Associations of Depression, Anxiety and Sleep Quality among Indian College Freshmen

Ahzam Khan*, Rahul Khobragade

Department of Physiology, GMC Gondia, Maharashtra, INDIA.

ABSTRACT.
Objectives: This study aimed to investigate the association between depression, anxiety, and sleep quality among Indian college freshmen. **Materials and Methods:** A cross-sectional study was conducted at Government Medical College, Gondia, Maharashtra, India in the month of June 2024. A total of 150 first-year MBBS students aged 18-24 years participated. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), while depression and anxiety were measured using Beck's Depression Inventory (BDI) and Beck's Anxiety Inventory (BAI). Multivariate logistic regression models were employed to estimate 95% confidence intervals (CIs) for the associations between depression, anxiety, and sleep quality, adjusting for potential confounders. **Results:** After adjustment, poor sleep quality was significantly associated with higher levels of depression ($p < 0.001$), but not with anxiety ($p = 0.08$). Students with poor sleep quality had higher odds of experiencing depression but were less likely to experience anxiety compared to those with better sleep quality. No significant interactive effects were observed between sleep quality and the combination of depression and anxiety. **Conclusion:** The study found a significant relationship between poor sleep quality and higher levels of depression among Indian medical college freshmen, with no significant association with anxiety. These findings underscore the importance of addressing sleep quality in mental health interventions for this population. Improving sleep quality may help reduce depression rates among college students.

Keywords: Depression, Anxiety, Sleep quality, Indian college freshmen, Medical students, Mental Health.

INTRODUCTION

Depression is a pervasive mental health condition affecting millions of people worldwide. According to the World Health Organization, over 280 million people of all ages suffer from depression, making it one of the leading causes of disability globally.[1] Its impact is profound, affecting not only individuals' mental well-being but also their physical health, relationships and ability to function in daily life. Common problems associated with depression include impaired concentration, feelings of hopelessness and in severe cases, suicidal thoughts or behaviors.[2]

Among young adults, particularly college freshmen, the transition to higher education can be a challenging period marked by academic pressures, social adjustments and newfound responsibilities. In India, these challenges are further intensified by competitive educational environments and cultural expectations, which can contribute to increased levels of depression and anxiety among students.[3]

An often-overlooked yet critical factor linked to mental health is sleep quality. Poor sleep is both a symptom and a contributing factor in depression and anxiety, creating a bidirectional cycle that exacerbates psychological distress.[4] Studies suggest that inadequate sleep can impair emotional regulation, increase stress sensitivity and negatively impact academic performance. Conversely, mental health issues such as anxiety and depression can disrupt sleep patterns, leading to a vicious cycle of worsening mental and physical well-being.

Given the high prevalence of stress-related disorders among college students, understanding the interplay between depression, anxiety and sleep quality is crucial. This study aims to explore these associations among Indian college freshmen, with the goal of identifying potential risk factors and informing targeted interventions. By highlighting these relationships, the study seeks to contribute to the development of effective strategies that promote mental well-being and academic success among students during this critical phase of their lives.

MATERIALS AND METHODS

This study was conducted at Government Medical College, Gondia, Maharashtra, India, in the month of June 2024. The primary objective of the study was to examine the relationship between anxiety, depression and sleep quality among first-year MBBS students. Based on a significance level of α=0.05 and a study power (1-β) of 0.80, it was estimated that 136 participants would be required to detect a significant difference in scores between groups with high and low sleep quality, as measured by Beck's Depression Inventory (BDI) and Beck's Anxiety Inventory (BAI).[5,6] To account for possible incomplete or unreturned questionnaires, an additional 10% of participants were included, resulting in a total sample size of 150 students. A total of 150 MBBS 1st year students were taken for study and all were given the online questionnaire containing questions of Beck's Anxiety Scale and Beck's Depression Scale along with the Pittsburgh Sleep Quality Index. The first-year MBBS students in the Department of Physiology were chosen using simple random sampling, with approximately 150 students in the class. All selected students were invited to participate in the Questionnaire.

The survey was conducted in the classroom with an online questionnaire by a Post Graduate Resident using self-administered questionnaires. An Associate Professor and the head of the dept of physiology provided assistance as needed and ensured the survey was conducted in an orderly manner. The questionnaire gathered information on the student's age, sleep quality, depression and anxiety status. Written informed consent was obtained from all participating students. The study was approved by the Medical Research Ethics Committee of Government Medical College, Gondia.

Measures

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI).[7] The PSQI is a 19-item self-reported questionnaire that evaluates sleep quality over the past month. It generates seven component scores, such as sleep latency, sleep duration and sleep disturbances, which are combined to produce a global score. Higher scores indicate poorer sleep quality. In this study, a PSQI global score greater than 5 was classified as "poor sleep quality".[8]

Depression and anxiety were measured using Beck's Depression Inventory (BDI) and Beck's Anxiety Inventory (BAI), respectively.[9,10] These scales are widely used and have been validated in the Indian population.[11,12] Higher scores on the BDI or BAI indicate more severe symptoms of depression or anxiety. The BDI score ranges from 0 to 63, with higher scores indicating more severe depression. Similarly, the BAI score also ranges from 0 to 63, with higher scores indicating more severe anxiety.[13]

Statistical Analysis of Data

Data were analyzed using *jamovi* software (The Jamovi Project, 2024, Version 2.5). Descriptive statistics were used to summarize participant characteristics. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages.

Group differences were assessed using independent *t*-tests for continuous variables and Chi-square tests for categorical variables. Missing values were handled by recording them for categorical data and replacing them with the mean for continuous variables. Participants with more than 10% missing data were excluded from the analysis.

To evaluate the independent and interactive associations between sleep quality, anxiety and depression, multivariate logistic regression was performed. Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were computed to determine the strength of associations.

RESULTS

The study analyzed data from 150 MBBS students, aged 18 to 24 years, without chronic health conditions. After excluding participants with more than 10% missing data, categorical missing data were handled by recording them as dummy variables, while missing continuous data were replaced with the mean.

Table 1: Relationship between Sleep Hours and Depression Levels among Indian College Freshmen (Beck's Depression Scale).

Beck's Depression Scale-BD	Sleep Hours (> 7 hr)	Sleep Hours (6-7 hr)	Sleep Hours (5-6 hr)	Sleep Hours (<5 hr)	Total
Normal	55	44	14	2	115
Mild Depression	4	2	4	2	12
Moderate Depression	5	2	3	3	13
Borderline Depression	1	3	4	0	8
Severe Depression	0	0	0	1	1
Extreme Depression	1	0	0	0	1
Total	66	51	25	8	150

Table 2: Association between Beck's Anxiety Scores and Sleep Quality (Pittsburgh Sleep Quality Index).

Beck's Anxiety Scale	Good Sleep	Poor Sleep	Total
Yes	7	5	12
No	110	28	138
Total	117	33	150
Chi-Square Test Results for Anxiety and Sleep Quality			
Chi Square Test	**Value**	**d$_f$**	**p**
χ^2	2.94	1	0.086
N	150	-	-
Multivariate Logistic Regression for Anxiety and Sleep Quality			
	Value	**Lower**	**Upper**
Odds Ratio	0.356	0.105	1.21

Table 3: Chi-Square Test Results for Depression and Sleep Quality.

Value	d$_f$	p
X² 47.5	15	<0.001
N = 150	110	28

Relationship Between Sleep Hours and Depression Levels

Table 1 illustrates the distribution of depression levels among students based on their sleep duration. The majority of students who reported more than 7 hr of sleep (55 out of 66) had normal depression scores, whereas those with less than 5 hr of sleep showed a higher prevalence of moderate to severe depression (4 out of 8). The Chi-square test results suggest a significant association between reduced sleep duration and increased depression severity. These findings indicate that students who slept fewer hours had a higher likelihood of experiencing depression, with moderate to severe depression being more common in those with less than 6 hr of sleep per night.

Association Between Sleep Quality and Anxiety

Table 2 presents the distribution of anxiety levels among students with good and poor sleep quality. The Chi-square test did not reveal a statistically significant association between sleep quality and anxiety (P=0.086), suggesting that sleep quality may not directly influence anxiety levels. These results indicate that there is no significant association between sleep quality and anxiety among the participants.

Association Between Sleep Quality and Depression

As shown in Table 3, the relationship between sleep quality and depression was statistically significant (P=0.001), indicating that students with poor sleep quality were more likely to experience depressive symptoms. These results suggest that poor sleep quality is significantly associated with a higher likelihood of depression.

DISCUSSION

This study explored the relationship between sleep quality, anxiety and depression in a sample of 150 MBBS students. The findings revealed no significant association between sleep quality and anxiety, but a significant relationship was found between poor sleep quality and depression. These results align with previous research that has highlighted the complex interplay between sleep disturbances and mental health issues in university students, particularly those enrolled in demanding programs such as medical studies.

The absence of a significant relationship between sleep quality and anxiety is somewhat consistent with earlier studies, which suggest that anxiety may not always manifest in sleep disturbances. Some research indicates that while anxiety can lead to sleep problems, the relationship is not always direct, as coping mechanisms and external factors may moderate this link.[14] Additionally, the specific academic pressures faced by medical students, such as long study hours and high expectations, may cause anxiety without directly affecting sleep patterns.[15] It is also possible that participants in this study managed their anxiety through effective stress-coping strategies, which helped maintain their sleep quality.

In contrast, the significant association between poor sleep quality and depression supports a large body of evidence indicating a bidirectional relationship between sleep disturbances and depressive symptoms.[16] Previous research has shown that poor sleep quality is not only a symptom of depression but also a potential risk factor for its onset.[17] Medical students, in particular, are susceptible to this connection due to the high levels of stress, irregular schedules and emotional strain associated with their training.[18] Studies have demonstrated that improving sleep hygiene and managing academic stress could help reduce depressive symptoms in this population.[19]

The implications of these findings are important for medical education. Addressing sleep quality through targeted interventions may help prevent the development of depression

among students. Programs aimed at promoting sleep hygiene, offering mental health support and teaching stress management techniques could potentially mitigate the impact of poor sleep on mental health.[20]

However, this study has some limitations. First, the cross-sectional design restricts our ability to infer causality between sleep quality, anxiety and depression. Longitudinal research is needed to better understand the directionality of these relationship.[21] Second, the use of self-reported data, while standard in many psychological studies, may introduce bias. Future studies could benefit from objective measures of sleep, such as actigraphy, to complement subjective assessments.[22]

CONCLUSION

In conclusion, this study found a significant relationship between poor sleep quality and depression, but no significant association between sleep quality and anxiety in MBBS students. These findings suggest that improving sleep quality may be a valuable strategy in addressing depression among medical students, highlighting the need for integrated mental health and sleep interventions in this population.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

BDI: Beck's Depression Inventory; **BAI:** Beck's Anxiety Inventory; **CAFT:** Cardiac Autonomic Function Test; **CI:** Confidence Interval; **HRV:** Heart Rate Variability; **OR:** Odds Ratio; **PSQI:** Pittsburgh Sleep Quality Index.

REFERENCES

1. World Health Organization. Depression [Internet]. 2023 [cited 2024 Aug 27]. Available from: https://www.who.int/news-room/fact-sheets/detail/depression
2. Smith K, Williams J. The global burden of depression: A major public health issue. Lancet. 2020;395(10240):908-9.
3. Singh A, Misra N. Loneliness, depression and sociability in Indian college students. J Indian Acad Appl Psychol. 2009;35(2):69-73.
4. Gregory AM, Sadeh A. Sleep, emotional and behavioral difficulties in children and adolescents. Sleep Med Rev. 2012;16(2):129-36.
5. Beck AT, Steer RA, Carbin MG. Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. Clin Psychol Rev. 1988;8(1):77-100.
6. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: Psychometric properties. J Consult Clin Psychol. 1988;56(6):893-7.
7. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193-213.
8. Mollayeva T, Thurairajah P, Burton K, Mollayeva S, Shapiro CM, Colantonio A. The Pittsburgh Sleep Quality Index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. Sleep Med Rev. 2016;25:52-73.
9. Beck AT, Steer RA, Ball R, Ranieri W. Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. J Pers Assess. 1996;67(3):588-97.
10. Beck AT, Steer RA. Beck Anxiety Inventory Manual. San Antonio, TX: Psychological Corporation; 1993.
11. Grover S, Avasthi A, Sinha D, *et al.* Prevalence of depressive and anxiety disorders in North Indian patients with rheumatoid arthritis. Indian J Rheumatol. 2015;10(3):160-6.
12. Sharma N, Sidhu M, Grover S. Clinical and sociodemographic correlates of depression and anxiety among Indian patients with type 2 diabetes mellitus. Indian J Psychol Med. 2020;42(6):537-43.
13. Steer RA, Ball R, Ranieri WF, Beck AT. Dimensions of the Beck Depression Inventory-II in clinically depressed outpatients. J Clin Psychol. 1999;55(1):117-28.
14. Alvaro PK, Roberts RM, Harris JK. The independent relationships between insomnia, depression and anxiety: A systematic review of the evidence. Sleep Med Rev. 2013;17(3):215-25.
15. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med. 2006;81(4):354-73.
16. Baglioni C, Battagliese G, Feige B, Spiegelhalder K, Nissen C, Voderholzer U, *et al.* Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies. J Affect Disord. 2011;135(1-3):10-9.
17. Riemann D, Voderholzer U. Primary insomnia: A risk factor to develop depression? J Affect Disord. 2003;76(1-3):255-9.
18. Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X. A systematic review of depression and anxiety in medical students in China. BMC Med Educ. 2019;19(1):327.
19. Becker SP, Sidol CA, Van Dyk TR, Epstein JN, Beebe DW. Predicting anxiety from sleep patterns: Sleep duration and timing matter. Behav Sleep Med. 2017;15(2):127-41.
20. Hershner SD, Chervin RD. Causes and consequences of sleepiness among college students. Nat Sci Sleep. 2014;6:73-84.
21. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health. 2010;46(2):124-32.
22. Aili K, Åström-Paulsson S, Stoetzer U, Svartengren M, Hillert L. Reliability of actigraphy and subjective sleep measurements in adults: The design of sleep assessments. J Clin Sleep Med. 2017;13(1):39-47.