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The Effect of Shift Fluctuations on Sleep Quality among Nurses Working in the Emergency Rooms in Amman, Jordan

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ABSTRACT

Introduction: Sleep Quality disturbances are common among nurses especially those working in stressful situations such as emergency room. Additionally, sleep quality disturbances were found to interfere with nurses' quality of life and work performance. No studies have found the effect of fluctuated shifts on sleep quality among nurses.

Objectives: To examine the impact of shift fluctuations on sleep quality among nurses working in the emergency room.

Methods: A cross-sectional, descriptive design was employed**.** Five emergency rooms were selected from public and private hospitals located in Amman, Jordan. The selected hospitals were also referral sites with capacity of more than 200 beds. A convenient sample of nurses who had a minimum of six months experience in the emergency room and working on rotating shifts were eligible for participation. Nurses with known chronic respiratory problems and sleep apnea were excluded. A self-administered questionnaire including a demographic and work-related questions, and the Arabic version of the Pittsburgh Sleep Quality Index were provided. Shift fluctuations were clustered based on interchanging between morning, evening and night shifts.

Results: A total of 179 emergency nurses working in rotating shifts participated in the study. The majority of the nurses were poor sleepers. The study found no significant differences between different shifts interchange and sleep quality. However, interchange between morning and evening shift reported the highest sleep disturbance. Sleep quality was positively correlated with the length of experience, while negatively correlated with the age and the number of monthly shifts. Nurses who declared higher satisfaction and ability to work under pressure revealed better sleep quality.

Conclusion: Emergency room nurses showed poor sleep quality. While there was no specific shift interchange cluster inducing poor sleep quality, some demographical and work-related characteristics indicated their influence on sleep quality.

Key words: Emergency room, Nurses, Shift fluctuation, Sleep quality

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Introduction

Sleep Quality (SQ) disturbances are common among nurses[1,2] especially nurses working in stressful situations such as emergency room (ER).[3,4] Further, it was reported that up to 92% of nurses working in ER complained of SQ disturbances.[3] Additionally, SQ disturbances were found to interfere with nurses' quality of life and work performance.[1,5] Suleiman et al[3] reported that Jordanian nurses working in ER had a mean sleep duration of 6.38 hours per

night, and needed on average 29.63 minutes to fall asleep. Although ER nurses reported bad SQ and 70% sleep efficiency, they had moderate problems with daytime functioning and used less sleep medication.[3]

Nurses comprise of health care providers who work round the clock so they need to work in shifts.[6-8] Shift work is recognized as working irregular hours organized into 2-shift or 3-shift systems and include rotation work, and night work.[9,10] No studies found that examined the effect of fluctuated shifts on SQ among nurses, however, it was reported that work in shift precisely night shift [11] may contribute to sleep disturbances.[12-14]

Sleep is regulated by sleep homeostasis and circadian rhythms.[15] Working in shifts may interfere with the circadian rhythm,[8] this suggests that nurses who work in shifts may experience SQ alterations. It was reported that 78% of nurses working in shifts had bad sleeping quality.[1] Unfortunately, no information describes nurses' SQ when they have fluctuated shift and which shift is associated with sleep alterations. Thus, there is a need for more studies to investigate the effect of fluctuated shifts on SQ among nurses.

Besides shift work, numerous factors were identified that contribute to lower SQ among nurses. Socio-demographic variables such as age and gender have a variable relationship with SQ among nurses. It was reported that nurses who are females,[1,16] old in age,[3] single and with a university degree were poor sleepers.[5] In contrast, Suleiman et al[3] reported no relationship between demographic and SQ among a sample of nurses working in the ER.

Previous literature reported numerous work-related variables that have a relationship with SQ include job satisfaction and the level of experience. Cheng and Cheng[17] reported that nurses with high job satisfaction had low sleep disturbances. Also, nurses with a lesser number of years of experience had poor SQ.[5,16] Other studies found no relationship between work-related variables and SQ among nurses.[3] Thus, these inconsistent findings warrant further studies to investigate the relationship between SQ and demographic and work-related variables.

Unfortunately, there is a lack of studies that examined SQ among Jordanian nurses working in fluctuated shifts in ER. Also, factors that may influence SQ such as demographics, work-related variables, and shift fluctuations were neglected by the health institution administrations in Jordan. The evaluation of nurses' SQ and the effect of fluctuated shift may inspire the Jordanian researchers to conduct interventional research that may help to improve nurses' SQ. Thus, the current study aims to assess the SQ disturbances and identify the relationship of shift fluctuations and other demographic and work related variables with SQ among ER nurses in Jordan.

Methods

2.1. Design, settings, and participants

A cross-sectional descriptive design was employed to meet the aims of this study. The study was carried out in ERs at selected private and public hospitals in Amman (Jordan). The health system in Jordan consisted of public and private clinical settings that provide medical care over 24 hours, 7 days a week. The hospitals were chosen based on their classification as referral teaching hospitals and their capacity which exceeded 200 beds.

The population of the study consisted of the registered nurses who are working at the ER in Jordan. For the current study, a non-probability convenience sample of nurses was chosen to recruit the sample. To calculate the sample size, the G*Power version (3.0.10) was used.[18] The total sample required for a two-tail test with medium effect size (α= 0.05), and power (= 0.80) was (168) subjects to find significant differences between the fluctuated shift groups and SQ. However, more participants were recruited to allow for (15-25%) attrition. Therefore, all eligible nurses who met the inclusion criteria and on duty at ERs in the chosen hospitals were asked to enroll in the study. The inclusion criteria were male and female nurses working on rotating shifts, with an associate degree and higher in nursing and had at least six months experience in ER. Any nurse with respiratory problems and sleep apnea were excluded from the study.

2.2. Data collection

A self-administered questionnaire package was given to the subjects that asked about demographic and work-related variables, in addition to the Arabic version of the Pittsburgh Sleep Quality Index (PSQI).[19] *The demographic sheet* included questions about nurses' age in years, gender as male or female, number of years of experience in nursing, income, the shift-type that affect their sleep, marital status, educational status, years of experience, number of shifts in one month, satisfaction about their work, work under pressure,

number of night shift during the month and hospital type either public or private.

To measure "shift fluctuations" the participants were asked which type of shift interchange interfere with their sleep using the following three categories as follows: morning to evening, evening to night and night to morning. Morning shift was defined as working from 7 am to 3pm. Evening shift was defined as working from 3pm to 11pm. While night shift was defined as working from 11pm to 7am.

The PSQI. The PSQI is a 19 self-reported questions[19] that examine numerous SQ components. Each item is rated on a 4-point scale ranges from 0 to 3 with higher scores indicate severe sleep difficulty. The 19 items are joined to form seven component scores that also ranges from 0 to 3 with higher scores denote poor sleep. The components are: sleep latency, subjective sleep quality, sleep disturbances, sleep duration, habitual sleep efficiency, sleep medications, and daytime dysfunction. The seven component scores are added to yield one global score that ranges from (0) to (21) with higher scores indicating poorer SQ. Buysse et al[19] have established a cut-off for the global of (5) that has been used to identify poor sleepers. Scores (< 5) refer to good sleepers; scores (≥5) refer to poor sleepers.

The PSQI demonstrated good internal consistency reliability of 0.83 among 148 psychiatric patients.[19] In the Arabic PSQI validation study, Suleiman et al [20] reported acceptable internal consistency reliabilities of the global PSQI (0.70) among 35 healthy Arabic participants. The study was done from 1st April 2019 to 15th May 2019

2.3. Data Analysis

The data was entered to the Statistical Package for the Social Sciences (SPSS) version (25). Initially, the data was cleaned, sorted and screened for outliers and missing. Description of the participant's characteristics was examined by calculating descriptive statistics for the demographic and work-related variables (frequency, percentages, mean (M), and Standard Deviations (SD) based on the level of measurements either numeric or categorical variable. To detect the differences in SQ in different levels of demographic and work-related variables, three statistical methods including Pearson correlation coefficient, an independent sample t-test, and the Analysis of variance (ANOVA) were conducted to explore the differences in the global PSQI scores by demographic variables. Additionally, to examine SQ in different levels of fluctuated shifts, the Analysis of variance (ANOVA) was used to detect the differences between the groups in terms of SQ.

2.4. Study Procedures and Data collection

The ER head nurses were approached by the researcher in the selected hospitals under the study. A clarification of the purpose and outcomes of the study and the nurses' population that will be included in the study was explained for the head nurses.

All nurses who met the inclusion criteria and who agree to participate in the study were approached by the researcher where the purpose and outcomes of the study explained for them. At the time of data collection, questionnaires were handed to the available nurses by the researcher. Within one week of participation, the participants were contacted via a follow-up telephone call to remind them to answer the questionnaires and return them. The completed questionnaires were collected by head nurses and given together in an envelope to the researcher himself. The data collection extended over six weeks.

2.5. Ethical considerations

The approval to conduct the study was obtained from the IRB committee from all hospitals included in the study. The researchers assured the participants that their participation in the study is voluntary and they have the right to withdraw at any point in the study without any penalties. Further, the participants were informed that there are no financial benefits from participation in the study. Subjects' return of the questionnaires implies consent. Additionally, all the information including the participants' names were kept confidential by the researcher.

Results

Of 220 nurses who agreed to participate in the current study, 179 returned the questionnaires with a response rate of 81%. After examining each questionnaire package, 12 nurses did not complete the questionnaire, 24 nurses did not return the questionnaire and 5 nurses were not Jordanians.

3.1. Sample characteristics

The mean age of the nurses who complete the study was 30.44 (SD= 8.16) ranging from 20 to 60. Almost half of the sample were males (n=95, 53.1%), and worked in a governmental hospital (n=97, 54.2%). In terms of educational levels, nurses who had bachelor's

degrees compromised three fourth of the participants in the study (n= 138, 77.1%). The nurses in the current study reported mean experiences in the emergency room of 7.58 (SD=10.78) years. At the entry of the study, the monthly income of the nurses ranged from 350 JD to 450 JD (M= 428.79 JD, SD=124.74). About half of the respondents (n= 88, 54%) are satisfied with their work and can tolerate working under pressure (n= 123, 68.7%) (Table 1).

3.2. Nurses' sleep quality

In the current study, the total mean scores of PSQI were 7.87 (SD= 3.86) which indicates more sleep problems among nurses (see Table 2). When examining nurses' scores according to the cut point score 5, about 84.4% of nurses had global scores ≥ 5 indicating poor sleep. Although the subjects in the current study reported a sleep duration of 7.02 (SD= 1.83) hour during night, they reported bad subjective SQ. Also, they reported an average time of 30.29 (28.26) min to fall asleep and had >58.7% sleep efficiency. Moreover, the majority of nurses had not used sleep medication (n=125, 69.8%), while, 42.5% (n= 76) of the nurses reported little problems with daytime functioning. The most frequent reason for sleep disturbances was waking at midnight or in the early morning (M= 1.70, SD= 1.1).

3.3. Fluctuated shift and sleep quality.

In this study, all nurses worked in a rotating shift schedule. The categories of shift interchange were: morning to evening, evening to night and night to morning (table 3). Most of the nurses in the current study reported that they had less SQ disturbances when they turn shift from night to morning (Mean= 7.71, SD= 3.7). While, the highest PSQI scores reported by nurses who turn shift from morning to evening. There was no significant difference in SQ in terms of shift fluctuation (F=0.84, p= 0.43) (table 3).

3.4. Demographic variables and sleep quality.

There was a statistically significant correlation between global PSQI and age (p=0.018) indicating that older nurses had higher SQ disturbances. But, when categorizing age into 4 categories, there were no significant differences between the groups, although the middle age group (41-50) years old reported the lowest PSQI score (M= 6.3, SD= 3.1). However, there were no significant correlations between global PSQI scores and other numerical demographical variables. Additionally, no other significant differences were revealed in terms of other categorical demographic variables (Table 1).

3.5. Work-related variables and sleep quality.

There was a statistically significant correlation between SQ and number of years' experience (r= -0.15, p=0.04), and number of shifts (r= -0.18, p=0.017). However, there were no significant correlations between global PSQI scores and other numerical work-related variables. Additionally, a significant difference was observed in SQ scores in terms of work satisfaction (t= -2.92, p=0.004) and the ability of nurses to work under pressure (t= -2.95, p=0.004) indicating that nurses who are satisfied with their work and can work under pressure had better SQ scores. (Table 1).

Table 1: Demographic, work-related variables and sleep quality characteristics.

Variable	Total (n=179)	Sleep quality between demographic and work related variables	
		Mean (SD)	t/f (p value)
Gender	N (%)		
Male	95 (53.1%)	8.09(3.83)	0.47(0.45)
Female	84 (46.9%)	7.64(3.90	
Marital status		N (%)	
Single	96 (53.6%)	8.03(3.61)	
Married	79 (44.1%)	7.80(3.98)	0.51(0.67)
Divorced/Widowed	4 (2.2%)	6.50(2.27)	
Educational status	N (%)		
Diploma	32(17.9%)	6.79(3.42)	
Bachelor	138 (77.1%)	8.13(3.19)	1.43(0.24)
Higher	9 (5%)	7.77(2.87)	

Table 1 cont ...

Job satisfaction	N (%)		
Yes	88 (54%)	7.17(2.94)	-2.92(0.004)
No	75 (46%)	8.94(4.44)	
Work under pressure	N (%)		
Yes	123(68.7)	7.27(3.34)	-2.92(0.004)
No	56(31.3)	9.10(4.52)	
Hospital type	N (%)		
Governmental	97 (54.2%)	8.28(3.37)	1.49(0.13)
Private	82(45.8%)	7.39(2.89)	
	Mean (SD)		
Age (Years)	30.44(8.16)		
Experience (Years)	7.58(7.32)		
Monthly income (JD)*	428.79(124.74)		

*JD: Jordanian dinar = 1.5 US dollars

Table 2: Subjective and objective sleep measures of the participants

PSQI* components	Total possible scores	Mean(SD)	Range
Global PSQI	0-21	7.87(3.86)	0-17
Subject sleep quality	0-3	1.31(0.86)	0-3
Sleep latency	0-3	1.41(0.92)	0-3
Sleep duration	0-3	1.08(1.02)	0-3
Sleep efficiency	0-3	1.06(1.0)	0-3
Sleep disturbance	0-3	1.44(0.76)	0-3
Sleep medications	0-3	0.50(0.89)	0-3
Daytime dysfunction	0-3	1.44(0.90)	0-3

*PSQI: Pittsburgh Sleep Quality Index

Table 3: Sleep quality scores for fluctuated shifts categories.

Shift fluctuation	N (%)	Mean (SD) for global PSQI* for each group	ANOVA† F test value and Sig
Morning to evening	45(25.1%)	8.62(3.7)	F= 0.84, p= 0.43
Evening to night	34(19%)	8.10(3.8)	
Night to morning	94(52.5)	7.71(3.78)	

*PSQI: Pittsburgh Sleep Quality Index, †ANOVA: Analysis of Variance.

Discussion

The current study reflected poor SQ among nurses working in the ER. The nurses reported a global PSQI score above the cut-off score of ≥5. Similar results were reported by other studies that examined SQ among Jordanian nurses working in the ER. Suleiman et al[3] reported a global PSQI score of 8.76 (3.18) among 186 nurses working in the ER. This indicates that nurses working in ER are poor sleepers. Probably, the stressful nature of nursing work in the ER with work overload and fatigue might be the reason for the poor SQ. Also, the results of this study were similar with previous studies that examined SQ in other acute care settings such as ICU or CCU.[16] This emphasizes that critical care settings are similar to ER in workload and may induce alterations in SQ for nurses too.

In the current study, all nurse was working in shift. The study did not reveal any differences in SQ in terms of shift fluctuations, although nurses fluctuated from shift morning to evening had the highest global PSQI scores which indicate poorer SQ than other shift fluctuations such as morning to night or evening to night. No previous studies have examined shift fluctuations on SQ. However, previous studies reported poor SQ

among nurses working in shift rotation. McDowall et al[13] reported poor SQ among 78% (n=888) of shift working nurses as compared to 59% (n= 116) of nurses who work in non-shifts. Also, they reported a statistically significant difference in terms of SQ between shift-working nurses and non-shift working nurses (t=4.653, P<0.001). Further, another study showed that nurses who are working in night shift sleep two to four hours less than daytime workers which may lead to sleep deficiency, malfunctioning, and tiredness.[5] This emphasizes that work in shifts does disturb the normal circadian rhythms that are why most of the nurses who work in shifts are more likely to suffer from sleep disturbances.

In this study, there was a statistically significant relationship between SQ and age. Additionally, the current study found no association between SQ scores and other socio-demographic variables. The correlation between SQ and age in the current study are consistent with previous studies.[11,16] Attia[21] found that better SQ scores were reported by older nurses in comparison to younger nurses. The reason that the older nurses mainly work on day shift and have more stability than the younger nurses. In terms of other demographic variables, the current study was consistent with Suleiman et al[3] study, but inconsistent with other studies that reported that gender, educational level, and marital status were among the most socio-demographic factors that have a relationship with SQ.[1,5,16]

On the other hand, the results of the current study showed a statistically significant relationship between SQ and the number of shifts worked and the duration of experience as nurses in the ER. Additionally, there were significant differences in SQ in terms of working under pressure and job satisfaction. These results are congruent with other studies that revealed a significant association between SQ and experience as nurse, and shift work.[1,5] Dong et al[1] found more SQ disturbances in nurses with less experience ($x2$= 159.7, p<0.001), and working on night shift (x^2= 29.2, p<0.001). Also, other studies reported that nurses with high job satisfaction and a low number of years of experience had low sleep disturbances.[5,16,17] This could be explained as nurses with more years of experience are more adapted to the stressful work condition in the ER and by the time they became more satisfied with their work and consequently have low SQ alterations. In contrast, other studies found no relationship between work-related variables and SQ among nurses.[3]

Conclusions

The aim of the current study was to examine the relationship between SQ and shift fluctuations among nurses working in the ER in Jordan. The study concluded that Jordanian ER nurses reported poor SQ. Further, there was no effect of shifts fluctuation on SQ. Factors that influenced SQ included age, years of experience, number of shifts worked in the ER and the level of nurses' satisfaction with their work. This may suggest appropriate education programs, and intervention studies that focus on sleep among nurses working in the ER as the target population. Therefore, it is hoped that the finding from the current study may be beneficial to health facilities administrators in identifying the nurses' level of SQ and find specific measures to try to modify some of the influencing factors that may interfere with SQ.

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