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Health Sciences Quarterly (Health Sci. Q.) journal as known by the name of "Journal of Scientific Perspectives" until April 2021 which has been published since 2017 is an international peer-reviewed journal of HOLISTENCE ACADEMY. It is published quarterly in January, April, July, and October. All manuscripts submitted for publication are evaluated by the editor-in-chief, section editor, editorial board, and referees. In addition, the journal provides a medium for highlighting selected articles reporting highly significant original findings, as Editor's Choice Manuscripts.

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Health Sciences Quarterly (Health Sci. Q.) is an open-access journal that publishes original research papers, case reports, and reviews, clinical studies covering a wide range of subjects in life sciences and medicine as well as clinical and experimental investigations only in English.

Researchers in health sciences will find much of great use and interest in the Health Sci. Q.

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# CONTENTS

## ORIGINAL ARTICLE

Chronic kidney disease and risk factors among Type 2 Diabetic patients in selected hospitals in Dhaka, Bangladesh

*Md. Rasel Mahbub & Maksudul Shadat Akash & Md. Osman Goni & Shahanaz Chowdhury*

259

## ORIGINAL ARTICLE

University student suicides in Türkiye: Insights from two decades of media reports

*Mahmut Şerif Yıldırım & Ramazan Akçan & Nisa Nur Aksu Gül*

305

## ORIGINAL ARTICLE

The effect of viral anxiety experienced by nurses working in pediatric service on psychological factors during Covid-19 period

*Çiğdem Müge Haylı & Seockhoon Chung & Dilek Demir Kösem*

271

## ORIGINAL ARTICLE

The association of vaccine hesitancy with other public health practices in well child care: a cross-sectional study

*İzzet Erdal*

317

## ORIGINAL ARTICLE

The effect of environmental stressors perceived by surgical intensive care unit patients on hopelessness level

*Dilek Güneş & Elif Okşak*

283

## ORIGINAL ARTICLE

Combination of oral anticoagulant and antiplatelet therapy does not change the 1-year prognosis compared to oral anticoagulant alone in stroke patients with atherosclerosis and atrial fibrillation

*Gökçe Zeytin Demiral & Hayri Demirbaş & Abdullah Güzel & Selin Betaş Akın & Sinem Yorgancı & Dilara Çulhaoğlu Gökçek & Hilal Hoşgeldi & Furkan İncebacak*

323

## ORIGINAL ARTICLE

The relationship between uropathogens and clinical characteristics of children with urinary tract infection

*Emre Leventoğlu & Mustafa Soran & Şadiye Kübra Tüter Öz & Elif Böncüoğlu & Zafer Bağcı*

293

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# Chronic kidney disease and risk factors among Type 2 Diabetic patients in selected hospitals in Dhaka, Bangladesh

Md. Rasel Mahbub<sup>1</sup>  Maksudul Shadat Akash<sup>2</sup>  Md. Osman Goni<sup>1</sup>   
Shahanaz Chowdhury<sup>1</sup> 

<sup>1</sup> Department of Community Medicine, Bangladesh University of Health Sciences. Dhaka / Bangladesh

<sup>2</sup> Department of Public Health & Informatics, Bangladesh University of Professionals. Dhaka / Bangladesh

## Abstract

Chronic kidney disease (CKD) may be defined as abnormalities of kidney function or structure present for more than 3 months. Around 10% of people worldwide have CKD. The data about chronic kidney disease among diabetics in Bangladesh is inadequate, and very few studies have been done on specific populations, i.e., male or female. Thus, the study aims to determine the prevalence of CKD and its risk factors among diabetic patients in selected hospitals in Dhaka city. The specific objectives of the study were to assess the participants through physical and laboratory evaluations, categorize them into the different stages of CKD, analyze their socio-demographic characteristics, and determine the association between CKD and various risk factors. This is a cross-sectional study. The study population consisted of different outpatient diagnostic centers and outpatient and indoor patients of Shaheed Suhrawardy Medical College and Hospital. The sample size of the study is 369. The Modification of Diet in Renal Disease equation was used to calculate eGFR. This study revealed that in Dhaka, 18.2% of Type 2 Diabetic patients had CKD. Most of the participants were between 46 and 65 years old. Most of the CKD patients had a low education level and a lower family income. Having diabetes for more than 3 years and hypertension for more than 5 years were associated with a higher risk of developing CKD, especially among individuals who consumed added salt in their diet.

**Keywords:** Chronic kidney disease, type 2 diabetes, hypertension, dyslipidemia, salt intake, body mass index

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**Corresponding Author:**  
Shahanaz Chowdhury  
Email: dr.shahanazch@gmail.com



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## Introduction

The term “chronic kidney disease” (CKD) refers to abnormalities of the kidney’s structure or function that persist for longer than three months and impact health. This includes individuals with kidney damage markers as well as those who, with or without kidney damage signs, have a glomerular filtration rate (GFR) of less than 60 ml/min/1.73 m<sup>2</sup> on at least two occasions separated by at least 90 days [1]. Chances of having CKD increase with age; it increases after age 50 years and is most common among adults older than 70 years [2]. Around 10% of people globally suffer from CKD, and millions of people lose their lives to the condition every year due to a lack of access to affordable treatment [3]. Data from hospital, urban and underprivileged population-based studies suggest that there is a CKD prevalence of 16-18% in Bangladesh; of them, 11% belong to stage-III and above [4]. The cause of chronic kidney disease is in some cases not known; it is referred to as chronic kidney disease of unknown etiology (CKDu). As of 2020 a rapidly progressive chronic kidney disease, unexplained by diabetes and hypertension, had increased dramatically in prevalence over a few decades in several regions in Central America and Mexico, a CKD referred to as the Mesoamerican nephropathy (MeN) [5].

About 10% of the global population is affected by CKD, and millions die each year because they do not have access to affordable treatment. According to the 2010 Global Burden of Disease study, chronic kidney disease was ranked 27<sup>th</sup> in the list of causes of total number of deaths worldwide in 1990 but rose to 18<sup>th</sup> in 2010 [6]. Chronic kidney disease resulted in 956,000 deaths in 2013 up from 409,000 deaths in 1990. From 409,000 deaths in 1990 to 956,000 deaths in 2013, chronic kidney disease was the cause of mortality. The only conditions on the list with a greater degree of movement up were HIV and AIDS. Currently, over 2 million people worldwide receive treatment for chronic kidney disease, yet this may only account for 10% of those who require medical attention [7]. According to analysis of another study, 4.1% of the individuals had diabetes, 11.6% had hypertension, and 7.7% had proteinuria. Among them, about 13.1% of

participants were found to have chronic kidney disease (CKD) based on the MDRD equation, whereas 16% were found to have CKD based on the Cockcroft-Gault equation [8]. Another study done in Bangladesh among healthcare provider found that the prevalence of chronic kidney disease was 9.9% according to Cockcroft-Gault (C-G) equation and 7.2% according to modification of diet in renal disease (MDRD) study equation [9]. Most of them were in stage 1-3 (7.9% in CG; 7.2% in MDRD). Among CKD patients, physicians were found to be at lower risk (39.3%) of developing CKD than other occupants working in the same hospital. Participants with lower income, <30,000 taka/month (68.8%) were also observed to be significantly associated with CKD. Approximately 17.3% were hypertensive; 4.5% were diabetic and 2.9% were proteinuria. Individuals older than 40 years (76.9%) and females (51.9%) were significantly prone to develop CKD. The risk factors like Type 2 Diabetes, hypertension (HTN) and combined diabetes and hypertension were demonstrated to be significantly associated with CKD. Another study was done to evaluate the management of End Stage Renal Disease-Bangladesh Perspective [4]. It is evident that although 415 million people globally have diabetes, including 78 million in the SEA Region, and there were 7.1 million cases of diabetes in Bangladesh in 2015 [10], very few studies among CKD patients suffering from diabetes have been conducted in Bangladesh. However, some isolated studies on CKD have been done. For example, between July 2003 and June 2005, a cross-sectional survey was conducted in selected slum neighborhoods of Mirpur, Dhaka, Bangladesh. The participants’ age range was 15 to 65. [8].

Overall, the data about CKD among diabetics in Bangladesh is inadequate, and very few studies have been conducted on specific population groups, such as males or females. Therefore, the study was carried out to determine the prevalence of chronic kidney disease among Type 2 Diabetic patients in Bangladesh.

## Materials and Methods

The study was a cross-sectional study done among 369 diabetic patients under 30 years old from different outpatient diagnostic centers (e.g. LABAID diagnostic, ALOK diagnostic, POPULAR diagnostics diagnostic etc.) and outpatient and indoor patients of Shaheed Suhrawardy Medical College and Hospital. Primary data were collected by a semi-structured pre-tested questionnaire, face to face interview. Secondary data were collected by documented past medical record analysis. In situations where the patient was unable to communicate with the interviewer, the interview of the patient's attendance was considered instead. All possible measures were taken to maintain good quality of the data for the study. Statistical analysis was performed using SPSS version 16 (IBM Corp., Armonk, NY, USA). The analyzed data were presented in tables, graphs and charts. All data were expressed as the frequency, percentage, median and mean  $\pm$  SD. Chi-square test was conducted to assess the relationship between selected variables. A significant level of 0.05 was considered as proper and thus *p*-values of less than 0.05 was considered statistically significant. Data analysis was also conducted using Numbers (Apple Inc., Cupertino, CA, USA) on the macOS X operating system. eGFR and stages of the CKD were done using MDRD formula: eGFR is estimated GFR calculated by the abbreviated MDRD equation:  $186 \times (\text{Creatinine}/88.4)^{-1.154} \times (\text{Age})^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if black})$ . BMI (body mass index) = weight in kilograms / (height in meter)<sup>2</sup>, BUN Creatinine ratio=BUN/serum creatinine ("eGFR Calculator," 2000).

The ethical clearance was obtained from the Ethical review committee of BUHS on 20.08.2020 and memo no: BUHS/ERC/EA/20/253. All participants who voluntarily consented were included in the study, and all personal information was kept confidential, with privacy respected.

## Results

Table 1 shows that 40% of the total population was male, and 59.1% was female. Most of the study subjects were married (79.1%), while 20.6% were widowed, and 0.3% was unmarried. Among different educational levels, JSC was 38.8%, no-education was 32.2%, SSC was 11.9%, HSC was 11.1%, and degree was 6.0%. In the case of profession of the participants, it was observed that 39.8% of patients' professions were in the others or prefers not to say category, 37.9% were in private service, 8.9% were in business, 7.9% were in government service, and day labor was 5.4%. Among the participants, patients earning less than 15,000 Taka (approximately 125 USD) comprised 45.0% (n=166), those earning between 15,000–30,000 Taka (approximately 125–251 USD) made up 34.1% (n=126), participants earning between 30,001–45,000 Taka (approximately 251–376 USD) accounted for 19.5% (n=72), those earning between 45,001–60,000 Taka (approximately 376–502 USD) were 1.1% (n=4), and only 1 participant (0.3%) reported an income above 60,000 Taka (approximately 502 USD). The income brackets were chosen to represent a wide range of economic conditions, reflecting the diversity of the population. The 30,000- and 60,000-Taka thresholds were not based on official poverty or wealth limits but were selected to categorize participants into relevant socioeconomic groups for analysis.

Table 2 shows that participants' urinary ACR levels were found to be normal (10-29) in 53.4%, microalbuminuria (30-299) in 40.4%, and gross proteinuria ( $\geq 300$ ) in 6.2%. The mean  $\pm$  SD was  $115 \pm 156.28$ . 18.2% of patients had serum creatinine levels above 1.4, while 81.2% had levels less than or equal to 1.4. The mean  $\pm$  SD was  $1.5 \pm 1$ . Among study participants, eGFR Stage 1 was found in 8.1%, Stage 2 in 37.4%, Stage 3A in 30.6%, Stage 3B in 8.7%, Stage 4 in 6.8%, and Stage 5 in 8.4% of patients. The mean  $\pm$  SD was  $57.59 \pm 25.82$ . Normal serum albumin (3.4-4.5) was observed in 73.7% of patients, while low serum albumin (<3.4) was seen in 26.3%, with a mean  $\pm$  SD of  $4.13 \pm 0.9$ . Normal serum potassium (3.5-5.5) was found in 65.9%, low serum potassium (<3.5) in 21.4%, and high serum potassium (>5.5) in 12.7% of patients, with a mean  $\pm$  SD of  $4.2 \pm 0.8$ . Normal

BUN (7-20) was found in 18.2% of patients, while high BUN (>20) was observed in 81.8%, with a mean  $\pm$  SD of  $24.87 \pm 27.73$ .

Table 3 shows that 81.8% of patients had no history of CKD, while 18.2% had a family history of CKD. Additionally, 46.6% of patients had hypertension for less than 5 years or were within normal limits, whereas 53.4% had hypertension for 5 years or more. Among the study participants, 1.4% were underweight (BMI <18.5), 19.5% had a normal BMI (18.5–24.9), and 79.1% were overweight (BMI >25). It was found that 99.2% of patients had no history of alcohol intake, while 0.8% did. Furthermore, 82.1% of patients had Type 2 Diabetes for 3 years or more, while 17.9% had the condition for less than 3 years. Regarding smoking, 65.3% had no history of smoking, while 34.7% did. Additionally, 48.2% of patients had abnormal bladder and bowel habits, while 51.8% had normal habits. Lastly,

68.6% of patients had no history of healthy food intake, while 31.4% reported a history of healthy food intake.

Table 4 shows that 16.6% (25 out of 176) of male and 19.3% (42 out of 126) of female participants had CKD. However, gender did not have a statistically significant effect on the prevalence of CKD ( $\chi^2=0.44$ ,  $p=0.507$ ). Additionally, 16.4% (48 out of 292) of married participants and 25% (19 out of 76) of widowed participants had CKD, while none of the unmarried participants had CKD. Marital status also did not show any significant association with CKD presence ( $\chi^2=3.2$ ,  $p=0.202$ ). Regarding education, it was found that 38.8% (143) had JSC, 32.2% (119) had no education, 11.9% (44) had SSC, 11.1% (41) had HSC, and 6.0% (22) had a degree. Education level showed a significant association with CKD presence ( $\chi^2=17.93$ ,  $p=0.001$ ), with the HSC group at higher risk, as 22% of this group had CKD,

**Table 1.** Distribution of respondents according to the socio-demographic status (n=369).

Variable	Frequency	Percentage
<b>Sex</b>		
Male	151	40.9
Female	218	59.1
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Marital status</b>		
Married	292	79.1
Unmarried	1	0.3
widowed	76	20.6
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Educational level of the respondents</b>		
Degree	22	6
HSC	41	11.1
SSC	44	11.9
JSC	143	38.8
No education	119	32.2
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Profession</b>		
Business	33	8.9
Day labor	20	5.4
Govt. service	29	7.9
Others or prefers not to say	147	39.8
Private service	140	37.9
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Family income</b> Mean $\pm$ SD: 21111 $\pm$ 12661		
<b>Residence</b>		
Rural	94	25.5
Slum	67	18.1
Urban	208	56.4
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Living Area</b>		
Building	200	54.2
Tin shed	169	45.8
<b>Total</b>	<b>369</b>	<b>100</b>

**Table 2.** Distribution of respondents according to the laboratory assessment (n=369).

Variables	Frequency	Percentage
<b>Urinary ACR (mg/gm)</b>		
Normal (10-29)	197	53.4
Microalbuminuria (30-299)	149	40.4
Gross proteinuria (>=300)	23	6.2
<b>Mean±SD: 115±156.28</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Serum creatinine(mg/dl)</b>		
Normal (<=1.4)	302	81.8
>1.4	67	18.2
<b>Mean±SD: 1.5±1</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>eGFR(ml/min)</b>		
Stage 1	30	8.1
Stage 2	138	37.4
Stage 3A	113	30.6
Stage 3B	32	8.7
Stage 4	25	6.8
Stage 5	31	8.4
<b>Mean±SD: 57.59±25.82</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Serum Albumin(gm/dl)</b>		
Normal (3.4-4.5)	272	73.7
Low (<3.4)	97	26.3
<b>Mean±SD: 4.13±0.9</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Serum potassium (mEq/l)</b>		
Normal (3.5-5.5)	243	65.9
Low (<3.5)	79	21.4
High (>5.5)	47	12.7
<b>Mean±SD: 4.2±0.8</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>BUN (mg/dl)</b>		
Normal (7-20)	67	18.2
High (>20)	302	81.8
<b>Mean±SD: 24.87±27.73</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Bicarbonate (HCO<sub>3</sub>) (mEq/l)</b>		
10-20	67	18.2
21-25	90	24.4
26-30	212	57.5
<b>Mean±SD: 25.11±3.31</b>		
<b>Calcium (mg/dl)</b>		
Normal (8.5-10.5)	306	82.9
Low (<8.5)	63	17.1
High (>10)	33	8.9
<b>Mean±SD: 9.3±0.7</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>HbA1C</b>		
6-9	70	19
9.1-12	272	73.7
>12.1	27	7.3
<b>Mean± SD: 10.01±1.87</b>		

**Table 2.** (continued) Distribution of respondents according to the laboratory assessment (n=369).

<b>Total</b>	<b>369</b>	<b>100</b>
<b>iPTH (pg/ml)</b>		
Normal (10-65)	308	83.5
High (>65)	61	16.5
<b>Mean± SD: 58±26.5</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>LDL (mg/dl)</b>		
Normal (<130)	110	29.8
High (≥130)	259	70.2
<b>Mean± SD: 145±25</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>HDL (mg/dl)</b>		
Normal	77	20.9
Low	292	79.1
<b>Mean± SD: 40.85±3.45</b>		
<b>Total</b>	<b>369</b>	<b>100</b>
<b>TG (mg/dl)</b>		
Normal (<150)	19	5.1
High (≥150)	350	94.9
<b>Mean± SD: 288.66±90.65</b>		
<b>Total</b>	<b>369</b>	<b>100</b>

**Table 3.** Distribution of respondents according to the risk factor (n=369).

<b>Variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Family History of CKD</b>		
No	302	81.8
Yes	67	18.2
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Duration of HTN (Years)</b>		
< 5 years or normal	172	46.6
5 or more years	197	53.4
<b>Total</b>	<b>369</b>	<b>100</b>
<b>BMI</b>		
Underweight (<18.5)	5	1.4
Normal (18.5-24.9)	72	19.5
Overweight (>25)	292	79.1
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Alcohol Intake</b>		
No	366	99.2
Yes	3	.8
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Duration of Diabetes (Years)</b>		
>3 years	303	82.1
< 3 years	66	17.9
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Smoking</b>		
No	241	65.3
Yes	128	34.7
<b>Total</b>	<b>369</b>	<b>100</b>
<b>Bladder bowel habit</b>		
Abnormal	178	48.2
Normal	191	51.8
<b>Total</b>	<b>369</b>	<b>100</b>



compared to 20.5% in the SSC group, 14.7% in the JSC group, and 14.3% in the no-education group. Profession did not have any significant association with CKD status ( $\chi^2=2.27$ ,  $p=0.687$ ), with 39.8% of patients falling under 'others or prefers not to say,' 37.9% in private service, 8.9% in business, 7.9% in government service, and 5.4% in day labor. It was also observed that 17% of rural respondents and 24.5% of urban respondents had CKD. From Table 4, it was noted that 30.5% of CKD patients were from buildings, while only 3.6% were from tin sheds.

Table 5 shows the following association between CKD status and variables regarding risk factors: Family history of CKD was negative in 15.9% of participants and positive in 18.4%. Family history of CKD was associated with CKD ( $\chi^2=5.73$ ,  $p=0.022$ ). In terms of hypertension, 7% of patients had hypertension for less than 5 years or no history of hypertension, while 27.9% had

hypertension for more than 5 years. There was a very strong association between the duration of hypertension and CKD ( $\chi^2=27.0$ ,  $p=0.000$ ). A strong association was also found between BMI and CKD ( $\chi^2=14.44$ ,  $p=0.001$ ). Alcohol intake was rare, with 99.2% of patients having no history of alcohol consumption, but there was no significant association between alcohol intake and CKD ( $\chi^2=0.47$ ,  $p=0.453$ ). Regarding diabetes, 82.1% of patients had Type 2 Diabetes for more than 3 years, and 17.9% had it for less than 3 years. There was a strong association between the duration of diabetes and CKD ( $\chi^2=6.01$ ,  $p=0.013$ ). Smoking was reported by 34.7% of participants, but no association was found between smoking and CKD ( $\chi^2=0.005$ ,  $p=0.95$ ). The study also found that 9.6% of CKD patients did not take added salt, compared to 23.2% who did. Bladder and bowel habits showed a very strong association with CKD ( $\chi^2=15.74$ ,

**Table 4.** Association between socio-demographic variables and CKD status (n=369).

Variables	CKD status %		$\chi^2$	p value
	CKD present	CKD absent		
<b>Gender</b>				
Male	16.6	83.4	0.44	0.507
Female	19.3	80.7		
<b>Marital Status</b>				
Married	16.4	83.6		0.202
Unmarried	0	1	3.2	
Widowed	25	75		
<b>Educational Status</b>				
Degree	50	50		<b>0.001</b>
HSC	22	78	17.93	
SSC	20.5	79.5		
JSC	14.7	85.3		
No education	14.3	85.7		
<b>Profession</b>				
Business	24.2	75.8		0.687
Day labor	15	85	2.27	
Govt	20.7	79.3		
Others or prefers not to say	19.7	80.3		
Private	15	85		
<b>Residence</b>				
Rural	17	83		<b>0.000</b>
Slum	0	67	20.61	
Urban	24.5	75.5		
<b>Living Area</b>				
Building	30.5	69.5		<b>0.000</b>
Tin shed	3.6	96.4	44.77	

$p=0.000$ ), while healthy food intake did not show any significant association with CKD status ( $\chi^2=0.095$ ,  $p=0.757$ ).

Figure 1 shows that 18.16% (67 out of 369) of study participants had CKD (chronic kidney disease). Figure 2 shows that among the study participants, eGFR Stage 1 was found in 30 (8.1%), Stage 2 in 138 (37.4%), Stage 3A in 113 (30.6%), Stage 3B in 32 (8.7%), Stage 4 in 25 (6.8%), and Stage 5 in 31 (8.4%) patients.

## Discussion

According to the study, 18.2% of patients with Type 2 Diabetes were found to have CKD, which is consistent with a similar study conducted in Ethiopia [11]. The research was carried out in urban, rural, and slum areas, with 369

participants, approximately 59.1% of whom were female and 40% male. Statistical analysis ( $\chi^2=0.44$ ,  $p=0.507$ ) indicated that gender did not have a statistically significant impact on the prevalence of CKD. This finding aligns with a study conducted in northern Thailand, where the gender distribution was similar, with the majority of patients being female (57.1%), and no significant association between gender and CKD prevalence among Type 2 Diabetes mellitus (T2DM) patients. The unadjusted CKD prevalence was 24.5% for males and 24.3% for females, with a  $p$ -value of 0.943, indicating no significant difference [12].

Elderly individuals were found to be more susceptible to CKD, as over half of the participants were aged 46–65. This is consistent with a related

**Table 5.** Association between CKD status & Risk factors (n=369).

Variables	CKD status %		$\chi^2$	$p$ value
	CKD present	CKD absent		
<b>Family History of CKD</b>				
No	15.9	84.1	5.73	<b>0.022</b>
Yes	18.4	81.6		
<b>Duration of HTN in Years</b>				
< 5 years or normal	7	93	27.0	<b>0.000</b>
5 or more years	27.9	72.1		
<b>BMI</b>				
Underweight (<18.5)	80	20	14.44	<b>0.001</b>
Normal (18.5-24.9)	12.5	87.5		
Overweight ( $\geq 25$ )	18.5	81.5		
<b>Alcohol Intake</b>				
No	18	82	0.47	0.453
Yes	33.3	66.7		
<b>Duration of Diabetes in Years</b>				
>3years	20.5	79.5	6.01	<b>0.013</b>
< 3years	7.6	82.4		
<b>Smoking</b>				
No	18.3	81.7	0.005	0.95
Yes	18	82		
<b>Salt Intake</b>				
No	9.6	90.4	10.72	<b>0.001</b>
Yes	23.2	76.8		
<b>Bladder bowel habit</b>				
Abnormal	26.4	73.6	15.74	<b>0.000</b>
Normal	10.5	89.5		
<b>Healthy food intake</b>				
No	18.6	81.4	0.095	0.757
Yes	17.2	82.8		



Ethiopian study, where participants had a mean age of  $45 \pm 14.5$  years [11]. Elderly patients (>65 years) with T2DM showed a similar trend, with CKD prevalence rates of 40.5% in one study and 56.1% at the national level in Thailand [13].

The study provides important insights into participants' blood pressure, with mean diastolic blood pressure (DBP) readings of  $91.98 \pm 14.77$  mmHg and systolic blood pressure (SBP) readings of  $145.01 \pm 26.27$  mmHg. In contrast, a study conducted in Thailand reported different

average blood pressure readings, with a mean DBP of  $77.6 \pm 11.1$  mmHg and mean SBP of  $132.4 \pm 18.2$  mmHg. These variations underscore the potential influence of demographic, cultural, or regional factors on cardiovascular health markers [12].

An important new finding is the relationship between albumin-to-creatinine ratio (ACR) levels and CKD, as evidenced by participants' urine ACR levels. Among the individuals, 40.4% had microalbuminuria (30–299), 6.2% had large

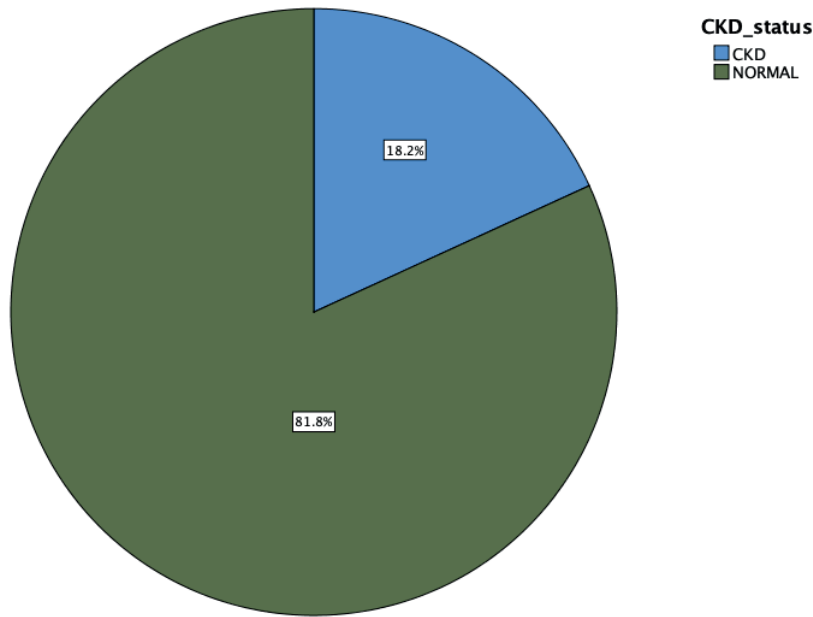


Figure 1. Distribution of respondents according to the prevalence of CKD.

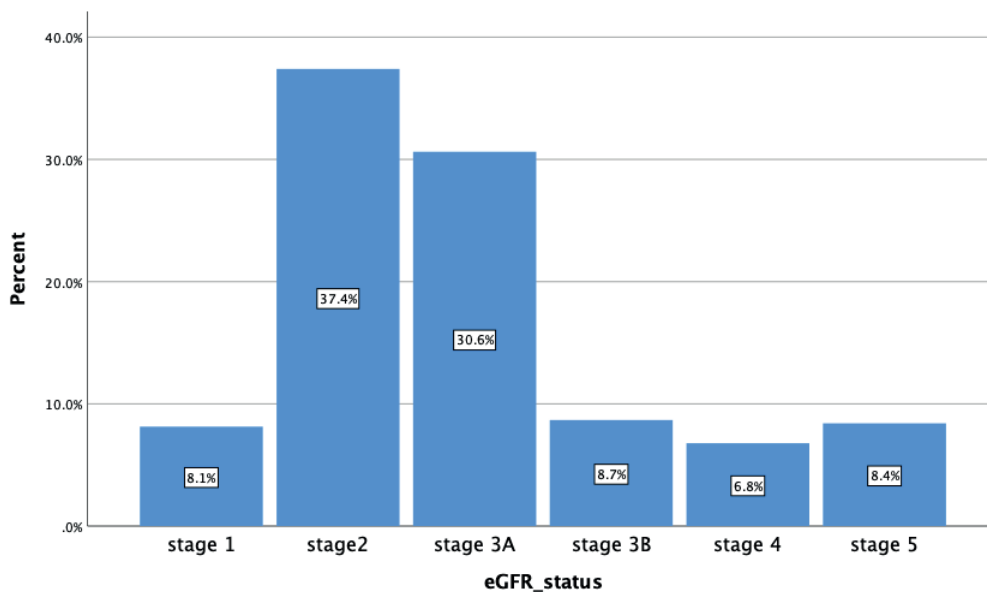


Figure 2. Different stages of CKD among the participants.

proteinuria ( $\geq 300$ ), and 53.4% had normal ACR (10–29). The mean ACR was  $115 \pm 156.28$ . A substantial correlation was observed between CKD and varying ACR levels ( $\chi^2=160.35$ ,  $p=0.000$ ). Given that proteinuria is present in 100% of individuals with CKD, this study emphasizes the importance of proteinuria as a reliable indicator of the disease. Monitoring urine ACR is thus critical in assessing and managing CKD risk in individuals with Type 2 Diabetes. These findings are consistent with a Chinese study, which showed varying rates of renal insufficiency and lower estimated glomerular filtration rates (eGFR) across normo-, micro-, and macroalbuminuria categories. This highlights the global significance of ACR as a key marker for assessing renal function and predicting CKD progression. When developing individualized treatment regimens and focused interventions for patients with Type 2 Diabetes, healthcare providers can make more informed decisions by understanding the relationship between urine ACR levels and renal outcomes [14].

The distribution of CKD stages among patients showed that 45.5% were in stages 1 and 2, 39.3% in stages 3A and 3B, and 15.2% in stages 4 and 5, indicating a greater proportion of patients in the early to moderate stages of CKD, with a smaller group experiencing advanced stages of the disease. This pattern is consistent with research from Ethiopia, underscoring the necessity of targeted therapies at various stages of CKD [11]. The study also found a strong correlation between the duration of diabetes and CKD ( $\chi^2=6.01$ ,  $p=0.013$ ). For instance, 82.1% of patients had diabetes for more than three years, and the risk of CKD increased with the duration of the condition. This is consistent with an Ethiopian study, which showed a greater prevalence of CKD (32.4% and 39.7%) in patients who had diabetes for more than ten years compared to those who had it for shorter periods (11.6% and 16.4%) [11]. These findings highlight the global importance of early detection and management of CKD, particularly among long-term diabetes patients.

The study also revealed a notable correlation between hypertension (HTN) and CKD in individuals with diabetes. Approximately 27.9%

of patients had hypertension for more than five years, while 7% had never experienced hypertension. These figures reflect the importance of regular blood pressure monitoring to manage CKD in diabetic patients, as demonstrated by another study in China, where 66.5% of CKD stage 1–2 patients and 81.8% of CKD stage 3–4 patients reported hypertension [14].

Overall, the study underscores the critical role of ACR monitoring, blood pressure management, and diabetes duration in the management of CKD among Type 2 Diabetes patients. Early intervention and tailored treatment strategies are essential for preventing or delaying CKD progression in this at-risk population.

## Conclusion

The research highlights the significance of consistent, individualized glucose management in achieving optimal control to minimize complications, particularly for individuals with Type 2 Diabetes Mellitus who also have chronic kidney disease (CKD). It emphasizes the need for further research, as early detection and targeted intervention have the potential to reduce CKD incidence and improve patient outcomes. Multidisciplinary care, which involves collaboration between doctors, nurses, pharmacists, dietitians, and social workers, plays a crucial role in providing optimal care for patients with complex chronic conditions like CKD and may be achieved through coordinated efforts among these healthcare professionals.

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## Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

## Data availability statement

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

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## ORIGINAL ARTICLE

# The effect of viral anxiety experienced by nurses working in pediatric service on psychological factors during Covid-19 period

Çiğdem Müge Haylı<sup>1</sup>  Seockhoon Chung<sup>2</sup>  Dilek Demir Kösem<sup>1</sup> 

<sup>1</sup>Department of Nursing, Faculty of Health Sciences, Hakkari University. Hakkari / Türkiye

<sup>2</sup>Department of Psychiatry, Asan Medical Center, University of Ulsan College of Medicine. Songpa-gu, Seoul / Korea

## Abstract

During the Covid-19 period, nurses, as healthcare professionals, have been under a great workload, and their anxiety levels have also increased their psychological effects. Therefore, this study was conducted to examine the effect of viral anxiety experienced by nurses working in the pediatric ward during the Covid-19 period on psychological factors. This is a descriptive study. Permission was obtained from Hakkari University Scientific Research and Publication Ethics Committee for research permission. Sociodemographic data were collected online from 1200 nurses working in the pediatric service who voluntarily participated in the study between October 13, 2023 and December 25, 2023 using the sociodemographic data collection form and the stress and anxiety scale for health workers due to virus epidemic-9 items (SAVE-9), Patient health questionnaire-9 (PHQ-9), Obsession with Covid-19 Scale (OCS), Reassurance-seeking behavior scale against coronavirus (CRBS). In order to compare SAVE, PHQ, OCS and CRBS scale scores according to sociodemographic information and vaccination status variables, independent groups t test one-way variance analysis Levene's F test was applied and data were analyzed using a statistical package program. It is understood that 59.9% of the participants are male and 40.1% are female. The proportion of married participants was 95.4%. The results of the scores obtained from the SAVE and PHQ scales show that the stress and anxiety related to the virus epidemic are above the middle level, the result of the OCS scale score shows that the dysfunctional thoughts associated with the coronavirus, and the scores obtained from the CRBS Total scale show that the assurance-seeking behavior is exhibited according to the results. The effect of viral anxiety on the psychological factor according to sociodemographic characteristics (gender, age, marital status, socioeconomic status, educational status, working area in pediatric service, vaccination status) showed significant and different results according to scale scores. It was concluded that the viral anxiety experienced by the nurses working in the pediatric service during the Covid-19 period showed different characteristics in terms of psychological factors and sociodemographic characteristics, and the nurses were not very effective due to the decrease in the effect of Covid-19.

**Keywords:** Nurses, pediatric service, Covid-19, anxiety, psychology

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**Corresponding Author:**  
Çiğdem Müge Haylı  
Email: [mugehayli@hakkari.edu.tr](mailto:mugehayli@hakkari.edu.tr)



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## Introduction

Anxiety is the individual's perception of danger from the situation in which he/she is in and perceiving himself/herself as powerless against that situation [1]. There are many definitions of anxiety in the literature. According to Freud, anxiety defines a function of the ego required to protect one's integrity, and according to Karen Horney, it defines the feeling of loneliness and helplessness in the face of a situation that the individual cannot cope with. Studies conducted in past epidemic periods show that the anxiety of the public and healthcare professionals increases during epidemics [2-4]. In addition, there are also studies showing that the anxiety levels of individuals increased with the Covid-19 pandemic [5,6]. Individuals who feel anxious feel that their present and future are in danger and question their lives intensely. It is meaningless for the individual to acquire a value that will not be realized and to pursue it. This decreases the individual's motivation and prevents self-realization.

Psychological resilience and psychological factors are defined as the ability of an individual to adapt to adverse conditions, maintain balance, and continue living without losing the sense of control over events [7]. Fredrickson stated that individuals with a high perception of psychological resilience are protected from depression and anxiety through positive emotions and that they develop with positive emotions [8]. Psychological resilience and psychological factors are expressed as a set of characteristics and protective mechanisms that facilitate the individual's successful adaptation to challenging conditions [9].

Since the first days of 2020, there has been an outbreak worldwide. The fact that the Covid-19 virus is very easy to transmit during the pandemic and that there is no treatment, medication or vaccine yet may arouse anxiety in people [10]. In this period, internal and external protective factors of individuals against risk factors become more important for healthcare professionals, especially for nurses working in the field of pediatrics. In addition to being a vulnerable group, it was determined that nurses

working in the field of pediatrics were affected psychologically (tired, blaming themselves, questioning, etc.) after the pandemic period and that the pediatric group patients they care for were affected (late mobilization, prolongation of the disease process, fear, anxiety and stress) [11]. The importance of the study is that the viral anxiety they experienced during the Covid-19 period also affects psychological factors in the following processes.

Nurses are under psychological pressure during the Covid-19 period, which has caused their anxiety, especially due to the virus, to increase. For this reason the aim of this study was to examine the effect of viral anxiety experienced by nurses working in the pediatric ward during the Covid-19 period on psychological factors.

### Research Question

Does the effect of viral anxiety experienced by nurses working in the pediatric ward during the Covid-19 period on the psychological factor differ significantly according to sociodemographic variables?

## Materials and Methods

*Type of Research:* This study is descriptive in nature.

*Place and Time of Research:* An online questionnaire (Google Form) was collected from the nurses who voluntarily participated in the study and completed the informed consent form between October 13, 2023, and December 25, 2023. The sociodemographic data form created online in the Google form and the stress and anxiety scale due to the virus epidemic for health workers-9 items (SAVE-9), Patient health questionnaire-9 (PHQ-9), Obsession scale with Covid-19 (OCS), the informed consent form added online before the obsession scale (OCS), the Reassurance-seeking behavior scale against coronavirus (CRBS), were added and the informed consent form in which the nurses participating in the study clearly stated that they accepted the study was accepted and their consent was obtained by accepting and marking the informed consent form. It took an average of 5 minutes for the nurses participating in the study to answer the questions.



**Population and Research Sample:** The population of the study was planned to consist of nurses working in the field of pediatrics in Türkiye who voluntarily participated in the study and completed the informed consent form. However, since it was not possible to reach all nurses in Türkiye, the study was conducted online. Online survey (Google Forms) and social networks and social media were used. The sample size was 1200 nurses working in the field of pediatrics who met the participation conditions according to the number of variables used in multivariate data selected by simple sampling method.

### Variables of the Study

**Independent Variables:** Gender, age, marital status, socioeconomic status, educational status, working area in pediatric service, vaccination status.

**Dependent Variable:** Viral anxiety and psychological factor.

### Inclusion and Exclusion Criteria

#### Inclusion

Nurses who voluntarily agreed to participate in the study.

Nurses working in pediatric ward.

#### Exclusion

Nurses who did not voluntarily agree to participate in the study.

Nurses not working in the pediatric ward.

### Data Collection Tools

The research data will be collected with the following data collection forms:

Socio-demographic questionnaire

Virus epidemic-related stress and anxiety scale for health workers-9 items (SAVE-9)

Patient health questionnaire-9 (PHQ-9)

Obsession Scale (OCS) with Covid-19

Reassurance-seeking behavior scale against coronavirus (CRBS).

**Sociodemographic Data Form:** This form comprised eight questions on gender, age, marital status, socioeconomic status, educational

status, working years, working area in pediatric service, vaccination status.

**Virus Epidemic Related Stress and Anxiety Scale for Healthcare Workers-9 Items (SAVE-9):** SAVE-9 was developed by Chung et al. in 2020 [12]. Its Turkish validity and reliability was conducted by Uzun et al. in 2021 [13]. The scale consists of 9 questions. The questions are in the form of a 5-point Likert scale (never: 0, rarely: 1, sometimes: 2, often: 3, always: 4). The scale provides a psychological evaluation of the stress and anxiety of healthcare workers due to the virus epidemic. It is a 2-factor scale; factor 1 (1,2,3,4,5,8 items) and factor 2 (6,7 and 9 items). The scale score is obtained by summing the item scores and there are no reverse items. The Cronbach Alpha value of SAVE-9 was calculated as 0.79 in the original study and 0.77 in the Turkish validity and reliability study and was found to be valid and reliable [13].

**Patient health questionnaire-9 (PHQ-9):** The Patient Health Questionnaire-9 (PHQ-9) was developed by Kronke et al. (2001) [14] and translated into all languages with a training grant provided by Pfizer Inc. Column scores are summed to obtain the total score. 1, very difficult: 2, extremely difficult: 3) is selected and the total score is summed. As a result of total scoring, 1-4 points are considered as minimal depression, 5-9 points as mild depression, 10-14 points as moderate depression, 15-19 points as moderately severe depression, 20-27 points as severe depression.

**Obsession Scale (OCS) with Covid-19:** It was created by Lee (2020) [15]. Kurt et al. (2021) [16] conducted the Turkish validity and reliability of the Obsession Scale with Covid-19. It is a usable scale with a sensitivity of 81% to 93% and a specificity of 73% to 76%. It consists of a total of 4 questions. The scale is internally consistent with a *Cronbach's alpha* of 0.80. Each item of the scale is rated on a 5-point scale from 0 (not at all) to 4 (almost every day) based on experiences over the past two weeks. This scaling format is consistent with the DSM-5 intersectional symptom scale. An OCS total score  $\geq 7$  indicates coronavirus-related dysfunctional thinking. High scores on a particular item or a high total scale score ( $\geq 7$ )

may indicate problematic symptoms that may require further assessment and/or treatment.

**Reassurance-seeking behavior scale against coronavirus (CRBS):** It was created by Lee (2020) [17]. It consists of a total of 4 questions. It is a reliable tool ( $\alpha = .90$ ) with robust factorial (single factor) and construct (related to dysfunctional coronavirus anxiety, generalized anxiety, depression, and health anxiety) validity ( $\alpha = .90$ ). The Turkish validity and reliability study was conducted by Kırac et al. [18] Cronbach's alpha reliability coefficient was calculated as 0.790. Each item is rated on a 5-point scale ranging from 0 (not at all) to 4 (almost every day) based on experiences in the last 2 weeks. This scaling format is consistent with the DSM-5 intersectional symptom measure. Severity scores are obtained by summing responses to all items, with total scores ranging from 0 to 20 ( $M = 6.23$ ;  $SD = 5.51$ ). Although clinical cut-off scores have not yet been determined, total scores  $\geq 12$  and above indicate above-average reassurance-seeking behavior.

**Data Analysis:** Independent samples t-test was used to compare the SAVE, PHQ, OCS, and CRBS scale scores according to the variables of gender, marital status, socioeconomic status, educational status, and vaccination status. One-way analysis of variance was used to compare the scale scores according to the field of study in the pediatric service. Levene's F test was applied to test the homogeneity of variances. Pearson correlation coefficients were calculated to determine the relationship between age and working time with the scale scores. Data were analyzed using SPSS 25.0 statistical package program.

**Ethical Consideration:** The study was conducted in accordance with the Declaration of Helsinki. It was approved by Hakkari University Scientific Research and Publication Ethics Committee (Date: 12.01.2023, Decision No: IRB: 2023/114-1) and informed consent was obtained from the nurses.

## Results

Table 1 shows is analyzed, 59.9% of the nurses were male, 40.1% were female and 95.4% were married. 70% of the participants stated that their socioeconomic status was at the middle level and the rate of participants with associate degree was 20%. 20% of the nurses work in the field of infection, 29.9% in general pediatric, 20% in oncology and 30.1% in pediatric intensive care. The rate of nurses who stated that they were vaccinated was 80%.

Table 2 shows that the skewness ( $Sh=0.07$ ) and kurtosis ( $Sh=0.14$ ) values calculated for the scale scores did not exceed the reference range. These results indicated that the assumption of normal distribution was not violated. It is understood that the scores obtained from the SAVE scale ranged between 17 and 32 and the mean score was calculated as 26.19 ( $SD=4.08$ ). According to the calculated mean score, in general, the stress and anxiety of the participants due to the virus epidemic is above the medium level. It is understood that the scores obtained from the PHQ Total scale ranged between 11 and 22 and the mean score was calculated as 17.61 ( $SD=3.38$ ). According to the mean score, in general, the participants had moderately severe depression. It was observed that the scores obtained from the OCS Total scale ranged between 4 and 16 and the mean score was calculated as 11.70 ( $SD=3.69$ ). The mean score showed that the participants had dysfunctional thoughts related to the coronavirus (Scale score  $\geq 7$ ). CRBS Total scale ranged between 7 and 19 and the mean score was calculated as 11.40 ( $SD=3.67$ ). A mean score of 12 and higher indicates that reassurance seeking behavior is exhibited. The mean score of the participants is quite close to this value (Table 2).

Table 3 the table is analyzed; the mean OCS Total scores did not show a significant difference according to gender ( $p>0.05$ ). However, SAVE PHQ showed a significant difference between CRBS total score averages ( $p<0.05$ ). It was determined that men's perceptions of stress, anxiety and depression due to the virus outbreak were higher, and women's tendency to exhibit reassurance-seeking behavior was higher. Table



3 continued shows that there is no significant relationship between age and SAVE, PHQ, OCS and CRBS Scale Scores. However, there are low and moderate negative relationships between working time and SAVE, OCS and CRBS scores ( $p < 0.01$ ). As age increases, participants' stress and anxiety levels due to the virus epidemic, their perceptions of depression, dysfunctional thoughts related to coronavirus, and their tendency to exhibit reassurance-seeking behavior decrease (Table 3).

Table 4 is analyzed, SAVE, PHQ, OCS, CRBS total mean scores did not show a significant difference according to marital status ( $p > 0.05$ ). It was

observed that married and single participants' stress and anxiety related to the virus epidemic, depression levels, dysfunctional thoughts related to coronavirus, and reassurance-seeking behavior were similar (Table 4).

Table 5 is analyzed, the mean PHQ total scores did not show a significant difference according to socioeconomic status ( $p > 0.05$ ). However, SAVE, OCS, CRBS total mean scores showed a significant difference ( $p < 0.05$ ). Participants with high socioeconomic status were more likely to have stress and anxiety related to the virus epidemic, while participants with medium socioeconomic status were more likely to have dysfunctional

**Table 1.** Distribution of participants according to diagnostic characteristics.

		f	%
Gender	Male	719	59.9
	Female	481	40.1
Marital status	Single	55	4.6
	Married	1145	95.4
Socioeconomic status	Middle	840	70
	High	360	30
Education status	Associate degree	240	20
	Undergraduate and above	960	80
In which area do you work in the pediatric service?	Infection	240	20
	General pediatric	359	29.9
	Oncology	240	20
	Pediatric intensive care	361	30.1
Have you had contact with Covid-19?	Yes	1200	100
Have you been infected with Covid-19?	Yes	1200	100
Have you been vaccinated?	Yes	960	80
	No.	240	20

**Table 2.** Skewness and Kurtosis Coefficients and descriptive values of the Scores Obtained from SAVE, PHQ, OCS and CRBS Scales.

Variables	Skewness		Kurtosis	
	z	Sh	z	Sh
SAVE Total	-0.79	0.07	0.19	0.14
PHQ Total	-0.37	0.07	-0.71	0.14
OCS Total	-0.85	0.07	-0.52	0.14
CRBS Total	0.72	0.07	-0.59	0.14
Variables	Min.	Maks.	Med.	Ss
SAVE Total	17	32	26.19	4.08
PHQ Total	11	22	17.61	3.38
OCS Total	4	16	11.70	3.69
CRBS Total	7	19	11.40	3.67

thoughts related to the coronavirus and to exhibit reassurance-seeking behaviors. The mean scores of SAVE and CCRBS total scores did not show a significant difference according to educational status ( $p>0.05$ ). However, the mean total scores of PHQ and OCS showed a significant difference ( $p<0.05$ ). Participants with undergraduate and graduate education had higher perceptions of depression and tendency to have dysfunctional thoughts related to coronavirus than participants with associate degree.

Table 6 is analyzed, the mean scores of SAVE, PHQ total, OCS and CGADS total scores showed a significant difference according to the area of work in the pediatric service ( $p<0.05$ ). According to the Scheffe Test results, the stress and anxiety scores of the participants working

in the pediatric intensive care unit due to the virus epidemic were significantly higher than the scores of the participants working in other departments. Participants working in the infection department had the highest level of depression perception and coronavirus-related dysfunctional thinking. These participants were followed by participants working in oncology, pediatric intensive care and general pediatric care departments, respectively. Participants working in the infection department had the highest level of reassurance-seeking behaviors against coronavirus, while participants working in the pediatric intensive care department had the lowest level of reassurance-seeking behaviors against coronavirus. Examined, SAVE, PHQ, OCS, and CRBS total mean scores showed a significant difference according to vaccination

**Table 3.** Mean, standard deviations and Independent Groups T-Test Results of SAVE, PHQ, OCS and CGAD Scale Scores by Gender and Means, Standard Deviations and Independent Groups T-Test Results of SAVE, PHQ, OCS and CRBS Scale Scores.

Variables	Gender	N	Med	Ss	t(1200)	p
SAVE Total	Female	481	25.48	4.99	-4.99	0.00*
	Male	719	26.67	3.25		
PHQ Total	Female	481	16.25	1.79	-12	0.00*
	Male	719	18.51	3.86		
OCS Total	Female	481	11.74	3.83	0.37	0.71
	Male	719	11.66	3.59		
CRBS Total	Female	481	12.74	2.49	10.87	0.00*
	Male	719	10.5	4.04		
Variables		Age		Working time (years)		
SAVE Total		0.014		-.242**		
PHQ Total		0.011		-.501**		
OCS Total		-0.005		-.366**		
CRBS Total		-0.010		-.397**		

\* $p<0.05$ , \*\* $p<0.01$ ; N=1200

**Table 4.** Means, standard deviations and Independent Groups T-Test Results of SAVE, PHQ, OCS and CRBS Scale Scores according to marital status.

Variables	Marial Status	N	Med	Ss	t(1200)	p
SAVE Total	Married	1145	26.2	4.09	0.09	0.93
	Single	55	26.15	3.92		
PHQ Total	Married	1145	17.6	3.38	-0.23	0.82
	Single	55	17.71	3.34		
OCS Total	Married	1145	11.66	3.7	-1.37	0.17
	Single	55	12.36	3.47		
CRBS Total	Married	1145	11.39	3.66	-0.60	0.55
	Single	55	11.69	3.89		

\* $p>0.05$

**Table 5.** Means, standard deviations and Independent Groups T-Test results of SAVE, PHQ, OCS and CRBS Scale Scores according to socioeconomic status and means, standard deviations and Independent Groups T-Test results of SAVE, PHQ, OCS and CRBS Scale Scores according to educational status.

Variables	Socioeconomic status	N	Med	Ss	t(1200)	p
SAVE Total	Middle	840	25,71	4,35	-6,44	0,00*
	High	360	27,33	3,10		
PHQ Total	Middle	840	17,72	3,57	1,83	0,07
	High	360	17,33	2,87		
OCS Total	Middle	840	11,85	3,91	2,23	0,03*
	High	360	11,33	3,10		
CRBS Total	Middle	840	12,00	3,55	8,93	0,00*
	High	360	10,00	3,56		

Variables	Education status	N	Med	Ss	t(1200)	p
SAVE Total	Associate degree	240	26,00	3,01	-0,82	0,41
	Undergraduate and above	960	26,24	4,31		
PHQ Total	Associate degree	240	15,50	1,50	-11,36	0,00*
	Undergraduate and above	960	18,13	3,51		
OCS Total	Associate degree	240	10,00	3,01	-8,17	0,00*
	Undergraduate and above	960	12,12	3,73		
CRBS Total	Associate degree	240	11,50	3,51	0,48	0,63
	Undergraduate and above	960	11,37	3,71		

\*p<0.05

**Table 6.** Means, standard deviations and ANOVA results of SAVE, PHQ, OCS and CRBS Scale Scores according to the area of work in pediatric service and mean, standard deviations and Independent Groups T-Test results of SAVE, PHQ, OCS and CRBS Scale Scores according to vaccination status.

Değişkenler	Area worked in pediatrics service	N	Med	Ss	F(3;1196)	p	Scheffe Post-Hoc
SAVE Total	Infection <sup>a</sup>	240	27.5	2.51	145.3	0.00*	a>d, b>d, c>d,
	General pediatric <sup>b</sup>	359	27.68	3.3			
	Ontology <sup>c</sup>	240	27.5	1.5			
	Pediatric intensive care <sup>d</sup>	361	22.98	4.91			
PHQ Total	Infection <sup>a</sup>	240	21.5	0.5	690.43	0.00*	a>b, a>c, a>d c>b, c>d b>d
	General pediatric <sup>b</sup>	359	14.68	2.87			
	Ontology <sup>c</sup>	240	20	2			
	Pediatric intensive care <sup>d</sup>	361	16.34	1.7			
OCS Total	Infection <sup>a</sup>	240	14	0.00	97.91	0.00*	a>b, a>c, a>d c>b, c>d d>b
	General pediatric <sup>b</sup>	359	11.33	5.26			
	Ontology <sup>c</sup>	240	13	2			
	Pediatric intensive care <sup>d</sup>	361	9.66	2.49			
CRBS Total	Infection <sup>a</sup>	240	13	6.01	22.73	0.00*	a>b, a>c, a>d c>d
	General pediatric <sup>b</sup>	359	11	2.95			
	Ontology <sup>c</sup>	240	11.5	0.5			
	Pediatric intensive care <sup>d</sup>	361	10.66	3.09			

Variables	Have you been vaccinated?	N	Med	Ss	t(1200)	p
SAVE Total	Yes	960	24.99	3.65	-25.25	0.00*
	No	240	31	1		
PHQ Total	Yes	960	17.13	3.55	-10.11	0.00*
	No	240	19.5	1.5		
OCS Total	Yes	960	12.37	2.92	13.58	0.00*
	No	240	9	5.01		
CRBS ToTAL	Yes	960	12.37	3.46	21.73	0.00*
	No	240	7.5	0.5		

\*p<0.05

status ( $p < 0.05$ ). Participants who stated that they were not vaccinated had higher stress and anxiety and depression perceptions related to the virus epidemic, while participants who stated that they were vaccinated had a higher tendency to have dysfunctional thoughts related to the Reassurance-seeking behavior scale against coronavirus.

## Discussion

Pediatric nurses who participated in the research; The rate of married people is 95.4%, of which 59.9% are men and 40.1% are women. It was determined that 70% of the nurses had a moderate socioeconomic status, 20% worked in the field of Infection, 29.9% worked in General Pediatrics, 20% worked in Oncology and 30.1% worked in pediatric intensive care. Our findings; the results of Zheng et al.'s cross-sectional study [19]: Prevalence of depression and anxiety among nurses during the Covid-19 epidemic in China and associated factors are similar. Azizpour et al.'s study titled "The effect of psychological factors on grief in front-line nurses fighting Covid-19" [20] and Del Pozo-Herce et al.'s study on the psychological impact on nursing professionals in the Rioja health service (Spain) due to the SARS-CoV-2 virus. The results of the study are consistent with [21].

According to the gender variable of the pediatric nurses who participated in the research; There was no difference between the OCS total scores, but there were significant differences between the total score averages of the other scales. Male nurses had higher levels of stress and anxiety than female nurses. Our findings; In the study of McAlonan et al., on the immediate and continuous psychological impact of the emerging infectious disease epidemic on healthcare workers, it was concluded that male nurses were more stressed and had higher anxiety levels [22]. In Sampai et al.'s study titled The effect of the Covid-19 epidemic on the mental health of nurses: A prospective cohort study, it was found that women had lower levels of anxiety in epidemic situations than male nurses [23]. Alwani et al.'s study evaluating nurses' knowledge, practices, attitudes and concerns about Covid-19 during the current epidemic in Karachi, Pakistan, found

that male nurses had higher anxiety and stress levels, according to the score results of the scales used [24].

It was concluded that as the age of the pediatric nurses participating in the study increases, the participants' stress and anxiety levels due to the virus epidemic, their perception of depression, their dysfunctional thoughts related to coronavirus and their tendency to exhibit reassurance-seeking behavior decrease. Our finding result; In Robert et al.'s study on endurance, anxiety and depression levels of nurses working in respiratory clinical areas during the COVID epidemic, nurses who were older in biological age had lower levels of anxiety and stress during the epidemic [25]. Similarly, Mosolova et al.'s study on the endurance, anxiety and depression levels of nurses working in respiratory clinical areas during the Covid-19 epidemic in Russia. In a study on stress and anxiety among healthcare professionals [26], it was stated that nurses who were older were more likely to be infected with the virus. Likewise, the results of Ali et al.'s investigation of psychological stress, anxiety factors and coping mechanisms of intensive care unit nurses during the Covid-19 epidemic in Saudi Arabia are also parallel [27].

According to the marriage status of the pediatric nurses who participated in the study, the total score averages of the scales did not show a significant difference in our findings. It was concluded that the stress and anxiety behaviors of married and single people were similar. This is our finding. In a cross-sectional study by Marthoenis et al., investigating the burden of mental distress among nurses in a Covid-19 referral hospital in a province in Indonesia, it was concluded that the anxiety levels of nurses were similar according to their marital status and were affected by each other [28]. The results of Alwani et al.'s study evaluating the knowledge, practices, attitudes and concerns of Pakistani nurses towards Covid-19 during the current epidemic in Pakistan and Lyu et al.'s study on the risk perception and prevention of hospital infections of frontline nurses during the Covid-19 epidemic [29]. The results of the study titled Factors Affecting Applications are compatible with our findings [30].

According to the socioeconomic levels of pediatric nurses, except for the total score averages of the PHQ scale, the total score averages of other scales show significant differences, and psychologically the viral anxiety of nurses with high and medium socioeconomic levels was found to be higher. This finding was found in König et al.'s German translation of the Stress and anxiety to viral epidemics-9 (SAVE-9) scale: Outcomes of healthcare workers during the second wave of Covid-19 in which healthcare workers with an economically lower budget reported less anxiety at the time of the epidemic [31]. It was found that the results of Chen et al.'s study on the psychological distress of nurses working during the SARS epidemic in Taiwan and Awona et al.'s study on the anxiety, depression and resilience of healthcare workers during the 2019 coronavirus disease epidemic in Japan were similar to our findings [32,33].

According to the educational status of the participating nurses; SAVE and CRBS scale total score averages did not show a significant difference, but a significant difference was found between PHQ and OCS total score averages. According to our findings, as the educational level increases, viral anxiety that may occur due to Covid-19 will have a greater impact on the psychological factor, which may suggest that coping processes are ineffective. This finding was found in Nobahar et al.'s study of depression, death anxiety and related factors in nurses caring for Covid-19 patients at the Kosar hospital in Semnan, Iran [34]. Nurses with a higher level of professional education had higher levels of anxiety and their anxiety increased during Covid-19. conclusion has been reached. As a result of Savitsky et al.'s study on anxiety and coping strategies in nursing students during the Covid-19 epidemic, it was determined that students in the lower grades coped better with viral anxiety [35]. In the study of Sinichi et al., on the psychological symptoms and coping strategies of nurses caring for patients with Covid-19 pneumonia, the nurses' professional experience rather than their educational status describes the Covid-19 process in a healthier way [36].

The total score averages of all scales showed significant differences according to the area where the participating pediatric nurses worked in the pediatric service, and the stress and anxiety levels of nurses working in pediatric intensive care were higher than those working in other services, followed by infectious oncology, pediatric intensive care and general pediatric care. This finding is supported by Fang et al.'s study: Causes and mediators of healthcare workers' anxiety in one of the hospitals most affected by Covid-19: in a qualitative analysis study, where nurses working in intensive care had high levels of anxiety, Ramadhana et al.'s Covid-19 in Patient Nursing Care Services Hospitals in the Hospital Zone [37]. Study results concluded that nurses working in the infection ward had high levels of depression and anxiety during the Covid-19 process [38]. According to the results of Şahin et al.'s study on the prevalence of depression, anxiety, distress and insomnia and related factors in healthcare workers during the Covid-19 epidemic in Türkiye, it is parallel to our findings [39].

Results according to vaccination status; the mean scores of all scales showed a significant difference, and those who were vaccinated were found to have higher levels of virus-related stress, anxiety and depression perceptions than those who were not vaccinated, and those who were vaccinated tended to feel insecure due to the virus. In Olashore et al.'s study titled "The psychological impact of Covid-19 on healthcare workers in African Countries: A systematic review" [40], it was determined that vaccinated people were comfortable with negative psychological situations that may occur as a result of virus anxiety. In Shahrour et al.'s study on acute stress disorder, coping self-efficacy and subsequent psychological distress among nurses amid Covid-19 [41], it was stated that vaccinated nurses had lower anxiety levels, but they still did not feel comfortable against the virus. The results of Branjerdporn et al.'s study of the interventional response of hospitals and healthcare services to the mental health effects of viral outbreaks on healthcare workers [42] are similar. One of the healthcare professionals who had to struggle the most with the epidemic



during the pandemic and who are at high risk of catching the epidemic is nurses [43]. These have caused nurses to become depressed, have sleep problems, have difficulty concentrating, and work in the field as anxious, hopeless and stressed individuals[43]. In a study conducted to determine the anxiety levels of individuals living in Türkiye during the Covid-19 pandemic, it was determined that single people had higher anxiety levels than married people [44]. In the study conducted by Karaveli and Kukul Güven in Türkiye titled evaluation of occupational anxiety in emergency service workers in the Covid-19 Pandemic, 90.4% of the participants stated that they had anxiety about work during the pandemic period. Our research findings are similar to studies conducted in Türkiye [45].

## Conclusion

It has been concluded that the results of pediatric nurses working in the ward regarding the possible psychological impact of Covid-19 and quarantine viral anxiety during the pandemic period differ according to some socio-demographic information and affect them directly and indirectly. In order to obtain more comparable results on this issue, studies conducted on large sample groups are needed. In addition, in line with the results obtained, it is important to reduce stress related to viral anxiety, relax techniques, awareness, self-compassion, and group and individual interventions to ensure psychological well-being of healthcare professionals, especially nurses, who are at the forefront of the fight against the pandemic. In addition, it may be useful to plan trainings that will reduce professional anxiety and increase professional self-confidence for this group, which is likely to experience future professional anxiety. In line with these results, it is suggested that it would be beneficial to establish psychological counseling units by determining the psychological behaviors of nurses and their fears and anxieties regarding processes such as pandemics, and to take into account the risk that their health anxiety levels may be high and to provide in-service training to reduce their anxieties on this issue. In addition; it is understood that the anxiety levels of nurses are high during the pandemic process we are

experiencing. In order to achieve this, in addition to increasing economic support, there should be activities and plans that will motivate them. It is recommended that studies be planned to ensure that nurses can continue their professions with love and motivation, and that similar studies be repeated in larger sample groups.

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## Conflict of interest

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# The effect of environmental stressors perceived by surgical intensive care unit patients on hopelessness level

Dilek Güneş<sup>1</sup>  Elif Okşak<sup>2</sup> 

<sup>1</sup> Department of Surgical Nursing, Faculty of Health Sciences, Fırat University, Elazığ / Türkiye

<sup>2</sup> General Surgery Intensive Care Clinic, Elazığ Fethi Sekin City Hospital, Elazığ / Türkiye

## Abstract

The aim of the research was to determine the effects of environmental stressors perceived by patients hospitalized in the surgical intensive care unit on hopelessness level. This descriptive research was performed between September 2023 and February 2024. The population of the study included all adult patients hospitalized in the Surgical Intensive Care Clinic of a City Hospital in Eastern Türkiye. The sample of the study includes 230 patients selected by random sampling method from this population. We used Personal Information Form, Intensive Care Unit Environmental Stressors Scale (ICUESS) and Beck Hopelessness Scale (BHS) to collect the data. Descriptive statistics, t-test, ANOVA, and correlation analysis tests were used to evaluate the data. The ICUESS mean score of the patients participated in the study was found to be at a high level with  $102.13 \pm 15.95$ . Beck hopelessness scale score mean was found to be at a mild level with  $6.36 \pm 5.78$ . It was found that the patients' gender, age, educational status, chronic disease status and previous intensive care experience affected the level of hopelessness. The relationship between ICUESS and BHS scores of the patients included in the study was examined and it was found that there was a low level of positive significant relationship between them ( $r: 0.162, p: 0.014$ ). The hopelessness level of patients in surgical intensive care units was found to increase as the level of exposure to environmental stressors increased. It may be recommended to identify environmental stressors affecting the hopelessness level of patients and to implement interventions to reduce them.

**Keyword:** Intensive care, environmental stressor, hopelessness, nurse

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**Corresponding Author:**  
Dilek Güneş  
Email: [dgunes23@yahoo.com](mailto:dgunes23@yahoo.com)



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## Introduction

In Intensive care units (ICU), patients are monitored due to one or more organ failure, necessary devices are used until the life-threatening situation is recovered, and 24-hour uninterrupted care is provided by an interdisciplinary team [1]. ICUs provide care to the most critically ill patients. It works in cooperation with other departments in the hospital [2]. Patients who are hospitalized in the intensive care unit usually come from the emergency department, operating room, surgery or internal units and other hospitals [3]. The patient is hospitalized in the intensive care unit to monitor his condition [4]. Since these units are a different environment for patients, they cause physical and mental stress in patients [5,6]. The pain felt by the patient, the limited duration of the visit, the constantly heard device sounds, noise, the lack of television are the most stressful factors for patients [7,8]. Other factors increasing stress include devices used for monitoring and treatment, lights being on all the time, the temperature of the environment being too high or too low, uncomfortable beds and pillows, the smell of the environment, and lack of privacy [9]. Reducing or eliminating environmental stressors during patients' treatment and care is important. Intensive care nurse gives treatment and care in order to accelerate the recovery process of patients in this process [7]. It evaluates the potential negativities and adverse effects as a result of these treatments and care [10].

In the literature, there are several studies on the perceived stressors and the experiences of the patients hospitalized in intensive care units [7,8,11]. In a study performed by Gültekin et al., the thirst, having tubes in the mouth and nose, and nurses performing continuous procedures at the bedside were found to be serious stressors on patients hospitalized in the intensive care unit [5]. In a study performed in a reanimation unit by Karadeniz et al., the most important stressors perceived by patients were found to be pain, opportunity to see their families and friends for a short time a day, privacy negligence, to be connected to tubes and to miss their family [12]. Patients hospitalized in ICU were observed to have psychological problems due to stressors

[8]. They are frequently observed to have psychological symptoms such as stress, fear, hopelessness, confusion, anxiety, desperation and depression [13]. Hopelessness is defined as the desperation, negative perspective, loss of all plans, expectations and hope for the future [14]. By affecting the individual's thoughts and motivation for his/her goals, hopelessness causes loss of confidence, courage, energy and inability to think logically [15].

Hopelessness leads to physical and psychological problems in the patients hospitalized in intensive care. As a result of physical and psychological problems arising out of illnesses, treatment complications are observed [16]. In this respect, intensive care nurses should determine the hopelessness level of patients and apply individualized nursing initiatives that support hope [17]. Therefore, the presence of hope, which is preserved during the treatment process, may give strength to the patient by providing psychological support. Motivating the patients may be useful for them to overcome the adverse effects of treatment [18]. The aim of the research was to determine the effects of environmental stressors perceived by patients hospitalized in the surgical intensive care unit on hopelessness level.

## Materials and Methods

### Research design and sampling

This descriptive study was performed in the Surgical Intensive Care Unit of Elazığ Fethi Sekin City Hospital in Eastern Türkiye from September 2023 and February 2024. The population of the study included all adult patients hospitalized in the same hospital. The sample size was determined as 240 patients in total according to the power analysis measurement by using the G Power 3.1.9.7 program, with 0.7 effect size, 0.05 error level, 0.95 confidence interval, and a power of 95% to represent the population [19]. The sample includes patients meeting the inclusion criteria and who were selected from the population by random sampling method. 7 patients who did not have the inclusion criteria and 3 patients who did not want to participate in the study were excluded from the study. The research was completed with 230 patients.

### Inclusion and exclusion criteria for the study

Inclusion criteria: (i) No communication problems, (ii) Being over 18 years of age, (iii) Having good mental health, (iv) Being willing to participate in the study, (v) Being hospitalized for 48 hours.

Exclusion criteria: Patients who (i) Stayed in the clinic for less than 48 hours, (ii) Patients who did not have the inclusion criteria were not included in the study.

### Data Collection Tools

We used Personal Information Form, Intensive Care Unit Environmental Stressors Scale (ICUESS) and Beck Hopelessness Scale (BHS) to collect the data. The data were obtained by the researcher through the face-to-face interview technique in the patient's room at the clinic. Data were obtained from all adult patients who met the inclusion criteria and had a minimum of 48 hours of hospitalization at the clinic. Each interview lasted approximately 30-35 minutes.

*Personal Information Form:* It was developed by the researcher in accordance with the literature [5,8,12]. The form includes questions regarding disease-related information like the patients' age, marital status, gender, educational status, having chronic disease, the reason of hospitalization in intensive care unit, and intensive care experience.

*Intensive Care Unit Environmental Stressors Scale (ICUESS):* The scale developed by Ballard was renewed by Cochran and Ganong. Aslan conducted a validity and reliability study. The Likert-type scale consists of 42 items. Although it does not contain any sub-dimensions, the responses are collected and evaluated by obtaining the intensive care unit environmental stressors scale total score. A minimum score of 42 and a maximum score of 168 can be obtained from the scale. As this score increases, the level of exposure to environmental stressors also increases. The cronbach alpha coefficient of the scale was found to be 0.94 [20-22]. In this study, the cronbach alpha coefficient was found to be 0.92.

*Beck Hopelessness Scale (BHS):* Beck et al. developed the Beck Hopelessness Scale in 1974 and this scale, developed by Durak et al in

1994 due to the smallness of the sample after making validity and reliability checks in our country by Seber et al., includes 20 items aimed at determining the individual's pessimism level for the future [23-25]. While answering the Beck hopelessness scale, the patient is asked to select the "yes" option for the expressions that match him/her and the "no" option for the expressions that do not match. The items 1, 3, 7, 11 and 18 in the scale measure the factor of 'Feelings and expectations about the future'; the items 2, 4, 9, 12, 14, 16, 17, and 20 measure the factor of 'Motivation Loss'; and the items 5, 6, 8, 10, 13, 15, and 19 measure the factor of 'Hope'. The total score of the scale vary between 0-20. It shows that the patients having a total score of 0-3 from the scale have minimal, a score of 4-8 have mild, a score of 9-14 have moderate, and a score of 15 and above have severe hopelessness. In Durak's study, the Cronbach alpha coefficient determined for the reliability of the scale was found to be 0.86 [24,25]. In this study, the Cronbach alpha coefficient was found to be 0.92.

### Data Analysis

It was used SPSS 25 (Statistical Package for the Social Sciences 25.0) program to analyze the data and the statistical significance level was accepted to be  $p < 0.05$  [26]. Mean, standard deviation, number and percentage were calculated for the quantitative variables of the study. It was analyzed by using t-test, ANOVA and correlation analysis tests as significance tests.

### Ethics Committee Approval

For this research, it was obtained written permission from Firat University Non-Interventional Research Ethics Committee (Decision no: 2023/11-09) and an institutional permission from Elazığ Fethi Sekin City Hospital, where the study will be conducted. All participants were included in the study voluntarily. The aim of the research was explained by the researcher and written consent was obtained from those who agreed to participate in the research. The research was carried out in accordance with Declaration of Helsinki principles.

## Results

The patients' mean age hospitalized in surgical intensive care clinic was  $60.08 \pm 17.60$ . 58.7% of the patients were determined to be male, 30.4% to be the ages of 60 to 69, 86.1% to be married, and 36.1% to be illiterate. It was found that 57% of the patients had a chronic disease, 32.6% had hypertension, 52.2% had been hospitalized in

intensive care due to GI problems, and 54.3% had not been in intensive care before (Table 1).

Patients hospitalized in intensive care were found to have been highly affected by environmental stressors with a mean score of  $102.13 \pm 15.95$ . The mean score of hopelessness scale was found to be low with  $6.36 \pm 5.78$  (Table 2).

**Table 1.** Socio-Demographic characteristics of the patients participating in the study (n:230).

Characteristics	n	%
<b>Gender</b>		
Male	135	58.7
Female	95	41.3
<b>Age category (60,08±17,60)</b>		
19-39	40	17.4
40-49	18	7.8
50-59	29	12.6
60-69	70	30.4
70 and above	73	31.7
<b>Marital status</b>		
Married	198	86.1
Single	32	13.9
<b>Educational status</b>		
Illiterate	83	36.1
Primary school	68	29.6
Secondary school	25	10.9
High School	30	13
College	24	10.4
<b>Chronic disease status</b>		
No	99	43
Yes	131	57
<b>Type of chronic disease</b>		
Diabetes	48	20.9
Hypertension	75	32.6
Heart failure	8	3.5
<b>The reason for being in the ICU</b>		
Respiratory	39	17
Circulatory disorder	37	16.1
Trauma	34	14.8
GI problems	120	52.2
<b>Previous hospitalization status in ICU</b>		
Yes	105	45.7
No	125	54.3

ICU: Intensive Care Unit

**Table 2.** The patients' mean scores on the Intensive Care Unit Environmental Stressors Scale and Beck Hopelessness Scale.

Scale	N	$\bar{x} \pm ss$	Min-max
ICUESS	230	$102.13 \pm 15.95$	69-138
BHS	230	$6.36 \pm 5.78$	0-18

ICUESS: Intensive Care Unit Environmental Stressors Scale

BHS: Beck Hopelessness Scale

It was found that the most perceived stressor was 'lack of privacy' and the least perceived stressor was 'frequent physical examination performed by doctors and nurses' (Table 3).

The comparison of the patients' mean scores on ICUESS and BHS is shown in Table 4. It was found that the BHS score of female patients hospitalized in intensive care unit was higher than of male patients ( $p: 0.002$ ). Patients aged 19-39 years had a higher ICUESS score than the other groups ( $p: 0.001$ ), and patients at the age of 70 years and older had a higher mean BHS score than the other groups ( $p: 0.001$ ). While the ICUESS score was higher in university-educated patients ( $p: 0.001$ ), it was found that the BHS score was higher in the illiterate group ( $p: 0.001$ ). It was found that ICUESS score of patients without chronic disease was higher ( $p: 0.001$ ), whereas BHS score of patients with chronic disease was found to be higher ( $p: 0.001$ ). The mean BHS score of patients previously hospitalized in the intensive care unit was found to be higher ( $p: 0.001$ ).

The correlation between the ICUESS and BHS scores of the patients included in the study was examined and a low level of positive significant correlation was found between them ( $p: 0.014$ ). It was found that as the level of patients' exposure to environmental stressors increased, their level of hopelessness also increased (Table 5).

## Discussion

Psychological problems such as stress, fear, hopelessness, anxiety and depression are

observed in patients hospitalized in ICU due to environmental stressors [13]. The thoughts and motivation of the patient who is hopeless are negatively affected [15]. In the study, environmental stressors scale mean scores of the patients hospitalized in the surgical intensive care unit was found to be high at  $102.13 \pm 15.95$  (Table 2). It was stated that in Gencer and Kumsa's study, the mean scale score is similar to  $128.32 \pm 16.37$  [27], while the mean scale score in Barros and Siuves's study is  $81.06 \pm 18.94$  [28], the mean scale score in Karadeniz and Kanan's study is  $69.26 \pm 21.84$  [12], and the mean score in the study of Dönmez et al. is stated to be  $79.9 \pm 31.3$  [7]. In accordance with the studies using the scale, the impact levels of patients by environmental stressors vary. Although the same scale was used, the differences between the results are thought to be due to many factors such as demographic characteristics, hospitalization diagnosis, and conducting the studies in different intensive care units.

The mean hopelessness scale score of the patients who participated in the study was found to be  $6.36 \pm 5.78$  at a low level (Table 2). When the literature was examined, it was not found a study to determine the level of hopelessness of patients hospitalized in intensive care. Therefore, the findings of the study were compared with the findings in other patient groups. While in the study conducted with cancer patients by Madani et al., the mean hopelessness score was similar [29] with  $5.93 \pm 4.71$ , in the study carried out by Karakaş et al. with diabetic patients, the mean hopelessness scale score was  $11.2 \pm 1.8$  [30], and

**Table 3.** Most and least perceived environmental stressors in the intensive care unit.

Perceived Stressor	N	$\bar{x} \pm ss$
<b>The most perceived environmental stressor</b>		
Lack of privacy (lack of confidence)	230	$3.62 \pm 0.52$
Unable to sleep	230	$3.49 \pm 0.66$
Get bored	230	$3.4 \pm 0.56$
Being in the same room of men and women	230	$3.24 \pm 0.71$
Feeling pain	230	$3.21 \pm 0.78$
<b>The least perceived environmental stressor</b>		
The nurses' constantly doing something besides the beds	230	$1.71 \pm 0.76$
Being cared for by unfamiliar doctors	230	$1.64 \pm 0.68$
Nurses' monitoring machines closer than they monitor you	230	$1.59 \pm 0.76$
Nurses' getting to know themselves	230	$1.48 \pm 0.6$
Frequent physical examinations by doctors and nurses	230	$1.47 \pm 0.73$



**Table 4.** Patients' ICUESS and BHS mean scores comparison.

Characteristics	N	ICUESS	BHS
		x±ss	x±ss
<b>Gender</b>			
Male	135	101.60±14.56	5.42±5.59
Female	95	102.89±17.79	7.93±6.27
	<b>Test</b>	t: -0.602 p:0.548	t:-3.180 p: <b>0.002</b>
<b>Age</b>			
19-39(1)	40	109.75±14.11	5.22±5.86
40-49 (2)	18	108.83±19.85	4.61±6.62
50-59 (3)	29	108.24±18.86	5.48±6.12
60-69 (4)	70	99.74±11.37	5.28±5.50
70 and above (5)	73	96.19 ±15.70	9.12±5.60
	<b>Test</b>	F:7.909 p: <b>0.001</b>	t:5.743 p: <b>0.001</b>
		<b>1,2,3&gt;4,5</b>	<b>5&gt;1,2,3,4</b>
<b>Marital status</b>			
Married	198	101.94±15.76	6.27±5.88
Single	32	103.34±17.33	7.62±6.68
	<b>Test</b>	t:-0.459 p:0.646	t:-1.179 p:0.289
<b>Educational status</b>			
Illiterate	83	96.85±15.37	9.46±5.92
Primary school	68	102.14±15.21	5.13±5.86
Secondary school	25	105.48±12.99	3.04±3.25
High School	30	108.46±15.54	5.80±6.05
College	24	109.00±17.99	4.25±4.44
	<b>Test</b>	F:5.192 p: <b>0.001</b>	F:10.464 p: <b>0.001</b>
<b>Chronic disease status</b>			
No	99	106.07±15.71	4.89±5.30
Yes	131	99.16±15.54	7.64±6.24
	<b>Test</b>	t:3.319 p: <b>0.001</b>	t:-3.524 p: <b>0.001</b>
<b>Type of chronic disease</b>			
Diabetes	48	99.16±15.12	8.64±6.15
Hypertension	75	99.13±16.04	7.42±6.41
Heart failure	8	99.50±15.15	3.75±3.10
	<b>Test</b>	F:0.002 p:0.988	F:2.262 p:0.108
<b>The reason for being in the ICU</b>			
Respiratory	39	99.10±14.88	5.92±5.56
Circulatory disorder	37	97.83±14.41	6.62±5.75
Trauma	34	103.67±17.72	7.88±6.67
GI problems	120	104.01±16.00	6.19±6.03
	<b>Test</b>	F:2.054 p:0.197	F:0.827 p:0.480
<b>Previous hospitalization status in ICU</b>			
Yes	105	101.74±15.59	7.98±5.92
No	125	102.47±16.31	5.19±5.78
	<b>Test</b>	t:-0.345 p:0.731	t:3.600 p: <b>0.001</b>

ICUESS: Intensive Care Unit Environmental Stressors Scale  
 BHS: Beck Hopelessness Scale

**Table 5.** Investigation of the correlation between ICUESS and BHS Scores of patients.

ICUESS	BHS	
	r	.162*
p	<b>.014</b>	
N	230	

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

in the study carried out by Budak et al. with cancer patients, the mean hopelessness score was  $10.23 \pm 1.94$  [31]. The differences between the findings are thought to be due to the differences in the sample groups.

In the study, the first five stressors perceived most by the patients were lack of privacy, inability to sleep, being bored, being shared of the same room by men and women and pain (Table 3). Koyuncu et al. found in a study that the first five stressors perceived most by the patients were inability to drink water, pain, inability to sleep, machine sounds and alarms, inability to move their arms due to serum sets, respectively [32]. Aktaş et al. found that the stressors were pain, not being able to sleep, lack of privacy, missing their spouse, being shared of the same room by men and women and pain [33]. In Berber and Kızıltan's study, these factors were stated as pain, lack of privacy, being connected to tubes, the tubes in the nose or mouth, not to have a comfortable bed and/or pillow [34]. There are similarities and differences between the results. In general, it can be said that patients are more affected by stressors such as lack of privacy and pain.

In the study, the lack of privacy was found as the most perceived stressor by patients (Table 3). Privacy negligence was found to be the fourth ranked stressor in Karadeniz and Kanan's study [12]. It was found to be the second ranked stressor in Zaybak and Çevik's study [35]. In Şahin and Köçkar's study, it was found to be the sixth ranked stressor [8]. The differences in the study results were thought to be due to the intensive care environment in which the study was performed, the fact that the patients were not dressed and were covered only with bed linen during their hospitalization in the intensive care unit.

In the study, inability to sleep was determined as the second most perceived stressor (Table 3). There are studies determining that insomnia is an important stressor. In the study of Gültekin et al. insomnia was found to be the fourth-ranked stressor [5]. Insomnia, the fourth-ranked stressor [7] in the study of Dönmez et al. was found to be the thirteenth ranked stressor in the

study of Barros and Siuves [28], and in the study of Koyuncu et al. it was found to be the third-ranked stressor [32]. It is thought that reasons such as the lights being on in the intensive care unit, noise, and nurses' hustling in patient rooms cause insomnia to be seen as an important stressor in patients.

In the study, it was found that the difference between the mean scores obtained from the intensive care unit environmental stressors scale and age, educational status and chronic disease status was significant (Table 4,  $p < 0.05$ ). In the study, it was found that patients aged 9-59 years had a higher ICUESS score than the other groups ( $p: 0,001$ ). In the study of Şahin and Köçkar, a significant correlation was found between age and total scores in the environmental stressor scale, and it was determined that patients aged 31-50 years were more likely to be affected by stressors than patients in other age groups [8]. The reason why the patients aged 60 years and younger were more affected by environmental stressors is thought to be resulted from higher perception of patients in this group. In the study, the ICUESS score was found to be higher in patients having bachelor's degree ( $p: 0.001$ ). Dönmez et. Al determined in a study that patients with bachelor's degree were more affected by environmental stressors [7]. As the educational level increases, the level of patients' exposure to environmental stressors also increases. According to this result, it is thought that patients having higher education level are more affected by the noise or devices in the environment and have higher comfort expectations than patients with lower education level.

It was determined that the difference between the patients' gender, age, educational status, chronic disease status, and previous hospitalization in intensive care unit and the Beck hopelessness scale mean scores were significant (Table 4,  $p < 0.05$ ). In Taşan and Sarıtaş's study, the difference between the Beck hopelessness scale and age and marital status was found to be significant [36]. In the study of Salık and Sarıtaş, the difference between the Beck hopelessness scale and age, marital status and educational status was found to be significant [37]. The literature findings are similar to the study findings. In the study,



it was found that as the level of being affected by environmental stressors increased, the level of hopelessness also increased and there was a significant positive correlation between them (Table 5,  $p$ : 0.014). Koyuncu et al. examined the effect of environmental stressors on sleep patterns and they found that there was a very strong negative correlation between them [32]. In a study, Gencer and Kumsar examined the effect of environmental stressors on sleep quality and they found that there was a weak positive correlation between patients' sleep quality and their level of being affected by environmental stressors [27]. As environmental stressors increase, conditions that negatively affect the patient such as hopelessness, insomnia, etc. are also increasing.

### Conclusion

The patients in intensive care units were found to be affected by environmental stressors at a high level and their hopelessness level was at a mild level. It has been determined that as the level of patients' exposure to environmental stressors increases, their level of hopelessness also increases. It may be recommended to plan and implement nursing interventions to identify and reduce environmental stressors that affect the hopelessness level of patients. To improve the quality of patient care, levels of hopelessness can be reduced by reducing environmental stressors in environments where patients receive care, such as intensive care units.

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### Conflict of interest

The authors have no relevant financial or non-financial interests to disclose.

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## ORIGINAL ARTICLE

# The relationship between uropathogens and clinical characteristics of children with urinary tract infection

Emre Leventoğlu<sup>1</sup> Mustafa Soran<sup>1</sup> Şadiye Kübra Tüter Öz<sup>2</sup> Elif Böncüoğlu<sup>2</sup> Zafer Bağcı<sup>3</sup> <sup>1</sup> Department of Pediatric Nephrology, Konya City Hospital, Konya / Türkiye<sup>2</sup> Department of Pediatric Infectious Diseases, Konya City Hospital, Konya / Türkiye<sup>3</sup> Department of Pediatrics, Konya City Hospital, Konya / Türkiye

## Abstract

Urinary tract infections (UTI) are common bacterial infections in children. This study aimed to examine the relationships between different microorganisms and both clinical and laboratory findings in pediatric patients with UTIs. We conducted a retrospective evaluation of children with UTI between 2019 and 2024. Patients were divided into four main groups as normal anatomy, vesicoureteral reflux (VUR), ureteropelvic junction obstruction (UPJO), and neurogenic bladder (NB). Information on clean intermittent catheterization (CIC) and prophylactic antibiotic use was recorded. Laboratory results were compared across these patient groups. The study included 266 patients, with a female predominance (female/male ratio: 7.33). NB was the most common urinary tract condition (43.3%), followed by VUR (10.9%) and UPJO (9%). Prophylactic antibiotics were used by 9% of the patients. Acute phase reactants in patients with CIC were significantly higher ( $p=0.023$  for white blood cell (WBC) and  $p=0.002$  for C-reactive protein (CRP) levels). They were also higher in patients with prophylactic antibiotics compared to those without ( $p=0.001$  for both). The most frequently detected bacteria in urine cultures were *E. coli* (65%), followed by *Klebsiella spp.* (18.8%), *Pseudomonas spp.* (7.5%), and *Proteus spp.* (4.9%). *Klebsiella spp.*, *Enterococcus spp.*, and *Morganella spp.* were not isolated from patients receiving prophylaxis ( $p=0.022$ ). Risk factors for UTIs need to be carefully assessed for every patient, and treatment should be customized according to clinical and laboratory results. Individual patient factors should guide drug selection, and treatment plans should account for potential resistance patterns.

**Keywords:** Antibiotic resistance, children, urinary tract infection, uropathogen

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**Corresponding Author:**  
Emre Leventoğlu  
Email: dremrevent@gmail.com



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## Introduction

Urinary tract infection (UTI) is one of the most common bacterial infections in pediatrics [1]. Due to the rising antibiotic resistance among uropathogens, UTI is now considered a public health concern [2]. Although diagnosing and treating UTI might seem straightforward, there are important points that cause confusion in pediatrics. The clinical manifestations are highly varied, including symptoms such as dysuria, frequent urination, incontinence, fever, or flank pain [3]. UTIs are most prevalent in infancy, with another peak occurring in the toddler years and third rise during adolescence. UTIs affect 2% of boys up to the age of 7 years, 4 times more in girls. Additionally, UTI recurs at least once in up to 30% of children who experience it [2,4]. The frequency of UTIs and the likelihood of recurrence increase significantly, particularly in the presence of anatomical abnormalities in the urinary system [5]. Urine sampling plays a crucial role in diagnosing UTI. A positive urinalysis for nitrite or nitrite combined with leukocyte esterase is highly specific for diagnosing UTI and for initiating empirical antibiotic therapy [6]. Antibiotic selection is one of the most important aspects of UTI treatment and should be guided by previously established resistance patterns in the relevant region [7]. Antibiotic prophylaxis may be indicated for patients who have a history of recurrent UTIs, defined as three or more infections per year or those with high-grade vesicoureteral reflux (VUR) (grades 4-5). Although there is a recent trend to minimize the use of prophylactic antibiotics, using them in certain situations can help avert long-term issues like hypertension and chronic kidney disease [8]. In this study, the potential correlations between clinical and laboratory characteristics and causative microorganisms in pediatric patients diagnosed with UTI were evaluated.

## Materials and Methods

In this study, we retrospectively evaluated children who admitted to Pediatric Nephrology/ Infection departments of Konya City Hospital between January 2019 and January 2024 with UTI with a single microorganism growth in urine culture. Patients with no growth in urine culture, or in whom growth was considered

as contamination, and patients with known immunodeficiency were excluded. In infants during their first year, the symptoms of a urinary tract infection (UTI) have been characterized by fever, hypothermia, apnea, bradycardia, lethargy and vomiting. For older children, lower urinary tract symptoms included dysuria, stranguria, increased frequency of voiding, foul-smelling urine, incontinence, hematuria, and suprapubic pain, while upper urinary tract symptoms were characterized by fever and flank pain [9]. For patients with recurrent UTIs, only the results from the most recent infection episode were included in the analysis. Additionally, it was recorded whether the patients underwent clean intermittent catheterization (CIC) for urinary drainage and whether they received prophylactic antibiotics for UTI prevention. The results of urinary ultrasonography (USG), voiding cystoureterography (VCUG) and Tc-99m mercaptoacetyltriglycine (MAG-3) imaging, if performed previously, were analyzed for possible urinary system anomalies. Patients were divided into four main groups: normal anatomy, vesicoureteral reflux (VUR), ureteropelvic junction obstruction (UPJO) and neurogenic bladder (NB). Urine samples were collected through either midstream urine or bladder catheterization, with patients whose samples were obtained using a collection bag excluded from the study. Urinalysis was conducted using the LabUMat & Urised Complete Urine Analysis System, recording leukocyte count, presence of bacteriuria, and results for leukocyte esterase and nitrite. Pyuria was characterized by a leukocyte count of 5/HPF or more in urinalysis and/or leukocyte esterase positivity in the dipstick test [4,6]. Bacteriuria was detected with an automated urine analyzer utilizing digital imaging. Quantitative urine cultures were established through standard microbiological methods. A positive urine culture from midstream urine was defined as one showing growth of a single organism at least 100,000 cfu/mL or  $\geq 50,000$  cfu/mL accompanied by pyuria [9]. Additionally, a UTI was diagnosed when bladder catheterization yielded growth of a single microorganism at least 10,000 cfu/mL [10]. Since it is not sufficient to diagnose UTI in patients with CIC by depending solely on



pyuria or urine culture results, the diagnosis in these patients was made with the presence of symptoms compatible with UTI and an increase in acute phase reactants in addition to pyuria and culture positivity [11,12]. Antibigrams were performed using the disk diffusion method. The antibiogram panel included ampicillin, amikacin, ceftriaxone, cefixime, carbapenem, trimethoprim-sulfamethoxazole (TMP-SMX), nitrofurantoin, and ciprofloxacin. The extended-spectrum beta-lactamase (ESBL) positivity was noted based on antibiogram results, and antimicrobial susceptibility test results were noted. The results of acute phase reactants, specifically white blood cell (WBC) and C-reactive protein (CRP), obtained at the time of hospital visits when patients were diagnosed with UTI, were recorded. Normal reference ranges are 4000-1000/uL for WBC and <0.5 mg/dL for CRP [13]. The results of blood and urine tests, anatomical and functional pathologies of the urinary system detected by imaging methods, whether or not CIC was performed, and whether or not antibiotic prophylaxis was used were compared. In addition, we analyzed whether there was a difference between blood and urine test results according to the microorganisms in urine culture. Antibiogram results of uropathogens were also evaluated, and their resistance status was analyzed according to underlying anatomical or functional pathologies. Whether hospitalization for UTI treatment was performed was noted and the laboratory results were compared with the hospitalization status. The study received approval from the Education Planning Commission of Konya City Hospital and KTO Karatay University, Faculty of Medicine Ethics Committee (Date: 30.01.2024, No: 77856).

### Statistical Analysis

Descriptive statistics were reported as counts and percentages for categorical variables, and as medians for continuous variables that did not follow a normal distribution. Continuous variables with a normal distribution were presented as means with standard deviations. The Chi-square test was employed to analyze categorical variables. Differences between two groups for non-normally distributed continuous variables were evaluated using the *Mann-Whitney*

*U test*, whereas the Student's t-test was applied to normally distributed ones. Data analysis was performed using IBM SPSS Version 25.0, and a *p*-value below 0.05 was deemed statistically significant.

### Results

The study involved a total of 266 children diagnosed with UTIs. The majority were female (n=234, 88%). The mean age was  $6.87 \pm 4.66$  years (median: 7 years old, min-max: 0.25-16.5 years old). Among the patients, 62 (23.3%) had not yet completed toilet training due to their young age. NB was the most prevalent urinary tract condition, affecting 116 patients (43.3%). Of the patients with NB, 91 (78.4%) had undergone surgery for meningomyelocele, and 53 (45.7%) were using CIC for urination. Prophylactic antibiotics for UTIs were administered to 24 patients (9%), all of whom were NB patients undergoing CIC. Other urinary system anomalies included VUR in 29 patients (10.9%) and UPJO in 24 patients (9%). As anticipated, the median levels of WBC, CRP, and urinary leukocytes were elevated. Median WBC count was 11459/uL, CRP was 12.1 mg/dL and median urine leukocyte count was 61/HPF. (Table 1).

In our study, when analyzed according to UTI risk factors, median acute phase reactants were highest in patients with UPJO (median WBC 15800/uL, median CRP 100.3 mg/dL) and lowest in patients without pathology (median WBC 8300/uL, median CRP 6.7 mg/dL) ( $p=0.004$  for WBC and  $p=0.049$  for CRP). In urinalysis, median leukocyte count was higher in patients with NB (117/HPF) compared to other pathologies and it was the lowest in the VUR group (25/HPF) ( $p=0.006$ ). Leukocyte esterase positivity (91.7%,  $p=0.204$ ) was more frequent in UPJO, nitrite positivity (54.3%,  $p=0.004$ ) in NB and bacteriuria (86.2%,  $p=0.001$ ) in VUR compared to other pathologies. The median WBC and CRP were elevated in CIC compared to non-CIC group (median WBC: 17100/uL vs 11100/uL,  $p=0.023$  and median CRP: 89 mg/dL vs 10.8 mg/dL,  $p=0.002$ ). Leukocyte esterase, nitrite positivity and bacteriuria were similarly found more frequently in patients who performed CIC compared to patients who did not ( $p=0.013$ ,  $p=0.122$  and  $p=0.002$ , respectively).



Table 1. Laboratory values according to patient characteristics.

	Blood						Urine											
	WBC			CRP			Leukocyte			LE			Nitrite			Bacteriuria		
	Median - IQR	Min-Max	p value	Median - IQR	Min-Max	p value	Median - IQR	Min-Max	p value	n (%)	p value	n (%)	p value	n (%)	p value			
<b>General</b>	11459 - 8210	4640 - 39690	-	12.1 - 72.7	0.6 - 314.1	-	61 - 356	0 - 4466	-	204 (76.7)	-	124 (46.6)	-	170 (63.9)	-			
<b>Urinary system pathology</b>																		
NB (n=116)	11600 - 6355	5890 - 28100		29 - 72.6	0.61 - 284.4		117 - 657	0 - 4466		85 (73.3)		63 (54.3)		81 (69.8)				
VUR (n=29)	9185 - 9440	5400 - 30560	<b>0.004</b>	8 - 80.9	0.66 - 172	<b>0.049</b>	28 - 171	1 - 4098		23 (79.3)	0.204	15 (51.7)	<b>0.004</b>	25 (86.2)	<b>0.001</b>			
UPJS (n=24)	15800 - 5797	8080 - 34010		100.3 - 167.8	1.5 - 200		51 - 67	2 - 723		22 (91.7)		4 (16.7)		10 (41.7)				
No pathology (n=97)	8300 - 8055	4640 - 39640		6.7 - 44.7	0.6 - 314.1		46 - 210	0 - 2544		74 (76.3)		42 (43.3)		54 (55.7)				
<b>CIC</b>																		
Patients who performed (n=53)	17100 - 7830	6610 - 20290	<b>0.023</b>	89 - 139.6	0.61 - 284.4	<b>0.002</b>	79 - 1057	1 - 2449		47 (88.7)	<b>0.013</b>	29 (54.7)		43 (81.1)	<b>0.002</b>			
Patients who did not (n=213)	11100 - 7010	4640 - 39690		10.8 - 64.3	0.6 - 314.1		55 - 266	0 - 4466		157 (73.7)		95 (44.6)		127 (59.6)				
<b>Prophylaxis</b>																		
Patients who used (n=24)	19240 - 3200	9270 - 20290	<b>0.001</b>	103.6 - 95	0.61 - 284.4	<b>0.001</b>	105 - 1754	3 - 2449		22 (10.8)	<b>0.050</b>	13 (10.5)		20 (11.8)	<b>0.028</b>			
Patients who did not (n=242)	11360 - 7252	4640 - 39690		10.5 - 64.4	0.6 - 314.1		55 - 312	0 - 4466		2 (3.2)		11 (7.7)		4 (4.2)				
<b>Uropathogens</b>																		
E.coli (n=173)	11360 - 8560	4640 - 28100		34.9 - 95.5	0.6 - 314.1		65 - 355	0 - 3795		140 (80.9)		86 (49.7)		119 (68.8)				
Klebsiella spp. (n=50)	11480 - 2200	5890 - 21380		3.9 - 38.4	0.91 - 152.4		50 - 569	0 - 4466		36 (72)		30 (60)		30 (60)				
Proteus spp. (n=13)	10840 - 11065	5450 - 34010	<b>0.000</b>	1.4 - 137.4	0.86 - 166.9	<b>0.021</b>	39 - 157	1 - 2446		12 (92.3)	<b>0.001</b>	4 (30.8)	<b>0.000</b>	7 (53.8)	<b>0.013</b>			
Enterococcus spp. (n=8)	10595 - 4863	7290 - 12750		8.2 - 22.5	0.6 - 29		87 - 179	11 - 210		2 (25)		0 (0)		6 (75)				
Pseudomonas spp. (n=20)	17010 - 21660	8000 - 39690		9.6 - 29.1	1.52 - 54.4		44 - 189	0 - 4098		14 (63.6)		4 (18.1)		6 (27.2)				

WBC, White blood cell; CRP, C-reactive protein; LE, Leukocyte esterase; NB, Neurogenic bladder; VUR, Vesicoureteral reflux; UPJS, Ureterovesical junction stenosis; CIC, Clean intermittent catheterization. Bolded *p* values are statistically significant.

**Table 2.** Growth rates of uropathogens according to patient characteristics.

	<i>E. coli</i>	<i>Klebsiella spp.</i>	<i>Proteus spp.</i>	<i>Enterococcus spp.</i>	<i>Pseudomonas spp.</i>	<i>Morganella spp.</i>	<i>p</i> value
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
<b>General</b>	173 (65)	50 (18.8)	13 (4.9)	8 (3)	20 (7.5)	2 (0.8)	-
<b>Urinary system pathology</b>							
NB ( <i>n</i> =116)	63 (54.3)	34 (29.3)	6 (5.2)	3 (2.6)	8 (6.9)	2 (1.7)	<b>0.004</b>
VUR ( <i>n</i> =29)	20 (69)	2 (6.9)	0 (0)	3 (10.3)	4 (13.8)	0 (0)	
UPJS ( <i>n</i> =24)	16 (66.7)	6 (25)	2 (8.3)	0 (0)	0 (0)	0 (0)	
No pathology ( <i>n</i> =97)	74 (76.3)	8 (8.2)	5 (5.2)	2 (2.1)	8 (8.2)	0 (0)	
<b>CIC</b>							
Patients who performed ( <i>n</i> =53)	41 (77.4)	6 (11.3)	2 (3.8)	0 (0)	4 (7.5)	0 (0)	0.139
Patients who did not ( <i>n</i> =213)	132 (62)	44 (20.7)	11 (5.2)	8 (3.8)	16 (7.5)	2 (0.9)	
<b>Prophylaxis</b>							
Patients who used ( <i>n</i> =24)	20 (83.3)	0 (0)	2 (8.3)	0 (0)	2 (8.3)	0 (0)	<b>0.022</b>
Patients who did not ( <i>n</i> =242)	153 (63.2)	50 (20.7)	11 (4.5)	8 (3.3)	18 (7.4)	2 (0.8)	

NB, Neurogenic bladder; VUR, Vesicoureteral reflux; UPJS, Ureterovesical junction stenosis; CIC, Clean intermittent catheterization. Bolded *p* values are statistically significant.

Table 3. Antibiotic resistance status of common uropathogens according to patient characteristics.

Uropathogens	Ampicilin		Amikacin		Ceftriaxone		Cefixime		TMP-SMX		Nitrofurantoin		Carbapenem		Ciprofloxacin	
	n (%)	P value	n (%)	P value	n (%)	P value	n (%)	P value	n (%)	P value	n (%)	P value	n (%)	P value	n (%)	P value
<i>E.coli</i>																
General	122 (70.5)	-	5 (7.5)	-	58 (58.5)	-	72 (63.7)	-	79 (45.6)	-	6 (3.7)	-	2 (2.6)	-	35 (34.6)	-
CIC (+)	31 (75.6)	0.030	1 (7.6)	0.055	11 (73.3)	0.025	15 (71.4)	0.032	30 (73.1)	0.000	2 (5.1)	0.324	0 (0) <sup>e</sup>	0.323	8 (38.1)	0.296
CIC (-)	91 (68.9)		4 (7.5)		47 (55.9)		57 (61.9)		49 (37.1)		4 (3.2)		2 (3.2)		27 (33.7)	
Prophylaxis (+)	16 (80)	0.028	1 (16.6)	0.092	6 (66.6)	0.033	8 (72.2)	0.044	13 (65)	0.004	0 (0) <sup>b</sup>	0.456	0 (0) <sup>d</sup>	0.266	3 (27.2)	0.565
Prophylaxis (-)	106 (69.3)		4 (6.6)		52 (57.7)		64 (62.7)		66 (43.1)		6 (4.1)		2 (2.9)		32 (35.5)	
<i>Klebsiella spp.</i>																
General	50 (100)	-	6 (15.7)	-	26 (68.4)	-	28 (70)	-	28 (56)	-	28 (56)	-	0 (0) <sup>e</sup>	-	20 (50)	-

**Table 3.** (continued) Antibiotic resistance status of common uropathogens according to patient characteristics.

CIC (+)	6 (100)	<b>0.000</b>	0 (0) <sup>a</sup>	2 (50)	0.082	2 (100)	0.080	2 (33.3)	0.226	2 <sup>2</sup> (33.3)	0.440	0 (0) <sup>f</sup>	0.247	0 (0) <sup>r</sup>	0.160
			6 (17.6)	24 (70.5)		26 (68.4)		26 (59)		26 (59)		0 (0) <sup>g</sup>		20 (55.5)	
CIC (-)	44 (100)														
Prophylaxis (+)	-		-	-		2 (100)		-		-		-		-	
			6 (15.7)	26 (68.4)		28 (70)	0.151	28 (56)		28 (56)		0 (0) <sup>h</sup>		20 (50)	
Prophylaxis (-)	50 (100)														

<sup>a</sup>n=4, <sup>b</sup>n=19, <sup>c</sup>n=15, <sup>d</sup>n=8, <sup>e</sup>n=40, <sup>f</sup>n=2, <sup>g</sup>n=38, <sup>h</sup>n=40, <sup>r</sup>n=4  
 TMP-SMX, Trimethoprim-sulfamethoxazole; CIC, Clean intermittent catheterization.  
 Bolded *p* values are statistically significant.

The median WBC and CRP values were elevated in patients who used antibiotic prophylaxis compared to those who did not (median WBC: 19240/uL vs 11360/uL, and median CRP: 103.6 mg/dL vs 10.5 mg/dL,  $p=0.001$  for both) (Table 1).

The most common bacteria grown in urine culture was *E. coli* ( $n=173$ , 65%), followed by *Klebsiella spp.* (18.8%), *Pseudomonas spp.* (7.5%) and *Proteus spp.* (4.9%). Based on the anatomical structure, the prevalence of *E. coli* was 76.3% in patients without any pathology, followed by *Klebsiella spp.* with a frequency of 8.2%. While *E. coli* is still

the most common uropathogen in NB and UPJO (54.3% and 66.7%, respectively), *Klebsiella spp.* are also quite prevalent in these conditions (29.3% and 25%, respectively). *Morganella spp.* grew in 2 patients and these patients were patients with NB who did not perform CIC or did not use prophylaxis ( $p=0.004$ ). There was no notable difference of microorganisms between patients with and without CIC. However, the incidence of *E. coli* was higher among patients who used antibiotic prophylaxis than in those who did not use prophylaxis. *Klebsiella spp.*, *Enterococcus spp.*, and *Morganella spp.* were not isolated in patients

**Table 4.** ESBL rates according to patient characteristics.

	ESBL positivity	
	n (%)	p value
<b>General</b>	108 (40.6)	-
<b>Urinary system pathology</b>		
<b>NB (<math>n=116</math>)</b>	47 (40.5)	<b>0.002</b>
<b>VUR (<math>n=29</math>)</b>	9 (31)	
<b>UPJS (<math>n=24</math>)</b>	14 (58.3)	
<b>No pathology (<math>n=97</math>)</b>	38 (39.2)	
<b>CIC</b>		
<b>Patients who performed (<math>n=53</math>)</b>	19 (35.8)	0.097
<b>Patients who did not (<math>n=213</math>)</b>	89 (41.8)	
<b>Prophylaxis</b>		
<b>Patients who used (<math>n=24</math>)</b>	9 (37.5)	0.111
<b>Patients who did not (<math>n=242</math>)</b>	99 (40.9)	
<b>Uropathogens</b>		
<b><i>E.coli</i> (<math>n=173</math>)</b>	76 (43.9)	<b>0.000</b>
<b><i>Klebsiella spp.</i> (<math>n=50</math>)</b>	28 (56)	
<b><i>Proteus spp.</i> (<math>n=13</math>)</b>	4 (30.8)	
<b><i>Enterococcus spp.</i> (<math>n=8</math>)</b>	0 (0)	
<b><i>Pseudomonas spp.</i> (<math>n=20</math>)</b>	0 (0)	

ESBL, Extended-spectrum beta-lactamase; NB, Neurogenic bladder; VUR, Vesicoureteral reflux; UPJS, Ureterovesical junction stenosis; CIC, Clean intermittent catheterization.

Bolded  $p$  values are statistically significant.

who used prophylaxis ( $p=0.022$ ) (Table 2).

When comparing uropathogens identified in urine cultures with laboratory data, it was found that the median WBC count was higher in infections caused by *Pseudomonas spp.* (17010/uL), while the CRP level was elevated in *E. coli* infections (63.9 mg/dL) compared to other microorganisms ( $p=0.000$  and  $p=0.021$ , respectively) (Table 1).

In the evaluations made to compare uropathogen and antibiotic resistance, most of the *E. coli* were resistant to ampicillin, ceftriaxone and cefixime antibiotherapies (70.5%, 58.5% and 63.7%, respectively); TMP-SMX and ciprofloxacin resistance was 45.6% and 34.6%, respectively, while amikacin, nitrofurantoin and carbapenem resistance remained at low levels (7.5%, 3.7% and 2.6%, respectively). It was noticed that all *Klebsiella spp.* were ampicillin resistant and, carbapenem resistance was not observed. Ampicillin, ceftriaxone, cefixime and TMP-SMX resistance rates of *E. coli* were markedly higher in patients who performed CIC compared to those who did not. Similarly, resistance rates to the same antibiotics were higher in patients who used antibiotic prophylaxis compared to those who did not. The overall TMP-SMX resistance rate in the study was 44.7% and increased to 54.5% in patients receiving TMP-SMX prophylaxis ( $p=0.044$ ) (Table 3).

ESBL positivity was observed in 40.6% of all patients. In the evaluation according to anatomical structures, it was most frequently (58.3%) observed in the UPJO and lowest in VUR (31%) ( $p=0.002$ ). ESBL positivity was not observed in *Enterococcus spp.* and *Pseudomonas spp.* infections, while 56% in *Klebsiella spp.*, 43.9% in *E. coli* infection and 30.8% in *Proteus spp.* ( $p=0.000$ ). No significant correlation was found between the CIC/prophylactic antibiotics for ESBL positivity (Table 4).

The number of patients requiring hospitalization for UTI was 93 (34.9%). The largest proportion of hospitalized patients ( $n=46$ , 49.4%) were diagnosed with NM. While 39.6% ( $n=46$ ) of patients with NM, 31% ( $n=9$ ) of patients with VUR and 79.1% ( $n=19$ ) of patients with UPJS were hospitalized, 19.5% ( $n=19$ ) of patients with

no underlying pathology were hospitalized ( $p=0.035$ ). Also, 39 (73.5%) of the patients who performed CIC were hospitalized due to UTI, only 7 (3.2%) of the patients who did not perform CIC were hospitalized ( $p=0.001$ ). The rate of hospitalization due to UTI was significantly higher in patients who used antibiotic prophylaxis than in patients who did not use prophylaxis (62.5% vs 32.2%,  $p=0.025$ ). Median WBC and CRP values of inpatients were significantly higher than outpatients (13350/uL vs 7580/uL for WBC,  $p=0.001$  and 35.4 mg/dL vs 16.4 mg/dL for CRP,  $p=0.005$ ). Similarly, the pyuria was higher in hospitalized patients (177/HPF vs 41/HPF,  $p=0.002$ ). Furthermore, hospitalization was required in 26.5% ( $n=46$ ) of patients with *E. coli*, 56% ( $n=28$ ) of patients with *Klebsiella spp.*, 15.3% ( $n=2$ ) of patients with *Proteus spp.* and 85% ( $n=17$ ) of patients with *Pseudomonas spp.* ( $p=0.023$ ).

## Discussion

Urinary tract infection is a significant cause of antibiotic use and hospitalization among children. While UTIs are more common in male infants younger than 12 months of age, the gender ratio shifts, with females being more affected after the age of one year [14]. In one study, 89% of patients with symptomatic UTIs were girls [15]. Our study also found a similar female predominance, with 88% of patients being female. Gram-negative bacteria are the primary culprits of UTIs, with the frequency of *E. coli* reported between 68.5% and 90% in previous studies [15-18]. Consistent with existing literature, *E. coli* was the most common bacteria in our study, followed by *Klebsiella spp.*, *Pseudomonas spp.*, and *Proteus spp.* Acute phase reactants are increased in UTI as in all infections [19]. When there is an anatomical disorder in the urinary system such as obstruction, hydronephrosis, fistula, when there is a foreign body such as ureteric stent, suprapubic tube or urethral catheterization, or when antibiotic resistance is high due to recurrent UTI, the risk of complicating UTI is high and a higher increase in acute phase reactants is expected [20,21]. In this study, WBC and CRP, which are acute phase markers, were measured at the lowest levels in patients without urinary tract anatomical disorders. Acute phase



reactants were found to be higher when UTI developed in patients who performed CIC or used prophylactic antibiotics. Pyuria is a key diagnostic criterion for UTIs, but in the absence of pyuria, the patient should be considered as UTI if clinical findings are compatible and urine culture shows significant growth [22,23]. In our study, although urine leukocyte levels increased up to >4000/HPF in some patients, no pyuria was detected in some of them. Because, our patients continued to be monitored at regular intervals, were admitted to the hospital without delay in case of any symptoms compatible with UTI, and urine samples were collected before an increase in urinary tract inflammation. In our study, the mean leukocyte count in urine during a UTI was higher in NB compared to those with other urinary tract anatomical disorders. However, a previous study demonstrated that pyuria could be seen in NB even in the absence of UTI and it was reported that additional markers besides pyuria are necessary to diagnose as UTI [11]. Another study showed that pyuria was more common in patients requiring CIC [12]. In our study, the mean urinary leukocyte count was higher in patients with CIC compared to those without, although not statistically significant. Similarly, pyuria levels during UTI were higher in patients with prophylactic antibiotics compared to those without. It is notable that the antibiotic resistance rates of microorganisms, especially in *E. coli* infection, were higher in patients who performed CIC or used antibiotic prophylaxis in our study. It may be considered that urinary system inflammation is higher in these patients due to resistant microorganisms and pyuria may be at higher levels as in acute phase reactants. Nitrite positivity is highly specific in the diagnosis of UTI, but it is not seen in some microorganisms such as *Enterococcus spp* [24]. In our study, nitrite positivity was not detected in *Enterococcus spp.* infection. Therefore, it should not be ignored that patients with nitrite negative findings may also have UTI. Bacterial positivity in a fresh urine sample that has not been centrifuged indicates that >100000 CFU bacteria will grow in urine culture. Bacteriuria is found more frequently in *E. coli* and *Klebsiella spp.* Infections [24]. In our study, bacteriuria was observed in the majority of patients with

infections caused by *E. coli*, *Klebsiella spp.*, and *Enterococcus spp.* The antibiotic resistance has been increasing in UTIs in recent decades [25]. Especially ampicillin and TMP-SMX resistance is quite high [26]. Moreover, ceftriaxone and cefixime resistance were also observed at high rates. Antibiotic resistances were higher in patients with CIC or prophylactic antibiotics compared to those without. In last years, ESBL-positivity for *E. coli* and *Klebsiella spp.* have been increasing. For example, ESBL positivity was 69% in *E. coli* and 50% in *Klebsiella spp.* in a study [27]. In our study, *E. coli* and *Klebsiella spp.* were the most common microorganisms. Therefore, it may be wise not to use a beta-lactam antibiotic such as ceftriaxone in empirical treatment in a patient with UTI. However, the empirical use of antibiotics with lower resistance rates such as amikacin and carbapenem in first-line treatment will increase resistance rates in the following years.

## Conclusion

Urinary tract infection is a common condition in childhood with high morbidity. It is essential to assess each patient's risk factors for UTI and to start appropriate treatment. However, any treatment administered might contribute to an increase in existing resistance rates or potentially lead to the emergence of new resistance in the future.

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## Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this study.

### Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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# University student suicides in Türkiye: Insights from two decades of media reports

Mahmut Şerif Yıldırım<sup>1</sup> 

Ramazan Akçan<sup>2</sup> 

Nisa Nur Aksu Gül<sup>2</sup> 

<sup>1</sup> Department of Forensic Medicine, Faculty of Medicine, Uşak University. Uşak / Türkiye

<sup>2</sup> Department of Forensic Medicine, Faculty of Medicine, Hacettepe University. Ankara / Türkiye

## Abstract

University student suicides have emerged as a significant societal concern, reflecting challenges inherent in the transition to adulthood and academic pressures. This study aims to analyze two decades of national media coverage on university student suicides in Türkiye, examining demographic trends, suicide methods, and social factors implicated in these tragic incidents. A comprehensive scan of Turkish national media archives from January 1, 2004, to December 31, 2023, identified 213 unique reports of university student suicides. Data extracted included age, sex, year of incident, prior suicide attempts, geographic distribution, housing status, academic major, psychiatric history, social background, suicide method, and presence of suicide notes or social media posts. Statistical analyses utilized *Fisher's* Exact Test and *Pearson's* Chi-square to examine categorical data. Male students accounted for 61.6% (n=125) of reported suicides, with a mean age of 22.2 years (SD=3.05). The most common suicide method was jumping from height, differing by sex, with hanging prevalent among males and jumping more frequent among females. Mobbing emerged as a predominant social stressor implicated in suicide incidents, surpassing other factors reported in the literature. The findings highlight an alarming increase in media-reported university student suicides, predominantly affecting males and characterized by distinct suicide methods. The pervasive impact of mobbing underscores the urgent need for targeted interventions addressing social stressors, alongside comprehensive medical, psychological, social, and economic support systems within academic settings. Efforts should prioritize proactive mental health initiatives, policy reforms, and community-based interventions to mitigate suicide risks among university students.

**Keywords:** University students, suicide, mobbing, media analysis

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**Corresponding Author:**  
Mahmut Şerif Yıldırım  
Email: [dr.msylidirim@gmail.com](mailto:dr.msylidirim@gmail.com)



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## Introduction

According to WHO numbers, more than 700,000 individuals die by suicide each year, making it the fourth leading cause of death among those aged 15 to 29 years [1]. In Türkiye, TurkStat data indicates that the crude suicide rate increased from 1.48 per 100,000 in 2002 to 3.03 per 100,000 in 2022, with the highest prevalence among individuals aged 15 to 29 years, demographic data that includes many higher education students [2]. University students encounter numerous challenges during their educational journey, including loss of social support, loneliness, social isolation, academic pressures, financial difficulties, and housing issues as they adapt to a new environment [3,4]. This transitional period from adolescence to adulthood creates a vulnerability to psychiatric disorders, alcohol and substance use, abuse, and addiction, and suicidal behavior [5,6]. Various studies have reported an increase in suicide risk factors among university students, such as psychological disorders, alcohol and drug use, and social isolation/loneliness, in recent years [7,8]. In Türkiye, the significant increase in the number of immigrant students and the impact of macroeconomic factors have contributed to a rise in the number of students lacking socioeconomic resources to meet basic daily needs, accommodation in particular. This situation has become a stressor for students and has drawn attention from both society and academic circles [9-12]. Over the past century, the incidence of student suicides, the causes behind them, and preventive measures have been extensively discussed in the literature [13-16]. Research on this topic has been growing, driven by the need for researchers to address incidents occurring in their vicinity and due to the frequent media coverage of student suicides [17,18]. Recent studies have also reported an increase in the frequency of suicides among university students [19,20]. In Türkiye, nationwide suicide statistics for university students are not maintained. Recent publications from Türkiye have focused on examining suicide risk factors and perspectives within specific university student samples [21-23]. However, real-time data on university student suicides remain scarce in the literature. This study aims

to fill this gap by examining national media reports on university student suicides in Türkiye and discussing the data obtained in light of existing literature. By analyzing media reports from 01/01/2004 to 31/12/2023, this study seeks to uncover trends, contributing factors, and potential preventive measures for university student suicides in Türkiye.

## Materials and Methods

This study examined news reports of university student suicides in the national media of Türkiye from 01/01/2004 to 31/12/2023. The data collection was performed using Google News and Inoreader software. After filtering out irrelevant and duplicate reports within the specified time frame, a total of 213 news articles were identified, each reporting a case of university student suicide. In order to be able to compare with national data, data on suicides at the national level, data on crude suicide rates and data on the number of suicides between the ages of 15-29 were obtained from TurkStat death statistics metadata spreadsheets [2]. Data on the total number of university students and the number of students by geographical regions were obtained from the metadata spreadsheets in the Turkish Higher Education Institution statistical database [24]. Since the data used in the study were taken from publicly available online websites, there was no need for ethics committee approval for the study. For each reported case, the following variables were recorded: age, sex, year of suicide, presence of prior suicide attempts, geographic region, employment status, accommodation type, academic major, psychiatric background, social background, suicide method, and the presence of a suicide note or social media post. Frequency and percentage analyses were conducted on these variables to identify trends and patterns. To analyze categorical data regarding psychiatric background, social background, and accommodation, *Fisher's* Exact Test was employed. *Pearson's* Chi-square test was used to examine differences in suicide methods and the presence of suicide notes or social media posts. All statistical analyses were conducted using Jamovi v2.4 [25].



## Results

Between 2004 and 2023, a total of 213 news reports about university student suicides were published in the Turkish national media. Information about sex was available for 203 of these cases, revealing that 61.6% (n=125) were male and 38.4% (n=78) were female. The ages of 199 cases ranged from 18 to 35 years, with a mean age of 22.2 years (SD = 3.05). Detailed information on sex, employment,

accommodation, major, psychiatric background, social background, suicide method, and the presence of a suicide note or social media post for the cases included in the study is presented in Table 1.

Upon examining the accommodation status of the cases, it was observed that the most common type of accommodation was living in one's own flat, reported in 49 cases. When

**Table 1.** Frequencies of sex, employment, accommodation, major, psychiatric background, social background, suicide method and presence of suicide note or social media post.

		Number	Percent	
<b>Sex</b>	<i>Male</i>	125	61.6%	
	<i>Female</i>	78	38.4%	
	<i>No data</i>	10	0.5%	
<b>Employment</b>	<i>Yes</i>	6	2.8%	
	<i>Not specified</i>	207	97.2%	
<b>Accommodation</b>	<i>Parental house</i>	30	19.5%	
	<i>Own flat</i>	50	32.9%	
	<i>Shared flat</i>	23	14.9%	
	<i>Foundation/Private dormitory</i>	7	4.5%	
	<i>State/University dormitory</i>	44	28.6%	
	<i>No data</i>	59	27.7%	
<b>Major</b>	<b>Graduate</b>	<i>Social Sciences</i>	45	25.3%
		<i>Health Sciences</i>	37	20.8%
		<i>Engineering</i>	31	17.4%
		<i>Educational Sciences</i>	19	10.7%
		<i>Arts and Humanities</i>	7	3.9%
		<i>Law</i>	6	3.4%
		<i>Science and Mathematics</i>	3	1.7%
		<i>Philology</i>	2	1.1%
		<i>Others</i>	12	6.7%
	<b>Post-graduate</b>	<i>MSc</i>	5	2.8%
	<i>PhD</i>	11	6.2%	
<b>Psychiatric Background</b>	<i>None</i>	156	73.2%	
	<i>Mood disorders</i>	47	22.1%	
	<i>Psychotic disorders</i>	2	0.9%	
	<i>Drug use</i>	8	3.8%	
<b>Social Background</b>	<i>None</i>	150	70.4%	
	<i>Financial problems</i>	8	3.8%	
	<i>Partner/spouse-related problems</i>	10	4.7%	
	<i>Mobbing/academic pressure</i>	23	10.8%	
	<i>Loss of a relative</i>	1	0.5%	
	<i>Parental issues</i>	4	1.9%	
	<i>Other</i>	17	8%	
<b>Suicide Method</b>	<i>Jumping from height</i>	81	40.9%	
	<i>Hanging</i>	76	38.4%	
	<i>Intoxication</i>	20	10.1%	
	<i>Firearm</i>	12	6.1%	
	<i>Stab wound</i>	1	0.5%	
	<i>Complex*</i>	1	0.5%	
	<i>Other</i>	7	3.5%	
	<i>No data</i>	15	7%	
<b>Suicide Note/Post</b>	<i>No/No data</i>	174	81.7%	
	<i>Yes</i>	39	18.3%	

\* Complex suicide was committed by jumping from height following left wrist incision.



this data was evaluated according to sex, the most common accommodation for male cases was their own flat, whereas for female cases, it was their parental home. The information about psychiatric background, prior suicide attempt, social background, accommodation and presence of suicide note or social media post by sex is shown in Table 2.

The most common method of suicide among university students was observed to be jumping from a height, followed by hanging. Notably, hanging was the predominant method among male students, whereas jumping from an elevated height was more commonly chosen by female students.

The highest number of suicides was recorded between 2014 and 2018. Detailed data on the suicide methods used within five-year intervals are presented in Table 3. The distribution of suicide methods according to sex is illustrated in Figure 1.

Analysis of cases according to geographical regions revealed that the Marmara region had the highest number of reported suicides, while the Southeastern part of country had the fewest. Specifically, the highest number of male suicides occurred in the Marmara region (n=28, 20%), and for female suicides, the Marmara and Aegean regions were the most common (n=16, 20.5%) (Figure 2).

**Table 2.** Psychiatric background, social background, accommodation, suicide method, presence of suicide notes or social media posts of cases.

		Male	Female	Total	<i>p</i>
<b>Psychiatric background</b>	<i>Mood disorders</i>	30	17	47	0.421*
	<i>Psychotic disorders</i>	0	2	2	
	<i>Drug use</i>	5	3	8	
<b>Prior suicide attempt</b>		3	2	5	0.942*
<b>Social background</b>	<i>Financial problems</i>	4	4	8	0.077*
	<i>Partner/spouse-related problems</i>	7	3	10	
	<i>Mobbing/academic pressure</i>	11	12	23	
	<i>Relative loss</i>	1	0	1	
	<i>Parental issues</i>	0	4	4	
	<i>Other</i>	12	4	16	
<b>Accommodation</b>	<i>Parental house</i>	16	13	29	0.037**
	<i>Own flat</i>	38	11	49	
	<i>Shared flat</i>	12	10	22	
	<i>Foundation/private dormitory</i>	4	2	6	
	<i>State/University dormitory</i>	20	23	43	
<b>Suicide note/post</b>	<i>Yes</i>	23	14	37	0.935**
	<i>No</i>	102	64	166	

\* Fisher's exact test. \*\* Pearson's Chi-square test.

**Table 3.** Suicide methods by 5-year intervals.\*

Years	Hanging	Jumping from height	Intoxication	Firearm	Other	Stab wound	Complex	Total
2019-2023	25	26	10	2	2	0	0	65
2014-2018	26	33	7	7	4	0	1	78
2009-2013	21	16	3	0	1	1	0	42
2004-2008	4	6	0	3	0	0	0	13
Total	76	81	20	12	7	1	1	198

\**p*=0.181 (Fisher's exact test)

Table 4 presents data on student suicide rates and total university enrollment by geographic region and year.

Higher education enrollment steadily increased between 2004 and 2021 but relatively declined

in 2022 and 2023. Figure 3 illustrates the mean number of university student suicides along with the enrollment across seven geographic regions from 2004 to 2023.

Crude suicide rates among university students

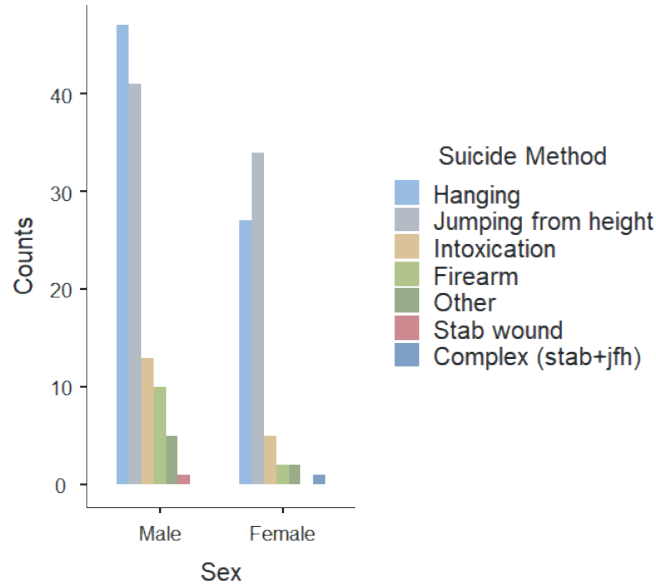


Figure 1. Suicide methods by sex.

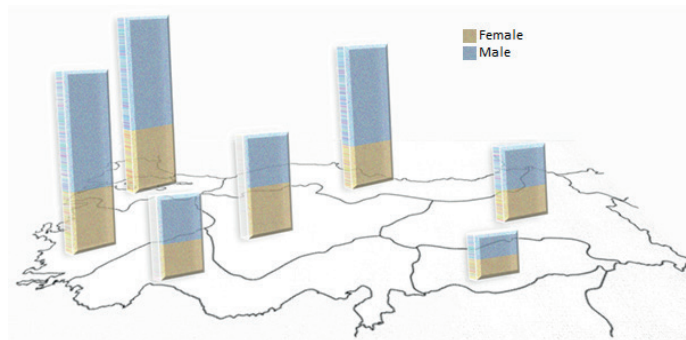


Figure 2. Male and female total suicide numbers illustration according to geographic regions.

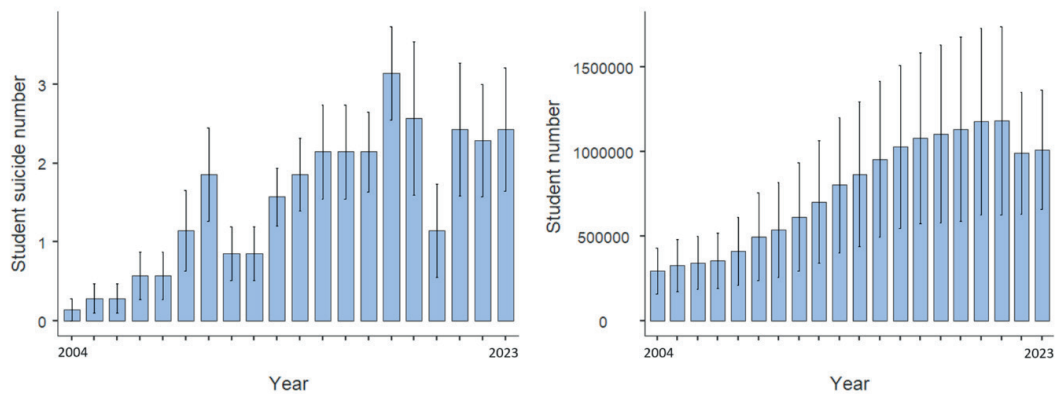


Figure 3. The mean number of university students committed suicide in seven geographical regions (left) and the mean number of university student enrollments in seven geographical regions (right) by years between 2004 and 2023.

**Table 4.** Suicide and student numbers by years and geographic regions (MM: Marmara region, BS: Black Sea region, EA: East Anatolia region, SE: Southeast Anatolia region, MT: Mediterranean region, A: Aegean region, A: Aegean region, CA: Central Anatolia region).

Year	MM suicide number	MM student number	BS suicide number	BS student number	EA suicide number	EA student number	SE suicide number	SE student number	MT suicide number	MT student number	A suicide number	A student number	CA suicide number	CA student number	Total suicide number	Total student number
2004	0	411,525	0	118,578	1	100,425	0	36,980	0	129,899	0	198,179	1	1,067,310	2	1,709,159
2005	0	453,503	0	129,728	0	107,702	0	40,500	1	144,607	1	223,602	0	1,199,779	2	1,905,591
2006	0	468,629	1	150,202	0	108,843	0	44,096	0	151,109	0	239,321	1	1,245,130	2	1,973,711
2007	2	492,281	0	158,028	0	108,774	0	45,803	1	157,615	1	246,661	1	1,275,632	5	2,034,302
2008	3	534,767	1	176,999	1	114,464	0	54,264	1	171,363	0	266,626	1	1,558,295	7	2,378,889
2009	1	589,435	1	198,538	2	133,332	0	69,214	0	190,140	3	289,490	4	2,010,094	11	2,923,001
2010	3	623,608	0	222,682	0	152,216	0	82,817	1	203,322	3	298,460	2	2,185,107	9	3,164,253
2011	1	715,841	0	265,493	0	181,301	0	100,376	1	229,933	1	331,944	0	2,478,662	3	3,605,737
2012	2	823,787	1	307,983	2	218,216	3	120,580	0	260,166	2	372,224	2	2,820,984	12	4,123,153
2013	2	975,878	2	369,376	3	271,302	0	145,443	1	295,209	3	428,918	0	3,132,953	11	4,675,342
2014	3	1,074,919	4	392,991	1	345,540	1	155,849	0	311,016	3	439,002	1	3,343,569	13	5,075,044
2015	2	1,223,702	4	439,238	3	411,015	1	173,162	2	347,807	4	481,874	1	3,612,387	17	5,594,911
2016	3	1,368,614	3	481,305	0	495,439	0	176,644	2	385,655	2	507,562	2	3,783,768	12	6,033,476
2017	4	1,428,782	2	498,279	2	561,926	1	180,362	4	399,232	3	518,354	2	3,973,436	18	6,363,376
2018	2	1,468,963	6	481,813	1	616,288	3	177,883	3	381,556	3	485,034	2	4,128,965	20	6,595,772
2019	6	1,555,145	4	465,993	2	657,787	1	179,400	0	369,857	5	478,438	0	4,233,513	18	6,816,302
2020	3	1,730,681	1	467,611	0	723,288	0	183,489	0	372,934	3	480,958	0	4,282,036	7	7,108,939
2021	6	1,734,494	1	452,926	3	773,069	2	186,157	3	364,916	5	465,079	1	4,320,318	21	7,192,797
2022	3	1,915,782	1	479,813	0	740,734	0	205,259	0	387,542	4	489,891	2	2,731,121	10	5,775,179
2023	2	2,009,618	4	497,613	0	817,684	0	217,192	1	393,540	1	499,606	4	2,646,036	12	5,866,878

were calculated annually. The mean rate was 0.189 per 100,000 students (SD =  $\pm 0.071$ ), significantly lower than the national mean of 4.198 per 100,000 (SD = 0.344). A detailed comparison of university and national suicide rates is presented in Supplementary Table 1 and Supplementary Figure 1, based on TurkStat death statistics [2].

Supplementary Table 2 and 3 provide detailed annual counts of university student suicides by geographic region.

## Discussion

Student suicides not only provoke profound societal indignation due to the loss of young and promising individuals, but they also receive considerable attention in academic literature, reflecting the academic community's inability to remain indifferent to such tragic events. For forensic medicine specialists, the experience of attending autopsies of students, or even encountering their own students on the autopsy table due to suicide, as experienced by one of the authors of this article, can have profoundly negative effects. Despite the absence of comprehensive data on university student suicides in Türkiye, recent media reports indicate an increase in these incidents [26]. To investigate this trend over the past two decades, this study analyzed media reports. A potential explanation for the observed rise is the substantial growth in higher education enrollment. Between 2014 and 2023, the number of university students surged by 5.12 times, from 1,383,232 to 7,081,289 [24]. Examining the geographical distribution of the cases reveals a higher incidence in the western and northern regions of Türkiye, where the student population density is greater, corresponding to the higher concentration of universities and students. Conversely, the number of cases is lower in the eastern and southeastern regions, where the student population is relatively smaller. When Table 4 is examined carefully, we see that this situation is not only valid for the Central Anatolia region. It is seen that the number of students is relatively higher in the Central Anatolia region compared to other regions. The probable reason for this situation is that distance education and national

open education programs are mainly offered at universities in this region. Therefore, although the number of students in the region seems high, the majority of these students live in other geographic regions and are likely recorded in news articles as a student suicide from their region of residence. When analyzing the sex distribution of the cases, a predominance of male cases is evident, which aligns with existing literature. It has been consistently reported that males have a higher incidence of suicide in the general population and that this trend extends to university students, increasing their relative risk of suicide [2,27–29]. Numerous studies have demonstrated that male sex has been predominant in university student suicides over the years [20,27–30]. Cheng et al. [30] attributed the higher incidence of male suicides among university students to greater financial and social pressures faced by male graduate students. However, in our study, financial problems were not identified as a significant factor in the predominance of male suicides, given that the number of male and female cases citing financial issues was equal. A study dealing with medical student suicides reported in media news in Bangladesh [31] a higher prevalence of female cases, which contradicted the broader literature and was attributed to the higher overall suicide rate among females in the country. However, in a subsequent study from the same research center, encompassing all students and using a similar methodology, the predominance of male suicides was observed, consistent with global trends but not with local literature [32]. Although studies have indicated an increased risk of suicide among university students during the COVID-19 pandemic [33], our study results revealed a decrease in suicides between 2019 and 2023, a period that includes the pandemic, with no significant difference compared to the preceding five years. One possible explanation for this decline could be the shift to remote education during the pandemic. Students who spent extended periods with their families likely benefited from increased social support, which has been shown to reduce the risk of suicide [34]. While our study found that many students lived alone in their own flats, which aligns with this perspective, it also noted that female students

generally lived with their families, contradicting this viewpoint. When evaluating the national suicide statistics and local literature, approximately half of the suicide cases in our country involve individuals living alone [35]. Kaggwa et al. [20] found that suicide is more prevalent among students living alone in Uganda. In contrast, the majority of cases in our study did not live alone, yet there were notable differences in the suicide methods among those who had. It has been reported that the most common method of suicide in our country, for both sexes, is hanging, with jumping from heights being the third most common method [35,36]. Similarly, numerous studies from other countries have found that hanging is the most prevalent method of suicide among students [14,20,27,31,32]. In our study, however, jumping from heights emerged as the most common method of suicide, regardless of sex. Among male cases, hanging was the most common method, which is consistent with the literature. This could be related to the high prevalence of men living in their own flats. While hanging was the preferred method among male cases who could complete their act of suicide without being seen or interrupted, jumping from heights was more common among male cases who shared their living environment with others and among female cases, which contradicts the existing literature. It is well-known that individuals who commit suicide seek out a private place to carry out their actions without interruption [20]. This might explain the higher number of men living in their own flats in our study. Suicide by firearms is prominently highlighted in studies conducted in the United States, where access to firearms among students is considered a significant risk factor [14,18]. In our country, however, the relative difficulty and expense of accessing firearms, coupled with restrictions preventing firearms from being carried into places such as universities, hospitals, dormitories, and shopping malls, have relegated firearms to the fourth most common method of suicide. Despite these measures, the finding that 12 cases still involved accessible firearms underscores the ongoing challenge of addressing individual firearm access issues. Emotional distress from various sources can precipitate suicidal behavior,

a common risk factor among students [37,38]. Numerous psychological stressors such as mental illnesses, academic pressures, financial difficulties, and interpersonal conflicts have been identified in different studies as contributors to student suicides [20,30–32,34,38]. Consistent with existing literature, mood disorders were documented in 47 cases (22.07%) in our study, prominently featured in news reports as the leading psychiatric factor associated with suicide. Notably, mobbing/academic pressure emerged as the most prevalent social stressor in our findings, in consistency with other studies where academic stressors typically predominate. For instance, a study from Taiwan highlighted pervasive academic stressors among students [38], while Mamun et al.'s study [32] reported academic reasons as the second most common cause of student suicides in Bangladesh, following romantic relationship issues. In our study, mobbing—an often-overlooked aspect of academic life—was implicated more frequently in suicide cases than any other social factor reported in the media. While academic pressure is listed among the factors for suicide in a suicide news article, it can be seen that mobbing is suggested instead of academic pressure in another media outlet's news article about the same suicide case. As a result, no distinction could be made between mobbing and academic pressure, and both were reported in our study as a single component. However, it has been noted that mobbing is not covered in other research in the literature, and the term is used more commonly in our country. This disparity may stem from underreporting or insufficient recognition of mobbing among other academic stressors. Conversely, romantic relationship problems, which typically rank highest in similar studies, were identified as the second most common social factor in our findings [30,32]. However, cultural differences may explain why these issues were reported more frequently among male cases in our study, contrasting with findings from Bangladesh where they are more prevalent among females [32]. In addition, although no statistically significant difference was observed between genders, another important finding in our study was that mobbing and academic pressure were proportionally



higher in female cases. In terms of crude suicide rates, different numbers emerge in different parts of the world. In fact, in the “big ten” study conducted in the USA, the crude suicide rate varied between 3.1 and 16.3 per hundred thousand students at different universities [39]. Some of these rates were determined to be higher than the crude suicide rate of the population, and some were lower. A primary limitation of this study is its reliance on news reports, which may lack comprehensive details for individual cases, potentially leading to information gaps. While studies on medical students often report higher crude suicide rates compared to the general population, variations exist both between countries and across studies [40]. For instance, a British study found student suicide rates to be half the national average [28], contrasting with our findings of rates as low as one-fortieth in some years (Supplementary Table 1 and Supplementary Figure 1). These discrepancies likely stem from methodological challenges. While annual student population data is accessible [24], there is no centralized registry for student suicides. Furthermore, incidents in smaller localities may escape national media coverage, and suicides occurring during holidays or outside student residences might be misclassified. Consequently, the calculated crude suicide rates should be interpreted with caution. The paucity of data on student suicides necessitates the development of robust data collection methodologies to improve accuracy and reliability. It is evident that many student suicides remain unreported, emphasizing the need for a comprehensive recording and tracking system.

## Conclusion

Recent years have witnessed a concerning rise in media reports on university student suicides. Our study revealed several critical insights: predominantly, male university students were more vulnerable to suicide, with jumping from height being the most frequent method. Significant sex disparities were observed in suicide methods, and mobbing emerged as the predominant contributing factor. Efforts to mitigate student suicides have long been advocated for the establishment of comprehensive support units

within universities, alongside proactive suicide prevention strategies [17,18,34,41]. However, our study underscores the urgent need to prioritize combating mobbing alongside providing robust medical, social, economic, and psychological support. Addressing mobbing as a primary concern can potentially mitigate its devastating impact on student mental health and well-being. In order to tackle related challenges effectively, well-managed efforts are needed across multiple fronts as in society, politics and educational policies, and in academic community. It is imperative for society to foster an environment that promotes mental health awareness and supports vulnerable student populations. Public awareness campaigns should highlight the signs of distress and promote destigmatization of seeking help for mental health issues. Community support networks should be strengthened to provide immediate assistance to students in crisis, emphasizing the importance of early intervention and peer support. Authorities must prioritize mental health as a national health issue. Legislation should be enacted or enhanced to mandate mental health services and suicide prevention programs within educational institutions. Funding allocations should prioritize research into effective prevention strategies and the establishment of comprehensive mental health support systems on campuses. Policies should also address socioeconomic factors contributing to student stress, such as financial insecurity and housing instability. Universities and colleges play a pivotal role in the mental well-being of their students. It is imperative for academic institutions to establish dedicated mental health units staffed with trained professionals. These units should offer accessible and confidential counseling services, crisis intervention, and proactive mental health education programs. Academic policies should be reviewed to reduce academic stressors and create a supportive learning environment that prioritizes student well-being alongside academic achievement. In conclusion, while efforts to combat student suicides have historically focused on reactive measures, such as crisis response and counseling, our study underscores the critical need for proactive, multifaceted approaches. By addressing societal



attitudes, implementing robust policies, and enhancing support within academic settings, we can collectively work towards reducing the incidence of student suicides and fostering a healthier, more resilient student population.

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### Conflict of interest

There is no conflict of interest between the authors concerning the materials or methods used in this study or the findings specified in this paper.

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# The association of vaccine hesitancy with other public health practices in well child care: a cross-sectional study

İzzet Erdal<sup>1\*</sup> 

<sup>1</sup> Clinic of Pediatric Metabolic Disease, Etlik City Hospital. Ankara / Türkiye

\* Division of Social Pediatrics, Department of Pediatrics, Faculty of Medicine, Hacettepe University. Ankara / Türkiye

## Abstract

Vaccination is one of the most successful public health initiatives in human history. Despite all the benefits of vaccination, it is noteworthy that the number of vaccine hesitant parents has increased in recent years. Individuals with vaccine hesitancy are known to have similar attitudes towards other scientific initiatives. In this study, it is investigated the relationship between the attitudes of vaccine hesitant parents and other practices and interventions in well child care. The "Parental Attitudes Towards Childhood Vaccinations (PACV) scale was applied to parents of children aged 2-6 without chronic diseases. A PACV score of 50 or above was considered as vaccine hesitancy. Sociodemographic characteristics, economic status and practices in well child care were questioned. Parents' vaccine hesitancy and their approaches to other practices in well child follow-up were compared. A total of 329 parents were included in the study. The rate of parents with vaccine hesitancy was 22.8% (n=75). In both groups, most participants had an undergraduate/graduate level of education. Those with vaccine hesitancy were less likely to have received vitamin K at birth (81.3% vs. 97.6%,  $p<0.01$ ), and use of prophylactic vitamin D (72% vs. 88.2%,  $p<0.01$ ) and iron supplements in the first year of life (66.7% vs 78.3%,  $p=0.038$ ) were lower. No difference was found for developmental hip dysplasia and hearing screening. The current attitudes of vaccine hesitant parents are not limited to vaccination, but also affect other health initiatives. This study indicates that vaccine hesitant individuals are also opposed and/or reluctant to child health initiatives. Taking this into account when developing strategies to overcome vaccine hesitancy may lead to more effective results.

**Keywords:** Vaccine hesitancy, well child car, PACV, newborn screening, public health

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**Corresponding Author:**  
İzzet Erdal  
Email: [izzet.erdal@gmail.com](mailto:izzet.erdal@gmail.com)



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## Introduction

Vaccination is one of the most successful public health initiatives in human history. Over the past 50 years, it has averted approximately 150 million premature deaths, with 95% of these occurring in children under 5 years old. Furthermore, half of the decline in child mortality over the past five decades can be attributed to vaccination. Vaccination provides personal immunity and limits the spread of disease within society. As diseases become less frequent and people are less exposed to them, the incidence of vaccine-preventable diseases decreases, making the vaccine's effectiveness less apparent. In a way, the vaccine becomes a victim of its own success [1-3]. Vaccine hesitancy is defined by the World Health Organization (WHO) Strategic Advisory Group of Experts on Immunization (SAGE) as delay or complete refusal to vaccinate despite the availability of vaccine services [4]. The number of unvaccinated children and the rate of vaccine hesitancy are increasing in Türkiye and globally, posing a significant threat to public health [5-7]. The decision to vaccinate involves complex decision-making mechanisms influenced by many factors. There are three basic beliefs leading to vaccine hesitancy:

1. Lack of confidence in the efficacy and reliability of the vaccine, the health system, and policymakers regarding the need for vaccination.
2. The belief that vaccination is unnecessary because vaccine-preventable diseases are rare or absent.
3. Inability to be vaccinated due to physical or social reasons [4].

In addition, the impact of socio-cultural factors on vaccine hesitancy has been highlighted by WHO [8]. It is known that vaccine-hesitant individuals often turn to alternative methods [9,10]. At the same time, although it is reported in the literature that these individuals keep their distance from other public health practices and avoid these practices, there are few studies on this subject in our country [10,11]. In this study, it is examined the approaches of vaccine-hesitant parents to healthy child monitoring practices.

## Materials and Methods

Ethical approval was obtained from Hacettepe University Ethics Committee (GO 23/481 dated 25.07.2023) within the framework of "Vaccine Hesitancy Study". Prior to the study, permission was obtained from Etlik City Hospital, where the participants were enrolled. The study included parents with children between the ages of 2 and 6 who registered at Etlik City Hospital between July 2023 and September 2023. After obtaining consent, participants were asked about their socio-demographic and economic status and their participation in well child monitoring practices. To assess vaccine hesitancy, they were asked to complete the Parents' Attitudes Toward Childhood Vaccines (PACV) questionnaire developed by Opel et al. [12] and adapted for Turkish validity and reliability by Bulun et al. [13]. Permission was obtained from both authors before using the survey. The PACV survey contains a total of 15 questions, two on parental vaccination behavior, four on safety and effectiveness, and nine on attitudes and confidence. Each participant's responses were scored to obtain a PACV score between 0 and 100 [12]. Those with a PACV score of less than 50 were classified as having no vaccine hesitancy, and those with a PACV score of 50 and above were classified as having vaccine hesitancy, to be consistent with other studies in the literature [12, 14-17]. The article has been edited according to the CONSORT guideline [18].

All statistical analyses were performed using SPSS for Windows, version 22.0 (IBM). Data distributions were assessed using the *Kolmogorov-Smirnov test* and histograms. For data conforming to the normal distribution, mean and standard deviation were used to report statistics. Comparisons between groups were made using the chi-squared test or Student's t-test, as appropriate. A *p*-value of less than 0.05 was considered statistically significant.

## Results

A total of 329 parents were included in the study. The rate of vaccine hesitant parents was found to be 22.8% (n=75). There were no differences between the two groups in terms of children's gender, parents' age, level of education, presence

of chronic illness in the mother, perceived economic situation and family structure. The total number of children was different between the two groups ( $p=0.02$ ). In the group without vaccine hesitancy, the rate of those with only one child (40.6%) was higher than in the other group (25.3%). The prevalence of chronic diseases in the father was also higher in the vaccine hesitant group ( $p=0.025$ ) (Table 1).

Among those with vaccine hesitancy, vitamin K administration at birth (81.3% vs. 97.6%,  $p<0.01$ ), prophylactic vitamin D (72% vs. 88.2%,  $p<0.01$ ) and iron supplementation (% 66.7 vs. 78.3%,  $p=0.038$ ) use in the first year were lower. No difference was found in heel prick test, developmental dysplasia of hip (DDH) and

hearing screening. Among those with vaccine hesitancy, the frequency of not using vitamin K was 9.49 times higher (95% CI=3.50-25.70), the frequency of not using vitamin D in infancy was 2.9 times higher (95% CI=1.54-5.46), and the frequency of not using prophylactic iron was 1.81 times higher (95% CI=1.03-3.18). -3.18) (Table 2).

## Discussion

Vaccine hesitancy and rejection have been present since the discovery of vaccines. However, today, it has escalated to a public health problem of dangerous dimension globally, prompting the WHO to take action [19-21]. In recent years, this issue has attracted the attention of health professionals and authorities in Türkiye and worldwide, leading to the initiation of studies.

**Table 1.** General characteristics of groups.

	PACV score <50	PACV score ≥50	p-value	Total
Sex				
Male	130 (79.3)	34 (20.7)	0.373	164 (50.2)
Female	124 (75.2)	41 (24.8)		165 (49.8)
Maternal age (mean ± SD)	34.9 (±6.80)	35.9 (±6.81)	0.270	35.1 (±6.82)
Paternal age (mean ± SD)	37.8 (±6.83)	39.5 (±7.05)	0.527	38.2 (±6.91)
Number of children				
1	103 (40.6)	19 (25.3)	<b>0.02</b>	122 (37.1)
2	94 (37)	29 (38.7)		123 (37.4)
3 or more	57 (22.4)	27 (36)		84 (25.5)
Education status of parent*				
Literate/primary/second	29 (11.4)	6 (8)	0.656	35 (10.6)
High school	73 (28.7)	24 (32)		97 (29.5)
University/MSc/PhD	152 (59.8)	45 (60)		197 (59.9)
Maternal chronic disease				
Yes	28 (11)	9 (12)	0.814	37 (11.2)
No	226 (89)	66 (88)		292 (88.8)
Paternal chronic disease**				
Yes	19 (7.5)	12 (16.2)	<b>0.025</b>	31 (9.5)
No	234 (92.5)	62 (83.8)		296 (90.5)
Perception of economic situation				
Income less than expenses	61 (24)	21 (28)	0.714	82 (24.9)
Income equal to expenses	145 (57.1)	39 (52)		184 (55.9)
Income more than expenses	48 (18.9)	15 (20)		63 (19.1)
Family status				
Nuclear family	234 (92.1)	70 (93.3)	0.729	304 (92.4)
Extended family	20 (7.9)	5 (6.7)		25 (7.6)

\*Survey respondent

\*\*The two deceased fathers were not included in the evaluation.

SD: Standard, deviation, PACV: Parents' Attitudes Toward Childhood Vaccines

Those with PACV scores of 50 and above were considered vaccine hesitant.

Values are given as mean±SD and %, groups were compared using Student-t test and Chi-square test, respectively.



However, the evaluation of trends remains limited due to the scarcity of historical data in Türkiye. The vaccine hesitancy rate in this study was 22.8%. Previous studies on vaccine hesitancy in Türkiye have reported rates ranging from 9.3% to 19.6% [10,22-24]. While the results of this study are in alignment with some previously reported rates, they indicate the highest prevalence of vaccine hesitancy to date. Vaccine hesitancy rates vary between 7% and 27% in different countries, with reports indicating that up to 40% of the population distrust vaccines [25-27]. It is known that vaccination rates are decreasing in Türkiye, and the rapid increase in vaccine rejection may have contributed to the higher rate of vaccine hesitancy observed in this study [5,7]. Another possible reason for the high rate of vaccine hesitancy in this study, conducted after the COVID-19 pandemic, is that distrust in the COVID-19 vaccine may have spilled over into distrust of childhood vaccines, fueled by uncontrolled and exaggerated media reports [28]. It was found that vaccine-hesitant parents were more likely to avoid giving their babies vitamin K at birth and to forego vitamin D and iron prophylaxis in the first year. Among the evaluated parameters, parents with vaccine

hesitancy had the highest risk of not giving their babies vitamin K. A pooled analysis of all participants revealed that the utilization rates of vitamin D and iron prophylaxis during the infancy were not at the desired levels. In a study conducted by Koyuncu et al., it was reported that the rate of iron and vitamin D prophylaxis use in babies of parents with vaccine hesitancy was lower, the frequency of resorting to alternative methods was higher, and no significant difference was found in terms of the heel stick test, DDH, and hearing screening [11]. Similarly, Yörük et al. reported that vaccine-hesitant individuals were less likely to use prophylactic iron and vitamin D for their babies and were more likely to use alternative methods [10].

### Study limitations

The main limitation of this study is that the population included in the study consisted of people who applied at the hospital. Given that individuals who seek medical care at a hospital have a relatively higher level of trust in the healthcare system and are more likely to do so, there was concern that the rate of vaccine hesitancy observed in this study might be lower than that observed in the general

**Table 2.** The relationship between well child care practices and vaccine hesitancy.

	PACV score <50	PACV score ≥50	p-value	Total	PACV score <50 vs PACV score ≥50 Odds ratio (%95 CI)
<b>Heel stick</b>					
Yes	250 (98.4)	74 (98.7)	0.881	324 (98.5)	0.85 (0.09 – 7.67)
No	4 (1.6)	1 (1.3)		5 (1.5)	
<b>Vitamin K</b>					
Yes	248 (97.6)	61 (81.3)	<0.01	309 (93.9)	9.49 (3.5 - 25.7)
No	6 (2.4)	14 (18.7)		20 (6.1)	
<b>Vitamin D</b>					
Yes	224 (88.2)	54 (72)	<0.01	278 (84.5)	2.90 (1.54 – 5.46)
No	30 (11.8)	21 (28)		51 (15.5)	
<b>Iron supplementation</b>					
Yes	199 (78.3)	50 (66.7)	0.038	249 (75.7)	1.81 (1.03 – 3.18)
No	55 (21.7)	25 (33.3)		80 (24.3)	
<b>Hearing screening</b>					
Yes	251 (98.8)	74 (98.7)	0.916	325 (98.8)	1.13 (0.12 – 11.03)
No	3 (1.2)	1 (1.3)		4 (1.2)	
<b>DDH</b>					
Yes	251 (98.8)	72 (96)	0.109	323 (98.2)	3.49 (0.69 – 17.64)
No	3 (1.2)	3 (4)		6 (1.8)	

DDH: Developmental dysplasia of hip, CI: confidence interval, PACV: Parents' Attitudes Toward Childhood Vaccines  
Those with PACV scores of 50 and above were considered vaccine hesitant.

population. Nevertheless, the vaccine hesitancy rate identified in this study was higher than that reported in previous studies conducted in Türkiye. This may still be a limitation of the study. Furthermore, it is possible that those who were reluctant to participate in the study were more likely to be vaccine-hesitant. However, this potential bias was minimized by ensuring that participants were anonymous. In addition, the fact that the participants were from a single city does not make it possible to generalize the results to society.

## Conclusion

The findings indicate that vaccine hesitancy is increasing in Türkiye and that vaccine hesitant individuals are hesitant not only about the vaccine but also about other public health initiatives. This situation calls for an expanded approach to include all health practices in interventions to address vaccine hesitancy. Further studies on this subject and the identification of common causes of vaccine hesitancy and distrust in other health practices will enable interventions to be more effective.

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## Conflict of interest

The author declares that there is no conflict of interest regarding the publication of this article.

## Data availability statement

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

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## ORIGINAL ARTICLE

# Combination of oral anticoagulant and antiplatelet therapy does not change the 1-year prognosis compared to oral anticoagulant alone in stroke patients with atherosclerosis and atrial fibrillation

Gökçe Zeytin Demiral<sup>1</sup> Hayri Demirbaş<sup>1</sup> Abdullah Güzel<sup>1</sup> Selin Betaş Akın<sup>2</sup> Sinem Yorgancı<sup>1</sup> Dilara Çulhaoğlu Gökçek<sup>1</sup> Hilal Hoşgeldi<sup>1</sup> Furkan İncebacak<sup>1</sup> <sup>1</sup> Department of Neurology, Faculty of Medicine, Afyonkarahisar Health Sciences University. Afyonkarahisar / Türkiye<sup>2</sup> Department of Neurology, Afyonkarahisar State Hospital. Afyonkarahisar / Türkiye

## Abstract

This study aims to evaluate the effectiveness of combined antiplatelet and oral anticoagulant (OAC) therapy versus OAC therapy alone on one-year post-stroke outcomes in patients with non-valvular atrial fibrillation (NVAf) and systemic atherosclerosis. A retrospective study was conducted using the recorded data of patients diagnosed with ischemic cerebrovascular disease between January 1, 2022, and January 1, 2023, at the Neurology Clinic, Afyonkarahisar Health Sciences University. Patients with non-valvular atrial fibrillation (NVAf) and systemic atherosclerosis were included in the study. Collected data included demographic information, medical history. Patients were divided into two groups based on the treatment regimen used at discharge: those receiving OAC alone and those receiving a combination of OAC and antiplatelet therapy. Clinical outcomes were evaluated within one year following the stroke. A total of 671 stroke patients were screened, and 565 (84.2%) had ischemic stroke. Among these, 113 (20%) had NVAf, and 53 had both NVAf and systemic atherosclerosis. Data from these 53 patients were analyzed. The mean age was 71.81±11.90 years, with a female gender ratio of 52.8%. Logistic regression analysis showed no statistically significant differences between the two treatment groups in terms of all-cause mortality, bleeding, recurrent stroke, and hemorrhagic stroke ( $p>0.05$  for all comparisons). The combination of antiplatelet and OAC therapy did not demonstrate superiority over OAC therapy alone in reducing the risks of recurrent ischemic stroke, hemorrhagic stroke, myocardial infarction, and mortality in patients with NVAf and systemic atherosclerosis. These findings suggest that OAC therapy alone may provide sufficient protection in this patient population. Prospective studies with larger samples are needed to confirm these results.

**Keywords:** Non-valvular atrial fibrillation, systemic atherosclerosis, ischemic stroke, oral anticoagulants, antiplatelet therapy

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**Corresponding Author:**  
Gökçe Zeytin Demiral  
Email: [gokce\\_zeytin@hotmail.com](mailto:gokce_zeytin@hotmail.com)



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## Introduction

Non-valvular atrial fibrillation (NVAF) is the most common cardioembolic cause of ischemic stroke [1]. To prevent systemic embolism, including ischemic stroke, NVAF patients are recommended to use oral anticoagulants (OAC), such as vitamin K antagonists (VKA) or direct oral anticoagulants (DOAC) [2]. Patients with NVAF may have coexisting atherosclerosis in several arteries [3-6]. The presence of systemic atherosclerosis in NVAF stroke patients increases the risk of vascular events in the same or different vascular beds, emphasizing the need for optimal antithrombotic strategies [4]. Adding an antiplatelet to OAC therapy is an option, but it can increase the risk of bleeding [2,7]. Specifically, dual antiplatelet plus anticoagulant therapy and triple therapy are major concerns as they increase the absolute risk of major bleeding [8]. Recent randomized studies indicate that OACs without antiplatelets do not increase systemic embolic events but reduce major bleeding compared to OACs with antiplatelets in patients with NVAF and stable coronary artery disease (CAD) [9,10]. Moreover, low-dose rivaroxaban combined with aspirin has been shown to improve cardiovascular outcomes in patients with coronary artery occlusive disease (CAOD) or peripheral artery occlusive disease (PAOD), suggesting potential benefits for NVAF patients with atherosclerosis [8,11].

Nevertheless, the optimal management strategies for stroke and systemic atherosclerosis in NVAF patients are not well-defined. This study aims to evaluate the effectiveness of combining antiplatelet therapy with OACs versus OAC therapy alone on one-year post-stroke outcomes in patients with NVAF and systemic atherosclerosis.

## Materials and Methods

We conducted a retrospective review of patients diagnosed with ischemic cerebrovascular disease between January 1, 2022, and January 1, 2023, using records from the Neurology Clinic at Afyonkarahisar Health Sciences University. Patients with non-valvular atrial fibrillation and systemic atherosclerosis were included. Comprehensive evaluations

during hospitalization were conducted to gather demographic data, medical history, clinical symptoms, vascular risk factors, and comorbidities. Clinical demographic characteristics were obtained from existing files. Information from routine computerized tomography (CT) angiography, brain CT, and/or magnetic resonance imaging for all ischemic patients was recorded. The results of standard blood tests, 12-lead electrocardiography, Holter monitoring and echocardiography to determine the etiology of ischemic cerebrovascular disease are also documented.

Demographic information, vascular risk factors, and comorbidities such as hypertension, diabetes, dyslipidemia, coronary artery occlusive disease (CAOD), peripheral artery occlusive disease (PAOD), and previous stroke history were recorded. Smoking status was noted for individuals who had smoked at least one cigarette in the past month, and alcohol consumption was also recorded. Stroke severity was measured using the National Institutes of Health Stroke Scale (NIHSS). Stroke subtypes were classified according to the Trial of Org 10172 in Acute Stroke Treatment classification [8]. Blood test results were categorized by glomerular filtration rate (GFR) into three groups: GFR<30, 30-50, and >50. Information on statin therapy prescribed at discharge was collected, with high-intensity statin therapy defined as atorvastatin doses greater than 40 mg or rosuvastatin doses greater than 20 mg.

### *Clinical Variables*

The study population was categorized based on the antithrombotic regimen prescribed at discharge: OAC alone or a combination of OAC and antiplatelet therapy. OACs included VKAs and DOACs such as dabigatran, rivaroxaban, apixaban, and edoxaban. Antiplatelet agents included aspirin, clopidogrel, cilostazol, prasugrel, ticlopidine, and ticagrelor.

### *Systemic Atherosclerotic Lesions*

The presence of atherosclerotic lesions in the aortic arteries, brain, heart, and peripheral arteries was assessed using recorded data. Systemic atherosclerotic lesions were defined by one or more of the following conditions: (1)



cerebral atherosclerosis with >50% stenosis; (2) aortic atheroma > 4 mm in the ascending aorta or aortic arch as seen on echocardiography; (3) history of previous CAOD or PAOD; and (4) coronary or carotid stent placement. CAOD was defined by (1) a history of myocardial infarction or unstable angina, and (2) documented symptomatic or asymptomatic coronary artery stenosis on catheter coronary angiography or multidetector coronary CT. PAOD presence was documented based on a history of peripheral artery disease in the patient's medical records.

### **Outcome Measures**

Data for patients who had a one-year follow-up examination after discharge were recorded. Causes of death were documented for deceased patients, with cardiovascular death recorded as death due to myocardial infarction, sudden cardiac death, heart failure, cardiovascular procedures, or stroke. Recurrent ischemic stroke (including TIA), hemorrhagic stroke, myocardial infarction, or bleeding events within one year post-stroke were recorded. Hemorrhagic stroke subtypes (intracerebral, intraventricular, subarachnoid, and subdural hemorrhages) were documented. All bleeding events, including hemorrhagic stroke, gastrointestinal bleeding, respiratory bleeding, and muscle bleeding requiring transfusion or hospitalization, were recorded. Fatal ischemic stroke, fatal hemorrhagic stroke, fatal myocardial infarction, and fatal bleeding events were defined as deaths occurring after the respective severe condition without any other obvious cause of death, as determined by the physician. The primary outcome of this study was the evaluation of all composite outcomes within one year after the index stroke. These predefined outcomes were compared based on medication within one year after the index stroke.

### **Statistical Analysis**

Statistical analyses were conducted using SPSS 26.0 software (IBM Corp. 2019, IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp). To compare demographic and clinical variables between groups, the Chi-square test and Fisher's exact test were utilized. Categorical data were presented as

frequencies and percentages. The *Shapiro-Wilk* test evaluated the normality of the quantitative data distribution. Continuous variables were compared using either the Independent Samples t-test or the *Mann-Whitney U* test. Logistic regression analysis was employed to examine the relationship between treatment groups and clinical outcomes such as all-cause mortality, bleeding, hemorrhagic stroke, and recurrent stroke. The analysis results were expressed as  $\beta$  (beta) coefficients, standard error (SE), *p*-values, Odds Ratios (OR), and confidence intervals (CI). Statistical significance was set at  $p < 0.05$ .

### **Ethical Considerations and Consent**

The study received approval from the Ethics Committee of Afyonkarahisar Health Sciences University (Date: 19.04.2024, Decision No: 2024/38). Due to the retrospective nature of the study, informed consent from individuals was not required.

### **Results**

A total of 671 stroke patients were screened in the study. Of these patients, 106 (15.8%) had hemorrhagic stroke and 565 (84.2%) had ischemic stroke. Atrial fibrillation was detected in 113 (20%) of the ischemic stroke patients. Twenty-nine of the patients with atrial fibrillation were excluded due to insufficient data. Eighty-four patients had diagnoses of ischemic stroke and atrial fibrillation. Systemic atherosclerosis was found in 53 of these patients. Data from a total of 53 patients were evaluated in the study. The mean age of these patients was  $71.81 \pm 11.9$ , with a female gender ratio of 28 (52.8%) and 23 (43.4%) patients over the age of 75. Thirty-eight (71.7%) patients had hypertension, 18 (34%) had diabetes mellitus, 33 (62.3%) had hyperlipidemia, and 21 (39.6%) had chronic heart failure. Cerebral atherosclerosis was found in 28 (52.8%) patients, coronary atherosclerosis in 25 (47.2%), peripheral atherosclerosis in 9 (17%), aortic atheroma plaque in 11 (20.8%), and coronary artery stent in 17 (32.1%). Twenty-two (41.5%) patients were smokers and 3 (5.7%) consumed alcohol. Thirty (56.6%) patients were on statin therapy, with 10 (18.9%) of them on high-dose statin therapy. As antiplatelet therapy, 10 (18.9%) patients were using clopidogrel and 8



(15.1%) were using aspirin. Recurrent stroke was observed in 18 (34%) patients, of which 2 (3.8%) were hemorrhagic strokes. One of the patients with intracranial hemorrhage was taking edoxaban 30 mg 1x1 and the other was taking

apixaban 2.5 mg 2x1. Table 1 presents the clinical and demographic characteristics of patients receiving oral anticoagulant+antiplatelet and oral anticoagulant therapy.

**Table 1.** Comparison of demographic and clinical characteristics of patients receiving oral anticoagulant + antiplatelet and oral anticoagulant therapy.

Variables	Groups		p-value
	Oral Anticoagulant + Antiplatelet (n:18)	Oral Anticoagulant (n:35)	
<b>Age</b>			
75 >	9(50%)	21(60%)	0.565
75 ≤	9(50%)	14(40%)	
<b>Gender</b>			
Male	10(55.6%)	15(42.9%)	0.402
Female	8(44.4%)	20(57.1%)	
<b>Cerebral Atherosclerosis</b>	11(61.1%)	17(48.6%)	0.562
<b>Coronary Artery Atherosclerosis</b>	9(50%)	16(45.7%)	0.497
<b>Peripheral Artery Atherosclerosis</b>	4(22.2%)	5(14.3%)	0.469
<b>Aortic Atheroma Plaque</b>	6(33.3%)	5(14.3%)	0.105
<b>Coronary Artery Stent</b>	6(33.3%)	11(31.4%)	1.000
<b>Cerebral Artery Stent</b>	1(5.6%)	3(8.6%)	0.581
<b>DOAC Type</b>			
Dabigatran	1(5.6%)	2(5.7%)	0.719
Rivaroxaban	10(55.6%)	14(40%)	
Apixaban	6(33.3%)	15(42.9%)	
Edoxaban	1(5.6%)	4(11.4%)	
<b>DOAC Dose</b>			
Low	4(22.2%)	11(31.4%)	0.357
Effective	14(77.8%)	24(68.6%)	
<b>Statin</b>	12(66.7%)	18(51.4%)	0.384
<b>High Dose Statin</b>	2(11.1%)	8(22.9%)	0.150
<b>TOAST</b>			
Large Artery	5(27.8%)	8(22.9%)	0.880
Cardioembolic	9(50%)	20(57.1%)	
Unknown Cause	4(22.2%)	7(20%)	
<b>Etiological Cause</b>			
Single	1(5.6%)	4(5.7%)	0.689
Multiple	17(94.4%)	33(94.3%)	
<b>Hypertension</b>	12(66.7%)	26(74.3%)	0.560
<b>Diabetes</b>	8(44.4%)	10(28.6%)	0.248

**Table 1.** (continued) Comparison of demographic and clinical characteristics of patients receiving oral anticoagulant + antiplatelet and oral anticoagulant therapy.

<b>Hyperlipidemia</b>	13(72.2%)	20(57.1%)	0.283
<b>Smoking</b>	10(55.6%)	12(34.3%)	0.137
<b>Alcohol</b>	2(11.1%)	1(2.9%)	0.263
<b>Chronic Heart Failure</b>	10(55.6%)	11(31.4%)	0.089
<b>Initial NIHSS</b>	6(33.3%)	16(45.7%)	0.386
≤4	12(66.7%)	19(54.3%)	
>4			
<b>GFR</b>	0(0)	1(2.9%)	0.534
<30	5(27.8%)	6(17.1%)	
≥30-50	13(72.2%)	28(80%)	
50<			
<b>Recurrent Stroke</b>	1(5.6%)	4(11.4%)	0.708
<b>Fatal</b>	1(5.6%)	3(8.6%)	
<b>Non-fatal</b>			
<b>Recurrent MI</b>			0.291
<b>Fatal</b>	1(5.6%)	0	
<b>Non-fatal</b>	0	1(2.9%)	
<b>Hemorrhagic Stroke</b>	0	2(5.7%)	0.432
<b>Non-Fatal</b>			
<b>Hemorrhagic Stroke Classification</b>			0.301
<b>Intracerebral</b>	0	2(5.7%)	
<b>Bleeding</b>	0	4(11.4%)	0.136
<b>Bleeding Classification</b>			0.329
Intracerebral Bleeding	0	2(5.7%)	
Gastrointestinal Bleeding	0	2(5.7%)	
<b>Death from All Causes</b>	7(38.9%)	12(34.3%)	0.741
<b>Death from Cardiovascular Causes</b>			0.320
Sudden Cardiac Death	3(16.7%)	6(17.1%)	
Heart Failure	1(5.6%)	0	
Ischemic Stroke	0	3(8.6%)	

DOAC: Direct Oral Anticoagulant; TOAST: Trial of Org 10172 in Acute Stroke Treatment; NIHSS: National Institutes of Health Stroke Scale; GFR: Glomerular Filtration Rate; MI: Myocardial Infarction

**Table 2.** Logistic regression analysis results on the effect of treatment groups on the frequency of death from all causes.

Variables	Groups	$\beta$	SE	<i>p</i>	Odds Ratio	95% CI	
						Lower	Upper
Group	Oral Anticoagulant + Antiplatelet	0.199	0.600	0.741	1.220	0.376	3.957
	Anticoagulant				Reference		

SE: Standard Error; CI: Confidence Interval

Logistic regression analysis comparing the two treatment groups revealed no statistically significant differences in all-cause mortality, bleeding, recurrent stroke, and hemorrhagic stroke ( $p=0.741$ ,  $p=0.998$ ,  $p=0.998$ ,  $p=0.421$ , respectively). Tables 2, 3, 4, and 5 present logistic regression analyses of the effects of the two treatments on the frequency of all-cause mortality, bleeding, hemorrhagic stroke, and recurrent stroke.

## Discussion

The results of this study reveal that in patients with NVAF and arterial atherosclerosis, combining antiplatelet and anticoagulant therapies did not prove superior to anticoagulant therapy alone regarding the risks of recurrent ischemic stroke (including transient ischemic attacks), hemorrhagic stroke, myocardial infarction, and mortality. Contrary to some studies, the combination therapy did not increase bleeding risk. There was no significant difference in the rates of bleeding, recurrent

stroke, and mortality between the two treatment groups over the one-year follow-up period. Atrial fibrillation (AF) and carotid artery stenosis (CAS) frequently coexist in acute stroke patients [4]. Atherosclerotic diseases are often observed in the carotid artery (up to 64%), coronary artery (17-38%), or peripheral arteries (6.7%) [12,13]. In this study, the most common site of atherosclerosis was cerebral atherosclerosis (52.8%), followed by coronary atherosclerosis (47.2%). Carotid artery stenosis significantly elevates the risk of ischemic stroke and TIA in NVAF patients [14]. Therefore, determining the most effective treatment for post-stroke patients with AF and arterial stenosis who require both OAC and antiplatelet (AP) therapy is crucial. However, the optimal antithrombotic treatment strategy remains under debate [15]. Managing NVAF patients with systemic atherosclerosis thus presents substantial challenges. Studies have shown that OAC monotherapy is linked to lower composite outcomes and mortality risks within one year following an ischemic stroke due to AF

**Table 3.** Logistic regression analysis results on the effect of treatment groups on the frequency of bleeding.

Variables	Groups	$\beta$	SE	$p$	Odds Ratio	95% CI	
						Lower	Upper
Group	Oral Anticoagulant + Antiplatelet	-19.155	9473.570	0.998	0.000	0.000	
	Oral Anticoagulant				Reference		

*SE: Standard Error; CI: Confidence Interval*

**Table 4.** Logistic regression analysis results on the effect of treatment groups on the frequency of hemorrhagic stroke.

Variables	Groups	$\beta$	SE	$p$	Odds Ratio	95% CI	
						Lower	Upper
Group	Oral Anticoagulant + Antiplatelet	-18.400	9473.574	0.998	0.000	0.000	
	Oral Anticoagulant				Reference		

*SE: Standard Error; CI: Confidence Interval*

**Table 5.** Logistic regression analysis results on the effect of treatment groups on the frequency of recurrent stroke.

Variables	Groups	$\beta$	SE	$p$	Odds Ratio	95% CI	
						Lower	Upper
Group	Oral Anticoagulant + Antiplatelet	-0.693	0.861	0.421	0.500	0.093	2.702
	Oral Anticoagulant				Reference		

*SE: Standard Error; CI: Confidence Interval*

and arterial atherosclerotic stenosis. Moreover, combining antiplatelet and OAC has been found to increase the risk of major bleeding [16,17]. Cardiac guidelines suggest OAC monotherapy without antiplatelet therapy (APT) for NVAf patients with stable coronary artery disease more than one-year post-myocardial infarction or percutaneous coronary intervention. OAC monotherapy presents similar risks for stroke, myocardial infarction, and mortality but carries a lower bleeding risk [18,19]. Certain clinical studies support combining antiplatelet therapy with anticoagulant therapy in patients with AF, carotid artery disease, or both in specific situations. One study suggests temporarily adding antiplatelet drugs to anticoagulation therapy to reduce risk in patients with atherosclerosis [20,21]. This approach is considered because not all strokes in AF patients are cardioembolic, and evidence suggests warfarin may not prevent non-cardioembolic strokes [22]. According to our data, anticoagulant therapy alone offers adequate protection for NVAf patients with atherosclerosis, with no increased bleeding risk. Therefore, it may be necessary to reconsider adding antiplatelet therapy to oral VKA anticoagulation in NVAf patients with stable coronary artery disease. Among the limitations of this study is that due to its retrospective nature, it is not known whether patients adhered to their medication or took it regularly as recorded in the system. Although the initial number of patients included in the study appears high, the number of patients analyzed after exclusion is limited. Silent myocardial infarctions, transient ischemic attacks or ischemic or hemorrhagic strokes that did not result in hospitalization may have been missed. If sudden deaths occurred at home, they may not have been reflected in hospital records and therefore not included in the analysis. There was no analysis to differentiate between different types of antiplatelet agents.

## Conclusion

In this study, the combination of antiplatelet and anticoagulant therapy in patients with non-valvular atrial fibrillation (NVAf) and arterial atherosclerosis did not demonstrate superiority over anticoagulant therapy alone in reducing the risks of recurrent ischemic stroke, hemorrhagic

stroke, myocardial infarction, and mortality. These findings suggest that anticoagulant therapy alone may provide adequate protection for patients with NVAf and atherosclerosis. Further prospective studies with larger sample sizes are needed to validate these results.

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## Conflict of interest

The authors declared no conflict of interest regarding this study.

## Data availability statement

All data used in this study are available from the corresponding authors upon request.

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