

## Sleep Quality and Sleepiness: A Comparison between Nurses with and without Shift Work, and University Employees

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### ABSTRACT

Shift work is an important factor influencing the sleep quality and sleepiness of nurses. The aim of the present research was to compare sleep quality in three groups: 1) nurses with shift work (SN), 2) nurses without shift work (DN) as a control group for evaluating the effects of shift work, 3) regular non-shift employees (DE) who were not nurses, as a control group for the nursing job; to evaluate the effect of shift work and the nursing job in regard to sleep quality. The present cross-sectional study was carried out in 2013. The research participants were 326 nurses without shift work and with shift work and employees from one of Kerman University of Medical Sciences' hospitals, Kerman, Iran. Data were gathered via the Pittsburgh Sleep Quality Questionnaire and the Epworth Sleepiness Questionnaire. Data were analyzed by SPSS 18. Overall, 91.2% of nurses (SN & DN) and 79.6% of employees (DE) had poor sleep quality. The sleep quality ( $P=0.013$ ) and sleepiness ( $P=0.005$ ) of all hospital nurses were significantly different from that of the university employees. However, there was not a significant difference between the nurses without and with shift work in terms of sleep quality ( $P=0.87$ ) and sleepiness ( $P=0.41$ ). Almost all nurses and most university employees suffer from poor sleep quality. Daily average sleep hours and shift work are among the influencing factors causing sleepiness and poor sleep quality.

**KEYWORDS:** *Sleep quality, Sleepiness, Shift work, Nurse*

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## INTRODUCTION

In Iran and many other developing countries, shift work is increasing due to increase in industries and the necessity of providing 24-hour services [1]. Any type of work done outside the routine daily working hours (7 am to 6 pm) is called shift work. According to this broad definition, about 20 to 30 percent of the global working force is doing shift work [2]. The necessity of providing 24 h medical services to the society, has led hospitals to organize shiftwork schedules for their employees [3-4]. Nurses are the largest professional group in the medical and health care system [5] and about 40% of the employees of hospitals are nurses [6].

Shiftwork employment is a known risk factor for sleep disorders [7-9]. These disturbances are also directly related to gender, age, health status and occupational activities [10,11]. These problems are related to disturbances in the natural sleep rhythm and waking up in the REM phase, and disturbances in the REM, non-REM pattern of human sleep [6, 12].

Shift working nurses often suffer from considerable weekly sleep deficiency, this leads to increased sleepiness and decreased sleep quality [3]. Due to the important role of nurses in health care and their critical role in taking care of human lives, their general health has an important role in the quality of health services [13,14].

One of the important complications of shiftwork is sleepiness during the day and increased reflex time, decrease incorrect and timeliness decision-making, decrease capability to solve complicated problems, speech ability, and increased error during working [15-19, 4]. The accuracy of shift work nurses in doing health care decreases during night and the initial morning hours [20]. Night working nurses are two times more prone to sleepiness and performing mistakes and errors [21].

Night shift nurses have poor performance in psychological tests due to sleepiness and insufficient sleeping hours and this increases their work errors [22]. Furthermore, the total sleep duration is reduced in shift work nurses and they may suffer from neurological complications that would lead to their absence from work and performing errors caused by sleepiness [23]. Sleeplessness at night and sleepiness during the day in nurses were the most common consequences of shift working [24]. Excessive sleepiness (33.1%) was the second most

common complaint of the nurses after sleeplessness [25].

As shift work has negative effects on nurses' health and an indirect effect on the quality of health services provided to patients, this study was conducted in order to compare the quality of sleep in shift working and non-shift working nurses and employees; in hospitals affiliated to Kerman University of Medical Sciences, Iran and determine some factors related to sleep quality.

## MATERIALS AND METHODS

This study design was a cross-sectional study including 159 nurses (with and without shift work) at an educational hospital (Afzalipoor Hospital, Kerman, Iran) and 167 university staff employees who worked only during day hours in 2013.

The project was approved by the University's Ethic Committee. Permission was obtained from the hospital and university managers. Then nurses volunteered to participate and informed consent was obtained from the nurses. Data collection was done at the participants' workplace. Two paper questionnaires were distributed among the participants.

The aim of this study was thoroughly explained to the participants and they were assured that their information would remain confidential. Then the questionnaire was distributed among people who were willing to participate, and on the working shift that they were on duty, on the day of data collection (morning, afternoon, or night).

Sufficient information was provided about how to complete the questionnaire. The questionnaires were completed in the presence of the researcher and were then collected.

The first questionnaire was the Pittsburgh Sleep Quality Index (PSQI), used to measure the sleep quality and sleep patterns of adults. This questionnaire is comprised of 19 questions which analyze seven facets of sleep quality including "subjective sleep quality", "sleep latency", "sleep duration", "habitual sleep efficiency", "sleep disturbance", "use of sleeping medication" and "daytime dysfunctions" during one month. The global score (a score for all questions in total) ranges from 0 to 21. Any score between 0 and 6 is considered as good sleep quality, between 6 and 10 as rather low sleep quality, and between 11 and 21 as poor sleep quality. The reliability of the questionnaire was approved by test and retest [26]. The sensitivity, precision and Cronbach's alpha coefficient for the Persian questionnaire were 100%, 93%, and 0.98%, respectively [27].

The Epworth Sleepiness Scale (ESS) includes 8 questions; the answer to each question has independent value which determines the

sleepiness intensity [28]. The score range for each question is 0 to 3. The final score is from 0 to 24. Three categories exist for the final score: a normal score is between 0 and 10 and means that the person does not have any sleepiness, a score between 10 and 16 means that the person has moderate sleepiness, and a score between 16 and 24 means the person has severe sleepiness. The validity of the questionnaire was determined as 0.88 by using Cronbach's alpha coefficient [29]. The validity of the Persian version of the questionnaire was 0.7 [30].

Additional data including age, work experience, history of shift working, average sleep time and work time in a week were gathered through another questionnaire.

The response rate was 93%. Data were analyzed using SPSS (Chicago, IL, USA) ver. 18. In order to investigate the difference in quantitative variables, among the three groups under study, one-

way ANOVA was used. In order to compare the percentage of sleep quality (in two categories) and sleepiness (in three categories) among the three groups under study, chi-square tests were used. Logistic regression was used to investigate the factors related to sleep quality.

## RESULTS

From the entire research population (326 participants), 41.1% (n=134) were nurses with shift work, 7.7% (n=25) were permanent nurses without shift work, and 51.2% (n=167) were the employees of Kerman Medical Science University. 81.3% of the participants were female. Moreover, 73.3% were married. In terms of education, 12% of the participants had a diploma, 8.3% had an associate degree, 71.2% held Bachelors (BSc), and 8.6% had Masters (MSc) degrees (Table 1).

**Table 1.** The difference in variables between shift nurses, permanent daytime nurses and employees

Variable	Nurses with shift work Mean(SD) (n=134)	Nurses without shift work (control for shiftwork) Mean(SD) (n=25)	Permanent day working university employees (control for nursing job) Mean(SD) (n=167)	P-value
Age (yr)	34(6.90)	35.68 ( 6.36)	40.04 (6.82)	0.87
Work experience(year)	10.24(7.92)	9.68(5.77)	9.6(13.47)	0.72
Shift work experience (year)	6.70(10.58)	7.12(15.12)	-----	----
The average hours of sleep per day, when working on a morning shift	6.99 (1.67)	7.24(0.92)	7.15(1.25)	0.50
The average hours of sleep per day, when working on an afternoon shift	6.79 (1.55)	----	----	----
The average hours of sleep per day, when working on a night shift	4.66 (2.22)	----	----	----
Average working hours during a week	43.64(7.83)	41.72(3.51)	45.25(10.19)	0.32
Sleep Quality	8.40(3.30)	8.30(3.70)	6.50(2.10)	0.0001*
Sleepiness	7.30(4.60)	6.20(4.20)	7.70(4.50)	0.20*

\*One-way ANOVA

One-way ANOVA showed that there was no statistically significant difference between average age (P=0.87), work experience (P=0.72), average sleep hours (P=0.50) and work hours during one week (P=0.32) between the three groups.

The average daily sleep hours for nurses working on morning, afternoon and night shifts were 6.99 (1.67), 6.79 (1.55) and 4.66 (2.22) h, respectively. The average sleep hours in nurses working on night shifts were significantly less than other nurses (P=0.0001).

Logistic regression showed that gender (P=0.21), age (P=0.60), education (P=0.06),

marriage (P=0.18) and the number of children (P=0.23) of each participant in the study did not affect the nurses' sleep quality, but factors such as shift work (P=0.02), and the average sleep hours per day (P=0.003) significantly influenced it.

The answers to the Pittsburgh Sleep Quality Index showed that 91.2% (n=145) of the hospital nurses and 79.6% (n=133) of the university employees had poor sleep quality.

Other variables from the sleep quality questionnaire and the results of the Epworth Sleepiness Scale have been shown with their details in Table 2.

**Table 2.** Frequency of the people with different safety culture based on the demographic variables

		Nurses without shift work (control for shift work) Percentage(frequency)	Nurses with shift work Percentage (frequency)	Permanent day working university employees (control for nursing job) Percentage(frequency)	Total
<b>Sleep quality</b>	Appropriate 0≤score≤6	8 (2)	9 (12)	20.40 (34)	14.70 (48)
	Inappropriate (6<score)	92 (23)	91 (122)	79.60 (133)	85.30 (278)
<b>Total</b>		100 (25)	100 (134)	100 (167)	<b>100 (326)</b>
<b>Sleepiness</b>	Non-existence of sleepiness	52 (13)	38.10 (51)	57.50 (96)	49.10 (160)
	Average	20 (5)	23.80 (32)	13.80 (23)	19.40 (60)
	Severe	28 (7)	38.10 (51)	28.70 (48)	32.50 (106)
<b>Total</b>		100 (25)	100 (134)	100 (167)	<b>100 (326)</b>

The chi-square test showed that the sleep quality of the nurses [SN & DN] was significantly worse than the sleep quality of the employees (P=0.013). The sleep quality of the nurses with shift work was also significantly lower than the daytime employees' (SN vs. DE) (P=0.006). However, the difference between the daytime nurses and nurses with shift work (DN vs. SN) (P=0.87), and between the nurses without shift work and daytime employees (DN vs. DE) (P=0.14), was not significant.

There was a significant difference between the daytime employees and nurses [DE vs. SN&DN] sleeplessness (P=0.005), and between the daytime employees and nurses with shift work sleeplessness (DE vs. SN). However, in relation to sleepiness, no significant difference was observed between the nurses with shift work (SN) and nurses without shift work (DN) (P= 0.41), and between the nurses without shift work (DN) and daytime employees (DE) (P=0.7) (Table 3).

**Table 3.** Differences between the sleep quality and sleepiness of the shift nurses, daytime nurses and university employees

Parameters	Nurses without shift work and university employees <i>P-value*</i>	Nurses with shift work and university employees <i>P-value*</i>	Nurses without shift work and shift nurses <i>P-value*</i>	Hospital nurses (with and without shiftwork) and university employees <i>P-value*</i>
Sleep quality	0.14	***0.006	0.87	***0.01
Sleepiness	0.70	**0.003	0.41	**0.005

\*significant statistical relation: chi square test

The comparison of seven subscales of sleep quality in the three groups showed that there was a significant association between the employees and the nurses' sleep quality with regard to 6 subscales including the subjective sleep quality, sleep latency, sleep duration, habitual sleep

efficiency, use of sleeping medication, and daytime dysfunction. However, there was not any significant relationship with respect to sleep disturbance, which was also true in the comparison of the nurses with shift work and the university employees (Table 4).

**Table 4.** The comparison of seven sleep quality subscales in the three groups

Variable Seven sleep quality subscales [each subscale had 4 categories]	Hospital nurses and university employees <i>P-value*</i>	Permanent daytime nurses and shift nurses <i>P-value*</i>	Shift nurses and university employees <i>P-value*</i>	Permanent daytime nurses and university employees <i>P-value*</i>
Subjective sleep quality	<b>0.0001*</b>	0.63	<b>0.0001*</b>	<b>0.003*</b>
Sleep latency	<b>0.0001*</b>	0.63	<b>0.0001*</b>	0.48
Efficient sleep duration	<b>0.0001*</b>	0.27	<b>0.0001*</b>	<b>0.0001*</b>
Habitual sleep efficiency	0.007	0.17	<b>0.002*</b>	0.47
Sleep disturbance	0.480	0.40	0.500	0.31
Use of sleeping medication	<b>0.002*</b>	0.02	0.030	<b>0.0001*</b>
Daytime dysfunction	<b>0.0001*</b>	0.90	<b>0.0001*</b>	0.10
Global PSQI score	0.01	0.87	0.006	0.14

By contrast, the comparison between the day worker and shift worker nurses showed that the only significant association was with respect to the use of sleeping medication ( $P=0.027$ ) while there were not any significant relationships regarding the other subscales (Table 4).

Comparisons between permanent nurses without shift work and employees showed that a significant difference existed between the two groups in terms of subjective sleep quality ( $P=0.003$ ), efficient sleep duration ( $P=0.0001$ ) and use of sleeping medication ( $P=0.0001$ ). No significant differences were observed between the two groups in relation to the other subscales (Table 4).

## DISCUSSION

The results of this study showed that 91.2% ( $n=145$ ) of the nurses and 79.6% ( $n=133$ ) of the hospital employees had poor sleep quality. In a study, 62.5% of nurses had poor sleep quality, 33.3 had relatively poor sleep quality and 4.2% had good sleep quality [31]. Also in Japan, only 8% of the nurses who worked in 2 shifts and 6% who worked in 3 shifts had good sleep quality [32].

In this study, there was a significant difference in sleep quality between nurses [shift working and non-shift working] and the university employees. In addition, there was a significant difference among the shift working and day working nurses and university employees. There was no significant difference between nurses' sleep problems in the 2-shift or 3-shift schedule [32]. However, sleep quality among nurses with fixed working hours was better than nurses with rotating shift [33]. Night-shift nurses had more somatic and emotional stress and more familial and social problems in comparison to non-night working employees [34]. In addition to shiftwork employment, other factors such as organizational factors are effective on the quality of sleep and sleeplessness. The result of our study showed that in addition to shiftwork, the duration of daily sleep is significantly related to sleep quality.

In this study, there was no difference concerning the amount of sleep medication used between shift working nurses and day working nurses. In a study about shiftwork and accidents related to sleepiness in nurses, the effect of shiftwork on sleep patterns, sleepiness and the incidence of non-professional accidents such as road accidents was evaluated. Rotating shiftwork nurses suffer 2.8 and night working nurses suffer 1.8 times more from low quality sleep than nurses working in fixed morning or afternoon shifts. In addition, these groups use more sleep medications than nurses with fixed morning or afternoon shifts [35].

Among the other result of this study was evaluating the factors effective on sleep quality in

nurses and employees, which showed that gender, age, education, marital status and the number of children was not effective on sleep, but shift work and the average daily working hours was significantly effective on sleep quality. A significant relation was not observed between genders, age, marital status and quality sleep either [31]. The study about the quality of sleep in nurses and its related factors in Hong Kong showed that more than 70% of nurses suffer from insufficient sleep, tension, stress, older age, perceived poor sleep status, gastrointestinal symptoms, and higher stress levels were risk factors that contributed to insufficient sleep [36].

Evaluating sleepiness in the groups under study showed that there was a significant difference about sleepiness among the university employees and nurses, but there was no difference about sleepiness between shift working nurses and day working nurses. Shift-working workers had had the experience of falling asleep more than day-working workers [7]. These problems are mainly due to disturbance in the natural rhythm of sleep and waking. Laboratory studies have shown that sleeping for even 8 h during unusual time, is 1 to 4 h less efficient than night sleep [37].

The prevalence of sleep disturbance among the nurses of Imam Khomeini hospital in Tehran was 87.7%. [38]. In California, sleep deprivation among shift-working nurses who rotated was more than others [9].

Organizational and family support of shift-working nurses and choosing the right people for doing shift work, rotating shifts and educating sleep health to shift-workers can help promote sleep quality and decrease sleeplessness. Therefore, managing shift-work programs according to ergonomic regulations is effective in increasing nurse's efficiency and increasing the level of health services to patients.

## CONCLUSION

Almost all nurses suffer from poor sleep quality. Proper shift-work scheduling, decreasing occupational stress factors and providing sufficient sleep hours can help improve the quality of sleep in shift-workers and decrease sleeplessness.

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