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Yazışma Adresi

Adıyaman Üniversitesi Sağlık Bilimleri Fakültesi, Altınşehir Mh. 3005 Sokak, No:1, 02040, Adıyaman, Türkiye

e-posta: sagbildergisi@adiyaman.edu.tr

Dergi Yazı Gönderimi Sayfası:
http://dergipark.org.tr/tr/pub/adiyamansaglik
Tel: +90 (416) 223 38 00 Cep: +90 507 261 81 26

Correspondence

Adıyaman University Faculty of Health Sciences, Altınşehir Neighborhood, 3005 Street, Building No: 1, 02040, Adıyaman, Turkey.

e-mail: sagbildergisi@adiyaman.edu.tr

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Tel: +90 (416) 223 38 00 Mobile: +90 507 261 81 26

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Research Article/Özgün Araştırma

Impact of black carrot juice on acrylamide-induced structural alterations in rats' testicles

Sıçanlarda akrilamid ile testiste oluşan yapısal değişiklikler üzerine siyah havuç suyu'nun etkisi

Hıdır PEKMEZ[1], Gülru ESEN[2], Alper YALÇIN[3], Ahmet TÜRK[4], Seda ÇETİN[2], Elif Merve Betül YANILMAZ[5], Anıl KAYA[1], Muhammed Furkan ARPACI[1]

[1]Malatya Turgut Ozal University, Faculty of Medicine, Department of Anatomy, 44210, Malatya-Turkey
[2]Adıyaman University, Faculty of Medicine, Department of Anatomy, 02040, Adıyaman-Turkey
[3]Kahramanmaraş Sütçü İmam University, Faculty of Medicine, Department of Histology and Embryology, 46000, Kahramanmraş-Turkey
[4]Adıyaman University, Faculty of Medicine, Department of Histology and Embryology, 02040, Adıyaman-Turkey
[5]Adıyaman University, Kahta Vocational School, Department of Veterinary Medicine, 02400, Adıyaman-Turkey

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Abstract

Aim: The purpose of this study was to investigate the deleterious effects of acrylamide on rat testicular tissue and to determine how these effects might vary in response to black carrot juice.

Materials and Methods: Four groups of adult male Wistar albino rats were formed: Control, Acrylamide, Black carrot juice and Acrylamide + Black carrot juice. For 30 days, 20 mg/kg acrylamide dose was administered intraperitoneally and 4 mg/kg black carrot juice dose was administered orally every second day.

Results: Malondialdehyde and glutathione S-transferase levels rose in the acrylamide group relative to the control group, whereas the levels of the enzymes glutathione and carboxylesterase dropped. Malondialdehyde and glutathione S-transferase levels were lower in the acrylamide+black carrot juice group than in the acrylamide group, whereas glutathione and carboxylesterase enzyme activity levels were higher.

Conclusion: Lipid peroxidation was discovered as a result of acrylamide's detrimental effects on the antioxidant enzyme system. It was observed that black carrot juice had positive effects.

Keywords: Acrylamide; Testis; Black carrot; Oxidative stress; Histopathology.

Öz

Amaç: Bu çalışmanın amacı akrilamidin sıçan testis dokusu üzerindeki zararlı etkilerini araştırmak ve bu etkilerin siyah havuç suyuna yanıt olarak nasıl değişebileceğini belirlemekti.

Gereç ve Yöntem: Yetişkin erkek Wistar albino sıçanlar dört gruba ayrıldı: Kontrol, Akrilamid, Siyah havuç suyu ve akrilamid + siyah havuç suyu. 30 gün boyunca, 20 mg/kg akrilamid dozu intraperitoneal olarak uygulandı ve 4 mg/kg siyah havuç suyu dozu her iki günde bir oral olarak uygulandı.

Bulgular: Malondialdehit ve glutatyon S-transferaz seviyeleri akrilamid grubunda kontrol grubuna göre artarken, glutatyon ve karboksilesteraz enzimlerinin seviyeleri düştü. Malondialdehit ve glutatyon S-transferaz seviyeleri akrilamid + siyah havuç suyu grubunda akrilamid grubuna göre daha düşüktü, buna karşın glutatyon ve karboksilesteraz enzim aktivite seviyeleri daha yüksekti.

Sonuç: Akrilamid'in antioksidan enzim sistemi üzerindeki zararlı etkilerinin bir sonucu olarak lipid peroksidasyonu keşfedildi. Siyah havuç suyu'nun pozitif etkileri olduğu görüldü.

Anahtar Kelimeler: Akrilamid; Testis; Siyah havuç; Oksidatif stres; Histopatoloji.

Yazışma Adresi/Address for Correspondence: Hıdır PEKMEZ, Malatya Turgut Ozal University, Faculty of Medicine, Department of Anatomy, 44210, Malatya-Turkey, E-mail: hidir.pekmez@ozal.edu.tr

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Introduction

Acrylamide (ACR) was declared a carcinogenic agent in 1994 by the International Agency for Research on Cancer. ACR is a very widely used substance that negatively affects all the systems in organisms.[1-3] The level of ACR in food depends on processes such as frying or baking, and the temperature and time applied. It has been determined that it is found in excessive amounts in some starchy foods cooked at high temperatures. Daily exposure is relatively high in those who consume fried potato products, toasted bread, potato chips, some breakfast cereals, and roasted coffee. ACR is used in printing to increase the durability of paper, oil well processes, water treatment, and cosmetics.[3-5] It has been shown that ACR causes oxidative stress and histological alterations in the tissues of the testes.[6] While ACR exposure increased lipid peroxidation levels in these tissues, a decrease was observed in antioxidant enzyme systems.[7-10] Consequently, oxidative stress plays crucial roles in ACR-induced toxicity due to over-production of reactive oxygen species (ROS). ROS lead to apoptosis, decreased motility, chromatin damage, and impaired fertilisation ability.[4,11]

Vitamin-rich black carrot (*Daucus carota L.*) is widely consumed. Carrots contain many substances such as kaempferol, quercetin, luteolin, myricetin and kaempferol which are flavonoid derivatives.[12,13] The amount of flavonoids found in black carrot carrots is much higher compared to other types of carrots.[14] The chemical component black carrot includes important pigments such as carotenoids, anthocyanins, polyacetylenes and falcarindiol. These component found in black carrots have many biochemical effects such as antioxidant, antitumor, anti-inflammatory, antimicrobial, anti-allergic, and anti-atherosclerotic activities. [15-18]

Free oxygen radicals and antioxidants are produced under control in tissues. However, when free oxygen radicals are overproduced, tissue damage known as oxidative stress occurs. Lipids in cell membranes are oxidized by free oxygen radicals, thus forming toxic products such as MDA.[19] When free oxygen radicals are overproduced, antioxidant defense systems counteract the harmful effects of free oxygen radicals for tissue integrity and normal functions. Antioxidant defense systems show their effects by blocking radical production and eliminating the harmful effects of formed radicals. GSH and GST are essential antioxidants. The GST enzyme has many functions in cells. It has an antioxidant effect against compounds such as hydroxyalkenals, propanals, and hydroperoxides formed in the cell. GST enzymes require the presence of the GSH molecule for its activity.[20,21] Many drugs are metabolized by the Ces. Ces has been detected in the liver, testis, and kidney tissues of mammals and is a member of esterases that catalyze the hydrolysis of esters, amides, and thioesters and convert esters into carboxylic acid and hydroxylated products. For this reason, changing activities in tissues are clinically very important.[22,23]

It is important to discover new substances or natural products to correct the negative effects of toxic substances on human health. In the literature review, it was observed that the effects of BCJ on testicular tissues were not studied against the oxidative stress caused by ACR in rats. Therefore, in this study, the effects of BCJ on MDA, GSH, GST, Ces, and histopathological parameters in rat testicular tissues exposed to ACR were investigated.

Materials and Methods

Animals

The Experimental Animal Production Implementation and Research Center of Adıyaman University in Turkey provided 32 male Wistar Albino rats, weighing between 200 and 250 g, which were used for the study. The rats were aged between 10 and 12 weeks. Throughout the study, the rats were provided with unlimited access to food and water, and they were kept in a room temperature of 22 ± 20 C with a 12-hour light and 12-hour dark cycle. The study was approved by Adıyaman University Animal Experiments Local Ethics Committee with the number 2022/88.

Experimental procedure

The rats were randomly divided into four groups as the Control (C), ACR, Black carrot juice (BCJ), and ACR+ BCJ (n=8 each group).

The vehicle solutions administered to the rats in the C group consisted solely of distilled water. The rats were administered 20 mg/kg intraperitoneally (IP) of dissolved ACR in distilled water.[19] The animals were given an orally administered dose of 4 ml/kg of BCJ. [20]ACR and BCJ were administered every other day for 30 days; ACR between 08:00 am and 09:00 am, and BCJ between 04:00 pm and 05:00 pm was given every other day for 30 days.

At the end of the 30-day experimental period, the combination of ketamine/xylazine HCl was administered to rats intramuscularly, and the blood was taken intracardiacally under anesthesia. Then, the testis and epididymis were removed, and the adipose tissue was cleaned and weighed. For biochemical analyses, it was stored at -80^{o} C. Testicular tissue samples were fixed with 10% formaldehyde for histopathological examination. When we look at the content of black carrot juice in the literature, total phenolics are 7.98–291.48 mg/100 g, anthocyanins are 837 mg/100 g, favo noids are 3.00–111.70 mg/100 g, falcarinol is 1.55 mg/100 g and favonols were reported as 51.6 mg/100 g.[24]

Biochemical analyses

Preparation of tissue homogenates

Testicular tissue samples were homogenized using a homogenizer (Heidolph RZ 2021, Germany) in a cooled potassium phosphate buffer (0.1 M, pH 7.4; 0.15 M KCl, 1 mM EDTA, and 1 mM DTT). For MDA analysis, five hundred microliters of homogenate were divided. The remaining homogenates were centrifuged (Hettich 460 R) at 16,000 x g for 20 minutes at 4 °C. The supernatants (S16) were then transferred into Eppendorf tubes to assess biomarkers other than MDA.

Determination of testis malondialdehyde (MDA) level and reduced glutathione (GSH) activity

MDA levels were measured using the Placer et al. technique in testicular tissue samples.21 MDA generates a pink-colored molecule when it interacts with thiobarbituric acid. The absorbancies of the resulting samples were measured at 532 nm using spectrophotometry (ThermoTM Varioskan Flash, Finland). The expression for the MDA level was nmol/mg protein.

The Moron et al.[25] method was used to calculate the quantity of GSH. Its response to 5,5'-dithiobis-2-nitrobenzoic acid was used to measure it. Using a spectrophotometer set at 412 nm, the absorbancies of the samples were measured (ThermoTM Varioskan Flash, Finland). The GSH concentration was given as nmol/mg of protein.

Determination of testis glutathione S-transferase (GST) activity

For the GST activity, 10 µL of supernatant, 100 µL of phosphate buffer (0.1 M, pH 6.5), and 100 µL of GSH mixture were produced. Subsequently, a substrate solution of 20 mM 1-Chloro-2,4 dinitrobenzene (CDNB) was produced in 96% ethanol and added to microplate wells. After the microplates were put in the microplate reader, the absorbance at 344 nm changed in less than two minutes at 25 °C. The formula for calculating specific GST activity was nmol/min/mg protein.

Determination of testis carboxylesterases (Ces)

26 mM p-nitrophenyl acetate (PNPA) was produced in 96% ethanol and utilized as a substrate in the Ces activity analysis. The reaction mixture, including 250 µL of 50 mM trizma buffer (pH, 7.4) and 5 µL of sample, was incubated at 25 °C for three minutes. 5 µL of substrate was added to start the reaction, which was then seen for two minutes at 25 °C at 405 nm. The protein activity was reported as nmol/min/mg.

Determination of total protein

The amount of protein was measured according to the Bradford[26] assay, using a bovine serum albumin (0–1.4 mg BSA / mL) standard.

Histological and immunohistochemical evaluation

Haematoxylin-eosin staining procedure

Following standard light microscopy methods, testicular tissue samples were

embedded in paraffin and preserved with 10% formaldehyde. After that, portions of these blocks, 4-6 µm thick, were removed and stained with hematoxylin-eosin (HxE). Under a light microscope (Leica DM500 connected Leica DFC295 Digital Image Analyze System), the preparations were inspected and photographed.

Immunohistochemistry for caspase 3

The technique employed was the streptavidin-biotin-peroxidase combination. By using this technique, slices of the blocked tissues, 4-6 µm thick, were removed and deparaffinized. Using a Thermo Scientific TM TP-015-HA commercial kit, the primary antibody Caspase-3 (Rabbit polyclonal IgG, Abcam, ab2302, London, UK) was diluted at a ratio of 1/200. Both the positive and negative controls were operated in accordance with the manufacturer's guidelines. The samples were stained with Mayer Hematoxylin, taken with a Leica DFC295 Digital Image Analyze System attached to a Leica DM500, and examined under a light microscope after applying AEC Chromogen.

The prevalence (0.1:<25%, 0.4:26-50%, 0.6:51-75%, 0.9:76-100%) and severity (0: none, +0.5: very mild, +1: mild, +2: moderate,+3: severe) of immunoreactivity in staining were used to produce the histoscore. (Severity x prevalence= Histoscore)

Spermatological examinations

Epididymal spermatozoa density

In a petri plate with 1 ml of physiological saline (0.9% NaCl), the epididymis was minced and allowed to incubate for four hours at room temperature. The supernatant containing spermatozoa up to 0.5 lines of red blood cell pipette was diluted at 1: 200, by drawing up to 101 lines of eosin solution (5 g sodium bicarbonate, 1 ml formalin, 25 mg eosin, and 100 ml distilled water). After this procedure, the supernatant was placed on the Neubauer slide (0.1 mm depth, 0.0025 mm^2 area, LABART, Munich, Germany) and was counted and calculated at 200 magnification under a light microscope.[27]

Spermatozoa motility

After placing the sample on the warming table of a slide microscope, its temperature reached 37 °C. A 200 µl Tris buffer solution was applied to the slide, which contained 3.63 g of Tris (hydroxymethyl) aminomethane, 0.50 g of glucose, 1.99 g of citric acid, and 100 ml of distilled water.

Next epididymis was sectioned, the 5–10 µl spermatozoa suspension was poured over the Tris buffer solution, and the entire mixture was mixed together. The motility percentage was computed using a 400 magnification light microscope.

Johnsen scoring

For light microscopic evaluations, modified Johnsen scoring was used to evaluate spermatogenesis in seminiferous tubules at 10× magnification in 30 randomly selected seminiferous tubules per section. Spermatogenic cells were examined using a Leica DM500 microscope and were evaluated according to maturation and density using a scoring table that gives scores ranging from 1 to 10. The Johnson scoring is shown in Table 1.[26]

Table 1. Modified Johnsen scoring.

10	Complete spermatogenesis with mature sperm cells
9	There are few sperm cells with disorganized germinal epithelium
8	There are less than 10 sperm cells (less than 5-10)
7	There are no sperm cells, there are spermatids
6	No sperm cells, less than 10 spermatids (less than 5-10)
5	There are no sperm cells and spermatids, there are spermatocytes
4	No sperm cells and spermatids, less than 5 spermatocytes
3	There are only spermatogonia as germ cells
2	There are no germ cells, only Sertoli cells
1	There are no cells in the seminiferous tubule

Statistical analysis

All of the computations were performed using the statistical program SPSS 22.0. For the results, the mean ± SEM was tabulated. The Tukey-HSD test was used to identify the significant groups after the groupings were statistically assessed using One-way analysis of variance (ANOVA).

Ethics committee approval

The study was approved by the Adıyaman University Experimental Animals Ethics Committee at the meeting dated 10.05.2018 with the decision numbered 2018/006 and received permission. All experimental procedures were carried out in accordance with the ethical guidelines for the care and use of laboratory animals.

Results

MDA, reduced GSH, GST, and Ces levels in the testis

The MDA levels of the rats exposed to ACR were higher than those of the C group with statistical significance ($p<0.001$). Between the BCJ and C groups, there was no statistically significant difference ($p>0.05$). In comparison to the C group, the MDA level of the ACR + BCJ group was shown to have increased ($p<0.001$), whereas it decreased ($p<0.01$) when compared to the ACR group. In contrast to the other groups, the GSH level in the ACR group dropped ($p<0.001$; $p<0.05$).

Other groups than the C group showed higher levels of GST enzyme activity ($p<0.001$). The GST enzyme activity levels in the BCJ and ACR + BCJ groups were found to have dropped ($p<0.001$) in contrast to the ACR group. The BCJ and ACR + BCJ groups' levels of Ces enzyme activity were found to be higher than those of the ACR group ($p<0.05$), but the ACR group's level was found to be lower than that of the C group ($p<0.001$). Moreover, it was shown that the levels of Ces enzyme activity in the ACR and ACR + BCJ groups had decreased relative to the C group ($p<0.05$). The biochemical parameter levels of the testicular tissue are listed in Table 2.

Table 2. Biochemical parameters in C, ACR, BCJ And ACR + BCJ treated groups (n=8).

Parameters	C	ACR	BCJ	ACR+BCJ
MDA (nmol/mg protein)	25.7±2.8	43.2±1.6c	29.5±3.5z	35.6±1.2cy
GSH (nmol/mg protein)	57.5±5.7	31.3±1.4c	45.3±2.7x	49.3±1.8x
GST (nmol/min/mg protein)	98.48±1.10	151.32±1.22c	111.03±1.15cz	123.24±1.99cz
Ces (nmol/min/mg protein)	0.72±0.04	0.42±0.02c	0.58±0.03ax	0.57±0.03ax

ANOVA
Values are expressed as means ± SE; n=8 for each treatment group.
Comparison with group C. a: $p<0.05$, b: $p<0.01$, c: $p<0.001$
Comparison with group ACR. x: $p<0.05$, y: $p<0.01$, z: $p<0.001$

Histologic analysis of testis tissue

Examining sections of the testicular tissues of the C and BCJ groups stained with Hematoxylin-Eosin (H.E.), it was discovered that the cells of the spermatogenic series and seminiferous tubules were normal (Figure 1A, 1B). Degeneration (arrow) in the seminiferous tubules and a decrease in the cells of the spermatogenic series (star) were observed when the sections of the rat testicular tissues of the ACR-applied group stained with H.E. were analyzed (Figure 1C). When the sections of the rat testicular tissues of the ACR and BCJ group were examined, a decrease in degeneration (arrow) and an increase in the cells of the spermatogenic series were observed (star) (Figure 1).

1A: The C group seen under a microscope. Testicular tissues in normal condition. 1B: A close-up of the BCJ-treated group. View of normal testicular tissue. 1C: ACR group seen under a microscope. Significant seminiferous degeneration (arrow) and a drop in spermatogenic series cells (star) were seen in the tubules. 1D: Under a microscope, tubules from ACR+BCJ showed a marked reduction in degeneration (arrow) and an increase in spermatogenic series cells (star). The scale bars represent 100 μm.

Caspases-3 immunohistochemical staining. The presence of caspase-3 in spermatogenic cells. Groups 2A–C: Testicular positivity is minimal or absent. 2B-BCJ: The testicles appear normally. The scale bars show 25 μm. 2C-ACR group: Severe positivity in the testis;

2D-ACR+ BCJ group: Diminished positivity in the testis.

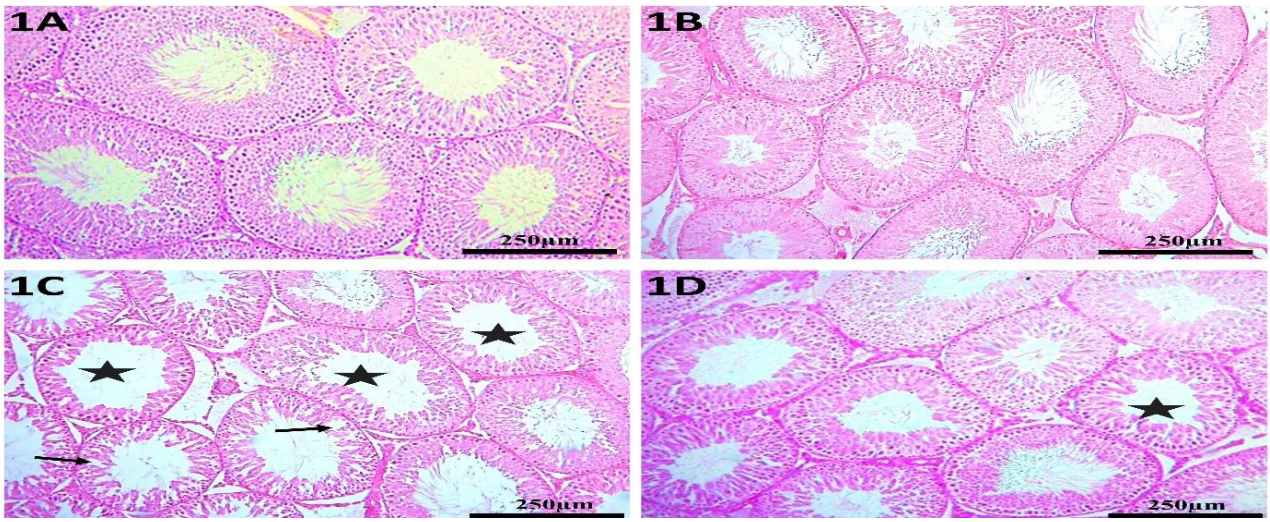

Figure 1. Histopathological effects of black carrot juice on testicular tissue of rats against damage caused by acrylamide are given in the figure. Accordingly: In the control and black carrot juice groups, testicular tissue was observed to have a normal histological structure. However, in the ACR group, to which only acrylamide was applied, degeneration in seminiferous tubules and spermatogenesis decreased and histopathological damage increased compared to the control group. However, in the treatment group, the ACR+ black carrot juice group, when compared to the ACR group, degeneration in seminiferous tubules decreased, spermatogenesis increased and therefore histopathological damage decreased. (H&E staining black arrow: seminiferous tubule degeneration, black star: decreased spermatogenesis. Scala bar 250 µm)

Immunohistochemical analysis of testis tissue

Caspase-3 immunoreactivity was detected in the testicular tissue of seminiferous tubules as a consequence of the immunohistochemical staining evaluation under light microscopy (red arrow). Caspase-3 immunoreactivities in testicular tissues were similar in the C (Figure 1 2A) and BCJ (Figure 1 2B) groups. Caspase-3 immunoreactivity was found to be statistically significantly increased in the ACR group (Figure 1 2C) compared to the C group (p<0.001). The Caspase-3 immunoreactivity in the ACR + BCJ group was found to be statistically lower than in the ACR group (Figure 1 2D) (p<0.001). Caspase-3 immunoreactivity parameter levels are given in Table 3.

Table 3. Caspase-3 activation in C, ACR, BCJ and ACR + BCJ treated groups (n=8)

Parameters	C	ACR	BCJ	ACR+BCJ
Histoscore	0.14±0.17	1.22±0.36c	0.15±0.18z	0.92±0.37cz

ANOVA
Values are expressed as means ± SE; n=8 for each treatment group.
Comparison with group C. a: p<0.05, b: p<0.01, c: p<0.001
Comparison with group ACR. x: p<0.05, y: p<0.01, z: p<0.001

According to the results of the modified Johnsen scoring system used to evaluate spermatogenesis in the seminiferous tubules, the control and BJC groups were similar (p=0.750). Spermatogenesis in the ACR group was statistically decreased compared to the control group (p<0.05). The Johnsen score of the ACR+BJC group, which was the treatment group, was statistically increased compared to the ACR group (p<0.05). (Figure 2D)

It was shown that there was no difference in testis weight, epididymal spermatozoa numbers, and motility between the C group and the BCJ group (p>0.05). Rats who received ACR application showed statistically lower testicular weight, seminal vesicle weight, and epididymal spermatozoa counts and motility (p<0.001) in comparison to the C group. The ACR + BCJ group showed a statistically significant increase (p<0.001). Spermatological parameter levels are given in Table 4.

Discussion

Many studies have indicated that negative effects on organism systems caused by ACR, which is commonly used nowadays.[7-9]

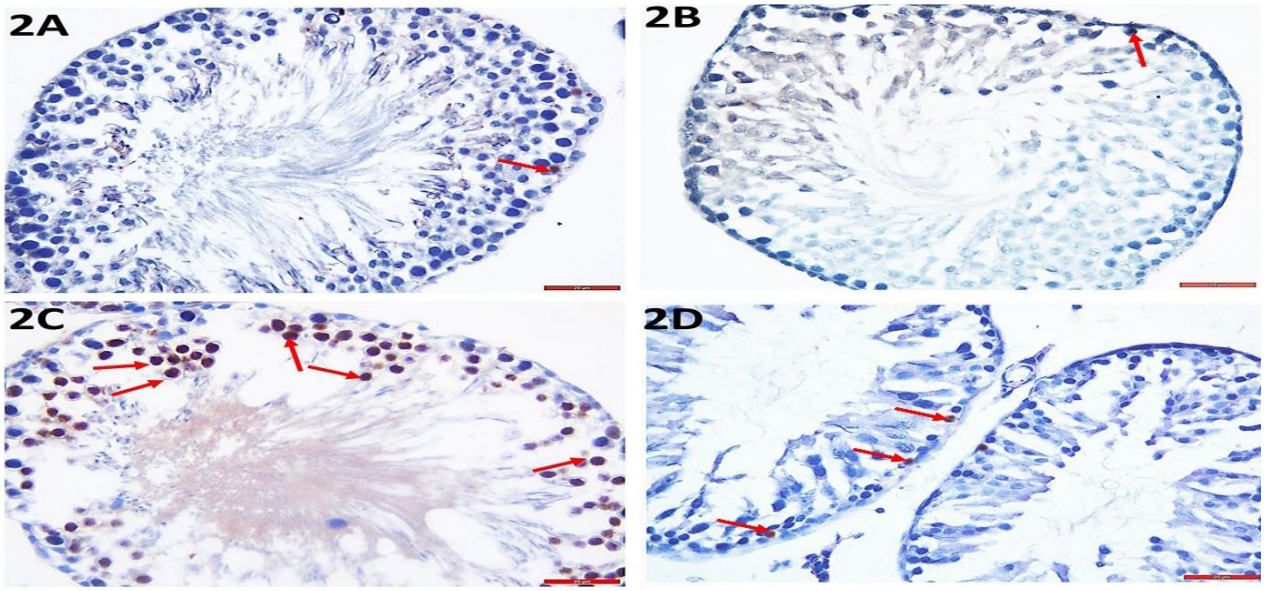

Figure 2. Caspase-3 immunoreactivity (red arrow) in rat testicular tissue of experimental groups is shown. No statistically significant difference was observed in caspase-3 immunoreactivity in control and black carrot groups. However, caspase-3 immunoreactivity was statistically increased compared to control and black carrot groups due to the damage caused by acrylamide. Only in the ACR group given acrylamide, caspase-3 immunoreactivity was statistically increased compared to the treatment group ACR+black carrot juice group. (A: control B: BCJ, C: ACR, D: ACR+BJR immunohistochemical staining AEC chromogen scala bar:20 µm)

Table 4. Spermatological parameters in C, ACR, BCJ, and ACR + BCJ treated groups (n=8).

Parameters	**C**	**ACR**	**BCJ**	**ACR+BCJ**
Testicular weight (g)	1.29±0.23	0.98±0.24c	1.34±0.14z	1.19±0.11bz
Epididymis weight (g)	0.39±0.07	0.214±0.11c	0.40±0.01z	0.30±0.10cz
Seminal gland weight (g)	0.78±0.09	0.41±0.11c	0.87±0.08cz	0.68±0.10cz
Spermatozoon count (million / cauda epididymis)	83.75±1.82	27.50±2.50c	85.62±1.45z	75.00±2.67az
Spermatozoon motility (%)	87.50±0,90	40.12±1.64c	88.12±0.83z	74.37±1.20cz

ANOVA
Values are expressed as means ± SE; n=8 for each treatment group.
Comparison with group C. a: $p<0.05$, b: $p<0.01$, c: $p<0.001$
Comparison with group ACR. x: $p<0.05$, y: $p<0.01$, z: $p<0.001$

ACR causes oxidative stress, and consequently, free radical levels increase which induces lipid peroxidation. As a result, the MDA, which is a lipid peroxidation product, increases.[14] In previous studies conducted on ACR applications, According to previous studies, testicular tissue contains higher MDA levels, which results in oxidative stress.[6,8,15,27,28] The results of these previous studies are similar to ours. Additionally, when compared to the C group, we discovered that rats exposed to ACR had statistically significant higher amounts of MDA (a consequence of lipid peroxidation) in their testicular tissue. Our analysis revealed that the MDA level was lower in the ACR + BCJ group compared to the ACR group. We believe that the antioxidant content of BCJ is the cause of the MDA level reduction in the ACR + BCJ group. Black carrot juice's flavonoid, phenolic, and antioxidant components have been shown to have strong antioxidant activity.

In contrast to the C group, we found a statistically significant drop in GSH levels in the rats that had ACR application in our investigation. Numerous investigations have revealed that the application of ACR in rats and mice results in a reduction in GSH levels in the testicular tissues. When comparing the ACR group to the C group in our study, there was a rise in GST levels. Also, Yildizbayrak et al[28] found similar results to our study. There

are studies that showed a decrease in GST levels with ACR application.[10,29] The GST enzyme has many functions in the cell. It has an antioxidant effect against compounds such as hydroxyalkenals, propanals, and hydroperoxides formed in the cell. GST enzymes require the presence of the GSH molecule for its activity.[20] In our study, we believe that the decrease of the GSH molecule and increase of the GST enzyme in the ACR-applied rat testicular tissues is because the GST enzyme excessively consumes the GSH molecule, which is necessary for activation.

Many drugs and toxins are metabolized by the Ces enzymes. Ces has been detected in the liver, testis, and kidney tissues of mammals, and is a member of esterases that catalyze the hydrolysis of esters, amides, and thioesters and convert esters into carboxylic acid and hydroxylated products. For this reason, activity changes in tissues are clinically very important.[22,23] Our study revealed that the Ces enzyme activities of the other groups were lower than those of the control group. According to the Ces enzyme activity of the ACR group, an increase was detected in the BCJ and ACR + BCJ groups. We think that ACR has the same negative effects on the Ces enzyme as it has on the antioxidant system. There are many biomolecules in black carrot content. It can be said that polyphenolic compounds, especially, react with molecules in Ces enzymes and change the activities of the structure.[30] However, we see the increase of Ces enzyme activities in BCJ groups as a positive effect compared to the ACR group.

In our study, light microscopic examination of the testicular tissue of rats exposed to ACR showed a degeneration in the seminiferous tubular epithelium and a decrease in cells of the spermatogenic series.[6] It has been reported in earlier research that ACR causes the seminiferous tubular epithelium and germ cells to degrade, a decrease in spermatogenic cells, and a decrease in mature sperm and spermatogonia.[15,29,31,32] Our research supports the findings of the previously mentioned studies. Similar to our study, there are studies reporting that the Caspase-3 immunoreactivity increases and apoptosis occur with ACR treatment.[7,28]

In a study on rats, Lebda et al determined that the seminiferous tubules lacked spermatitis and spermatozoa due to the application of ACR.[6,33] Detected changes in testicular weights and seminiferous tubules in rats exposed to ACR. In our study, rats given ACR had lower testicular weights, seminal vesicle weights, epididymal sperm counts, and sperm motility than the C group. In the ACR + BCJ group, the numerical increases in these parameters were observed to be statistically significant.

Limitations

This study has some limitations. Since the experimental period was only 30 days, this period may not be sufficient to understand the long-term effects of acrylamide and black carrot juice.

The study was conducted only on Wistar albino rats. This may limit its generalizability to other species and humans.

Conclusion

Our study detected a decrease in testicular function of the rats exposed to ACR, and this decrease could be prevented with the antioxidant properties of BCJ. Chemicals that harm the organism cause oxidative stress and thus damage the cells and tissues. Antioxidants are thought to be an effective treatment method in the prevention of tissue damage caused by oxidative stress. It is important to discover new substances or natural products in order to ameliorate the negative effects of harmful chemicals. As a result, We think that BCJ may be able to lessen the harmful effects of ACR-induced oxidative stress and toxic consequences.

Ethics Committee Approval

The Adıyaman University Animal Experiments Local Ethics Committee provided ethical approval (2018/006). All experimental procedures were carried out in accordance with the ethical guidelines for the care and use of laboratory animals.

Author Contributions

Conceptualization: HP; Design: GE, SÇ, EMBY; Auditing: SÇ, AY, AT; Resources: HP, AK, MFA; Data collection: AK, AT, AY;

Data analysis and interpretation: EMBY, AT; Literature review: SÇ, AK, MFA; Writers: GE, AY; The final version of this article was read and approved by all authors.

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None

Conflict of Interest

The authors declare that there is no conflict of interest for this article.

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References

1. Nodeh HR, Ibrahim WAW, Kamboh MA, Sanagi MM. Magnetic graphene sol–gel hybrid as clean-up adsorbent for acrylamide analysis in food samples prior to GC–MS. *Food chemistry*. 2018;239:208-216.
2. Koszucka A, Nowak A, Nowak I, Motyl I. Acrylamide in human diet, its metabolism, toxicity, inactivation and the associated European Union legal regulations in food industry. *Critical reviews in food science and nutrition*. 2020;60(10):1677-1692.
3. Pan M, Liu K, Yang J, Hong L, Xie X, Wang S. Review of Research into the Determination of Acrylamide in Foods. *Foods*. 2020;9(4):524.
4. Acaroz U, Ince S, Arslan-Acaroz D, et al. The ameliorative effects of boron against acrylamide-induced oxidative stress, inflammatory response, and metabolic changes in rats. *Food and chemical toxicology*. 2018;118:745-752.
5. Abdel-Daim MM, Abo El-Ela FI, Alshahrani FK, et al. Protective effects of thymoquinone against acrylamide-induced liver, kidney and brain oxidative damage in rats. *Environmental Science and Pollution Research*. 2020;27:37709-37717.
6. Lebda M, Gad S, Gaafar H. Effects of lipoic acid on acrylamide induced testicular damage. *Materia socio-medica*. 2014;26(3):208.
7. Yilmaz BO, Yildizbayrak N, Aydin Y, Erkan M. Evidence of acrylamide-and glycidamide-induced oxidative stress and apoptosis in Leydig and Sertoli cells. *Human & experimental toxicology*. 2017;36(12):1225-1235.
8. Hasanin NA, Sayed NM, Ghoneim FM, Al-Sherief SA. Histological and ultrastructure study of the testes of acrylamide exposed adult male albino rat and evaluation of the possible protective effect of vitamin E intake. *Journal of microscopy and ultrastructure*. 2018;6(1):23.
9. Erdemli Z, Erdemli ME, Turkoz Y, Gul M, Yigitcan B, Gozukara Bag H. The effects of acrylamide and Vitamin E administration during pregnancy on adult rats testis. *Andrologia*. 2019;51(7):e13292.
10. Bedir F, Kocatürk H, Yapanoğlu T, et al. Protective effect of taxifolin against prooxidant and proinflammatory kidney damage associated with acrylamide in rats. *Biomedicine & Pharmacotherapy*. 2021;139:111660.
11. Ramazani N, Mahd Gharebagh F, Soleimanzadeh A, et al. The influence of L-proline and fulvic acid on oxidative stress and semen quality of buffalo bull semen following cryopreservation. *Veterinary Medicine and Science*. 2023;9(4):1791-1802.
12. Ribarova F, Atanassova M, Marinova D, Ribarova F, Atanassova M. Total phenolics and flavonoids in Bulgarian fruits and vegetables. *JU Chem Metal*. 2005;40(3):255-260.
13. Arscott SA, Tanumihardjo SA. Carrots of many colors provide basic nutrition and bioavailable phytochemicals acting as a functional food. *Comprehensive reviews in food science and food safety*. 2010;9(2):223-239.
14. Bahorun T, Luximon-Ramma A, Crozier A, Aruoma OI. Total phenol, flavonoid, proanthocyanidin and vitamin C levels and antioxidant activities of Mauritian vegetables. *Journal of the Science of Food and Agriculture*. 2004;84(12):1553-1561.
15. Zhang X, Chen F, Huang Z. Apoptosis induced by acrylamide is suppressed in a 21.5% fat diet through caspase-3-independent pathway in mice testis. *Toxicology Mechanisms and Methods*. 2009;19(3):219-224.
16. Bawari S, Sah AN, Tewari D. Anticalcifying effect of Daucus carota in experimental urolithiasis in Wistar rats. *Journal of Ayurveda and integrative medicine*. 2020;11(3):308-315.
17. Liu R, Choi HS, Kim S-L, Kim J-H, Yun B-S, Lee D-S. 6-Methoxymellein isolated from carrot (Daucus carota L.) targets breast cancer stem cells by regulating NF-κB signaling. *Molecules*. 2020;25(19):4374.
18. Rao AV, Rao LG. Carotenoids and human health. *Pharmacological research*. 2007;55(3):207-216.
19. Alkadi H. A review on free radicals and antioxidants. *Infectious Disorders-Drug Targets (Formerly Current Drug Targets-Infectious Disorders)*. 2020;20(1):16-26.
20. Sherratt PJ, Hayes JD. Glutathione S-transferases. *Enzyme systems that metabolise drugs and other xenobiotics*. 2001:319-352.
21. Kisaoglu A, Borekci B, Yapca OE, Bilen H, Suleyman H. Tissue damage and oxidant/antioxidant balance. *The Eurasian journal of medicine*. 2013;45(1):47.
22. Satoh T. Toxicological implications of esterases—from molecular structures to functions. *Toxicology and applied pharmacology*. 2005;207(2):11-18.
23. Ross MK, Borazjani A, Edwards CC, Potter PM. Hydrolytic metabolism of pyrethroids by human and other mammalian carboxylesterases. *Biochemical pharmacology*. 2006;71(5):657-669.
24. Akhtar S, Rauf A, Imran M, Qamar M, Riaz M, Mubarak MS. Black carrot (Daucus carota L.), dietary and health promoting perspectives of its polyphenols: A review. *Trends in Food Science & Technology*. 2017;66:36-47.
25. Moron M, Depierre J, Mannervik B. Biochim Biophys Acta. *Gen Subj*. 1979;582:67-78.
26. Oliveira Filho AB, Souza RSd, Azeredo-Oliveira MTVd, Peruquetti RL, Cedenho AP. Microdissection testicular sperm extraction causes spermatogenic alterations in the contralateral testis. 2010;
27. Hamdy S, Bakeer H, Eskander E, Sayed O. Effect of acrylamide on some hormones and endocrine tissues in male rats. *Human & experimental toxicology*. 2012;31(5):483-491.
28. Yildizbayrak N, Erkan M. Therapeutic effect of curcumin on acrylamide-induced apoptosis mediated by MAPK signaling pathway in Leydig cells. *Journal of Biochemical and Molecular Toxicology*. 2019;33(7):e22326.
29. Takahashi M, Inoue K, Koyama N, et al. Life stage-related differences in susceptibility to acrylamide-induced neural and testicular toxicity. *Archives of toxicology*. 2011;85:1109-1120.
30. Stocker P, Yousfi M, Djerridane O, et al. Effect of flavonoids from various Mediterranean plants on enzymatic activity of intestinal carboxylesterase. *Biochimie*. 2004;86(12):919-925.
31. Wang H, Huang P, Lie T, et al. Reproductive toxicity of acrylamide-treated male rats. *Reprod Toxicol*. Apr 2010;29(2):225-30. doi:10.1016/j.reprotox.2009.11.002
32. Şen E, Tunali Y, Erkan M. Testicular development of male mice offsprings exposed to acrylamide and alcohol during the gestation and lactation period. *Hum Exp Toxicol*. Apr 2015;34(4):401-14. doi:10.1177/0960327114542883
33. Kaçar S, Şahintürk V, Can B, Musmul A. L-Cysteine Partially Protects Against Acrylamide-Induced Testicular Toxicity. *Balkan Med J*. Apr 4 2018;35(4):311-9. doi:10.4274/balkanmedj.2017.0830

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Research Article/Özgün Araştırma

The relationship between fracture type and time of trauma in elderly patients admitted to the emergency department with proximal femur fracture after a fall

Düşme sonrası proksimal femur kırığı ile acil servise başvuran yaşlı hastalarda kırık tipi ve travma oluş zamanı arasındaki ilişki

Bekir KARAGÖZ[1], Hatice Kübra ÖNDER KARAGÖZ[2], Ozan KEÇELİ[3], Kasım TURGUT[4], Murat BAKIR[5]

[1]Eskisehir City Hospital, Department of Orthopedics and Traumatology, 26080, Eskişehir-Turkey
[2]Eskisehir City Hospital, Department of Emergency Medicine, 26080, Eskişehir-Turkey
[3]Tarsus State Hospital, Department of Orthopedics and Traumatology, 33460, Mersin-Turkey
[4]Adıyaman University, Faculty of Medicine, Department of Surgical Medical Sciences, Department of Emergency Medicine, 02040, Adıyaman-Turkey
[5]Health Science University, Haydarpasa Numune Training and Research Hospital, Department of Orthopedics and Traumatology, 34668, İstanbul-Turkey

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Abstract

Aim: To investigate whether the time of day affects the type of fall-related hip fracture.

Materials and Methods: This retrospective study included patients diagnosed with hip fracture due to falls between 2012 and 2022. Fracture times were categorized as daytime (09:00–16:59) and nighttime (17:00–08:59). Patients were grouped accordingly, and demographic and radiological data were analyzed to assess differences in fracture types between groups.

Results: Among 935 patients, intracapsular fractures were more common during the day, while extracapsular fractures were more common at night (p=0.003). Intracapsular fractures peaked at 13:00; extracapsular at 11:00.

Conclusion: Hip fractures occurred most frequently during the day, especially at noon. Intracapsular fractures were significantly more common in daytime, extracapsular at night.

Keywords: Hip fracture; Time to fall; Daytime; Nighttime; Intracapsular; Extracapsular.

Öz

Amaç: Günün saatinin düşmeye bağlı kalça kırığı tipini etkileyip etkilemediğini araştırmak.

Gereç ve Yöntem: Bu retrospektif çalışmaya, 2012–2022 yılları arasında düşme nedeniyle kalça kırığı tanısı alan hastalar dahil edildi. Kırık oluş zamanı gündüz (09:00–16:59) ve gece (17:00–08:59) olarak ikiye ayrıldı. Hastalar bu zaman dilimlerine göre gruplandırıldı ve gruplar arası kırık tipi farklarını değerlendirmek amacıyla demografik ve radyolojik veriler analiz edildi.

Bulgular: Toplam 935 hasta çalışmaya dahil edildi. Gündüz saatlerinde daha sık intrakapsüler kırıklar, gece saatlerinde ise daha sık ekstrakapsüler kırıklar görüldü (p=0.003). İntrakapsüler kırıklar en sık 13:00 civarında, ekstrakapsüler kırıklar ise 11:00 civarında meydana geldi.

Sonuç: Kalça kırıkları en sık gündüz saatlerinde, özellikle öğle saatlerinde meydana geldi. İntrakapsüler kırıklar gündüz, ekstrakapsüler kırıklar ise gece saatlerinde anlamlı olarak daha sık görüldü.

Anahtar Kelimeler: Kalça kırığı; Düşme zamanı, Gündüz; Gece, İntrakapsüler; Ekstrakapsüler.

Yazışma Adresi/Address for Correspondence: Bekir KARAGÖZ, Eskisehir City Hospital, Department of Orthopedics and Traumatology, 26080, Eskişehir-Turkey, E-mail: drbkr71@gmail.com

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Introduction

Falls are a significant problem that can have negative consequences in every age group and cause more serious problems, especially in the geriatric age group. [1-3] Falls can cause a significant loss of functionality in elderly individuals and negatively affect more than one aspect of life.[1]

Fractures that occur due to falls are important causes of morbidity and mortality in elderly individuals.[4,5] The most common orthopedic trauma in these patients is hip fractures, which seriously affect morbidity and mortality.[6] Studies have shown that the mortality rate in patients who have suffered a hip fracture is high, ranging between 33% and 45% within the first two years.[7] It is estimated that these fractures, which cause high costs and difficult psychological rehabilitation, affect 18% of women and 6% of men throughout life.[8]

Due to the increase in life expectancy at the global level, projections expect serious increases in the incidence of hip fractures.[9,10] Many studies are being conducted on these fractures, which are expected to be seen more frequently in the health sector in the coming years.[4,11,12] These studies aim to reduce the incidence of fractures by determining risk factors. Studies have shown many internal and external factors.[13] While external factors are balance and slipping and tripping hazards, internal factors are related to the individual's health status and physical structure. While the correction of internal factors requires long-term follow-up, reductions in fracture occurrence can be seen by considering strategies related to external factors.[14,15] There are very few studies on the timing of falls that cause hip fractures, especially in elderly patients.[9,16,17] Patients have daily routines that are distributed in time at home. These routines can cause differences in the risk of falling during the day.[16] In studies conducted, the majority of hip fractures occur during the day.[17]

Having an idea about when and where hip fractures will occur can seriously affect fall prevention strategies. This study aims to determine the distribution of fall-related hip fractures in elderly individuals based on different time periods throughout the day. Additionally, the relationship between the type of fracture and the time of the fall has been evaluated, and potential strategies to prevent falls in elderly individuals have been discussed in line with this relationship. Hip fractures are associated with high morbidity and mortality rates, particularly in the elderly population. Therefore, identifying the timing of fracture occurrence is of great importance for developing preventive measures. Our study is expected to contribute to the literature by providing insights into environmental modifications, individual precautions, and health policy developments aimed at reducing fall risk in elderly individuals.

Materials and Methods

The type of the study

This study was designed as a retrospective cross-sectional study

The samples of the research

Patients who applied to the emergency department of a university hospital due to a fall between January 2012 and December 2022 and were diagnosed with hip fractures were included in the study. When the hospital's digital database was searched between these years, 1135 patients who applied to the emergency department due to hip fractures were identified. Eligible patients included in the study were male and female patients aged ≥ 65 years with intracapsular femoral neck fracture or extracapsular hip fracture (intertrochanteric or subtrochanteric fractures). Additionally, patients with concomitant fractures in other regions along with hip fractures were also included in the study. The reason for including these patients is that falls often result in extensive trauma, leading to multiple fractures, and this inclusion ensures that the study reflects real-life data. Patients with the following criteria were excluded from the study: 1) Patients with incomplete data (patients whose trauma time was not known precisely) (n=19), 2) Patients who developed hip fractures other than fall-related causes such as osteoarthritis, infection, tumor metastasis, avascular necrosis of the femoral head (n=43), 3) Patients aged <65 years (n=138). Two

hundred patients who met the exclusion criteria were excluded from the study. The remaining 935 patients were included in the study. The patients were divided into two groups according to the time of the fall: daytime hours were determined as 09:00-16:59, and those with hip fractures between these hours were divided into Group 1, and nighttime hours were determined as 17:00-08:59, and those with hip fractures between these hours were divided into Group 2. Previous similar studies were considered in this separation of daytime and nighttime hours.[18,19] In the Turkish healthcare system, regular daytime working hours are generally between 08:00 and 17:00, coinciding with the period when individuals engage in the most daily activities. Nighttime hours have been considered a separate category, as they represent the period when individuals are asleep and household mobility decreases. Similar studies have also categorized daytime and nighttime based on individuals' activity levels and the functioning of the healthcare system. These time intervals were determined to ensure that the results of our study align with the existing literatüre. The number of patients in Group 1 was 562, and the number in Group 2 was 373.

Data collection tools

In order to perform intergroup analysis, information on the time of the fall, fracture type, age, gender, fracture side, and presence of additional fractures was collected from the hospital digital data recording system. Data scanning was performed on the presence of hypertension, diabetes mellitus, coronary artery disease, cerebrovascular accident, cataract, Alzheimer's disease, chronic obstructive pulmonary disease, asthma, Parkinson's disease, vertigo, heart failure, and chronic renal failure as comorbidities to be examined. The times of the fall that led to the hip fracture of the patients were obtained by interviewing the patients themselves or their families during their admission to the emergency department.

Statistical analysis

SPSS version 25.0 (*IBM Corp., Armonk, NY, USA*) statistical package program was used for statistical analyses. While evaluating the study data, descriptive statistical methods (mean, standard deviation, frequency, minimum-maximum, percentage) were used to summarize the data. Shapiro-Wilk Test was used for normality tests of continuous variables. In cases where normality was achieved, the significance of the differences between the means was investigated with a two-group independent sample t-test. In cases where normality was not achieved, the significance of the differences was investigated with Mann-Whitney Tests. Fisher's Exact Test was performed for the independence test between two-group categorical variables. When there were more than two groups of categorical variables, the Chi-Square Independence Test was applied. In order to find the relationships between two continuous variables, Spearman-Rho correlation coefficients were obtained in cases where normality was not achieved. The significance level was taken as 0.05 for all tests performed.

Ethics committee approval

This study was conducted with the necessary approval from the Adıyaman University Non-Interventional Clinical Research Ethics Committee (Ethics committee approval number: 2022/8-7 and date: 15.11.2022). This study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent form were obtained from all patients.

Results

A total of 935 patients, 517 (55.3%) female and 418 (44.7%) male, with an average age of 81.33±8.08 (65-108 years), were included in the study. Intracapsular hip fracture was observed in 293 (31.3%) patients and extracapsular hip fracture was observed in 642 (68.7%). The relationship between the time of trauma and the variables is given in Table 1. According to the results, among the analyzed variables, only heart failure and the time of trauma were found to be significantly related (p=0.05). There was no relationship between the other variables and the time of trauma.

In order to examine the distribution of the fracture type in patients with the time of the

fall, the relationship between the intracapsular and extracapsular hip fracture types and the time of the trauma is given in Figure 1. According to the data obtained, it is seen that intracapsular hip fractures are seen in small numbers starting at night and start to increase towards morning, are seen at the highest rate at noon, and finally decrease in the evening and are seen very rarely again towards midnight. It is seen that extracapsular hip fractures do not follow a regular course like intracapsular hip fractures. It is understood that they decrease at night and in the morning, like intracapsular hip fractures, but increase during the day. It is seen that intracapsular fractures occur most around 13:00, and extracapsular fractures occur most around 11:00.

Table 1. Characteristic of patients falls in daytime and nighttime.

Variables		**Time of Fall**		***p***
		Group 1 (N: 562)	**Group 2 (N: 373)**	
Age (years)		81,17±7,97	81,58±8,25	0,347[1]
Gender	Female	311 (%55,3)	206 (%55,2)	0,513[2]
	Male	251 (%44,7)	167 (%44,8)	
Side	Right	288 (%51,4)	193 (%52)	0,893[2]
	Left	272 (%48,6)	178 (%48)	
Additional Fracture	Distal Radius fracture	10 (%1,8)	2 (%0,5)	0,157[3]
	Proximal humerus fracture	7 (%1,2)	3 (%0,8)	
	Clavicle fracture	3 (%0,5)	0	
Hypertension		394 (%70,1)	270 (%72,4)	0,463[2]
Diabetes Mellitus		198 (%35,2)	149 (%39,9)	0,147[2]
Coronary Artery Disease		210 (%37,4)	133 (%35,7)	0,628[2]
Cerebrovascular Disease		86 (%15,3)	69 (%18,5)	0,209[2]
Alzheimer's Disease		57 (%10,1)	32 (%8,6)	0,495[2]
Chronic Obstructive Pulmonary Disease		76 (%13,5)	51 (%13,7)	0,999[2]
Asthma		24 (%4,3)	13 (%3,5)	0,610[2]
Parkinson's Disease		6 (%2)	17 (%2,6)	0,519[2]
Vertigo		12 (%2,1)	11 (%2,9)	0,519[2]
Heart Failure		42 (%7,5)	16 (%4,3)	**0,05[2]**
Chronic Kidney Failure		18 (%3,2)	12 (%3,2)	0,999[2]

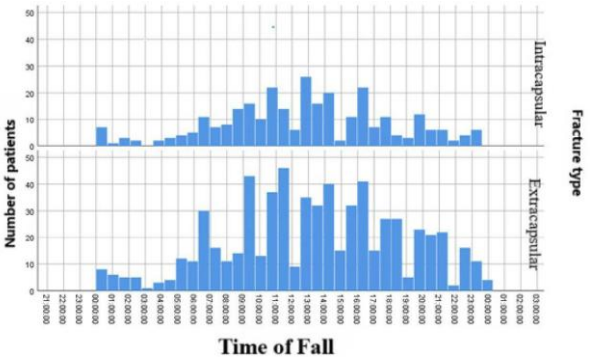

Figure 1. Hourly distribution of the occurrence of ıntracapsular and extracapsular hip fractures

The distribution between the fracture types and the time of the fall is given in Table 2. Extracapsular fractures were the most common type of fracture both during the day and at night among all fractures. However, when evaluated proportionally, intracapsular fractures were more frequently observed during daytime hours (34.9% during the day vs. 26% at night), while extracapsular fractures occurred at a higher rate during nighttime hours (74% at night vs. 65.1% during the day). This difference was found to be statistically significant (p=0.003). These findings indicate that intracapsular fractures predominantly occur during daytime hours, whereas extracapsular fractures show a significant increase during nighttime hours.

Table 2. The distribution of fracture types during daytime and nighttime.

Variables		**Time of Fall**		***p***
		Group 1 (N: 562)	**Group 2 (N: 373)**	
Fracture type	İntracapsular fracture	196 (%34,9)	97 (%26)	
	Extracapsular fracture	366 (%65,1)	276 (%74)	**0,003[1]**

[1] Fisher's Exact Test

Discussion

Some significant results were obtained in this study. As a result of the analyses, it was seen that the frequency of both intracapsular and extracapsular hip fractures decreased at night, increased in the morning hours, and reached the highest level at noon. Another significant result was that while intracapsular hip fractures were more common during the day, extracapsular hip fractures occurred at a higher rate at night. In addition, it was observed that the frequency of hip fractures due to falls increased during the day in patients with heart failure. This difference was not detected in other comorbid diseases.

It is possible to come across many studies in which an etiological examination was made in hip fractures resulting from falls.[10,20-23] Apart from etiological reasons related to the person, the number of studies conducted on whether the type of hip fracture that occurs will change according to place and time is few and insufficient.[9,17] In one of the studies investigating how seasonal changes affect the type of hip fracture, the study conducted by Crawford et al. found that more hip fractures occurred in the winter months compared to the summer months.[24] In addition, an increase in the number of extracapsular fractures and a tendency for higher mortality in patients admitted during the winter months have been detected. It is also possible to reach other studies on this subject.[25,26] However, the number of studies examining the relationship between the type of hip fracture and the time of the fall is limited.[9,17,27] According to Kim et al., among these studies, it has been shown that the risk of falling at night increases due to factors such as visual impairment, and the incidence of hip fractures increases accordingly.[27] However, according to Chen et al., the opposite is the case.[9] It has been shown that fracture events occur mainly during the day and reach their highest level between 8-10 in the morning. Our study also obtained results similar to the results of Chen et al. According to the results we obtained, it has been determined that intracapsular hip fractures are seen in small numbers during the night and start to increase towards the morning, are seen at the highest rate at noon, and finally decrease in the evening and are seen very rarely again towards midnight. It has been shown that extracapsular hip fractures also decrease at night and in the morning but increase towards noon.

Elderly patients start their customary daily rituals by getting out of bed in the morning and going to the toilet. With these actions, they enter a more active period compared to the nighttime. Being more active during the daytime may lead to falling more during this active period. Another significant result determined in this study is that the types of hip fractures change according to the time of the fall. According to the results, intracapsular hip fractures are more common during the daytime, while extracapsular hip fractures due to falls are more common at night. It is possible to determine many etiological factors that contributed to the formation of these two fracture types in the literatüre.[21,22] Many factors such as age, gender, body mass index, comorbidities, fall position, and fall energy have been investigated.[10,17,20-22] As a result of our literature review, no study has correlated the fracture type with fall time. According to literature data, the extracapsular hip fracture type frequency increases as the average age of patients with hip fractures increases.[24] In our study, it was determined that the average age of patients who had hip fractures at night was higher. The statistically significant result obtained in our study on this issue may be explained by the fact that the average age of patients with hip fractures at night was higher. In addition, rotational movements during falls are associated with the formation of extracapsular hip fractures.[23] Patients' ability to balance may be weakened at night compared to daytime due to waking up from sleep. In this case, it may cause the fall to be more uncontrolled. We think that the increase in rotational movements during uncontrolled falls compared to daytime may cause an increase in the formation of extracapsular hip fractures.

This study highlights the importance of implementing fall prevention measures at different times of the day in the elderly population. Getting out of bed is particularly a high-risk movement, and to reduce this risk, bed rails can be installed along the edges of the

bed. Elderly individuals are at high risk of falling at any time of the day when going to the toilet. Therefore, the widespread use of protective equipment should be encouraged to enhance safety. Using non-slip flooring inside the home, increasing nighttime lighting, and installing grab bars in bathrooms and hallways can help reduce fall risk. Additionally, the use of assistive walking devices such as walkers, canes, and support equipment should be promoted. Handrails on stairs and well-organized movement areas are also crucial safety measures. Moreover, falls in some elderly individuals may be linked to health conditions such as orthostatic hypotension. In such cases, slow movements during initial mobilization, taking support while sitting and standing up, and performing circulation-balancing exercises are recommended. In elderly care facilities, ensuring sufficient staff during night shifts, adjusting bed heights appropriately, and using mobility-supporting equipment can further enhance safety.

Limitation of the study

There are several limitations in our study. First, our study was designed retrospectively. Second, although the study only included hip fractures that occurred due to “falls,” the homogeneity of the patients included in the study may have been disrupted due to the difference in the concept of “falls” commonly understood among patients. Third, no examination was made on where the fall occurred. With all these limitations, future multicenter studies using larger samples and including where the fall occurred will increase the contribution to the literature.

Conclusion

This study has shown that the time of fall and fracture types in hip fractures may vary. Our findings revealed that both types of hip fractures included in the study were most frequently seen during the daytime, with a peak during the afternoon. It was also determined that extracapsular hip fractures were significantly more common at night, and intracapsular fractures were significantly more common during the daytime. This information may help develop fall prevention strategies for elderly individuals.

Ethics Committee Approval

Approval was taken from the Ethical Board of the State University the study was conducted in (Ethics committee approval number: 2022/8-7 and date: 15.11.2022) and written permission was taken from University. The study was conducted in accordance with the Helsinki declaration principles.

Author Contributions

Idea, design, collection of resources, analysis and interpretation of results and literature, written and critical: BK, HKOK, OK, KT, MB

Conflict of Interest

There is no conflict of interest to declare

Financial Disclosure

There is no person/organization supporting this study financially.

Peer-review

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References

1. Giovannini S, Brau F, Galluzzo V, et al. Falls among Older Adults: Screening, Identification, Rehabilitation, and Management. *Applied Sciences*. 2022; 12(15):7934.
2. Mehta J, Knowles K, Wilson E. Prevalence of Falls in Patients Presenting to an Ophthalmic Outpatients Department—A Surveillance Study. *Br. Ir. Orthopt. J.* 2021; 17: 134–41.
3. Steenkamp C, Kong VY, Clarke DL, et al. The effect of systematic factors on the outcome of trauma laparotomy at a major trauma centre in South Africa. *Ann R Coll Surg Engl* 2017; 99:540–4.
4. Hogea B, Bardan R, Sandesc M, et al. Are night-time voiding and lower urinary tract symptoms significant risk factors for hip fractures caused by falling during the night in male subjects? *Patient Prefer Adherence*. 2019; 13:1191-97.
5. Dykes PC, Burns Z, Adelman J, et al. Evaluation of a Patient-Centered Fall-Prevention Tool Kit to Reduce Falls and Injuries: A Nonrandomized Controlled Trial. *JAMA Netw Open*. 2020;3(11): e2025889.
6. Florence CS, Bergen G, Atherly A, et al. Medical Costs of Fatal and Nonfatal Falls in Older Adults. *J Am Geriatr Soc*. 2018 Apr;66(4):693-98.
7. *Alic T, Zehir S. Have mortality rates in elderly patients with hip fractures changed during pandemic? Eur Rev Med Pharmacol Sci. 2023;27(2):524-31.*
8. Veronese N, Maggi S. Epidemiology and social costs of hip fracture. *Injury*. 2018;49(8):1458–60.
9. Chen CC, Chen CH, Kuo YJ, et al. The Relationship Between the Time and Location Distribution of Falls in Elderly Hip Fracture Patients and Clinical Characteristics. *Research Square*. Publish Online: 29 March 2024.
10. Chen YP, Kuo YJ, Liu CH, et al. Prognostic factors for 1-yearfunctional outcome, quality of life, care demands, and mortality after surgery in Taiwanese geriatricpatients with a hip fracture: a prospective cohort study. *Ther Adv Musculoskelet Dis*. 2021; 13:1759720x211028360.
11. De Andrea S, Lucenteforte E, Bravi F, et al. Risk factors for falls in community-dwelling older people: a systematic review and meta-analysis. *Epidemiology*. 2010; 21:658– 68.

12. Patrascu JM, Vermesan D, Mioc ML, et al. Musculo-skeletal tumors incidence and surgical treatment – a single center 5-year retrospective. *Eur Rev Med Pharmacol Sci*. 2014; 18:3898–3901.
13. Lord SR, Close JCT. New horizons in falls prevention. *Age Ageing*. 2018; 47(4):492–8.
14. Molés Julio MP, Lavedán Santamaría A, Botigué Satorra T, et al. Characteristics and Circumstances of Falls in the Community-Dwelling Older Adult Population. *J Prim Care Community Health*. 2020; 11:2150132720940508.
15. Formiga F, Lopez-Soto A, Duaso E, et al. Characteristics of falls producing hip fractures in nonagenarians. *J Nutr Health Aging*. 2008;12(9):664–67.
16. Oliver D, Healey F, Haines TP. Preventing falls and fall-related injuries in hospitals. *Clin Geriatr Med*. 2010; 26(4):645–92.
17. Leavy B, Aberg AC, Melhus H, et al. When and where do hip fractures occur? A population-based study. *Osteoporos Int*. 2013;24(9):2387–2396.
18. Kitamura T, Kiyohara K, Nitta M, et al. Survival following witnessed pediatric out-of-hospital cardiac arrests during nights and weekends. *Resuscitation*. 2014; 85:1692–8.
19. Hirose T, Kitamura T, Katayama Y, et al. Impact of nighttime and weekends on outcomes of emergency trauma patients: A nationwide observational study in Japan. *Medicine (Baltimore)*. 2020 Jan;99(1): e18687.
20. Guzon-Illescas O, Perez Fernandez E, Crespí Villarias N, et al. Mortality after osteoporotic hip fracture: incidence, trends, and associated factors. *J Orthop Surg Res*. 2019;14(1):203.
21. Court-Brown CM, Caesar, B. Epidemiology of adult fractures: A review. *Injury*. 2006; 37(8): 691–697.
22. Bäcker, H. C. et al. Epidemiology of proximal femoral fractures. *J. Clin. Orthop. Trauma*. 2021; 12(1): 161–165.
23. Zhu Y, Chen W, Sun T, et al. Epidemiological characteristics and outcome in elderly patients sustaining non-simultaneous bilateral hip fracture: a systematic review and meta-analysis. *Geriatr Gerontol Int*. 2015;15(1):11-8.
24. Crawford JR, Parker MJ. Seasonal variation of proximal femoral fractures in the United Kingdom. *Injury*. 2003;34(3):223-5.
25. Johansen A, Grose C, Havelock W. Hip fractures in the winter-Using the National Hip Fracture Database to examine seasonal variation in incidence and mortality. *Injury*. 2020;51(4):1011-1014.
26. Bulajic-Kopjar M. Seasonal variations in incidence of fractures among elderly people. *Inj Prev*. 2000; 6:16–9.FGF
27. Kim M, Chang M, Nam E, et al. Fall characteristicsamong elderly populations in urban and rural areas in Korea. *Medicine (Baltimore)*. 2020;99(46): e23106.

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Research Article/Özgün Araştırma

The effect of subcutaneous drain use on the healing process and development of recurrences in open repair of incisional hernias

İnsizyonel herninin açık yöntemle tamirinde cilt altı dren kullanımının iyileşme sürecine ve nüks gelişimine etkisi

Azad Gazi ŞAHİN[1], Erman ALÇI[1]

[1]Balıkesir University, Faculty of Medicine, Department of Surgical Medical Sciences, Department of General Surgery, 10185, Balıkesir-Turkey

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Abstract

Aim: Incisional hernias are a common complication following abdominal surgical procedures. This retrospective study aimed to evaluate the role of perioperative drains in the healing process following incisional hernia repair using mesh.

Materials and Methods: A total of 117 patients who underwent elective hernia repair surgery were analyzed. Patients were divided into two groups based on whether a subcutaneous drain was inserted perioperatively. Various clinical outcomes were assessed.

Results: Drains were used in 64.1%, with seroma and surgical site infections observed in 6% each and a recurrence rate of 11.9%. Defect size significantly increased drain use, while BMI prolonged hospital stay by 7% per unit. Recurrence, seroma, and surgical site infections were not significantly affected by other factors.

Conclusion: The results of the study suggest that routine use of drains in incisional hernia repair may not be necessary and that their benefits remain uncertain.

Keywords: Incisional hernia; Subcutaneous drain; Recurrence; Seroma.

Öz

Amaç: İnsizyonel fıtıklar, karın cerrahisi işlemlerini takiben sık görülen bir komplikasyondur. Bu retrospektif çalışma, mesh kullanılarak insizyonel fıtık onarımı sonrası iyileşme sürecinde perioperatif drenlerin rolünü değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Elektif insizyonel herni onarımı uygulanan toplam 117 hasta analiz edildi. Hastalar perioperatif olarak subkutan dren koyulup koyulmadığına göre iki gruba ayrıldı. Çeşitli klinik sonuçlar değerlendirildi.

Bulgular: Drenler %64,1 hastada kullanılmış, seroma ve yara enfeksiyonu oranları her biri için %6 olarak saptanmış ve nüks oranı %11,9 olarak belirlenmiştir. Defekt boyutu dren kullanımını anlamlı şekilde artırırken, BMI hastanede kalış süresini birim başına %7 oranında uzatmıştır. Nüks, seroma ve yara enfeksiyonları diğer faktörlerden anlamlı şekilde etkilenmemiştir.

Sonuç: Çalışmanın sonuçları, insizyonel fıtık onarımında drenlerin rutin kullanımının gerekli olmayabileceğini ve faydalarının belirsiz kaldığını öne sürmektedir.

Anahtar Kelimeler: İnsizyonel herni; Cilt altı dreni; Nüks, Seroma.

Yazışma Adresi/Address for Correspondence: Erman ALÇI, Balıkesir University, Faculty of Medicine, Department of Surgical Medical Sciences, Department of General Surgery, 10185, Balıkesir-Turkey, E-mail: ealci@yahoo.com

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Introduction

Incisional hernias, which occur due to inappropriate closure of the fascia following abdominal surgical interventions for various reasons, lead to significant labour loss and morbidity and negatively affect the quality of life.[1,2] An incisional hernia may develop after all abdominal incisions, such as midline, Pfannenstiel, McBurney, and paramedian incisions. Between 4% and 12% of all closed abdominal incisions result in incisional hernias.[2–4] Risk factors include comorbidities such as obesity, diabetes mellitus, chronic obstructive pulmonary disease, and patient-related factors such as advanced age, male gender, steroid use, emergency surgical operations, surgical site infection, the type of abdominal surgery (open/laparoscopic surgery, bariatric surgery, malignancy surgery), and technical factors such as the closure of the fascial defect with continuous/intermittent sutures.[5,6]

This fascial defect may cause incarceration and strangulation in a significant proportion of patients, necessitating emergency abdominal surgery. Additionally, large hernias may require surgery in many patients for cosmetic reasons.[7]

Repair of incisional hernias can be performed using open, laparoscopic, or robotic surgical methods; anatomical repair or the use of prosthetic materials.[8] Many synthetic or biologic prosthetic materials have been frequently used in incisional hernia surgery in recent years.[9] The type of surgery and whether or not prosthetic materials will be used varies from patient to patient. Complications such as hematoma, seroma, surgical site infection, nosocomial infections, intestinal obstruction, chronic fistula, chronic pain, and recurrence may develop after the repair of the incisional hernia.[10,11] Recurrence rates have been reported to range between 8% and 27% in the literature.[4,12,13] Despite a lack of sufficient scientific evidence or expert consensus, the use of drains is a traditional method to prevent the perioperative or postoperative development of seroma or hematoma.[1] However, whether the use of drains contributes to wound healing and prevents the development of recurrences has not been fully clarified. Some authors have suggested that drains increase the risk of infection, cause pain, and may have undesirable consequences, such as prolonged postoperative hospital stays. Additionally, studies suggesting that the use of drains does not prevent the development of postoperative seroma have made the use of drains in incisional hernia surgery a controversial issue.[14]

We retrospectively evaluated the surgically repaired cases of incisional hernia in our clinic to determine whether drains placed after incisional hernia repair operations aid in the healing process.

Materials and Methods

This is a retrospective study in which a total of 117 patients who underwent incisional hernia repair using mesh between June 2019 and December 2022 in the General Surgery Clinic of Balıkesir University Hospital were analyzed. The study was approved by Balıkesir University Clinical Research Ethics Committee. Informed consent was obtained preoperatively from all patients. Patients older than 18 years of age with a diagnosis of incisional hernia who underwent elective open hernia repair surgery using mesh were included in the study. Patients who underwent laparoscopic surgery, emergency surgery due to incarceration or strangulation, or those in whom mesh was not used during repair were excluded from the study. The same type of mesh (polypropylene mesh) was placed in all patients using the same technique (onlay) by four senior surgeons in the general surgery department. Negative pressure drain systems (VAC) were used in the study. These drains were routinely placed to prevent postoperative fluid accumulation and were generally removed within 2–3 days in patients without complications. During the postoperative period, sterile dressings were applied to all patients. The first dressing was changed 24 hours after surgery, followed by daily dressing changes using an antiseptic solution (povidone-iodine). Abdominal support garments were recommended for all patients after surgery, and they were advised to use them regularly for a period of 4 weeks. In our study, dissection was performed to provide sufficient space for mesh placement, typically

aiming for at least a 5 cm area beyond the defect margins to allow for comfortable placement of the mesh. This approach aimed to balance expanding the surgical field with minimizing tissue trauma. Patients who underwent incisional hernia repair were divided into two groups based on whether or not a subcutaneous drain was inserted perioperatively. In the series of 117 patients, Group 1 consisted of 75 patients in whom the same type of subcutaneous drain was used during the operation, while Group 2 consisted of 42 patients in whom no drain was used. These groups were evaluated in terms of age, gender, hernia diameter, duration of hospitalization, surgical site infection, seroma formation, recurrent hernia development, and timing of drain removal. The complete healing was evaluated based on clinical parameters such as the absence of surgical site infection, seroma formation, recurrence, and postoperative complications. Recurrences were defined as the development of hernias at any time after complete healing. The mean follow-up period was 21 months (12-43 months).

Statistical analysis

In summarizing the data obtained from the study, descriptive statistics were tabulated as mean ± standard deviation or median, minimum and maximum depending on the distribution pattern of continuous (numerical) variables. Categorical variables were summarized as numbers and percentages. The fitness of the numerical variables to normal distribution pattern was checked by Shapiro-Wilk, Kolmogorov-Smirnov and Anderson-Darling tests.

In intergroup comparisons of differences in categorical variables, Pearson Chi-Square test was used in 2x2 contingency tables with expected cell counts of ≥5. However, Fisher's Exact Test was used in tables with expected cell counts below 5, and Fisher-Freeman-Halton test was used in RxC tables with expected cell counts below 5.

In comparisons between two independent groups, Independent Samples t-Test was used for normally, and Mann- Whitney U test for non-normally distributed numerical variables.

In comparisons among more than two independent groups, One-Way ANOVA test was preferred for normally, and Kruskall-Wallis H test for non-normally distributed numerical variables. For multiple comparisons Games-Howell or Tukey test was used in parametric, and Dwass-Steel-Critchlow-Fligner test in nonparametric tests.

Spearman's Rho correlation coefficient was used to evaluate the relationship between non-normally distributed variables.

In this study, five different regression analyses were applied to investigate the effects of drain use on the healing process in incisional hernia repair. Each analysis included univariate and multivariate regression models to predict specific clinical outcomes (drain requirement, length of hospitalization, recurrence, surgical site infection, and seroma).

In each analysis, the effect of variables on outcomes was assessed using Odds Ratios (ORs), 95% Confidence Intervals (CIs) and p values. Univariate regression models were used to assess the independent effect of each variable, and multivariate regression models were applied to assess the effect of each variable when all other variables were controlled.

Statistical analyses were performed with Jamovi (Version 2.3.28) and JASP (Version 0.17.3) statistical software programs and the level of statistical significance was set at p=0.05.

Ethics committee approval

This study was approved by the Clinical Studies Ethics Board of Balıkesir University (date: 20.12.2023, No. 2023/191). This study conformed to the principles of Helsinki Declaration.

Results

The study population, with a median age of 57 years, consisted of 72 (61.5%) female and 45 (38.5%) male patients. The mean follow-up period was 21 months (12-43 months). Postoperatively, drains were used in 75 (64.1%) patients, while they were not used in 42 (35.9%) patients. The mean body mass

index (BMI) was 29.7 kg/m². The defect size was < 4 cm in 29 (24.8%), 4-10 cm in 54 (46.2%), and > 10 cm in 34 (29.1%) patients. Seroma formation and surgical site infection were observed in 7 (6.0%) patients each. The median hospitalization time was 2 days, with a median drain removal time also of 2 days. Recurrence was seen in only 14 (11.9%) out of 127 patients (Table 1). A total of 20 cases operated on for incisional hernia were recurrent incisional hernias. Among these, postoperative drains were placed in 12 cases, while no drains were used in 8 cases.

Table 1. Demographic, and clinical characteristics of cases with incisional hernia.

		Total n=117
Age (year) median (range)		57.0 [32.0 – 89.0]
Gender. n (%)	Female	72 (61.5)
	Male	45 (38.5)
Presence of drains, n (%)	No	42 (35.9)
	Yes	75 (64.1)
[1]BMI kg/m² (mean)		29.7 ± 3.7
Defect size		
<4 cm, n (%)		29 (24.8)
4-10 cm, n (%)		54 (46.2)
> 10 cm, n (%)		34 (29.1)
Seroma formation, n (%)	No	110 (94.0)
	Yes	7 (6.0)
Surgical site infection, n (%)	No	110 (94.0)
	Yes	7 (6.0)
Length of hospital stay (day): median (range)		2.0 [1.0 – 4.0]
Drain removal time (day): median (range)		2.0 [1.0 – 6.0]
Recurrence, n (%)	No	103 (88.1)
	Yes	14 (11.9)

[1]BMI: Body mass index

There were no significant differences between patients in whom drains were used and those in whom they were not used in terms of age, gender, seroma formation, surgical site infection, length of hospital stay, and recurrence rates (p>0.05 for each). BMI values were significantly higher in patients with drains (p=0.015). Drains were used significantly less frequently in patients with a defect size of less than 4 cm (p<0.001). Drain insertion rates were similar in patients with defect sizes between 4-10 cm and larger than 10 cm (Table 2). Hematoma development was observed in a total of 3 patients in the group where drains were used, while it was detected in 2 patients in the group without drains. When 72 patients with drains were classified according to the Clavien-Dindo classification: 3 patients (4.1%) were classified as grade 1, 3 patients (4.1%) as grade 2, 2 patients (2.7%) as grade 3a, 1 patient (2.7%) as grade 3b, and 1 patient (2.7%) as grade 4a. When 45 patients without drains were classified according to the Clavien-Dindo classification: 2 patients (4.4%) were classified as grade 1, 2 patients (4.4%) as grade 2, 1 patient (2.2%) as grade 3a, 2 patients (4.4%) as grade 3b, and 1 patient (2.2%) as grade 4a. For patients with seroma from both the drained and non-drained groups, bedside aspiration procedures were performed, while patients with surgical site infections were treated with antibiotic therapy. Patients with subcutaneous abscesses underwent percutaneous surgical drainage procedures and were treated with antibiotic therapy. One patient from each group requiring respiratory support was monitored in the intensive care unit, and no mortality was observed between the groups.

According to the results of the univariate logistic regression analyses, no significant effects of age and gender were observed on drain insertion rates (p>0.05), whereas BMI and defect size had a significant impact on this parameter. Accordingly, a 1-unit increase in BMI increased the probability of drain use by 14% (p=0.028), while the frequency of drain use increased 4.09 times (p=0.004) in patients with a defect size between 4-10 cm and 22.96 times (p<0.001) in patients with a defect size greater than 10 cm compared to patients with a defect size less than 4 cm (Table 3). In our

study, the relationship between seroma, surgical site infection, and recurrence development was evaluated. In univariate analysis, it was observed that seroma (OR: 3.12; 95% CI: 0.88–11.02; *p*=0.081) and surgical site infection (OR: 2.45; 95% CI: 0.74–8.18; *p*=0.135) might increase the risk of recurrence, but this relationship was not found to be statistically significant.

Table 2. Comparison of demographic and clinical characteristics in incisional hernia patients according to drain use

	Drain use		***p***
	No (n=42)	**Yes** (n=75)	
Age (year) median (range)	58.0 [32.0 – 78.0]	57.0 [34.0 – 89.0]	0.089**
Gender. n (%)			
Female	29 (69.0)	43 (57.3)	0.293*
Male	13 (31.0)	32 (42.7)	
[1]BMI kg/m^2 (mean)	28.6 ± 2.9	30.2 ± 4.0	**0.015*** **
Defect size [‡]			
<4 cm, n (%)	20 (47.6)[a]	9 (12.0)[b]	**<0.001***
4-10 cm, n (%)	19 (45.2)[a]	35 (46.7)[a]	
> 10 cm, n (%)	3 (7.1)[a]	31 (41.3)[a]	
Seroma formation, n (%)	3 (7.1)	4 (5.3)	0.700*
Surgical site infection, n (%)	4 (9.5)	3 (4.0)	0.248*
Length of hospital stay (day): median (range [§]	2.0 [1.0 – 3.0]	2.0 [1.0 – 4.0]	0.256**
Drain removal time (day): median (range)[§]	--	2.0 [1.0 – 6.0]	--
Recurrence, n (%)	6 (14.2)	8 (10.6)	0.700*

a, b: Letters signifying the presence of intergroup differences.
*. Pearson Chi-Square or Fisher's Exact test.
**. Mann-Whitney U test.
***. Independent Samples t-Test.

According to the results of the multivariate logistic regression analyses, age, gender and BMI had no significant effect ($p<0.05$), whereas defect size had a significant effect on drain insertion rates. Accordingly, drain insertion rates increased 4.06 times ($p=0.007$) in patients with a defect size between 4-10 cm and 19.37 times ($p<0.001$) in patients with a defect size larger than 10 cm compared to patients with a defect size smaller than 4 cm (Table 3).

Table 3. Factors associated with the use of drains in cases with incisional hernia.

"Logistic regression analysis predicting use of drains"	**Univariate Logistic Regresssion**		**Multivariate Logistic Regresssion**	
	OR. [95%CI]	***p* value**	**OR. [95%CI]**	**P value**
Age	0.97 [0.94 – 1.01]	0.103	0.98 [0.94 – 1.01]	0.191
Gender: *Male vs. Female*	1.66 [0.75 – 3.69]	0.213	1.46 [0.59 – 3.61]	0.407
BMI	1.14 [1.01 – 1.27]	**0.028**	1.02 [0.89 – 1.17]	0.750
Defect size: *ref.= <4 cm*				
4-10 cm	4.09 [1.56 – 10.74]	**0.004**	4.06 [1.47 – 11.22]	**0.007**
>10 cm	22.96 [5.54 – 95.21]	**<0.001**	19.37 [4.24 – 88.52]	**<0.001**

BMI: Body mass index; OR: Odds ratio, CI:: Confidence interval

According to the results of the univariate logistic regression analyses, age, gender, defect size, surgical site infection, seroma formation, and drain use had no significant effect on the length of hospital stay ($p>0.05$ for each). However, a 1-unit increase in BMI caused an 8% increase in the length of hospital stay ($p<0.001$) (Table 4).

According to the results of the multivariate regression analyses, no significant effect of age, defect size, and drain use was observed on the length of hospital stay, while hospitalization time decreased by 31% in males compared to females, and a 1-unit increase in BMI caused a 7% increase in length of hospital stay ($p=0.001$) (Table 4).

In cases with incisional hernia, the results of both univariate and multivariate logistic regression analyses revealed that age, gender, BMI, defect size, presence of drains, and length of hospital stay did not have significant effects on recurrence rates ($p>0.05$ for each) (Table 5).

Tablo 4. Factors effecting the length of hospital stay in cases with incisional hernia.

"Linear regression analysis predicting the length of hospital stay"	**Univariate Linear Regresssion**		**Multivariate Linear Regresssion**	
	OR. [95%CI]	***p* value**	**OR. [95%CI]**	***p* value**
Age	-0.01 [-0.02 – 0.01]	0.162	-0.01 [-0.02 – 0.01]	0.286
Gender: *Male vs. Female*	-0.29 [-0.61 – 0.02]	0.067	-0.31 [-0.61 – 0.01]	**0.049**
BMI	0.08 [0.04 – 0.12]	**<0.001**	0.07 [0.03 – 0.12]	**0.001**
Defect size: *ref.= <4 cm*				
4-10 cm	0.21 [-0.17 – 0.59]	0.283	0.10 [-0.29 – 0.49]	0.609
>10 cm	0.35 [-0.07 – 0.77]	0.104	-0.02 [-0.49 – 0.46]	0.948
Surgical site infection: *Yes vs. No*	0.12 [-0.52 – 0.77]	0.707		
Seroma formation: *Yes vs. No*	-0.18 [-0.83 – 0.47]	0.589		
Drain use : *Yes vs. No*	0.23 [-0.09 – 0.54]	0.167	0.12 [-0.22 – 0.46]	0.484

BMI: Body mass index; OR: Odds ratio, CI: Confidence interval

Table 5. Factors effective on recurrence rates in cases with incisional hernia.

"Logistic regression analyses predicting development of recurrences"	**Univariate Logistic Regression**		**Multivariate Logistic Regression**	
	OR. [95%CI]	***p* value**	**OR. [95%CI]**	***p* value**
Age	1.01 [0.95 – 1.07]	0.876		
Gender: *Male vs. Female*	1.21 [0.26 – 5.7]	0.806		
BMI	0.86 [0.68 – 1.09]	0.221	0.81 [0.61 – 1.08]	0.154
Defect size: *ref.= <4 cm*				
4-10 cm	0.25 [0.02 – 2.94]	0.273	0.39 [0.03 – 4.78]	0.460
>10 cm	1.80 [0.30 – 10.62]	0.516	4.21 [0.54 – 32.74]	0.169
Drain use: *Yes vs. No*	0.73 [0.16 – 3.44]	0.693		
Length of hospital stay	0.59 [0.21 – 1.65]	0.319	0.76 [0.25 – 2.32]	0.633

BMI: Body mass index; OR: Odds ratio, CI: Confidence interval

According to the results of univariate logistic regression analyses in cases with incisional hernia, age, gender, presence of seroma, drain use, and length of hospital stay had no significant effect on the development of surgical site infection (p>0.05 for each), whereas defect size had a significant effect on this parameter. Accordingly, the risk of surgical site infection increased by 9% in cases with a defect size of 4-10 cm compared to cases with a defect size of less than 4 cm (p=0.032), while these parameters had no significant effect on the risk of surgical site infection in cases with a defect size greater than 10 cm (p=0.087) (Table 6).

Table 6. Factors effective on the development of surgical site infections in cases with incisional hernia

"Logistic regression analyses predicting development of surgical site infection"	**Univariate Logistic Regression**		**Multivariate Logistic Regression**	
	OR. [95%CI]	***p* value**	**OR. [95%CI]**	***p* value**
Age	0.95 [0.9 – 1.02]	0.146	0.95 [0.88 – 1.02]	0.128
Gender: *Male vs. Female*	0.62 [0.12 – 3.36]	0.582		
BMI	0.86 [0.68 – 1.09]	0.221	0.98 [0.76 – 1.26]	0.858
Defect size: *ref.= <4 cm*				
4-10 cm	0.09 [0.01 – 0.82]	**0.032**	0.11 [0.01 – 1.14]	0.064
>10 cm	0.15 [0.02 – 1.33]	0.087	0.15 [0.01 – 2.44]	0.181
Seroma formation: *Yes vs. No*	2.89 [0.3 – 28]	0.360		
Drain use: *Yes vs. No*	0.4 [0.08 – 1.86]	0.241	0.71 [0.1 – 4.83]	0.726
Length of hospital stay	1.19 [0.49 – 2.87]	0.704		

BMI: Body mass index; OR: Odds ratio, CI: Confidence interval

In cases with an incisional hernia, the results of both univariate and multivariate logistic regression analyses revealed that age, gender, BMI, defect size, surgical site infection, and the presence of drains did not have significant effects on seroma formation (p>0.05 for each) (Table 7).

Discussion

Despite the lack of sufficient scientific evidence or expert consensus, perioperative drain placement is a common practice among surgeons in order to remove perioperative and postoperative fluid.[1] Although there is no consensus on whether these drains improve wound healing or prevent recurrences, some authors have stated that they may lead to

undesirable outcomes such as an increased risk of infection, pain, and prolonged postoperative hospitalization.[14,15] In this study, we aimed to investigate whether drains help healing and prevent the development of recurrences in open repair of incisional hernia using mesh. In our study, in line with the recommendations in the literature, mesh was placed in all patients undergoing surgery for incisional hernia, regardless of defect size. Numerous randomized controlled trials in the literature emphasize that the use of mesh significantly reduces recurrence rates and improves long-term surgical outcomes, even in defects smaller than 2 cm[8,12].

Table 7. Factors effective on the seroma formation in cases with incisional hernia

"Logistic regression analyses predicting seroma formation"	**Univariate Logistic Regression**		**Multivariate Logistic Regression**	
	OR. [95%CI]	***p* value**	**OR. [95%CI]**	***p* value**
Age	1.04 [0.97 – 1.11]	0.244	1.04 [0.98 – 1.12]	0.200
Gender: *Male vs. female*	1.21 [0.26 – 5.7]	0.806		
BMI	0.95 [0.76 – 1.18]	0.623		
Defect size: *ref.= <4 cm*				
4-10 cm	1.08 [0.19 – 6.28]	0.932		
>10 cm	0.41 [0.04 – 4.76]	0.475		
Surgical site infection: *Yes vs.No*	2.89 [0.30 – 28]	0.360	3.86 [0.37 – 40.77]	0.261
Drain use: *Yes vs.No*	0.73 [0.16 – 3.44]	0.693		

BMI: Body mass index; OR: Odds ratio, CI: Confidence interval

Although male gender is among the risk factors for incisional hernia, 72 (61.5%) of the 117 patients included in our study were female, and 45 (38.5%) were male. Consistent with the literature data, the median age of the patients was 57 years. We observed that, consistent with the relevant literature data, female gender and obesity prolonged the postoperative hospital stay.[6,16] The longer hospital stay of obese patients may be explained by the presence of a greater number of comorbidities or their increased susceptibility to complications.

In our study, we focused on the effects of drain use in incisional hernia repair. The findings revealed that the use of drains had no significant effect on factors such as seroma formation, surgical site infection, length of hospital stay, and recurrence rates. Some authors have not routinely recommended the use of drains, indicating that their presence does not reduce postoperative fluid collection.[1,17] For example, one study showed that drain use did not objectively reduce the rate of postoperative fluid collection and that routine drain use in incisional hernia repair was unnecessary.[17] On the other hand, a study by Miller et al. showed a significantly lower rate of seroma formation in the group where drains were used.[18] Mohamedahmed et al. found that drainage was associated with higher rates of surgical site infections; however, they couldn't find a significant correlation between drainage and seroma, hematoma formation or recurrence.[19]

In our study, it was observed that the risk of infection increased by 9% (p= 0.032) in hernia defects measuring 4–10 cm, but this increase was not statistically significant in defects larger than 10 cm (p= 0.087). This may be attributed to the small number of cases in the large defect group and the limited statistical power, resulting in a random variation. Additionally, in incisional hernia surgeries, defects larger than 10 cm are often considered more complex cases, and surgeons tend to exercise greater caution during such procedures. We believe this heightened caution may have acted as a factor reducing the risk of infection, thereby influencing our results. It is evident that these findings need to be supported by further studies with larger patient groups.

In our study, the recurrence rate was found to be 11.9%, which is consistent with the reported range of 8–27% in the literature. Possible causes of recurrence reported in the literature include large defect sizes, obesity, inadequate surgical techniques, and postoperative complications[8,11,12]. In our study, variables that might influence recurrence, such as age, sex, BMI, hernia defect size, postoperative seroma, and surgical site infection, were evaluated. Statistical analyses

did not find any significant effect of these parameters on recurrence. However, higher recurrence rates were observed in patients with large hernia defects (>10 cm) and high BMI. Additionally, although not statistically significant, recurrence rates were higher in cases with postoperative seroma and surgical site infection. We attribute the lack of statistical significance to the limited sample size and the heterogeneity of the patient group. We believe that larger-scale studies could provide better insights into this issue.

The prolongation of hospital stay due to higher BMI in incisional hernia surgeries can be associated with the common comorbidities observed in obese patients, the increased complexity of surgical procedures, and challenges related to wound healing and mobilization in the postoperative period.[5,6] These findings once again highlight the importance of obesity management in surgical planning for patients undergoing incisional hernia surgery.

A study has shown that the use of drains did not create a statistically significant difference in the formation of postoperative seroma and the development of surgical site infections.[20] In another study, Louis et al. reported that the use of drains had no significant effect on the occurrence of surgical site infection.[21] In a record-based analysis of 39,523 patients, similar to our study, Sahm et al. showed that the use of drains in incisional hernia surgery did not prevent recurrences.[14]

The literature emphasizes that differences in patient characteristics, surgical techniques, and types of drains may influence seroma formation. For example, in our study, active negative pressure drains were generally used subcutaneously, whereas some studies in the literature report the use of passive subcutaneous drains operating under the effect of gravity. Additionally, surgical practices such as closing dead spaces and using compression garments in the postoperative period in our study may have limited the impact of drains on seroma formation.[4,11,12]

In the light of all these results, we think that the use of drains in incisional hernia repair does not decrease complication rates nor prevent recurrences. However, in this study, according to the results of the univariate logistic regression analyses, we observed that BMI values were significantly higher in patients in whom drains were used. In multivariate analysis, we observed that this effect of BMI became insignificant due to its interaction with other variables. In our study, we also found that drains were used at a significantly lower rate in patients with a defect size of less than 4 cm, but the rates of drain use were similar in patients with a defect size of 4-10 cm and those larger than 10 cm. Some studies have shown that obesity and larger hernia defects may increase the complication and recurrence rates after hernia operations.[22–25] We speculate that the higher rate of drain use in obese patients or patients with larger defects in our study was due to surgeons believing that obesity and large hernias increased the risk of complications such as recurrence and surgical site infection, prompting them to use drains more cautiously in this group. Similarly, we observed that surgeons tended to use drains more frequently in obese patients or those with large defects. In the aforementioned record-based analysis by Sahm et al., more frequent use of drains in patients with higher BMI or large defects was reported, consistent with our study results.[14] Specifically, the increased risk of infection in defects measuring 4–10 cm is suggested to be due to the surgical dissection becoming more complex and the formation of larger dead spaces in defects of this size. Additionally, these defects are often observed in patients with higher BMI or comorbid conditions. However, the lack of a significant increase in infection risk for defects larger than 10 cm may be explained by surgeons applying stricter infection prevention protocols and employing more meticulous surgical techniques in these cases. Furthermore, the smaller number of patients in this group may have limited the ability to detect statistical significance.

The reasons for longer hospital stays in obese patients are not limited to observed complications. This situation can be associated with obesity-related comorbidities, subclinical problems, surgeons' preventive approaches, and individual differences in recovery

processes. The need for closer monitoring in obese patients is evident. In particular, for patients with high BMI, longer hospital stays were often preferred to observe early signs of complications. We believe that the low complication rates may be attributed to the careful and meticulous surgical approaches employed by our surgeons for obese patients.

The retrospective nature of our study and the relatively small number of cases in our series compared to the literature are the limitations of this study. We believe that studies with a larger number of patients should be performed to understand the benefits of drains in incisional hernia surgery and their roles (if any) in preventing recurrences.

Conclusion

This study has provided important information for treatment planning and management of incisional hernias by evaluating the effects of drain use and various influential factors. It was shown that surgeons were more inclined to use drains as body mass index and defect size increased and that there was no difference in wound healing, postoperative infection, length of hospital stay, and recurrence in patients with and without drains. To address the question about the benefits of drains placed during incisional hernia repair, we believe that studies involving a larger number of patients should be conducted.

Ethics Committee Approval

This study was approved by the Clinical Studies Ethics Board of Balıkesir University (date: 20.12.2023, No. 2023/191). This study conformed to the principles of Helsinki Declaration.

Informed Consent

Informed consent was obtained preoperatively from all patients.

Author Contributions

All of the authors contributed at every stage of the study.

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None

Conflicts of Interest

The authors declare that they have no conflict of interest.

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References

1. Gurusamy KS, Samraj K. Wound drains after incisional hernia repair. *Cochrane Database Syst Rev*. 2007;(1).
2. López-Cano M. Editorial: Incisional Hernia Prevention. *J Abdom wall Surg JAWS*. 2023;2:11495. doi:10.3389/jaws.2023.11495
3. Kössler-Ebs JB, Grummich K, Jensen K, et al. Incisional hernia rates after laparoscopic or open abdominal surgery—a systematic review and meta-analysis. *World J Surg*. 2016;40:2319-2330.
4. Deerenberg EB, Henriksen NA, Antoniou GA, et al. Updated guideline for closure of abdominal wall incisions from the European and American Hernia Societies. *Br J Surg*. 2022;109(12):1239-1250.
5. Kroese LF, Gillion J-F, Jeekel J, Kleinrensink G-J, Lange JF. Primary and incisional ventral hernias are different in terms of patient characteristics and postoperative complications-A prospective cohort study of 4,565 patients. *Int J Surg*. 2018;51:114-119.
6. Bosanquet DC, Ansell J, Abdelrahman T, et al. Systematic review and meta-regression of factors affecting midline incisional hernia rates: analysis of 14 618 patients. *PLoS One*. 2015;10(9):e0138745.
7. Cassar K, Munro A. Surgical treatment of incisional hernia. *Br J Surg*. 2002;89(5):534-545.
8. Sauerland S, Walgenbach M, Habermalz B, Seiler CM, Miserez M. Laparoscopic versus open surgical techniques for ventral or incisional hernia repair. *Cochrane database Syst Rev*. 2011;(3).
9. Olavarria OA, Bernardi K, Dhanani NH, et al. Synthetic versus biologic mesh for complex open ventral hernia repair: a pilot randomized controlled trial. *Surg Infect (Larchmt)*. 2021;22(5):496-503.
10. Eker HH, Hansson BME, Buunen M, et al. Laparoscopic vs open incisional hernia repair: a randomized clinical trial. *JAMA Surg*. 2013;148(3):259-263.
11. Kokotovic D, Bisgaard T, Helgstrand F. Long-term recurrence and complications associated with elective incisional hernia repair. *Jama*. 2016;316(15):1575-1582.
12. Pereira JA, Bravo-Salva A, Montcusí B, Pérez-Farre S, Fresno de Prado L, López-Cano M. Incisional hernia recurrence after open elective repair: expertise in abdominal wall surgery matters. *BMC Surg*. 2019;19:1-6.
13. Romain B, Renard Y, Binquet C, et al. Recurrence after elective incisional hernia repair is more frequent than you think: an international prospective cohort from the French Society of Surgery. *Surgery*. 2020;168(1):125-134.
14. Sahm M, Pross M, Hukauf M, Adolf D, Köckerling F, Mantke R. Drain versus no drain in elective open incisional hernia operations: a registry-based analysis with 39,523 patients. *Hernia*. Published online 2023:1-15.
15. Luo Y, Mohammed Jinnaah S, Masood D, Hodgson R. Drain tube use in incisional hernia repair: a national survey. *Hernia*. 2021;25:427-433.
16. Shankar H, Sureshkumar S, Gurushankari B, Sreenath GS, Kate V. Factors predicting prolonged hospitalization after abdominal

wall hernia repair-a prospective observational study. *Turkish J Surg*. 2021;37(2):96.
17. Willemin M, Schaffer C, Kefleyesus A, et al. Drain versus no drain in open mesh repair for incisional hernia, results of a prospective randomized controlled trial. *World J Surg*. 2023;47(2):461-468.
18. Miller BT, Tamer R, Petro CC, et al. Retromuscular drain versus no drain in robotic retromuscular ventral hernia repair: a propensity score-matched analysis of the abdominal core health quality collaborative. *Hernia*. 2023;27(2):409-413.
19. Mohamedahmed AYY, Zaman S, Ghassemi N, et al. Should routine surgical wound drainage after ventral hernia repair be avoided? A systematic review and meta-analysis. *Hernia*. 2023;27(4):781-793.
20. Westphalen AP, Araújo ACF, Zacharias P, Rodrigues ES, Fracaro GB, Lopes Filho G de J. Repair of large incisional hernias. To drain or not to drain. Randomized clinical trial. *Acta Cir Bras*. 2015;30:844-851.
21. Louis V, Diab S, Villemin A, et al. Do surgical drains reduce surgical site occurrence and infection after incisional hernia repair with sublay mesh? A non-randomised pilot study. *Hernia*. 2023;27(4):873-881.
22. Bueno-Lledó J, Bonafe-Diana S, Carbonell-Tatay F, Torregrosa-Gallud A, Pous-Serrano S. Component separation and large incisional hernia: predictive factors of recurrence. *Hernia*. 2021;25(6):1593-1600.
23. Van Silfhout L, Leenders LAM, Heisterkamp J, Ibelings MS, Tilburg VHG. Recurrent incisional hernia repair: surgical outcomes in correlation with body-mass index. *Hernia*. 2021;25:77-83.
24. Gignoux B, Bayon Y, Martin D, et al. Incidence and risk factors for incisional hernia and recurrence: retrospective analysis of the French national database. *Color Dis*. 2021;23(6):1515-1523.
25. Moreno-Egea A, Carrillo-Alcaraz A, Aguayo-Albasini JL. Is the outcome of laparoscopic incisional hernia repair affected by defect size? A prospective study. *Am J Surg*. 2012;203(1):87-94.

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Research Article/Özgün Araştırma

Incidental findings of brain magnetic resonance imaging in patients with treatment-resistant depression

Tedaviye dirençli depresyon hastalarında beyin manyetik rezonans görüntülemenin tesadüfi bulguları

Olga BAYAR KAPICI[1], Yaşar KAPICI[2], Mehmet ŞİRİK[2], Dilek ÖRÜM[3]

[1]Adana Seyhan State Hospital, 01150, Adana-Turkey
[2]Adıyaman University, Faculty of Medicine, 02040, Adıyaman-Turkey
[3]Elazig Fethi Sekin City Hospital, 23280, Elazığ-Turkey

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Abstract

Aim: In this study, incidental findings of brain magnetic resonance imaging (MRI) of patients diagnosed with treatment-resistant depression (TRD) were compared with healthy controls (HC).

Materials and Methods: The study included 68 patients with TRD (42 females, 26 males) and 72 HC (35 females, 37 males). Global assessment scale (GAS) was administered.

Results: In the TRD group, those with general cerebral atrophy were found to have significantly lower global assessment scale (GAS) scores (p<0.001). In the TRD group, those with cavum veli interpositi (CVI) were found to have significantly lower GAS scores (p=0.001). In the TRD group, when the effect of age was controlled, a significant correlation was found between the GAS score and the duration of the disorder (r=-0.400; p=0.001).

Conclusion: CVI, a neurodevelopmental abnormality, has been shown to be more common in patients diagnosed with TRD.

Keywords: Treatment-resistant major depressive disorder; Magnetic resonance imaging; Incidental finding.

Öz

Amaç: Bu çalışmada, tedaviye dirençli depresyon (TDD) tanılı hastaların beyin manyetik rezonans görüntüleme (MRG)'nin tesadüfi bulguları sağlıklı kontrollerle (SK) karşılaştırıldı.

Gereç ve Yöntem: Çalışmaya TDD tanılı 68 hasta (42 kadın, 26 erkek) ve 72 SK (35 kadın, 37 erkek) dahil edildi. Global değerlendirme ölçeği (GDÖ) uygulandı.

Bulgular: TDD grubunda, genel serebral atrofisi olanların global değerlendirme ölçeği (GDÖ) skorlarının anlamlı derecede düşük olduğu bulundu (p<0,001). TDD grubunda, kavum veli interpositi (KVİ) saptananların GDÖ skorlarının anlamlı derecede düşük olduğu bulundu (p=0,001). TDD grubunda, yaşın etkisi kontrol edildiğinde, GDÖ skoru ile bozukluk süresi arasında anlamlı bir korelasyon bulundu (r=-0,400; p=0,001).

Sonuç: Nörogelişimsel bir anormallik olan KVİ'nin TDD tanılı hastalarda daha yaygın olduğu gösterilmiştir.

Anahtar Kelimeler: Tedaviye dirençli majör depresif bozukluk; Manyetik rezonans görüntüleme; Tesadüfi bulgu.

Yazışma Adresi/Address for Correspondence: Yaşar KAPICI, Adıyaman Training and Research Hospital, Psychiatry Department, 02040, Adıyaman-Turkey, E-mail: dryasarkapici@gmail.com

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Introduction

Major depressive disorder (MDD) is characterized by symptoms including a persistently low mood, diminished pleasure in activities, fatigue, psychomotor retardation, difficulty concentrating, and disruptions in sleep and appetite. This condition imposes a substantial burden on affected individuals and is linked to significant economic costs.[1] According to 2015 data from the World Health Organization, the global prevalence of depression ranges from 2.90% to 6.31%, with a prevalence rate of 4.4% in Turkey.[2] MDD is influenced by a combination of social, cultural, and biological factors and is typically diagnosed in women at twice the rate of men. Approximately 40% of individuals experience their first depressive episode before the age of 20, with onset most commonly occurring between mid-adolescence and the mid-40s.[3,4]

MDD often follows a recurrent, lifelong course with episodic patterns. Approximately 80% of individuals experience at least one subsequent episode of depression. The likelihood of future episodes increases with each recurrence, particularly when the onset occurs at an older age, which is associated with less favorable outcomes.[5] While approximately half of patients recover within a year, with episodes typically lasting three to six months, the other half do not achieve full remission.[6] Treatment-resistant depression (TRD) describes cases where individuals fail to achieve remission despite several therapeutic interventions.[7] There is no singular, universally recognized definition of treatment-resistant depression (TRD); however, it is typically characterized in patients who do not exhibit a sufficient response to at least two trials of appropriate antidepressant therapy. Prevalence estimates vary widely due to these differing definitions, with rates reported between 12% and 55%.[8] Studies indicate that patients with substantial treatment resistance often experience ongoing symptoms and impaired functioning, despite continuous treatment.[9]

The mechanisms driving TRD remain incompletely understood. While structural brain alterations in MDD have been widely studied, research on brain structure in TRD is more limited. MRI studies on TRD patients have primarily focused on white matter (WM) and gray matter (GM) variations.[10] Research demonstrates that both first-episode MDD and TRD patients exhibit diminished gray matter volume in the right middle temporal cortex when contrasted with healthy controls (HC), with a notable reduction in bilateral caudate volume specifically in TRD cases.[11] Additionally, patients with TRD display decreased GM density in the right putamen, right superior frontal gyrus, and diminished volumes in the right caudate nucleus and right prefrontal lobe compared to HCs and individuals recovered from recurrent MDD. Fronto-striatal atrophy patterns in TRD have been significantly linked to disorder severity, affecting regions like the rostral anterior cingulate cortex and the hippocampus.[12] In TRD patients, reduced GM volumes in the insula and parahippocampal gyrus have also been reported, and in comparison to first-episode MDD, patients with TRD show smaller right medial frontal gyrus and left insula volumes, correlated with the duration of illness.[13] One WM study found a notable decrease in fractional anisotropy among TRD patients, involving regions such as the corpus callosum, forceps minor, forceps major, and bilateral superior and inferior longitudinal fasciculi.[14] Besides these commonly noted structural changes in MDD, incidental anatomical differences also exist. This study aims to identify incidental MRI findings in TRD patients, hypothesizing a possible link between these incidental findings and TRD.

Materials and Methods

Type of the study

A cross-sectional study.

The sample of the study

This study was conducted in Adıyaman Training and Research Hospital psychiatry outpatient clinic. Sociodemographic and clinical data of the participants were obtained through the hospital record system and e-nabiz. The e-nabiz application serves as a database that provides access to comprehensive medical histories of patients, including details on surgeries, hospital stays, laboratory results, imaging studies, allergy information,

diagnoses, prescribed medications, vaccination history, cancer screening records, intensive care details, reports, and emergency documentation. The treatment processes of patients followed up with depression spectrum disorder are recorded by their physicians. Through the patient registration system, information on the duration of medication use, depression severity score, and treatment resistance status of the patients can be accessed. Individuals who were similar to the TRD group in terms of age and gender, who applied to the hospital where the study was conducted for any reason and had MRIs obtained but were not diagnosed with any disease, were accepted as the control group.

The criteria of TRD

The definition of TRD adopted by the US Food and Drug Administration and the European Medicines Agency is failure to respond to two or more antidepressant regimens despite adequate dose and duration and adherence to treatment.[15] This definition was also taken into account in this presented study.

The procedures of the study

Brain MRIs scanned for any purpose are evaluated by the same hospital's radiologist and the imaging report is also recorded in the e-nabiz. Atrophy, one of the parameters investigated in this study, refers to generalized cerebral atrophy.

The Fazekas scale is utilized to classify and assess the severity of white matter (WM) hyperintensities observed in brain imaging studies. These lesions may signal a range of neurological issues, particularly related to small vessel disease or cerebrovascular conditions. The scale generally includes two main categories: Fazekas Score 0 indicates no significant WM hyperintensities, while Scores 1, 2, and 3 denote progressively greater severity of hyperintensities. Higher scores on the Fazekas scale are frequently linked to an increased risk of cognitive decline.[16]

The septum pellucidum is a delicate, semi-transparent bilaminar structure comprised of both white and gray matter, located between the anterior horns of the lateral ventricles in the brain. Variations of the septum pellucidum include the cavum septum pellucidum (CSP), cavum vergae (CV), and cavum veli interpositi (CVI).[17]

There were 72,325 admissions to the Adıyaman Training and Research Hospital psychiatry outpatient clinic between the specified dates. Nineteen thousand one hundred and fifty-two of these admissions were for health board reports. Nine thousand eight hundred and seventy-four of the remaining admissions consisted of depression spectrum disorder diagnoses. Information indicating that 2,843 of these admissions met the TRD criteria was recorded in the patient registration system. One hundred seventy-six of these admissions had a brain MRI report after TRD record. Abnormal brain MRI findings were reported in 11 of these reports. The e-nabiz records of the subjects with non-abnormal brain MRIs were examined in detail. Twenty-three patients were excluded due to a lack of sufficient data confirming they met the TRD criteria. Thirty-six patients were excluded due to comorbid mental disorder. Seven patients were excluded due to comorbid neurological disease, two patients due to history of brain trauma, one patient were excluded due to history of brain tumour, one patient due to previous brain surgery, four patients due to history of electroconvulsive therapy, and ten patients due to chronic and/or systemic diseases. Thirteen patients with TRD were excluded from the study because they were not in remission. Consequently, a total of 68 individuals diagnosed with TRD were incorporated into the study. A flowchart depicting the study's sample is provided in Figure 1. All included patients were in remission and were receiving regular psychotropic medications. The HC group consisted of individuals who had undergone brain MRI examinations due to conditions like non-migraine headaches and vertigo, with findings reported as normal. These individuals had no active illnesses and were not on any medication.

Data collection tools

Sociodemographic information for all patients was collected using the patient registration system. The Global Assessment

Scale, created by Endicott and Spitzer in 1976, is a rapid assessment tool that evaluates various dimensions of changes in psychopathology, including psychological, social, and professional functioning. This scale has a scoring range from 0 to 100.[18]

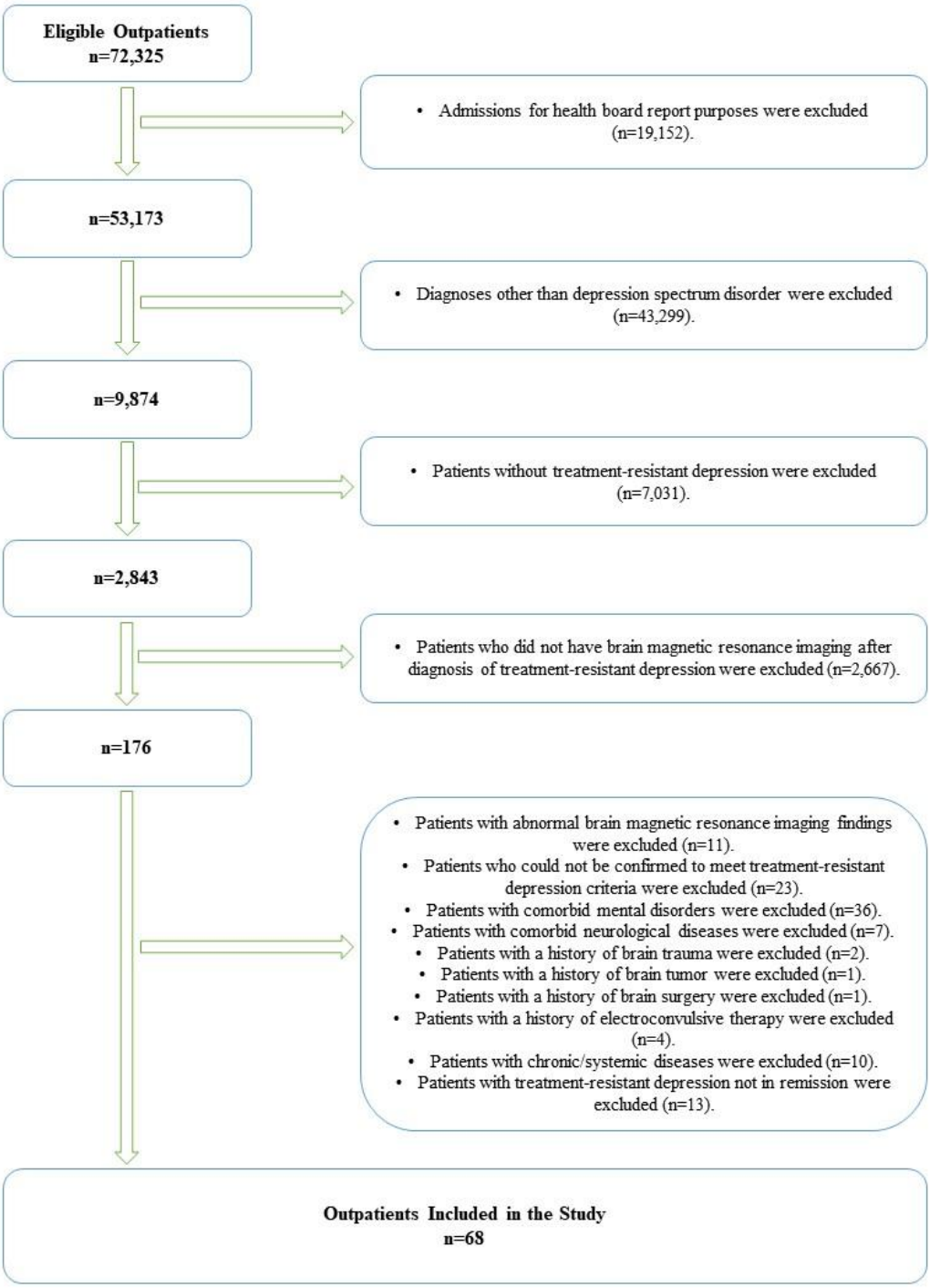

Figure 1. Flow-chart illustration of the study's sample

For brain MRI scans, we utilized a Philips Achieva MR machine (Philips Medical Systems, Best, Netherlands), applying a magnetic field intensity of 1.5 Tesla using a head coil. The mass intermedia was identified in cross-sectional images through the cranial midline, specifically from T1 FLAIR-weighted images in the sagittal plane. The MRI parameters included a repetition time (TR) of 1665 ms, echo time (TE) of 20 ms, a field of view (FOV) of 220×230, slice thickness of 5 mm, a matrix of 292×214, a number of acquisitions (NSA) of 1, a gap of 1 mm, voxel size of 0.75×1.07×5, and a total of 24 sections.

The images were evaluated using the PACS system at our facility and the Philips Achieva Rev R5 v30-rev.02 workstation. For the assessment, we employed T1-weighted axial, T2-weighted axial, FLAIR axial, T2-weighted coronal, and T1-weighted sagittal images. Patient data, including age, gender, and brain MRI findings, were recorded. The Fazekas scale was utilized to evaluate cognitive aging, following the guidelines for white matter hyperintensities (WMH). According to the Fazekas scale, grades 0–1 indicate spot foci, grade 2 signifies the initial formation of a foci group, and grade 3 refers to more extensively grouped areas.[19]

Data analysis

Statistical evaluations were conducted using IBM SPSS Statistics version 26.0 (IBM SPSS Inc., Chicago, IL, USA). Continuous variables were presented as averages with their standard deviations, and categorical variables were displayed as percentages. Kurtosis and skewness values were calculated and compliance with normal distribution was determined by the Kolmogorov-Smirnov test. For continuous data that met normality assumptions, an independent samples t-test was used for comparisons between independent binary groups; otherwise, the Mann-Whitney U test was applied. Categorical variables were evaluated using Chi-square tests and Fisher's Exact test. A p-value threshold of less than 0.05 was defined as statistically significant.

Ethics committee approval

Ethics committee approval was obtained from Adıyaman University for this study (Date of Decision: May 21, 2024; IRB Number: 2024/5-16). All methods followed the ethical guidelines outlined in the Declaration of Helsinki. Signed informed consent form was obtained from all participants.

Results

The TRD group included 68 participants (42 women and 26 men), whereas the HC group comprised 72 individuals (35 women and 37 men). The average age in the TRD group was 38.31 ± 9.30 years, compared to 37.28 ± 8.15 years in the HC group. There were no notable differences between the groups in terms of mean age (p=0.486) or gender distribution (p=0.118). Within the TRD group, the average duration of MDD was 13.98 ± 7.21 years.

All patients in the TRD group were using at least one antidepressant medication (venlafaxine 26, duloxetine 10, fluoxetine nine, bupropion seven, escitalopram seven, sertraline six, paroxetine two, and reboxetine one). Twenty-seven patients in the TRD group were using a second antidepressant medication (mirtazapine 10, clomipramine six, amitriptyline six, mianserin three, sertraline one, and escitalopram one). Four patients in the TRD group were using a third antidepressant medication (clomipramine three and amitriptyline one). As a result, 41 patients (60.30%) were using one antidepressant, 23 patients (33.80%) were using two antidepressants, and four patients (5.90%) were using three antidepressants. In the TRD group, 38 patients were using one of the antipsychotic medications other than quetiapine (olanzapine 13, aripiprazole 12, paliperidone five, risperidone four, sulpride two, and clozapine two). The number of patients using quetiapine for the treatment of insomnia in the TRD group was 18 (26.50%). In the TRD group, five patients (7.40%) were using lamotrigine as a mood stabilizer, while three patients (4.40%) were using lithium. In the TRD group, 16 patients (23.50%) were managed with single, 24 patients (35.30%) with double, 17 patients (25.00%) with triple, seven patients (10.30%) with quadruple and four patients (5.90%) with quintuple psychotropic medications (antidepressant, antipsychotic, or mood stabilizer). Three patients (4.40%) in the TRD group were on thyroid hormone replacement. There were no patients using benzodiazepines or psychostimulants.

The sociodemographic data and frequency of incidental MRI findings of the groups was shown in Table 1 and Table 2. The GAS score showing the level of functionality in the TRD group was significantly lower than in the HC group (p<0.001). Generalized cerebral atrophy (p=0.012), Fazekas grade (p=0.013), and CVI

(p=0.002) were significantly higher in the TRD group than in the HC group.

No remarkable differences were found between genders in terms of antidepressant type, antipsychotic type, thyroid replacement therapy, Fazekas grade, CVI, and generalized cerebral atrophy in patients with TRD (Table 2).

Table 1. Comparison of sociodemographic, clinical data, and incidental MRI findings between patients with TRD and HCs.

Variables	TRD (n=68) mean±SD & n (%)	HC (n=72) mean±SD & n (%)	*p*
Age (years)	38.31±9.30	37.28±8.15	0.486[a]
GAS score	64.55±8.43 (mean rank 34.50)	93.31±4.82 (mean rank 104.50)	<0.001*[b]
Gender (female/male)	42/26	35/37	0.118[c]
Atrophy (generalized atrophy)	6 (8.80)	0 (0.00)	0.012*[d]
Fazekas (grade 0/grade 1/grade 2/grade 3)	60/5/2/1	71/1/0/0	0.013*[d]
Cavum veli interpositi	8 (11.80)	0 (0.00)	0.002*[d]
Cavum septum pellucidum	4 (5.90)	0 (0.00)	0.053[d]
Cavum vergae	3 (4.40)	0 (0.00)	0.112[d]
Ethmoidal thickening	26 (38.20)	24 (33.30)	0.545[c]
Maxillary thickening	11 (16.20)	15 (20.80)	0.479[c]
Frontal thickening	1 (1.50)	4 (5.60)	0.193[d]
Sphenoid thickening	3 (4.40)	0 (0.00)	0.112[d]
Retention cyst	11 (16.20)	14 (19.40)	0.614[c]
Arachnoid cyst	4 (5.90)	0 (0.00)	0.053[d]
Adenoid hypertrophy	10 (14.70)	5 (6.90)	0.138[c]
Non-specific gliotic foci	4 (5.90)	2 (2.80)	0.365[d]
Demyelination plaque	1 (1.50)	0 (0.00)	0.486[d]
Mastoiditis	2 (2.90)	3 (4.20)	0.527[d]
Virchow-Robin spaces	2 (2.90)	0 (0.00)	0.234[d]
Pituitary macroadenoma	1 (1.50)	0 (0.00)	0.486[d]
Antrochoanal polyp	1 (1.50)	0 (0.00)	0.486[d]
Central neurocytoma	1 (1.50)	0 (0.00)	0.486[d]
Meningioma	0 (0.00)	1 (1.40)	0.514[d]
Hyperostosis frontalis interna	1 (1.50)	0 (0.00)	0.486[d]

*p<0.05; Independent Samples t-test (a), Mann-Whitney U test (b), Chi-square analysis (c) and Fisher's Exact test (d) were used in statistical analysis. Abbreviations: MRI=Magnetic resonance imaging, TRD=Treatment-resistant depression, HC=Healthy control, SD=Standard deviation, GAS=Global assessment scale

Table 2. Comparison of sociodemographic, clinical data, and incidental MRI findings of TRD group by gender.

Variables	Female (n=42) mean±SD & n (%)	Male (n=26) mean±SD & n (%)	*p*
Age (years)	39.17±9.10	36.92±9.64	0.338[a]
GAS score	62.88±8.56	66.30±8.45	0.112[a]
Duration MDD	15.23±7.15	11.96±6.98	0.069[a]
Atrophy (generalized atrophy)	4 (9.50)	2 (7.70)	0.582[c]
Fazekas (grade 0/grade 1/grade 2/grade 3)	38/1/2/1	22/4/0/0	0.359[c]
Cavum veli interpositi	6 (14.30)	2 (7.70)	0.341[c]
Cavum septum pellucidum	2 (4.80)	2 (7.70)	0.496[b]
Cavum vergae	1 (2.40)	2 (7.70)	0.324[c]
Ethmoidal thickening	15 (35.70)	11 (42.30)	0.587[b]
Maxillary thickening	7 (16.70)	4 (15.40)	0.889[b]
Frontal thickening	0 (0.00)	1 (3.80)	0.382[c]
Sphenoid thickening	1 (2.40)	2 (7.70)	0.324[c]
Retention cyst	6 (14.30)	5 (19.20)	0.590[b]
Arachnoid cyst	1 (2.40)	3 (11.50)	0.152[c]
Adenoid hypertrophy	5 (11.90)	5 (19.20)	0.407[b]
Non-specific gliotic foci	3 (7.10)	1 (3.80)	0.504[c]
Demyelination plaque	0 (0.00)	1 (3.80)	0.382[c]
Mastoiditis	0 (0.00)	1 (3.80)	0.382[c]
Virchow-Robin spaces	2 (4.80)	0 (0.00)	0.378[c]

Pituitary macroadenoma	0 (0.00)	2 (7.70)	0.143[c]
Antrochoanal polyp	0 (0.00)	1 (3.80)	0.382[c]
Central neurocytoma	0 (0.00)	1 (3.80)	0.382[c]
Hyperostosis frontalis interna	1 (2.40)	0 (0.00)	0.618[c]

Independent Samples t-test (a), Chi-square analysis (b) and Fisher's Exact test (c) were used in statistical analysis. Abbreviations: MRI=Magnetic resonance imaging, TRD=Treatment-resistant depression, SD=Standard deviation, GAS=Global assessment scale, MDD=Major depressive disorder

In the TRD group, GAS scores of those with generalized cerebral atrophy (mean ± standard deviation=49.50±3.93; mean rank=5.17) and those without (mean ± standard deviation=65.61±7.56; mean rank=37.34) were compared and it was found that those with generalized cerebral atrophy had significantly lower GAS scores (Mann-Whitney U test $p<0.001$).

In the TRD group, GAS scores of those with CVI (mean ± standard deviation=65.61±7.91; mean rank=12.06) and those without (mean ± standard deviation=53.50±6.00; mean rank=37.49) were compared and it was found that those with CVI had significantly lower GAS scores (Mann-Whitney U test $p=0.001$).

Correlation analysis conducted within the TRD group, while controlling for age, revealed a significant relationship between the GAS score and the duration of MDD ($p=0.001$, r=-0.400).

Discussion

This study compared the incidental findings obtained from MRI in patients with TRD with those in HC and the following findings were obtained: (i) Higher Fazekas grades were detected more frequently in the TRD group, (ii) Generalized cerebral atrophy was higher in the TRD group, (iii) CVI was higher in the TRD group, (iv) Incidental MRI findings in female and male patients were similar, (v) In the TRD group, the presence of CVI and generalized cerebral atrophy was associated with lower functionality.

On T2-weighted MRI sequences, WM hyperintensities are shown as lesions with increased signal intensity. Amount of WM T2 hyperintense lesions is measured using the Fazekas classification system.[16] Histopathological findings such as demyelination, axon loss, arteriosclerosis, dilated perivascular spaces, gliosis, lacunar infarcts, and spongiosis are detected in WM hyperintensities areas. WM hyperintensities can occur in healthy individuals,[20] studies have identified a correlation between these hyperintensities and cerebrovascular risk factors such as hypertension,[21] hypercholesterolemia,[22] and diabetes mellitus.[23] However, patients in this study did not exhibit these risk factors. WM hyperintensities have been extensively studied in depression,[24] particularly in late-life depression.[25] A meta-analysis by Wang et al.[26] found that deep WM hyperintensities were significantly linked to depression in their cross-sectional subgroup analyses. Numerous cross-sectional studies have also indicated an association between WM hyperintensities and TRD.[27] Furthermore, alterations in WM microstructure have been correlated with treatment resistance in MDD.[14] Patients with a greater burden of WM hyperintensities may require higher initial doses of antidepressants and may provide insights into the treatment response trajectory.[28] This study demonstrated that WM hyperintensities were significantly higher in TRD than in HC. This finding supports the literature that WM hyperintensities may be associated with treatment resistance.

In addition to genetic and developmental factors, stress also has a significant effect on the emergence of depression. Studies have shown that stress leads to changes in brain structure through mechanisms such as decreased brain derived neurotrophic factor, increased glucocorticoids, and decreased neurogenesis. These mechanisms may result in atrophy.[29] Brain atrophy in various regions is often observed in individuals with depression. Structural changes in MDD are primarily noted in areas such as the orbitofrontal cortex, caudate nucleus, putamen, and hippocampus, which play roles in emotion processing and stress regulation.[30] Research has indicated that these brain structural changes may correlate with factors like the severity of depression and treatment resistance, potentially aiding in differentiating TRD from MDD.[14] In a review

by Klok et al.[31], examining structural brain features in depression, it was found that reduced GM in the right cerebellum, anterior cingulate cortex, superior and medial frontal gyrus, hippocampus, and caudate nucleus did not effectively differentiate TRD from MDD. However, decreased GM in the precentral gyrus, inferior frontal gyrus, putamen, angular gyrus, and post-central gyri, alongside specific changes in parietal white matter tracts, may be indicative of TRD.[31] While a direct comparison of cerebral atrophy between TRD and MDD was not feasible due to the absence of MDD patients in this study, generalized cerebral atrophy was identified in some TRD patients, whereas it was absent in the HC group. In MDD patients, functionality may decline due to various factors.[32] TRD tends to be more closely linked to reduced functionality than MDD, and this study found a significant relationship between generalized cerebral atrophy and functionality levels in TRD patients.[33]

The CSP, a variant of the septum pellucidum, is more prevalent in schizophrenia and bipolar disorder, but studies indicate that its occurrence is comparable in MDD patients and HCs.[34] In this study, no significant differences were noted in CSP frequency between patients with TRD and HCs. Landin-Romero et al.[35] suggested that another variant of the septum pellucidum, the CV, may be a risk factor for severe mental disorders, with a frequency of 1.1% reported in individuals with mood and psychotic disorders, and none detected in HCs. Although the prevalence of CV in TRD has not been previously studied, the current research indicates that it may be more common in TRD patients than in HCs, although this difference was not statistically significant. The CVI, located within the double-layered tela choroidea of the third ventricle and surrounding the internal cerebral veins, has also not been thoroughly explored in relation to mental disorders.[36] The association of CVI with psychotic disorder has been reported through a limited number of cases.[37,38] Supprian et al.[37] reported CVI in a patient with a diagnosis of psychotic disorder but not in monozygotic twin. They suggested that the finding of the CVI in the psychotic twin could be incidental; however, it may indicate a dysgenic process in early brain development and, thus, play a significant role in the etiology of psychosis.[37] This study is the first to demonstrate that the frequency of CVI is significantly higher in TRD patients compared to HCs. Additionally, the presence of CVI is associated with lower functionality levels. CVI on brain MRI of one of the TRD patients is shown in Figure 2.

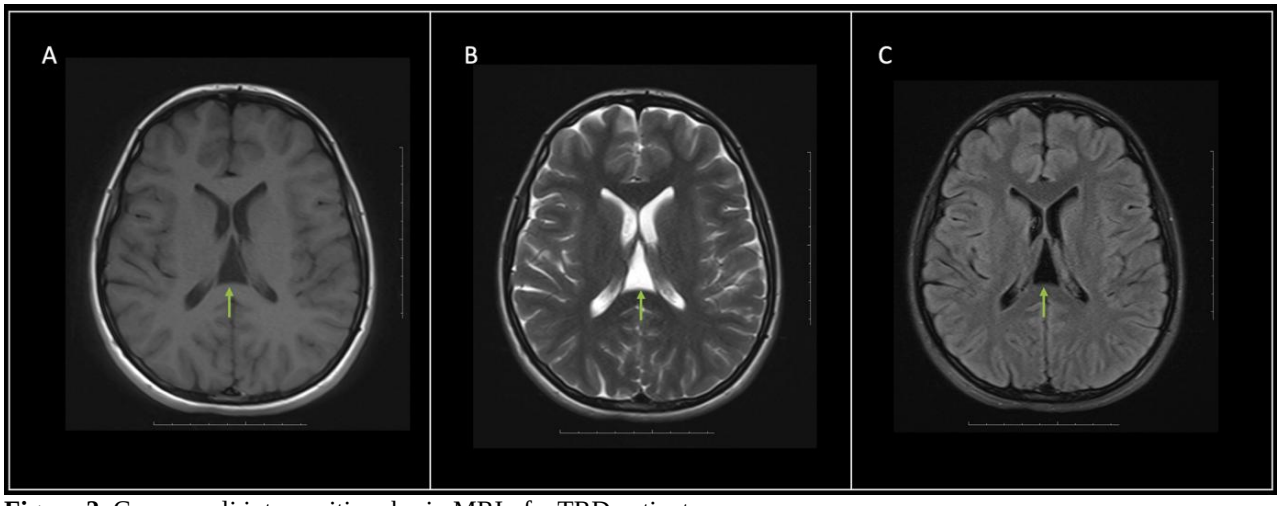

Figure 2. Cavum veli interpositi on brain MRI of a TRD patients

Notes: Cavum veli interpositi (green arrow) is shown in axial sections in T1-weighted sequence (A), T2-weighted sequence (B) and FLAIR-weighted sequence in a 37-year-old female patient.

This investigation scrutinized a variety of incidental findings extending beyond the previously mentioned variables, disclosing no substantial discrepancies between the TRD and HC cohorts. Although these variables did not show statistical significance, many were explored for the first time in the context of TRD. The paranasal sinuses, which include the

maxillary, frontal, ethmoid, and sphenoid sinuses, are air-filled spaces in the bones surrounding the nose.[39] This study is the inaugural investigation into the occurrence of mucosal thickening in the paranasal sinuses in individuals with TRD, revealing no notable differences between the two groups. Retention cysts occurring along the floor of the paranasal sinuses were also identified as similar between groups.[40] Arachnoid cysts, which are fluid-filled sac structures, were also found to be similar between the groups.[41] Adenoid hypertrophy is a natural reaction to increased immunological activity in early stages of development, and no evidence has been found to be associated with TRD.[42] Non-specific gliotic foci, demyelination plaque, mastoiditis, Virchow-Robin spaces, pituitary macroadenoma, antrochoanal polyp, central neurocytoma, meningioma, hyperostosis frontalis interna were observed at very low frequencies and did not help distinguish between the groups. It has been shown that MRI incidental findings in the TRD group did not vary according to gender.

Strengths and limitations

The striking feature of this study is the investigation of incidental MRI findings in patients diagnosed with TRD and the presentation of findings related to CVI. A control group is not needed in studies investigating incidental findings. However, the inclusion of a control group in this presented study can be considered as a contribution of the study to the literature. This study has several limitations. Its cross-sectional nature is the most important limitation. Another important limitation is that it did not include patients with MDD in addition to TRD and HC. The possible effects of psychotropic medications used in the treatment of TRD on MRI incidental findings are unknown. One limitation of this study is the absence of volumetric analysis, as it focuses solely on morphological characteristics.

Conclusion

This study shows that WM hyperintensities are more frequently detected in TRD, generalized cerebral atrophy is more common in TRD, and the level of functionality decreases as generalized cerebral atrophy increases. Evidence suggests that CVI, a neurodevelopmental anomaly, occurs more frequently in individuals with TRD. It was determined that TRD patients with CVI had lower levels of functionality. It may be useful to consider this information in the management of patients with TRD who are detected to have CVI on MRI examinations. Cerebral atrophy may be a parameter in the follow-up of patients with TRD and the Fazekas scale can be used for this purpose. Longitudinal studies are needed to reveal the relationship between incidental findings detected through MRI and TRD processes. Additional research could provide a deeper understanding of these findings in individuals with TRD.

Ethics Committee Approval

Ethics committee approval was obtained from Adıyaman University for this study (Date of Decision: May 21, 2024; IRB Number: 2024/5-16). All procedures were utilized in accordance with the Declaration of Helsinki.

Informed Consent

Signed informed consent form was obtained from all participants.

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None.

Conflict of Interest

There is no conflict of interest to declare.

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Peer-review

Externally peer-reviewed.

References

1. Greenberg PE, Fournier AA, Sisitsky T, et al. The Economic Burden of Adults with Major Depressive Disorder in the United States (2010 and 2018). *Pharmacoeconomics.* 2021;39(6):653-665. doi: 10.1007/s40273-021-01019-4
2. https://www.who.int/data/gho/data/indicators/indicator-details/GHO/estimated-population-based-prevalence-of-depression
3. Kessler RC, Berglund P, Demler O, Jin R, Merikingas KR, Walters EE. How common are common mental disorders? Evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Arch Gen Psychiatry*. 2005;62(7):593–602.
4. Nihalani N, Simionescu M, Dunlop BW. Depression: phenomenology, epidemiology, and pathophysiology. In: Schwartz TL, Petersen T, eds. Depression: treatment strategies

and management. Boca Raton, Florida, FL: CRC Press, 2016: 1–22.
5. Malhi GS, Mann JJ. Depression. *Lancet.* 2018; 392: 2299–2312.
6. Ferrari AJ, Charlson FJ, Norman RE, et al. Burden of depressive disorders by country, sex, age, and year: findings from the global burden of disease study 2010. *PLoS Med.* 2013;10(11):e1001547. doi: 10.1371/journal.pmed.1001547
7. Rybak YE, Lai KSP, Ramasubbu R, et al. Treatment-resistant major depressive disorder: Canadian expert consensus on definition and assessment. *Depress Anxiety*. 2021;38:456–467.
8. Zhdanava M, Pilon D, Ghelerter I, et al. The prevalence and national buren of treatment-resistant depression and major depressive disorder in the United States. *J Clin Psychiatry.* 2021;82(2):20m13699.
9. Dunner DL, Rush AJ, Russell JM, et al. Prospective, long-term, multicenter study of the naturalistic outcomes of patients with treatment-resistant depression. *J Clin Psychiatry*. 2006;67(5):688-695. doi: 10.4088/jcp.v67n0501
10. Sankar T, Chakravarty MM, Jawa N, et al. Neuroanatomical predictors of response to subcallosal cingulate deep brain stimulation for treatment-resistant depression. *J Psychiatry Neurosci.* 2020;45(1):45-54. doi: 10.1503/jpn.180207
11. Ma C DJ, Li J, Guo W, Long Z, et al. Resting-state functional connectivity bias of middle temporal gyrus and caudate with altered gray matter volume in major depression. *PLoS One.* 2012; 7: e45263.
12. Shah PJ, Glabus MF, Goodwin GM, Ebmeier KP. Chronic, treatment-resistant depression and right fronto-striatal atrophy. *Br J Psychiatry.* 2002; 180: 434–440.
13. Serra-Blasco M, Portella MJ, Gomez-Anson B, et al. Effects of illness duration and treatment-resistance on grey matter abnormalities in major depression. *Br J Psychiatry.* 2013; 202: 434–440.
14. de Diego-Adelino J, Pires P, Gomez-Anson B, et al. Microstructural white-matter abnormalities associated with treatment resistance, severity and duration of illness in major depression. *Psychol Med.* 2014; 44: 1171–1182.
15. McIntyre RS, Alsuwaidan M, Baune BT, et al. Treatment-resistant depression: definition, prevalence, detection, management, and investigational interventions. *World Psychiatry.* 2023;22(3):394-412. doi: 10.1002/wps.21120
16. Fazekas F, Chawluk JB, Alavi A, Hurtig HI, Zimmerman RA. MR signal abnormalities at 1.5 T in Alzheimer's dementia and normal aging. *AJR Am J Roentgenol.* 1987;149(2):351-356. doi: 10.2214/ajr.149.2.351.
17. Born CM, Meisenzahl EM, Frodl T, et al. The septum pellucidum and its variants. An MRI study. *Eur Arch Psychiatry Clin Neurosci.* 2004;254(5):295-302. doi: 10.1007/s00406-004-0496-z
18. Endicott J, Spitzer RL. Psychiatric rating scales. In: Kaplan HI, Sadock BJ, eds. Comprehensive textbook of psychiatry (5th ed). Baltimore, MD: Williams & Wilkins, 1989: 2391–409.
19. Alves M, Pita Lobo P, Azevedo Kauppila L, et al. Neuroimaging cerebrovascular biomarkers in Parkinson's Disease. *Neuroradiol J.* 2022;35:490–496.
20. Young VG, Halliday GM, Kril JJ. Neuropathologic correlates of white matter hyperintensities. *Neurology.* 2008;71(11):804-811. doi: 10.1212/01.wnl.0000319691.50117.54
21. Park MK, Jo I, Park MH, Kim TK, Jo SA, Shin C. Cerebral white matter lesions and hypertension status in the elderly Korean: the Ansan Study. *Arch Gerontol Geriatr*. 2005;40(3):265-273. doi: 10.1016/j.archger.2004.09.003
22. Murray AD, Staff RT, Shenkin SD, Deary IJ, Starr JM, Whalley LJ. Brain white matter hyperintensities: relative importance of vascular risk factors in nondemented elderly people. *Radiology.* 2005;237(1):251-257. doi: 10.1148/radiol.2371041496
23. Tamura Y, Araki A. Diabetes mellitus and white matter hyperintensity. *Geriatr Gerontol Int*. 2015;15(1):34-42. doi: 10.1111/ggi.12666
24. Park JH, Lee SB, Lee JJ, et al. Depression Plays a Moderating Role in the Cognitive Decline Associated With Changes of Brain White Matter Hyperintensities. *J Clin Psychiatry.* 2018;79(5):17m11763. doi: 10.4088/JCP.17m11763
25. Herrmann LL, Le Masurier M, Ebmeier KP. White matter hyperintensities in late life depression: a systematic review. *J Neurol Neurosurg Psychiatry*. 2008;79(6):619-624. doi: 10.1136/jnnp.2007.124651
26. Wang L, Leonards CO, Sterzer P, Ebinger M. White matter lesions and depression: a systematic review and meta-analysis. *J Psychiatr Res.* 2014;56:56-64. doi: 10.1016/j.jpsychires.2014.05.005.
27. Serafini G, Pompili M, Borgwardt S, et al. The role of white matter abnormalities in treatment-resistant depression: a systematic review. *Curr Pharm Des.* 2015;21(10):1337-1346. doi: 10.2174/1381612820666140929094531
28. Aizenstein HJ, Khalaf A, Walker SE, Andreescu C. Magnetic resonance imaging predictors of treatment response in late-life depression. *J Geriatr Psychiatry Neurol*. 2014;27(1):24-32. doi: 10.1177/0891988713516541
29. Swaab DF, Bao AM, Lucassen PJ. The stress system in the human brain in depression and neurodegeneration. *Ageing Res Rev*. 2005;4(2):141-194. doi: 10.1016/j.arr.2005.03.003
30. Zhang FF, Peng W, Sweeney JA, Jia ZY, Gong QY. Brain structure alterations in depression: Psychoradiological evidence. *CNS Neurosci Ther.* 2018;24(11):994-1003. doi: 10.1111/cns.12835
31. Klok MPC, van Eijndhoven PF, Argyelan M, Schene AH, Tendolkar I. Structural brain characteristics in treatment-resistant depression: review of magnetic resonance imaging studies. *BJPsych Open.* 2019;5(5):e76. doi: 10.1192/bjo.2019.58
32. Hammar A, Ardal G. Cognitive functioning in major depression--a summary. *Front Hum Neurosci.* 2009;3:26. doi: 10.3389/neuro.09.026.2009.
33. Petersen T, Papakostas GI, Mahal Y, et al. Psychosocial functioning in patients with treatment resistant depression. *Eur Psychiatry.* 2004;19(4):196-201. doi: 10.1016/j.eurpsy.2003.11.006
34. Shioiri T, Oshitani Y, Kato T, et al. Prevalence of cavum septum pellucidum detected by MRI in patients with bipolar disorder, major depression and schizophrenia. *Psychol Med.* 1996;26(2):431-434. doi: 10.1017/s0033291700034838
35. Landin-Romero R, Sarró S, Fernández-Corcuera P, et al. Prevalence of cavum vergae in psychosis and mood spectrum disorders. *J Affect Disord.* 2015;186:53-57. doi: 10.1016/j.jad.2015.07.020
36. Born CM, Meisenzahl EM, Frodl T, et al. The septum pellucidum and its variants. An MRI study. *Eur Arch Psychiatry Clin Neurosci.* 2004;254(5):295-302. doi: 10.1007/s00406-004-0496-z
37. Supprian T, Bengel D, Hofmann E, Fallgatter AJ, Franzek E. Cavum veli interpositi and psychotic disorder in a monocygotic twin. *Eur Arch Psychiatry Clin Neurosci*. 2000;250(2):76-78. doi: 10.1007/s004060070038
38. Gama Marques J. Schizophrenia Misdiagnosis after Capgras and Cotard Delusions in a Patient with Infantile Cystinosis, Cavum Septi Pellucidi, Cavum Vergae and Cavum Veli Interpositi. *Behav Sci (Basel).* 2023;13(2):157. doi: 10.3390/bs13020157
39. Chmielewski PP. Clinical anatomy of the paranasal sinuses and its terminology. *Anat Sci Int.* 2024;99(4):454-460. doi: 10.1007/s12565-023-00745-3
40. Eggesbø HB. Radiological imaging of inflammatory lesions in the nasal cavity and paranasal sinuses. *Eur Radiol.* 2006;16(4):872-88. doi: 10.1007/s00330-005-0068-2
41. Pradilla G, Jallo G. Arachnoid cysts: case series and review of the literature. *Neurosurg Focus.* 2007;22(2):E7. doi: 10.3171/foc.2007.22.2.7
42. Niedzielski A, Chmielik LP, Mielnik-Niedzielska G, Kasprzyk A, Bogusławska J. Adenoid hypertrophy in children: a narrative review of pathogenesis and clinical relevance. *BMJ Paediatr Open*. 2023;7(1):e001710. doi: 10.1136/bmjpo-2022-001710.

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Research Article/Özgün Araştırma

Aggressive breast cancer in young women: Single-center experience

Genç kadınlarda agresif meme kanseri: Tek merkez deneyimi

Özlem DOĞAN[1], Yakup DÜZKÖPRÜ[2], Eyyüp ÇAVDAR[1], Tülay EREN[1]

[1]Adıyaman University Training and Research Hospital, Department of Medical Oncology, 02040, Adıyaman-Turkey
[2]Aksaray University Training and Research Hospital, Department of Medical Oncology, 68200, Aksaray-Turkey
[3]Ankara Etlik City Hospital, Department of Medical Oncology, 06170, Ankara-Turkey

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Abstract

Aim: Breast cancer is the most common malignancy among women, with poorer survival outcomes in younger patients. Adolescents and young adults (AYAs), typically defined as women under 40–45 years, often present with aggressive tumor subtypes and advanced-stage disease. This study analyzes the epidemiological and demographic characteristics of breast cancer patients under 45 at our center to provide insights into this high-risk group.

Materials and Methods: This retrospective study analyzed 90 breast cancer patients aged 45 years or younger, diagnosed at our clinic between January 2015 and December 2023.

Results: A total of 90 female breast cancer patients, with a median age of 39 years (25–45), were analyzed in our study. At diagnosis, 27.8% were in early stages (stage 1–2), 57.8% had locally advanced disease (stage 3), and 14.4% were *de novo* metastatic. Axillary lymph node positivity was observed in 72.2%, and invasive ductal carcinoma was the most common histological subtype (61.1%).Tumor grades 2 and 3 were identified in 24.4% and 56.7% of patients, respectively. Hormonal receptor positivity was detected in 86.7% of patients, HER2 positivity in 41.1%, and BRCA mutation in 20%. Metastases were most commonly found in the bone (20%) and lung (12.2%).

Conclusion: Our study underscores the aggressive nature of breast cancer in young patients, marked by advanced stages and high-risk features at diagnosis. These findings highlight the need for enhanced early detection and personalized treatment approaches to improve outcomes for young breast cancer patients.

Keywords: Young breast cancer; invasive ductal carcinoma; HER2 positivity; BRCA mutation.

Öz

Amaç: Meme kanseri, kadınlar arasında en sık görülen malignitedir ve genç hastalarda sağkalım oranları daha düşüktür. Genellikle 40–45 yaş altındaki kadınlar bu grupta tanımlanır ve sıklıkla agresif tümör alt tipleriyle birlikte ileri evre hastalıkla tanı alırlar. Bu çalışma, merkezimizde takip edilen 45 yaş altındaki meme kanseri hastalarının epidemiyolojik ve demografik özelliklerini inceleyerek yüksek riskli bu grup hakkında daha fazla bilgi sağlamayı amaçlamaktadır.

Gereç ve Yöntem: Çalışmamızda Ocak 2015 ile Aralık 2023 tarihleri arasında kliniğimizde tanı alan 45 yaş ve altındaki 90 meme kanseri hastasını analiz ettik.

Bulgular: Çalışmamızda, ortalama yaşı 39 (25–45) olan toplam 90 kadın meme kanseri hastasını analiz ettik. Tanı anında hastaların %27,8'i erken evrede (evre 1–2), %57,8'i lokal ileri evrede (evre 3) ve %14,4'ü *de novo* metastatik evredeydi. Hastaların %72,2'sinde aksiller lenf nodu pozitifliği gözlemlendi ve en sık görülen histolojik alt tip invaziv duktal karsinom (%61,1) idi. Tümör grade'leri 2 ve 3 olan hastaların oranları sırasıyla %24,4 ve %56,7 olarak belirlendi. Hormonal reseptör pozitifliği hastaların %86,7'sinde, HER2 pozitifliği %41,1'inde ve BRCA mutasyonu %20'sinde saptandı. Metastazlar en sık kemik (%20) ve akciğerde (%12,2) görüldü.

Sonuç: Çalışmamız, genç hastalarda meme kanserinin agresif doğasını, tanı anında ileri evre ve yüksek riskli özelliklerle belirgin bir şekilde ortaya koymaktadır. Bu bulgular, genç meme kanseri hastalarının tedavi sonuçlarını iyileştirmek için geliştirilmiş erken teşhis yöntemlerine ve kişiselleştirilmiş tedavi yaklaşımlarına olan ihtiyacı vurgulamaktadır.

Anahtar Kelimeler: Genç meme kanseri; İnvaziv duktal karsinom; HER2 pozitifliği; BRCA mutasyonu.

Yazışma Adresi/Address for Correspondence: Özlem DOĞAN, Adıyaman University Training and Research Hospital, Department of Medical Oncology, 02040, Adıyaman-Turkey, E-mail: drozlemdogan@hotmail.com

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Introduction

Breast cancer is the most common cancer among women and continues to be a significant health concern.[1] Survival rates in the metastatic stage are significantly lower compared to early-stage Breast cancer due to various contributing factors.

Age is an independent risk factor, and Breast cancer in adolescents and young adults (AYAs) has been linked to lower survival rates.[2,3] While the definition of AYAs breast cancer has not yet been standardized, the literature generally categorizes women under the age of 40–45 in this group. Although the incidence of breast cancer increases with age, approximately 7–10% of cases occur in AYAs.[4] According to a large database study conducted in our country, 48% of breast cancer cases are diagnosed in women under the age of 50, with 17% of these in women under 40.[5]

AYAs are more likely to develop aggressive cancer subtypes compared to individuals over 50 years old. This group faces higher mortality rates and significantly poorer survival outcomes.[6,7] Several factors contribute to this disparity, including advanced-stage diagnosis, more aggressive tumor phenotypes, lower hormone receptor positivity rates, higher HER2 positivity rates, larger tumor sizes, increased lymph node involvement, higher histological grades, and poorer responses to treatment.[2,3,5,8-10]

In this study, we aimed to contribute to the literature by analyzing the epidemiological and demographic characteristics of patients diagnosed with breast cancer under the age of 45 at our center.

Materials and Methods

In this study, patients diagnosed with breast cancer at our clinic between January 2015 and December 2023 were retrospectively analyzed. Patients aged 45 years and younger were included in the study, while those whose complete information was not available in their medical records or the hospital's computer system at the time of diagnosis were excluded. Incomplete information was defined as missing key clinical data, including tumor histology, receptor status (ER, PR, HER2), TNM staging, or treatment details. In total, 90 patients were included in the analysis. The demographic and clinicopathological characteristics of the patients were documented, including age, tumor size, histological subtype, hormone receptor status, HER2 status, histological grade, TNM stage, lymph node involvement, and treatment modalities such as surgery type, chemotherapy, and radiotherapy. Additionally, follow-up data, including disease-free survival and overall survival, were recorded.

Statistical analysis

Statistical analyses were conducted using IBM SPSS Statistics version 22.0 (IBM SPSS, USA). Descriptive statistics were used to analyze the clinical and demographic characteristics of the patients. Categorical and numerical data were presented as counts and percentages (n%), while continuous variables were summarized using median values.

Ethics committee approval

The study was conducted according to the principles of the Declaration of Helsinki, and approval was obtained from the ethics committee of Ankara Etlik City Hospital on April 24, 2024, with approval number 2024-322. Since the study was retrospective in nature, informed consent could not be obtained from the patients.

Results

In our study, a total of 90 patients were evaluated. All patients were female, with a median age at diagnosis of 39 years (25–45). Of these, 79 patients (87.8%) had no smoking history and 79 patients (87.8%) had at least one child before diagnosis. A family history of breast cancer was reported in 17 patients (18.9%). At the time of diagnosis, 25 patients (27.8%) were in the early stages (stage 1–2), 52 patients (57.8%) had locally advanced disease (stage 3), and 13 patients (14.4%) were diagnosed with *de novo* metastatic disease. Axillary lymph node positivity was detected in 65 patients (72.2%).A total of 79 patients (87.8%) had surgery, including 48 (53.3%) who had modified radical mastectomy (MRM) and 31 (34.4%) who had breast-conserving surgery (BCS). Additionally, 62 patients

(68.9%) had axillary lymph node dissection (ALND). Pathological examination revealed that invasive ductal carcinoma was the most common subtype, identified in 55 patients (61.1%), followed by invasive lobular carcinoma, observed in 32 patients (35.6%). Among the patients, 78 (86.7%) were hormone receptor (HR) positive, 37 (41.1%) were HER2 positive, and only 2 (2.2%) were triple-negative. In our study, 22 patients (24.4%) had grade 2 tumors, while 51 patients (56.7%) had grade 3 tumors. BRCA mutation positivity was identified in 18 patients (20%). Neoadjuvant therapy was administered to 27 patients (30%), all of whom were treated with anthracyclines. Among HER2-positive patients, all received trastuzumab during the neoadjuvant and adjuvant periods, while 8 patients (8.9%) also received pertuzumab. Additionally, 62 patients (68.9%) had adjuvant radiotherapy (RT). The number of *de novo* metastatic patients was 13 (14.4%). Including 16 patients (17.8%) who developed metastases during follow-up, the total number of metastatic patients reached 29 (32.2%). Among these metastatic patients, 1 was triple-negative, 12 were HER2-positive, and 28 were hormone receptor-positive. The most common site of metastasis was the bone, observed in 18 cases, followed by the lung, seen in 11 cases. (Table 1)

Table 1. Clinical, laboratory, and demographic characteristics of patients.

	n (%)
Median Age	39 (25-45)
Smoking History	
Yes	11 (12.2)
No	79 (87.8)
Child	
Yes	79 (87.8)
No	11 (12.2)
Family History	
Yes	17 (18.9)
No	73 (81.1)
Stage at Diagnosis	
Stage 1-2	25 (27.8)
Stage 3	52 (57.8)
Stage 4	13 (14.4)
Axillary Lymph Node Involvement at Diagnosis	
Yes	65 (72.2)
No	25 (27.8)
Type of Surgery	
MRM (Modified Radical Mastectomy)	48 (53.3)
BCS (Breast-Conserving Surgery)	31 (34.4)
Pathological Subtype	
Invasive Ductal Carcinoma	55 (61.1)
Invasive Lobular Carcinoma	32 (35.6)
Other (Medullary, Mucinous, etc.)	3 (3.3)
Lymphovascular Invasion	
Yes	25 (27.8)
No	53 (58.9)
Unknown	12 (13.3)
Perineural Invasion	
Yes	16 (17.8)
No	62 (68.9)
Unknown	12 (13.3)
HR and HER2 Status	
HR +, HER2 +	32 (35.5)
HR +, HER2 -	51 (56.7
HR -, HER2 +	5 (5.6)
HR -, HER2 -	2 (2.2)

Tumor grade	
Grade 1	7 (7.8)
Grade 2	22 (24.4)
Grade 3	51 (56.7)
Sites of Metastasis	
Bone	18 (20)
Lung	11 (12.2)
Other (Brain, Liver, Peritoneum, Abdominal)	7 (7.8)
Ki67(%)	
≤20	**35 (38.9)**
>20	**55 (61.1)**

Discussion

Young age is considered a poor prognostic factor in breast cancer, as demonstrated by various studies reporting worse survival outcomes and more aggressive tumor characteristics in AYAs.[2,3,5,7] Although the definition of AYAs breast cancer has not been fully standardized, women under the age of 40–45 are typically included in this group in studies.[2,5,10,11] This group represents approximately 7–10% of all breast cancer cases.[4,5]In our study, we classified patients aged 45 years and younger within this category.

Studies have shown that breast cancer in AYAs tends to have a more aggressive biological behavior, often resulting in diagnosis at more advanced stages and poorer survival rates.[2,5,8,10] Even among patients with early-stage disease, survival rates are lower compared to women diagnosed at older ages. [5,12] This disparity has been linked to several factors, including advanced-stage diagnosis, more aggressive tumor phenotypes, lower hormone receptor positivity, higher HER2 positivity rates, larger tumor sizes, increased lymph node involvement, and higher histological grades.

Similar to the findings of Çulha et al., our study also revealed that young breast cancer patients frequently present with advanced-stage disease (57.8% stage 3, 14.4% metastatic at diagnosis) and exhibit high-risk tumor features such as elevated HER2 positivity (41.1%) and axillary lymph node involvement (72.2%).[13] These findings align with the work of Anders et al., who highlighted that younger patients are more likely to develop biologically aggressive subtypes, including triple-negative and HER2-positive tumors, which significantly impact prognosis.[14]

Ki-67, a marker of tumor proliferation, is a well-recognized prognostic factor in breast cancer. In our study, 61.1% of patients had Ki-67 levels >20%, indicating a higher proliferation rate and supporting the notion of aggressive tumor biology in younger patients. This observation is consistent with the findings of Cancello et al., who demonstrated that elevated Ki-67 levels are associated with poorer survival outcomes, particularly in HER2-positive and triple-negative subtypes.[15]

When compared to large-scale studies such as Ozmen et al., our cohort had a higher proportion of advanced-stage diagnoses (57.8% vs. 19% stage 3) and a slightly different distribution of histological subtypes. While Ozmen et al. reported invasive ductal carcinoma in 79% of patients, we observed this subtype in 61.1%, reflecting potential regional or institutional differences.[5] Similarly, our BRCA mutation positivity rate of 20% was higher than the rates typically reported in international literature, such as Anders et al. (10–15%), which may suggest the need for broader genetic screening in young breast cancer patients in Turkey.[14]

Another critical aspect is the discrepancy in hormone receptor (HR) positivity. Our study reported an HR positivity rate of 86.7%, higher than the rates reported by Çulha et al. and Oflazoğlu et al., which were approximately 61–72%.[13,16] This difference may reflect variations in patient demographics or institutional practices. Higher HR positivity rates in our cohort may partially explain the favorable response to endocrine therapies, although HER2 positivity and high Ki-67

levels remain significant contributors to disease aggressiveness and recurrence risk.

Furthermore, survival outcomes in younger patients are heavily influenced by advanced-stage diagnosis and tumor biology. Partridge et al. and Gnerlich et al. noted that younger patients, even those with early-stage disease, often have worse outcomes due to aggressive subtypes and higher recurrence rates.[12,17] In our study, the majority of metastatic patients were HR-positive (96.6%), with bone being the most common site of metastasis, consistent with the findings of Partridge et al.[17]

Despite these findings, our study has certain limitations. The retrospective design and single-center data may limit the generalizability of our results, and the relatively small sample size could reduce the statistical power of certain analyses. Additionally, the lack of multicenter data restricts broader conclusions that could be drawn from a more diverse patient population. However, the high proportion of advanced-stage diagnoses and aggressive tumor characteristics in our cohort underscores the pressing need for improved early detection programs and more personalized treatment strategies for younger breast cancer patients. These findings highlight the importance of considering specific molecular and clinical factors that contribute to the poorer prognosis in this group, and further studies are necessary to validate our results across different populations.

Conclusion

Our study highlights the aggressive nature of breast cancer in young patients, consistent with previous data, and emphasizes the advanced stages and high-risk features observed at diagnosis. These findings underscore the importance of improving early detection efforts, addressing factors specific to the study population or healthcare setting, and implementing personalized treatment strategies to enhance outcomes for young breast cancer patients. Furthermore, the study calls for future research to explore the molecular characteristics of aggressive tumors in this group and to consider larger, multi-center studies to validate these findings and improve generalizability.

Ethics Committee Approval

The study was conducted according to the principles of the Declaration of Helsinki and approval was obtained from the ethics committee of Ankara Etlik City Hospital on April 24, 2024, with approval number 2024-322.

Informed Consent

All participants provided informed consent upon enrollment.

Author Contributions

O.D. took part in the planning, data collection, ethics committee application and writing of the manuscript. Y.D contributed to the statistical analysis. E.C. contributed to the planning and data collection of the manuscript. T.E contributed to data collection.

Conflict of interest

The authors declare that there is no conflict of interest for this article.

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References

1. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. 2024;74(3):229-263.
2. Anders CK, Fan C, Parker JS, et al. Breast carcinomas arising at a young age: unique biology or a surrogate for aggressive intrinsic subtypes? *Journal of clinical oncology*. 2011;29(1):e18-e20.
3. Bleyer A, Barr R, Hayes-Lattin B, et al. The distinctive biology of cancer in adolescents and young adults. *Nature Reviews Cancer*. 2008;8(4):288-298.
4. DeSantis CE, Ma J, Gaudet MM, et al. Breast cancer statistics, 2019. *CA: a cancer journal for clinicians*. 2019;69(6):438-451.
5. Özmen V. Breast cancer in Turkey: clinical and histopathological characteristics (analysis of 13.240 patients). *The journal of breast health*. 2014;10(2):98.
6. Chung W-P, Lee K-T, Chen Y-P, et al. The prognosis of early-stage breast cancer in extremely young female patients. *Medicine*. 2021;100(1):e24076.

7. El Saghir NS, Seoud M, Khalil MK, et al. Effects of young age at presentation on survival in breast cancer. *BMC cancer*. 2006;6:1-8.
8. Tichy JR, Lim E, Anders CK. Breast cancer in adolescents and young adults: a review with a focus on biology. *Journal of the National Comprehensive Cancer Network*. 2013;11(9):1060-1069.
9. Anders C, Hsu S, Acharya C, et al. Molecular signatures characterize early stage breast cancer arising in young women and have prognostic and therapeutic implications independent of ER status. *Journal of Clinical Oncology*. 2007;25(18_suppl):522-522.
10. Cathcart-Rake EJ, Ruddy KJ, Bleyer A, Johnson RH. Breast cancer in adolescent and young adult women under the age of 40 years. *JCO oncology practice*. 2021;17(6):305-313.
11. Anastasiadi Z, Lianos GD, Ignatiadou E, Harissis HV, Mitsis M. Breast cancer in young women: an overview. *Updates in surgery*. 2017;69:313-317.
12. Gnerlich JL, Deshpande AD, Jeffe DB, Sweet A, White N, Margenthaler JA. Elevated breast cancer mortality in women younger than age 40 years compared with older women is attributed to poorer survival in early-stage disease. *Journal of the American College of surgeons*. 2009;208(3):341-347.
13. Culha Y, Davarci SE, Ünlü B, Özaşkin D, Demir H, Baykara M. Comparison of clinicopathological and prognostic features of breast cancer patients younger than 40 years and older than 65 years. *Discover Oncology*. 2024;15(1):1-14.
14. Anders CK, Hsu DS, Broadwater G, et al. Young age at diagnosis correlates with worse prognosis and defines a subset of breast cancers with shared patterns of gene expression. *Journal of clinical oncology*. 2008;26(20):3324-3330.
15. Cancello G, Maisonneuve P, Rotmensz N, et al. Prognosis and adjuvant treatment effects in selected breast cancer subtypes of very young women (< 35 years) with operable breast cancer. *Annals of oncology*. 2010;21(10):1974-1981.
16. Oflazoglu U, İriağaç Y, Küçükzeybek Y, et al. Prognostic Value of De-Ritis Ratio in Adolescents and Young Adult Patients with Breast Cancer. *Acta Oncologica Turcica*. 2020;53:37-45.
17. Partridge AH, Hughes ME, Warner ET, et al. Subtype-dependent relationship between young age at diagnosis and breast cancer survival. *Journal of Clinical Oncology*. 2016;34(27):3308-3314.

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Research Article/Özgün Araştırma

Forensic medical evaluation of dog bite injury cases admitted to a university hospital

Bir üniversite hastanesine başvuran köpek ısırığına bağlı yaralanma olgularının adli tıbbi açıdan değerlendirilmesi

Uğur DEMİR[1], Hüseyin KAFADAR[1], Fırat ÖZDEN[1], Muhiddin AKİZ[1], Neslihan ERİN[1], Mehmet ÇELİK[2]

[1]Harran University, Medical Faculty, Department of Forensic Medicine, 63290, Şanlıurfa-Turkey
[2]Harran University, Medical Faculty, Department of Infectious Diseases and Clinical Microbiology, 63290, Şanlıurfa-Turkey

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Abstract

Aim: This study aims to contribute to the literature by examining the demographic characteristics of cases presenting to the hospital due to dog bites, the anatomical locations of the wounds, rabies prophylaxis, and whether they were evaluated as forensic cases.

Materials and Methods: During a three-year period, the epicrisis reports of patients admitted to Şanlıurfa Harran University Hospital with diagnosis codes for dog bites or strikes according to ICD-10 were retrospectively reviewed along with records in the fonet system.

Results: The average age of the 297 cases in our study was 17.15±14.82. Among the cases, 76.1% were male, 66.0% were children under 18 years old. The highest number of admissions occurred in the fall season with 90 cases (30.3%) and December had the highest number of cases with 46 (15.5%). The most frequently injured body part was the hands (21.5%). Rabies vaccination was administered to 287 cases (96.6%), it was observed that a judicial report was prepared for 22 of 297 cases (7.4%).

Conclusion: Dog bites remain a significant public health issue in our country. Physicians encounter a considerable number of dog bite cases during hospital admissions. Institutional training is necessary for both medical and forensic evaluations of dog bites.

Keywords: Dog bite; Judicial notice; Judicial report.

Öz

Amaç: Köpek ısırıkları nedeniyle hastaneye başvuran olgularının demografik özellikleri, yaraların anatomik lokazisyonları, kuduz profilaksisi, adli olgu olarak değerlendirilip değerlendirilmediği incelenerek literatüre katkı sağlanması amaçlanmıştır.

Gereç ve Yöntem: 3 yıllık dönemde Şanlıurfa Harran Üniversitesi Hastanesi'ne başvuran hastaların, ICD-10'a göre köpek tarafından ısırılma veya darbelenme tanı kodu ile fonet sisteminde yer alan kayıtlar ile birlikte düzenlenen epikriz raporları retrospektif olarak incelendi.

Bulgular: Çalışmamızda 297 olgunun yaş ortalaması 17,15±14,82 idi. Olguların %76,1'i erkek ve %66,0'sı 18 yaş altı çocuklardı. Başvurular 90(%30,3) vaka ile en çok sonbahar mevsiminde, 46(%15,5) vaka ile en çok aralık ayında görüldü. Olguların en sık yaralandığı vücut bölgesi eller (%21,5) idi. Olguların 287'sine (%96,6) kuduz aşısı yapıldığı, 297 olgunun 22'sine(%7,4) adli rapor düzenlendiği gözlendi.

Sonuç: Köpek ısırıkları ülkemizde hala önemli bir halk sağlığı sorunudur. Hekimler hastane başvurularında azımsanamayacak kadar köpek ısırıkları vakaları ile karşılaşmaktadır. Köpek ısırıklarının hem tıbbi hem adli olarak değerlendirilmesi için kurum içi eğitimlerin verilmesi gerekmektedir.

Anahtar Kelimeler: Köpek ısırığı; Adli bildirim; Adli rapor.

Yazışma Adresi/Address for Correspondence: Uğur DEMİR, Harran University, Medical Faculty, Department of Forensic Medicine, 63290, Şanlıurfa-Turkey, E-mail: ugurdmr81@gmail.com

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Introduction

Dog bites are still a significant public health problem worldwide because they can cause serious injuries and various infections. Although there is no definitive data in the world, it is thought that ten million injuries occur each year due to dog bites.[1] In the United States, dog attacks constitute approximately 0.3%-1% of all emergency room visits and this number is estimated to reach 4.5 million per year.[2,3,4]

In Turkey, approximately 250,000 rabies risk contacts are reported annually with dogs being the leading cause and an average of 1 to 2 rabies cases are seen per year.[5] The number of stray dogs in Turkey is rapidly increasing and these stray dog attacks cause various public health problems.[6,7] These attacks cause serious injuries, infection risks and economic losses to people.[8]

Dog bites can cause traumatic damage to tendons and nerves, disability, infections such as rabies, psychological and emotional trauma, hospitalization and in rare cases death.[9] In addition, if a person is attacked by a dog, a lawsuit can be filed against the owner according to the articles in both the Turkish Code of Obligations and the Turkish Penal Code. Municipalities and governorships are jointly responsible for the damages caused by stray dogs.[10] Therefore it is of great legal importance that cases applying to hospitals due to animal attacks are evaluated as forensic cases.

The literature generally addresses rabies risk contact cases. In our study, unlike the literature, only cases injured as a result of dog bites were included and the forensic medical evaluation of these cases was aimed. In this study, we aimed to contribute to the literature by examining the demographic characteristics of dog bite cases that applied to the emergency department in a 3-year period, the anatomical locations of the wounds, rabies prophylaxis and whether they were evaluated as forensic cases by the physician.

Materials and Methods

Type of the study

This study is a retrospective study of dog bite cases admitted to the Emergency Department of Şanlıurfa Harran University Hospital.

The sample size of the study

Cases that applied to Harran University Faculty of Medicine Hospital with a dog bite or strike diagnosis code in the 3-year period between 01.01.2021 and 31.12.2023 were evaluated by examining their epicrisis notes and forensic reports through the hospital registration system. Cases recorded with the International Classification of Diseases-10 (ICD-10) coding and dog bite or strike diagnosis code were determined through the Hospital Information Management System (Fonet). Epicrisis notes and forensic reports of each case were examined. Cases with incomplete epicrisis notes and cases in which dog bite was not clearly mentioned in the epicrisis notes were not included in the study.

Data collection tools

The epicrisis notes and forensic reports of the cases were retrospectively reviewed via the Hospital Fonet system. The cases were evaluated in terms of age, gender, whether the application was evaluated as forensic by the physician, anatomical localization of the injury in the body, frequency of hospital admissions after dog bites according to months and seasons and whether rabies vaccination was administered.

Data analysis

Data analysis was performed using SPSS 25.0 for Windows (SPSS Inc., Chicago, IL). Descriptive statistics for categorical variables were given as numbers and percentages, and for numerical variables as mean and standard deviation. Invariant groups were compared using Chi-Square Tests (Pearson Chi-Square, Fisher's Exact Test) and statistical alpha significance level was accepted as $p<0.01$.

Ethics committee approval

This retrospective study was carried out with the permission of the Clinical Research Ethics Committee of Harran University Rectorate (decision number: 2024/05/01, dated: April 29, 2024).

Results

Retrospective clinical follow-ups and forensic reports of cases who applied to the Emergency Department of Harran University Faculty of Medicine with a dog bite or trauma diagnosis code based on the International Classification of Diseases-10 (ICD-10) between 2021-2023 were analyzed through our hospital's Fonet system. A total of 297 cases were included in the study and the mean age was 17.15 ± 14.82 years. Of these, 196 cases (66.0%) were children under the age of 18, while only 5 cases (1.7%) were over the age of 65. Of the cases included in the study, 226 (76.1%) were male and 71 (23.9%) were female.

A total of 21 cases (7.1%) were found to have injuries in more than one anatomical region due to dog bites. The most frequently injured anatomical regions were the hands in 64 cases (21.5%) and the legs in 60 cases (20.2%). There was a genital injury in one case and a pregnant individual in one case. The most commonly injured area in male patients was the hands (54 cases, 18.2%), while the most commonly affected areas in female patients were the legs (11 cases, 3.7%) and feet (12 cases, 4.0%). Forensic reports were prepared for 22 cases (7.4%), of which 18 (6.1%) were male and 4 (1.3%) were female (Table 1).

Table 1. Demographic characteristics of dog bites, localization of ınjury, rabies prophylaxis, evaluation as a forensic case.

Age Range	**Male n**	**Female n**	**Total n (%)**	**P-** ***p*=0,636**
0-17	148	48	196 (%66.0)	
17-34	47	15	62 (%20.9)	
35-64	27	7	34 (%11.4)	
>65	4	1	5 (%1.7)	
Total	226	71	297 (%100)	
Body Location of Injury*	**Male n**	**Female n**	**Total n (%)**	***p*=0,212**
Head and Neck	24	6	30 (%10.1)	
Back	10	8	18 (%6.1)	
Shoulder	10	2	12 (%4)	
Arm-Forearm	26	10	36 (%12.1)	
Hand	54	10	64 (%21.5)	
Chest	10	0	10 (%3.4)	
Abdomen	6	0	6 (%2.0)	
Gluteal	16	2	18 (%6.1)	
Thigh	16	4	20 (%6.7)	
Leg	49	11	60 (%20.2)	
Foot	12	12	24 (%8.1)	
Genitalia	1	0	1 (%0.3)	
Unknown	14	12	26 (%8.6)	
Seasons	**Male n**	**Female n**	**Total n (%)**	***p*=0,456**
Spring	46	9	55 (%18.5)	
Summer	55	20	75 (%25.3)	
Autumn	66	24	90 (%30.3)	
Winter	59	18	77 (%25.9)	
Forensic Evaluation	**Male n**	**Female n**	**Total n (%)**	***p*=0,515**
Forensic Case	18	4	22 (%7.4)	
Not Evaluated as a Forensic Case	208	67	275 (%92.6)	
Rabies Prophylaxis	**Male n**	**Female n**	**Total n (%)**	***p*=0,226**
Yes	220	67	287 (%96.6)	
No	6	4	10 (%3.4)	

*There was multiple trauma in 21 cases

There was no statistically significant difference between age groups and body regions.

In 196 pediatric cases, dog bite injuries most commonly affected the hands (46 cases, 15.5%). In addition, head and neck injuries were seen in 30 cases (10.1%), of which 24 (8.1%) involved children (Figure 1).

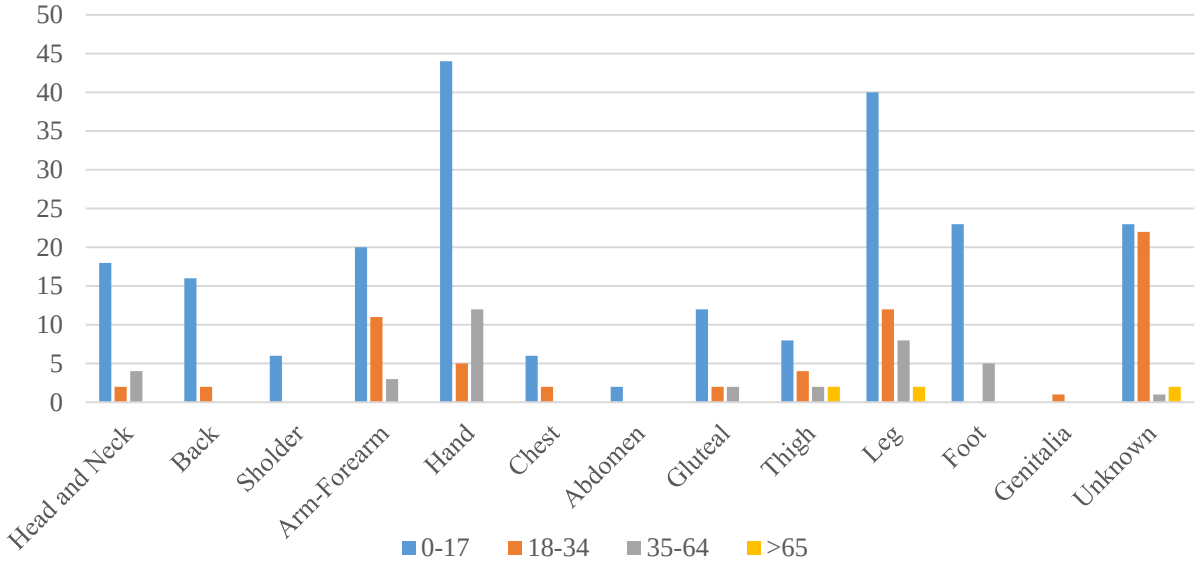

Figure 1. Localization of dog bites by age range.

When the seasonal and monthly distribution of dog bite cases was examined, the highest number of cases was seen in the fall (90 cases, 30.3%) and the lowest number of cases was seen in the spring (55 cases, 18.5%) (Table 2). The highest number of cases was seen in December (46 cases, 15.5%), while the lowest number of cases were seen in February and March (14 cases, 4.7% each) (Figure 2). Rabies vaccination prophylaxis was administered to 287 cases (96.6%) during hospitalization and 10 cases (3.4%) were not vaccinated. In the 22 general forensic examination reports examined, It was observed that the injuries of 12 cases were mild enough to be treated with simple medical intervention, and the injuries of 5 cases were not so mild that they could be treated with simple medical intervention. 2 cases had injuries that caused tissue loss, 2 cases had injuries that invaded fascia and muscle, 1 case had a fracture.

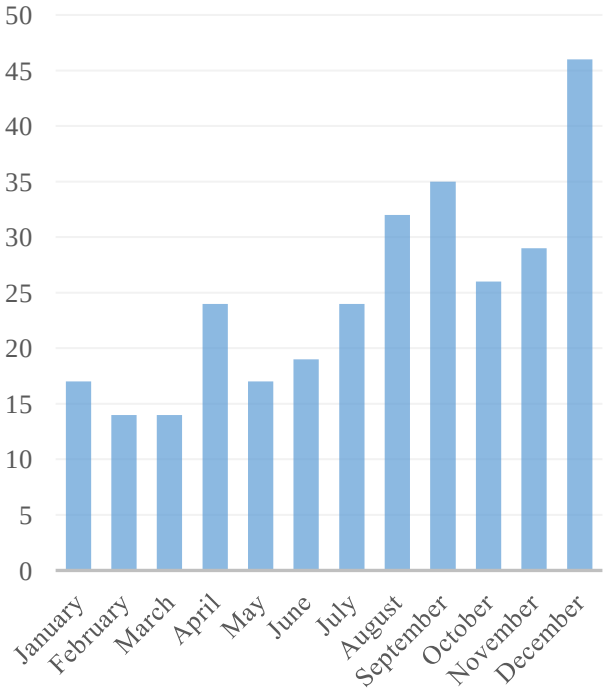

Figure 2. Distribution of dog bites by month.

Table 2. Forensic cases and seasonal changes according to age ranges

	0-17 n (%)	18-34 n (%)	35-64 n (%)	>65 n (%)
Seasons				
Spring	40 (13.47)	10 (3.37)	5 (1.68)	0 (0)
Summer	46 (15.49)	20 (6.73)	7 (2.36)	2 (0.67)
Autumn	61 (20.54)	18 (6.06)	11 (3.70)	0 (0)
Winter	49 (16.50)	14 (4.71)	11 (3.70)	3 (1.01)
Forensic Evaluation				
Forensic Case	12 (4.04)	4 (1.35)	6 (2.02)	0 (0)
Not Evaluated as a Forensic Case	184 (61.96)	58 (19.53)	28 (9.43)	5 (1.68)

No statistically significant difference was found between age groups and seasons.

Discussion

Traffic accidents, firearm and explosive injuries, cutting-piercing-crushing tool injuries, assault-force cases, as well as animal scratches and bites are stated as cases of forensic nature.[11] Most cases attacked by dogs go to the hospital for cosmetic problems that may be caused by the injury, wound infection and rabies vaccination.[12] All physicians in the world and in our country have the responsibility to intervene medically in judicial cases, prepare a judicial report and report. This issue is clearly emphasized in Article 280 of the Turkish Penal Code.[13]

According to Article 177 of the Turkish Penal Code, "Any person who releases an animal under his/her supervision in a manner that may endanger the life or health of others or who shows negligence in taking them under control shall be punished with imprisonment of up to six months or a judicial fine".[14] Articles 67 and 68 of the In the Turkish Code of Obligations, it is stated that the person who takes on the care and management of a dog temporarily or permanently is liable to compensate for the damage caused by the dog to someone else, and this situation is defined as one of the types of strict liability, and in private law, if the dog is a pet, the owner is held responsible for the damage caused by the dog, and municipalities and governorships are held responsible for the damage caused by stray dogs.[10,15] According to Article 280 of the Turkish Penal Code, "A health professional who does not report the situation to the competent authorities or delays in doing so despite encountering an indication that a crime has been committed while performing his/her duty shall be punished with imprisonment of up to one year".[14] Healthcare workers, especially physicians, frequently encounter cases that present as a result of trauma or are suspected of trauma and they fulfill the responsibility of evaluating, documenting and reporting as a forensic case.[16] In our study findings, only 7.4% of 297 cases were evaluated as forensic cases by physicians, while in the animal bite study by Derinöz et al.[17], 56.4% of the cases were evaluated as forensic cases. It is thought that forensic case reports are low due to the busy emergency services and the lack of sufficient knowledge of healthcare workers about the need to report dog bites as forensic cases.

Various studies have been conducted on dog attacks and it is seen that different results are reached in terms of gender and age. Our study findings are that the average age of the cases was 17.15 ± 14.82 and 76.1% of the cases were male. In the study conducted by Morzycki et al.[2], the average age of the cases was 41 and 62% of these cases were female. In the study conducted by Yılmaz et al.[18], the average age of the cases applying to the emergency room due to dog bites was 26.6 and 76.4% of them were mostly male. In the animal bite study conducted by Derinöz et al.[17], the average age of the cases was 11 and 61.7% of the cases were male. In the study conducted by Söğüt et al.[19] on rabies risk contact cases, the average age was 21.1 and 67% of the cases were male. In the study conducted by Temiz et al.[20], the average age of the cases applying to the rabies vaccination center was 21.63 and 78.6% were male. In the study by Loder et al.[21], the average age was 28.9 and 52.6% were male. Our own study findings support the findings of the studies by Söğüt et al.[19] and Temiz et al.[20]. It is thought that in the Eastern and Southeastern regions of our country, it is related to the fact that men are more involved in social life and are in the outside environment from a young age.

The most commonly injured body parts in dog bites are generally known to be the extremities.[22] In our study findings, the most injured body locations were the hands (21.5%) and the legs (20.2%) out of 297 cases. In the pediatric age group, the most common injury was seen in the hands (15.5%). In the head and neck region, it was 8.1%. It was observed that head and neck injuries were higher in children than in other age groups. In the study conducted by Morzycki et al.[2] in 2019, it was seen that the hands were injured in 56% of the cases, in the study conducted by Park et al.[9] in 2019 on 9962 cases, the most common injury was in the upper extremity with 33.3%, in the study conducted by Derinöz et al.[17] on animal bites in children, it was seen that the hands were injured in 34%, in the study conducted by McGuire et al.[23] on children, it was seen that

the face was injured in 42.9% and in the study conducted by Yılmaz et al.[18], it was seen that the upper extremity was injured in 48.2%. In the study conducted by Temiz et al.[20] on cases applying to the rabies vaccination center, it was seen that the trunk-extremity was injured in 69.6% of the cases and the hand was injured in 24.8%. Injuries due to dog attacks are most commonly found in the pediatric group in some studies, but the extremities are most commonly injured in the general population. Considering the size of dogs, the head and neck region are seen as the areas that dogs can reach during an attack in children, and the legs and thighs in the adult population. In addition, bites are expected to be seen in these anatomical localizations because people use their hands to defend themselves.

According to our study findings, when the frequency of dog bite cases was examined according to seasons and months, it was seen that 30.3% of the cases were mostly applied to the hospital in the autumn season and 15.5% in December. In the study conducted by Can et al.[24] in the Erzurum region of our country, 69.9% of the cases that applied to the emergency room due to animal bites and contact were dog attacks, 28.1% of them were in the spring months. In the study conducted by Morzycki et al.[2] in 2019, 29% of the cases were seen in the summer months. In the animal bite study conducted by Derinöz et al.[17] 31.9% were seen in the spring and 31.9% in the summer, in the study by McGuire et al.[23], 16.5% were seen most frequently in July. In many studies, it was seen that the cases were mostly in the spring and summer months. In our study, the fact that dog bite cases were mostly in the autumn season can be explained by Şanlıurfa's climate conditions, socio-cultural differences, the fact that the summer months are very hot, and people spend more time outside in the autumn months due to cooler air temperatures.

The most important cause of rabies risk contact cases in the world is dogs. Being infected with the rabies virus causes various problems both medically and economically.[25] Rabies virus is fatal once a person is infected.[26] Since rabies can be prevented by vaccination, it is extremely important to apply rabies prophylaxis immediately after or before contact.[27] In our study, 96.6% of the cases were vaccinated against rabies at the time of emergency admission after contact. In the study conducted by Morzycki et al.[2], only 1% of cases attacked by dogs were given post-exposure rabies vaccination; in the animal bite and rabies risk contact study conducted by Kara et al.[4], 97.6% of the cases received rabies vaccination after contact; in the study conducted by McGuire et al.[23], 4.4% of the cases received rabies vaccination after contact; in the study conducted by Joshua et al. [28], 45.5% of the cases received rabies prophylaxis after contact; in the study conducted by Gündüz et al.[29], evaluating dog and cat bites, 72.5% of the cases received rabies vaccination after contact. In the literature, while rabies vaccination is applied at very low rates in studies conducted abroad, it is seen that rabies vaccination is applied at high rates after contact in studies conducted in our country and in our current study. It was stated that this difference is due to the fact that the dogs are unvaccinated, ownerless and cannot be easily monitored.

Limitations

As stated in the materials and methods section of the study, the data evaluated were determined through the Hospital Information Management System (Fonet) with the International Classification of Diseases-10 (ICD-10) coding and dog bite or strike diagnosis code. Epicrisis notes and forensic reports of each case were examined. Cases with incomplete epicrisis notes and cases where dog bite was not clearly stated in epicrisis notes were not included in the study, limiting the number of cases to 297. In addition, since our study was conducted in a single center, there were limitations in the number of cases. Incomplete information of patients whose anatomical localization information of the injured person in our study was not added to the epicrisis or forensic report was defined as unknown data.

Conclusion

The occurrence of dog attacks and bites in our country indicates the existence of a public health problem that has not yet been solved.

Studies published in Turkey show that most dog attacks are caused by stray dogs. The increase in the number of stray dogs creates many negativities in social life and the Amendments made to the Animal Protection Law in order to prevent these negativities were published in the Official Gazette on 02.08.2024 and entered into force. We will be able to see the effects of this law which has been implemented in some cities on injuries caused by dog attacks and emergency room visits more clearly in the coming years. Dog bite injury cases should be recorded regularly and each case should be approached with care. In addition, it is of great importance to provide regular training to physicians and healthcare professionals on the subject of dog bite cases that should be evaluated as forensic cases. These trainings should be planned both before and after graduation and the knowledge and awareness of healthcare professionals should be increased.

Ethics Committee Approval

This retrospective study was carried out with the permission of the Clinical Research Ethics Committee of Harran University Rectorate (decision number: 2024/05/01, dated: April 29, 2024). Our study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent

Data concerning the study were collected with the permission of the Şanlıurfa Harran University Hospital.

Author Contribution

All of the authors contributed at every stage of the study

Conflict of Interests

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

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References

1. Khan UR, Soomar SM, Ghazi SM, Naeem R, Kerai S, Jamali S. Epidemiological Pattern and Management of Dog Bite Injuries in Karachi, Pakistan: A cross-sectional study. *Injury*. 2023;54 Suppl 4:110473. doi:10.1016/j.injury.2022.11.016
2. Morzycki A, Simpson A, Williams J. Dog Bites in The Emergency Department: A Descriptive Analysis. *CJEM*. 2019;21(1):63-70. doi:10.1017/cem.2018.2
3. Ramgopal S, Macy ML. US Estimates for Dog Bite Injuries Presenting to Emergency Departments. *Public Health*. 2021;196:1-3. doi:10.1016/j.puhe.2021.04.028
4. Kara SS, Delice O. Evaluation of Pediatric Patients with Animal Bite and Rabies Risk Contact. *Kafkas Journal of Medical Sciences.* April 2018;8(1):13-19. doi:10.5505/kjms.2018.08860.
5. Rabies Prophylaxis Guide, Republic of Turkey Ministry of Health, General Directorate of Public Health, Department of Zoonotic and Vector Diseases, Ankara, 2019
6. Kırışık F, Öztürk K. From Violence News to Animal Rights, Stray Dog Problem. *Dumlupınar University Journal of Social Sciences*. July 2021;(69):360-388. doi:10.51290/dpusbe.946017.
7. Aydoğdu M, Meral O. Controlling the Population of Stray Dogs and Creating the Related Legal Infrastructure. *Dokuz Eylül University Faculty of Law Journal*, 2019;21(2), 2129-59.
8. Unal V, Unal E, Cetinkaya Z, et al. Disability due to animal related injuries: three case reports. *J For Med* 2015;29(2):124-30. doi:10.5505/adlitip.2015.41636
9. Park JW, Kim DK, Jung JY, et al. Dog-bite injuries in Korea and risk factors for significant dog-bite injuries: A 6-year cross-sectional study. *PLoS One*. 2019;14(2):e0210541. doi:10.1371/journal.pone.0210541.
10. Vural T, Erbaş M, Karaca BI. Medical and Legal Evaluation of İnjuries Due To Dog Bites: A Türkiye Study. *National Trauma Emergency Surgery Journal*. 2024;30(1):43-49.
11. Bıçakçı S, Bıçakçı N, Şahin H, et al. One Year Retrospective Review of Forensic Reports Reported in the Emergency Department. Namık Kemal Med J. 2024 Jun;12(2):115-121. doi:10.4274/nkmj.galenos.2024.72324.
12. Karakaş A, İlhan H, Turhan V. Animal and human bites: prophylaxis and treatment approach. *Turkish Journal of Hygiene and Experimental Biology*, 2010; 67(3): 153-160.
13. Saka N, Toprak D. Evaluation of the Last Decade Studies on Approach to Non-Emergency Forensic Patients in Primary Health Care. *Eurasian Journal of Family Medicine*. 2019;127-129.
14. Turkish Penal Code, Official Gazette No. 25611 dated 12/10/2004. Retrieved from: https://www.mevzuat.gov.tr/mevzuatmetin/1.5.5237.pdf, (access date: 25.09.2024)
15. Turkish Code of Obligations, Official Gazette No. 27836 dated 04/02/2011. Access: https://www.mevzuat.gov.tr/mevzuatmetin/1.5.6098.pdf (access date:25.09.2024)
16. Aslan F, Timur S, Teke H, Kurt Z. Forensic Medical Evaluation of a Girl Who Was Seriously Injured in a Pitbull Dog Attack: A Case Report. Bulletin of Legal Medicine. 2022;27(1):107-111.
17. Derinöz O, Akar T. Animal Bite Cases Presenting to a University Hospital Pediatric Emergency Department. J Pediatr Emerg Intensive Care Med. 2017;4(1):22-26.
18. Yılmaz S, Delice O, Yılmaz Sİ. Epidemiological Characteristics, Seasonality, Trends of Dog Bite İnjuries and Relationship With Meteorological Data. *Annals of agricultural and environmental medicine*, 2023;30(2), 229-234
19. Söğüt Ö, Sayhan MB, Gökdemir MT, Kara HP. A Preventable Public Health Problem in Southeastern Turkey: Rabies Risky Contact Cases. *JAEM*, 2011;1(10), 14-7.
20. Temiz H, Akkoç H. Evaluation of 809 Cases Applied to Diyarbakir State Hospital Rabies Vaccination Center. *Dicle Medical Journal*, 2008;35(3), 181-184.
21. Loder RT. The Demographics of Dog Bites in The United States. *Heliyon*. 2019;5(3):e01360. Published 2019 Mar 20. doi:10.1016/j.heliyon.2019.e01360.
22. Balin ŞÖ, Denk A. Evaluation of Rabies Risk Contact Notifications. *Fırat Medical Journal*, 2016; 21(3).

23. McGuire C, Morzycki A, Simpson A, Williams J, Bezuhly M. Dog Bites in Children: A Descriptive Analysis. *Plast Surg (Oakv)*. 2018;26(4):256-262. doi:10.1177/2292550318767924.
24. Can FK, Tekin E, Sezen S, Clutter P. Assessment of rabies prophylaxis cases in an emergency service. *Journal of Emergency Nursing*. 2020; 46(6), 907-913.
25. Cesur M, Olgun N. Knowledge, Attitudes and Behaviors of Patients Applying to Hospital with Complaints of Rabies Suspected Animal Attack. *Acıbadem University Journal of Health Sciences*, 2014; (2), 135-140.
26. Ellis R, Ellis C. Dog and Cat Bites. *Am Fam Physician*. 2014;90(4):239-243.
27. Kadıoğlu E, Uyar C, Özmen A. Detailed Analysis of Rabies Suspected Contact Cases After Emergency Service Application: Dumlupınar University Medical Faculty Evliya Çelebi Hospital Experience. *J Contemp Med*, 2017;7(4), 323-328.
28. Joshua IA, Bello M, Adeiza A, Danbirni S. Analysis of 4-Year Dog-Bite Cases Treated at Ahmadu Bello University Health Centre, Zaria, Nigeria. *TAF Preventive Medicine Bulletin*, 2012;11(6).
29. Gündüz T, Elçioğlu Ö, Balcı Y. Evaluation of Dog and Cat Bites in a Five-Year Period: A Case Study from Eskişehir. *National Journal of Trauma and Emergency Surgery*, 2011;17(2), 133-140.

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Research Article/Özgün Araştırma

The effect of first aid training provided to teachers on their first aid knowledge level

Öğretmenlere verilen ilk yardım eğitiminin ilk yardım bilgi düzeyine etkisi

Seheray ZEYREKLİ[1], Gülendam KARADAĞ[2]

[1]Dokuz Eylül University, Institute of Health Sciences, Public Health Nursing MSc Program, 35210, İzmir-Turkey
[2]Dokuz Eylul University, Faculty of Nursing, Department of Nursing, Department of Public Health Nursing, 35340, İzmir-Turkey

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Abstract

Aim: This study aims to evaluate the impact of first aid training on the knowledge levels of middle school teachers and to emphasize the importance of school health nursing.

Materials and Methods: The study was conducted between January and June 2022 with 104 teachers, utilizing face-to-face interviews and the Individual Identification and First Aid Knowledge Test. The research was conducted in a quasi-experimental design with a pretest-posttest control group. Statistical analyses, including descriptive statistics, mean, standard deviation, median, ANOVA, and two-way analysis of variance, were performed using SPSS version 29.0.

Results: It was found that 52.9% of participants frequently encountered situations requiring first aid, and 78.3% felt inadequate in first aid. The experimental group's mean score increased from 63.65 in the pre-test to 77.33 in the post-test following first aid training. In contrast, the control group's mean scores were 62.40 in the pre-test and 61.94 in the post-test. Significant differences were observed between the experimental and control groups on the first aid knowledge test in the post-tests *(p*=0.00*)*.

Conclusion: It has been determined that the first aid training given has a positive effect on the short-term first aid knowledge levels of teachers.

Keywords: teacher; school injuries; first aid training; nursing.

Öz

Amaç: Bu çalışmanın amacı, ilk yardım eğitiminin ilkokul öğretmenlerinin bilgi düzeyleri üzerindeki etkisini değerlendirmek ve okul sağlığı hemşireliğinin önemini vurgulamaktır.

Gereç ve Yöntemler: Çalışma, Ocak-Haziran 2022 tarihleri arasında 104 öğretmenle yüz yüze görüşmeler ve Bireysel Tanımlama ve İlk Yardım Bilgi Testi kullanılarak gerçekleştirilmiştir. Araştırma, ön test-son test kontrol grubu ile yarı deneysel bir tasarımda yapılmıştır. Tanımlayıcı istatistikler, ortalama, standart sapma, medyan, ANOVA ve iki yönlü varyans analizini içeren istatistiksel analizler SPSS sürüm 29.0 kullanılarak gerçekleştirilmiştir.

Bulgular: Katılımcıların %52,9'unun ilk yardım gerektiren durumlarla sıklıkla karşılaştığı ve %78,3'ünün ilk yardımda yetersiz hissettiği bulunmuştur. Deney grubunun ortalama puanı, ilk yardım eğitiminin ardından ön testte 63,65'ten son testte 77,33'e yükselmiştir. Buna karşılık, kontrol grubunun ön testte ortalama puanları 62,40 ve son testte 61,94'tür. Deney ve kontrol grupları arasında son testlerde ilk yardım bilgi testi puan ortalaması arasında anlamlı fark saptanmıştır *(p*=0.00*)*.

Sonuç: Verilen ilk yardım eğitiminin öğretmenlerin kısa vadeli ilk yardım bilgi düzeyleri üzerinde olumlu bir etkisi olduğu belirlenmiştir.

Anahtar kelimeler: öğretmen; okul yaralanmaları; ilk yardım eğitimi; hemşirelik.

Yazışma Adresi/Address for Correspondence: Seheray ZEYREKLİ, Dokuz Eylül University, Institute of Health Sciences, Public Health Nursing MSc Program, 35210, İzmir-Turkey, E-mail: seheray05@gmail.com

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Introduction

Injury is the most common cause of preventable morbidity and mortality among children.[1] Although the school environment prepares children for life, it also contains some environmental risks. School-age children spend most of their time at school.[2] The most common health problem faced by school-age children is school injuries. In a study, it was found that 14.0% of injuries occurred in schools.[3] When the etiology of school injuries is examined, it is seen that there are factors such as children spending most of their time at school daily, starting to socialize, engaging in more physical activity, and increasing their movement skills and independence.[4]

School health in the world and our country the development of nursing was characterized by work aimed at solving health problems of the school-age population, developed over time according to need and now emerges as a separate area of specialization.[5,6] School health nursing is an advanced nursing practice to protect the health of children.[7] In the regulations on school health or school nursing, the first The importance of first aid and the duties of the nurse related to first aid are included.[6] However, not every school in our country has a school health nurse. For this reason in the group of first responders in injuries occurring in schools teachers.[8,9]

First aid is particularly important in the context of school injuries. In a study, it was determined that the classroom teacher was the first to intervene in 64.3% of school injuries.[10] In many studies conducted in our country, it has been determined that teachers' first aid knowledge is not sufficient.[10-13] Similarly, when looking at international literature, studies are showing that teachers' first aid knowledge level is insufficient.[11,14,15,16]

Teachers spend extended periods with students, and as a result, they play a very important role in tasks such as intervening in injuries as part of health services, providing education, and observing for risk factors.[16] Although school health nurses cannot take an active role in the field, studies show that nurses and teachers have a significant role in the school injuries that school children encounter most frequently. Therefore, this study aimed to determine the effect of first aid training on protection from school injuries given to secondary school teachers on the teachers' first-aid knowledge level.

Research hypotheses

Ho: First aid training given to teachers has no effect on the first aid knowledge levels of teachers.

H_1: First aid training given to teachers has an effect on the first aid knowledge levels of teachers.

Materials and Methods

Type of research

This research was conducted a quasi-experimental design with pretest and posttest control group.

Population and sample of the research

The population of the study consists of 208 teachers working at two middle schools affiliated with the Ministry of National Education in a province in western Turkey. The sample is made up of 104 teachers working in middle schools in a province in western Turkey between January and June 2022 (Experimental Group:69, Control Group:35). Although randomization was not applied, naturally existing groups (e.g., schools) were used to assign participants to the experimental and control groups.

The first aid knowledge levels of secondary school teachers were the dependent variables of the study. The sociodemographic characteristics of the participants and the content of first-aid training constitute the independent variables of the study.

Procedur

Before the training, the Individual Identification Form and First Aid Knowledge Test were applied to the experimental and control groups. The appropriateness of the training content, which included first aid practices, was evaluated by obtaining the opinions of 12 experts, each of whom was an expert in their own field. These experts consisted of 2 first aid trainers, 5 public health nurses, 2 surgical nurses and 3 pediatric nurses. After the training content and materials were

finalized after the opinions of these experts, first aid training was given to the experimental group in two sessions in the meeting room provided by the school administration. Each session lasted approximately 40-45 minutes. Immediately after the completion of the training sessions, a simultaneous post-test (First Aid Knowledge Test) was applied to both the experimental and control groups immediately after the training. A follow-up test was applied to the experimental and control groups 8 weeks after the post-test. Later, training was planned for the control group for ethical reasons, but it could not be done because the school administration refused to receive training. The dependent variables of the study were the first aid knowledge levels of secondary school teachers. The sociodemographic characteristics of the participants and the content of the first aid training were the independent variables of the study (Figure I).

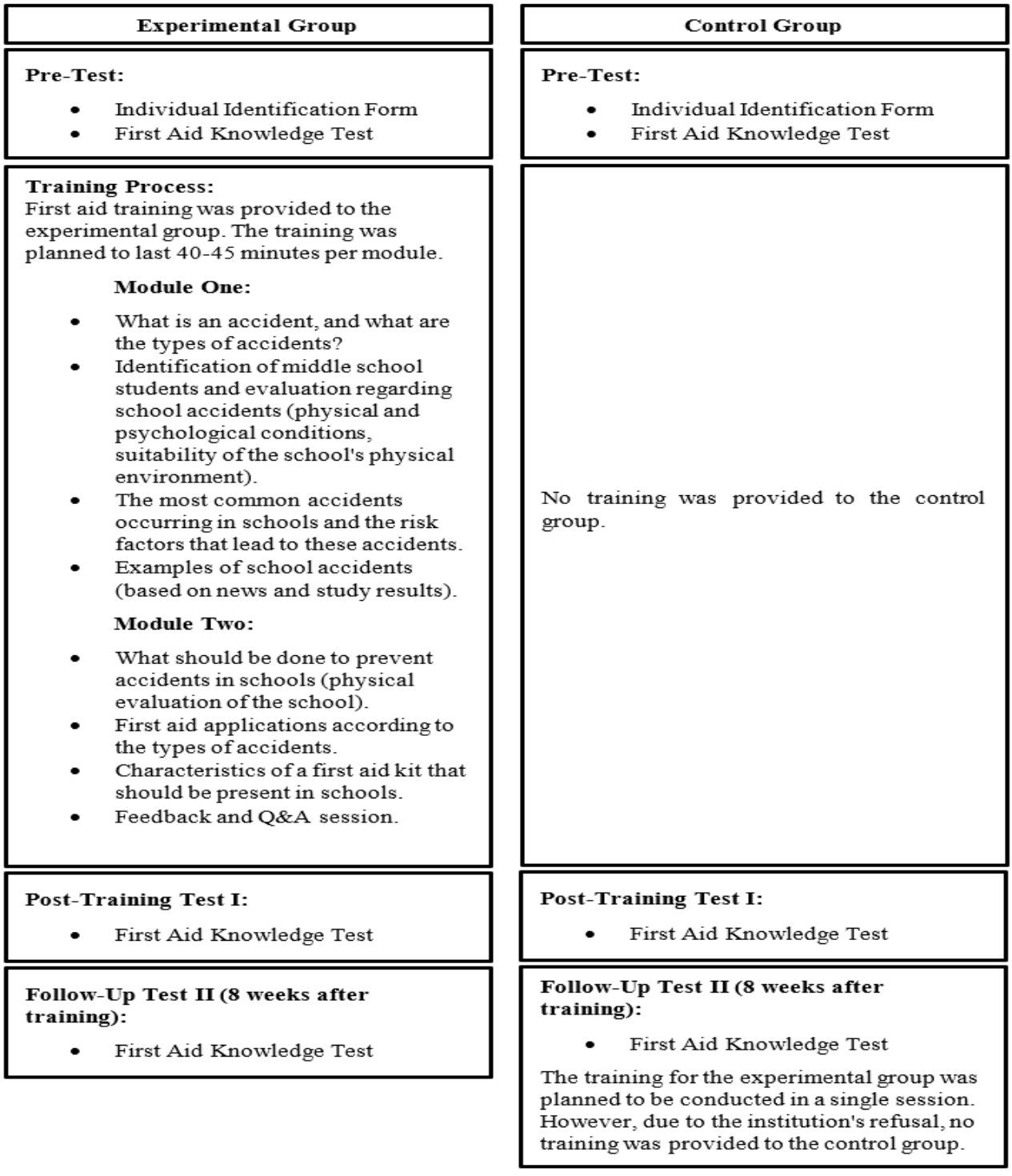

Figure I. Flowchart of the study for the participant.

Data collection tools

The study's data were collected through face-to-face interviews using the “Individual Identification Form” and the “First-Aid Knowledge Test”.

Individual identification form

This form, prepared by the researcher in light of the literature, consists of 19 questions, including 10 questions about the sociodemographic characteristics of the participants and 9 questions about their school injuries and first aid experiences. [3,4,10,13,14]

First-Aid information form

This form, which was prepared by the researchers based on the literature, consists of 25 statements about injuries that teachers may encounter in school-age children and first aid practices, which are answered as "yes" or "no". For the validity and appropriateness of the "First Aid Information Form", 12 experts in the field were consulted. Accordingly, each question in this test, which consists of 25 questions, was valued at 4 points, and the first aid knowledge scores of the participants were evaluated as over 100 points. The highest score that could be obtained from the first aid information form was accepted as 100. As the score obtained increases, the level of first aid knowledge increases in direct proportion. For the First Aid Information Form to be used to measure the first aid knowledge levels of the participants, ANOVA with Tukey’s Test for Nonadditivity was applied to the form. According to the results obtained, it was seen that this test had the "additivity" feature (*p=0*,169). In addition, Box’s M and Mauchly’s Test of Sphericity values were examined for the reliability of this test. In the literature, it is said that if $0.00 \leq \alpha < 0.40$, the scale is not reliable, if $0.40 \leq \alpha < 0.60$, the scale has low reliability, if $0.60 \leq \alpha < 0.80$, the scale is quite reliable, and if $0.80 \leq \alpha < 1.00$, the scale is a highly reliable scale.[17] However, as a result of the analysis made for the First Aid Knowledge Test, it was determined that the Cronbach alpha coefficient was 0.47 and its reliability was low.

Statistical evaluation of the data

In the data analysis of the research, descriptive statistics (mean, standard deviation, median), ANOVA test, and two-way analysis of variance were used in the SPSS 29.0 program**.** The significance level was set at 0.05.

Ethics committee approval

Before starting the study, written permission was obtained from the Non-Interventional Ethics Committee of a university (date:05.01.2022 and decision number: 2022/01-04) (2015/118) and the Provincial Directorate of National Education. After the necessary explanations about the study were made, written consent was obtained from all teachers. The study was conducted in accordance with the Declaration of Helsinki.

Results

The average age of the teachers participating in the research (n:104) is 40.7±7.0 (min:28, max:55) 74% of the participants were women, 81.7% were married, 88.5% had a bachelor’s degree, and 69.2% stated that they had received first aid training before. It was determined that 45.2% of the participants received first-aid training through the Ministry of National Education.

Of the participants, 52.9% reported frequently encountering situations requiring first aid at school, 61.5% stated that they had never provided first aid before. Of the participants, 99% thought that first aid was necessary and that first aid training should be provided in undergraduate education to teachers. The answers given by the participants to questions about first aid are shown in Table 1.

The correct responses given by the experimental group participants to the statement about applying pressure to bleeding gradually increased in the post-test (75.3%) and follow-up test (84.0%). The correct responses given by the experimental group participants to the statement about tetanus intervention in puncture wounds were found to be at the same rate in both the post-test (75.3%) and the follow-up test (75.3%).

Table 1. Characteristics of participants regarding first-aid.

Questions	Answers	Experimental Group		Control Group		Total Participants	
		n	%	n	%	n	%
Do you often encounter situations requiring first aid at school?	Yes	34	49.3	21	60.0	55	52.9
	No	33	47.8	14	40.0	47	45.2
Have you ever given first aid to anyone before?	Yes	27	39.1	13	37.1	40	38.5
	No	42	60.9	22	62.9	64	61.5
Is there a first aid cabinet at the school?	Yes	50	72.5	26	74.3	76	73.1
	No	4	5.8	2	5.7	6	5.8
	I don't know	15	21.7	7	20.0	22	21.2
Do you feel competent in first aid?	Yes	15	21.7	5	14.3	20	19.2
	No	54	78.3	30	85.7	84	80.8
Would you like to receive training in first aid?	Yes	57	82.6	29	82.9	86	82.7
	No	12	17.4	5	14.3	17	16.3
Total		69	100	35	100	104	100

The rate of correct responses from the experimental group participants regarding the statement involving actions to be taken in a fire situation increased in the post-test (33.3%), but this rate decreased in the follow-up test (4.3%). The correct response rate to the statement about heatstroke in the posttest increased in the experimental group and decreased in the control group. While there was an increase in the correct answer rates given by the experimental group in the post-test to statements about animal bites and bee stings, there was a decrease in the follow-up test. The correct response rates to the statement about low blood sugar (hypoglycemia) increased in the experimental group (97.1%) in the post-test, whereas a decrease was observed in the control group (71.4%).

Since there were repeated measurements of different groups in this research, ANOVA and two-way analysis of variance were used for mixed measurements. When the interactions of the participants were examined according to time, it was found that the control and experimental groups had similar/same characteristics, and the sample showed a normal distribution.

The mean score of the participants included in the experimental group from the pre-test was 63.65, the mean score from the post-test administered after the first aid training was 77.33, and the mean score from the follow-up test administered six to eight weeks after the training was 67.76. The mean of the scores of the control group from the pre-test is 62.40, the mean of the scores from the post-test is 61.94 and the mean of the scores from the follow-up test administered six to eight weeks after the post-test is 65.14. (Table 2).

Significant difference was found in the answers given by the experimental and control groups on the first aid knowledge form in the post-test (*p=0.00*) (Table 3).

Table 2. Mean scores of participants on first aid knowledge tests.

Groups	Time	Mean	Std. Error
Experimental Group	Pre Test	63.65	0.99
	Post Test	77.33	0.93
	Follow-Up Test	67.76	1.03
Control Group	Pre Test	62.40	1.39
	Post Test	61.94	1.30
	Follow-Up Test	65.14	1.45

Two-Way Analysis of Variance

Table 3. Comparison of participants' first aid knowledge levels over time.

Time	Groups (I)	Groups (J)	Mean Difference (I-J) and Standard Error	Sig.[b]
Pre Test	Experimental Group	Control Group	+1.25±1.71	0.46
Post Test	Experimental Group	Control Group	15.39*±1.60	0.00
Follow-Up Test	Experimental Group	Control Group	-2.62±1.78	0.14

The significance level was set at 0.05. ANOVA Test

Discussion

When the health problems of school-age children are examined, school injuries emerge as the most common health problem.[1-4] It is estimated that 10% to 25% of childhood injuries occur while the child is in school.[15,18] In studies conducted in Turkey, children are more exposed to injuries, mostly in schools, and injuries are identified as the most prevalent health issue in schools.[10,13,19] In a study conducted by Sönmez et al.,[13] it was determined that 68.2% of teachers encountered a situation requiring first aid in their professional lives. In another study by Dinçer et al., [20] 68.8% of teachers were found to experience the same situation. All these findings indicate that teachers are the individuals who should provide initial intervention for students in school injuries.[15,19] In this study, it was determined that almost half of the experimental group and more than half of the control group stated that they frequently encountered situations requiring first-aid at school.

Almost all of the teachers who participated in our study believed that first aid was necessary, and they considered their knowledge of first aid to be insufficient.[6,13,14] In the study conducted by Nayir et al.,[21] which showed similar results to our study, 86.0% of the teachers stated that they did not find their first aid knowledge level sufficient and 81.0% of the teachers stated that they wanted to receive training on first aid.[21] In another study, it was revealed that teachers have insufficient knowledge in first aid, may provide incorrect interventions, and emphasize the significance of education in this field.[12] Gowri and Missiriya[14] found that 78% of teachers did not have sufficient knowledge about health care.

The mean score of the participants in the experimental group from the pre-test was 63.65±0.99, and the mean score of the control group was 62.40±1.39. Upon reviewing other studies in the literature, in the study conducted in Isparta, among primary and high school teachers, the mean of the first aid knowledge score was 7.07 out of 12.[21] Demirci and Alptekin[16] in their study, the mean score of teachers on the First Aid Knowledge Form was inadequate in a study conducted with preschool teachers, the mean score of teachers on first aid knowledge questions and in another study conducted with primary school teachers the mean of first aid knowledge level scores of teachers was low score.[12,15,16,22] In both the studies reviewed in the literature and the results of our study, the mean of first aid knowledge scores of teachers were generally moderate level.

When looking at the correct knowledge rates based on answers of teachers to first aid knowledge questions, the least correct answers were given to the statements about fire, fracture, epilepsy crisis, and bleeding, while the highest correct answers were asthma, choking, and fainting.[23] In contrast to our study findings, Aktaş et al.[24] reported that 96.6% gave correct responses to fractures and dislocations and 94.8% gave correct responses to bleeding, whereas similar to our study, they indicated that 75% gave correct responses to blocking the trachea by a foreign object.[24] According to our study results, while the teachers' first aid knowledge test average score was 63.65±0.99 before the first aid training, it increased to 77.33±0.93 after the training. In addition, with advanced analyses, while there was no significant difference between the answers given by the experimental and control groups to the pre-tests (p=0.04), a significant difference was found between the answers to the post-test applied to the teachers in the control group and experimental group simultaneously after the training given to the experimental group (p=0.00). This result shows that the first aid training provided has a statistically significant effect on the short-acting first aid knowledge of teachers. Özyürek et al.[25] examined the short-term effect of 16 hours of basic first aid training given to teachers and found that the mean score of teachers from the pre-test was 48.512±14.18, the mean score of the post-test was 80.20±11.2511.25, and that there was a statistically significant difference between the pre- and post-test knowledge levels. Similar results were observed in our study.

When we examined the further effects of the first aid training given to teachers in our study, it was found that the score of the experimental group in the post-test and follow-up test was

higher than the score they received in the pre-test, and the difference between the scores they received in the first aid information form created a statistically significant difference. However, although the score they obtained from the follow-up test was higher than that from the pre-test, it was lower than that from the post-test. These results indicate that first aid training should be repeated periodically and its continuity should be ensured. In addition, while no significant difference was detected between the answers given by the experimental and control groups in the follow-up tests (p=0.14), a slight increase was observed in the first aid score mean of the control group, but this increase was not statistically significant (p=1.00). This increase is thought to result from teachers becoming familiar with the questions by solving them again in the pre-test, post-test, and follow-up test.

The low reliability coefficient of the first aid knowledge test used in our study is an important limitation. The Cronbach alpha coefficient calculated for the scale is 0.47, which is below the generally accepted reliability threshold in the literature. Scales with an alpha value below 0.60 are considered to have low reliability.[17]

Conclusion

According to the results of this study investigating the effect of first aid training given to teachers on their knowledge levels, it was determined that the first aid training given had a high instantaneous and short-term effect on the first aid knowledge level of teachers, and the effect of the training on the first aid knowledge level decreased over time.

In line with these results; the development of measurement tools to assess the level of first-aid knowledge, with tested validity and reliability, periodic training for teachers on school injuries and first-aid, and the employment of school health nurses in schools are recommended. More studies are needed to identify school injuries and determine in which areas teachers are more likely to have a lack of knowledge. Furthermore, it is recommended that schools coordinate with Community Health Centers, the Provincial Public Health Directorate, and the Provincial Directorate of National Education for the mentioned first-aid training programs, and even collaborate with universities in their regions if available.

Ethics Committee Approval

Before starting the study, written permission was obtained from the Non-Interventional Ethics Committee of a university (date:05.01.2022 and decision number: 2022/01-04) (2015/118) and the Provincial Directorate of National Education. After the necessary explanations about the study were made, written consent was obtained from all teachers. The study was conducted in accordance with the Declaration of Helsinki.

Informed Consent

All participating teachers were fully informed about the aim and procedures of the study. Written informed consent was obtained from all participants, and confidentiality of the data was ensured throughout the research process. This study was conducted in accordance with the Declaration of Helsinki.

Authors Contrubituons

Seheray Zeyrekli (S.Z.): Contributed to conceptualization, study design, data collection, material provision, data analysis, literature review, manuscript writing (original draft), and critical review of the content.

Gülendam Karadağ (G.K.): Contributed to study design, supervision of data collection, statistical analysis, manuscript writing (review & editing), and critical review of the final version

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Peer-review

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References

1. Çaylan N, Yalçın SS, Tezel B, Aydın Ş, Özen Ö, Şengelen M, Çakır, B. Evaluation of injury-related under-five mortality in Turkey between 2014-2017. *The Turkish Journal of Pediatrics* 2021;63: 37-47. https://doi.org/10.24953/turkjped.2021.01.005.
2. Şengel A, Gür K, Kılınç E. The epidemiology of students injuries in a private primary school in Turkey from 2012 to 2018. *Clinical and Experimental Health Sciences* 2020; 10: 362-368. https://doi.org/10.33808/clinexphealthsci.649682.

3. Özsoy, S., Kalkım, A., Sert, Z.E. (2019). Diagnosis of health status and health risks of primary school students. *Balıkesir Journal of Health Sciences* 2019;8: 135-142.
4. Dönmez H, Çalışkan C, Arberk OK, Ünlü H, Küçük Biçer B, Özcebe H. An evaluation of injuries in children aged 7-14 Years in Turkey. *Turkish Journal of Pediatric Disease* 2018;4: 236-242.
5. Meydanlıoğlu A, Gözüm S. Practices and programs to improve school health in Turkey. *Turkey Clinics Public Health Nursing-Special Topics* 2019; 5: 16-23.
6. Lineberry MJ, Ickes M J. The role and impact of nurses in American elementary schools: A systematic review of the research. *The Journal of School Nursing* 2015;31:22-33.
7. Maughan E, Bobo N, Butler S, Schantz S, Schoessler S. Framework for 21st century school nursing practice: An overview. *National Association of School Nurses (NASN) School Nurse* 2015; 30: 218-231. doi:10.1177/1942602X15589559.
8. Arrue-Gerra M, Barrio-Cortes J, Lozano-Hernández C M, Ruiz-Janeiro J, Ruiz-Zaldibar C, Ruiz-López M. School nurse practice: A descriptive Spanish study. *The Journal of School Nursing* 2024;40: 380-390. Doi:10.1177/10598405221111567.
9. Kılınç E, Gür K. The Effect of Health Belief Model in Preventing School Injuries. *Journal of Health Sciences and Professions* 2018; 5:467-475.
10. Akçay D, Yıldırımlar A. Investigation of children's accidents in school environment and parental behaviors towards safety measures. *Dokuz Eylül University Faculty of Nursing Electronic Journal* 2018;11: 48-55.
11. Özlü ZK, Aras GU, Özlü İ, Apay S E, Avşar G, Coşar Z, Küçükoğlu A, Taşgın A. Determination of teachers' knowledge levels on first aid. *Anatolian Journal of Health Research* 2023; 3:139-143. https://doi.org/10.29228/anatoljhr.64990.
12. Kızıl M, Üstünkarlı N, Yıldız Ş, Kurtel K, Şemin İ, Hakan AY. Evaluation of the accuracy of first aid information and its effect on first aid practices. *Prehospital Journal* 2018;.3:15-30.
13. Sönmez Y, Uskun E, Pehlivan A. Knowledge levels of pre-school teachers related with basic first-aid practices, Isparta sample. *Turkish Archives of Pediatrics*/*Türk Pediatri Arşivi* 2014; 49: 238.
14. Gowri M, Missiriya S. Knowledge and practice of school teachers on health care of school children. *International Journal Of Pharma and Bio Sciences* 2017; 8: 227-31.
15. Pandey R, Chauhan R, Dobhal S, Dabral S, Nathani S, Negi S, et al. First aid knowledge among health assigned teachers of primary schools. *International Journal of Research in Medical Sciences* 2017; 5: 1522-1527.
16. Güler M P D, Alptekin İ. Determination of the basic first aid knowledge levels of primary school teacher candidates. *Ahi Evran University Kırşehir Faculty of Education Journal* 2021; 22: 299-331. https://doi.org/10.29299/kefad.762751.
17. Kilic S. Cronbach's alpha reliability coefficient. Psychiatry and Behavioral Sciences 2016; 6: 47.
18. Gereige R S, Gross T, Jastaniah E. Council on School Health and Committee on Pediatric Emergency Medicine. *Individual medical emergencies occurring at school. Pediatrics* 2022;150:e2022057987.
19. Keleş P U, Yıldırım Z, Aydın S. Determining the Basic First-Aid Knowledge Levels of the Class Teachers Working In the City Center of Agri. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)* 2015;6: 404-410.
20. Dinçer Ç, Atakurt Y, Şimşek I. A research on first aid knowledge levels of preschool educators. *Ankara Medical Faculty Mecmuası* 2000;53:31-38. https://doi.org/10.1501/Tipfak_0000000417.
21. Nayir T, Uskun E, Türkoğlu H, Uzun E, Öztürk M, Kişioğlu AN. First aid knowledge levels and attitudes of teachers working in Isparta city center. *Journal of SDU Faculty of Medicine* 2011; 18: 123-127.
22. Bozkurt A, Özbar N, Çekiç S, Küçük YM. Determination of first aid knowledge levels of classroom teachers and branch teachers. International Refereed Journal of Orthopedics. *Traumatology and Sports Medicine* 2015;2:1-10. https://docplayer.biz.tr/865626-Sinif-ogretmenleri-ve-brans-ogretmenlerinin-ilkyardim-bilgi-duzeylerinin-tespit-edilmesi-1.html.
23. Vermonden M, Dehaerne L, Toelen J, De Coninck D. Teacher preparedness for medical emergencies in Belgian classrooms: studying objective and subjective first-aid knowledge. *Children* 2023;10:669. https://doi.org/10.3390/children10040669.
24. Aktaş B, Yılmaz M, Dereli F, Sarı HY. First aid knowledge level of primary first and second level teachers. *Journal of Academic Research in Nursing (Jaren)* 2019;5:17-22.
25. Özyürek P, Bayram F, Beştepe G, Ceylantekin Y, Ciğerci Y, Çelik Y, Kuyucuoğlu N, Karaca Ş, Temel S, Yılmazer A. Evaluation of the effectiveness of basic first aid training given to high school teachers. *Journal of Social Sciences* 2013;15:183-198. http://dx.doi.org/10.5578/JSS.6806.

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Research Article/Özgün Araştırma

Satisfaction, struggles, and suggestions: ICU experiences of open-heart surgery patients in Türkiye

Memnuniyet, mücadeleler ve öneriler: Türkiye'de açık kalp ameliyatı hastalarının yoğun bakım deneyimleri

Bilgen ARIKAN[1], Serdar SEVER[1]

[1]Uşak University, Faculty of Health Sciences, Department of Nursing, Department of Surgical Diseases Nursing, 64200, Uşak-Turkey

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Abstract

Aim: The experiences of patients who undergo open-heart surgery in the intensive care unit (ICU) have been insufficiently explored. This study aims to investigate the ICU experiences of open-heart surgery patients in Türkiye.

Materials and Methods: This qualitative research was conducted with 15 patients who underwent open-heart surgery. Data were collected through semi-structured in-depth interviews, recorded, transcribed, and analyzed using inductive content analysis.

Results: Participants identified four main themes: i) satisfaction, ii) physical problems, iii) emotional feelings, iv) physical environment. They expressed gratitude towards healthcare professionals and family, discussed postoperative challenges, and emphasized the need for improved privacy. Healthcare professionals played a key role in decision-making and alleviating psychological stress.

Conclusion: This study sheds light on the experiences of open-heart surgery patients in the ICU, highlighting the importance of addressing both physical and emotional needs. The findings suggest that incorporating patient feedback can improve patient-centered care and enhance outcomes.

Keywords: Open-heart surgery; Coronary artery bypass grafting; Qualitative research; Life experiences; Intensive care unit.

Öz

Amaç: Açık kalp cerrahisi geçiren hastaların, yoğun bakım ünitesinde (YBÜ) geçirdiği süre zarfındaki deneyimleri sınırlı bir şekilde araştırılmıştır. Bu çalışma, Türkiye'deki açık kalp cerrahisi hastalarının YBÜ deneyimlerini keşfetmeyi amaçlamaktadır.

Gereç ve Yöntem: Bu nitel araştırma, açık kalp cerrahisi geçiren 15 hasta ile yapılmıştır. Veriler, yarı yapılandırılmış derinlemesine görüşmelerle toplanmış, ses kaydına alınmış ve içerik analizi yöntemiyle değerlendirilmiştir.

Bulgular: Katılımcılar, dört ana tema etrafında deneyimlerini paylaşmışlardır: i) memnuniyet, ii) fiziksel problemler, iii) duygusal hisler, iv) fiziksel çevre. Katılımcılar, sağlık profesyonelleri ve ailelerine teşekkür ederken, postoperatif zorlukları ve gizlilik ihtiyacını dile getirmişlerdir. Sağlık profesyonelleri, karar alma süreçlerinde önemli bir rol oynamış ve psikolojik stresi azaltmada destek sağlamıştır.

Sonuç: Bu çalışma, açık kalp cerrahisi hastalarının YBÜ'deki deneyimlerini aydınlatmakta ve hastaların fiziksel ve duygusal ihtiyaçlarının karşılanmasının önemini vurgulamaktadır. Bu bulgular, hasta odaklı bakımın iyileştirilmesine katkı sağlayacaktır.

Anahtar Kelimeler: Açık kalp ameliyatı; Koroner arter baypas greft; Nitel araştırma; Yaşam deneyimleri; Yoğun bakım ünitesi.

Yazışma Adresi/Address for Correspondence: Serdar SEVER, Uşak University, Faculty of Health Sciences, Department of Nursing, Department of Surgical Diseases Nursing, 64200, Uşak-Turkey, E-mail: serdar.sever@usak.edu.tr

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Introduction

Cardiovascular disease (CVD) is the leading global cause of death, accounting for approximately 17.9 million deaths annually.[1] Open-heart surgery, a common treatment for CVD, is on the rise due to increased life expectancy and medical advancements.[2,3] However, it brings postoperative complications, posing challenges for both patients and healthcare professionals. [4–6] Factors such as severity of clinical conditions, high-risk status, age, and comorbidities contribute to complications.[7] Post-surgery complications range from 15% to 30%,[5] impacting resource utilization, ICU, and hospital stays, as well as morbidity and mortality.[8]

ICU stays post-heart surgery, lasting 1-3 days or longer, present complex challenges and stress for patients. Stress factors include invasive procedures, immobility, mechanical ventilation, orotracheal intubation, and pain.[9] The ICU environment introduces anxiety-inducing factors like separation from family, communication difficulties, continuous noise, disorientation, and presence of unfamiliar individuals.[10] These factors can impact patients' well-being, clinical outcomes, and care experiences.[10] Despite some studies addressing ICU experiences,[10–12] there's a scarcity of research on ICU experiences after open-heart surgery,[4] particularly in Turkish patients. This study aims to explore Turkish patients' ICU experiences post-open-heart surgery qualitatively, contributing to personalized care decision-making for healthcare professionals.

Materials and Methods

Research design

The Standards for Reporting Qualitative Research (SRQR) checklist has been used to report this study.[13] This research utilized a qualitative descriptive framework and a phenomenological approach, specifically adopting a descriptive phenomenological design to unveil life experiences following open-heart surgery.[14]

Sample of the research

The study employed purposive sampling method and criterion sampling technique for participant selection. Eligible participants for this research must have undergone open-heart surgery with a median sternotomy approach, be clinically stable (normal blood pressure, no heart rhythm alterations, normal oxygen saturation), be 18 years or older, and proficient in speaking and understanding Turkish. Exclusions were made for those with evident cognitive impairments or unwillingness to participate. The ultimate research sample comprised 15 participants (10 males, 5 females) observed at the post-op cardiovascular surgery clinic of a training and research hospital. Before data collection, participants received and signed an informed consent form detailing the research. Following this, demographic information was collected, and in-depth interviews were conducted.

Those who had open-heart surgery and fulfilled the inclusion criteria were interviewed in a secluded space. The selection of this particular room in the post-op cardiovascular surgery clinic was based on its suitability for facilitating in-depth interviews, ensuring optimal conditions concerning sound, noise, light, and temperature. Precautions were implemented to prevent disruptions during interviews: a notice indicating an ongoing interview was affixed to the door, and team members were briefed accordingly. Data collection concluded after the interview with the 15th participant, as data saturation was reached, no novel information emerged, and responses became repetitive.[16–18]

Data collection

Data for the research were collected through a comprehensive semi-structured interview. The interview guide was crafted based on insights from existing literature,[4,15] and pilot tests were conducted before finalizing the form **(See Appendix 1).** The semi-structured interview questions focused on patients' experiences and emotions following open-heart surgery. Participants were asked to describe their feelings after surgery, share their intensive care experiences, and reflect on how these experiences impacted their lives.

The interviews were conducted by the initial researcher, possessing pertinent experience in qualitative studies, in a private space that guaranteed participant comfort and provided essential conditions for secure data collection. The second researcher documented field notes derived from their observation of participants' non-verbal cues. Following each interview, demographic information about the participant was collected, along with their confirmation regarding the utilization of their results and feedback.[14] The interviews, on average, lasted for 36 minutes (ranging from a minimum of 20 minutes to a maximum of 65 minutes). They were recorded using an audio recorder and transcribed verbatim. The transcriptions were subsequently reviewed for accuracy.

Data analysis

The data underwent inductive content analysis. All interview recordings and notes from the interviews were amalgamated with the collected data. These were documented without additional comments, aligning with the nature of the data, and were analyzed by two researchers following the steps recommended by Graneheim and Lundman (2004):[16]

- Raw data were repeatedly reviewed for overall comprehension
- Text content was segmented into meaningful units, coded, and condensed.
- Codes were interpreted, scrutinized for differences and similarities, leading to subthemes.
- A back-and-forth examination across all text units was conducted.
- Subthemes were consolidated, and overarching study themes were identified.

Following the establishment of the final code version, an assessment of coder compatibility was conducted by two individuals external to the study. The inter-coder consistency ratio, measured through Cohen's kappa (k) value, was determined to be 0.86. A kappa value falling between 0.81 and 1.00 is considered indicative of a perfect agreement between raters.[14]

Rigor, trustworthiness, and authenticity of data

To assess the internal authenticity, a team of four experts, comprising a cardiovascular surgeon and three nurses, reviewed and finalized the semi-structured interview guide. The data analysis process was independently carried out by each researcher. Two authors separately encoded the participants' statements to enhance the authenticity of the emerging themes and sub-themes. The codes were compared, common codes identified, discrepancies discussed, and new categories established through a re-evaluation process.[16,18] Additionally, to bolster the external trustworthiness of the research, the researchers forwarded their perceptions, notes, and conclusions that underpin the report, along with all the tools used for data collection, raw data, and encoded data to an external specialist for verification.[14,19]

Ethics committee approval

Approval was granted by an ethics board (No: 33-33-08, dated 05.01.2023), institutional permission (E-45786011-602.02.01) and written informed consent was obtained from all participants. The research adhered to the ethical standards outlined in the Helsinki Declaration throughout all stages. Participants were guaranteed the confidentiality of the collected data, and pseudonyms were employed in data submission.

Results

Sample characteristics

Five women and ten men, totalling 15 patients who underwent open-heart surgery, participated in the study. The average age of the patients was 58.4 (range: 46-76). The majority of the patients were married (*n*=13) and unemployed (*n*=9). Most of the patients (n=12) had undergone coronary artery bypass grafting (CABG) surgery. The most common comorbidity observed was hypertension. The average length of stay in the intensive care unit (ICU) was 6.4 days (range: 4-13). Ten patients reported having no prior knowledge about the ICU. Information regarding age, gender, marital status, education level, employment status, comorbidities, type of surgery, and length of stay in the ICU and hospital is presented in Table 1.

Table 1. Demographic data of the participants in the study.

Participant	Age	Sex	Marital status	Education	Employment status	Comorbidities	Type of surgery	Length of hospital stay (day)	Lenght of stay in ICU (day)	Previous information about the ICU
P1	72	F	Single	Primary	Retired	Mitral regurgitation, Thyroid	CABG	24	5	No
P2	58	F	Married	Middle school	Retired	HT, DM, HL	CABG	28	7	No
P3	61	F	Married	Primary	Retired	Thyroid	CABG	25	5	No
P4	51	M	Married	High school	Employed	HT, HL	CABG	18	8	Yes
P5	59	M	Married	Middle school	Retired	HT, DM, HL	CABG	19	6	No
P6	60	M	Married	Middle school	Retired	HT, KOAH, HL	CABG	20	13	No
P7	76	F	Married	Primary	Retired	DM, HL	Valve surgery	19	4	Yes
P8	49	M	Married	Middle school	Employed	HT, HL	CABG	18	6	No
P9	54	M	Married	Middle school	Employed	HT, DM	CABG	29	13	Yes
P10	48	M	Married	High school	Employed	HT, DM, HL	CABG	16	4	No
P11	62	F	Single	Primary	Retired	HT, DM	Valve surgery	14	4	No
P12	46	M	Married	University	Employed	HT, DM, HL	CABG	14	5	Yes
P13	54	M	Married	High school	Retired	HT	CABG	17	5	Yes
P14	62	M	Married	Primary	Retired	HT, HL	Valve surgery	14	6	No
P15	64	M	Married	Primary	Retired	HT, HL, COPD	CABG	19	5	No

Abbreviations: HT, hypertension; DM, diabetes mellitus; HL, hyperlipidaemia; COPD, chronic obstructive pulmonary disease; CABG, coronary artery bypass grafting

Themes

Open-heart surgeries, being major operations, have various impacts on patients in many ways. In-depth interviews closely examined patients' individual intensive care experiences after open-heart surgery. As a result of the content analysis of qualitative interviews, four main themes and 22 sub-themes were obtained (Table 2). In this section, four main themes, namely "satisfaction," "physical problems," "emotional feelings," and "physical environment," along with their sub-themes, were discussed. All quoted participants were anonymized, and the quotes were presented in the form of participant number, age, and gender, such as (P1, 58, F).

Table 2. The main and sub-themes related to the experiences of patients in the intensive care unit following open-heart surgery.

Main Theme	Sub-themes
Satisfaction	Interest of healthcare professionals
	Satisfaction with treatment and care
	Family support
	Beliefs and encouragement
Physical Problems	Difficulty lying on the back
	Pain
	Difficulty eating
	Not being able to sleep
Emotional Feelings	Desire to leave/escape from the intensive care unit
	Relief
	Comparing oneself with other patients
	Feeling dependent on others
	Fear of death
	Concerns about not recovering
	Feeling alone
	Not remembering
	Developing a positive perspective
	Difficulty coping with surgery
Physical Environment	Noise
	Crowdedness
	Feeling cold
	Privacy

1. Main theme: Satisfaction

In the study, most patients (*n*=13) reported high satisfaction with ICU care, citing confidence, moral support, cheerfulness, and effective communication from doctors and nurses. They expressed gratitude for healthcare providers and conveyed satisfaction.

"...he (the doctor) comes and goes, 'don't worry, I'll make you feel better,' comes and caresses my head, gives me morale; may God be pleased, a very good doctor. When he enters through that door, a great sense of morale comes to you because he comes towards you with such kindness…" (P2, 58, F)

Patients in the ICU also expressed satisfaction with nursing care, with seven noting complete fulfilment of their needs. Some conveyed their contentment with care as follows:

"Intensive care, my God, may nobody experience it. It's really tough, but there are people working there, you know. It's like they're superhuman. They take care of everything so attentively. They peeled my apple for me. I don't know, they peeled my egg. They shredded my chicken. Their effort, you know? They're all very good people. I can't say anything bad about them." (P8, 49, M)

Patients, in addition to being satisfied with healthcare workers, reported receiving support and morale from their families during and after the intensive care process (*n*=8). P1's statements included:

"They were shattered, but now I am pleased with my children. They all rallied around me... They said, 'We are always behind you,' they said, 'We pray for you every day.'" (P1, 72, F)

Upon waking up in the ICU, patients (*n*=11) expressed gratitude to God for surviving the challenging postoperative period. Coping with the intensive care process, some (n=5) mentioned relying on prayer, instilling belief in recovery, and maintaining hope, as reflected in their statements:

"I was receiving treatment, and I was always praying to God. I was constantly trying to pray in my mind, and when I prayed, I felt a bit relieved." (P2, 58, F)

2. Main theme: Physical problems

Patients (n=9) reported physical challenges during the postoperative ICU process, with lying on their backs continuously being the most common issue.

They mentioned discomfort, back pain, fatigue, pressure sores, and difficulty attending to toilet needs as associated challenges.

"Seriously, there's nothing else but lying down there. Does a person ever get tired of lying down?" (P10, 48, M)

Postoperative pain was a commonly mentioned issue, with over half of the patients (*n*=8) experiencing pain in the intensive care unit. This included pain in incision areas, and two patients reported pain related to urinary catheters.

"Look, I swear, on the day they removed the catheter, it felt like a tractor lifted off me, just imagine that." (P10, 48, M)

Patients also reported the inability to eat as another physical problem. Factors such as post-anaesthesia nausea-vomiting, loss of appetite, and difficulty adhering to a salt-free diet were cited by patients (*n*=8). Patient P7 expressed this issue as follows:

"Until yesterday evening, whatever I ate came back up. My tongue is dry, my palate is burning, my body is thirsty, I even wet my feet. It's very difficult. I would be fine if there wasn't any nausea..." (P7, 76, F)

The necessity of lying on their backs continuously, pain, being dependent on mechanical ventilation, and environmental factors led patients to experience sleep problems. They expressed using medication for sleep (*n*=6).

"I took sleeping pills. I couldn't sleep continuously, you know. I can't sleep in this position. Because I always turn and sleep on my side." (P9, 54, M)

3. Main theme: Emotional feelings

After open-heart surgery, ICU patients reported intense emotions, emphasizing a significant psychological impact. Over half of the study participants (*n*=8) expressed a strong desire to leave the ICU promptly.

"Seriously, you just want to get out as soon as possible. You're dependent on everything there. You can't even clean yourself. Freedom is something else. It's not there. Okay, they take care of you for a certain period and all, but it doesn't mean anything. It doesn't fill that emotional void of yours..." (P12, 46, M)

The predominant emotion expressed by patients was relief, as the surgery went better than expected (*n*=7). Patients conveyed happiness and gratitude for surviving open-heart surgery, with one (P15) expressing a sense of revival upon waking up in the ICU for the first time.

"Not an easy surgery. It's a very serious surgery... It's like I've died, but I'm coming back to life. I didn't think I would come back, but thanks to God, we made it..." (P15, 64, M)

After open-heart surgery, there were multiple patients in the same environment in the ICU. Some of the participating patients (*n*=5) mentioned observing other patients, comparing themselves, feeling hope when they saw patients in better conditions, feeling sad when they saw patients in worse overall condition, and experiencing psychological impact when others suffered (*n*=3).

"You see those who are doing better than you, and you see those who are doing worse than you. When you see the worse, you're grateful for your own condition. And when you see someone in a better condition leaving, you hope that you'll be taken out too. I mean, you experience the emotions of the world. You look at someone who's struggling, yelling, screaming. You look at them, then you look at yourself and feel grateful for your own situation..." (P12, 46, M)

Patients in the ICU after surgery also expressed the challenge of meeting self-care needs due to limited mobility. They mentioned feeling dependent on others and experiencing a sense of freedom loss because they couldn't attend to their own needs (*n*=5).

"You're just tied to a bed, constantly needing help from someone. It really gets to you. Of course, you can't get up and drink water from the table, you can't grab a tissue, you can't adjust your pillow. The simplest things, you know... It's really distressing." (P4, 51, M)

Patients raised the topic of the fear of death, experiencing it both in the preoperative and ICU phases. They mentioned feeling upset at

the thought of not seeing their family and loved ones again (*n*=5).

"...I don't have my children by my side; I panicked at the thought of dying and not being able to see them…" (P2, 58, F)

During the ICU process, patients expressed anxiety stemming from the fear of not recovering, pondering on their chances of recovery, and experiencing a sense of uncertainty (*n*=4).

"There, no one else but yourself can help you. It puts a person under stress in that regard. What will happen to me, will I die, will I survive, will I get out, or won't I be able to get out?" (P13, 54, M)

In the ICU process, some patients mentioned feeling lonely as family visits were limited to specific times (twice a day). They expressed getting emotional and crying upon seeing their family and children (*n*=3).

"No one is around, when I look around, none of my children are there. I felt that feeling strange, it's not easy. You feel lonely..." (P7, 76, F)

Patients after surgery mentioned the inability to remember the first moments of waking up after the operation (*n*=5). Statements from P3 and P5 on this matter were as follows:

"Honestly, I don't remember waking up at all. I opened my eyes like this, looked around. Someone said, 'Sleep, sleep.' I slept a little more, then they removed the tube (endotracheal tube)." (P5, 59, M)

Post open-heart surgery, some patients mentioned a shift in their perspectives on life. They developed a positive outlook, gained a better understanding of the value of life, living, and being healthy, and expressed a commitment to avoiding harmful habits (*n*=5).

"Well, I can only say this: a person who has been in the ICU looks at life from a more beautiful and positive perspective, really looking at the positive side of life and events... You learn to overlook some things, that's one thing. Secondly, your instinct to say 'no' to people increases. According to my logic, in the past, if you came to me, said something, even if I felt hurt, I couldn't react. I didn't want to hurt them either. But after the ICU, people change. You say, 'Life is not really long enough to be upset for someone else...'" (P4, 51, M)

Patients expressed that the surgery was very challenging, with five individuals highlighting the difficulty of both the surgery and the postoperative process (*n*=5).

"Once you come to your senses, once you get out of the intensive care unit, there is a feeling of happiness in a person as if they have been freed from prison, to be honest. You not only feel a sense of happiness but also become quite happy. However, the intensive care unit is not an easy place; it's a difficult process, but I think it's a necessary process." (P13, 54, M)

"...It's like a very heavy surgery; I felt as if two trucks had passed over me. I felt that kind of pain." (P15, 64, M)

4. Main theme: Physical environment

Some of the patients who underwent open-heart surgery mentioned problems related to the physical environment of the ICU. Three patients were uncomfortable due to the stressful and noisy environment, three patients felt discomfort due to the high number of people in the room and the fear of getting an infection, and one patient felt cold due to the low room temperature. One of the most frequently mentioned issues related to the physical environment was privacy. Some patients expressed discomfort about men and women sharing the same space, and feeling uneasy when their hair or upper body was exposed. They emphasized the need for more attention and care for privacy (*n*=6).

“It bothered me personally, for example, you are uncomfortable here, you want to sleep, the patient next to you has come back from surgery and he wants to scream, he is screaming, you cannot stop anyone, you have no right to do anything anyway.” (P4, 51, M)

Patients made suggestions regarding the physical environment, emphasizing the need for improved privacy. One patient suggested individual rooms in ICUs, while two proposed separate ICUs for male and female patients. Another patient recommended a more spacious arrangement of the physical space.

"Let me give you an example; the intensive care unit I stayed in was right next to it, an eight-bed room... If you divide those eight people into two rooms, it fits, and if you make separate rooms for them, no one will disturb each other." (P4, 51, M)

"They could make it a bit more comfortable (spacious). I mean, there are already six, seven, eight patients, seven, eight staff, plus there's a shift change. The noise gets quite loud during the shift change. The shift change could be done elsewhere..." (P9, 54, M)

Discussion

Open-heart surgery is a common major procedure with patients spending the initial postoperative period in the ICU, crucial for care. This study explores the experiences of individuals after open-heart surgery in the ICU, offering valuable insights into the challenges and emotions faced. Recognizing and understanding these experiences are paramount to enhancing the postoperative ICU journey for those undergoing open-heart surgery.[4] Our study findings were classified under four main themes, namely "satisfaction," "physical problems," "emotional feelings," and "physical environment," obtained through the content analysis of qualitative interviews.

The study found that the majority of ICU patients expressed high satisfaction with both doctors and nursing staff. This positive sentiment was attributed to the healthcare professionals' establishment of trust, provision of moral support, cheerful demeanour, and effective communication. Previous research on post-cardiac surgery experiences underscores the crucial role of healthcare professionals, particularly nurses, in providing attention and care.[20–22] Patients specifically praised the nurses for meeting all their needs, reflecting positively on the nursing profession. Similar satisfaction with care has been observed in studies on cardiovascular surgery patients in the ICU.[23-24] Additionally, over half of the patients highlighted the significance of family support in navigating the recovery process, aligning with findings from previous studies emphasizing the importance of psychological and social support from families after cardiac surgery.[24]

Study participants, all Muslim, expressed gratitude to God for surviving the challenging postoperative period in the ICU. They highlighted the importance of prayer as a coping mechanism during critical care, similar to previous qualitative research that underscores patients relying on spirituality, prayer, and self-motivation to navigate the surgical process.[20,22,25] This finding underscores the critical need for integrating spiritual support into ICU care to address patients' emotional and psychological well-being during recovery.

The second major theme in our study focused on physical problems reported by patients in the ICU. These issues included challenges like discomfort lying on their backs, pain, difficulty eating, sleep disturbances, and reliance on medical equipment. Various qualitative studies corroborate these findings.[4,20,21,25] Over half of our participants experienced varying levels of pain in the ICU, consistent with existing literature.[4,20–23] Nurses should be aware of the physical problems of patients in the ICU and provide the necessary support. In particular, effective pain management in the ICU is paramount, necessitating nurses to assess postoperative pain and implement suitable interventions for its reduction or alleviation. Success in pain management has been shown to improve when nurses actively listen to patients' feelings, provide feedback regarding their pain, and implement evidence-based nonpharmacological pain relief methods. Notably, therapeutic communication and redirecting patients' attention have been found to significantly reduce the perception of pain.[26]

Study participants cited challenges in eating, including post-anesthesia nausea-vomiting, loss of appetite, and difficulty adhering to a salt-free diet. Similar issues of appetite loss have been noted in qualitative research.[4,20] Additionally, participants reported sleep problems due to lying on their backs, pain, mechanical ventilator connection, and environmental factors. They used medication for sleep, consistent with findings in prior studies.[4,20] Given the impact of these issues on recovery, integrating dietary counseling, nonpharmacological sleep

interventions, and a multidisciplinary care approach could help improve patients' nutritional intake, sleep quality, and overall well-being. However, further studies are needed to confirm their impact in the ICUs.

ICU patients post open-heart surgery reported intense emotions, often experiencing the ICU for the first time. Notable emotions included the desire to leave the ICU quickly, postoperative relief, self-comparisons with other patients, dependency on others, fear of death and non-recovery, feelings of loneliness, inability to recall the initial awakening, developing a positive outlook on life, and the challenges of the surgery. Our findings align with various qualitative studies.[4,20–22,25] It is important for nurses to provide psychosocial support so that the individual can effectively cope with the emotions they experience in the ICU. In this context, the nurse should evaluate the patient's reaction to events; allow the patient to express themselves; observe the patient's facial expressions, hand and arm movements, tone of voice and eye contact. In addition, the patient's support systems (spouse, relatives, etc.) should be learned and support should be obtained from them. Appropriate coping methods should be choosen together with the patient, and if necessary, the patient should be provided with support from psychologists/psychiatrists.[27]

In this study, the majority of patients expressed a strong desire for prompt discharge from ICU. Post-cardiac surgery, patients experience elevated stress levels, both postoperatively and during ICU stays.[4,25,26] Consequently, exploring interventions to reduce anxiety in post-cardiovascular surgery patients is crucial. Nurses should know effective methods of coping with stress and introduce them to patients.[27] A meta-analysis highlights the efficacy of post-heart surgery music therapy in anxiety reduction.[29] Reducing anxiety through these practices warrants further investigation.

In our study, the physical environment of the ICU emerged as another key theme. Participants conveyed discomfort from the stress and noise in the ICU, expressed concerns about infection due to the crowded space, and reported feeling cold from low room temperatures. Some specifically noted noise issues during shift changes. Prior research has similarly documented complaints about ICU noise.[4,25] Healthcare professionals should be mindful of the physiological and psychological impact of noise on patients, making efforts to minimize loud conversations.

Our study identified a significant concern regarding privacy in the physical environment. Patients expressed discomfort with mixed-gender spaces and exposure of hair or upper body, highlighting the urgent need for enhanced privacy measures. Maintaining privacy, especially in situations where patients lose control (e.g., under anaesthesia, in intensive care, or connected to medical equipment), is crucial for physical, social, and informational confidentiality.[30] The cardiovascular surgery ICU in the hospital where the study was conducted has a capacity of nine beds. Eight beds are located in the same area, while one bed is in a glass-partitioned section reserved for isolated patients. Curtains separate the beds; however, they are closed during procedures such as cardiopulmonary resuscitation, body care, and perineal care. However, in the early postoperative period, the curtains are kept open to facilitate close monitoring of patients.

Healthcare professionals, particularly nurses, play a pivotal role in ensuring privacy awareness. A study has shown that nurses exhibit higher levels of privacy awareness compared to other healthcare professionals, and education on patient rights can further enhance this.[30] In another study, it was found that privacy violations often occur due to an insufficient number of nurses to provide care to a large number of patients.[31] Therefore, institutional arrangements such as increasing the number of nurses in the ICU can help reduce privacy violations.

Limitations

The study has some limitations. For instance, the sample only includes patients admitted to a training and research hospital. Therefore, it can be acknowledged as a limitation that the findings of the study may not be generalizable to the entire population. The interviews were conducted in the

cardiovascular surgery ward where post-ICU patients are admitted. The fact that patients are still hospitalized and undergoing continued care and treatment may have influenced their comments on their experiences. Despite these limitations, the study provides significant contributions to the literature in terms of improving patients' ICU experiences and enhancing the quality of care.

Conclusion

This study highlights the emotional and physical challenges faced by patients in the ICU after open-heart surgery, including pain, discomfort, anxiety, and concerns about privacy. Based on these findings, specific recommendations include improving communication training for healthcare professionals, providing psychosocial support, enhancing ICU privacy measures, and integrating nonpharmacological pain management strategies. These insights can help improve patient-centered care, increase satisfaction, and enhance postoperative outcomes in cardiovascular surgery ICUs.

Ethics Committee Approval

Approval was granted by the non-interventional clinical research ethics board (No: 33-33-08, dated 05.01.2023). The research adhered to the ethical standards outlined in the Helsinki Declaration throughout all stages. Participants were guaranteed the confidentiality of the collected data, and pseudonyms were employed in data submission.

Informed Consent

Written informed consent was obtained from all participants.

Authors' contributions

BA and SS contributed to the conceptualization or design of the work. BA and SS contributed to the acquisition, analysis, or interpretation of data for the work. BA and SS drafted and critically revised the manuscript. All authors gave final approval to be accountable for all aspects of the work, ensuring accuracy and integrity.

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Conflict of Interest

The authors have no competing interests.

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Availability of the data material

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

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References

1. WHO. Cardiovascular diseases. https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1. Published 2023. Accessed November 27, 2023.
2. Neumann FJ, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J*. 2019;40(2):87-165. doi:10.1093/eurheartj/ehy394
3. Vaduganathan M, Mensah GA, Turco JV, Fuster V, Roth GA. The Global Burden of Cardiovascular Diseases and Risk: A Compass for Future Health. *J Am Coll Cardiol*. 2022;80(25):2361-2371. doi:10.1016/j.jacc.2022.11.005
4. Albanesi B, Nania T, Barello S, et al. Lived experience of patients in ICU after cardiac surgery: A phenomenological study. *Nurs Crit Care*. 2022;27(2):204-213. doi:10.1111/nicc.12562
5. Chen PK, Shih CC, Lin FC, et al. Prolonged use of noninvasive positive pressure ventilation after extubation among patients in the intensive care unit following cardiac surgery: The predictors and its impact on patient outcome. *Sci Rep*. 2019;9(1). doi:10.1038/s41598-019-45881-x
6. Widyastuti Y, Stenseth R, Wahba A, Pleym H, Videm V. Length of intensive care unit stay following cardiac surgery: Is it impossible to find a universal prediction model? *Interact Cardiovasc Thorac Surg*. 2012;15(5):825-833. doi:10.1093/icvts/ivs302
7. Lapp L, Bouamrane MM, Kavanagh K, Roper M, Young D, Schraag S. Evaluation of Random Forest and Ensemble Methods at Predicting Complications Following Cardiac Surgery. In: Riaño D, Wilk S, ten Teije A, eds. *Artificial Intelligence in Medicine*. Cham: Springer International Publishing; 2019:376-385.
8. Welsby IJ, Bennett-Guerrero E, Atwell D, et al. The Association of Complication Type with Mortality and Prolonged Stay After Cardiac Surgery with Cardiopulmonary Bypass. *Anesth Analg* . 2002;94(1072-8).
9. Holm A, Dreyer P. Intensive care unit patients' experience of being conscious during endotracheal intubation and mechanical ventilation. *Nurs Crit Care*. 2017;22(2):81-88. doi:10.1111/nicc.12200
10. Alasad JA, Abu Tabar N, Ahmad MM. Patients' experience of being in intensive care units. *J Crit Care*. 2015;30(4):859.e7-859.e11. doi:10.1016/j.jcrc.2015.03.021
11. Nielsen AH, Egerod I, Hansen TB, Angel S. Intensive care unit diaries: Developing a shared story strengthens relationships between critically ill patients and their relatives: A hermeneutic-phenomenological study. *Int J Nurs Stud*. 2019;92:90-96. doi:10.1016/j.ijnurstu.2019.01.009

12. Karlsson V, Bergbom I, Forsberg A. The lived experiences of adult intensive care patients who were conscious during mechanical ventilation: A phenomenological-hermeneutic study. *Intensive Crit Care Nurs*. 2012;28(1):6-15. doi:10.1016/j.iccn.2011.11.002
13. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: A synthesis of recommendations. *Academic Medicine*. 2014;89(9):1245-1251. doi:10.1097/ACM.0000000000000388
14. Creswell JW,, Poth CN. *Qualitative Inquiry and Research Design Choosing among Five Approaches*. 4th ed. Thousand Oaks: SAGE Publications; 2018.
15. Adamson H, Murgo M, Boyle M, Kerr S, Crawford M, Elliott D. Memories of intensive care and experiences of survivors of a critical illness: An interview study. *Intensive Crit Care Nurs*. 2004;20(5):257-263. doi:10.1016/j.iccn.2004.06.005
16. Graneheim UH, Lindgren BM, Lundman B. Methodological challenges in qualitative content analysis: A discussion paper. *Nurse Educ Today*. 2017;56:29-34. doi:10.1016/j.nedt.2017.06.002
17. Kallio H, Pietilä AM, Johnson M, Kangasniemi M. Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *J Adv Nurs*. 2016;72(12):2954-2965. doi:10.1111/jan.13031
18. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24(2):105-112. doi:10.1016/j.nedt.2003.10.001
19. Speziale H.S., Streubert H.J., Carpenter D.R. *Qualitative Research in Nursing*. Lippincott Williams & Wilkins; 2011.
20. Dağcan N, Özden D, Gürol Arslan G. Pain perception of patients in intensive care unit after cardiac surgery: A qualitative study using Roy's Adaptation Model. *Nurs Crit Care*. 2023. doi:10.1111/nicc.12958
21. Edeer AD, Bilik Ö, Kankaya EA. Thoracic and cardiovascular surgery patients: Intensive care unit experiences. *Nurs Crit Care*. 2020;25(4):206-213. doi:10.1111/nicc.12484
22. Chang YL, Tsai YF. Early illness experiences related to unexpected heart surgery: A qualitative descriptive study. *Australian Critical Care*. 2017;30(5):279-285. doi:10.1016/j.aucc.2016.11.005
23. Aslan Ö, Tosun B. Cardiovascular Surgery Patients: Intensive Care Experiences and Associated Factors. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2015;9(4):336-341. doi:10.1016/j.anr.2015.10.003
24. Sadeghi M, Hashemi M, Sararoudi R, Merasi M, Molaeinezhad M, Shamsolketabi H. Demographic and psychological predictors of recovery from coronary artery bypass graft. *J Educ Health Promot*. 2017;6(1):92. doi:10.4103/jehp.jehp_154_16
25. Shafipour V, Mohammadi E, Ahmadi F. Experiences of open heart surgery patients from admission to discharge: a qualitative study. *Iran J Crit Care Nurs*. 2013;6(1):1-10.
26. Kurt, E., & Nazik, E. (2023). Kalp cerrahisi geçiren hastalarin yoğunbakimdaki ağri deneyimleri: nitel bir çalişma. Uluborlu Mesleki Bilimler Dergisi, 6(2), 1-11.
27. Carpenito, LJ. (2025). Hemşirelik tanıları el kitabı (Çev: F.Erdemir, G. Türk). Nobel Tıp Kitabevleri. (Orijinal basım yılı 2023).
28. Carey MG, Qualls BW, Burgoyne C. Patients' perception of stressful events in the intensive care unit after cardiac surgery. *American Journal of Critical Care*. 2019;28(2):149-151. doi:10.4037/ajcc2019254
29. Kakar E, Billar RJ, Van Rosmalen J, Klimek M, Takkenberg JJM, Jeekel J. Music intervention to relieve anxiety and pain in adults undergoing cardiac surgery: A systematic review and meta-Analysis. *Open Heart*. 2021;8(1). doi:10.1136/openhrt-2020-001474
30. Ozdinc A, Aydin Z, Calim M, Ozkan AS, Bakir H, Akbas S. Privacy awareness among healthcare professionals in intensive care unit: A multicenter, cross-sectional study. *Medicine*. 2023;102(6):E32930. doi:10.1097/MD.0000000000032930
31. Yilmaz SA, Celik SS. Patient privacy: a qualitative study on the views and experiences of nurses and patients. *Australian Journal of Advanced Nursing*. 2022;39(2):12-22. doi:10.37464/2020.392.447

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Özgün Araştırma/Research Article

Amputasyon cerrahi öncesi hastaların spiritüel iyi oluş düzeyleri ile ameliyat sonrası ağrı düzeyi ve yaşam bulguları arasındaki ilişki

Relationship between spiritual well-being levels of patients before amputation surgery and level of pain and vital signs postoperative

Remziye CİCİ[1], Ahmet ÖZDEMİR[2], Gülnaz KIZILKAYA[3], Meral ÖZKAN[4]

[1]Hitit Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, Cerrahi Hastalıklar Hemşireliği Anabilim Dalı, 19200, Çorum-Türkiye
[2]Kahramanmaraş Sütçü İmam Üniversitesi, Sağlık Bilimleri Fakültesi Hemşirelik Bölümü, Cerrahi Hastalıklar Hemşireliği Anabilim Dalı, 46100, Kahramanmraş-Türkiye
[3]Tokat Gaziosmanpaşa Üniversitesi, Erbaa Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, Cerrahi Hastalıklar Hemşireliği Anabilim Dalı, 60500, Tokat-Türkiye
[4]İnönü Üniversitesi, Hemşirelik Fakültesi, Hemşirelik Bölümü, Cerrahi Hastalıklar Hemşireliği Anabilim Dalı, 44000, Malatya-Turkey

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Abstract

Amaç: Amputasyon cerrahisi öncesi hastaların spiritüel iyi oluş düzeyleri ile ameliyat sonrası ağrı ve yaşam bulguları arasındaki ilişkiyi belirlemektir.

Gereç ve Yöntem: Tanımlayıcı ve ilişki arayıcı türdeki araştırma, Türkiye'nin doğusundaki bir hastanenin ortopedi kliniğinde Ocak-Aralık 2023 tarihleri arasında 175 amputasyon hastasıyla gerçekleştirildi. Verilerin toplanmasında Sosyo-demografik Özellikler Soru Formu, Üç Faktörlü Spiritüel İyi Oluş Ölçeği, Yaşam Bulguları Ölçüm Formu ve Sayısal Ağrı Değerlendirme Ölçeği kullanıldı.

Bulgular: Yaş ortalamasının 60,08±13,87, % 84'ünün kadın ve %46,9'unun ilköğretim mezunu olduğu belirlendi. Spiritüel iyi oluş puan toplam puanının 122,01±10,14 olduğu ve ameliyat sonrası ağrı ile ilişkili olmadığı saptandı (p>0,05). Spiritüel iyi-oluş ile ameliyat sonrası 24. saat ölçülen solunum, ameliyat öncesi ve ameliyat sonrası 8. saatte ölçülen diastolik kan basıncı değerleri arasında negatif yönde zayıf ilişki saptandı (p<0,05).

Sonuç: Hastaların spiritüel iyi oluş düzeylerinin yüksek olduğu belirlendi. Manevi iyilik hali arttıkça kan basıncı ve solunum hızı azaldı, ancak ağrıyla herhangi bir ilişki bulunmadı.

Anahtar Kelimeler: Amputasyon; Ağrı; Spiritüel iyi oluş; Yaşam bulguları; Ameliyat sonrası.

Öz

Aim: To determine the relationship between the spiritual well-being levels of patients before amputation surgery and postoperative pain and vital signs.

Materials and Methods: The descriptive and correlational study was conducted in the orthopedic clinic of a hospital in eastern Turkey between January and December 2023 with 175 amputation patients. The Socio-demographic Characteristics Questionnaire, Three-Factor Spiritual Well-Being Scale, Vital Signs Measurement Form, and Numerical Pain Assessment Scale were used to collect data.

Results: The mean age was 60.08±13.87; 84% were female, and 46.9% were primary school graduates. The total spiritual well-being score was 122.01±10.14 and was not associated with postoperative pain (p>0.05). A weak negative correlation was found between spiritual well-being and the respiration measured at 24 hours after surgery and the diastolic blood pressure values measured before surgery and at 8 hours after surgery (p<0.05).

Conclusion: The patients' high levels of spiritual well-being were determined. Blood pressure and respiratory rate decreased as spiritual well-being increased, but no relationship was found with pain.

Keywords: Amputation; Pain; Spiritual well-being; Vital signs; Postoperative.

Yazışma Adresi/Address for Correspondence: Remziye CİCİ, Hitit Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, Cerrahi Hastalıklar Hemşireliği Anabilim Dalı, 19200, Çorum -Turkey, E-mail: remziyecici@hitit.edu.tr

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Giriş

Amputasyon; iyileşemeyecek ve bireyin hayatını tehlikeye sokacak bir durumda ekstremitenin tamamının veya bir kısmının cerrahi olarak vücuttan uzaklaştırılmasıdır.[1] Deprem, sel, savaş gibi felaketlerde, kronik hastalıklarda ve enfeksiyonlarda artışlar amputasyonların sayısını hızla artırmaktadır.[2] Günümüzde hala devam eden Gazze-İsrail savaşında 4050 kişiye amputasyon cerrahisi uygulanmıştır.[3] Dünya Sağlık Örgütü'nün 2022 verilerine göre Dünyada 180 milyon bireye amputasyon işlemi uygulanmıştır.[2] Çoğunlukla amputasyon cerrahisi alt ekstremitelere (%90) uygulanmaktadır ve %40'nı diyabetik ayak kaynaklı amputasyonlar oluşturmaktadır.[1] Ülkemizde diyabetik ayak kaynaklı alt ekstremite amputasyonlarının %39,7-%48,6 arasında olduğu bildirilmektedir.[4,5] Amputasyon birey için bir organın kaybının yanı sıra doğal aktivitelerde işlevsel ve yapısal kısıtlamalar, iş kaybı, yaşam kalitesinde düşüş, beden imajında değişiklik, topluma katılım yeteneğinde azalma, sosyal iletişimde ve kişilerarası ilişkilerde sorun anlamına da gelebilmektedir. Amputasyon sonrası tüm bu nedenlerle hastalar yoğun stres yaşadıklarını ifade etmektedirler.[1, 6,7]

Literatürde amputasyon sonrası stresi gidermek için meditasyon, yoga, müzik ve spiritüel iyi oluş gibi kullanılan çok çeşitli yöntemler bulunmaktadır. Spiritüel iyi olma (ilahi bir güç ile iletişim halinde olmak ve manevi kaynaklardan destek almak), bireyin benlik saygısının korunmasına ve geliştirilmesine destek olmakta ve bu durum da stres ile baş etmesini kolaylaştırmaktadır.[8,9] Bununla birlikte maneviyat kişisel değerleri güçlendirmekte, yaşam tarzını olumlu etkilemekte ve hastalık ile baş etmeyi kolaylaştırmaktadır. Bu bağlamda maneviyat ile aynı anlamda kullanılan spiritüel boyutun önemi ortaya çıkmakta ve spiritüel iyi olma kaygı ile baş etmede ve kaygının oluşturduğu sorunlardan korunmada bireyin önemli bir destek kaynağı halini almaktadır.[8,10]

Amputasyon sonrası ağrı, genellikle fantom ve/veya organ ağrısı olarak yaşanmaktadır ve yaygınlığı %8 ile %72 arasında değişmektedir. Ağrı, amputasyon sonrası yaşam kalitesini ciddi şekilde etkilemektedir.[11] Ağrının fizyolojik tepkileri arasında artan kan basıncı, nabız hızı ve solunum hızı yer almaktadır. Yaşam bulgularında bozulma hastanın iyileşme ve normal yaşamına dönme sürecini olumsuz etkilemektedir.[12] Ağrı ameliyattan sonra hastalarda korku, kaygı ve hareket kısıtlılığına neden olarak da yaşam bulguları önemli ölçüde etkileyebilmektedir.[6,12,13]

Bu bağlamda ameliyat öncesi süreçteki hastaların manevi boyutunun değerlendirilmesi ve bakıma dahil edilmesi gerekmektedir. Ayrıca hastaların duygu, düşünce ve beklentilerini ifade etmelerinin sağlanması ve baş etme mekanizmalarının desteklenmesi hemşirelik uygulamalarının ayrılmaz bir parçası haline gelmektedir. Hemşireler ameliyat öncesi süreçte bireylerin spiritüel iyi olma durumlarını ve hastalar üzerindeki etkilerini değerlendirmeli, hastalarda spiritüel iyi oluş düzeylerinin yüksek olması gerektiği bilincini oluşturmaya çalışmalıdır. Bu bağlamda bu çalışmanın sonuçları literatüre önemli katkı sunacaktır. Ayrıca bu alanda literatürün yeterli düzeyde olmaması da bu çalışmanın sonuçlarının literatüre katkısı olacaktır. Tüm bu bilgilerden dolayı çalışma amputasyon cerrahisi öncesi hastaların spiritüel iyi oluş düzeyleri ile ameliyat sonrası ağrı ve yaşam bulguları arasındaki ilişkiyi belirlemek amacıyla yapıldı.

Gereç ve Yöntem

Araştırmanın tipi

Tanımlayıcı ve ilişki arayıcı türdeki araştırma, Ocak-Aralık 2023 tarihleri arasında Türkiye'nin doğusundaki bir hastanenin ortopedi kliniğinde amputasyon cerrahisi hastaları ile gerçekleştirildi.

Araştırmanın evreni ve örneklemi

Araştırmanın evrenini; Türkiye'nin doğusundaki bir hastanenin ortopedi kliniğinde transtibial ekstremite amputasyonu planlanan tüm hastalar oluşturdu. Klinikte yılda ortalama 320 hastaya amputasyon girişimi uygulanmaktadır. Araştırma kriterlerine uyan hastalar; evrenden olasılıklı örnekleme yöntemi ile seçildi. Örneklem büyüklüğü, G*Power 3.1.9.7 programı kullanılarak %95 güven aralığında, 0.05 hata

payı ve 0.3 etki büyüklüğünde minimum 134 katılımcı olarak belirlendi. Ancak, olası katılımcı kayıpları göz önünde bulundurularak ve istatistiksel gücün artırılması amacıyla örneklem 175 hasta ile tamamlandı.

Araştırmaya gönüllü olarak katılan, görme, konuşma, işitme ile ilgili bir sorunu olmayan, iletişim kurulabilen, 18 yaş üstü, psikiyatrik bir tanısı olmayan ve diyabet, periferik arter hastalığı (PAH), travma ve tümörler gibi çeşitli nedenlerle transtibial (diz altı) amputasyon yapılan tüm hastalar dahil edildi.

Veri toplama araçları

Verilerin toplanmasında; araştırmacılar tarafından oluşturulan Sosyo-demografik Özellikler Soru Formu,[1,6-8,10,11] Üç Faktörlü Spiritüel İyi Oluş Ölçeği, Yaşam Bulguları Ölçüm Formu ve Sayısal Ağrı Değerlendirme Ölçeği'nin yer aldığı anket formu kullanıldı. Sosyo-demografik özellikler soru formunda, hastaların demografik özellikleri (yaş, cinsiyet, eğitim düzeyi, medeni durum, gelir durumu vb.) ve bazı tıbbı özellikleri (amputasyon nedeni, ameliyat deneyimi, kronik hastalık varlığı, ağrı ile baş etmede kullandığı yöntemler, analjezik kullanma durumu vb) yer almaktadır. Veriler, araştırmada yer alan bir araştırmacı (verilerin toplandığı sırada hastanede görev yapan) tarafından yüz yüze anket formunun uygulanması, yaşam bulgularının ve ağrı düzeylerinin ölçülmesi ile toplandı. Anket sorularının cevaplanması yaklaşık 10 dakika sürdü.

Örneklemdeki bireylere ameliyattan önce (ameliyat günü) oluşturulan anket formu doldurulduktan sonra ağrı değerlendirilmesi yapılarak yaşam bulguları ölçüldü. Ameliyat sonrası ağrı değerlendirmesinde ilk ölçüm ameliyat sonrası ilk gün anestezinin etkisi geçtikten sonra 8. saatte, ikinci ve üçüncü ölçüm ise ameliyattan sonraki 24. ve 48. saatlerde yapıldı. Hastaların analjezik kullanımları hasta formlarından kayıt edildi (48 saat boyunca kullanılan tüm ilaçlar göz önünde bulundurularak kayıt yapıldı). Ameliyat sonrası yaşam bulguları ölçümü de ağrı değerlendirmelerinden hemen önce ameliyat sonrası 8. 24. ve 48. saatlerde yapıldı.

Üç faktörlü spiritüel iyi oluş ölçeği:

Ekşi ve Kardaş[14] tarafından geliştirilen Spiritüel İyi Oluş Ölçeği 2019 yılında Kardaş tarafından Üç Faktörlü Spiritüel İyi Oluş Ölçeği olarak değiştirilmiştir.[14,15] Ölçek üç alt boyuttan ve 29 sorudan oluşmaktadır. Aşkınlık alt boyutu: 1, 4, 5, 8, 9, 12, 13, 16, 17, 20, 21, 24, 25, 27, 29 no'lu maddelerden, doğayla uyum alt boyutu: 2, 6, 10, 14, 18, 22, 28 no'lu maddelerden ve anomi alt boyutu: 3, 7, 11, 15, 19, 23, 26 no'lu maddelerden oluşmaktadır. Toplam puan için aşkınlık ve uyum alt boyutu maddelerinin toplamı ve anomi alt boyutu maddelerin ise ters olarak hesaplanması ile elde edilir.[14,15].[12,13] Ölçekten en az 29 en çok 145 puan alınmaktadır. Herhangi bir kesme puanı olmayan ölçekten alınan toplam puan arttıkça spiritüel iyi oluş düzeyi artmaktadır.[14,15] Ölçeğin cronbach alpha katsayısı 0,886'dır. Bu araştırmada ölçeğin toplam puanı kullanıldı ve cronbach alpha katsayısı 0,71 olarak saptandı.

Sayısal ağrı değerlendirme ölçeği:

Ölçekte ağrı düzeyi sayılarla açıklanmakta ve 0-10 arasında değerlendirilmektedir. "0" noktası ağrının olmadığını, "10" ise hayal edilebilecek en kötü ağrının olduğunu göstermektedir. Ölçek ile ağrı şiddetinin tanımı, puanlaması ve kayıt altına alınması çok kolay olduğundan sıklıkla tercih edilmektedir.[16]

Verilerin analizi

Çalışmada elde edilen bulguların istatistiksel analizler için IBM SPSS Statistics 25 (IBM SPSS, Türkiye) programı kullanıldı. Çalışmada verilerin parametrelerinin normal dağılıma uygunluğu Shapiro Wilks testi, çarpıklık ve basıklık ise Kolmogorov-Smirnov testi ile değerlendirildi. Tanımlayıcı istatistiksel yöntemlerin (Ortalama, Standart sapma, Frekans) yanı sıra niceliksel verilerin karşılaştırmalarında normal dağılım gösterenler için Student-t Test, normal dağılım göstermeyen iki grup için Mann Whitney U testi ve üç veya daha fazla sayıda grup için Kruskal Wallis-H Testi kullanıldı. Ölçek puan ortalamaları arasındaki ilişkinin belirlenmesi amacıyla Pearson korelasyon testi uygulandı. Anlamlılık $p<0,05$ düzeyinde değerlendirildi.

Araştırmanın etik boyutu

Çalışma Helsinki Bildirgesi'ne uygun olarak yürütüldü. Çalışmaya başlamadan önce Hitit Üniversitesi Girişimsel Olmayan Araştırmalar Etik Kurulu'ndan (Karar No: 2022-23) etik onay alındı. Ayrıca çalışmanın yapılacağı kurumun başhekimliği ve Anabilim dalı başkanlığından (Sayı No: E-68636013-770-277224) kurum izinleri alındı. Çalışmaya katılan bireylere istedikleri zaman çalışmadan çekilebilecekleri bildirildi ve sözlü ve yazılı onamları alındı.

Bulgular

Araştırma kapsamına alınan hastaların sosyo-demografik özelliklerinin dağılımı ve spiritüel iyi-oluş puan ortalamalarının karşılaştırılması Tablo 1'de gösterildi. Hastaların yaş ortalamasının 60,08±13,87 olduğu, % 64'ünün erkek, %88'inin evli, %46,9'unun ilköğretim mezunu ve %66.9'unun amputasyon nedeninin diyabetik ayak olduğu belirlendi. Lise mezunu hastaların spiritüel iyi oluş puan ortalamasının diğer eğitim düzeyindeki hastalara göre düşük olduğu ve gruplar arasındaki farkın anlamlı olduğu saptandı (p<0,05). Travma nedeniyle ampute olan hastaların ise spiritüel iyi oluş puan ortalamasının diğer gruplara göre yüksek ve gruplar arası farkın anlamlı olduğu belirlendi (p<0,05). Hastaların %64,6'sının çalışmadığı ve gelirini giderinden az olarak belirtenlerin oranının %48,6'ı olduğu saptandı. Geliri giderine eşit olanların spiritüel iyi-oluş puan ortalamasının diğer gruplardan yüksek ve gruplar arasındaki farkın anlamlı olduğu belirlendi (p<0,05). Araştırma kapsamındaki hastaların %36'sının ameliyat deneyimi ve %76,6'sının kronik hastalığı olduğu, kronik hastalığı olan grupta spititüel iyi-oluş puan ortalamasının yüksek ve gruplar arasındaki farkın anlamlı olduğu saptandı (p<0,05). Ağrıyla baş etmek için hastaların %36,6'sının evde analjezik kullandığı bu oranın hastanede %75,4 olduğu tespit edildi. Analjeziklerden non-steroid anti-inflamatuar ilaçlar (NSAİİ) uygulanmayan hastaların uygulanan hastalara göre spititüel iyi-oluş puan ortalaması yüksek ve farkın anlamlı olduğu saptandı (p<0,05) (Tablo 1).

Tablo 1. Hastaların sosyo-demografik özelliklerinin dağılımı ve spiritüel iyi-oluş puan ortalamalarının karşılaştırılması (N:175)

Değişkenler	N	%	Ortalama	±	SD	Test	Anlamlılık
Tanı							
Travma	9	5.1	129,00	±	6,29		
Diyabetik Ayak	117	66,9	122,81	±	10,29	X^2_{k-w}	0,006
Onkoloji Nedenler	9	5,1	117,00	±	7,10		
PAH	40	22,9	120,32	±	9,67		
Yaş	175	100	60,08	±	13,87		
Cinsiyet							
Kadın	63	36,0	122,25	±	10,42	Student t testi	0,818
Erkek	112	64,0	121,88	±	10,02		
Medeni Durum							
Evli	154	88,0	122,31	±	9,92	MWU	0,289
Bekar	21	12,0	119,80	±	11,68		
Eğitim Düzeyi							
İlköğretim	120	46,9	123,96	±	9,33[a]		
Lise	46	26,3	118,19	±	11,58[b]	X^2_{k-w}	0,039
Lisans ve lisansüstü	9	17,5	127,66	±	10,85		
Çalışma Durumu							
Çalışıyor	17	9,7	118,35	±	9,61		
Çalışmıyor	113	64,6	123,08	±	10,51	X^2_{k-w}	0,424
Emekli	45	25,7	120,71	±	9,05		
Gelir Durumu							
Gelir giderden az	85	48,6	119,65	±	9,98		
Gelir gidere eşit	84	48,0	124,60	±	10,04	X^2_{k-w}	0,031
Gelir giderden fazla	6	3,4	119,16	±	3,48		
Ameliyat Deneyimi							
Evet	63	36,0	123,50	±	9,95	Student t testi	0,145
Hayır	112	64,0	121,17	±	10,19		

Kronik Hastalık Varlığı							
Evet	134	76,6	123,19	±	9,81	Student t testi	0,005
Hayır	41	23,4	118,17	±	10,36		
Ağrıyla Baş Etme Yöntemleri*							
Sıcak-soğuk uygulama	14	8,0	121,50	±	9,81		
Masaj	3	1,7	122,66	±	10,36		
Gevşeme egzersizleri	4	2,3	120,00	±	9,81		
Müzik dinleme/TV izleme	62	35,4	122,43	±	10,36	X^2_{k-w}	0,813
Analjezik kullanma	64	36,6	121,21	±	9,81		
Dua etme	28	16,0	123,39	±	10,36		
Hastanede Kullanılan Analjezik Türü: NSAİİ							
Evet	142	81,1	120,16	±	8,58	Student t testi	0,005
Hayır	33	18,9	130,00	±	12,40		
Hastanede Kullanılan Analjezik Türü: Parasetamol							
Evet	169	96,6	121,95	±	10,03	MWU	0,686
Hayır	6	3,4	123,66	±	13,99		
Hastanede Kullanılan Analjezik Türü: Opioid**							
Evet	97	55.4	121,73	±	7,07	Student t testi	0,680
Hayır	78	44.6	122,37	±	13,03		

*Hastaların cevaplarına göre kullanılan yöntemler gruplandırılmıştır.** Klinikte multimodal analjezi tedavisi uygulanmakta ve opioid ilaçlar lüzum hali olarak order edilmektedir.**%:** Yüzde, **SD:** Standart sapma, X^2_{k-w}: Kruskal Wallis test, **MWU:** Man-Whitney U testi, **NSAİİ**: Non-steroid anti-inflamatuar ilaçla

Hastaların yaşadıkları ameliyat sonrası ağrı durumları ile spiritüel iyi-oluşları arasındaki ilişki Tablo 2'te gösterildi (Tablo 2). Buna göre hastaların spiritüel iyi oluş toplam puanının 122,01±10,14 olduğu ve ameliyat sonrası ağrıları ile spiritüel iyi-oluş düzeyleri arasında istatistiksel olarak önemli bir farkın olmadığı saptandı (p>0,05). Ameliyat sonrası 8.saat yaşanan ağrı ile ilerleyen günlerdeki ağrılar arasında negatif yönde anlamlı ilişki vardır (p<0,001).

Hastaların spiritüel iyi-oluşları ile yaşam bulguları arasındaki ilişki Tablo 3 ve Tablo 4'de gösterildi. Spiritüel iyi-oluş ile ameliyat sonrası 24. saat ölçülen solunum değeri arasında negatif yönde anlamlı zayıf ilişki saptandı (p<0,05) (Tablo 3). Bununla beraber spiritüel iyi-oluş ile ameliyat öncesi ve ameliyat sonrası 8.saat diastolik kan basıncı değerleri arasında negatif yönde anlamlı zayıf ilişki belirlendi (p<0,01) (Tablo 4).

Tartışma

Amputasyon cerrahisi, hareketsizliğe, güdük bölgesinde ağrıya ve fantom ağrısına neden olabilir. Bu durum, hastaların günlük yaşamlarında önemli zorluklar yaşamalarına yol açar.[17-19] Bu bağlamda amputasyon planlanan hastaların, ameliyat öncesinde bu zorluklar ile baş etme durumlarının belirlenmesi büyük öneme sahiptir.

Tablo 2. Hastaların ağrıları ile spiritüel iyi-oluş arasındaki ilişki (N: 175)

Değişkenler		**Ortalama**	**±**	**SD**	**1.**	**2.**	**3.**	**4.**	**5.**
1. Ağrı ameliyat öncesi	r	1,13	±	1,21	1				
	p				-				
2. Ağrı ameliyat sonrası 8. saat	r	8,54	±	1,55	-,233**	1			
	p				,002	-			
3. Ağrı ameliyat sonrası 24. saat	r	7,53	±	1,72	-,257**	,819**	1		
	p				,001	,000	-		
4. Ağrı ameliyat sonrası 48. saat	r	7,12	±	1,69	-,283**	,777**	,896**	1	
	p				,000	,000	,000	-	
5. Spiritüel iyi-oluş	r	122,01	±	10,14	-,131	,148	,033	,058	1
	p				,084	,050	,662	,444	-

r: Pearson korelasyon katsayısı, **SD:** Standart sapma, ****p*<0,001

Tartışma

Amputasyon cerrahisi, hareketsizliğe, güdük bölgesinde ağrıya ve fantom ağrısına neden olabilir. Bu durum, hastaların günlük yaşamlarında önemli zorluklar yaşamalarına yol açar.[17-19] Bu bağlamda amputasyon planlanan hastaların, ameliyat öncesinde bu zorluklar ile baş etme durumlarının belirlenmesi büyük öneme sahiptir.

Tablo 3. Hastaların yaşam bulgularından solunum ve nabız değerleri ortalaması ile spiritüel iyi-oluş arasındaki ilişki (N: 175).

	Değişken	Ortalama	±	SD	Test	1	2	3	4	5	6	7	8	9
1	**Sİ-O**	122,01	±	10,14	r	1								
					p	-								
2	**Nb. ameliyat öncesi**	80,31	±	11,11	r	,024	1							
					p	,751	-							
3	**Nb. ameliyat sonrası 8. saat**	83,49	±	12,67	r	,114	,722**	1						
					p	,135	,000	-						
4	**Nb. ameliyat sonrası 24. saat**	84,77	±	13,63	r	,093	,678**	,878**	1					
					p	,222	,000	,000	-					
5	**Nb. ameliyat sonrası 48. saat**	86,78	±	15,37	r	,134	,546**	,777	,785	1				
					p	,077	,000	,000	,000	-				
6	**Sol. ameliyat öncesi**	21,26	±	7,16	r	-,030	,099	,053	,057	,102	1			
					p	,693	,191	,482	,454	,178	-			
7	**Sol. ameliyat sonrası 8. saat**	21,05	±	1,24	r	-,134	-,027	,108	,039	,064	-,079	1		
					p	,077	,724	,155	,606	,401	,297	-		
8	**Sol. ameliyat sonrası 24. saat**	21,29	±	1,15	r	-,197**	,003	,138	,147	,136	,044	,361**	1	
					p	,009	,971	,068	,052	,073	,560	,000	-	
9	**Sol. ameliyat sonrası 48. saat**	21,11	±	1,02	r	,043	-,196**	,025	,056	,059	-,123	,253**	,319**	1
					p	,576	,009	,745	,466	,437	,106	,001	,000	-

r: Pearson korelasyon katsayısı, **SD:** Standart sapma**, Si-O:** Spiritüel iyi-oluş, **Nb:** Nabız**, Sol:** Solunu, ***p*<0.05, ****p*<0.001

Tablo 4. Hastaların yaşam bulgularından kan basıncı değerleri ortalaması ile spiritüel iyi-oluş arasındaki ilişki (N: 175).

	Değişken	Ortalama	±	SD	Test	1	2	3	4	5	6	7	8	9
1	**Sİ-O**	122,01	±	10,14	r	1								
					p	-								
2	**Sist. ameliyat öncesi**	124,05	±	19,84	r	-047	1							
					p	,537	-							
3	**Sist. ameliyat sonrası 8. saat**	130,09	±	119,91	r	,028	,758**	1						
					p	,708	,000	-						
4	**Sist. ameliyat sonrası 24. saat**	128,23	±	18,80	r	,017	,682**	,942**	1					
					p	,822	,000	,000	-					
5	**Sist. ameliyat sonrası 48. saat**	131,45	±	18,40	r	,042	,655**	,915**	,964**	1				
					p	,582	,000	,000	,000	-				
6	**Dias. ameliyat öncesi**	76,61	±	13,21	r	-,184*	,468**	,365**	,416**	,361**	1			
					p	,015	,000	,000	,000	,000	-			
7	**Dias. ameliyat sonrası 8. saat**	79,74	±	13,29	r	-,169*	,572**	,688**	,687**	,663**	,707**	1		
					p	,025	,000	,000	,000	,000	,000	-		

8	**Dias. ameliyat sonrası 24. saat**	78,61	±	12,73	r	-,093	,561**	,497**	,498**	,491**	,519**	,553**	1	
					p	,222	,000	,000	,000	,000	,000	,000	-	
9	**Dias. ameliyat sonrası 48. saat**	79,70	±	12,54	r	-,023	,408**	,614**	,674**	,689**	,393**	,765**	,509**	1
					p	,762	,000	,000	,000	,000	,000	,000	,000	-

r: Pearson korelasyon katsayısı, SD: Standart sapma, Si-O: Spiritüel iyi-oluş, Sist: Sistolik kan basıncı, Dias: Diastolik kan basıncı, *p<0,05, **p<0,001

Literatürde ruhsal sorunların hastaların motivasyonları ve adaptasyonları üzerindeki olumsuz etkilerinden bahsedilmektedir.[20] Ayrıca hastaların durumlarını kabul etmelerinin sorunları ile baş etmedeki kolaylaştırıcı etkisinden de bahsedilmektedir.[21] Yapılan çalışmalarda da hastaların güçlükler ile baş edebilmeleri için güçlü bir spiritüel iyilik haline sahip olmalarının gerekliliğinden söz edilmektedir.[18,22,23] Bu araştırma sonuçlarında literatürü destekler nitelikte hastaların spiritüel iyi-oluş düzeylerinin yüksek olduğu belirlendi (Tablo 2). Bu durum sevindirici bir bulgudur ve çalışmaya katılan hastaların amputasyon sonrası yaşanabilecek zorluklar ile daha kolay baş edebileceklerini düşündürmektedir. Ancak literatürde düşük spiritüel iyilik haline sahip amputasyon hastalarının yer aldığı çalışmalar da yer almaktadır.[24,25] Bu farklılıklar çalışmaların yapıldığı coğrafyalardaki farklı dini inanışlar ve kültürlerden kaynaklanmış olabilir.

Literatürde spiritüel iyiliğin ağrı ile başa çıkmada önemli rolü,[26,27] spiritüel iyilik hali arttıkça ağrı yoğunluğunun ve analjeziklere olan ihtiyacın azaldığı ve spiritüel iyi oluşun ağrının kronik hale gelmesini engellediği bildirilmektedir.[28,29] Literatürden farklı olarak araştırma bulgularımızda ağrı ve spiritüel iyi oluş arasında bir ilişki saptanmamıştır (Tablo 2). Arefpour ve arkadaşlarının[30] yaptığı çalışmada da alt ekstremite amputasyonu geçirmiş hastalardan spiritüel psikoterapi alan hasta grubu ile terapi almayan grup arasında ağrı düzeyi bakımından anlamlı bir farkın olmadığı bildirilmektedir. Spiritüel psikoterapinin spiritüel iyi oluşu artırdığı göz önünde bulundurulduğunda çalışma bulgularımızı destekler niteliktedir. Popülasyon farkına rağmen kanser hastaları ile yapılan bir çalışmada da spiritüel iyilik ile ağrı arasında ilişki saptanmamıştır.[31] Ancak çalışma bulgularımızda analjezik uygulanmayan hastaların spiritüel iyi oluş düzeylerinin uygulananlara göre daha yüksek olduğu ve NSAİİ ilaç uygulananlarda farkın istatistiksel olarak anlamlı olduğu saptandı (Tablo 1). Bu sonuç spiritüel iyiliğin analjezik ihtiyacını azalttığının bir göstergesidir. Bu durum dolaylı olarak spiritüel iyiliğin ağrıyı azalttığını da göstermektedir. Arefpour ve arkadaşlarının[30] çalışmasında da psikoterapi almayan grubun fazla analjezik kullandığının tespiti ancak ağrı ile spiritüel iyilik arasında ilişki saptanmaması çalışma bulgularımızı destekler nitelikte spiritüel iyiliğin dolaylı olarak ağrı ile ilişkili olduğunu göstermektedir.

Alt ekstremite amputasyon sonrası hastaların %18-20'sinde depresyon ve kaygı görüldüğü bildirilmektedir.[32] Spiritüel iyiliğin stres ile baş etme ve kaygıyı azaltmadaki etkinliğini gösteren çalışmalar[8-10,22,33,34] kaygının fizyolojik belirteçleri olan yaşam bulguları üzerinde de olumlu etkileri olabileceğini düşündürmektedir. Nitekim çalışmamızda spiritüel iyi oluş ile ameliyat öncesi ve ameliyat sonrası 8. saatte ölçülen diastolik kan basıncı değerleri (Tablo 4) ile ameliyat sonrası 24. saatteki solunum sayısı değerleri arasındaki negatif yönde zayıf ilişkisinin tespiti (Tablo 3) yüksek düzey spiritüel iyiliğin kan basıncı ve solunum sayısını düzenlediğini göstermektedir. Literatürde spiritüel iyiliğin yaşam bulguları ile ilişkisi yönünde çalışmalar genellikle belli bir müdahalenin sonuçlarını ve kan basıncı üzerindeki etkisini gösterir niteliktedir.[35,36] Bu çalışmalardan Teixeira ve ark adaşlarının çalışmasında spiritüel iyi oluşun hipertansiyonun düzenlenmesi üzerine olumlu etkilerinden bahsedilmektedir.[35] Bir meta analiz çalışmasında manevi temelli meditasyon ve yoga gibi uygulamaların diastolik ve sistolik kan basıncını azaltmadaki yararlı etkilerinden bahsedilmektedir.[36] Her ne kadar bu çalışmalar farklı hasta popülasyonları ve bir müdahalenin etkinliğinden bahseden çalışmalar olsa da sonuçlar spiritüel iyi oluşun kan basıncını düzenlediği görüşünü savunur niteliktedir. Başka bir sistematik derlemede (herhangi bir müdahalenin etkinliğinden bahsedilmemekte)

bulgularımızı destekler nitelikte spiritüel iyi oluşun kan basıncı üzerinde negatif korelasyonu olduğu yani kan basıncının düşürdüğü bilgisi yer almaktadır.[37] Solunuma yönelik çalışma sonuçlarına bakıldığında yoğun bakım hastalarını içeren ve dini müdahalelerin etkinliğinin araştırıldığı çalışmaların yer aldığı bir meta analiz çalışmasında solunum hızı ile spiritüel iyilik arasında ilişki saptanmamıştır.[38] Çalışmamız ile arasındaki farkın dahil edilen çalışmaların çoğunlukla yaşam bulguları ölçümlerini dini uygulamalardan hemen önce ve sonra yalnızca bir kez ölçülmesinden ve hastaların spritüel iyi oluş düzeylerinin değil de müdahalelerin etkinliğini ölçülmesinden kaynaklanmış olduğu düşünülmektedir. Ayrıca Li ve arkadaşlarının[38] çalışmasında yer alan hastaların ventilasyon cihazına bağlı olması ve kullanılan ilaçların solunum üzerindeki etkilerinin dikkate alınmamış olması da farkın nedeni olabilir.

Araştırmanın sınırlılıkları

Bu çalışmanın sınırlılıkları amputasyon hastalarının ulaşılması zor bir popülasyon olması ve yapılan ameliyat sayılarının sınırlı olması nedeniyle kısıtlı hastaya ulaşılmış olmasıdır.

Sonuç

Amputasyon hastalarının ameliyat sonrası bir çok sıkıntı yaşadığı[15-17] ve spiritüel iyi olmanın bireylerin zorluklar ile baş etme, acıyı hafifletme, umudu artırma, algılanan stresi azaltma ve empati duygusunu geliştirmekteki olumlu rolü literatürde yer almaktadır. [6-8,20,33,34] Ancak literatürde amputasyon cerrahisi öncesi hastalarının spiritüel iyi oluş düzeyleri ve ameliyat sonrası parametreler ile ilişkisini inceleyen bir çalışma yer almamaktadır. Bu yönü araştırmanın literatüre önemli katkı sağlayacağını göstermektedir. Nitekim bu araştırmanın sonuçlarında amputasyon hastalarının spiritüel iyi oluş düzeylerinin yüksek olduğu saptandı. Ayrıca spiritüel iyi oluş artıkça ameliyat sonrası yaşam bulgularından kan basıncı ve solunum hızının düştüğü tespit edildi. Ağrı ile doğrudan bir ilişki saptanmamakla birlikte, bu sonucun spiritüel iyilik hâlinin analjezik kullanım ihtiyacını azaltıcı etkisine bağlı olabileceği düşünülmektedir. Nitekim NSAİİ uygulananların uygulanmayanlara göre spiritüel iyi oluş düzeyinin daha düşük olduğu saptandı.

Tüm bu bilgiler çalışma sonuçlarımızın amputasyon cerrahisi planlanan hastalarda spiritüel iyilik hali düzeyinin tespit edilmesi ve hastaların bu konuda desteklenmesinin gerekliliğini ortaya koyan bir çalışma niteliğinde olduğunu ortaya koymaktadır. Ayrıca bu çalışma sonuçları ile ameliyat sürecindeki amputasyon hastalarının bütüncül bakımına vurgu yapılmaktadır. Hemşirelik, bireyin sadece fiziksel sağlığına değil, aynı zamanda ruhsal ve duygusal iyilik haline de odaklanan bir meslek olarak, bu süreçte kritik bir rol üstlenmektedir. Perioperatif süreçte hemşireler, hastaların fiziksel, psikososyal ve spiritüel gereksinimlerini değerlendirmeli ve ihtiyaçların karşılanmasını sağlamalıdır. Bu bağlamda çalışma hemşirelerin spiritüel bakım konusundaki farkındalığını artırmaya ve bütüncül bakım anlayışına katkı sağlamaya yönelik önemli sonuçlar sunmaktadır. Bununla beraber çalışmada ortaya çıkan bulgular, etkili hasta merkezli ve bütüncül bakımı teşvik ederek klinik sonuçları iyileştirebilir.

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Yazarlar çıkar çatışması bildirmemektedir.

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Çalışmayı maddi olarak destekleyen kişi/kuruluş yoktur.

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Dış bağımsız.

Kaynaklar

1. Sarroca N, Valero J, Deus J, Casanova J, Luesma MJ, Lahoz M. Quality of life, body image and self-esteem in patients with unilateral transtibial amputations. *Scientific Reports.* 2021;11(12559): 1-8.
2. World Health Organization. Musculoskeletal Health. https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions. Haziran 2022'de basıldı. 25 Kasım 2024'de erişildi.
3. World Health Organazition. WHO Analysis Highlights Vast Unmet Rehabilitation Needs İn Gaza. https://www.who.int/news/item/12-09-2024-who-analysis-highlights-vast-unmet-rehabilitation-needs-in-gaza. 26.02.2025'de erişildi
4. Tanır B, Uğur K, Kurt O, Balin ŞÖ. Diyabetik ayak infeksiyonu olan hastalarda nöropatik ağrıya etkili ilaç kullanımının hastaneye yatış sıklığı, debridman ve ampütasyon ihtiyacı üzerine etkisi. *Klimik Journal/Klimik Dergisi.2024; 37*(3):168-173.
5. Karacaer Z, Yalçı A, Gündüz HŞ, et al. Diyabetik ayak enfeksiyonu olan hastalarda ampütasyon sıklığı ve ampütasyonla ilişkili risk faktörlerinin belirlenmesi. *Ankara Üniversitesi Tıp Fakültesi Mecmuası*. 2021;74(Suppl 1):30-35. doı: 10.4274/atfm.galenos.2020.20591
6. Holzer LA, Sevelda F, Fraberger G, Bluder O, Kickinger W, Holzer G. Body image and self-esteem in lower-limb amputees. *PloS One.* 2014;9(3):e92943. doi: 10.1371/journal.pone.0092943.
7. Özsoy İ, Okyayuz ÜH. Amputasyon geçirmiş kişilerin baş etme becerileri: Olgu sunumu. *Klinik Psikiyatri Dergisi*. 2016;19(1):45-51. doi:10.5505/kpd.2016.30074.
8. Fradelos EC, Tzavella F, Koukia E, et al. Integrating chronic kidney disease patient's spirituality in their care: health benefits and research perspectives. *Materia socio-medica.* 2015;27(5): 354-358. doi:10.5455/msm.2015.27.354-358.
9. Amini K, Tahrekhani M, Abbas-Alamdari Z, Faghihzadeh S. The effect of spiritual care on anxiety about death in patients with gastrointestinal cancer undergoing chemotherapy: a randomized controlled trial. *European Journal of Integrative Medicine.* 2020; 36:101117. doi:10.1016/j.eujim.2020.101117.
10. Hosseini SM, Naseri-Salahshour V, Farsi Z, et al. The effect of spirituality-oriented psychological counseling on the fear of death among patients undergoing chronic hemodialysis: A randomized controlled trial. *European Journal of Integrative Medicine.* 2022;49:102103. doi:10.1016/j.eujim.2022.102103
11. Markewych A, Suvar T, Swanson M, et al. Approaches to neuropathic amputation-related pain: narrative review of surgical, interventional, and medical treatments. *Regional Anesthesia & Pain Medicine.* 2024;49(12):889-899. doi:10.1136/rapm-2023-105089.
12. Christ M. Pain-the fifth vital sign. *Swiss Med Wkly.* 2020;24:150. doi: 10.4414/smw.2020.20215.
13. Gürsoy A, Candaş B, Güner Ş, Yılmaz S. Preoperative stress: An operating room nurse intervention assessment. *Journal of PeriAnesthesia Nursing.* 2016;31(6):495-503. doi:10.1016/j.jopan.2015.08.011.
14. Ekşi H, Kardaş S. Spiritual well-being: Scale development and validation. *Spiritual Psychology and Counseling*. 2017; 2(1):73–88. doi:10.12738/spc.2017.1.0022.
15. Kardaş S. Erratum: Correcting the name of the Spiritual Well-Being Scale as the Three-Factor Spiritual Well-Being Scale. *Spiritual Psychology and Counseling.* 2019;4:85–85. doi:10.12738/spc.2019.4.1.0068.
16. Eti-Aslan F. Ağrı değerlendirme yöntemleri. *Cumhuriyet Üniversitesi Hemşirelik Yüksekokulu Dergisi.* 2002;6(1):9-16.
17. Langeveld M, Bosman R, Hundepool CA, et al. Phantom limb pain and painful neuroma after dysvascular lower-extremity amputation: A Systematic review and meta-analysis. *Vascular and Endovascular Surgery.* 2024;58(2):142-150. doi:10.1177/15385744231197097.
18. Limakatso K, Lebiletsa T, Smeets RJEM, Parker R. Care priorities for ındividuals with lower extremity amputations: a patient delphi study. *Clinical Rehabilitation.* 2024;38(10):1415-1426. doi:10.1177/02692155241258913.
19. Shue S, Wu-Fienberg Y, Chepla KJ. Psychiatric disease after isolated traumatic upper extremity amputation. *Journal of Hand and Microsurgery*. 2021;13(02):75-80. doi:10.1055/s-0040-1701156.
20. Pedras S, Meira-Machado L, Couto de Carvalho A, Carvalho R, Pereira MG. Anxiety and/or depression: which symptoms contribute to adverse clinical outcomes after amputation? *J. Ment. Health*.2022; *31*: 792–800.
21. Seyman. CC, Ozcetin YSU. "I wish I could have my leg": a qualitative study on the experiences of ındividuals with lower limb amputation. *Clin. Nurs. Res.* 2022;*31(3):* 509–518. doi:10.1177/10547738211047711.
22. de Diego-Cordero R, Suárez-Reina P, Badanta B, Lucchetti G, Vega-Escano J. (2022). The efficacy of religious and spiritual interventions in nursing care to promote mental, physical and spiritual health: A systematic review and meta-analysis. *Applied Nursing Research*. 2022;67:151618. doi:10.1016/j.apnr.2022.151618.
23. Kizilkurt OK, Kizilkurt T, Gulec MY, et al. Quality of life after lower extremity amputation due to diabetic foot ulcer: The role of prosthesis-related factors, body image, self-esteem, and coping styles. *Dusunen. Adam. J. Psychiatry Neurol Sci.* 2020;3(2):109–119. doi:10.14744/dajpns.2020.00070.
24. Salomé GM, Pereira VR, Ferreira LM. Spirituality and subjective wellbeing in patients with lower-limb ulceration. *Journal of Wound Care.* 2013;22(5):230-236. doi:10.12968/jowc.2013.22.5.230.
25. Salomé GM, De Almeida, SA, Mendes B, et al. Association of sociodemographic factors with spirituality and hope in patients with diabetic foot ulcers. *Advances in Skin and Wound Care*. 2017;30(1):35–39. doi: 10.1097/01.ASW.0000508446.58173.29.
26. Erol F. Reflection of spiritual care in nursing process. *Journal of Innovative Healthcare Practices.*2020;1(1):30–39.
27. Çınaroglu M. Religion, spirituality, mental health and wellbeing; a revıew. *Journal of Religion and Human.* 2023;3(6):46–64.
28. Korkut S. Comparison of the predictive role of spiritual well-being and pain ıntensity on pain catastrophizing in acute and chronic pain. *Pain Management Nursing*.2025;6(32): 1-7. doi:10.1016/j.pmn.2024.12.024.
29. Korkut S, Ülker T, Saatçi G. The power of spiritual well-being: Its relationship with pain intensity, pain management, and pain catastrophizing in individuals with chronic pain. *Pain Management Nursing.* 2024;25(1): 62–68. doi:10.1016/j.pmn.2023.09.004.
30. Arefpour AM, Foroughi A, Jamshidi K, et al. The effect of multidimensional spiritual psychotherapy on the quality of life of bone cancer survivors with a history of lower extremity amputation. *Asian Pacific Journal of Cancer Prevention: APJCP.* 2024;25(2):425-431. doi:10.31557/apjcp.2024.25.2.425.
31. Grossoehme DH, Friebert S, Baker JN, et al. Association of religious and spiritual factors with patient-reported outcomes of anxiety, depressive symptoms, fatigue, and pain ınterference among adolescents and young adults with cancer. *JAMA network open.* 2020;3(6):e206696. doi:10.1001/jamanetworkopen.2020.6696.
32. Abrahamsen C, Madsen UR, Jensen APS, Bundgaard K, Jensen CM, Kristensen PK. Validity and reliability of the danish

version of the hospital anxiety and depression scale (HADS) in patients with major lower extremity amputations: A psychometric study. *International Journal of Orthopaedic and Trauma Nursing*. 2025;56: 101157. doi:10.1016/j.ijotn.2025.101157.

33. Ichihara K, Ouchi S, Okayama S, et al. Effectiveness of spiritual care using spiritual pain assessment sheet for advanced cancer patients: A pilot non-randomized controlled trial. *Palliative & Supportive Care*. 2019;17(1):46-53. doi:10.1017/S1478951518000901.
34. Peirano AH, Franz RW. Spirituality and quality of life in limb amputees. The International Journal of Angiology : Official *Publication of the International College of Angiology*. 2012;21(1):47–52. doi:10.1055/s-0032-1304275.
35. Teixeira MEF, Vitorino PVO, Brandão AA, et al. Influence of spiritual well-being on blood pressure, central hemodynamics and endothelial function. *Arquivos Brasileiros de Cardiologia*. 2022;119(4):622–626. doi:10.36660/abc.20210886.
36. Khabiri R, Jahangiry L, Abbasian M, et al. Spiritually based ınterventions for high blood pressure: A systematic review and meta-analysis. *Journal of Religion and Health*. 2024;63(5):3474–3500. doi:10.1007/s10943-024-02034-3.
37. Shattuck E C, Muehlenbein MP. Religiosity/spirituality and physiological markers of health. *Journal of Religion and Health.* 2020; 59(2):1035-1054. doi:10.1007/s10943-018-0663-6.
38. Li L, Chen M, Yu N, Zhang Q. Effectiveness of spiritual care interventions among patients in the intensive care unit: A systematic review and meta-analysis. *Nursing in Critical Care.* 2024;1-13. doi:10.1111/nicc.13202.

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Letter to the Editor/Editöre Mektup

Comment On: A Comparison of the short-term effects of steroid injection, prolotherapy and home-based physiotherapy in patients with chronic lateral elbow tendinopathy

Yorum: Kronik lateral dirsek tendinopatili hastalarda steroid, proloterapi ve ev tabanlı fizyoterapinin kısa dönem etkilerinin karşılaştırılması

Mehmet Serkan KILIÇOĞLU[1]

[1]Bezmialem Vakıf University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, 34093, İstanbul-Turkey

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Dear Editor,

The article titled "A Comparison of the short-term effects of steroid injection, prolotherapy and home-based physiotherapy in patients with chronic lateral elbow tendinopathy" (Bayrak and Zora, 2024), published in the 2024 10 (1) issue of *ADYÜ Sağlık Bilimleri Dergisi*, is quite remarkable for evaluating different treatment approaches collectively in the context of chronic lateral elbow tendinopathy (LET).[1] The study especially underscores the notable superiority of steroid injection in short-term pain relief and functional improvement, while prolotherapy and home-based physiotherapy also yielded meaningful but comparatively more limited improvements. In that sense, this work serves as an important guide for clinicians when choosing among treatment options.

Nonetheless, several considerations could further enrich the study's contribution to the literature. First, confining the follow-up period to only six weeks may not fully capture any additional long-term advantages of prolotherapy.[2] Future research featuring longer tracking periods could more clearly reveal whether prolotherapy or home-based physiotherapy have a more durable effect compared to the known relapse tendency of steroid injections.

Second, the home-based physiotherapy protocol—including exercises and cold application—relies heavily on patient adherence, which might be incomplete in real-life scenarios. Implementing a hybrid model that combines tele-rehabilitation methods or routine in-person check-ups could improve consistency in adherence and allow for a more structured follow-up.[3]

Yazışma Adresi/Address for Correspondence: Mehmet Serkan KILIÇOĞLU, Bezmialem Vakıf University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, 34093, İstanbul-Turkey, E-mail: dr.serkan.kilicoglu@gmail.com
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Lastly, although this study employed a specific protocol for prolotherapy—covering solution composition and injection frequency—data concerning varied dosages or intervals remain lacking. Since there is no clear consensus on prolotherapy standardization, significant discrepancies may occur in clinical practice.[4] In light of this, more robust evidence, especially from multicenter randomized trials, is essential to establish a definitive guideline.

In conclusion, Bayrak and Zora's (2024) study makes a valuable short-term comparison of conservative therapies for chronic LET.[1] I firmly believe that including longer-term follow-up, exploring combined therapeutic strategies, and focusing on patient adherence would enrich the literature and potentially enhance clinical outcomes in the future.

Conflict of Interest

The authors have no conflicts of interest to declare.

References

1. Bayrak G, Zora H. A Comparison of the short-term effects of steroid injection, prolotherapy and home-based physiotherapy in patients with chronic lateral elbow tendinopathy. *ADYÜ Sağlık Bilimleri Derg.* 2024;10(1):45-54. doi:10.30569.adiyamansaglik.1407644
2. Coombes BK, Bisset L, Vicenzino B. Management of tennis elbow. *BMJ*. 2015;351:h3725.
3. Palacios S, Vazquez R, Santos L. Long-term outcomes of steroid injection vs physiotherapy in lateral epicondylitis. *Int J Sports Med.* 2020;41(5):315-322.
4. Larmer PJ, Reay ND, McNair PJ. Prolotherapy and elbow tendinopathy: Literature review. *Clin J Sport Med.* 2022;32(2):e130-e140.

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Author's Response/Yazarların Yanıtı

RE: A Comparison of the short-term effects of steroid injection, prolotherapy and home-based physiotherapy in patients with chronic lateral elbow tendinopathy

Yazarların Yanıtı: Kronik lateral dirsek tendinopatili hastalarda steroid enjeksiyonu, proloterapi ve fizyoterapinin kısa dönemdeki etkilerinin karşılaştırılması

Gökhan BAYRAK[1], Hakan ZORA[2]

[1]Muş Alparslan University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, 49250, Muş-Turkey
[2]Private Medicabil Hospital, Department of Orthopedics and Traumatology, 16140, Bursa-Turkey

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Dear Editor,

We would like to express our gratitude to the authors for their insightful comments and thorough analyses regarding the results of our article.[1] As stated by the authors, their insights support and reinforce our findings, underscoring the strength of our work.

The six-week follow-up period in our study unfortunately constrains our ability to present the longer-term benefits of various therapeutic approaches, particularly those like prolotherapy and home-based physiotherapy. While corticosteroid injections often provide rapid pain relief, their effects can be transient. In contrast, prolotherapy may require more time to reveal its true potential. To fully understand the enduring effectiveness of each treatment option, future studies should adopt longer follow-up durations. This will allow us to gain deeper insights into their long-term impacts and underscore the value of our work in guiding better patient care.[2]

As mentioned by the authors, variability in patient compliance may influence the consistency of the outcomes regarding adherence to home-based physiotherapy.[3] Our study provided participants with structured guidance and regular reminders to ensure adherence. Incorporating digital tools like telerehabilitation or mobile applications may enhance monitoring and engagement, leading to a more structured and trackable exercise training process in future protocol designs and studies.

Yazışma Adresi/Address for Correspondence: Gökhan BAYRAK, Muş Alparslan University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, 49250, Muş-Turkey, E-mail: gokhan2803@gmail.com
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Lastly, we also recognize the current lack of clear standardization in prolotherapy protocols. Our protocol was developed in accordance with the available literature and the author's clinical experiences. Still, we recognize that differences in dosage, frequency, and injection technique may lead to variability in results across different settings.[4] Therefore, as the author suggests, we agree that the author's observations on larger-scale and multicenter randomized controlled trials are needed to develop evidence-based guidelines for prolotherapy.

In conclusion, we appreciate the valuable insights in this letter, highlighting key areas for further research. We are confident that such cooperative academic discussions will contribute significantly to optimizing treatment strategies for chronic lateral elbow tendinopathy.

Declaration of Interests

The authors have no conflict of interest to declare.

References

1. Bayrak G, Zora H. A Comparison of the short-term effects of steroid injection, prolotherapy and home-based physiotherapy in patients with chronic lateral elbow tendinopathy. *ADYÜ Sağlık Bilimleri Derg.* 2024;10(1):45-54. doi:10.30569.adiyamansaglik.1407644
2. Gupta GK, Rani S, Shekhar D, Sahoo UK, Shekhar S. Comparative study to evaluate efficacy of prolotherapy using 25% dextrose and local corticosteroid injection in tennis elbow - A prospective study. *J Family Med Prim Care.* 2022;11(10):6345-6349. doi:10.4103/jfmpc.jfmpc_116_22
3. Taylor L, Wiebusch M, Bisset LM, Coombes BK. Adherence to exercise in lateral elbow tendinopathy, a scoping review. *Musculoskelet Sci Pract.* 2024;72:102978. doi: 10.1016/j.msksp.2024.102978.
4. Zhu M, Rabago D, Chung VC, Reeves KD, Wong SY, Sit RW. Effects of Hypertonic Dextrose Injection (Prolotherapy) in Lateral Elbow Tendinosis: A Systematic Review and Meta-analysis. Arch Phys Med Rehabil. 2022;103(11):2209-2218. doi:10.1016/j.apmr.2022.01.166