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Corresponding Author Email:

ramsha@maliruniversity.edu.pk

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ORIGINAL STUDY

Assessing the Influence of Stress, Fatigue, and Sleep Quality on Shift-Working Female Nurses in Karachi

Ramsha Alam¹, Fiza Abdul Rasheed¹, & Syeda Faizan Qadri²

¹Malir University of Science and Technology, Karachi-Pakistan

²Atia General Hospital, Karachi-Pakistan

Abstract

Background: Numerous studies have shown the relationship between shift work and diseases, such as coronary disease, depression, hypertension, and breast cancer. Similarly, sleep-related health affects overall work performance in shift work nurses. This study aimed to evaluate the association between stress and sleep satisfaction among shift work nurses in Karachi.

Methodology: Employing a descriptive correlation design, self-administered surveys were used to collect data on distress, fatigue, and sleep quality from 311 nurses in Karachi between July 2023 and January 2024.

Results: Elevated fatigue levels were associated with higher reported stress levels, diminished overall health, and decreased sleep satisfaction ($p\text{-value} = <0.001$). The sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQ). Its scores showed significant correlations with fatigue, health status, and stress ($p\text{-value} = <0.001$).

Conclusion: The current study findings highlighted a connection between stress and sleep satisfaction among shift-working nurses in Karachi. Hence, it is implicated that shift working nurses should adopt stress management strategies which might lead to improved health and sleep quality for nurses.

Keywords

Nurse, Fatigue, Sleep Quality, Visual Analog Scale, Pittsburgh Sleep Quality Index

Introduction

The demanding nature of nursing, especially within the context of shift work, has long been recognized as a significant source of occupational stress, which can adversely affect both physical and mental health, including sleep quality. The intricacies of these relationships, however, remain insufficiently explored, particularly in developing countries like Pakistan, where the healthcare system is burdened with unique challenges¹.

Nurses work in stressful environments and greater stress erodes work satisfaction. Stress and its sequelae must be controlled so that nurses can maintain quality patient care². A direct relationship has been shown between stress and medical errors. More errors occur when nurses work longer than 16 hours. When high stress is combined with nursing's irregular hours, results include fatigue and lower performance³.

Sleep is an important factor in reducing fatigue and increasing concentration on work activities⁴. Studies on shift-work nurses in Japan showed that fatigue decreased if the nurse had adequate sleep and rest before the night shift work⁵. Nurses were more fatigued if their break and nap lasted less than two hours during the 16-hour night shift⁵. In addition, night shift nurses who took breaks before midnight reported more fatigue than those who took breaks after midnight. Lower levels of fatigue were reported when shift breaks were taken⁶. Lastly, the sleep quality of shift work nurses is related to both increased levels of fatigue and decreased work performance⁵.

Rotating shift nurses suffer a decline in sleep quality. Shift work also affects overall health^{4, 7}. Numerous studies have shown the relationship between shift work and diseases, such as coronary disease, depression, hypertension, and breast cancer^{3, 8, 9}. Similarly, sleep-related health affects overall work performance in shift work nurses¹⁰. This study aimed to evaluate the association between stress and sleep satisfaction among shift work nurses in Karachi. In addition, nurses who engage in activities to manage stress might achieve higher levels of health and high sleep quality.

Methodology

This research was conducted among female nurses below 45 years of age working in shifts at Kohi Goth Hospital and Attia Hospital in Karachi. The nurses were recruited through a non-probability random sampling technique. Exclusion criteria were applied, excluding head nurses/nurse managers due to their lack of direct patient care duties, nurses above 45 years of age, and nurses who regularly used sleep medication, as this could potentially confound the measurement of sleep quality and related variables. Additionally, lactating and pregnant nurses were also exempted from the inclusion criteria.

The sample size was calculated using Raosoft online sample size calculator, keeping the population size of nurses in Sindh as 2000 according to the records of the Health Department of Sindh (2018)¹¹. Using a 95% confidence interval and a 5% error margin, with a 50% response rate the sample size was calculated to be 323.

A survey questionnaire was disseminated to 323 nurses between July and December 2023. Participation was voluntary, implied consent, and completed questionnaires were deposited into designated collection bags in sealed envelopes over two weeks. The questionnaires provided data on several key areas of interest in the study including demographics, stress levels, sleep quality as well as quantity, sleep satisfaction, fatigue levels, and overall health status.

Additionally, participants were queried about their exercise habits, bedroom/sleeping environment, activities on non-working days and stress management strategies. Demographic inquiries encompassed age, gender, height, weight, marital status, living arrangements with family, and number of children. Furthermore, participants were asked about their exercise routines, sleep environments, and leisure activities.

Current stress levels among shift-working nurses were assessed using a self-administered visual analog scale (VAS). The Visual Analog Scale (VAS) scale consists of a straight horizontal line with a

fixed length, typically 100 mm. This line represents the range of the parameter being measured, such as a symptom, level of pain, or state of health. The left end signifies the worst condition, while the right end represents the best condition. A score of 0 mm, signifying "no stress at all," and the other end representing a score of 100 mm, indicates "extreme stress." The VAS is commonly utilized for quantitatively measuring subjective mental states¹².

Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI-J). This self-administered questionnaire gauges sleep quality and quantity over a period of three months. The PSQI-J comprises seven component scores: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction. Each item is rated on a 0-3 scale. Total scores range from 0 to 21, with higher scores indicating poorer sleep quality. For the worldwide scale, PSQI-J has a test-retest reliability of 85%, a sensitivity of 89.6%, and a specificity of 86.5%¹³.

The data analysis was performed using IBM SPSS Statistics version 22.0. Pearson's correlations were computed to assess the relationships between stress levels and associated factors. Independent-sample T-tests were employed for bivariate analyses to investigate the activities utilized by nurses for stress management or reduction. A significance threshold of $p < 0.05$ was applied for all analyses.

Result

Out of this sample size, 7 nurses did not respond to the Questionnaire and 5 nurses were in usual intake of sleep medication, resulting in data analysis for 311 participants.

The mean age was 27.6 ± 7.3 years and the mean experience was 27 ± 6.8 years, duty hours 36 ± 10.8 . Around 42.1% were unmarried, 45% were living alone, and 61% not have children. Nurses were assigned to various wards, including post-surgical (29%), internal/medical (31.59%), a combination of post-surgical and internal/medical (13.8%), ICU, CCU emergency, the operating department (15%), and others (2.89%) (Table 1).

Stress levels ranged between 7 to 100 mm (the maximum), with a mean of 60.8 ± 21.8 . A significant majority, comprising 280 (90.03%) of participants, reported actively managing their stress. Fatigue levels varied from 0 to 100 mm (the maximum), with an average of 67.5 ± 19.8 mm). Nurses working on the night shift reported higher fatigue levels of 79.0 ± 19.3 , whereas health ratings spanned from 0 to 100, with a mean of 49.8 ± 21.5 . Further, common stress management strategies included spending time with friends/family (1.78%), engaging in physical activity/exercise (4.28%), dining out (32.14%), sleeping/taking a nap (30.3%), shopping (4.64%), traveling (1.78%).

Moreover, sleep quality was evaluated using the PSQI instrument, with scores ranging from 0 to 3, where higher scores indicate poorer sleep quality. The mean total score was calculated as 7.0 ± 2.2 , with 64.95% of nurses reporting scores above the 4.5 cut-off point. This suggests that more than half of the nurses experienced decreased sleep quality. Specifically, these participants reported average scores for sleep quality (1.4 ± 0.7), sleep latency (1.1 ± 0.9), sleep duration (1.6 ± 0.6), habitual sleep efficiency (1.3 ± 0.8), sleep disturbance (0.9 ± 0.5), and daytime dysfunction (0.9 ± 0.8). The sleep medication score is 0.0 because we exclude nurses who use sleep medication. Additional details on stress, fatigue, and sleep quality among nurses were also measured showing 64.95% of nurses deal with bad sleep quality and only 35% were able to get good quality (Table 2).

Table 3 presents the Pearson's correlation coefficients computed among variables including sleep duration, sleep quality satisfaction, stress levels, fatigue levels, health status, and total scores as well as subscales of the PSQI. Individuals experiencing greater fatigue levels also indicated experiencing more stress, reduced satisfaction with sleep, and generally poorer health status (p -value= <0.001). The total score on the PSQI was found to be inversely related to the duration of sleep, directly related to the amount of time required to fall asleep ($r=0.576$, p -value= <0.001), and inversely related to sleep satisfaction. Given that higher scores on the PSQI indicate poorer sleep quality, it was observed that nurses with

lower sleep quality tended to sleep fewer minutes, experienced longer delays in falling asleep, and reported less satisfaction with their sleep. Furthermore, the overall PSQI scores showed

significant but weak correlations with reported stress levels, fatigue levels, and health status (p -value = <0.001).

Table 1. Demographic characteristics (N = 311).

Characteristics		
Age in year (means \pm SD)		27 \pm 6.8
Experience in years (means \pm SD)		27 \pm 6.8 years
Duty hours (means \pm SD)		36 \pm 10.8
Department number. (%)	Post-surgical department	91 (29)
	Internal/medical department	98 (31.51)
	Combination of post-surgical and internal	43 (13.8)
	ICU, CCU, emergency	40 (15.0)
	Operating department	30 (12.86)
	Others	9 (2.89)
Marital Status. (%)	Single	131 (42.1)
	Married	180 (57.8)
No of Students. (%)	Children	120 (38.58)
	No child	191 (61.4)
Family Status (%)	Combine	171 (54.9)
	Nuclear	140 (45)
Exercising Status (%)	Exercise	63 (20)
	No exercise	248 (80)

Table 2: Stress, fatigue, and sleep quality among shift work nurses (N = 311).

Levels of stress, VAS (mm, means \pm SD)	60.8 \pm 21.8
Levels of fatigue, VAS (mm, means \pm SD)	67.5 \pm 19.8
Levels of fatigue on a night shift work, VAS (mm, means \pm SD)	79.0 \pm 19.3
Levels of Health, VAS (mm, means \pm SD)	49.8 \pm 21.5
Usual Times on sleep at night (minutes, means \pm SD)	340.3 \pm 60.0
Times it takes to get to sleep (minutes, means \pm SD)	20.3 \pm 25.8
Times on sleep before or after a night shift, (minutes, means \pm SD)	523.7 \pm 119.7
Sleep satisfaction, VAS (mm, means \pm SD)	37.3 \pm 23.5
Actively manage stress, no. (%)	280 (90.03)
Spending time with family/friends	5 (1.78)
Engage in physical activity/exercise	12 (4.28)
Eat out	90 (32.14)
Sleep/take a nap	85 (30.3)
Go shopping	70 (25)
Go on a trip	5 (1.78)
Listen to music	13 (4.64)

Not actively managing stress, no. (%)	31 (9.96)
PSQI component scores (0 - 3) (means \pm SD)	
1) Subjective sleep quality	1.4 \pm 0.7
2) Sleep latency	1.1 \pm 0.9
3) Sleep duration	1.6 \pm 0.6
4) Habitual sleep efficiency	1.3 \pm 0.8
5) Sleep disturbances	0.9 \pm 0.5
6) Use of sleeping medication	0.0 \pm 0.0
7) Daytime dysfunction	0.9 \pm 0.8
PSQI score (means \pm SD)	7.0 \pm 2.2
≤ 5.5 means good sleep quality (%)	109 (35)
> 5.5 means bad sleep quality (%)	202(64.95)

Table 3: Correlation Analysis of Stress, Fatigue, and Sleep Quality (PSQI) Among Shift-Working Nurses (N = 311)

		Minutes of sleep	Time to Get to sleep (minutes)	Sleep satisfaction (VAS)	Levels of stress (VAS)	Levels of fatigue (VAS)	Levels of health (VAS)
Levels of stress (VAS)	<i>r</i>	-0.108	0.800	-0.415	1.000	0.780	-0.329
	<i>P</i>	0.05	0.150	<0.001		<0.001	<0.001
Levels of fatigue (VAS)	<i>r</i>	-0.118	0.070	-0.430	0.800	1.000	-0.350
	<i>P</i>	0.025	0.220	<0.001	<0.001		<0.001
PSQI							
Subjective Sleep Quality	<i>r</i>	-0.228	0.301	-0.540	0.390	0.370	-0.400
	<i>P</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sleep Latency	<i>r</i>	-0.153	0.845	-0.192	0.050	0.068	-0.160
	<i>P</i>	0.002	<0.001	<0.001	0.450	0.210	0.003
Sleep Duration	<i>r</i>	-0.895	0.200	-0.270	0.072	0.089	-0.142
	<i>P</i>	<0.001	<0.001	<0.001	0.190	0.100	0.007
Habituation sleep efficiency	<i>r</i>	-0.282	0.128	-0.017	0.053	0.039	-0.088
	<i>P</i>	<0.001	0.020	0.774	0.358	0.500	0.200
Sleep Disturbances	<i>r</i>	-0.100	0.333	-0.245	0.197	0.210	-0.222
	<i>P</i>	0.053	<0.001	<0.001	<0.001	<0.001	<0.001
Daytime dysfunction	<i>r</i>	-0.092	0.024	-0.250	0.300	0.276	-0.281
	<i>P</i>	0.083	0.700	<0.001	<0.001	<0.001	<0.001
PSQI score	<i>r</i>	-0.528	0.576	-0.440	0.296	0.299	-0.380
	<i>P</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Discussion

This study aimed to delve into the dynamics between stress, fatigue, and sleep quality among nurses engaged in shift work in Karachi, Pakistan's largest city and a central hub for medical services. Given the critical role that nurses play in healthcare

delivery, understanding these interrelations is paramount for developing effective interventions aimed at enhancing their well-being and, consequently, the quality of care they provide¹⁴. By employing a descriptive correlational design and utilizing self-administered surveys, this research

seeks to shed light on the magnitude of stress and fatigue experienced by nurses and how these factors correlate with their sleep quality.

In this sample, shift-work nurses reported elevated levels of stress (67.5 ± 19.8 mm) and fatigue (79.0 ± 19.3). Despite their relatively young age (27 ± 6.8 years), self-reported health scores placed them in the middle range on the Visual Analog Scale (VAS). It is plausible that the combination of shift work and dealing with high acuity cases in an advanced treatment hospital places a physical strain on the nurses, contributing to this moderate level of health. Furthermore, the relative lack of experience among young nurses in handling acutely ill patients might also contribute to heightened stress levels¹⁵.

This study delved into various activities that could impact fatigue and stress levels during days off. Nearly 90% of nurses engage in stress-relieving activities to rejuvenate and revitalize themselves. Consequently, exploring specific, effective measures to target stress reduction and alleviate fatigue would be beneficial. The current study did not assess the correlation between engaging in stress-relieving activities and reduced fatigue or stress levels. Hence, future studies should consider potential activities that could assist shift-work nurses in managing their fatigue and stress.

Nurses who worked 16-hour shifts reported higher levels of current stress, which correlated with increased fatigue, poorer sleep quality, and lower levels of health and sleep satisfaction. This aligns with the findings of Honosa M and Uesugi Y study conducted in 2023⁵. The study showed that heightened fatigue is linked to diminished sleep quality and poorer health status among shift-work nurses in Taiwan. These results suggested that nurses who work for 20 hours in night shifts encounter greater difficulty in alleviating stress and fatigue associated with their work⁵.

In Karachi, nurses working in two shifts consisting of 8 hours of daytime work and 20 hours of night-time work, experience heightened fatigue, potentially compromising their performance. Ahmed AS and Hamed RA in 2020 demonstrated

that prolonged hours among shift workers might lead to reduced performance, injuries, chronic illnesses, and fatigue-related errors⁸. This study concluded that nurses working in shifts depict sleep deprivation and fatigue which affects their quality of life. Studies consistently show that nurses on shift work face significant challenges related to sleep deprivation and fatigue¹⁶⁻¹⁸, which in turn detrimentally affect their life quality and increase the likelihood of making medical errors during their duties¹⁹.

Firstly, the disruption of natural sleep patterns due to irregular shift timings has been extensively documented. Such disruptions lead to insufficient sleep, adversely affecting nurses' physical health, mental acuity, and emotional stability¹⁶.

Furthermore, the issue of fatigue cannot be overlooked. The long and at times nocturnal hours contribute to a pervasive sense of weariness and a decrease in alertness among nurses. This state of fatigue critically impairs their ability to function at their best, impacting not just their personal well-being but also their satisfaction with their work.

Crucially, the intersection of sleep deprivation and fatigue elevates the risk of errors in patient care¹⁹. The diminished capacity of nurses to perform with the necessary vigilance and precision can result in medication mishaps, inaccurate patient assessments, and other critical errors, posing serious safety risks to patients and raising significant legal and ethical concerns for healthcare providers.

In summary, addressing the adverse effects of shift work on nurses demands urgent attention. Adopting measures such as designing better work schedules, ensuring sufficient rest periods, and supporting strategies to cope with stress and fatigue are essential steps. Moreover, creating an organizational culture that prioritizes open dialogue and support can play a pivotal role in enhancing the well-being of nurses and the safety of patient care in such challenging work environments.

While the results shed light on the interplay among shift work, sleep patterns, fatigue, and stress, the descriptive correlational design does not imply causality. Additionally, the utilization of a convenience sample introduces bias and restricts the generalizability of the findings. Given that the sample consisted exclusively of females, the findings might also reflect gender bias. Despite careful selection, self-report instruments are known to pose a threat to internal validity.

Conclusion

This study revealed a relationship between shift work nurses' weariness and stress levels and their contentment with their sleep. Consequently, it is critical to look at practical, effective ways to reduce stress and exhaustion in shift-work nurses, such as making the most of nutrition, managing stress, and taking breaks during extended shifts.

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