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ORIGINAL RESEARCH

Diagnostic Profile of Obstructive Sleep Apnea: An Analysis of Clinical, Physical, and Endoscopic Findings

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ABSTRACT

Background: Obstructive sleep apnea (OSA) is a common sleep disorder characterized by repetitive upper airway obstruction during sleep, resulting in fragmented sleep patterns and reduced oxygen saturation. OSA is associated with significant comorbidities such as hypertension, diabetes, and cardiovascular conditions. This study aimed to evaluate the diagnostic profile of OSA patients through clinical, physical, and polysomnographic assessments. **Methods:** This observational study was conducted at the Department of Otorhinolaryngology, Civil Hospital, Parbhani, from June 2017 to October 2018. A total of 70 patients suspected of OSA were evaluated based on clinical history, physical examination, and full-night polysomnography. Patients were assessed for symptoms such as snoring, excessive daytime sleepiness (EDS), and disturbed sleep. Video endoscopy with Muller's maneuver to identify the site of obstruction were. Comorbidities such as hypertension, diabetes, and hypothyroidism were recorded. **Results:** The majority of the study population were aged between 41-50 years (38.57%) with a slight male predominance (55.71%). Snoring (92.86%), EDS (82.86%), and disturbed sleep (85.71%) were the most commonly reported symptoms. Modified Mallampati Grade III (42.86%) was the most common, while tonsillar hypertrophy was prominent in 34.29% (Grade II). The retropalatal region was the most frequently identified site of obstruction (34.29%), with 42.86% of patients demonstrating multi-level airway obstruction. **Conclusion:** The study highlights the significant burden of OSA among middle-aged individuals with a high prevalence of snoring, EDS, and disturbed sleep. The findings reinforce the role of obesity, increased neck circumference, and multi-site airway obstruction in the pathogenesis of OSA. Comprehensive evaluation using polysomnography and video endoscopy is crucial for accurate diagnosis and treatment planning. Early identification and intervention strategies can help reduce the associated morbidity and improve patient outcomes.

Keywords: Obstructive Sleep Apnea, Modified Mallampati Score, Sleep-Disordered Breathing.

INTRODUCTION

Obstructive sleep apnea (OSA) is a common yet often underdiagnosed sleep disorder characterized by recurrent episodes of partial or complete upper airway obstruction during sleep, resulting in disrupted breathing patterns and reduced oxygen saturation levels. It is one of the most prevalent forms of sleep-disordered breathing and is associated with significant morbidity and mortality. The condition is frequently linked to excessive daytime sleepiness, loud snoring, and interrupted sleep, often resulting in impaired cognitive function and reduced quality of life. The severity of OSA is typically quantified using the Apnea-Hypopnea Index (AHI), which measures the number of apneas and hypopneas per hour of sleep. A diagnosis of OSA is confirmed through overnight polysomnography, the gold-standard diagnostic tool for this condition[1].

The pathogenesis of OSA is complex and multifactorial. It is primarily driven by the anatomical and physiological characteristics of the upper airway. Anatomical impairments such as a collapsible pharyngeal airway are central to the development of obstructive apneas[2]. Additionally, factors such as reduced upper airway muscle tone during sleep, an increased arousal threshold, and abnormal respiratory control mechanisms play significant roles in the pathogenesis of OSA[3]. Obesity is widely recognized as one of the primary modifiable risk factors for OSA, contributing to mechanical airway obstruction through excess fat deposition around the neck and pharyngeal structures[4]. Emerging research also highlights the role

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of neural control mechanisms, which influence the stability or instability of breathing patterns during sleep[5]. Furthermore, conditions like hypertension, cardiovascular diseases, diabetes, and depressive disorders are closely associated with OSA, exacerbating its clinical impact and increasing the risk of adverse health outcomes[6].

OSA presents a significant public health challenge due to its association with cardiovascular diseases, metabolic disorders, and reduced cognitive function. Studies have shown that untreated OSA is linked to an increased risk of hypertension, myocardial infarction, stroke, and heart failure[7]. Additionally, individuals with OSA are at higher risk of workplace accidents and impaired social functioning due to excessive daytime sleepiness and fatigue[8]. Identifying and addressing the condition at an early stage is essential to minimize these risks.

Given the rising burden of OSA and its potential impact on patients' health, this study was conducted to evaluate the diagnostic profile of patients presenting with suspected OSA. The study aimed to assess demographic characteristics, clinical presentation, comorbid conditions, and diagnostic findings through comprehensive assessments, including full-night polysomnography and endoscopic examination. By exploring these parameters, the study aimed to improve diagnostic accuracy and contribute to better management strategies for OSA patients.

MATERIALS AND METHODS

This observational study was conducted by the Department of Otorhinolaryngology at Civil Hospital, Parbhani, between April 2019 and December 2019. The study included forty patients who presented with symptoms suggestive of obstructive sleep apnea (OSA) and were identified as being at high risk for the condition. Patients with severe neurological conditions, unstable cardiovascular status, or those who declined participation were excluded from the study. Each enrolled patient underwent a thorough evaluation that began with a detailed history assessment. Information was collected from the patient or their spouse regarding the severity of snoring, excessive daytime sleepiness, witnessed apnea episodes during sleep, and associated comorbidities such as hypertension, cardiovascular diseases, and diabetes mellitus.

A comprehensive physical examination was performed, which included measurement of neck circumference and body mass index (BMI). Detailed otorhinolaryngological and head and neck examinations were conducted, focusing on the assessment of the neck, face, and nasal structures. Additionally, examination of the mandible and maxilla, along with a detailed evaluation of the oral cavity and oropharynx, was performed with special attention to tonsil size, palatal position, and tongue position. Routine hematological and biochemical investigations were carried out for all patients, along with electrocardiograms (ECG) and chest radiographs to assess for any associated comorbid conditions.

Each patient underwent a full-night polysomnography, which served as the gold-standard diagnostic tool for OSA. Key parameters such as the Apnea/Hypopnea Index (AHI), oxygen saturation levels, and sleep architecture details were recorded during the sleep study. Additionally, all patients underwent video endoscopy with Muller’s maneuver to assess the anatomical site(s) of airway obstruction while awake. Sites of obstruction, including the hypopharynx, retropalatal, retrolingual, and nasal regions, were carefully documented.

All collected data were subsequently compiled and analyzed using descriptive statistics such as mean, standard deviation, and percentages. Comparative analysis was performed to explore associations between symptoms, physical characteristics, and diagnostic findings. Ethical clearance for the study was obtained from the institutional ethics committee, and informed consent was obtained from all participants. Confidentiality of patient data was maintained throughout the study. This methodology ensured a comprehensive diagnostic evaluation of patients with suspected OSA, incorporating clinical assessments, diagnostic investigations, and polysomnographic data to enhance diagnostic precision.

RESULTS

Table 1: Age and Gender Distribution

Age Group	Male	Male%	Female	Female%
≤ 30	4	5.71%	2	2.86%
31 to 40	10	14.29%	8	11.43%
41 to 50	15	21.43%	12	17.14%
51 to 60	6	8.57%	13	18.57%

The study included a total of 70 patients diagnosed with obstructive sleep apnea (OSA). In terms of age distribution, the majority of the patients fell within the 41 to 50 years age group, accounting for 21.43% males and 17.14% females. The 31 to 40 years and 51 to 60 years age groups also represented a notable proportion of the study population. Younger patients (≤ 30 years) were fewer in number, comprising 5.71% males and 2.86% females.

On physical examination, the mean neck circumference was 36.6 ± 3.2 cm, suggesting a strong correlation with upper airway obstruction. The mean Body Mass Index (BMI) was recorded at 31.77 ± 3.35 kg/m², indicating a prevalence of overweight and

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obese individuals in the study population — a recognized risk factor for OSA. The mean score on the Epworth Sleepiness Scale (ESS) was 13.0 ± 2.77, reflecting a moderate to severe level of daytime sleepiness. The average Polysomnography Apnea-Hypopnea Index (PSG AHI) score was 48.75 ± 7.96, indicating severe OSA in the majority of the patients.

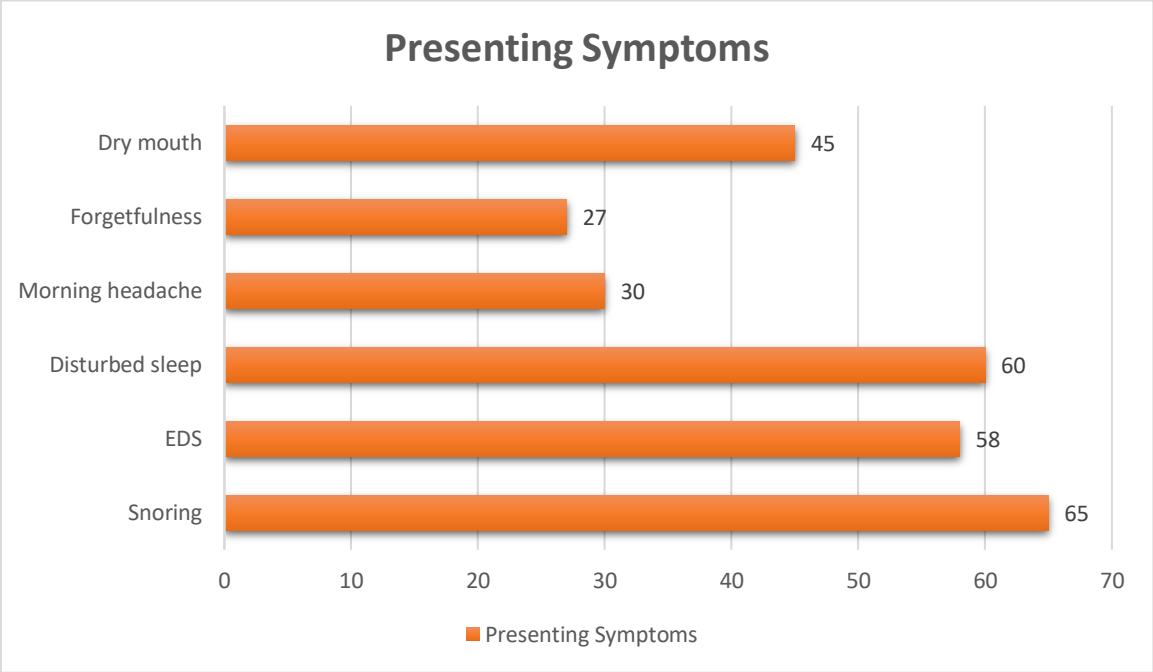

Figure 1: Distribution of Presenting Symptoms

Among the presenting symptoms, snoring was the most common complaint, reported by 92.86% of the patients. This was followed by disturbed sleep (85.71%) and excessive daytime sleepiness (EDS) (82.86%). Other notable symptoms included dry mouth (64.29%), morning headaches (42.86%), and forgetfulness (38.57%). This symptom profile highlights the multifaceted nature of OSA and the varying degrees of clinical manifestation.

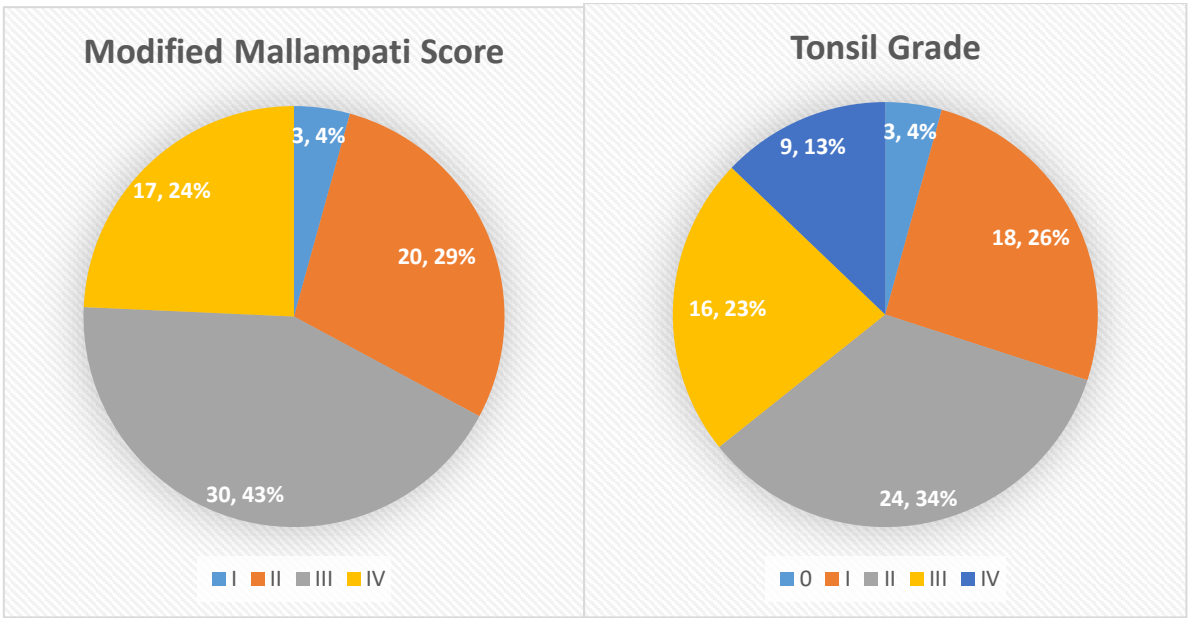

Figure 2: Modified Mallampati Score and tonsil grade

Evaluation of the Modified Mallampati score revealed that most patients had Grade III (42.86%) and Grade II (28.57%), indicating compromised airway space. Grade IV, which is indicative of a significantly narrowed oropharyngeal airway, was observed in

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24.29% of the patients, while only 4.29% had Grade I, reflecting minimal airway restriction.

On assessment of tonsil size, Grade II was the most prevalent, observed in 34.29% of the patients, followed by Grade I (25.71%) and Grade III (22.86%). Grade IV, indicative of significant tonsillar hypertrophy, was present in 12.86% of patients, while Grade 0 (no hypertrophy) was observed in a small minority (4.29%).

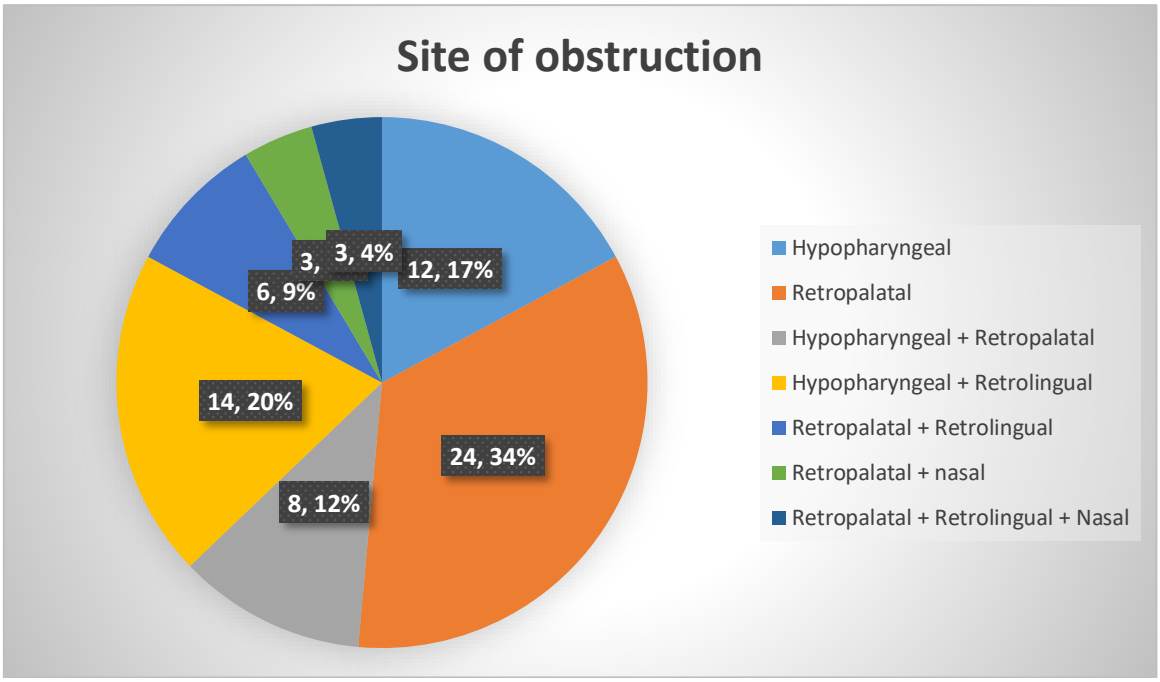

Figure3: Site of Obstruction

Video endoscopy with Muller's maneuver revealed that the most common site of obstruction was the retropalatal region (34.29%). Hypopharyngeal obstruction accounted for 17.14% of the cases, while combinations of multiple sites were also common. Hypopharyngeal + Retropalatal obstruction was observed in 11.43%, while Hypopharyngeal + Retrolingual involvement was seen in 20.00%. Other combinations, such as Retropalatal + Retrolingual and multiple-site obstruction, were less common but still significant.

Table 2: Associated Comorbidities

Condition	n	Percentage
Hypertension	50	71.43%
Diabetes	15	21.43%
Hypothyroidism	18	25.71%
Depressive disorder	5	7.14%

Among the comorbidities identified, hypertension was the most prevalent, affecting 71.43% of the study population. Hypothyroidism (25.71%) and diabetes (21.43%) were also commonly reported. A small proportion of patients (7.14%) had a history of depressive disorders, emphasizing the psychological impact of chronic sleep disturbances.

Table 3: Comparative Analysis on Epworth Sleepiness Scale

ESS Score	n	Percentage
0-10	5	7.14%
10-12	14	20.00%
12-24	51	72.86%

On the Epworth Sleepiness Scale, the majority of patients (72.86%) recorded scores in the range of 12-24, indicating excessive daytime sleepiness. 20% scored in the borderline range (10-12), while a small subset (7.14%) had minimal symptoms with scores below 10.

DISCUSSION

In our study, the majority of patients with obstructive sleep apnea (OSA) belonged to the 41 to 50 years age group, followed closely by individuals aged 51 to 60 years. This aligns with previous research, which identifies middle-aged adults as the most susceptible

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to OSA due to age-related loss of upper airway muscle tone, increased fat deposition around the neck, and greater airway collapsibility[1]. Studies have consistently shown that OSA prevalence increases with age, with a notable rise in individuals over 40 years[2]. Additionally, the distribution of males (55.71%) and females (44.29%) aligns with established findings that males are generally more prone to OSA. This is often attributed to anatomical differences, such as men having longer pharyngeal airways and larger soft tissue volumes around the upper airway[3]. Furthermore, postmenopausal women, without hormone replacement therapy, demonstrate an elevated risk of developing OSA compared to premenopausal women, which may account for the relatively higher proportion of older females in our sample[4].

The high prevalence of snoring (92.86%) in our study aligns with previous research, where snoring has been identified as the most common and earliest symptom of OSA[5]. Studies have shown that snoring is strongly associated with upper airway resistance and turbulent airflow, increasing the risk of airway collapse[6]. The reported rates of excessive daytime sleepiness (EDS) (82.86%) and disturbed sleep (85.71%) are consistent with established data that correlate these symptoms with fragmented sleep cycles, nocturnal hypoxia, and impaired restorative sleep[7]. Additionally, morning headaches and forgetfulness, observed in 42.86% and 38.57% of patients respectively, are recognized effects of nocturnal oxygen desaturation and poor sleep quality[8]. Notably, the 62.86% prevalence of dry mouth reflects the common tendency for OSA patients to breathe through their mouths, particularly those with nasal obstruction or excessive oral airflow[9].

The mean neck circumference of 36.6 ± 3.2 cm in our study aligns with established risk thresholds for OSA, where neck circumferences exceeding 35 cm in males and 32 cm in females have been strongly linked to increased airway collapsibility[10]. Elevated BMI values (31.77 ± 3.35 kg/m²) in our sample further emphasize the role of obesity as a major risk factor for OSA. Obesity contributes to increased pharyngeal fat deposits, reducing airway patency and heightening the likelihood of upper airway collapse during sleep[11]. Our mean Epworth Sleepiness Scale (ESS) score of 13.0 ± 2.77 falls within the range indicative of moderate-to-severe daytime sleepiness, a common feature of patients with severe OSA[12]. The mean PSG AHI score of 48.75 ± 7.96 corresponds to severe OSA, where AHI values exceeding 30 events per hour are typically linked to greater cardiovascular risks, metabolic dysfunction, and impaired cognitive performance[13].

Our findings demonstrated that Grade III (42.86%) and Grade II (28.57%) were the most prevalent among patients. This correlates with studies that show these grades are highly predictive of OSA due to the reduced visibility of the oropharyngeal structures, indicating a narrowed upper airway[14]. Conversely, Grade IV was observed in 24.29% of patients, representing significant airway crowding and severely increased risk of obstruction, consistent with research demonstrating a strong correlation between Mallampati Grade IV and severe OSA[15].

The predominance of Grade II (34.29%) and Grade III (22.86%) tonsil sizes aligns with established evidence highlighting the role of moderate to large tonsillar hypertrophy as a risk factor for upper airway collapse, particularly in younger patients[16]. The lower prevalence of Grade IV tonsils (12.86%) may reflect the older age profile in our sample since tonsillar hypertrophy is more common in pediatric and adolescent populations[17].

In our sample, the retropalatal region was the most common site of obstruction (34.29%), followed by combinations of hypopharyngeal and retrolingual sites. This pattern is well supported by studies emphasizing the retropalatal region as the most frequently implicated anatomical site in OSA pathogenesis[18]. The presence of multi-level obstruction in 42.86% of patients aligns with research demonstrating that more severe cases of OSA often involve multiple airway segments, particularly in obese individuals or those with complex anatomical variations[19].

The high prevalence of hypertension (71.43%) mirrors well-documented associations between OSA and elevated blood pressure, where intermittent hypoxia, sympathetic activation, and oxidative stress are primary contributing mechanisms[20]. Similarly, the presence of diabetes (21.43%) reflects evidence indicating that OSA-induced insulin resistance plays a role in glucose dysregulation[21]. The prevalence of hypothyroidism (25.71%) is consistent with data identifying thyroid dysfunction as a frequent comorbidity in OSA patients, with both conditions sharing overlapping risk factors such as obesity and metabolic syndrome[22]. The reported rate of depressive disorders (7.14%) is supported by studies linking poor-quality sleep, oxygen desaturation, and chronic fatigue with mood disturbances and depressive symptoms[23].The distribution of ESS scores reflects a considerable proportion of patients reporting moderate-to-severe daytime sleepiness (72.86%), consistent with previous findings that patients with severe OSA experience disrupted REM sleep and excessive arousals during sleep cycles[24]. The presence of 5 patients scoring below 10 suggests that not all individuals with severe OSA experience profound subjective daytime sleepiness, a phenomenon that has been previously noted in patients with higher arousal thresholds[25].

CONCLUSION

Conflict of interest:

The authors declare that there are no conflicts of interest regarding the publication of this study.

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