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Etiology of obstructive sleep apnoea syndrome

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ABSTRACT

Background: The aims of the study were to evaluate the various etiological factors of obstructive sleep apnoea syndrome and to make recommendations based on study findings.
Methods: The study group consists of 60 patients who are diagnosed clinically and polysomnographically to have obstructive sleep apnoea syndrome at ENT and Pulmonary Medicine outpatient departments.
Results: Most cases of severe OSA were in age group of 21-40 (47.8%). No significant association was observed between age distribution and severity of OSA ($p=0.295$). A significant association was observed between obesity and increasing severity of OSA ($p<0.05$). The mean AHI of patients with mild, moderate and severe OSA was 8.45, 23.31 and 49.07 respectively ($p<0.05$). Enlarged adenoids, narrow oropharyngeal inlet, bulky tongue, enlarged tonsils and greater neck circumference were significantly associated with OSA ($p<0.05$). No significant association between DNS, ITH, concha bullosa and enlarged adenoids with OSA ($p>0.05$).
Conclusions: Certain naso-oro-pharyngeal parameters were found to be significantly associated with obstructive sleep apnoea syndrome viz. enlarged adenoids, bulky tongue, greater neck circumference and narrow oropharyngeal inlet. Patients with these features should further be investigated with CPAP titration polysomnography and surgical intervention.

Keywords: Etiology, OSA, Obstructive sleep apnoea

INTRODUCTION

The earliest description of what seems to have been a sleep apnoea is found in 'Pickwik Papers' by Charles Dickens in 1837. It was about a century later that sleep apnoeas were documented scientifically as a distinct entity. In spite of significant research in this field, there is not much published literature from India. Sleep apnoea syndrome is characterized by snoring, excessive daytime sleepiness, neuropsychological disturbances and recurring morning headache. The frequency of sleep apnea syndrome in the general population is estimated to be between 0.5 – 3%.

A prospective value for India would indicate the existence of 4 million sleep apnea patients. Apnoea can be defined as cessation of airflow at the nostrils and mouth for at least 10 seconds. Apnoea index is the number of apnoea per hour of sleep. Hypopnea is defined as 50% reduction in thoraco-abdominal movement lasting for 10 seconds in the presence of continued airflow. Apnoea-hypopnea index is the number of apnoeas and hypopneas during one hour of sleep. Sleep apnoea syndrome can be defined as 30 or more apnoeic episodes during a 7 hour period of sleep or an apnoea index equal to or greater than 5. The American sleep association grades sleep apnoea as follows- mild: 5-20 apnoeas per hour, moderate: 20-40 apnoeas per hour, severe: more than 40 apnoeas per hour.[1]

Sleep apnoea syndrome can be classified into 3 types- obstructive, central and mixed types. Obstructive sleep apnoea is the most common type constituting 62% of sleep apnea syndromes. It is the cessation of airflow in the presence of continued respiratory effect. Causes of obstructive sleep apnoea include nasal polyps, deviated nasal septum, nasopharyngeal tumors, enlarged adenoids and tonsils, large tongue, obesity, micrognathia/ retrognathia, tumors of larynx. Symptoms of obstructive sleep apnoea are snoring, daytime sleepiness, obstructive episodes, morning headaches, personality changes, poor memory, nocturnal choking and frequent waking.[1]

Rationale for the study

Obstructive sleep apnoea syndrome is the most common sleep disorder in the world. Only 2-4% of the total population is aware of this condition. The need to create awareness about this condition is of utmost importance. This study is being conducted to evaluate the various etiological factors of obstructive sleep apnoea syndrome, to create awareness amongst the people regarding this condition so that it can be treated effectively and to a certain extent be prevented.

METHODS

A Hospital based observational study was conducted at Department of ENT and Pulmonary Medicine outpatient department, KS Hedge Hospital, Mangalore.

The study group consists of 60 patients who are diagnosed clinically and polysomnographically to have Obstructive sleep apnoea syndrome at ENT and Pulmonary Medicine outpatient departments. The study was carried out from November 2013 to September 2015. Patients who were diagnosed clinically and polysomnographically to have Obstructive sleep apnoea syndrome were included in the study. Patients who have uncontrolled systemic illness, psychiatric illness. patients who have already been diagnosed with other sleep disorders like narcolepsy, patients on specific medications like immuno-suppressants, narcotics, anti-depressants were excluded from the study.

All subjects were informed about the aim of study before taking their consent. The patient's detailed history is taken regarding the symptoms of obstructive sleep apnoea syndrome along with standard sleep study questionnaires (Berlin questionnaire), detailed ENT examination, diagnostic nasal endoscopy and overnight polysomnography were performed on all patients after taking their consent.

Statistical analysis

All the data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 17 for statistical analysis. Appropriate tests were applied according to type and distribution of data and a p-value of less than 0.05 was taken as significant.

RESULTS

In our study males had preponderance over females with the ratio of 2.5:1. Most patients with severe OSA were males (91.3%) and in females mild and moderate OSA were common. Though the difference did not reach significant levels (p=0.054).

Of the 60 cases evaluated for OSA 49 cases (81.7%) were either obese or overweight. A significant association was observed between obesity and increasing severity of OSA (p<0.05).

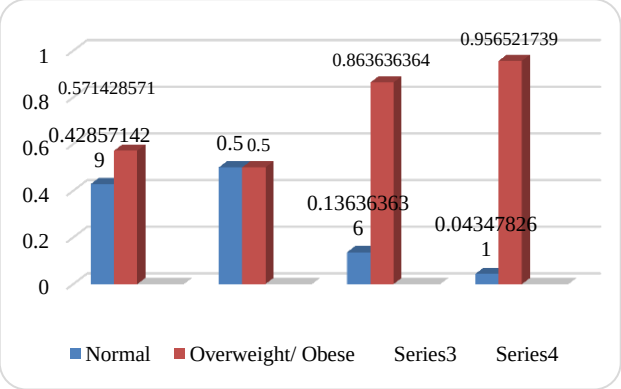

Figure 1: Association between obesity and OSA.

Apnoea–Hypopnoea Index (AHI) is an index used to indicate the severity of sleep apnea.

The mean AHI of patients with mild, moderate and severe OSA was 8.45, 23.31 and 49.07 respectively (p< 0.05).

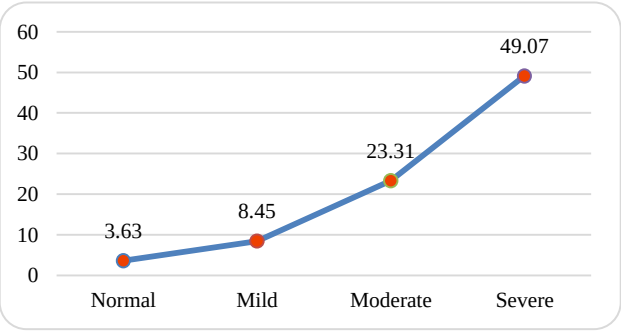

Figure 2: Mean apnoea- hypopnea index of subjects.

Bulky tongue was seen in 34 cases out of total 60 cases evaluated for OSA (56.7%). Out of 60 cases, 22 cases had grade 3 and 12 cases had grade 4 enlargement.

A significant association was seen between presence of bulky tongue and OSA (p=0.01).

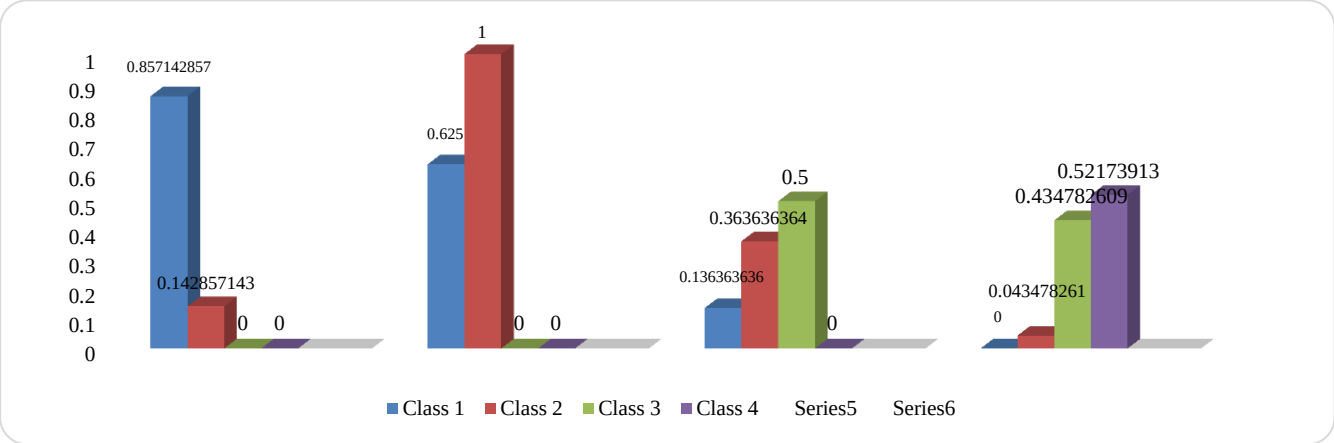

Figure 3: Association between bulky tongue and OSA.

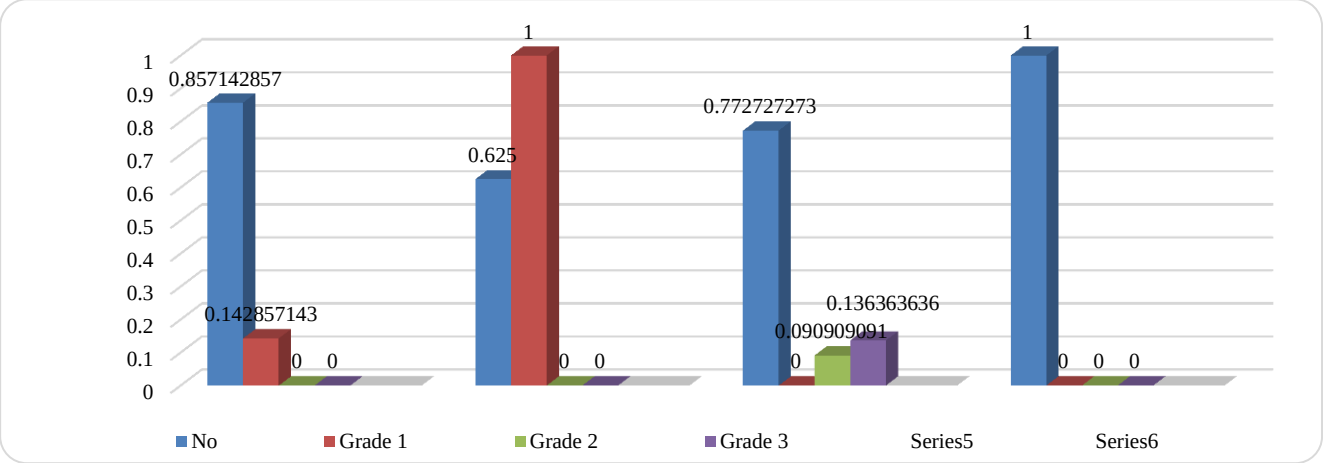

Figure 4: Association between adenoid hypertrophy and OSA.

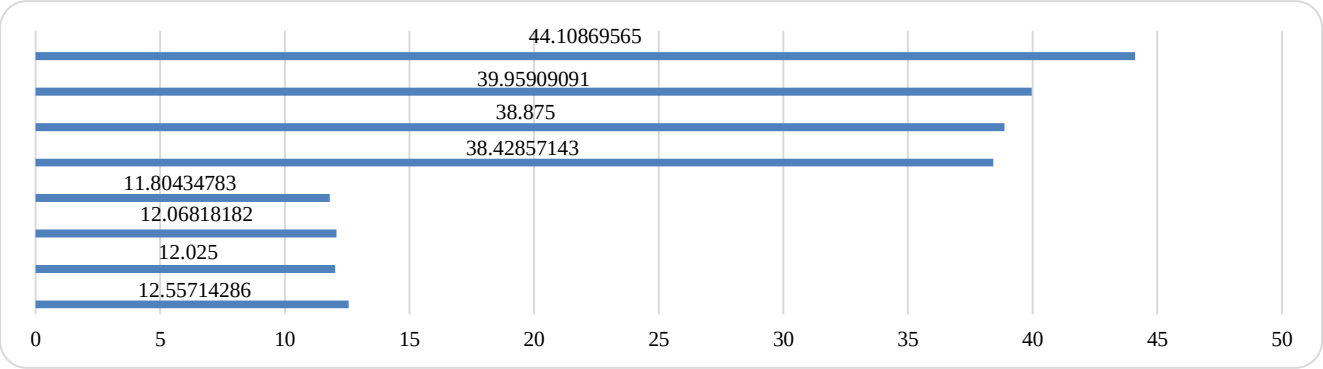

Figure 5: Association between neck circumference and OSA.

Adenoid hypertrophy was seen in 9 cases out of total 60 cases evaluated for OSA (15%). 1.7% had grade 1, 6.7% had grade 2, and 6.7% had grade 3 adenoid hypertrophy respectively. A significant association was seen between presence of adenoid hypertrophy and OSA (p-0.025).

Significant association was found between neck circumference and OSA (p=0.05).

DISCUSSION

Obstructive sleep apnoea (OSA) is being increasingly recognized as an important cause of medical morbidity and mortality. It is a relatively common sleep disorder that is characterized by recurrent episodes of partial or complete collapse of the upper airway during sleep. The ensuing reduction of airflow often leads to acute derangements in gas exchange and recurrent arousals

from sleep. The health consequences of obstructive sleep apnoea are numerous. If left untreated, it leads to excessive daytime sleepiness, cognitive dysfunction, impaired work performance, and decrements in health-related quality of life. Cardinal manifestations include loud snoring, witnessed breathing pauses during sleep, fitful sleep quality, and excessive daytime sleepiness Present hospital based observational study was conducted with the objective of evaluating the symptoms and various etiological factors of obstructive Sleep apnoea syndrome.

Several studies have attempted to address the cause of age-related impact on sleep apnoea but no conclusions have been reached. Mechanisms proposed for the age-related increase in prevalence include increased deposition of fat in the parapharyngeal area, lengthening of the soft palate, and changes in body structures surrounding the pharynx.[2] In present study, the mean age of the study subjects was 38.8 years with approx. half of the cases belonged to the age group 21-40 years. Both the cases with above 60 years of age had severe OSA, however no significant association was observed between age distribution and severity of OSA

It is not clear why OSA is more common in men than women. It can be attributed to anatomical and functional properties of the upper airway and in the ventilatory response to the arousals from sleep.[3] Imaging studies have revealed that men have increased fat deposition around pharyngeal airway as compared with women.[4] Besides, hormonal differences may play a role in the predisposition to abnormal breathing during sleep.[5] In a study by Kaul et al mean age of study subjects was 46.36 years (range: 36-56 years) with male to female ratio of 3:1. Cassel et al in their study, also observed a higher male to female ratio of 7:1.[6,7] Male preponderance was also observed in present study with male to female ratio of 3.2:1. Most patients with severe OSA were males (94.7%) and in females mild and moderate OSA were common (66.7%).

Obesity/visceral obesity is the major risk factor for the development of OSA, it is thought to be associated with anatomic alterations that predispose to upper airway obstruction during sleep, by increasing adiposity around the pharynx and body. A number of previous epidemiological studies have investigated the associations between sleep apnoea and obesity. In a community-based cohort of middle-aged Caucasian subjects, a 1-SD increase in body mass index was associated with a four-fold rise in the prevalence of sleep apnoea.[8] Maria et al in their study also concluded that BMI had a significant effect on obstructive sleep apnoea severity.[9] Of the 60 cases evaluated for OSA in present study 50 cases (80%) were either obese or overweight. We also observed a significant association between obesity and increasing severity of OSA ($p<0.05$).

Obstructive sleep apnoea symptoms generally begin insidiously and are often present for years before the patient is referred for evaluation. Nocturnal symptoms may include the following: Snoring, apnoea episodes, gasping and choking sensations, nocturia, insomnia, restless sleep. Daytime symptoms may include the following: non-restorative sleep, morning headache, excessive daytime sleepiness, daytime fatigue/tiredness, cognitive deficits; memory and intellectual impairment (short-term memory, concentration), decreased vigilance, morning confusion, personality and mood changes, including depression and anxiety, sexual dysfunction, GERD, hypertension and depression.[10]

In present study significant association was seen between symptoms like snoring, obstructive episodes, night arousals and day time sleepiness with severity of OSA.

In present study, we observed that bulky tongue, short neck, neck circumference, narrow oropharyngeal inlet and adenoid hypertrophy were significantly associated with increasing severity of OSA ($p<0.05$). Tongue size was graded according to modified Mallampati score and tongue sizes falling in class 3 and 4 showed significant association to OSA ($p=0.01$). Out of 60 cases, 22 cases had grade 3 and 12 cases had grade 4 enlargement. Short and thick necks also are risk factors for OSA. In the present study, significant association was found between neck circumference and OSA ($p=0.05$). Adenoid hypertrophy was also found to be an important causative factor. 9 out of 60 cases in the present study had adenoid hypertrophy out of which 1.7% had grade 1, 6.7% had grade 2, and 6.7% had grade 3 adenoid hypertrophy respectively. A significant association was seen between presence of adenoid hypertrophy and OSA ($p=0.025$).

Elongated or excessive tissue of the soft palate, a bulky tongue, enlarged uvula, large tonsils, and redundant pharyngeal mucosa are the most common causes of snoring and obstructive sleep apnoea. It decrease the cross-sectional area of the upper airway and/or increase the pressure surrounding the airway, both of which predispose the airway to collapse.[11] Liistro et al showed that a larger tongue is a risk factor for obstructive sleep apnoea, because the airway at oropharyngeal level is reduced.[12]

The major causative factors like adenoid hypertrophy, bulky tongue, enlarged tonsils, narrow oropharyngeal inlet and other causes like concha bullosa, deviated nasal septum, inferior turbinate hypertrophy which contributes to OSA can be corrected surgically. Significant changes and relief in symptoms can be achieved through surgical intervention. Several surgical techniques can be employed like adenoidectomy, tonsillectomy, uvulo-palatopharyngoplasty, resection of base of tongue, septoplasty, conchoplasty, turbinectomy which will be very helpful in alleviating the symptoms of OSA. Moreover lifestyle changes like weight loss, regular exercise, meditation and yoga, healthy eating habits can

significantly improve quality of life of a patient with OSA.

CONCLUSION

Certain naso-oro-pharyngeal parameters were found to be significantly associated with obstructive sleep apnoea syndrome viz. enlarged adenoids, bulky tongue, greater neck circumference and narrow oropharyngeal inlet. Patients with these features should further be investigated with C PAP titration polysomnography and surgical intervention. We thus conclude that obesity is a potent risk factor for the development and progression of sleep apnea, so, weight-reduction strategies should be given importantce in such patients for an optimal outcome. In cases of naso-oro-pharyngeal obstruction, surgical intervention along with the lifestyle modifications should be the treatment of choice. However, low sample size should be taken as one of the limitations of the present study and we recommend further multi-centric studies with larger sample size to further validate our study findings

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