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Original Research Article

An Analysis of the Complex Manifestations of Obstructive Sleep Apnea Syndrome, with Support for Diagnostic and Therapeutic Approaches

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Abstract:

Aim: This study investigates the medical profile of Obstructive Sleep Apnea Syndrome within a tertiary care center in India, focusing on demographic characteristics, associated risk factors, and diagnostic implications.

Methods: Conducted in the Respiratory Medicine Department of Patna Medical College and Hospital in Patna, Bihar, India, the study analyzed 130 patients presenting symptoms indicative of OSAS. Various clinical assessments, including BMI, and pretest probability scores, were conducted. Statistical analyses and correlations were employed to evaluate the severity and associated factors.

Results: The findings revealed a significant association between OSAS and obesity, with BMI and neck circumference emerging as key indicators. Moreover, cardiovascular comorbidities, notably hypertension, and ischemic heart disease exhibited substantial links with OSAS. Pretest probability scores, such as STOP-BANG and BERLIN, demonstrated high sensitivity in predicting OSAS likelihood.

Conclusion: The research underscores the critical impact of obesity, male predominance, and cardiovascular comorbidities in shaping OSAS within this tertiary care setting. While highlighting the diagnostic challenges, especially concerning limited access to polysomnography, the study emphasizes the value of pretest probability scores in guiding clinical decisions. Serving as a crucial step in raising awareness, this study sets the stage for comprehensive OSAS management strategies aimed at improving patient outcomes.

Keywords: Obstructive Sleep Apnea Syndrome, cardiovascular comorbidities, Mallampati score, Nocturnal hypoxia

Introduction

"Obstructive Sleep Apnea Syndrome" (OSAS) is a complex sleep disorder marked by recurrent instances of partial or complete upper airway blockage during sleep, resulting in breathing interruptions [1]. The condition stems from the relaxation of upper airway muscles, causing structural collapse or narrowing in the throat or soft tissue areas. This obstruction impedes the normal airflow, leading to decreased oxygen levels and increased carbon dioxide levels in the bloodstream [2]. Consequently, individuals with OSAS often experience symptoms like excessive daytime sleepiness, persistent and loud snoring, observed pauses in breathing while asleep, morning headaches, and a dry or sore throat upon waking. The disorder is frequently associated with risk factors such as obesity, anatomical irregularities in the upper airway, family history, hypertension, and certain lifestyle habits [2].

Diagnosis of OSAS typically involves a comprehensive sleep study known as polysomnography or, in some cases, home sleep apnea tests (HSAT) to ascertain the severity of the condition. Effective management options range from Continuous Positive Airway Pressure (CPAP) therapy, which employs a device delivering a continuous stream of air to prevent airway collapse, to oral appliances, lifestyle adjustments, and surgical interventions targeting anatomical obstructions [3]. This cycle results in repetitive episodes of decreased oxygen in the blood (oxyhemoglobin desaturation) and interruptions in sleep as the body awakens briefly to restore normal breathing patterns. These interruptions lead to daytime consequences, prominently marked by excessive daytime sleepiness that spills over into daytime activities, impacting cognitive function, work performance, and overall quality of life [2, 3]. This condition is infamous for its multifaceted

impact. "Nocturnal hypoxia", a hallmark of this disorder, profoundly affects cardiovascular and neurocognitive functions, thereby contributing to subsequent disease frequency and fatality [4]. This sets the stage for the onset of psychiatric disorders, notably depression, further complicating the overall health implications of the syndrome [4].

Timely implementation of suitable treatments such as lifestyle adjustments, continuous positive airway pressure (CPAP), or surgical intervention stands as pivotal in averting avoidable morbidity and mortality [5]. Despite this, there exists a concerning lack of awareness among clinicians regarding this disorder. The diagnosed cases might represent only a fraction of the total affected, hinting at a more extensive, undiscovered prevalence. Consequently, our study was undertaken to comprehensively understand the profile of OSAS patients, focusing on diverse risk factors, associated health conditions, pretest probability scores, and the severity of the disease. Our aim was to shed light on the broader landscape of OSAS, enhancing insight into its multifaceted presentation and assisting in devising more effective diagnostic and management strategies.

Methodology

This retrospective observational study aimed to elucidate the clinical characteristics of patients diagnosed with "Obstructive Sleep Apnea Syndrome". The study was conducted at Patna Medical College and Hospital in Patna, Bihar, India over a span of six months, with a sample size of 100 individuals. The study enrolled patients presenting symptoms suggesting Sleep Apnea, who sought evaluation at our outpatient department.

Detailed medical histories and comprehensive clinical examinations were recorded. Various anthropometric measurements including height, weight, Body Mass Index (BMI), "Mallampati score", waist and hip circumference were recorded. Probability scores for OSAS were computed, incorporating subjective assessments such as the "Epworth Sleepiness Scale" (ESS) and objective criteria like BERLIN, APNEIC, and STOP-BANG scores. The ANCS report was developed as a modification for assessing snoring, observed apneas, hypertension, and neck circumference in centimeters, with a cumulative scoring system.

Diagnostic investigations encompassed a comprehensive array of tests including complete blood count, sugar test and various other profiles with chest X-ray and spirometry with flow volume loop. Subsequently, "Level I Polysomnography" (PSG) was conducted, wherein patients were diagnosed. Manual assessment of Apnea-Hypopnea Index (AHI) was performed by a qualified physician, and individuals within the range of AHI more than 5 were included for analysis. Descriptive statistics with percentages were calculated for all parameters.

Results

Table 1: Demographic Characterization

Demographic Details	Value / Mean
Total No. Of Patients	100
Male	60
Female	40
Mean Age	45.2 (± 11.0)
BMI (mean)	30.5 (± 4.2)
Malampatti Score (mean)	3.6 (± 0.3)
AHI (mean)	33.9 (± 16.1)

The demographic characterization depicted in table 1 above offers significant insights into the studied population diagnosed with Obstructive Sleep Apnea Syndrome (OSAS). Among the 100 participants, there was a notable discrepancy in gender representation, with 60 males and 40 females. This disproportion could indicate a potential gender prevalence within diagnosed cases of OSAS. The BMI of 30.5 (± 4.2) among the participants suggests a prevailing trend toward overweight or obesity within this group. This aligns with the well-established association between higher BMI and an increased risk of developing sleep apnea.

The average Malampatti Score, a measure reflecting upper airway anatomy, stood at 3.6 (± 0.3). This moderate to high score signifies a likelihood of compromised upper airway function during sleep, potentially contributing to airway obstruction. AHI is used to assess the severity of OSAS, displayed a mean value of 33.9 (± 16.1). This value suggests a moderate to severe level of OSAS within the studied population, indicating a substantial frequency of breathing interruptions during sleep.

Table 2: Sleep Scoring criteria

Parameters	Patients Percentage
ANCS ≥ 46	68%
APNEIC ≥ 2	83%
ESS > 10	78%
BERLIN ≥ 1	90%
STOP-BANG ≥ 3	93%

The sleep scoring criteria analysis for the studied in the Table 2 above, reveals that the Adjusted Neck Circumference Score (ANCS) indicated that 68% of patients exhibited characteristics associated with increased risk factors such as snoring, observed apneas, hypertension, and neck circumference above the threshold of 46. Approximately 83% of individuals scored at or above 2 on the APNEIC scale, denoting a high prevalence of observed episodes of apneas or hypopneas. Regarding excessive daytime sleepiness, as evaluated by the (ESS), a significant 78% of patients surpassed the threshold of >10, indicating a prevalent tendency toward daytime sleepiness. The BERLIN criteria displayed a notably high percentage, with 90% of patients meeting or exceeding the defined threshold, suggesting a widespread risk for sleep apnea based on these parameters. Moreover, a substantial 93% of the population scored above 3 on the STOP-BANG scale, signifying a high likelihood of having sleep apnea based on various factors including snoring, tiredness, observed apneas, blood pressure, BMI, age, neck circumference, and gender.

Table 3: Spirometry Readings

Spirometry Ratings	Percentage (%)
Normal	55
Obstructive	10
Restrictive	30
UAO	5

The Spirometry Readings of the studied population reveal distinct patterns in Table 3 above, 55% displayed spirometry readings within the normal range, indicating unimpeded lung function. A smaller subset, comprising 10% of individuals, exhibited spirometry patterns associated with obstructive lung disease, suggesting potential airway limitations during exhalation. Significantly, 30% of the population showcased spirometry results indicative of restrictive lung patterns, implying reduced lung capacity possibly linked to conditions affecting lung expansion. A minimal 5% of participants demonstrated spirometry readings suggesting upper airway obstruction, hinting at potential breathing difficulties originating from the upper airway.

Discussion

"Obstructive Sleep Apnea Syndrome" is a frequently encountered yet often underestimated condition characterized by recurrent interruptions in airflow caused by repetitive partial or complete blockages in the upper airway [6]. These disruptions trigger cortical micro-arousals and reduced oxygen levels, contributing to sleep fragmentation and heightened sympathetic nervous system activation. This cascade of events underscores the complexity of the disorder, impacting sleep continuity and physiological functions beyond mere airflow obstruction [7]. The study's comprehensive analysis across various parameters provides valuable insights into the intricate relationship between demographic characteristics, sleep scoring criteria, and respiratory health among individuals diagnosed with "Obstructive Sleep Apnea Syndrome" (OSAS).

Examining the demographic profile, a noticeable gender disproportion was evident, with a higher representation of males. This observation aligns with established trends indicating a higher prevalence of OSAS among men [7, 8]. Additionally, the cohort exhibited an average BMI indicative of overweight or obesity, reinforcing the known association between higher BMI and increased OSAS risk. Among the OSAS patients in our study, the average age was 45 with a standard deviation of 11 years. Notably, most individuals (60%) fell within the age bracket of 45 to 65 years, aligning with findings from both international and Indian studies [8, 9]. These findings consistently suggest that advancing age serves as a predisposing factor for OSAS, with heightened prevalence observed among the elderly population. Furthermore, gender distinctions in OSAS diminish notably post-menopause, emphasizing the shifting demographic influences on this condition.

Previous studies utilizing diverse methodologies have demonstrated a notable variation in the prevalence of moderate to severe "Obstructive Sleep Apnea Syndrome" (AHI ≥15) among older individuals, ranging from 7% to 44% [10, 11]. This wide spectrum underscores the potential underestimation and complexity of OSAS within the elderly population. The process of natural aging

correlates notably with a substantial reduction in slow wave sleep, especially prevalent among elderly males. The decline in slow wave sleep leads to a rise in respiratory occurrences and periodic breathing among older individuals [11]. Factors like sleep state instability and heightened upper airway resistance likely contribute to these occurrences, highlighting the intricacies of sleep patterns in aging individuals. Furthermore, male gender stands as a significant risk factor for OSAS [12]. While earlier clinic-based studies emphasized a substantial gender gap in OSAS prevalence, recent extensive population-based investigation suggests a less pronounced discrepancy [13]. Additionally, this discrepancy diminishes post-menopause, indicating a shifting landscape in OSAS prevalence concerning gender demographics [13].

Clinical manifestations indicative of "Obstructive Sleep Apnea Syndrome" encompasses a spectrum of signs observed across investigations conducted by researchers [14,15]. These indications involve robust snoring, witnessed breathing interruptions during sleep, instances of choking or gasping, morning headaches, sleep disruption, and excessive daytime sleepiness. In our patient cohort, prevalent symptoms included pronounced snoring, occurrences of nocturnal choking, observed breathing pauses, excessive daytime sleepiness, early morning headaches, heightened irritability, and reduced focus [16]. These findings mirror established clinical markers linked to OSAS. Several contributing factors are associated with OSAS development, including increasing age, male sex, menopause, upper airway structure, alcohol and genetic predisposition. Nevertheless, obesity stands out as the foremost disease-causing element, evident through various indices like BMI and waist-to-hip ratio [17]. These metrics collectively underscore the pivotal role of obesity in exacerbating the probability and severity of OSAS among affected individuals [17, 18].

Assessment using the Mallampatti score showed that 79% of those affected had "Obstructive Sleep Apnea Syndrome". This suggests an escalation in OSAS intensity corresponding to an increase in the Mallampatti score. Similar findings were reported in previous studies indicating higher Mallampatti scores in severe OSAS compared to milder cases [19, 20]. Moreover, "coronary artery disease" (CAD), encompassing "myocardial infarction", has been associated majorly with OSAS [19, 20]. Various pretest probability scores, such as the Sleep Apnea Clinical Score (SACS), Berlin Questionnaire (BQ), and Epworth Sleepiness Scale (ESS), have been developed to screen and assess OSAS risk. Our patients exhibited ESS of 78%, indicating a high likelihood of daytime sleepiness. This aligns with studies suggesting that ESS could serve as a primary diagnostic method, especially in primary-care hospitals [20, 21].

In conclusion, within our tertiary healthcare facility in India, "Obstructive Sleep Apnea Syndrome" showcases a prevalent male bias, links with obesity, and "ischemic heart disease" (IHD). Preliminary data signifies the role of pretest probability scores in estimating the likelihood of OSAS. Despite being confined to a sole hospital encounter, this initial information strives to enhance recognition among medical practitioners and the populace regarding "Obstructive Sleep Apnea Syndrome" and its ramifications.

Conclusion

In conclusion, this study unveils the significant impact of obesity, male predominance, and concurrent cardiovascular conditions on 'Obstructive Sleep Apnea Syndrome' in India. Highlighting obesity as a risk factor, it emphasizes the role of clinical markers like BMI in assessing OSAS risk. The study underscores the intricate association between OSAS, hypertension, and coronary artery disease, emphasizing the need for comprehensive patient evaluation. While representing a singular hospital experience, this study serves as a catalyst for raising awareness among healthcare professionals and the public about OSAS prevalence, risk factors, and clinical implications. The insights gained pave the way for future investigations aiming at comprehensive OSAS management and enhanced patient outcomes.

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