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ASSOCIATION OF SLEEP DISTURBANCE, DEPRESSION AND ANXIETY AMONG MEDICAL COLLEGE STUDENTS

Original Research

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ABSTRACT

Background: Sleep is a fundamental biological process essential for physical and psychological restoration. Disruptions in sleep quality have been strongly linked with various neuropsychiatric conditions, including anxiety and depression. These associations are particularly prevalent in student populations, where academic stress and irregular routines frequently impair sleep. Comorbid sleep disturbances, depression, and anxiety have been increasingly reported and are known to contribute to cognitive impairment, poor academic performance, substance misuse, and psychological distress.

Objective: To determine the association between sleep disturbance, depression, and anxiety among students of Gulab Devi Educational Complex.

Methods: This cross-sectional study was conducted from October 2020 to March 2021 at Gulab Devi Educational Complex, Lahore. A total of 270 students aged 18 to 25 years were enrolled through non-probability purposive sampling. Data collection tools included the Pittsburgh Sleep Quality Index (PSQI) to evaluate sleep quality and the Depression Anxiety Stress Scale (DASS-21) to assess psychological health. Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize participant characteristics, and Spearman's rho correlation test was applied to assess associations.

Results: Among 270 participants, 55.9% were male and 44.1% were female, with the highest proportion (29.3%) aged 23 years. According to DASS-21, 34.8% had moderate depression, 25.2% severe depression, and 8.1% extremely severe depression. Anxiety levels were also elevated, with 28.9% reporting mild anxiety, 27.0% moderate, and 11.9% extremely severe. Sleep quality assessment revealed that only 10% had very good sleep, while 48.1% experienced fairly bad sleep. Statistically significant positive correlations were observed between depression and sleep disturbance ($p < 0.01$) and between anxiety and sleep disturbance ($p < 0.01$).

Conclusion: The study confirmed strong associations between poor sleep quality and higher levels of depression and anxiety in students. Early intervention strategies focusing on sleep hygiene and mental health awareness are crucial in academic settings.

Keywords: Anxiety, Depression, Mental Health, Pittsburgh Sleep Quality Index, Sleep Disturbance, Students, Stress.

INTRODUCTION

Sleep plays an essential role in maintaining overall health and mental well-being, yet disturbances in sleep patterns are increasingly reported among student populations, especially those undergoing the rigorous demands of medical education. Defined by both behavioral markers and physiological changes in brain activity, sleep is broadly classified into two distinct stages: non-rapid eye movement (NREM) and rapid eye movement (REM) sleep, each serving unique neurocognitive and restorative functions (1,2). Disruptions in these stages, commonly assessed using tools such as polysomnography (PSG), sleep questionnaires, and diaries, have been linked to various psychological and physiological conditions (3). Sleep deprivation, frequently observed among students, can be triggered by multifactorial causes including insomnia, parasomnias, psychiatric disorders such as depression and anxiety, and underlying medical or neurological conditions (4). The stress-response mechanism, primarily governed by the hypothalamic–pituitary–adrenal (HPA) axis, has been shown to be significantly activated during periods of sleep deprivation, suggesting a bidirectional relationship between sleep loss and psychological stress (5). Depression and anxiety, two of the most prevalent psychiatric conditions, often coexist and share overlapping symptomatology, complicating diagnosis and management. Reports indicate that up to 85% of individuals with depression also exhibit anxiety, and vice versa, making it critical to assess both conditions simultaneously to inform effective treatment strategies (6). In pediatric and adolescent populations, anxiety has been associated with a range of sleep-related issues including insomnia, nightmares, and reluctance to sleep alone, reinforcing the early-life link between emotional dysregulation and sleep disturbances (7). Similarly, depressive disorders are closely tied to insomnia, hypersomnia, circadian rhythm disruptions, and other sleep-related complaints, with bidirectional relationships now well established across multiple longitudinal studies (8).

Several studies substantiate the strong interrelation between sleep, depression, and anxiety. For instance, a study found that individuals with insomnia were significantly more likely to exhibit clinically relevant depression and anxiety symptoms compared to those with normal sleep, with specific types of insomnia showing stronger associations with these psychiatric conditions (9-11). Another cross-sectional study conducted in a Brazilian medical school identified high prevalence rates of depressive and anxiety symptoms among students, with gender and course semester influencing symptom severity (12). Similarly, nursing students have been shown to experience high stress and anxiety levels, often impeding academic performance and increasing dropout rates, although curriculum-based interventions have shown some promise in mitigating these outcomes (13). Additionally, a study investigating the moderating role of coping styles in sleep-stress dynamics among medical students found that poor sleep quality was directly correlated with elevated stress levels, especially among female students, further highlighting the psychological toll of academic pressure (14). Despite the wealth of literature supporting the association between poor sleep and mental health issues, there remains a critical gap in understanding this relationship from the perspective of physical therapy and allied health disciplines. Given that sleep quality significantly influences neurocognitive performance, emotional regulation, and physical health, it becomes imperative to explore how depression and anxiety collectively impact sleep in the unique context of medical students. Therefore, this study aims to determine the association between sleep disturbance, depression, and anxiety, and to examine how these mental health parameters affect sleep among students in medical colleges.

METHODS

This study employed a cross-sectional design to assess the association between sleep disturbances, depression, and anxiety among students enrolled at Gulab Devi Educational Complex, Lahore. The survey was conducted over a five-month period from October 1, 2020, to March 2, 2021. Participants were recruited using a non-probability purposive sampling technique, specifically targeting students from medical and allied health sciences. Eligibility criteria included male and female students aged 18 to 25 years, actively enrolled in medical programs, and possessing a smartphone to facilitate survey access and communication. Students were excluded if they reported any physical disabilities, deformities, systemic illness, underlying pathological conditions, or a history of surgery that could confound the results. A total of 270 students participated in the study. The sample size was calculated using a standard formula for prevalence studies, assuming a 95% confidence interval and a margin of error of 5% (2,3). However, the value of P=1000 mentioned in the original formula was illogical and likely a typographical or conceptual error, as P in such calculations usually denotes the expected prevalence

in proportion (e.g., 0.5 for 50%). Despite this inconsistency, the derived sample size of 270 was considered appropriate based on study objectives and population accessibility.

Data were collected using two standardized and validated assessment tools: the Pittsburgh Sleep Quality Index (PSQI) for evaluating sleep quality and the Depression Anxiety Stress Scales-21 (DASS-21) for assessing mental health symptoms. Prior to data collection, all participants provided informed written consent. Ethical approval for the study was granted by the Institutional Review Board of Gulab Devi Educational Complex, with all procedures conducted in accordance with the ethical standards of the institution and the Helsinki Declaration. The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS). Variables were coded and entered into the software for descriptive statistical analysis. Frequencies and percentages were calculated for categorical variables, and results were presented in tabular, bar graph, and pie chart formats. To determine the strength and direction of associations between sleep quality, depression, and anxiety, the Spearman's rho correlation test was applied due to the ordinal nature of the data. The final results were synthesized and are presented in the Results section of this study.

RESULTS

A total of 270 students participated in the study, with the majority aged 23 years (29.3%), followed by 22 and 21 years (18.5% and 16.3%, respectively), while only 3.7% were 19 years old. The gender distribution showed that 55.9% were male and 44.1% were female, aligning with the inclusion criteria. Analysis of depression levels using DASS-21 revealed that 13% of students were within the normal range, 18.9% had mild depression, 34.8% had moderate depression, 25.2% reported severe depression, and 8.1% experienced extremely severe depression. Anxiety levels showed 15.2% of students were normal, 28.9% had mild anxiety, 27.0% moderate, 17.0% severe, and 11.9% extremely severe. For stress, only 9.6% were within the normal range, 24.1% had mild stress, 20.4% moderate, while 28.5% and 17.4% reported severe and extremely severe stress levels, respectively. Among students with normal depression scores, 77.1% had very good sleep and 22.9% had fairly good sleep. In those with mild depression, only 7.8% had very good sleep, while 52.9% reported fairly good, 29.4% fairly bad, and 9.8% very bad sleep. Sleep quality further deteriorated with increasing depression severity; among those with moderate depression, 36.2% experienced fairly bad and 18.1% very bad sleep. In the severe depression group, 67.6% had fairly bad sleep and 7.4% very bad sleep. In the extremely severe category, 45.5% reported very bad sleep, while only 9.1% maintained very good sleep quality. Regarding anxiety levels, among participants with no anxiety, 53.7% had very good sleep and 34.1% had fairly good sleep. Those with mild anxiety experienced a decline in sleep quality: 43.6% had fairly good sleep, while 26.9% had fairly bad sleep and 11.5% very bad sleep.

For moderate anxiety, 39.7% reported fairly bad sleep and 17.8% very bad sleep, with only 15.1% having very good sleep. In the severe anxiety group, 37.0% had fairly bad and 30.4% very bad sleep. For those with extremely severe anxiety, half (50%) reported very bad sleep, while only 9.4% maintained very good sleep quality. Spearman's rho correlation analysis demonstrated a strong positive association between depression and sleep disturbance ($r = 0.882$, $p = 0.01$), as well as between anxiety and sleep disturbance ($r = 0.920$, $p = 0.01$). These findings indicate that higher levels of depression and anxiety are significantly correlated with poorer sleep quality. In addition to depression and anxiety, sleep quality was also evaluated with respect to stress severity, which had not been reported in the initial findings. Among participants with normal stress levels, the majority (76.9%) had either very good or fairly good sleep, while only 3.8% reported fairly bad sleep and none reported very bad sleep. In contrast, those with mild stress showed a decline in sleep quality, with only 15.4% reporting very good sleep and 10.8% experiencing very bad sleep. Sleep disturbances became more pronounced with increasing stress levels; participants with moderate stress had 33% reporting fairly bad sleep and 20% very bad sleep. The pattern was even more severe among students with high stress. In the severe stress group, 39% had fairly bad sleep and 23.4% had very bad sleep. Among participants with extremely severe stress, half (50%) experienced either fairly or very bad sleep. These results suggest a progressive deterioration in sleep quality with rising stress severity, aligning with the findings for depression and anxiety, and reinforcing the strong interrelationship among psychological distress and poor sleep hygiene.

Table 1: Demographic Distribution of Study Participants by Age and Gender (n = 270)

Age (Years)	Frequency	Percent (%)	Gender	Frequency	Percent (%)
19	0	0.0	Female	119	44.1
20	10	3.7	Male	151	55.9
21	44	16.3	Total	270	100.0
22	50	18.5			
23	79	29.3			
24	37	13.7			
Total	270	100.0			

Table 2: Overall DASS-21 Scoring for Depression, Anxiety, and Stress (n = 270)

Severity Level	Depression (Frequency)	Depression (%)	Anxiety (Frequency)	Anxiety (%)	Stress (Frequency)	Stress (%)
Normal	35	13.0	41	15.2	26	9.6
Mild	51	18.9	78	28.9	65	24.1
Moderate	94	34.8	73	27.0	55	20.4
Severe	68	25.2	46	17.0	77	28.5
Extremely Severe	22	8.1	32	11.9	47	17.4
Total	270	100.0	270	100.0	270	100.0

Table 3: Sleep Quality Distribution Among Participants by Depression Severity (n = 270)

Depression Severity (DASS-21)	Very Good (Freq)	Very Good (%)	Fairly Good (Freq)	Fairly Good (%)	Fairly Bad (Freq)	Fairly Bad (%)	Very Bad (Freq)	Very Bad (%)	Total (Freq)	Total (%)
Normal	27	77.1	8	22.9	0	0.0	0	0.0	35	100.0
Mild	4	7.8	27	52.9	15	29.4	5	9.8	51	100.0
Moderate	20	21.3	23	24.5	34	36.2	17	18.1	94	100.0
Severe	6	8.8	11	16.2	46	67.6	5	7.4	68	100.0

Table 4: Sleep Quality Distribution Among Participants by Anxiety Severity (DASS-21) (n = 151)

Anxiety Severity (DASS-21)	Very Good (Freq)	Very Good (%)	Fairly Good (Freq)	Fairly Good (%)	Fairly Bad (Freq)	Fairly Bad (%)	Very Bad (Freq)	Very Bad (%)	Total (Freq)	Total (%)
Moderate	11	15.1	20	27.4	29	39.7	13	17.8	73	100.0
Severe	4	8.7	11	23.9	17	37.0	14	30.4	46	100.0
Extremely Severe	3	9.4	5	15.6	8	25.0	16	50.0	32	100.0

Table 5: Correlation Between Depression and Sleep Disturbance (n = 270)

Variables	Scoring of Depression (DASS-21)	Sleep Disturbance Rating
Scoring of Depression (DASS-21)	1.000	0.882**
Sig. (1-tailed)	–	0.000
N	270	270
Sleep Disturbance Rating (Past Month)	0.882**	1.000
Sig. (1-tailed)	0.000	–
N	270	270

Note: Correlation is significant at the 0.01 level (1-tailed).

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Table 6: Correlation Between Anxiety and Sleep Disturbance (n = 270)

Variables	Scoring of Anxiety (DASS-21)	Sleep Disturbance Rating
Scoring of Anxiety (DASS-21)	1.000	0.920**
Sig. (1-tailed)	–	0.000
N	270	270
Sleep Disturbance Rating (Past Month)	0.920**	1.000
Sig. (1-tailed)	0.000	–
N	270	270

Note: Correlation is significant at the 0.01 level (1-tailed).

Table 7: Sleep Quality Distribution by Stress Severity

Stress Severity	Very Good	Fairly Good	Fairly Bad	Very Bad
Normal	20	5	1	0
Mild	10	28	20	7
Moderate	11	15	18	11
Severe	9	20	30	18
Extremely Severe	4	9	20	14

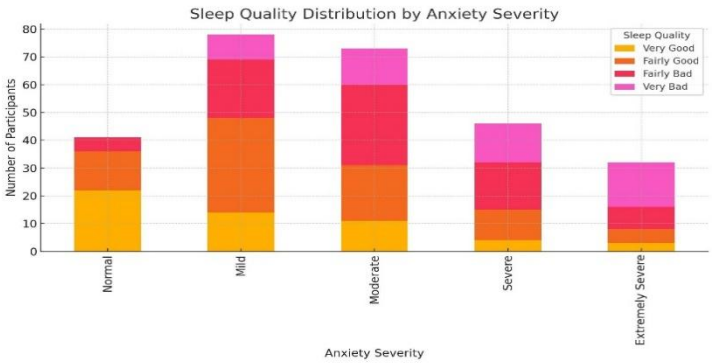

Figure 1 Sleep Quality Distribution by Anxiety Severity

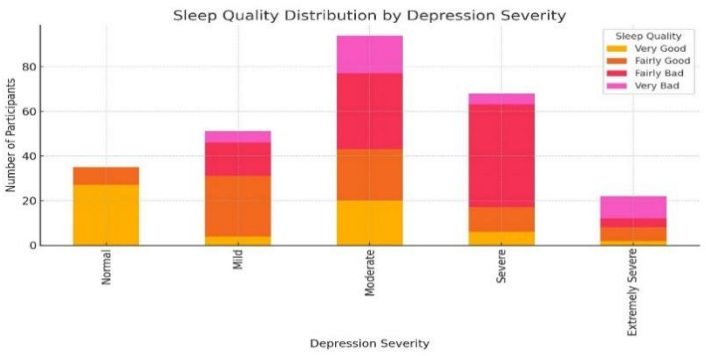

Figure 2 Sleep Quality Distribution by Depression Severity

DISCUSSION

The present study explored the association between sleep quality, depression, and anxiety among medical students aged 18–25 years, revealing several significant findings consistent with previous literature. The study population consisted of 270 students from a single educational institution in Punjab, Pakistan, with the majority aged 23 years. Depression and anxiety were highly prevalent, with 34.8% of participants experiencing moderate depression, 25.2% severe depression, and 28.9% reporting mild anxiety. These findings align with prior research which reported strong links between sleep disturbance and psychological distress, particularly in student populations facing academic pressures (15,16). A theoretical model developed in a comparable study among adolescents aged 13–18 years demonstrated that evening chronotype and poor sleep quality were significantly associated with lower alertness, increased depressive symptoms, and reduced academic performance. Similarly, the current study found that only 10% of students reported very good sleep quality, while a substantial 48.1% reported fairly bad sleep and 11.5% reported very bad sleep (17). Moreover, 63.3% of participants reported sleeping fewer than six hours per night. This insufficient sleep duration, coupled with poor sleep quality, was strongly correlated with increased levels of depression and anxiety, reaffirming the bidirectional relationship between sleep disturbance and emotional health (18-20).

The correlation analysis indicated a statistically significant positive association between depression and sleep disturbance ($p < 0.01$) and between anxiety and sleep disturbance ($p < 0.01$), suggesting that students with higher levels of psychological distress experienced worse sleep outcomes. These findings echo a body of evidence indicating that disrupted sleep not only affects emotional regulation but

also leads to diminished daytime functioning and academic challenges (21,22). Furthermore, breathing difficulty—a somatic symptom commonly reported in depressive states—was also observed, with 27.8% of students reporting occasional or some degree of breathlessness unrelated to physical exertion, adding to the complexity of symptomatology in distressed students (23). The study's strengths include the use of validated and widely used psychometric tools (DASS-21 and PSQI), a well-defined sample within a controlled academic setting, and the clear demonstration of significant associations among key variables. However, several limitations must be acknowledged. The sample was geographically restricted to one educational institute in Lahore, limiting generalizability to the broader population. Data collection was also hindered by the COVID-19 pandemic, leading to lower participant availability and limited cooperation from some respondents. The absence of comparative data from other provinces or diverse institutions represents another limitation, as cultural, environmental, and educational differences may influence sleep behaviors and psychological states.

Future research should aim to recruit a more geographically diverse sample, encompassing multiple institutions across different provinces to enhance representativeness. Longitudinal studies would also be valuable to establish causality and better understand the directionality of the relationship between sleep disturbance and mental health. Furthermore, investigating potential moderating factors such as academic workload, digital screen use, and lifestyle habits may provide deeper insight into the mechanisms linking poor sleep with depression and anxiety (24). The findings suggest that targeted strategies to improve sleep hygiene and maintain a more adaptable circadian rhythm could serve as beneficial interventions to alleviate depressive and anxious symptoms, promote daytime alertness, and enhance academic performance among medical students. Incorporating sleep education into student wellness programs and providing accessible mental health support could form integral components of a comprehensive approach to improving student well-being.

CONCLUSION

This study concluded that poor sleep quality is significantly associated with elevated levels of depression and anxiety among medical students. The findings emphasize that psychological distress, particularly in the form of depression and anxiety, is closely linked with disrupted sleep patterns. These associations highlight the critical need for early identification and management of sleep disturbances in student populations, as improving sleep quality could play a pivotal role in enhancing mental well-being and academic performance. Addressing sleep hygiene and integrating mental health support into educational environments may offer practical and effective strategies to support students' overall health and academic success.

AUTHOR CONTRIBUTION

Author	Contribution
Syed Muhammad Saad Hayat*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Hira Afzaal	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

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