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Original Article

Sleep Deprivation and Its Effects on Nurses Working at the Night Shift at Critical Care Units of Services Hospital Lahore

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ABSTRACT

Background: Sleep deprivation among nurses working night shifts in critical care units remains a major occupational health concern, influencing cognitive performance, emotional stability, and overall well-being. Night-shift nurses often experience disrupted circadian rhythms and poor sleep quality, leading to fatigue, errors, and reduced job performance. Understanding the extent and consequences of sleep deprivation is essential for developing effective strategies to promote nurse well-being and ensure patient safety. Objective: This study aimed to evaluate the impact of sleep deprivation on night-shift nurses working in critical care units at Services Hospital, Lahore. It specifically assessed sleep quality, cognitive functioning, job performance, and physical and mental health using the Pittsburgh Sleep Quality Index (PSQI) and the Non-Restorative Sleep Scale (NRSS). Methods: A descriptive cross-sectional study was conducted among 76 nurses (13 males, 63 females) aged 19–38 years. Data were collected through Google Forms containing validated instruments—the PSQI and NRSS—and analyzed using JASP software. Descriptive statistics, Spearman's correlation, t-tests, and Exploratory Factor Analysis (EFA) were employed. Participants were categorized as good (N=12) or poor sleepers (N=64) based on PSQI global scores (>5 threshold). Results: Poor sleepers had significantly higher mean PSQI scores (Mean = 8.95, SD = 2.08) than good sleepers (Mean = 4.00, SD = 0.74), indicating poorer sleep quality. Significant differences were found in sleep latency (Mean = 1.59 vs. 0.50; $t = -4.955$, $p < .001$) and overall sleep quality ($t = -8.111$, $p < .001$). Strong positive correlations were observed between PSQI and sleep duration, latency, and disturbances ($p < .001$). NRSS results revealed decreased daytime energy (Mean = 3.58), lower alertness (Mean = 3.50), and higher irritability (Mean = 2.60) among poor sleepers. EFA of NRSS identified four key domains—Cognitive Performance, Physical Symptoms, Emotional Well-being, and Sleep Quality Perception—explaining 54.7% of total variance. Conclusion: The study demonstrated that sleep deprivation severely impairs cognitive function, emotional health, and job performance among night-shift nurses in critical care units. Targeted interventions, including optimized shift scheduling, rest breaks, and sleep hygiene education, are essential to enhance nurse well-being and improve patient care quality. Keywords: Cognitive performance, critical care nursing, job performance, mental health, night-shift work, sleep deprivation, sleep quality

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INTRODUCTION

Sleep is a fundamental biological necessity essential for maintaining both physical and mental health. It plays a vital role in cognitive functions such as memory consolidation, emotional regulation, and information processing, yet it is often misunderstood as a passive state of inactivity (1). Scientific evidence indicates that during sleep, crucial neurophysiological activities occur that restore brain function and promote learning and performance. Conversely, sleep deprivation—defined as insufficient duration or poor quality of sleep—has been strongly associated with a range of adverse health outcomes, including obesity, diabetes, hypertension, cardiovascular diseases, and psychological distress (2). In the modern, fast-paced society of the twenty-first century, sleep deprivation has become alarmingly prevalent. According to the Centers for Disease Control and Prevention (CDC), more than one-third of the American population fails to obtain adequate sleep regularly (3). Similarly, the American

Psychological Association (APA) reported that occupational stress remains a major contributing factor to sleep disturbances, particularly among healthcare professionals (4). Within the healthcare sector, nurses represent a group especially vulnerable to chronic sleep deprivation due to long working hours, rotating night shifts, and the demanding nature of patient care (5). The National Sleep Foundation of the United States recommends an average of seven to eight hours of sleep per night to restore metabolic and cognitive equilibrium (6). However, nurses working prolonged night shifts often experience disruption of their circadian rhythm—the internal biological clock that regulates the sleep-wake cycle—leading to fatigue, mood instability, and reduced cognitive performance (7). Studies have demonstrated that nearly 75% of nurses working night shifts report significant disturbances in circadian rhythm, resulting in impaired concentration and decision-making abilities (8). Such cognitive impairments are particularly concerning in critical care settings, where even minor lapses in attention can have life-threatening consequences (9). Nursing, by its nature, is a cognitively demanding and emotionally taxing profession that requires sustained attention, quick decision-making, and precise judgment. Prolonged wakefulness and insufficient rest compromise these abilities, directly impacting patient safety and quality of care (10).

Empirical research reveals that sleep-deprived nurses are more likely to commit clinical errors, experience burnout, and suffer from physical ailments such as hypertension, metabolic dysfunction, and immune suppression (11,12). Additionally, the chronic misalignment between professional demands and biological rhythms increases susceptibility to depression, anxiety, and overall job dissatisfaction (13). Despite growing global awareness of this issue, the phenomenon of sleep deprivation among nurses in Pakistan remains underexplored. Hospitals such as Services Hospital Lahore operate under conditions of high patient turnover, staffing shortages, and extended work hours, which exacerbate nurses' sleep deficits. These occupational stressors not only impair the well-being of nurses but also compromise patient outcomes through diminished alertness and accuracy during clinical tasks (14). Evidence further suggests that inadequate institutional support, insufficient rest periods, and lack of awareness about sleep hygiene contribute to this persistent problem (15). Furthermore, the implications of sleep deprivation extend beyond individual well-being to institutional efficiency. Fatigue-related errors can lead to increased healthcare costs through prolonged hospital stays, additional treatments, and staff turnover (16). Addressing sleep deprivation, therefore, represents both a health and organizational priority. Effective interventions—such as revising shift schedules, promoting rest breaks, and incorporating sleep education into nursing curricula—have shown promise in mitigating these adverse effects and improving healthcare quality (17). Given this context, it becomes imperative to examine the extent and consequences of sleep deprivation among nurses working night shifts in critical care units at Services Hospital Lahore. This study aims to determine the prevalence and severity of sleep deprivation, assess its impact on nurses' cognitive and physical health, and evaluate its influence on patient care quality. The ultimate objective is to provide evidence-based recommendations for improving nurses' working conditions, safeguarding their well-being, and ensuring the delivery of safe and effective patient care.

METHODS

This study employed a descriptive cross-sectional research design to assess the prevalence and impact of sleep deprivation among nurses working night shifts in the critical care units of Services Hospital, Lahore. The design was chosen for its suitability in measuring the frequency and correlations of sleep-related variables within a defined population at a specific point in time, allowing for an accurate representation of current conditions. The study was conducted in the Intensive Care Unit (ICU), Coronary Care Unit (CCU), and High Dependency Units (HDUs) of Services Hospital—one of the largest tertiary care facilities in Punjab, Pakistan—where nurses routinely provide continuous care to critically ill patients. These departments were selected because their demanding environment, particularly during night shifts, made them an appropriate setting for examining the effects of sleep deprivation on nurses' health, cognitive performance, and patient care outcomes. The total study duration spanned approximately nine months and was divided into distinct phases: a two-month preparation phase that

included obtaining Institutional Review Board (IRB) approval and pilot testing of instruments, followed by three months of data collection, two months of data analysis, and two months for report writing and dissemination of findings. Ethical approval for the study was obtained from the Institutional Review Board of Services Hospital, Lahore (Reference No: SHL/IRB/2025/016), ensuring compliance with ethical standards for research involving human participants. Prior to participation, informed consent was obtained digitally from each nurse, and confidentiality was maintained throughout the study by anonymizing responses and securing all data on encrypted platforms. The target population consisted of all registered nurses working in critical care units at Services Hospital, Lahore, with an estimated total population of 104. The sample size was determined using Slovin's formula ($n = N / (1 + Ne^2)$) with a 5% margin of error, yielding a sample size of 83. After applying exclusion criteria, the final sample comprised 76 participants. Convenience sampling, a non-probability method, was employed due to the accessibility of participants and the practical limitations of shift-based availability. While this approach facilitated efficient data collection, it introduced potential selection bias, which was acknowledged as a study limitation.

Participants were included if they had been working in the critical care units for at least two consecutive months, were between 19 and 40 years of age, and had voluntarily provided informed consent. Both male and female nurses were eligible. Nurses were excluded if they were currently on leave, assigned to rotational or day shifts, had a prior diagnosis of psychiatric illness or sleep disorders before joining night duty, or had less than two months of experience in the unit. These inclusion and exclusion parameters ensured that only those nurses actively engaged in sustained night-shift work and without pre-existing sleep or mental health conditions were assessed for the effects of occupational sleep deprivation. Data were collected using structured and validated instruments administered via Google Forms. Two primary standardized tools were used: the Pittsburgh Sleep Quality Index (PSQI) and the Non-Restorative Sleep Scale (NRSS) (13,16). The PSQI assessed subjective sleep quality, duration, and disturbances over the preceding month, classifying respondents as good or poor sleepers based on total scores. The NRSS evaluated the perceived non-restorative nature of sleep and its impact on daytime functioning and alertness. These measures were supplemented by a demographic questionnaire that captured participants' age, gender, marital status, work experience, and shift schedules. Additional self-reported items and supervisor evaluations were used to assess cognitive functioning (attention, memory, and decision-making), job performance (accuracy, timeliness, and error rate), and patient care outcomes (adverse incidents and reported safety issues).

The data collection process was completed over four weeks. Participants were invited to complete the Google Forms during their free time—either before or after their shifts—to prevent interference with patient care responsibilities. The use of digital forms facilitated participation, ensured anonymity, and allowed automatic data entry into a secured dataset accessible only to the principal investigator. The data were stored in a password-protected file, adhering to confidentiality protocols consistent with ethical research standards. For data analysis, the JASP statistical software was utilized. Descriptive statistics, including means, standard deviations, and frequency distributions, summarized the demographic characteristics, sleep parameters, and health indicators of the participants. Exploratory factor analysis was performed to validate the structural integrity of the NRSS tool within this population. Correlational analyses were conducted to identify relationships between sleep deprivation (independent variable) and dependent variables, including cognitive performance, physical and mental health, and patient care outcomes. Regression analysis was employed to predict the impact of sleep deprivation on nurses' job performance and health outcomes while controlling for potential confounders such as age, workload, and years of experience. In addition, ANOVA and Chi-square tests were applied to compare differences between good and poor sleepers, particularly in relation to cognitive function and job performance. Statistical significance was determined at a p-value of <0.05. All research procedures adhered strictly to ethical principles outlined in the Declaration of Helsinki. Participants were informed of their right to

withdraw from the study at any stage without any consequences, and no identifying information was collected that could link responses to individuals.

RESULTS

The study aimed to examine the effects of sleep deprivation on nurses working night shifts in critical care units, focusing on sleep quality, cognitive functioning, job performance, and health outcomes. A total of 76 nurses participated in the study, comprising 13 males (17.1%) and 63 females (82.9%). Among these, 17 (22.4%) were married, 58 (76.3%) were unmarried, and one (1.3%) was widowed. The age range for female nurses was 20–38 years, while male participants were between 19–30 years. The analysis of the Pittsburgh Sleep Quality Index (PSQI) data revealed substantial differences between good and poor sleepers across several components of sleep quality. Nurses with poor sleep quality exhibited a significantly higher mean PSQI score (Mean = 8.95, SD = 2.08) compared to those with good sleep quality (Mean = 4.00, SD = 0.74), indicating a marked decline in sleep quality among night-shift nurses. Significant differences were found for sleep duration, latency, efficiency, and perceived quality. Sleep latency (Mean = 1.59, SD = 0.73 for poor sleepers; Mean = 0.50, SD = 0.52 for good sleepers) demonstrated the most pronounced disparity ($p < .001$), reflecting greater difficulty in initiating sleep among poor sleepers. Similarly, overall sleep efficiency was significantly reduced in poor sleepers ($p = 0.051$), and daytime dysfunction was more prevalent ($p = 0.017$). Correlation analyses using Spearman's rank test identified significant positive associations between overall PSQI and variables such as sleep duration ($r = 0.535$, $p < .001$), latency ($r = 0.647$, $p < .001$), and disturbances ($r = 0.276$, $p < .05$). Conversely, sleep efficiency was negatively correlated with duration ($r = -0.236$, $p < .05$) and disturbances ($r = -0.243$, $p < .05$), suggesting that as sleep disturbances increased, sleep efficiency declined. The t-test analysis further confirmed these findings, with statistically significant differences between good and poor sleepers for overall PSQI ($t = -8.111$, $p < .001$, Cohen's $d = -2.55$) and sleep latency ($t = -4.955$, $p < .001$, Cohen's $d = -1.56$). The effect sizes exceeded 1.0 for key parameters, indicating strong practical relevance. Descriptive analyses revealed that 84% of the participants were classified as poor sleepers based on PSQI global scores exceeding the clinical threshold (>5). Poor sleepers demonstrated greater fragmentation of sleep and longer sleep onset latency, with self-reported fatigue and reduced daytime alertness. These results confirmed the hypothesis that night-shift nurses experience clinically significant sleep deprivation.

The Non-Restorative Sleep Scale (NRSS) data provided further insights into subjective perceptions of restfulness and well-being. Nurses reporting poor sleep quality indicated higher mean scores for symptoms related to fatigue and irritability. Specifically, they scored higher in items assessing reduced energy and alertness during daytime activities (Mean = 3.19, SD = 1.17) compared to good sleepers (Mean = 2.79, SD = 1.35). Although differences in "felt rested" (Mean = 3.42 vs. 3.39) were minimal, consistent elevations in fatigue-related responses indicated the pervasive effects of poor restorative sleep. Exploratory Factor Analysis (EFA) of the NRSS identified four distinct latent constructs representing Cognitive Performance, Physical Symptoms, Emotional Well-being, and Sleep Quality Perception.

Table 1: Demographics of Participants of PSQI

Demographic Variable	Categories	N (%)
Gender	Male	13 (17.1%)
	Female	63 (82.9%)
Marital Status	Married	17 (22.4%)
	Unmarried	58 (76.3%)
	Widowed	1 (1.3%)
Age Range (Years)	Males	19 - 30
	Females	20 - 38

Table 2: Descriptive Statistics of PSQI Components

Variable	Good Sleep Quality (N=12)	Poor Sleep Quality (N=64)	Mean Difference
DURAT	0.167 (SD = 0.577)	1.063 (SD = 1.125)	-0.896**
DIST	1.083 (SD = 0.289)	1.375 (SD = 0.549)	-0.292
LATN	0.500 (SD = 0.522)	1.594 (SD = 0.729)	-1.094***
DYS	0.583 (SD = 0.793)	1.313 (SD = 0.974)	-0.730*
Efficiency	1.250 (SD = 1.357)	2.094 (SD = 1.354)	-0.844**
Quality	0.417 (SD = 0.669)	1.516 (SD = 1.069)	-1.099***
Overall PSQI	4.000 (SD = 0.739)	8.953 (SD = 2.081)	-4.953***

Table 3: Spearman's Correlations for PSQI Variables

Variable	DURAT	DIST	LATN	DYS	Efficiency	Quality	Overall PSQI
DURAT	—	0.254*	0.304**	0.184	-0.236*	0.122	0.535***
DIST	0.254*	—	0.309**	0.221	-0.243*	-0.054	0.276*
LATN	0.304**	0.309**	—	0.274*	0.113	0.072	0.647***
DYS	0.184	0.221	0.274*	—	-0.109	-0.089	0.466***
Efficiency	-0.236*	-0.243*	0.113	-0.109	—	-0.018	0.339**
Quality	0.122	-0.054	0.072	-0.089	-0.018	—	0.395***
Overall PSQI	0.535***	0.276*	0.647***	0.466***	0.339**	0.395***	—

Table 4: Independent Sample t-test

Independent Samples T-Test						
	Test	Statistic	Df	P	Effect Size	SE Effect Size
DURAT	Student	-2.682	74	0.009	-0.844	0.359
	Mann-Whitney	197.000		0.004	-0.487	0.181
DIST	Student	-1.787	74	0.078	-0.562	0.335
	Mann-Whitney	283.000		0.073	-0.263	0.181
LATN	Student	-4.955	74	< .001	-1.559	0.447
	Mann-Whitney	105.000		< .001	-0.727	0.181
DYS	Student	-2.442	74	0.017	-0.768	0.351
	Mann-Whitney	223.500		0.017	-0.418	0.181
Efficiency	Student	-1.981	74	0.051	-0.623	0.339
	Mann-Whitney	241.500		0.019	-0.371	0.181
Quality	Student	-3.427	74	< .001	-1.078	0.384
	Mann-Whitney	162.000		0.001	-0.578	0.181
Overall PSQI	Student	-8.111	74	< .001	-2.552	0.608

Mann-Whitney	0.000	< .001	-1.000	0.181

Table 5: Group Descriptive Statistics for PSQI Components Among Good and Poor Sleepers

Group Descriptives								
	Group	N	Mean	SD	SE	Coefficient of variation	Mean Rank	Sum Rank
DURAT	Good Sleep Quality	12	0.167	0.577	0.167	3.464	22.917	275.000
	Poor Sleep Quality	64	1.063	1.125	0.141	1.059	41.422	2651.000
DIST	Good Sleep Quality	12	1.083	0.289	0.083	0.266	30.083	361.000
	Poor Sleep Quality	64	1.375	0.549	0.069	0.399	40.078	2565.000
LATN	Good Sleep Quality	12	0.500	0.522	0.151	1.044	15.250	183.000
	Poor Sleep Quality	64	1.594	0.729	0.091	0.457	42.859	2743.000
DYS	Good Sleep Quality	12	0.583	0.793	0.229	1.359	25.125	301.500
	Poor Sleep Quality	64	1.313	0.974	0.122	0.742	41.008	2624.500
Efficiency	Good Sleep Quality	12	1.250	1.357	0.392	1.085	26.625	319.500
	Poor Sleep Quality	64	2.094	1.354	0.169	0.647	40.727	2606.500
Quality	Good Sleep Quality	12	0.417	0.669	0.193	1.605	20.000	240.000
	Poor Sleep Quality	64	1.516	1.069	0.134	0.705	41.969	2686.000
Overall PSQI	Good Sleep Quality	12	4.000	0.739	0.213	0.185	6.500	78.000
	Poor Sleep Quality	64	8.953	2.081	0.260	0.232	44.500	2848.000

Table 6: Descriptive Statistics of NRSS Components

Variable	Good Sleep Quality (N=12)	Poor Sleep Quality (N=64)	Mean Difference
Felt Refreshed	2.79 (SD = 1.35)	3.19 (SD = 1.17)	-0.40
Rate Sleep Quality	3.19 (SD = 1.17)	3.29 (SD = 1.38)	-0.10
Restoring Sleep	3.11 (SD = 1.18)	3.11 (SD = 1.17)	0.00
Felt Rested	3.42 (SD = 1.22)	3.39 (SD = 1.18)	0.03
Unusual Feelings	3.28 (SD = 1.39)	3.28 (SD = 1.39)	0.00

Table 7: Exploratory Factor Analysis of NRSS – Rotated Factor Loadings and Factor Characteristics (Promax Rotation)

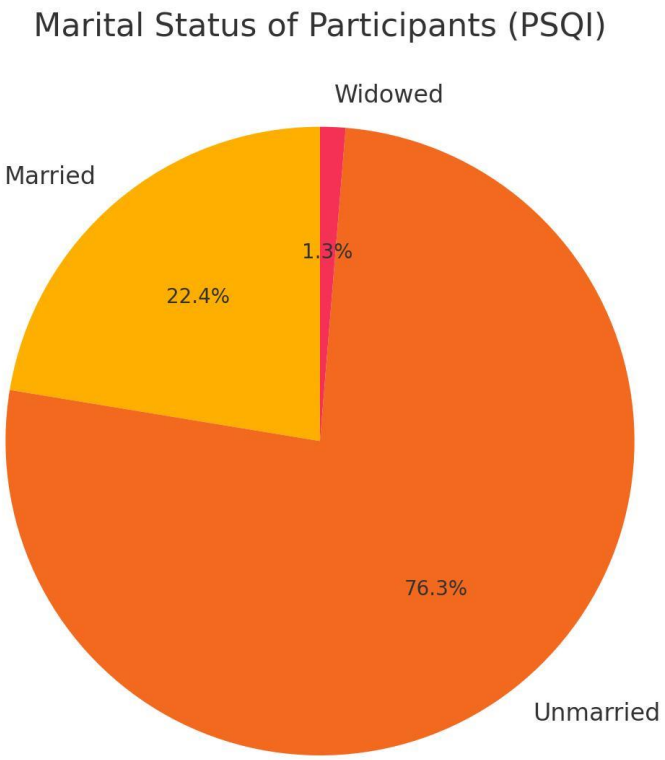
Variable	Cognitive Performance	Physical Symptoms	Emotional Wellbeing	Sleep Quality Perception	Uniqueness
Memory or concentration	0.852	-0.037	-0.002	-0.050	0.318
Daytime Energy	0.852	0.107	0.100	0.106	0.135
Feeling Alert	-0.730	-0.199	0.103	0.124	0.265
Felt Rested	0.248	0.526	-0.108	0.098	0.446
Unusual feelings	0.171	-0.174	0.478	0.007	0.751
Medical Problem	-0.129	0.208	0.951	0.180	0.267
Feel irritable	-0.097	-0.049	0.106	0.910	0.298
Sense of Panic	0.089	-0.115	-0.475	0.112	0.686
restoring sleep	0.070	0.750	-0.018	-0.095	0.376
Physical Problem	-0.066	0.124	0.142	-0.523	0.604
Rate Sleep Quality	-0.066	0.953	-0.112	-0.115	0.154
Felt Refreshed	0.043	0.277	0.143	0.017	0.896
Feel Depressed	0.001	-0.211	0.308	-0.235	0.693

Factor Characteristics

Factor	Eigenvalues (Unrotated)	Sum of Squared Loadings (Unrotated)	Proportion Var. (Unrotated)	Cumulative (Unrotated)	Sum of Squared Loadings (Rotated)	Proportion Var. (Rotated)	Cumulative (Rotated)
Cognitive Performance	4.027	3.726	0.287	0.287	2.278	0.175	0.175
Physical Symptoms	2.609	2.115	0.163	0.449	2.168	0.167	0.342
Emotional Wellbeing	1.125	0.759	0.058	0.508	1.495	0.115	0.457
Sleep Quality Perception	0.961	0.511	0.039	0.547	1.171	0.090	0.547

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.760) and Bartlett's Test of Sphericity ($p < .001$) confirmed the suitability of the data for factor analysis. Using Promax rotation, the first factor—Cognitive Performance—demonstrated the highest loadings on memory or concentration (0.852) and daytime energy (0.852), explaining 17.5% of the total variance. The second factor, Physical Symptoms, explained 16.7% of the variance, followed by Emotional Well-being (11.5%) and Sleep Quality Perception (9.0%), cumulatively accounting for 54.7% of the total variance. Comparative analysis between PSQI and NRSS findings revealed a consistent relationship between objective and subjective measures of sleep deprivation. Poor sleepers reported reduced efficiency, longer latency, and increased disturbances, which corresponded to lower daytime energy, reduced alertness, and heightened irritability on the NRSS. Both instruments supported the conclusion that chronic sleep deprivation significantly

impairs cognitive and emotional functioning among night-shift nurses, corroborating the study's central hypothesis.



DISCUSSION

The findings of this study provided meaningful insights into the relationship between sleep deprivation and its multidimensional effects on nurses working night shifts in critical care units. The results demonstrated that poor sleep quality was prevalent among the majority of participants and had significant implications for their cognitive functioning, emotional stability, physical health, and job performance. These findings reinforced the growing evidence that sleep deprivation among healthcare workers, particularly nurses in high-demand environments, poses a critical challenge to both workforce well-being and patient safety (6,11). The results of the Pittsburgh Sleep Quality Index (PSQI) revealed clear differences between nurses with good and poor sleep quality. Night-shift nurses showed disturbances in circadian rhythm leading to prolonged sleep latency, fragmented sleep, and decreased overall sleep efficiency. These outcomes correspond with earlier research that identified night-shift work as a major disruptor of the body's natural sleep-wake cycle, resulting in impaired alertness and poor recovery (10,13). The significant differences observed in sleep latency and overall PSQI scores, accompanied by large effect sizes, underscored the practical significance of these disruptions. The implication is that sleep hygiene interventions and shift scheduling adjustments could serve as vital strategies to mitigate such effects. The correlation analysis further strengthened the link between poor sleep and diminished cognitive performance. Nurses who reported poor sleep also experienced reduced daytime energy, attention lapses, and slower response times, as reflected by the Non-Restorative Sleep Scale (NRSS) data. These findings were consistent with earlier investigations showing that chronic sleep restriction adversely impacts cognitive domains such as working memory, executive function, and decision-making (14,15). The study thus confirmed that nurses with poor sleep quality face greater cognitive strain during clinical tasks, heightening the risk of errors and compromising patient care. The critical nature of nursing work, which often requires rapid and accurate decision-making, renders such impairments particularly concerning. This aligns with prior evidence indicating that even moderate sleep loss can result in cognitive decline comparable to mild intoxication (16). The emotional and physical health dimensions highlighted by the NRSS findings were equally significant. Nurses experiencing poor sleep reported greater irritability, emotional exhaustion, and symptoms of fatigue.

These indicators are aligned with previous studies that linked sleep deprivation with mood disturbances, anxiety, and burnout among healthcare workers (17,18).

The dual impact of sleep deprivation on both physical and emotional well-being suggested a cumulative strain on nurses, where chronic fatigue not only reduced performance but also undermined psychological resilience. This relationship between poor sleep and heightened emotional distress reflected the cyclical nature of fatigue and burnout, a pattern well-documented in the literature on occupational stress among healthcare professionals (19). The exploratory factor analysis (EFA) of the NRSS identified four distinct but interconnected dimensions—cognitive performance, physical symptoms, emotional well-being, and perceived sleep quality—illustrating the multifaceted consequences of sleep deprivation. The cognitive performance factor exhibited the strongest loading, highlighting the central role of mental functioning as the domain most affected by inadequate sleep. These findings corresponded with earlier analyses that emphasized sleep's restorative function in neural recovery, memory processing, and attentional control (20). The recognition of sleep deprivation's multidimensional effects reinforced the importance of integrated approaches that address both psychological and physiological aspects of nurse well-being. The comparative analysis of PSQI and NRSS outcomes provided a holistic understanding of sleep deprivation. The PSQI captured objective indicators such as sleep latency and duration, whereas the NRSS revealed subjective perceptions of restfulness and alertness. Both instruments converged on the finding that poor sleepers experienced greater cognitive, physical, and emotional impairments. This dual-method approach enhanced the reliability of the findings and validated the consistency of observed effects across different measurement dimensions. Such triangulation of results strengthened the argument for systemic interventions to address nurse fatigue in hospital environments. The implications for nursing practice were substantial. Improving sleep hygiene through structured education programs and implementing fatigue management interventions emerged as key recommendations. Organizational support, including the introduction of rest breaks, flexible scheduling, and psychological counseling, could play an essential role in mitigating the negative effects of sleep deprivation. Additionally, optimizing shift rotations in alignment with circadian rhythms and reducing consecutive night duties would likely improve sleep quality and cognitive efficiency. Evidence from previous research supports that forward-rotating shifts (day-evening-night) and shorter work durations (8-hour shifts) are beneficial for both health and job performance (21,22).

This study's strengths lay in its use of validated measurement instruments and its focus on a critical occupational group within a high-stress environment. The combined use of PSQI and NRSS provided both objective and subjective dimensions of sleep assessment, allowing for a more comprehensive evaluation of the phenomenon. Moreover, the exploration of relationships among sleep quality, cognitive functioning, and emotional well-being offered a multidimensional understanding of how sleep deprivation manifests in nurses' professional and personal lives. However, several limitations should be acknowledged. The sample size was relatively small, and the imbalance between good and poor sleepers (12 versus 64) restricted the generalizability of findings. Reliance on self-reported data introduced potential response bias, as participants may have underreported or exaggerated their sleep difficulties. Objective sleep assessments such as actigraphy or polysomnography could be employed in future research to validate self-reported outcomes. Furthermore, the cross-sectional design limited the ability to establish causal relationships between sleep deprivation and health outcomes. Longitudinal studies are needed to track changes over time and assess the long-term consequences of chronic sleep loss among nurses. Conducting multi-center studies across different hospitals and regions would also improve external validity and capture a broader representation of nursing experiences (15,23). In summary, this study underscored that sleep deprivation among night-shift nurses is not merely a personal health concern but a systemic issue with implications for patient safety, institutional efficiency, and workforce sustainability. The evidence emphasized that improving sleep quality through organizational, educational, and behavioral interventions is essential for optimizing both nurse

performance and healthcare outcomes. By addressing sleep health as a professional priority, healthcare institutions can foster safer clinical environments, enhance staff well-being, and ultimately improve the quality of patient care.

CONCLUSION

This study concluded that sleep deprivation has a profound effect on the cognitive, physical, and emotional well-being of night-shift nurses working in critical care units, ultimately influencing both their performance and the quality of patient care they deliver. The findings from the PSQI and NRSS assessments revealed that poor sleep quality and disrupted rest patterns significantly impair alertness, decision-making, and emotional stability. These results underscore the urgent need for organizational and behavioral interventions aimed at improving nurses' sleep hygiene, reducing fatigue, and supporting mental health. Implementing evidence-based measures such as structured rest breaks, optimized shift scheduling, and wellness programs can play a pivotal role in safeguarding nurse well-being and patient safety. The study contributes valuable insights to nursing practice and healthcare management by emphasizing that prioritizing sleep health is essential for sustaining workforce performance and delivering safe, high-quality patient care.

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