

Original Research Article

Examining sleep behavior and its association with academic performance among college students

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ABSTRACT

Background: Sleep is essential for physical and mental well-being and may influence academic performance among college students. Irregular sleep habits, inadequate sleep duration, and poor sleep quality may adversely affect concentration, memory, and learning.

Methods: A descriptive-correlational study was conducted among 50 college students using a structured online Likert-scale questionnaire. Sleep patterns were assessed across sleep latency, sleep duration, and sleep efficiency. Academic performance was measured using CGPA/SGPA. Descriptive statistics, reliability analysis, correlation, multiple regression, cluster analysis, and group comparison tests were performed.

Results: The mean CGPA/SGPA was 7.68 ± 1.19 . Mean scores for sleep latency, sleep duration, and sleep efficiency were 3.37 ± 0.64 , 3.80 ± 0.47 , and 3.34 ± 0.52 , respectively. The sleep scale demonstrated acceptable reliability (Cronbach's $\alpha = 0.692$). Significant positive correlations were observed among sleep dimensions; however, no significant correlation was found between sleep patterns and academic performance ($p > 0.05$). Multiple regression analysis showed that sleep variables explained only 4.4% of the variance in academic performance ($R^2 = 0.044$), with the overall model not statistically significant ($p = 0.554$). Cluster analysis identified two distinct sleep behavior groups, with no significant difference in academic performance between groups.

Conclusions: College students generally demonstrated moderate-to-good sleep patterns and satisfactory academic performance. Although sleep dimensions were significantly interrelated, they were not significantly associated with academic achievement. Academic performance is likely influenced by multiple factors beyond sleep behavior alone. Larger, multicentric studies are warranted to further explore these relationships.

Keywords: Sleep patterns, Sleep latency, Sleep duration, Sleep efficiency, Academic performance, CGPA, College students

INTRODUCTION

Sleep is an important part of a student's daily life and plays a significant role in maintaining physical health, mental alertness, and emotional well-being. Proper sleep helps students stay focused, active, and prepared for academic activities, whereas poor sleep may lead to

fatigue, reduced concentration, and impaired academic functioning.¹

In recent years, researchers have shown growing interest in understanding the relationship between sleep habits and academic achievement. Healthy sleep patterns, including adequate sleep duration, good sleep quality, and

consistent sleep schedules, have been associated with better academic performance among college students.^{2,3} Several studies have also reported that sleep quality, duration, and consistency are related to improved learning and academic outcomes.^{4,5}

However, the relationship between sleep and academic performance is not always consistent, as students with different sleep habits may demonstrate similar academic outcomes. Sleep-related factors may interact with other academic and personal characteristics, making the relationship complex.²

Several factors can affect students' sleep patterns. Academic workload, examination pressure, irregular schedules, and extensive use of mobile phones and social media may contribute to inadequate or disturbed sleep. Lifestyle factors, stress, and daytime sleepiness may further influence students' academic functioning and overall well-being.^{5,6}

Understanding sleep behavior is important because it influences not only academic activities but also overall health and daily functioning. Evidence suggests that sleep may be an important modifiable factor associated with student success and retention.⁷ At the same time, academic performance depends on multiple factors such as study habits, learning environment, motivation, and personal discipline.

The present study focused on the relationship between sleep latency, sleep duration, sleep efficiency, and academic performance among college students. It also examines the associations among different sleep dimensions to better understand how sleep patterns relate to students' academic outcomes.

Objectives of the study

Primary objective

To assess students' sleep patterns (sleep latency, sleep duration, and sleep efficiency) and examine their relationship with academic performance as measured by CGPA/SGPA.

Secondary objective

To evaluate the reliability of sleep-related measures and identify distinct sleep behavior patterns among students in relation to their academic performance.

METHODS

Study design and setting

A descriptive-correlational study was conducted among college students at St John's College Agra, from Jan 2025 to March 2025. The study was designed to assess

students' sleep patterns and examine their relationship with academic performance.

Study population and sample size

The study included all students enrolled in the selected class/section during the study period. A total of 50 students participated in the study. Since all eligible students in the selected class/section were approached and included, complete enumeration (census) sampling was used. Therefore, no formal sample size calculation was performed.

Eligibility criteria

Students enrolled in the selected class/section during the study period who were willing to participate and provided informed consent were included. Students who did not provide consent or submitted incomplete questionnaires were excluded from the analysis.

Data collection procedure

Data were collected using a structured online questionnaire administered through Google forms. The purpose of the study was explained to the participants before participation, and informed consent was obtained electronically. The questionnaire collected information regarding sleep patterns and academic performance.

Sleep patterns were assessed using Likert-scale items covering three dimensions: sleep latency, sleep duration, and sleep efficiency. Sleep latency represented the time required to fall asleep, sleep duration represented the amount of sleep obtained, and sleep efficiency reflected the perceived restfulness and effectiveness of sleep. Academic performance was assessed using the students' CGPA/SGPA.

Study variables

The independent variable was sleep pattern, assessed through sleep latency, sleep duration, and sleep efficiency. The dependent variable was academic performance, measured using CGPA/SGPA.

Data management and statistical analysis

The collected responses were coded, checked for completeness, and organized before statistical analysis. Descriptive statistics, including mean and standard deviation, were used to summarize the study variables. The internal consistency of the sleep scale was assessed using Cronbach's alpha.

Correlation analysis was performed to examine the relationships among sleep dimensions and between sleep variables and academic performance. Multiple linear regression analysis was used to assess the predictive relationship between sleep dimensions and academic

performance. Cluster analysis was performed to identify groups of students with similar sleep behavior patterns, followed by appropriate group comparison tests to examine differences in academic performance between the identified groups. A two-sided p value <0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the department of statistics, St John's College Agra, Participation was voluntary, and informed consent was obtained from all participants before data collection. The confidentiality and anonymity of participants were maintained throughout the study.

RESULTS

The results of the study provide a general understanding of students' sleep patterns and their academic performance, along with how these variables are related to each other. The findings are presented using tables and supported with simple interpretation to make the results clear and easy to follow. The discussion also makes use of graphical representations to support the interpretation in a more visual and understandable way.

Table 1: Descriptive statistics of sleep patterns and academic performance.

Variables	Minimum	Maximum	Mean $\pm$ SD
Current CGPA/SGPA	5.00	9.00	7.68 $\pm$ 1.186
Sleep latency	1.80	4.40	3.37 $\pm$ 0.642
Sleep duration	2.60	4.60	3.80 $\pm$ 0.472
Sleep efficiency	2.20	4.40	3.34 $\pm$ 0.524

Among the 50 college students included in the study, the mean current CGPA/SGPA was 7.68 $\pm$ 1.19, with scores

ranging from 5.00 to 9.00, indicating generally satisfactory academic performance. The mean score for sleep latency was 3.37 $\pm$ 0.64, with values ranging from 1.80 to 4.40. The mean score for sleep duration was 3.80 $\pm$ 0.47, ranging from 2.60 to 4.60. The mean score for sleep efficiency was 3.34 $\pm$ 0.52, with values ranging from 2.20 to 4.40. Overall, the findings indicated moderate-to-good sleep patterns among the participating students.

The distribution of sleep latency, sleep duration, and sleep efficiency was compared across three academic performance groups based on CGPA/SGPA (8.0-10.0, 6.0-8.0, and 4.0-6.0). For sleep latency, the 8.0-10.0 group showed a median score of approximately 3.5, while the median was slightly higher in the 6.0-8.0 group and lower in the 4.0-6.0 group. The 8.0-10.0 group demonstrated relatively wider variability in sleep latency, whereas the 4.0-6.0 group showed comparatively lower central values.

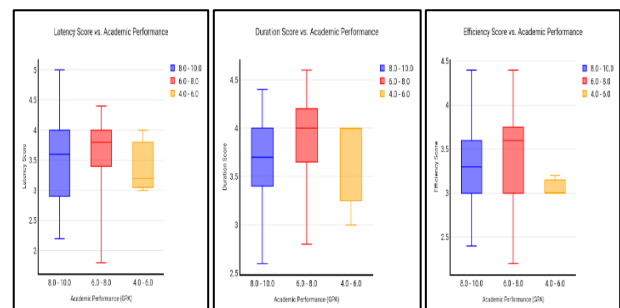


Figure 1: Sleep patterns across academic performance groups.

For sleep duration, the 6.0-8.0 academic performance group showed the highest median score, approximately 4.0, followed by the 8.0-10.0 group, with a median of approximately 3.7. The 4.0-6.0 group showed a lower median, with greater overlap in the distribution across groups.

Table 2: Distribution of academic performance (CGPA).

Grading scale (GPA)	Academic description	Frequency	Percentage
8.0-10.0	Outstanding	20	40
6.0-8.0	Very satisfactory	27	54
4.0-6.0	Fairly satisfactory	3	6
Below 4.0	Did not meet expectations	0	0
Total		50	100

For sleep efficiency, the 6.0-8.0 group had the highest median score, followed by the 8.0-10.0 group, whereas the 4.0-6.0 group demonstrated a comparatively lower and narrower distribution. Overall, the boxplots suggested some variation in sleep dimensions across academic performance groups; however, visual differences alone do not establish statistical significance.

Among the 50 students, 27 (54%) had a GPA of 6.0-8.0, categorized as very satisfactory academic performance. Twenty students (40%) had a GPA of 8.0-10.0, indicating outstanding academic performance. Only 3 students (6%) had a GPA of 4.0-6.0, categorized as fairly satisfactory, while none of the students had a GPA below 4.0. Overall, 94% of students had a GPA of 6.0 or higher, indicating generally satisfactory to outstanding academic performance in the study population.

Table 3: Correlation between sleep patterns and academic performance.

Variables	Latency	Duration	Efficiency	CGPA/SGPA
Latency	1.000	0.365**	0.353*	-0.010
Duration	0.365**	1.000	0.498**	-0.175
Efficiency	0.353*	0.498**	1.000	0.017
CGPA/SGPA	-0.010	-0.175	0.017	1.000

Note: * $p < 0.05$, ** $p < 0.01$.

Table 4: Multiple regression analysis of sleep patterns and academic performance.

Model summary					
R	R ²	Adjusted R ²		Std. Error	
0.210	0.044	-0.018		1.196	
ANOVA Table					
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.029	3	1.010	0.705	0.554
Residual	65.851	46	1.432		
Total	68.880	49			
Coefficients Table					
Variable	B	Std. Error	Beta	t	Sig.
Constant	8.707	1.479	—	5.887	0.000
Latency	-0.023	0.301	-0.013	-0.078	0.939
Duration	-0.594	0.437	-0.237	-1.360	0.180
Efficiency	0.393	0.396	0.174	0.993	0.326

Correlation analysis demonstrated significant positive associations among the three sleep dimensions. Sleep latency was positively correlated with sleep duration ($r=0.365$, $p<0.01$) and sleep efficiency ($r=0.353$, $p<0.05$). A stronger positive correlation was observed between sleep duration and sleep efficiency ($r=0.498$, $p<0.01$).

In contrast, CGPA/SGPA showed no significant correlation with sleep latency ($r=-0.010$), sleep duration ($r=-0.175$), or sleep efficiency ($r=0.017$). Thus, none of the three sleep dimensions demonstrated a statistically significant association with academic performance in the present study.

Multiple linear regression was performed to examine whether sleep latency, sleep duration, and sleep efficiency predicted academic performance (CGPA/SGPA). The overall regression model was not statistically significant ($F=0.705$, $p=0.554$). The model yielded an R value of 0.210 and an R² of 0.044, indicating that the three sleep variables collectively explained 4.4% of the variance in academic performance. The adjusted R² was -0.018 , with a standard error of 1.196.

None of the individual sleep dimensions significantly predicted academic performance. Sleep latency was not a significant predictor ($B=-0.023$, $\beta=-0.013$, $p=0.939$). Similarly, sleep duration showed a negative but non-significant association with academic performance ($B=-0.594$, $\beta=-0.237$, $p=0.180$), while sleep efficiency showed a positive but non-significant association

($B=0.393$, $\beta=0.174$, $p=0.326$). These findings indicate that sleep latency, sleep duration, and sleep efficiency did not independently predict academic performance in this study.

Table 5: Cluster analysis of sleep patterns.

Variables	Cluster 1	Cluster 2
Latency	3.7	2.8
Duration	4.0	3.6
Efficiency	3.6	3.0
Number of cases		
Cluster	Number of students	
1	30	
2	20	
Total	50	

Cluster analysis identified two distinct groups of students based on their sleep patterns. Cluster 1, comprising 30 students (60%), had higher mean cluster-center scores for sleep latency (3.7), sleep duration (4.0), and sleep efficiency (3.6). Cluster 2, comprising 20 students (40%), showed comparatively lower scores for sleep latency (2.8), sleep duration (3.6), and sleep efficiency (3.0).

Overall, cluster 1 represented the larger group and was characterized by relatively higher scores across all three sleep dimensions, whereas cluster 2 demonstrated comparatively lower scores. These findings indicate the presence of two distinguishable sleep behavior patterns within the study population.

Table 6: Group differences in sleep patterns.

A: Descriptive statistics				
Variables	CGPA=4.0-6.0 (n=3)	CGPA=6.0-8.0 (n=27)	CGPA=8.0-10.0 (n=20)	Total
Latency	3.40±0.53	3.39±0.65	3.34±0.67	3.37±0.64
Duration	3.67±0.58	3.91±0.45	3.68±0.48	3.80±0.47
Efficiency	3.07±0.12	3.37±0.59	3.33±0.47	3.34±0.52
B: Comparison results				
Variables	F value		P value	
Latency	0.031		0.969	
Duration	1.546		0.224	
Efficiency	0.445		0.644	

Note: No significant differences were observed ($p>0.05$).

Sleep patterns were compared across three academic performance groups based on CGPA/SGPA: 4.0-6.0 ($n=3$), 6.0-8.0 ($n=27$), and 8.0-10.0 ($n=20$). The mean sleep latency scores were 3.40 ± 0.53 , 3.39 ± 0.65 , and 3.34 ± 0.67 , respectively. The corresponding mean sleep duration scores were 3.67 ± 0.58 , 3.91 ± 0.45 , and 3.68 ± 0.48 , while mean sleep efficiency scores were 3.07 ± 0.12 , 3.37 ± 0.59 , and 3.33 ± 0.47 , respectively.

One-way analysis of variance showed no statistically significant differences among the three academic performance groups for sleep latency ($F=0.031$, $p=0.969$), sleep duration ($F=1.546$, $p=0.224$), or sleep efficiency ($F=0.445$, $p=0.644$). Thus, sleep patterns did not differ significantly according to academic performance category in the present study.

DISCUSSION

The present study examined sleep patterns in college students and their relationship with academic performance. The mean CGPA/SGPA was 7.68 ± 1.19 , indicating generally satisfactory academic performance. Most students (94%) had a CGPA/SGPA of 6.0 or higher. The mean scores for sleep latency, sleep duration, and sleep efficiency were 3.37 ± 0.64 , 3.80 ± 0.47 , and 3.34 ± 0.52 , respectively, suggesting moderate-to-good sleep patterns among the participants.

The present findings showed that the three sleep dimensions were significantly and positively interrelated. Sleep latency was positively correlated with sleep duration ($r=0.365$, $p<0.01$) and sleep efficiency ($r=0.353$, $p<0.05$), while sleep duration demonstrated a stronger positive correlation with sleep efficiency ($r=0.498$, $p<0.01$). This indicates that students' sleep characteristics were related to one another, although these relationships did not translate into differences in academic performance.

In contrast to the significant associations among sleep dimensions, none of the sleep variables was significantly correlated with CGPA/SGPA. Sleep latency ($r=-0.010$), sleep duration ($r=-0.175$), and sleep efficiency ($r=0.017$)

showed no statistically significant association with academic performance. This finding is consistent with the observation by Armand et al, who reported that the relationship between overall sleep quality and academic performance among university students was not simply linear and could vary according to psychological well-being. Their findings suggested that the highest academic achievers were not necessarily the best sleepers.¹

The absence of a significant association in the present study differs from findings reported by Okano et al, who used objective wearable activity-tracker measurements and found that better sleep quality, longer sleep duration, and greater sleep consistency were associated with better academic performance in college students. Their study also reported that sleep measures accounted for a substantial proportion of variation in academic performance.⁶ Similarly, Lin et al. reported an association between objectively measured sleep characteristics and higher academic performance among college students.⁴ These differences may partly reflect methodological variations, particularly the use of objective actigraphy in those studies compared with the self-reported Likert-scale assessment used in the present study. Objective measures may capture sleep duration, timing, and consistency more accurately than subjective assessments.

The present findings also differ from the results of Desjardins and Grandbois, who reported that sleep efficiency, daytime dysfunction due to sleepiness, and total sleep time were associated with students' GPA.² However, their study assessed several components of the Pittsburgh sleep quality index and used a larger sample of 105 university students. The current study had a relatively small sample of 50 students and assessed three specific sleep dimensions. Differences in sample size, measurement instruments, and characteristics of the study population may therefore explain the inconsistent findings.

Previous evidence generally supports a modest relationship between sleep and academic outcomes. A meta-analytic review by Dewald et al. found significant but relatively small associations between sleep quality,

sleep duration, sleepiness, and academic performance.³ More recent evidence has similarly emphasized the potential importance of daytime sleepiness in academic functioning. Nguyen et al., in a systematic review and meta-analysis, reported a significant association between daytime sleepiness and poorer academic performance.⁵ However, daytime sleepiness was not specifically assessed as an independent variable in the present study, which may partly explain why a significant relationship with academic performance was not observed.

Multiple regression analysis in the present study further supported the lack of a meaningful predictive relationship. Sleep latency, sleep duration, and sleep efficiency collectively explained only 4.4% of the variance in CGPA/SGPA ($R^2=0.044$), and the overall regression model was not statistically significant ($F=0.705$, $p=0.554$). None of the individual sleep dimensions significantly predicted academic performance. These findings suggest that academic achievement in this population is likely influenced by a broader combination of factors rather than sleep behavior alone. This interpretation is consistent with the wider literature emphasizing that academic performance is influenced by behavioral, environmental, psychological, and individual factors in addition to sleep.⁷

The comparison of sleep patterns across academic performance categories further supported this interpretation. No significant differences were observed among the 4.0-6.0, 6.0-8.0, and 8.0-10.0 CGPA/SGPA groups for sleep latency ($F=0.031$, $p=0.969$), sleep duration ($F=1.546$, $p=0.224$), or sleep efficiency ($F=0.445$, $p=0.644$). Although the 6.0-8.0 group had a relatively higher mean sleep duration and sleep efficiency, these differences were not statistically significant. Therefore, the observed variations should be interpreted as descriptive rather than evidence of a meaningful association.

Cluster analysis identified two distinct sleep behavior groups. Cluster 1 included 30 students (60%) and demonstrated higher cluster-center scores for latency, duration, and efficiency than cluster 2, which included 20 students (40%). Despite this distinction in sleep characteristics, the overall findings did not demonstrate a corresponding meaningful difference in academic performance. This further suggests that grouping students according to sleep behavior alone may not adequately explain differences in academic achievement.

The findings should be interpreted in light of several limitations. First, the study included only 50 students from a single selected class/section, which limits statistical power and generalizability. Second, sleep characteristics were assessed using a self-reported online questionnaire, which may be affected by recall and reporting bias. Third, the cross-sectional design prevents conclusions regarding causality or the direction of the relationship between sleep and academic performance.

Fourth, academic performance is multifactorial, and potentially important factors such as study habits, examination stress, motivation, mental well-being, socioeconomic circumstances, and use of electronic devices were not comprehensively evaluated.

Despite these limitations, the study provides useful evidence that sleep dimensions may be closely related to each other without necessarily showing a direct relationship with academic performance in a small student population. Future studies should include larger and more diverse samples, longitudinal designs, and objective sleep measurements such as actigraphy. Assessment of additional factors, particularly daytime sleepiness, sleep consistency, psychological well-being, study habits, and electronic-device use, may provide a more comprehensive understanding of the relationship between sleep and academic achievement.

Overall, the present study found that although sleep latency, sleep duration, and sleep efficiency were significantly interrelated, they were not significantly associated with or predictive of academic performance. The findings highlight the multifactorial nature of academic achievement and suggest that sleep should be considered as one component of a broader set of determinants of student academic success.

CONCLUSION

The study set out to understand students' sleep patterns and to explore whether these patterns are connected to their academic performance. The findings show that students generally report moderate to good sleep behavior in terms of sleep latency, duration, and efficiency. At the same time, most students fall within the "very satisfactory" to "outstanding" range of academic performance. This suggests that, overall, the group of students in this study is performing reasonably well while also maintaining fairly stable sleep routines.

However, the analysis does not show a strong or meaningful relationship between sleep patterns and academic performance. The results indicate that differences in sleep latency, duration, and efficiency may not directly translate into differences in CGPA/SGPA. Although the sleep variables are related to each other and seem to form a consistent pattern, this pattern does not appear to have a clear connection with academic outcomes in this sample.

These findings suggest that academic performance may depend on a combination of factors rather than sleep alone. Elements such as study habits, time management, motivation, and stress levels may play a more important role in shaping how students perform academically. It is possible that some students are able to maintain good performance even with less consistent sleep, while others with better sleep patterns may still face academic challenges due to other reasons.

Another point to consider is the limited variation in academic performance within the sample. Since most students fall within similar performance categories, it becomes more difficult to observe strong relationships between variables. This may have influenced the overall results and reduced the visibility of any potential connection between sleep and performance.

In conclusion, the study suggests that sleep patterns are present and show internal consistency among students, but their direct influence on academic performance appears limited in this context. Sleep may still be an important aspect of student well-being, but it likely works alongside several other factors that together influence academic success.

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