

## Sleep Quality and Academic Performance among Medical Students

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<p><b>Corresponding Author: Sadeem Alzahrani</b> Princess Nourah University, Riyadh, KSA</p> <p><b>Article History</b> Received: 01 / 04 / 2026 Accepted: 02 / 05 / 2026 Published: 15 / 05 / 2026</p>	<p><b>Abstract:</b></p> <p><b>Background:</b> Sleep quality is an important factor influencing student well-being, concentration, and academic performance. Medical students are particularly vulnerable to disturbed sleep patterns because of demanding academic schedules, prolonged study periods, and examination-related stress. Poor sleep habits may negatively affect educational performance and daily functioning among university students.</p> <p><b>Objective:</b> To evaluate the association between sleep quality and academic performance among undergraduate medical students.</p> <p><b>Methodology:</b> A cross-sectional study was conducted among 148 undergraduate medical students from second- to fourth-year academic levels. Data were collected using a structured self-administered questionnaire. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), while academic performance was evaluated using self-reported Grade Point Average (GPA). Sleep quality was categorized into good, fair, and poor sleep groups according to PSQI scores. Statistical analysis included descriptive statistics, chi-square testing, and Pearson correlation analysis. A p-value of less than 0.05 was considered statistically significant.</p> <p><b>Results:</b> Fair sleep quality was the most frequently observed category among participants (43.9%), while 31.8% demonstrated poor sleep quality. Students with poorer sleep quality were more likely to demonstrate lower GPA categories compared with students reporting healthier sleep patterns. A statistically significant association was identified between sleep quality and GPA categories (<math>\chi^2 = 15.34, p = 0.002</math>). In addition, Pearson correlation analysis demonstrated a statistically significant negative correlation between PSQI scores and GPA values (<math>r = -0.29, p = 0.001</math>), indicating that poorer sleep quality was associated with lower academic performance.</p> <p><b>Conclusion:</b> The findings of the present study suggest that sleep quality may represent an important lifestyle-related factor associated with academic performance among undergraduate medical students. Encouraging healthier sleep habits and balanced academic routines may contribute positively to student well-being and educational performance.</p> <p><b>Keywords:</b> <i>Sleep quality; Pittsburgh Sleep Quality Index; GPA; Academic performance; Medical students; Cross-sectional study.</i></p>
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### Introduction

Sleep is an important component of overall health and daily functioning. Adequate sleep is associated with improved alertness, mood, concentration, and the ability to perform academic tasks effectively, whereas poor sleep habits may negatively affect student well-being and educational performance.[1,2] University students commonly experience irregular sleep patterns because of academic responsibilities, prolonged study schedules, examination stress, and lifestyle-related factors.[3] Medical students, in particular, may be more vulnerable to disturbed sleep due to the demanding nature of medical education and continuous academic workload.

Medical training often requires students to balance lectures, laboratory sessions, assignments, clinical exposure, and independent study within limited time periods. As a result, many students reduce their sleeping hours in an attempt to meet academic

demands. However, inadequate sleep may contribute to daytime tiredness, reduced focus during lectures, lower study efficiency, and difficulty maintaining consistent academic performance.[2,4] Previous studies have also linked poor sleep habits with fatigue, reduced classroom attention, and decreased examination performance among university students.[5]

Several international studies have investigated the relationship between sleep quality and Grade Point Average (GPA), with many reporting that students with healthier sleep patterns tend to achieve better academic results compared with students experiencing inadequate or disturbed sleep.[3,4] The Pittsburgh Sleep Quality Index (PSQI) is one of the most frequently used instruments for assessing sleep quality in student populations and has been widely applied in educational and clinical research.[1] Earlier investigations have reported varying degrees of association between PSQI scores and academic achievement,



although differences in student populations, educational systems, and study methods have resulted in some variability in findings.[4,6]

Medical students represent an important population for sleep-related research because factors such as prolonged screen exposure, irregular study routines, academic pressure, and examination stress may contribute to unhealthy sleeping behaviors.[5,7] In addition to affecting academic performance, poor sleep habits during university years may influence emotional well-being, stress levels, and overall quality of life. Understanding sleep patterns among medical students may therefore help universities and educators develop supportive strategies that encourage healthier student lifestyles and improved academic balance.[2,8]

Despite increasing awareness regarding sleep health, limited regional studies have examined the relationship between sleep quality and academic performance among undergraduate medical students in Saudi Arabia. Identifying lifestyle-related factors associated with academic achievement may assist educational institutions in developing student-support initiatives aimed at improving both well-being and educational outcomes. Therefore, the present study aimed to evaluate the association between sleep quality and GPA among undergraduate medical students.

**Methodology**

**Study Design and Setting**

A cross-sectional study was conducted “among undergraduate medical students from medical colleges in the central region of Saudi Arabia.

**Study Participants**

A total of 148 undergraduate medical students from second-, third-, and fourth-year levels participated in the study. Participation was voluntary, and questionnaire responses were collected anonymously. Students with incomplete questionnaire responses were excluded from the final analysis.

**Data Collection**

Data were collected using a structured self-administered electronic questionnaire. The questionnaire included two major sections:

1. Demographic and academic information
2. Sleep quality assessment

Demographic information included age, gender, academic year, and self-reported Grade Point Average (GPA). GPA values were categorized into three academic performance groups:

1. Low GPA (<3.0)
2. Moderate GPA (3.0–4.0)
3. High GPA (>4.0)

**Assessment of Sleep Quality**

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated questionnaire commonly used for evaluating subjective sleep quality among adults.[9] The PSQI evaluates several components related to sleep patterns during the previous month, including sleep duration, sleep latency, sleep disturbance, daytime dysfunction, and overall sleep quality.[9]

Global PSQI scores were classified into three sleep-quality categories:

1. Good sleep quality (0–5)
2. Fair sleep quality (6–10)
3. Poor sleep quality (>10)

**Higher PSQI scores indicated poorer sleep quality.**

**Statistical Analysis**

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software version 26. Descriptive statistics were presented as frequencies, percentages, means, and standard deviations. Associations between sleep-quality categories and GPA groups were evaluated using the chi-square test. Pearson correlation analysis was performed to assess the relationship between PSQI scores and GPA values. A p-value of less than 0.05 was considered statistically significant.

**Ethical Considerations**

The study protocol was reviewed according to the ethical standards of the Institutional Review Board (IRB) of PNU. Participation in the study was voluntary and anonymous, and confidentiality of participant information was maintained throughout the study period. All collected data were used solely for academic and research purposes.

**Results**

A total of 148 undergraduate medical students participated in the study. Female students represented 58.1% of the study population, while male students accounted for 41.9%. Participants were distributed across second-, third-, and fourth-year academic levels, with third-year students forming the largest proportion of the sample (36.5%). The mean participant age was 20.9 ± 1.4 years. Approximately 51.4% of participants reported living away from their families during their studies. (Table 1).

**Table 1. Demographic and Academic Characteristics of Participants (N = 148)**

Characteristics	n (%)
Gender	
Male	62 (41.9)
Female	86 (58.1)
Academic year	
Year 2	48 (32.4)
Year 3	54 (36.5)

Year 4	46 (31.1)
Age (years), mean ± SD	20.9 ± 1.4
Living arrangement	
With family	72 (48.6)
Away from family	76 (51.4)

Assessment of sleep quality using the Pittsburgh Sleep Quality Index demonstrated that fair sleep quality was the most frequently observed category among participants, accounting for 43.9% of the sample. Poor sleep quality was identified in 31.8% of students, whereas only 24.3% demonstrated good sleep quality. The mean global PSQI score was  $8.7 \pm 3.6$ , with scores ranging from 1 to 18. The average reported sleep duration was  $6.3 \pm 1.1$  hours per night. (Table 2, Figure 1)

**Table 2. Sleep Quality Characteristics of Participants**

Sleep quality (PSQI)	n (%)
Sleep quality category	
Good (PSQI ≤5)	36 (24.3)
Fair (PSQI 6–10)	65 (43.9)
Poor (PSQI >10)	47 (31.8)
PSQI global score (0–21), mean ± SD	$8.7 \pm 3.6$
PSQI score range	1–18
Average sleep duration per night (hours), mean ± SD	$6.3 \pm 1.1$

Footnote: PSQI = Pittsburgh Sleep Quality Index. Higher PSQI scores indicate poorer sleep quality.

Analysis of academic performance demonstrated that 28.4% of students belonged to the lower GPA category (<2.50), while 45.9% demonstrated GPA values between 2.50 and 3.49. Approximately 25.7% of participants achieved GPA values of ≥3.50. Students with better sleep quality generally demonstrated higher GPA categories compared with students reporting poorer sleep quality. Among students classified within the good sleep-quality group, 42.9% achieved GPA values of ≥3.50, whereas only 14.9% of students within the poor sleep-quality category achieved similar GPA levels. In contrast, lower GPA scores (<2.50) were more frequently observed among students reporting poor sleep quality (53.6%) compared with students demonstrating good sleep quality (14.3%). A statistically significant association was identified between sleep quality and GPA categories ( $\chi^2 = 15.34, p = 0.002$ ). (Table 3).

**Table 3. Association Between Sleep Quality and GPA Categories**

Sleep quality (PSQI category)	< 2.50 n (%)	2.50–3.49 n (%)	≥ 3.50 n (%)	Total n (%)
Good (≤5) (n = 36)	5 (14.3)	16 (45.7)	15 (42.9)	36 (24.3)
Fair (6–10) (n = 65)	17 (26.2)	32 (49.2)	16 (24.6)	65 (43.9)
Poor (>10) (n = 47)	20 (53.6)	20 (42.6)	7 (14.9)	47 (31.8)
Total	42 (28.4)	68 (45.9)	38 (25.7)	148 (100)

Footnote:  $\chi^2 = 15.34, df = 4, p = 0.002^*$ .

\*Statistically significant association between sleep quality and GPA categories.

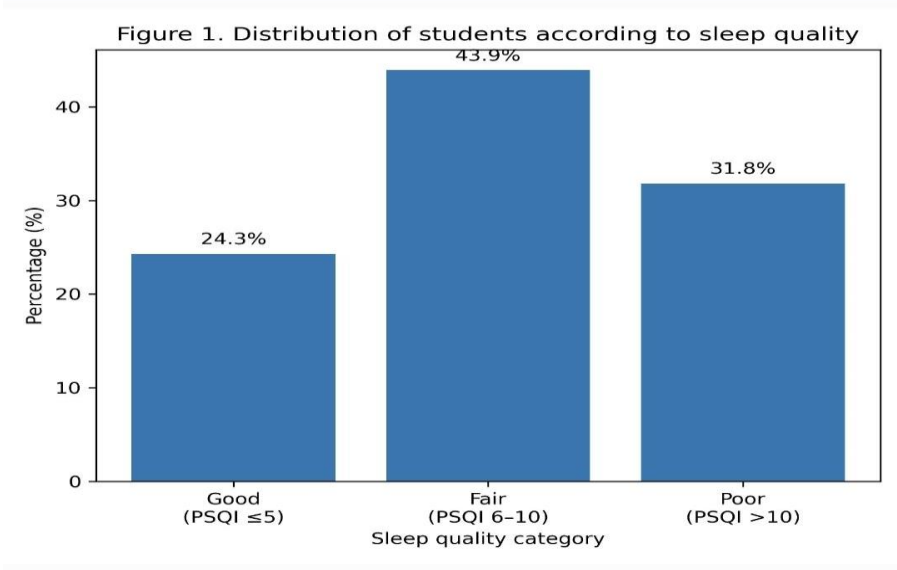
Pearson correlation analysis demonstrated a statistically significant negative correlation between PSQI scores and GPA values ( $r = -0.29, p = 0.001$ ), indicating that poorer sleep quality was associated with lower academic performance among undergraduate medical students. (Table 4, Figure 2)

**Table 4. Correlation Between PSQI Score and GPA**

Variables	Pearson Correlation Coefficient (r)	P-value
PSQI Score vs GPA	-0.29	0.001*

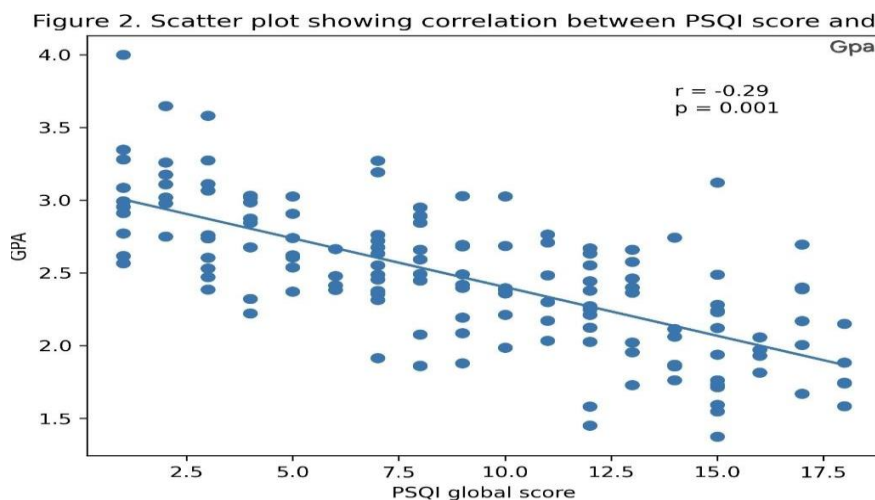
\*Statistically significant negative correlation between PSQI score and GPA.

**Figure 1.** Distribution of Sleep Quality Categories Among Undergraduate Medical Students



Bar graph demonstrating the distribution of undergraduate medical students according to sleep quality categories based on Pittsburgh Sleep Quality Index (PSQI) scores. Fair sleep quality (PSQI 6–10) represented the largest proportion of participants, followed by poor sleep quality (PSQI >10). Good sleep quality (PSQI ≤5) was observed in a smaller proportion of students.

**Figure 2.** Correlation Between PSQI Score and Grade Point Average Among Undergraduate Medical Students



Scatter plot illustrating the relationship between Pittsburgh Sleep Quality Index (PSQI) scores and Grade Point Average (GPA) among undergraduate medical students. A statistically significant negative correlation was observed between PSQI score and GPA ( $r = -0.29$ ,  $p = 0.001$ ), indicating that poorer sleep quality was associated with lower academic performance.

## Discussion

The present study evaluated the relationship between sleep quality and academic performance among undergraduate medical students and demonstrated that poorer sleep quality was associated with lower GPA scores. A substantial proportion of students reported fair to poor sleep quality, highlighting the high frequency of disturbed sleeping patterns within medical student populations. In addition, Pearson correlation analysis demonstrated a statistically significant inverse relationship between PSQI scores and GPA values, suggesting that worsening sleep quality may negatively influence academic achievement.

Medical students are commonly exposed to demanding academic schedules, prolonged study periods, frequent examinations, and irregular daily routines.[10,11] These academic

pressures may contribute to reduced sleeping hours and inconsistent sleep patterns. Similar observations have been reported in previous university-based studies, where inadequate sleep was associated with reduced focus, daytime tiredness, and poorer academic performance among students.[11,12]

An important observation in the current study was the variation in GPA categories across different sleep-quality groups. Students with better sleep quality were more likely to achieve higher GPA ranges, whereas students reporting poor sleep quality demonstrated a greater proportion of lower GPA scores. These findings suggest that maintaining healthier sleep habits may support improved classroom performance and study effectiveness among medical students.

Several lifestyle-related factors may explain the relationship between sleep quality and academic performance.

Adequate sleep may help students maintain attention during lectures, sustain concentration while studying, and remain mentally alert during examinations. In contrast, inadequate sleep may contribute to fatigue, reduced motivation, difficulty maintaining study schedules, and reduced attentiveness during academic activities. Students experiencing persistent sleep disturbances may therefore find it more difficult to maintain consistent academic performance throughout the semester.

Sleep quality may also influence emotional well-being and stress tolerance among university students. Poor sleeping habits have been associated with irritability, mental exhaustion, anxiety, and increased academic stress.[13] Medical students frequently encounter heavy coursework, continuous assessments, and examination-related pressure, all of which may contribute to unhealthy sleep behaviors. Disturbed sleep patterns may therefore create a cycle in which academic stress negatively affects sleep quality, while poor sleep further contributes to fatigue and reduced academic performance.

### **Comparison with Previous Literature**

The findings of the present study are generally consistent with previous investigations examining the relationship between sleep quality and academic performance among university students. Earlier studies have similarly reported that students with inadequate sleep patterns tend to achieve lower academic results and experience greater daytime fatigue.[10–13]

A study conducted by Hershner and Chervin among college students reported that insufficient sleep and daytime sleepiness were associated with poorer concentration and reduced academic performance.[10] Comparable findings were observed in the present study, where students reporting poorer sleep quality demonstrated lower GPA categories.

Similarly, Curcio and colleagues reported that sleep deprivation negatively affected student learning, attention span, and academic performance.[11] The present findings support these observations, as students with poorer sleep quality demonstrated lower academic achievement compared with students reporting healthier sleep patterns.

Okano et al. also reported that better sleep consistency and improved sleep quality were associated with stronger academic performance among university students.[12] Although their investigation included additional sleep-related variables, the overall findings remain comparable to the present study, where healthier sleep habits were associated with higher GPA ranges.

In contrast, some previous investigations have demonstrated weaker or inconsistent relationships between sleep quality and academic achievement.[13] Variations in educational systems, cultural background, study design, sample size, and methods of GPA assessment may partially explain these differences across university populations. Nevertheless, the majority of available evidence continues to support the importance of adequate sleep in maintaining student well-being and educational performance.

The negative correlation observed between PSQI scores and GPA further supports the association between poor sleep quality and lower academic achievement.[12–14] Since higher PSQI scores indicate poorer sleep quality, the inverse relationship

identified in the present study suggests that GPA values tended to decline as sleep quality worsened. Although the strength of the correlation was moderate, the statistically significant findings indicate that sleep quality may represent an important lifestyle-related factor associated with student academic performance.

The predominance of fair and poor sleep quality observed among participants may reflect common lifestyle patterns among medical students. Irregular sleeping schedules, prolonged nighttime studying, excessive screen exposure, academic stress, and examination pressure may collectively contribute to disturbed sleeping habits.[13,15] The demanding nature of medical education may unintentionally encourage late-night studying and reduced sleeping hours, particularly during examination periods.

The average sleep duration observed in the present study was lower than commonly recommended sleep durations for young adults. Inadequate sleep may contribute to daytime tiredness, reduced lecture participation, difficulty maintaining concentration, and lower study efficiency.[11,15] Persistent poor sleep habits may therefore negatively affect both academic performance and overall student well-being.

The findings of the present study may have practical importance for student-support programs within medical education. Universities may benefit from introducing sleep-health awareness programs, academic counseling services, stress-management support, and time-management guidance aimed at promoting healthier student lifestyles. Encouraging balanced daily routines and healthier sleep habits may contribute positively to educational performance, emotional well-being, and overall quality of life among undergraduate medical students.

Several limitations should be considered while interpreting the findings of this study. The study relied on self-reported questionnaire responses, which may introduce recall bias and subjective reporting inaccuracies. Self-reported GPA values may not completely reflect official academic records. Furthermore, the cross-sectional design limits the ability to establish direct causal relationships between sleep quality and academic performance. Since the study was conducted within a single institution, generalization of the findings to other student populations may also be limited. Additional factors such as caffeine intake, psychological stress, mental health status, and screen time were not specifically evaluated and may have influenced the observed results.

Future investigations involving larger multi-center student populations and longitudinal follow-up may provide a clearer understanding of the long-term relationship between sleep quality and academic performance among university students. The use of objective sleep-assessment methods may further improve the reliability of future studies.

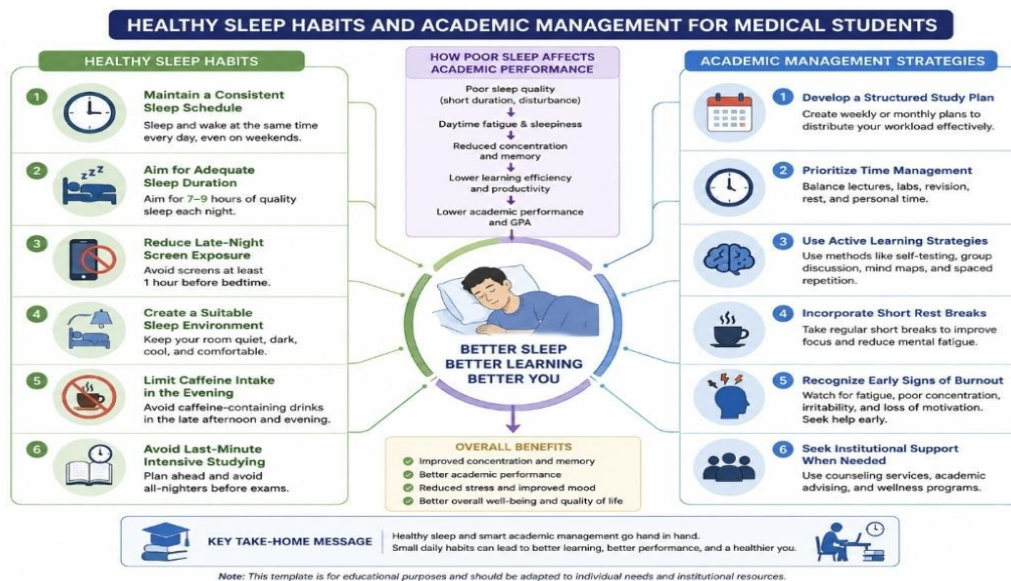
Overall, the findings of the present study suggest that sleep quality represents an important factor associated with academic performance among undergraduate medical students. Promoting healthier sleep behaviors and balanced academic routines may contribute positively to student well-being, classroom performance, and educational success. Recommended healthy sleep practices and academic management strategies for medical students are summarized in Figure 3.

**Table 5. Comparative Summary of Selected Studies Evaluating Sleep Quality and Academic Performance Among University Students**

Author	Country	Population	Sample Size	Main Findings	Relevance to Current Findings
Hershner and Chervin (2014)[10]	United States	College students	Review article	Poor sleep and daytime sleepiness negatively affected concentration and academic functioning	Similar findings showing poorer sleep quality associated with lower academic performance
Curcio et al. (2006)[11]	Italy	University students	Review study	Sleep deprivation reduced learning efficiency and academic productivity	Supports the observed association between poor sleep quality and lower GPA
Okano et al. (2019)[12]	United States	College students	100 students	Better sleep quality and consistency were associated with improved academic outcomes	Comparable relationship between healthier sleep patterns and higher GPA categories
Gilbert and Weaver (2010)[13]	United States	Undergraduate students	133 students	Sleep quality demonstrated a moderate relationship with academic performance	Similar overall trend, although strength of association varied

Footnote: PSQI = Pittsburgh Sleep Quality Index; GPA = Grade Point Average.

**Figure 3: Healthy Sleep Habits and Academic Management Strategies for Medical Students**



Schematic illustration summarizing healthy sleep practices and academic management strategies that may support student well-being and academic performance among undergraduate medical students. The figure highlights behavioral factors associated with poor sleep quality, practical sleep-hygiene recommendations, and educational strategies aimed at improving concentration, productivity, stress management, and overall academic functioning.

## Conclusion

The present study demonstrated a significant association between sleep quality and academic performance among undergraduate medical students. Poorer sleep quality was associated with lower GPA scores, whereas students with healthier sleep patterns were more likely to demonstrate better academic performance. In addition, a statistically significant negative correlation was observed between PSQI scores and GPA values, indicating that worsening sleep quality was associated with declining academic achievement.

The findings also highlighted the high prevalence of fair to poor sleep quality among medical students, emphasizing the importance of maintaining healthy sleep habits within demanding academic environments. Sleep quality may represent an important lifestyle-related factor associated with concentration, classroom performance, study effectiveness, and overall student well-being.

Encouraging sleep-health awareness, balanced academic routines, stress-management strategies, and student-support initiatives within medical education may contribute positively to both educational performance and quality of life among undergraduate students. Further multi-center and longitudinal investigations are recommended to better understand the long-term relationship between sleep quality and academic performance among university students.

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