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Original Research Article

Gender differences in clinical profile and risk factors for obstructive sleep apnea in a public health care setting

Vijay Kapse, Vikas Patel*, Dilip Mhaisekar, Mithilesh Kulkarni

Department of Respiratory Medicine, Dr. Shankarrao chavhan Government Medical College, Nanded, Maharashtra, India

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***Correspondence:**
Dr. Vikas Patel,
E-mail: vikaskauraw@gmail.com

ABSTRACT

Background: Obstructive Sleep Apnea Syndrome is an increasingly prevalent chronic condition which is, unfortunately, still underdiagnosed. It is peculiarity of this noisy disease that it announces itself to everyone within earshot-except its victims. The intermittent hypoxemia and sleep fragmentation caused by recurrent episodes of upper airway collapse are chiefly responsible for the pathophysiology associated with this condition.
Methods: The present study was carried out from January 2014 to August 2015 in a tertiary care government hospital. In this comparative hospital based study 94 patients with Sleep Disordered Breathing and >13 years of age were included. There were 58 males and 36 females in the present study. All patients who satisfied inclusion criteria were studied after taking written consent. Collection of data was carried out with predesigned proforma.
Results: Of all the 94 patients who underwent overnight Polysomnographic study,80 patients were diagnosed as Obstructive Sleep Apnea. Risk factor of OSA have gender differences in their distribution. Female patient is older with significantly higher mean age compared to male patients with OSA (52.9 vs 44.7 years). Females are having significantly higher BMI compared to male OSA(38.2 vs 31.5) but neck circumference is higher in males (44.7 Vs 38.1 cm).The prevalence of Smoking and Alcoholism as a risk factor is higher in male patients while endocrine disorder are more common in females. ENT abnormalities are present more or less equally in both the sexes.
Conclusions: In the present study females' patients with Obstructive Sleep Apnea were mainly Older, Obese, Postmenopausal and endocrine disorder like Hypothyroidism were more prevalent while male patients were Smoker, Alcoholic and had higher neck circumference.

Keywords: Endocrine disorder, Hypothyroidism, Obstructive sleep apnea, Polysomnographic study, Postmenopausal, Sleep disorder, Sleep disordered breathing

INTRODUCTION

Obstructive Sleep Apnea Syndrome is an increasingly prevalent chronic condition which is, unfortunately, still underdiagnosed. It is peculiarity of this noisy disease that it announces itself to everyone within earshot except its victims. The intermittent hypoxemia and sleep fragmentation caused by recurrent episodes of upper airway collapse are chiefly responsible for the pathophysiology associated with this condition.[1] OSA is defined by the presence of repetitive episodes of upper airway obstruction during sleep. An AHI of equal to or greater than 5 events/h is commonly used to define OSA,

with obstructive or mixed (rather than central) events comprising more than 50% of the total. The OSAS is usually defined by an AHI equal to or greater than 5 events/h and persistent complaints of Snoring, Excessive Daytime Somnolence, Unrefreshing Sleep, or Fatigue.[1]

Sleep study is gold standard for diagnosis but it has its limitation, it requires overnight stay in Polysomnography laboratory staffed with qualified personnel that can collect and interpret complex physiological data.[1] Factors that increase vulnerability for OSA includes age, male sex, obesity, craniofacial abnormalities, family history ,certain health behavior such as Smoking and Alcohol abuse, certain endocrine disorders such as Hypothyroidism, Polycystic ovary disease (PCOD),Cushing syndrome and upper airway obstructive pathology like Tonsillar Hypertrophy, DNS, Macroglossia, Nasal Polyps. Gender differences exist in distribution of these risk factors of OSA rendering males more susceptible to this disorder.[1]

This study aims to study the gender differences in clinical profile and risk factors for OSA.

METHODS

A prospective observational hospital-based study was conducted in our tertiary care hospital. The study group consisted of 94 consecutive patients, who attended our Out-patients department and patient admitted in ward (Medicine and Pulmonary medicine) for Sleep Disordered Breathing. The symptoms were either identified by themselves or by their physician and were referred to our department for a sleep study. The Study design was Prospective single centre comparative study.

At baseline, the patient's medical history was recorded, and a limited physical examination was performed. The medical history chiefly included inquiry about sleep disordered. It also included prior medical history especially systemic hypertension, diabetes mellitus and ischemic heart diseases, history of comorbidities like deviated nasal septum (DNS), allergic rhinitis, tonsillitis, history of endocrine disorder like thyroid disorder, Cushing syndrome, history of psychiatric illness like depression, history of addictions like smoking or alcohol consumption and medication history. Habitual alcohol intake was defined as ingestion of alcohol at least four nights per week.

The limited physical examination included measurement of Height in Meters, Weight in Kilograms, Body Mass Index (BMI=weight/(height) in Kilograms per Metre square), Neck, Waist and Hip circumferences in Cm, Pulse rate, Respiratory rate and Blood Pressure.[2] Neck circumference was measured at the Cricothyroid level, Waist circumference midway between 12th rib and Iliac crest, and Hip circumference at the level of Greater Trochanter, using a measuring tape.

All patients with sleep disordered breathing underwent overnight Polysomnographic study. The episodes of apnea were defined as complete cessation of airflow for ≥10 s, and hypopnea consisted of a ≥50% reduction in oronasal airflow accompanied by a reduction in oxygen saturation measured by pulse Oximetry of at least 4%. Apnea events were classified as obstructive, mixed, or central, according to the presence or absence of breathing efforts with thoraco-abdominal paradox. AHI was determined by the frequency of these events per hour during sleep time based on the results of the overnight Polysomnography.

Gender differences in clinical profile and risk factors for OSA were assessed. These gender differences were tested for statistical significance using various test of statistical significance depending on the type of data. For quantitative data student 't' test and for qualitative data 'chi-square' test was used. The Statistical Package for the Social Sciences (SPSS-15) software was used for data handling and analysis. Probability (p) values of less than 0.05 were considered statistically significant

Inclusion criteria

1. Age more than 13 years.
2. Patients attending to outpatient department and admitted in wards with symptoms suggestive of Sleep Disordered Breathing:

- Excessive daytime somnolence
- Disruptive snoring
- Fragmented sleep
- Choking and gasping
- Un-refreshing sleep,Morning headache
- Personality changes and Impaired concentration
- Insomnia
- Daytime headache

Exclusion criteria

- Age less than 13 years.
- Patients with Acute Myocardial Infarction and Acute Stoke.
- Patients admitted from emergency room life threatening deterioration including acute respiratory failure, critical metabolic acidosis, altered sensorium and LVF.
- Patients with active Pulmonary Tuberculosis.
- Patients not ready to participate in the study.

RESULTS

Total 94 patients with sleep related symptom, enrolled through OPD and IPD after satisfying inclusion and exclusion criteria, underwent overnight Polysomnographic study. Out of total 94 patients,80 patients diagnosed as OSA were evaluated for gender

differences in clinical profile and distribution of various risk factors for obstructive sleep apnea.

Out of total 94 patients in study population,85.10% were diagnosed as OSA while others were simple snorer. Of all the male patients (58) 86.20% patients (50) were OSA and of all female patients in study population (36) 83.33% were diagnosed as OSA.

The prevalence of OSA increases with age for both male and female. But this increase is more marked in females and majority of females in study population were above 40 years of age (83.4%). While 60% of male patients were above 40 years of age. If we take mean age of male and female patients with OSA, the mean age for male is 44.7 years and for female it is 52.93 years. Females patients were older as compared to male patients. Majority of female patients were Post-menopausal. Male predominance among the patients with OSA is suggested by 50 patients with OSA. Male to female ratio is 1.66:1 in present study

Most of the patients with OSA were overweight and obese (91.25%). Out of total male patients 66% were obese while 86.7% female patients were obese. Morbid obesity (BMI>40) was present in 30 % female patients compared to 16 % of male patients. If mean BMI is taken into consideration, female was having higher mean BMI (38.29) than male patients (31.52).Among male patients 12 % were having normal BMI while only 1 female patient was having normal BMI.

Most of the male (41) patients diagnosed as OSA were having neck circumference greater than 42.5 cm, only 9 male patients were having neck circumference less than 42.5 cm. Similarly, 24 females with neck circumference greater than 37.5 cm were having OSA and only 4 females have neck circumference less than 37.5. The female patients with OSA 70% were Postmenopausal while only 30 % were Premenopausal. all the male patients with OSA,86% were smoker and majority of female patients (96.6) were non-smoker. Only one out of 30 female patients w among all the OSA patients, 76% of male patients were habitual Alcoholic while none of the female patient were alcoholic. On ENT examination the prevalence of DNS, adenoid and tonsillar hypertrophy was 4% each in male and 1% each in females and nasal polyps was present in 2% of male and 1 % of female patients with OSA.

Endocrine disorder as a risk factor was seen only in females. None of the male patients with OSA suffered from any endocrine disorder while almost 20% of female patients with OSA were having some endocrine disorder in which Hypothyroidism predominates.66.6% of female patients with OSA and endocrine disorder were having Hypothyroidism.

Risk factor of OSA have gender differences in their distribution. Female patient is older with significantly higher mean age compared to male patients with OSA (52.9 vs 44.7 years). Females are having significantly higher BMI compared to male OSA (38.2 vs 31.5) but neck circumference is higher in males (44.7 vs 38.1 cm).

The prevalence of Smoking and Alcoholism as a risk factor is higher in male patients while endocrine disorder is more common in females. ENT abnormalities are present more or less equally in both the sexes.

DISCUSSION

Majority of patients in study population were adult and elderly. As age increases the prevalence of OSA increases in both male and female patients, but this increase in more marked in females' patients compared to male patients after the age of 50 years. There is relative greater clustering of female OSA patients after 50 years of age (56% vs 40 %) while there is relative greater clustering of male OSA patients below 40 years of age.

These finding are consistent with the findings of the retrospective study conducted by by Koo BB et al, in which female patients with SDB were significantly older compared to male patients (55 vs 44;$p<0.05$).[2]

Tishler PV et al, showed in their study that risk of OSA increases only moderately with age in males but rises steadily and markedly in females.[3]

Obesity is major risk factor for development of OSAS. Most of the patients with Obstructive Sleep Apnea were overweight and obese (91.25%). Out of total male patients 66% were obese while 86.7% female patients were obese. Among male patients 12 % were having normal BMI while only 1 female patient was having normal BMI. If mean BMI is taken into consideration, female was having higher mean BMI (38.29) than male patients (31.52).

When analysis of BMI was performed between the two matched groups among all the OSA patients, female was found to be much heavier than age and AHI matched male patients with OSA. The mean BMI of female group was significantly more than that of male OSA patients (37.7 vs 30.8; $p<0.05$).

Even the woman who weighed the least was already on the borderline obesity (24.0), while males of slight build can still present with OSA (minimum BMI in OSA male equals 20.8 vs 24.0 in OSA female).

Males tolerates obesity poorly compare to females considering higher frequency and severity of OSA despite lower BMI compared to females. And if male and female patients with OSA are matched for BMI then OSA would be more severe in male patients. The fact that females were more obese may explain that in the female sex a higher BMI is needed to produce OSA because body fat distribution follows a gynecoid pattern in

females. By the time that females develop clinical symptoms leading them to seek medical help, they are comparatively much more overweight than males. Quintana-Gallegoa E et al, showed that obesity was more frequent and severe in female patient compared to male patients with OSA.[4] In another study by Christian Guilleminault C et al, also females were statistically more obese than male patients with OSA (mean BMI- 38.4 vs 30.4; $p<0.05$).[5]

Neck circumference as a measure of central obesity is more important risk factor for OSA because male patients despite having lower mean BMI have more severe (higher mean AHI) and frequent OSA compared to females. In present study 82 % of males with Obstructive Sleep Apnea has neck circumference greater than 42.4 cm and 80 % female patients with Obstructive Sleep Apnea has neck circumference greater than 37.5 cm. So increased neck circumference is associated with OSAS. Also, males OSA patients have higher neck circumference than female OSA patients as mean neck circumference of male was significantly greater than female patients (44.75 cm Vs 38.12 cm; $p<0.05$).

Similar findings were shown by a study by Onat A et al, On Neck circumference as a measure of central obesity found strong association with OSAS in Turkish males.[6] Several Other studies illustrated that neck circumference corrected for height is more useful as a predictor of obstructive sleep apnoea than general obesity.[7-9] Menopausal Status is the risk factor exclusively found in female patients rendering them to be at a higher risk for OSA. 70 % of female patients with OSA in this study are post-menopausal. The risk is increased to the extent that the incidence of OSA in females equals to that of the male patients. The male to female ratio for OSA in the age group 21-30 year (Premenopausal) is 8:1 which an approach to one in the age more than 50 years (Postmenopausal). Bixler and co-workers showed Postmenopausal women with HRT were not at increased risk of OSA(odds ratio 0.9) but Postmenopausal women without HRT had an almost four-fold risk (odds ratio 4.3).[10]

In this study,55 % of all OSA patients were smoker and among them 86% of male OSA patients were smoker while only one female OSA patient was smoker. Though Smoking is a risk factor for OSA, it is mainly confined to male subjects. In a study by Wetter DW et al, concluded that Current cigarette smokers are at greater risk for sleep-disordered breathing than are never smokers. Heavy smokers have the greatest risk while former smokers are not at increased risk for sleep-disordered breathing. Thus, Smoking cessation should be considered in the treatment and prevention of Sleep Disordered Breathing.[11]

In a study by Kashyap R it was observed that smokers were 2.5 times to have Obstructive Sleep Apnea than nonsmokers.[12]

Quintana-Gallego E et al, in their clinical study of 1166 patients with OSA found that smoking as a risk factor was more prevalent in males (36.5% Vs 11.7).[4] Of all the male patients with OSA 76% were Alcoholic while none of the female patient gave history of Alcohol intake, so Alcohol addiction is strong risk factor for development of OSA mainly in male patients only.

According to Jamie CM et al, in definition, epidemiology and natural history alcohol abuse is strong risk factor for obstructive sleep apnea. Alcohol intake can prolong apnoea duration, suppress arousals, increase frequency of occlusive episodes and worsen the severity of hypoxemia.[13] Agrawal S et al, in a study of prevalence of metabolic syndrome in a north Indian hospital-based population with obstructive sleep apnoea found significant association of obstructive sleep apnea and alcohol consumers.[14] Several Other studies showed similar findings.[4,15-17]

In this study, of all male patients with OSA 14% had upper airway obstructive pathologies like DNS, nasal polyps, adenoid and tonsillar hypertrophy and similar proportion (16.5%) of female patients had such lesion. So, there was no significant gender predilection as for as these risk factors of OSA are concerned ($p<0.05$). According to Meyer TK et al, in a surgical management of snoring and OSA had commented that deviated nasal septum, adenoid hypertrophy, nasal polyps, retrognathia, lateral pharyngeal wall thickening are associated with OSA.[18] According to Review by Rappai M et al, septum deviation, Nasal polyps, adenoid hypertrophy leads to nasal obstruction and Obstructive Sleep Apnea .Patients with complaints of nasal congestion due to allergy have been reported to be 1.8 times (odds ratio) more likely to have moderate-to-severe SDB compared to those without symptomatic nasal congestion.[19] Endocrine disorder as a risk factor was seen only in females. None of the male patients with OSA suffered from any endocrine disorder while almost 20% of female patients with OSA were having some endocrine disorders including Hypothyroidism (13.3%), Cushing syndrome (3.3%) and PCOD (3.3%). There were 66.6% of female patients with OSA and endocrine disorder were having Hypothyroidism. In a study by Grunstein RR et al, confirms the hypothyroidism as a risk factor for development of OSA and concluded that treatment of Hypothyroidism in the presence of Sleep Apnea is potentially hazardous and may lead to cardiovascular complications. Management by a combination of CPAP and low-dose thyroxine is helpful in this situation.[20]

Punjabi NM et al, also confirms the association of Hypothyroidism with obstructive sleep apnea.[21] Hypothyroidism is established as a risk factor by various other studies.[20,22] Fogel et al, reported that females with polycystic ovary syndrome (characterized by obesity and androgen excess) are at increased risk for OSAS.[23]

Gopal M et al, demonstrated in their study that OSAS is significantly more prevalent in female with PCOD than in a population of obese females. There was no correlation between obesity and severity of the OSAS. Obesity is not the cause of this increased prevalence of OSAS in a population of females with PCOS. Thus PCOD, disorder exclusively found in females, is a risk factor for OSA is found only in females.[24]

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