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Research Article

CLINICAL PROFILE AND SPIROMETRIC FINDINGS IN PATIENTS HAVING OBSTRUCTIVE SLEEP APNOEA: A PROSPECTIVE STUDY

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ABSTRACT

Objectives: The objectives of the study are as follows: (1) To study the clinical profile of patients with OSA. (2) To assess the prevalence of spirometric abnormalities in obstructive sleep apnea (OSA).

Methods: This was a prospective study in which 50 patients with OSA were included on the basis of a predefined inclusion and exclusion criteria. Written informed consent was obtained from the participants. Demographic data such as age, gender, weight, height, and BMI were recorded. Severity of OSA was diagnosed on the basis of Apnea-Hypoapnea index. Presenting complaints were analyzed. Spirometry was done in all the cases and disease pattern such as obstructive or restrictive was determined. SSPS 21.0 software was used for statistical analysis and $p<0.05$ was taken as statistically significant.

Results: Among the 50 studied cases, there were 36 (72 %) males and 14 (28.00%) females with a M: F ratio of 1: 0.38. The mean age of the studied cases was found to be 50.04±13.58 years. majority of the patients presenting with obstructive sleep apnea were either obese (64.00%) or overweight (26.00%). OSA was found to be mild, moderate, and severe in 27 (54.00 %), 18 (36.00%), and 5 (10.00 %) patients, respectively. snoring (100%) followed by disturbed sleep or difficulty falling asleep 32 (64%) were most common presenting complaints. Overall abnormal spirometry findings were seen in 35 (70%) patients.

Conclusion: Snoring and sleep disturbance are the common presenting complaints in patients with OSA. A significant number of patients with OSA are found to have spirometric abnormalities.

Keywords: Obstructive sleep apnea, Snoring, Sleep disturbance, Spirometry.

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INTRODUCTION

Obstructive sleep apnea (OSA) is characterized by frequent episodes of partial or complete collapse of major airways during sleep that may result into decreased oxygen saturation and causing arousal from sleep. The disturbed sleep consequently may have implications for physical as well as mental health of individual suffering from OSA [1]. The usual symptoms associated with OSA include irregular breathing including apnea during sleep, snoring, and daytime somnolence. In general population, the risk factors for OSA include being overweight and obese, metabolic syndrome, and hypertension. The other risk factors include chronic alcoholism, smoking, and certain drugs such as benzodiazepines. Males are predominantly affected as compared to female population. OSA may start with innocuous snoring which may then progress to episodes of airway collapse eventually causing sleep disturbances [2].

The prevalence of symptomatic OSA is reported to be approximately 2–4%. The prevalence of subclinical or asymptomatic OSA can be still higher. The diagnosis of OSA is usually made on the basis of American Academy of Sleep Medicine (AASM) criteria that define OSA as having apnea hypoapnea index (AHI) greater than or equal to 15 events/h or AHI between 5 and 14 events/h in presence of symptoms such as daytime somnolence, mood affective disorder, insomnia, hypertension, or impaired cognition [3]. One of the important differential diagnosis of OSA is Insomnia as both of these disorders have overlapping signs and symptoms and may present as sleep disturbance, daytime somnolence, and systemic manifestations such as hypertension. The co-occurrence of OSA as well as insomnia may further complicate the clinical picture as well as management protocol [4].

The usual clinical picture of patients with OSA include loud and habitual snoring, episodes of apnea which may be witnessed by others, choking sensation that may cause arousal from sleep, nocturia, and disturbed sleep. Daytime symptoms in these patients may include non-restorative sleep that is defined as waking up as tired, daytime somnolence, fatigue, cognitive disturbances, lack of concentration, hypertension, and psychological problems such as anxiety and depression [5].

OSA is known to affect intrathoracic airway and found to be associated with lower respiratory tract inflammation. Many studies have suggested involvement of lung volumes such as functional residual capacity (FRC) as well as expiratory lung volume to be involved in the pathogenesis of OSA. Some studies have also suggested that many patients with obstructive airway disease may have co-existent OSA. A significant number of patients with OSA are found to have obstructive airway disease on spirometry. For this reason, pulmonary function test (spirometry) is commonly done in patients presenting with obstructive sleep apnea [6].

The management of OSA includes general as well as behavioral measures such as reducing weight, stopping alcohol intake, and sleeping in lateral position. A significant weight loss is associated with striking improvement in symptoms in patients of OSA. Patients not responding to conservative measures such as weight loss and positional therapy may require mechanical measures such as continuous positive pressure ventilation (CPAP), bilevel positive airway pressure (BiPAP) device, and oral appliance (OA) therapy [7].

We conducted this prospective study to analyze clinical features, presenting complaints, and pulmonary function test findings in patients of OSA.

Aims and objectives

The objectives of the study are as follows:

1. TO study the clinical profile of patients with OSA.
2. To assess the prevalence of spirometric abnormalities in obstructive sleep apnea (OSA)

METHODS

This was a prospective study in which 50 patients with OSA (diagnosed on the basis of Apnea hypoapnea score of more than 5 or more/h and having daytime symptoms such as daytime somnolence, fatigue, or cognitive disturbance) were included in this study on the basis of a predefined inclusion and exclusion criteria. The study was conducted in Mahavir institute of medical sciences Vikarabad Telangana, India. The Institutional ethical committee approved the disease and informed written consent was obtained from the participants. An informed written consent was obtained from the parents or guardians of children who have been included in this study. Sample size calculation was done on the basis of pilot studies done for LSCS under spinal anesthesia. Keeping power (1-Beta error) at 80% and confidence interval (1-alpha error) at 95%, the minimum sample size required in each group was 45 patients; therefore, we included 50 patients (more than minimum required number of cases).

Demographic details such as age, gender, weight, and body mass index were recorded in all the cases. The occupation and socioeconomic status of all the patients was noted. A detailed history was taken with respect to presence of symptoms such as significant snoring, daytime somnolence, waking up tired, night sweats, waking up from sleep due to choking sensation, morning headache, and symptoms such as irritability, anxiety, and depressive symptoms. A thorough general and clinical examination was done. Vital was checked. The diagnosis of OSA was done on the basis of polysomnography. The presence of apnea hypoapnea score of more than 5 or more/hour and having daytime symptoms such as daytime somnolence, fatigue or cognitive disturbance was taken as diagnostic of OSA. Spirometry to determine pulmonary function was done in all the cases. The values such as forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), FEV1/FVC, and maximal mid-expiratory flow (MMEF) were analyzed in all the cases. Spirometry findings were interpreted as per Global Initiative for Chronic Obstructive Lung Disease (GOLD guidelines) [8]. FER (FEV1/FVC<0.7 after bronchodilator) and FEV1 (mild ≥80% of predicted value, moderate 50–80% of predicted value, severe 30–49% of predicted value, and very severe <30% of predicted value). Patients in whom there was decreased FEV1/FVC ratio were diagnosed as cases of obstructive lung disease whereas patients in whom there was Decreased FEV1 along with decreased FVC and a normal or increased FEV1/FVC were labeled to be having restrictive lung disease.

Analyses were done using software Statistical Package for the Social Sciences (SPSS) version 21.0. Mean and standard deviation was used for various parameters. The correlation of spirometric parameters with severity of AHI was assessed using Pearson's correlation. $p<0.05$ was taken as statistically significant.

Inclusion criteria

The following criteria were included in the study:

1. Patients diagnosed to be having OSA on the basis of polysomnography (Apnea hypoapnea score of 5 or more/h and having daytime symptoms such as daytime somnolence, fatigue, or cognitive disturbance).
2. Those who gave informed consent to be part of study.
3. Age more than 18 years.

Exclusion criteria

The following criteria were excluded from the study:

1. Those who refused consent.
2. Patients with serious comorbid conditions such as congestive cardiac failure, severe asthma, and mental disorders affecting sleep.
3. Patients with active respiratory infections such as pharyngitis, laryngitis, or pneumonia.
4. Patients having sleep disorders including somnambulism, night terror, narcolepsy, or somniloquy.

RESULTS

Among the 50 studied cases, there were 36 (72 %) males and 14 (28.00%) females with a M: F ratio of 1: 0.38 (Fig. 1).

The analysis of the age group of the studied cases showed that the majority of the patients were between 51 and 60 years (32.00%) and 61–70 years (28.00%). Seventeen (34.00%) patients were <50 years of age whereas only 3 (6.00%) patients were above 70 years of age. The mean age of the studied cases was found to be 50.04±13.58 years (Table 1).

The analysis of studied cases on the basis of body mass index showed that majority of the patients presenting with obstructive sleep apnea were either obese (64.00%) or overweight (26.00%). It was less common in individuals having healthy BMI (10.00%) (Table 2).

Analysis of risk factors and comorbidities showed that on examination, systemic hypertension was seen in 24 (48%) patients whereas diabetes mellitus was seen in 21 (42%) patients. History of smoking and alcohol consumption was present in 12 (24%) and 14 (28%) patients, respectively. Neck circumference of more than 39 cm in men and more than 35 cm in women was seen in 42 (84%) patients (Table 3).

OSA, as determined by AHI, was found to be mild, moderate, and severe in 27 (54.00%), 18 (36.00%), and 5 (10.00%) patients, respectively (Table 4).

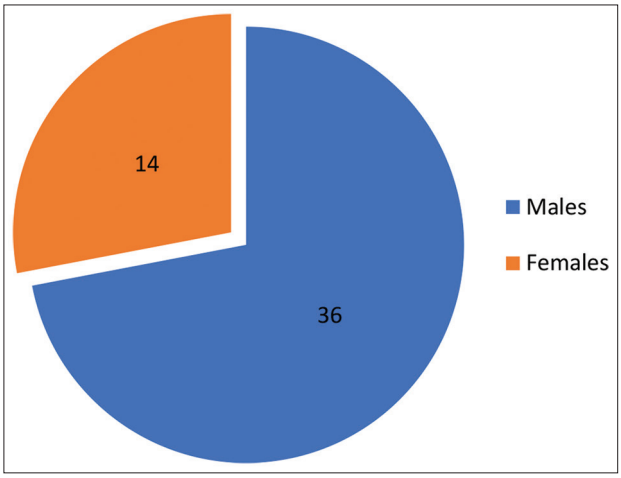

Fig. 1: Gender distribution of the studied cases

Table 1: Distribution of age groups among study participants

Age in years	Frequency	Percent
<35	8	16.00
35–50	9	18.00
51–60	16	32.00
61–70	14	28.00
>70	3	6.00
Total	50	100.0

Mean age : 50.04±13.58 years

Table 2: Body mass index in studied cases

Body mass index	Frequency	Percent
Underweight (<18.5)	0	0.00
Healthy Weight (18.5–24.9)	5	10.00
Overweight (25–29.9)	13	26.00
Obese (30 or above)	32	64.00
Total	50	100.0

The analysis of total sleep time showed that the mean sleep time in patients having normal AHI was 282.6 min where it was 299.5, 267.8 and 223.7 min in patients having mild, moderate, and severely affected AHI. The mean sleep time was found to be comparable and there was no statistically significant difference in any of the group (p=0.093) (Table 5).

The most common presenting complaints in the patients having obstructive sleep apnea were found to be snoring (100%) followed by disturbed sleep or difficulty falling asleep which was seen in 32 (64%) patients. Excessive daytime sleepiness was seen in 28 (56%) cases whereas non-restorative sleep (feeling of waking u tired) was seen 26 (52%) cases. 21 (42%) patients complained of waking up during night hours with a sensation of choking or respiratory difficulty (Fig. 2).

Spirometry was done in all the cases to find out pattern of lung disease in patients having different grades of AHI. Patients in whom there was decreased FEV1/FVC ratio were diagnosed as cases of obstructive lung disease whereas patients in whom there was decreased FEV1 along with decreased FVC and a normal or increased FEV1/FVC were labeled to be having restrictive lung disease. In patients with mild sleep apnea severity, 11 (22%) had normal spirometry findings. Restrictive and obstructive features were found in 13 (26%) and 1 (2%) patient, respectively. Mixed restrictive as well as obstructive features were seen in 2 (4%) patients. IN cases of moderate severity restrictive features were seen in 11 (22%) patients whereas in cases of severe degree of OSA restrictive as well as obstructive feature were seen in 2 (4%). Overall abnormal spirometry findings were seen in 35 (70%) patients (Table 6).

Table 3: Comorbidities and risk factors in studied cases

Comorbidity/risk factors	Frequency	Percent
Hypertension	24	48.00
Diabetes	21	42.00
Smoking	12	24.00
Alcohol Intake	14	28.00
Neck circumference >39 cm in men and 35 cm in women	42	84.00

Table 4: Severity of obstructive sleep apnea

Sleep apnea severity	No of patients	Percentage
Mild (AHI 5–14)	27	54
moderate (AHI=15–30)	18	36
severe (AHI>30)	5	10
Total	50	100

Table 5: Comparison of mean sleep time in different grades of AHI

Sleep apnea severity	Mean sleep time (In minutes)	Standard deviation
Mild	284.8	85.6
Moderate	272.8	59.6
Severe	231.1	54.7

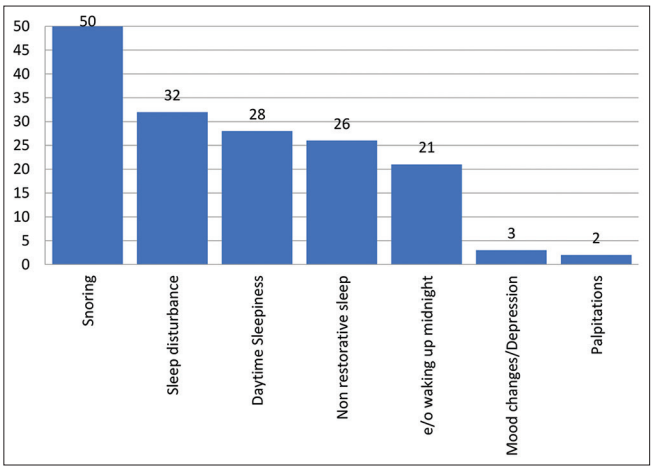

Fig. 2: Clinical presentation in studied cases

DISCUSSION

In this study of 50 patients with different grades of OSA cases, there were 36 (72%) males and 14 (28.00%) females with a M: F ratio of 1: 0.38. Male preponderance has been reported almost uniformly in patients having OSA. Although there is no exact mechanism which has been found to be responsible for male predominance, there are many pathophysiological reasons as to why men are more commonly affected by OSA as compared to women. Factors such as increased prevalence of obesity, alcohol intake, smoking, and hormonal factors are found to be important factors responsible for increased propensity of men to develop OSA. One of the important factors which contributes to diagnosis of OSA in men is that men are more likely to have severe OSA which usually is picked up by primary care physician as compared to women who usually have milder form of the disease as compared to men. Moreover, in females particularly who have a normal weight, sleep disturbance secondary to OSA is commonly attributed to depression or mood disorder thereby delaying the diagnosis in females. Sharma *et al*. conducted a cross-sectional study to assess the prevalence and risk factors of OSA in a semi-urban Indian population [9]. For this purpose, an OSA assessment was performed in 2400 subjects who were screened in Stage 1 of the study by means of a sleep questionnaire. A total of 36 habitual snorers (46.75%) and two non-habitual snorers (2.73%) were found to have OSA, giving prevalence rates of 13.74% and 3.57%, respectively, for OSA and OSA syndrome (OSAS) on extrapolation. Multivariate analysis revealed that male gender, age, obesity (defined by a high body mass index), and waist/hip ratio as significant risk factors for OSAS. Similar male preponderance was also reported by the authors such as Young *et al*. [10] and Ip *et al*. [11].

The majority of the patients in our study were between 51 and 60 years (32.00%) and 61–70 years (28.00%). The mean age of the studied cases was found to be 50.04±13.58 years. Kiral *et al*. conducted a study to investigate the effect of age on severity of obstructive sleep apnea syndrome (OSAS) severity was the aim of this study [12]. Polysomnography of 874 was performed with Sleep Screen - Viasys device and scoring was done according to the criteria of Rech-Schaffen Kales. In this study, the mean age was 49.1±10.7 and of the cases, 602 (68.9%) were male, 272 (31.1%) were female. The mean age of patients with OSA was similar to our study. Similar mean age of the affected cases was also reported by Arzt *et al*. [13] and Alchanatis *et al*. [14].

IN our study, majority of the patients presenting with obstructive sleep apnea were either obese (64.00%) or overweight (26.00%). Neck circumference of more than 39 cm in men and more than 35 cm in women was seen in 42 (84%) patients. In our study, majority of the patients were either overweight or obese. Obesity is uniformly identified as risk factor for development of OSA in various studies [15]. History of smoking and alcohol consumption were present in 12 (24%) and 14 (28%) patients, respectively. Similar other studies have also found smoking and alcohol intake to be associated with increased risk of OSA [16].

The analysis of clinical features in our patients showed that snoring (100%) followed by disturbed sleep or difficulty falling asleep (64%) patients, excessive daytime sleepiness (56%) and non-restorative sleep (52%) were common complaints in studied cases. Similar findings were reported by Potdukhe *et al*. who found reported that excessive daytime sleepiness (80%) and non-refreshing sleep (60%) were the common clinical features of patients presenting with OSA [17]. Similar findings were also reported by the authors such as Stansbury *et al.* [18].

Table 6: Spirometric findings in studied cases

Spirometry Findings	Mild (AHI 5–14)		Moderate (AHI=15–30)		Severe (AHI >30)	
	No of cases	Percentage	No of cases	Percentage	No of cases	Percentage
Normal	11	22.00	3	6.00	1	2.00
Obstructive features	1	2.00	2	4.00	1	2.00
Restrictive features	13	26.00	11	22.00	1	2.00
Obstructive+Restrictive	2	4.00	2	4.00	2	4.00
Total	27	54.00	18	36.00	5	10.00

In patients with Mild sleep apnea severity, 11 (22%) had normal spirometry findings. Restrictive and obstructive features were found in 13 (26%) and 1 (2%) patient, respectively. Mixed restrictive as well as obstructive features was seen in 2 (4%) patients. IN cases of moderate severity restrictive features were seen in 11 (22%) patients whereas in cases of severe degree of OSA restrictive as well as obstructive feature were seen in 2 (4%). Overall abnormal spirometry findings were seen in 35 (70%) patients. Mehfooz *et al*. conducted a study to find the correlation between the spirometric indices and snoring, grades of apnea–hypoapnea index (AHI), and STOPBANG [19]. The study found that abnormalities of spirometric indices were found to be common in patients with OSA. Obstructive pattern on spirometry was found to be more common (40%) as compared to restrictive (10%) pattern whereas in our study, we found more patients with restrictive pattern as compared to obstructive pattern. Predominant restrictive pattern in patients with OSA on spirometry was also reported by the authors such as Thorve *et al.* [20].

Limitation of the study

Relatively small size was limitation of this study. Moreover, factors such as prevalence of smoking and alcohol intake in patients of OSA were based on history given by patients themselves; hence, there are chances of bias against accepting these addictions.

CONCLUSION

A significant number of patients having OSA have presence of known modifiable risk factors such as obesity and history of addiction. These factors can be modified to treat or reduce severity of OSA. Majority of patients with OSA were found to have spirometric abnormalities which makes determination of pulmonary function an essential part of evaluation of these patients.

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AUTHORS' CONTRIBUTIONS

MS: Concept and design of the study, interpreted the results, prepared first draft of manuscript and critical revision of the manuscript, statistically analyzed and interpreted, reviewed the literature, and manuscript preparation; PD: statistically analyzed and interpreted data, preparation of manuscript, and revision of the manuscript, Concept and coordination of the overall study.

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