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LEVEL OF DEPRESSION AND ITS IMPACT ON SLEEP QUALITY AMONG CHRONIC STROKE PATIENTS. A CROSS-SECTIONAL STUDY

Original Research

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ABSTRACT

Background: Chronic stroke survivors frequently experience long-term physical, emotional, and cognitive impairments. Among these, post-stroke depression (PSD) is a common yet under-addressed complication, affecting an estimated 20% to 60% of individuals. Depression in this population not only impacts psychological well-being but also disrupts sleep, further compromising recovery and quality of life. Understanding the interplay between depression and sleep disturbances is essential for developing integrated care approaches in stroke rehabilitation.

Objective: To assess the level of depression and its association with sleep quality among individuals with chronic stroke.

Methods: This cross-sectional study was conducted at the Pakistan Society for the Rehabilitation of the Disabled (PSRD) over a six-month period. A total of 111 patients with chronic stroke (≥6 months post-stroke) were recruited using a non-probability convenience sampling method. Standardized tools were used for data collection: the Depression, Anxiety, and Stress Scale-21 (DASS-21) measured depressive symptoms, while the Pittsburgh Sleep Quality Index (PSQI) assessed sleep quality. Data were analyzed using IBM SPSS version 25, with regression analysis applied to determine associations.

Results: Of the 111 participants, 17 (15.3%) had no depression, 21 (18.9%) had mild depression, 30 (27.0%) moderate, 29 (26.1%) severe, and 14 (12.6%) extremely severe depression. Sleep difficulties were reported as mild in 43 (38.7%), moderate in 52 (46.8%), and severe in 16 (14.4%) participants. A significant association was observed between depression severity and sleep quality ($p < 0.001$). Regression analysis revealed that increasing depression scores were predictive of higher PSQI scores ($B = 0.354$, 95% CI: 0.269–0.439, $R^2 = 0.383$), indicating worsening sleep quality.

Conclusion: The study concluded that greater severity of depression was significantly associated with poorer sleep quality in chronic stroke patients, highlighting the need for integrated psychological care in rehabilitation.

Keywords: Chronic Stroke, Depression, DASS-21, Pittsburgh Sleep Quality Index, Post-Stroke Depression, Sleep Disorders, Sleep Quality.

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INTRODUCTION

Stroke, a leading cause of long-term disability worldwide, often leaves survivors grappling not only with physical impairments but also with substantial psychological burdens. Among these, post-stroke depression (PSD) and poor sleep quality stand out as particularly prevalent and debilitating. Depression affects a considerable proportion of chronic stroke patients and has been shown to significantly delay or even derail the rehabilitation process (1). Sleep disturbances, on the other hand, are highly common following stroke, with prevalence rates reported between 25% and 78% (2). These two factors—depression and sleep quality—are not only widespread but also closely intertwined, creating a feedback loop that can severely compromise recovery and reduce quality of life (2,3). Post-stroke depression emerges as a persistent and under-addressed issue in stroke rehabilitation. It has been associated with diminished motivation, cognitive decline, and poorer treatment adherence, thereby compounding other post-stroke deficits (4). In parallel, stroke survivors often experience a spectrum of sleep-related problems, including insomnia, obstructive sleep apnea, reduced sleep duration and efficiency, delayed sleep onset, and increased nighttime awakenings (5). These disruptions not only impair physical recovery but also exacerbate mood disturbances, particularly depressive symptoms (6,7). The cyclical relationship between disturbed sleep and depression forms a compounding barrier to neurological and psychological healing.

Several contributing factors may explain this interconnectedness, including the location and severity of the brain lesion, biochemical changes following stroke, and the psychological stress associated with loss of function and independence (8). Importantly, evidence suggests that poor sleep acts not just as a symptom but also as a driver of depression in stroke patients, making it a modifiable risk factor with therapeutic significance (6,9). Addressing sleep disorders alongside depressive symptoms, therefore, may offer a more comprehensive approach to post-stroke care than treating either in isolation (10,11). Recent advances underscore the efficacy of integrated treatment models combining pharmacological therapies, cognitive-behavioral interventions, and lifestyle modifications. Such synergistic strategies aim to optimize both mood and sleep, thereby enhancing overall recovery and life satisfaction (11,12). Despite this, a clear gap remains in clinical practice regarding the concurrent management of these two interlinked conditions. Given the global rise in stroke incidence, there is a compelling need to deepen understanding of how depression and sleep disturbances interact in chronic stroke patients. This study aims to investigate the bidirectional relationship between post-stroke depression and sleep quality, with the objective of informing targeted interventions that could substantially improve rehabilitation outcomes and quality of life for stroke survivors (13).

METHODS

This cross-sectional study was conducted at the Pakistan Society for the Rehabilitation of the Disabled (PSRD) over a six-month period following the approval of the research synopsis. A total of 111 chronic stroke patients were recruited using a non-probability convenience sampling technique. Ethical approval for the study was obtained from the institutional review board, and formal permission was granted by the relevant university committee prior to data collection. All participants provided written informed consent after being briefed about the study's objectives and procedures. Eligibility criteria were clearly defined to ensure the relevance and reliability of the findings. Participants were required to be at least 18 years old and have experienced a stroke at least six months prior to enrollment. Only those without any pre-existing physical disabilities before their stroke, and who were capable of understanding and providing informed consent, were included. Individuals were excluded if they had experienced a stroke secondary to invasive procedures such as coronary artery bypass grafting (CABG), angiography, or other surgeries. Further exclusions included patients with terminal illnesses such as end-stage cancer or renal failure, as well as those with communication impairments or other medical conditions that could hinder accurate assessment of depression and sleep quality.

Data collection was carried out using a structured, three-part questionnaire. The first section recorded demographic and clinical information. The second part utilized the validated Depression, Anxiety and Stress Scale-21 (DASS-21) to assess depressive symptoms, while the third part comprised the Pittsburgh Sleep Quality Index (PSQI) to evaluate sleep disturbances. Depression was designated as the independent variable, and sleep quality served as the dependent variable. All tools employed were standardized and widely recognized for their psychometric validity and reliability in clinical research. Participants who met the inclusion criteria were approached

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individually, and the study procedure was explained to ensure comprehension and voluntary participation. The questionnaire was self-administered under supervision, ensuring consistency in responses and minimizing response bias. The data obtained were coded and entered into IBM SPSS Statistics version 25 for analysis. Descriptive statistics such as frequencies, percentages, and means were calculated for demographic variables and survey responses. Categorical variables were examined using the Chi-square test after checking for data normality. To explore the relationship between depression and sleep quality, multivariate linear regression was performed, identifying predictive associations between the study variables.

RESULTS

The study analyzed data from 111 chronic stroke patients to examine the relationship between depressive symptoms and sleep quality. The findings revealed that 17 participants (15.3%) had no depression, 21 (18.9%) had mild depression, 30 (27.0%) exhibited moderate depression, 29 (26.1%) were classified as having severe depression, and 14 (12.6%) were categorized under extremely severe depression based on the DASS-21 scoring criteria. Regarding sleep quality, 43 participants (38.7%) experienced mild sleep difficulty (PSQI = 1–7), 52 (46.8%) had moderate sleep difficulty (PSQI = 8–14), and 16 (14.4%) were reported to have severe sleep difficulty (PSQI = 14–21). Cross-tabulation analysis demonstrated a progressive trend between the severity of depression and worsening sleep quality. Among participants without depression, 82.4% had mild sleep difficulty, while 17.6% had moderate sleep difficulty, and none had severe sleep disturbance. In the mild depression category, 57.1% had mild sleep issues, while 42.9% experienced moderate difficulty, with none falling into the severe category. For those with moderate depression, 40.0% had mild, 56.7% had moderate, and 3.3% had severe sleep difficulties.

A notable shift was observed among participants with severe depression, where only 13.8% had mild sleep difficulty, 69.0% experienced moderate difficulty, and 17.2% suffered from severe sleep disturbance. The most pronounced association was evident in participants with extremely severe depression, where only 7.1% reported mild sleep issues, 21.4% moderate difficulty, and a striking 71.4% suffered from severe sleep difficulty. A statistically significant association was found between depression severity and sleep quality ($p = 0.00$), indicating a strong correlation between worsening depression and poorer sleep outcomes. A linear regression analysis was conducted to examine whether depression severity predicted sleep difficulty in chronic stroke patients. Depression scores were significantly associated with PSQI scores ($B = 0.354$, 95% CI: 0.269 to 0.439, $p = 0.0000$). The model accounted for approximately 0.383 of the variance in sleep difficulty scores, indicating that higher levels of depression were associated with greater sleep impairment among stroke survivors.

Table 1: Frequency distribution of Depression Scale

	Frequency	Percentage
No Depression (DASS Score 0-9)	17	15.3
Mild Depression (DASS Score 10-13)	21	18.9
Moderate (DASS Score 14-20)	30	27.0
Severe (DASS Score 21-27)	29	26.1
Extremely severe Depression (DASS Score 28+)	14	12.6
Total	111	100.0

Table 2: Frequency distribution of Global PSQI score

	Frequency	Percentage
Mild Sleep Difficulty (PSQI = 1-7)	43	38.7
Moderate Sleep Difficulty (PSQI = 8-14)	52	46.8
Severe Sleep Difficulty (PSQI = 14-21)	16	14.4
Total	111	100.0

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Table 3: Frequency distribution of Depression Scale * Global PSQI Score Cross tabulation

Pittsburgh Sleep Quality Index Scale (PSQI Scale)						
		Mild Sleep Difficulty (PSQI = 1-7)	Moderate Sleep Difficulty (PSQI = 8-14)	Severe Sleep Difficulty (PSQI = 14-21)	Total	P-Value
Depression Scale	Normal (DASS Score 0-9)	14(82.4%)	3(17.60%)	0(0%)	17(100%)	0.00
	Mild Depression (DASS Score 10-13)	12(57.10%)	9(42.90%)	0(0%)	21(100%)	
	Moderate (DASS Score 14-20)	12(40%)	17(56.70%)	1(3.30%)	30(100%)	
	Severe (DASS Score 21-27)	4(13.80%)	20(69%)	5(17.20%)	29(100%)	
	Extremely severe (DASS Score 28+)	1(7.10%)	3(21.40%)	10(71.40%)	14(100%)	
Total		43(38.70%)	52(46.80%)	16(14.40%)	111(100%)	

Table 4: Regression Analysis: Depression Predicting PSQI

Variable	Coefficient (B)	95% CI Lower	95% CI Upper	p-value	R-squared
DepressionScore	0.354	0.269	0.439	0	0.383

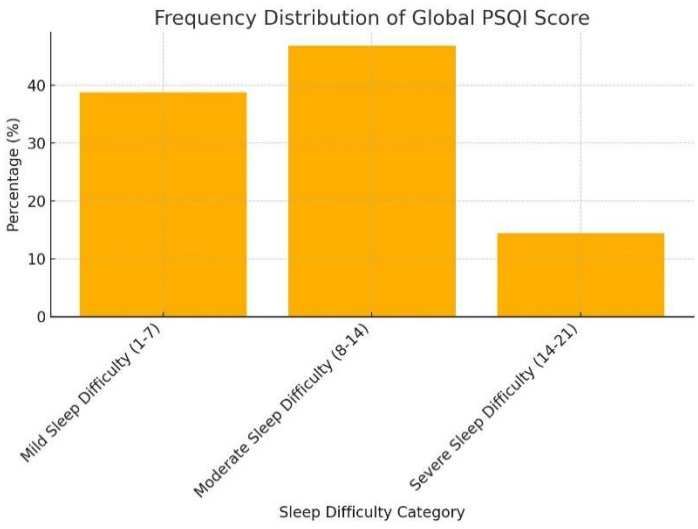


Figure 2 Frequency Distribution of Global PSIQ Score

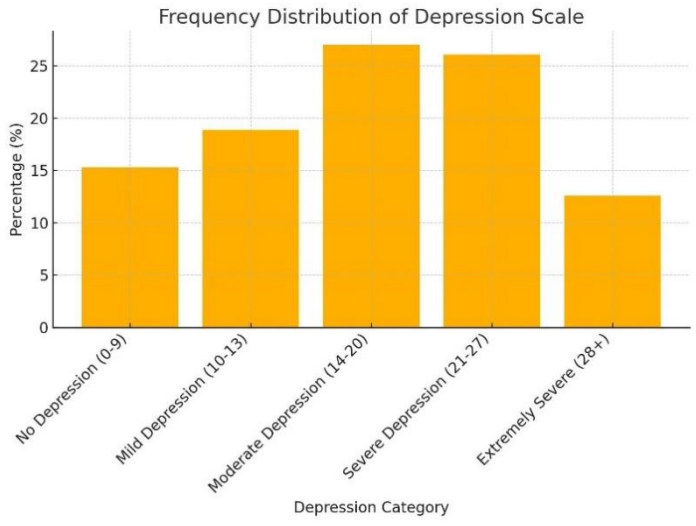
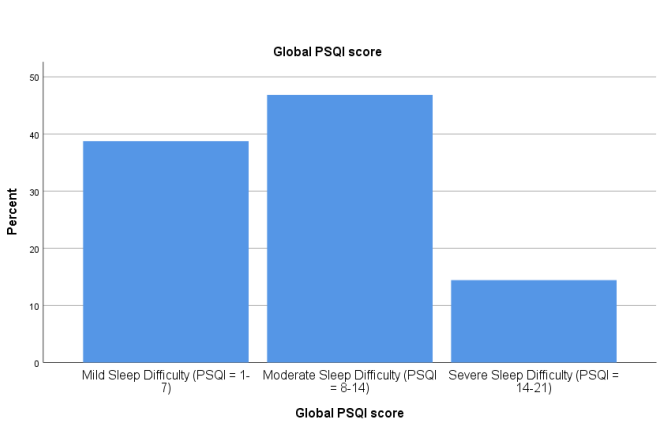
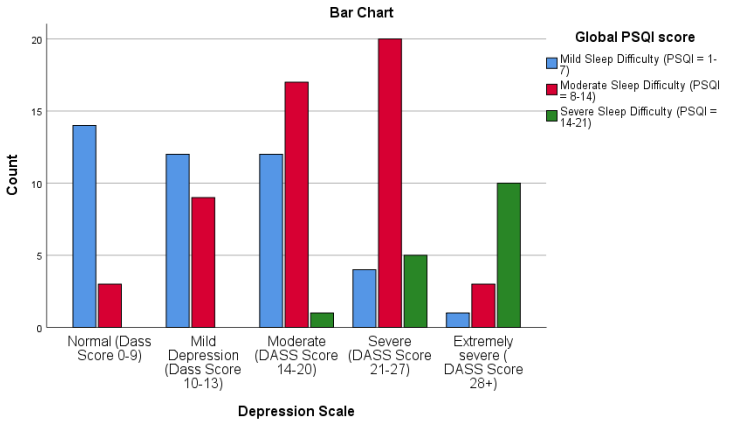


Figure 1 Frequency Distribution of Depression Scale

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DISCUSSION

The findings of this cross-sectional study provide compelling evidence that depression severity significantly impacts sleep quality among patients with chronic stroke. While previous research has acknowledged the association between post-stroke depression and sleep disturbances, the current study offers a more comprehensive understanding by highlighting the spectrum of both depression and sleep problems in a defined population. Unlike earlier work that primarily focused on functional rehabilitation outcomes, this investigation addresses the psychological dimension, offering critical insights into the bidirectional relationship between mood disorders and sleep dysfunction in stroke survivors (14,15). A previous investigation conducted in a rehabilitation setting demonstrated a notable association between depressive symptoms and impaired sleep patterns in stroke patients (16). These findings are supported by the current study, which showed that 38.7% of participants experienced mild sleep difficulties, 46.8% had moderate difficulties, and 14.4% suffered from severe sleep disturbances. Moreover, depression levels varied widely, with 15.3% showing no symptoms and others falling within mild to extremely severe categories. These results indicate a broader psychological impact in the post-stroke population than earlier literature suggested and underscore the variability in individual experiences of recovery.

The strength of association observed in this study aligns with prior findings that sleep disturbances are particularly common in individuals with severe depressive symptoms (17,18). The present data confirm that individuals with no depression predominantly experienced mild sleep issues, whereas those with severe or extremely severe depression frequently reported moderate to severe sleep difficulties. These patterns reaffirm the intertwined nature of emotional and sleep-related dysfunction and suggest that addressing one domain in isolation may be insufficient for holistic post-stroke rehabilitation (19). An additional aspect explored was sleep duration, which is frequently overlooked in post-stroke care. The observation that only 20.7% of participants reported sleeping more than seven hours per night reflects a concerning trend, as inadequate sleep duration may contribute not only to persistent fatigue and impaired neuroplasticity but also to heightened depressive symptoms and reduced rehabilitation engagement (20). This aspect of sleep behavior may represent a modifiable target for intervention to support mental health and functional gains in stroke patients.

The findings advocate for the integration of psychological and behavioral therapies into routine stroke rehabilitation programs. Comprehensive approaches that address sleep hygiene, mood regulation, and behavioral modifications may yield better recovery trajectories than conventional models focused solely on physical rehabilitation. Regular screening for depression and sleep quality, followed by personalized interventions, should be considered a standard practice in long-term stroke management (21). This study offers several strengths, including the use of validated assessment tools, the inclusion of a diverse clinical sample, and the statistical rigor applied through multivariate regression analysis to quantify the predictive role of depression on sleep quality. However, there are limitations that warrant acknowledgment. The use of non-probability convenience sampling may restrict the generalizability of the results. Furthermore, the cross-sectional design precludes causal inference, and the reliance on self-reported data may introduce response bias. The exclusion of confounding variables such as medication use, stroke severity, lesion location, and comorbidities also limits the depth of interpretation.

Future research should adopt longitudinal designs to better understand the temporal dynamics between depression and sleep disturbances post-stroke. Investigations that include neuroimaging correlates, objective sleep monitoring tools such as actigraphy or polysomnography, and interventional trials targeting sleep improvement may further elucidate causal pathways and optimize

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rehabilitation outcomes. In conclusion, the study reinforces the crucial role of addressing psychological and behavioral dimensions in stroke recovery. Depression and sleep disturbances, often under-recognized yet highly prevalent, are key determinants of functional and psychosocial outcomes. Integrated, patient-centered care models that recognize these interdependencies are essential for improving quality of life and long-term rehabilitation success in stroke survivors.

CONCLUSION

This study concluded that depression plays a significant role in shaping the sleep quality of patients with chronic stroke. As levels of depression increased, sleep disturbances became more pronounced, underscoring the deep psychological toll of stroke beyond physical impairments. These findings emphasize the importance of routinely assessing and managing depression as part of comprehensive stroke rehabilitation. Addressing emotional health alongside physical recovery can enhance overall outcomes and quality of life. Integrating psycho-social care into rehabilitation frameworks is therefore essential to support the long-term well-being and functional independence of stroke survivors.

AUTHOR CONTRIBUTION

Author	Contribution
Muhammad Umar*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Umm e Habiba	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Hafiz Muhammad Asim	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Maliha Safdar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Zainab Aslam	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Attiya Rehman	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Dil Awaiz Muhammad	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Sayam Manzoor	Writing - Review & Editing, Assistance with Data Curation
Momina Umer	Writing - Review & Editing, Assistance with Data Curation
Hafiza Nimra Aslam	Writing - Review & Editing, Assistance with Data Curation

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