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A Clinical Study of Obstructive Sleep Apnea

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Abstract **Original Research Article**

Clinical study of Obstructive Sleep Apnea shows a predilection towards male sex and Prevalence increases with Age. Obesity is strongest risk factor; there is significant positive correlation between BMI, Neck Circumference, AHI, Mallampati score and STOP- BANG SCORE. OSA is frequently in association with cardiovascular comorbidities such as Hypertension and CAD.

Keywords: Obstructive sleep apnea, Polysomnography.

INTRODUCTION

Obstructive sleep apnea is increasingly

Recognized as an important cause of medical morbidity and mortality. The reduction of airflow often leads to acute derangments in gas exchange and recurrent arousals from sleep. It leads to excessive day time sleepiness, cognitive dysfunction, impaired work performance and decrement in health related quality of life. OSA is associated with a myriad of comorbidities like systemic hypertension, diabetes Miletus, ischemic heart disease obesity and metabolic syndromes. This study was done in Bhaskar Medical College is to analyse the clinical profile of OSA patients with respect to various risk factors, comorbities, present probability scores and severity of the disease.

AIM

- Study to Analyse the Clinical Profile in patients diagnosed as obstructive sleep apnea (OSA).
- Study Probability scores and Co-Morbidities associated with OSA.

OBJECTIVES

1. Predisposing/risk factors.
2. Clinical Features.
3. Co-Morbidities.
4. Pretest Probability Score.

METHODOLOGY

Patients

All patients presenting with the symptoms of OSA attending to Pulmonology OPD and patients admitted in Pulmonology wards of Bhaskar Medical College and General Hospital.

Methods

- Informed and written consent is taken from patient.
- A detailed history and clinical examination of patient.
- Body measurements like height, weight, BMI, Mallampati score, Neck circumference is taken
- Pre-test probability sleep scores subjective scores Epworth sleepiness score (ESS), and objective scores like STOP-BANG for OSA is calculated.
- Required Investigations will be done.
- Polysomnography (PSG) with Philips PDx machine performed.

Inclusion Criteria

- Patient Presenting with the symptoms of OSA Qualifying Pretest Scores.
- All Adults.

Exclusion Criteria

- All Critically ill patients.
- Patients with end stage organ disease and malignancy.

- Pregnant women.
- Anatomical abnormalities of chest and Airways.

Study Design: Observational study.

Sample Size: 50 patients fulfilling the inclusion criteria.

Study Period: Over a period of 18 months from September 2019 to March 2021.

Ethical Implications

- The study subjects will be selected following inclusion and exclusion criteria.
- Written & informed consent will be taken.
- Every patient will be completely explained about the study and related procedures and their importance and complications in their own understandable language.

Financial Implications

- Funding – none
- Expenses if any will be incurred by me if patients are not affordable.

Investigations

1. Pre Test Scores: EPWORTH SLEEPINESS SCALE, STOP BANG SCORE
2. Polysomnography (PSG).
3. Electrocardiography (ECG).
4. Spirometry.
5. Fasting blood sugar (FBS), Post-prandial blood sugar (PPBS), Glycosylated hemoglobin.
6. THYROID PROFILE.
7. 2D echo.

RESULTS

OSA patients were included in the study. Their ages ranged from 30-75 years. Number of cases was increasing with increase in the age up to 60 years.

Table 1: Age distribution

Age Groups	Number	Percentage
<20	0	0%
20-30	1	2%
31-40	9	18%
41-50	13	26%
51-60	18	36%
61-70	7	14%
>70	2	4%
TOTAL	**50**	**100%**
Mean +/- SD	51 +/- 11	

Mean age of the study group was 51 years, with a standard deviation of 11 yrs. Most of the patients fell in the age group 35 to 65 years, comprising 40 patients (80%).

Table 2: Sex distribution

Sex Distribution		
Male	34	68%
Female	16	32%

Out of 50 patients 34 (68%) were male patients, while 16 were females (32%).

Table 3: Clinical features of OSA

Symptoms	Frequency	Percentage
Snoring	50	100%
Excessive Day Time Sleepiness	40	80%
Nocturnal Choking	30	60%
Apnea	30	60%
Morning Headache	25	50%
Irritability	36	72%
Nocturia	22	44%
Tiredness	35	70%

As shown above the commonest clinical features were loud snoring (100%), excessive daytime sleepiness (80%), Nocturnal Choking (60%), witnessed apneas (60%), early morning headache (50%), excessive irritability (72%), Nocturia (44%) and Tiredness (70%).

Table 4: Smoking Habit

smoking Habit	Number	percentage
smoker	14	28%
Non smoker	36	72%

Out of the 50 patients, 14 had smoking habits including current and ex-smoker, all of them being males and 36 were non-smokers.

Table 5: Body Mass Index (BMI)

BMI	Frequency	percentage
18.5-24.9	7	14%
25-29.9	15	30%
30-34.9	14	28%
35-39.9	9	18%
>40	5	10%
total	**50**	**100%**
Mean +/- SD	31.6 +/- 6.48	

Based on WHO classification of BMI ($kg/m^{2)}$, Most of our patients were overweight or obese, with just 7 patients (14%) having a normal or low body mass index (BMI). 15 patients (30%) were overweight, while 14 patients (28%), 9 (18%) and 5 (10%) patients had mild, moderate and morbid obesity, respectively.

The study observed mean BMI of 31.6 +/- 6.48 kg/m2.

Table 6: Neck Circumference

Neck Circumference	Number	percentage
<37	11	22%
37-40	17	34%
>40	22	44%
Mean +/- SD	39.5+/- 3.08	

Average neck circumference in our group of patients was 39.5+/- 3.08cm. Only 11 patients (22%) had a neck circumference less than 37 cm, 17 patients had a neck circumference ranging from 37 to 40 (34%), while 22(44%) had neck circumference more than 40 cm circumference.

Table 7: Mallampatti classification (MPC)

MPC	Number	percentage
Class I	4	6%
Class II	12	26%
Class III	25	50%
Class IV	9	18%
Mean +/- SD	2.8+/-0.6	

Mallampati classification (MPC) was Class I in 4 patients (6%), Class II in 12 (26%) Class III in 25 patients (50%), and Class IV in 9 patients (18%).

Table 8: Epworth Sleepiness Scale (ESS)

ESS scale	Number	percentage
<8	1	2%
8 to 10	11	22%
10 to 16	24	48%
>16	15	30%
Mean+/-SD	13.5+/- 3.05	

Epworth sleepiness score (ESS), which is the most commonly used subjective assessment score for sleepiness, was less than 8 in only 1 patient, signifying normal sleepiness, while 11 (22%) patients had ESS between 8 and 10, 24 (48%) between 10 and 16, and 15 (30%) had ESS more than 16. Average ESS for the group was 13.5 (± 3.5).

Table 9: Stop BANG

Stop BANG	Number	Percentage
<3	7	14%
3 to 5	23	46%
>5	20	40%
Mean+/-SD	5.04+-/1.4	

Average STOP-BANG score of our group was 5.04 (± 1.4). Only 7 patients had a score of less than 3.

Table 10: Associated Comorbidities

Comorbidities	Number	percentage
Obesity	28	56%
HTN	36	72%
DM	21	42%
Dyslipidemia	13	26%
Hypothyroidism	13	26%
OAWD	9	18%
Arrythmias	2	4%
CAD	9	18%
PAH	14	28%

Among all Comorbidities hypertension was the commonest present in 36 patients (72%), followed by diabetes mellitus in 21 (42%), Dyslipidemia, Coronary Artery disease (CAD) in 9 (18%), Arrythmias in 2(4%), Pulmonary Artery Hypertension PAH 14(28%), Obstructive Airway disease in 9(18%) and hypothyroidism in13 (26%).

Table 11: Severity of OSA

OSA	Number	Percentage
Mild	4	8%
Moderate	12	24%
Severe	34	68%

An overnight Polysomnography (PSG) was finally done to assess the severity of OSA. Severity was classified based on the Apnea–Hypopnea index (AHI). AHI between 5 and 15/hour suggests mild OSA, between 15–30 moderate, and more than 30 is severe OSA. PSG revealed a total of 4 patients with mild OSA (8%), 12 patients with moderate OSA (24%), while 34 patients had severe OSA (68%).

Table 12: BMI and OSA

BMI	OSA		
	Mild	Moderate	severe
normal	2%	8%	4%
overweight	6%	12%	10%
Mild obese	0%	2%	26%
Moderate obese	0%	2%	18%
Severe Obese	0%	0%	10%

Table 13: Neck Circumference and OSA

	OSA		
NC	mild	moderate	severe
<36	6%	12%	4%
36-40	2%	8%	24%
>40	0%	4%	40%

Table 14: Mallampatti Score and OSA

Malampatti	OSA						
	Mild		moderate		severe		
	no.	%	NO	%	NO	%	
I	3	6%	1	2%	0	0%	p <0.0001
II	1	2%	10	20%	1	2%	
III	0	0%	1	2%	24	48%	
IV	0	0%	0	0%	9	18%	

Table 15: ESS and OSA

ESS scale	OSA		
	Mild	Moderate	Severe
8 to 10		12%	10%
10 to 16	8%	12%	28%
>16	0%	0%	30%

Table 16: Stop BANG and OSA

Stop BANG	OSA		
	mild	moderate	severe
<3	4%	8%	2%
3 to 5	4%	14%	28%
>5	0%	2%	38%

DISCUSSION

The study of clinical profile of OSA was conducted in Department of Respiratory Medicine of Bhaskar Medical College and General Hospital. Mean age of OSA patients in our study was 51 ± 11 years. Majority of the patients (60%), fell between the age of 45 to 65. This is in concordance with most of the international and Indian studies which suggest that aging predisposes to OSA.

Another important risk factor associated with OSA is male gender. The prevalence of OSA is only 1.5–3 times higher in men than women and this gender gap narrows even further after menopause. Women may not present with the "classic" symptoms of OSA and therefore may less likely be referred for a formal evaluation. Our study, however, clearly shows male predisposition as far as OSA is concerned. 68% of our OSA patients were males, as compared to only 32% of females.

The major clinical symptoms present in our OSA patients were loud snoring (100%), excessive daytime sleepiness (80%), Nocturnal Choking (60%), witnessed apneas (60%), early morning headache (50%), excessive irritability (72%), Nocturia (44%) and Tiredness (70%).

Several risk factors have been identified in the development of OSA including aging, male gender, menopause, craniofacial abnormalities, upper airway anatomy, smoking, alcohol, and genetic predisposition.

Smoking may increase the risk of or worsen OSA. In one study, current smokers were nearly three times more likely to have OSA than past or never smokers. In Our Study could not reflect the association between smoking and OSA since the number of smokers were 28% and Current smoker were altogether much less.

The strongest risk factor is obesity reflected by several markers including BMI, neck circumference. Multiple population-based studies have documented a direct relationship between the OSA epidemic and the obesity epidemic. Moreover, more than half of the prevalence of OSA is attributable to excess body weight. In fact, per each unit increase in BMI the adjusted odds ratio for developing OSA is 1.14. In our group also, 86% of the patients with OSA had a BMI of more than 24.9 kg/m2. Mean BMI in our group of patients was 31.6 kg/m2 (± 6.48).

Also, neck circumference was more than 37cm in most of these patients with AHI more than 5/hour. Neck circumference was used as a measure of central obesity with a mean value of 39.5 ± 2.6 cm, and results were similar as reported by Sharma *et al.*, This agrees with what was found in a similar study by Resta *et al.*, on 161 obese subjects using PSG.

The correlation of AHI with various anthropologic measurements like BMI and neck circumference. Both have a positive correlation, although this is not linear, with Pearson's correlation coefficient being 0.34 and 0.43, respectively.

Assessment of oropharynx by using Mallampatti score has higher likelihood predicting the OSA. In our study, it was found that 68% patients were in class III or IV, and the majority (87%) of these had severe OSA, suggesting an increase in the severity with an increase in the score. In a study performed by Uzma, *et al.*, higher Mallampati score was observed in patients with severe OSAS than in moderate and mild OSA patients. There was a statistically significant association between modified mallampati scores class and obstructive sleep apnea (p<0.0001).

Various medical conditions are associated and may also lead to OSA. In our study, 36 patients (72%) of the patients had hypertension. It is known that OSA has an adverse effect on blood pressure and OSA patients have an increased risk of hypertension, independent of obesity and age.

Further, coronary artery disease (CAD), defined as angina pectoris and/or myocardial infarction has been independently associated with OSA. The sleep heart health study, a large population-based study, documented a modest association between OSA and CAD. In subjects with the highest quartile of AHI (AHI >11), an adjusted odds ratio of 1.27 was observed relative to subjects with no OSA. Similarly, in a clinic-based study, OSA was a significant and independent predictor of incident CAD25 (relative risk 4.60). In patients with documented CAD, the prevalence of OSA has ranged from 30 to 57%. Our study group reveals that 18% of OSA patients had associated CAD.

Similar mechanism like that in hypertension and other cardiovascular diseases, association exist between OSA and Arrythmias like atrial fibrillation, therefore thromboembolism may be an important cause of stroke in OSA patients.

Another common comorbidity noted in our group of patients was diabetes mellitus. It was estimated that approximately 42% of our patients were diagnosed cases of type 2 diabetes mellitus (T2DM). Moreover, many of these patients had poor glycemic control and were on 2 or more oral hypoglycemic agents for proper control. There is an independent association between OSA and altered glucose metabolism, insulin resistance, metabolic syndrome, and T2DM.

Study of OSA patients observed a significant association between the AHI and HDL cholesterol that was independent of age, gender, BMI, diabetes and lipid lowering medication; at 6 months, there were improvements in lipid levels with CPAP therapy. In our study 26% of the OSA Patients has Dyslipidemia.

Majority of our patients (28%) had PAH.

In our study, the prevalence of spirometry abnormalities and FV loop was low, 18% of patients who had some form of obstruction had associated respiratory conditions, such as asthma, chronic obstructive pulmonary disease.

Confirmation of OSA requires an overnight PSG, a time-consuming and expensive test of limited availability. Various pretest probability scores have been developed to screen patients for a PSG and assessing risk for OSA during pre-anesthesia check-up. The sleep apnea clinical score Epworth sleepiness scale (ESS) is used to assess daytime sleepiness. STOP-BANG score is routinely used by the anesthetists to assess the probability of OSA in patients to be taken up for surgeries.

Our patients had a mean ESS of 13.8 ± 3.5, which suggests a high likelihood of falling asleep during the daytime.

This was in concordance with our group of patients, in whom 86% patients had a high probability of OSA using the STOP-BANG score.

However, it is important to note, that although these scores predict the likelihood of OSA, higher scores do not correlate well with the severity of OSA.

Higher the AHI more is the likelihood of these scores to be positive, as demonstrated by El-Sayed. The probability of moderate to severe OSA increases in direct proportion to the STOP- Bang score, which makes the questionnaire an easily used tool for identifying patients at high risk for OSA. Patients with a STOP-Bang score of 0 to 2 can be classified as being at low risk for moderate to severe OSA. Those with a STOP-Bang score of 5 to 8 can be classified high risk for moderate to severe OSA. our patients also demonstrated a positive correlation between ESS and STOP-BANG with OSA, with Pearson's correlation coefficient (r) being 0.52 and 0.50 respectively.

Our study group had 34 cases with severe OSA, 12 were moderate, and 4 was mild OSA, Finding was similar to the study by Uzma N with majority of patients (56%) with severe OSA.

CONCLUSION

1. OSA in our Study shows a predilection towards male sex and Prevalence increases with Age.
2. In Our Study Obesity is Strongest Risk Factor, there significant positive correlation between BMI, Neck Circumference and AHI
3. Mallampatti score has higher likelihood predicting the OSA. In our study, it was found that 68% patients were in class III or IV, and the majority (87%) of these had severe OSA, suggesting an increase in the severity with an increase in the score.
4. Snoring and Excessive Daytime Sleepiness is common symptoms in 100% and 75% of OSA.
5. Positive correlation has also been observed with OSA and STOP- BANG SCORE about 86% of OSA is with >3 score in which 66% had Severe OSA.
6. OSA is frequently in association with cardiovascular comorbidities such as Hypertension (72%) and CAD (18%).

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