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The sleep quality of nurses and its influencing factors

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Abstract:

BACKGROUND: It is a known fact that nurses who are obliged to maintain the continuity of quality and safety patient care have a serious risk of sleeping problems. From this point of view, the study was conducted to determine the sleep quality of nurses and its influencing factors.

MATERIALS AND METHODS: This descriptive-cross-sectional study was carried out on 152 nurses working at a training and research hospital in Istanbul. A questionnaire form including Individual Characteristics Form, Pittsburgh Sleep Quality Index (PSQI), Hospital Anxiety and Depression Scale (HAD), Epworth Sleepiness Scale (ESS), and Fatigue Severity Scale (FSS) was used to collect data. Descriptive tests, Chi-square test, Spearman's correlation analysis, and binary logistic regression analysis were used for statistical analysis.

RESULTS: It was determined that 61.9% of nurses had poor sleep quality. While a weak positive correlation was found between PSQI, ESS, and HAD-D, a moderate correlation was determined between PSQI, FSS, and HAD-A. Age, working shifts, anxiety, and fatigue levels were found to be factors influencing sleep quality.

CONCLUSIONS: The results of the study show that sleep quality of nurses is low in approximately two-thirds of them, and factors such as older age, night shift work, and high anxiety and fatigue levels have a negative effect on sleep quality. It is thought that the regulation of working life considering age, professional experience, and mental health status may be effective in order to increase the sleep quality of nurses.

Keywords:

Nursing, sleep quality, sleep

Introduction

Today as a result of health care organizations' efforts to provide high-quality and cost-effective care with minimum staffing, nurses who are the most crowded professional group in an organization are forced to struggle with irregular schedules.^[1] This leads to impaired quality of sleep among nursing staff resulting in physical and mental health conditions, which in turn reflects their professional performance and thus may jeopardize patient safety.^[2,3]

The workload in nursing shifts may vary as reported by studies from different parts of the

world, but there is consensus that working in shifts interferes with sleep quality.^[2-8] In parallel, studies also report that nurses with poor quality of sleep suffer more frequently from daytime sleepiness and fatigue.^[2,9-13] A study from Norway indicates that chronic fatigue is more common among nurses who work in night shifts compared to those who do not.^[10] Sleep problems are associated with an impairment in learning, focusing, safe functioning, and decision-making skills of nurses.^[14,15] At the same time, some studies suggest that it also increases the likelihood to make medical errors, to be involved in workplace accidents, and to suffer from chronic conditions.^[12,16]

In spite of numerous studies to evaluate the sleep quality of nurses globally, there

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are only few publications that address this issue in our country and thus, we believe that this study will contribute to the available body of scientific evidence. Based on this assertion, this study aims to identify the factors that influence the sleep quality of nurses.

Materials and Methods

This descriptive-cross-sectional study was conducted at a teaching and research hospital in Istanbul between July 15 and August 15, 2016. The sample comprised 152 nurses (out of 200) working in the hospital during the study who filled out the questionnaire completely and correctly and accepted to participate in the study. The participation rate to the study was 76%.

Data were collected using a questionnaire, which included 5 chapters and 64 questions on the following: Individual Characteristics Form, Pittsburgh Sleep Quality Index (PSQI), Hospital Anxiety and Depression Scale (HAD), Epworth Sleepiness Scale (ESS), and Fatigue Severity Scale (FSS).

Individual Characteristics Form

The investigators designed the form based on a literature review to collect data on 12 personal characteristics of nursing staff including age, gender, marital status, number of children, department and position, professional seniority/tenure, mode of working, and weekly working hours.^[17-20]

Pittsburgh Sleep Quality Index

This scale consists of 7 components and 18 individual items. Each component is rated between 0 and 3 and a global sleep quality score is calculated by adding the seven component scores. The lowest and highest global scores on this scale are 0 and 21, respectively. A score of 5 or above indicates a “poor” sleep quality of the respondent.^[21] The Cronbach’s alpha reliability value for this scale was 0.70 in this study.

Hospital Anxiety and Depression scale

This scale consists of 14 questions, seven of which are related to anxiety (odd numbers) and seven to depression (even numbers). Each item is scored from 0 to 3. The lowest and highest scores achievable on this scale are 0 and 21, respectively. Individuals who score 10 or above on the anxiety subscale (HAD-A) or 7 or above on the depression subscale (HAD-D) are categorized as “high risk” for anxiety or depression.^[22] In this study, the Cronbach’s alpha reliability values were 0.75 and 0.50 for the HAD-A and HAD-D scales, respectively.

Epworth Sleepiness Scale

This scale evaluates the daytime sleepiness by measuring the likelihood of falling asleep or being sleepy in eight

different situations of daily life. Each item is scored between 0 and 3 and the lowest and highest total scores are 0 and 24, respectively. A score of 10 or above indicates a “daytime sleepiness problem” of the individual.^[23] The Cronbach’s alpha reliability value for this scale was 0.76 in this study.

Fatigue Severity Scale

Each item on this 9-item scale is scored between 1 and 7 (1 = strongly disagree and 7 = strongly agree) and the average of 9 items gives the total score. The lowest and highest global scores achievable on this scale are 9 and 63, respectively. A score of 4 or above indicates a “pathologic fatigue problem” of the individual.^[24] The Cronbach’s alpha reliability value for this scale was 0.70 in this study.

The study was approved by the Ethics Board (Decision No: 2017/311), and written permission was obtained from the public secretariat our organization reports to. After providing information and obtaining verbal consent from the participating nurses, they were asked to complete the questionnaire at their leisure time (questionnaire’s average response time: 15–20 min). The charge nurses of the units delivered the completed forms to the investigators.

Statistical analysis

The collected data were analyzed using SPSS Statistics computer software for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as numbers and percentages and continuous variables were expressed as means and standard deviations (SD). Kolmogorov–Smirnov test showed an abnormal distribution of the scales ($P < 0.05$). Chi-square test was used to correlate the individual characteristics of nurses with the likelihood of falling in the normal/poor sleep quality group on the PSQI. The relationship between PSQI and the other scales was studied using Spearman’s correlation analysis. Dual logistic regression was used to identify factors that impact the quality of sleep of nurses. Reliability analysis was used to determine the Cronbach’s alpha reliability values of the scales used. The significance level was set at 0.05.

Results

The mean age of nurses who were included in the study was 31.6 years (range: 20–56 years, SD: 8.2), with the majority of participants being female (75%). More than half of the nurses (57.2%) were married with children (55.9%). Approximately half (48.7%) of the nurses had a graduate degree and 38.8% had 10 years or more of professional experience. Based on the information provided, 13.8% of the respondents had managerial positions, more than half (55.9%) worked in open spaces, 44.7% worked in rotational shifts, and

58.6% worked 45 h more per week. Nearly 42.1% were nonsmokers and 84.2% had no medical conditions. The individual characteristics of the participants are shown in Table 1.

The mean score of the nurses on the PSQI scale was 6.65 ± 3.48 (min: 0, max: 17) and 61.9% of the nurses reported that their quality of sleep was poor. The mean scores on the HAD-A and HAD-D scales were 9.05 ± 4.07 (min: 1, max: 19) and 7.61 ± 3.09 (min: 2, max: 15), respectively. Almost 42.8% of the nurses were categorized as high risk for anxiety and 58.6% as high risk for depression. The mean score on the ESS was 6.18 ± 4.66 (min: 0, max: 18) and the mean score of the FSS was 35.98 ± 15.32 (min: 0, max: 63), which suggests that 22.4% of the nurses suffer from daytime sleepiness and 55.9% from pathological fatigue [Table 2].

The average scores of the nurses on the PSQI scale are shown in Table 3. The highest average scores were obtained on sleep duration (1.31 ± 0.95), whereas the lowest average score was related to medication use (0.13 ± 0.49) component. A score of 0 was obtained on medication use by 91.4%, on sleep efficiency in 82.9%, and on subjective quality of sleep in 8.6%.

The correlation of the individual characteristics of nurses with the likelihood of falling in the normal/poor sleep quality group on the PSQI is shown in Table 1. Significant correlation was identified with being in the normal/poor sleep quality group on the PSQI and participant's age ($P < 0.001$), duration of professional experience ($P < 0.01$), working shifts ($P < 0.001$), and smoking ($P < 0.05$). While the likelihood of being in poor sleep quality group was higher for nurses in the 25–32 years' age group who had a professional experience of 10 years or more and who were smokers, the nurses who worked in the day shift were less likely to suffer from poor quality of sleep.

There was a significant correlation with the working shifts of nurses and to be in normal/high-risk group according to HAD-D ($P < 0.01$) and FSS ($P < 0.05$). Nurses who worked in day shifts were less likely to be in the high-risk group according to HAD-D and FSS. There was no statistical difference between the working shifts of nurses and the likelihood of being in the normal/high-risk group according to HAD-A and ESS ($P > 0.05$) [Table 4].

Table 5 shows a weak positive correlation between PSQI and ESS ($r = 0.35$; $P < 0.001$) or HAD-D ($r = 0.49$; $P < 0.001$) and a moderately positive correlation between FSS ($r = 0.55$; $P < 0.001$) and HAD-A ($r = 0.52$; $P < 0.001$).

The continuous variables in dual logistic regression model show a reporting of sleep quality power of

70% (Nagelkerke $R^2 = 0.696$). The likelihood to be in the poor sleep quality group was 50 times higher in nurses who are 41 years and older (odds ratio [OR] = 49.5; confidence interval [CI] = 1.56–1571) and 23 times higher in the 25–32 years' age group (OR = 22.8; CI = 1.32–397.6) compared to nurses who are 25 years or younger. Nurses who work in night shifts were shown to be 14 times more likely to be in the poor sleep quality group (OR = 14.1; CI = 2.62–76.2) than nurses who work in day shifts. There was a significant correlation between being in the normal/poor sleep quality group and FSS (Wald = 18.457; $P < 0.001$) and HAD-A (Wald = 4.230; $P < 0.05$). The likelihood of being in the poor sleep quality group increased by 1.1 and 1.3 folds with higher scores on the FSS (CI = 1.05–1.15) and HAD-A (CI = 1.01–1.69) scales, respectively [Table 6].

Discussion

Delivery of health-care services in a rapidly evolving and changing world is based on two principal pillars: patient and staff safety, and the interest of the scientific community usually centers on threats and opportunities that may impact these two concepts. This study evaluates the factors that interfere with sleep quality of nurses and focuses on a potential threat for staff safety, and thus, on patient safety.

The principal result that 61.9% of the nurses in our study suffered from poor quality of sleep has also been reported by studies from other parts of the world.^[4-8] Compared to reports from other provinces in Turkey, however, our results appear to be lower than some^[17-20] and higher than others.^[25] We believe that the difference in sleep quality of nursing staff between provinces can be explained by varying policies and procedures, nursing staff numbers and qualifications, and patient profile between different organizations along with the fact that most of the related studies are single-center studies. Due to consistently poor quality of sleep of nurses identified in different parts of the world and our country and to be able to make better comparisons, we are convinced that there is an urgent need for multicentric studies that evaluate patient outcomes and organizational outcomes in addition to physical, psychological, and social factors.

The high scores on sleep duration and subjective sleep quality of nurses in this study are comparable to other reports in the literature.^[5,7,17,25] However, the scores on sleep latency, sleep disorder, and daytime function components, though comparable to other national reports,^[17,25] are lower than results reported from studies in Brazil and Spain.^[5,7] This suggests that the nurses who are deprived of sleep at night may suffer from signs of sleep deprivation and fatigue. Our results show that nurses who work in day shifts have a better quality of

Table 1: Distribution of nurses' individual characteristics and comparison of good and poor sleep quality with these characteristics (N=152)

Individual Characteristics	n	%	Good		Poor		Test and P Value
			n	%	n	%	
Age Groups							
25 aged below	41	27,0	27	17,8	14	9,2	32,156
25-32 aged	59	38,8	10	6,6	49	32,2	0,000
33-40 aged	25	16,4	5	3,3	20	13,2	
41 aged and above	27	17,8	5	3,3	22	14,5	
Gender							
Female	114	75,0	40	26,3	48,7	74	3,706
Male	38	25,0	7	4,6	20,4	31	0,054
Marital Status							
Married	87	57,2	29	19,1	58	38,2	0,554
Single	65	42,8	18	11,8	47	30,9	0,457
Childhood Status							
Yes	85	55,9	28	18,4	57	37,5	0,368
No	67	44,1	19	12,5	48	31,6	0,544
Education Level							
Medical Vocational High School	21	13,8	8	5,3	13	8,6	1,101
Associate Degree	31	20,4	8	5,3	23	15,1	0,777
Graduate Degree	74	48,7	22	14,5	52	34,2	
Postgraduate Degree	26	17,1	9	5,9	17	11,2	
Duration of Professional Experience							
5 years under	55	36,2	27	17,8	28	18,4	13,462
5-9 years	38	25,0	7	4,6	31	20,4	0,001
10 years and over	59	38,8	13	8,6	46	30,3	
Position							
Manager	21	13,8	7	4,6	14	9,2	0,066
Clinician	131	86,2	40	26,3	91	59,9	0,797
Place of Working							
Open Spaces	85	55,9	26	17,1	59	38,8	0,010
Closed Spaces	67	44,1	21	13,8	49	30,3	0,920
Working Shifts							
Day Shift	34	22,4	21	13,8	13	8,6	27,506
Rotational Shift	68	44,7	22	14,5	46	30,3	0,000
Night Shift	50	32,9	4	2,6	46	30,3	
Weekly Working Duration							
45 h and above	63	41,4	20	13,2	43	28,3	0,034
45 h over	89	58,6	27	17,8	62	40,8	0,853
Smoking Status							
Nonsmoker	64	42,1	13	8,6	51	33,6	8,978
Exsmoker	47	30,9	22	14,5	25	16,4	0,011
Smoker	41	27,0	12	7,9	29	19,4	
Health Problem							
Yes	24	15,8	5	3,3	19	12,5	1,358
No	128	84,2	42	27,6	86	56,6	0,244

Table 2: Nurses' mean scores of obtained from scales and distribution of rates in normal/risky groups (N=152)

Scales	Mean ± SD	Min-Max Values	Normal Group		Risky Group	
			n	%	n	%
PSQI	6,65±3,48	0-17	47	30,9	105	61,9
HAD-A	9,05±4,07	1-19	87	57,2	65	42,8
HAD-D	7,61±3,09	2-15	63	41,4	89	58,6
ESS	6,18±4,66	0-18	118	77,6	34	22,4
FSS	35,98±15,32	0-63	69	44,1	85	55,9

sleep and that the quality of sleep of nurses who work in the night shift is 14.1 times poorer than day-shift nurses. Majority of studies conducted agree that working in shifts interferes with sleep quality and that nursing managers have to be actively involved in reducing this negative impact.^[4-8,10,17,20,25] Although one-fourth of nurses included in this study suffered from day time sleepiness problem, similar studies conducted in Spain and Norway have not reported a similar significant correlation with shift work.^[5,10] In addition to pathological fatigue

Table 3: Nurses' mean scores obtained from PSQI components (N=152)

PSQI components	0 point		1 point		2 point		3 point		Mean±SD (0-3 points)
	n	%	n	%	n	%	n	%	
Subjective sleep quality	13	8,6	42	27,6	58	38,2	39	25,7	1,30±0,94
Sleep latency	45	29,6	51	33,6	35	23,0	21	13,8	1,21±1,02
Sleep duration	42	27,6	32	21,1	67	44,1	11	7,2	1,31±0,95
Sleep efficiency	126	82,9	13	8,6	7	4,6	6	3,9	0,30±0,73
Sleep disturbance	17	11,2	96	63,2	33	21,7	6	3,9	1,18±0,67
Use of sleep medications	139	91,4	9	5,9	1	0,7	3	2,0	0,13±0,49
Daytime disfunction	48	31,6	40	30,3	34	22,4	24	15,8	1,22±1,06

Table 4: Comparison of nurses' working shift with normal and risky groups of sleep quality (N=152)

Scales	Day Shift		Rotational Shift		Night Shift		Test and P value
	n	%	n	%	n	%	
HAD-A							
Normal	24	15,8	39	25,7	24	15,8	4,219
Risky	10	6,6	29	19,1	26	17,1	0,121
HAD-D							
Normal	23	15,1	24	15,8	16	10,5	12,516
Risky	11	7,2	44	28,9	34	22,4	0,002
ESS							
Normal	30	19,7	53	34,9	35	29,7	3,882
Risky	4	2,6	15	9,9	15	44,1	0,144
FSS							
Normal	22	14,5	29	19,1	16	10,5	8,885
Risky	12	7,9	39	25,7	34	22,4	0,012

Table 5: The relationship between PSQI and HAD, FSS, ESS (N=152)

Scales	r
ESS	0,35*
FSS	0,55*
HAD-A	0,52*
HAD-D	0,49*

*P<0.001, r. Correlation coefficient

identified in more than half of the nurses, a similar significant correlation with shift work is also reported from a study in Norway.^[10] Another study from Egypt reports no significant correlation between the exhaustion level of nurses and working in shifts but demonstrates a relation with depression level and tendency to make medical errors.^[2] Considering that clinician nurses are more prone to make medical errors, it is suggested that nursing managers should pay attention to two important clues which are sleeplessness and fatigue.^[2,26]

The anxiety and depression levels that we identified in this study are lower than those reported from China (HAD-A: 11.0 ± 3.3 vs. HAD-D: 9.7 ± 3.7), but higher than those reported from Brazil (HAD-A: 6.3 ± 3.7 vs. HAD-D: 5.2 ± 3.3).^[6,27] In spite of variations between countries, many studies with similar designs suggest a higher anxiety and depression level among nurses who mostly work in night shifts.^[9,27] Similar to our results, some

studies point to the higher incidence of psychological problems among staff members who work in shifts,^[2,17,28,29] while others fail to demonstrate a significant correlation or difference between the two.^[10,30,31] The common finding in both study groups is that nurses who work in rotational shifts are at higher risk to suffer from psychological problems than nurses who only work in day shifts.^[2,10,28-31] It is, therefore, advisable for organizations to choose day-night shift systems that change at certain intervals and take personal characteristics of nursing staff in consideration rather than using rotational and arbitrary shift schedules. At the same time, there is need for experimental and prospective studies that may help create evidence-based guidelines to provide guidance to both organizations and nursing managers.

In this study, nurses who were 41 years or above were 9.5 times more likely to be in poor sleep quality group than nurses who are 25 years or younger, which suggests that advanced age is a risk factor for poor quality of sleep. Many studies demonstrate that advanced and, in parallel, extended professional experience, negatively impacts sleep quality among nurses.^[4,6,17,18] It is also known that the nature of the profession has an impact on the quality of sleep of nurses.^[6] On the other hand, a study from Japan shows that adaptation to night shift is poorer among elderly individuals.^[32] We believe that early retirement and professional wear arrangements, simplifying the job of nurses above a certain age, and limiting night shift work of elderly nurses may help to remediate the situation.

The results of this study suggest that sleepiness, fatigue, anxiety, and depression are enhanced with deterioration in sleep quality. A study from Izmir demonstrated that with increasing anxiety levels in nurses who work in day shift, they become more prone to make medical errors related to medication and transfusion administration and patient infections.^[33] Another study on care providers in Intensive Care Unit settings showed that 15.6% of nurses had signs of depression, which are an important risk factor for the occurrence of medical errors.^[34] Saleh *et al.* reported a correlation between sleep quality and medical errors, fatigue, and sleeplessness.^[2] In addition to evidence that show a correlation of poor sleep quality

Table 6: Factors Influencing Nurses' Sleep Quality (N=152)

Değişkenler	β	SH	Wald	P	OR	%95 CI
Age Groups						
25 aged below			5,345	0,148		
25-32 aged	3,130	1,457	4,619	0,032	22,885	1,32-397,6
33-40 aged	3,075	1,690	3,311	0,690	21,641	0,79-593,7
41 aged and above	3,903	1,763	4,899	0,027	49,565	1,56-1571
Duration of Professional Experience						
5 years under			1,692	0,429		
5-9 years	-0,846	1,459	0,336	0,562	0,429	0,025-7,50
10 years and over	-1,787	1,549	1,332	0,248	0,167	0,008-3,48
Working Shifts						
Day Shift			10,309	0,006		
Rotational Shift	0,264	0,717	0,136	0,713	1,302	0,319-5,312
Night Shift	2,649	0,860	9,496	0,002	14,138	2,622-76,22
Smoking Status						
Nonsmoker			0,366	0,833		
Exsmoker	0,470	0,793	0,352	0,553	1,601	0,338-0,757
Smoker	0,104	0,770	0,018	0,893	1,110	0,245-5,018
ESS	-0,038	0,085	0,206	0,650	0,962	0,815-1,136
FSS	0,099	0,023	18,457	0,000	1,104	1,055-1,155
HAD-A	0,271	0,132	4,230	0,040	1,311	1,013-1,696
HAD-D	0,117	0,085	1,886	0,170	1,124	0,951-1,327

B: Regression coefficient, Nagelkerke R Square: 0,696

among nurses with patient safety, there are also studies that provide evidence that it also interferes with staff safety such as sharp-stick injuries and violent actions.^[2,35] In light of these results, any action that will improve the quality of sleep of nurse will translate into a better staff as well as patient safety.

Limitations

Our results may not be generalized as this is a single-center study and no sample selection methodology was utilized.

Conclusions

The results of this study indicate that quality of sleep is poor in approximately two-thirds of nurse and it is negatively affected by advanced age, working in night shift, and increased anxiety and fatigue levels.

We recommend that the working hours of nursing staff are scheduled according to national and international guidelines, night shift work is reduced based on professional seniority and thus, nurse's age, and the sleep quality of nursing staff is assessed, an action plan to maintain physical and psychological well-being of nurses is devised, and similar studies are conducted on nurses who work in different shift schedules throughout the nation.

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Conflicts of interest

There are no conflicts of interest.

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