



Original Research Article

INSIGHTS INTO SLEEP MEDICINE: A CROSS-SECTIONAL STUDY AMONG THE MEDICAL FRATERNITY

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ABSTRACT

Background: Knowledge of sleep physiology and sleep medicine is important for recognising, evaluating, and managing sleep-related disorders. However, formal exposure to sleep medicine remains limited during medical training.

Aim: To assess and compare knowledge regarding sleep physiology and sleep medicine among undergraduate medical students, interns, postgraduate students, and faculty members.

Materials and Methods: A web-based cross-sectional study was conducted among undergraduate medical students, interns, postgraduate medical students, and faculty members at Kamineni Institute of Medical Sciences, Narketpally, Telanganaduring the period from June 2025 to November 2025. Participants were recruited through virtual snowball sampling. Knowledge was assessed using the 30-item Assessment of Sleep Knowledge in Medical Education questionnaire. The items were classified into two domains: sleep physiology knowledge and sleep medicine knowledge. Responses were collected through an online form and analysed using SPSS version 11. Categorical variables were expressed as frequencies and percentages. Associations between participant characteristics and knowledge categories were examined using the chi-square test. A p value of <0.05 was considered statistically significant.

Results: A total of 274 participants were included, of whom 170 (62.0%) were female and 104 (38.0%) were male. The sample comprised 177 (64.6%) undergraduate students, 26 (9.5%) interns, 14 (5.1%) postgraduate students, and 57 (20.8%) faculty members.

Overall, 169 participants (61.7%) demonstrated adequate sleep-physiology knowledge, whereas 105 (38.3%) had inadequate knowledge. Adequate sleep-medicine knowledge was observed in 111 participants (40.5%), while 163 (59.5%) demonstrated inadequate knowledge. Sleep-physiology knowledge did not differ significantly according to gender, with adequate knowledge observed in 67 males (64.4%) and 102 females (60.0%; $p=0.464$). Similarly, adequate sleep-medicine knowledge was observed in 46 males (44.2%) and 65 females (38.2%), without a statistically significant gender difference ($p=0.326$).

Conclusion: Knowledge differed significantly across academic stages. Adequate sleep-physiology knowledge was observed among 94 undergraduates (53.1%), 30 interns and postgraduate students combined (75.0%), and 45 faculty members (78.9%; $p=0.00039$). Adequate sleep-medicine knowledge was identified among 53 undergraduates (29.9%), 22 interns and postgraduate students.

Keywords: Sleep Medicine, Physiology, Psychiatry

INTRODUCTION

Sleep is a fundamental, actively regulated biological process that supports neurocognitive performance, emotional regulation, immune function, metabolic homeostasis, cardiovascular health, and overall well-being. Disturbances in sleep duration, continuity, timing, or architecture are associated with substantial adverse health consequences. Recent global estimates suggest that approximately 852 million adults may experience clinically relevant insomnia, corresponding to a worldwide prevalence of about 16.2%, while nearly 415 million may have severe insomnia.^[1] This considerable burden, together with the high prevalence of obstructive sleep apnoea, circadian rhythm disorders, hypersomnolence, and other sleep-related conditions, makes competence in sleep medicine increasingly important for physicians across specialties.

Sleep-related problems are particularly common among medical students, whose demanding academic schedules, prolonged screen exposure, examination stress, irregular routines, night duties, and shift-based clinical training may adversely affect their sleep. A systematic review and meta-analysis involving 109 studies and 59,427 medical students estimated that 55.6% had poor sleep quality and 33.3% experienced excessive daytime sleepiness. The average reported sleep duration was approximately 6.5 hours per night, and at least 30% of medical students slept for less than the generally recommended seven to nine hours.^[2] Indian evidence has similarly demonstrated a high burden, with one study reporting poor sleep among 72.9% of medical students compared with 51.9% of non-medical students.^[3] These findings are important not only for students' personal health but also because sleep deprivation may impair attention, memory, decision-making, academic performance, emotional stability, and clinical functioning.

Despite the widespread clinical importance of sleep disorders, sleep medicine has historically received limited attention in undergraduate and postgraduate medical education. Deficiencies in formal teaching may result in poor recognition of sleep-related symptoms, inadequate sleep-history taking, inappropriate attribution of daytime manifestations, delayed diagnosis, and insufficient counselling or referral. A 2024 study of final-year medical students found that although many participants recalled instruction about sleep apnoea and sleep physiology, considerably fewer remembered structured education regarding sleep assessment, insomnia, or the management of shift work. Students identified the treatment of common sleep disorders, performance of a sleep history, and navigation of shift work as priority learning needs.^[4]

Sleep medicine education also remains uneven across countries and institutions. A recent assessment of medical students in Brazil found that

only 3.7% reported exposure through a dedicated discipline, while more than half experienced barriers such as limited curricular time. Knowledge was positively related to the extent of educational exposure, supporting the value of deliberate and sustained curriculum integration.^[5] Similarly, a study among Nigerian medical and dental students reported that 77% had low sleep-knowledge scores; year of study and prior awareness of sleep medicine were among the predictors of knowledge.^[6] Studies from other regions have likewise documented limited knowledge and inadequate confidence among medical students, suggesting that this is a systemic international educational deficit rather than an isolated institutional problem.

The situation is particularly relevant in Asia, where the development of sleep medicine varies widely between countries. A 2024 regional survey identified important barriers to organised sleep-medicine training, including shortages of trained specialists and technologists, limited accredited programmes, and the absence of national certification structures in several countries. The study emphasised the need for standardised curricula, defined competencies, formal accreditation, and collaborative training across the region.^[7] A subsequent Asian sleep-medicine fellowship curriculum further highlighted the growing need to establish structured, milestone-based training pathways appropriate to regional healthcare requirements.^[8]

Knowledge deficiencies may persist even as students advance through medical education when sleep-related concepts are dispersed across physiology, psychiatry, respiratory medicine, neurology, otorhinolaryngology, paediatrics, and general medicine without explicit vertical integration. Earlier multicentre research among Saudi medical students using the Assessment of Sleep Knowledge in Medical Education questionnaire found a mean score of only 10.39 out of 30, while fewer than 1% scored above 20. Most students rated their knowledge as below average or poor, illustrating the discrepancy between the clinical burden of sleep disorders and curricular preparation.^[9]

The Assessment of Sleep Knowledge in Medical Education survey was developed as a standardised instrument to assess knowledge across basic sleep principles, circadian sleep–wake regulation, normal sleep architecture, common sleep disorders, the effects of drugs and alcohol on sleep, and sleep in medical disorders. The original 30-item instrument demonstrated strong internal consistency, with a Kuder–Richardson coefficient of 0.89, and effectively discriminated between groups with different levels of sleep-related training and expertise.^[10] It has subsequently been used internationally to identify educational deficiencies among medical students, practising clinicians, and other healthcare trainees.

Importantly, knowledge gaps in sleep medicine are potentially modifiable. Educational interventions incorporating focused lectures, workshops, case-based instruction, and short intensive training programmes have demonstrated measurable improvements in ASKME and other sleep-knowledge scores. A sleep-medicine educational programme for health-professions trainees produced significant improvements in both ASKME and Dartmouth Sleep Knowledge and Attitude Survey scores, even among participants with relatively high baseline interest and knowledge.^[11] These findings support the feasibility of introducing structured sleep-medicine teaching within existing medical curricula.

Assessment of baseline knowledge among both learners and faculty is necessary before designing such educational interventions. Comparing undergraduate students, interns, postgraduate students, and faculty members may help determine whether knowledge improves with academic progression and identify domains in which deficiencies persist despite increasing clinical experience. Therefore, the present study was undertaken to assess and compare knowledge regarding sleep physiology and sleep medicine among medical students and faculty members and to examine its association with gender and academic stage.

Aim

To assess and compare knowledge regarding sleep physiology and sleep medicine among medical students and faculty members.

Objectives

1. To determine the level of knowledge regarding sleep physiology and sleep medicine among undergraduate students, interns, postgraduate students, and faculty members.
2. To examine the association of gender and academic stage with knowledge regarding sleep physiology and sleep medicine.

MATERIALS AND METHODS

Study Design

A questionnaire-based, web-based cross-sectional study was conducted among members of the medical fraternity.

Study Setting

The study was conducted at Kamineni Institute of Medical Sciences, Narketpally, Telangana.

Study Population

The study population consisted of undergraduate medical students, interns, postgraduate medical students, and faculty members.

Sample Size

A total of 274 participants who completed the study questionnaire were included in the final analysis.

Sampling Technique

Participants were recruited using a virtual snowball sampling technique. The online questionnaire was

initially circulated among eligible participants through digital communication platforms, and recipients were encouraged to share it with other eligible individuals within their professional and academic networks.

Eligibility Criteria

Inclusion Criteria

Undergraduate medical students, interns, postgraduate medical students, and faculty members who were willing to participate and submitted a completed questionnaire were included.

Exclusion Criteria

Participants from non-medical academic backgrounds, individuals who did not provide consent, and respondents who submitted incomplete or duplicate questionnaires were excluded.

Study Instrument

Knowledge was assessed using the Assessment of Sleep Knowledge in Medical Education questionnaire. The instrument consisted of 30 items designed to assess knowledge related to sleep.

For the purpose of analysis, the questionnaire items were classified into the following two domains:

1. Sleep Physiology Knowledge
2. Sleep Medicine Knowledge

Participant responses were evaluated according to the scoring framework of the questionnaire and categorised as adequate or inadequate knowledge within each domain.

Data-Collection Procedure

The questionnaire was converted into a structured online form and circulated electronically among undergraduate students, interns, postgraduate students, and faculty members. The first section collected information regarding gender and academic stage. The subsequent sections assessed knowledge regarding sleep physiology and sleep medicine.

Participation was voluntary. Respondents were informed about the purpose of the study before completing the questionnaire. No personally identifying information was collected. Submitted responses were screened for completeness and eligibility before inclusion in the final analysis.

Study Variables

The primary outcome variables were:

- Adequate or inadequate sleep-physiology knowledge
- Adequate or inadequate sleep-medicine knowledge

The explanatory variables were:

- Gender
- Academic stage

Academic stage was classified as undergraduate, intern, postgraduate, or faculty. Interns and postgraduate students were combined into a single category for inferential analyses because of the relatively small number of participants in the individual groups.

Operational Definitions

Adequate Knowledge

A participant whose questionnaire score met the predefined adequacy threshold for the respective knowledge domain was classified as having adequate knowledge.

Inadequate Knowledge

A participant whose questionnaire score was below the predefined adequacy threshold for the respective knowledge domain was classified as having inadequate knowledge.

Sleep-Physiology Knowledge

Knowledge relating to the physiological basis, regulation, stages, and functions of sleep, as assessed by the relevant items of the questionnaire.

Sleep-Medicine Knowledge

Knowledge relating to the recognition, evaluation, clinical implications, and management of sleep-related disorders, as assessed by the relevant questionnaire items.

Data Management and Statistical Analysis

Data collected through the online questionnaire were exported into a spreadsheet, checked for completeness, coded, cleaned, and entered into SPSS software version _____ for statistical analysis.

Categorical variables were summarised using frequencies and percentages. Knowledge regarding sleep physiology and sleep medicine was categorised as adequate or inadequate.

The chi-square test was used to assess:

- The association between gender and sleep-physiology knowledge
- The association between gender and sleep-medicine knowledge
- The association between academic stage and sleep-physiology knowledge
- The association between academic stage and sleep-medicine knowledge

All statistical tests were two-sided. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of Kamineni Institute of Medical Sciences, Narketpally, Telangana.

RESULTS

A total of 274 participants were included in the study. Of these, 104 (38.0%) were male and 170 (62.0%) were female. Undergraduate students constituted the largest group, accounting for 177 (64.6%) participants, followed by 57 (20.8%) faculty members, 26 (9.5%) interns, and 14 (5.1%) postgraduate students.

Table 1: Demographic and academic characteristics of the study participants (N=274)

Characteristic	Category	n	%
Gender	Male	104	38.0
	Female	170	62.0
Academic stage	Undergraduate	177	64.6
	Intern	26	9.5
	Postgraduate	14	5.1
	Faculty	57	20.8

Overall, 169 (61.7%) participants demonstrated adequate knowledge of sleep physiology, while 105 (38.3%) had inadequate knowledge. In comparison, adequate knowledge of sleep medicine was observed in 111 (40.5%) participants, whereas 163 (59.5%) had inadequate knowledge.

Table 2: Overall knowledge of sleep physiology and sleep medicine (N=274)

Knowledge domain	Adequate, n (%)	Inadequate, n (%)
Sleep physiology	169 (61.7)	105 (38.3)
Sleep medicine	111 (40.5)	163 (59.5)

The proportion of participants with adequate sleep-physiology knowledge was 21.2 percentage points higher than the proportion with adequate sleep-medicine knowledge.

Table 3: Magnitude of knowledge deficit across the two domains

Measure	Sleep physiology	Sleep medicine
Adequate knowledge, %	61.7	40.5
Inadequate knowledge, %	38.3	59.5
Absolute difference in adequate knowledge	21.2 percentage points	

Among male participants, 67 (64.4%) had adequate sleep-physiology knowledge and 37 (35.6%) had inadequate knowledge. Among female participants, 102 (60.0%) had adequate knowledge and 68 (40.0%) had inadequate knowledge. The association between gender and sleep-physiology knowledge was not statistically significant ($\chi^2=0.534$, $df=1$, $p=0.465$).

Table 4: Association between gender and sleep-physiology knowledge (N=274)

Gender	Adequate, n (%)	Inadequate, n (%)	χ^2	df	p-value
Male (n=104)	67 (64.4)	37 (35.6)	0.534	1	0.465
Female (n=170)	102 (60.0)	68 (40.0)			

Adequate sleep-medicine knowledge was observed in 46 (44.2%) male participants and 65 (38.2%) female participants. Inadequate knowledge was observed in 58 (55.8%) males and 105 (61.8%)

females. The association between gender and sleep-medicine knowledge was not statistically significant ($\chi^2=0.962$, $df=1$, $p=0.327$).

Table 5: Association between gender and sleep-medicine knowledge (N=274)

Gender	Adequate, n (%)	Inadequate, n (%)	χ^2	df	p-value
Male (n=104)	46 (44.2)	58 (55.8)	0.962	1	0.327
Female (n=170)	65 (38.2)	105 (61.8)			

Sleep-physiology knowledge differed significantly according to academic stage. Adequate knowledge was observed in 94 (53.1%) undergraduate students, 30 (75.0%) interns and postgraduate students

combined, and 45 (78.9%) faculty members. The association between academic stage and sleep-physiology knowledge was statistically significant ($\chi^2=15.696$, $df=2$, $p<0.001$).

Table 6: Association between academic stage and sleep-physiology knowledge (N=274)

Academic stage	Adequate, n (%)	Inadequate, n (%)	χ^2	df	p-value
Undergraduate (n=177)	94 (53.1)	83 (46.9)	15.696	2	<0.001
Intern and postgraduate (n=40)	30 (75.0)	10 (25.0)			
Faculty (n=57)	45 (78.9)	12 (21.1)			

A significant association was also observed between academic stage and sleep-medicine knowledge. Adequate knowledge was present in 53 (29.9%) undergraduate students, 22 (55.0%) interns and

postgraduate students combined, and 36 (63.2%) faculty members. The association was statistically significant ($\chi^2=23.817$, $df=2$, $p<0.001$).

Table 7: Association between academic stage and sleep-medicine knowledge (N=274)

Academic stage	Adequate, n (%)	Inadequate, n (%)	χ^2	df	p-value
Undergraduate (n=177)	53 (29.9)	124 (70.1)	23.817	2	<0.001
Intern and postgraduate (n=40)	22 (55.0)	18 (45.0)			
Faculty (n=57)	36 (63.2)	21 (36.8)			

Faculty members demonstrated the highest proportion of adequate knowledge in both domains, followed by interns and postgraduate students, while

undergraduate students had the lowest proportion of adequate knowledge.

Table 8: Academic-stage-wise comparison of adequate knowledge across domains

Academic stage	Sleep physiology, n (%)	Sleep medicine, n (%)	Difference between domains, percentage points
Undergraduate	94 (53.1)	53 (29.9)	23.2
Intern and postgraduate	30 (75.0)	22 (55.0)	20.0
Faculty	45 (78.9)	36 (63.2)	15.7

Compared with undergraduate students, faculty members had a 25.8-percentage-point higher prevalence of adequate sleep-physiology knowledge and a 33.2-percentage-point higher prevalence of

adequate sleep-medicine knowledge. Interns and postgraduate students had corresponding increases of 21.9 and 25.1 percentage points.

Table 9: Absolute differences in adequate knowledge according to academic stage

Comparison with undergraduates	Sleep physiology, percentage-point difference	Sleep medicine, percentage-point difference
Intern and postgraduate versus undergraduate	+21.9	+25.1
Faculty versus undergraduate	+25.8	+33.2

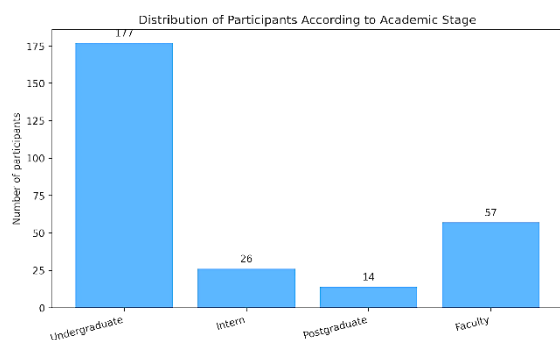


Figure 1: Distribution of Participants According to Academic Stage

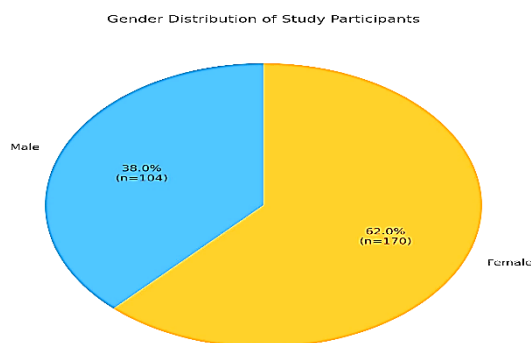


Figure 2: Gender Distribution of Study Participants

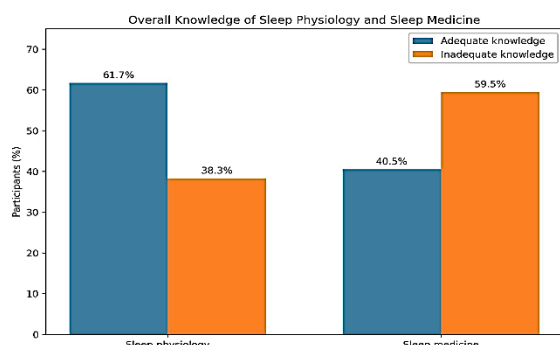


Figure 3: Overall Knowledge of Sleep Physiology and Sleep Medicine

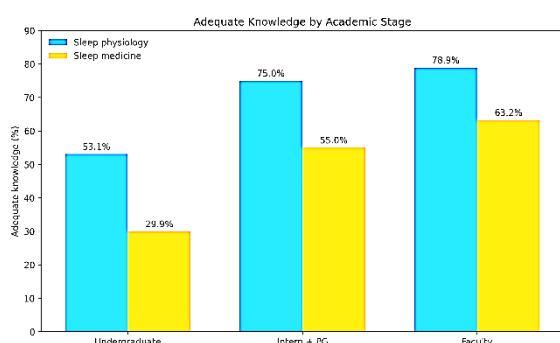


Figure 4: Adequate Knowledge of Sleep Physiology and Sleep Medicine According to Academic Stage

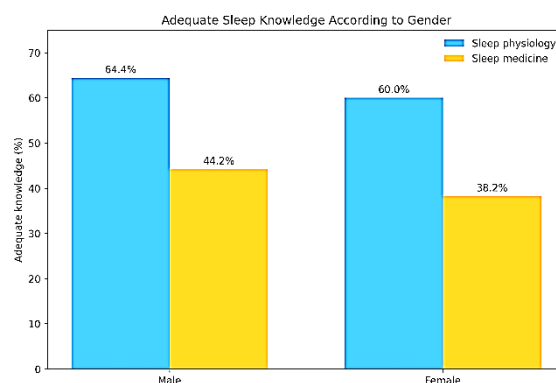


Figure 5: Adequate Knowledge of Sleep Physiology and Sleep Medicine According to Gender

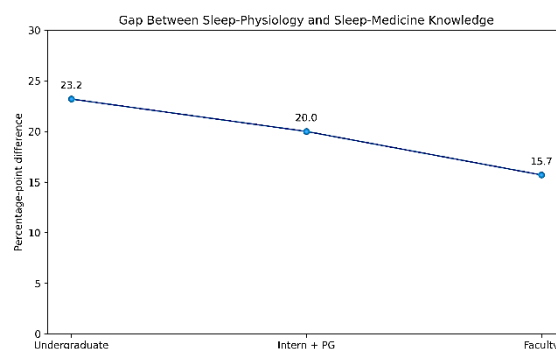


Figure 6: Gap Between Sleep-Physiology and Sleep-Medicine Knowledge According to Academic Stage

DISCUSSION

The present study assessed knowledge regarding sleep physiology and sleep medicine among 274 members of the medical fraternity, including undergraduate students, interns, postgraduate students, and faculty members. Overall, 61.7% of participants demonstrated adequate knowledge of sleep physiology, whereas only 40.5% demonstrated adequate knowledge of sleep medicine. Thus, the proportion with adequate knowledge was 21.2 percentage points lower in the clinical sleep-medicine domain than in the sleep-physiology domain. Gender was not significantly associated with knowledge in either domain. In contrast, academic stage showed a significant association with both sleep-physiology knowledge and sleep-medicine knowledge, with faculty members demonstrating the highest adequacy levels and undergraduate students demonstrating the lowest. The finding that sleep-physiology knowledge exceeded sleep-medicine knowledge suggests that participants were more familiar with fundamental concepts than with the recognition and clinical management of sleep disorders. This pattern is educationally plausible because basic sleep physiology is generally introduced during preclinical teaching, whereas clinical sleep medicine is often distributed across respiratory medicine, psychiatry, neurology, otorhinolaryngology, paediatrics, and general medicine without a clearly defined longitudinal curriculum. A recent survey of

final-year medical students in New Zealand found that 71% recalled receiving education in sleep physiology and 83% recalled teaching on sleep apnoea, but considerably fewer recalled structured teaching on sleep assessment, insomnia, and shift work. Students identified the treatment of common sleep disorders and performance of a sleep history as priority learning needs.^[12] These findings closely support the present observation that theoretical sleep knowledge may be retained better than clinically applicable sleep-medicine knowledge.

The overall level of adequate sleep-medicine knowledge in the present study was modest but comparatively higher than that reported in several international student populations. In a study of 488 medical and dental students in Nigeria, 77% had low sleep-knowledge scores when a threshold of 60% correct responses was applied.^[13] Similarly, a study from Qassim University, Saudi Arabia, reported poor sleep-medicine knowledge in 94.8% of participating fourth- and fifth-year students, while only 5.2% demonstrated good knowledge.^[14] These substantially poorer findings may reflect differences in participant composition, adequacy thresholds, curriculum exposure, and inclusion of faculty members in the present study. Nevertheless, all three studies indicate that sleep medicine remains insufficiently understood by a considerable proportion of medical trainees.

A multicentre study among graduating medical students in Lebanon reported mean ASKME scores of 17.5/30 in 2020 and 15.9/30 in 2021. Knowledge scores did not significantly differ according to gender, age, medical-school system, or institution, although the presence of sleep-medicine education in the curriculum was associated with higher scores.^[15] The absence of a significant gender association is consistent with the present study, in which adequate sleep-physiology knowledge was observed in 64.4% of males and 60.0% of females, while adequate sleep-medicine knowledge was observed in 44.2% and 38.2%, respectively. Neither difference was statistically significant. These findings indicate that knowledge deficiencies are more likely to be related to educational exposure and academic experience than to gender.

Alanazi et al. assessed 296 medical students using the ASKME survey and found deficiencies in knowledge regarding circadian neuroscience and sleep disorders despite generally favourable attitudes towards sleep medicine.^[16] Their findings further demonstrate that recognition of the importance of sleep does not necessarily translate into adequate clinical knowledge. This distinction is relevant to the present study because almost 60% of participants had inadequate sleep-medicine knowledge despite belonging to the medical profession.

Recent Brazilian evidence presents a somewhat more favourable knowledge profile. Among 240 senior medical students, the overall correct-response rate for sleep medicine and chronobiology was

79.75%. However, only 3.7% reported receiving instruction through a dedicated discipline, more than half encountered educational barriers, and knowledge was positively correlated with the extent of curricular exposure.^[17] The higher accuracy reported in that study may be partly related to the adapted instrument, inclusion of students in the final two years, and differences in scoring methodology. Importantly, the association between educational exposure and knowledge reinforces the present finding that participants at more advanced academic stages had higher adequacy levels.

The present academic-stage gradient was marked. Adequate sleep-physiology knowledge increased from 53.1% among undergraduates to 75.0% among interns and postgraduate students and 78.9% among faculty members. Adequate sleep-medicine knowledge increased more sharply, from 29.9% among undergraduates to 55.0% among interns and postgraduate students and 63.2% among faculty. Nigerian data similarly identified year of study as an independent predictor of sleep knowledge.^[13] These patterns suggest that increasing clinical exposure contributes to improved recognition of sleep-related conditions. However, the persistence of inadequate sleep-medicine knowledge in 36.8% of faculty members indicates that clinical seniority alone does not guarantee comprehensive competence.

This concern is supported by recent physician-level evidence. A 2026 study among 110 primary-care physicians in Qatar reported a mean ASKME score of 56.5%, with only 44.5% achieving the predefined adequate-knowledge threshold of 60%. Knowledge was lowest in common sleep disorders, sleep architecture, and the effects of drugs and alcohol on sleep.^[18] Although the population and setting differed, the proportion with adequate knowledge was comparable to the 40.5% overall sleep-medicine adequacy observed in the present study. Together, these findings indicate that deficiencies may persist beyond undergraduate training and may affect practising clinicians who are expected to recognise sleep disorders in routine care.

Indian studies have reported similar educational gaps. In a questionnaire-based study involving 278 resident doctors and interns from university hospitals in Central India, the mean basic sleep-knowledge score was 12.51 ± 5.08 . Although 58.63% expressed interest in sleep medicine, 62.94% supported its inclusion in the curriculum, and 53.23% were willing to enrol in sleep-medicine courses, knowledge remained limited and was not significantly correlated with attitude.^[19] This demonstrates that a positive attitude towards learning sleep medicine is insufficient unless accompanied by structured educational exposure. The present findings are consistent with this Indian evidence, particularly the inadequate sleep-medicine knowledge observed in 59.5% of all participants.

An earlier multicentre study of 615 final-year medical undergraduates from six medical colleges in Tamil Nadu found that 63.9% achieved good scores

in the knowledge domain, whereas only 9.1% achieved good scores in beliefs related to sleep and sleep hygiene. No significant gender differences were identified across knowledge, beliefs, or practice domains.^[20] The 63.9% good-knowledge rate is numerically close to the 61.7% adequate sleep-physiology knowledge in the present study, although the instruments and domains were not identical. The very low proportion with good sleep-related beliefs also highlights the potential disconnect between factual knowledge and its application to personal or clinical behaviour.

A North Indian study by Sandhu et al. used a validated sleep-knowledge questionnaire and evaluated whether an educational intervention could improve medical students' knowledge.^[21] The study was specifically designed around identifiable educational deficiencies and supports the feasibility of addressing these gaps through formal teaching. Although direct numerical comparison is limited by differences in scoring and intervention design, its Indian context strengthens the argument for curriculum-based sleep-medicine education rather than relying on incidental exposure during clinical training.

Deficiencies have also been documented among practising Indian physicians. An assessment of 65 chest physicians from Hyderabad, Secunderabad, and Warangal found poor overall awareness of sleep-disordered breathing, with no association between professional qualification and awareness level.^[22] This is particularly relevant to the present study because it shows that advanced qualifications do not necessarily ensure adequate knowledge in a specialised sleep domain. The current finding that more than one-third of faculty members lacked adequate sleep-medicine knowledge may represent the same broader problem of limited formal training. International curriculum surveys indicate that the problem is structural. A survey of undergraduate medical education in the United Kingdom found that the median time allocated to sleep medicine was only 1.5 hours, the most common allocation was less than one hour, and only 8% of medical schools had a dedicated syllabus or core module. Sleep teaching was often absorbed into other specialties, with obstructive sleep apnoea dominating the limited content.^[23] This fragmented curricular model may explain why learners acquire isolated facts without developing competence in sleep history, differential diagnosis, treatment principles, or referral pathways.

The observed difference between sleep-physiology and sleep-medicine knowledge also has practical implications. A survey of 261 medical students in the United States reported that 71.5% believed they required more than seven hours of sleep for optimal functioning, but only 24.9% actually obtained that duration during a typical academic period. During examination weeks, the proportion fell to 15.3%, and more than 40% slept for fewer than six hours.^[24] Thus, awareness of healthy sleep requirements may

coexist with poor personal sleep practices. Although sleep behaviour was not assessed in the present study, future research should evaluate whether knowledge is associated with sleep hygiene, daytime sleepiness, academic performance, and willingness to screen patients for sleep disorders.

Encouragingly, sleep-medicine knowledge is responsive to focused educational interventions. Salas et al. evaluated a two-day sleep-medicine course among 21 health-professions trainees. The mean baseline ASKME score was 21.4 ± 3.4 out of 30, and the intervention produced a mean improvement of 2.9 ± 2.1 points ($p=0.004$). Dartmouth Sleep Knowledge and Attitude Survey scores also increased by 2.5 ± 3.0 points ($p=0.001$).^[25] Another educational study found that a brief sleep intervention improved knowledge among medical students, although it did not produce a corresponding improvement in sleep quality, suggesting that knowledge acquisition alone may be insufficient to modify behaviour. These findings support structured teaching while also indicating that education should include behavioural, clinical, and institutional components.

The significant academic-stage associations observed in the present study support vertical integration of sleep education throughout medical training. Foundational instruction could begin with normal sleep physiology, circadian regulation, and sleep requirements during the preclinical years. Clinical training should subsequently address sleep-history taking, insomnia, obstructive sleep apnoea, circadian rhythm disorders, parasomnias, hypersomnolence, medication-related sleep disturbances, and appropriate referral. Internship and postgraduate education should incorporate sleep-related clinical decision-making, night-shift adaptation, fatigue risk, and patient-safety considerations. Faculty-development programmes are equally important because inadequate faculty knowledge may limit the quality and consistency of undergraduate teaching.

The findings should be interpreted in light of certain limitations. The single-centre, cross-sectional design limits generalisability and does not establish whether academic progression caused the observed increase in knowledge. Virtual snowball sampling may have introduced selection bias, and participant numbers were uneven across academic categories. Interns and postgraduate students were therefore combined for inferential analysis. The study classified knowledge as adequate or inadequate but did not report continuous ASKME scores, item-level performance, prior exposure to sleep teaching, specialty, years of experience, clinical confidence, attitudes, or personal sleep behaviour. Moreover, direct paired analysis between sleep-physiology and sleep-medicine knowledge could not be performed without participant-level cross-tabulated data.

Despite these limitations, the study provides relevant Indian evidence by simultaneously comparing undergraduate students, interns,

postgraduate students, and faculty members across separate sleep-physiology and sleep-medicine domains. The findings demonstrate that knowledge improves with academic advancement but remains inadequate in a substantial proportion of participants, including faculty. The marked deficit in clinical sleep-medicine knowledge supports the introduction of structured, longitudinal, competency-based sleep education within the medical curriculum and continuing professional development.

CONCLUSION

The study identified a substantial difference between knowledge of sleep physiology and knowledge of sleep medicine among members of the medical fraternity. Although 61.7% of participants demonstrated adequate knowledge of sleep physiology, only 40.5% had adequate knowledge of sleep medicine.

Gender was not significantly associated with knowledge in either domain. In contrast, academic stage was significantly associated with both sleep-physiology and sleep-medicine knowledge. Faculty members demonstrated the highest proportion of adequate knowledge, followed by interns and postgraduate students, while undergraduate students demonstrated the lowest levels.

Despite comparatively higher knowledge among advanced academic groups, more than one-third of faculty members had inadequate sleep-medicine knowledge. These findings indicate that advancement through medical education alone may not ensure sufficient clinical knowledge of sleep-related disorders. Formal, vertically integrated, and clinically oriented sleep-medicine education is therefore required across undergraduate, postgraduate, and faculty-development programmes. Strengths

The study assessed knowledge in both basic sleep physiology and clinical sleep medicine, enabling identification of the relative strengths and deficiencies across the two domains. Inclusion of participants from different stages of medical education permitted comparison across undergraduate students, interns, postgraduate students, and faculty members.

Use of a standardised questionnaire provided a structured approach to knowledge assessment. The web-based format enabled rapid and economical data collection from a comparatively broad group of participants. The study also generated institutionally relevant evidence that may be used to guide curriculum planning and faculty-development initiatives.

Limitations

The study was conducted at a single medical institution, which may limit the generalisability of its findings to other medical colleges and regions. The use of virtual snowball sampling may have

introduced selection bias because individuals with greater interest in sleep medicine or online academic activities may have been more likely to participate.

The number of participants was uneven across academic categories, with undergraduate students forming the largest group and interns and postgraduate students being comparatively underrepresented. Consequently, interns and postgraduate students had to be combined for inferential analysis.

The web-based design relied on voluntary self-participation and may have resulted in non-response bias. The study assessed knowledge using questionnaire responses but did not evaluate participants' clinical competence, diagnostic confidence, sleep-related attitudes, personal sleep behaviours, or previous formal exposure to sleep-medicine teaching.

The cross-sectional design provides information regarding knowledge at a single point in time and cannot determine whether academic progression or educational exposure directly caused the observed differences. Participant-level paired data linking sleep-physiology and sleep-medicine knowledge were not available for valid within-person domain-association analysis.

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