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SLEEP APNEA IN ADULTS: AN OBSERVATIONAL STUDY

Pulmonary Medicine

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ABSTRACT

Background- OSA is defined by the presence of repetitive episodes(AHI>5) of upper airway obstruction during sleep. This study aims to assess the polysomnographic characteristics of OSA in young population(<50yrs age). **Methodology-** A prospective observational study of young population <50 years of age was conducted at department of pulmonary medicine, where all 36 participants underwent polysomnography. In this study we aim to outline the various variables, co-morbidities and AHI severity in this population. **Results-** Out of 36 participants in our study population- 33 participants were found to have OSA. It comprised of 33%(n=12) females and 66%(n=24)males. 55.5%(n=20) participants had severe AHI of which 85%(n=17) were males. 21%(n=25) of the population had an underlying obstructive airway disease. Smokers constituted almost 55%(n=19) of the cases and 65%(n=13) were males. ENT and thyroid disorders were found to be a common in severe and moderate AHI patients (16%,n=15 and 10%,n=9) prevailing more in females. **Conclusion-** OSA in young population is an overlooked diagnosis. Average AHI for the study population was (42.525). Overall, males (66%, n=24) were more prone to develop OSA in young. Female participants reported increased incidence of Asthma, ENT symptoms and hypothyroidism: when compared to men in the same subset. Smoking (55%,n=20) was found to be an independent risk factor for OSA prevalence as well as severity. Chest wall disorders and underlying obstructive airway disease (21%, n=19) predisposed the subjects to develop the condition.

KEYWORDS

OSA, Pre-AHI, young, Smokers, AHI, middle age, males

INTRODUCTION

Obstructive sleep apnoea/hypopnoea (OSAH) is the term for a sleep disorder characterised by dynamic upper airway obstruction during sleep. (Miller and Maskell 2019). It is characterized by recurrent episodes of pharyngeal collapse leading to variable airflow obstruction (atleast AHI>5) and causes neurological and cardiorespiratory implications, as well as, higher mortality and morbidity.

Prevalence in the general population is a highly debated topic owing to controversies regarding a definitive diagnostic criterion and lack of research data. Usually, countries with higher prevalence of obesity reported higher incidence of OSA owing to a string correlation between obesity and OSAH.

Symptoms such as snoring, obesity, co morbidities such as hypertension and Diabetes, thick neck, nasal congestion, excessive day time sleepiness and the most important being observed instances of apnea or hypopnea point towards a clinical diagnosis of OSA. Each respiratory event is associated with hypoxaemia which usually terminates by a brief arousal from sleep, which in turn leads to a spike in blood sugar and blood pressure and the cardinal symptoms of osa-excessive daytime sleepiness. The results of repeated cycles of brief deoxygenation followed by quick reoxygenation may lead to activation of numerous inflammatory cells that pose harm to the endothelium and predispose to atherosclerotic plaque formation.

Although, it's a rather prevalent condition, almost 85% people with clinically significant OSA have not received a clinical diagnosis; this might be due to ignorance of the severity of symptoms by the patient and the family. Sleep study or PSG(Polysomnography) is commonly used to diagnose and confirm with an apnea hypopnea index (AHI)> 5/hr considered to be diagnostic. Most studies have been conducted on the general population and reflects a strong corelation with age. There still remains a dearth of information regarding the prevalence and rise in incidence in the younger age group population, and, how it presents at an early stage.

This study aims to assess the polysomnographic and the clinical characteristics of OSA in young population (<50yrs age).

Methodology

Study Design and Duration

A prospective study was conducted at The Department Of Pulmonary Medicine And sllep medicine at a tertiary care superspeciality hospital over a period of 1 year.

Inclusion Criterion

Individuals who met the clinical criterion for Obstructive Sleep Apnea and had not yet received any therapy for it were registered. Criterion included obesity, daytime sleepiness, snoring, nocturnal awakening, nasal blockage and breathing difficulty. PSG was performed all the patients.

Exclusion Criterion

All those patients with age <18yrs and > 50yrs were excluded. People unable to afford PSG and those with terminal illness. Those with prior diagnosis of OSA or received treatment for sleep apnea were also removed from the study.

Study Population

Patients were carefully selected based on the inclusion and exclusion criterion over the study period. During the study period, 184 patients underwent a sleep study out of which 36 met our criterion. Out of these 3 were non-OSA and 33 were OSA.

Clinical Evaluation

The selected population underwent polysomnography and 33 were reported to have OSA (AHI>5). These were then further stratified into 3 groups based on their severity as mild, moderate and severe. They were evaluated based on their age, BMI, gender, smoking status, co morbidities- Hypertension, Diabetes Mellitus, Obstructive Airway Disease, ENT symptoms including nasal blockage and sleep study pre AHI >5.

Statistical Analysis

The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data with normal distribution were presented as the means ± SD. The data normality was checked by using Shapiro-Wilk test. The following statistical tests were applied for the results:

1. The association of the variables which were quantitative and normally distributed in nature were analysed using ANOVA.
2. The association of the variables which were qualitative in nature were analysed using Fisher's exact test as atleast one cell had an expected value of less than 5.
3. Spearman rank correlation coefficient was used for correlation of pre AHI with age and body mass index.

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0.

For statistical significance, p value of less than 0.05 was considered statistically significant.

RESULTS

All the participants underwent sleep study. Those with AHI <5 were classified as Non-OSA, 5-15 as Mild OSA, AHI >15-35 as Moderate OSA and >35 as Severe OSA. Furthermore, Base on BMI, patients were classified as normal,(18.5-23); overweight (23.1-24.9), obese (25-29.9) and Morbidly obese or Obes2 (>29.9).

Demographic Characterstics

Out of the total, 24 patients (66.67%) were male, and 12 patients (33.33%) were female.

The body mass index (BMI) distribution showed that 20 cases (55.56%) were classified as obese 2, 8 cases (22.22%) as obese, 6 cases (16.67%) as normal, and 2 cases (5.56%) as overweight. The mean BMI for all study subjects was 31.14 ± 7.27, with a median value (25th-75th percentile) of 30.55 (25.851-34.929).

Regarding demographic characteristics, 20 cases (55.56%) were smokers, 17 cases (47.22%) had hypertension, 15 cases (41.67%) had ENT issues, 13 cases (36.11%) had other conditions, 12 cases (33.33%) had diabetes mellitus, 10 cases (27.78%) had COPD, 9 cases (25.00%) had asthma, 9 cases (25.00%) had thyroid conditions, and 8 cases (22.22%) had cardiac conditions.

The mean age of the study subjects was 43.47 ± 4.77 years, with a median age (25th-75th percentile) of 44.5(42-46). (Table 1, figure 1.1 and 1.2)

Table 1:- Demographic Characteristics Distribution

Demographic characteristics	n(%)	Mean ± SD	Median (25th-75th percentile)	Range
Gender				
Female	12 (33.33%)	-	-	-
Male	24 (66.67%)			
Body mass index(kg/m²)				
Normal	6 (16.67%)	31.14 ± 7.27	30.55(25.851-34.929)	19.92-50.81
Overweight	2 (5.56%)			
Obese	8 (22.22%)			
Obese 2	20(55.56%)			
Smokers	20(55.56%)	-	-	-
Diabetes mellitus	12 (33.33%)			
Hypertension	17 (47.22%)			
Asthma	9 (25.00%)			
COPD	10 (27.78%)			
ENT	15 (41.67%)			
Cardiac	8 (22.22%)			
Thyroid	9 (25.00%)			
Others	13 (36.11%)			
Age(years)	-	43.47 ± 4.77	44.5(42-46)	15-50

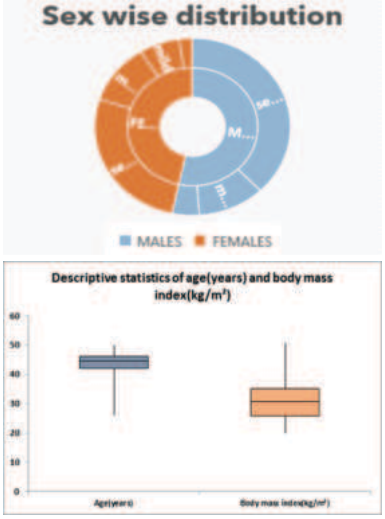

Figure 1.1:- Descriptive Statistics Of Age(years) And Body Mass Index(kg/m²).

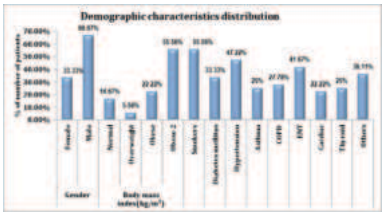

Figure 1.2:- Demographic Characteristics Distribution.

PRE AHI

In 20 cases (55.56%), the obstructive sleep apnea (OSA) severity was classified as severe (AHI > 35), while 10 cases (27.78%) were categorized as moderate (AHI > 15 to 35). Additionally, 3 cases (8.33%) showed an absence of OSA (AHI < 5), and an equal number had mild OSA (AHI 5 to 15).

The mean value of the pre-Apnea-Hypopnea Index (AHI) for the study subjects was 42.52 ± 22.87, with a median value (25th-75th percentile) of 49 (23.375-62.175). (Table 2, figure 2.1 and 2.2)

Table 2:- Oha Distribution.

OHA	n(%)	Mean ± SD	Median (25th-75th percentile)	Range
OHA				
Absent{<5}	3(8.33%)	-	-	-
Mild{5 to 15}	3(8.33%)			
Moderate {>15 to 35}	10(27.78%)			
Severe {>35}	20(55.56%)			
Pre AHI	-	42.52 ± 22.87	49(23.375-62.175)	2.6-73.3

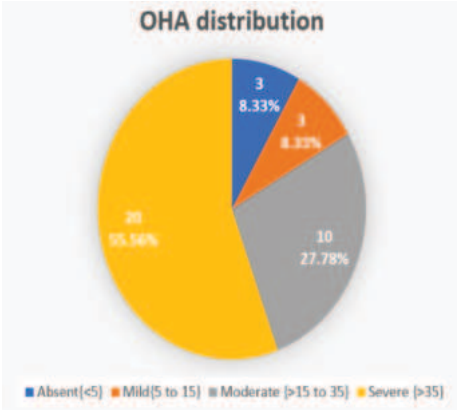

Figure 2.1:- Oha Distribution.

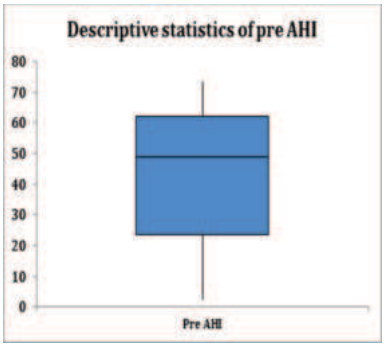

Figure 2.2:- Descriptive Statistics Of Pre AHI.

Correlation Of Pre AHI With BMI And AGE

Significant moderately positive correlation was seen between pre AHI with age(years) with correlation coefficient of 0.552. Significant positive correlation was also seen between pre AHI with body mass index(kg/m²) with correlation coefficient of 0.032.. (Table 3, figure 3.1, 3.2)

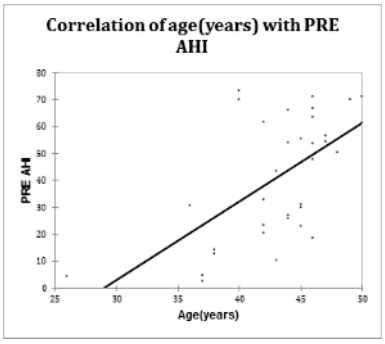

Figure 3.1:- Correlation Of Age(years) With Pre AHI.

Table 3:-correlation Of Pre AHI With Age And Body Mass Index.

Variables	Age(years)	Body mass index(kg/m²)
Pre AHI		
Correlation coefficient	0.552	0.032
P value	0.001	0.042

Spearman Rank Correlation Coefficient

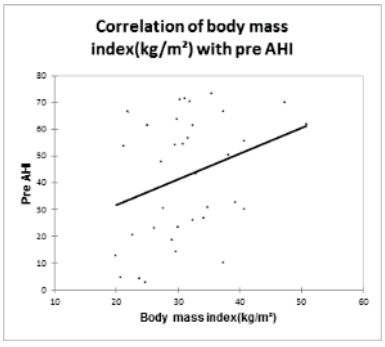

Figure 3.2:- Correlation Of Body Mass Index(kg/m²) With Pre AHI.

Association Of Demographic Characterstics With OSA

The proportion of female patients was significantly higher in the mild category (AHI 5 to 15) compared to the absent (AHI < 5), moderate (AHI > 15 to 35), and severe (AHI > 35) categories (100% vs 33.33%, 50%, and 15% respectively). Conversely, the proportion of male patients was significantly higher in the severe category (AHI > 35) compared to the absent (AHI < 5), mild (AHI 5 to 15), and moderate (AHI > 15 to 35) categories (85% vs 66.67%, 0%, and 50% respectively, p value=0.009).

In terms of body mass index (BMI), the proportion of normal BMI was significantly higher in the absent (AHI < 5) and mild (AHI 5 to 15) categories compared to the moderate (AHI > 15 to 35) and severe (AHI > 35) categories (33.33%, 33.33% vs 10%, 15% respectively). Overweight individuals were significantly higher in the absent (AHI < 5) category compared to mild (AHI 5 to 15), moderate (AHI > 15 to 35), and severe (AHI > 35) categories (66.67% vs 0%, 0%, and 0% respectively). Obese individuals were significantly higher in the mild (AHI 5 to 15) and moderate (AHI > 15 to 35) categories compared to the absent (AHI < 5) and severe (AHI > 35) categories (33.33%, 30% vs 0%, 20% respectively). Obese 2 individuals were significantly higher in the moderate (AHI > 15 to 35) and severe (AHI > 35) categories compared to the absent (AHI < 5) and mild (AHI 5 to 15) categories (60%, 65% vs 0% and 33.33% respectively, p value=0.04).

Table 4:-association Of Demographic Characteristics With OHA.

Demographic characteristics	Absent {<5} (n=3)	Mild {5 to 15} (n=3)	Moderate {>15 to 35} (n=10)	Severe {>35} (n=20)	Total	P value
Gender						
Female	1 (33.33%)	3 (100%)	5 (50%)	3 (15%)	12 (33.33%)	0.009 *
Male	2 (66.67%)	0 (0%)	5 (50%)	17 (85%)	24 (66.67%)	
Body mass index(kg/m²)						
Normal	1 (33.33%)	1 (33.33%)	1 (10%)	3 (15%)	6 (16.67%)	0.04*
Overweight	2 (66.67%)	0 (0%)	0 (0%)	0 (0%)	2 (5.56%)	
Obese	0 (0%)	1 (33.33%)	3 (30%)	4 (20%)	8 (22.22%)	
Obese 2	0 (0%)	1 (33.33%)	6 (60%)	13 (65%)	20 (55.56%)	
Smokers	3 (100%)	0 (0%)	5 (50%)	12 (60%)	20 (55.56%)	0.106 *
Diabetes mellitus	1 (33.33%)	0 (0%)	3 (30%)	8 (40%)	12 (33.33%)	0.756 *
Hyper-tension	0 (0%)	1 (33.33%)	5 (50%)	11 (55%)	17 (47.22%)	0.435 *
Asthma	2 (66.67%)	2 (66.67%)	2 (20%)	3 (15%)	9 (25%)	0.082 *
COPD	0 (0%)	0 (0%)	3 (30%)	7 (35%)	10 (27.78%)	0.603 *
ENT	3 (100%)	2 (66.67%)	4 (40%)	6 (30%)	15 (41.67%)	0.113*
Cardiac	1 (33.33%)	1 (33.33%)	2 (20%)	4 (20%)	8 (22.22%)	0.862 *
Thyroid	1 (33.33%)	1 (33.33%)	3 (30%)	4 (20%)	9 (25%)	0.815 *
Others	1 (33.33%)	0 (0%)	3 (30%)	9 (45%)	13 (36.11%)	0.606 *
Age (years)	33.33 ± 6.35	39.67 ± 2.89	43.1 ± 2.88	45.75 ± 2.97	43.47 ± 4.77	<0.00 01†

* Fisher's exact test, † ANOVA

The distribution of demographic characteristics (smoking, diabetes mellitus, hypertension, asthma, COPD, ENT issues, cardiac conditions, thyroid conditions, and others) was comparable with OHA, though not statistically significant (p value>0.05). Significant associations were found between demographic characteristics, including age (years) and mean BMI, with OHA (p value=0.001 and 0.042 respectively).

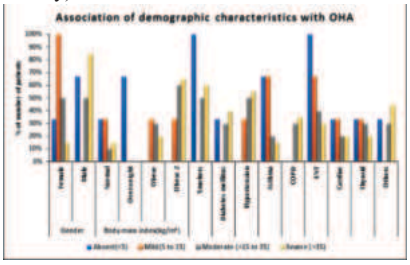

Figure 4.2:- Association Of Demographic Characteristics With OHA.

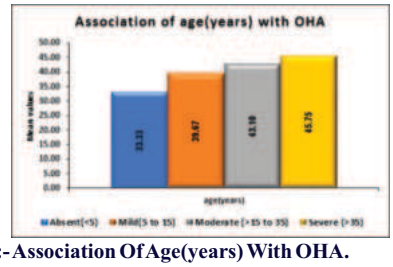

Figure 4.2:- Association Of Age(years) With OHA.

The data shows that as the severity increases, there is a statistically significant trend of higher age, with the mean age progressively rising from 33.33 years in the Absent group to 45.75 years in the Severe group (p < 0.0001). This suggests a potential association between age and the severity of the condition.

DISCUSSION AND CONCLUSIONS

Prevalence and Age

The average age of the participants in this study was found to be 43.47 ± 4.77 years old. The prevalence of OSA in young patients seems to increase with age reaching its peak at middle age . Although, males were on an average, 42.77 ± 4.84 years old and females were, 44.53 ± 8.32 years old. According to studies by Bixler et al. , OSA was most prevalent in middle aged population between 30-65 yrs of age, even higher than females. This age group was more prone to sleeping

difficulties at night time.Furthermore, according to Deng et al.'s research, age and obesity are significant risk factors for the severity of OSA, similar to our findings.

GENDER

OSA is usually more common in older male, which be due to a variety of factors such as male upper body pattern of obesity- which directly affects neck circumference and increases severity of OSA.. According to some studies, the estimated prevalence is as much as 15% in males and 5% in females . Our results were in line with most of the studies, we found that men were almost 2 times more likely to be affected than women in age <50yrs age of presentation. Males also tend to have more severe OSA as compared to women in the same age group, also reflected in our study. Some researches also suggest that men and people between 30-64 age group were more likely to suffer from OSA than women. Although the mechanics behind this is unclear, it is proposed to be due to stiffer upper airways in females, as compared to their male counterparts, which makes upper airway collapse less likely in the former.According to reports, higher prevalence was observed in postmenopausal women than premenopausal women.

BMI

The most significant risk factor for OSA is obesity. Our study findings, point towards a strong correlation (p value 0.04) between weight and development of sleep apnea. More recently, it has even been used as a clinical parameter for diagnosing OSA with daytime sleepiness (as used in STOPBANG questionnaire). Almost 60-90% of these diagnosed with OSA are believed to be obese. Our study reflected, that, Obese and morbidly obese (Obese 2) individuals were significantly higher in the moderate (AHI > 15 to 35) and severe (AHI > 35) categories compared to the mild (AHI 5 to 15) categories (60%, 65% vs 33.33% respectively, p value=0.04). These were consistent with previous researches suggesting similar results that BMI has a significant effect on the severity of OHS. . Our study also reported that the proportion of normal BMI was significantly higher in the absent (AHI < 5) and mild (AHI 5 to 15) categories compared to the moderate and severe (AHI > 35) categories (33.33%, 33.33% vs 10%, 15% respectively), which was similar to the findings by Glicksmann et al. Pre AHI and BMI were associated significantly (p value = 0.042) in the study, consistent to results of various other researches. Prevalance of moderate -to- sever OSA was almost 3 times more in people with the highest BMI than those with the lowest BMI , in the Sleep Heart Health Study. .It was also observed that participants with high pre AHI had more BMI, as seen in other studies. For every 1% change in weight, there was a 3% change in severity of OSA.

Demographic Characterstics

About 55% of the study group was an active smoker and 22% had cardiovascular disease; but , we did not find any correlation between smoking status, cardiac disorder and AHI. Individuals with more common CVD condition usually smoker more cigarettes per day were more likely to have severe OSA. Male gender, smoking, alcoholism and middle age are predisposing factors for sleep apnea related snoring. Senaratna CV, et al in their study on sleep apnea on men found an association of OSA with older age, COPD, Asthma and cardiac disorder.

Hypertension in sleep apnea has been often theorised to be associated with OSA. Repeated cycles of apnea and hypopnea resulted in stimulation of sympathetic system leading to arousal from sleep and a brief surge in systolic blood pressure. Studies also reveal early development and increased risk of hypertension in OSA patients. Among 17 hypertensive participants in our study group, 16 had moderate to severe OSA, but we found no significant association between HTN and OSA.

41% of the participants in the study were suffering from recurrent episodes of nasal blockage. Nasal obstruction leads to mouth breathing which aggravates apnea by destabilising the upper airways.the winscosin sleep study concluded that 35% of individuals with chronic nasal congestion had an AHI >5.our study reported similar results with 41% with nasal congestion jad OSA and out of which 35% were in sever category. In a study by Magliulo et al, 70% of the OSA study cohort had nasal obstruction. Nasal obstruction reduces airflow, causes narrowing and collapsibilty of airways and interferes with nasal reflexes that stimulate ventilation. No positive correlation was observed in our study between OSA and Co-Morbidities such as hypertension, diabetes and hypothyroidism, although some studies do suggest otherwise.

CONCLUSION

About, 85% of the people with clinically significant OSA remain undiagnosed.Although previous research suggests significant correlation between BMI, age and OSA; OSA has seldom been studied in younger population.

In conclusion- our study shows that obesity, male gender and middle age are together a risk factor for future development and severity OSA. It has been traditionally a disorder associated with increasing BMI and older age, however, the results shed light on the dearth of data in young population and the need for better evaluation of this disorder. The prevalence in middle aged population highlights the importance of considering demographic factors in the assessment and management of this particular health condition. Polysomnography (PSG) or sleep study still remains the primary diagnostic tool for this treatable disorder. Oftentimes, failure to recognize symptoms and reluctance of young population towards follow up evaluation, the disorder is seen to have a delayed diagnosis. An improved compliance for CPAP and life style modifications has been suggested for a better treatment response which is seldomly seen in the younger subset of population.

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