

Sleep Quality and Its Associated Factors Among Medical Undergraduates of a Tertiary Care Teaching Institution in Perambalur District, Tamil Nadu - A Cross -Sectional Study

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Abstract

Background: Sleep is essential for physical, cognitive and emotional well-being, yet it is frequently compromised among medical undergraduates by demanding academic schedules and stress. Data from small tertiary teaching institutions in semi-urban India remain limited.

Objective: To assess the level of sleep quality and academic stress among medical undergraduates at a tertiary care teaching institution in Perambalur District using the Pittsburgh Sleep Quality Index (PSQI).

Methods: A cross-sectional study was conducted over one month among 289 Phase I and II medical undergraduates selected by convenience sampling. Data

on sociodemographic and lifestyle characteristics, academic stress, and the 19-item PSQI were collected using a Google Forms questionnaire. A global PSQI score >5 defined poor sleep quality. Data were analysed in SPSS using descriptive statistics, the independent-samples t-test, one-way ANOVA and the chi-square test.

Results: Participants had a mean age of 19.7 ± 1.69 years; 60.9% were female. Overall, 232 of 289 students (80.3%) had poor sleep quality (PSQI >5). Mean global PSQI score was significantly higher in females than males (7.09 ± 2.47 vs 6.18 ± 2.63 ; $p=0.003$), and a significantly greater proportion of females had poor sleep quality (85.8% vs 71.7%; $p=0.003$). Mean perceived academic stress score was 6.86 ± 2.35 (range 1–10), and was significantly higher among second-year than first-year students (7.25 ± 2.42 vs 6.44 ± 2.19 ; $p=0.003$), although global PSQI scores did not differ significantly by year of study ($p=0.148$). Nearly half of the participants (47.4%) reported no regular physical activity, and the median daily screen time was 4 hours.

Conclusion: Poor sleep quality is highly prevalent among medical undergraduates in this semi-urban teaching institution, particularly among female students, and coexists with substantial academic stress, low physical activity and high screen exposure. Institutional sleep-hygiene and stress-management interventions are warranted.

Keywords: Sleep quality, Pittsburgh Sleep Quality Index, medical students, academic stress, cross-sectional study, India

Introduction

Sleep is a fundamental physiological process essential for physical health, cognitive functioning and emotional well-being¹. Good-quality sleep is characterised not merely by duration but by its restorative value and by

uninterrupted rest across defined dimensions such as sleep latency, sleep efficiency and the frequency of nocturnal disturbances¹. Globally, sleep disorders and poor sleep quality have emerged as major public health concerns; the World Health Organization estimated that more than one billion people worldwide carried a burden of disturbed sleep in 2023, a figure projected to rise to 1.4 billion by 2030². In India, epidemiological surveys suggest that approximately one-quarter of the population experiences insomnia symptoms³, with disturbances documented across the lifespan — from a delayed sleep phase tendency among adolescents, whose mean sleep duration has been reported as 7.49 ± 1.12 hours on weekdays and 9.32 ± 1.55 hours on weekends⁴, through stress - related disturbance in adults, to fragmented and shortened sleep among the elderly.

Undergraduate medical students form a particularly vulnerable group within this spectrum. Rigorous academic schedules, prolonged study hours, night duties during clinical postings and high psychological stress converge to compromise their sleep. A pooled analysis of 57 studies involving 25,735 medical students estimated the global prevalence of poor sleep quality on the Pittsburgh Sleep Quality Index (PSQI) at 52.7%⁵, while individual surveys from Saudi Arabia, Pakistan, Nigeria and a seven-country multinational cohort during the COVID-19 pandemic have reported prevalence figures ranging from roughly one-third to over four-fifths of students^{6,10}. Within India, medical students have similarly been shown to be vulnerable, with internet gaming disorder linked to perceived stress and suicidal behaviour¹¹ and a high burden of poor sleep quality (74.9%) coexisting with low levels of physical activity¹². Poor sleep among medical students has consistently been associated with impaired

concentration, mood disturbance, reduced cognitive performance and lower academic productivity¹³, and rising screen exposure has emerged as a contemporary contributor, with recent Indian data showing a strong positive correlation ($r=0.86$) between cumulative screen time and global PSQI score among medical and nursing students¹⁴.

Despite this substantial body of international and national evidence, sleep quality among medical undergraduates in the specific socio-academic context of small tertiary teaching institutions in semi-urban districts of Tamil Nadu — such as Perambalur — remains largely uncharacterised. Characterising the burden and correlates of poor sleep in this setting is necessary to inform locally relevant student-wellness interventions.

Research Question

What is the level of sleep quality and its associated factors among medical undergraduates at a tertiary care teaching institution in Perambalur District?

Study Objectives

Primary objective: To assess the level of sleep quality among medical undergraduates at a tertiary care teaching institution in Perambalur District using the Pittsburgh Sleep Quality Index (PSQI).

Secondary objective: To assess the level of academic stress among medical undergraduates at the same institution and to examine its association with sleep quality.

Methodology

This was an institution-based, descriptive cross-sectional study conducted over a period of one month at the Dhanalakshmi Srinivasan Institute of Medical Sciences and Hospital, a tertiary care teaching institution in Perambalur District, Tamil Nadu. A cross-sectional design was chosen to allow rapid ascertainment of sleep-

quality status across a large group of students within a limited time frame. The study population comprised Phase I and Phase II undergraduate medical students of the institute. Students willing to participate were included; those undergoing treatment for a diagnosed sleep disorder, or unwilling to participate, were excluded. Participants were recruited by convenience sampling during non-academic hours in classrooms and hostels; a total of 289 students provided complete responses and were included in the final analysis. Data were collected using a structured, self-administered questionnaire circulated as a Google Form via WhatsApp and institutional e-mail, with at least one reminder sent during the collection period. The questionnaire captured sociodemographic details (age, gender, year of study, type of residence), lifestyle factors (caffeine intake, smoking and alcohol use, physical activity, screen time, use of sleep medication) and self-reported academic stress on a 1–10 scale. Sleep quality over the preceding month was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated 19-item self-rated instrument comprising seven component scores — subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction — summed to yield a global score ranging from 0 to 21. A global PSQI score >5 was taken to indicate poor sleep quality, and a score ≤ 5 was taken to indicate good sleep quality. Written informed consent was obtained from all participants after the purpose of the study was explained and doubts clarified. Responses were exported from Google Forms into Microsoft Excel for initial organisation and subsequently analysed using SPSS (Statistical Package for the Social Sciences).

The dependent variable was sleep quality, dichotomised as good (PSQI ≤ 5) or poor (PSQI > 5). Independent variables comprised sociodemographic characteristics (age, gender, year of study, residence type); the seven PSQI components; lifestyle and behavioral variables (screen time, caffeine consumption, smoking and alcohol use, physical activity, study hours); and academic/psychosocial variables (self - reported academic stress, examination pressure, use of sleep medication). Descriptive statistics (means, standard deviations, medians, frequencies and percentages) were used to summarise sociodemographic, lifestyle and sleep-related variables. The independent-samples t-test was used to compare mean global PSQI and academic stress scores between two groups (gender), one-way analysis of variance (ANOVA) was used to compare means between year-of-study groups, and the chi-square test was used to assess the association between

categorical variables (gender and sleep-quality category). A p-value < 0.05 was considered statistically significant.

Ethical considerations

Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement of the study. Informed consent was obtained from all participants, and anonymity and confidentiality of responses were maintained throughout.

Results

A total of 289 medical undergraduates participated in the study, comprising 176 (60.9%) females and 113 (39.1%) males, with a mean age of 19.7 ± 1.69 years (range 17–37 years). First-year students constituted 48.1% ($n=139$) and second-year students 51.9% ($n=150$) of the sample. The great majority (90.0%) resided in the on-campus hostel. Sociodemographic and lifestyle characteristics of the participants are summarised in Table 1.

Table 1: Sociodemographic and lifestyle characteristics of study participants (N = 289)

Variable	Category	n	%
Gender	Female	176	60.9
	Male	113	39.1
Age (years)	Mean $\pm$ SD (range)	19.7 ± 1.69 (17–37)	
Year of study	First year	139	48.1
	Second year	150	51.9
Residence	On-campus hostel	260	90.0
	Off-campus, with friends	3	1.0
	With family	26	9.0
Known medical condition	None	273	94.5
	Present, untreated	9	3.1
	Present, on treatment	7	2.4
Daily caffeine intake	None	89	30.8
	1–2 cups	186	64.4
	3–4 cups	11	3.8

	>4 cups	3	1.0
Smoking	Non-smoker	285	98.6
	Occasional/Regular	4	1.4
Alcohol use	Never	285	98.6
	Occasional (1–2×/month)	4	1.4
Weekly exercise frequency	Nil	137	47.4
	1–2 days/week	81	28.0
	3–4 days/week	40	13.8
	5–6 days/week	11	3.8
	Every day	20	6.9
Daily screen time (hours)	Median (IQR)	4.00 (3.00–5.75)	

SD: standard deviation; IQR: interquartile range.

On the PSQI, the overall mean global score was 6.71 ± 2.56 , and 232 of 289 participants (80.3%) had poor sleep quality (global PSQI score >5). Nearly half the students reported difficulty maintaining adequate sleep duration, and 16.3% reported taking more than 30 minutes to fall asleep. The mean perceived academic stress score was 6.86 ± 2.35 (range 1–10), indicating a moderate-to-high level of academic stress overall; 21.5% of students rated their stress at the maximum level (10/10).

Global PSQI score and perceived academic stress score, stratified by gender and year of study, are presented in Table 2. Female students had a significantly higher mean global PSQI score than male students (7.09 ± 2.47 vs

6.18 ± 2.63 ; $p=0.003$, independent-samples t-test), indicating comparatively poorer sleep quality among females. Mean academic stress scores did not differ significantly by gender (6.92 ± 2.32 in females vs 6.77 ± 2.39 in males; $p=0.595$). By year of study, global PSQI scores were similar between first-year (6.96 ± 2.44) and second-year (6.52 ± 2.67) students ($p=0.148$, one-way ANOVA), whereas perceived academic stress was significantly higher among second-year students (7.25 ± 2.42) than first-year students (6.44 ± 2.19 ; $p=0.003$).

Table 2: Global PSQI score and perceived academic stress level according to gender and year of study

Variable	Group	n	Mean $\pm$ SD	SE	P value
Global PSQI score	Female	176	7.09 ± 2.47	0.186	0.003*
	Male	113	6.18 ± 2.63	0.247	
	First year	139	6.96 ± 2.44	0.207	0.148
	Second year	150	6.52 ± 2.67	0.218	
Perceived academic stress (1–10)	Female	176	6.92 ± 2.32	0.175	0.595
	Male	113	6.77 ± 2.39	0.225	
	First year	139	6.44 ± 2.19	0.186	0.003*

	Second year	150	7.25 ± 2.42	0.198	
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SD: standard deviation; SE: standard error. Gender comparisons by independent-samples t-test; year-of-study comparisons by one-way ANOVA. * $p < 0.05$ considered statistically significant.

The association between gender and sleep-quality category is presented in Table 3. A significantly larger proportion of females (85.8%) than males (71.7%) had poor sleep quality (PSQI > 5) (χ^2 test, $p = 0.003$).

Table 3: Association between gender and sleep-quality category (PSQI)

Gender	Poor sleep quality (PSQI > 5), n (%)	Good sleep quality (PSQI ≤ 5), n (%)	Total	P value
Female	151 (85.8)	25 (14.2)	176	0.003*
Male	81 (71.7)	32 (28.3)	113	
Total	232 (80.3)	57 (19.7)	289	

PSQI: Pittsburgh Sleep Quality Index. χ^2 test; * $p < 0.05$ considered statistically significant.

With regard to lifestyle correlates, physical inactivity was common: 47.4% of students reported no regular weekly exercise, and among those who did exercise, 38.8% engaged in less than 30 minutes of activity per day. Caffeine consumption was near-universal but modest in quantity (64.4% consuming 1–2 cups daily), while smoking and alcohol use were rare (1.4% each). The median daily screen time was 4 hours (IQR 3.00–5.75). Seven students (2.4%) were on regular medication for a diagnosed medical condition; of the medications reported, montelukast, migraine preparations, verapamil and metoprolol are pharmacologically recognised to be associated with sleep disturbance.

Discussion

In this cross-sectional study of 289 Phase I and II medical undergraduates in a semi-urban tertiary teaching institution in Tamil Nadu, four in five students (80.3%) had poor sleep quality on the PSQI. This figure is markedly higher than the pooled global estimate of 52.7% derived from 25,735 medical students across 57 studies⁵, and higher than prevalence figures reported from Pakistan (39.5%), Nigeria (32.5%)^{8,9} and a recent multicentric Croatian cohort (67.9%)¹⁵, although it is comparable to, or lower than, figures reported from

Saudi Arabia (76–83%)^{6,7} and from South Indian doctors and medical students (74.9%)¹². This wide variability across studies likely reflects differences in sampling frames, academic calendars, cultural attitudes to sleep, and the specific phase of training studied, but the consistently high prevalence across geographically and culturally diverse settings underscores that poor sleep is a near-universal feature of undergraduate medical education rather than an artefact specific to any one institution. A striking finding in the present study was the significant gender disparity in sleep quality: female students had both a higher mean global PSQI score and a significantly greater prevalence of poor sleep (85.8% vs 71.7%; $p = 0.003$). This pattern is consistent with several recent reports. In a large multicentric Croatian study, female medical students had significantly higher PSQI scores than males, alongside higher depression, anxiety and stress scores¹⁵, and comparable gender gradients favouring poorer sleep among women have been reported from other Indian medical-student cohorts. Hormonal, psychosocial and stress-appraisal differences between genders have all been proposed as contributory mechanisms, though the

precise pathway could not be examined within the cross-sectional design of the present study.

Academic stress was substantial overall (mean 6.86 ± 2.35 on a 10-point scale) and was significantly higher among second-year than first-year students, even though global PSQI scores did not differ significantly between the two years. This dissociation — rising stress without a parallel, statistically significant deterioration in global sleep score — suggests that second-year students may be partially compensating for, or adapting to, higher academic demands, or that the global PSQI score, being a composite of seven components, may not be sensitive enough over a single academic year to capture more subtle shifts in specific sleep domains such as latency or efficiency. Nonetheless, a positive association between academic/perceived stress and poor sleep quality has been repeatedly demonstrated in the medical-student literature^{6,16}, and the marked stress escalation seen here in second-year students merits close monitoring as they progress toward clinical postings. Lifestyle correlates identified in this study — near-universal caffeine use, low levels of structured physical activity (47.4% reporting no weekly exercise) and a median screen time of 4 hours daily — mirror patterns described elsewhere. A recent Indian study among medical and nursing undergraduates found a strong positive correlation ($r=0.86$, $p<0.001$) between cumulative screen time and global PSQI score¹⁴ reinforcing screen exposure as a modifiable target for intervention, although evidence from other settings on this association has been mixed, with some European cohorts finding no significant correlation once confounders were accounted for. Physical inactivity, similarly, has been linked with poorer sleep quality in medical and nursing students in other South Indian cohorts¹², consistent with the low

activity levels observed in the present sample. These findings collectively point toward feasible avenues for institutional intervention. A systematic review of psychological interventions among medical and paramedical students found that both structured sleep-hygiene education and cognitive behavioral therapy for insomnia produced significant improvements in sleep quality, with cognitive behavioral approaches showing more consistent effects¹⁷. Embedding brief sleep-hygiene modules, promoting structured physical activity, and rationalising examination and clinical-posting schedules — particularly around the second year, when academic stress peaks — may therefore be reasonable, evidence-aligned steps for the institution to consider.

Strengths

This study benefits from a reasonably large sample size ($n=289$) relative to many single-centre studies in this field, use of the validated and internationally comparable PSQI instrument, and a comprehensive assessment spanning sociodemographic, lifestyle and psychosocial correlates of sleep. To the best of the investigators' knowledge, it provides among the first institution-level data on sleep quality from a semi-urban tertiary medical teaching institution in Perambalur District, addressing a geographical gap in the existing literature.

Limitations

Several limitations warrant consideration. First, the cross-sectional design precludes any causal or temporal inference between the identified correlates (stress, screen time, physical inactivity) and poor sleep quality. Second, convenience sampling from a single institution may limit the generalisability of findings to other medical colleges or regions. Third, all data, including PSQI responses and academic stress ratings, were self-reported and collected via an online form, introducing potential recall and

social-desirability bias, and possibly excluding students with limited digital access. Fourth, the study was restricted to Phase I and II students and conducted over a relatively short one-month window, so findings may not extend to senior or clinical-phase students who face different stressors such as clinical postings and night duties. Finally, objective measures of sleep (e.g. actigraphy) were not used to corroborate subjective PSQI ratings.

Conclusion

This study demonstrates a high prevalence of poor sleep quality (80.3%) among medical undergraduates at a tertiary care teaching institution in Perambalur District, with female students and those in their second year of study emerging as particularly affected in terms of sleep quality and academic stress, respectively. Academic pressure, low physical activity and substantial screen exposure appear to be important, potentially modifiable correlates. These findings highlight the need for structured sleep-hygiene education, stress-management support and wellness programmes within the medical curriculum to safeguard students' well-being, academic performance, and long-term physical and mental health.

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