Sleep Quality and Work Performance Among Shift Work Critical Care Nurses: A Cross-Sectional Study

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ABSTRACT

Background: Sufficient sleep quality empowers a well-balanced immunity, and supports work performance and work safety. Sleep quality is particularly important in the population of nurses.

Objectives: To determine the association between nursing shift work in intensive care units and sleep quality and work performance.

Setting: Salmaniya Medical Center (SMC), Bahrain.

Design: Survey using the Pittsburgh Sleep Quality Index (PSQI) and Nurse Work Function Questionnaire (NWFQ).

Methods: The study was performed from 1st February 2021 to 30th April 2021. PSQI and NWFQ were used in a cross-sectional survey in random sample of 200 nurses working in five intensive care units in SMC. For data analysis, descriptive statistics, t-tests, ANOVA, Pearson's correlation, and stepwise regression were used.

Results: One hundred seventy-eight (89%) reported poor sleep quality, with a mean (SD) of 13.6 (± 4.9); it was significantly associated with nurse performance level. One-hundred forty-five (72.5%) nurses were females; 159 (79.5%) were over 31; 157 (78.5%) were married, and 142 (71%) had a bachelor's degree. Their age ranged from 24 to 65 years old. One hundred eighty-eight (94%) were staff nurses; 178 (89%) were shift workers; 164 (82%) worked three-night shifts. One hundred forty-eight (74%) had worked for more than six years. The following were found to be significant predictors of nurse work performance: Sleep latency, subjective sleep quality, daytime dysfunction, sleep disturbances, habitual sleep efficiency, sleep duration, and use of sleeping medication, shift work, Female nurses and having children, nurses' educational level, and nurses' job designation.

Conclusion: Poor sleep quality might lead to decreased nursing work performance.

Keywords: Sleep quality, Work performance, Critical care nursing, Shift work schedule

INTRODUCTION

Sleep quality is a critical health issue that has recently been highlighted by Healthy People 2020 and healthcare providers; it is associated with high societal costs and occupation hazards[1]. Sleep quality is fundamental for well-being and optimal health[2]. Sufficient sleep quality empowers a well-balanced immunity, better work performance, and work safety[3]. Sleep quality is particularly important in the population of nurses who work diverse shift schedules, including evening and night duties over twenty-four hours per day against the sleeping-waking cycle and a person's circadian pacemaker[3-5].

Sleep is an essential and complex physiological function for all humans and especially nurses; sleep disorders such as insomnia could result in physiological and psychological complications. The risks associated with poor sleep quality include cognitive problems, mood alterations, depression, increased irritability, decreased work productivity, loss of motivation, high risks of injury, and altered physiological responses[6-8]. Several studies have revealed that insufficient sleep is an important cause of medical errors in the healthcare environment[5,9].

Modern culture demands that nurses must work eight or twelve hours shifts, which often affects the sleep-wake cycle and result in a low level of work performance and poor sleep quality[3,10-12].

Over the previous decade, the number of people sleeping less than six hours in a 24-hour cycle has increased significantly culminating in an epidemic of insufficient sleep[13]. As evidence of this, several studies have evaluated the sleep quality of nurses on shift duty and discovered that nurses sleep less than six hours per day when working diverse shift schedules and that poor sleep quality is a prevalent concern among nurses[14].

Maintaining high-quality sleep for critical care nurses in stressful healthcare environments remains a universal goal for health economy because sleep could influence work performance. Various studies

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revealed that adults require seven to ten hours of sleep duration per day (24-hour cycle)[3]. Nurses working in different shift duties could directly influence their lifestyles, health, sleep quality, and indirectly their job performance[15]. Shift work, and mostly night shift, is documented as a source of stress for nurses[16].

Working shifts is recognized to be an occupation hazard which could result in inadequate rest, tiredness, and daytime sleepiness culminating in medical errors and accidents[17,18]. In a study by Christian et al, it was found that about 57% to 83.2% of nurses were at a higher risk of sleep deprivation and poor sleep quality because of job-related factors; 20%-30% of shift workers suffer from shift work sleep disorder (SWSD), 27% of nurses used sleep medications, 18.5% have mild to severe obstructive sleep apnea (OSA), and 4.5% of nurses were excessively sleepy during the day[19].

This study aims to determine the association between nursing shift work in intensive care units and sleep quality and work performance.

METHOD

The study was performed from 1st February 2021 to 30th April 2021. Four hundred nurses worked in a critical care unit of SMC. Two hundred (50%) nurses were included in the study; those nurses willingly participated and were not on (sick) leave at the time of the study. SMC had five major critical care settings, and the nurses worked 48 hours a week in three different types of shifts (morning 6:30 am to 2:30 pm, evening 2:30 pm to 10:30 pm, and night 10:30 pm to 6:30 am. The supervisor nurses worked one shift from 6:30 am to 2:30 pm.

The following data collection tools were employed in the study:
Sociodemographic Characteristics Questionnaire: included age, gender, level of education, marital status, children, weight, height, BMI, number of exercises, caffeine intake (Coffee and Tea), smoking, work experience, area of practice, position, shifts pattern (fixed duty or two shifts duty, morning/evening or three shifts duty morning/evening/night), pregnancy, diabetic, hypertension, hearts disease.

The Pittsburgh Sleep Quality Index (PSQI): it is widely utilized in sleep studies[20,21]. It includes Subjective sleep quality (one item), sleep latency (four items), sleep length (one item), sleep efficiency (four items), sleep disturbance (one item), Daytime dysfunction (one item), and Use of sleep medications (four items)[21].

The Nurses Work Functioning Questionnaire (NWFQ): comprises subjective self-reported items to assess work impairments caused by common mental disorders in healthcare workers over the last four weeks[22]. NWFQ consists of a 50-item questionnaire divided into seven subscales: cognitive aspects of task execution (11 items), impaired decision making (3 items), workplace incidents (8 items), avoidance behavior (8 items), conflicts and irritations with colleagues (7 items), impaired contact with patients and their families (8 items), and lack of energy and motivation (5 items)[22]. The sum of all components offers a measure of overall job performance, with a conventional sum score ranging from 1 to 100[22]. Therefore, in this study, the researcher included all subscales except the impaired decision-making scale.

IBM SPSS V.28 was used for data analyses, in which the demographic variables and scale findings were summarized. Categorical variables such as gender, education level, age groups, etc were summarized using frequency and percentage distribution for each category. Continuous variables like the NWFQ and PSQI scales were analyzed using the central tendencies measures (mean and median) and measures of dispersions (standard deviation, range, etc.). Cronbach's Alpha, a measure of internal consistency was used to examine the reliability of NWFQ and PSQI scales.

RESULT

One-hundred forty-five (72.5%) nurses were females; 159 (79.5%) were over 31; 157 (78.5%) were married, and 142 (71%) had a bachelor's degree. Their age ranged from 24 to 65 years old, with a mean (standard deviation SD) of 38.23 (8.224). One hundred eighty-eight (94%) were staff nurses; 178 (89%) were shift workers; 164 (82%) worked three-night shifts. One hundred forty-eight (74%) had worked for more than six years, see Table 1.

Table 1: Study nurses' sociodemographic characteristics

Characteristics	Categories	Frequency (n)	Percentage (%)
Gender			
	Male	55	27.5%
	Female	145	72.5%
Age Group (years)			
	21-30 years	41	20.5%
	31-40 years	74	37.0%
	41-50 years	73	36.5%
	51-65 years	12	6.0%
Marital Status			
	Single	40	20.0%
	Married	157	78.5%
	Divorced/ Separated	3	1.5%
Having Children			
	Without	58	29.0%
	With	142	71.0%
Education Level			
	Diploma	31	15.5%
	Bachelor	162	81.0%
	Master	7	3.5%
Area of Practice			
	Burns Unit	10	5.0%
	CCU	27	13.5%
	ICU	80	40.0%
	NICU	74	37.0%
	PICU	9	4.5%
Length of Clinical Experience (years)			
	21-30 years	41	20.5%
	31-40 years	74	37.0%
	41-50 years	73	36.5%
	51-65 years	12	6.0%
Designation			
	RN	188	94.0%
	Supervisor	9	4.5%
	Head Nurse	3	1.5%
Number of Work Shifts			
	One Shift	22	11.0%
	Two Shifts	14	7.0%
	Three Shifts	164	82.0%

One hundred seventy-eight (89%) reported poor sleep quality, with a mean (SD) of 13.6 (± 4.9), see table 2. Sleep quality components were

Table 2: Sleep quality and nurse work function

Variables	Mean	Std. Deviation	Minimum	Maximum	Kurtosis	Skewness
Global Sleep Quality	13.6	4.9	0.0	21.0	1.8	-1.6
Subjective Sleep Quality	2.6	0.8	0.0	3.0	3.3	-2.1
Sleep Latency	2.4	1.0	0.0	3.0	0.8	-1.4
Sleep Duration	2.1	0.7	0.0	3.0	1.0	-0.8
Habitual Sleep Efficiency	0.3	0.5	0.0	3.0	6.8	2.4
Sleep Disturbances	2.3	0.9	0.0	3.0	0.9	-1.3
Use of Sleeping Medication	1.8	1.0	0.0	3.0	-0.3	-0.8
Daytime Dysfunction	2.3	0.9	0.0	3.0	1.4	-1.4
Nurses Work Function	56.3	22.6	0.0	92.7	0.3	-0.6
Cognitive Aspects of Task Execution and General Incidents	68.1	23	0	100	0.722	-1.004
Causing Incidents at Work	42	19.1	0	77	0.158	-0.488
Avoidance Behavior	51.6	24.4	0	100	-0.533	0.477
Conflicts and Irritations with Colleagues	62.2	28.9	0	100	0.326	-0.395
Impaired Contact with Patients and their Families	51.3	20.8	0	91.7	-0.196	-0.757
Lack of Energy and Motivation	62.3	28.6	0	100	0.140	-0.861

Table 3: Nurses' characteristics and sleep quality

		Pittsburgh Sleep Quality Index (PSQI)		
Variable	Categories	Mean	SD	P-value
Gender				
	Male	12.4	±6.3	0.603
	Female	14.1	±4.2	
Age Group				
	21-30 years	13.2	±5.2	0.263
	31-40 years	13.1	±5.4	
	41-50 years	14.5	±4.5	
	51-65 years	13.7	±2.8	
Marital Status				
	Single	11.7	±6.3	0.421
	Married	14.1	±4.4	
	Divorced	12.7	±4.0	
Having Children				
	Without	12.4	±5.7	0.201
	With	14.1	±4.5	
Education Level				
	Diploma	12.6	±4.3	<0.0001*
	Bachelor	14.1	±4.8	
	Master	8.4	±6.4	
Area of Practice				
	Burns unit	12.9	±6.5	0.332
	CCU	12.7	±4.8	
	ICU	13.8	±4.9	
	NICU	13.6	±5.0	
	PICU	15.4	±2.6	
Length of Clinical Experience				
	1 year	15.6	±1.5	0.308
	2-5 years	14.1	±4.5	
	6-10 years	11.9	±5.8	
	11-15 years	16.0	±3.2	
	>15 years	14.4	±1.3	
Designation				
	RN	14.3	±4.2	<0.0001*
	Supervisor	2.8	±3.6	
	Head Nurse	4.3	±4.9	
Work Shifts Schedule				
	One shift	1.4	±1.0	<0.0001*
	Two shifts	9.2	±0.9	
	Three shifts	15.7	±1.8	

*Statistically significant differences with Kruskal-Wallis test at Alpha 0.05.

as follows: sleep latency of 2.4 (± 1); a subjective sleep quality of 2.6 (± 0.8); daytime dysfunction of 2.3 (± 0.9); sleep disturbances of 2.3 (± 0.9); habitual sleep efficiency of 0.3 (± 0.5); sleep duration of 2.1 (± 0.7); and use of sleeping medication of 1.8 (± 1), see table 2.

Educational level revealed a significant difference in sleep quality. Master holders reported significantly better sleep quality than those with diploma and bachelor's degrees (8.4 (± 6.4) vs. 12.6 (± 4.3) and 14.1 (± 4.8), P-value 0.0001. Both nursing supervisors and head nurses reported significantly better sleep quality than the registered nurses (2.8 (± 3.6) and 4.3 (± 4.9) vs. 14.3 (± 4.2), P-value: 0.0001. Nurses who work only one shift reported normal sleep quality of 1.4 (± 1) whereas those who work two shifts had significantly poor sleep quality measured as 9.2 (± 0.9), P-value:0.0001. Furthermore, nurses who work three shifts reported even worse sleep quality with a statistically significant difference than the two mentioned groups (15.7 (±1.8), P-value 0.0001. However, no significant differences between the groups by area of practice and length of clinical experience existed, see table 3.

Nurse work functioning questionnaire had an overall mean (SD) of 56.3 (± 22.5). Each NWFQ subscale's mean (SD) was as follows: cognitive aspects of task execution 68.1 (± 23), causing incidents at work 42 (± 19.1), avoidance behavior 51.6 (± 24.4), conflicts and irritations with colleagues 62.2 (± 28.9), impaired contact with patients and their family 51.3 (± 20.8), and lack of energy and motivation 62.3 (± 28.6), see table 2.

Nurses' characteristics were associated with one or more aspects of impaired nurse work functioning questionnaire among the sample except for age group and marital status. Female nurses and having children reported significantly impaired contact with patients and their families (P-value: 0.010), (P-value 0.043). The educational level was associated with all the NWFQ aspects; those who have master's degrees reported significantly less work impairment in all of these aspects compared to the Bachelor and diploma holders, P-value: 0.0001. Intensive care unit (ICU) and pediatric intensive care unit (PICU) nurses reported the highest impaired work function in all 6 aspects with significant differences compared to the other three units, P-value: 0.012. The participants' work experience was found to be associated with their cognitive, avoidance behavior, and lack of energy. As experience increases, the level of impairment significantly decreases. Registered nurses significantly revealed higher work impairment across the 6 aspects compared with the supervisors and the head nurses. The more shifts the participants work, the higher the impaired work functions, see table 4.

Each sleep indicator is independent of the others. Indeed, each subscale of NWFQ had significant positive correlations (P-value. 0001) with sleep quality, see table 5. Moreover, the relationship is further modeled using the simple linear regression which revealed a highly significant regression model for all subscales of NWFQ and sleep quality, see table 6.

DISCUSSION

Sleep deprivation is associated with shift work which might significantly impair nurse performance[23]. In this study, sleep quality components were linked to work performance.

In this study, one hundred seventy-eight (89%) nurses had poor sleep quality. Critical care nurses had a significantly greater prevalence of sleep problems than nurses in other countries: 43.1% to 86% among healthcare workers in Iran; 79.8% among night duty nurses in Korea; 78% among shift-work nurses in the United Kingdom (UK); 69% of shift working nurses in India; 30.8% to 56% in shifts work nurses in USA; 54.8% to 83% in nurses in China; 57% in nurses in Taiwan; 48.6% to 59.8% in nurses in Saudi Arabia, and 43.2% to 58.3% in nurses in Nigeria[6,7,13,14,23-36].

The prevalence of poor sleep quality among critical care nurses at SMC may be related to overly demanding working conditions, particularly in intensive care units, such as nursing shortages, an excessive workload, long working hours, fatigue, prolonged time away from family, fear of spreading the disease to the families, and workplace safety concerns. The Eastern Mediterranean Region (including Bahrain) has a critically low number of nurses in practice: 15.6 nurses per 10,000 residents[37,38]. Nurses suffering from sleep problems may be a result of this discrepancy. In the Eastern Mediterranean Region, nurse shortages and staffing levels are 17% compared to other regions[37]. Because of nurse staffing levels, long shifts no longer serve as a statistically reliable indicator of patient safety[37,38].

An additional reason that may have contributed to the prevalence of poor sleep quality in this study compared to earlier studies is anxiety about the COVID-19 pandemic's contagiousness. As frontline providers of healthcare, nurses are deeply concerned about the COVID-19 outbreak. They face the danger of getting infected by their patients. Additionally, they are under a great deal of pressure to protect their families and themselves from the sickness. Poor sleep quality and short sleep duration could be caused by any one of these reasons[39].

In this study, a high mean (±SD) global sleep quality score of 13.6 (±4.9) was found. According to earlier research, nurses had significantly higher mean (SD) global sleep quality scores than the general population: Chinese nurses had scores of 7.32 (±3.24) compared to the Chinese general population 4.26 (±2.67) and Korean nurses had scores of 7.18 (±2.98) compared to the Korean general populations 5.8 (±3.4)[23,32,40,41].

Furthermore, the discrepancy is probably because nurses in previous studies were only included if they worked during the day, whereas shift workers were included in the current study. The findings suggested that working night shifts and taking more shifts may considerably worsen nurses' sleep quality. Nurses who worked three shifts (morning, evening, and night) scored higher than those who worked one shift: 15.7 (±1.8) for three shift duty nurses compared to 1.4 (±1.0) for one shift duty nurses. Shift work sleep disorders reduce the quality of sleep and are strongly correlated with shift work.

Evidence suggests that nurses who pursue postgraduate studies are more likely to possess improved critical thinking and decision-making abilities, leadership qualities that allow them to confront poor practice, and the competencies needed for advanced clinical practice responsibilities[42]. There is no doubt that the advancement of nursing profession improves professional practice. The complex interaction between professional nurses promotes a positive balance for the best possible client outcomes[43].

Furthermore, it was observed that female nurses with children reported significantly impaired contact with patients and their families. This outcome might be explained by psychological and physiological characteristics unique to women. Female nurses must balance their work and family commitments. As a result, they face greater life pressure than male nurses[44].

In this study, intensive care unit (ICU) and pediatric intensive care unit (PICU) nurses (P-value 0.012) had the worst impaired work function

Table 4: Participants' characteristics and nurse functioning

Variable	Categories	Cognitive		Causing incidents		Avoidance		Impaired contact		Conflict		Lack of energy		Total NWFQ	
Gender		Mean±SD		Mean±SD		Mean±SD		Mean±SD		Mean±SD		Mean±SD		Mean±SD	
	Male	63.9	±27.7	37.2	±22.7	53.4	±29.2	44.9	±23.3	59.4	±36.4	58.2	±35.4	52.8	±27.9
	Female	69.7	±20.9	43.9	±17.2	51.0	±22.5	53.8	±19.3	63.3	±27.1	63.9	±25.6	57.6	±20.1
	p-value	0.214		0.060		0.880		0.010*		0.998		0.841		0.181	
Age Group															
	21-30 Years	70.1	±26.5	43.3	±21.6	56.0	±29.3	52.4	±24.4	62.2	±32.9	63.3	±31.7	57.9	±25.8
	31-40 Years	67.3	±26.2	43.5	±22.2	56.6	±27.0	52.6	±23.1	63.2	±34.5	62.8	±32.8	57.7	±26.1
	41-50 Years	68.0	±18.4	40.4	±14.5	44.9	±16.8	49.9	±16.6	61.3	±23.5	62.0	±23.1	54.4	±17.1
	51-65 Years	67.0	±16.4	39.1	±14.6	47.4	±21.6	48.6	±17.3	62.5	±26.0	58.6	±22.9	53.9	±17.8
	p-value	0.664		0.190		0.065		0.404		0.698		0.778		0.743	
Marital Status															
	Single	60.9	±31.9	37.6	±25.4	56.0	±31.2	44.3	±27.3	58.2	±38.7	52.9	±38.1	51.6	±30.7
	Married	69.9	±19.8	43.3	±17.1	50.4	±22.4	53.0	±18.4	63.3	±27.5	64.9	±25.4	57.5	±20.0
	Divorced	68.7	±31.1	35.4	±12.7	57.3	±28.4	56.9	±30.9	61.9	±20.3	54.4	±26.9	55.8	±24.6
	p-value	0.466		0.318		0.747		0.104		0.975		0.328		0.344	
Having children															
	Without	62.5	±28.5	37.8	±22.4	52.0	±28.7	46.0	±24.4	57.8	±34.2	55.8	±34.0	52.0	±27.0
	With	70.4	±20.0	43.8	±17.4	51.5	±22.6	53.5	±18.8	64.0	±27.9	65.0	±25.8	58.1	±20.3
	p-value	0.940		0.104		0.864		0.043*		0.323		0.224		0.084	
Education level															
	Diploma	62.6	±17.3	37.4	±14.8	40.7	±12.7	46.6	±16.1	54.3	±26.8	56.8	±24.0	49.7	±16.2
	Bachelor	70.5	±22.9	44.1	±19.1	54.8	±25.3	53.4	±20.9	65.1	±29.4	65.0	±28.5	58.8	±22.6
	Master	37.0	±25.4	15.5	±10.5	28.1	±18.5	23.8	±15.9	30.1	±32.7	26.2	±26.0	26.8	±20.5
	p-value	0.001*		<0.0001*		0.001*		0.001*		0.007*		0.003*		<0.0001*	
Area of practice															
	Burns unit	59.7	±21.3	35.0	±17.6	43.1	±15.3	43.8	±19.5	53.6	±29.7	52.7	±28.3	48.0	±20.9
	CCU	62.3	±14.6	37.5	±14.6	43.1	±17.1	45.2	±13.8	57.0	±27.8	51.0	±23.0	49.4	±16.5
	ICU	72.3	±28.0	47.6	±22.6	61.6	±30.0	58.2	±24.7	68.7	±33.7	68.9	±33.0	62.9	±27.2
	NICU	66.4	±20.2	38.7	±15.8	45.6	±17.5	47.4	±17.5	57.7	±26.5	60.3	±25.1	52.7	±18.3
	PICU	72.1	±11.9	42.1	±12.3	48.3	±17.8	49.5	±9.3	67.9	±15.9	65.9	±14.0	57.6	±11.2
	p-value	0.010*		0.020*		0.008*		<0.0001*		0.045*		0.001*		0.012*	
Length of Clinical Experience															
	1 Year	90.6	±9.8	61.7	±14.8	84.4	±19.3	73.3	±14.4	90.7	±11.7	92.0	±8.4	82.1	±8.7
	2-5 Years	71.5	±18.8	44.0	±16.3	51.6	±24.2	52.6	±17.1	61.6	±27.5	65.3	±25.4	57.8	±19.5
	6-10 Years	63.5	±29.8	39.7	±24.4	54.5	±28.1	50.9	±27.1	59.6	±36.1	56.9	±36.1	54.6	±28.8
	11-15 Years	69.9	±12.5	41.1	±9.2	44.9	±13.2	47.7	±10.3	64.4	±19.9	63.6	±15.2	55.5	±11.7
	>15 Years	70.6	±9.2	45.3	±10.0	45.4	±20.3	53.1	±8.6	63.2	±23.0	70.2	±12.1	53.8	±15.0
	p-value	0.045*		0.120		0.005*		0.121		0.245		0.032*		0.112	
Designation															
	RN	71.0	±20.3	44.3	±17.2	53.5	±23.8	53.8	±18.8	65.5	±27.1	65.5	±25.8	58.9	±20.3
	Supervisor	20.0	±14.7	5.6	±7.3	18.7	±12.4	11.6	±10.0	5.2	±13.0	8.9	±18.3	11.7	±10.7
	Head Nurse	32.8	±21.8	8.3	±10.8	37.5	±21.7	16.7	±16.3	26.2	±45.4	27.8	±48.1	24.9	±27.3
	p-value	<0.0001*		<0.0001*		<0.0001*		<0.0001*		<0.0001*		<0.0001*		<0.0001*	
Number of work shifts															
	One Shift	17.9	±9.3	3.1	±4.2	21.3	±9.5	10.0	±7.1	2.1	±9.9	0.8	±3.6	9.2	±5.2
	Two Shifts	42.5	±10.9	19.9	±2.7	36.4	±18.6	28.0	±6.2	39.3	±26.3	35.5	±19.1	33.6	±11.9
	Three Shifts	77.1	±12.2	49.1	±12.0	57.0	±22.8	58.9	±13.6	72.3	±19.7	72.9	±16.8	64.6	±14.0
	p-value	<0.0001*		<0.0001*		<0.0001*		<0.0001*		<0.0001*		<0.0001*		<0.0001*	

*Statistically significant differences with Kruskal-Wallis test at Alpha 0.05.

Table 5: Nurses' characteristics and nurse work functioning questionnaire

		NWFQ	Subjective sleep quality	Sleep latency	Sleep duration	Habitual sleep efficiency	Sleep disturbances	Use of sleeping medication	Daytime dysfunction	Global sleep quality
NWFQ	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Subjective Sleep Quality	Pearson Correlation	0.758**								
	Sig. (2-tailed)	<0.001								
	N	200								
Sleep Latency	Pearson Correlation	0.797**	0.845**							
	Sig. (2-tailed)	<0.001	<0.001							
	N	200	200							
Sleep Duration	Pearson Correlation	0.530**	0.673**	0.700**						
	Sig. (2-tailed)	<0.001	<0.001	<0.001						
	N	200	200	200						
Habitual Sleep Efficiency	Pearson Correlation	0.112	0.197**	0.254**	0.568**					
	Sig. (2-tailed)	0.114	0.005	<0.001	<0.001					
	N	200	200	200	200					
Sleep Disturbances	Pearson Correlation	0.833**	0.813**	0.778**	0.601**	0.209**				
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	0.003				
	N	200	200	200	200	200				
Use of Sleeping Medication	Pearson Correlation	0.792**	0.759**	0.781**	0.612**	0.265**	0.754**			
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
	N	200	200	200	200	200	200			
Daytime Dysfunction	Pearson Correlation	0.801**	0.793**	0.747**	0.610**	0.211**	0.815**	0.663**		
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001		
	N	200	200	200	200	200	200	200		
Global Sleep Quality	Pearson Correlation	0.840**	0.909**	0.913**	0.810**	0.406**	0.894**	0.866**	0.867**	
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
	N	200	200	200	200	200	200	200	200	

*NWFQ= Nurses Work Functioning Questionnaire

Table 6: Linear regression models and associations of NWFQ with sleep quality

Dependent Variable	Independent Variable	Regression Results					
		R	R^2	F	B	T	P
Sleep Quality	NWFQ	+0.680	0.70	474.6	0.84	21.8	p<.0001
	Cognitive Aspects of Task Execution	+0.86	0.74	577.4	0.86	24.0	p<.0001
	Causing Incidents at Work	+0.81	0.65	377.4	0.81	19.4	p<.0001
	Avoidance Behavior,	+0.56	0.32	93.4	0.57	9.7	p<.0001
	Conflicts and Irritations with Colleagues	+0.76	0.81	401.7	0.82	20.0	p<.0001
	Impaired Contact with Patients and Their Family	+0.76	0.58	277.9	0.77	16.7	p<.0001
	Lack of Energy and Motivation	+0.84	0.71	495.8	0.85	22.3	p<.0001

*NWFQ= Nurses work functioning questionnaire

compared to the other three units[9]. Nursing supervisors and head nurses were found to have significantly better sleep quality than the registered nurses (2.8 ± 3.6 and 4.3 ± 4.9 vs. 14.3 ± 4.2, P-value 0.0001) and less work functioning impairment compared to the supervisors and the head nurses (24.9 ± 27.3 and 11.7 ±1 0.7 vs 58.9 ± 20.3, P-value 0.0001). Several studies found that poor sleep quality and low work performance were more frequent in registered nurses than nurse managers, which is consistent with the finding of the present study[3,4,7,45,46]. It is possible that registered nurses have shiftwork, direct contact with patients and their families, more workload, and high work stress than non-shift nurses[9]. Rahimi-Moghadam et al revealed that one shifts work nurses were more likely to have better job satisfaction, fewer work-related incidents, better sleep quality, and fewer mental and physical illnesses than shift work nurses[45].

This study revealed a significant correlation between excessive shift and poor sleep quality (15.7 ± 1.8 vs 9.2 ± 0.9 and 1.4 ± 1, p<0.0001), and work performance (64.6 ±14.0 vs 33.6 ± 11.9 and 9.2 ± 5.2, p<0.0001). Other studies revealed that shift work in itself is an independent risk factor for poor sleep quality that led to low work performance[7,47]. Shift works produce chronic and increased fatigue by reducing both sleep quantity and quality[48]. Nurses working no-shift duty had better sleep quality and quantity than those working shift[49]. Additionally, shift-working nurses appeared to have poorer work performance than non-shift nurses; sleep loss significantly affected decision-making, taking the initiative, integrating information, paying attention to details, making plans, carrying them through, and being vigilant[50-52]. Numerous studies showed that nurses who had previously worked shifts were much more likely to have bad sleep than nurses who had never worked shifts[53].

Sleep quality revealed a significant association with NWFQ (r = +0.680, P-value. 0001). Productivity, efficiency, task execution speed, and supervision could be affected by sleep quality[5]. Nurses with good sleep quality could provide quality health care services[52,53]. Sleep deprivation was a reason for unscheduled absenteeism during work performance[54]. Short sleep duration is statistically linked to worse ratings of nursing care quality and patient safety[3].

This study is inherently limited by being a questionnaire, but it would be a solid foundation to design and conduct a prospective randomized controlled trial study in the future.

Shift work is essential to ensure that patient care is provided on time, effectively and safely. Little is currently known regarding the relationship between sleep quality and work performance in Bahraini nursing literature; this study intended to fill the gap.

CONCLUSION

Poor sleep quality is very prevalent among shift work critical care nurses in Bahrain, and significant relationship between sleep quality and work performance.

Worksite training and education services are needed to detect, prevent, manage, and follow up with nurses who have poor sleep quality to maintain nurses' well-being and health.

Authors' Contribution: All authors share equal contributions towards (1) substantial contributions to conception and design, acquisition of data, or analysis, and interpretation of data; (2) drafting the article or revising it critically for important intellectual content; and (3) Final approval of the version to be published. Yes.

Potential Conflict of Interest: None

Competing Interests: None

Ethical Approval: Approved by the Institutional Review Board (IRB) of the Collage of Health and Sport Sciences, Bahrain. Reference Number is 3/2020-21 dt. October 1, 2020. And, from the Ministry of Health (MOH), Bahrain. The reference Number is AURS/ 358/ 2020.
Acceptance Date: 25 October 2022

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