feelings of helplessness and despair, which arise from unbearable pain, serious problems, confusion, mental breakdown, and a weakened sense of self. The dominant motive in suicide is the desire to escape from oneself, which arises when an individual's self-awareness is negative according to Baumeister. The person begins to experience depression and anxiety as a result of negative self-awareness. With a narrow focus on the present, the person experiences profound hopelessness, leading them to seek escape from their current situation by engaging in suicidal behavior (3).

Individuals who engage in suicidal behavior also exhibit inflexible cognitive characteristics and thought structures that contain some dysfunctional assumptions, which make them more susceptible to suicide. A common cognitive characteristic among individuals who exhibit suicidal behavior is cognitive rigidity, which means they lack the flexibility needed to solve problems and, as a result, become stuck and hopeless when faced with difficulties (4). Mraz and Runco, who examined the relationship between creative problem solving and suicidal thoughts, point out the importance of both creativity and flexibility in problem solving. The main starting point of the view that the lack of problem-solving skills is an important factor in explaining suicidal behavior is the cognitive rigidity of these individuals (5).

Social support includes all the concepts that make individuals feel cared for, loved, valued, and believe that they are part of a network of mutual communication and obligations. It can also be expressed as the sum of connections between individuals or groups that provide services aimed at developing adaptive competence to overcome short-term crises and life transitions, long-term difficulties, and stresses (6). Social support can reduce the risk of developing mental illness by increasing resilience and coping against the negative effects of stressful life events. Feelings of loneliness and isolation, which may arise due to insufficient social support, can be experienced by individuals who have suicidal ideation, and the difficulties they face in seeking help from those around them can also reduce their social support. However, ultimately, the loneliness, hopelessness, and isolation that a person is in will probably increase with the decrease in social support.

Problem-solving is a skill that must be learned and developed by an individual, requiring time, effort, energy, and practice, as well as creativity, intelligence, emotions, willpower, and action (7). The problem-solving process is a complex process that involves a series of cognitive, emotional, and behavioral activities that we put forth to solve problems that we may encounter throughout our lives, which create obstacles and cause stress. Insufficient social problem-solving skills have been reported to be associated with depression and suicidal behavior in children and adolescents (8). A study conducted with young adults hospitalized for suicidal behavior, which examined the effects of stress and problem-solving ability on suicidal thoughts and attempts, observed that stress was a precursor to suicidal ideation and attempts. Adolescents with low problem-solving ability who are exposed to high levels of stress have been found to have a high incidence of suicidal ideation and also attempts (9).

While the relationship between social support, problem-solving skills, and suicide has been extensively studied, our knowledge regarding which specific sub-dimensions are particularly important for suicide is limited. In our study, we aim to examine how the perception of social support and all dimensions of problem-solving skills affect suicidal behavior in individuals with suicidal ideation or intention. We believe that our study data will guide clinicians on what to consider in these two areas when developing suicide prevention and intervention plans.

MATERIALS AND METHODS

Sample

This research is a cross-sectional observational survey study. The sample consisted of individuals aged between 18-65 who presented to the emergency department or psychiatric outpatient clinic of Dr. Abdurrahman Yurtaslan Ankara Oncology Research and Training Hospital due to a suicide attempt. The sample also included individuals who presented to the hospital's psychiatric outpatient clinic but had not attempted suicide before. A total of 150 individuals were evaluated, including 75 individuals who

had attempted suicide and 75 individuals who had not attempted suicide.

Measurement Tools

Sociodemographic Data Form: This form was created by the researchers. It includes sociodemographic characteristics such as age, gender, marital status, education level, family history of psychiatric disorders, all medications used, age of onset of illness, time elapsed until diagnosis and etc.

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I): This is a structured clinical interview scale administered by the interviewer to investigate Axis I disorder diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders-IV. The scale was developed by First et al. and has been adapted into Turkish with a reliability study (10-11).

Beck Anxiety Inventory (BAI): It is a self-report inventory measures the frequency and severity of anxiety symptoms experienced by an individual (12). The validity and reliability of the scale has been established in Turkey by Ulusoy and colleagues (13), and a high total score on the scale indicates a higher level of anxiety experienced by the individual.

Beck Depression Inventory (BDI): It measures emotional, somatic, cognitive, and motivational symptoms of depression and is based on clinical observations rather than a specific theory (14). The highest possible score is 63, and an increase in score indicates a higher level of depression. The validity and reliability of the Turkish version of the inventory was established by Hisli in 1989 (15).

Problem Solving Inventory (PSI): It is a self-assessment scale that measures an individual's perception of their problem-solving skills (16). The scale has three subscales: Problem-Solving Confidence, Approach-Avoidance Style, and Personal Control. Higher total scores on the scale indicate that the individual perceives themselves as inadequate in their problem-solving skills. The Turkish adaptation of the scale was carried out by Nesrin Hisli Şahin (17).

Multidimensional Perceived Social Support Scale (MPSSS): The scale subjectively evaluates the sufficiency of social support obtained from three different sources and consists of a total of 12 items. The scale is rated on a seven-point Likert scale and contains three groups of four items, each related to the source of support: family, friends, and a significant other 18. It was validated and tested for reliability in Turkey by Eker and Arkar (19).

Suicide Intent Scale (SIS): It is a 20-item scale that assesses the patient's environmental conditions, post-attempt tendencies, and expectations during a suicide attempt (20). The first nine items primarily provide information about the facts and events related to the attempt, called "Conditions of the Suicide Attempt". The second section is a retrospective evaluation of the individual's emotions and thoughts during the attempt, called "Self-Assessment". The last 5 questions are not scored due to uncertainty in the options during the interview. The validity and reliability for the Turkish sample have been conducted by Dilbaz and colleagues (21).

Statistical Analysis

SPSS (Statistical Package for Social Sciences for Windows v.22.0, SPSS Inc. Chicago, IL) was used to analyze the data of the study. Descriptive statistics were given as mean (±) standard deviation, median (min-max) and percentage. It was planned to evaluate the dataset obtained from the research using Independent two-sample t-test, Analysis of Variance (ANOVA), and Tukey HSD and Tamhane T2 tests from multiple comparison methods, if the parametric test prerequisites for continuous variables were met. If the parametric prerequisites were not met, and assumptions were not met after data transformation, Mann-Whitney U Test, Kruskal-Wallis Test, and Dunn Test from multiple comparison methods were used in the data analysis of continuous variables when necessary. Categorical variables were analyzed using Chi-Square Test, Yates-Corrected Chi-Square Test, and Fisher's Exact Test. The statistical significance level was accepted as $p<0.05$.

RESULTS

In this study 75 people had attempted suicide while the other 75 individual had never attempted suicide. The mean age of the suicide attempt group (SAG) was 33.37±9.06 years, and the mean education duration was 9.89±3.69 years, while the participants without suicide attemption had a mean age of 33.40±8.72 years and a mean education duration of 10.84±3.24 years. There were no statistically significant differences between the SAG and no suicide attempted group in terms of age, gender, marital status, education duration, place of residence, total monthly household income, cohabiting individuals, and medical history. There was a statistically significant difference between the SAG and no suicide attempted group in terms of employment status (p:0.014). The comparative sociodemographic characteristics of the SAG and non-attempters are presented in Table 1.

Table 1: Comparison of Sociodemographic Characteristics of Suicide Attempted Group and Non Suicide Attempted Group

	Suicide attempted group (n:75)		Non suicide attempted group (n:75)		p value
	Amount	%	Amount	%	
Age Groups					
≤29 Years	26	34,7	27	36,0	0,981
30-39 Years	24	32,0	24	32,0	
≥40 Years	25	33,3	24	32,0	
Gender					
Female	58	77,3	50	66,7	0,203
Male	17	22,7	25	33,3	
Marital Status					
Married	39	52,0	40	53,3	0,441
Single	24	32,0	28	37,3	
Divorced/ Widoved	12	16,0	7	9,4	
Duration of Education (years)					
<8 Years	19	25,3	8	10,7	0,067
8 Years	15	20,0	17	22,7	
9-12 Years	19	25,3	30	40,0	
>12 Years	22	29,3	20	26,7	
Living condition					
City center	72	96,0	72	69,0	0,998
District	3	4,0	3	4,0	
Employment Status					
Unemployment	52	69,3	37	49,3	0,014*
Irregularly employed	12	16,0	12	16,0	
Regularly employed	11	14,7	26	34,7	
Persons Living Together With					
Spouse And Children	39	52,0	43	57,3	0,146
Parents	19	25,3	20	26,7	
Alone	5	6,7	9	12,0	
With a relative	9	12,0	2	2,7	
Student House or Dormitory	3	4,0	1	1,3	
History of Medical Treatment					
None	58	77,3	69	88,0	0,023*
Yes	17	22,7	6	12,0	

**:statistically significant; **:number of people*

53 people (70.7%) in the SAG group had attempted suicide once, 13 people (17.3%) twice, and the remaining 9 people (12.0%) had attempted suicide three or more times. Of these individuals, 41 (54.7%) stated that they had attempted suicide with non-psychiatric drugs, 7 (9.3%) with psychiatric medication, 54 (72.0%) had taken the same medication used by other household members, and 3 (4.0%) had purchased medication for this purpose from a pharmacy. When asked about the reasons for their suicide attempt, 37.3% (28 people) stated family problems as the primary reason, followed by abandonment at 28% (21 people) and physical violence at 13.3% (10 people). Sexual violence (2.7%) and having no specific reason (2.7%) were less frequently reported reasons for suicide attempts. 70 individuals (93.3%) stated that they had made the decision to attempt suicide suddenly.

Those in the SAG group stated that 60 individuals (80.0%) had received psychiatric treatment before, while 24 individuals (32.0%) in the no suicide attempt group had received psychiatric treatment before, and this difference was statistically significant ($p<0.001$).

The Beck Anxiety Inventory (BAI) scores of the SAG individuals who participated in the study were 31.80±12.93, while their Beck Depression Inventory (BDI) scores were 26.20±9.69. The no suicide attempt group had BAI scores of 18.64±10.56 and BDI scores of 17.80±6.70. The anxiety and depression scores of the SAG individuals were found to be statistically significantly higher compared to the no suicide attempt group ($p<0.001$ for both).

When the perceived social support of the participants was evaluated, the total and subscale scores of the Multidimensional Perceived Social Support Scale (MPSSS) were found to be significantly lower in the SAG group compared to the no suicide attempt group (SAG MPSSS total: 40.47±12.50, no suicide attempt group MPSSS total: 67.80±10.16; $p<0.001$). When the problem-solving skills of the participants were evaluated, it was found that the SAG group felt significantly more inadequate in problem-solving compared to the non attempters (SAG PSS score: 126.25±18.18, no suicide attempt group PSS score: 95.77±15.34; $p<0.001$). The participants' MPSSS and PSS total and subscale scores are presented in Table 2.

Table 2: Multidimensional Perceived Social Support Scale (MPSSS) and Problem Solving Inventory (PSI) Scores of Participants

	Suicide attempted group (n:75)	Non suicide attempted group (n:75)	p value
	Mean±SD	Mean±SD	
MPSSS- Family	14,11±5,20	22,52±3,47	<0,001†
MPSSS- Friends	14,39±5,77	22,80±3,92	<0,001†
MPSSS- A relative	11,97±6,44	22,48±4,70	<0,001†
MPSSS Total	40,47±12,50	67,80±10,16	<0,001†
	Suicide attempted group (n:75)	**Non suicide attempted group (n:75)**	**p value**
	Mean±SD	**Mean±SD**	
PSI-PSC*	39,24±8,37	29,63±7,83	<0,001†
PSI-AAS**	57,83±10,69	43,39±8,68	<0,001†
PSI-PC***	20,28±3,80	14,67±3,81	<0,001†
PSI-TOTAL	126,25±18,18	95,77±15,34	<0,001†

*†:statistically significant; *PSC: Problem-Solving Confidence; **AAS: Approach-Avoidance Style; ***PC: Personal Control; n: number of people; SD: standard deviation*

To evaluate the perceived social support, problem-solving skills, and suicidal attempt according to age groups, three groups were formed as <30 years, 30-39 years, and >40 years within the SAG. In the created age groups, the PSI -Approach-Avoidance style score and Suicide Intent Scale-Self-Evaluation scores were statistically significantly higher in individuals under 30 years of age compared to those over 40 years of age (p:0.046 and p:0.016, respectively). The BAI, BDI, MPSS, PSI and SIS scores of individuals who attempted and did not attempted suicide according to age groups, are presented in Table 3.

To evaluate the perceived social support, problem-solving skills, and suicidal attempt according to age groups, three groups were formed as <30 years, 30-39 years, and >40 years within the SAG. In the created age groups, the PSI -Approach-Avoidance style score and Suicide Intent Scale-Self-Evaluation scores were statistically significantly higher in individuals under 30 years of age compared to those over 40 years of age (p:0.046 and p:0.016, respectively). The BAI, BDI, MPSS, PSI and SIS scores of individuals who attempted and did not attempted suicide according to age groups, are presented in Table 3.

A correlation analysis was conducted to evaluate whether there was a relationship between suicide ideation and problem-solving skills, perceived social support, and sociodemographic characteristics of the individuals involved in SAG. The analysis revealed that there was no significant correlation between suicide ideation and the scores of BAS, BDS, PSI, and MPSSS (p:0.608, r:0.060; p:0.189, r:0.153; p:0.165, r:0.162; p:0.919, r: -0.012), respectively. In these individuals, there was a statistically significant negative relationship between the scores of the PSI-Approach-Avoidance subscale and their age (p:0.008, r:-0.304) and monthly total income (p:0.005, r:-0.318), between the scores of PSI-Problem Orientation subscale and their age (p:0.036, r:-0.243), and between the total scores of PSI and their age (p:0.014, r:-0.284) and monthly total income (p:0.004, r:-0.333). The correlation analysis between the suicide ideation scale, PSI, and MPSSS scores in SAG individuals is presented in Table 4.

DISCUSSION

It is possible to mention many risk factors for those who attempt or commit suicide. Psychiatric disorders come first among these risk factors. In studies, it has been reported that the risk of suicide increases in many different mental disorders such as depressive disorder, bipolar disorder, psychotic disorders, and substance use disorder (22-23). Therefore, recognizing and treating the underlying psychiatric illness is crucial in preventing suicide and intervening in suicidal behavior. As expected, in our study, it was found that the anxiety and depression scores of individuals who attempted suicide were significantly higher compared to those who did not attempt.

Table 3: Comparison of Anxiety, Depression, Problem Solving Skills, Perceived Social Support Scores and Sub-Dimensions According to Age Groups in Suicide Attempted and Non Suicide Attempted Groups

	Age Groups			p value
	<30 Years	30-39 Years	≥40 Years	
	Mean±SD	Mean±SD	Mean±SD	
Suicide Attempted Group				
Beck Anxiety Scale	33,85±14,28	30,33±12,67	31,08±11,89	0,556
Beck Depression Scale	28,15±12,56	23,75±6,75	26,52±8,44	0,405
MPSSS- Family	13,35±5,86	14,04±5,06	14,96±4,68	0,456
MPSSS- Friends	13,12±6,56	15,21±4,89	14,92±5,68	0,382
MPSSS- A relative	11,54±7,34	11,96±6,39	12,44±5,64	0,412
MPSSS Total	38,00±15,90	41,21±9,78	42,32±10,78	0,361
Problem Solving Inventory	39,92±8,27	38,92±7,66	38,84±9,38	0,879
Approach Avoidance Style	62,15±9,28[a]	56,33±12,05	54,76±9,54	0,046*
Personal Control	21,15±4,27	20,29±3,26	19,36±3,68	0,114
Problem-Solving Confidence - TOTAL	131,92±16,60	124,21±19,23	122,32±17,97	0,168
Conditions of the Suicide Attempt	7,72±3,69	6,92±3,41	6,27±3,96	0,315
Self Assesment	6,25±2,75[a]	5,80±3,39	4,12±2,94	0,016*
Suicide Intent Scale-TOTAL	13,52±6,81	13,17±5,31	10,38±6,26	0,140
	Age Groups			p value
	<30 Years	30-39 Years	≥40 Years	
	Mean±SD	Mean±SD	Mean±SD	
Non Suicide Attempted Group				
Beck Anxiety Scale	18,41±10,82	17,71±10,02	19,83±11,10	0,924
Beck Depression Scale	19,15±8,18	15,17±5,21	18,92±5,56	0,075
MPSS- Family	21,93±3,98	23,50±2,67	22,21±3,47	0,180
MPSS- Friends	22,30±3,68	23,46±4,61	22,71±3,47	0,216
MPSS- A relative	21,93±5,38	23,54±4,88	22,04±3,59	0,121
MPSS Total	66,15±10,32[b]	70,50±11,51	66,96±8,22	0,047*
PSI	29,85±6,79	31,58±9,02	27,42±7,41	0,290
Approach Avoidance Style	45,19±8,42	43,04±9,29	41,71±8,29	0,255
Personal Control	15,74±3,88	14,54±3,49	13,58±3,88	0,186
Problem-Solving Confidence - TOTAL	98,96±15,71	97,50±15,13	90,46±14,32	0,094

*MPSSS: Multidimensional Perceived Social Support Scale; *: statistically significant; a :In post-hoc pairwise comparison, a statistically significant difference was found between the ≥40 years group. b :In post-hoc pairwise comparison, a statistically significant difference was found between the 30-39 years group.*

Table 4: Correlation Analysis between Suicide Intent Scale (SIS), Problem Solving Inventory (PSI) and Multidimensional Perceived Social Support Scale (MSPSS) Scores in Suicide Attempted Group

		Suicide Intent Scale Conditions	Suicide Intent Scale Self Assesment	Suicide Intent Scale TOTAL
Age	r*	0,139	0,225	0,183
	p	0,233	0,052	0,116
Education Level (Year)	r	0,226	0,069	0,167
	p	0,051	0,557	0,152
Montly Income	r	0,144	0,138	0,162
	p	0,217	0,238	0,165
Beck Anxiety Scale	r	0,128	-0,018	0,060
	p	0,274	0,881	0,608
Beck Depression	r	0,148	0,122	0,153
	p	0,204	0,297	0,189
MPSSS-Family	r	0,001	0,025	0,016
	p	0,992	0,829	0,892
MPSSS-Friends	r	-0,061	0,019	-0,025
	p	0,600	0,871	0,830
MPSSS-A Relative	r	-0,079	0,116	0,023
	p	0,501	0,321	0,846
MPSSS-TOTAL	r	-0,074	0,045	-0,012
	p	0,529	0,704	0,919
Problem- Solving Confidence	r	-0,097	-0,115	-0,115
	p	0,406	0,325	0,326
Approach Avoidance Style	r	-0,156	-0,154	-0,151
	p	0,181	0,187	0,196
Personal Control	r	-0,038	-0,098	-0,078
	p	0,744	0,402	0,504
Problem Solving Inventroy (PSI) TOTAL	r	-0,140	-0,171	-0,162
	p	0,231	0,143	0,165

		PSI-PSC†	PSI-AAS	PSI-PC	PSI-TOTAL
Age	r	-0,147	-0,304	-0,243	-0,284
	p	0,207	**0,008**	**0,036**	**0,014**
Education Level (Year)	r	0,002	0,045	0,225	0,045
	p	0,986	0,699	0,052	0,703
Montly Income (TL)	r	-0,149	-0,318	-0,192	-0,333
	p	0,203	**0,005**	0,098	**0,004**
Beck Anxiety Scale	r	0,199	0,169	0,157	0,195
	p	0,087	0,148	0,178	0,094
Beck Depression	r	0,073	-0,074	-0,062	-0,054
	p	0,535	0,531	0,597	0,644
MPSSS-Family	r	-0,167	-0,067	-0,020	-0,126
	p	0,152	0,567	0,863	0,281
MPSSS-Friends	r	0,018	-0,110	-0,097	-0,065
	p	0,875	0,347	0,406	0,579
MPSSS-A Relative	r	-0,063	-0,127	-0,036	-0,117
	p	0,593	0,278	0,759	0,317
MPSS-TOTAL	r	-0,046	-0,126	-0,110	-0,120
	p	0,693	0,281	0,348	0,303

r: Spearman correlation coefficient; MPSSS: Multidimensional Perceived Social Support Scale; †PSI-PSC: Problem Solving Inventory - Problem-Solving Confidence; ††PSI-AA: Problem Solving Inventory – Approach Avoidance ; †††PSI-PC: Problem Solving Inventory Personal Control

In previous studies conducted to understand the reasons for suicide, it has been reported that the risk of suicide increases in individuals with high social isolation or low social integration, especially those who experience negative relationships within the family, and those who perceive low social support (23-24). In a study, it was reported that individuals in the group who attempted suicide perceived themselves as more lonely, also they were in social isolation, and experienced more economic difficulties compared to the other group (25). Even after taking confounding factors into account, Holma et al. (26) concluded that major depressive disorder and the length of partial remission, along with previous suicide attempts and insufficient perceived social support, were significant predictors of suicide attempts. Similarly, in our study, it was found that the perceived social support of those who attempted suicide was significantly lower compared to those who did not. A person who is deprived of social support and perceives their surroundings as unloving and rejecting may be driven to suicidal behavior by psychologic, individual, and societal forces, that mostly based on an unconscious level, and making it easier for them to detach from life and engage in self-destructive actions. Our study found that all three aspects of social support were affected. In a study conducted with 283 individuals aged between 15-25 to evaluate suicide risk factors, it was found that the family dimension of social support is especially important in reducing suicide risk (27). Having someone in one's family who can provide emotional support, being able to talk about their problems, sharing their joy and sorrow, and feeling that their feelings are valued can be protective against suicide risk.

Individuals who struggle and engage in suicidal behavior have insufficient functional problem-solving skill. In a study conducted with patients who have attempted suicide and those who have not, as well as a control group, it was reported that problem-solving skills predicted suicide risk at different levels, especially among those who had attempted suicide in the past (29). Redley et al. found that individuals who frequently attempt suicide and engage in self-harm behavior have deficiencies in problem-solving abilities (29). In our study, it was also found that the problem-solving skills of individuals who attempted suicide were insufficient compared to those who did not. In a study with individuals aged between 13 and 62, it was found that problem solving skills were lower in the 13-24 age group with high suicidal risk (30). In our study, it was found that problem solving skills were less developed in the younger age group of the individuals who attempted suicide. In addition, it was determined that high monthly

income, being married, and being employed have positive effects on problem solving skills. In some suicidal actions, individuals with lower problem-solving skills may carry out the suicidal act as a call for help and a means of communication to interact with their environment, expressing their pain and hopelessness to those around them. In these suicidal actions, the primary goal may not be death and loss of consciousness, but rather a way to express problems to others. Based on these data and literature knowledge, it can be said that problem solving should not be considered as a natural born characteristic in suicide prevention and treatment interventions, and that this skill can be learned. It may be important to develop problem solving skills in high-risk individuals through interventions.

Our study should be considered with some limitations. Individuals were evaluated cross-sectionally in our study, and it was not possible to determine whether there was a difference in the change in risk factors between those who did not attempt suicide and those who did in terms of suicide development. The possible impact of risk factors on suicide attempts can be better evaluated with longitudinal follow-up studies. Secondly, the sample size of the study is limited to enable generalization of the data to suicide attempted individuals. Larger sample size studies are needed to investigate the possible relationship between problem-solving skills and perceived social support with suicidal intention. Additionally, individual characteristics such as personality traits, intelligence, and past traumatic life experiences, which may have an impact on individuals' problem-solving skills, were not evaluated in our study. These variables may also have a relationship with both suicide and factors that may affect suicide.

CONCLUSION

Suicide actions are not situations where a single factor, event, emotion or mental disorder is responsible. In suicide prevention or intervention plans, the individual's relationships with their family, friends, and individuals with whom they share emotional connections should be taken into account. Increasing perceived social support and improving problem-solving skills should be included in intervention plans. At a time when suicide remains an important public health issue worldwide, identifying and modifying suicide ideation, intention, attempt, or completed suicide risk factors is crucial in suicide prevention efforts.

DECLARATIONS

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Conflict of interest

The authors declare that they have no competing interests.

Ethical approval

This study was approved by the Clinical Research Ethics Committee of Dr. Abdurrahman Yurtaslan Ankara Oncology Research and Training Hospital (approval number: 2014-12/134). Written and verbal informed consents were obtained for each participant.

Author contributions

S.A., C.O.Y., A.C.K. and A.Ç. conceived and designed the study. S.A. and A.Ç. collected the data. S.A. contributed the data. S.A. , C.O.Y. and A.C.K. performed the analysis and wrote the paper. A.C.K. and A.Ç. reviewed critically the paper. All authors read and approved the final manuscript.

REFERENCES

1. Organization WH. Suicide worldwide in 2019; global health estimates, 2021.
2. Kushner HI, Sterk CE. The limits of social capital: Durkheim, suicide, and social cohesion. Am J Public Health. 2005;95:1139-43.
3. Baumeister RF. Suicide as escape from self. Psychol Rev. 1990;97:90. DOI: 10.1037/0033-295x.97.1.90
4. Rudd MD, Brown GK. A cognitive theory of suicide: Building hope in treatment and strengthening the therapeutic relationship. APA. 2011. p.169-81 https://doi.org/10.1037/12303-010
5. Mraz W, Runco MA. Suicide ideation and creative problem solving. Suicide Life Threat Behav. 1994;24:38-47. DOI:10.1111/j.1943-278X.1994.tb00661.x
6. Barrera Jr M, Ainlay SL. The structure of social support: A conceptual and empirical analysis. J Community Psychol. 1983;11:133-143. DOI: 10.1002/1520-6629(198304)11:2<133::aid-jcop2290110207>3.0.co;2-l
7. Davidson JE, Sternberg RJ. The psychology of problem solving: Cambridge university press; 2003. p. 263-85.
8. Xavier A, Otero P, Blanco V, et al. Efficacy of a problem-solving intervention for the indicated prevention of suicidal risk in young Brazilians: Randomized controlled trial. Suicide Life Threat Behav. 2019;49:1746-61. DOI: 10.1111/sltb.12568
9. Grover KE, Green KL, Pettit JW, et al. Problem solving moderates the effects of life event stress and chronic stress on suicidal behaviors in adolescence. J Clin Psychol. 2009;65:1281-90. https://doi.org/10.1002/jclp.20632
10. First MB, Gibbon M. The structured clinical interview for DSM-IV axis I disorders (SCID-I) and the structured clinical interview for DSM-IV axis II disorders (SCID-II). Wiley; 2004. p.134-44.
11. Özkürkçügil A, Aydemir Ö, Yıldız M, et al. (1999) DSM-IV Eksen I Bozuklukları için Yapılandırılmış Klinik Görüşmenin Türkçeye Uyarlanması ve Güvenilirlik Çalışması, İlaç ve Tedavi Dergisi 12: 233–6.

12. Beck AT, Epstein N, Brown G, et al. An inventory for measuring clinical anxiety: psychometric properties. J. Consult Clin Psychol 1988;56:893. DOI: 10.1037//0022-006x.56.6.893
13. Ulusoy M, Sahin NH, Erkmen H. Turkish version of the Beck Anxiety Inventory: Psychometric properties. J. Cogn. Psychother. 1998;12:163.
14. Beck AT, Ward CH, Mendelson M, et al. J. An inventory for measuring depression. Arch Gen Psychiatry. 1961;4:561-71. DOI: 10.1001/archpsyc.1961.01710120031004
15. Hisli N. A reliability and validity study of Beck Depression Inventory in a university student sample. J Psychol. 1989;7:3-13.
16. Heppner P. The problem solving inventory: Consulting Psychologists Press Palo Alto, CA-Consulting Psychologists Press; 1988. p. 229-41.
17. Sahin N, Sahin NH, Heppner PP. Psychometric properties of the problem solving inventory in a group of Turkish university students. Cognit Ther Res. 1993;17:379-96.
18. Zimet GD, Dahlem NW, Zimet SG, et al. The multidimensional scale of perceived social support. J Pers Asses 1988;52:30-41.
19. Eker D. Factorial Structure, Validity, and Reliability of Revised Form of the Multidimensional Scale of Perceived Social Support. Turk Psikiyatri Derg. 2001;12:17-25.
20. Beck RW, Morris JB, Beck AT. Cross-validation of the suicidal intent scale. Psychol Rep. 1974;34:445-6. DOI: 10.2466/pr0.1974.34.2.445
21. Dilbaz N, Bayam G, Bitlis V. İntihar Niyeti Ölçeği: Geçerlilik ve güvenirliği. Psikiyatri, Psikoloji, Psikofarmakoloji Dergisi 1995;3:28-31. https://doi.org/10.1501/ Kriz_0000000098
22. Arnberg FK, Gudmundsdóttir R, Butwicka A, at al. Psychiatric disorders and suicide attempts in Swedish survivors of the 2004 southeast Asia tsunami: a 5 year matched cohort study. Lancet Psychiatry 2015;2:817-24. DOI: 10.1016/S2215-0366(15)00124-8
23. Sokero TP, Melartin TK, Rytsälä HJ, at al. Prospective study of risk factors for attempted suicide among patients with DSM–IV major depressive disorder. BJPsych 2005;186:314-8. DOI: 10.1192/bjp.186.4.314
24. House JS, Landis KR, Umberson D. Social relationships and health. Science 1988;241:540-5. DOI: 10.1126/science.3399889
25. Özgüven HD, Soykan Ç, Haran S. İntihar girişimlerinde sorun alanları ve tetikleyiciler. Kriz Dergisi 2003; 11:13-24 https://doi.org/10.1501/Kriz_0000000188
26. Holma KM, Melartin TK, Haukka J, et al. Incidence and predictors of suicide attempts in DSM–IV major depressive disorder: a five-year prospective study. Am J Psychiatry. 2010;167:801-8. DOI: 10.1176/appi.ajp.2010.09050627
27. Moller CI, Cotton SM, Badcock PB, at al. Relationships between different dimensions of social support and suicidal ideation in young people with major depressive disorder. J Affect Disord. 2021;281:714-20. DOI: 10.1016/j.jad.2020.11.085
28. D'Zurilla TJ, Chang EC, Nottingham EJ, at al.Social problem-solving deficits and hopelessness, depression, and suicidal risk in college students and psychiatric inpatients. J Clin Psychol. 1998;54:1091-7. DOI: 10.1002/(sici)1097-4679(199812)54:8<1091::aid-jclp9>3.0.co;2-j
29. Redley M. Towards a new perspective on deliberate self-harm in an area of multiple deprivation. Sociol Health Illn. 2003;25:348-72. DOI: 10.1111/1467-9566.00350
30. Batıgün AD. Suicide Probability: An Assessment Terms of Reasons for Living, Hopelessness and Loneliness. Turk Psikiyatri Derg. 2005;16:29-39. PMID:15793696

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Radiology / Radyoloji

Evaluation of the Role of Computed Tomography Imaging Findings in Determining The Prognosis in Acute Pancreatitis Case by Comparison with Ranson Criteria

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ABSTRACT

Background/Purpose: Acute pancreatitis (AP) progresses with pathological changes. Therefore, the prognosis of the disease can be quite variable. In severe pancreatitis, local or systemic complications with high mortality may occur. Treatment of patients after diagnosis of AP depends on early assessment of disease severity. In this study, we aimed to evaluate the effectiveness of predicting pancreatitis severity and prognosis by comparing computerized tomography (CT) scan findings with Ranson criteria.

Methods: Patients aged 18 years and over who applied to our hospital with the diagnosis of AP between January 2018 and December 2020 were included in the study. We retrospectively analyzed 190 patients in order to determine the severity and prognosis of pancreatitis by comparing CT scan findings and Ranson criteria. Demographic, clinical, radiological and laboratory data of the patients at the time of admission were retrospectively analyzed. In laboratory data, hematocrit (HTC) decrease, blood urea nitrogen (BUN) increase, serum calcium (Ca) level, partial arterial oxygen pressure (PaO2), base deficit and fluid sequestration were evaluated. On CT findings, pancreatic expansion, pancreatic density, peripancreatic fluid collection, intra-abdominal ascites, peripancreatic fatty tissue heterogeneity, presence of peripancreatic lymph nodes, Wirsung duct diameter, presence of pathology in the gallbladder, hepatosteatosis, splenomegaly, splenic vein diameter were assessed.

Results: A statistically significant difference was found in the comparison of the degree of peripancreatic fluid collection and the severity of pancreatitis. There was no statistically significant difference in our other comparisons.

Conclusion: In general, studies are dominated by the opinion that the presence of necrosis in patients with AP may be a criterion for determining the prognosis. In our study, it was determined that the presence or absence of pancreatic necrosis in the CT performed at the time of admission was not a prognostic predictor. However, follow-up of necrosis in control imaging can be a marker in determining the prognosis.

Keywords: acute necrotizing pancreatitis, prognosis, computerized tomography

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Akut Pankreatit Tanısı Alan Olgularda Bilgisayarlı Tomografi Bulgularının Prognozu Belirlemedeki Rolünün Ranson Kriteri ile Karşılaştırılarak Değerlendirilmesi

ÖZET

Giriş/Amaç: Akut pankreatit (AP) patolojik değişikliklerle seyreder. Bu nedenle, hastalığın prognozu oldukça değişken olabilir. Şiddetli pankreatitte mortalitesi yüksek lokal veya sistemik komplikasyonlar ortaya çıkabilir. AP tanısından sonra hastaların tedavisi, hastalık şiddetinin erken zamanda değerlendirilmesine bağlıdır. Bu çalışmada bilgisayarlı tomografi (BT) tarama bulgularını Ranson kriterleri ile karşılaştırarak pankreatit şiddeti ve prognozunu tahmin etmedeki etkinliği değerlendirmeyi amaçladık.

Metot: Ocak 2018-Aralık 2020 tarihleri arasında hastanemize AP tanısı ile başvuran 18 yaş ve üzeri hastalar çalışmaya dahil edildi. BT tarama bulguları ve Ranson kriterlerini karşılaştırarak pankreatitin şiddetini ve prognozunu belirlemek için 190 hastayı retrospektif olarak inceledik. Hastaların başvuru anındaki demografik, klinik, radyolojik ve laboratuvar verileri retrospektif olarak incelendi. Laboratuvar verilerinde hematokrit (HTC) düşüşü, kan üre nitrojeni (BUN) artışı, serum kalsiyum (Ca) düzeyi, parsiyel arteriyel oksijen basıncı (PaO2), baz açığı ve sıvı sekestrasyonu değerlendirildi. BT bulgularında pankreas genişlemesi, pankreas yoğunluğu, peripankreatik sıvı toplanması, karın içi asit, peripankreatik yağ dokusu heterojenliği, peripankreatik lenf nodu varlığı, Wirsung kanal çapı, safra kesesinde patoloji varlığı, hepatosteatoz, splenomegali, splenik ven çapı değerlendirildi.

Bulgular: Peripankreatik sıvı toplanma derecesi ile pankreatit şiddeti karşılaştırıldığında istatistiksel olarak anlamlı fark bulundu. Diğer karşılaştırmalarımızda istatistiksel olarak anlamlı fark yoktu.

Sonuç: Çalışmalarda genel olarak AP'li hastalarda nekroz varlığının prognozu belirlemede bir kriter olabileceği görüşü hakimdir. Çalışmamızda başvuru anında çekilen BT'de pankreatik nekroz varlığının veya yokluğunun prognostik bir belirteç olmadığı belirlendi. Ancak kontrol görüntülemede nekrozun takibi prognozu belirlemede bir belirteç olabilir.

Anahtar Kelimeler: Akut nekrotizan pankreatit, prognoz, bilgisayarlı tomografi

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Acute pancreatitis (AP) progresses with pathological changes of varying severity, ranging from mild edematous pancreatitis to severe necrotizing pancreatitis. Therefore, the prognosis of the disease can be quite variable. In severe pancreatitis, local or systemic complications with high mortality may occur (1). Treatment of patients after diagnosis of AP depends on early assessment of disease severity. This assessment, based on objective parameters, is crucial for predicting clinical complications and identifying potentially fatal attacks known to occur in 2-10% of patients with AP (2,3). It is also important in terms of predicting the prognosis of the disease and determining and planning the need for systemic antibiotics, intensive care or surgical treatment. Many scoring systems have been developed for this purpose. Ranson, APACHE-II and Atlanta criteria are the most commonly used and known scoring systems (4,5).

Contrast-enhanced Computed tomography (CT) according to the Atlanta criteria is the first choice for imaging cases with prediagnosis of pancreatitis. Because it is easily accessible for acute patients and has a high degree of accuracy (6). On CT, the presence of pancreatic necrosis, pancreatic parenchymal and extrapancreatic fluid collections is evaluated and characterized. The presence of gallstones, biliary dilatation, venous thrombosis, aneurysms, inflammatory involvement of the gastrointestinal tract such as ascites and extra-pancreatic findings are defined (7).

In this study, we aimed to evaluate the effectiveness of predicting pancreatitis severity and prognosis by comparing CT scan findings with Ranson criteria.

MATERIALS and METHODS

Patients aged 18 years and over who applied to our hospital with the diagnosis of AP between January 2018 and December 2020 were included in the study. Ethical approval for this study was obtained from the Trakya University Study Ethics Committee (TÜTF-GOBAEK 2022/416) and written consent was received from all patients included in the study.

Patients who were being 18 years of age or older, meeting the diagnostic criteria for AP and having an abdominal CT image were included in the study. Patients who had missing laboratory data, pregnancy and technical inadequacy of CT imaging were excluded. A total of 204 patients were diagnosed with AP and underwent abdominal CT imaging, of whom six patients were excluded due to missing data and eight patients due to technical inadequacy of CT images. The number of patients included in the study was 190.

Demographic, clinical, radiological and laboratory data of the patients at the time of admission were retrospectively analyzed. In laboratory data, hematocrit (HTC) decrease, blood urea nitrogen (BUN) increase, serum calcium (Ca) level, partial arterial oxygen pressure (PaO2), base deficit and fluid sequestration were evaluated. On CT findings, pancreatic expansion, pancreatic density, peripancreatic fluid collection, intra-abdominal ascites, peripancreatic fatty tissue heterogeneity, presence of peripancreatic lymph nodes, Wirsung duct diameter, presence of pathology in the gallbladder, hepatosteatosis, splenomegaly, splenic vein diameter were assessed.

In the diagnosis of AP, typical abdominal pain, known as the Atlanta criteria, increase in serum amylase and/or lipase values more than 3 times the upper limit of normal, and imaging findings compatible with AP on CT were used (8). Patients with 2 or more of these findings were considered AP. Demographic, clinical and laboratory data of patients diagnosed with AP were recorded. CT studies were performed using an 8-channel Toshiba Aquilion 64 multislice device (Toshiba Medical Systems, Tokyo, Japan), and all images were interpreted with the PACS imaging system (Sectra PACS Linköping-Sweden). The radiologist with 15 years of experience interpreting CT images was unaware of the study and patient outcomes. Age, gender, vital signs and laboratory data of the patients were recorded. At the end of the study, the first 24-hour Ranson scores were calculated retrospectively using the clinical, laboratory and radiological imaging findings of the patients.

Statistical analysis was performed with Turcosa Analytics software. The conformity of the variables to the normal distribution was examined by visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Descriptive analyses were given for normally distributed variables using mean, standard deviation and median. Pearson's Chi-Square and Fisher's Exact Tests were compared on 2x2 tables. In cases where the data did not show normal distribution, groups of 2 were evaluated with the Mann Whitney U test. Differences where the p value was less than 0.05 were considered statistically significant.

RESULTS

In our study, the data of 190 patients with a mean age of 63.6±16.1 (oldest 94, youngest 18) were analyzed retrospectively. Of the cases, 91 (47.8%) were male and 99 (52.2%) were female (Table 1).

Pancreatitis severity was divided into four categories as mild, moderate, severe and very severe. There were 56 patients with mild pancreatitis, 106 patients with moderate pancreatitis, 26 patients with severe pancreatitis and 2 patients with very severe pancreatitis.

On CT imaging, pancreatic expansion degree, amount of intra-abdominal ascites, peripancreatic fatty tissue heterogeneity and severity of pancreatitis were compared. There was no statistically significant difference between these CT findings and the severity of pancreatitis (Table 1).

Table 1. Comparison of demographic data with study groups

	Severity of Pancreatitis				p
	Mild	**Moderate**	**Severe**	**Very Severe**	
Age	58.3 (18-85)	64.9 (23-94)	68.6 (26-92)	80 (71-89)	0.003*
Sex					
Male n (%)	30 (32.9)	51 (56.1)	8 (8.8)	2 (2.2)	0.144**
Female n (%)	26 (26.3)	55 (56.5)	18 (18.2)	0	

*Note: Data were obtained by *Kruskal-wallis test ** Chi-square test. p<0.05 was considered statistically significant and statistically significant difference is highlighted in bold. Abbreviations; n: number of patients*

A statistically significant difference was found in the comparison of the degree of peripancreatic fluid collection and the severity of pancreatitis (Table 2).

On CT imaging, the presence of peripancreatic lymph nodes, the presence of gallbladder pathology, the degree of hepatosteatosis, the presence of splenomegaly, the presence of pancreatic-peripancreatic necrosis were compared with the severity of pancreatitis, and no statistically significant difference was detected between these CT findings and the severity of pancreatitis (Table 3).

No statistically significant difference was found in the comparison of the density of the pancreas (Hounsfield Unit, HU) with the severity of the disease on CT imaging (ANOVA, p=0.363, ANOVA, Figure 1).

The results of the Kruskal-Wallis test revealed that there was no statistically significant difference was observed in the comparison of the diameter of the main pancreatic duct (wirsung) and the severity of the disease on CT imaging (Kruskal-Wallis, p=0.503, Figure 2).

No statistically significant difference was found in the comparison of the splenic vein diameter and the severity of the disease on CT imaging (ANOVA, p=0.482, Figure 3).

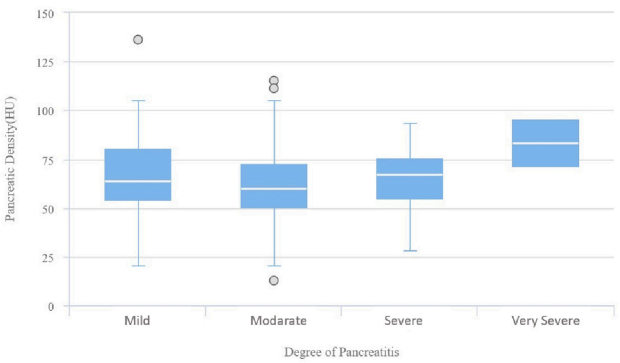

***Fig. 1** Comparison of pancreatic density (HU) on CT with the severity of the disease*

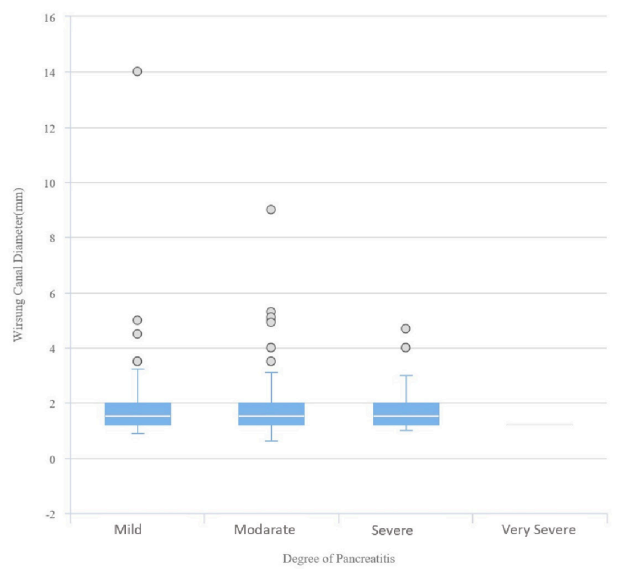

***Fig. 2** Comparison of wirsung diameter (mm) with disease severity on CT*

Table 2. Comparison of the degrees of CT findings and the severity of pancreatitis

		Severity of Pancreatitis				p
		Mild (n, %)	Moderate (n, %)	Severe (n, %)	Very Severe (n, %)	
Pancreas expansion on CT	Absent	12(%25.5)	29(%61.6)	6(%12.9)	0	0.705*
	Focal	13(%34.2)	21(%55.4)	3(%7.8)	1(%2.6)	
	Diffuse	31(%29.2)	56(%53.3)	17(%16.3)	1(%1.2)	
Peripancreatic fluid collection on CT	Minimal	25(%22.6)	68(%61.2)	16(%14.4)	2(%1.8)	0.042*
	Focal	14(%51.9)	8(%29.6)	5(%18.5)	0	
	Diffuse	17(%32.7)	30(%57.7)	5(%9.6)	0	
Intra-abdominal ascites	Absent	20(%25.3)	48(%60.8)	9(%11.4)	2(%2.5)	0.352*
	Mild	18(%26.5)	39(%57.4)	11(%16.1)	0	
	Moderate	16(%43.3)	17(%45.9)	4(%10.8)	0	
	Massive	2(%33.3)	2(%33.3)	2(%33.4)	0	
Peripancreatic fatty tissue heterogeneity on CT	No	10(%32.3)	19(%61.3)	2(%6.5)	0	0.551*
	Yes	46(%28.9)	87(%54.7)	24(%15.1)	2(%1.3)	

*Note: Data were obtained by * Chi-square test. Categorical variables are presented as counts (percentages).*
p<0.05 was considered statistically significant and statistically significant difference is highlighted in bold.
Abbreviations; n: number of patients, CT: computerized tomography

Table 3. Comparison of the degrees of CT findings with the severity of pancreatitis

		Severity of Pancreatitis				p
		Mild (n, %)	Moderate (n, %)	Severe (n, %)	Very Severe (n, %)	
Peripancreatic lymph node on CT	No	15(%27,3)	31(%56,4)	8(%14,5)	1(%1,8)	0.895*
	Yes	41(%30,4)	75(%55,5)	18(%13,3)	1(%0,8)	
Gallbladder pathology	Nonbiliary	5(%20,9)	17(%70,8)	2(%8,3)	0	0.445*
	Biliary	51(%30,7)	89(%53,6)	24(%14,5)	2(%1,2)	
Degree of hepatosteatosis	Absent	34(%27,4)	74(%59,7)	16(%12,9)	0	0.226*
	Mild	14(%35)	20(%50)	5(%12,5)	1(%2,5)	
	Moderate	5(%22,7)	11(%50)	5(%22,7)	1(%4,6)	
	Severe	3(%75)	1(%25)	0	0	
Splenomegaly	No	51(%28,5)	101(%56,5)	25(%13,9)	2(%1,1)	0.673*
	Yes	5(%45,4)	5(%45,4)	1(%9,2)	0	
Pancreatic-peripancreatic necrosis on CT	No	50(%29,3)	96(%56,1)	23(%13,4)	2(%1,2)	0.948*
	Yes	6(%31,6)	10(%52,6)	3(%15,8)	0	

*Note: Data were obtained by * Chi-square test. Categorical variables are presented as counts (percentages).*
p<0.05 was considered statistically significant and statistically significant difference is highlighted in bold. Abbreviations; n: number of patient, CT: computerized tomography

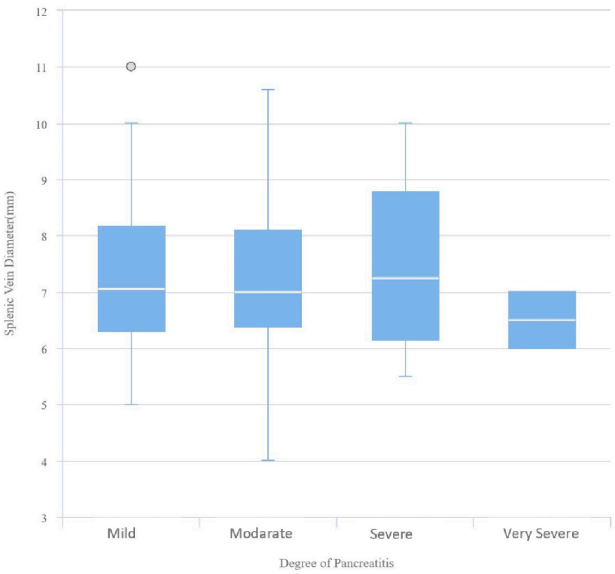

Fig. 3 *Comparison of the splenic vein diameter (mm) and the severity of the disease on CT*

DISCUSSION

In our study, of the patients admitted to our hospital and diagnosed with AP, the severity of the disease was evaluated to be mild in 56 (29.3%), moderate in 106 (55.5%), severe in 26 (13.6%), and very severe in 2 (0.5%) (according to Ranson criteria). In the studies available in the literature, they conducted research on prognosis prediction by scoring the severity of the disease on CT (CT severity score) in cases diagnosed with AP. We evaluated the CT criteria in this scoring system, in addition to splenic vein diameter, hepatosteatosis grade, splenomegaly, etc., by adding a few more criteria, and we separately evaluated whether they were effective in determining the prognosis. As a result of our study, a statistically significant difference was found only in the comparison of the degree of peripancreatic fluid collection and the severity of pancreatitis (p=0.042). Moreover, we concluded that the comparison of the CT findings at the time of application with the Ranson criteria, which we evaluated, did not have a predictive value or contribution of its own in determining the prognosis.

Shen et al (9,10) reported that the use of contrast-enhanced CT is not an accurate method for estimating severity in patients with pancreatitis. However, in another study, it has been shown to be superior to the Ranson criteria. In the study of Aphinives et al (11), it was found that the sensitivity of Ranson criteria was only 40.9%, while that of contrast-enhanced CT was 64.2%. However, the specificity of Ranson criteria was higher than CT (93.4% vs. 84.5%). Chand et al (12) showed that there was no statistically significant difference between Ranson criteria and Modified CT severity index (CTSI) in evaluating the outcome of AP among systemic complications. Although local complications were observed in patients with high Ranson score, the difference was not statistically significant. Kumar et al (13) showed that there was no significant difference between Ranson criteria and Modified CTSI in predicting pancreatic necrosis, organ failure, and intensive care unit hospitalization in patients with AP, with a p value of 0.10, 0.22, and 0.10 respectively.

Some CT findings have been suggested as an indicator of disease severity in AP. Meyrignac et al (14) measured the necrosis volume in adults with AP using a software and reported that an extrapancreatic necrosis volume greater than 100 ml was associated with organ dysfunction.

In general, studies are dominated by the opinion that the presence of necrosis in patients with AP may be a criterion for determining the prognosis. In our study, it was determined that the presence or absence of pancreatic necrosis in the CT performed at the time of admission was not a prognostic predictor. However, follow-up of necrosis in control imaging can be a marker in determining the prognosis.

Although CT is a very useful imaging method in diagnosing pancreatitis, CT imaging performed at the time of diagnosis does not provide sufficient information about the prognosis. An important criterion in this regard is how long after the onset of the patient's symptoms CT imaging is performed. In our study, the patients underwent CT imaging after an average of 24.1±23.8. hours. Pancreatic necrosis associated with severe AP usually occurs within 72 hours of disease onset. CT scan can be suspicious within 24-48 hours. Therefore, CT scan is recommended 72 hours after the onset of symptoms (15).

Limitations of our study include being a retrospective study and having a small number of patients. In addition, the fact that CT was performed at an average of 24 hours from the onset of symptoms can also be considered a limitation of our study.

CONCLUSION

Correlation was found between the parameters showing the severity of CT findings and the clinical parameters (Ranson, APACHE, etc.) evaluating the severity of AP in most of the studies. However, there was no general advantage. When we evaluated the criteria one by one, only one criterion (peripancreatic fluid collection) made a statistically significant difference. In this context, the contribution of CT in the diagnosis and prognosis of AP is clearly evident. However, with the combination of these findings, there is a need for larger and longer-term studies to be conducted in prospective cases, taking into account the CT hours at the time of diagnosis, in order to create a more quantitative prognostic prediction.

DECLARATIONS

Funding

Not applicable

Conflicts of Interest/Competing Interests

Authors declare no conflict of interest.

Ethics Approval

All protocols for this study were approved by the Trakya University Study Ethics Committee (TÜTF-GOBAEK 2022/416).

Availability of Data and Material (Data Transparency)

All data has been presented.

Authors' Contributions

All authors contributed to this work in accordance with the ICMJE authorship criteria.

REFERENCES

1. Garg PK, Singh VP. Organ Failure Due to Systemic Injury in Acute Pancreatitis. Gastroenterology. 2019;156(7):2008-23.
2. Bradley EL, 3rd. A clinically based classification system for acute pancreatitis. Summary of the International Symposium on Acute Pancreatitis, Atlanta, Ga, September 11 through 13, 1992. Arch Surg. 1993;128(5):586-90.
3. Dervenis C, Johnson CD, Bassi C, Bradley E, Imrie CW, McMahon MJ, et al. Diagnosis, objective assessment of severity, and management of acute pancreatitis. Santorini consensus conference. Int J Pancreatol. 1999;25(3):195-210.
4. Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, et al. Classification of acute pancreatitis--2012: revision of the Atlanta classification and definitions by international consensus. Gut. 2013;62(1):102-11.
5. Ranson JH, Pasternack BS. Statistical methods for quantifying the severity of clinical acute pancreatitis. J Surg Res. 1977;22(2):79-91.
6. Balthazar EJ. Staging of acute pancreatitis. Radiol Clin North Am 2002;40(6):1199-209.
7. Thoeni RF. The revised Atlanta classification of acute pancreatitis: its importance for the radiologist and its effect on treatment. Radiology 2012;262(3):751-64.
8. Waller A, Long B, Koyfman A, Gottlieb M. Acute Pancreatitis: Updates for Emergency Clinicians. J Emerg Med 2018;55(6):769-79.
9. Leung TK, Lee CM, Lin SY, Chen HC, Wang HJ, Shen LK, et al. Balthazar computed tomography severity index is superior to Ranson criteria and APACHE II scoring system in predicting acute pancreatitis outcome. World J Gastroenterol. 200514;11(38):6049-52.
10. Balthazar EJ, Robinson DL, Megibow AJ, Ranson JH. Acute pancreatitis: value of CT in establishing prognosis. Radiology. 1990;174(2):331-6.
11. Aphinives P, Karunasumetta C, Bhudhisawasdi V, Saesaew OT. Acute pancreatitis: assessment severity with Ranson score and CT evaluation. J Med Assoc Thai. 2011;94(4):437-40.
12. Chand P, Singh R, Singh D, Rani N. Evaluation of the outcome of acute pancreatitis by Ranson's criteria and modified CT severity index. Renal failure. 2017;2(2):4-25.
13. Harshit Kumar A, Singh Griwan M. A comparison of APACHE II, BISAP, Ranson's score and modified CTSI in predicting the severity of acute pancreatitis based on the 2012 revised Atlanta Classification. Gastroenterology report. 2018;6(2):127-31.
14. Meyrignac O, Lagarde S, Bournet B, Mokrane FZ, Buscail L, Rousseau H, et al. Acute Pancreatitis: Extrapancreatic Necrosis Volume as Early Predictor of Severity. Radiology. 2015;276(1):119-28.
15. Knoepfli AS, Kinkel K, Berney T, Morel P, Becker CD, Poletti PA. Prospective study of 310 patients: can early CT predict the severity of acute pancreatitis? Abdom Imaging. 2007;32(1):111-5.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Physiotherapy and Rehabilitation / Fizyoterapi ve Rehabilitasyon

Investigation of the Effect of Physical Activity Level on Fear of Birth and Quality of Life During Pregnancy

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ABSTRACT

Purpose: Although the importance of physical activity in every period of life is known, it may decrease depending on the changes during pregnancy. This study aims to understand how physical activity levels, quality of life, and fear of childbirth are affected during pregnancy and to emphasize the importance of physical activity levels during pregnancy.

Methods: Our study's population was planned as a cross-sectional study of pregnant women who applied to the Physiofit wellness center. The sample consists of 84 volunteer pregnant women participating in the study. Physical activity levels; with the Pregnancy Physical Activity Questionnaire (PPAQ), quality of life; with the Short Form-36 (SF-36), fear of birth level; with Wijma Delivery Expectancy/Experience Questionnaire A (WDEQ-A) were evaluated.

Results: It was determined that the total PPAQ score median of pregnant women was 141.27. PPAQ sub-parameter scores were correlated with almost all sub-parameter scores of SF-36 ($p<0.05$). In comparison with the quality of life, the highest correlation was observed in moderate intensity and sports/exercise type physical activities ($p<0.05$), no correlation was observed between the sedentary physical activity sub-parameter and any quality of life sub-parameter ($p>0.05$). A negative and significant correlation was observed between all sub-parameters of physical activity except sedentary-intensity and Household/care-type sub-parameter and WDEQ-A total score($p<0.05$).

Conclusion: As a result, it was observed that women's quality of life decreases, and their fear of childbirth increases with the inadequacy of physical activity levels during pregnancy.

Keywords: Fear of Birth, Quality of Life, Physical Activity, Pregnancy.

Gebelikte Fiziksel Aktivite Düzeyinin Doğum Korkusu ve Yaşam Kalitesine Etkisinin İncelenmesi

ÖZET

Amaç: Fiziksel aktivitenin hayatın her dönemindeki önemi bilinmesine rağmen gebelik dönemindeki değişimlere bağlı olarak azalabilir. Bu çalışma gebelikte fiziksel aktivite düzeylerinin, yaşam kalitesinin ve doğum korkusunun nasıl etkilendiğini anlamayı ve gebelikte fiziksel aktivite düzeylerinin önemini vurgulamayı amaçlamaktadır.

Metod: Çalışmamızın popülasyonunu Fizyofit sağlıklı yaşam merkezine başvuran gebeler, örneklemini ise araştırmaya katılan gönüllü 84 gebe oluşturmuştur. Gebelerin fiziksel aktivite seviyeleri Gebelik Fiziksel Aktivite Anketi (GFAA)ile yaşam kaliteleri Kısa Form-36 (KF-36) ile doğum korkusu düzeyleri Wijma Doğum Beklentisi/Deneyim Anketi A (WDBÖ-A) ile değerlendirildi.

Sonuçlar: Gebelerin toplam GFAA puan medyanlarının 141.27 olduğu belirlendi. GFAA alt parametre puanları, KF-36'nın hemen hemen tüm alt parametre puanları ile korele idi ($p<0.05$). Yaşam kalitesi ile karşılaştırıldığında, en yüksek korelasyon orta şiddette ve spor/egzersiz türü fiziksel aktivitelerde gözlenirken ($p<0.05$), sedanter fiziksel aktivite alt parametresi ile herhangi bir yaşam kalitesi alt parametresi arasında korelasyon gözlenmedi ($p>0.05$).Fiziksel aktivitenin sedanter-yoğunluk ve Ev/bakım tipi alt parametresi dışındaki tüm alt parametreleri ile WDBÖ-A toplam puanı arasında negatif ve anlamlı bir korelasyon gözlendi ($p<0.05$).

Tartışma: Sonuç olarak, gebelikte fiziksel aktivite düzeylerinin yetersizliği ile birlikte kadınların yaşam kalitelerinin düştüğü, doğum korkularının arttığı görüldü.

Anahtar Kelimeler: Doğum Korkusu, Yaşam Kalitesi, Fiziksel Aktivite, Gebelik.

With the modernization of daily life, the decrease in physical activity levels and the increasing stress levels of individuals cause adverse effects on general health in the whole population (1).The necessity of doing enough physical activity to reduce these adverse effects and improve health has been shown in many studies. It is known that regular physical activity has positive effects on psychological functionality as well as general health (2).

Pregnancy, a transitional period for women, is when frequent physical and emotional changes are experienced (3). A direct relationship exists between maintaining physical fitness during pregnancy, managing weight gain, reducing the risks of gestational diabetes, preeclampsia, hypertension, and prenatal depression, and improving psychological well-being and regular physical activity. In epidemiological studies, It has been reported that women who are active during their pregnancy have a lower risk of developing physical problems and are in a better situation in terms of adaptation to changes in pregnancy. It is emphasized that physically active women's maternal and child health are positively affected during pregnancy (4). The published guide stated that pregnant women should do moderate-intensity exercise for at least half an hour every day of the week, and women who were active before pregnancy could maintain their lifestyles (5). Despite the reported benefits of regular physical activity, the level of physical activity in women is lower than in men, especially during pregnancy. Problems during pregnancy can further increase physical activity restriction, which may increase gradually in the later stages. In addition, pregnant women may think that physical exercises may affect the fetus's health and reduce their physical activities. Many pregnant women may be concerned about the potential harm of physical activity to the fetus (6). As with hormonal and physiological changes, the source of psychological changes during pregnancy is the fetus, which tries to complete it during this period. However, in most women, some mental changes can be seen, which can occur in different periods of pregnancy, such as mild, moderate, and severe. These mood changes can cause conflict, anxiety, introversion, uncertainty, and fear. Fear affects women negatively during the last pregnancy period (4).

Fear of childbirth is a common clinical problem. Almost all women can be afraid of birth. Especially in the last trimester, baby-protective approaches predominate. Negative thoughts experienced with the delivery approach can further confuse pregnant women's minds and increase their fear of childbirth. These fears affect daily life by increasing stress and triggering the stress-fear cycle, and can impair quality of life. Concerns in this process; can cause anxiety and depression and negatively affect the postpartum period. All of these can affect the healthy progression of pregnancy (7). Therefore, the pregnant woman should have a healthy, peaceful, and happy pregnancy period for herself and her fetus (8).

Many studies examined the effects of physical activity levels during pregnancy on the quality of life of pregnant women (4,9). These studies emphasized that physical activity positively contributed to the pregnant's quality of life and mental state. However, the standard limitation of these studies is that pregnancy-specific measurement methods were not used. In addition, only two studies (10,11) evaluate the relationship between fear of childbirth and physical activity levelwhich is necessary for maternal and child health during and after pregnancy. The most important limitations of these studies are that the scales used are non-standardized. This study aims to understand how the physical activity levels of pregnant women affect their fear of birth and their quality of life and to emphasize the importance of interventions to increase physical activity levels, especially by drawing attention to the adverse effects of decreased physical activity in pregnant women.

METHODS

Study Design and Population

84 volunteer pregnant women who applied to Physiofit wellness center between 01/08/2022 and 01/09/2022 were included in our cross-sectional study. Ethics committee approval was obtained from the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee before starting the study (Date: 18/07/2022 Decision No: 0133). The study was conducted by the Helsinki Principles.The inclusion criteria were between 24 and 36 weeks, aged between 20 and 35 years, single baby pregnancy, and accepting to be included in the study. Women with multiple pregnancies, having a history of miscarriage before conception, and chronic diseases such as hemodynamically significant heart disease, restrictive lung diseases, diabetes, and hypertension were excluded from the study. In the power analysis performed to determine the sample size, it was determined that 84 people were needed for the correlation analysis to be completed by taking the Pearson correlation coefficient r = .30 with 80% power (alpha = .05, bidirectional) in the G*power program. Before the study, the participants were informed,

and their consent was obtained for their participation in the study.

Measuring Methods

Demographic information, such as the participant's age, height, and weight, was obtained. In addition, physical activity levels, fear of childbirth, and quality of life were evaluated with data collection forms.

The Pregnancy Physical Activity Questionnaire (PPAQ) (12), which is widely used to evaluate the physical activity levels of pregnant women, is semi-quantitative and takes an average of 15 minutes to fill out. There are 32 activities, including 12 Home/care activities, 5 occupational activities), 9 sports/exercise, 3 transportation activities, and 3 inactivity activities. Participants are asked to choose the category of the amount spent for each activity in their trimester. From the PPAQ, the number of hours spent in each activity was multiplied by the activity intensity to arrive at a measure of average daily energy expenditure (MET-hours per day) attributable to each activity. Activities were categorized by intensity (i.e., light, moderate, vigorous), type (i.e., household, occupation, sport), or as total activity (sum of all intensity and type scores). Our study used the Turkish version of PPAQ (13).

SF-36 is a measurement tool capable of determining patients' general health status, and daily activity and working dynamics in the previous four weeks, and also capable of evaluating their emotional status. It was first developed by Ware and Sherbourne in 1992 (14), and was adapted into Turkish by Kocyigit et al. (15).Turkish version of SF-36 was used in our study. SF-36 generates eight subscales - general health, physical functioning, role limitations due to physical health, role limitations due to emotional problems, social functioning, body pain, vitality, and mental health. These were all scored between 0 and 100 and were subjected to statistical analysis. While the minimum score to be taken from the scale is 0, and the maximum score is 100, high scores indicate good quality of life. While the original SF-36 Cronbach α was > 0.85, the Cronbach α value of our study was 0.88.The average time to complete the questionnaire is 10 minutes.

The Turkish version of the Wijma Birth Expectation/Experience Questionnaire (W-DEQ), which was validated by Körükcü et al., was used to assess the participants' fear of birth (16). The 33-item questionnaire measures women's expectations before birth (version A), experiences after birth (version B), and their fear of childbirth (17). The score that can be obtained from each question in a Likert-type scale ranges from 0 to 5. While the minimum score to be taken from the questionnaire is 0, and the maximum score is 165, an increase in the score obtained means an increase in the level of fear. The average time to complete the questionnaire is 10 minutes. The original W-DEQ, Cronbach α > 0.87 in Swedish pregnant women reported that the Cronbach α of our study was 0.82.

Statistical Analysis

"Statistical Package for Social Sciences" (SPSS) version 26.0 (SPSS inc., Chicago, IL, USA) was used for statistical analysis in the study. $p<0.05$ was accepted as the statistical significance level. Visual (histogram, probability graphs) and analytical methods (Kolomogrov-Smirnov/Shapiro-Wilk's test) were used to define whether the variables were normally distributed or not. Numerical variables with normal distribution are shown as mean±standard deviation. Non-normally distributed variables were represented by the median (IQR). Since at least one data was not normally distributed, the relationship between the PPAQ questionnaire and the SF-36 and WDEQ was evaluated with Spearman Correlation Analysis. Correlation coefficient 0.05-0.30 low, 0.30-0.40 low-moderate, 0.40-0.60 moderate, 0.60-0.70 good, 0.70-0.75 strong, and 0.75-1.00 rated as very strong (18).

RESULTS

Age, height, weight, BMI, education level, and trimesters of 84 postpartum volunteer women included in the study are given in Table 1.

The total PPAQ score, physical activity sub-parameter scores, short form-36 sub-parameter scores, and WDEQ-A total scores of the pregnant women are shown in Table 2.

When the relationship between physical activity and quality of life is examined, a positive, moderately significant correlation was found between total activity and Physical functioning, Role limitations (physical), Vitality, Social functioning, and General health perception scores ($r= 0.40-0.60$, $p<0.05$) (Table 3), while a positive low significant relationship was found between Role limitations (emotional), Mental health, and Pain ($r= 0.05-0.30$, $p<0.05$) (Table 3).A positive low significant relationship was found between Light activity and Physical functioning, Role limitations (physical), Role limitations (emotional), and General health perception ($r= 0.05-0.30$, $p<0.05$) (Table 3).

Table 1. Demographics of pregnant women

		Pregnant Women (n=84)	
		X ± SD	
Age (years)		27.14±1.86	
Height (cm)		168.15±3.89	
Weight (kg)		69.18 ±6.76	
BMI (kg / cm^2)		25.19±3.24	
		n	%
Education level	Primary School	6	7,15
	High School	14	16,66
	University	56	66,66
	Master's Degree	8	9,53
Pregnancy Period	2nd trimester	40	47,61
	3nd trimester	44	52,39

X ± SD: mean ± standard deviation, cm: centimeters, kg: kilograms, BMI: body mass index

Table 2. Physical activity, quality of life and fear of birth measurement results of pregnant women

	Pregnant Women (n=84)
Pregnancy Physical Activity Questionnaire, Median (IQR)	
Total activity[2]	141.27 (41.55-309.87)
Activity intensity	
Sedentary (<1.5 METs)[2]	39.62 (6.92-141.1)
Light (1.5≤3.0 METs)[2]	67.31 (6.63-139.78)
Moderate activity (3.0–6.0 METs)[2]	21.13 (7.12-162.61)
Vigorous activity (>6.0 METs)[2]	0 (0-12.55)
Activity Type	
Household/caregiving[2]	64.30 (20.8-156.6)
Occupational activity[2]	0 (0-61.20)
Sports/exercise[2]	12.2 (2-40.8)
SHORT FORM-36 (0-100), Median (IQR)	
Physical functioning[2]	85 (75-95)
Role limitations (physical problems)[2]	85 (50-100)
Role limitations (emotional problems)[2]	80 (33.3-100)
Vitality[2]	60 (50-65)
Mental health[2]	76 (64-80)
Social functioning[2]	75 (50-100)
Pain[2]	77.5 (45-90)
General health perception[2]	70 (55-80)
WDEQ-A (0-165), X ± SD	
Total WDEQ Score[1]	56.89 ± 11.23

**p < 0.05, [1]: Data are expressed as X±SD, X ± SD: mean ± standard deviation, [2]: Data are presented as median (IQR), WDEQ-A: Wijma delivery expectancy/experience questionnaire version a, MET: metabolic energy turnover*

There was a moderately significant positive relationship between Moderate activity and Physical functioning, Role limitations (physical), Role limitations (emotional), Vitality, Mental health, Social functioning, and General health perception (r= 0.40-0.60, p<0.05) (Table 3), while a positive low significant relationship was found with pain (r= 0.05-0.30, p<0.05) (Table 3).While a positive low-moderate significant relationship was found between Vigorous activity and Physical functioning, Role limitations (physical), and Social functioning (r= 0.30-0.40, p<0.05) (Table 3), a positive low-significant relationship was found between Mental health and General health perception (r= 0.05-0.30, p<0.05) (Table 3).A positive low significant relationship was found between Household/caregiving and Physical functioning and General health perception (r= 0.05-0.30, p<0.05) (Table 3).There was a moderately significant positive correlation between Occupational activity and Physical functioning, Role limitations (physical), pain, and General health perception (r= 0.40-0.60, p<0.05) (Table 3). In contrast, a good significant positive correlation was found between Role limitations (emotional) and Vitality (r= 0.60-0.70, p<0.05) (Table 3).On the other hand, a strong and significant positive correlation was found between mental health, social functioning, and Occupational activity (r= 0.70-0.75, p<0.05) (Table 3).There was a very strong and positive relationship between Sports/ exercise and Physical functioning, Role limitations (physical), Role limitations (emotional), and Vitality (r= 0.75-1.00, p<0.05) (Table 3). A good significant positive relationship was found between Mental health, Social functioning, pain, and General health perception (r= 0.60-0.70, p<0.05) (Table 3).

When the relationship between physical activity and fear of childbirth is examined, A moderately significant negative correlation was found between Total activity and Occupational activity and Total WDEQ score (r= 0.40-0.60) (Table 4).A low significant negative correlation was found between Light and Moderate activity and Total WDEQ score (r= 0.05-0.30, p<0.05) (Table 4). A low-moderate significant negative correlation was found between vigorous activity and Total WDEQ score (r= 0.30-0.40, p<0.05) (Table 4). A good significant negative correlation was found between sports/exercise and Total WDEQ score (r= 0.60-0.70, p<0.05) (Table 4).

Table 3. The relationship between pregnant women's average physical activity and quality of life scores

		Pregnant Women (n=84)							
		Total activity	Sedentary	Light activity	Moderate activity	Vigorous activity	Household/ caregiving	Occupational activity	Sports/ exercise
Physical functioning	r	0.41	-0.02	0.21	0.44	0.32	0.13	0.45	0.76
	p	**0.011***	0.54	**0.01***	**0.03***	**0.044***	**0.031***	**0.03***	**0.015***
Role limitations (physical)	r	0.47	0.11	0.29	0.46	0.39	0.02	0.56	0.81
	p	**0.002***	0.54	**0.014***	**0.03***	**0.047***	0.54	**0.024***	**0.011***
Role limitations (emotional)	r	0.28	0.05	0.22	0.40	0.26	-0.12	0.65	0.77
	p	**0.01***	0.54	**0.044***	**0.036***	0.54	0.54	**0.04***	**0.02***
Vitality	r	0.48	0.16	0.11	0.54	-0.02	-0.04	0.63	0.75
	p	**0.034***	0.54	0.54	**0.04***	0.54	0.54	**0.03***	**0.01***
Mental health	r	0.24	-0.12	0.03	0.48	0.22	-0.11	0.71	0.68
	p	**0.01***	0.54	0.54	**0.033***	**0.024***	0.54	**0.01***	**0.02***
Social functioning	r	0.51	-0.05	0.09	0.55	0.34	0.13	0.74	0.65
	p	**0.01***	0.54	0.22	**0.02***	**0.01***	0.54	**0.016***	**0.03***
Pain	r	0.23	-0.02	0.02	0.17	-0.06	-0.07	0.41	0.60
	p	**0.01***	0.54	0.54	**0.032***	0.54	0.54	**0.02***	**0.01***
General health perception	r	0.42	0.07	0.27	0.49	0.12	0.26	0.54	0.61
	p	**0.01***	0.54	**0.01***	**0.03***	**0.017***	**0.041***	**0.04***	**0.03***

**p < 0.05, r: correlation coefficient*

Table 4. The relationship between pregnant women's average physical activity and fear of birth scores

	Pregnant Women (n=84)	
	W-DEQ A	
	r	P
Total activity	-0.43	0.04*
Sedentary	0.02	0.564
Light activity	-0.11	0.048*
Moderate activity	-0.23	0.019*
Vigorous activity	-0.37	0.011*
Household/caregiving	0.22	0.047
Occupational activity	-0.47	0.001*
Sports/exercise	-0.63	0.001*

**p < 0.05, WDEQ-A: Wijma delivery expectancy/experience questionnaire version a, MET: metabolic energy turnover, r: correlation coefficient.*

DISCUSSION

This study showed that women's physical activity levels during pregnancy were insufficient, and their fear of birth and quality of life levels were adversely affected.

In o In our study, pregnant women's physical activity total score median was 141.27. Our study, the physical activity total score median of pregnant women was 141.27. In addition, it was determined that pregnant women mostly did light-intensity activities and primarily engaged in Household/caregiving-type activities. In studies similar to our research, it was determined that pregnant women generally do light-intensity activities and deal with housework/care work the most (19,20). Studies show that although it is known to protect health during pregnancy and reduce the risk of some problems, the amount of physical activity in women during pregnancy is insufficient (21). Additionally, studies show that a lack of physical activity during pregnancy leads to increased pain (22) and deterioration in sleep quality, especially mood disorders (23). The results of these studies emphasize the importance of physical activity during motherhood, which is one of the essential processes of life.

Similar to other studies, there was a correlation between the total activity score of physical activity and all sub-parameters of quality of life (19,24). It is known that the quality of life of physically active women during pregnancy is also positively affected. Our study observed the highest correlation between physical activity and quality of life between moderate-intensity and sports/exercise-type physical activities. In the published guidelines, the recommendation of moderate-intensity aerobic physical activities during pregnancy supports this result (6). Similar to other studies, no correlation was found in any of the sub-parameters of sedentary and quality of life (9,24). Studies have shown that being sedentary negatively affects the quality of life during pregnancy. As it is known, sedentary life negatively affects the whole life process, especially pregnancy. Studies have shown that many complications may occur during pregnancy with sedentariness, and the quality of life may decrease (25). Our study observed a correlation between low-intensity physical activity and physical and emotional role limitations of the quality of life. Also, a correlation was observed between moderate-intensity activity and all parameters. Low-intensity activity can be effective in pregnant women, especially in situations that limit them physically and emotionally. However, the intensity of activities may need to be slightly higher to increase the quality of life, especially in parameters such as vitality, social functioning, and mental health (26). However, moderate-intensity exercises recommended in the guidelines can ultimately affect the systems of individuals and improve all parameters of their quality of life (6). On the other hand, high-intensity activities can negatively affect individuals' emotional states and vitality and cause fatigue in pregnant women (27). Therefore, in our study, a relationship between quality of life parameters such as pain, vitality, mental health, and high-intensity physical activity may not have been observed. With household/caregiving, only the correlation of quality of life with physical functioning and general health perception was observed. Household/caregiving activities include low-intensity, non-regular physical activities. The difference between physical activity and exercise supports our results. The fact that people do routine household activities does not indicate that they are physically active enough. In addition, sedentary life brings with it many problems. All these prevent an individual's quality of life from increasing. One of the remarkable results is the exercise type Occupational activity, which has the highest correlation with mental health and social functioning sub-parameters. The fact that pregnant women feel competent not only in household chores but also in activities related to their profession and that they are doing their jobs, in any case, made them feel more self-confident and competent and may have been influential in the emergence of these results. It is usual that physical activity in sports and exercise type strongly correlate with the quality of life in almost all parameters. Especially the pregnancy period is an opportunity for individuals to gain healthy habits. Pregnant women's exercise activities keep them physically and hormonally strong and play an essential role in increasing their quality of life (23). In general, in most studies conducted similar to our research, it was observed that physical activity positively affected the quality of life. Still, no significant relationship was found in a few studies (20,29). We think that is because the physical activity questionnaire used in these studies is not specific to pregnancy, and the pregnant women in these studies are mainly inactive.

Our study found pregnant women's total fear of labor score as 56.89 ± 11.23. It is stated that the fear of childbirth is higher, especially in women who experienced their first pregnancy (7). The level of fear and stress due to the unknown is elevated in pregnant women who will give birth for the first time. In studies in the literature, fear of childbirth; has been said that it is affected by many individual and environmental variables such as socio-demographic, obstetric, and psycho-social factors and that there may be differences in the measurement results due to the sample diversity and the lack of social support received. Studies have found a significant relationship between fear of childbirth and depression and anxiety, albeit at different levels (29,30). Studies have stated that depression and anxiety can affect the quality of life of pregnant women.

Our study observed a negative correlation between physical activity total score and fear of childbirth. In addition, we found a relationship between all sub-parameters of physical activity and fear of childbirth, except for the sedentary and household/caregiving parameter. In particular, a good negative correlation was found between physical activity in the sports/exercise type and fear of childbirth. The results of the other two studies examining the effects of physical activity on fear of childbirth in the literature are similar to ours (10,11). However, the weakness of these studies is that physical activity was evaluated only verbally in one of these studies. The other research assessed the fear of childbirth with a questionnaire without standardized validity and reliability. Studies show that regular physical activity reduces depression levels in pregnant women and effectively manages stress and anxiety (6,22). In addition, the physiological benefits of physical activity in pregnant women also affect their mental health of

pregnant women. It makes pregnant women feel more comfortable and enables them to control their bodies and minds more easily. All these reasons may have been effective in these results.

One of the strengths of our study is that the questionnaires used to evaluate both physical activity and fear of childbirth are specific to the pregnancy period. The most important limitation of our study is that the measurement results were not analyzed according to the trimester of the pregnant woman in our study.

CONCLUSION

Our study states that women's quality of life decreases, and their fear of childbirth increases with the inadequacy of physical activity levels during pregnancy. Insufficient physical activity levels in pregnant women can decrease their satisfaction levels from life and negatively affect their fear of childbirth. These results may adversely affect the pregnancy process. Increasing the physical activity levels of women during pregnancy provides both the physiological benefits of physical activity in women and the motivational contribution provided by activity and mental relaxation. This will positively affect pregnant women's care and social and professional functions. Our study will guide the literature that directing pregnant women to physical activities is at least as necessary as other supports. In future studies, examining the effects of different types of physical activity on various factors in women during pregnancy is essential.

DECLARATIONS

Funding

None

Conflicts of Interest/ Competing Interests

None

Ethics Committee Approval

Ethics committee approval was obtained from the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee before starting the study (Date: 18/07/2022 Decision No: 0133).

Availability of Data

Available upon request.

Authors' Contributions

HIB created the study idea, reached the individuals who participated, and brought it to the literature. MB organized the study method, created evaluation forms, made necessary evaluations of the individuals for the study, collected the data, analyzed the data, entered it into the system, and brought them to the literature. Both authors have read and approved the final version of the manuscript.

REFERENCES

1. Thivel D, Tremblay A, Genin PM, Panahi S, Rivière D, Duclos M. Physical Activity, Inactivity, and Sedentary Behaviors: Definitions and Implications in Occupational Health. Front Public Health. 2018;6:288. doi:10.3389/fpubh.2018.00288
2. Warburton DER, Bredin SSD. Health benefits of physical activity: a systematic review of current systematic reviews. Curr Opin Cardiol. 2017;32(5):541-556. doi:10.1097/HCO.0000000000000437
3. Lagadec N, Steinecker M, Kapassi A, Magnier AM, Chastang J, Robert S, Gaouaou N, Ibanez G. Factors influencing the quality of life of pregnant women: a systematic review. BMC Pregnancy Childbirth. 2018;18(1):455. doi:10.1186/s12884-018-2087-4
4. Chan CWH, Au Yeung E, Law BMH. Effectiveness of Physical Activity Interventions on Pregnancy-Related Outcomes among Pregnant Women: A Systematic Review. Int J Environ Res Public Health. 2019;16(10):1840. doi:10.3390/ijerph16101840
5. Physical Activity and Exercise During Pregnancy and the Postpartum Period: ACOG Committee Opinion, Number 804. Obstet Gynecol. 2020;135(4):e178-e188. doi:10.1097/AOG.0000000000003772
6. Evenson KR, Barakat R, Brown WJ, Dargent-Molina P, Haruna M, Mikkelsen EM, Mottola MF, Owe KM, Rousham EK, Yeo S. Guidelines for Physical Activity during Pregnancy: Comparisons From Around the World. Am J Lifestyle Med. 2014;8(2):102-121. doi:10.1177/1559827613498204
7. Johnson AR, Kumar MG, Jacob R, Jessie MA, Mary F, Agrawal T, Raman V.. Fear of Childbirth among Pregnant Women Availing Antenatal Services in a Maternity Hospital in Rural Karnataka. Indian J Psychol Med. 2019;41(4):318-322. doi:10.4103/IJPSYM.IJPSYM_292_18
8. Türk R, Sakar T, Erkaya R. The effect of pregnancy on happiness. Procedia. 2017;237:1247–53. doi: 10.1016/j.sbspro.2017.02.198
9. Bahadoran P, Mohamadirizi S. Relationship between physical activity and quality of life in pregnant women. Iran J Nurs Midwifery Res. 2015;20(2):282-286.
10. Guszkowska M. The effect of exercise and childbirth classes on fear of childbirth and locus of labor pain control. Anxiety Stress Coping. 2014;27(2):176-189. doi:10.1080/10615806.2013.830107
11. Mortazavi F, Agah J. Childbirth fear and associated factors in a sample of pregnant iranian women. Oman Med J. 2018;33(6):497–505. doi:10.5001/omj.2018.9
12. Chasan-Taber L, Schmidt MD, Roberts DE, Hosmer D, Markenson G, Freedson PS. Development and validation of a Pregnancy Physical Activity Questionnaire Med Sci Sports Exerc. 2004;36(10):1750-1760. doi:10.1249/01.mss.0000142303.49306.0d
13. Çırak Y, Yılmaz GD, Demir YP, Dalkılınç M, Yaman S. Pregnancy physical activity questionnaire (PPAQ): reliability and validity of Turkish version. J Phys Ther Sci. 2015;27(12):3703-3709. doi:10.1589/jpts.27.3703
14. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30(6):473-483.
15. Koçyiğit H, Aydemir Ö, Fişek G, Ölmez N, Memiş A. Kısa Form36 (KF-36)'nın Türkçe versiyonunun güvenilirliği ve geçerliliği [Reliability and validity of the Turkish version of short form-36 (SF-36)]. İlaç ve Tedavi Dergisi 1999;12:102-6

16. Korukcu O, Kukulu K, Firat MZ. The reliability and validity of the Turkish version of the Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ) with pregnant women. J Psychiatr Ment Health Nurs. 2012;19(3):193-202. doi:10.1111/j.1365-2850.2011.01694.x
17. Wijma K, Wijma B, Zar M. Psychometric aspects of the W-DEQ; a new questionnaire for the measurement of fear of childbirth. Journal of psychosomatic obstetrics and gynaecology. 1998;19(2):84–97. doi: 10.3109/01674829809048501
18. Mukaka MM. Statistics corner: A guide to appropriate use of correlation coefficient in medical research. Malawi Med J. 2012;24(3):69-71.
19. Nascimento SL, Surita FG, Godoy AC, Kasawara KT, Morais SS. Physical Activity Patterns and Factors Related to Exercise during Pregnancy: A Cross Sectional Study PLoS One. 2015;10(6):e0128953. doi:10.1371/journal.pone.0128953
20. Kostanoğlu A, Manzak A, Şahin A.Gebelerde fiziksel aktivite seviyesi ve uyku kalitesinin yaşam kalitesine etkisi. Journal of Turkish Sleep Medicine. 2019;3:80-87.
21. Kołomańska D, Zarawski M, Mazur-Bialy A. Physical Activity and Depressive Disorders in Pregnant Women-A Systematic Review. Medicina (Kaunas). 2019;55(5):212. Published 2019 May 26. doi:10.3390/medicina55050212
22. Caputo EL, Ferreira PH, Ferreira ML, et al. Physical Activity Before or During Pregnancy and Low Back Pain: Data From the 2015 Pelotas (Brazil) Birth Cohort Study. J Phys Act Health. 2019;16(10):886-893. doi:10.1123/jpah.2018-0624
23. Cilar Budler L, Budler M. Physical activity during pregnancy: a systematic review for the assessment of current evidence with future recommendations. BMC Sports Sci Med Rehabil. 2022;14(1):133. doi:10.1186/s13102-022-00524-z
24. Krzepota J, Sadowska D, Biernat E. Relationships between Physical Activity and Quality of Life in Pregnant Women in the Second and Third Trimester. Int J Environ Res Public Health. 2018;15(12):2745. doi:10.3390/ijerph15122745
25. Fazzi C, Saunders DH, Linton K, Norman JE, Reynolds RM. Sedentary behaviours during pregnancy: a systematic review. Int J Behav Nutr Phys Act. 2017;14(1):32. doi:10.1186/s12966-017-0485-z
26. Sytsma TT, Zimmerman KP, Manning JB, et al. Perceived Barriers to Exercise in the First Trimester of Pregnancy. J Perinat Educ. 2018;27(4):198-206. doi:10.1891/1058-1243.27.4.198
27. Ward-Ritacco C, Poudevigne MS, O'Connor PJ. Muscle strengthening exercises during pregnancy are associated with increased energy and reduced fatigue. J Psychosom Obstet Gynaecol. 2016;37(2):68-72. doi:10.3109/0167482X.2016.1155552
28. Özdemir ÖÇ, Sürmeli M, Özel A, et al. The relation between physical activity and quality of life in pregnancy. Anatol Clin. 2017;22:95-102. doi: 10.21673/anadoluklin.296544
29. Alipour Z, Lamyian M, Hajizadeh E, Vafaei MA. The association between antenatal anxiety and fear of childbirth in nulliparous women: a prospective study. Iran J Nurs Midwifery Res. 2011;16(2):169-173.
30. Storksen HT, Eberhard-Gran M, Garthus-Niegel S, Eskild A. Fear of childbirth; the relation to anxiety and depression. Acta Obstet Gynecol Scand. 2012;91(2):237-242. doi:10.1111/j.1600-0412.2011.01323.x

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nutrition and Dietetics / Beslenme ve Diyetetik

Evaluation of Gastrointestinal Life Quality and Food Consumption and Choices in Recovered Covid-19 Patients

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ABSTRACT

Background/Objectives: This study explores how gastrointestinal symptoms affect patients' nutrition, food choices, consumption, and gastrointestinal quality of life index (GIQLI) scores after recovering from COVID-19.

Subjects/Methods: A questionnaire-based cross-sectional study was conducted among patients aged 18 and older who recovered from COVID-19 between 15th May 2020 and 15th June 2020. The researchers sent 594 patients a questionnaire via e-mail, which included demographical information and questions related to supplement use, food choices, and a survey for GIQLI. Seventy-six patients who responded and consented to take the questionnaire were included in the final analysis.

Results: Weight loss post-COVID was significant for both male and female genders (-5.1± 4.0 vs. -1.5 ± 2.4; p-value:0.001). The length of hospitalization, the loss of appetite, and the loss of smell were significantly higher in male participants (P<0,05). The mean GIQLI score was significantly higher in males compared to females (102.2± 14.6 vs. 89.5 ± 23.2; p=0.003). Gender and regular probiotic use before and after hospitalization were correlated with the total GIQLI score (R = 0.646; R2 = 0.417)

Conclusion: COVID-19 affects the Gastrointestinal system (GIS) and appetite. Therefore, healthy nutrition, well adapted to the body's needs and the current level of physical activity, becomes particularly important during and post-COVID. In addition, the treatment of gut dysbiosis involving an adequate intake of pre and probiotics could be a beneficial instrument for modulating the immune system in COVID-19 patients and prophylactically pre-infection. Therefore, we recommend integrating probiotic use into current COVID-19 nutritional guidelines.

Keywords: COVID-19, Food, Infection, Diarrhea, Nutrition, Probiotic

İyileşen Covid-19 Hastalarında Gastrointestinal Yaşam Kalitesi, Besin Tüketimi ve Tercihlerinin Değerlendirilmesi

ÖZET

Amaç: Bu çalışma, COVID-19 geçirip iyileştikten sonra gastrointestinal semptomların; hastaların beslenmesini, besin tercihlerini, tüketimini ve gastrointestinal yaşam kalitesi indeksi (GIQLI) puanlarını nasıl etkilediğini araştırmaktadır.

Konu/ Yöntemler: 15 Mayıs 2020 ile 15 Haziran 2020 tarihleri arasında COVID-19 geçirip iyileşen 18 yaş ve üstü hastalar arasında anket tabanlı bir kesitsel çalışma yapıldı. Araştırmacılar, demografik bilgiler, takviye kullanımı, besin tercihleri ve GIQLI için sorular içeren bir anketi 594 hastaya e-posta yoluyla gönderdiler. Anketi yanıtlayan ve onaylayan 76 hasta son analize dahil edildi.

Bulgular: COVID-19 sonrası ağırlık kaybı erkek ve kadın bireyler için istatistiksel olarak anlamlıydı (-5.1± 4.0 vs. -1.5 ± 2.4; p-değeri: 0.001)). Hastanede kalma süresi, iştah kaybı ve koku kaybı erkek katılımcılarda önemli ölçüde daha yüksekti (p<0,05). Ortalama GIQLI puanı, erkeklerde kadınlara göre anlamlı ölçüde yüksekti (102.2± 14.6 vs. 89.5 ± 23.2; p=0.003). Cinsiyet ve hastaneye yatış öncesi ve sonrası düzenli probiyotik kullanımı, toplam GIQLI puanı ile ilişkiliydi (R = 0,646; R2 = 0,417).

Sonuç: COVID-19, gastrointestinal sistem (GIS) ve iştahı etkiler. Bu nedenle, vücudun ihtiyaçlarına ve mevcut fiziksel aktivite düzeyine uygun sağlıklı beslenme, özellikle COVID-19 sırasında ve sonrasında önemlidir. Ayrıca, bağırsak disbiyozunun tedavisi, uygun miktarda prebiyotik ve probiyotik alımını içeren, COVID-19 hastalarında bağışıklık sistemi modülasyonu için faydalı olabilir ve önleyici olarak enfeksiyondan önce kullanılabilir. Bu nedenle, probiyotik kullanımının mevcut COVID-19 beslenme yönergelerine entegre edilmesini öneriyoruz.

Anahtar Kelimeler: COVID-19, Besin, Enfeksiyon, Diyare, Beslenme, Probiyotik

Main Points

Seventy percent of immune system cells reside in GIS, and there is a strong relationship between gut cells, immunity, and dietary habits.

The digestive system may have been the main target organ of COVID-19. Probiotic supplementation may reduce the severity or shorten the duration of infection.

Probiotic use prior to COVID-19 is associated with higher total GIQLI scores. Therefore, healthy nutrition, well adapted to the body's needs and the current level of physical activity, becomes particularly important during and post-COVID.

Introduction

Patients experience gastrointestinal symptoms in the early stages of the COVID-19 infection, as in severe acute respiratory syndrome (SARS-CoV) and the Middle East respiratory syndrome (MERS-CoV) (1). In a cohort study conducted with 1099 patients in China, researchers observed vomiting or nausea symptoms in 5% of the patients and diarrhea in 3.8% of all patients (2). The coronavirus virus (SARS-CoV-2) has a 79.6% similarity to the SARS-CoV virus, and it codes and synthesizes the proteins that can attach to angiotensin-converting enzyme 2(ACE2) to be able to penetrate human cell (3). ACE2 receptors in type 2 alveolar cells are also synthesized in copious amounts in the small and large intestines (4). The detection of SARS-CoV-2 in fecal samples of 50% of patients and the presence of SARS-CoV-2 in the intestinal mucosa of patients with COVID-19 implies that invaded enterocytes expressing ACE2 lead to intestinal symptoms (5).

It is largely unknown how COVID-19 manages to evade the immune system. Studies show a relationship between disease severity, the level of proinflammatory cytokines, and the subgroups of immune cells. During the acute phase of infection, the dysregulation of the immune system and the elevated level of proinflammatory cytokines may lead to tissue damage (6). To mitigate potential damage, a balanced diet, physical activity, and healthy sleep patterns are among the most effective ways of disease prevention and strengthening the immune system (7, 8). In addition, the body's energy requirements soar due to an increased metabolism during an active immune system. Thus, it is essential to supply energy, macro, and micronutrients to support immune cells and create an efficient and rapid response to pathogens for the best immunologic results. If exogenous sources such as diet are not enough, the requirements of the immune system for energy, macro, and micronutrients are met from endogenous sources such as body storage (7).

Macro and micronutrients have specific roles in developing and maintaining a lifelong potent immune system. Zinc (Zn), manganese (Mn), copper (Cu), iron (Fe), selenium (Se), folate, and vitamins B6, B2, and B12 comprise the micronutrients required for an effective immune response. Antioxidant vitamins, such as vitamins E, C, and A, carotenoids, and flavonoids, also positively affect the immune system and cytokines, protect us from oxidative stress, and generate proliferative responses (8). Seventy percent of immune system cells primarily reside in GIS. The latest scientific studies revealed a strong relationship between gut cells, immunity, and dietary habits. In this context, probiotics such as yogurt, kefir, homemade pickle, and cheese and prebiotics such as banana, apple, strawberry, grapes, artichoke, celery, asparagus, onion, garlic, leek, legumes, whole grains, flaxseed, almond, walnut supply the necessary ingredients to the body for the integrity of the intestinal immune system (9). The World Health Organization recommended daily consumption of adequate water and fresh and unprocessed foods to supply the body's vitamins, minerals, dietary fiber, protein, and antioxidants during the pandemic. Recent studies advise against the consumption of excessive amounts of sugar, salt, and fat as they may suppress the immune system (10).

In this study, we explored how gastrointestinal symptoms of recovered hospitalized COVID-19 patients affected their nutrition and food preferences. Moreover, we analyzed the relationship between patient's food choices and consumption, body weight change, and how these affect GIS health as potential risk factors. The studies examining changes in food choices and consumption are limited to the general population during the lockdown period (11).

Our study is unique in the literature because it explores the GIQLI and food choices in recovered patients.

Methods

The researchers screened 3513 patients aged 18 years and older who underwent inpatient COVID-19 treatment between 15th May 2020 to 15th June 2020. The study coordinators sent a questionnaire to patients whose e-mail was in the patient registry system (n=594), of whom 13% (n=76) responded and consented to participate. While those who had COVID-19 and recovered were included in the study, those with cancer, pregnant-lactating, digestive system diseases were not included. The first part of the questionnaire included demographic information and questions related to alcohol, tobacco, supplement use, level of exercise, and food choices. The second part contained GIQLI, a 36-question survey querying symptoms, physical status, emotions, social dysfunction, and effects of medical treatment. Every question is scored from zero to four points (0–4), and a higher value represents a better outcome. The maximum score on this scale is 144 (12). The usual range of scores is between 118-126 (13). Appetite, taste, smell, intestinal gas and bloating were evaluated with a 1-10 mm Visual Analog Scale (VAS). Before conducting this study, we obtained ethics approval from the Medical Research Ethics Board of Acibadem University. The data were analyzed with descriptive statistics and univariate analyses (Student's t-test and Mann–Whitney U Test) to identify variables associated with total GIQLI scores using SPSS version 22.0. First, we performed a Shapiro-Wilk normality test to confirm data normality. Next, we used Cronbach's alpha to measure internal consistency and reliability. Finally, cross-tabulation and the chi-square tests investigated associations among the variables, and multiple linear regression analyses helped identify the predictors of total GIQLI scores. All calculations were two-tailed with an alpha set at 0.05.

Results

Socioeconomic demographics, comorbidities, pre, and post-COVID alcohol and tobacco consumption, and exercise levels of the recovered cases are presented in Table 1. Among the study participants, 52.6% (n=40) were female, and 47.4% (n=36) were male. Most female (72.5%) and male participants (63.9%) held a higher education degree. In addition, 26.3% (n=20) of the sample were current smokers when they were infected, and the percentage of smokers decreased by 7.9% (n=6) after COVID recovery. Only 36.8% (n=28) of the participants did not consume alcohol. The rate of social-alcohol consumption, defined as one or two glasses of alcohol a couple of times a month, was 63.2% (n=48) before COVID infection, which decreased to 39.5% (n=30) after recovery. The percentage of patients diagnosed with chronic diseases such as diabetes and hypertension was 38.2% (n=29). Table 2 shows the means and standard deviations for variables of recovered cases based on gender. The participants' ages ranged from 21 to 74 years, with a mean (±SD) age of 42.7± 12.3 years and a mean weight of 77.9±16.8 kg (89.9±11.1 kg for males and 67.1±13.3 kg for females pre-COVID. Weight change in discharged patients was -1.5±2.4 kg in females and -5.1±4.0 kg in males ($p<0.001$). In addition, the hospitalization length in male participants was significantly higher than in female participants ($p<0.001$). Females experienced a significantly higher loss of appetite and smell than male participants ($p<0.05$). Male participants (102.2±14.6) scored significantly higher on the GIQLI than their female counterparts (89.5±23.2) ($p<0.05$). There were no significant differences in GIQLI subscales scores between the two genders ($p<0.05$). Table 3 lists the participants' most frequently consumed vitamins and supplements pre-COVID-19 as vitamins C, D, B12, and probiotics. After recovery, vitamin C (68.4%), probiotics (48.7%), and combination multivitamin & mineral (53.9%) supplements were popular among patients. Table 4 indicates the changes in food consumption quantities in recovered patients. Post COVID-19 infection, fresh vegetables (59.2%), fresh fruits (51.3%), nuts (32.9%), yogurt (28.9%), herbal tea (32.9%) and water (75.0%) consumption increased. Meanwhile, patients decreased the amount of white bread (40.8%), bakery products (27.6%), carbonated (31.6%), and lightly carbonated beverages (27.6%) in their post-COVID diet. Multiple linear regression analyses showed a significant correlation between gender, regular probiotic use and GIQLI total scores pre and post COVID-19 infection ($p<0.001$; $R= 0.646$, $R^2 = 0.417$) (See Table 5).

Table 1.Socioeconomic demographic, smoking, alcohol use and exercise levels

Variables	Male		Female		Total		Chi-Square	*p*-value
	n	%	n	%	n	%		
Educational level								
Elementary or secondary school	2	5.6	-	-	2	2.6	5.291	0.259
High school	4	11.1	6	15.0	10	13.2		
University	23	63.9	29	72.5	52	68.4		
Postgraduate	7	19.4	5	12.5	12	15.8		
Marital status								
Married	31	86.1	22	55.5	53	69.7	12.619	0.006
Single	5	13.9	18	44.5	23	30.3		
Smoking status before infection								
Yes	10	27.8	10	25.0	20	26.3	0.1	0.494
No	26	72.2	30	75.0	56	73.7		
Smoking status after infection								
Yes	2	5.6	4	10,0	6	7.9	0.515	0.389
No	34	94.4	39	90.0	70	92.1		
Alcohol consumption before infection								
Yes	24	66.7	24	60.0	48	63.2	0.362	0.359
No	12	33.3	16	40.0	28	36.8		
Alcohol consumption after infection								
Yes	12	33.3	10	25.0	30	39.5	1.719	0.141
No	24	66.7	30	75.0	46	60.5		
Exercise before infection (at least 150 minute / per week)								
Yes	12	33.3	10	25.0	22	28.9	0.324	0.370
No	24	66.7	30	75.0	54	71.1		
Exercise after infection (at least 150 minute / per week)								
Yes	15	41.7	8	20.0	23	30.3	0.071	0.486
No	21	58.3	32	80.0	53	69.7		
Diagnosed disease before infection								
Yes	16	44.4	13	32.5	29	38.2	1.146	0.202
No	20	55.6	27	67.5	47	61.8		

*$p < 0.05$.

Table 2. Means and standard deviations for the variables of participants

Variables	Male		Female		Total		*p*-value
	Mean	SD	Mean	SD	Mean	SD	
Age (year)	45.9	11.2	39.8	12.6	42.7	12.3	**0.031**
Weight in pre-infection (kg)	89.9	11.1	67.1	13.3	77.9	16.8	**0.000**
Weight in discharged (kg)	84.8	11.1	65.6	13.1	74.7	15.5	**0.000**
Weight differences (kg)	-5.1	4.0	-1.5	2.4	-3.2	3.7	**0.000**
BMI in pre-infection (kg/m^2)	28.1	3.2	25.0	4.9	26.5	4.4	**0.002**
BMI discharged (kg/m^2)	26.5	3.0	24.5	4.9	25.5	4.2	**0.037**
Current BMI (kg/m^2)	27.2	2.7	25.5	5.6	26.3	4.5	0.114
Hospitalization day	12.8	7.3	7.8	5.0	10.1	6.6	**0.001**
Changes post-infection?							
Appetite	6.2	2.2	5.4	2.1	5.8	2.1	0.107
Sense of taste	6.4	2.1	5.0	3.1	5.7	2.7	**0.032**
Sense of smell	6.5	2.2	4.9	3.1	5.7	2.8	**0.017**
Intestinal gas	6.3	1.8	6.4	2.5	6.4	2.2	0.856
Abdominal bloating	5.3	2.0	6.5	2.9	5.9	2.6	0.052
GIQLI Total Score	102.2	14.6	89.5	23.2	95.5	20.5	**0.030**
Core symtpom score	28.3	6.0	23.7	8.1	25.9	7.5	0.059
Psychological symptom score	14.6	3.7	13.5	4.8	14.0	4.3	0.105
Physical sypmtom score	14.3	4.4	12.6	4.5	13.4	4.5	0,122
Social sypmtom score	8.1	3.0	7.4	2.6	7.7	2.8	0.093
Diseases-specific symptom score	36.9	3.2	32.3	6.7	34.5	6.0	0.055

BMI; Body mass index, GIQLI; Gastrointestinal quality of life index
*Data are presented as mean ± SD. Independent t-test were performed. *p < 0.05.*

Tablo 3. The frequency of food supplements use by participants in pre and post-COVID19 Infection

Food Sumpplements	Use of food supplements pre-COVID19 infection		Use of food supplements after recovered COVID-19		Chi-Square	*p*-value
	n	%	n	%		
Vitamin C	44	57.9	52	68.4	8.681	0.004
Vitamin D	35	46.1	34	44.7	18.696	0.000
Zinc	17	22.4	23	30.3	28.154	0.000
Curcumin	17	22.4	17	22.4	29.322	0.000
Propolis	15	19.7	20	26.3	35.104	0.000
Probiotic	31	40.8	37	48.7	1.339	0.177
Sambucus nigra	18	23.7	16	21.1	11.169	0.004
Iron	14	18.4	11	14.5	37.157	0.000
Calcium	12	15.8	7	9.2	41.127	0.000
Magnesium	13	17.1	9	11.8	26.504	0.000
Selenium	7	9.2	8	10.5	30.364	0.000
Vitamin E	7	9.2	5	6.6	32.073	0.000
Omega-3	7	9.2	21	27.6	49.851	0.000
Vitamin B12	28	36.8	18	23.7	9.016	0.004

**p < 0.05 (χ^2-test) for the difference in proportions between pre and after COVID-19*

Table 4. The frequency of changing food consumption preferences after infection in patients with COVID-19 infection

Foods	Changing food consumption preferences after recovered COVID-19					
	Increased		Decreased		Unchanged	
	n	%	n	%	n	%
Milk	5	6.6	3	3.9	68	89.5
Yoghurt	22	28.9	1	1.3	53	69.7
Kefir	13	17.1	-	-	63	83.9
Cheese	7	9.2	4	5.3	65	85.5
Pickles	6	7.9	7	9.2	63	82.9
Fruits (fresh)	39	51.3	-	-	37	48.7
Fruits (dried, frozen)	1	1.3	11	14.5	64	84.2
Vegetables (fresh)	45	59.2	1	1.3	30	39.5
Vegetables (frozen, can)	4	5.3	9	11.8	63	82.9
Legumes	22	28.9	4	5.3	50	65.8
Bread (white)	2	2.6	31	40.8	43	56.6
Bread (whole grain)	19	25.0	3	3.9	54	71.1
Bakery foods	9	11.8	21	27.6	46	60.5
Whole grains	13	17.1	6	7.9	57	75.0
Red Meat	17	22,4	7	9.2	52	68.4
Poultry	6	7,9	7	9.2	63	82.9
Fish and sea foods	14	18.4	8	10.5	54	71.1
Bone broth	10	13.2	3	3.9	63	82.9
Carbonated beverages (with sugar)	2	2.6	24	31.6	50	65.8
Carbonated beverages (light)	-	-	21	27.6	55	72.9
Herbal tea	25	32.9	6	7.9	45	59.2
Black tea	9	11.8	6	7.9	61	80.3
Green tea	8	10.5	4	5.3	64	84.2
Coffee	7	9.2	12	15.8	57	75.0
Spicy	10	13.2	6	7.9	60	78.9
Water	57	75.0	3	3.9	16	21.1
Ginger	16	21.1	4	5.3	56	73.7
Turmeric	11	14.5	3	3.9	62	81.6
Olive oil	10	13.2	-	-	66	86.8
Butter	16	21.1	1	1.3	59	77.6
Milky desserts	12	15.8	4	5.3	60	78.9
Pastries	3	3.9	16	21.1	57	75.0
Nuts	25	32.9	3	3.9	48	63.2
Seeds	8	10.5	10	13.2	58	76.3

Discussion

At the time of this publication, COVID-19 has affected more than 216 million people globally and over six million in Turkey. Previous reports about GIS symptoms in SARS-CoV-2 are varied, and it is estimated that they occur in 5 to 50% of people (2). Subsequently, less common manifestations, such as abdominal discomfort, nausea, vomiting, and diarrhea, present significant differences among various study populations, along with an early onset and mild symptoms usually followed by respiratory manifestations (14). Data from previous studies suggested that the enteric tropism of SARS coronavirus (SARS-CoV) was confirmed by viral detection in stool and biopsy specimens, even in discharged patients. This finding may partly explain the GIS signs and symptoms, potential relapse, and transmission of SARS via the continuous fecal shedding of the virus (15). Other reports specified the percentage of COVID-19 patients with GIS symptoms as 2 to 10%, and the main symptoms listed were diarrhea and vomiting (14). In our study, almost half of the hospitalized patients did not experience any GIS issues, and among those who did, the most common complaints were nausea, anorexia, and diarrhea. The gastrointestinal system may be a target organ of COVID-19, and in these patients, the amount of virus in feces poses minimal risk. Research by Wang et al. reported that patients who were positive for COVID-19 in their stool samples presented gastrointestinal symptoms such as changes in bowel habits and diarrhea. They were re-admitted after respiratory samples had negative test results and upon resolution of the previous chest computed tomography findings (16). In our study, participants reported the following GIS symptoms post-COVID; gas: 29%, nausea: 17.1%, abdominal pain: 11.8%, constipation: 9.2%; diarrhea: 7.9%, and acid reflux:7.9%. In addition, we evaluated patients' appetite, smell, taste, abdominal gas, and bloating perceptions with a visual analog scale. Following discharge, appetite, smell, and taste in males were more affected than in females, while abdominal gas and bloating were the more common symptoms in females. Pan et al. found 103 patients who reported digestive-system-related symptoms, such as lack of appetite, diarrhea, vomiting, and abdominal pain, in COVID-19 patients (17). However, we did not find any publication in the literature investigating above GIS symptoms in post-COVID-19 patients.

Table 5. Multiple regression analyses on gastrointestinal quality of life index (GIQLI) score in the overall sample

	B	SE	β	t	95% CI		p
Age (years)	0.335	0.171	0.201	1.964	-0.005	0.676	0.054
Gender[1]	11.503	5.426	0.282	2.120	0.676	22.331	**0.038**
Weight before infection (kg)	-0.073	0.159	-0.060	-0.460	-0.391	0.244	0.647
Length of hospitalization(day)	-0.363	0.326	-0.118	-1.114	-1.015	0.288	0.269
Comorbidities[2]	-1.230	4.629	-0.029	-0.266	-10.468	8.008	0.791
Regular probiotic use pre-Covid-19[3]	-9.252	4.531	-0.223	-2.042	-18.293	-0.211	**0.045**
Regular probiotic use post Covid-19[4]	-16.976	4.788	-0.417	-3.546	-26.530	-7.422	**0.001**

B = beta coefficient; SE = Standard error; β = Standardized beta coefficient; CI: Confidence Interval
[1]1=female; 2=male, [3]0=no; 1=yes, [4]0=no; 1=yes,

According to a study by Nguyen et al., males had a longer length of hospital stay than females and a higher death rate across all age, race and ethnicity groups, and preexisting comorbidities (18). Similarly, in a retrospective study, higher age (70+), male sex, and individual comorbidities were all significantly associated with in-hospital stay and mortality (19). Our study illustrates similar results with a higher mean hospital stay for males vs. females.

Various vitamins and trace elements are essential for the normal functioning of the immune system. However, one should note that supplements do not have a protective effect on COVID-19. A healthy immune system is essential where no effective preventive and curative medicine exists. A recent review by Jayawardena et al. reported that vitamins A, D, and E, and some trace elements, such as zinc and selenium, have shown favorable immune results in viral respiratory infections (20). Also, many nutraceuticals and probiotics demonstrated immune-promoting effects for preventing or treating viral infections. However, good nutrition is essential during and after illness, so a healthy diet is necessary for supporting the immune system (21). In our study, participants reported using supplements with immune supportive effects, such as vitamin C, D, B12, multivitamins, minerals, and probiotics pre and post-COVID (Table 3). The most preferred supplements were vitamin C, D, multivitamins, minerals, and probiotics.

In addition, post-COVID 19, most patients reported increased consumption of vegetables, fruits, nuts, yogurt, water, and herbal teas. Unfortunately, to our knowledge, the studies in the literature examining the change in patients' food preferences pre- and post-COVID are limited to the general population during the lockdown period (22). Schmulson et al. reported that GIS symptoms in patients with COVID-19 seem equally distributed between male and female genders (23). Our study results align with these findings. At the time of this publication, we could not find data about gastrointestinal complaints and gender relationships post-COVID-19 infection in the literature. In our study, female patients with COVID-19 had significantly lower GIQLI scores than males post-infection. Therefore, we suspect women with COVID-19 may experience more intense GIS complaints after discharge. However, further studies are needed in this area.

Probiotics offer a wide range of health benefits. A meta-analysis by Lee et al. revealed that probiotics had a moderate impact on reducing the common cold (24). Furthermore, several studies suggested that probiotic supplementation either reduced the severity of infection or shortened its duration. These studies also indicated the efficacy of Lactobacillus for viral-originated respiratory tract infection treatment (25). Researchers emphasized the significant association between Bifidobacterium and improved immune function and intestinal microbiota in the elderly (26). Many clinical trials and meta-analyses explored the benefits of probiotics for common gastrointestinal illnesses such as irritable bowel syndrome (27), Helicobacter Pylori infection (28), Necrotizing Enterocolitis (29), antibiotic-associated diarrhea (30), infectious diarrhea, and traveler's diarrhea (31). All these studies revealed that probiotic bacteria have notable effects on preventing and treating gastrointestinal illnesses (31). In a recent review, Dhar and Mohanty expressed that gut microbiota has a role in affecting lung disease (32). The meta-analyses held in developed countries in a health-care setting established that respiratory virus infection disturbs the gut microbiota (32).

Nutrition, environment, and genetics play an essential role in forming gut microbiota which can affect immunity. The diversity of intestinal microbiota declines with age, and COVID-19 has been fatal in older patients, highlighting the gut microbiota's role in diseases. Research suggests that enhancing gut microbiota with personalized nutrition and supplementation improves immunity and may help reduce symptom burden in the elderly and immune-compromised people.

In our study, 40.8% of patients reported using probiotic supplements (mostly Bifidobacterium spp.) pre-infection and 48.7% post-infection (mostly Saccharomyces boulardii). We conducted a multiple linear regression analysis to ascertain the independent effects of probiotic use before and after COVID-19 on the GIQLI total score. In summary, we found that GIS complaints persisted at least two weeks after discharge in one-fifth of patients with COVID-19. Almost half of the patients used one or more dietary supplements after release, especially vitamin C, vitamin D, multivitamins, minerals, and probiotics. In addition, patients increased their consumption of fresh vegetables, fresh fruit, nut, water, and herbal tea post-COVID. Patients who used probiotic supplements before and after infection had a better gastrointestinal quality of life. In conclusion, respiratory system symptoms drive the criteria for diagnosis and discharge of COVID-19; however, some patients may primarily show digestive symptoms due to infection of the gastrointestinal tract by SARS-CoV-2.

COVID-19 affects GIS. Hence, healthy nutrition, well adapted to the body's needs and the current level of physical activity, becomes particularly important during and post-COVID. In addition, the treatment of gut dysbiosis involving an adequate intake of pre and probiotics could be a beneficial instrument for modulating the immune system in COVID-19 patients and prophylactically pre-infection. Therefore, we recommend integrating probiotic use into current COVID-19 nutritional guidelines.

Declarations

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Conflict of Interest

The authors declare no potential conflicts of interest.

REFERENCES

1. Chan JF, Yuan S, Kok KH, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission : a study of a family cluster. Lancet. 2020; 395.10223:514–523.
2. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of Coronavirus disease 2019 in China. N Engl J Med. 2020; 382:1708–1720.
3. Zhou P, Yang XL, Wang XG, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020; 579.7798:270–273.
4. Xiao F, Tang M, Zheng X, et al. Evidence for gastrointestinal infection of SARS-CoV-2. Gastroenterology. 2020; 158(6):1831–1833.
5. Wu Y, Guo C, Tang L,et al. Prolonged presence of SARS-CoV-2 viral RNA in faecal samples. Lancet Gastroenterol Hepatol. 2020; 5(6): 434–435.
6. Ye Q, Wang B, Mao J. The pathogenesis and treatment of the 'Cytokine Storm" in COVID-19.' J Infect. 2020; 80.6: 607–613.
7. Kim S, Su K. Using psychoneuroimmunity against COVID-19. Brain , Behav , Immun. 2020; 87: 4-5.
8. Childs CE., Calder PC, Miles EA. Diet and immune function. Nutrients. 2019; 11.8,1933:1–9.
9. Baş M.Yaşam Dediğin 9 Metre.İstanbul: Destek Yayınları; 2019.
10. WHO (2020) Nutrition advice for adults during the COVID-19 outbreak. http://www.emro.who.int/nutrition/nutrition-infocus/nutrition-advice-for-adults-during-the-COVID-19-outbreak.html
11. González-Monroy C, Gómez-Gómez, I, Olarte-Sánchez, CM, et al. Eating behaviour changes during the COVID-19 pandemic: A systematic review of longitudinal studies. Int J Environ Res Public Health. 2021;18(21), 11130.
12. Eypasch E, Williams JI, Wood-Dauphinee S, et al. Gastrointestinal Quality of Life Index: Development, validation and application of a new instrument. Br J Soc 1995; 82: 216–222.
13. Lee WJ, Lee MH, Yu PJ, et al. Gastro-intestinal quality of life after metabolic surgery for the treatment of type 2 diabetes mellitus. Obes Surg. 2015;25, 1371-1379.
14. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel Coronavirus-infected pneumonia in Wuhan, China. J Am Med Assoc 2020; 323(11):1061–1069.
15. Leung WK, To KF, Chan HL, et al.Enteric involvement of severe acute respiratory syndrome associated coronavirus infection, Gastroenterology, 2003; 125: 1011–1017.
16. Wang X, Zhou Y, Jiang N, Zhou Q, Ma WL. Persistence of intestinal SARS-CoV-2 infection in patients with COVID-19 leads to re-admission after pneumonia resolved. Int J Infect Dis 2020; 95: 433–435.
17. Pan L, Mu M, Yang P, et al. Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, China. Am J Gastroenterol. 2020;115:766–773.
18. Nguyen NT, Chinn J, De Ferrante M, et al.Male gender is a predictor of higher mortality in hospitalized adults with COVID-19. PloS one. 2021;16(7), e0254066.
19. Henkens MTHM, Raafs AG, Verdonschot JAJ, et al. Age is the main determinant of COVID-19 related in-hospital mortality with minimal impact of pre-existing comorbidities, a retrospective cohort study. BMC Geriatr.2022; 22, 184.
20. Jayawardena R, Sooriyaarachchi P, Chourdakis M. Enhancing immunity in viral infections, with special emphasis on COVID-19 : A review. Diabetes Metab Syndr Clin Res Rev 2020; 14.4 : 367–382.
21. FAO (2020) Maintaining a healthy diet during the COVID-19 pandemic. Rome

22. Lombardo M, Guseva E, Perrone MA,et al. Changes in Eating Habits and Physical Activity after COVID-19 Pandemic Lockdowns in Italy. Nutrients. 2021;13(12), 4522. https://doi.org/10.3390/nu13124522
23. Schmulson M, Dávalos MF, Berumen J. et al. Los Síntomas Gastrointestinales Podrían Ser Una Manifestación De La COVID-19. Rev Gastroenterol Mex. 2020; 85.3 :282-287.
24. Lee HK, Hwang IH, Kim SY, et al. The effect of probiotics on prevention of the common cold: A meta-analysis of randomized controlled trial studies. Korean J Fam Med 2013; 34:2–10.
25. Berggren A, Ahrén I, Larsson N, et al. Randomised, double-blind and placebo-controlled study using new probiotic lactobacilli for strengthening the body immune defence against viral infections. Eur J Nutr. 2011; 50 (3): 203–210.
26. Akatsu H, Iwabuchi N, Xiao JZ,et al. Clinical effects of probiotic bifidobacterium longum BB536 on immune function and intestinal microbiota in elderly patients receiving enteral tube feeding. J Parenter Enter Nutr. 2013; 37(5): 631–640.
27. Hoveyda N, Heneghan C, Mahtani KR, et al. A systematic review and meta-analysis: Probiotics in the treatment of irritable bowel syndrome. BMC Gastroenterol. 2009; 9 (15): 1–11.
28. Tong JL, Ran ZH, Shen J, et al. Meta-analysis: the effect of supplementation with probiotics on eradication rates and adverse events during Helicobacter pylori eradication therapy. Aliment Pharmacol Ther. 2007; 25(2): 155–168.
29. Deshpande G, Rao S, Patole S. Probiotics for prevention of necrotising enterocolitis in preterm neonates with very low birthweight: a systematic review of randomised controlled trials. Lancet. 2007; 369:1614–1620.
30. Hawrelak JA, Whitten DL MS. Is Lactobacillus Rhamnosus GG effective in preventing the onset of antibiotic-associated diarrhoea: A systematic review. Digestion. 2005; 72(1): 51–56.
31. Sazawal S, Hiremath G, Dhingra U, et al. Efficacy of probiotics in prevention of acute diarrhoea: a meta-analysis of masked, randomised, placebo-controlled trials. Lancet Infect Dis. 2006; 6(6):374–382.
32. Dhar D, Mohanty A. Gut microbiota and COVID-19- possible link and implications. Virus Res. 2020; 285:198018.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nursing / Hemşirelik

Evaluation of the Knowledge Level of Nurses about the Follow-up of Complications That May Occur after Coronary Angiography

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ABSTRACT

Objective: In this study, it was aimed to determine the level of knowledge of nurses about follow-up complications and whether this level of knowledge was related to age, education level, and experience in patients who underwent coronary angiography.

Methods: The sample of this cross-sectional and descriptive study consisted of 89 nurses who worked in the cardiology clinic for at least one year and agreed to participate in the study, among the nurses in a training and research hospital and a tertiary cardiovascular center in Istanbul between 01 September 2021 and 31 September 2021. In the study, the "Personal Information Form" and "Coronary Angiography Knowledge Form" prepared based on their levant literature were used to collect data. Statistical analysis was performed using the R studio package program.

Results: The mean number of total correct answers in the cardiology knowledge questionnaire was 5.07±1.94; the average of correct answers to all questions on interventional cardiology complications showed a statistically significant increase with 5.37 (p=0.034) for nurses with a bachelor's degree, 5.50 (p=0.013) for those with 15 years or more of Professional experience, and 6.43 (p<0.001) for those with cardiology experience of 10 years or more.

Conclusion: The results of this study showed that education, Professional, and field experience were associated with an increase in knowledge about effective patient follow-up after coronary angiography.

Keywords: coronary angiography; complications; level of knowledge; experience; nurse; care

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Koroner Anjiyografi Sonrası Oluşabilecek Komplikasyonların Takibiyle İlgili Hemşirelerin Bilgi Düzeyinin Değerlendirilmesi

ÖZET

Amaç: Bu çalışmamızda koroner anjiyografi uygulanan hastalarda hemşirelerin komplikasyonların takibi ile ilgili bilgi düzeylerini ve bilgi düzeyinin yaş, eğitim düzeyi, deneyim ile ilişkili olup olmadığının saptanması amaçlanmıştır.

Yöntemler: Kesitsel ve tanımlayıcı nitelikteki bu çalışmanın örneklemini, 01 Eylül 2021 ve 31 Eylül 2021 tarihleri arasında İstanbul'da bir eğitim ve araştırma hastanesinde ve bir tersiyer kardiyovasküler merkezdeki hemşireler arasından en az bir yıldır kardiyoloji kliniğinde çalışan ve çalışmaya katılmayı kabul eden 89 hemşire oluşturmuştur. Araştırmada verilerin toplanmasında ilgili literatüre dayanarak hazırlanan "Kişisel Bilgi Formu" ve "Koroner Anjiyografi Bilgi Formu" kullanılmıştır. Rstudio paket programı kullanılarak istatistiksel analiz yapılmıştır.

Bulgular: Kardiyoloji bilgi anketi toplam doğru yanıt ortalamasının 5.07±1.94 olduğu; girişimsel kardiyoloji komplikasyonları tüm sorularına doğru yanıt ortalamalarının lisans mezunu hemşirelerde 5.37 (p=0.034), mesleki deneyimi 15 yıl ve üzeri olanlarda 5.50 (p=0.013) ve kardiyoloji deneyimi 10 yıl ve üzeri olanlarda 6.43 (p=0.0001) ile istatistiksel olarak anlamlı olacak şekilde arttığı bulunmuştur.

Sonuç: Bu çalışma sonuçları, eğitim, mesleki ve alana ilişkin deneyimin, koroner anjiyografi sonrası etkin hasta takibine ilişkin bilgi düzeyinin artması ile ilişkili olduğunu göstermiştir.

Anahtar sözcükler: koroner anjiyografi, komplikasyon, bilgi düzeyi, deneyim, hemşire, bakım

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Ischemic heart disease (IHD) is the main global cause of death. It is estimated by the World Health Organization (WHO) that 17.9 million people died from ischemic heart disease (IHD) globally in 2019, accounting for 32% of all deaths (1,2). According to 2019 Turkish Statistical Institute data, it is reported that 36.8% of deaths are caused by circulatory system diseases and 39.1% of these are caused by ischemic heart diseases (3). According to the data of TEKHARF (Heart Disease and Risk Factors in Turkish Adults), the largest heart health study conducted in Turkey, it is reported that ischemic heart disease ranks first among all causes of death in Turkey with a share of 42% over 26-years (4). Invasive angiography is recommended as an alternative test for the diagnosis of ischemic heart disease in patients with a high clinical probability of diagnosing ischemic heart disease and with severe symptoms unresponsive to medical therapy, or in patients with a clinical assessment indicating a high risk of events and typical angina at a low level of exercise (5).

Although coronary angiography is more comfortable and less risky for the patient, there is a potential risk of complications during and after the procedure (6,7). Prevention, early detection, and intervention of complications that may occur after coronary angiography is possible with a high level of awareness, sufficient theoretical knowledge, and experienced nursing services (8, 9,10). In today's coronary angiography procedure, the pre-procedure, during and post-procedure evaluation and follow-up forms include vital signs monitoring (heart rhythm, blood pressure, saturation, fever, and pain), blood sugar, edema, pain, a catheter (sheath) location and peripheral circulation monitoring (bleeding, hematoma, numbness, tingling, peripheral filling, limb diameter, skin temperature), planned catheter (Sheath) extraction time, urine output, amount of contrast media used are evaluated (6,7,8). Standard forms are indispensable for patient follow-up and nursing practices. However, nurses' knowledge level and critical thinking skills are very important in increasing the quality of care and improving patient outcomes by increasing the level of knowledge to the optimal level, ensuring that patients receive the same quality service in every shift (9,10,11).

Our study, it was aimed to determine the level of knowledge of nurses about the processes followed and whether the level of knowledge is related to age, education level, and experience in patients who planned and applied interventional cardiological procedures.

MATERIAL AND METHODS

Study Setting and Time of Research, Population

The population of this cross-sectional and descriptive study consisted of 134 nurses working in the cardiology clinic for at least one year, among the nurses in a cardiac-specified training and research hospital in Istanbul between 01 September 2021 and 31 September 2021. Among these 134 nurses, 89 who agreed to participate in the study were included.

Statistical Analysis

Statistical analysis was performed using the Rstudio (Version 1.4.1106 2009-2021 RStudio, PBC, General Public License.) package program. Continuous variables were expressed as mean ± standard deviation (SD) values, a 95% Confidence Interval while categorical variables were expressed as numbers and percentages. The K-means clustering method was used to determine the cut-off point, and conformity to normal distribution was evaluated with the Shapiro-Wilk test. The Henryson method was used to evaluate the difficulty of the questions in the Angiography Information Form, and the simple method was used to evaluate the discrimination index. When the distribution was abnormal, the Mann-Whitney U test was used to compare whether there was a difference between the mean scores of two independent groups and the Kruskal Wallis test to compare whether there was a difference between the mean scores of three or more independent groups. In cases where both dependent and independent variables were categorical, the x^2 test was used to test the difference between the observed frequency values of the variables and the expected frequency values. Item Difficulty Index and Item Discrimination Index were used in order to perform Distractor Analysis Based. A p-value of <0.05 was considered statistically significant.

Data Collection Tools and Data Collection Process

In the study, the "Personal Information Form" and "Coronary Angiography Information Form", which were prepared based on the relevant literature, were used to collect data. The personal information form included questions about the nurses' age, gender, educational background, professional experience, and experience in the cardiology clinic. In the coronary angiography information form, 10 multiple-choice questions from the literature and studies evaluating nurses' knowledge of the coronary angiography process and patient follow-up were used (8,9,10). Each question in the form consists of 1 correct answer and 4 wrong answers, and the participant gets 1 point when he/she marks the correct answer

and 0 points when he/she marks the wrong answer. While the highest score that can be obtained from the Coronary Angiography Information Form is 10, the lowest score that can be obtained is 0. The latest version of the questions in the form can be seen below.

Table 1. Coronary Angiography Information Form

Question no.	Questions
Q1	What are the local complications that occur in patients after coronary angiography?
Q2	With what signs and symptoms do you detect pseudoaneurysm after coronary angiography?
Q3	When should you check the serum creatinine level of patients after coronary angiography?
Q4	What is the complication of delayed sheath removal?
Q5	When does contrast media-induced nephropathy develop after coronary angiography?
Q6	Who is at risk of developing kidney failure after coronary angiography?
Q7	What are the signs and symptoms of thrombus formation after coronary angiography?
Q8	How many hours should the patient's treated extremity remain immobilized after coronary angiography?
Q9	Who is at risk of developing pulmonary edema after coronary angiography?
Q10	When you detect a hematoma at the puncture site after coronary angiography, which of the followingshouldn't you do?

Ethical Aspect of Research

Ethics Committee approval was obtained on 05/08/2021, numbered 225. Helsinki declaration principles were followed in our study. In the e-mail where the link of the Google Form was shared with the participants, the participants were informed about the purpose of the study. Participants whose written consents were obtained by marking the phrase "I agree to participate in the research" at the top to the Google Form were asked to fill in the form.

RESULTS

The mean age of the 89 nurses working in the cardiology clinic was 36.18±9.27 years, 78.65% of them were female and 58.42% of them had a bachelor's degree. The duration of professional experience is 14.18±9.87 years and the duration of cardiology nursing experience is 5.46±3.39 years, the cut-off point for professional experience is 15 years, and cardiology experience is 10 years (Table2).

Table 2. The demographical data of nurses (n=89)

Demographic Features	N	%
Age 36.18±9.27 (%95 CI [34.23-38.13])		
Gender		
Female	70	78.65
Male	19	21.35
Educational status		
High School	2	2.25
Associate degree	14	15.73
Bachelor's	52	58.42
Master's Degree	21	23.60
Professional experience period 14.18±9.87 years		
14 years or less	34	38.20
15 years or more	55	61.80
Cardiology nursing experience period 5.46±6.39 years		
9 yearsor less	68	76.40
10 years or more	21	23.60

Item analysis is a process of interpreting the items with the answer given by the participants to the questions. The item difficulty (p) of the questions ranged from 0.25 to 0.75, and the total item difficulty of 10 questions was 0.50. The item discrimination (r) of the questions ranged from 0.25 to 0.67 (Table 3).

According to education levels and years of experience in cardiology, it was statistically significant that a nurse was able to answer the question "What are the local complications that occur in patients after coronary angiography?" (x^2=12.54 p=0.001; x^2=7.19 p=0.007 respectively). Local complications that occur in patients after cardiac catheterization are known as the level of education increases or is learned as experience in cardiology nursing is gained.

According to their education level, professional experience, and cardiology experience, it was found statistically significant that the 4th question "What is the complication of delayed sheat removal?" was answered correctly (x^2=8.05 p=0.018; x^2=9.42 p=0.002; x^2=7.95 p=0.005 respectively). 70% of all nurses participating in the study, 86% of those with a master's degree, 82% of those with a professional experience of more than 15 years, and 95% of those with a cardiology professional experience of more than 10 years answered this question correctly.

Table 3. Question item analysis (n=89)										
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
True	59	48	67	63	41	35	54	29	22	34
Item difficulty (p)	0.66	0.54	0.75	0.71	0.46	0.39	0.61	0.33	0.25	0.38
	Middle	Middle	High	Middle	Middle	Middle	Middle	Low	Low	Middle
Item discrimation (r)	0.67	0.29	0.63	0.67	0.58	0.46	0.42	0.25	0.54	0.33
	High	Quite High	High	High	High	High	High	Quite High	High	Quite High
Q: Question										

According to education level, High School/Associate Degree graduates were able to answer the fifth question "When does contrast media-induced nephropathy develop after coronary angiography?' was found to be statistically significant (x^2=9.58; p=0.008). 46% of the nurses who participated in the study, 75% of those with high school/associate degree education, 50% of those with 15 years or more of professional experience, and 62% of those with 10 years or more of cardiology experience answered this question correctly.

It was found statistically significant that the correct answer to the seventh question "What are the signs and symptoms of thrombus formation after coronary angiography?" (x^2=10.45; p=0.005). While 60% of the nurses participating in the study and 76% of those with more than 10 years of cardiology experience answered this question correctly, only 25% of those with high school education answered this question correctly. The correct answer to the tenth question was found to be statistically significant (x^2=13.13 p=0.001). Only 38% of the nurses participating in the study answered this question correctly, and 54% of those with bachelor's degrees answered this question correctly.

According to education level, professional experience, and cardiology experience, giving the correct answer to the ninth question "Who has the risk of developing pulmonary edema after coronary angiography?" was found to be statistically significant (x^2=8.97 p=0.011; x^2=6.88 p=0.009; x^2=4.86 p=0.027 respectively). While 24% of the nurses participating in the study and 43% of the master's degree answered correctly, none of those with high school/associate degree could give the correct answer 34% of those with more than 15 years of professional experience and 43% of those with more than 10 years of cardiology experience gave the correct answer.

53% of the nurses who participated in the study answered the question "With what signs and symptoms do you detect pseudo aneurysm after coronary angiography?" and the rate of correct answers increased as the education level, professional years and cardiology professional experience increased. The question "When should you check the serum creatinine level of patients after coronary angiography?" was answered correctly by 75% of the participants in the study. The rate of correct answers increased in those with more professional and cardiology experience. The question "Who has the risk of developing kidney failure after coronary angiography?" was answered correctly by 39% of the participants, and the rate of correct answers was increased in those with more cardiology experience. To the eighth question, " How many hours should the patient's treated extremity remain immobilized after coronary angiography?", 32% of the participants answered correctly, and the correct response rate of those with more professional experience increased. For these questions, no statistically significant difference was found (Table 4).

The mean of the total correct answer in the cardiology information questionnaire was 5.07±1.94 (95% CI [4.66-5.49]). The average of those who gave correct answers to all questions about interventional cardiology complications was 5.37 (x2=4.502;p=0.034) in nurses with a bachelor's degree, 5.50 (U=634; p=0.013) in those with 15 years or more of professional experience, and 6.43 (U=350; p<0.001) in those with 10 years or more of cardiology experience was found to be statistically significant (Table 5).

Table 4. Differences in Survey Items by Descriptive Characteristics

Education % (a)			Professional exp. % (b)		Cardiyology exp. % (c)	
Hig school/ associate (n=16)	Bachelor (n=52)	Master(n=21)	14 years or less% (n=34)	15 years or more% (n=55)	9 years and less% (n=68)	10 years and more% (n=21)
Correct Answer						
1. What are the local complications that occur in patients after coronary angiography?% (a,c)*						
31% (5)*	69% (36)	86% (18)	58% (19)	71% (40)	59% (40)	90% (19)*
2. With what signs and symptoms do you detect pseudoaneurysm after coronary angiography?						
44% (7)	52% (27)	67% (14)	48% (16)	57% (32)	53% (36)	57% (12)
3. When should you check the serum creatinine level of patients after coronary angiography?						
69% (11)	81% (42)	67% (14)	64% (21)	82% (46)	72% (49)	86% (18)
4. What is the complication of delayed sheath removal? (a,b,c)*						
44% (7)*	73% (38)	86% (18)	52% (17)	82% (46)*	63% (43)	95% (20)*
5.When does contrast media-induced nephropathy develop after coronary angiography?(a)*						
75% (12)*	46% (24)	24% (5)	39% (13)	50% (28)	41% (28)	62% (13)
6. Who is at risk of developing kidney failure after coronary angiography?						
63% (10)	31% (16)	43% (9)	42% (14)	38% (21)	34% (23)	57% (12)
7. What are the signs and symptoms of thrombus formation after coronary angiography?(a)*						
25% (4)*	69% (36)	67% (14)	61% (20)	61% (34)	56% (38)	76% (16)
8. How many hours should the patient's treated extremity remain immobilized after coronary angiography?						
38% (6)	37% (19)	19% (4)	24% (8)	38% (21)	32% (22)	33% (7)
9. Who is at risk of developing pulmonary edema after coronary angiography?						
0% (0)*	25% (13)	43% (9)	9% (3)	34% (19)*	19% (13)	43% (9)*
10. When you detect a hematoma at the puncture site after coronary angiography, which of the followingshouldn't you do?						
13% (2)	54% (28)*	19% (4)	39% (13)	38% (21)	37% (25)	43% (9)

**statistically significant (Chi-square test; p<0.05) Exp: experience*

Table 5. Distribution of Exam Results According to Nurses' Descriptive Characteristics (n=89)

Characteristics	Mean +SD	95% CI	x^2/U	P
Education				
High school/associate degree	4.00±2.03	2.92-5.08	4.50*	0.034***
Bachelor's degree	5.37±1.93	4.83-5.90		
Master's degree	5.19±1.81	4.37-6.01		
Professional Experience				
14 years or less	4.36±1.88	3.70-5.03	634.00**	0.013***
15 years or more	5.50±1.91	4.99-6.01		
Cardiology Nursing Experience				
9years or less	4.66±1.91	4.20-5.12	350.00**	<0.001***
10 years or more	6.43±1.50	5.74-7.11		

**Kruskal Wallis H **Mann Whitney U Test ***statistically significant (p<0.05) CI: confidence interval*

DISCUSSION

In our study, more than 50% of the nurses who participated in the study gave correct answers to the questions about local complications after coronary angiography, pseudoaneurysm, when to check the serum creatinine level, complications of delayed sheath removal, and thrombus formation after the procedure. However, less than 50% of the nurses who participated in the study answered the questions correctly about contrast-induced nephropathy, the risk of developing kidney failure, the duration of immobilization of the affected extremity, the risk of developing pulmonary edema, and the practices that should not be done in the area where hematoma was detected. Studies on contrast-induced nephropathy has been detected in cases of acute and basic eGFR <45 ml/min/1.73 ml of the risk of contrast-induced nephropathy in patients with acute only 150> dose is important that the dose of contrast with pre-existing renal function is an interaction between short and long-term negative effects on survival and quality of life have shown (12,13). Preventing the occurrence of all these effects is one of the basic rules for ensuring adequate hydration in patients after angiography in terms of in-hospital and long-term mortality. In addition to providing hydration in the provision of nursing services, it is important to monitor the patient for complications that may occur (14,15).

In the literature, in the study of Hasballah et al. (11) with 40 nurses, it was found that all of the nurses working in the cardiac catheterization unit had insufficient knowledge about patient safety and 77.5% of nurses had a negative attitude towards patient safety. Feroze et al. (9) study with 171 nurses found that the total level of knowledge was over 40%. In Hassan's (10) study in 2015, less than 50% of the nurses who participated in the study answered correctly the questions about contrast-induced nephropathy, the risk of developing kidney failure, and the duration of immobilization of the affected extremity (9,10). Vascular complications and back pain associated with the mobilization time of the limb can be observed after transfemoral coronary angiography. In particular, the provision of nursing services today is aimed at preventing complications that may occur in the patient, as well as increasing the comfort of the patient. Especially in recent years, studies have been conducted that reveal the importance of position and early mobilization after transfemoral angiography (16,17). According to the protocol of the clinic that performs transfemoral angiography, it is mostly followed up with a sandbag for six hours and, as can be seen from the studies conducted, complaints of low back and back pain are often observed (18). After coronary angiography, the patient follow-up procedures are performed by our nurses as nurses establishment and implementation of the employer but less than %50 of the time to be affected extremity immobilized, hematoma detected in the region with information that applications need to be made level (19).

As education level, professional experience and cardiology experience increased, the rate of correct answers to questions about local complications after a cardiac catheterization, pseudoaneurysm, and complications of delayed sheat removal increased. Both professional experience, and cardiology experience have been effective in correctly answering questions about when to control serum creatinine level, contrast-induced nephropathy, thrombus formation, and the risk of developing pulmonary edema. In the literature, it is shown that the level of knowledge increases in parallel with the level of education and experience (9,10). In the study conducted by Henedy et al. (8) with 40 nurses, it was found that nurses who graduated from faculty had higher average and practice knowledge scores than nurses who graduated from technical institutes. In our study, it was found that the mean of total correct answers to the cardiac catheterization information questionnaire increased as the education level, professional experience, and cardiology experience increased, similar to the literature (6,9). In parallel with education and experience, the level of awareness and knowledge increases (20). In addition, the patient follow-up charts used after cardiac catheterization are believed to be a guide for systematic patient evaluation and patient follow-up, therefore answers to the questions of local complications, pseudo-aneurysm, when to check the serum creatinine level, complications of delayed sheath removal, and thrombus formation after the procedure is highly correct. We believe that updating the patient follow-up forms used in clinics, especially by experienced and trained nurses, and revising them in line with quality standards will contribute to the delivery of health services to the patient.

CONCLUSION

In order for the health service, which is a dynamic system carried out with human power, to continue 24/7 uninterrupted, it is not always possible to plan nurses who are specialized in the relevant field and/or professionally experienced. The results of the study show that education level, and professional and field experience increase the level of knowledge. Therefore, in addition to general education, we think that it is important to determine

the knowledge level of the people before the education and to create the pieces of training planned for the lack of existing knowledge, the guides used in the clinics, and the checklists in line with the identified deficiencies in the provision of quality nursing service.

The results of this study showed that education, Professional, and field experience were associated with an increase in knowledge about effective patient follow-up after coronary angiography.

Ethics Approval

The study was approved by the S.B.Ü Ümraniye Eğitim ve Araştırma Hastanesi Klinik Araştırmalar Etik Kurulu, no: 225 (05/08/2021).

REFERENCES

1. WHO. Cardiovascular diseases (CVDs). Key Facts. 11 June 2021 https://www .who.int/en/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)(Date of access: 21.05.2020)
2. WHO. The Global Health Observatory, Explore a world of health data, Cause-specific mortality, 2000–2019(Date of access: 21.05.2020) https://www. who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe- leading- causes-of-death
3. Turkish Statistical Institue. Turkey Health Surver Micro Data Set 2019. Ankara
4. Onat A, Can G. New Coronary Events and the Frequency of Cardiac Deaths.TEKHARF 2017 Pioneering the Approach of the Medical World to Chronic Diseases.Editrr: Altan ONAT. Logos Press İstanbul 2017; 24.
5. Knuuti J, Wijns W, Saraste A, Capodanno D, Barbato E, Funck-Brentano C at all. 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes.Eur Heart J. 2020; 14;41(3):407-477. doi: 10.1093/eurheartj/ehz425.
6. Manda YR, Baradhi KM. Cardiac Catheterization Risks and Complications. StatPearls Publishing, Treasure Island (FL). 2021;1-17. PMID: 30285356
7. Tavakol M, Ashraf S, Brener SJ. Risks and Complications of Coronary Angiography: A Comprehensive Review. Global Journal of Health Science. 2012; 4(1): 65-93
8. Henedy WM, El-Sayed El-Sayad H. Nurses' Knowledge and practice regarding patient's safety Post Cardiac Catheterization. IOSR Journal of Nursing and Health Science (IOSR-JNHS). 2019;8(3): 43-52.
9. Feroze M, Afzal M, Sarwar H, Galani A, Afshan S. Assess Knowledge and Practice of Registered Nurses about Patient Safety after Cardiac Catheterization in Punjab Institute of Cardiology Hospital, Lahore. International Journal of Musculoskeletal Pain Prevention.2017;2.
10. Hassan AF. Assessment of Nurses Knowledge about Patient Safety after Cardiac Catheterization for Adult Patients in Ibn Al - Biter Specialist Center Cardiac Surgery. International Journal of Science and Research (IJSR). 2015; 78.96: 2319-7064.
11. Hasballah SM, ElganyShaor OA, Mohamed MA, Mohamed AK. Assess Nurses' Knowledge and Attitude for Patient Safety in Cardiac Catheterization Unit, Assiut Scientific Nursing Journal. 2019; 7(19):151 – 159.
12. Barbieri L, Verdoia M , Suryapranata H, Luca Ga.& on behalf of the Novara Atherosclerosis Study Group (NAS). Impact of vascular access on the development of contrast induced nephropathy in patients undergoing coronary angiography and/or percutaneous coronary intervention. International Journal of Cardiology. 2019; 275: 48-52.
13. Helgason D, Long TE, Helgadottir S, Palsson R, Sigurdsson GH, Gudbjartsson T, Indridason OS, Gudmundsdottir IJ, Sigurdsson. Acute kidney injury following coranary angiography: a nationwide study of incidence, risk factors and long-term outcomes. Journal of Neprology. 2018; 31: 721-730.
14. Chen S-Q, Liu Y, Bei W.J,Wang Y, Duan C-Y, Wu D-X, Wang K, Chen P.Y, Chen J-Y, Tan N, Li L-W. Optimal hydration volume among high-risk patients with advanced congestive heart failure undergoing coronary angiography. Oncotarget. 2018; 9 (34): 23738-23748.
15. Bei W-J, Wang K, Li H-L, Guo X-S, Guo W, Abuduaini T, Chen S-Q, Shariful Islam SM, Chen P-Y, Chen J-y, Liu Y, Tan N. Safe Hydration to Prevent Contrast-Induced Acute Kidney Injury and Worsening Heart Failure in Patients with Renal Insufficiency and Heart Failure Undergoing Coronary Angiography or Percutaneous Coronary Intervention. Int Heart J Advance Publication. 2019; 60(2):247-254.
16. Höglund J, Stenestrand U, Tödt T, Johansson I. The effect of early mobilisation for patient undergoing coronary angiography; a pilot study with focus on vascular complications and back pain. Eur J Cardiovasc Nurs. 2011;10:130-6.
17. Pollard SD, Munks K, Wales C, Crossman DC, Cumberland DC, Oakley GD, et al. Position and mobilisation post-angiography study (PAMPAS): A comparison of 4.5 hours and 2.5 hours bed rest. Heart. 2003;89:447-8.
18. Jenita E, Pushpakala E. Effect of Early Ambulation Versus Late Ambulation on Patients' Outcome among Patients Underwent Transfemoral Coronary Procedures. International Journal of Nursing Education. 2019; 11(1): 74-78.
19. Kurt Y, Kaşıkçı M. The effect of the application of cold on hematoma, ecchymosis, and pain at the catheter site in patients undergoing percutaneous coronary intervention. Int J Nurs Sci. 2019; 6(4): 378-84.
20. Steffenino G, Dutto S, Conte L, Dutto M, Lice G, Tomatis M, et all. Vascular Access complications after cardiac catheterisation: a nurse-led quality assurance program. Eur J Cardiovasc Nurs. 2006; 5 (1): 31-6.

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nursing / Hemşirelik

Health Anxiety and eHealth Literacy as Predictors of Cyberchondria in Women

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ABSTRACT

Purpose: This study aimed to investigate whether women's cyberchondria levels differ according to some socio-demographic demographic characteristics and the effect of health anxiety and e-health literacy on cyberchondria levels.

Methods: The descriptive and cross-sectional study was conducted between December 2022 and March 2023 with women who applied to the gynecology outpatient clinic of a state hospital. The purposive sampling method was used, and 178 women were included in the study. The data were collected using a personal information form, Cyberchondria Severity Scale (CSS), Health Anxiety Inventory (HAI), and eHealth Literacy Scale (eHEALS). ANOVA, t-test, Pearson correlation, and hierarchical linear regression analysis analyzed the data.

Results: In this study, the cyberchondria levels of the participants differed according to some socio-demographic characteristics ($p< 0.05$). The participants' mean score was 28.25 ± 8.45 on the CSS, 18.93 ± 10.78 on the HAI, and 25.65 ± 9.05 on the eHEALS. There was a positive and moderate relationship between the level of cyberchondria and health anxiety ($r= 0.416$; $p=0.001$) and e-health literacy ($r= 0.378$; $p=0.001$). Hierarchical regression analysis revealed that spending six hours or more on the Internet per day ($\beta = 0.130$), health anxiety ($\beta = 0.319$) and e-health literacy ($\beta = 0.273$) were predictors of cyberchondria ($p< 0.05$), and these variables explained 35% of the variance in cyberchondria ($F=14.279$; $p=0.001$).

Conclusion: The study provides new findings in health-related Internet use research and contributes to the ongoing debate on the possible predictors of cyberchondria.

Keywords: Cyberchondria, eHealth literacy, health anxiety, health literacy, women

Fatma USLU-SAHAN

Seda PURTUL

Kadınlarda Siberkondriyanın belirleyicileri olarak sağlık kaygısı ve e-sağlık okuryazarlığı

ÖZET

Amaç: Bu araştırmada kadınların siberkondri düzeylerinin bazı sosyo-demografik özelliklere göre farklılık gösterip göstermediğini ve sağlık anksiyetesi ve e-sağlık okuryazarlığının siberkondria düzeyine etkisini belirlemek amaçlanmıştır.

Yöntem: Tanımlayıcı ve kesitsel nitelikteki yapılan araştırma bir devlet hastanesinin kadın hastalıkları polikliniğine başvuran kadınlar ile Aralık 2022-Mart 2023 tarihleri arasında gerçekleştirildi. Amaçlı örnekleme yöntemi ile araştırmaya 178 kadın dahil edildi. Araştırmanın verileri kişisel bilgi formu, Siberkondri Ciddiyeti Ölçeği (SCÖ), Sağlık Anksiyetesi Ölçeği (SAÖ) ve E-sağlık Okuryazarlığı Ölçeği (E-SOÖ) ile toplantı. Verilerin analizinde ANOVA, t-testi, Pearson korelasyon ve hiyerarşik doğrusal regresyon analizi kullanıldı.

Bulgular: Araştırmada katılımcıların siberkondriya düzeyleri bazı sosyo-demografik özelliklerine göre farklılaştığı belirlendi ($p< 0,05$). Katılımcıların SCÖ puan ortalaması $28,25 \pm 8,45$, SAÖ puan ortalaması $18,93 \pm 10,78$ ve E-SOÖ puan ortalaması $25,65 \pm 9,05$'di. Kadınların siberkondriya düzeyi ile sağlık anksiyetesi ($r= 0,416$; $p=0,001$) ve e- sağlık okuryazarlık ($r= 0,378$; $p=0,001$) düzeyi arasında pozitif ve orta düzeyde bir ilişki saptandı. Hiyerarşik regresyon analizi ile günde altı saat ve üzeri internette zaman harcama ($\beta = 0,130$), sağlık anksiyetesi ($\beta = 0,319$) ve e-sağlık okuryazarlığının ($\beta = 0,273$) siberkondrianın yordayıcıları olduğu belirlendi ($p< 0,05$) ve bu değişkenler siberkondriadaki varyansın %35'ini açıkladı ($F=14,279$; $p=0,001$).

Sonuç: Araştırmada sağlıkla ilgili internet kullanımı araştırmalarında yeni bulgular ortaya koymuş ve siberkondriyanın olası belirleyicileri konusunda devam eden tartışmalara katkıda bulunmuştur.

Anahtar Kelimeler: Siberkondriya, e-sağlık okuryazarlığı, sağlık anksiyetesi, sağlık okuryazarlığı, kadın

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Rapid information and communication technology developments have enabled individuals to access online information easily (1–3). Individuals can find a variety of health-related topics (healthy habits, diseases, risk factors, etc.) online, compare the collected information across multiple online sources (health forums, corporate websites, blogs, etc.), and interact with health professionals or services via social media (3–5). It is emphasized that studies on gender-specific differences in the use of digital health technologies are limited, and the existing literature indicates that women conduct more internet searches for health-related information than men (5–9). In addition, information sites, online discussion groups, forums, etc., on health and medical topics are often addressed to or created by women, often focussing on women-specific diseases (female cancers) (7,10) pregnancy (11) and parenthood (9).

Access to online health information has potential benefits in educating women about the nature, causes, prevention, and treatment of certain health conditions (2,3,6,9,12). However, uncontrolled online sharing of all kinds of true or false information (8) may cause exposure to confusing, unreliable, contradictory information and increase health anxiety (3). Health anxiety refers to excessive, unwarranted fear provoked by a perceived health threat (13). Online health information seeking can expose users to potentially harmful consequences (such as self-diagnosis and self-treatment) (8,14) and lead to increased levels of health anxiety (ranging from no anxiety to pathological anxiety), characterized by fears and worries about perceived symptoms (4,14).

Therefore, eHealth literacy, which consists of individuals' ability to access and use high-quality information online, navigate various information sources, and think critically about media and science issues, has become a public health priority (12,15). eHealth literacy is the ability to search, find, understand, and evaluate health information from digital sources to identify or solve a health-related problem (15). eHealth literacy is known to play a mediating role in improving individuals' health management, controlling and preventing diseases, facilitating the identification of symptoms and treatment options, and simplifying communication between health professionals and patients (6,12,16).

The irregular, low-quality, incomplete, or inaccurate health information exposed to by women with low eHealth literacy in online environments may cause increased health anxiety associated with excessive or repeated online searches (6). This phenomenon, termed "cyberchondria," is characterized by frequent and repetitive medical information seeking online and is associated with the exacerbation of anxious thoughts and feelings about health (17). If anxiety intensifies, it can lead to search cessation, or vice versa, and encourage further online research (3,14,18). Cyberchondria is considered an abnormal pattern of behavior rather than the presence of a condition or diagnosis (3,4) and is known to be particularly prevalent in people with high levels of health anxiety (2–4,14). Cyberchondria can turn into a behavior that aims to reduce the fear of illness and regain confidence in health (16,17). Paradoxically, the situation experienced by the person may become an even more significant source of anxiety (2,3,17).

In summary, previous studies have emphasized that the Internet is an enormous and widespread source of health and medical information and that women participate in health-related online activities more than men (6,18). Repeatedly searching for health information on the Internet and not evaluating the information obtained with a critical approach may increase health anxiety and cyberchondria severity. However, the possible influence of health anxiety and eHealth literacy on cyberchondria is still under-researched. Moreover, previous studies have not examined the severity of cyberchondria and the effect of health anxiety and e-health literacy on cyberchondria, especially in a sample of women searching for online health information in the last three months, taking into account the socio-demographic characteristics of women. This study aimed to determine whether women's cyberchondria levels differ according to some socio-demographic characteristics and the effect of health anxiety and e-health literacy on the cyberchondria level.

Research Questions

1. What are the socio-demographic characteristics affecting participants' cyberchondria level?

2. What is the participants' level of cyberchondria, health anxiety, and e-health literacy?

3. What is the relationship between participants' cyberchondria levels and health anxiety and e-health literacy levels?

4. How do health anxiety and e-health literacy levels affect participants' cyberchondria levels?

MATERIALS and METHODS

Type of Study

The study was conducted as a descriptive cross-sectional design.

Settings and Participants

The study was conducted in the gynecology outpatient clinic of a state hospital located in the district center of Ankara between 1 December 2022 and 1 March 2023. The study population consisted of women who applied to the gynecology outpatient clinic on the data collection dates. G*Power 3.1.9.2 (Franz Faul, Universitat Kiel, Germany) was used to determine the sample size of women. It was planned to include 157 women in the sample of the study with 12 (10 descriptive variables; 2 independent) predictor variables, with an effect level of medium (0.15), a power level of 90%, and a significance level of 0.05. A total of 190 women were evaluated in terms of eligibility for the study, and 12 women were not included in the study sample because they did not meet the research criteria (10 women were not willing to participate in the study, and two women were illiterate). The research was completed with 178 women. According to the power analysis at the end of the research, this research was completed at a 94% power level.

Purposive sampling was utilized for the study's sample selection. In accordance with the purpose of the study, the inclusion criteria for the sample were as follows: willingness to participate in the study, literacy, age between 18 and 64, female gender, and reporting internet health information searches within the previous three months. Women who declined to participate were excluded from the study.

Data Collection

The second author collected the data for the study. The purpose of the study was explained to the women who met the inclusion criteria, they were given information about the study, and those who consented to participate signed an informed consent form. In an empty room in the outpatient clinic, the participants completed the forms. Each data collection period lasted approximately twenty minutes, and pandemic rules were adhered to. Participants were assured that only the researchers would have access to their data and that their personal information would be kept private.

Data Collection Tools

Personal information form, Cyberchondria Severity Scale, eHealth Literacy Scale, and Health Anxiety Inventory were used in the research data.

Personal information form

This form, which the researchers developed by reviewing the literature (1,3,14,19,20), consists of 10 questions, including socio-demographic characteristics such as age, education, and time spent daily on the internet.

Cyberchondria Severity Scale - Short Form

The scale was developed by McElroy et al. in 2019 to measure cyberchondria, a form of anxiety characterized by excessive health research on the internet (21). The Turkish validity and reliability study of the scale was carried out by Söyler et al. (22). The scale is a five-point Likert-type and consists of 12 items. The scoring of the scale is between 1-5 for each item, and a high score indicates a high level of cyberchondria severity. A minimum score of 12 and a maximum score of 60 can be obtained from the scale. The Cronbach's alpha value of the Turkish scale was 0.862 (22); in this study, Cronbach's alpha value was found to be 0.840.

Health Anxiety Inventory

The scale was developed by Salkovskis et al. (13) in 2002 to measure the health anxiety of individuals, and the Turkish validity and reliability study was conducted by Aydemir et al. (23). The scale is a four-point Likert-type and consists of 18 items. The scoring of the scale is between 0-3 for each item, and a high score indicates a high level of health anxiety. The lowest score of 0 and the highest score of 54 can be obtained from the scale. The Cronbach's alpha value of the Turkish scale was 0.91 (23); in this study, Cronbach's alpha value was found to be 0.840.

eHealth Literacy Scale

The scale was developed by Norman and Skinner (15) to measure individuals' e-health literacy, and the Turkish validity and reliability study was conducted by Gencer (24). The scale is a five-point Likert-type and consists of 8 items. The scoring of the scale is between 1-5 for each item, and a high score indicates a high level of e-health literacy. A minimum score of 8 and a maximum score of 40 can be obtained from the scale. The Cronbach's alpha value of the Turkish scale was 0.863 (24); in this study, Cronbach's alpha value of the scale was found to be 0.840.

Statistical Analysis

Data were analyzed using SPSS version 20.0 (Chicago, IL, USA). The Kolmogorov-Smirnov test was used to determine the conformity of continuous variables to normal distribution. Participants' descriptive characteristics, cyberchondria, health anxiety, and eHealth literacy were analyzed using descriptive statistics. ANOVA or t-test, and Bonferroni post hoc tests were used to analyze differences in cyberchondria according to participants' descriptive characteristics. Correlations between variables were determined using Pearson correlation coefficients. Hierarchical linear regression analyses were performed to examine whether cyberchondria level was associated with descriptive characteristics, health anxiety, and eHealth literacy. Only variables with p-value p<0.05 in univariate analysis were included in the multivariate analysis. During the analyses, the variables were divided into three models. Each model was analyzed using multiple linear regression assumptions such as correlation coefficients between variables, variance inflation factor, Durbin-Watson statistics, and tolerance. p<0.05 was considered statistically significant.

RESULTS

Socio-demographic characteristics of the participants

The descriptive characteristics of the participants in the study are shown in Table 1. When the table is analyzed, the mean age of the participants was 34.94 ± 11.40 years, and the majority were women aged between 18-30 years. 53.4% of the participants were university graduates or higher, 61.8% were married, 64.6% were not working, and 44.4% perceived their income as equal to their expenses. In addition, although most participants did not have any chronic disease, 68.5% had a first-degree relative with a chronic disease. The majority of the participants (30.3%) reported that they spent between 2-3 hours daily on the Internet, 58.4% did not believe that the information about health on the Internet was accurate, and 77.5% did not make health-related decisions based on the information obtained from the Internet.

Univariate analysis of socio-demographic characteristics associated with cyberchondria

Table 1 shows univariate analyses of socio-demographic factors associated with cyberchondria severity. According to socio-demographic factors, there were statistically significant differences in the cyberchondria levels of the participants (age, marital status, time spent on the internet daily, believing that health-related information on the internet is accurate, and making health-related decisions according to the information obtained from the internet). Participants aged between 18-30 years (t= 3,397; p = 0.036), single (t= -2,597; p = 0.010), spending 6 hours or more on the internet daily (F= 11,986; p = 0.001), believing that health-related information on the internet is accurate (t= 4,270; p = 0.001) and making health-related decisions based on information obtained from the internet (t= 4,829; p = 0.001) had higher cyberchondria levels.

Table 1. Comparison of cyberchondria levels according to socio-demographic characteristics of the participants (n=178)

Characteristics	n	%	Mean ± SD	Statistical Analysis
Age				
Mean±SD (year) : 34.94 ± 11.40				
18-30 (1)	83	46.6	29.81 ± 8.42	**t= 3.397 p= 0.036 (1>3)**
31-40 (2)	40	22.5	28.08 ± 6.53	
41-65 (3)	55	30.9	26.04 ± 9.29	
Education status				
Primary education	31	17.4	9.32 ± 1.67	F= 0.736 p= 0.481
High School	52	29.2	8.47 ± 1.17	
University and above	95	53.4	8.16 ± 0.84	
Marital Status				
Married	110	61.8	26.97 ± 8.33	**t= -2.597 p= 0.010**
Single	68	38.2	30.31 ± 8.29	
Employment status				
Working	115	64.6	27.41 ± 8.21	t= -1.795 p= 0.074
Not working	63	35.4	29.78 ± 8.72	
Perceived economic situation				
Income less than expenditure	62	34.8	28.74 ± 8.14	F= 0.285 p= 0.753
Income equals expenditure	79	44.4	28.28 ± 8.96	
Income more than expenditure	37	20.8	27.41 ± 7.96	
Chronic illness				
Yes	42	23.6	26.27 ± 10.04	t= -1.727 p= 0.086
No	136	76.4	28.85 ± 7.85	
Chronic disease in first-degree relatives				
Yes	122	68.5	28.11 ± 8.92	t= -0.339 p= 0.735
No	56	31.5	28.57 ± 7.40	
Time spent on the Internet daily				
Less than 1 hour (1)	44	24.7	23.59 ± 7.85	**F= 11.986 p=0.001 (1 < 3,4)**
Between 2-3 hours (2)	54	30.3	26.94 ± 7.19	
4-5 hours (3)	46	25.8	30.59 ± 7.66	
6 hours or more (4)	34	19.1	33.36 ± 8.61	
Believing that health-related information on the Internet is accurate				
Yes	74	41.6	31.34 ± 8.20	**t= 4.270 p= 0.001**
No	104	58.4	26.09 ± 7.96	
Making health-related decisions based on information obtained from the internet				
Yes	40	22.5	31.34 ± 8.20	**t= 4.829 p= 0.001**
No	138	77.5	26.09 ± 7.96	

Abbreviation: SD, standard deviation; t=Independent samples t-test; F = One way analysis of variance (ANOVA).

Descriptive statistics on cyberchondria, health anxiety, and eHealth literacy

Table 2 shows descriptive statistics regarding cyberchondria, health anxiety, and eHealth literacy. The participants' mean scores on the cyberchondria severity scale were 28.25 8.45, the health anxiety inventory was 18.93 10.78, and the e-health literacy scale was 25.65 0.05, as shown in the table. Considering the minimum and maximum values that can be derived from the scales, it is possible to conclude that the participants' cyberchondria and health anxiety levels are moderate, while their e-health literacy is high.

Table 2. Descriptive statistics and correlations among the acceptance of illness and the supportive care needs

Scales	Mean ± SD	Low-High values	Min-Max	Cyberchondria	
				r	p
Cyberchondria	28.25 ± 8.45	12-60	12-52	-	-
Health anxiety	18.93 ± 10.78	0-54	1-72	0.416	0.001
eHealth literacy	25.65 ± 9.05	8-40	8-40	0.378	0.001

Associations among Cyberchondria, health anxiety, and eHealth literacy

Pearson correlation analysis (Table 3) showed that there was a positive and moderate relationship between the cyberchondria scale and health anxiety (r= 0.416; p=0.001) and eHealth literacy (r= 0.378; p=0.001).

Multivariate analysis of factors predicting the level of cyberchondria

The Durbin–Watson (=1.210) test statistics revealed no autocorrelation between the error margins of the model. While satisfying the assumption of normally distributed residuals, the final model was validated (F = 14.279, p = 0.001). In the hierarchical regression analysis for participants' level of cyberchondria, in line with the results obtained from Model 1, descriptive characteristics explained 21% of the variance in cyberchondria (F=8.667; p=0.001). In this model, spending 6 hours or more on the internet daily (β = 0.209, p = 0.004) and making health-related decisions based on information obtained from the internet (β = 0.246, p = 0.003) were significantly associated with cyberchondria. The significance of these variables continued in Model 2 (β = 0.165, p = 0.017; β = 0.160, p = 0.042, respectively). In Model 2, health anxiety (β = 0.334, p = 0.001) explained approximately 10% of the variance in cyberchondria; all significant variables together explained 28% (F = 12.389; p = 0.001). In the final model, the variable of making health-related decisions based on information obtained from the internet (β = 0.147, p = 0.05) lost its significance. Spending 6 hours or more on the internet per day (β = 0.130, p = 0.049), health anxiety (β = 0.319, p = 0.001), and e-health literacy (β = 0.273, p = 0.001) were significantly associated with cyberchondria. The model explained 35% of the variance in cyberchondria (F=14.279; p=0.001).

Table 3. Hierarchical linear regression analysis results regarding determinants of cyberchondria

Variables*	Model 1				Model 2				Model 3			
	B	SE	β	p	B	SE	β	p	B	SE	β	p
Age (1= 18-30 years old)	1.532	1.443	0.091	0.290	0.692	1.362	0.041	0.612	0.480	1.299	0.028	0.712
Marital status (1=Single)	0.239	1.520	0.014	0.875	1.129	1.435	0.065	0.432	0.335	1.380	0.019	0.808
Time spent on the internet daily (1= 6 hours or more)	4.472	1.551	0.209	0.004	3.527	1.465	0.165	0.017	2.788	1.407	0.130	0.049
Believing that health-related information on the internet is accurate (1= Yes)	2.170	1.378	0.127	0.117	2.407	1.292	0.141	0.064	2.195	1.232	0.128	0.077
Making health-related decisions based on information gained from the internet (1= Yes)	4.967	1.639	0.246	0.003	3.225	1.574	0.160	0.042	2.967	1.502	0.147	0.050
Health Anxiety					0.262	0.052	0.334	0.001	0.250	0.050	0.319	0.001
eHealth Literacy									0.254	0.060	0.273	0.001
F (p)	8.677 (0.001)				12.389 (0.001)				14. 279 (0.001)			
R^2	0.21				0.30				0.37			
adjR^2	0.18				0.28				0.35			
R^2-change-					0.10				0.07			

Abbreviations: B, unstandardized coefficients; β, standardized coefficient; SE, standard error.
** Predictor(s) had a statistically significant association with the outcome variable in univariate analysis (P < .05).*
Durbin-Watson: 1.210; Tolerance: 0.587~0.912; Variance inflation factor: 1.094~1.705

DISCUSSION

Little is known about the variables affecting women's cyberchondria level. In this study, it was determined that women's cyberchondria levels differed according to some socio-demographic characteristics, and health anxiety and eHealth literacy had an effect on cyberchondria levels. The current study's results should help fill this gap in the literature.

In the study, women's cyberchondria levels differed according to age and marital status; younger and single women had higher cyberchondria levels. Similar to our research results, it has been reported in the literature that age has a significant negative effect on cyberchondria and that cyberchondria-related behaviors are more common among young people (25,26). In contrast to our results, Özkan et al. (1) and Gioia and Boursier (8) reported that women's age and marital status did not affect the level of cyberchondria. This result of our study may be due to the fact that younger women have unlimited access to the Internet and are more likely to use it frequently, and when we consider the possibility that single women are mostly younger, they are more likely to use the Internet more. In the study, the variables of education, employment, perceived income, and presence of chronic disease (self and first-degree relative) did not cause a difference in women's cyberchondria level. Contrary to our results, it is stated in the literature that cyberchondria levels may differ according to education (1), employment, income status (1,8,25), and the presence of chronic diseases (1,25). The result of the research may be due to the fact that the sample consists of women living in central geography, they have easy access to the internet, and with today's technological opportunities, women of all sociodemographic characteristics have the opportunity to do research on the internet. Research on the relationship between these variables and the cyberchondria level is still needed.

Cyberchondria was moderately severe among the participants of the study. Our research results are similar to the literature (1,14,20). Cyberchondria is a growing public health concern due to the expanding use of the Internet and the potential negative effects of online health searches (2). High levels of cyberchondria can cause mental disorders such as anxiety, depression, stress, and obsessive-compulsive disorders (2,8,25). Individuals with high levels of cyberchondria may frequently apply to healthcare services despite not having any health problem; this may negatively affect communication with healthcare professionals and increase healthcare costs (17). Therefore, to develop strategies to minimize the negative consequences, the study's result is essential in raising awareness about the level of cyberchondria in women.

Participants in the current study had moderate health anxiety. In community-based studies, health anxiety is reported to vary between 3.4-19.8% (16). In contrast to our research results, it is emphasized that the participants' health anxiety level is low in studies whose results are shared regardless of gender differences (16,27). The result of our study may be because our sample is female, as the existing literature emphasizes that women have higher levels of health anxiety (8). Health anxiety may cause individuals to search the internet for reassuring information. However, the information they find may provide more reasons to worry.

Health literacy is also regarded as an important proximal factor influencing health (6,8,28,29). The participants in the study have an above-average level of eHealth literacy. It has been reported that individuals' eHealth literacy ranges from low (28) to medium (20,30) to high (12). Similar to our results, community-based studies conducted in Lebanon (30) and Korea (12) found that participants held a moderate level of eHealth literacy. Bardus et al. discovered that women, notably young women, had a higher eHealth literacy rate than men. Şahin et al. reported that pregnant women had a high level of eHealth literacy (6). The high eHealth literacy level of the women in this study may be a result of their high educational attainment and their youth. Assessing women's eHealth literacy could be a requirement for the development of digital health interventions.

The present study found a positive and moderate relationship between the cyberchondria scale and health anxiety. Health anxiety had a significant effect on cyberchondria as well. A recent meta-analysis summarized the data on the positive association of health anxiety with cyberchondria (3). It is reported that there is a positive relationship between health anxiety and cyberchondria in the literature (2,8,14,27), and health anxiety is a strong predictor of cyberchondriac symptoms (3,8,14). Fergus and Russell emphasized a strong and hidden relationship between cyberchondria and health anxiety (18); Nadeem et al. found that health anxiety contributed to 40% of the variance in cyberchondria (14). Searching for health-related information online is an expected behavior, often accompanied (14) by an initial feeling of relief (18). However, the study's results suggest that women's health anxiety increases the

severity of their internet searches for medical information and that they continue their search behavior despite the related anxiety. Current findings suggest that health professionals should give special consideration to the potential role of health anxiety in cyberchondria.

E-health literacy in searching health-related information online is critical in researching reliable sources and accessing accurate information (1,3,19,20,31). This is because it is claimed that people with cyberchondria tendency increase their anxiety due to the information they discover while trying to relieve their anxiety and produce new anxieties and uncertainties (1,3).The present study stated that there was a relationship between the cyberchondria scale and e-Health literacy, and it had almost as much effect on cyberchondria as health anxiety. According to the regression model, the e-health literacy level explains 7% of the variance in cyberchondria levels. Özkan et al. reported a positive and weak relationship between cyberchondria and digital literacy in healthcare workers and that digital literacy perception explained 2% of the total variance in cyberchondria levels (1). Özer et al. reported that the cyberchondria level explained 12.4% of the variance in eHealth literacy. Deniz (31) and McMullan et al. (3) found a positive relationship between health anxiety and cyberchondria. The study's results predict that as women's eHealth literacy levels increase, they tend to exhibit cyberchondriac behavior. As a result, this tendency will negatively affect women's psychological state.

According to the final regression model, it was found that the variables of daily time spent on the internet, believing that health-related information on the internet is accurate and making health-related decisions based on information gained from the internet, as well as health anxiety and e-health literacy levels had a significant effect on cyberchondria levels. Time spent on the internet, believing that health-related information on the internet is accurate, and health-related decisions based on information gained from the internet are behaviors related to problematic internet use (2,4). In the study, the relationship between cyberchondria and problematic internet use behaviors was as strong as the relationship between cyberchondria and health anxiety and e-health literacy, which are essential for a better understanding of cyberchondria. The definition of cyberchondria does not explicitly refer to problematic use of the internet, although it includes the specific concept of repeated (and thus excessive) online searching (3,4,20). The results of this study showed that health anxiety, e-health literacy, and problematic internet behaviors, highlighted in the literature, explained 35% of the total variance in cyberchondria. Our research is consistent with the results of Starcevic et al., who found a strong relationship between cyberchondria and health anxiety and problematic internet use (2). McMullan et al. found significant relationships between internet searching for health information and cyberchondria (3). The literature emphasizes that people with high anxiety levels search for health information more than those with low anxiety levels (3,18–20,25). People with high levels of health problems are known to stay online more frequently and for more extended periods(2–4,20). These results obtained in the study will guide the planning of interventions to reduce cyberchondria behavior.

CONCLUSION

According to our knowledge, cyberchondria currently has no specific treatment. The results of the study shed light on interventions to reduce the level of cyberchondria by providing a deeper understanding of the cyberchondria phenomenon that may negatively impact the lives of women and the variables that may influence it. The study found that women had moderate levels of cyberchondria, health anxiety, and eHealth literacy. Moreover, cyberchondria levels among women varied based on socio-demographic characteristics. Daily Internet use of six hours or more, health anxiety, and e-health literacy were all significant predictors of cyberchondria. To learn the actual cause of a disease, it is more accurate to consult a health institution or health service provider than to attempt to access and apply every piece of information on the internet. Encouraging women to acquire technological skills that reduce their health anxiety and contribute to their e-health literacy is crucial for preventing cyberchondriac behavior and keeping them current with emerging technologies. In order to reduce cyberchondria in women, interventions based on the findings of this study will be implemented.

Limitations

There are some limitations of the present study. First, the results obtained from the study are based on participants' self-report. Second, since the study was cross-sectional, the causal relationship between cyberchondria, health anxiety, and eHealth literacy could not be determined. In the future, longitudinal studies are recommended. Thirdly, the participants in the study were women admitted to a public hospital, which limits the generalizability of the study. Finally, this study examined a limited number of variables related to cyberchondria's complex and multidimensional nature. In addition to the variables investigated here, other variables (loneliness, depression, number of children, etc.) should be examined.

Ethical Approval

The ethical standards of the Declaration of Helsinki conducted the study. Ethical approval for this study was obtained from the University Non-Interventional Clinical Research Ethics Committee (Date: 01.11.2022; Decision No: GO 22/1107). Verbal and written informed consent was obtained from each participant before conducting the study.

REFERENCES

1. Özkan O, Sungur C, Özer Ö. Investigation of cyberchondria level and digital literacy on women in Turkey. J Hum Behav Soc Environ 2022;32(6):768–780. DOI: 10.1080/10911359.2021.1962776
2. Starcevic V, Baggio S, Berle D, Khazaal Y, Viswasam K. Cyberchondria and its relationships with related constructs: A network analysis. Psychiatr Q 2019;90:491–505. DOI: 10.1007/s11126-019-09640-5
3. McMullan RD, Berle D, Arnáez S, Starcevic V. The relationships between health anxiety, online health information seeking, and cyberchondria: Systematic review and meta-analysis. J Affect Disord 2019;245:270–278. DOI: 10.1016/j.jad.2018.11.037
4. Starcevic V, Berle D. Cyberchondria: towards a better understanding of excessive health-related Internet use. Expert Rev Neurother 2013;13(2):205–213. DOI: 10.1586/ern.12.162
5. Baumann E, Czerwinski F, Reifegerste D. Gender-specific determinants and patterns of online health information seeking: results from a representative German health survey. J Med Internet Res 2017;19(4):e92. DOI: 10.2196/jmir.6668
6. Şahin E, Çatıker A, Özdil K, Bulucu Büyüksoy GD. Predictors of eHealth literacy in pregnant women: A structural equation model analysis. Int J Gynecol Obstet 2023;160(3):783–789. DOI: 10.1002/ijgo.14416
7. Martino ML, Gargiulo A, Lemmo D, Margherita G. Cancer blog narratives: The experience of under-fifty women with breast cancer during different times after diagnosis. Qual Rep 2019;24(1):158–173. DOI: 10.46743/2160-3715/2019.3646
8. Gioia F, Boursier V. What does predict cyberchondria? Evidence from a sample of women. J Psychol 2020;7(69):1047–2313. DOI: 10.12974/2313-1047.2020.07.6
9. Shieh C, Khan I, Umoren R. Engagement design in studies on pregnancy and infant health using social media: Systematic review. Prev Med Reports 2020;19:101113. DOI: 10.1016/j.pmedr.2020.101113
10. Turhan Cakir A. Cyberchondria levels in women with human papilloma virus. J Obstet Gynaecol Res 2022;48(10):2610–2614. DOI: 10.1111/jog.15354
11. Dhore M, Bhate A, Warikoo A, Modak A, Aher A. Online Forum for Unintended Pregnancy-Related Queries. J Womens Heal Dev 2022;5(2):132–138. DOI: 10.26502/fjwhd.2644-28840083
12. Lee J, Tak SH. Factors associated with eHealth literacy focusing on digital literacy components: A cross-sectional study of middle-aged adults in South Korea. Digit Heal 2022;8:20552076221102764. DOI: 10.1177/20552076221102765
13. Salkovskis PM, Rimes KA, Warwick HMC, Clark D. The Health Anxiety Inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. Psychol Med 2002;32(5):843–853. DOI: 10.1017/s0033291702005822
14. Nadeem F, Malik NI, Atta M, Ullah I, Martinotti G, Pettorruso M, Vellante F, Di Giannantonio M, De Berardis D. Relationship between health-anxiety and cyberchondria: Role of metacognitive beliefs. J Clin Med 2022;11(9):2590-2608. DOI: 10.3390/jcm11092590
15. Norman CD, Skinner HA. eHealth literacy: essential skills for consumer health in a networked world. J Med Internet Res 2006;8(2):e506. DOI: 10.2196/jmir.8.2.e9
16. Doherty-Torstrick ER, Walton KE, Fallon BA. Cyberchondria: parsing health anxiety from online behavior. Psychosomatics 2016;57(4):390–400. DOI: 10.1016/j.psym.2016.02.002
17. McElroy E, Shevlin M. The development and initial validation of the cyberchondria severity scale (CSS). J Anxiety Disord 2014;28(2):259–265. DOI: 10.1016/j.janxdis.2013.12.007
18. Fergus TA, Russell LH. Does cyberchondria overlap with health anxiety and obsessive–compulsive symptoms? An examination of latent structure and scale interrelations. J Anxiety Disord 2016;38:88–94. DOI: 10.1016/j.janxdis.2016.01.009
19. Asgher S, Saleem N. Online Health Information and female users; Needs, Usages and Effects. J Media Commun 2021;2(1): 158-171. http://jmc.ilmauniversity.edu.pk/arc/Vol2/2.2/4.pdf
20. Özer Ö, Özmen S, Özkan O. Investigation of the effect of cyberchondria behavior on e-health literacy in healthcare workers. Hosp Top 2021;1–9. DOI: 10.1080/00185868.2021.1969873
21. McElroy E, Kearney M, Touhey J, Evans J, Cooke Y, Shevlin M. The CSS-12: Development and validation of a short-form version of the cyberchondria severity scale. Cyberpsychology, Behav Soc Netw 2019;22(5):330–335. DOI: 10.1089/cyber.2018.0624
22. Söyler, S., Biçer, İ., & Çavmak, D (2021): Siberkondri Ciddiyeti Ölçeği Kısa Formu (CSS-12) Geçerlilik ve Güvenirlilik Çalışması. 302. In: S. Uyar & R. Kıraç (Ed.), Davranışsal Boyutları ile Sağlık. Nobel Akademik Yayıncılık. Ankara. https://toad.halileksi.net/wp-content/uploads/2022/07/siberkondri-ciddiyeti-olcegi-kisa-formu-css-12-toad.pdf
23. Aydemir Ö, Kirpinar I, Sati T, Uykur B, Cengisiz C. Sağlık Anksiyetesi Ölçeği'nin Türkçe için Güvenilirlik ve Geçerlilik Çalışması. Arch Neuropsychiatry Ars 2013;50(4): 325-331. DOI: 10.4274/npa.y6383
24. Tamer GZ. Norman ve Skinner'in E-sağlık okuryazarlığı ölçeğinin kültürel uyarlaması için geçerlilik ve güvenilirlik çalışması. İstanbul Üniversitesi İletişim Fakültesi Dergisi. 2017; 52: 131- 145. DOI:10.17064/iuifd.333165
25. Bajcar B, Babiak J. Self-esteem and cyberchondria: The mediation effects of health anxiety and obsessive–compulsive symptoms in a community sample. Curr Psychol 2021;40:2820–2831. DOI: 10.1007/s12144-019-00216-x
26. Ambrosini F, Truzoli R, Vismara M, Vitella D, Biolcati R. The effect of cyberchondria on anxiety, depression and quality of life during COVID-19: the mediational role of obsessive-compulsive symptoms and Internet addiction. Heliyon 2022;8(5):e09437. DOI: 10.1016/j.heliyon.2022.e09437
27. Fergus TA. The Cyberchondria Severity Scale (CSS): an examination of structure and relations with health anxiety in a community sample. J Anxiety Disord 2014;28(6):504–510. DOI: 10.1016/j.janxdis.2014.05.006
28. Cui GH, Li SJ, Yin YT, Chen LJ, Li JQ, Liang FY, Liu XY, Chen L. The relationship among social capital, eHealth literacy and health behaviours in Chinese elderly people: a cross-sectional study. BMC Public Health 2021;21(1):1–9. DOI: 10.1186/s12889-020-10037-4
29. Reder, M., Soellner, R., Kolip, P. Do women with high eHealth literacy profit more from a decision aid on mammography screening? Testing the moderation effect of the eHEALS in a randomized controlled trial. Frontiers in Public Health, 2019; 7: 46. DOI: 10.3389/fpubh.2019.00046
30. Bardus M, Keriabian A, Elbejjani M, Al-Hajj S. Assessing eHealth literacy among internet users in Lebanon: A cross-sectional study. Digit Heal 2022;8:20552076221119336. DOI: : 10.1177/20552076221119336
31. Deniz S. A study on the e-health literacy and cyberchondria levels of individuals. Insa Insa J Sci Cult Art Thought. 2020;7(24):84–96. DOI: 10.29224/insanveinsan.674726

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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Health Policy / Sağlık Politikası

Designing and Developing a Compacted Immersive Virtual Therapy Environment: RelaXRoom

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ABSTRACT

Purpose: This study discovers the potential of IVR systems to provide mental health support by investigating current applications and results of research. It analyses the required functionalities and design components to structure a blueprint of an IVR prototype called RelaXRoom.

Methods: This technical paper employs the stages of rapid prototyping methodology to develop a compact immersive therapy environment and to present the working principle and features of RelaXRoom to escalate a debate among the researchers. The design components of RelaXRoom were determined after applying an online short survey to 667 about mental support, analysing related literature and interviewing two therapists to offer self-meditation, ill-structured supportive group or peer-to-peer therapy opportunities in a single app.

Results: RelaXRoom was designed as a compact virtual therapy environment to support individuals` mental and social well-being. RelaXRoom is a smart system that uses Wit.ai for speech recognition and analyses the mood of users using the data table. If the user wants to participate in either group or peer-to-peer therapy, RelaXRoom assigns them to a virtual room depending on their moods or considering their particular needs.

Conclusion: Integrating a therapist pool to pick one considering their rate and professionality, anonymity, payment system, and virtual buddies for every online user may enhance quality, privacy, feeling of presence and embodiment during the therapy sessions. RelaXRoom has the potential to be a facilitator for diagnosing people's problems and supporting their well-being.

Keywords: Virtual reality, therapy, design, immersive

Kompakt bir Sürükleyici Sanal Terapi Ortamının Tasarlanması ve Geliştirilmesi: RelaXRoom

ÖZET

Amaç: Bu çalışma bireylerin mental ve sosyal iyi olma hallerinin desteklenmesi için sanal terapi platformu olarak tasarlanan RelaXRoom platfomunda bulunması gereken özellikleri belirlemeyi amaçlamaktadır. İhtiyaç analizi aşamasında geliştirilmiş olan kapsayıcı sanal gerçeklik sistemleri, yazılımlar ve araştırma sonuçları incelenmiştir.

Yöntem: Hızlı prototipleme metodolojisinin aşamaları uygulanan bu teknik makalede, ihtiyaç duyulan tasarım bileşenleri belirlendikten sonra daldırıcı bir sanal gerçeklik uygulaması olarak geliştirilen RelaXRoom prototipinin çalışma mantığı ve özellikleri tanıtılarak, sanal gerçeklikte terapi ortamlarının taşıması gereken özelliklere ilişkin araştırmacılar arasında tartışmanın alevlenmesi beklenmektedir. RelaXRoom'un tasarım bileşenleri 667 kişiye mental desteğe ihtiyaç duymaları ile ilgili çevrimiçi kısa anketin uygulanması, ilgili literatürün analiz edilmesi ve iki terapist ile yarı yapılandırılmış görüşme yapılması sonucunda elde edilen verilere içerik analizi uygulanması sonucunda belirlenmiştir.

Bulgular: Kendindelik egzersizi, yapılandırılmamış grup terapisi ve birebir terapist ile düzenlenen terapi seanslarının tek bir uygulamada bir araya getiren RelaXRoom, kullanıcıların anlık durumlarının belirlenmesinde uygulama başında, kendilerini nasıl hissettiklerini tanımlamalarını istemektedir. Ses tanıma için Wit.ai kullanan bu sistemde algılanan veri, kullanıcıların duygu durumu analizi için tanımlanmış örnek cümlelere sahip verisetinden beslenmektedir. Kullanıcıların belirlenen anlık duygu durumları kendilerine uygun diğer kullanıcılarla bir araya gelmeleri veya kişiselleştirilmiş bir deneyime sahip olmaları için uygun grup terapisi veya birebir terapi seanslarına atanmalarında da kullanılmaktadır.

Sonuç: RelaXRoom'da terapist havuzu oluşturularak kullanıcıların puanlaması ve terapistlerin uzmanlığına göre seçim yapabilmesi, ödeme sistemlerinin entegre edilmesi ve utangaç bireylerin anonim olarak oturumlara katılabilmesi ile kişisel verilerin korunmasının sağlanması gibi çeşitli fonksiyonların entegre edilmesi gerekmektedir. Kullanıcılardan elde edilecek verilerle tutarlılığı artması planlanan RelaXRoom, bireylerin mental olarak desteklenmeleri veya problemlerin teşhisinde kullanılma potansiyeline sahiptir.

Anahtar kelimeler: Sanal gerçeklik, terapi, tasarım, sürükleyici

A crisis like the pandemic caused us to switch our habits fastly, and applied obligations for protection affected many people's mental health. According to Dozois (1), depression increased two-fold, and anxiety increased four-fold in Canada during the pandemic. Another study from Poland evaluated the distinguishing depressive, anxious, suicidal and stressed behaviours of university students. The results revealed increased symptoms for all variables apart from emphasising the vulnerability of females (2). Robb, de Jager (3) sought the answer to the same question for determining the effects of a pandemic on the older British people, and the results were again similar. Anxiety and depression profoundly increased in the participants. Zhou, Zogan (4) analysed the tweets using machine learning algorithms to detect the emotional changes of Australians. The results not only revealed the increasing depression dynamics of people but also showed the correlation between depression tendency and increasing case numbers all around the country. The results of summarised studies and more points out that the depression level of individuals has evolved depending on the sharp changing numbers of cases.

The researchers have tried to find either the positive or negative impacts of this pandemic from different perspectives. According to the researchers, the relapsing mental well-being of people may have several reasons. Most were forced to cope with the physical separation from their loved ones, families or friends (5) during the pandemic, and almost everyone became lonelier than ever (6). Lee, Cadigan (7) indicated that loneliness and reduced social support are the main reinforcers of depression. Wondering about our health and reduced opportunities for well-being triggered anxiety. People started to feel unsafe because of the disease, misinformation, and rumours raised a variety of stressors around all of us (5). The other studies showed that loneliness makes us both depressive and anxious (8). The most people become more lonely, depressive, anxious because of the social isolation, social distancing (3), and other lockdown regulations.

This study discovers the potential of IVR systems to provide mental health support by investigating current applications and results of research. It analyses the required functionalities and design components to structure a blueprint of an IVR prototype called RelaXRoom. This technical paper also presents the working principle and features of RelaXRoom to escalate a debate among the researchers.

Therapy Techniques

Therapists may prefer different techniques considering the requirement of their patients, such as cognitive-behaviour therapy, non-directive supportive therapy, behavioural activation therapy, psychodynamic therapy, problem-solving therapy, interpersonal psychotherapy, and social skills training (9). Non-directive supportive therapy is an ill-structured technique for helping people to vent both their experiences and emotions by offering empathy (10). If we consider loneliness as the problem, in this case, social techniques like non-directive supportive therapy or group therapies may help.

It is possible to apply the different therapy techniques from distance or face-to-face. Today, even therapies moved to the virtual worlds because of the social distancing rules or switching habits. Many therapists moved their sessions to video or teleconference systems to provide sustainable mental support to their patients. Neither therapists nor patients have a consensus regarding the effectiveness of these applications. According to the finding of MacMullin, Jerry (11), technology use was more integrated with psychotherapy practice, and psychotherapists were more confident and comfortable with telepsychotherapy than the literature predicted. The meta-analysis of Inchausti, MacBeth (12) points out that telepsychotherapy may provide benefits to several people, including health care workers, individuals with new mental health distress as a function of COVID-19 diagnosis, or losing family and loved ones to the illness, or the psychological effects of prolonged physical distancing; and individuals with existing mental health conditions. Online therapies may be effective considering the technological adaptation, attitudes, past experiences, and demographic features of both therapists and patients (13). Before applying online techniques for therapy, the therapists should select the most adequate platform for their sessions, considering the usability, digital security and patient preferences. Patient agreeability, consistency and reflection upon patient-therapist dynamics are the other factors to conceive (6).

VR in Therapy

The idea of using VR for supporting therapy sessions is not new. According to Glantz, Durlach (14), if we integrate the multimodal sensorimotor technologies into IVR environments and use them for supporting therapies, we may have several benefits in favour of both the clients and therapists through the enhanced presence in VR.

Imagining, experiencing and remembering are essential components of several psychotherapy techniques and environments. Experiencing or visualising through IVR may help us to re-evaluate the events and restructure our well-being. Because of that, IVR may offer an accurate solution to both patients and therapists by creating an individualised supportive therapy environment. Designing the therapy environment regarding the patients' requirements and controlling the scenarios into structured virtual worlds may shift the therapy habits and techniques of the future. According to Riva (15), the value of well-designed VR therapy environments will create new opportunities and challenges for reinforcing the quality of professional practice.

There are several scientific studies regarding using VR for therapies, although fewer of them produce innovative VR environments or interfaces as supplementary material for their treatment. Matsangidou, Otkhmezuri (16) designed and developed MUVR for patients who have eating disorders. Five psychotherapists played an active role in the design of MUVR that reflects the virtual avatar considering the users' original body size and edits the weight of the avatar considering the actual appearance. MUVR also uses a cartoon cube character as a virtual therapist. The findings showed that MUVR is viable for treating eating disorders, and the patients felt more comfortable thanks to the cartoon design of the therapist. The research of Kiefl, Figas (17) discusses the effects of graphical styles of VR-supported psychotherapy on the users' emotional states. The findings gathered from 74 healthy students showed that the graphic design of the IVR therapy environment can create a positive emotional change and relaxation. These recommendations emphasise the significance of the design component of an IVR environment.

Numerous studies prove the effectiveness of using IVR for both preventing and treating stress or anxiety (18). The disadvantages of COVID-19 on health workers inspired Pallavicini, Orena (19) to design MIND-VR as a psychoeducation tool that supports the well-being of healthcare employees. IVR systems are highly effective for the treatment of social anxiety. The experimental research of Hur, Shin (20) is the first research that uses fMRI brain scanning to analyse the brain responses of 21 participants who have a social anxiety disorder. The results revealed that overall symptoms of the participants with social anxiety were reduced after undergoing VR-based therapy. Streck, Stepnicka (21) developed a Neomento project as an exposure therapy VR environment for patients with social anxiety.

Van Gelderen, et al (2018) have used visual and audio as multi-sensory inputs for personalising the VR and optimising the effectiveness of trauma-focused psychotherapy, called Multi-modular Motion-assisted Memory Desensitization and Reconsolidation (3MDR). The results showed that VR provided presence and in-session attention facilitated memory retrieval of the participants.

According to the study by Seabrook, Kelly (22), VR is a supportive tool for formal therapy sessions and an effective material for self-guided concepts like meditation. They designed and developed Mindfulness for the Oculus Go users as a 360 video-based VR app for the general population. Thirty-seven participants experienced Mindfulness in the controlled environment to gather data using State Mindfulness Scale and Simulator Sickness Questionnaire. The state mindfulness of participants had a significantly positive effect after experiencing the VR environment. Besides, every Oculus Quest user may easily experience the demo or paid version of the meditation VR app, call as TRIPP, after installing it from Oculus Store. TRIPP presents an immersive visual and interactive user experience for well-being. Several big companies all around the world use TRIPP to support their employees. Also, several researchers use TRIPP for clinical trials in the field of anxiety reduction, depression and substance use disorder.

The literature review of this research indicates the positive impacts of using IVR to support peer-to-peer therapy, social therapy or self-meditation, also thematic IVR applications for healing our mental or social requirements. As a matter of course, therapists may use different kinds of supportive VR apps considering the selected treatment technique. Although, therapist-dependent IVR environments require physical proximity and guidance. When we look at the current research on well-being and supportive therapy techniques, it is possible to notice the positive impacts of ill-structured therapy techniques like social group therapy, psychodynamic therapy or therapeutical alliance.

Materials and Methods

This technical paper employs the stages of rapid prototyping to develop a compact immersive therapy environment. Designing software is time-consuming and comprehensive work. Rapid prototyping is a feasible methodology to handle the difficulties of the software design process. Using this method not only helps to reduce the time needed to complete a design and development project but also facilitates the development of high-quality products (23). The five fundamental phases of rapid prototyping are (1) analysing needs and content, (2) setting objectives, (3) constructing a prototype, (4) utilising a prototype, and (5) installing (24).

Analysing Needs and Content

I published a single-question survey on Instagram that asked `Do you need psychological support because of the effects of the pandemic in your life?'. The 498 of 667 participants answered this question as `Yes`. This finding indicated approximately each 3 of 4 people, who responded to the survey, require a new kind of therapy or support environment, which may be indicative of a global trend.

Pandemic-related restrictions not only affect the physical conditions of people but also affect the mental health and psychological well-being of individuals. According to several studies all around the world, people started to struggle with different kinds of mental issues like anxiety, depression, distress, displeasure, anger or post-traumatic stress disorder (1, 3, 4). The findings of another research indicate spiritual well-being and loneliness are the main predictors of psychological mental health. Depending on these factors, depressive symptomatology of individuals increased because of the COVID-19 pandemic (25).

The majority of therapists moved their sessions to the online environment to support their patients from home. Some countries like the US organised `telepsychology revelation` and started to use digital platforms for providing mental health care delivery during and after the pandemic (26). If the preparedness of therapists and patients regarding technological acceptance and adaptation is accurate, there are several benefits of video conference sessions (6, 11, 13).

The effectiveness of the virtual environment can be evaluated by considering interaction types, interface, usability, adaptability, feedback or personalised scenario of the structured world. This is why it is always possible to design and develop more effective virtual therapy sessions.

Setting the Objectives

What are the components of an effective therapy environment? Firstly, the literature emphasises the significance of ill-structured therapies like a therapeutical alliance for feeling more comfortable and confident during the sessions. Someone like you may be more helpful than someone who analyses you depending on the theoretical knowledge. Social group therapy is another ill-structured supportive technique for solving problems like loneliness through sharing and comprehending someone else's experience, which may provide an evaluation of the situations from another field of view. Secondly, video conference-based peer-to-peer therapies either have some deficiencies or benefits related to the presence, technological adaptation or personal habits of the users.

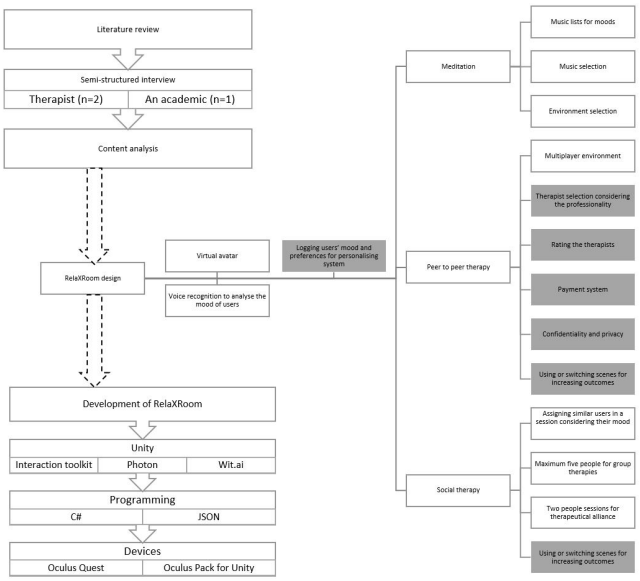


Figure 1. *The followed phases and applied functions of RelaXRoom*

Interaction of video sessions is highly restricted; therefore, some therapists use supplementary materials such as images, audio or video to increase the expected outcomes. Immersive visuals and sounds are reachable today thanks to VR technologies. Third, the benefits of meditation have been known for centuries, and there are successful projects like TRIPP for supporting meditation under the scopes like focusing, sleeping, calming or relaxing. After synthesising the points above, the researcher interviewed two therapists and a psychology professor to determine the fundamental design components of an ideal VR therapy environment. The semi-structured interviews were recorded and transcribed using word processor software. After the content analysis, the blueprint of RelaXRoom was designed as a comprehensive virtual solution, as seen in Fig 1.

Constructing a Prototype

To offer an all-in-one solution to the users, I merged all modules under the huge geodesic dome, as seen in Fig 2. When the user entered the RelaXRoom, they would find themselves in this dome among compacted modules. The menu appears in front of them and asks about their mood to direct them to the accurate virtual space after the therapy type selection.

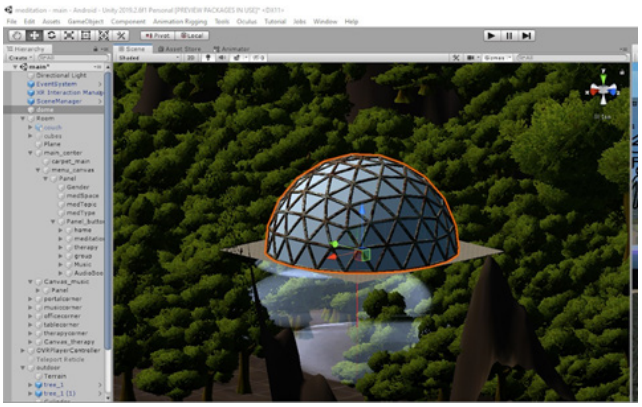
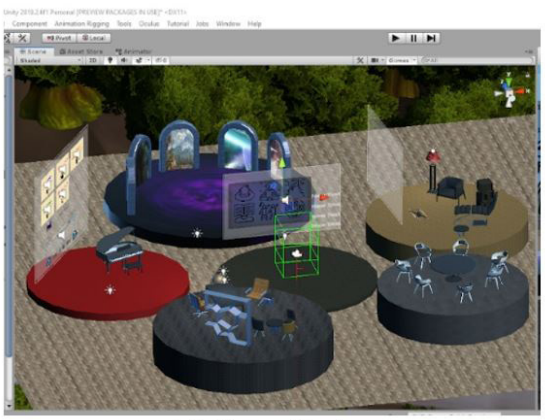


Figure 2. *Geodesic dome design of RelaXRoom*

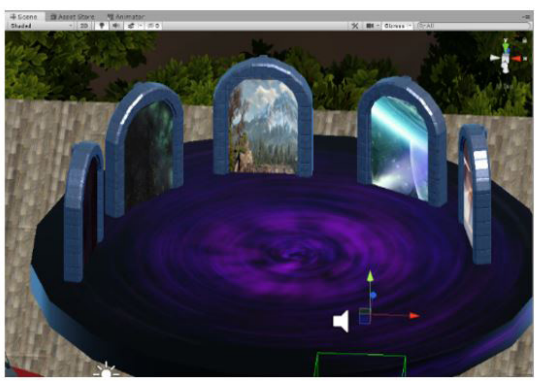
RelaXRoom is developed to provide three essential therapy opportunities to its users: meditation, peer-to-peer therapy, and group therapy. The meditation functionality of RelaXRoom includes three different virtual scenes to meditate through the users can meditate at the space, mountains or a coastline. The users may switch the background music or jump from one place to another during their experience.

The second therapy environment is designed to offer peer-to-peer synchronous therapy sessions (Fig. 3c). This module works for anyone who would like to connect for the pilot version of RelaXRoom, although we plan to create a therapist pool regarding their professions in the short term. I believe using blockchain algorithms for therapist and patient selection can protect the confidentiality and anonymity of the users. Using blockchain cryptocurrencies may also enhance payment privacy for participants for future studies.

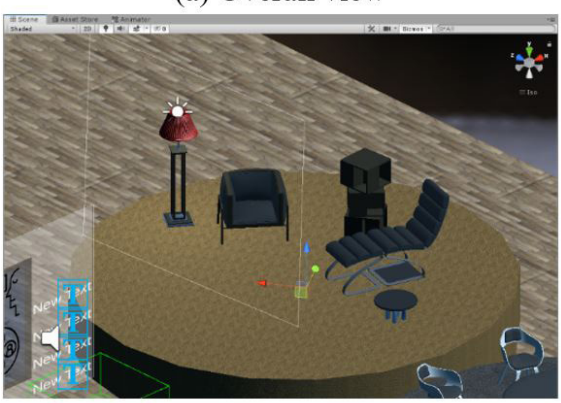
The third module of RelaXRoom offers social group therapy or meeting with a therapeutical alliance to its users (Fig. 3d). For group therapies, only five participants can be online in a single moment to share their experiences. Besides, the user can meet their alliance in a peer-to-peer session. This structure is not much different than peer to peer sessions for this version of RelaXRoom. The group therapy module brings people together, considering this version's three predetermined subs categorised as anxiety, depression, and stress.



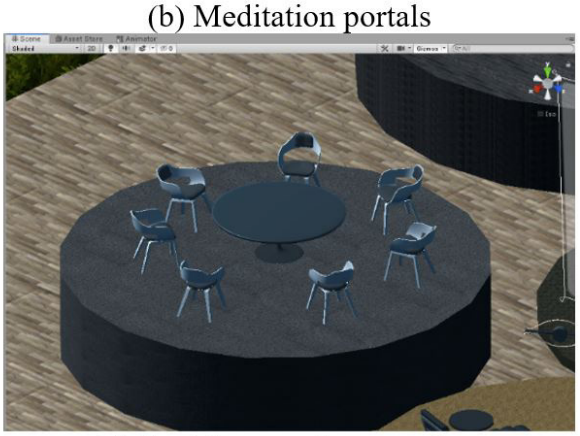
(a) Overall view



(b) Meditation portals



(c) Peer-to-peer therapy place



(d) Social group therapy place

Figure 3. *Main corners of RelaXRoom*

Utilising a Prototype

The first version of RelaXRoom is adaptable to the Oculus Quest and Oculus Quest 2 VR goggles. Unity Game engine version 2019.2.6f is preferred because of the opportunity to use Unity's XR interaction tool to develop multidevice adaptable AR and VR applications. This tool provides quick assets for different XR interactions, camera settings, pointers, teleport area, anchor and interactable objects, as seen in Fig. 4.

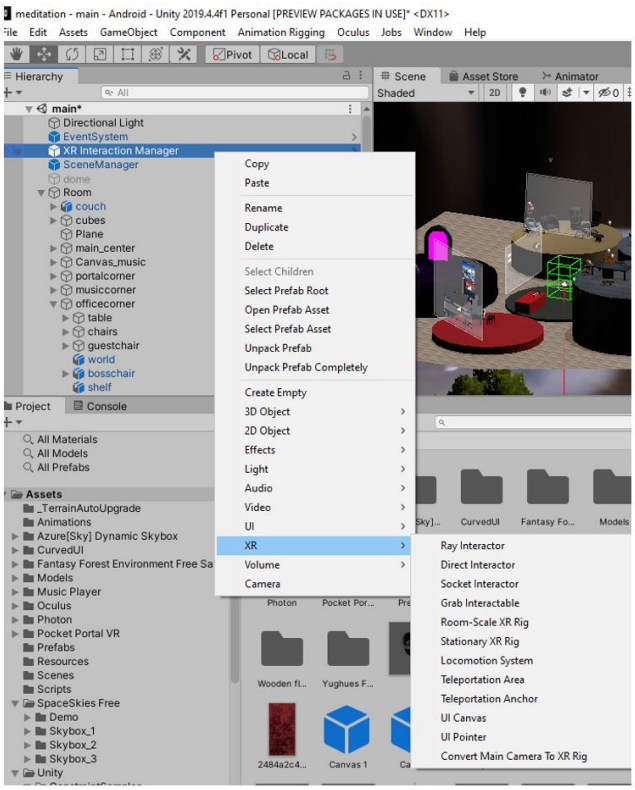


Figure 4. *Features of XR Interaction tool*

RelaXRoom is an Oculus adaptable application that uses Oculus Integration SDK and its assets on Unity. RelaXRoom includes three active portals for teleporting to the other scenes to self-meditate.

The multiplayer parts like peer-to-peer therapy and group sessions use Photon Pun Network Framework SDK on the Unity game engine that offers a NetworkManager package to create multiplayer or cross-platform apps. Wit.ai was integrated into Unity using JSON for voice recognition. RelaXRoom uses the expression of users to analyse their gender, meditation space and moods. For analysis, Wit.ai system was trained using 75 words and two sample sentences for each word. For instance, if the user says, "I am seriously overthinking my problems", the system recognises the "overthinking" word under the anxiety data and directs the user to the correct session, as seen in Fig. 5.

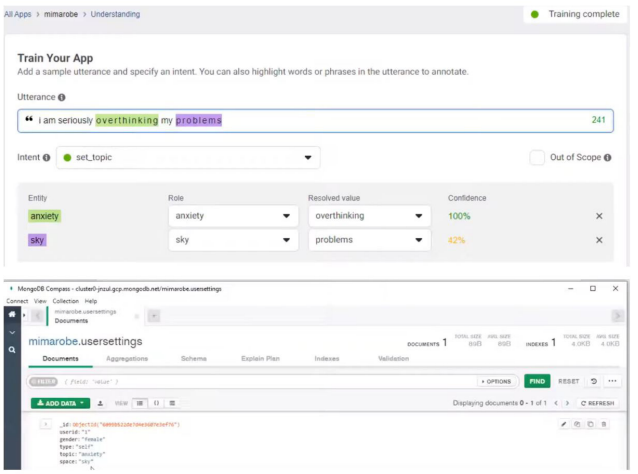


Figure 5. *Wit.ai learning interfaces*

Results and Discussion

No one knows the long-term psychological or social effects of the pandemic, although the studies indicate an accelerated number of mental problems which has to be solved. According to the statistics, the symptoms like anxiety or depression have increased from 36.4% to 41.5% between August 2020 and February 2021 (27). People need alternative therapy opportunities with these changes. Today, telepsychotherapy or video conference therapies may offer opportunities to expand the provision in challenging environments (11), although they bring other restrictions. Despite the application of alternative techniques like tele or video therapies, the efficiencies of these sessions are still controversial (13). Considering the outcomes of IVRLEs, a well-structured virtual therapy environment may cope with the limitation of current video conference-based systems. Embodiment in VR may help patients engage in the virtual environment; even sample simulated scenarios may help them to visualise, perceive, and become more aware of the situations (28). Therapists already use several augmented or virtual reality applications to support their patients with anxiety, phobia, PTSD or autism.

This technical paper applies the phases of rapid prototyping methodology to present a systematic design by investing the RelaXRoom as an alternative virtual therapy platform that aims to provide mental and social support to individuals with increased well-being issues. Need analysis and survey results revealed the increased therapy requirement of participants. The design components, interaction types, functionalities and upcoming preferences of RelaXRoom have structured considering the suggestion of experts and literature.

RelaXRoom offers a multiplayer IVR experience and focuses on ill-structured therapy techniques like social group therapy or therapeutical alliance due to the emphasised effectiveness of these methods. According to one of the interviewed therapists in this research, an expert should observe the group therapy sessions for emergencies for practical implementations. Meditation is one of the most recommended habits for mental well-being for ages. For this reason, RelaXRoom represents a self-meditation space with scene and music selection preferences for its users. Peer-to-peer therapy, under the consideration of an expert, is another essential module of RelaXRoom that also requires confidentiality, privacy, payment options and a therapist pool for the patients.

Conclusion

This paper discusses therapy techniques and the shift towards online sessions by examining the use of IVR in therapy. It also presents innovative applications in mental health, showcasing its potential for personalised and immersive experiences.

This technical paper analyses the required functionalities and design features of a potential IVR environment in a therapy called RelaXRoom. The prototype of RelaXRoom developed in this study includes meditation, peer-to-peer, and group therapy sessions and explains their features.

According to the studies, IVR has positively reduced stress, anxiety, and social isolation. Leveraging IVR technology allows for comprehensive and tailored virtual solutions to meet the growing demand for mental health care. As we navigate the challenges of the pandemic and beyond, it is crucial to explore and utilise IVR systems to support mental health. Ongoing research, development, and collaboration among therapists, researchers, and technology experts are essential to unlock the benefits of IVR in enhancing mental well-being and providing accessible therapy worldwide.

Declarations

Funding
This project has no funder.

Competing Interests
The authors declare that they have no competing interests. This manuscript has not been published or under consideration for publication elsewhere.

Ethics Approval
Not applicable.

Availability of Data and Material
All data generated or analysed during this study are included in this published article [and its supplementary information files].

Authors Contributions Section
This manuscript and related project were developed with the personal effort of the researcher.

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References

1. Dozois D. J. A. and Mental Health Research Canada. Anxiety and depression in Canada during the COVID-19 pandemic: A national survey. Canadian Psychology / Psychologie canadienne. 2020;62(1):136–142. DOI: 10.1037/cap0000251
2. Debowska A, Horeczy B, Boduszek D, et al. A repeated cross-sectional survey assessing university students' stress, depression, anxiety, and suicidality in the early stages of the COVID-19 pandemic in Poland. Psychological Medicine. 2020:1-4. DOI: 10.1017/S003329172000392X
3. Robb CE, de Jager CA, Ahmadi-Abhari S, et al. Associations of social isolation with anxiety and depression during the early COVID-19 pandemic: A survey of older adults in London, UK. Frontiers in Psychiatry. 2020;11:1-12. DOI: 10.3389/fpsyt.2020.591120
4. Zhou J, Zogan H, Yang S, et al. Detecting community depression dynamics due to COVID-19 pandemic in Australia. IEEE Transactions on Computational Social Systems. 2021;8(4):982-991. DOI: 10.1109/TCSS.2020.3047604
5. Kim U and Bhullar N. and Debra J. Life in the pandemic: Social isolation and mental health. Wiley Online Library, 2020. DOI: 10.1111/JOCN.15290
6. McBride H.L, Joseph A.J, Schmitt P.G, et al. Clinical recommendations for psychotherapists working during the coronavirus (COVID-19) pandemic through the lens of AEDP (Accelerated Experiential Dynamic Psychotherapy). Counselling Psychology Quarterly. 2020; 34: 411-431, DOI: 10.1080/09515070.2020.1771283
7. Lee C.M, Cadigan J.M and Rhew I.C. Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. Journal of Adolescent Health. 2020;67(5):714-717. DOI: 10.1016/j.jadohealth.2020.08.009

8. Canet-Juric L, Andrés M.L, Del Valle M, et al. A longitudinal study on the emotional impact cause by the COVID-19 pandemic quarantine on general population. Frontiers in Psychology. 2020;11:24-31. DOI: 10.3389/fpsyg.2020.565688
9. Leichsenring F, Hiller W, Weissberg M, et al. Cognitive-behavioral therapy and psychodynamic psychotherapy: techniques, efficacy, and indications. American Journal of Psychotherapy. 2006;60(3):233-259. DOI: 10.1176/appi.psychotherapy.2006.60.3.233Somanas A. 10 business sectors boosted by coronavirus concerns Financial Management2020 [Available from: https://www.fm-magazine.com/news/2020/apr/business-sectors-boosted-by-coronavirus-concerns.html.
10. Cuijpers P, Van Straten A, Andersson G, el al. Psychotherapy for depression in adults: A meta-analysis of comparative outcome studies. Journal of Consulting and Clinical Psychology. 2008;76(6):909-922. DOI: 10.1037/a0013075
11. MacMullin K, Jerry P and Cook K. Psychotherapist experiences with telepsychotherapy: Pre COVID-19 lessons for a post COVID-19 world. Journal of Psychotherapy Integration. 2020;30(2):248-364. DOI: 10.1037/int0000213
12. Inchausti F, MacBeth A, Hasson-Ohayon I, et al. Telepsychotherapy in the age of COVID-19: A commentary. Journal of Psychotherapy Integration. 2020; 30(2): 394-405. DOI: 10.1037/int0000222
13. Békés V and Aafjes-van Doorn K. Psychotherapists' attitudes toward online therapy during the COVID-19 pandemic. Journal of Psychotherapy Integration. 2020;30(2):238-247. DOI: 10.1037/int0000214
14. Glantz K, Durlach NI, Barnett RC, Aviles WA. Virtual reality (VR) and psychotherapy: Opportunities and challenges. Presence: Teleoperators & Virtual Environments. 1997;6(1):87-105. DOI: 10.1162/pres.1997.6.1.87
15. Riva G. Virtual reality in psychotherapy. Cyberpsychology & Behavior. 2005;8(3):220-230. DOI: 10.1089/cpb.2005.8.220
16. Matsangidou M, Otkhmezuri B, Ang CS, et al. "Now I can see me" designing a multi-user virtual reality remote psychotherapy for body weight and shape concerns. Human-Computer Interaction. 2020;37(4):314-340. DOI: 10.1080/07370024.2020.1788945
17. Kiefl N, Figas P and Bichlmeier C. Effects of graphical styles on emotional states for VR-supported psychotherapy: 10th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games). 2018: Germany. IEEE. DOI: 10.1109/VS-Games.2018.8493419
18. Parong J and Mayer RE. Learning science in immersive virtual reality. Journal of Educational Psychology. 2018;110(6):785-797. DOI: 10.1037/edu0000241
19. Pallavicini F, Orena E, di Santo S, et al. MIND-VR: Design and evaluation protocol of a virtual reality psychoeducational experience on stress and anxiety for the psychological support of healthcare workers involved in the COVID-19 pandemic. Frontiers in Virtual Reality. 2021; 2: 1-15. DOI: 10.3389/frvir.2021.620225
20. Hur J-W, Shin H, Jung D, Lee H-J, Lee S, Kim GJ, et al. Virtual Reality–Based Psychotherapy in Social Anxiety Disorder: fMRI Study Using a Self-Referential Task. JMIR Mental Health. 2021;8(4):e25731.
21. Streck A, Stepnicka P, Klaubert J, et al. Neomento-towards building a universal solution for virtual reality exposure psychotherapy: IEEE Conference on Games (CoG). 2019: London. IEEE. DOI: 10.1109/CIG.2019.8848110
22. Seabrook E, Kelly R, Foley F, et al. Understanding how virtual reality can support mindfulness practice: Mixed methods study. Journal of Medical Internet Research. 2020;22(3):e16106. DOI: 10.2196/16106
23. Jones T.S and Richey R.C. Rapid prototyping methodology in action: A developmental study. Educational Technology Research and Development. 2000;48(2):63-80. DOI:10.1007/BF02313401
24. Tripp S.D and Bichelmeyer B. Rapid prototyping: An alternative instructional design strategy. Educational technology Research and Development. 1990;38(1):31-44. DOI:10.1007/BF02298246
25. González-Sanguino C, Ausín B, Castellanos MÁ, et al. Mental health consequences of the coronavirus 2020 pandemic (COVID-19) in Spain. A longitudinal study. Frontiers in Psychiatry. 2020;11:1-6. DOI: 10.3389/fpsyt.2020.565474
26. Pierce B.S, Perrin P.B, Tyler C.M, et al. The COVID-19 telepsychology revolution: A national study of pandemic-based changes in US mental health care delivery. American Psychologist. 2020; 76(1):14–25. DOI: 10.1037/amp0000722
27. Vahratian A, Blumberg S.J, Terlizzi E.P, et al. Symptoms of anxiety or depressive disorder and use of mental health care among adults during the COVID-19 pandemic—United States, August 2020–February 2021. Morbidity and Mortality Weekly Report. 2021;70(13):490-494. DOI: 10.15585/mmwr.mm7013e2
28. Tacgin Z. Virtual and Augmented Reality: An Educational Handbook: Cambridge Scholars Publishing; 2020

Acıbadem Univ. Sağlık Bilim. Derg. 2023; 14 (3): 470-476
https://doi.org/10.31067/acusaglik.1174801

ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Health Policy / Sağlık Politikası

Examining the Relationship between Health Literacy and Distrust in Health Care Systems

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ABSTRACT

Aim: The study aimed to examine the relationship between individuals' distrust of the health care system and their health literacy levels and how demographic characteristics affect their level of distrust.

Materials and Methods: The research was conducted with 450 people over 18 living in the Selcuklu, Meram, and Karatay districts of the central districts of Konya province. A 32-question survey consisting of demographic questions, the Health Literacy Scale (HLS), and the Health Care System Distrust Scale (HCSD) was applied to the participants.

Results: According to the Pearson's correlation test conducted in the research, a negatively weak significant relationship was found between health literacy and distrust of health care systems, which associated increased health literacy with lower distrust. According to the regression analysis, there was a statistically significant relationship between health literacy and distrust of health care systems. Accordingly, 4.4% of the variance in distrust of health care systems was explained by health literacy (R^2=0,044).

Result: The educational and income status positively affect individuals' level of health literacy. As health literacy level increases, trust in health care systems also increases. For trust to be established between health service providers and consumers, actions should be taken to improve their level of health literacy.

Keywords: Health care systems, Health literacy, Trust

Sağlık Okuryazarlığı Ve Sağlık Sistemlerine Güvensizlik Arasındaki İlişkinin İncelenmesi

ÖZET

Amaç: Kişilerin sağlık okuryazarlığı düzeyleri ve sağlık sistemlerine güvensizlikleri arasındaki ilişkiyi incelemek ve demografik özelliklerin, kişilerin sağlık okuryazarlığını ve sağlık sistemlerine güvensizliklerini nasıl etkilediğini araştırmaktır.

Gereç ve Yöntem: Araştırma Konya ili merkez ilçelerinden Selçuklu, Meram ve Karatay ilçelerinde yaşayan 18 yaş üstü 450 kişiyle yapılmıştır. Katılımcılara demografik bilgi soruları, Sağlık Okuryazarlığı Ölçeği ve Sağlık Sistemlerine Güvensizlik Ölçeğinden oluşan 32 soruluk bir anket uygulanmıştır.

Bulgular: Araştırmada yapılan Pearson Korelasyon testine göre sağlık okuryazarlığı ile sağlık sistemlerine güvensizlik arasında negatif yönde zayıf düzeyde anlamlı bir ilişki tespit edilmiştir, Sağlık okuryazarlığı arttıkça, güvensizlik azalmaktadır. Yapılan regresyon analizine göre sağlık okuryazarlığı ve sağlık sistemlerine güvensizlik arasında istatistiksel olarak anlamlı bir ilişki vardır. Analize göre Sağlık Sistemlerine Güvensizlikte gerçekleşen değişimin %4,4'ü Sağlık Okuryazarlığı tarafından açıklanmaktadır (R2=0,044).

Sonuç: Öğrenim düzeyi ve gelir durumu kişilerin sağlık okuryazarlığını olumlu yönde etkilemektedir. Sağlık okuryazarlığı arttıkça, sağlık sistemlerine duyulan güven de artmaktadır. Sağlık hizmeti sunucuları ve kullanıcıları arasında güven oluşabilmesi için sağlık okuryazarlığını arttırmaya yönelik çalışmalar yapılmalıdır.

Anahtar Kelimeler: Sağlık Sistemleri, Sağlık Okuryazarlığı, Güven

The concept was first introduced in 1974 by Scott K. Simonds in the study titled "Health Education as Social Policy" as the "health education that meets the minimum standards at every level of education" (1). Another critical definition of health literacy was suggested in the report published by the American Medical Association (AMA) Council for Health Literacy in 1999. The report defines the concept as a set of skills necessary for individuals to function within the health care system (1,2).

Nutbeam examined health literacy under three categories as functional, interactive, and critical health literacy. Basic (functional) literacy includes the ability of an individual to effectively use basic skills in reading and writing health-related topics in everyday life. It usually is sufficient to take care of one's health. Although it has individual-level benefits, it also indirectly impacts society. Interactive literacy includes the more advanced skills to actively participate in daily activities, extract and understand information from health messages transmitted through various communication forms, and adapt existing health information to changing conditions. In addition to the added social skills, critical literacy also refers to an advanced level of cognitive skills to question the health information that they are provided with, as well as analyzing the data and using it to increase their level of life management. People with critical health literacy are expected to confirm, question, evaluate and share the accuracy of the information they receive from health service providers, the media, or their circle (3,4).

Like basic literacy, health literacy is not static and continues to develop throughout a person's life. It is also influenced by demographic, sociopolitical, psychosocial, and cultural factors (5).

Hosmer defines the concept of trust as "individuals having optimistic feelings about the other party when making a decision at the moment of exposure to danger or crediting for something" (6). Individuals trust in health care systems plays a role in explaining one's access to medical care, use of medical care, compliance with medications and treatments, continuity of care, and self-reported health status (7).

When patients do not trust health professionals, they do not tend to cooperate with them and thus do not follow their recommendations and conditions. They may reject the diagnosis, interfere with the treatment process, want to consult another physician, or leave the hospital (8).

On the other hand, patients who trust physicians take their medications more regularly do not disrupt their follow-up appointments and fulfill what they are told throughout the treatment process. These behaviors discourage them from contacting another physician to be satisfied with their health. Therefore, unnecessary requests for examinations, tests, and analyses can be prevented. This situation contains the health budget and the resources allocated to health services from being wasted (9).

In particular, the uncertainty of the thoughts of those with a long history of illness or more complex diseases causes the decimation of trust between the health professional and the patient (10). Individuals begin to question the events around them as their educational level increases, and their reasoning and comparison abilities improve correlatively. Therefore, they may become more selective and insecure in health services (11).

Materials and Methods

Research Universe

The research universe consists of 949,630 people over 18 living in Selcuklu, Meram, and Karatay districts in Konya province (TURKSTAT, 2021) (34). A sample of 384 people was found to be sufficient for the universe (12), and 450 people were reached within the scope of the study.

Data Collection Tools

In the study, a 32-question survey was applied to the participants. The first consists of 8 questions about demographic data, the second consists of the Health Literacy Scale (13), and the third consists of the Health Care System Distrust Scale (14). The Health Literacy Scale was developed by Suka et al. in 2010 (15). Turkish validity and reliability were performed by Türkoğlu and Kılıç (2021). As a result of the reliability analysis, the Cronbach Alpha value of the scale was found to be 0,85. It consists of functional, interactive, and critical sub-dimensions. The Health Care System Distrust Scale was developed by Rose et al. Its Turkish validity and reliability were performed by Yeşildal et al. in 2019. As a result of the reliability analysis, the Cronbach Alpha value of the scale was found to be 0,789.

Ethical Considerations

Before conducting the research, ethical approval was received from the Non-Interventional Clinical Research Ethics Committee of the Dean of the Faculty of Health Sciences of Selcuk University on December 29th, 2021, with decision no. 1918. Afterward, the researcher collected the data on March 1st and May 15th, 2022, using online

(Google Forms) and face-to-face survey methods. The participants were explained and informed about the research before filling out the survey, and the informed consent form was received from those who agreed to participate.

Data Analysis

After the collection process, the data were transferred to the computer environment. The SPSS 25.0 (Statistical Program for Social Sciences) package was used to evaluate the data. The findings evaluated percentage distributions, averages, standard deviations, and minimasses maximum values. To determine whether the data conform to the normal distribution (Skewness-Kurtosis), the normality distribution test was used, and the scales were found to conform to normal distribution. As a result, parametric tests were used during data analysis, and Independent Samples t-test, One-way ANOVA, and Pearson's Correlation tests were performed.

Results

In this chapter, sociodemographic data of the participants and analysis and explanations of their responses to the Health Literacy Scale and the Health Care System Distrust Scale were included.

Table 1. Findings Related to the Socio-Demographic Characteristics of the Participants

Gender	**(n)**	**(%)**
Male	198	44.0
Female	252	56.0
Age	**(n)**	**(%)**
18-22	153	34.0
23-29	139	30.9
30 and older	158	35.1
Marital Status	**(n)**	**(%)**
Single	295	65.6
Married	155	34.4
Educational Status	**(n)**	**(%)**
High school degree and lower	110	24.4
Associate degree	62	13.8
Bachelor's degree	226	50.2
Postgraduate degree	52	11.6
Income Status (TL)	**(n)**	**(%)**
0-4999	136	30.2
5000-7999	162	36.0
8000 and above	152	33.8
Do you have a chronic disease? (Diabetes, blood pressure, asthma, etc.)	**(n)**	**(%)**
Yes	58	12.9
No	392	87.1
Does anyone in your family have a chronic disease?	**(n)**	**(%)**
Yes	219	48.7
No	231	51.3
Place of Residence	**(n)**	**(%)**
Selcuklu	219	48.7
Meram	117	26.0
Karatay	114	25.3

As seen in Table 1, 56% (252 people) of the participants are female, 35.1% (158 people) are aged 30 or older, 65.6% (295 people) are single, 50.2% (226 people) hold bachelor's degree, and 36.0% (162 people) have an income of ₺5000 to ₺7999. 87.1% (392 people) have no chronic diseases. 51.3% (231 people) have no family history of chronic disease. Lastly, 48.7% (219 people) live in the Selcuklu district.

As seen in Table 2, according to the results of the t-test performed between the Health Literacy Scale and its subscales, there was a statistically significant relationship between health literacy and gender ($p<0,05$). Women's ($\dot{x}=3,92$) level of health literacy was higher than those of men ($\dot{x}=3,66$).

According to the results of the t-test performed between the Health Literacy Scale and marital status, it was found that there was a statistically significant relationship between the Functional subscale and marital status ($p<0,05$). Single ($\dot{x}=3,49$) individuals were found to have a higher level of functional health literacy than married ($\dot{x}=3,27$) individuals.

According to the results of the t-test conducted between the Health Care System Distrust Scale and gender, marital status, chronic illness, and the family history of chronic disease, no significant relationship was found ($p>0,05$).

Table 2. The T-Test Analysis of the Health Literacy Scale and its Subscales and the Health Care System Distrust Scale

		HLS	HLS Subscales			HCSD-S
			Functional	Interactive	Critical	
Gender	**Male**	3,66±0,65	3,29±0,98	3,81±0,79	3,93±0,87	2,96±0,64
	Female	3,92±0,60	3,51±0,97	4,04±0,73	4,27±0,79	2,87±0,65
Test and p-value		t=-4,330	t=-2,389	t=-3,191	t=-4,256	t=1,520
		p<0,001	**p=0,017**	**p=0,002**	**p<0,001**	p=0,127
Marital Status	**Single**	3,84±0,61	3,49±0,93	3,93±0,74	4,16±0,81	2,92±0,61
	Married	3,74±0,68	3,27±1,06	3,95±0,82	4,05±0,90	2,88±0,70
Test and p-value		t=1,598	t=2,231	t=-0,216	t=1,239	t=0,706
		p=0,111	**p=0,026**	p=0,829	p=0,216	p=0,480
Chronic Disease	**Yes**	3,71±0,65	3,34±1,03	3,92±0,74	3,92±0,93	3,04±0,73
	No	3,82±0,63	3,43±0,98	3,94±0,77	4,15±0,82	2,89±0,63
Test and p-value		t=-1,185	t=0,698	t=-0,225	t=-1,916	t=1,660
		p=0,236	p=0,507	p=0,822	p=0,056	p=0,097
Family History of Chronic Disease	**Yes**	3,81±0,65	3,38±1,03	3,96±0,76	4,16±0,86	2,97±0,68
	No	3,80±0,62	3,45±0,93	3,93±0,77	4,08±0,82	2,85±0,60
Test and p-value		t=0,137	t=-0,684	t=0,413	t=0,893	t=1,840
		p=0,891	p=0,494	p=0,680	p=0,372	p=0,066

Table 3. ANOVA Test Analysis for the Health Literacy Scale and its Subscales and the Health Care System Distrust Scale

		HLS	HLS Subscales			HCSD-S
			Functional	Interactive	Critical	
Age	**18-22[1]**	3,91±0,58	3,69±0,88	3,93±0,69	4,17±0,78	2,90 ± 0,61
	23-29[2]	3,86±0,65	3,48±0,95	3,97±0,83	4,19±0,85	2,94 ± 0,62
	30+[3]	3,66±0,65	3,10±1,03	3,92±0,78	4,01±0,88	2,89 ± 0,70
Test and p-value		F=7,027	F=14,691	F=0,175	F=1,920	F=0,273
		p=0,001	**p<0,001**	p=0,839	p=0,146	p=0,761
Post-Hoc		1,2 > 3[a]	1,2 > 3[a]			
Educational Status	**High school degree and lower[1]**	3,60±0,68	3,21±1,03	3,80±0,78	3,83±0,92	2,85 ± 0,62
	Associate Degree[2]	3,95±0,56	3,56±0,88	4,06±0,73	4,29±0,78	2,85 ± 0,58
	Bachelor's degree[3]	3,84±0,59	3,49±0,97	3,93±0,73	4,17±0,80	2,93 ± 0,68
	Postgraduate degree[4]	3,91±0,71	3,38±0,98	4,11±0,87	4,32±0,77	3,01 ± 0,61
Test and p-value		F=5,718	F=2,493	F=2,620	F=6,540	F=1,014
		p=0,001	p=0,060	p=0,050	**p<0,001**	p=0,386
Post-Hoc		2,3,4 > 1[a]			2,3,4 > 1[a]	
Income (TL)	**0-4999**	3,80±0,59	3,45±0,93	3,85±0,73	4,18±0,77	2,81 ± 0,57
	5000-7999	3,77±0,64	3,36±0,98	3,95±0,79	4,06±0,88	2,98 ± 0,63
	8000 and above	3,85±0,67	3,45±1,03	4,01±0,76	4,13±0,85	2,92 ± 0,71
Test and p-value		F=0,562	F=0,467	F=1,499	F=0,745	F=2,424
		p=0,571	p=0,627	p=0,224	p=0,475	p=0,090
Post-Hoc						
Place of Residence	**Selcuklu[1]**	3,90±0,59	3,56±0,99	4,00±0,71	4,19±0,81	2,92 ± 0,63
	Meram[2]	3,78±0,65	3,35±0,97	3,92±0,78	4,14±0,79	2,86 ± 0,67
	Karatay[3]	3,65±0,68	3,22±0,95	3,85±0,84	3,95±0,93	2,94 ± 0,65
Test and p-value		F=5,572	F=4,944	F=1,340	F=3,106	F=0,477
		p=0,004	**p=0,008**	p=0,261	**p=0,046**	p=0,621
Post-Hoc		1 > 3[a]	1 > 3[a]		1 > 3[b]	

Post-Hoc tests a=Scheffe b=LSD

As seen in Table 3, a statistically significant difference was found in the health literacy scores and functional subscale scores of the participants according to their age, as a result of the ANOVA test (p<0,05). Participants aged between 18 and 22 (ẋ=3,91) and between 23 and 29 (ẋ=3,86) were found to have a higher level of high literacy than those aged 30 and older (ẋ=3,66). According to the post-hoc (Scheffe) test conducted in the Functional subscale, the functional health literacy levels of people aged 18 to 22 and 23 to 29 were higher than those aged 30.

According to the ANOVA test conducted between educational status and the Health Literacy Scale and its subscales, there was a significant difference between the overall Health Literacy Scale score and Critical subscale and academic status (p<0,05). According to the post-hoc (Scheffe) test, the health literacy levels of individuals with high school and lower (ẋ=3,60) degree levels were lower than those with associate degree (ẋ=3,95), bachelor's degree (ẋ=3,84), and postgraduate (ẋ=3,91) degrees. According to the Post-Hoc (Scheffe) test conducted in the Critical subscale, the critical health literacy levels of high school and lower students were lower than those with an associate, bachelor's, and postgraduate degrees.

According to the ANOVA test conducted between the place of residence and the Health Literacy Scale and its subscales, a significant difference was found between the overall Health Literacy Scale score and the Functional and Critical subscales (p<0,05). According to the overall Health Literacy Scale score and the post-hoc (Scheffe) test conducted in the Functional subscale, participants living in Selcuklu were found to have higher levels of health literacy and functional health literacy than those residing in Karatay. According to the post-hoc (LSD) test conducted in the Critical subscale, it was found that the critical health literacy levels of those living in Selcuklu were higher than those living in Karatay.

No significant relationship was found with the results of the ANOVA test conducted between the Health Care System Distrust Scale and age, educational status, income, and place of residence.

Table 4. Correlation Analysis between the Health Literacy Scale and the Health Care System Distrust Scale

	The Healthy Literacy	Subscales		
		Functional	Interactive	Critical
The Health Care System Distrust Scale	r=-0,209**	r=-0,275**	r=-0,040	r=-0,104*
	p<0,001	p<0,001	p=0,196	p=0,013

***Correlation is significant at 0.01.*
**Correlation is significant at 0.05.*

According to the Pearson's correlation analysis conducted between the Health Literacy Scale and its subscales and the Health Care System Distrust Scale, there was a weak negative relationship between the Health Care System Distrust Scale and the Health Literacy Scale (r=-0,209) and the Functional subscale (r=-0,275) and the Critical subscale (r=-0,104). According to this result, it may be concluded that as participants' health literacy levels increase, their trust in health systems also increases.

Table 5. Regression Analysis

Dependent Variable	Independent Variable	B	se	t	F	p	R^2
The Health Care System Distrust	Constant	3.722	0.182	20.499	20.436	0.000	0.044
	The Healthy Literacy	-0.212	0.047	-4.521			

In light of the data in Table 5, the regression analysis conducted between the Health Care System Distrust Scale and the Health Literacy Scale was found significant (p<0.05). According to the table, 4.4% of the variance in distrust of health care systems is explained by health literacy (R^2=0,044). The Health Literacy Scale score increase reflects individuals' distrust of the health care systems (B=-0.212). The increase in health literacy significantly negatively affects the suspicion of health care systems.

Discussion

The current study found that factors such as gender, age, marital status, and educational status affect individuals' health literacy levels. Health literacy levels of women were found to be significantly higher than those of men. When the literature is examined, various research has been reached to support the current conclusion (16,17,18,19,20). According to the study conducted by Kamberi et al. in 2013 and the dissertation born by Beyoğlu in 2019, the health literacy level of male participants was higher (21,22).

In the current research, participants' age significantly affected their health literacy levels. The level of those over 30 was lower than that of younger participants. The previous studies also agree with this conclusion (16,21-23,24,25).

According to the findings, only the functional health literacy of single participants was higher than that of married participants, and there was no significance in other subscales. The literature review showed that the health literacy levels of married participants were higher than those of single participants (14,22,26,27).

A significant positive relationship was found between the participants' educational status and health literacy levels. When the literature was examined, it was seen that participants with a higher academic standing also had higher health literacy levels (14,17,23,24,28).

Although studies have concluded that as individuals' financial and social status increases, their health literacy rates also increase (21,25,28,29), no such relationship has been found in the current study.

When the data was examined, it was seen that whether individuals had chronic diseases did not affect their health literacy levels, while some studies suggested the opposite (22,27-29,30).

No significant relationship was found between individuals' distrust of health care systems and their demographic characteristics. In previous studies, no association was found between distrust of health care systems and gender (31,32), and educational status and income level did not affect distrust (32). However, there are studies indicating that the trust levels of participants increase as their age increases (31-33).

Conclusion

High educational status and higher socioeconomic conditions are among the determinants of high health literacy. As health literacy level increases, trust in health care systems also increases. Individuals with high health literacy have an active say in their health, and as their trust level increases, their treatment progresses, becomes more accurate, and their recovery time shortens. To build trust between the health service providers and consumers, actions should also be taken to improve their level of health literacy.

DECLARATIONS

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Competing Interests

No potential conflict of interest was reported by the authors.

Ethics Approval

Ethics committee approval was obtained for the study from Selcuk University Faculty of Health Sciences Non-Invasive Clinical Research Ethics Committee with the decision numbered 1918 on 29.12.2021.

Availability of Data and Material

All data has been presented.

Authors Contributions Section

Beyzanur Üstünbaş collected the data, performed the analysis, and wrote the paper. Yunus Emre ÖZTÜRK conceived and designed the analysis and contributed data or analysis tools.

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References

1. Kavuncuoğlu D. Erzurum il merkezinde yetişkinlerin sağlık okuryazarlığı düzeyi ve etkili faktörler. Uzmanlık tezi, Atatürk Üniversitesi Tıp Fakültesi. 2020;Erzurum.
2. Andrus MR, Roth MT. Health literacy: a review. Pharmacotherapy. 2002;22(3):282-302.
3. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International. 2000;15(3):259-67.
4. Yılmaz M, Tiraki Z. Sağlık okuryazarlığı nedir? Nasıl ölçülür?. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi. 2016;9(4):142-47.

5. Zarcadoolas C, Pleasant A, Greer DS. Understanding health literacy: an expanded model. Health Promotion International. 2005;20(2):195-203.
6. Hosmer LT. Trust: The connecting link between organizational theory and philosophical ethics. Academy of Management Review. 1995;20(2):379-402.
7. Ozawa S, Sripad P. How do you measure trust in the health system? A systematic review of the literatüre. Soc Sci Med. 2013;91:10-14.
8. Karakaya Ç, Sümer FE, Demir ZG, et al. Is communication a receipt for doctors? The relationship between communication competence and trust: a research on breast patients. Türkiye İletişim Araştırmaları Dergisi. 2021;37:92-108.
9. Türkyılmaz D. Tıbbi güven ve güvensizlik. Başkent Üniversitesi Sağlık Bilimleri Fakültesi Dergisi. 2021;6(1):15-30.
10. Ertong G. Sağlık sisteminde hekim hasta ilişkisi ve güven unsuru. Doktora tezi, Ankara Üniversitesi Sosyal Bilimler Enstitüsü. 2011;Ankara.
11. Nal M. Türkiye'de sağlık hizmetleri sistemine güven. Bandırma Onyedi Eylül Üniversitesi Sağlık Bilimleri ve Araştırmaları Dergisi. 2021;3(1):1-10.
12. Altunışık R, Coşkun R, Bayraktaroğlu S, et al. Sosyal bilimlerde araştırma yöntemleri. Sakarya: Sakarya Yayıncılık;2015.
13. Türkoğlu N, Kılıç D. Sağlık okuryazarlığı ölçeği'nin Türkçeye uyarlanması: Geçerlilik ve güvenilirlik çalışması. Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi. 2021;24(1):25-33.
14. Yeşildal M, Erişen MA, Kıraç R. Sağlık sistemlerine güvensizlik: Bir geçerlilik ve güvenilirlik çalışması. Usaysad Derg. 2020;6(2):251-9.
15. Suka M, Odajima T, Kasai M, et al. The 14-item health literacy scale for Japanese adults (HLS-14). Environ Health Prev Med. 2013;18(5):407-15.
16. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: Comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25(6):1053–8.
17. Cavanaugh KL, Wingard RL, Hakim RM, et al. Low health literacy associates with increased mortality in ESRD. Journal of the American Society of Nephrology. 2010;21(11):1979-85.
18. Türkoğlu Ç. Sağlık okuryazarlığı ile öz bakım gücü arasındaki ilişkinin incelenmesi: Isparta ili örneği. Yüksek lisans tezi. SDÜ Sosyal Bilimler Enstitüsü. 2016;Isparta.
19. Kıraç R, Öztürk YE. Halkın sağlık okuryazarlık düzeyi ile sağlık kaygısı arasındaki ilişki. Sosyoloji Araştırmaları Dergisi. 2020;23(2):214-43.
20. Yeşildal M, Kaya ŞD. Yetişkin bireylerde dijital okuryazarlık ve sağlık okuryazarlığı arasındaki ilişki: Konya örneği. Sağlık Bilimleri Dergisi. 2021;30(2):174-81.
21. Kamberi H, Hysa B, Toçi E, et al. Functional health literacy among primary health care users in transitional Kosovo. Medical Archives. 2013;67(3):209-11.
22. Beyoğlu MM. Diyabetes mellitus veya hipertansiyonu olan yetişkin bireylerde sağlık okuryazarlığı, endişe ve anksiyete arasındaki ilişkinin incelenmesi ve kronik hastalığı olmayan bireylerle karşılaştırılması. Uzmanlık tezi. Van Yüzüncü Yıl Üniversitesi Tıp Fakültesi. 2019;Van.
23. Paasche-Orlow MK, Parker RM, Gazmararian JA, et al. The prevalence of limited health literacy. J Gen Intern Med. 2005;20(2):175-84.
24. Jeong SH, Kim HK. Health literacy and barriers to health information seeking: A nationwide survey in South Korea. Patient Educ Couns. 2016;99(11):1880-7.
25. Kale Aktaş H. Kronik hastalığı olan bireylerde sağlık okuryazarlığının ve sağlık algısının değerlendirilmesi. Uzmanlık tezi. Sağlık Bilimleri Üniversitesi. 2021;İstanbul.
26. Çimen Z, Bayık Temel A. Kronik hastalığı olan yaşlı bireylerde sağlık okuryazarlığı ve sağlık algısı ilişkisi ve sağlık okuryazarlığını etkileyen faktörlerin incelenmesi. Ege Üniversitesi Hemşirelik Fakültesi Dergisi. 2017;33(3):105-25.
27. Bulun Yediyıldız M. Preoperatif hasta anksiyete düzeyleri ile sağlık okuryazarlığı arasındaki ilişkinin değerlendirilmesi. Uzmanlık tezi. NEÜ Meram Tıp Fakültesi. 2021;Konya.
28. Yağız E. Kocaeli Üniversitesi öğrencilerinin sağlık okuryazarlığı düzeyleri ve bu durumun akılcı ilaç kullanımıyla olan ilişkisinin incelenmesi. Tıpta uzmanlık tezi. Kocaeli Üniversitesi Tıp Fakültesi. 2020;Kocaeli.
29. Akpınar ÖF. Erişkin hastalarda sağlık okuryazarlığı düzeyinin birinci basamak sağlık hizmetlerini kullanımı üzerine etkisi. Tıpta uzmanlık tezi. Sağlık Bilimleri Üniversitesi. 2019;İstanbul.
30. Çiftçi Kİ. Kronik hastalığı olan bireylerin sağlık okuryazarlığı ve sağlık bakım hizmetlerinin belirlenmesi. Yüksek lisans tezi. Atatürk Üniversitesi Sağlık Bilimleri Enstitüsü. 2015;Erzurum.
31. Rose A, Peters N, Shea JA, et al. Development and testing of the health care system distrust scale. J Gen Stajyer Med. 2004;19(1):57-63.
32. Armstrong K, Rose A, Peters N, et al. Distrust of the health care system and self-reported health in the United States. J Gen Intern Med. 2006;21(4):292-7.
33. Göde A, Kuşcu FN. E-Nabız sistemi kullanımının sağlık sistemlerine güvensizlik üzerine etkisinin incelenmesi: Üniversite öğrencileri üzerinde bir araştırma. Journal of Academic Value Studies. 2022;8(1):37-46.
34. TURKSTAT, 2021. Access address: https://www.tuik.gov.tr/

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REVIEW / DERLEME

Psychiatry / Psikiyatri

Depression Prevalence of Healthcare Workers During the First Wave of the COVID-19 Pandemic and Its Affecting Variables: A Meta-Analysis

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ABSTRACT

Purpose: This meta-analysis aimed to systematically review the affecting variables regarding the prevalence of depression in healthcare workers during the COVID-19 pandemic.

Method: MedLine, PubMed, Web of Science (Wos), and GoogleScholar databases were searched until June 19, 2020. The quality of studies included was evaluated with The Newcastle-Ottawa Scale. Data were analyzed using Comprehensive Meta-Analysis Version 3.0. The pooled prevalence of depression was interpreted according to the random-effects model. The heterogeneity of the studies was evaluated with Cochran's Q test and I^2 statistics.

Results: A meta-analysis of depression prevalence in healthcare workers was carried out with 8 studies. Studies with high-quality assessments were analyzed. In this study, which was conducted with a total of 9,841 healthcare workers, the overall depression rate was 40.8% (95% confidence interval [CI] 33.5-48.6; I^2=96.48%). In the subgroup analysis to determine the influencing variables, the rate of depression in female healthcare workers was 24.5% (95% CI: 17.4–33.3) and the rate of depression in male healthcare workers was 8.5% (95% CI: 5.5–12.7). In addition, the depression rate was 43.6% (95% CI: 35.9–51.7) in studies conducted in China and 18.5% (95% CI: 7.5–38.7) in a study conducted in Korea. No statistically significant difference was found as a result of the subgroup analysis in terms of profession, the measurement tool and the period of time (p>0.05).

Conclusion: This meta-analysis provides evidence that 4 out of 10 healthcare workers experience depression during the COVID-19 pandemic, with country and gender as the most influencing variable, respectively.

Keywords: COVID-19, depression, healthcare workers, meta-analysis, prevalence

Emel KAYA

Tuğba ÖZTÜRK YILDIRIM

COVID-19 Pandemisinin Birinci Dalgasında Sağlık Çalışanlarında Görülen Depresyon Prevelansı ve Bu Prevelansı Etkileyen Değişkenler: Bir Meta-Analiz

ÖZET

Amaç: Bu meta-analiz, COVID-19 pandemisi sırasında sağlık çalışanlarında görülen depresyon prevalansına ilişkin etkileyen değişkenleri sistematik olarak gözden geçirmeyi amaçladı.

Yöntem: Meta-analiz için MedLine, PubMed, Web of Science (Wos) ve GoogleScholar veri tabanlarında 19 Haziran 2020'ye kadar tarama yapıldı. Dahil edilen çalışmaların kalitesi The Newcastle-Ottawa Scale ile değerlendirildi. Comprehensive Meta-analysis version 3.0 kullanılarak veriler analiz edildi. Genel depresyon oranı rasgele etkiler modeline göre yorumlandı. Çalışmaların heterojenliği Cochran's Q test ve I^2 istatistiği ile değerlendirildi.

Bulgular: Sağlık çalışanlarında görülen depresyon prevalansının meta analizi 8 çalışma ile gerçekleştirildi. Yüksek kalite değerlendirilmesine sahip olan çalışmalar analiz edildi. Toplam 9,841 sağlık çalışanı ile yapılan bu çalışmada genel depresyon oranı %40.8 (%95 güven aralığı [GA] 33.5-48.6; I^2=%96.48) olarak bulundu. Etkileyen değişkenleri belirlemek için yapılan alt grup analizinde kadın sağlık çalışanlarında depresyon oranı %24,5 (%95 GA: 17,4–33,3) ve erkek sağlık çalışanlarında depresyon oranı %8,5 (%95 GA: 5,5–12,7) olarak belirlendi. Ayrıca Çin'de yapılan çalışmalarda depresyon oranı %43.6 (%95 GA: 35.9–51.7), Kore'de yapılan bir çalışmada ise %18.5 (%95 GA: 7.5–38.7) depresyon oranı belirlendi. Yapılan alt grup analizi sonucunda meslek, ölçüm aracı ve zaman dilimi açısından istatistiksel olarak anlamlı fark bulunmadı (p>0.05).

Sonuç: Bu meta analiz COVID-19 pandemisinde her on sağlık çalışanının dördünde depresyon görüldüğüne ve en çok etkileyen değişkenin sırasıyla ülke ve cinsiyet olduğuna kanıt sağlar.

Anahtar kelimeler: COVID-19, depresyon, sağlık çalışanları, meta analiz, prevelans

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The high morbidity and mortality caused by the COVID-19 pandemic have led to a global crisis. In this process, where all systems were negatively affected, the biggest load was on healthcare services and healthcare workers (1). Healthcare workers had to deal with many difficulties caused by the pandemic while providing healthcare services to protect public health. This situation has caused healthcare workers to experience mental health problems day by day (2,3). Thus, it has become a focus of researchers as an important factor in reducing the quality of healthcare services. One of the most emphasized issues regarding the psychological effects of the COVID-19 pandemic on healthcare workers was depression (4–10).The changing daily work and life routines of healthcare workers, who are at high risk in the COVID-19 pandemic, were effective in the emergence of depression symptoms (11). First, due to the rapid increase in the number of patients with COVID-19, resources in healthcare institutions were insufficient. When the number of infected and dying patients increased, many nurses could not be sent to their homes due to a lack of personnel. Many healthcare organizations have asked their employee caring for COVID-19 patients to continue working until they show symptoms of the disease to meet their personnel needs (12). This situation created challenges in ensuring the sustainability of qualified healthcare services (1). In addition, adverse effects such as increased workload, long working hours, physical fatigue, difficulty in using personal protective equipment (PPE), and allergies related to the use of PPE were commonly observed (13–17). Healthcare workers had to make critical decisions on testing suspected COVID-19 patients and whether to isolate the patient or employee in patient care units based on a positive test result (18). At the same time, the daily lives of healthcare workers were also deeply affected. Healthcare workers had to be separated from their family members for different periods of time to protect them. Staying at home (or lodging, dormitory, hotel, etc.) or living between work and home without socializing, and not being able to meet their daily basic needs have increased their distance from the world (4,11). In an environment of distance, with the closure of educational institutions, the baby/childcare has created a big problem for families with children (19). Another issue was that healthcare workers were stigmatized or rejected by their neighbors while being declared heroes for their work (19–21). Healthcare workers faced challenges they had never experienced during the COVID-19 pandemic compared to previous outbreaks (18). All these were effective in the emergence of depression symptoms in healthcare workers (11).

Studies have revealed the relationship of the prevalence of depression in healthcare workers in the COVID-19 pandemic with variables such as age (3,10,21–23), gender (3,4,28,29,13,16,21,22,24–27), marital status (21,29), profession (3,8,29), professional title level (29), the status of being a frontline health employee (22,25), years of working (29), stigmatization (24), life-time psychiatric disorder (8,22), past medical history, drinking, exercise habit, parent status, families or relatives with suspected or confirmed COVID-19 (29). Depression is an important mental health problem for healthcare workers, and it is necessary to measure this phenomenon to assess its magnitude. To the best of our knowledge, there has been no systematic review of the variables affecting the prevalence of depression in healthcare workers. This study was conducted to systematically examine the prevalence of depression and affecting variables in healthcare workers during the COVID-19 pandemic.

METHODS

Research Strategy

In this study, "Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)", a protocol used for systematic review and meta-analysis (30) was used. Researches on depression in healthcare workers during the pandemic, which were published before the date of ethical approval on June 19, 2020, were included in the study. Using the database of the library of their university, one of the researchers identified the records of publications related to depression in healthcare workers during the COVID-19 pandemic period in MedLine, PubMed, Web of Science (Wos), and GoogleScholar. The keywords and combinations of "Coronavirus" OR "COVID-19" OR "Sars-Cov-2" AND "healthcare workers" OR "healthcare professions" OR "medical staff" AND "depression" OR "mental health" OR "psychological effect" were used for scanning (see Table S1). There was no language restriction.

Inclusion and Exclusion Criteria

Studies on depression in healthcare workers during the pandemic were evaluated. Inclusion criteria were identified as 1) study design cross-sectional, case-control, cohort 2) health care worker(s) only 3) depression (prevalence) rate given 4) references of 3 previously published systematic reviews and meta-analysis studies that met the criteria. The exclusion criteria were determined as 1) case reports, comments, editorials, review articles, guideline, qualitative, gray literature 2) studies written in a language other than English and Turkish 3) studies with unavailable full text 4) other healthcare personnel working with

healthcare workers (administrator, technician, etc.) as well as non-healthcare workers (retired, student, etc.)

Quality Assessment

Twenty-one studies were coded in Excel independently by two researchers using a standard form: prevalence of a total number of participants, the rate of participation, number of female-male participants, number of physicians and nurses, number of married-unmarried employees, mean age, duration of the study, year of study, study design, clinic, education level, title, position, country of study, depression scale and depression scores of the participants. Then, the Newcastle-Ottawa scale (NOS), which is used for non-randomized studies to assessed the risk of bias and the quality of the study, was used by the two researchers independently. NOS was developed in 2009 by Wells et al. as an easy and convenient tool to evaluate the quality of non-randomized studies, including case-control and cohort studies (31). NOS consists of 8 items and three dimensions. One star is awarded for each item. Two stars are given only for comparability (32). It is rated from zero to nine stars. Seven to nine stars are rated as high quality, five to six stars as medium quality, and four stars or below as low quality (31). In our study, the research design consists of cross-sectional studies and NOS was used for quality evaluation of cross-sectional studies. The quality assessment of the studies was carried out independently by two researchers. Studies were analyzed using inter-rater reliability: the kappa statistics.

Data Analysis

Statistical Package Program Comprehensive Meta-Analysis Version 3 (CMA V.3) was used for meta-analysis of the data. Cochran's Q test and I-square (I^2) statistics were used to determine inter-study heterogeneity (33). The magnitude of Cochran's Q value was evaluated based on the degrees of freedom (df) value in the chi-square table and if Cochran's Q>df, it can be said that the studies forming the meta-analysis have a heterogeneous structure. A p-value of <0.10 was interpreted as significant heterogeneity (34,35). For the I^2 value, <30% indicates little concern; 30% to 75% indicates moderate heterogeneity; >75% indicates substantial heterogeneity (33).

Funnel plot, Egger's regression intercept, and Begg and Mazumdar rank correlation were used to determine the publication bias (36).

Sensitivity analysis was evaluated by using fixed-effect models and using the difference after subtracting the study with the highest sampling and the study with the lowest sampling.

Subgroup Analysis

To determine the source of heterogeneity, subgroup analysis was performed. As a subgroup analysis, the gender, occupation, type of scale used in the study, and the country of the study were evaluated. In addition, since all of the studies were conducted in 2020, the data collection period was divided into two categories as before March and after March (Table 1). In the variables of marital status, education level, and position of the healthcare workers in the table, the depression rate of the data included in this subgroup could not be analyzed since it was not included in the article itself. In addition, the age variable, which is a continuous variable and planned as a meta-regression, could not be analyzed because it was not included in a sufficient number of studies. All results were evaluated according to the random-effects model.

RESULTS

Search Results

The PRISMA flowchart shows the selection criteria for the study (Figure 1). As a result of the first screening, a total of 470 studies were reached. The full text and abstracts of the records obtained were determined with the other researcher. Sixty five duplication studies were determined by individual researchers and then removed by consensus. The remaining 405 studies were examined. The authors were contacted for the unavailable full texts. Fifty eight records were not suitable for analysis such as unavailable full texts, bulletins and comments were excluded. From the remaining 347 studies, 21 studies included mainly due to they reported the outcome of depression prevalence of healthcare workers. The quality of each included study was assessed using the quality scale. Finally, 8 studies were included in the meta-analysis (Figure 1).

Methodological Quality Assessment

The quality assessment of 21 studies was evaluated with NOS (see Table S2). Since all studies were cross-sectional, the focus was on the dimensions of selection, comparability, and outcome. For the quality evaluation made by two independent researchers, analysis of inter-rater agreement between researchers was performed (Cohen's k=0.704; p<0.001). It was observed that there was a good level of compliance between researchers (37). As a result, 2 studies were found to be high quality, 6 studies were found to be moderate quality, and 13 studies were found to be low quality and at high risk of bias (<3 points). Thus, Eight studies with high and moderate-quality scores were included in the analysis (Table 1).

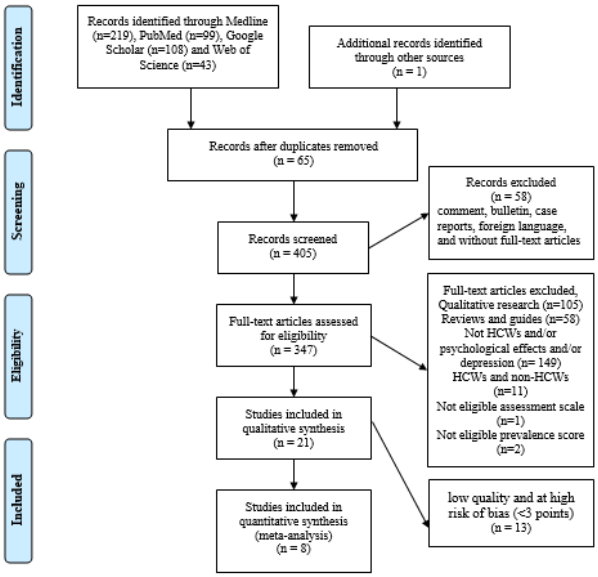

Figure 1. *PRISMA flowchart presenting the literature search process*

Characteristics of Included Studies

All studies included in the research were conducted in 2020 involving a total of 9,841 people. Table 1 presents information on the variables included in the meta-analysis. In this context, of the participants in the study, 7,191 are females and 2,660 are males. Except for the study of Chen et al., 4,637 are physicians and 5,099 are nurses (5). Seven studies (5,10,25,38–40) were conducted in China, and 1 study (23) was conducted in the Republic of South Korea. While 5 studies used the Patient Health Questionnaire (PHQ-9) (23,25,38–40) as a depression assessment scale, 3 studies used the Self-rating Depression Scale (SDS) (5,10,41). The research design of all studies was cross-sectional. Finally, the data collection date of the studies conducted before March was between January 29 - February 03, 2020 in J. Lai et al study, between January 30 - February 07, 2020 in Wang et al study, between February 01-29, 2020 in the study of J. Zhu et al., and between January-February 2020 in the study of Zhpu et al. The data collection dates of the studies conducted after March were between April 6-10, 2020 in the Tian et al.'s study and on April 10, 2020 in the study of Yang et al.

Table 1. Features of included studies

Study	Year	Country and Study Location	Sample size	Respond rate	Type of study	Occupation		Gender		Marital Status		Education		Age (mean)	Position		Survey Time Period	Scale type	Depression rate
						Doctor	Nurse	Female	Male	Married	Unmarried	Under-graduated	Post-graduated		Front-line	Second-line			
Chen Y., Zhou H. et al	2020	Guiyang, China	105	84,7	Cross-sectional	*NA	*NA	95	10	*NA	*NA	*NA	*NA	32,6 ±6,50	*NA	*NA	*NA	SDS	29,5
Lai J.et al	2020	Wuhan, Hubei and outside Hubei, China	1257	68,7	Cross-sectional	493	764	964	293	839	418	953	304	*NA	522	735	29 January-03 February 2020	PHQ-9	50,4
Lv Y.et al	2020	24 provinces, China	7071	87,5	Cross-sectional	3693	3378	5034	2037	5069	2002	*NA	*NA	*NA	2549	4522	NA	PHQ-9	36,97
Tian et al	2020	Beijing, China	845	79,94	Cross-sectional	196	649	714	131	*NA	*NA	*NA	*NA	35,5 ±6,70	*NA	*NA	6-10 April 2020	PHQ-9	45,56
Wang et al	2020	Wuhan, Hubei and outside, China	123	50	Cross-sectional	48	75	111	22	37	86	72	51	33,75 ±8,41	*NA	*NA	30 January-07 February 2020	SDS	25,2
Yang et al	2020	NA, South Korea	65	89	Cross-sectional	65	0	31	34	*NA	*NA	*NA	*NA	*NA	*NA	*NA	10 April 2020	PHQ-9	18,46
Zhu J., Sun L. et al	2020	Gansu, China	165	100	Cross-sectional	79	86	137	28	39	126	153	12	34,16 ±8,06	165	*NA	01-29 February 2020	SDS	44,24
Zhpu et al	2020	Hubei, China	210	95,4	Cross-sectional	63	147	105	105	112	98	194	14	30,47 ±4,53	*NA	*NA	January-February 2020	PHQ-9	71,9

**NA: Not Available*

Depression Prevalence of Health Care Workers

The rate of depression in the 8 studies included in the analysis was 18.5%-71.9%, and the overall effect size of the depression rate was 40.8% (95% CI 33.5-48.6) (Figure 2). The values of I^2=96.48, Q=199.03 and p=0.000 indicate the heterogeneity of the study. The study was evaluated according to the random-effects model.

Subgroup Analysis

When the depression rate in healthcare workers is analyzed by gender, the overall depression rate in male healthcare workers was 8.5% (95% CI: 5.5%–12.7%; p=0.000), and the depression rate in female healthcare workers was 24.5% (95 %CI: 17.4%–33.3%; p=0.000), and the rate of depression was found to be higher in female healthcare workers (Q_B=15.541; df=1; p=0.000; see Table S3).

According to the results obtained from 6 studies in which the depression rate of physicians and nurses was determined, the depression rate of physicians was 19.3% (95% CI: 13.2% – 27.3%; p=0.000), and the depression rate of nurses was 24% (95% CI: 16,7%–33.2%; p=0.000) and no statistically significant difference was found in the effect size (Q_B=0.745; df=1; p=0.388; see Table S3).

Five of the 8 studies included to measure the rate of depression in healthcare workers used PHQ-9 (23,25,38–40) and 3 used SDS (5,10,41) measurement tool. According to the results of the subgroup analysis, the PHQ-9 scale was 45.5% (95% CI: 35.8%-55.5%; p=0.376), the SDS scale was 32.8% (95% CI: 22.2%- 45.6%; p=0.009) and no statistically significant difference was found in the effect size (Q_B=2,406; df=1; p=0.121; see Table S3).

When the depression rate in healthcare workers is analyzed by country, it was 43.6% (95% CI: 35.9%-51.7%; p=0.119) in China (5,10,25,38–41), 18.5% (95% CI: 7.5%-38.7%; p=0.005) in Korea (23), and the rate of depression in China was determined to be higher (Q_B=4.999; df=1; p=0.025; see Table S3).

The period of time in which the studies were conducted was classified by the researchers as before March (5,10,25,38,41) and after March (23,39). The depression rate before March was 48% (95% CI: 32.8%-63.7%; p=0.811), and the depression rate after March was 31.8% (95% CI: 15.5%-54.3%; p=0.109). According to these results, no statistically significant difference was found in the effect size (Q_B=1,403; df=1; p=0.236; see Table S3).

Publication Bias

Publication bias was analyzed with a funnel diagram (Figure 3). It was observed that 8 studies included in the study were not distributed symmetrically on the right and left of the diagram and some studies were not included in the slope line. In addition, studies with large sample sizes were clustered at the top of the funnel and near the mean effect size. However, the interpretation of the funnel diagram is subjective and is not sufficient to assess publication bias. Therefore, it is necessary to evaluate the study with other publication bias statistics. Other statistics used to test publication bias are Egger's regression intercept and Begg and Mazumdar rank correlation. According to the results of the analysis, we can say that there is no publication bias in the study (see Table S4). The results of the meta-analysis were also found to be strong using the sensitivity analysis (see Table S5).

Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value	Total	Relative weight
Chen Y., Zhou H. et al	0,295	0,216	0,389	-4,067	0,000	31 / 105	11,45
Lai J.et al	0,504	0,477	0,532	0,310	0,756	634 / 1257	14,12
Lv Y.et al	0,370	0,359	0,381	-21,659	0,000	2614 / 7071	14,33
Tian et al	0,456	0,422	0,489	-2,577	0,010	385 / 845	14,00
Wang et al	0,252	0,183	0,336	-5,238	0,000	31 / 123	11,59
Yang et al	0,185	0,108	0,298	-4,646	0,000	12 / 65	9,16
Zhu J., Sun L. et al	0,442	0,369	0,519	-1,476	0,140	73 / 165	12,64
Zhpu et al	0,719	0,654	0,776	6,121	0,000	151 / 210	12,71
	0,408	0,335	0,486	-2,307	0,021		

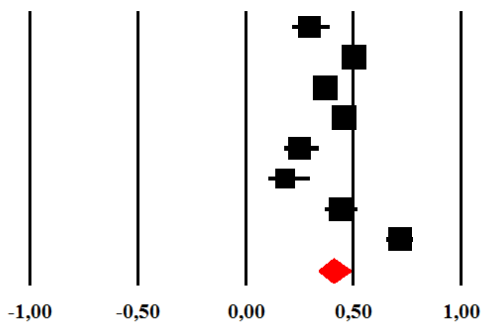

Figure 2. *Forest plot showing the prevalence of depression*

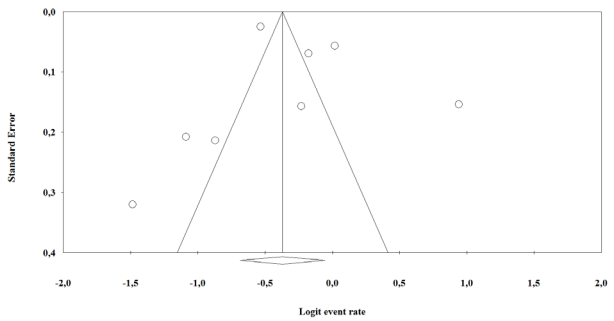

Figure 3. *Funnel plot of the studies*

DISCUSSION

In this study, the rate of depression seen in healthcare workers during the COVID-19 pandemic was found to be 40.8%. This depression rate is higher than the studies of Sahebi et al (2021) (24.83%), Salari et al. (2020) (24%) and Pappa et al. (2020) (%22.8), who are engaged in similar meta-analysis studies (15,42,43). Among the studies included in the meta-analysis, the highest rate of depression was in the study of Zhpu et al (2020) with 71.9% and the lowest was reported in the study of Yang et al (2020) with 18.5% (23,38). All eyes were turned to healthcare professionals with the rapid impact of the COVID-19 pandemic in the world. The fact that healthcare workers in the community are in the high-risk group who come into contact with patients caused them to have mental health problems that may have a negative impact on their daily life and work life (28,40). Depression is the most common mental illness in society. In a survey of 3904 participants who had COVID-19 disease, it was determined that 52.4% of the participants showed symptoms of major depression (51). COVID-19 has impacted psychiatric disorders, and studies have shown an increase in the severity of psychiatric symptoms through mechanisms common to oxidative stress, inflammation, and neuroinflammation (52). The World Health Organization (WHO) reported in 2001 that depression will take second place among the global diseases by 2020 (44). In the WHO 2017 report, it was announced that 322 million people in the world suffer from depression, and almost half of these people are those living in the highly populated South-East Asia and Western Pacific region (45). Today, we see that the load in the world is increasing due to depression and in other mental health diseases (46). In the meta-analysis study of Lim et al. conducted with 1,112,573 adults covering 30 countries between 1994 and 2014, the pooled depression rate was found to be 12.9% (47). In addition, in the first study reporting the psychological symptoms of frontline healthcare workers during the pandemic, the rate of depression was found to be 12.7% (7). In later studies, it has been reported that the depression rate is 50% and above during the pandemic (6,20,22). The results of our meta-analysis show that the mental health of healthcare workers is greatly affected.

Subgroup analyzes were performed in the study. First, the rate of depression was found to be higher in female healthcare workers (24.5%). In the studies included in the meta-analysis, the level of depression was higher in females (10,25,40). Similar results were obtained in the meta-analysis by Lim et al. (2018), in the WHO reports and other studies (28,40,44–47). During this period, women's long hours of work under difficult conditions, increased workload, and fear of infecting their relatives, as well as the responsibilities of being a woman (child care, home care) may have caused them to experience depression. Considering the subgroup analysis according to the country where the data was collected, another variable, the depression rate in healthcare workers living in China was found to be higher than the healthcare workers living in Korea. The result of the analysis may have been affected by the fact that only one country other than China was included and the data obtained from Korea was the least number of samples. However, meta-analysis results may have been affected by the fact that China was the first country to be exposed to the virus, and health workers were experiencing depression due to lack of knowledge about COVID-19, psychological unpreparedness, inability to help patients, lack of family support, and fears of the risk of death due to exposure to the disease (7,41). In the analysis based on profession, there was no statistically significant difference in the depression rate of physicians and nurses. However, in the meta-analysis study by Pappa et al. (2020), a higher rate of depression was found in nurses, while Sahebi et al. (2021) found a higher rate of depression in physicians in their meta-analysis study (15,42). In general, the fact that nurses constitute the majority in the health system and that they are directly and intensely involved in patient care as the closest occupational group to the patient shows that the depression levels are higher than the physicians (3,13,40,46,48,49). No statistically significant difference was found in the subgroup analysis based on the period of time. A similar result was found by Pan et al. (2020) in the meta-analysis study (50). The fact that this study was conducted with data obtained during the high course of the pandemic may have rendered this variable meaningless. Finally, there was no statistically significant difference according to the depression assessment scales, PHQ-9 and SDS. These results provide evidence that the source of heterogeneity is not related to

these variables. Although this study shows that the source of heterogeneity is due to insufficient data, we can say that the results are statistically significant with the sensitivity analysis and the study is still robust.

Limitations

The most important limitation of our study is that, as researchers, we aimed to conduct a meta-analysis with more studies, while 8 studies were analyzed as a result of quality evaluation. Including studies with high quality evaluation in our study caused us to face a decrease in the number of studies. This situation caused subgroup analysis to be conducted with limited data and we were unable to perform meta-regression analysis with the number of existing studies. In addition, the lack of analysis results regarding the variables in the study (age, education level, clinic, psychological assessments in self-report tools), also limited our results. Finally, the data of our study to include mostly Asian healthcare workers limited the generalizability of the results.

CONCLUSION

These results clearly demonstrated the high prevalence of depression among the 9,841 healthcare workers caring for patients with COVID-19. It is necessary to provide psychological support to healthcare workers who are struggling with the pandemic. In addition, these results require policymakers and healthcare authorities to develop contingency plans to support the psychological health of healthcare workers.

DECLARATIONS

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Conflict of Interests

The authors have no conflicts of interest to declare.

Ethical Approval

İstanbul Yeni Yüzyıl University Ethics Committee (Approval number: 2020/07-485)

The Turkish Ministry of Health (Approval number: 2020-06-14T01_28_22).

Availability of Data and Material

All data and material are available on request from the authors.

Author Contributions

Study conception and design: All authors; Data collection: All authors; Data analysis and interpretation: EK; Drafting of the article: All authors; Critical revision of the article: All authors.

REFERENCES

1. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Du H, Chen T, Li R, Tan H, Kang L, Yao L, Huang M, Wang H, Wang G, Liu Z, Hu S. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open 2020; 3. [PMID: 32202646 DOI: 10.1001/jamanetworkopen.2020.3976]
2. Fernandez R, Lord H, Halcomb E, Moxham L, Middleton R, Alananzeh I, Ellwood L. Implications for COVID-19: A systematic review of nurses' experiences of working in acute care hospital settings during a respiratory pandemic. Int J Nurs Stud 2020; 111. [PMID: 32919358 DOI: 10.1016/j.ijnurstu.2020.103637]
3. Guo J, of Authors O, Liao L, Wang B, Li X, Guo L, Tong Z, Guan Q, Zhou M, Wu Y, Zhang J. The Lancet Psychiatry Psychological effects of COVID-19 on hospital staff: a national cross-sectional survey of China mainland.
4. Chen B, Li Q, Zhang H, Zhu J, Wu Y, Xiong J, Li F, Wang H, Chen Z. The psychological impact of COVID-19 outbreak on medical staff and the general public. (e-pub ahead of print 2020; doi:10.21203/rs.3.rs-21213/v1).
5. Chen Y, Zhou H, Zhou Y, Zhou F. Prevalence of self-reported depression and anxiety among pediatric medical staff members during the COVID-19 outbreak in Guiyang, China. Psychiatry Res. 2020; 288. DOI:10.1016/j.psychres.2020.113005
6. Chew NWS, Lee GKH, Tan BYQ, Jing M, Goh Y, Ngiam NJH, Yeo LLL, Ahmad A, Ahmed Khan F, Napolean Shanmugam G, Sharma AK, Komalkumar RN, Meenakshi P V., Shah K, Patel B, Chan BPL, Sunny S, Chandra B, Ong JJY, Paliwal PR, Wong LYH, Sagayanathan R, Chen JT, Ying Ng AY, Teoh HL, Tsivgoulis G, Ho CS, Ho RC, Sharma VK. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. Brain Behav Immun 2020; 88: 559–565. [PMID: 32330593 DOI: 10.1016/j.bbi.2020.04.049]
7. Du J, Dong L, Wang T, Yuan C, Fu R, Zhang L, Liu B, Zhang M, Yin Y, Qin J, Bouey J, Zhao M, Li X. Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. Gen. Hosp. Psychiatry. 2020; 67: 144–145.
8. Johnson SU, Ebrahimi O V, Hoffart A. Level and Predictors of PTSD Symptoms Among Health Workers and Public Service Providers During the COVID-19. (e-pub ahead of print 2020; doi:10.31234/osf.io/w8c6p).
9. Xu J, Xu Q hui, Wang C ming, Wang J. Psychological status of surgical staff during the COVID-19 outbreak. Psychiatry Res. 2020; 288. DOI:10.1016/j.psychres.2020.112955
10. Zhu J, Sun L, Zhang L, Wang H, Fan A, Yang B, Li W, Xiao S. Prevalence and Influencing Factors of Anxiety and Depression Symptoms in the First-Line Medical Staff Fighting Against COVID-19 in Gansu. Front Psychiatry 2020; 11. [DOI: 10.3389/fpsyt.2020.00386]
11. Amin S. The psychology of coronavirus fear: Are healthcare professionals suffering from corona-phobia? Int J Healthc Manag 2020; : 249–256. [DOI: 10.1080/20479700.2020.1765119]
12. Baumgaertner E, Karlamangla S. Doctors and nurses brace for coronavirus onslaught: 'What happens if I end up on a ventilator? Los Angeles Times. 2020. Available from: https://www.latimes.com/california/story/2020-03-20/coronavirus-doctors-nurses-fears-ventilator-icu-emergency

13. Liu Z, Han B, Jiang R, Huang Y, Ma C, Wen J, Zhang T, Wang Y, Chen H, Ma Y. Mental health status of doctors and nurses during COVID-19 epidemic in China.
14. Mo Y, Deng L, Zhang L, Lang Q, Liao C, Wang N, Qin M, Huang H. Work stress among Chinese nurses to support Wuhan in fighting against COVID-19 epidemic. J Nurs Manag 2020; 28: 1002–1009. [PMID: 32255222 DOI: 10.1111/jonm.13014]
15. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. Brain Behav Immun 2020; 88: 901–907. [PMID: 32437915 DOI: 10.1016/j.bbi.2020.05.026]
16. Zhang SX, Liu J, Jahanshahi AA, Nawaser K, Li J, Alimoradi H. When the storm is the strongest: Healthcare staff's health conditions and job satisfaction and their associated predictors during the epidemic peak of COVID-19. Brain Behav Immun (e-pub ahead of print 2020; doi:10.1101/2020.04.27.20082149).
17. Muller M. Nursing service management standards. Health SA Gesondheid 2000; 5(4), 3–18. Retrieved September 10,2020, from https://doi.org/10.4102/hsag.v5i4.40
18. Tsamakis K, Rizos E, Manolis A, Chaidou S, Kympouropoulos S, Spartalis E, Spandidos D, Tsiptsios D, Triantafyllis A. COVID-19 pandemic and its impact on mental health of healthcare professionals. Exp Ther Med (e-pub ahead of print 7 April 2020; doi:10.3892/etm.2020.8646).
19. Alan H, Eskin Bacaksiz F, Tiryaki Sen H, Taskiran Eskici G, Gumus E, Harmanci Seren AK. "I'm a hero, but…": An evaluation of depression, anxiety, and stress levels of frontline healthcare professionals during COVID-19 pandemic in Turkey. Perspect Psychiatr Care (e-pub ahead of print 2020; doi:10.1111/ppc.12666).
20. Choudhury T, Debski M, Wiper A, Abdelrahman A, Wild S, Chalil S, More R, Goode G, Patel B, Abdelaziz HK. COVID-19 Pandemic: Looking after the Mental Health of Our Healthcare Workers. J. Occup. Environ. Med. 2020; 62: e373–e376.
21. Khanna RC, Honavar SG, Metla AL, Bhattacharya A, Maulik PK. Psychological impact of COVID-19 on ophthalmologists-in-training and practising ophthalmologists in India. Indian J Ophthalmol 2020; 68: 994–998. [PMID: 32461412 DOI: 10.4103/ijo.IJO_1458_20]
22. Elbay RY, Kurtulmuş A, Arpacıoğlu S, Karadere E. Depression, anxiety, stress levels of physicians and associated factors in Covid-19 pandemics. Psychiatry Res 2020; 290. [PMID: 32497969 DOI: 10.1016/j.psychres.2020.113130]
23. Yang S, Kwak SG, Ko EJ, Chang MC. The mental health burden of the covid-19 pandemic on physical therapists. Int J Environ Res Public Health 2020; 17. [PMID: 32466164 DOI: 10.3390/ijerph17103723]
24. Huarcaya-Victoria J, Podestá A, David Huarcaya-Victoria J. Factors associated with distress among medical staff of a general hospitalduring the initial phase of the COVID-19 pandemic in Peru. (e-pub ahead of print doi:10.13140/RG.2.2.26554.34241).
25. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Du H, Chen T, Li R, Tan H, Kang L, Yao L, Huang M, Wang H, Wang G, Liu Z, Hu S. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw open 2020; 3: e203976. [PMID: 32202646 DOI: 10.1001/jamanetworkopen.2020.3976]
26. Rossi R, Socci V, Pacitti F, Di Lorenzo G, Di Marco A, Siracusano A, Rossi A. Mental Health Outcomes among Frontline and Second-Line Health Care Workers during the Coronavirus Disease 2019 (COVID-19) Pandemic in Italy. JAMA Netw Open 2020; 3. [PMID: 32463467 DOI: 10.1001/jamanetworkopen.2020.10185]
27. Salman M, Raza MH, Ul Mustafa Z, Khan TM, Asif N, Tahir H, Shehzadi N, Hussain K. The psychological effects of COVID-19 on frontline healthcare workers and how they are coping: a web-based, cross-sectional study from Pakistan. (e-pub ahead of print 2020; doi:10.1101/2020.06.03.20119867).
28. Vahedian-Azimi A, Moayed MS, Rahimibashar F, Shojaei S, Ashtari S, Pourhoseingholi MA. Comparison of the severity of psychological distress among four groups of an Iranian population regarding COVID-19 pandemic. BMC Psychiatry 2020; 20. [PMID: 32770975 DOI: 10.1186/s12888-020-02804-9]
29. Zhu Z, Xu S, Wang H, Liu Z, Wu J, Li G, Miao J, Zhang C, Yang Y, Sun W, Zhu S, Fan Y, Chen Y, Hu J, Liu J, Wang W. COVID-19 in Wuhan: Sociodemographic characteristics and hospital support measures associated with the immediate psychological impact on healthcare workers. EClinicalMedicine 2020; 24. [DOI: 10.1016/j.eclinm.2020.100443]
30. Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009 Jul 21;6(7):e1000097. doi: 10.1371/journal.pmed.1000097. Epub 2009 Jul 21. PMID: 19621072; PMCID: PMC2707599.
31. Wells G, Shea B, O'Connell D, Peterson J, Welch V, Losos M, Tugwell P. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. 2009. Retrieved July 20 ,2020, from http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp.
32. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. Eur J Epidemiol. 2010 Sep;25(9):603-5. doi: 10.1007/s10654-010-9491-z. Epub 2010 Jul 22. PMID: 20652370.
33. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. BMJ. 2003 Sep 6;327(7414):557-60. doi: 10.1136/bmj.327.7414.557. PMID: 12958120; PMCID: PMC192859.
34. Basu A. How to conduct a metaanalysis: A basic tutorial. PeerJ. 2017;5:e2978v1. doi: 10.7287/peerj.preprints.2978v1.
35. Huedo-Medina TB, Sánchez-Meca J, Marín-Martínez F, Botella J. Assessing heterogeneity in meta-analysis: Q statistic or I2 index? Psychol Methods. 2006 Jun;11(2):193-206. doi: 10.1037/1082-989X.11.2.193. PMID: 16784338
36. Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997 Sep 13;315(7109):629-34. doi: 10.1136/bmj.315.7109.629. PMID: 9310563; PMCID: PMC2127453.
37. Alpar R. Spor, sağlık ve eğitim bilimlerinden örneklerle uygulamalı istatistik ve geçerlik – güvenirlik. Ankara, Türkiye: Detay Yayıncılık;2014 (In Turkish).
38. Zhpu P, Du N, OuYang Y. Investigation on the Mental Health of Healthcare Workers for Aid in Hu Bei Province During the Outbreak of Covid-19 Based on the Network Survey. (e-pub ahead of print 2020; doi:10.21203/rs.3.rs-34118/v1).
39. Tian T, Meng F, Pan W, Zhang S, Cheung T, Ng CH, Li XH, Xiang YT. Mental health burden of frontline health professionals treating imported patients with COVID-19 in China during the pandemic. Psychol. Med. 2022; 52: 398–399.
40. Lv Y, Yao H, Xi YY, Zhang Z, Zhang Y, Chen J, Li J, Li J, Wang XX, Luo H. The Lancet Psychiatry Social support protects Chinese medical staff from suffering psychological symptoms in COVID-19 defense. Available from: https://ssrn.com/abstract=3559617
41. Wang S, Xie L, Xu Y, Yu S, Yao B, Xiang D. Sleep disturbances among medical workers during the outbreak of COVID-2019. Occup Med (Chic Ill) 2020; 70: 364–369. [PMID: 32372077 DOI: 10.1093/occmed/kqaa074]
42. Sahebi A, Nejati-Zarnaqi B, Moayedi S, Yousefi K, Torres M, Golitaleb M. The prevalence of anxiety and depression among healthcare workers during the COVID-19 pandemic: An umbrella review of meta-analyses. Prog Neuro-Psychopharmacology Biol Psychiatry 2021; 107. [PMID: 33476692 DOI: 10.1016/j.pnpbp.2021.110247]

43. Salari N, Khazaie H, Hosseinian-Far A, Khaledi-Paveh B, Kazeminia M, Mohammadi M, Shohaimi S, Daneshkhah A, Eskandari S. The prevalence of stress, anxiety and depression within front-line healthcare workers caring for COVID-19 patients: a systematic review and meta-regression. Hum Resour Health. 2020 Dec 17;18(1):100. doi: 10.1186/s12960-020-00544-1. PMID: 33334335; PMCID: PMC7745176.

44. World Health Organization. The World health report : 2001 : Mental health : new understanding, new hope. World Health Organization, 2001. Retrieved August 5, 2020, from https://apps.who.int/iris/handle/10665/42390

45. World Health Organization. Depression and other common mental disorders: Global health estimates. World Health Organization, 2017. Retrieved August 5, 2020, from https://apps.who.int/iris/handle/10665/254610.

46. World Health Organization Depression. World Health Organization,2020. Retrieved August 5, 2020, from https://www.who.int/news-room/fact-sheets/detail/depression

47. Lim GY, Tam WW, Lu Y, Ho CS, Zhang MW, Ho RC. Prevalence of Depression in the Community from 30 Countries between 1994 and 2014 /692/699/476/1414 /692/499 article. Sci Rep 2018; 8. [PMID: 29434331 DOI: 10.1038/s41598-018-21243-x]

48. Garciá-Fernández L, Romero-Ferreiro V, López-Roldán PD, Padilla S, Calero-Sierra I, Monzó-Garciá M, Pérez-Martín J, Rodriguez-Jimenez R. Mental health impact of COVID-19 pandemic on Spanish healthcare workers. Psychol. Med. 2020. DOI:10.1017/S0033291720002019

49. Song X, Fu W, Liu X, Luo Z, Wang R, Zhou N, Yan S, Lv C. Mental health status of medical staff in emergency departments during the Coronavirus disease 2019 epidemic in China. Brain Behav Immun 2020; 88: 60–65. [PMID: 32512134 DOI: 10.1016/j.bbi.2020.06.002]

50. Pan R, Zhang L, Pan J. The Anxiety Status of Chinese Medical Workers During the Epidemic of COVID-19: A Meta-Analysis. Psychiatry Investig. 2020 May;17(5):475-480. doi: 10.30773/pi.2020.0127. Epub 2020 May 15. PMID: 32403209; PMCID: PMC7265026.

51. Perlis RH, Ognyanova K, Santillana M, et al. Association of Acute Symptoms of COVID-19 and Symptoms of Depression in Adults. JAMA Netw Open. 2021;4(3):e213223. doi:10.1001/jamanetworkopen.2021.3223.

52. Mingoti MED, Bertollo AG, Simões JLB, Francisco GR, Bagatini MD, Ignácio ZM. COVID-19, Oxidative Stress, and Neuroinflammation in the Depression Route. J Mol Neurosci. 2022 Jun;72(6):1166-1181. doi: 10.1007/s12031-022-02004-y. Epub 2022 Mar 23. PMID: 35322375; PMCID: PMC8942178.

Supplementary Tables

Table S1. Search Strategy

Database	
Google Scholar Medline PubMed WoS	((COVID-19) OR (COVID) OR (Coronavirus) OR (Sars-Cov-2) OR (Sars cov 2)) AND ((healthcare workers) OR (health care workers) OR (medical staff) OR (medical workers) OR (nurs*) OR (physician) OR (doctor)) AND ((psychological effect) OR (mental health) OR (depression))

Table S2. The Quality Scores of The Studies

		NOS								
		Selection				Comparability	Outcome			
		1	2	3	4	1	1	2	3	Total
**Chen Y., Zhou H. et al	cross-sectional studies	*	*	…	…..	*	*	*	*b	6
Choudhury et al	cross-sectional studies	*b	*	…	…	*	*	…	*b	4
Du J. et al	cross-sectional studies	….	…	…	….	*	*	…	….	2
Elbay et al	cross-sectional studies	…	…	….	…	*	*	….	….	2
García-Fernández et al	cross-sectional studies	…	…	…	….	*	*	…	…	2
Guo J. et al	cross-sectional studies	…	…	…	…	*	*	…	…	2
Huarcaya-Victoria and Podestá	cross-sectional studies	….	…	…	…	*	*	…	….	2
Khanna et al	cross-sectional studies	…	….	…	…	*	*	…	…	2
**Lai J.et al	cross-sectional studies	*	*	….	…	*	*	*	*b	6
Liu Z., Han B. et al	cross-sectional studies	….	….	….	…	*	*	..	…	2
**Lv Y.et al	cross-sectional studies	*	*	…	…	*	*	*	*b	6
Rossi et al	cross-sectional studies	…	…	…	*	*	*	…	….	3
Salman et al	cross-sectional studies	…	….	….	…	*	*	…	…	2
Song et al	cross-sectional studies	…..	…	….	….	*	*	….	….	2
**Tian et al	cross-sectional studies	*	*	….	*	*	*	*	*b	7
**Wang et al	cross-sectional studies	*b	*	…	….	*	*	….	*b	5
**ang et al	cross-sectional studies	*	*	….	*	*	*	*	*b	7
Zhang, Alimoradi et al	cross-sectional studies	…..	…	….	….	*	*	….	….	2
Zhang, Hou et al	cross-sectional studies	…..	…	….	*	*	*	….	….	3
**Zhu J., Sun L. et al	cross-sectional studies	*	*	…	…	*	*	*	*b	6
**Zhpu et al	cross-sectional studies	*	*	…	…	*	*	*	*b	6

** studies included in meta-analysis

Table S3. Subgroup analysis

Subgroup	Number of studies	Event rate	%95 CI	Z	p	Q_B	df	P
Gender								
Female	4	0.245	0.174-0.333	-5.130	0.000			
Male	4	0.085	0.055-0.127	-10.306	0.000	15,541	1	0.000
Total	8	0.148	0.048-0.373	-2.789	0.005			
Profession								
Doctor	3	0.193	0.132-0.273	-6.195	0.000			
Nurse	3	0.240	0.167-0.332	-4.988	0.000	0.745	1	0.388
Total	6	0.215	0.166-0.275	-7.906	0.000			
Type of scale								
PHQ-9	5	0.455	0.358-0.555	-0.885	0.376			
SDS	3	0.328	0.222-0.456	-2.596	0.009	2,406	1	0.121
Total	8	0.397	0.282-0.525	-1.576	0.115			
Country								
China	7	0.436	0.359-0.517	-1.557	0.119			
South Korea	1	0.185	0.075-0.387	-2.836	0.005	4.999	1	0.025
Total	8	0.316	0.124-0.603	-1.273	0.203			
Period of time								
Before March	4	0.480	0.328-0.637	-0.239	0.811			
After March	2	0.318	0.155-0.543	-1.602	0.109	1.403	1	0.236
Total	6	0.418	0.273-0.578	-1.006	0.314			

Note: weights are from random effects analysis

Table S4. Publication Bias

Outcome	Begg's test				Egger's test			
	Tau	z-value	1 tailed p-value	2 tailed p-value	intercepet	t-value	1 tailed p-value	2 tailed p-value
	-0.25	0.87	0.19	0.39	1.77	0.61	0.28	0.56

Table S5. Depression prevalence of health care workers in sensitivity analyses

	ES [95 %]	Q	p	I^2
Using fixed-effect models	0.40 [0.39-0.41]	199.034	0.000	96,483
*excluding the largest trial (Lv Y.et al)	0.41[0.32-0.51]	106.483	0.000	94.365
*excluding the lowest trial(Yang et al)	0.44 [0.36-0.52]	187.601	0.000	96.802

*random effects model