To Make a Definitive Diagnosis of Obstructive Sleep Apnea in Snorers by Polysomnography Attending A Tertiary Care Hospital
(Research Study)

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ABSTRACT
Introduction: Obstructive Sleep Apnoea (OSA) is one the most potential causes of increased upper airway resistance resulting in snoring, so needs to be confirmed and properly managed. Polysomnography is considered as the gold standard in diagnosis of OSA.

Aims and objectives: To make a definitive diagnosis of OSA in snorers and assess its prevalence, as well as to compare its prevalence in obese versus non-obese people.

Materials and methods: A total of 300 patients met the criteria and were included. Medical records and data of patients who underwent Polysomnography (PSG) were reviewed retrospectively.

Results: Prevalence of obstructive sleep apnoea among snorers in the study is 67.3%. Its prevalence among obese and non-obese are 79% and 59.7% respectively. There were no untoward effects during the study.

Conclusion: Undiagnosed OSA is quite prevalent in our country. Polysomnography is the gold standard in diagnosis of OSA. Though obesity is one of the risk factors of OSA, non-obese persons with symptoms suggestive of OSA should also be evaluated with PSG.

Key Words: Obstructive sleep apnoea, Polysomnography, obese, non-obese

INTRODUCTION
Habitual snoring is common, occurring in 44 percent of males and 28 percent of females who are between 30 and 60 years of age in the general population. Occasional snoring is almost universal. Snoring is indicative of increased upper airway resistance. It can be a sign of obstructive sleep apnea (OSA), a sleep disorder characterized by obstructive apneas and hypopneas that occurs when upper airway resistance is severe. The primary purpose of evaluating patients who snore is to identify...
potential causes of increased upper airway resistance, so they can be confirmed and treated, if necessary. Snoring is most often associated with obesity or obstructive sleep apnea (OSA).

From the experience of our polysomnography unit, we have found occurrence of OSA among quite a number of non-obese patients as well; though generally this entity is known to be associated with obesity. Our aim is to study the occurrence of OSA in habitual snorers. Subjective or clinical impression alone is not sufficient to identify patients with Obstructive Sleep Apnoea Hypopnoea Syndrome. Definitive diagnosis requires polysomnography (sleep study) and appropriate treatment definitely reduces the morbidity and mortality associated with the disorder.

Descriptions on an entity constituting obesity and extreme somnolence were highlighted in the character Joe - a fat boy in Charles Dickens’ series, PICKWICK PAPERS in 1835. Dickens described Joe as a loud snorer who was obese and excessively somnolent - classical description of Pickwickian syndrome. Sir William Osler in 1918 first linked obesity and Pickwickian syndrome. ³ Over the last 30 years we have begun to understand the pathogenesis of sleep apnoea and have developed effective diagnostic and treatment modalities for this common disorder.

Sleep related breathing disorders (formerly called sleep disordered breathing) refer to an abnormal respiratory pattern (eg, apneas, hypopneas, or respiratory effort related arousals) or an abnormal reduction in gas exchange (eg, hypoventilation) during sleep.

International classification of sleep disorders (Data from 2005, International Classification of Sleep Disorders (ICSD-2)⁴

It is estimated that 26 percent of adults are at high risk for OSA. The prevalence of OSA in the general population is approximately 20 % if defined as an apnea hypopnea index greater than five events per hour⁵. It is common to be asymptomatic and have an AHI (apnea hypopnea index ) greater than five events per hour. The prevalence of OSA increases from 18 to 45 years of age, with a plateau occurring at 55 to 65 years of age. There is a two- to three-fold higher prevalence among individuals who are 65 years and older, compared to those who are 30 to 64 years old. ⁶ OSA is more prevalent in African Americans who are younger than 35 years old, compared to Caucasians of the same age group. ⁷ 3-4 % of women and 6 - 9 % of men have OSA, when defined as an AHI greater than five events per hour accompanied by daytime sleepiness or a cardiovascular morbidity (eg, hypertension). ⁶ Some of the gender differences may be age-related. Males have a higher AHI during adulthood, although there is little gender difference among adolescents or after the sixth decade. ⁸ Various risk factors were found associated with OSA like; Gender (male:female-2:1), Obesity (>120% ideal body weight), Neck size (collar size >17 inches in males and >15 inches in females), Craniofacial and upper airway soft tissue abnormalities (genetic), Current smokers (but not past smokers), Nasal congestion & patients with diabetes or insulin resistance. ⁹ ¹⁰ ¹¹
Any factor that causes a section of the upper airway to narrow can contribute to airway collapse. The increased resistance will cause a pressure drop across the narrowed site. The downstream section of the airway will then be at risk for collapse when muscle tone is reduced during sleep. Genetic factors affecting upper airway size and tissue volumes contribute to airway collapse by increasing the transmural pressure in the collapsible segment of the airway. It has been suggested that neuromechanical impairment of the upper airway can contribute to upper airway obstruction in patients with OSA.

Most patients with OSA are males who are 18 to 60 years old, although OSA is also common at other ages and in women. The physical exam is frequently normal, except for obesity (body mass index >30 kg/m²) and a crowded oropharyngeal airway. The obesity may be only moderate, since 18 to 40 percent of patients are less than 20 percent above their ideal body weight. Additional physical findings like Elevated blood pressure, Narrow airway, Large neck and/or waist circumference, and Signs of pulmonary hypertension or cor pulmonale (eg, peripheral edema) may exist if OSA coexists with obesity hypoventilation syndrome or an alternative cause of daytime hypoxemia. If left unattended it can lead to various undesirable consequences like Neurocognitive and Cardiovascular disturbances.

The American Academy of Sleep Medicine recommends offering positive airway pressure therapy to all patients who have OSA.

Behaviour modification is important in management of OSA and includes weight loss, sleep position, alcohol avoidance and medication selection (regarding medications that inhibit the central nervous system).

**OSA-SPECIFIC THERAPIES**

APAP (Autotitrating Positive Airway Pressure) increases or decreases the level of positive airway pressure in response to a change in airflow, a change in circuit pressure, or a vibratory snore (signs that generally indicate that upper airway resistance has changed). There are an increasing number of oral appliances designed to protrude the mandible forward (ie, mandibular advancement splints) or hold the tongue in a more anterior position (ie, tongue retaining devices). Surgical treatment appears to be most effective in patients who have mild OSA due to a severe, surgically correctable obstructing lesion.

**MATERIALS AND METHODS**

The present study is an Observational descriptive analysis conducted in a tertiary hospital. The Study population comprised those Patients coming to the Outpatient Dept. of Respiratory Medicine with complaints of excessive snoring with or without other associated features of OSA, including males and females, urban and rural, adults who met the following inclusion and exclusion criteria.

**Inclusion criteria**

1. Age >18 years
2. History of excessive snoring as reported by the patient or the nearest relative
Exclusion criteria
1. Recent MI
2. Upper airway surgery
3. Congestive cardiac failure
4. Pregnancy
5. Chronic renal failure
6. Systemic steroid intake and HRT
7. Alcohol ingestion, especially around bedtime
8. Psychiatric illness and treatment
9. Respiratory allergy and non-anatomical nasal obstruction
10. Use of tranquilisers/muscle relaxants
11. Hypothyroidism/acromegaly
12. Sleep deprivation (shift workers)

Sample size was calculated to be 300 using the formula $n = \frac{4p(1-p)}{L^2}$
where, $P$ - Prevalence (as noted from recent literature)
$Q = 100 - p$
$L$ - Allowable error (20% of $p$)

Medical records and polysomnographic data of 300 patients who underwent PSG for the diagnosis of OSA from April 2000 to May 2010 were analysed retrospectively. All the eligible patients had been monitored in the Dept. of Respiratory Medicine. Data regarding age, gender and BMI were analysed. Regarding the PSG reports, the variable studied was AHI.

RESULTS

Table - 1: Age distribution of analysed cases

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 30yrs</td>
<td>22</td>
<td>7.3</td>
</tr>
<tr>
<td>30 - 65yrs</td>
<td>256</td>
<td>85.3</td>
</tr>
<tr>
<td>&gt; 65yrs</td>
<td>22</td>
<td>7.3</td>
</tr>
</tbody>
</table>
Table 2: Gender Distribution of analysed cases

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>220</td>
<td>73.3%</td>
</tr>
<tr>
<td>Female</td>
<td>80</td>
<td>26.7%</td>
</tr>
</tbody>
</table>

Table 3: Distribution of OSA Positive cases

<table>
<thead>
<tr>
<th>OSA</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>202</td>
<td>67.3%</td>
</tr>
<tr>
<td>No</td>
<td>98</td>
<td>32.7%</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 4: Age wise distribution of OSA

<table>
<thead>
<tr>
<th>OSA</th>
<th>Age</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;30yrs</td>
<td>30-65yrs</td>
</tr>
<tr>
<td>Yes</td>
<td>14</td>
<td>177</td>
</tr>
<tr>
<td>No</td>
<td>8</td>
<td>79</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>256</td>
</tr>
</tbody>
</table>
Table 5: Gender wise distribution of OSA

<table>
<thead>
<tr>
<th>OSA</th>
<th>Sex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Yes</td>
<td>154</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>48</td>
</tr>
</tbody>
</table>
TABLE-6 Distribution of OSA according to severity

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>83</td>
<td>41.1%</td>
</tr>
<tr>
<td>Moderate</td>
<td>76</td>
<td>37.6%</td>
</tr>
<tr>
<td>Mild</td>
<td>43</td>
<td>21.3%</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Graph showing Obstructive Apnoea
Of the total number of 300 patients studied, 73.3% were males and the rest females. 85.3% were between the age of 30 and 65. The youngest patients studied was 18 years and oldest 80 yrs of age. Total study group had 73.3% males and others were females. Non obese patients were 60.3% and others were obese. Out of the total number of patients studied, OSA was positive in 67.3% of which 69.1% were between the age of 30 and 65 years. Majority of OSA positive were males (76.24%). According to the severity, 41.1% had severe OSA, 21.3% had mild OSA and others moderate. OSA was more common among non-obese (53.5%) of which 36.1% had severe OSA. Among obese 46.8% had severe OSA. Of the non-obese OSA positive patients 84.3% were males and among obese, it was 67%.

DISCUSSION

Snoring is a common problem that poses a high risk for OSA. It is a common chronic disorder that often requires lifelong care. It is important because patients are at increased risk for poor neurocognitive performance and organ system dysfunction, due to repeated arousals or hypoxemia during sleep over months to years. The severity and duration of OSA culminating in these sequelae varies among individuals. There is a increased risk of mortality if not treated. PSG is considered gold standard diagnostic test when it is performed over night in a sleep laboratory with a technologist in attendance.

Objective of this study is to make a definitive diagnosis of OSA among those suspected. Though, this is generally a disease of obese, it can occur in non-obese as well. This study highlights the need to evaluate all patients including non-obese, with symptoms that sound like sleep apnoea. As compared with previous studies, recent studies show a significant increase in OSA among non obese. This is because many sleep specialists when they see thin person sitting in front of them, don’t think of the possibility of OSA right away. To that end, medical records and PSG data of 300 patients were analysed. A total of 300 patients met the study criteria and were included. Of these, 220 (73.3%) were males and 80 (26.7%) were females. Males predominated in this study.

Majority of the study group was within the age group of 30 – 65 years.(85.3%) Non obese patients were 181(60.3%) and obese 119 (39.6%) there was predominance of non-obese patients in this study.

In our study, 202 patients were OSA positive (67.3%) and 98 were negative (32.7%).This is similar to another study which had 66% OSA positivity.28

OSA was more in the age group of 30-65 yrs. (69.1%) in our study as compared to 63.6% in patients < 30 years and 50% in patients > 65 years.

In our study 70% of males & 60% females had OSA. In another study also males suffered from OSA more frequently than females.28

Among non obese, 108 had OSA (59 .7%) and among obese, 94 had OSA (79%). It is worth noting that more than half of non obese patients were having OSA. In another study, 54% of non obese had OSA.28
Among non obese 91 were males and 17 were females. The same study which showed 54% of non-obese having OSA, had showed predominance of middle aged men. Among the obese, 63 were males and 31 were females. Among obese, 46.8% had severe, 31.9% moderate and 21.3% mild OSA. Among the non-obese, 36.1% had severe OSA, 42.6% moderate and 21.3% mild OSA. Our study showed that non-obese had more mild to moderate disease, whereas obese had more severe disease.

Though PSG per se does not have any reported complications, in the present study there was no coincidence of any untoward event while the patients were being studied.

There are only limited data on prevalence of OSA in Indian population, but major finding from our study is that undiagnosed OSA is quite prevalent in our population.

Our study reiterates PSG as the gold standard in diagnosis of OSA as well as the need to evaluate all snorers. Though many patients had mild OSA, in-lab PSG is more reliable than portable methods. The following are the conclusions drawn:

- 73.3% were males
- 85.3% was between 30 and 65 years of age
- Youngest patient studied was 18 years and oldest 80 years of age.
- Total study group had 73.3% males.
- Non-obese patients were 60.3%.
- OSA was positive in 67.3%.
- 69.1% of OSA positive patients were between 30 and 65 years of age.
- Majority of OSA positive were males (76.24%).
- According to the severity, 41.1% had severe OSA, 21.3% had mild and others moderate.
- OSA was most common among non-obese (53.5%).
- Among the non-obese 36.1% had severe OSA and among obese it was 46.8%.
- Incidence of mild OSA was equal in obese and non-obese (21.3%).
- Non-obese males having OSA were 84.3% and among obese 67% were males.
- Major finding from our study is that undiagnosed OSA is quite prevalent in our country.
- More than half of the non-obese studied had OSA, though they had more of mild to moderate disease as compared to obese which had more of severe disease. This study reiterates PSG as the gold standard in diagnosis of OSA as well as the need to evaluate all snorers. Since many patients had mild OSA, in-lab PSG is more reliable than portable methods. The following are the conclusions drawn:

**CONCLUSION AND RECOMMENDATIONS**

Major finding from this study is that undiagnosed OSA is quite prevalent in our country. More than half of the non-obese patients studied had OSA, though they had more of mild to moderate disease as compared to obese which had more of severe disease. This study reiterates PSG as the gold standard in diagnosis of OSA as well as the need to evaluate all snorers. Since many patients had mild OSA, in-lab PSG is more reliable than portable methods. The following are the conclusions drawn:

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- Major finding from our study is that undiagnosed OSA is quite prevalent in our country.
- More than half of the non-obese studied had OSA, though they had more of mild to moderate disease as compared to obese which had more of severe OSA.
RECOMMENDATIONS

1. All habitual snorers should be evaluated, especially those between 30 and 65 years.
2. PSG is the gold standard in diagnosis of OSA.
3. Though obesity is one of the risk factors for OSA, it is quite prevalent in non-obese as well.
4. In–lab PSG is far superior to portable method.
5. Diagnosis of mild OSA is also significant because such patients can be advised regarding sleep hygiene measures, weight reduction, regular follow up and treatment when necessary.

REFERENCES


