

Original Research Article

Prevalence of sleep disorders and their association with poor academic performance among medical students of Punjab, Pakistan: a cross-sectional study

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ABSTRACT

Background: Medical students face heavy workloads, overnight duties, and high stress, which can impair sleep and academic performance. Objectives were to assess the prevalence of sleep disorders among medical students in Punjab, Pakistan, and their association with academic performance.

Methods: From January to June 2025, MBBS students at ~16 medical colleges in Punjab were invited to complete the English SLEEP-50 questionnaire (pilot-tested on 30 students). Of ~500 invitees, 345 (69%) participated. Demographics, BMI, sleep patterns, and annual academic percentage were self-reported. Sleep duration was classified as short (<6 hours), normal (6-8 hours), or long (>8 hours). Academic performance was grouped as below average (50-69%), excellent (70-85%), or outstanding (>85%). Chi-square tests and binary logistic regression- adjusting for all the variables in the model- were used to identify factors independently associated with poor performance (<70%).

Results: Mean age was 21.85±3.1 years; 30% female; mean BMI 22.3±3.6 kg/m². Seventy-five percent screened positive for at least one sleep disorder: narcolepsy (62%), restless legs syndrome (29%), and insomnia (18%). Adjusted analysis showed obesity (OR=13.16; 95% CI 3.08-55.56; p<0.001), insomnia (OR=5.24; 95% CI 2.19-12.50; p<0.001), narcolepsy (OR=5.00; 95% CI 1.93-12.99; p=0.001), and male gender (OR=4.20; 95% CI 1.63-10.84; p=0.003) as significant factors.

Conclusions: Sleep disorders are common among Punjab's medical students. Obesity, insomnia, narcolepsy, and male gender were independently associated with poor academic performance. Early screening and targeted interventions are needed to improve student well-being and achievement.

Keywords: Academic performance, Association, Cross-sectional study, Medical students, Prevalence, Sleep

INTRODUCTION

Sleep is a vital biological process necessary for human life, and adequate, high-quality sleep is crucial for maintaining students' mental well-being.¹ Many brain processes, including intelligence, attention, decision-making, speech, and most importantly, learning and memory, depend on getting enough good sleep.² Because

exhaustion and drowsiness are epidemics that contribute to a number of health problems, there is increasing interest in researching sleep disorders.³ One segment of the general population that seems particularly susceptible to inadequate sleep is medical students. This could be because of their lifestyle choices, clinical responsibilities that need them to be on call all night, work that can be emotionally taxing, and the length and intensity of their

studies.⁴ There is mounting proof that college students have risk factors for and symptoms of a number of sleep problems.⁵ A previous study discovered that an average of fifty percent of students experienced daytime sleepiness, which leads to poor academic performance and an increased risk of psychological disorders.⁶

Research has indicated that sleep disorders affect between 3.9% and 45.0% of the global population.^{7,8} According to a 2020 Australian study with 836 participants, 41% of women and 42% of men struggle with sleep. Over half (53%) of the participants in another study conducted in Turkey with 5021 participants experienced sleep difficulties.⁹ A survey of 1998 members of the educational community of Pakistan revealed that 1584 (79.28%) of them suffered from sleep problems, such as sleep apnea (34.08%) and insomnia (45.20%).¹⁰

The purpose of this study was to ascertain how common sleep disorders are among medical students in Punjab, Pakistan and to investigate any possible links between them and academic achievement. We aimed to determine the prevalence of sleep disorders among Punjab medical students and examine their association with academic performance.

METHODS

This cross-sectional study investigated sleep disorders among medical students enrolled across all academic years (1st through final MBBS) from around 16 public

and private medical colleges throughout Punjab, Pakistan. Conducted from January to June 2025, the study employed convenience sampling to collect data via an online survey from Google Forms, while sample size was calculated based on the Cochran’s formula which came out to be 345 with a 95% confidence level, 5% margin of error, and 50% estimated percentage. Of the approximately 500 students invited to participate, data were successfully collected from 345 respondents, meeting the required sample size. Eligible participants were all MBBS students enrolled from first to final year in public or private medical colleges across Punjab, Pakistan, who were actively attending academic sessions and voluntarily consented to participate in the study. Students who declined consent, were unable to understand the English-language questionnaire, or submitted incomplete or duplicate responses were excluded. Ethical approval was obtained from the Institution. Prior to the main survey, 30 medical students participated in a pilot study of the SLEEP-50 to ensure item clarity and internal consistency. Data collection utilized the validated SLEEP-50 questionnaire by Spoomaker et al, which screens for ten sleep disorders-obstructive sleep apnea (OSA), insomnia, nightmare disorder, sleep state misperception (SSM), narcolepsy, circadian rhythm disorder (CRD), sleepwalking, hypersomnia, and restless legs syndrome (RLS).¹¹ Participants were categorized as having at least one screen-positive sleep disorder if they met the cutoff score for any SLEEP-50 subscale. Responses were recorded on a Likert scale, with a total score exceeding 15 indicating potential clinically significant sleep pathology (Table 1).

Table 1: Sleep disorders based on the SLEEP-50 questionnaire.

Disorder	Items	Sub-score
Obstructive sleep apnea	1-8	≥15
Insomnia	9-16	≥19
Affective disorder	10, 11, 43, 44	≥12
Sleep state misperception	Insomnia, estimated hours slept <4	≥19
Narcolepsy	17-21	≥7
Restless legs syndrome/periodic limb movement disorder	22-25	≥7
Circadian rhythm disorder	26-28	≥8
Sleep walking	29-31	≥7
Nightmares	32	≥3
	33-35	≥9
Hypersomnia	44-50	No item or ≥15 on impact of sleep disorder on daily functioning
All sleep disorders		≥15 on impact of sleep disorder on daily functioning

The SLEEP-50 demonstrates robust psychometric properties, including an internal consistency (Cronbach’s alpha) of 0.85, test-retest reliability ranging from 0.65 to 0.89, significant diagnostic concordance ($\kappa=0.77$), and strong sensitivity and specificity.¹¹ Additionally, the survey captured demographics (gender, age), self-

reported height and weight (for body mass index BMI calculation), academic performance (percentage), and sleep patterns (duration and timing). Participants were categorized as short (<6 hours), normal (6-8 hours), or long (>8 hours) sleepers based on average daily sleep duration.¹² BMI was categorized as underweight

(<18.5 kg/m²), normal weight (18.5-24.9 kg/m²), overweight (25.0-29.9 kg/m²), and obese (≥30.0 kg/m²). Academic grades are classified as below average (50-69%), excellent (70-85%), and outstanding (>85%). Participants with percentage <70% are considered to have poor academic performance. Participation was entirely voluntary, informed consent was secured electronically from all respondents, and data anonymity and confidentiality were rigorously maintained throughout the research process. The mean±standard deviation for continuous variables and frequency and percentage for categorical variables were used to characterize the participant characteristics. To evaluate the relationship between categorical variables, a chi-square test was used. After controlling for all the variables in the model, a binary logistic regression analysis was conducted to determine the relationship between each sleep problem and academic performance. There was a report on odds ratios (OR) and their 95% CI. P values below 0.05 were regarded as statistically significant. Independent t-tests were performed for continuous variables, and chi-square tests were used to assess associations between categorical variables. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) software, version 27.0. This cross sectional observational study was conducted and reported in accordance with the STROBE

(strengthening the reporting of observational studies in epidemiology) guidelines.

RESULTS

A total of 345 students completed the online questionnaire. All 345 responses were included in the analysis. Their mean age was 22±3.1 years (range 17-25), 30.4% (105) were female and 69.6% (240) were male. The mean body mass index was 22.3±3.63 kg/m². Students were from first through final year in the following proportions: 16.5%, 12.8%, 4.9%, 24.6%, and 41.2%, respectively. Most of students were from final year. About 20.6% of students were short sleepers, 68.1% of students were normal sleepers and 11.3% of the students were long sleepers.

Out of 345 students, a total number of 259 students (75%) were screened positive for at least one sleep disorder. About 0.9% of the students screened positive for hypersomnia, 28.7% for restless legs syndrome, 2% for sleep state misperception (SSM), 62.3% for narcolepsy, 11% for affective disorder, 18.3% for insomnia, 14.8% for circadian rhythm alterations, 7.5% for sleepwalking, 1.45% for nightmares, and 19.1% for sleep apnea.

Table 2: Demographic distribution of undergraduate medical students.

Total number of respondents =345	N (%)
Gender	
Male	240 (69.6)
Female	105 (30.4)
Age (years) mean±SD	21.85±3.11
Weight (kg) mean±SD	64.98±11.55
Height (cm) mean±SD	170.72±9.06
BMI kg/m² mean±SD	22.29±3.63
Obese (BMI≥30 kg/m²)	12 (3.5)
Year of study	
First year	57 (16.5)
Second year	44 (12.8)
Third year	17 (4.9)
Fourth year	85 (24.6)
Final year	142 (41.2)
Annual percentage	
Below average	53 (15.4)
Excellent	248 (71.9)
Outstanding	44 (12.8)

There was no significant association between year of study and sleep disorder having chi square p value of 0.947. Annual percentage scoring is as; greater than 85% was in 12.8% of students, 70%-85% was in 71.9% of students, 50-69% in 15.4% of students. There was significant association between academic percentage and sleep disorder with Chi square p value of 0.032. There was significant association of BMI (as a continuous

variable) with sleep disorder and academic performance having p value of 0.013 and <0.001 respectively by independent t test with BMI as continuous variable. There was no significant association with overall sleep disorder and gender (p=0.751) but there was significant association between gender and sleep apnea (p=0.035) with apnea more common in males. The association of gender with insomnia (p=0.58), affective disorders

($p=0.871$), SSM ($p=1.000$), narcolepsy ($p=0.073$), restless legs syndrome ($p=0.582$), circadian rhythm alteration ($p=0.406$), sleep walking ($p=0.083$) and nightmares ($p=0.642$) was not significant. But the association between hypersomnia and gender was significant with females having more hypersomnia than males ($p=0.028$). Associations involving SSM, nightmares, and hypersomnia were assessed using Fisher's exact test; all other comparisons used the chi square test. There is significant association of gender with academic performance ($p=0.003$) with poor academic performance more frequent in male students. Chi-square test of independence shows significant association between academic performance and sleep disorder with p value of 0.032 with 46 out of 259 students (17.76%) have poor academic performance. Poor academic performance was

observed in 14 students with sleep apnea (36.7%; $p=0.143$) and in 22 students with insomnia (34.9%; $p<0.001$). Affective sleep disorders were associated with poor performance in 12 students (31.6%; $p=0.003$), and narcolepsy in 46 students (21.4%; $p<0.001$). By contrast, restless legs syndrome (16.2%; $n=16$; $p=0.794$) and sleepwalking (15.4%; $n=4$; $p=0.997$) showed no significant associations, while circadian rhythm disorders were linked to poor performance in 13 students (25.5%; $p=0.030$). Using Fisher's exact test, nightmares were significantly associated with poor grades in 3 students (60.0%; $p=0.027$), whereas hypersomnia and sleep state misperception showed no such association (0% for both; $p=1.000$ and $p=0.601$, respectively). All other comparisons were made with the chi square test as in Table 3.

Table 3: Association between individual sleep disorders and academic performance among medical students (n=345).

Sleep disorders	Good academic performance N (%)	Poor academic performance N (%)	Total N (%)	P value
Apnea	52 (63.63)	14 (36.67)	66 (19.1)	0.143
Insomnia	41 (65.08)	22 (34.92)	63 (18.3)	<0.001
Affective disorder	26 (68.42)	12 (31.58)	38 (11)	0.003
SSM	7 (100)	0 (0)	7 (2)	0.601*
Narcolepsy	169 (78.6)	46 (21.4)	215 (62.3)	<0.001
RLS	83 (83.83)	16 (16.17)	99 (28.7)	0.794
Circadian rhythm	38 (74.51)	13 (25.49)	51 (14.8)	0.030
Sleepwalking	22 (84.62)	4 (15.38)	26 (7.5)	0.997
Nightmare	2 (40)	3 (60)	5 (1.45)	0.027*
Hypersomnia	3 (100)	0 (0)	3 (0.9)	1.000*

*Fisher's exact test.

Using binary logistic regression, and after adjusting for all variables in the model, several factors were found to be significantly associated with poor academic performance. The model assessed the association with the outcome using a sample of 345 students. Obesity (BMI >30 kg/m²) showed the strongest association with poor academic performance, with students having over 13 times higher odds of poor performance (adjusted OR=13.16; 95% CI: 3.08-55.56; $p<0.001$). Only 12 participants were classified as obese, therefore the estimated odds ratio should be interpreted cautiously due to small sample size. Sleep disorders were also significantly associated; students with insomnia had 5.24 times the odds of poor performance (adjusted OR=5.24; 95% CI 2.19-12.50; $p<0.001$), and students with narcolepsy had 5.00 times the odds of poor performance (adjusted OR=5.00; 95% CI 1.93-12.99; $p=0.001$). Furthermore, male gender was significantly associated with poor academic performance compared to female gender (adjusted OR=4.20; 95% CI 1.63-10.84; $p=0.003$). Interestingly, once adjusted for other factors, sleep apnea ($p=0.214$), RLS ($p=0.205$), sleepwalking ($p=0.078$), nightmares ($p=0.853$), circadian rhythm disorders

($p=0.430$), and the perceived impact of sleep disorders ($p=0.914$) were not significantly associated with academic performance.

DISCUSSION

This cross-sectional study explored the prevalence and association of sleep disorders with the academic performance among medical students of Punjab. Out of 345 students included in the analysis, a significant majority (75%) were found to have at least one sleep disorder, with narcolepsy, restless legs syndrome, insomnia, and nightmares as the most common disorders. Because the SLEEP-50 is a screening tool rather than a diagnostic test, these findings should be interpreted as screen-positive sleep problems rather than clinically confirmed sleep disorders. Most students were in their final year and had normal sleep durations, while a smaller portion were identified as short or long sleepers. Gender and year of study were not significantly linked to overall sleep disorders, however, males were more likely to experience sleep apnea, while females had higher rates of hypersomnia. Poor academic performance was

significantly associated with certain sleep disorders, particularly insomnia and narcolepsy, as well as higher BMI (obesity) and male gender. Among all factors, obesity came out to be the strongest factor associated with poor academic performance. Other sleep disorders like sleep apnea, restless legs syndrome, and nightmares did not statistically influence academic outcomes after adjustment for other variables.

There was a significant number of short sleepers, slightly lower than previous study by Yassin.¹³ In our study population three out of four students were suffering from some kind of sleep disturbance like restless legs syndrome, narcolepsy, insomnia, affective sleep disorder, circadian rhythm alterations and sleepwalking. This three fourth (75%) the prevalence of sleep disorder was consistent with previous study by Gilstrap et al including narcolepsy (62.3%), restless legs syndrome (28.7%) and insomnia (18.3%).¹⁴ The high prevalence of narcolepsy correlates with study among medical students of Saudia, prevalence of restless legs syndrome with previous study among undergraduate nursing students of United Arab Emirates and insomnia with previous study in Jordan.^{13,15,16} A similar study performed by Yassin concluded that the similar association was present between poor academic performance and insomnia, affective disorder, narcolepsy, circadian rhythm disturbances.¹³ The relatively high proportion of students screening positive for certain sleep disorders should be interpreted cautiously. The SLEEP-50 is designed as a screening instrument with high sensitivity, which may identify individuals with symptoms suggestive of a disorder rather than clinically confirmed diagnoses. Gender and obesity are in accordance with previous study by Yassin.¹³ The insignificant association of year of study is in accordance with previous study.¹⁶ Our study shows prevalence of poor academic performance among male students and this finding is supported by study in Bhatti et al.¹⁷

Our study found a significant association between sleep disorders and academic performance. And this is consistent with previous study by Gilstrap et al.¹⁴ Although our study found a significant association between female gender and hypersomnia other studies haven't reported such gender bias for hypersomnia. Both male and female genders were found to be equally prone to hypersomnia and other sleep related issues in a study by Yassin et al.¹³

It's also noteworthy that obesity and academic achievement are related. More than a 13-fold higher chance of receiving lower academic scores was linked to obesity, highlighting its possible use as a gauge of general health and lifestyle quality but temporal relationships cannot be established due to the cross-sectional design. However, the association between obesity and poor academic performance showed a wide confidence interval, likely reflecting the small number of obese participants and limited precision. A similar cross-

sectional study in Bangladesh 2024 including 600 university students found that normal-weight students had the highest academic achievement (73.8%), while overweight/obese students had the lowest (15.9%) and were more likely to have poor academic performance (58.8%) compared to normal-weight peers (36.2%).¹⁸

Sleep disorders, specifically insomnia, were associated with 5.24 times higher odds of poor academic performance. This finding is also supported by Wale et al which stated that insomnia is highly prevalent among students and significantly associated with poor academic outcomes, including lower academic percentage, impaired concentration, and increased daytime sleepiness.¹⁹

The strength of this study lies in its relatively large population size and comprehensive detailed questionnaire assessing all aspects of sleep disturbances and diseases. By identifying insomnia, narcolepsy, obesity, and male gender as factors associated with poor academic outcomes, this study highlights the need for early screening and targeted interventions to improve students' sleep routine and overall well-being. Our study may play a valuable role in guiding educational institutions and healthcare providers to integrate mental health and sleep support programs into student support initiatives. Addressing sleep health could enhance not just academic success but also long-term physical and psychological health in future healthcare professionals.

However, this study is limited by its cross-sectional design, which precludes assessment of causality, and its reliance on self-reported data makes it susceptible to the recall bias, hence future studies should consider using stratified random sampling rather than convenient sampling to reduce selection bias. Confounders such as caffeine intake, stress levels, and evening screen use- may have affected the observed associations between sleep disorders and academic performance.

Future research should focus on the targeted screening programs and intervention to detect sleep disorders in time and treated with efficacy in medical students. Future research should use a longitudinal design a multiple institutions to assess the causal relationship between sleep disorders and academic performance over time.

This study has several limitations. Its cross-sectional design precludes causal inferences between sleep disorders and academic performance. The use of self-reported data introduces the possibility of recall and reporting bias. Although the SLEEP-50 is a validated screening instrument, it is not diagnostic and may have overestimated the prevalence of certain disorders, particularly narcolepsy. Furthermore, unmeasured confounders, such as stress levels, caffeine consumption, and screen time, may have influenced the observed associations. The high proportion of final-year students may have influenced the results and limited the generalizability of the findings.

CONCLUSION

In summary, our research shows how important getting enough good-quality sleep is for medical students' academic success. Using the SLEEP-50 screening questionnaire, we found a high proportion of students who screened positive for at least one sleep disorder. High prevalence of sleep disorders was detected among medical students, with narcolepsy, insomnia, and restless legs syndrome being the most common. Although overall sleep disorders were not significantly associated with gender or year of study, specific conditions like sleep apnea and hypersomnia showed gender-based differences. Additionally, insomnia, narcolepsy, obesity, and male gender were significantly associated with poor academic performance. Better academic outcomes and long-term health may be achieved if medical curricula address sleep disorders.

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