Original Article   **Open Access**

Sleep quality of Iranian nurses: A nationwide and cross-sectional study

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Abstract

Introduction: Nurses' sleep quality is an important issue associated with patient care quality. The present study evaluated the sleep quality of Iranian nurses.

Materials and Methods: In this cross-sectional study, we evaluated 920 nurses working in hospitals in 6 cities in Iran, who were selected using a random multi-stage sampling method. The nurses filled out demographic information questionnaire and Pittsburgh sleep quality index. We analyzed the data using descriptive statistics, t-test, Chi-square test, multiple linear regression analysis, and SPSS 24.

Results: The total sleep quality score was 7.86 ± 3.58 out of 21. 71.73% of the nurses had poor sleep quality. The most common problems were sleep disturbance and sleep efficiency. Sleep quality was positively correlated with education level and negatively correlated with having a second job ($P < 0.05$). Other occupational and demographic variables had no statistically significant relationship with sleep quality ($P > 0.05$). Shift work and work in two hospitals were factors predicting a lower quality of nurses' sleep.

Conclusion: We concluded that poor sleep quality is a significant health issue for Iranian nurses. The main reasons for their low sleep quality are low sleep efficiency and high sleep disturbances.

Keywords: Nurse, Sleep health, Sleep quality

Introduction

Nurses constitute the backbone of health facilities worldwide. A study found that in Iran, roughly 80% of healthcare practitioners work as nurses (1), proving nurses' prominence in shaping the quality of care. Quality nursing care reflects improvements in the patient's well-being, recovery rate, and hospital days. Consequently, the nurse's sleep quality is directly related to their working capacity. Moreover, fatigue and sleep deprivation cause medication errors (2) and undermine cognitive

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functions vital in patients' management (3). Also, lack of sleep weakens an individual's ability to interact with fellow workers, which can be a detriment to patients (4). Research across various countries reveals a worrying trend: According to the study, a considerable number of nurses report patterns of insomnia. The prevalence percentage varies from one region to another; it ranges from 31%. It is taking the range from 8% to 56% in the United States (5) and even up to a rather alarming 60% in Japan (6).

In Iran, the level of sleep dysfunction perceived among nurses is very high, with a percentage of 95.7. Some factors may include shift work, stressful jobs, and working hours. Furthermore, other organizational factors such as the number of back-to-back shifts, night shifts, exposure to workplace bullying, gender, and age may also have an influence (7-10).

Although sleep quality in nurses is low by researchers from Iran and other countries (11,12), some local Iranian research has given a contrasting picture (13). This paradox is what calls for further research. There is also some uncertainty about the connection between a nurse's educational level and sleep quality. According to Iranian research, lower education is recommended as being associated with poor sleep (14). However, Taiwanese and Chinese research did not show a relevant link (15,16).

Some scope in previous Iranian studies includes small samples, focus on some area, and contradiction in results (17). This limits their findings, making the research results less generalizable. Thus, a national cross-sectional study is needed to offer more detailed data for policymakers to design interventions to enhance the quality of nurses' sleep.

Studies examining the role of age, sex, and marital status on sleep produce inconclusive literature. This aspect of the identified relationship proposed no considerable correlation by some works (15), and old age, female sex, and marriage were associated with poor quality sleep per other studies (8,14).

Thus, the objective of this cross-sectional national survey was to determine the proportion and type of sleep disorders among Iranian nurses and the demographic and workplace characteristics that affect their sleep patterns.

Materials and Methods

The present cross-sectional study was carried out during January to October 2019 in 6 cities in Iran: Tehran, Zanjan, Isfahan, Semnan, Qom, and Shahrud. We calculated the sample size equal to 897 nurses using the sample size formula and a conducted study by Park et al. (18). We used a multi-stage random sampling method. First, six out of the 31 provinces across Iran were chosen randomly. Second, we selected 11 hospitals from the six provinces. At the final stage, we identified 1000 nurses using systematic random sampling. The inclusion criteria included being nurse, having at least a bachelor's degree, and willingness to participate in research. The exclusion criteria was incomplete questionnaires.

Research instruments

A) The Demographic Checklist: It included variables such as age, gender, marital status, number of children, place of residence, level of education, hospital unit type, work experience, shift (time assigned for work within the hospital), and work outside nursing/dual employment status. Specifically, the work shift was obtained by a question item in the questionnaire.

B) Pittsburgh Sleep Quality Index (PSQI): This tool is a self-reported instrument to measure sleep quality experienced over the past month. It comprises eighteen questions clustered in seven components. Each question is scored on a 4-degree Likert scale (0= no difficulty to 3= severe difficulty). The components are as follows: 1. subjective sleep quality, 2. sleep latency, 3. sleep duration, 4. sleep efficiency, 5. sleep disturbances, 6. use of sleeping medication, and 7. daytime dysfunction. The overall PSQI score (0-21) is obtained by adding the scores from all seven components. Higher scores indicate poorer sleep quality (19).

In Iran, the reliability coefficients (Cronbach's alpha method) for this questionnaire reported as 0.88. Its sensitivity coefficient and specificity were reported to be 100% and 93%, respectively (20). In this study, the internal stability of the instrument was measured using Cronbach's alpha coefficient ($\alpha= 0.93$).

As a sponsor, the vice-chancellor for Zanjan University of Medical Sciences coordinated with selected provinces' health facility managers. One colleague from each area was invited to participate. The colleagues (from six provinces) took lists of hospitals and nurses, and names of random nurses were sent to the sampler colleagues. Sampler colleagues

referred to the participant's hospital ward. We analyzed the data using SPSS version 24, the descriptive statistics, the Chi-square test, and the linear regression test.

Results

Of the 1000 distributed questionnaires, 920 were completed and entered the statistical analysis stage. Major part of the nurses were female (75.59%) and aged 31.16 ± 7.03 with an average work experience of 7.85 ± 6.82 years. Most of them were married (60.08%), childless (58.45%), and working in non-critical wards (62.47%). Most of them had 0-10 years of work experience (71.95%) and a bachelor's degree (93.27%), and most of them worked in rotating shifts (84.81%). Also, 90.23% worked in only one hospital.

The results showed that the mean PSQI score was 7.86 ± 3.58. However, 73% had a score higher than 5. Also, 95.10% had problems in the sleep disturbances, and 90.98% experienced problems in the sleep efficiency (Table 1 and Figure 1). Figure 1 shows the frequency of nurses' responses to PQSI in total and each of its subscales (n= 920). A "0" indicates no sleep problems, and a "1-3" indicates a problem on that subscale. Regarding the total score, "≤ 5" means that there is no problem, and "> 5" indicates a problem in the quality of sleep.

Table 1. Frequency and mean scores of nurses in Pittsburgh Sleep Quality Index subscales

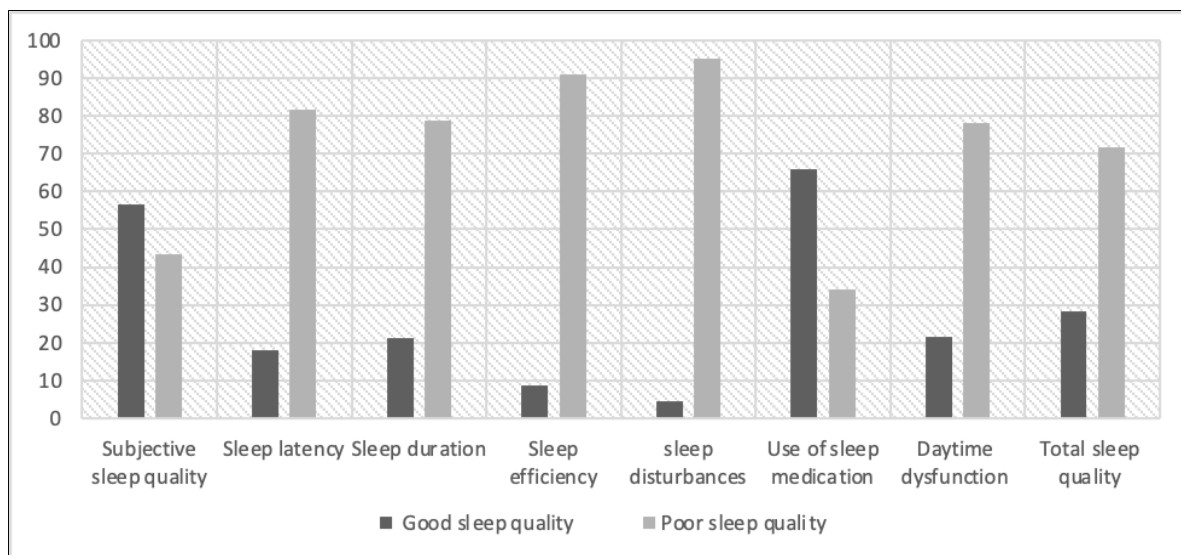| Subscales	Sleep quality				
	No problem N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mean ± SD
Subjective sleep quality	520 (56.52)	227 (24.67)	90 (9.78)	83 (9.02)	1.30 ± 0.70
Sleep latency	166 (18.04)	420 (45.54)	240 (26.03)	94 (10.19)	1.30 ± 0.87
Sleep duration	194 (21.08)	412 (44.67)	205 (22.23)	109 (11.82)	1.34 ±0.90
Sleep efficiency	81 (8.80)	564 (61.16)	217 (23.53)	58 (6.29)	0.85 ± 0.92
Sleep disturbances	43 (4.67)	597 (64.74)	240 (26.03)	40 (4.33)	1.33 ± 0.61
Use of sleep medication	607 (65.97)	215 (23.31)	67 (7.26)	31 (3.36)	0.49 ± 0.77
Daytime dysfunction	199 (21.63)	380 (41.21)	225 (24.40)	116 (12.58)	1.29 ± 0.94

Figure 1. The frequency of nurses' scores in PQSI total and its subscales

Based on the findings, sleep quality was related to educational level. Nurses with a bachelor's degree had more sleep disorders than those with a master's degree (*P*< 0.001). Sleep disorders were also associated with working in more than one medical center (hospital) (*P*= 0.009). Other demographic variables, such as age and gender, did not correlate with sleep quality (Table 2). Those who worked a night shift or switched between day and night shifts had poorer sleep quality. However, no significant difference was seen regarding the ward (critical, non-critical, and emergency) (Figure 2).

Table 2. Association between sleep quality and nurses' demographic and occupational characteristics

Variables		Sleep quality		Sig.
		Poor (PSQI score> 5) N (%)	Good (PSQI score≤ 5) N (%)	
Gender	Male	155 (69.50)	68 (30.49)	X²= 1.097 P= 0.578
	Female	505 (72.45)	191 (27.40)	
Age (Year)	20-30	381 (73.41)	137 (26.39)	X²= 2.559 P= 0.634
	31-40	204 (69.38)	90 (30.61)	
	41-50	75 (70.09)	32 (29.90)	
Marital status	Single	247 (73.51)	89 (26.48)	X²=5.330 P= 0.255
	Married	387 (69.85)	166 (29.96)	
	Divorced	26 (86.66)	4 (13.33)	
Number of children	No children	400 (74.21)	138 (25.60)	X²=6.981 P= 0.323
	1	113 (64.57)	62 (35.42)	
	2	124 (71.26)	50 (28.73)	
	3	23 (71.87)	9 (28.12)	
Ward	Critical care units	131(74.43)	45 (25.56)	X²=1.550 P= 0.818
	Non-critical care units	407 (70.65)	168 (29.16)	
	Emergency	122 (72.61)	46 (27.38)	
Work experience (Year)	0 – 10	478 (72.20)	184 (27.79)	X²=6.354 P= 0.785
	11 – 20	144 (70.93)	59 (29.06)	
	21 - 30	37 (69.81)	16 (30.18)	
Education	Bachelor	624 (72.55)	236 (27.44)	X²=18.535 P= 0.000
	Master	35 (59.32)	23 (38.98)	
Type of shift	Fixed	87 (63.04)	51 (36.95)	X²=11.742 P= 0.068
	Rotating	573 (73.27)	208 (26.59)	
Working in two hospitals	Yes	51 (57.95)	37 (42.04)	X²=9.355 P= 0.009*
	No	609 (73.19)	222 (26.68)	

*$P< 0.05$ is considered statistically significant   Abbreviations PSQI: Pittsburgh Sleep Quality Index; SD: Standard Deviation; N: Number of participants; Sig: Statistical Significance; X^2, Chi-square test; P: Probability value.
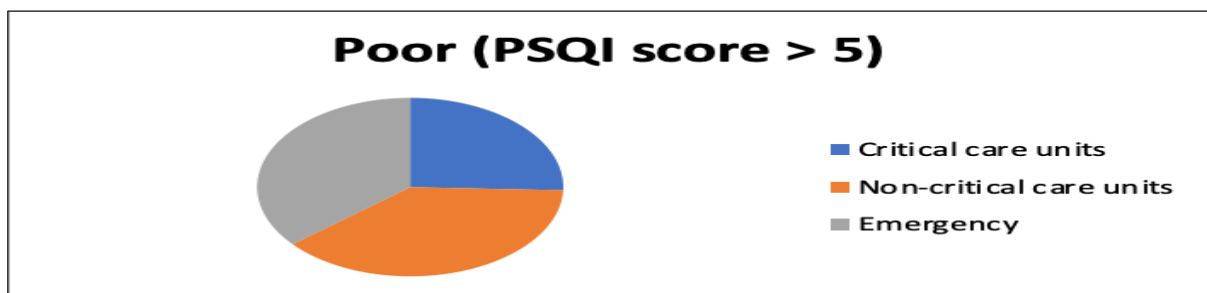

Figure 2. Poor sleep quality among nurses based on their work place

The multiple linear regression analysis results showed that nurses' demographic and occupational variables predicted only 1.7% of the sleep quality variance. The variables of work shift (β= 0.067, t= 1.99, *P*= 0.046) and work elsewhere (β= 0.076, t= 2.17, *P*= 0.030) were two variables that could predict the quality of nurses' sleep (Table 3).

Table 3. Results of multiple linear regression analysis regarding sleep quality prediction based on nurses' characteristics

Variables	B	SE	β	t	P
Constant	5.725	1.468		3.899	0.000
Age	-0.015	0.033	-0.029	-0.452	0.652
Gender	0.289	0.292	0.035	0.989	0.323
Marital status	0.416	0.253	0.062	1.644	0.101
Number of kids	-0.316	0.180	-0.079	-1.754	0.080
Units	-0.349	0.193	-0.060	-1.807	0.071
Work experiences	0.019	0.033	0.037	0.590	0.555
Education	-0.818	0.484	-0.056	-1.688	0.092
Work shifts	0.266	0.133	0.067	1.998	0.046*
Working in two hospitals	0.920	0.424	.076	2.172	0.030*

*$P< 0.05$ is considered statistically significant. Abbreviations B: Unstandardized Beta Coefficient; SE: Standard Error of B; β: Standardized Regression Coefficient; t: student t-test

Discussion

This study aimed to evaluate the sleep quality of Iranian nurses at the national level. We concluded that the mean score of sleep quality in Iranian nurses was 7.86 ± 3.58 out of 21. This score indicates poor quality sleep. Also, major part of nurses (71.6%) had poor sleep quality. Compared to the prevalence of poor sleep quality in Iranian general populations, this finding indicates a higher prevalence of sleep problems among nurses than in other professions. For example, Khosravi et al. studied the sleep quality in the general population of Iran through PSQI and found the mean score equal to 6.9 ± 4.0. Also, 37% of Iranians have poor sleep quality (21).

Working in shifts and the stressful conditions of nursing can predict the poorer sleep quality in nurses compared to the general population. However, we reported a more severe and higher prevalence of sleep problems in our study compared to other studies conducted on nurses in the United States (5,22) and Japan (6).

These differences may be related to nurses' work schedules, longer work hours and changing shifts each week throughout a month. Nursing managers create the schedules, and the nurses do not create these schedules individually. In addition, nursing managers require mandatory overtime for all nurses regardless of their willingness or availability due to the shortage of nurses in Iran (23). Schedules commonly do not follow sequentially or even the same-hour schedule, which causes a change in sleep-wake patterns (24).

The sleep quality of Iranian nurses is mainly impaired due to issues in the two subscales of frequency and efficiency. Nurses in the two subscales of sleep disturbances, with 92.70%, and sleep efficiency, with a frequency of 90.98%, had sleep problems. Similar findings in multiple studies in other countries also revealed a high frequency of sleep disturbances among nurses, such as Saudi Arabia (25), China (12), United Arab Emirates (26), and Korea (27). Also, Haseli et al. compared the sleep quality of nurses and midwives in Iran. They found that the two subscales of sleep disturbance and sleep efficiency are partially responsible for the low quality of sleep among Iranian nurses (28).

Regarding the differences in the results of our study with other Iranian studies, we can point to the significant limitations of other studies. One of the most important limitations of previous Iranian studies is the limited number of samples

and the selection of research samples from a small and non-representative population of the Iranian nursing community. Based on demographic variables, this study showed a statistically significant relationship between sleep quality and education level. Nurses with only an undergraduate education had more difficulty with sleep quality than nurses with a postgraduate degree. Sleep disturbance by educational level can be attributed to the difference in work duties and responsibilities. In Iran, nurses with undergraduate education have a higher patient workload and more work stress than nurses with a master's degree.

This study has included a logical explanation suggesting that poor sleep quality often characterizes nurses working in two hospitals due to more income. Quality of sleep may be altered due to circadian rhythm, an increase in the absolute level of stress, and the demanding nature of roles. This could result in shift work, causing irregular sleep in nurses by interfering with melatonin production (29) and increasing sleep disturbances and fatigue. Thus, the mix of chaotic scheduling, artificial light exposure with night work (30), and stress from juggling many responsibilities are problems (31) when trying to keep sleep quality in line for this population.

This study showed that except for the two variables of education level and work elsewhere, other demographic and occupational variables such as age, sex, marital status, number of children, place of work (specialty and non-specialty wards), work experience, and work schedule (constant versus rotating) had no statistically significant relationship with sleep quality. This study did not look for the reasons for these findings; however, the difference in these results compared to different studies of other cultures shows that various cultural factors can affect sleep.

Future studies could focus on the underlying variables affecting sleep and the reasons in different research communities and cultures among nurses. One of the unexpected findings in this study was the need for more relationship between sleep quality and nurses' work shifts (constant or circulating). A review of the literature in this area indicates contradictory findings. Chien et al. found no relationship between work shifts and sleep quality, in line with our findings (32).

However, another group of studies has shown that shift work does affect sleep quality (2,33). Such different results are due to the studied

populations and the nature of sleep, which needs to be fully understood. The complexity of human sleep and its related factors need further study. In sum, the rates of poor sleep quality reported among Iranian nurses are disconcertingly high and require immediate intervention from healthcare managers and policymakers. As one can infer, focusing on the cause factors, including workload, shift schedules, and education, is vital to addressing nurses' well-being and, in effect, outcomes in nursing. Subsequent studies need to focus on the roles of culture and identify other factors that can predispose nurses to sleep disruptions in different cultural settings.

Requiring measures like cutting down forced working hours, balancing staffing schedules, and using sleep hygiene knowledge as forms of intervention are viable measures that would help counter the negative impacts of poor sleep quality among Iranian nurses. By using such measures, healthcare institutions can create a culture that supports the physical and mental well-being of the nursing workforce.

There are likely limitations to generalizing these findings to other nursing communities in terms of cultural, societal, and occupational-related differences observed within the nursing profession globally. The final common source of bias is the self-reported assessment of sleep quality with the help of questionnaires. Furthermore, several variables, including psychiatric disorders, smoking, and secondary employment, were not studied in the research, while these conditions can substantially affect the quality of nurses' sleep.

Conclusion

The findings indicated that more than three-quarters of Iranian nurses reported poor sleep quality, which is greater than the general Iranian population and higher than nurses from different countries.

It was shown that working at more than one medical centers and having undergraduate degree were associated with poor sleep quality. Additionally, it was shown that while demographic parameters like age and gender did not correspond with sleep quality, occupational factors as shift work did. Overall, the study demonstrated the complexity of issue by suggesting several factors could be involved in Iranian nurses' poor sleep quality.

Authors' Contributions

Study concept and design: Kourosh Amini and Mehran Tahrekhani; Interpretation of data: Kourosh Amini and Mehran Tahrekhani; Data collection: Mehran Tahrekhani, Lida Sasani, and Mina Shayestefar; Drafting of the manuscript and final approval of the article: Tracey Long, Kourosh Amini, and Mehran Tahrekhani; Statistical analysis: Kourosh Amini.

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