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Association Between Sleep Quality and Job Stress Among Night-Shift Nurses in Critical Care Units: A Cross-Sectional Study

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ABSTRACT

Objective: The current study aimed to investigate the association between sleep quality and job stress among night-shift critical care nurses, while examining how socio-demographic factors influence these issues within the working hours system in effect.

Methods and Materials: A cross-sectional study was conducted with the participation of 178 night-shift critical care nurses working in three randomly selected governmental healthcare facilities. Participants were selected via the availability sampling method. Demographic characteristics, Pittsburgh Sleep Quality Index (PSQI), and the Expanded Nurses Stress Scale (ENSS) were collected. Data collection took place from September 12, 2024, to October 29, 2024. SPSS 27 was used for data analysis.

Findings: Among the 178 nurses, 62.9% were classified as having poor sleep quality, while 37.1% had good sleep quality. A significant proportion of participants (51.1%) reported high job stress levels. The results revealed a significantly positive correlation between sleep quality and job stress.

Conclusion: The study identifies a strong association between sleep quality and job stress among night-shift critical care nurses. Key demographic factors influencing these outcomes were highlighted, offering insights for targeted interventions.

Keywords: Critical care nurse, Sleep quality, job stress, Night-Shift,

Introduction

Sleep is essential for cognitive, physiological, and psychosocial functions (Gruber, 2013). Human nightly sleep is vital for many different brain processes, and even a single night's sleep deprivation impairs memory, mood, and concentration the following day (Lewis, 2021). Sleep quality could be affected by many factors, such as acquired habits, occupational and sociodemographic characteristics, so sleep disorders are prominent among healthcare providers (Güngördü et al., 2023) Poor quality of sleep has detrimental effects on several aspects of physical health, including elevated body mass index, type 2 diabetes, and hypertension (Clement-Carbonell et al., 2021; Lou et al., 2015). Shift work, which is widespread in hospitals, might potentially jeopardize the circadian clock's ability to synchronize (Burek et al., 2022; Vetter, 2020). Working during the night can negatively impact

auditory attention and understanding. Additionally, worsening sensory gating may be related to decreased speech perception in noisy environments after sleep deprivation (Holding et al., 2019). Nurses, particularly those working long hours in critical care units on overnight shifts, often experience poor sleep quality, which significantly affects their ability to perform life-saving tasks requiring focus and attention (Chang et al., 2011).

Stress, though individualized, is a critical factor affecting health. Workplace hazards can cause specific occupational illnesses, while non-specific conditions impacting physical, mental, and social well-being often arise from job stress. Notably, job stress is a key contributor to occupational illnesses, including cancer (Cannizzaro et al., 2019). Nurses face numerous stressors and challenges that contribute to job stress and burnout. Nursing, especially in critical care units, is both physically and psychologically taxing. Furthermore, nurses contend with long work hours and circadian shift changes, making exhaustion inevitable and hindering their ability to perform at their best (Nogueira et al., 2017). The night shift system for nurses in Iraqi government hospitals is more favorable than in neighboring countries, allowing a maximum of three 18-hour night shifts per week. However, there is a critical gap in understanding sleep quality and work stress among Iraqi nurses, particularly how these factors influence each other in this demanding context. This study explores the relationship between sleep quality and job stress among night-shift nurses in critical care units, contributing to their well-being and professional performance.

Methods and Materials

Study Design and Participants

A cross-sectional study was conducted to evaluate the association between sleep quality and job stress among night-shift nurses in critical care units.

The study was conducted in three different governmental healthcare facilities in the Holy City of Karbala. First, the largest hospital, namely AL-Imam Alhussain Medical City, Imam Al-Hassan Al-Mujtaba Teaching Hospital, and Karbala Center for Cardiac Disease and Surgery. These three healthcare facilities were selected as settings for the study from among the

six governmental hospitals in the holy Karbala Governorate. The selection was made using a simple random method. Six names were written on six pieces of paper, placed in a small box, and then mixed well. Then draws with replacement were done randomly from the box until three different hospital names were obtained.

The study employed an availability sampling technique. The target population consisted of 277 night-shift critical care nurses. A pre-data collection visit determined this number. Using the finite Population Collection formula at a 95% confidence level and a margin of error of 0.05, the minimum sample size required was 161. The final sample size was estimated at 178, taking into account a 10% dropout rate. Nurses of both genders from the selected hospital, who expressed a willingness to participate and had at least one year of experience in critical care units, were included in this study. Nursing supervisors who were not directly involved in patient care were excluded.

Instruments

Part I: Demographic Data: This section of the questionnaire collects information on age, gender, Marital status, level of education, income level, years of experience in critical care units, department, workplace, and employment status as a nurse in the private sector. **Part II:** Pittsburgh Sleep Quality Index PSQI: a widely used standard self-administered questionnaire to measure sleep quality over one month. The internal consistency (Cronbach's) was .77 for the total score, and the test-retest reliability correlation was .78 for the total score. It consists of eighteen items, creating seven components that produce one global score. A PSQI score of 5 or more indicates poor sleep quality.

Part III: Job Stress Questionnaire: This part consists of the Expanded Nursing Stress Scale (ENSS). It was developed by Susan E. French in 2000 to identify sources and frequency of stress experienced by nurses (French et al., 2000). The ENSS, initially consisting of 57 items, was adapted by the researcher of the current study by removing six items incompatible with local traditions. The Remaining (51) items contain eight sub-scales: death and dying stressors (7 items), conflict with physician (4 items), emotional preparation (3 items), problems with peers (6 items), supervision stressors (7 items), workload stressors (9 items), uncertainty

concerning treatment stressors (9 items), and patient/ family stressors (6 items). ENSS was reliable and valid in the original study since the alpha coefficients of the subscales were 0.70 or higher, and the adapted scale showed excellent internal consistency (Cronbach's) with .98 in the current study. A five-point semantic scale was used (never stressful, occasionally stressful, frequently stressful, extremely stressful, does not apply) to assess job stress. Items have been rated and scored as (1) never stressful, (2) occasionally stressful, (3) frequently stressful, (4) extremely stressful, and (0) does not apply.

Data Analysis

Data analysis was performed using SPSS v26; repeated measures ANOVA was employed to examine changes across the three time points. Bonferroni post-hoc tests were used to identify significant group differences. Assumptions of normality (Shapiro-Wilk test) and sphericity (Mauchly's test) were tested, and appropriate corrections (e.g., Greenhouse-Geisser) were applied where necessary. To control for potential confounding variables, ANCOVA was used with baseline scores as covariates. Effect sizes (η^2) and statistical power were reported to determine the magnitude and reliability of observed effects.

Findings and Results

According to Table 1, out of the 178 participants, 52.2% were female, and most were married (70.8%), with the highest proportion holding a diploma (41.0%). Nearly half of the respondents (45.5%) reported insufficient income. Most participants had 1–5 years of experience (62.4%). And primarily worked in the General ICU (38.8%). Additionally, a significant portion was engaged in the private sector (55.6%).
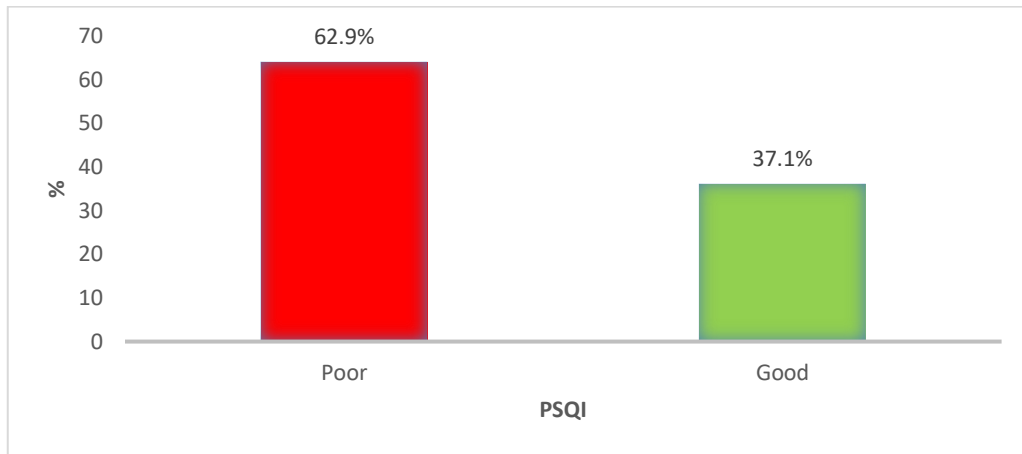
Table 1

Participant Demographics and Characteristics

Variable	Category	N	%
Gender	Male	85	47.80%
	Female	93	52.20%
Marital Status	Single	47	26.40%
	Married	126	70.80%
	Other	5	2.80%
Education	Nursing Secondary School	26	14.60%
	Diploma	73	41.00%
	Bachelor Degree	67	37.60%
	Higher Education	12	6.70%
Income	Sufficient	42	23.60%
	Somewhat Sufficient	55	30.90%
	Insufficient	81	45.50%
Experience	1–5 Years	111	62.40%
	6–10 Years	45	25.30%
	More than 10 Years	22	12.40%
Unit	General ICU	69	38.80%
	CCU	51	28.70%
	Emergency Unit	40	22.50%
	Open Heart ICU	18	10.10%
Private Sector	Yes	99	55.60%
	No	79	44.40%

Figure 1 illustrates the distribution of participants based on their Pittsburgh Sleep Quality Index (PSQI) scores, where the majority of participants (62.9%, n=112) were classified as having poor sleep quality. In comparison, 37.1% (n=66) had good sleep quality.

Figure 1

Distribution of Participants by PSQI Category

Descriptive statistics for attributes of sleep quality:

Table 2 shows that among the 178 participants, the mean subjective sleep quality score was 1.85 (SD = 1.36). All subscales had scores ranging from 0.00 to 3. The global Pittsburgh Sleep Quality Index (PSQI) scores ranged from 1.00 to 16.00, with an average of 8.65 (SD = 4.27), indicating varied sleep quality within the sample.

Table 2

Descriptive statistics for attributes of sleep quality:

Variable	Minimum	Maximum	Mean	Standard Deviation
Subjective Sleep Quality	0	3	1.85	1.36
Sleep Latency	0	3	1.57	1.07
Sleep Duration	0	3	1.03	.96
Sleep Efficiency	0	3	.85	1.16
Sleep Disturbance	1	3	1.28	.46
Use of sleep medication	0	3	.41	.66
Daytime Dysfunction	0	3	1.61	1.05
Total PSQI	1	16	8.65	4.27

Figure 2 illustrates that 51.1% of participants reported high job stress levels, while 23.6% reported low stress, indicating its high prevalence in the sample.

Figure 2

Distribution of Job Stress Among Participants
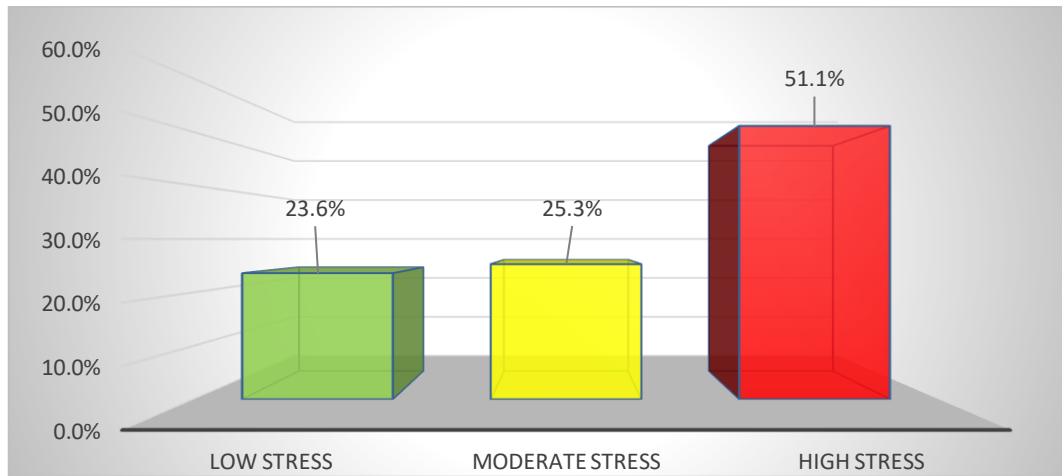
**no stress = (0-0.9), low stress = (1-1.99), moderate stress = (2-2.99), high stress = (3-4).

Distribution of overall job stress and its subscales among participants:

Table 3 revealed that the workload stressors had the highest mean (3.40, SD = .78), while conflict with physician stressors had the lowest mean score (1.87, SD = .75). The overall job stress mean score was 2.83 (SD = .83), indicating variability in stress levels across the participants

Table 3

Descriptive statistics for job stress and subscales:

Variable	Minimum	Maximum	Mean	Standard Deviation
Death and Dying Stressors	1.29	4.00	2.86	.76
Conflict with Physician Stressors	.25	3.00	1.87	.75
Emotional Preparation Stressors	.67	4.00	2.79	1.11
Problems with Peer Stressors	.67	4.00	2.75	1.10
Supervision Stressors	.14	4.00	2.77	1.21
Workload Stressors	.89	4.00	3.40	.78
Uncertainty Concerning Treatment Stressors	.67	3.67	2.58	.89
Patient or Family Stressors	.83	4.00	3.12	.81
Overall Job Stress	1	3.86	2.83	.83

Table 4 shows that poor sleep was more prevalent among females (81.7%), participants with insufficient income (98.8%), those working in the private sector (88.9%), with secondary nursing education (76.9%), and 1–5 years of experience (80.2%).

Table 4

Association between PSQI categories and nurses' characteristics

Variable	Category	PSQI		p-value
		Poor	Good	
Gender	Male	38 (44.7%)	47 (55.3%)	≤ 0.001
	Female	76 (81.7%)	17 (18.3%)	
Marital Status	Single	28 (59.6%)	19 (40.4%)	0.20
	Married	81 (64.3%)	45 (35.7%)	
	Other	5 (100.0%)	0 (0.0%)	
Income	Sufficient	4 (9.5%)	38 (90.5%)	≤ 0.001
	Somewhat Sufficient	30 (54.5%)	25 (45.5%)	
	Insufficient	80 (98.8%)	1 (1.2%)	
Education	Nursing Secondary School	20 (76.9%)	6 (23.1%)	≤ 0.001
	Diploma	50 (68.5%)	23 (31.5%)	
	Bachelor Degree	43 (64.2%)	24 (35.8%)	
	Higher Education	1 (8.3%)	11 (91.7%)	
ICU Experience (years)	1–5	89 (80.2%)	22 (19.8%)	≤ 0.001
	6–10	7 (15.6%)	38 (84.4%)	
	More than 10	18 (81.8%)	4 (18.2%)	
Unit	General ICU	27 (39.1%)	42 (60.9%)	0.001
	CCU	16 (31.4%)	35 (68.6%)	
	Emergency Unit	8 (20.0%)	32 (80%)	
	Open Heart ICU	13 (72.2%)	5 (27.8%)	
Private Sector	Yes	88 (88.9%)	11 (11.1%)	≤ 0.001
	No	26 (32.9%)	53 (67.1%)	

Chi-square analysis revealed significant associations between job stress categories and various participant characteristics (Table 5). Female nurses were significantly more likely to experience high job stress (73.1%). Similarly, nurses with insufficient income (77.8%), nurses with diplomas (60.3%), nurses with 1-5 years of experience (76.6%), emergency nurses (62.5%), and those working in the private sector (71.7%) all exhibited the highest levels of job stress. In contrast, nurses working in the open-heart unit predominantly reported low job stress (55.6%).

Table 5

Association between Job Stress and nurses' characteristics

Variable	Category	Low Stress (n, %)	Moderate Stress (n, %)	High Stress (n, %)	p-value
Gender	Male	31 (36.5%)	31 (36.5%)	23 (27.1%)	< 0.001
	Female	11 (11.8%)	14 (15.1%)	68 (73.1%)	
Marital Status	Single	1 (2.1%)	19 (40.4%)	27 (57.4%)	< 0.001
	Married	41 (32.5%)	23 (18.3%)	62 (49.2%)	
	Other	0 (0.0%)	3 (60.0%)	2 (40.0%)	
Education	Nursing Secondary School	5 (19.2%)	12 (46.2%)	9 (34.6%)	< 0.001
	Diploma	14 (19.2%)	15 (20.5%)	44 (60.3%)	
	Bachelor Degree	12 (17.9%)	17 (25.4%)	38 (56.7%)	
	Higher Education	11 (91.7%)	1 (8.3%)	0 (0.0%)	
Income	Sufficient	31 (73.8%)	11 (26.2%)	0 (0.0%)	< 0.001
	Somewhat Sufficient	11 (20.0%)	16 (29.1%)	28 (50.9%)	
	Insufficient	0 (0.0%)	18 (22.2%)	63 (77.8%)	
ICU Experience (years)	1–5	0 (0.0%)	26 (23.4%)	85 (76.6%)	< 0.001
	6–10	39 (86.7%)	2 (4.4%)	4 (8.9%)	
	More than 10	3 (13.6%)	17 (77.3%)	2 (9.1%)	
Unit	General ICU	17 (24.6%)	17 (24.6%)	35 (50.7%)	< 0.001
	CCU	9 (17.6%)	14 (27.5%)	28 (54.9%)	
	Emergency Unit	6 (15.0%)	9 (22.5%)	25 (62.5%)	
	Open Heart ICU	10 (55.6%)	5 (27.8%)	3 (16.7%)	
Private Sector	Yes	11 (11.1%)	17 (17.2%)	71 (71.7%)	< 0.001
	No	31 (39.2%)	28 (35.4%)	20 (25.3%)	

Association between Sleep Quality and Job Stress

A chi-squared test of independence was conducted to examine the association between job stress and sleep quality among night shift nurses. The results in Table 6 showed a significant association, χ^2 (2, N=178) =121.09, p<.001, indicating a strong relationship between job stress and sleep quality (PSQI). All 91 participants with high stress (100%) reported poor sleep quality. Cramer's V was calculated at .825, indicating a strong association between both variables.

Table 6

Association between Sleep Quality and Job Stress

Sleep Quality (PSQI)	Poor, n (%)	Good, n (%)	χ^2	p-value
Job Stress			121.09	<.001
Low Stress	2 (4.8%)	40 (95.2%)		
Moderate Stress	21 (46.7%)	24 (53.3%)		
High Stress	91 (100%)	0 (0.0%)		

Cramer's V = .825

Discussion and Conclusion

Nurses are the cornerstone of healthcare organizations. This study aimed to examine the association between sleep quality and job stress among night-shift critical care nurses.

The current study revealed that more than half of night shift nurses in critical care units have poor sleep quality. Considering the PSQI used, the mean score for the total sleep quality among participants was close to that observed among nurses in Bahrain and Saudi Arabia (Alameri et al., 2024; Alaradi et al., 2022). Poor sleep quality among night shift nurses is often linked to disrupting their natural circadian rhythms. This disruption interferes with the production of melatonin, a hormone essential for maintaining a healthy sleep-wake cycle (Bracci et al., 2016). Subjective sleep quality, sleep latency, and daytime dysfunction were the most affected components of sleep quality. These findings align with the results of (Fang et al., 2022). A nurse working night shifts might sleep for seven hours during the day, but still feel exhausted because their body is not naturally programmed to rest at that time (James et al., 2020).

Regarding job stress, a large percentage of nurses in our study experienced moderate to high job stress, which is supported by several studies (Chegini et al., 2019; Vangelova et al., 2020). Critical care nurses frequently report high job stress, with studies indicating prevalence rates of 68.29% in India (Kumar et al., 2016), 82.8%, 82.8% in Iran (Chegini et al., 2019). Workload stressors, patient and family stressors, and death and dying stressors were considered causes of stress among shift work nurses. This is supported by the findings of several studies, which showed that high workloads and long working hours are primary factors of job stress among nurses (Alsalim & Salhi, 2022; Diannita et al., 2024). Bolado in his study found that nurses who witnessed death and dying at critical care units were 2.34 times more likely to report high stress compared to those who hadn't been exposed to such situations (Bolado et al., 2024). On the other hand, conflict with physician stressors was found to be the least significant factor affecting stress in this study. This could be attributed to the strong interprofessional teamwork observed in Iraq's hospitals (Al-Twigey & Al-Fayyadh, 2024). This finding aligns with recent studies suggesting that while conflicts with physicians occur, they are often overshadowed by more pressing challenges, such as high patient acuity or emotional demands (Alsalim & Salhi, 2022; Diannita et al., 2024).

In this study, female nurses, nurses with low income, those with nursing secondary school education, and nurses working in the private sector were more likely to experience poor sleep quality. These findings are consistent with previous research about sleep disturbances among nurses (Mohamed et al., 2022; Segon et al., 2022). Female nurses had poorer sleep quality due to the additional community and household responsibilities they assumed. In addition, there was an association between sleep quality and monthly income, where shiftwork nurses in critical care units with inadequate monthly income had poor sleep. This finding supports Gao's findings, which identified that most nurses with lower salaries experienced poor sleep (Gao, 2022). It could be related to financial stress, which was reported as one of the most significant factors that

negatively affect sleep quality (Suleiman et al., 2020). The current study's results revealed a statistically significant relationship between education level and sleep quality, with nurses having only a secondary school education being more likely to report poor sleep quality. In contrast, those with higher education were least likely to do so. The finding was also supported by Mohamed et al. (2022), who found that nurses with diploma-level education had significantly lower sleep quality than those with more advanced education (Mohamed et al., 2022). One possible explanation for this is that higher education enhances cognitive abilities, clinical judgment, and problem-solving skills. The results of this study revealed that working in the private sector is significantly associated with sleep quality. It can be explained by combining night shifts in a governmental hospital with other shifts in the private sector, which can create effects similar to those caused by rotating shift work, which negatively impacts sleep patterns. In contrast, results of a study conducted in Iran concluded that there was no observed relationship between variables such as gender, number of night shifts, and place of work with the sleep quality of nurses (Saberi et al., 2020).

Regarding job stress, female nurses were significantly more likely to experience high levels of job stress. This aligns with several studies, which suggest that females often face additional stressors, such as balancing household responsibilities and work-family conflicts, which can amplify their job stress levels (Faraji et al., 2019; Sabzi et al., 2017). Income level was also found to be one of the factors influencing stress. Nurses with insufficient income were more likely to report high job stress. Financial stress is a well-documented stressor, and its impact on mental health is particularly pronounced in high-pressure professions like nursing. This finding is consistent with previous research, which highlighted the role of financial instability in exacerbating stress levels among healthcare workers (Mohamed et al., 2022). Marital status influenced stress levels, with single nurses reporting the highest levels of stress. These results agree with (Howells et al., 2020). These findings contrast with some studies that suggest married individuals may experience more job stress due to work-family conflicts (Faraji et al., 2019; Sabzi et al., 2017). The differences in experiencing job stress could be attributed to differing support systems and responsibilities. Single nurses may lack the social support that can help reduce job stress (Amarneh, 2017).

Education level also played a significant role, with nurses holding diplomas and bachelor's degrees reporting higher levels of job stress compared to those with higher education. The result aligns with Khodadadi et al, who reported that nurses with a higher educational level (Master of Science in Nursing) had a lower level of job stress compared to those with a Bachelor of Science in Nursing (BScN) (Khodadadi et al., 2016). This could be attributed to self-confidence among the higher educated nurses, as well as their enhanced problem-solving and coping skills, which may help them manage stress more effectively (Faraji et al., 2019). In contrast, a study conducted by Trousselard in 2015 found that a high level of education was a significant factor contributing to high job stress (Trousselard et al., 2016). The current study showed that nurses with low years of experience reported the highest levels of job stress compared to those with more experience. This finding aligns with previous studies indicating that nurses with less experience often encounter higher job stress due to insufficient adaptation (Feng et al., 2021; Narbona-Gálvez et al., 2024). The type of unit in which nurses work significantly impacts their job stress levels. Nurses in ICUs and CCUs report moderate to high stress, while those in emergency units face even more pressures. Conversely, nurses in the OH unit typically experience low stress, reflecting the distinct workloads associated with each department. These results are supported by research from Mahmood et al., which indicates that emergency nurses experience significantly higher levels of job stress than their peers in other critical care units (Mahmood et al., 2020). Moreover, private sector nurses working overtime often report elevated stress due to the challenges of juggling nighttime and daytime responsibilities, which hampers their rest (Windarwati et al., 2023).

The study found a strong positive correlation between job stress and sleep quality, indicating that higher levels of job stress are associated with worse sleep outcomes. Also, the chi-square test results showed that all nurses with high-stress levels reported poor sleep quality, while those with low-stress levels were more likely to have good sleep quality. This finding aligns with a previous study conducted by Fadae in 2020, who identified a direct relationship between job stress and sleep

disorders (Fadae Aghdam et al., 2020). Similarly, a systematic Review found that high job stress is related inversely to sleep quality among shift workers (Mao et al., 2023). In parallel, a cross-sectional study was conducted to examine the relation between job stress and sleep quality (N=180 nurses), according to which, the results showed that higher job stress was associated with poorer sleep quality (Deng et al., 2020). In contrast, an Iranian study involving 139 nurses in 2020 found no significant relationship between sleep quality and job stress (Vangelova et al., 2020). The strong correlation between sleep quality and job stress may be linked to the release of stress hormones that can cause insomnia, leading to a prolonged time to fall asleep and ultimately resulting in poor sleep quality. Another potential factor could be tea consumption, a common stimulant and traditional beverage among Iraqi nurses.

The study identifies a strong association between sleep quality and job stress among night-shift critical care nurses. Key demographic factors influencing these outcomes were highlighted, offering insights for targeted interventions. Recommendations include implementing mental health programs, stress management training, and relaxation techniques. Providing opportunities for short naps during shifts is also suggested to help nurses restore energy. Further research is needed to identify potential factors influencing job stress and sleep quality among night-shift nurses in intensive care units.

While the random selection of hospitals supports generalizability, the use of availability sampling may have introduced potential bias. Additionally, the administered questionnaire was lengthy, and data collection was challenging due to the night shift critical care nurses' extremely busy schedules, which may have influenced their responses.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

By the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contribute to this study.

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