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The Relationship Between Nurses' Sleep Quality and Their Tendency to Commit Medical Errors

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Abstract

Objective To examine the relationship between nurses' sleep quality and their tendency to commit medical errors.

Materials and Methods The research was conducted in a state hospital, a private hospital, and a university hospital in a province located in the west region of Turkey (n = 378 nurses) between September 2020 and October 2021. Data was collected using a sociodemographic data form, the Medical Error Tendency Scale in Nursing (METSN), and the Pittsburgh Sleep Quality Index (PSQI). Verbal and written consent were obtained from the nurses who participated in the study. The data were collected through face-to-face interviews.

Results The mean score of the nurses was of 8.25 ± 4.81 on the PSQI and of 230.29 ± 14.15 on the METSN. A significant difference was found regarding age, marital status, level of schooling, weekly working hours, and the shift schedule of nurses and their sleep quality ($p < 0.001$). A significant difference was found regarding age, marital status, level of schooling, the hospital the nurses worked in, and the tendency to commit medical errors ($p < 0.001$). There was a statistically significant negative and moderate correlation between the PSQI and METSN scores ($p < 0.001$; $r = -0.548$).

Conclusion The tendency of nurses to commit medical errors was determined as low, and their sleep quality was poor. We have also determined that, as the sleep quality worsened, the tendency of nurses to commit medical errors increased.

Keywords
- sleep quality
- work hours
- nurses

Introduction

Continuity is important in the care of patients, so nurses should work in shifts so that care is not disrupted. As the largest workforce in hospitals, nurses have heavy responsibilities regarding patient care. Nurses suffer from poor sleep, especially in hospitals.[1] In recent years, this has been a thoroughly-discussed issue worldwide in terms of ethical, legal, medical, educational, and managerial aspects, for there have been many deaths and injuries related to medical errors globally.[2,3] Medical errors are often either directly caused by healthcare professionals or are the result of the healthcare systems.[4,5]

The nursing profession, which is one of the occupational groups that has to work in shifts, makes up an important risk group in terms of high sleep disorders and low sleep quality due to working hours that are not suitable for the natural biological rhythm of humans.[6–8] In the nursing profession,

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sleep quality is essential to be able to provide proper care to patients. Nursing also requires high levels of concentration, the performance of complex tasks, and it entails huge responsibilities. Factors such as the pace of work, overtime, and shift work may produce stress, which may increase the probability of suffering from sleep disorders.[9] In the study conducted by Dong et al.,[1] the sleep quality of emergency nurses in public hospitals in China was found to be poor. Some studies[10–12] have shown that night-shift nurses have significantly worse sleep quality scores than day-shift nurses.

Medical errors are largely preventable.[4] Globally, as many as 4 in 10 patients are harmed in primary and outpatient health care. In the study by Jember et al.,[13] the rate of reports of medication error among nurses was found to be of 57.4%. In the study by Vaziri et al.,[14] the results of the meta-analysis indicate that the overall prevalence of medication error was of 50%. The most detrimental errors are related to diagnosis, prescription, and the use of medicines.[15] Among health professionals, medical errors are mostly committed by nurses.[9,16] The heavy working conditions for nurses (who are in constant communication with patients, caring for critical patients, exposed to intense stress, and have to perform many procedures at the same time) always increase the possibility of making mistakes. Various studies[2,16,17] have shown that conditions such as working in stressful environments, long working hours, working shifts, insomnia, and lack of personnel increase the tendency to commit medical errors. Di Simone et al.[16] found a significant relationship between the risk of committing medication errors and poor sleep quality among nurses.

In order not to cause medical harm to patients, nurses should be careful not to perform practices that endanger patient safety and to evaluate patients holistically. In addition, they should be aware of the conditions that increase the risk of committing medical errors and take precautions to avoid legal problems that may occur.[2]

According to the literature, the tendency of nurses to commit medical errors is high, and their sleep quality is low, but this depends on many factors. Nonetheless, studies on the relationship between nurses'1 sleep quality and their tendency to commit medical errors are limited. There are separate studies on nurses' tendency to commit medical errors[3,4,8] and their sleep quality[7] in Turkey, but no study on the relationship between those two concepts has been found. In this context, the present study was conducted to examine the relationship between the sleep quality of nurses working shifts and their tendency to commit medical errors.

Research Questions

1. What is the level of quality of sleep among nurses and their tendency to commit medical errors?
2. Do sociodemographic factors and work characteristics affect nurses' sleep quality and tendency to commit medical errors?
3. Is there a relationship between the sleep quality of nurses and their tendency to commit medical errors?

Materials and Methods

Study Design

The present research was conducted as a descriptive and correlational study to determine the relationship between nurses' sleep quality and their tendency to commit medical errors. The research was conducted between September 2020 and October 2021 with nurses working shifts at a state hospital (N = 235), a private hospital (N = 278), and a university hospital (N = 757) in a province in the west of Turkey.

Study Population

The population of the study consisted of 1,270 nurses working at these three hospitals. The study sample was determined by using the sampling of the known universe formula:

$$n = N \times t^2 \times p \times q \div d^2 \times (N - 1) + t^2 \times p \times q.$$

In the present study, the calculation of the sample was based on a confidence level of 95%, an error margin of 5%, and t = 1.96 and d = 0.05 were used in the formula. Accordingly, the sample size for the total number of 1,270 nurses was calculated at a 0.05 significance level as follows:

$$N = 1{,}270 \times (1.96)^2 \times (0{,}5 \times 0{,}5) \div (0{,}05)^2 \times (1{,}270\text{-}1) + (1.96)^2 \times (0.5 \times 0.5);$$
$$n = 1{,}270 \times 3.8416 \times 0.25 \div 0.0025 \times 1{,}269 + 3.8416 \times 0{,}25;$$
$$n = 295.$$

Based on this equation, and considering the ± 5% tolerable sampling error, 95% confidence level, and the assumption of a heterogeneous universe, the minimum sample size was determined as 295 subjects. Considering data loss, a total of **378** nurses were reached.

Nurses who were not on leave at the time of the study and volunteered to participate were included. Verbal and written consent was obtained from the nurses by providing the necessary information about the purpose of the study and data collection forms. The data were collected through face-to-face interviews. Filling out the forms took an average of 15 minutes.

The independent variables included sociodemographic characteristics (age, gender, level of schooling, and marital status), information about their job (the institution in which they work, total work experience, shift schedule [8 am–4pm: 8 hours; 8am–8pm: 12 hours; 4pm–8am: 16 hours; and permanent night shift: midnight–8am: 8 hours], the number of patients they provide care for, the difficulties they experience in the workplace etc.), and individual characteristics (alcohol and cigarette use, daily tea/coffee consumption, presence of chronic disease, drugs regularly used) that are thought to affect sleep quality.

The dependent variables included the mean scores on the Medical Error Tendency Scale in Nursing (METSN) and the Pittsburgh Sleep Quality Index (PSQI). The inclusion criteria were working as a nurse for at least one year and working shifts, and the exclusion criteria were nurses who were away from work during the data collection period, and those who worked in the polyclinic or were only working the day shift.

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Data Collection

The data collection tools were a sociodemographic data form, which reflects the sociodemographic characteristics of nurses, the METSN, and the PSQI.

Sociodemographic Data Form

This form was developed by the researchers following a review of the literature. It consists of 14 questions, including sociodemographic characteristics, information about the nursing profession, and individual characteristics that are thought to affect sleep quality.[10,12,17,18]

METSN

This scale was developed by Özata and Altunkan[18] to determine the tendency of working nurses to commit medical errors, and its validity and reliability study was conducted by the same authors. The scale is used to evaluate the routine care activities of nurses working at a hospital. High total scores on the scale are interpreted as a decrease in the tendency to commit medical errors, and the scale has a 5-point Likert-type structure that consists of 49 items and 5 subdimensions, namely: drug and transfusion applications (18 items); prevention of infections (12 items); patient follow-up and material-device safety (9 items); prevention of falls (5 items); and communication (5 items), which include the activities that nurses perform daily in terms of in-patient care. Each item contains 5 answer options: 1) never; 2) rarely; 3) sometimes; 4) usually; and 5) always.[18] The internal consistency (Cronbach alpha) of the original scale was of 0.95, while it was found to be of 0.80 in the present study. The internal consistency of the subdimensions of the scale were calculated as follows; 0.70 for drug and transfusion practices; 0.71 for prevention of infections; 0.74 for patient follow-up and material-device safety; 0.79 for prevention of falls; and 0.80 for communication.

PSQI

Developed by Buysse et al.,[19] the PSQI is a self-report screening and evaluation test that provides detailed information on sleep quality and the type and severity of sleep disturbances in the last month. It consists of 24 questions divided into 7 components: subjective sleep quality; sleep latency; sleep duration; sleep efficiency; sleep disturbance; use of sleep medication; and daytime dysfunction. The total score, which ranges from 0 to 21, is obtained by adding the scores on each component; scores between 0 and 4 indicate good sleep quality, and those above 5 indicate that the person has serious trouble in at least two areas of sleep or has mild or moderate distress in more than three areas. The Turkish validity and reliability study of the index was conducted by Ağargün et al.,[20] and the Cronbach alpha coefficient was of 0.80, the same value found in the present study.

Ethical Considerations

We obtained approval from the Ethics Committee for Non-Interventional Research (date: 2021/01-38;5844-GOA), as well as written permission from the hospitals where the research was conducted and the provincial health directorate. Moreover, permission from the authors to use the METSN and PSQI was obtained via e-mail.

Before the study was initiated, the nurses were informed about its purpose and that participation was voluntary; then, we obtained their informed consent.

Data Analysis

The statistical analysis was conducted using the IBM SPSS Statistics for Windows (IBM Corp., Armonk, NY, United States) software, version 24.0, and the normality of the data was evaluated through the Kolmogorov-Smirnov test. Descriptive statistics for normally-distributed continuous variables were reported as mean ± standard deviation (SD) values. Descriptive statistics of the non-normally-distributed variables were calculated as median (minimum–maximum) values. The independent *t*-test or the Mann-Whitney U test was used for the comparison of continuous variables between two independent groups depending on the normal distribution of the data. When the quantitative variables were compared in groups of three or more, one-way analysis of variance (ANOVA) was used for the normally-distributed data, and the Kruskal-Wallis test was used for data that were not normally distributed. We used non-parametric tests in paired and multiple comparisons, since the weekly working hours of the nurses and the mean PSQI scores did not show normal distribution. Parametric tests were used in paired and multiple comparisons, such as those regarding sociodemographic variables and variables related to working conditions, and the total and subdimension scores on the METSN showed normal distribution. The Spearman correlation coefficient was used to measure the relationship involving the non-normally distributed scores. Significance was evaluated within a 95% confidence interval (95%CI) and set as values of $p < 0.05$.

Results

Sociodemographic and Work Characteristics

The mean age of the 378 nurses was of 29.27 ± 7.79 years, 81.7% were female, 65.1% were single, and 56.9% had an undergraduate degree. In total, 47.1% worked in private hospitals, 58.7% worked shifts, 48.1% were on duty 6-10 times a month, 86.2% worked more than 40 hours a week, and 39.4% provided care to at least 1 to 5 patients while 33.1%, to 6 to 10 patients (►**Table 1**).

Comparison of Sociodemographic and Work Characteristics and Mean METSN Scores

The mean total METSN score was of 230.29 ± 14.15, and mean scores on the sub-dimensions of the scale were as follows: drug and transfusion applications – 85.99 ± 4.92; infection prevention – 56.63 ± 4.58; patient follow-up and material-device safety – 39.81 ± 4.57; prevention of falls – 23.88 ± 1.67; and communication – 23.98 ± 1.37.

Statistically significant differences were found regarding total and subdimension METSN scores in terms of age group, marital status, level of schooling, the hospital in which the nurses worked, shift schedule, and weekly working hours ($p < 0.05$). Accordingly, the total and subdimension METSN scores were higher among nurses aged between 20 and 35 years, who were high school graduates, worked in a

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Table 1 Data collected on the nurses' work (n = 378).

	n	%
Institution served		
Public hospital	70	18.5
University Hospital	130	34.4
Private hospital	178	47.1
Shift schedule		
8am–4pm	78	20.6
8am–8pm	11	2.9
4pm–8am	23	6.6
Permanent night shift (midnight–8am)	44	11.7
Shift	222	58.7
Working on weekends		
Yes	355	93.9
No	23	6.1
Number of seizures per month		
No	65	17.2
1–5	59	15.6
6–10	182	48.1
11–15	65	17.2
≥ 16	7	1.9
Weekly working hours		
40	52	13.8
> 40	326	86.2
Number of patients to whom daily care is provided		
1–5	149	39.4
6–10	125	33.1
11–15	46	12.2
15–20	27	7.1
> 21	31	8.2
TOTAL	**378**	**100.0**

private hospital, were single, worked on the 4pm to 8am shift, and worked more than 40 hours per week (►**Table 2**).

Distribution of PSQI Scores According to Descriptive Characteristics

The mean PSQI score was of 8.25 ± 4.81, and– 78.31% of the nurses had poor sleep quality (PSQI > 5), while 21.69% had healthy sleeping habits (PSQI ≤ 5) (►**Table 3**).

Statistically significant differences were found regarding the mean PSQI scores in terms of age, marital status, level of schooling, shift schedule, and weekly working hours ($p < 0.05$) (►**Table 4**).

Correlations regarding METSN and PSQI Scores

There was a moderate and statistically significant negative correlation between the METSN and PSQI scores ($p < 0.001$; $r = -0.548$): as the sleep quality deteriorated, the tendency to commit medical errors increased. According to the Spearman correlation analysis, there were statistically significant, negative, and weak correlations involving the PSQI scores and the scores on the following METSN subdimensions: drug and transfusion applications ($p < 0.001$; $r = -0.218$); prevention of infections ($p = 0.004$; $r = -0.146$); prevention of falls ($p = 0.130$; $r = -0.369$); patient monitoring and material-device safety ($p < 0.003$; $r = -0.338$); and communication ($p = 0.036$; $r = -0.488$). As the sleep quality deteriorated, the tendency to commit medical errors increased (►**Table 5**).

Discussion

In the present study, the mean PSQI score was > 5 (8.25 ± 4.81), and 78.31% of the sample had poor sleep quality, which is in line with some of the studies in the literature. Palhares et al.[21] found a mean PSQI score of 7.3 ± 3.6, and 34.9% of the nurses in their sample had a mean PSQI score ≥ 5. Kamkar et al.[22] reported that nurses had poor sleep quality. Analyzing Turkish studies on the sleep quality of nurses, Pirinçci et al.[7] found a mean PSQI score of 6.70 ± 3.35, and 55.8% had poor sleep quality. In the study by Tarhan et al.,[23] the rate of poor sleep quality was of 61.9%, and Khatony et al.[24] found a rate of 77.4%.

In the present study, a significant difference was found between age and sleep quality: sleep quality deteriorated as age increased ($p < 0.05$). Aliyu et al.[25] and Morimato et al.[26] differ from our research, for they have reported that sleep quality does not change according to age. Tarhan et al.[23] found that nurses aged ≥ 41 years were 9.5 times more likely to be in the group with low sleep quality than nurses aged ≤ 25 years, and that advanced age was a risk factor for poor sleep quality. In the study by Khatony et al.,[24] younger nurses experienced more sleep problems, and Kamkar et al.[22] found that age was an important factor affecting sleep quality.

In the present study, marital status was one of the factors affecting sleep quality. Studies, such as the one by Kamkar et al.,[22] have shown that the sleep quality of married nurses is worse than that of single nurses. However, Salehi et al.[27] found no relationship between marital status and sleep quality.

Shift work has significantly changed the sleep patterns of nurses. Sleep problems are prevalent among shift nurses, and they have a negative effect on health, the quality of the care provided, and job satisfaction.[11] In the present study, we found a significant difference between sleep quality and shift schedule. In particular, nurses working shifts and constantly at night had higher mean PSQI scores and worse sleep quality ($p < 0.05$). Bazrafshan et al.[28] found that working shifts negatively affected the sleep quality of nurses. Dong et al.,[1] McDowall et al.,[29] and Khatony et al.[24] found that the sleep quality of nurses working shifts in general and of those working the night shift was low. Tarhan et al.[23] emphasized that the sleep quality of nurses working the day shift was better, and that the sleep quality of those working the night shift was 14.1 times lower.

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Table 2 Comparison of sociodemographic and work characteristics and mean METSN scores(n = 378).

	n	Drug and transfusion applications: mean ± SD	Prevention of infections: mean ± SD	Fall prevention: mean ± SD	Patient monitoring and material-device safety: mean ± SD	Communication: mean ± SD	METSN total score Mean ± SD
Age in years							
20–35 (1)	301	86.54 ± 4.79	56.99 ± 4.46	24.12 ± 1.47	40.06 ± 4.57	23.99 ± 1.34	231.70 ± 13.70
36–50 (2)	69	83.58 ± 4.75	55.14 ± 4.72	22.84 ± 2.11	38.65 ± 4.55	23.97 ± 1.59	224.19 ± 14.38
≥ 51 (3)	8	85.88 ± 5.69	55.88 ± 5.69	24.25 ± 1.04	40.13 ± 3.80	23.88 ± 0.83	230.00 ± 16.69
Test		F: 10.697; **$p = 0.001$**;* 2 > 3; 2 > 1; 3 > 1	F: 4.741; **$p = 0.009$**;* 2 > 3; 2 > 1; 3 > 1	F: 18.097; **$p = 0.001$**;* 2 > 1; 2 > 3; 1 > 3	F: 2.705; **$p = 0.048$**;* 2 > 1; 2 > 3; 1 > 3	F: 0.131; $p = 0.269$	F: 8.210; **$p = 0.001$**;* 2 > 3; 2 > 1; 3 > 1
Marital status							
Married	132	84.48 ± 5.01	55.58 ± 4.92	23.38 ± 1.93	38.62 ± 4.84	24.02 ± 1.33	234.49 ± 12.36
Single	246	87.52 ± 4.62	57.68 ± 4.15	24.41 ± 1.95	40.98 ± 4.32	23.94 ± 1.42	230.29 ± 14.15
Test		*t*: 3.231; **$p = 0.001$***	*t*: 2.294; **$p = 0.004$***	*t*: 4.142; **$p = 0.001$***	*t*: 3.252; **$p = 0.001$***	*t*: 0.174; $p = 0.934$	*t*: 5.685; **$p = 0.001$***
Level of schooling							
High school (1)	51	88.84 ± 4.51	58.47 ± 2.47	24.08 ± 1.94	43.18 ± 2.54	24.57 ± 0.83	239.14 ± 9.11
Prebachelor's (2)	105	87.80 ± 4.00	58.20 ± 3.51	24.45 ± 1.17	41.94 ± 3.15	24.26 ± 1.06	236.65 ± 11.39
Bachelor's (3)	215	84.42 ± 4.87	55.43 ± 5.04	23.58 ± 1.73	38.02 ± 4.70	23.74 ± 1.53	225.19 ± 14.19
Master's/Doctorate (4)	7	86.29 ± 3.99	56.43 ± 4.96	23.57 ± 1.99	38.00 ± 2.16	23.00 ± 1.53	227.29 ± 11.64
Test		F: 20.483; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 1; 4 > 2; 4 > 1	F: 12.918; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 1; 4 > 2; 4 > 1	F: 7.057; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 1; 4 > 2; 4 > 1	F: 36.078; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 1; 4 > 2; 4 > 1	F: 8.294; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 1; 4 > 2; 4 > 1	F: 28.146; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 1; 4 > 2; 4 > 1
Institution served							
Public hospital (1)	70	83.30 ± 4.48	55.41 ± 4.37	22.47 ± 2.21	37.89 ± 3.75	23.76 ± 1.78	222.83 ± 12.12
University hospital (2)	130	84.18 ± 5.05	54.77 ± 5.36	23.88 ± 1.29	37.61 ± 4.88	23.60 ± 1.49	224.04 ± 14.72
Private hospital (3)	178	88.37 ± 3.78	58.46 ± 3.13	24.44 ± 1.31	42.16 ± 3.33	24.35 ± 0.95	237.79 ± 10.19
Test		F: 30.572; **$p = 0.001$**;* 1 > 2; 1 > 3; 2 > 3	F: 31.909; **$p = 0.001$**;* 1 > 2; 1 > 3; 2 > 3	F: 42.881; **$p = 0.001$**;* 1 > 2; 1 > 3; 2 > 3	F: 58.556; **$p = 0.001$**;* 1 > 2; 1 > 3; 2 > 3	F: 13.293; **$p = 0.001$**;* 1 > 2; 1 > 3; 2 > 3	F: 33.073; **$p = 0.001$**;* 1 > 2; 1 > 3; 2 > 3

(*Continued*)

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Table 2 (*Continued*)

	n	Drug and transfusion applications: mean ± SD	Prevention of infections: mean ± SD	Fall prevention: mean ± SD	Patient monitoring and material-device safety: mean ± SD	Communication: mean ± SD	METSN total score Mean ± SD
Shift schedule							
8am–4pm (1)	78	87.71 ± 3.92	58.23 ± 3.11	24.12 ± 1.65	41.72 ± 3.33	24.40 ± 0.83	236.17 ± 10.74
8am–8pm (2)	11	84.73 ± 5.10	54.91 ± 5.03	24.09 ± 0.94	39.73 ± 3.95	23.73 ± 1.10	227.18 ± 14.96
4pm–8am (3)	23	80.91 ± 3.87	51.86 ± 4.42	22.59 ± 1.59	37.73 ± 3.38	23.55 ± 0.91	216.64 ± 12.80
Permanent night shift (midnight–8am) (4)	44	84.80 ± 5.21	55.23 ± 5.49	24.14 ± 1.00	38.02 ± 4.97	23.75 ± 1.16	225.93 ± 15.12
Shift (5)	222	86.18 ± 4.91	56.88 4.44	23.87 ± 1.77	39.71 ± 4.77	23.95 1.57	230.59 14.00
Test		F: 8.065; **$p = 0.001$**;* 3 > 2; 3 > 4; 3 > 5; 2 > 4; 2 > 5; 4 > 5	F: 8.893; **$p = 0.001$**;* 3 > 2; 3 > 4; 3 > 5; 2 > 4; 2 > 5; 4 >	F: 3.372; **$p = 0.005$**;* 3 > 5; 3 > 2; 3 > 1; 3 > 4; 5 > 2; 5 > 1; 5 > 4	F: 5.368; **$p = 0.001$**;* 3 > 4; 3 > 5; 3 > 2; 4 > 5; 4 > 2; 5 > 2	F: 3.249; **$p = 0.007$**;* 3 > 2; 3 > 4; 3 > 5; 2 > 4; 2 > 5; 4 > 5	F: 8.527; **$p = 0.001$**;* 3 > 4; 3 > 2; 3 > 5; 4 > 2 4 > 5; 2 > 5
Weekly working hours							
40	52	86.09 ± 6.09	56.65 ± 3.34	24.66 ± 2.25	39.87 ± 4.27	23.90 ± 0.89	230.34 ± 12.59
> 40 hours	326	85.04 ± 4.73	56.46 ± 4.74	22.07 ± 1.48	39.36 ± 4.62	23.52 ± 1.42	228.59 ± 14.37
Test		U: 3.002; **$p = 0.018$***	U: 1.076; **$p = 0.786$***	U: 33.814; **$p = 0.001$***	U: 0.543; $p = 0.461$	U: 8.947; **$p = 0.003$***	U: 1.096; **$p = 0.296$***

Abbreviations: METSN, Medical Error Tendency Scale in Nursing; SD, standard deviation.
Notes: *t*: independent *t*-test. F: one-way analysis of variance (ANOVA). U: Mann-Whitney U test. Differences: Bonferroni test. *Statistically significant ($p < 0.05$).

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Table 3 Frequency distribution of sleep quality (n = 378).

Pittsburgh Sleep Quality Index (PSQI)	N	%
Good sleeper (PSQI ≤ 5)	82	21.69
Bad sleeper (PSQI > 5)	296	78.31
Total	378	100.00

In the present study, when the mean PSQI score was examined according to the weekly working hours, the sleep quality of those who worked more than 40 hours was found to be low, and the difference was significant. Dong et al.,[1] Stimpfel et al.,[30] and Farag et al.,[31] found that sleep quality decreased in parallel with the increase in weekly working hours.

Table 5 Correlations regarding the total score son the METSN and PSQI.

Total and subdimension METSN scores	Total PSQI score	
	r_p	p
Drug and transfusion applications	−0.218	**0.001***
Prevention of infections	−0.146	**0.004***
Fall prevention	−0.369	0.130
Patient monitoring and material-device safety	−0.338	**0.003***
Communication	−0.488	**0.036***
Total METSN score	−0.548	**0.001**

Abbreviations: METSN, Medical Error Tendency Scale in NursingPSQI, Pittsburgh Sleep Quality Index.
Note: *Statistically significant ($p < 0.05$).

Table 4 Distribution of Pittsburgh Sleep Quality Index (PSQI) scores according to sociodemographic and work data (n = 378).

	N	PSQI: mean ± standard deviation	Test
Age in years			
20–35	301	8.22 ± 4.83	
36–50	69	8.33 ± 4.79	
≥ 51	8	8.52 ± 4.54	Kruskal-Wallis = 8.907; **p = 0.001***
Gender			
Female	309	8.25 ± 4.81	
Male	69	8.23 ± 4.81	Mann-Whitney U = 1.023; p = 0.338
Marital status			
Married	132	8.32 ± 4.78	
Single	246	8.11 ± 4.95	Kruskal-Wallis = 2.401 **p = 0.008***
Level of schooling			
High school	51	8.39 ± 4.72	
Prebachelor's degree	105	8.24 ± 4.76	Kruskal-Wallis = 10.690; **p = 0.014***
Bachelor's degree	215	8.26 ± 4.89	
Master's or Doctorate	7	7.54 ± 4.56	
Institution served			
Public hospital	70	8.33 ± 4.68	Kruskal-Wallis = 4.771; p = 0.214
University Hospital	130	8.28 ± 4.43	
Private hospital	178	8.04 ± 4.52	
Shift schedule			
8am–4pm	78	7.53 ± 4.18	Chi-squared = 7.015; **p = 0.001***
8am–8pm	11	8.05 ± 4.33	
4pm–8am	23	8.14 ± 4.72	
Permanent night shift (midnight–8am)	44	8.48 ± 4.83	
Shift	222	8.54 ± 4.92	
Weekly working hours			
40	52	8.28 ± 4.63	
> 40	326	9.34 ± 4.51	Mann-Whitney U = 2.031; **p = 0.036***

Note: *Statistically significant ($p < 0.05$).

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We found that the tendency of nurses to commit medical errors was low (230.29 ± 14.15), which is in line with the studies by Ozer et al.,[4] Özen et al.,[32] and Sabanciogullari et al.[8] Karadağ et al.[17] found that nurses had a higher tendency to make medical errors in drug administration and transfusions and in preventing falls, and a lower tendency to make medical errors in communication and in prevention of infection.

In the present study, we found a significant difference between the shift schedule and the tendency to commit medical errors: nurses working on the 4pm to 8am shift had a higher tendency to commit medical errors ($p < 0.05$), which corroborates the findings of Kiymaz and Koç,[2] and Özen et al.[32] We also found a statistically significant difference between the level of schooling and the tendency to commit medical errors, unlike Özen et al.[32]

We found a moderate and statistically significant negative correlation between the PSQI and METSN scores ($r = -0.548$; $p < 0.001$): as the sleep quality deteriorates, the tendency to commit medical errors increases. Working shifts and particularly the night shift can disrupt the circadian sleep rhythm and cause fatigue, inattention, and poor performance, resulting in medical errors.[8] Di Simone et al.[16] found a significant relationship between the risk of committing medication errors and poor sleep quality among nurses. No other study was found in the literature on nurses' sleep quality and their tendency to commit medical errors. Therefore, it is a topic that should be more thoroughly discussed.

Conclusion

In the present study, we found that the tendency of nurses to commit medical errors was low, and there were significant differences regarding the mean METSN scores, age, level of schooling, and the hospital in which they worked. We concluded that nurses had poor sleep quality, and there were statistically significant differences involving the mean PSQI scores and age, level of schooling, shift schedule, and weekly working hours. Moreover, there was a statistically significant negative and moderate relationship regarding the METSN and PSQI scores and the tendency to commit medical errors increased as the sleep quality deteriorated.

To improve sleep quality and minimize medical errors, the number of nurses in health institutions should be increased as much as possible, the number of shifts should be reduced, and the working and resting hours should be rearranged. Nurses should be provided education on medical errors at regular intervals. It is thought that arranging the work life by taking sociodemographic and work characteristics into account may effectively increase nurses' sleep quality and reduce the rate of medical errors.

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Conflict of Interests
The authors have no conflict of interests to declare.

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