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Knowledge, Attitudes, and Practices Regarding Sleep-Related Breathing Disorders: A Cross-Sectional Study among Medical Students

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ABSTRACT

Introduction: Sleep-related breathing disorders (SRBD) affect millions globally and are associated with serious health complications such as cardiovascular diseases, stroke, and impaired cognitive function. Early recognition and management are crucial in reducing the burden. However, knowledge, attitude, and practice (KAP) regarding sleep related breathing disorders among medical students remain understudied.

Methods: A cross-sectional study was conducted on 250 medical students (1st to 4th year) between June and September 2024. A validated semi-structured questionnaire was used to assess the participants' knowledge, attitudes, and practices concerning SRBD. Descriptive statistics and Chi-square tests were employed for data analysis .

Results: The majority of participants were between 21-30 years of age (77.2%), with a slight female predominance (52.8%). The study revealed that 62.4% had limited knowledge of sleep-related breathing disorders, while 24.8% were well-informed. Knowledge about SRBD's consequences, diagnostic methods, and treatments was moderate, with 79.6% acknowledging its impact on health. In the attitude domain, 54.0% of students would seek medical help if experiencing Obstructive sleep apnea (OSA) symptoms, and 52.0% were likely to undergo polysomnography. However, 66.0% had never discussed sleep-related concerns with healthcare professionals. In terms of practice, 71.6% did not engage in habits that could exacerbate SRBD, and 50.8% prioritized sleep regularly. The mean knowledge score was 10.74 ± 3.999, attitude score was 6.71 ± 2.681, and practice score was 3.40 ± 1.996.

Conclusions: Medical students demonstrated moderate knowledge and generally positive attitudes towards SRBD, but their practices concerning sleep health were insufficient. The findings highlight the need for improved education and training in sleep medicine to enhance early detection and management of SRBD. Further studies with broader samples are recommended to validate these findings and improve the generalizability of the results.

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Introduction

Healthy individuals spend about one-third of their lives asleep, with adequate sleep serving as a crucial indicator of overall health and bodily function (1). Obstructive sleep apnea (OSA) is the most common sleep-related breathing disorder that disrupts normal sleep cycles (2). OSA affects individuals of all ages and sexes,

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characterized by recurrent upper airway obstruction or reduced airflow during sleep, causing desaturation, hypercapnia, and arousals. Adults with OSA often report loud snoring, apnea, unrefreshing sleep, and daytime hypersomnolence, with both short- and long-term negative consequences (3,4).The Sleep Heart Health Study reported a marginally higher prevalence of moderate to severe OSA among Blacks (20%) and American Indians (23%) compared with Whites (17%) (5). Subsequent studies have demonstrated prevalence estimates of 30% in Whites, 32% in Blacks, 38% in Hispanics, and 39% in Chinese individuals (6). Sleep-related breathing disorders (SRBD) are linked to complications like hypertension, ischemic heart disease (7), and stroke (8), leading to a reduced quality of life and increased healthcare utilization (9,10).

The prevalence of OSA is rising with increasing obesity, affecting an estimated 1 billion people worldwide, most of whom remain undiagnosed and untreated. Symptomatic OSA is present in 8–16% of adults (11,12). The prevalence of sleep problems varies with lifestyle, shift work, and comorbidities. In India, insomnia affects 25.7% of the population, while OSA has a prevalence of 37.4% (13). OSA is up to four times more common in males and seven times more common in individuals with obesity (BMI ≥ 30), though one-third of patients with OSA are not overweight or obese (14). The prevalence rises with age, particularly in those over 60, and is more common in individuals with obesity. The aging population and increasing obesity rates are driving its growing prevalence (15,16, 17).

Effective screening and early recognition by healthcare providers are essential to reduce the health impacts of OSA and improve cost-effectiveness (18). There have been various studies done on knowledge and attitudes regarding OSA among healthcare workers, but there are no available studies with medical students. Hence this study was undertaken.

Materials and Methods

Study Design, Sample Size and Source of Data

This cross-sectional study was conducted on 250 medical students (MBBS 1st-4th year) at Bangalore Medical College and Research Institute (BMCRI) in Bangalore over a period of four months from June 2024 to September 2024.

Inclusion Criteria

The study included medical students enrolled in the first to fourth year at BMCRI who were above 18 years of age and provided informed consent.

Exclusion Criteria

Individuals who did not consent to participate in the study and those with incomplete responses in the questionnaire were excluded.

Method of Data Collection

After obtaining approval from the institutional ethics committee, students who met the inclusion criteria were enrolled in the study after providing informed consent. Based on a study conducted by Goyal A et al (19), the sample size was calculated by considering a 95% confidence interval, 0.4% precision, and a standard deviation of knowledge score of 2.94. The final sample size was 208, but we considered 250 samples for this study. A conceptual framework was developed to design the questionnaire by identifying relevant domains through a literature search. A 30-item semi structured questionnaire was developed through a comprehensive literature review and comparable studies, then reviewed and validated by experts in Sleep Medicine. Each response was scored as correct, intermediate, or incorrect, and percentages were calculated separately for each question and for the knowledge, attitude, and practice domains. Domain-wise results were interpreted by grouping the total percentage of individuals' responses. Knowledge, attitude, and practice were categorized as good, adequate, or poor based on responses calculated as median scores at 33% and 66% of the average score of correct responses of all individuals.

The study tool was a validated semi-structured questionnaire divided into four sections. Section 1 captured participants' demographic characteristics, including age,

gender, education, occupation, and residence details. Section 2 comprised 10 questions assessing knowledge on symptoms, diagnosis, treatment, and the impact of the disease condition. Section 3 assessed attitudes using a 3-point Likert scale with options such as Yes, Maybe, No, and Very Likely, Somewhat Likely, Not Likely at All. Section 4 included questions exploring practices related to the resources and management of OSA. The main questionnaire underwent content validation by an expert panel to enhance its accuracy and appropriateness.

Statistical Analysis

The data collected will be entered into Microsoft Excel 2016 and analyzed using IBM SPSS Statistics (Version 29.0). Descriptive statistics, including frequency and percentage analysis for categorical variables, and mean and standard deviation for continuous variables, will be utilized. The Chi-Square test or Fisher's exact test will be used to assess associations in categorical data. Additional tests may be applied based on data distribution. A significance level of 0.05 will be considered for all statistical tests.

Result

The study consisted of 250 medical students with mean age of 23.3 ± 4.7 years, with the majority (77.2%) aged between 21-30 years and 22.8% aged up to 20 years. Females constituted 52.8% of the participants, while males accounted for 47.2%. Most participants resided in urban areas (84.8%), with only 15.2% from rural regions.

Table 1. Comparison of sociodemographic characteristics.

Age group (in years)	Values
Upto 20	57 (22.8%)
21 - 30	193 (77.2%)
Mean age (in years)	23.3 + 4.7
Gender	
Male	118 (47.2%)
Female	132 (52.8%)
Place of residence	
Rural	38 (15.2%)
Urban	212 (84.8%)

Values are represented as mean + standard deviation and n (%) : frequency (percentage*)*

Knowledge Domain

It consists of 10 questions. Result from the knowledge questionnaire revealed that 62.4% of participants had limited awareness of sleep-based breathing disorders, while 24.8% were well-informed. About 67.2% could name a few disorders, and 65.2% regarded them as serious diseases. Most participants (54.4%) knew 2-3 potential consequences of untreated disorders, such as cardiovascular problems and cognitive impairment. Awareness of diagnostic methods was moderate, with 62.0% somewhat familiar, although only 28.8% identified all common diagnostic tests like polysomnography. In terms of treatment, 56.4% were somewhat knowledgeable, and half (50.0%) believed all mentioned treatments, including CPAP, were appropriate. A majority (79.6%) acknowledged the impact of these disorders on overall health, but 64.8% felt there was insufficient awareness about the condition (Table 2).

Attitude Domain

The attitude questionnaire revealed that 54.0% of participants would seek medical help for symptoms such as snoring and fatigue, while 45.2% were very likely to seek help if they suspected a sleep-related breathing disorder. Over half (52.0%) were very likely to undergo polysomnography for diagnosis. While 77.2% had never been diagnosed with a sleep-related breathing disorder, only 1.6% reported being diagnosed. Regarding treatment, 55.6% expressed willingness to seek treatment, and 50.8% were very likely to get evaluated for

complications like heart failure or stroke. However, a notable proportion remained unsure or hesitant about seeking medical help or treatment (Table 3).

Table 2. Knowledge responses of medical students.

Sl. No.	Knowledge questionnaire	Responses N (%)
1.	**Have you ever heard of sleep based breathing disorders before?**	
	Know little	156 (62.4%)
	Know very well	62 (24.8%)
	None	32 (12.8%)
2.	**Can you name any sleep based breathing disorder that you are aware of?**	
	No, I can't name any	39 (15.6%)
	Yes, I can name few	168 (67.2%)
	Yes, I can name many	43 (17.2%)
3.	**Do you regard sleep based breathing disorders as a serious disease?**	
	No	87 (34.8%)
	Yes	163 (65.2%)
4.	**How many potential consequences of untreated sleep based breathing disorders do you know? - Cardiovascular problems, Daytime fatigue and sleepiness, Increased risks of accidents, cognitive impairment, Stroke**	
	2 to 3	136 (54.4%)
	4 to 5	93 (37.2%)
	None	21 (8.4%)
5.	**Do you know about any diagnostic methods of sleep based breathing disorders?**	
	Not at all	52 (20.8%)
	Somewhat	155 (62.0%)
	Very well	43 (17.2%)
6.	**Do you think the following options are common tests for diagnosing sleep based breathing disorders? - Examination Methods, X-ray, Head CT, Nasal endoscopy, Flexible nasopharyngoscopy (FNP), Polysomnography (PSG)**	
	All	72 (28.8%)
	Maybe a few	162 (64.8%)
	No	16 (6.4%)
7.	**How well do you know about the treatment of sleep based breathing disorders?**	
	Not at all	71 (28.4%)
	Somewhat	141 (56.4%)
	Very well	38 (15.2%)
8.	**Do you think the following options are the appropriate treatment for sleep based breathing disorders? Treatments, Weight control, Change sleep position, medical treatment, Non-invasive continuous positive pressure ventilation (CPAP) / (non-invasive ventilator)**	
	All	125 (50.0%)
	Maybe a few	105 (42.0%)
	No	20 (8.0%)
9.	**Do you believe sleep – based breathing disorders can impact overall health and well-being?**	
	No	12 (4.8%)
	Not sure	39 (15.6%)
	Yes	199 (79.6%)
10.	**Do you think there is enough awareness about sleep – based breathing disorders?**	
	No	162 (64.8%)
	Not sure	63 (25.2%)
	Yes	25 (10.0%)

Table 3. Attitude responses of medical students.

Sl. No.	Attitude questionnaire	Responses N (%)
1.	**If you have symptoms such as prolonged snoring, mouth breathing, daytime sleepiness, fatigue, etc., will you go to see doctors for help?**	
	Maybe	66 (26.4%)
	No	49 (19.6%)
	Yes	135 (54.0%)
2.	**How likely are you to seek medical help if you suspect you have a sleep based breathing disorder?**	
	Not likely at all	28 (11.2%)
	Somewhat likely	109 (43.6%)
	Very likely	113 (45.2%)
3.	**Will you undergo Polysomnography to confirm sleep disorder?**	
	Not likely at all	35 (14.0%)
	Somewhat likely	85 (34.0%)
	Very likely	130 (52.0%)
4.	**Have you ever been diagnosed with any sleep related breathing disorder?**	
	No	193 (77.2%)
	Not sure	53 (21.2%)
	Yes	4 (1.6%)
5.	**Will you get treated for sleep disorders?**	
	No	54 (21.6%)
	Not sure	57 (22.8%)
	Yes	139 (55.6%)
6.	**Will you get evaluated for complications of Sleep related breathing disorders like cor-pulmonale, heart failure, coronary artery disease, arrhythmia, stroke, cognitive impairment, etc?**	
	Not likely at all	31 (12.4%)
	Somewhat likely	92 (36.8%)
	Very likely	127 (50.8%)

Practice Questionnaire

The practice questionnaire revealed that 71.6% of participants did not engage in lifestyle habits that could contribute to sleep-based breathing disorders, while 16.8% reported occasional habits, and 11.6% admitted to such behaviors. Half of the participants (50.8%) always prioritized getting enough sleep, while 38.4% did so sometimes, and 10.8% rarely prioritized sleep. However, 66.0% had never discussed sleep-related concerns with a healthcare professional, with only 14.4% having done so and 19.6% discussing such concerns occasionally.

Table 4. Practice responses of medical students.

Sl. No.	Practice questionnaire	Responses N (%)
1.	**Do you engage in any lifestyle habits that may contribute to or exacerbate sleep-based breathing disorders? (e.g., smoking, excessive alcohol consumption, sedentary lifestyle)**	
	No	179 (71.6%)
	Occasionally	42 (16.8%)
	Yes	29 (11.6%)
2.	**How often do you prioritize getting enough sleep each night?**	
	Always	127 (50.8%)
	Rarely	27 (10.8%)
	Sometimes	96 (38.4%)
3.	**Have you ever discussed sleep-related concerns with a healthcare professional?**	
	No	165 (66.0%)
	Sometimes	49 (19.6%)
	Yes	36 (14.4%)

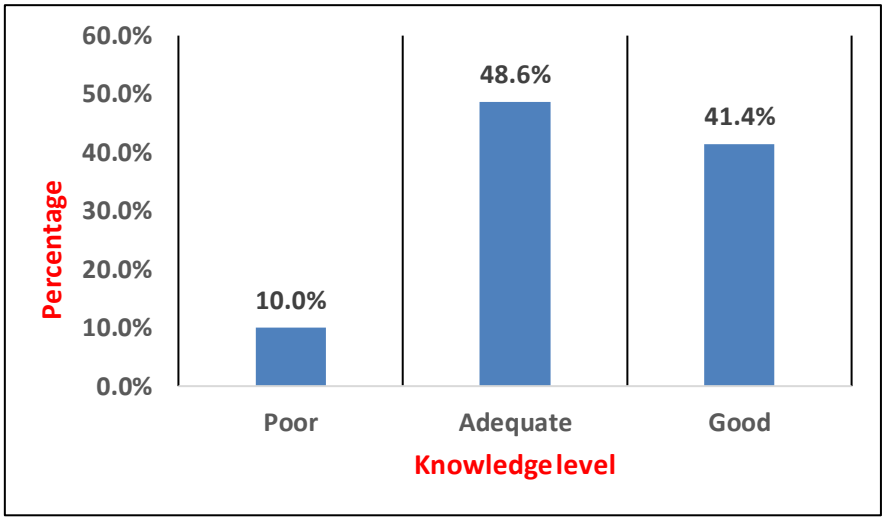

Figure1. Bar graph representing knowledge level of medical students.

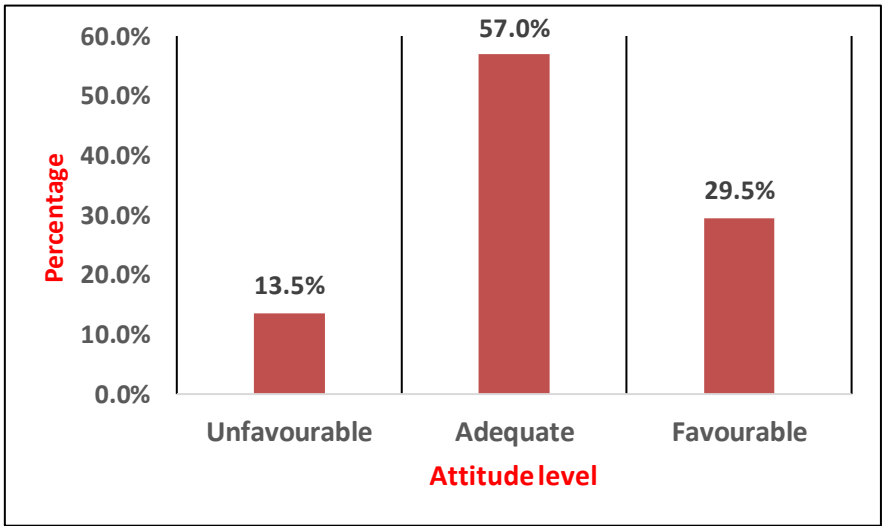

Figure 2. Bar graph representing attitude level of medical students.

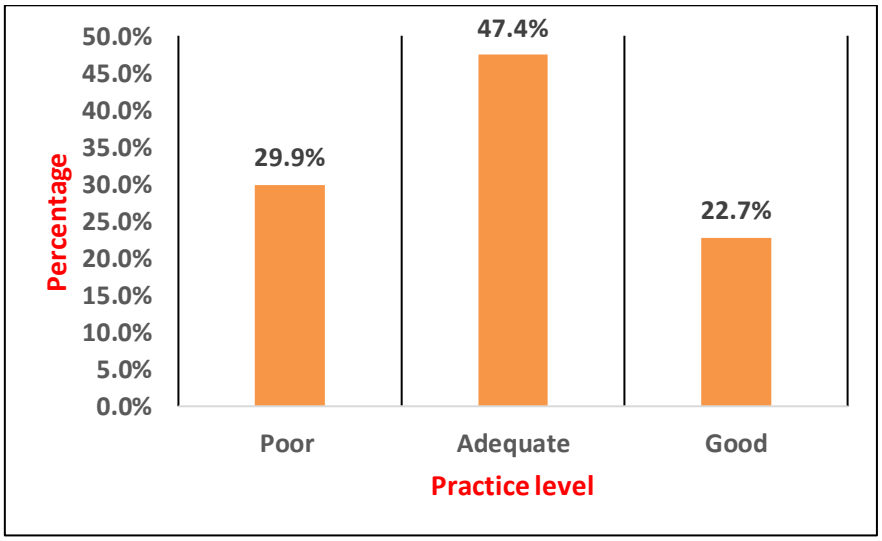

Figure 3. Bar graph representing practice level of medical students.

Table 5 shows the mean scores for the Knowledge, Attitude, and Practice (KAP) domains among medical students as follows: Knowledge scored 10.74 ± 3.999, Attitude scored 6.713 ± 2.681, and Practice scored 3.40 ± 1.996.

Table 5. Mean KAP scores of medical students.

DOMAIN	Mean score
Knowledge	10.74 + 3.999
Attitude	6.713 + 2.681
Practice	3.40 + 1.996

Values are represented as Mean + standard deviation

Discussion

Clinical studies indicate that SRBD significantly impacts health and quality of life, contributing to the global disease burden. Despite the availability of effective diagnostic methods and treatments, screening and identifying of OSA remains challenging. A key barrier to early recognition and intervention is the lack of initiative among symptomatic patients to seek medical help (18,19).

This study explores the KAP regarding SRBD among medical students. Our findings indicate that partially medical students exhibit adequate knowledge, moderately positive attitudes, and practices regarding SRBD. It highlights the relationship between these factors and underscores the need for improved awareness and education on OSA among medical students. The study offers valuable insights that can guide future initiatives to enhance SRBD knowledge and practices in healthcare settings .

In our study the mean scores for the KAP domains among medical students were 10.74 ± 3.999, 6.713 ± 2.681, and 3.40 ± 1.996 respectively. A study by Goyal A et al (19), found a mean (SD) knowledge score of 6.828 ± 2.94, but the questionnaire used was different from our study. Studies using the OSAKA questionnaire in adults report knowledge scores of 76% in cardiologists, 62% in anesthetists, and 60% in primary care physicians (20,21,22). Screening questionnaires in Croatia and Singapore showed that medical students had positive attitudes toward sleep medicine but poor knowledge about sleep disorders (23,24). In a study by Marran NM et al (25), the total knowledge score ranged from 0 to 15, with a mean of 8.46 ± 3.26 and a median of 9. The attitude scores had a mean of 18.33, a median of 19, and a standard deviation of 2.918.

In our study among medical students, 10% had poor knowledge, 48.6% had adequate knowledge, and 41.4% had good knowledge. A study by Chérrez-Ojeda I (26), revealed low knowledge levels among recent medical graduates, similar to findings from a previous study on Latin-American physicians in practice (22). In a study by Wadhwa R et al (27), most students recognized snoring as a key symptom of adult OSA, the necessity of polysomnography for diagnosis, and the importance of craniofacial examination. These findings align with previous studies from regions like Ecuador (26), and Nigeria (28). [The maximum achievable knowledge score was 18, with scores ranging from 0 to 15. The mean score was 7.6 ± 3.2 (42.2%), and the median score was 8 (IQR: 6–10), the total attitude score ranged from 1 to 5, with a mean of 2.9 ± 0.7. The mean score for the two-item importance subscale was 3.3 ± 0.9, and for the three-item confidence subscale, it was 2.7 ± 0.8].

Despite experiencing symptoms, a majority of both medical students (64.8%) did not seek medical advice or treatment. Only a small percentage sought medical help, with 9.6% of medical students .

To improve healthcare providers' role in OSA management, evidence-based strategies such as standardized OSA screening protocols for cardiovascular inpatients, interdisciplinary sleep health teams, and continuing education on OSA management for healthcare professionals could be implemented. These approaches, proven effective in managing comorbid conditions in other medical areas, may also enhance OSA and cardiovascular disease management.

The KAP theory emphasizes that understanding, positive attitudes, and healthy practices are interconnected in health education. SRBDs hold particular relevance for medical students, not only due to their prevalence but also because of the critical role physicians play in recognizing, diagnosing, and managing these conditions in patients. Adequate knowledge of SRBDs during medical training is essential, as these disorders are frequently underdiagnosed despite their well-established associations with cardiovascular, metabolic, and neurocognitive morbidity. As medical graduates transition into clinical practice, their ability to identify symptoms, counsel patients, and integrate sleep medicine into

holistic care will directly influence patient outcomes.

In this study, the medical students had some knowledge of OSA, but it was insufficient, and positive practices were not fully developed. The findings suggest the need to accelerate efforts to raise awareness of OSA, which could lead to improved attitudes and practices, encouraging active medical help-seeking behaviours and mutual reinforcement of the three elements.

Conclusion

The study found that medical students had some knowledge and positive attitudes about sleep related breathing disorders, but it was insufficient. It suggests that if medical students lack knowledge about SRBD screening, treatment, and referrals, they may miss diagnoses. The results may change as participants gain more knowledge about these disorders.

Limitations

The study's results may not represent the entire population due to potential selection bias, as there was no randomization. Most data were collected from a tertiary care center with uneven distribution, involving medical students, some of whom may not have encountered OSA cases. Additionally, the lack of comparison with other groups further limits the generalizability of the findings. Another limitation is that the questionnaire used was not a standard one, therefore it lacks internal validity and reliability. It is recommended that future studies be conducted with a larger sample size, including a cohort of all categories of medical personnel and the general public, to improve the generalizability of the findings.

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No

Conflict of Interest

None

Ethical Approval

Bangalore Medical College and Research Institute Ethical Committee .

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