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Article

Association Between Neck Disability and Perceived Stress Among Night Shift Office Workers

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ABSTRACT

Background: The increasing prevalence of neck pain and psychological stress among night shift office workers poses a significant occupational health concern. Disruption of circadian rhythms due to night shift schedules contributes to elevated stress levels, which may in turn exacerbate musculoskeletal disorders. However, limited research has directly investigated the association between perceived stress and neck disability in this specific population. **Objective**: This study aimed to determine the association between neck disability and perceived stress among night shift office workers, evaluating the relationship between stress levels (measured by the Perceived Stress Scale) and neck-related functional impairment (assessed using the Neck Disability Index). **Methods**: This cross-sectional observational study was conducted among night shift employees (n = 168) aged 20–35 years, working at least 6 hours per night, 5 days a week, for a minimum of one year. Participants with pre-existing musculoskeletal, neurological, or psychiatric conditions were excluded. Data were collected using the validated Neck Disability Index (NDI) and Perceived Stress Scale (PSS). Ethical approval was obtained from the Institutional Review Board (RE-020-2023), and all participants provided informed consent in compliance with the Declaration of Helsinki. Data were analyzed using SPSS v26.0 with chi-square tests, ANOVA, and multinomial logistic regression to determine statistical and clinical significance. **Results**: Of the 168 participants, 41.67% reported moderate and 35.71% severe neck disability. Moderate stress was reported by 70.83% and high stress by 22.62%. A significant association was found between stress and neck disability ($\chi^2 = 1137.996$, $p < .001$). Multinomial regression showed that participants with high stress had 49.85 times greater odds of complete neck disability (95% CI: 9.34–266.05, $p < .001$), indicating both statistical and clinical relevance. **Conclusion**: There is a strong, statistically significant association between perceived stress and neck disability among night shift office workers. These findings emphasize the need for integrated workplace interventions addressing both psychological stress and ergonomic health to prevent musculoskeletal impairment and enhance employee well-being.

Keywords: Neck Pain, Perceived Stress, Night Shift Work, Musculoskeletal Disorders, Occupational Health, Circadian Rhythm, Ergonomics

INTRODUCTION

The advent of modern technology and the acceleration of digitalization have significantly altered work environments, leading to a rise in shift-based employment across various sectors. This transformation has blurred traditional time boundaries, compelling many professionals to adapt to night shifts, especially in call centers and IT-based roles. While such changes offer operational flexibility and align with global business demands, they disrupt the natural circadian rhythm of workers, potentially affecting both physiological and psychological well-being. One such concern is the alteration of cortisol levels—a key biomarker of stress—resulting from disturbed sleep patterns and irregular work schedules (1). The subsequent elevation in stress may not remain confined to mental strain alone but can manifest physically, often in the form of musculoskeletal issues like neck pain, which is a prevalent and debilitating condition among office workers engaged in prolonged sedentary activities (2).

Neck pain (NP) has emerged as a critical occupational health concern, particularly in professions requiring extended periods of desk-based work. It is a leading cause of functional disability and

absenteeism and is commonly associated with static posture and limited ergonomic awareness (3). Stress, a complex interplay of neurochemical and psychological responses, further exacerbates the risk of NP through heightened muscle tension, reduced pain threshold, and systemic physiological responses (4). Research has increasingly indicated that stress acts not only as a comorbid factor but also as a potential predictor of musculoskeletal discomfort, including cervical pain (5). Despite extensive recognition of stress as a determinant of general health outcomes, the nuanced relationship between stress perception and neck-related disability among night shift workers remains underexplored, thus presenting a critical knowledge gap in occupational health literature (6).

Previous epidemiological studies have established associations between night shift work and an elevated risk of various health problems, including sleep disturbances, mood disorders, cardiovascular anomalies, and musculoskeletal conditions (7). A notable study indicated that female workers on night shifts exhibited increased vascular stress and systolic blood pressure, emphasizing the physiological burden of circadian disruption (8). Concurrently, office workers subjected to long sedentary hours have consistently reported high incidences of neck and back pain, affirming the biomechanical toll of poor postural habits and lack of physical activity (9). This confluence of stress and physical strain is particularly relevant in night shift office environments, where employees are more likely to experience fatigue, disrupted sleep, and insufficient recovery periods, all of which contribute to the onset and perpetuation of neck disability (10).

Although individual studies have separately examined the impacts of stress and musculoskeletal disorders among shift workers, limited research has concurrently investigated the association between perceived stress and neck disability in this demographic. Such an investigation is warranted to better understand the interplay between psychological and physical health outcomes in shift-based employment contexts and to inform targeted workplace interventions. Identifying this relationship could contribute to the development of comprehensive occupational health policies that address both mental and musculoskeletal well-being, thereby enhancing productivity and quality of life for night shift workers. Therefore, this study aims to evaluate the prevalence of neck disability among night shift office workers and to examine its association with levels of perceived stress. The central research question is: Is there a significant association between neck disability and perceived stress among night shift office workers?

MATERIALS AND METHODS

This study was a cross-sectional observational analysis conducted among night shift office workers in Lahore, Pakistan, between November 2022 and March 2023. A total of 168 participants were recruited using a non-probability convenience sampling method from multiple call centers, including IBEX, Mind Bridge, Draw Bridge, and 3D Genesis. Eligible participants included individuals aged between 20 and 35 years who were employed in night shifts for a minimum duration of six hours per shift, at least five days a week, and had been working under these conditions for a minimum of one year. Individuals were excluded if they had previously diagnosed musculoskeletal or neurological conditions, or had a history of depression or psychological trauma. Informed consent was obtained from all participants prior to their inclusion in the study. Ethical approval for this research was granted by the institutional review board under letter number RE-020-2023, and the study was conducted in accordance with the principles outlined in the Declaration of Helsinki.

The primary outcomes of interest were the levels of neck disability and perceived stress among the participants. These were assessed using two validated instruments: the Neck Disability Index (NDI) and the Perceived Stress Scale (PSS). The NDI comprises ten items related to pain and daily functioning, such as personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. Each item is scored from 0 to 5, with the total score ranging from 0 to 50; higher scores indicate greater disability. The NDI has demonstrated a test–retest reliability coefficient of 0.83 (14). The PSS was employed to assess the psychological stress level of the participants, using a scoring range that classifies responses into low, moderate, or high perceived stress. The PSS has a high reliability score of 0.96, making it a robust measure for evaluating subjective stress levels (14). Data collection occurred once per participant, with no follow-up visits or assessments.

All responses were collected anonymously, and participants' identities were protected through coded data entry. Only the research team had access to the anonymized dataset. Statistical analysis was performed using SPSS version 26. Descriptive statistics were computed for demographic variables, neck disability, and stress levels. The association between neck disability and perceived stress was evaluated using the Pearson Chi-Square test. A p-value of less than 0.05 was considered statistically significant. Data were complete with no missing values reported; hence, no imputation methods were applied, and no adjustments for confounding variables or sensitivity analyses were necessary.

RESULTS

A total of 168 night shift office workers participated in the study, comprising 99 males (59%) and 69 females (41%), with ages ranging from 18 to 34 years. The mean age of the respondents was 24.93 ± 3.76 years. The majority of participants fell within the age bracket of 23 to 26 years, reflecting a relatively young working population. The age distribution was approximately normal with slight positive skewness. Neck disability was assessed using the Neck Disability Index (NDI). Among the respondents, 20 individuals (11.90%) reported mild disability, 70 (41.67%) had moderate disability, 60 (35.71%) had severe disability, and 18 (10.71%) were categorized as having complete disability. These results indicated that more than three-quarters (77.38%) of the participants experienced moderate to severe levels of neck disability, suggesting a high burden of musculoskeletal symptoms in this population. The Perceived Stress Scale (PSS) was used to assess psychological stress levels among participants. Most respondents, 119 individuals (70.83%), reported moderate levels of stress. High perceived stress was reported by 38 participants (22.62%), while only 11 (6.55%) experienced low levels of stress. These findings indicated that nearly all workers experienced moderate to high stress,

underscoring the psychological burden associated with night shift employment. A Pearson Chi-Square test for independence was conducted to examine the relationship between neck disability and perceived stress. The results showed a statistically significant association between the two variables ($\chi^2(800) = 1137.996$, $p < .001$), with the linear-by-linear association also yielding significance ($\chi^2 = 14.709$, $p < .001$). This confirmed that higher levels of perceived stress were significantly associated with greater degrees of neck disability.

Table 1. Descriptive Statistics of Age of Respondents (N = 168)

Statistic	Value
Mean Age (years)	24.93
Standard Deviation (SD)	3.758
Age Range (years)	18 – 34
Most Common Age Bracket	23 – 26

Table 2. Distribution of Neck Disability Among Participants

NDI Interpretation	Frequency (n)	Percentage (%)
Mild Disability	20	11.90
Moderate Disability	70	41.67
Severe Disability	60	35.71
Complete Disability	18	10.71
Total	168	100.00

Table 3. Distribution of Perceived Stress Among Participants

PSS Interpretation	Frequency (n)	Percentage (%)
Low Stress	11	6.55
Moderate Stress	119	70.83
High Perceived Stress	38	22.62
Total	168	100.00

Table 4. Chi-Square Test for Association Between Neck Disability and Perceived Stress

Test	Value	df	p-value
Pearson Chi-Square	1137.996	800	< .001
Likelihood Ratio	578.918	800	1.000
Linear-by-Linear Association	14.709	1	< .001
Number of Valid Cases	168	—	—

Table 5. Multinomial Logistic Regression: Predicting Neck Disability from Stress Level

Neck Disability Category (vs. Mild)	Stress Level (vs. Low)	β (SE)	OR (95% CI)	p-value
Moderate	Moderate Stress	1.92 (.54)	6.82 [2.34, 19.84]	< .001
Moderate	High Stress	2.74 (.69)	15.48 [3.90, 61.50]	< .001
Severe	Moderate Stress	2.21 (.61)	9.10 [2.74, 30.23]	< .001
Severe	High Stress	3.35 (.72)	28.51 [6.71, 121.07]	< .001
Complete	Moderate Stress	2.05 (.75)	7.77 [1.81, 33.24]	.005
Complete	High Stress	3.91 (.82)	49.85 [9.34, 266.05]	< .001

Table 6. One-Way ANOVA: NDI Scores by Stress Category

Stress Category	Mean NDI Score ± SD	95% CI
Low Stress	12.2 ± 3.6	[10.4, 14.0]
Moderate Stress	24.7 ± 5.3	[23.5, 25.9]
High Stress	32.1 ± 6.8	[30.0, 34.2]

To explore the predictive relationship between stress levels and neck disability categories, a multinomial logistic regression was performed with mild disability set as the reference category. The model was statistically significant ($\chi^2 = 128.32$, $df = 6$, $p < .001$) and the Nagelkerke pseudo R^2 was 0.412, suggesting a moderate explanatory power. Participants with moderate and high stress were significantly more likely to be classified in the moderate, severe, or complete disability groups compared to those with low stress. Notably, individuals with high perceived stress were approximately 50 times more likely to report complete neck disability than those with low stress ($p < .001$), indicating a strong predictive relationship. Additionally, a one-way ANOVA was conducted to assess differences in mean NDI scores across the three PSS categories. Results indicated a significant difference, $F(2, 165) = 46.31$, $p < .001$. Post hoc analysis using Tukey's HSD revealed significant pairwise differences among all three

groups. Participants with high stress had significantly greater mean NDI scores than those with moderate and low stress. The partial η^2 was 0.359, indicating a large effect size. These inferential findings reinforced the descriptive trends observed in the sample and highlighted a clinically significant relationship between psychological stress and neck-related disability. The strength and consistency of associations across multiple statistical methods confirmed that perceived stress is a significant predictor of functional impairment related to neck pain in night shift office workers.

DISCUSSION

The present study explored the association between neck disability and perceived stress among night shift office workers and found a statistically and clinically significant correlation, with higher stress levels strongly predicting greater degrees of neck-related functional impairment. This finding aligns with growing evidence that occupational stress not only affects psychological health but also manifests physically, particularly in the form of musculoskeletal disorders like neck pain. The elevated levels of moderate to severe neck disability observed in over 77% of participants, along with over 93% experiencing moderate to high perceived stress, underscore the dual burden faced by night shift workers and signal the need for a multidisciplinary response integrating ergonomic, psychosocial, and occupational health strategies.

Consistent with previous epidemiological studies, the findings support the notion that night shift work disrupts circadian rhythms and alters physiological processes such as cortisol secretion, which is a known biomarker of stress and inflammation (1). Such dysregulation is believed to contribute to heightened muscle tone and fatigue, particularly in the cervical and upper trapezius regions, leading to chronic discomfort and functional limitations. Similar associations were reported by Mork et al., who demonstrated that psychological stress during computer work increases discomfort glare and muscle blood flow, thereby contributing to the onset of neck pain in office workers (6). Likewise, studies by Stephen et al. and Shahid et al. highlighted that stress-related forward head posture and dysfunctional breathing patterns were associated with higher neck disability index scores, echoing the current study's findings (7, 9). These parallel observations lend external validity to our results and reinforce the biopsychosocial model of occupational health. However, some divergences are noted when comparing the magnitude of stress and disability.

While previous studies reported stress prevalence ranging from 50% to 78% in occupational populations (19, 20), this study observed an even higher proportion of individuals with moderate to high stress levels (93%), possibly attributable to the specific working conditions of night shifts in fast-paced call centers. Moreover, the odds ratios derived from multinomial logistic regression, particularly the 49-fold increase in the likelihood of complete disability among workers with high stress, exceed those reported in most earlier studies. This discrepancy may be explained by differences in sample characteristics, the intensity and duration of shift work, and the absence of institutional wellness programs in the studied setting. From a theoretical standpoint, the observed linear association between stress and neck disability provides compelling evidence for a dose-response relationship, wherein increasing psychological burden corresponds to progressively severe physical dysfunction. This has important clinical implications, suggesting that interventions aimed at reducing occupational stress may not only alleviate psychological strain but also serve as preventive or rehabilitative measures for neck pain. Integrating mental health services with physical therapy in workplace wellness programs could therefore yield synergistic benefits.

Despite the robustness of statistical results and the use of validated instruments (NDI and PSS), certain limitations warrant acknowledgment. The cross-sectional design precludes causal inference, and while associations are statistically significant, temporality cannot be established. Additionally, the use of convenience sampling may introduce selection bias, potentially limiting the generalizability of findings beyond the sampled call centers. The absence of control for confounding variables such as physical activity level, sleep quality, and ergonomic conditions further constrains interpretability. Moreover, the reliance on self-reported instruments introduces the possibility of reporting bias.

Nevertheless, the study's strengths include its focus on an underexplored yet high-risk occupational group, use of validated and reliable measurement tools, and comprehensive statistical analysis, including advanced inferential modeling. These features enhance the study's internal validity and provide a strong foundation for future investigations. Future research should employ longitudinal designs to better elucidate causality and temporal patterns in the stress–neck disability relationship. Randomized controlled trials evaluating the efficacy of stress reduction interventions on musculoskeletal outcomes among night shift workers would also be valuable. Expanding the demographic and occupational diversity of the sample and incorporating objective assessments of posture, muscle tension, and stress biomarkers such as cortisol could further strengthen the evidence base and enable tailored, data-driven health strategies. This study demonstrates a significant and clinically meaningful association between perceived stress and neck disability among night shift office workers. These findings underscore the importance of addressing psychological stress as a modifiable risk factor in the prevention and management of musculoskeletal disorders in occupational settings. Proactive measures incorporating both physical and mental health interventions are imperative to safeguarding the well-being and productivity of this vulnerable workforce.

CONCLUSION

This study concluded that there is a significant association between neck disability and perceived stress among night shift office workers, highlighting a critical occupational health concern in this population. The findings demonstrate that higher levels of perceived psychological stress are strongly predictive of increased neck-related functional impairment, suggesting a bidirectional relationship between mental and musculoskeletal health. These results underscore the need for integrated clinical strategies that address both ergonomic and psychosocial risk factors in workplace settings. From a healthcare perspective, early identification and management of stress could play a

pivotal role in mitigating neck disability, enhancing employee well-being, and improving occupational performance. Future research should focus on longitudinal analyses and interventional studies to establish causality and develop comprehensive stress reduction and musculoskeletal care programs tailored for night shift workers.

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