RESEARCH PAPER

# Assessment of Sleep Quality and Its Determinants among II MBBS Undergraduate Students in Kolhapur: A Cross-Sectional Study

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*ABSTRACT*

The quality of sleep among medical students is one of the most important factors determining learning, mental health and clinical performance but academic stress and irregular work schedule may be responsible for the disturbances of sleep. The present study aimed at evaluating sleep quality, excessive daytime sleepiness (EDS) and its related factors amongst the second year MBBS students of Kolhapur district, Maharashtra. In May–June 2026, a cross-sectional survey included 115 students who were assessed with the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Google Form was used to collect data and analysed by SPSS version 26, Cronbach's α was performed to assess the reliability of the data and the significance of the statistical data was set at $p<0.05$.

The average age of the participants was 20 years and the majority of participants (57%) were females. A high prevalence of poor sleep quality (PSQI >5) was found in 56.5% of the students; sleep latency was the most impaired domain. The average score of ESS was 7.7 ± 5.2, with 27.8% of the students showing mild to severe EDS. There was significant difference in gender and poor sleep quality ($\chi^2=12.24$, $p=0.0005$) with females being poorer sleepers than males. The value of $B=0.324$, with $p=0.000$, indicated that age was a significant predictor of sleep duration in regression analysis. Medical students had relatively poor sleep quality and EDS was common especially among females. The results indicate that there is a need for structured sleep hygiene education and stress management programs to be incorporated into the medical curriculum to protect academic outcomes, mental health and clinical competence.

**Keywords:** Daytime sleepiness, Kolhapur, Sleep, Stress, Students

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## 1. Introduction

### 1.1 Background

Sleep is an essential biological process which plays an important role in the physical, cognitive and emotional well-being. Good sleep promotes memory consolidation, learning potential, psychological resistance, and emotional

control. Conversely, "sleep deficit" has been associated with decreased attention, poorer school performance, and higher rates of anxiety and depression [1]. Medical students are especially susceptible to sleep disorders due to the heavy work load, irregular schedules, and high psychological stress caused by studying and doing clinical practice. Poor sleeping habits have been reported in medical students in various countries as India (29–37%) [2], Saudi Arabia (73.7%) [3], Vietnam (36.6%) [4], Ethiopia (65.1%) [5] and Rwanda (80%) [6]. These are important figures to highlight the burden of sleep issues in medical education worldwide. Sleep has a direct impact on schoolwork, with even the moderate loss of sleep leading to decreased concentration, memory, and problem-solving ability all important attributes for medical studies. Studies conducted in Saudi Arabia have revealed this strong correlation, which has been reported between poor sleep quality and a reduced grade point average (GPA) [3]. In addition to academics, insufficient sleep is associated with psychiatric morbidity, stress, and excessive daytime sleepiness (EDS), all of which could negatively impact clinical performance and patient safety [1,7]. The quality of sleep is often evaluated by validated questionnaires like the Pittsburgh Sleep Quality Index (PSQI) and daytime sleepiness is evaluated by the Epworth Sleepiness Scale (ESS). These types of tools have been extensively used with medical students to assess sleep disturbances and their impact in the real world [8,9].

**1.2 Rationale and Objectives**

Medical students' sleep issues have been reported in international studies but not many studies have been conducted in smaller cities like Kolhapur in India. Second year MBBS students are at a critical stage of training where they are still learning pre-clinics, but at the same time are getting more and more clinical exposure and hence they are more susceptible to sleep related problems. For this reason, the present study was conducted to: To find the extent of poor sleep quality among second year MBBS students in Kolhapur, Maharashtra, India. Evaluate excessive daytime sleepiness in this group. Determine demographic and lifestyle factors associated. Analyze PSQI and ESS scores to identify sleep disturbance areas (e.g., sleep latency, daytime sleepiness). Compare and contrast results with international data to place results in context of international literature. In this study, the aim is to place the local findings in the context of global research, thus contributing to the growing evidence for the need for sleep hygiene education and stress management interventions in medical education. These are essential to the well-being of students, maximizing their academic achievement, and ensuring safe clinical practice.

## 2. Methods

**2.1 Study Design**

This cross-sectional observational study was conducted from May-June 2026, after obtaining ethical clearance from the Institutional Ethics Committee (IEC) of Dr. D. Y. Patil Medical College, Kolhapur dated 24th April 2026). The design was selected to estimate the prevalence of poor sleep

quality and excessive daytime sleepiness (EDS) among medical students at a given time. No intervention was used.

**2.2 Setting and Participants**

- Place: Dr. D Y Patil Medical College, Kolhapur, Maharashtra, India.
- Population: Second-year MBBS undergraduate students.
- Sample size: All eligible students were invited to participate. A total of 115 students completed the survey
- Recruitment: Data were collected using a structured Google Form distributed via lecture halls and hostels. Participation was voluntary, anonymous, and based on informed consent.
- Eligibility criteria:

➢ Inclusion Criteria

(1) Currently enrolled undergraduate Second year MBBS students

(2) Consent: Students who have provided written informed consent to participate.

(3) Active Attendance: Students actively attending academic sessions and clinical postings (not on prolonged medical or academic leave).

(4) Students taking hypno-sedative medications will be included.

➢ Exclusion Criteria

(1) Pre-existing Sleep Disorders

Known clinical diagnoses of sleep disorders such as obstructive sleep apnea (OSA), narcolepsy, or restless legs syndrome.

(2) Medication Use:

Students currently taking medications apart from hypno-sedatives were excluded, CNS stimulants drugs.

(3) Psychiatric and Medical Conditions: Known, active psychiatric illnesses (such as severe depression or clinical anxiety) or chronic pain conditions that directly interfere with sleep.

(4) Recent Travel: Students who have travelled across multiple time zones in the past 2–4 weeks (to rule out jet lag).

(5) Acute Illness: Students suffering from an acute febrile illness or respiratory infection at the time of taking the survey.

(6) Those students doing night duties

(7) Any other condition interfering with sleep.

(8) Incomplete Data: Questionnaires with missing responses on the PSQI or ESS that prevent accurate final scoring.

**2.3 Instruments**

**1. Pittsburgh Sleep Quality Index (PSQI)**

- **Description:** 19 self-rated items across 7 components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction.
- **Scoring:** Each component scored 0–3; global score range 0–21.
- **Interpretation:** Global score ≤5 = good sleep quality; PSQI >5 = poor sleep quality [10].
- **Validation:** English version used, validated in Indian populations.
- **Reliability:** Internal consistency assessed using Cronbach's α.

**2. Epworth Sleepiness Scale (ESS)**

- **Description:** 8 items assessing tendency to fall asleep in common daily situations (e.g., reading, watching TV, sitting quietly).
- **Scoring:** Each item scored 0–3; total score range 0–24.
- **Interpretation:**
  - 0- 5 = Lower normal
  - 6 -10 =Higher normal

- 11–15 = excessive daytime sleepiness (EDS)
- 16–24 = severe EDS [11]

- **Reliability:** Internal consistency assessed using Cronbach's α.

**3. Demographic Proforma**

- Collected data on: gender, age, residence (hostel/home), average daily screen time, and year of study.

**2.4 Statistical Analysis**

**Software:** IBM SPSS Statistics v26 and Microsoft Excel were used for data analysis.

**Descriptive statistics:**

- Continuous variables presented as mean ± standard deviation (SD).
- Categorical variables presented as frequencies and percentages.

**Reliability:**

- Internal consistency assessed using Cronbach's α.
- Values ≥0.70 considered acceptable.

**Normality testing:**

- Shapiro–Wilk test applied.
- Confirmed non-normal distribution of PSQI and ESS scores.

**Inferential statistics:**

- **Chi-square test:** Associations between categorical variables.
- **Mann–Whitney U (MW) test:** Group comparisons for two independent samples.
- **Kruskal–Wallis (KW) test:** Group comparisons for more than two independent samples.
- **Spearman's rank correlation (rs):** Relationships between continuous/ordinal variables.
- **Multiple regression analysis:** Used to determine predictors of sleep duration.

**Criteria for significance:**

- A p-value <0.05 was considered statistically significant.

**Additional recommendations (for robust reporting):**

- Report **odds ratios (OR) with 95% confidence intervals** for categorical outcomes (e.g., gender vs. poor sleep).
- Use **binary logistic regression** instead of linear regression for categorical outcomes (poor vs. good sleeper).
- Include **effect sizes** for chi-square, Mann–Whitney, and Kruskal–Wallis tests.

**3. Results**

**3.1 Sleep Quality (PSQI)**

- The mean global PSQI score among the 115 medical students was 6.55 ± 2.94, which is above the cut-off of 5 and indicates generally poor sleep quality. A total of 65 students (56.5%) were poor sleepers (PSQI ≥5) and 50 students (43.5%) were good sleepers (PSQI ≤5), respectively (Table 1). The highest mean score (1.17 ± 0.95) among PSQI components was found in sleep latency, which was the most impaired domain.

Table 1: PSQI Sleep Quality – Frequency Distribution (N=115)

| Sleep Quality | Criteria | Frequency (n) | Percentage (%) | Cumulative (%) |
|---|---|---|---|---|
| **Good Sleeper** | PSQI ≤5 | 50 | 43.5 | 43.5 |
| **Poor Sleeper** | PSQI > 5 | 65 | 56.5 | 100 |
| **Total** | | **115** | **100** | |

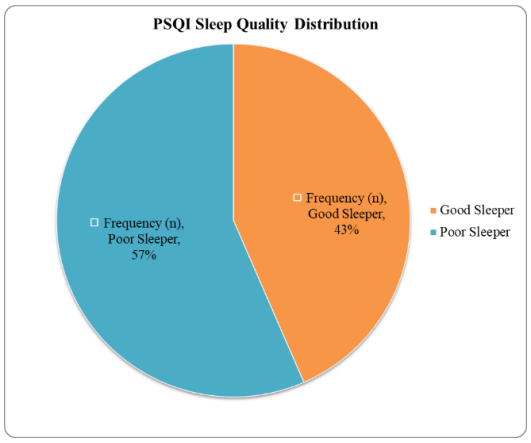


**Fig 1**. Distribution of sleep quality according to PSQI in medical students (N=115).

The pie chart shows that 43.5% were good sleepers and 56.5% were poor sleepers. Therefore, more than half the cohort reported poor sleep quality.

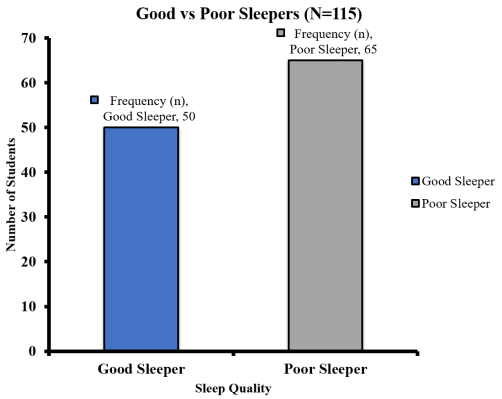


**Fig. 2** Bar chart of PSQI sleep quality distribution among medical students (N = 115). The chart compares the number of good sleepers (PSQI ≤ 5; n = 50, 43.5%) and poor sleepers (PSQI ≥ 5; n = 65, 56.5%)

**Component scores:**

The sleep latency component had the highest mean score among the PSQI domains, indicating that students most frequently experienced difficulty in initiating sleep. Sleep duration (1.10 ± 0.78), habitual sleep efficiency (1.09 ± 1.35), sleep disturbances (1.08 ± 0.66), and subjective sleep quality (1.00 ± 0.62) also showed moderate impairment.

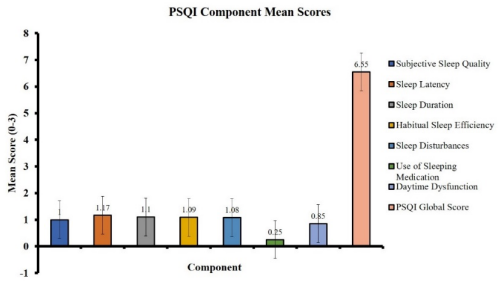


**Fig. 3** Bar graph shows mean values of subjective sleep quality, sleep latency, sleep length, habitual sleep efficiency, sleep disruptions, usage of sleeping medication, daytime dysfunction and PSQI global score.

Use of sleep medication was minimal (0.25 ± 0.59), and daytime dysfunction was relatively low (0.85 ± 0.86), suggesting that pharmacological aids were rarely required. Overall, poor sleep quality was prevalent in this population, with a global PSQI score of 6.55 ± 2.94 (range 1–16, median 6) (Table 2). Average scores (0–3) for each domain are displayed; the higher the score, the greater the impairment.

**3.2 Daytime Sleepiness (ESS)**

The mean ESS score for the 115 medical students was **7.66 ± 5.20**, which falls within the **higher normal range (6–10)**. Most students demonstrated normal daytime sleepiness. However, **27.8% (n = 32)** scored ≥11, indicating clinically significant excessive daytime sleepiness (EDS). Specifically, **22.6% (n = 26)** were in the excessive EDS range (11–15), and **5.2% (n = 6)** were in the severe EDS range (16–24). This distribution shows that while the majority of students were in the normal range, more than one-quarter experienced EDS that could impair daily functioning and academic performance.

**Table 2 ESS Daytime Sleepiness – Frequency Distribution (N=115)**

| ESS Category | Score Range | Clinical Meaning | Frequency (n) | Percentage (%) | Cumulative (%) |
|---|---|---|---|---|---|
| Lower normal | 0–5 | No action needed | 39 | 33.9 | 33.9 |
| Higher normal | 6–10 | Normal daytime sleepiness | 44 | 38.3 | 72.2 |
| Excessive daytime sleepiness (EDS) | 11–15 | Clinical evaluation recommended | 26 | 22.6 | 94.8 |
| Severe EDS | 16–24 | Immediate medical evaluation | 6 | 5.2 | 100 |
| Total | – | – | 115 | 100 | – |

This indicates that although the majority of students exhibited typical daytime vigilance, over a quarter encountered drowsiness that could impair everyday activities (Table 2).

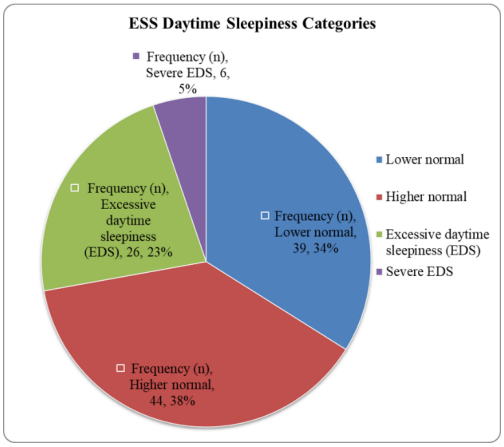


**Fig.4** Pie chart showing the distribution of student in each ESS category: Lower Normal (33.9%), Higher Normal (38.3%), Mild EDS (13%), Moderate EDS (9.6%) and Severe EDS (5.2%).

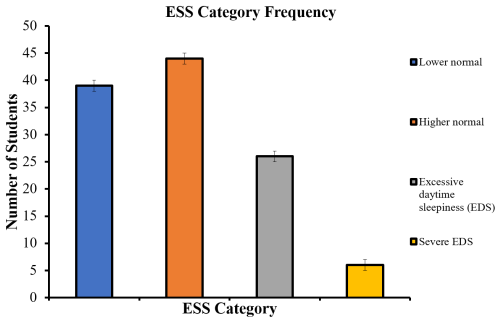


**Fig. 5** Bar graph illustrating the number of students for each category of ESS with most students being in the normal range and a smaller fraction being in the mild to severe EDS range.

### 3.3 Reliability of Instruments

The consistency of the two instruments was measured utilizing Cronbach's alpha. The PSQI score was 0.457, which is beneath the established threshold of 0.70. This reduced reliability corresponds with prior studies and signifies the scale's complex

nature. On the other hand, the ESS revealed a Cronbach's alpha of 0.823, demonstrating commendable internal consistency and validating its efficacy as a gauge of daytime sleepiness (Table 3).

**Table 3 Reliability Analysis Summary — PSQI & ESS**

| Instrument | Items (k) | N | Cronbach's α | Threshold | Interpretation |
|---|---|---|---|---|---|
| **PSQI (7 Components)** | 7 | 115 | **0.457** | ≥ 0.70 | Below threshold — expected (multidimensionality) |
| **ESS (8 Items)** | 8 | 115 | **0.823** | ≥ 0.70 | Good internal consistency |

### 3.4 Inferential Statistics

Shapiro-Wilk test showed that PSQI scores (p = 0.0009) and ESS scores (p = 0.0019) distribution was not normal. The chi-square test showed that gender and sleep quality were significantly associated ($\chi^2$=12.236, p=0.0005). Female students included 47 poor sleepers and 19 good sleepers, while male students included 18 poor sleepers and 31 good sleepers. The p-value < 0.05 suggests that female students had a significantly higher likelihood of poor sleep quality compared to male students (Table 4).

**Table 4 Chi-square analysis of gender versus sleep quality among medical students (N = 115)**

| Gender | Good Sleeper | Poor Sleeper |
|---|---|---|
| **Female** | 19 | 47 |
| **Male** | 31 | 18 |

$\chi^2 = 12.236$, $p < 0.001$; female students were significantly more likely to have poor sleep quality compared to males.

**Table 5 Group comparisons of PSQI outcomes using Mann–Whitney U and Kruskal–Wallis tests (N = 115)**

| Test | Groups | Outcome | Statistic | p-value |
|---|---|---|---|---|
| **MW** | Male vs Female | Sleep Duration | 1422 | 0.2572 |
| **MW** | Male vs Female | Sleep Latency | 1639 | 0.9021 |
| **MW** | Alcohol Yes vs No | Sleep Duration | 427.5 | 0.5992 |
| **KW** | Residence | Sleep Duration | 5.367 | 0.0683 |
| **KW** | Smartphone | Sleep Latency | 2.75 | 0.4318 |

Note: Note: MW = Mann–Whitney U test; KW = Kruskal–Wallis test.

The PSQI outcomes were compared across groups using the Mann–Whitney U and Kruskal–Wallis tests (Table 5). No statistically significant differences were found in sleep duration (p = 0.257) or sleep latency (p = 0.902) between male and female students. Alcohol intake was not associated with sleep duration (p = 0.599), and there was no relationship between smartphone use

and sleep latency (p = 0.432). The type of residence showed a trend toward near-significance for sleep duration (p = 0.068), but this was not statistically significant. Overall, these findings indicate that demographic and lifestyle factors such as gender, alcohol use, residence, and smartphone use did not significantly impact sleep quality in this cohort.

### 3.5 Correlation Analysis

There was a weak negative correlation between screen time and sleep duration (rs = −0.092, p = 0.328), which was not statistically significant. This suggests that higher screen time was not meaningfully associated with shorter sleep in this group. In contrast, several significant correlations were observed among the ESS items. Sleepiness while reading was positively correlated with sleepiness while watching television (rs = 0.285, p = 0.002). Sleepiness while sitting inactive was correlated with sleepiness as a car passenger (rs = 0.358, p = 0.0001). Sleepiness after lunch was correlated with sleepiness in traffic (rs = 0.322, p = 0.0005). These results suggest that daytime sleepiness tends to cluster in similar everyday situations (Table 6).

**Table 6 Spearman's rank correlations among ESS items and screen time (N = 115)**

| Variable 1 | Variable 2 | rs | p-value |
|---|---|---|---|
| Screen time | Sleep duration | −0.092 | 0.3279 |
| Age | Sleep latency | — | — |
| ESS1 (Reading) | ESS2 (Watching TV) | 0.285 | 0.002 |
| ESS3 (Sitting inactive) | ESS4 (Car passenger) | 0.358 | 0.0001 |
| ESS5 (Lying down afternoon) | ESS6 (Sitting & talking) | 0.026 | 0.7843 |
| ESS7 (After lunch) | ESS8 (In traffic) | 0.322 | 0.0005 |

Note rs- Spearman's rank correlation coefficient

### 3.6 Regression Analysis

A multiple regression analysis was performed to determine whether age, gender, caffeine consumption, screen time, and physical activity were predictive of sleep duration (Table 7). These variables collectively accounted for only a minor proportion of the variance in sleep duration, as the overall model was not statistically significant ($R^2 = 0.03$, p = 0.495). Caution should be exercised when interpreting individual predictors, as the model was non-significant. The coefficient (B = 0.324, p < 0.001) for age indicates that older students reported slightly longer sleep duration; however, this finding should be regarded as exploratory rather than conclusive. Physical activity (p = 0.361), caffeine intake (p = 0.173), screen time (p = 0.668), and gender (p = 0.703) were not significant predictors. Future research should implement binary logistic regression with categorical sleep outcomes (poor vs. good sleeper) and report odds ratios

(OR) with 95% confidence intervals, as well as effect sizes, to offer more robust insights into the predictors of poor sleep quality.

**Table 7. Multiple regression analysis of predictors of sleep duration (N = 115)**

| Predictor | B | p-value |
|---|---|---|
| **Age** | 0.324 | $p < 0.001$ |
| **Gender (Male)** | −0.112 | 0.703 |
| **Caffeine intake** | −0.278 | 0.173 |
| **Screen time** | −0.060 | 0.668 |
| **Physical activity** | 0.186 | 0.361 |

## 4. Discussion

In this study, second year MBBS students of Kolhapur had poor sleep quality with sleep latency as the most disturbed domain and almost 1/3 of them had clinically relevant excessive daytime sleepiness (EDS). These findings are in agreement with the world literature but some contextual factors need further discussion.

Females were significantly more likely than males to experience suboptimal sleep. The same results have been reported in Saudi Arabia, Ethiopia and Rwanda [12,13,14]. This difference might be attributed to biological differences, including hormonal changes, heightened sensitivity to stress, or the expectations and pressures of the sociocultural environment that female students may face. The influences underscore the importance of gender responsive interventions in medical education.

The most impaired domain is sleeping latency. Long sleep latency time indicates lifestyle and psychological factors. These are probably caused by late night study sessions, irregular routines and increased academic pressure. Similar findings have been reported with other student groups [15]. One consideration is structured sleep hygiene education which may be helpful particularly in the management of sleep onset problems with focus on reduced late night screen time, regular sleep schedules and stress reduction strategies. Contrary to some previous research that has shown a relationship between electronic media and sleep, this study did not show a significant relationship between the two. Cain and Gradishar (2010) found a number of studies indicating that exposure to screens before sleep could postpone time to bedtime and impact on sleep quality [16]. This difference might be attributed to the small sample size, self-reported measures or differences in digital behaviour patterns between pupils in smaller cities in India and those in larger urban centres. More research is needed that includes objective measures of screen use (e.g., digital tracking) to understand this relationship better.

Reliability of PSQI. The Cronbach α for the PSQI was only 0.457, which is not acceptable at an α of 0.70. The low internal consistency is partly due to the multidimensionality of the PSQI as different domains (such as sleep latency, sleep duration, disturbances) do not strongly correlate. This is a limitation of the PSQI, which is a validated form [17] but should be recognized, and future research could

include the use of objective measures, such as actigraphy or polysomnography.

Application for medical education in smaller towns in India. The majority of published research on the quality of sleep of medical students is from large institutions in the metropolitan area. This study reveals the importance of focusing on smaller cities, including Kolhapur, where students could be experiencing sociocultural factors, fewer wellness programs, and less access to counselling services, thus making sleep problems equally common there. Including sleep hygiene education and stress management workshops in the curriculum may be a cost-effective intervention that has substantial impact on academic performance, mental health and clinical competence. Recently, several systematic reviews have highlighted that sleep is improved and daytime sleepiness decreased with the use of structured programs [18].

Some limitations exist in this investigation. Although the study was conducted at a single medical college, the sample size was relatively small, which may restrict its generalizability. Sleep quality and daytime drowsiness are captured at a single point in time by the cross-sectional design, which precludes the inference of causal relationships. Recall or reporting bias may be introduced by the use of self-reported questionnaires, and objective measures such as actigraphy or polysomnography were not implemented. And finally, the PSQI exhibited a lower internal consistency, which was indicative of its multidimensional nature.

## 5. Conclusion

This study showed a high prevalence of poor sleep quality and excessive daytime sleepiness (EDS) among second-year MBBS students in Kolhapur, Maharashtra. Over half reported poor sleep quality, with sleep latency most impaired, and nearly one-third had clinically relevant EDS. Female students were significantly more likely to report poor sleep quality, consistent with findings from Saudi Arabia [3], Ethiopia [5], and Rwanda [6]. Age was a significant predictor of sleep duration, indicating developmental influences even within a narrow age range. These results align with international studies reporting high sleep disturbance among medical students [2–6]. Poor sleep has been associated with lower cognitive functioning, greater psychological distress, and reduced clinical competence [1,3,7]. Because sleep issues are multifaceted, interventions should address both behavioural and institutional factors. Evidence shows that structured programs teaching sleep hygiene and stress management improve sleep quality and reduce daytime sleepiness [8,9]. Incorporating such measures into medical curricula could protect student well-being, enhance learning, and promote safer clinical practice.

## 6. Conflict of Interest

Conflict of Interest: The authors declare no conflict of interest.


## 7. Funding Statement

Funding: No external funding was received for this study.


## 8. Ethics Statement

This cross-sectional observational study was conducted from May–June 2026, after obtaining ethical clearance from the Institutional Ethics Committee (IEC) of Dr. D. Y. Patil Medical College, Kolhapur (dated 24th April 2026).

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