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Original Article *Özgün Araştırma*

ALARMING PREVALENCE OF POOR SLEEP AND ANXIETY IN MEDICAL STUDENTS

Tıp Fakültesi Öğrencilerinde Yetersiz Uyku ve Anksiyete Yaygınlığı Endişe Verici

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ABSTRACT

Objective: Anxiety and sleep disorders have been reported to be common in medical students. This study aimed to determine the frequency of poor sleep quality and anxiety symptoms in medical students. Moreover, to reveal the relationship between sociodemographic characteristics, lifestyle data, perceptions of professional future, academic performance with anxiety, and sleep quality.

Material and Methods: A total of 225 participants enrolled in the first through fifth years of education in Kafkas University's Faculty of Medicine in the 2022-23 academic year participated in the study. Participants were asked to complete a questionnaire encompassed sociodemographic data, lifestyle information that may affect sleep, the Pittsburgh Sleep Quality Index (PSQI), Generalized Anxiety Disorder-7 (GAD-7) scale. Statistical analyses were performed with R Statistical Software (v4.2.2; R Core Team 2022).

Results: It was found that 76% of the participants had poor sleep quality according to the PSQI, while 31.56% of the participants had GAD-7 scores of 10 or above. There was a relationship between the poor sleep quality and anxiety of the participants ($p<0.001$). Academic performance was not found to be significantly associated with poor sleep quality or anxiety. Most of the participants with anxiety were related to their future professional careers, and the academic performances of participants who indicated such anxiety were higher than others.

Conclusion: This study has revealed that anxiety levels are high and sleep disturbances are very common among medical students. Most of the students' anxiety was related to their professional careers, and the academic performances of the participants who indicated such anxiety were higher.

Keywords: *Sleep quality, academic performance, student, anxiety, anxiety disorders*

ÖZ

Amaç: Tıp fakültesi öğrencilerinde anksiyete ve uyku bozuklukları sık görüldüğü raporlanmıştır. Bu çalışmanın amacı; öğrencilerde kötü uyku kalitesinin, anksiyete semptomlarının sıklığının belirlenmesidir. Ayrıca, sosyodemografik özellikler, yaşam tarzı verileri, mesleki gelecek algıları, akademik performans ile anksiyete ve uyku kalitesi arasındaki ilişkiyi ortaya koymaktır.

Gereç ve Yöntemler: Çalışmaya 2022-23 akademik yılında Kafkas Üniversitesi Tıp Fakültesinde öğrenim gören 1-5. sınıflar arasındaki toplam 225 katılımcı katılmıştır. Katılımcılara sosyodemografik verileri, uykuyu etkileyebilecek yaşam tarzı bilgileri, Pittsburg Uyku Kalitesi İndeksi (PUKİ), Yaygın Anksiyete Bozukluğu-7 (YAB-7) ölçeği yöneltildi. İstatistiksel analizler R istatistik yazılımı kullanılarak (v4.2.2; R Core Team 2022) yapıldı.

Bulgular: Katılımcıların %76'sında PUKİ ölçeğine göre kötü uyku kalitesi vardı. Katılımcıların %31.56'sının YAB-7 puanı 10 ve üzerindeydi. Katılımcılarda kötü uyku kalitesi ve anksiyete arasında bir ilişki bulundu ($p<0.001$). Akademik performansın kötü uyku kalitesi ve anksiyete ile ilişkisiz olduğu görüldü. Gönüllülerin kaygılarının çoğu mesleki kariyerleriyle ilgili olup, bunu belirten katılımcıların akademik puanlarının daha yüksek olduğu tespit edildi.

Sonuç: Bu çalışmada tıp öğrencilerinde kaygı düzeylerinin yüksek olduğu ve uyku bozukluğunun çok yaygın olduğu görülmüştür. Öğrencilerin kaygılarının çoğunun mesleki kariyerleriyle ilgili olduğu ve bunu belirten katılımcıların akademik puanlarının daha yüksek olduğu ortaya konmuştur.

Anahtar Kelimeler: *Uyku kalitesi, akademik performans, öğrenci, anksiyete, anksiyete bozuklukları*

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INTRODUCTION

Anxiety is a negative emotional state that manifests when a person is overly concerned about safety, fate, and the future and feels impending threats (1). Sleep disturbance is associated with depression and anxiety and is potentially a factor leading to an increased risk of psychiatric disorders (2). It has been emphasized that anxiety may lead to sleep deprivation through a positive feedback mechanism and that sleep deprivation may lead to further increases in anxiety levels (3).

Modern lifestyles have a dramatic impact on sleep quality. Increased screen time due to the anxiety-inducing use of cell phones has adverse effects on the sleep quality of university students, and according to a recent study, poorer sleep quality is associated with higher levels of cell phone anxiety (4). Sleep deficiency and inefficiency can lead to fatigue, social maladjustment, and cognitive dysfunction. Sleep disturbances can negatively affect students' learning performance and lead to academic failure (5). A Slovenia-based study of medical students revealed that sleep quality disturbances negatively affected academic performance (6).

University students may be more predisposed to anxiety due to academic pressure, concerns about finding jobs, or worries about what working conditions will be like in their future professions. It has been shown that students are more likely than the general population to experience anxiety symptoms, and this is especially true of medical school students (7). A meta-analysis reported the global prevalence of anxiety in medical students to be 33.8% (8). Anxiety about the future is common in anxiety disorders (9). People with anxiety about the future pay more attention to negative stimuli and are more distracted by these thoughts (10). Epidemiological data on anxiety related to the professional future among medical students in Türkiye are very limited, however. There are no studies to date on the relationship among future anxiety, sleep quality, and academic achievement, although it has been estimated in recent years that the burdens of the COVID-19 pandemic and the problems reported by physicians and other healthcare professionals have also been reflected upon medical students.

This study aims to investigate the relationship between future anxiety, sleep quality, and academic performance in medical students in Türkiye. In addition, data on sleep, dietary, and other lifestyle habits, which are known to affect sleep quality, are analyzed.

MATERIALS AND METHODS

The research data were obtained through a questionnaire that was completed by medical students. This cross-sectional study included students enrolled in the first through fifth years of education in Kafkas University's Faculty of Medicine in the fall semester of the 2022-23 academic year. The study was approved by the Ethics Committee of Kafkas University's Faculty of Medicine with a decision dated 08/06/2022 and numbered 86.

The total population of the study included 426 students, with 104, 104, 106, 63, and 49 students in the first, second, third, fourth, and fifth years of the medical program, respectively. The minimum sample size was determined with the help of the formula suggested by Sundas et al., and calculated as 189 (11).

In the first part of the questionnaire, questions were asked about sociodemographic and lifestyle characteristics. These questions included the participant's age, gender, year of study, smoking, alcohol and coffee consumption, academic performance in the previous semester, place of residence, and average screen time.

Anxiety levels were assessed using the Generalized Anxiety Disorder-7 (GAD-7) scale, which contains seven questions and has been found to have high specificity and sensitivity in the clinical diagnosis of generalized anxiety disorder (12). The Turkish validity and reliability study of this scale was conducted in 2013 by Konkan et al. (13). The GAD-7 is a Likert-type scale with replies ranging from 0 ("not at all characteristic of me") to 3 ("entirely characteristic of me") for total scores ranging from 0 to 21. Scores of 5, 10, and 15 are the threshold points for mild, moderate, and severe anxiety levels, respectively. A score above 10 on this scale has a sensitivity and specificity of over 80% for the diagnosis of generalized anxiety disorder. In the present study, it was also examined whether the symptoms questioned in the GAD-7 were related to individuals' feelings about their professional futures.

The Pittsburgh Sleep Quality Index (PSQI), the Turkish validity and reliability of which was established by Agargun, was used to assess sleep quality (14). This scale consists of 7 subdimensions and 18 questions that participants answer to provide self-reported data on sleep quality. The subdimensions are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, daytime dysfunction, and use of sleep medicine. Each subdimension is scored between 0-3 and 0-21 in total. Participants with scale scores of 5 and above are considered to have poor sleep quality.

To measure academic performance, the grades of the students in the preclinical classes from all exams during the fall semester of the 2022-23 academic year were evaluated.

All analyses were performed using R Statistical Software (v4.2.2; R Core Team 2022). The Shapiro-Wilk test was performed to determine whether data were normally distributed. Independent t-tests and one-way analysis of variance (ANOVA) were applied to analyze

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groups with normal distribution and the Tukey post hoc test was applied for each comparison. The Mann-Whitney U and Kruskal-Wallis tests were applied for the comparison of non-normally distributed groups. The chi-square test was used to investigate the relationship between sleep quality and anxiety, and multiple linear regression analysis was applied to determine the relationships between the subdimensions of the PSQI and anxiety. Values of $p<0.05$ were considered statistically significant.

RESULTS

Data were obtained from the completed questionnaires of 225 students of the medical faculty, constituting 52.82% of the study population. The participation rate was higher among students enrolled in preclinical classes, at 57.64%, to allow for the investigation of the relationships between academic performance and sleep and anxiety. Of the participants, 106 were men and 119 were women. The mean age distribution of the participants was 20.42±1.83 years, with a minimum age of 18 and a maximum age of 26.

The average PSQI score of the participating students was 8.60±3.23. According to the scores, 76% of the participants had sleep disturbances. The average GAD-7 score of the participants was 7.97±4.78, and 31.56% had GAD-7 scores of 10 or above. Based on cut-off points of 5%, 102 students (45.33%) had mild anxiety, 48 students (21.33%) had moderate anxiety, and 23 students (10.22%) had severe anxiety.

No relationship was observed between the participants' genders, screen time, or eating behaviors in the 2 hours before bedtime and PSQI scores. Only 13 students (5.8%) lived with their families during their university studies. Students living with their families had significantly lower PSQI scores compared to those living in dormitories and those who selected "other" as their place of residence (p=0.0327, F=3.474). Smoking and alcohol consumption were associated with poor sleep quality. PSQI scores were also significantly higher among those who consumed alcoholic, carbonated, or caffeinated beverages in the 2 hours before bedtime on most days (p=0.0134, F=4.40). The relationships between participants' sociodemographic characteristics and PSQI scores are summarized in Table 1.

Table 1: The relationship between sociodemographic and lifestyle characteristics and PSQI score

Sociodemographic Feature		**Number (n) / (%)**	**PSQI Score Mean ± SD (Median)**	***p* value F value**
Gender	Male	106 (47.11)	8.55±3.22 (8)	*T Test*
	Female	119 (52.89)	8.64±3.25 (9)	p=0.849
Place of residence	With family	13 (5.8)	6.54±2.57 (6)	*One-way ANOVA*
	Dormitory	112 (49.78)	8.96±3.39 (9)	p=0.032*
	Other	97 (43.11)	8.44±3.07 (8)	F=3.474
Daily caffeine consumption	Less than 1 cup	85 (37.78)	7.87±3.24 (8)	*T Test*
	1 cup or more	140 (62.22)	9.04±3.16 (9)	p=0.008**
Smoking	No	180 (80)	8.39±3.17 (8)	*T Test*
	Yes	45 (20)	9.44±3.36 (9)	p=0.050*
Alcohol consumption	No	180 (80)	8.37±3.28 (8)	*T Test*
	Yes	45 (20)	9.53±2.87 (9)	p=0.030 *
Screen time	Less than 3 hours	49 (21.78)	8.98±3.44 (9)	*T Test*
	More than 3 hours	176 (78.22)	8.49±3.17 (8)	p=0.353
Eating before bedtime	Less than one day in a week	45 (20)	8.00±3.05 (8)	*One-way ANOVA*
	1 or 2 days in a week	67 (29.78)	8.46±2.81 (8)	p=0.249 F=1.39
	Most of days	113 (50.22)	8.9 ±3.51 (9)	
Drinking before bedtime	Less than one day in a week	73 (32.44)	7.93±3.01 (8)	*One-way ANOVA*
	1 or 2 days in a week	64 (28.44)	8.31±3.28 (8)	p=0.013* F=4.400
	Most of days	88 (39.11)	9.36±3.25 (9)	
Grades	1st	78/104 (75)	9.33±3.42	One-way ANOVA
	2nd	62/104 (59.6)	8.17±2.98	p=0.178
	3rd	41/106 (38.67)	8.36±3.09	F=1.588
	4th	11/63 (17.46)	8.09±3.36	
	5th	33/49 (67.35)	8.12±3.22	

PSQI: Pittsburg Sleep Quality Index, SD: Standard Deviation. *: $p<0.05$, **: $p<0.01$

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Seventy-one (31.56%) of the participating students had GAD-7 scores of 10 or above. Participants with high anxiety scores were asked to evaluate to what extent their anxiety was related to their professional future. Among these 71 participants, 31 (43.66%) stated that their anxiety was mainly related to their professional future, 27 (38.02%) stated that it was partially related, and only 13 participants (18.31%) stated that their anxiety was not related to their professional future. The participants with GAD-7 scores of 10 or above who indicated that their anxiety was mainly related to their professional future were considered as the subgroup having anxiety about their professional future for further analyses.

Chi-square test analysis revealed a relationship between the poor sleep quality and anxiety of the participants ($p<0.001$), as presented in Figure 1. The relationships between anxiety and the seven subdimensions of the PSQI were then explored by multiple linear regression analysis. In these analyses, the threshold value for the presence of anxiety was accepted as a score of ≥10 on the GAD-7 scale. Sleep latency, sleep disturbance, and daytime dysfunction were found to be associated with anxiety ($p<0.001$, $R^2N=0.265$). However, no relationship was observed between subjective sleep quality, sleep duration, or habitual sleep activity and anxiety scores. The relationship between sleep medication usage and anxiety could not be evaluated due to an insufficient sample size. These relationships between anxiety and the subdimensions of the PSQI are summarized in Table 2.

Table 2: Relationship between PSQI sub-dimensions and the existence or not of anxiety

Variable	B	Standart error	Beta	t value	*p* value	%95 CI
(Intercept)	2.17	0.859		2.535	0.12	0.485 3.871
Subjective sleep quality	0.87	0.271	0.2	0.32	0.749	-0.448 0.62
Sleep latency	0.791	0.375	0.132	0.132	0.036*	0.051 1.53
Sleep duration	0.5	0.331	0.009	0.15	0.881	-0.6 0.7
Habitual sleep efficiency	-0.332	0.193	-0.10	-1.719	0.087	-0.714 0.049
Sleep disturbances	1.917	0.533	0.238	3.595	<0.001***	0.866 2.969
Daytime dysfunction	1.554	0.317	0.314	4.904	<0.001***	0.929 2.176
Global PSQI	0.507	0.093	0.343	5.452	<0.0001***	0.324 0.690

Multiple linear regression analysis was used to analyze the data. PSQI: Pittsburg Sleep Quality Index. CI: Confidence interval. *:p<0.05, ***:p<0.001

Academic performance was not found to be associated with sleep quality or anxiety scores (Figure 2A and 2B). However, according to the one-way ANOVA analysis, in the group that reported having anxiety mainly related to their professional futures, academic performance was significantly higher compared to the group reporting anxiety unrelated to their professional futures (*p*=0.048, F=2.692), as presented in Figure 3.

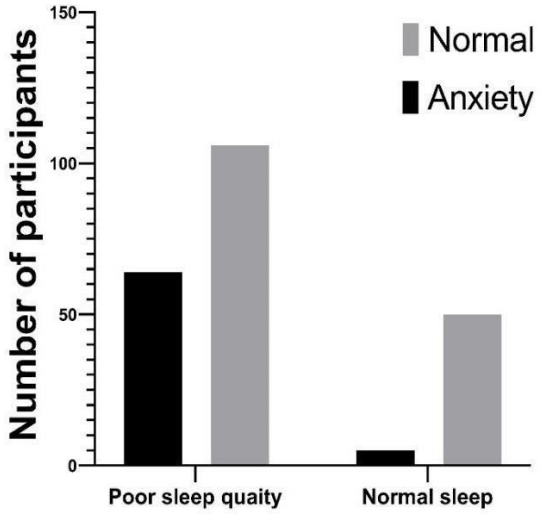

Figure 1: Relationship between poor sleep quality and anxiety (p<0.001)

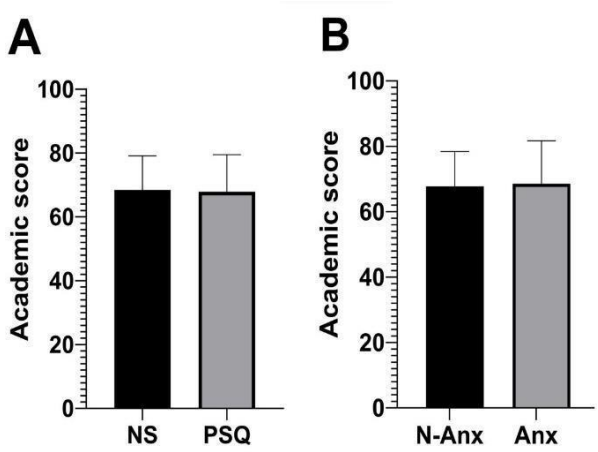

Figure 2: The relationship of sleep quality (A) and anxiety (B) with academic score NS: Normal sleep, PSQ: Poor sleep quality, N-Anx: No anxiety, Anx: Anxiety

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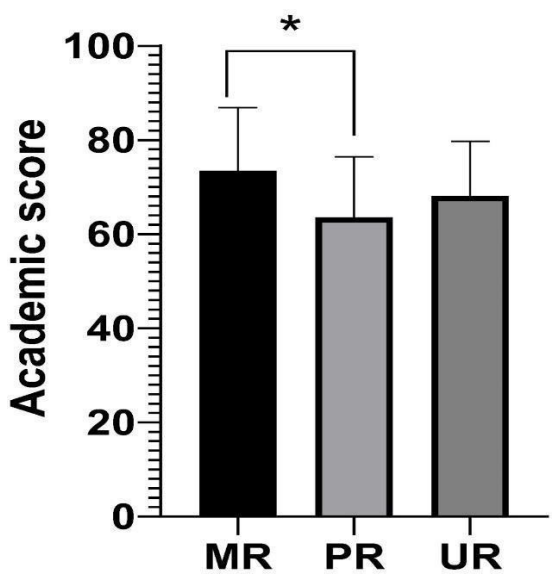

Figure 3: The relationship between participants' anxiety about their professional future and academic grade.

Participants with high anxiety scores were asked to evaluate to what extent their anxiety was related to their professional future. According to the one-way ANOVA analysis, in the group that reported having anxiety mainly related to their professional futures, academic performance was significantly higher compared to the group reporting anxiety unrelated to their professional futures. *: p<0,05. MR: Mainly related, PR: Partially related, UR: Unrelated

DISCUSSION

Considering the threshold values of the scales we used, this study showed that the prevalence of generalized anxiety disorder was 31.55%, and the prevalence of sleep disorders was 76% among medical students. Although the scales are not diagnostic tools, they are frequently used in similar studies. In this respect, in terms of the prevalence of generalized anxiety disorder, the rate reported here is higher than that of the general population but similar to the rates found in other studies involving medical students. The lifetime prevalence of anxiety disorders in the population is very variable (3.8-25%) (15). This prevalence is higher among medical students. A meta-analysis published by Quek et al. reported that the prevalence of anxiety among medical students is 33.8% (8). However, the prevalence of poor sleep quality in this study was found to be quite high compared to other rates in the current literature. In a meta-analysis by Rao et al, the prevalence of poor sleep quality utilizing the PSQI is 52.7% (16).

In this study, place of residence, alcohol consumption, smoking, and beverage consumption patterns 2 hours before bedtime were associated with sleep quality. There is no consensus in the current literature about the relationship between place of residence and sleep quality. In the study conducted by Foulkes et al., it was determined that poor sleep quality became more widespread after students moved to a university campus, and many factors were mentioned to explain that situation (17). In a study conducted in Türkiye, students living with their families had lower sleep quality scores than those living in dormitories, but the difference was not significant (18). Our study showed that sleep quality scores were significantly lower among those who lived with their families, but it must be noted that very few participants lived with their families. The relationship between poor sleep quality and factors such as smoking and alcohol consumption in the younger population is widely accepted despite some findings to the contrary (17,19).

In previous studies, a strong correlation between anxiety symptoms and poor sleep quality was reported (20). Anxiety results in sleep deprivation and, sleep deprivation leads to a further increase in anxiety levels (3). Poor sleep quality is frequently observed in college students, and this is especially more prominent among medical school students (21). However, in our study, poor sleep quality was reported at a rate of 76%, much higher than the rates of 45.3% and 60.1% previously reported in the literature (16).

While it is not possible to determine the exact reasons why poor sleep quality was higher in our study compared to the previous data, it can be partially explained based on the sociodemographic and lifestyle characteristics of the participants. The fact that only 5.8% of our participants lived with their families and the specific relationship between living with family and sleep quality may be one of the factors partially explaining this situation. Other factors, such as the high daily coffee consumption of the participants and the frequency of drinking behavior two hours before bedtime, are also likely contributing factors. However, it seems that there are still further factors that need to be taken into consideration. The relationship between students' anxiety and their professional futures may be meaningful in terms of explaining this difference.

Anxiety about the future increases with economic and social changes and it may be related not only to academic failure but also to occupational opportunities or working conditions (22). In this respect, it was predicted that economic and demographic changes in Türkiye and dissatisfaction with working conditions in the health field might trigger future anxiety among medical students. In our study, most of the participants stated that their anxiety was partially or mainly related to their professional futures. The academic performance of the students who reported this type of anxiety was found to be higher compared to those of other students. Although our findings on anxiety related to occupational

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future are valuable, the results must be confirmed with different methodological studies due to methodological limitations such as the lack of a suitable and widely accepted scale to measure it.

Some studies on the relationship between PSQI scores and academic performance reported negative correlations, while others did not (6,23,24). Considering that the PSQI considers the individual's sleep status within the last 1 month, it was thought that academic performance should be monitored in the acquisition of the study data rather than considering a single exam. Therefore, the exam results obtained over the course of a whole semester were considered here. In addition, for more nuanced analysis, the relationships between the subdimensions of the PSQI and academic performance were also analyzed and no significant relationships were found. Although we considered these particular issues while planning our study to obtain more accurate results, the high rate of sleep disturbance among our participants may have affected our other analytical results.

One of the most important contributions that our study makes to the literature is our demonstration of the fact that the frequency of sleep disorders is extremely high among medical school students. In their meta-analysis, Rao et al. found the percentage of students with PSQI scores above the cut-off value to be between 45.3% and 60.1%, while this rate was 76% in our study (16). In addition, another distinctive consideration of our research was the question of anxiety about individuals' professional futures. Although various scales and questionnaires have been developed to address this question on a wider basis, there is no scale to date addressing the current problems related to employment in the medical profession in Türkiye. In particular, previous studies have not discussed real-world issues such as the COVID-19 pandemic or, more importantly, violence against healthcare professionals. In the previous study that might be considered the most relevant to these issues, medical students completed a questionnaire addressing their future professional lives, but more general questions regarding the field of specialization and communication with patients were included (25).

The most important limitation of our study is that it was based on data from a single educational institution. However, the fact that more than half of the relevant students of this institution were reached in the process of building the sample is one of the positive features of our study.

Since this study was conducted in a medical faculty of a state university with a history of approximately 20 years, it is likely to show characteristics that would be similar to those of medical faculties across Türkiye on average. However, as mentioned above, it would not be accurate to generalize a single-centered study to the whole country. Important cautionary data have been presented here, but new studies are needed to confirm these data. With multicenter studies, our results could be confirmed or refuted on a national level in Türkiye. This would help reveal the factors affecting anxiety and sleep disturbances among medical students on a wider scale.

In conclusion, this study has shown that anxiety levels were high and sleep disturbances were common among medical students. The majority of the anxiety reported by these students was related to their future professional careers, and the academic performance levels of the participants who reported such stress were higher. In light of these findings, new approaches should be developed to better understand the reasons for such anxiety among medical students in Türkiye and to develop new strategies for reducing their levels of stress.

*Conflict of interest***:** No potential conflict of interest was declared by the authors.

Researchers' Contribution Rate Statement: Concept/ Design: İY, SB; Analysis/Interpretation: İY; Data Collection: İY, SB; Writer: İY, SB; Critical Review: İY, SB; Approver: İY, SB

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Ethics Committee Approval: The study was approved by the Ethics Committee of Kafkas University's Faculty of Medicine with a decision dated 08/06/2022 and numbered 86.

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