

Clinical Prediction of OSA: A Retrospective Study

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DOI No:10.5958/0974-0155.2015.00015.7

Indian J Sleep Med 2015; 10.3, 101-104

Abstract

Background: Obstructive sleep apnea (OSA) is a common yet unrecognized medical disorder with significant morbidity. Polysomnography (PSG) is considered as the gold standard to confirm the clinical diagnosis of OSA, to assess its severity, and to guide therapeutic choices. Continuous positive airway pressure (CPAP) constitutes the main treatment option in most of the cases. Under-diagnosis of OSA and under-utilization of treatment options are the main challenges in developing countries and, therefore, identification using simple clinical predictors are important.

Methods: A retrospective study was conducted from January 2012 to August 2015 in a Sleep Clinic based in Chennai. Patients with the symptoms of OSA, present during the study period, were included. Demographic, diagnostic, and comorbidity details of the patients were collected and analyzed with a specific focus on their symptoms as clinical predictors of OSA.

Results and Conclusion: A total of 532 patients with the symptoms of OSA were included in the study (Males-81.8%/Females-18.2%; Average Age-48.49; BMI-31.53; ESS score-10.37). Based on the prediction of clinical symptoms of OSA, these patients were recommended to PSG to confirm the diagnosis. 408 out of 532 patients (76.69%) underwent PSG or home-based portable study, of which, 97.3% (n=397) were positive for OSA based on the results of PSG. Snoring was the most common symptom followed by fatigue and excessive daytime sleepiness (EDS). Hypertension was the most common co-morbid illness associated with OSA. Profiling patients based on age, sex, symptoms, and comorbidities could increase our clinical index of suspicion of OSA.

Keywords: Obstructive sleep apnea (OSA), Polysomnography, Morbidity, Continuous positive airway pressure (CPAP)

Introduction

Obstructive sleep apnea (OSA) is one of the common sleep related disorders that is recognized as a major health problem. OSA is caused by pharyngeal collapse during sleep and characterized by frequent awakenings, disrupted sleep,

and consequent excessive daytime sleepiness. It is estimated to affect 2-4% of middle aged people and associated with high morbidity and increased risk of cardiovascular complications. With the increase in obesity, the most important risk factor for OSA, prevalence of the disease is bound to increase over the coming years thus representing an important health problem. OSA is diagnosed based on combination of clinical features and over-night polysomnography (PSG). Behavioral, medical, and surgical options are available for treatment. Continuous positive airway pressure (CPAP) represents the treatment of choice in

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most patients. CPAP has been demonstrated to be effective in reducing symptoms, cardiovascular morbidity, and mortality, but is often poorly tolerated. In developing countries, OSA is still under-diagnosed and under-treated due to several reasons. Lack of awareness of physicians and people, and cost constraints with respect to diagnosis as well as therapy constitutes main challenges.

In the current study, various symptoms and comorbidities that are associated with OSA and the utility of these symptoms in predicting OSA are analyzed.

Methods

This was a retrospective study conducted at the Nithra Institute of Sleep Sciences, Chennai, India. Data from January 2012 to August 2015 were retrieved and analyzed. Patients with symptoms of OSA were included in the study. Patients with any other sleep problems (like insomnia, parasomnia) were excluded.

A total of 532 patients met the inclusion criteria and were included in the study. Self-reported questionnaires that patients completed during initial presentation were retrieved and reviewed, with a focus on symptoms associated to OSA like snoring, witnessed apneas and morning headaches, excessive daytime sleepiness (EDS) and fatigue. Epworth sleepiness score (ESS), body mass index (BMI) and details of co-morbid illnesses like diabetes, hypertension, hypothyroid, epilepsy, asthma, COPD, impotence and nasal sinus problems were also noted.

Clinically suspected cases of OSA were recommended to PSG based on their symptoms. Based on PSG results, the diagnosis was confirmed. OSA was then classified as mild, moderate, or severe based on the apnea hypopnea index (AHI) values (mild 5-15 per hour, moderate 15-30 per hour and severe >30 per hour, as per the American Sleep Disorder Association guidelines).

Clinical parameters associated with OSA like age, sex, BMI, ESS, witnessed apneas, ESS, diabetes, hypertension, hypothyroidism, and epilepsy were analyzed with the results of the PSG.

Results

A total of 532 patients with symptoms of OSA were included in the study. Average age of the patients was 48.49±12.2 years. Males constituted majority with 81.8%

(*n*=435) and females with 18.2% (*n*=97). Average BMI was 31.53 and the average ESS score 10.37. (Table 1)

Snoring was the most common symptom seen in the patients clinically diagnosed with OSA (97.2%) followed by fatigue (70.7%) and EDS (60.7%). Witnessed apneas were found in 46.8% and morning headaches in 29.3% of patients. Hypertension was the most common comorbid illness associated with OSA (46.6%) followed by diabetes in 30.6% and hypothyroidism in 15%. Study group included 22% smokers and 33.1% alcoholics.

Out of the 532 patients, 408 (76.69%) underwent

Table 1: Characteristics of study population.

Variable (Average)	Total	Male	Female
Subjects	532	435 (81.8%)	97 (18.2%)
Age (y)	48.49 ±12.21	47.4 ±12.2	53.19 ±11.14
Weight (kg)	86.92 ±18.5	88.33 ±18.76	80.60 ±15.91
Height (cm)	166.59 ±9.39	169.29 ±7.67	154.48 ±6.38
BMI (kg/m ²)	31.49 ±(6.25)	24.60 ±3.64	33.96 ±6.58
ESS	10.37 ±5.66	10.72 ±5.7	8.78 ±5.23
AHI	46.12±23.41	48.82 ±23.22	34.89 ±20.84

BMI= Body mass index, ESS= Epworth sleepiness score, AHI= Apnea-hypopnea index

the recommended PSG, rest of which did not undergo the study. 96.5% of the subjects (*n*=394) underwent home-based portable study and 3.4% subjects (*n*=14) underwent polysomnography.

Among 408 patients, who underwent sleep study, 97.3% (*n*=397) were confirmed with the diagnosis of OSA, of which 75% (*n*=306) were diagnosed with severe OSA. Snoring was the most common predictive symptom (*p*=0.008), followed by EDS and witnessed apneas. (Table 2)

Only 2.69% of patients (*n*=11) had a normal study in spite of their symptoms. The average apnea-hypopnea index (AHI) among the study group was 46.12 per hour. The average nocturnal oxygen de-saturation noted was 75%. (Table 3).

CPAP therapy was advised for patients whose diagnosis was confirmed with PSG. 71.5% (*n*=284) underwent the prescribed CPAP treatment. Severe OSA patients were more compliant with CPAP

therapy(77.81%) than the mild OSA group. Followup AHI among those who underwent CPAP titration was 4.93 per hour.

Table 2: Clinical Parameters associated with OSA.

Variable	Total	P Value
Patients diagnosed with OSA based on Clinical symptoms	408	
Patients diagnosed with OSA based on PSG	397 (97.3%)	
Snoring	394 (96.5%)	0.008
EDS	255 (62.5%)	0.683
Witnessed apneas	194 (47.5%)	0.802
EDS=Excessive daytime sleepiness, AHI= Apnea-hypopnea index		

Table 3: Results of sleep study.

Parameters	Values
Mild OSA (6–15)	28 (6.86%)
Moderate OSA (16–30)	63(15.44%)
Severe OSA (>30)	306 (75%)
Normal OSA (<5)	11 (2.69%)
AHI (Average)	46.12 ± 23.41
Desaturation (Average)	75 ± 12.56
Follow up AHI (Average)	4.93 ± 4.53

Discussion

This study identified certain clinical parameters that could predict the presence of OSA with suggestive symptoms. The utility of similar studies which were conducted in the western population is limited in the setting, as the race and the race related differences in the craniofacial morphology have been shown to have a significant impact on the development and presentation of OSA.

Age was the predictor of OSA, with a majority of the OSA subjects aged between 45–60 years in our study group. In the subsequent age groups, there was a decline in the prevalence of OSA. This finding was consistent with the experience of most sleep clinics, where the peak

age of presentation was about 50 years and there is decline in presentation before and after the peak^{1,2}.

The fact that the male gender has a significant association with OSA could be due to various reasons. Several studies^{3,4} have demonstrated differences in the structure and the physiological behavior of the upper airway between the genders, with females having increased activity of the genioglossus muscle which protects their airway from collapsing during sleep. Female hormones also seem to have a protective role. Other reasons like difference in upper airway caliber, the smaller neck size in women and the smaller size of the critical soft tissue structures in women are also suggested as reasons. Whittle et al⁵. observed that the total neck soft tissue volume was greater in men than in women.

BMI was either in an overweight or obese range in this study. It has been demonstrated that a 10% body weight reduction was associated with a parallel 26% decrement in AHI⁶. Thus, weight reduction is an important conservative treatment for sleep apnea.

In our study, snoring was significantly associated with prediction of OSA ($p=0.008$). The other clinical symptoms were EDS and witnessed apneas. Smoking is associated with a higher prevalence of snoring and sleep-disordered breathing^{7,8}. Alcohol relaxes upper airway dilator muscles, increases upper airway resistance and may induce OSA in susceptible subjects. So alcohol intake can prolong apnea duration, suppress arousals, increase frequency of occlusive episodes, and worsen the severity of hypoxemia, however, the underlying mechanisms are not well understood⁹.

Hypertension was the most common comorbid illness associated with OSA in our study as was found in many previous studies¹⁰. Hypothyroidism is considered a relatively infrequent cause of OSA in the west, a study from India has demonstrated OSA in 30% of patients with primary hypothyroidism¹¹. In this study, 15% of OSA patients were diagnosed to have hypothyroidism.

To diagnose OSA in lab PSG is the gold standard, but portable home-based study is also helpful^{12,13}. In our study, majority of patients underwent home-based sleep study. Therapeutic strategy for management of OSA includes CPAP and a methodical weight loss program¹⁴. In this study group only 71.5% of the patients underwent treatment with the prescribed CPAP; the rest did not comply due to various reasons.

Conclusions

OSA is a common sleep related breathing disorder requiring high index of clinical suspicion and polysomnography for confirmation of diagnosis. This study identified that age (45 to 60), male sex, BMI (Overweight and Obese), snoring and witnessed apneas, and daytime hypersomnolences should raise our clinical index of suspicion for OSA and the commonest comorbidity was hypertension.

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