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Prevalence of Obstructive Sleep Apnea Among Patients Attending the Outpatient Department of a Tertiary Care Hospital in Telangana: A Cross-Sectional Study

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Abstract

Background: Obstructive Sleep Apnea (OSA) is a common sleep-related breathing disorder associated with significant cardiovascular, metabolic, and neurocognitive morbidity. Despite its growing burden, data on OSA prevalence in India remain limited, particularly in outpatient settings. Objectives: To estimate the prevalence of OSA among patients attending the outpatient department of a tertiary care hospital in Telangana, assess the demographic characteristics of patients with OSA, evaluate the validity of the STOP-BANG questionnaire as a screening tool, and determine OSA severity using Level III polysomnography. **Methods**: This cross-sectional study was conducted among 120 adults attending the Department of Respiratory Medicine, Mediciti Institute of Medical Sciences, between January 2020 and March 2021. Participants were screened using the STOP-BANG questionnaire and categorized into low-, intermediate-, and high-risk groups. All participants subsequently underwent Level III polysomnography. OSA was diagnosed based on an Apnea–Hypopnea Index (AHI) ≥5 events/hour. Results: OSA was diagnosed in 21 participants, yielding an overall prevalence of 17.5%. Among OSA patients, 19.0% had mild, 57.1% had moderate, and 23.8% had severe OSA. The majority of OSA patients were males (71.4%) and belonged to the 41–50 years age group (47.6%). Snoring and observed apneas were each present in 81.0% of OSA patients. All participants in the low-risk STOP-BANG category were free of OSA, whereas all participants in the high-risk category were diagnosed with OSA on polysomnography. **Conclusion:** OSA was prevalent among outpatient attendees, with moderate OSA being the most common severity category. The STOP-BANG questionnaire demonstrated excellent utility in identifying high-risk individuals and excluding OSA in low-risk individuals, supporting its use as an effective screening tool in clinical practice.

Keywords: Obstructive Sleep Apnea; STOP-BANG Questionnaire; Polysomnography; Apnea–Hypopnea Index; Prevalence.

INTRODUCTION

Obstructive sleep apnea (OSA) is one of the most prevalent chronic sleep-related breathing disorders encountered worldwide and represents an important public health concern. It is estimated to affect nearly 2–4% of the adult population, with a comparatively higher prevalence among middle-aged men[1]. OSA is characterized by recurrent episodes of partial or complete upper airway obstruction during sleep, predominantly involving collapse of the oropharyngeal airway, resulting in marked reduction or complete cessation of airflow[2]. These repetitive obstructive events, manifesting as apneas or hypopneas, lead to intermittent hypoxia and progressive respiratory effort against the occluded airway, usually terminating in transient arousal from sleep in order to restore airway patency.

Clinically, OSA is defined by the occurrence of five or more apnea or hypopnea episodes per hour of sleep in association with symptoms suggestive of sleep-disordered breathing[3]. Diagnosis is generally established through overnight polysomnography, which involves comprehensive monitoring of respiratory parameters, sleep architecture, and cardiovascular activity during sleep. This evaluation facilitates identification of obstructive respiratory events and associated fluctuations in arterial oxygen saturation (SaO2)[4,5]. The severity of OSA is most commonly assessed using the apnea–hypopnea index (AHI), which represents the average number of apnea and hypopnea episodes occurring per hour of sleep and is derived from nocturnal cardiorespiratory recordings[4].

In India, OSA has emerged as a significant and increasingly recognized health problem, with studies reporting a prevalence ranging between 13% and 19% in the general population[6,7]. Despite its high burden, a substantial proportion of affected individuals remain undiagnosed. It has been estimated that nearly 82% of men and 92% of women with moderate-to-severe OSA are yet to be identified clinically[8,9].On a global scale, prevalence estimates based on an AHI threshold of five or more events per hour indicate that approximately 936 million individuals aged 30–69 years suffer from mild-to-severe OSA, while nearly 425 million individuals are affected by moderate-to-severe disease. Among the countries with the highest number of affected individuals, China ranks first, followed by the United States, Brazil, and India [10].

A growing body of evidence indicates that obstructive sleep apnea (OSA) contributes significantly to adverse health outcomes and impaired overall well-being. Appropriate diagnosis and timely treatment of OSA have been shown to reduce associated clinical complications and improve sleep-related quality of life[11].In recent years, increasing attention toward chronic lifestyle-related disorders, particularly obesity and its metabolic consequences [12] along with demographic changes and population ageing, has contributed to the growing recognition of OSA as an important global health issue. Furthermore, the close association of OSA with several non-communicable diseases has reinforced concerns regarding its expanding public health burden in the coming decades[13,14].

OSA is associated with a wide range of cardiovascular, metabolic, neurocognitive, and psychosocial consequences. Several studies have demonstrated an independent relationship between OSA and systemic hypertension. Findings from the Sleep Heart Health Study showed that the prevalence of hypertension increased proportionately with the severity of sleep-disordered breathing. Similarly, the Nurses' Health Study reported an age-adjusted relative risk of cardiovascular events of 1.46 among occasional snorers and 2.02 among habitual snorers. The corresponding risk of stroke was found to be 1.60 and 1.88 among occasional and regular snorers, respectively. In addition to cardiovascular morbidity, OSA has also been linked to pulmonary hypertension, impaired neurocognitive function, diminished quality of life, excessive daytime sleepiness, motor vehicle accidents, morning headaches, impaired childhood growth, pregnancy-induced hypertension, fetal growth restriction, and disruption of sleep quality among bed partners.

Despite the increasing burden of OSA, epidemiological data from India remain relatively limited, particularly regarding its prevalence among patients attending healthcare facilities. Considering the scarcity of regional data, the present study was undertaken to estimate the prevalence of obstructive sleep apnea among patients attending the outpatient department of a tertiary care hospital in Telangana. The study also aimed to evaluate the association between OSA risk and various demographic characteristics, comorbid medical conditions, and anthropometric parameters. This study aimed to estimate the prevalence of Obstructive Sleep Apnea (OSA) among patients attending the outpatient department of a tertiary care hospital in Telangana

MATERIALS AND METHODS

Study Design: A cross sectional study
Study Population: Participants chosen by stratified random sampling for screening using STOP- BANG Questionnaire
Study Setting: Department of Respiratory Medicine, Mediciti Institute of Medical Sciences (MIMS)
Study Duration: January 2020 -March 2021
Sample Size: 120 participants for STOP- BANG screening questionnaire.
Inclusion Criteria:

- Age > 18 years
- Patients who provide **written informed consent** to participate
- Clinically stable
- Patients willing to undergo OSA screening using the **STOP-BANG questionnaire** and **Level III polysomnography**

Exclusion Criteria:

- Patients with severe cognitive impairment, psychiatric illness, or communication difficulties that prevent completion of the questionnaire
- Patients who are critically ill or medically unstable

Study Method:
Patients meeting the predefined inclusion and exclusion criteria were enrolled in the study after obtaining written informed consent. A total of 120 participants were screened for Obstructive Sleep Apnea (OSA) using the STOP-BANG questionnaire and were subsequently categorized into low-, intermediate-, and high-risk groups for OSA based on their STOP-BANG scores.
Total STOP-BANG Score: 8
Low risk: 0-2

Intermediate risk: 3-4
High risk: 5-8
Patients categorized as having low, intermediate, or high risk for OSA based on the STOP-BANG questionnaire underwent Level III polysomnography for the diagnosis of Obstructive Sleep Apnea. The Apnea–Hypopnea Index (AHI) was calculated from the polysomnography findings, and the severity of OSA was classified accordingly. Based on these findings, the prevalence of Obstructive Sleep Apnea among patients attending the outpatient department was determined.

Instruments Used in the Study : Level-III Polysomnography

Ethical Consideration : Institutional ethical clearance was obtained from institutional review board, Mediciti Institute of Medical science

Statistical Analysis: All quantitative variables were described using descriptive statistics and expressed as mean ± standard deviation (SD) for normally distributed data or median with range for non-normally distributed data. Qualitative variables were presented as frequencies and proportions (percentages).

Observation and Results
Among the 120 participants evaluated, 21 were found to have Obstructive Sleep Apnea (OSA), defined as an Apnea–Hypopnea Index (AHI) > 5 events/hour on Level III polysomnography. The overall prevalence of OSA in the study population was 17.5%.

Table 1 : Prevalence of Obstructive Sleep Apnea

OSA Status	**Frequency (Percentages)**
OSA PRESENT (AHI≥ 5)	21 (17.5%)
OSA ABSENT (AHI<5)	99 (82.5%)
Total	**120**

Severity of Obstructive Sleep Apnea was classified based on the Apnea–Hypopnea Index (AHI). Among the 21 participants diagnosed with OSA, 4 (19.0%) had mild OSA, 12 (57.1%) had moderate OSA, and 5 (23.8%) had severe OSA. Moderate OSA was the predominant severity category, accounting for more than half of the diagnosed cases.

Table 2: Grading of severity of obstructive sleep apnea based on Apnea- Hypopnea Index

Severity of OSA (AHI Score)	**Frequency(Percentages)**
Mild OSA (5-15)	4 (19 %)
Moderate OSA (15-30)	12 (57.1%)
Severe OSA (>30)	5 (23.8%)
Total	**21 (100%)**

Among the participants diagnosed with Obstructive Sleep Apnea (OSA), the highest proportion belonged to the 41–50 years age group 10 (47.6%), followed by the 61–70 years age group 5 (23.8%). The 31–40 years and 51–60 years age groups each contributed 3 (14.3%) of the OSA cases.

Table 3. Age Distribution of Participants with Obstructive Sleep Apnea (AHI ≥ 5 Events/Hour) (n = 21)

Age groups	**No of Patients with OSA (n=21)**
31-40 years of age	3 (14.2%)
41-50 years of age	10 (47.6%)
51-60 years of age	3 (14.2%)
61-70 years of age	5 (23.8%)

Majority of the patients with OSA were males 15 (71.4%), followed by females 6 (29 %).

Table 4: Distribution of OSA patients according to Gender

Gender	**No of Patients with OSA (n=21)**

Male	15 (71.4%)
Female	6 (29%)

Majority of the patients with OSA belong to upper middle class 10(47.7%), followed by upper class 5(23.8%), middle class 4(19%), and only 2(9.5%) belong to lower middle class and none in lower class.

Table 5: Distribution of OSA patients according to socio economic status (modified BG prasad classification)

Socio Economic Status	No of Patients with OSA (n=21)
Class 1 (upper class)	5 (23.8%)
Class 2 (Upper middle class)	10 (47.7%)
Class 3 (middle class)	4 (19%)
Class 4 (Lower-middle class)	2 (9.5%)
Class 4 (Lower class)	0

Analysis of personal habits among patients with Obstructive Sleep Apnea (OSA) showed that 13 (61.9%) were smokers, 10 (47.7%) used sedatives, and 8 (38.0%) consumed alcohol.

Table 6: Distribution of Habits among Participants Diagnosed with Obstructive Sleep Apnea (Multiple Response) (n = 21)

Habits	No of Patients with OSA (n=21)
Smoking	13 (61.9%)
Alcohol	8 (38 %)
Sedative use	10 (47.7%)

Among the 120 study participants, the individual components of the STOP-BANG questionnaire showed variable prevalence. Snoring was reported in 67 (55.8%), tiredness in 56 (46.6%), and observed apneas in 63 (52.5%) participants. Hypertension was present in 52 (43.3%), while 56 (46.6%) had a BMI > 35 kg/m². Advanced age (>50 years) was noted in 84 (70.0%) participants, and increased neck circumference was observed in 57 (47.5%). Male gender accounted for 63 (52.5%) of the study population.

Among patients diagnosed with Obstructive Sleep Apnea (OSA), snoring and observed apneas were the most frequently reported components, each present in 17 (81.0%) patients, followed by male gender in 16 (76.1%). Hypertension was observed in 12 (57.1%) OSA patients, while tiredness was reported in 10 (47.8%). Age >50 years and increased neck circumference were each present in 10 (47.8%) patients. BMI >35 kg/m² was observed in 7 (33.3%) of OSA patients.
Overall, snoring, observed apneas, and male gender showed a higher proportion among OSA patients compared to the overall study population, suggesting their stronger association with the presence of Obstructive Sleep Apnea in this cohort.

Table 7: Distribution of STOP-BANG Questionnaire Components in the Study Population and Among Patients with Obstructive Sleep Apnea (OSA) (Multiple Response)

STOP BANG Component	Total Participants (N=120), n %	OSA Patients (N=21), n %
Snoring	67 (55.8%)	17 (81%)
Tiredness	56 (46.6%)	10 (47.8%)
Observed apneas	63 (52.5%)	17 (81%)
Blood Pressure	52 (43.3%)	12 (57.1%)
BMI> 35 Kg/m^2	56 (46.6%)	7 (33.3%)
Age> 50 years	84 (70%)	10 (47.8%)
Neck Circumference > 16 inches (41cm for females)	57 (47.5%)	10 (47.8%)

>17 inches (43cm for males)		
Gender (Male)	63 (52.5%)	16 (76.1%)

The correlation between STOP-BANG score and polysomnography findings demonstrated a strong agreement at the extremes of risk stratification. All participants categorized as low risk (score 0–2; n = 88) had an Apnea–Hypopnea Index (AHI) < 5, indicating no false-negative cases in this group. In contrast, all participants classified as high risk (score 5–8; n = 7) were found to have OSA on polysomnography (AHI > 5), demonstrating a strong positive predictive value for this category.

Among individuals in the intermediate-risk group (score 3–4; n = 25), 14 (56.0%) were diagnosed with OSA while 11 (44.0%) did not have OSA, indicating a mixed diagnostic yield in this subgroup. Overall, the findings suggest that the STOP-BANG questionnaire has high utility in ruling out OSA in low-risk individuals and identifying OSA in high-risk individuals, while its discriminative ability is moderate in the intermediate-risk category.

Table 7: Correlation between STOP-BANG score and Polysomnography Findings (N=120)

STOP-BANG Risk Category	**Total,n (%)**	**OSA Present (AHI > 5),n%**	**OSA Absent (AHI < 5),n%**
High (5-8)	7 (5.8%)	7 (5.8%)	0
Intermediate risk (3-4)	25 (20.8%)	14 (11.6%)	11 (9.1%)
Low (0-2)	88 (73.3%)	0	88 (73.3%)
Total	**120**	**21**	**99**

DISCUSSION

Obstructive Sleep Apnea (OSA) is defined as the presence of at least five episodes of apnea or hypopnea per hour of sleep, in association with symptoms attributable to sleep-disordered breathing. Patients at high risk for OSA are known to have a higher prevalence of cardiopulmonary and endocrine comorbidities.

In the present study, a total of 120 patients were evaluated for the presence of OSA.The overall prevalence of OSA in the study population was 17.5% (21 patients).Among the 21 patients diagnosed with OSA based on AHI scoring, 4 (19%) had mild OSA, 12 (57.1%) had moderate OSA, and 5 (23.8%) had severe OSA. Moderate OSA was the most common severity category observed in the study population. In the study done by Pattanaik et al [15] 1,012 participants were screened using the STOP-Bang questionnaire and found that the prevalence of OSA was 13.7%. In the Pinto et al.[16] rural South India study, the prevalence of obstructive sleep apnea (OSA) by apnea–hypopnea index (AHI) criteria was reported as approximately 3.74%.

In the present study,the majority of patients diagnosed with OSA were 41-50 years of age is 10 (47.6%), followed by those aged more than 60 years is 5 (23.8%). Overall, OSA was observed to be more prevalent in the older age groups compared to younger individuals in the study population. The findings of the present study are consistent with those reported by Agarwal et al.[17], who observed that patients at high risk for OSA were older than those at low risk. The mean age was 48.98 years in the high-risk group compared with 40.72 years in the low-risk group, suggesting that advancing age is an important risk factor for the development of OSA. Pattanaik et al.[15] reported a similar age distribution in their study involving 1,012 participants. The majority of participants belonged to the 18–29 years age group (n = 424), followed by the 40–49 years (n = 183), 30–39 years (n = 166), 50–59 years (n = 124), 60–69 years (n = 83), and ≥70 years (n = 32) age groups. Pereira H et al.[18] also reported similar findings, demonstrating that the prevalence of Obstructive Sleep Apnea (OSA) was higher among older individuals, thereby supporting the age-related increase in the risk of OSA observed in the present study. Pinto AM et al.[16]reported that advancing age was a significant risk factor for the development of Obstructive Sleep Apnea (OSA). This observation is consistent with the findings of the present study,thereby supporting the association between increasing age and the occurrence of OSA.

In the present study, the majority of patients diagnosed with Obstructive Sleep Apnea (OSA) were males (71.4%), while females constituted 28.6% of the cases. Similar observations were reported by Singh et al.[19] who found that the prevalence of high-risk OSA was 6.8% among males (70/1028) compared to 4.8% among females (23/484), with an overall

prevalence of 6.2%. Pattanaik et al.[15] reported a higher prevalence of OSA among males (14.8%) compared to females (12.9%) based on STOP-BANG screening, although the association between gender and OSA was not statistically significant ($p = 0.326$). Similarly,Pereira H et al.[18] observed a significantly higher occurrence of OSA among males than females (70% vs. 37%; $p < 0.001$). El Shayeb et al.[20] also reported a marked male predominance, with a male-to-female ratio of 2.9:1 among patients with OSA. Overall, the findings of the present study are in agreement with the majority of published literature demonstrating a higher prevalence of OSA among males.

The majority of patients diagnosed with Obstructive Sleep Apnea (OSA) belonged to the upper middle socioeconomic class (10/21, 47.6%), followed by the upper socioeconomic class (5/21, 23.8%). Patients from the middle socioeconomic class accounted for 4 (19.0%) cases, while 2 (9.5%) belonged to the lower middle socioeconomic class.

In the present study,analysis of personal habits among patients with Obstructive Sleep Apnea (OSA) showed that 13 (61.9%) were smokers, 10 (47.7%) used sedatives, and 8 (38.0%) consumed alcohol.In a study by Agrawal et al.[17], 17.2% of participants were identified as regular smokers and 11.3% as alcohol consumers without alcohol dependence.
Among the 120 study participants, the individual components of the STOP-BANG questionnaire showed variable prevalence.Snoring, observed apneas, and male gender were among the most prevalent STOP-BANG components in both the overall study population and among patients with OSA. In the overall cohort, snoring, observed apneas, and male gender were present in 55.8%, 52.5%, and 52.5% of participants, respectively. Similarly, among OSA patients, snoring and observed apneas were each reported in 81.0% of cases, while male gender was observed in 76.1%, indicating a higher occurrence of these factors among individuals with OSA.

The prevalence of snoring (55.8%) and observed apneas (52.5%) in the present study was considerably higher than that reported by Singh et al.[19], where 35.1% of subjects reported snoring and only 9.1% reported frequent breathing pauses. Among OSA patients, snoring and observed apneas were each noted in 81.0% of cases, highlighting these symptoms as important indicators of OSA.

The present study demonstrated a strong correlation between STOP-BANG risk categories and polysomnography findings. None of the participants classified as low risk (STOP-BANG score 0–2) were diagnosed with OSA, while all individuals in the high-risk category (score 5–8) had OSA on polysomnography, indicating excellent performance of the questionnaire at both ends of the risk spectrum. However, the intermediate-risk group (score 3–4) showed a mixed outcome, with OSA being confirmed in 56% of participants. These findings suggest that the STOP-BANG questionnaire is highly effective in ruling out OSA among low-risk individuals and identifying OSA among high-risk individuals, although its predictive accuracy is comparatively lower in the intermediate-risk category.

CONCLUSION

The present study found that the prevalence of Obstructive Sleep Apnea (OSA) among patients attending the outpatient department of a tertiary care hospital in Telangana was **17.5%**, as confirmed by Level III polysomnography. Moderate OSA constituted the majority of diagnosed cases. OSA was more common among middle-aged and older individuals, males, and those with risk factors such as snoring, observed apneas, smoking, alcohol consumption, and sedative use. Snoring, observed apneas, and male gender emerged as the most prevalent STOP-BANG components among patients with OSA. Furthermore, a strong correlation was observed between STOP-BANG risk stratification and polysomnography findings, with the questionnaire demonstrating excellent ability to rule out OSA in low-risk individuals and identify OSA in high-risk individuals. These findings support the utility of the STOP-BANG questionnaire as a simple and effective screening tool for OSA in outpatient settings.

The present study has certain limitations. Being a single-center study with a relatively small sample size, the findings may not be generalizable to the broader population. The sample size was relatively small, reducing the precision of prevalence estimates and subgroup analyses.The cross-sectional design limits the ability to establish causal relationships between risk factors and OSA. Additionally, the use of Level III polysomnography instead of the gold-standard Level I polysomnography may have influenced diagnostic accuracy. Certain risk factors and lifestyle variables were self-reported and may be subject to recall or reporting bias. Furthermore, the study population comprised hospital attendees, which may not accurately reflect the prevalence of OSA in the general community.

Future studies should focus on larger multicenter and community-based populations to obtain more representative estimates of OSA prevalence. Longitudinal research is needed to evaluate the long-term health consequences of OSA and the impact of early diagnosis and treatment. Further studies utilizing full polysomnography and assessing the performance of the STOP-BANG questionnaire in diverse populations may help improve the accuracy of OSA screening and facilitate early identification of high-risk individuals.

Conflict of Interest : None

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