To study the prevalence and severity of obstructive sleep apnea in metabolic syndrome in a tertiary care center in western India: A cross sectional study

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Abstract: Background - The worldwide prevalence of both OSA and metabolic syndrome is increasing at a fast pace. Metabolic syndrome has become a major public health problem. Obstructive sleep apnea has been shown to be an independent risk factor for hypertension and insulin resistance. It is therefore important to study the prevalence of OSA in metabolic syndrome.

Aim and Objectives: 1) To study the prevalence symptoms of obstructive sleep apnea in patients suffering from metabolic syndrome on the basis of Epworth sleepiness scale.2) To determine the severity of obstructive sleep apnea in patients having metabolic syndrome on the basis of polysomnography.

Method: A cross sectional study was conducted among 86 patients attending the OPD of Department of Respiratory Medicine and Department of General Medicine in a tertiary care center in western India. Clinical history, BMI, blood pressure (recorded after at least 5 minutes of rest in both arms sitting/supine position) was recorded. Blood samples of 5 ml drawn after 12 hours (overnight fasting) for the measurement of lipid profile and fasting plasma glucose. OSA is defined as apnoea-hypopnoea index (AHI) > 5 that is more than five episodes per hour of cessation of breathing for at least 10 seconds.

Results Excessive day time sleepiness was seen in all 86 patients.43 patients were snorers and apnea were witnessed in 34 patients. EDS and snoring were found to be associated with higher AHI in this study. Mean BMI was found to be 32.52 kg/m^2 and maximum BMI observed was 42.4 kg/m^2. Body mass index of patients >30 kg/m^2 was significantly associated with severity of OSA for the moderate and severe OSA groups.

Conclusions: The results of the present study suggests that patients with metabolic syndrome should be assessed and evaluated for OSAS as it helps in an appropriate treatment with CPAP. Routine screening for metabolic disorders may prevent misdiagnosis and allows physicians to find primary condition and start appropriate therapy, inhibiting the progression of the primary disorder.

Keywords: OSA, Sleep Apnea, Epworth sleepiness scale.

INTRODUCTION:

Obstructive Sleep Apnea (OSA) is recognized as a major contributor to possible health-related ailments. The environment, working conditions, socio- economic status, ethnicity, genetic make-up, dietary habits and cultural factors all have a significant impact on human health. It is a common disorder affecting at least 24% men and 9% women in general population.[1]

Obstructive sleep apnea (OSA) is a clinical condition characterized by recurrent episodes of complete obstruction (apnea) or partial obstruction (hypopnea) of the upper airway, leading to increased negative intrathoracic pressure, sleep fragmentation, and intermittent hypoxia during sleep. OSA afflicts all age groups. Its severity is usually graded according to the average number of apneic and hypopneic episodes per sleep hour (apnea– hypopnea index [AHI]) in sleep studies.

It is a part of the spectrum of disorders characterised by abnormal breathing during sleep, and may range from intermittent snoring to persistent snoring, upper airway resistance syndrome, obstructive sleep apnea syndrome and obesity hypoventilation syndrome. OSA may be associated with symptoms such as excessive daytime sleepiness, loud snoring reported by the patient and/or his or her partner, a feeling of choking or suffocation at night, un-refreshing or restless sleep, changes in mood and personality and cognitive changes[1,2]. These symptoms can be readily detected using simple screening questionnaires such as the Epworth Sleepiness Scale and Berlin questionnaires[3].

A study done in Delhi estimated the prevalence of OSA and obstructive sleep apnea and hypoventilation syndrome (OSAHS) in an Indian study population to be 13.7% and 3.6% respectively.[4] Although, loud snoring is seen in all patients with OSA, not all snorers have OSA. Understanding the differences between patients with OSA and simple snorers is important to explain the mechanism responsible for upper airway obstruction rather than those between OSA and normal non-snorers.[5]

Although the incidence of metabolic syndrome in India is on the rise, there is paucity of Indian data on its correlation with obstructive sleep apnoea. This study was primarily designed to study the clinical prevalence of in metabolic syndrome; and to find risk factors associated with obstructive sleep apnoea (OSA).

AIMS AND OBJECTIVES:

1)To study the prevalence of symptoms of obstructive sleep apnea in patients suffering from metabolic syndrome on the basis of Epworth sleepiness scale in a tertiary care centre in western India.

2)To determine the severity of obstructive sleep apnea in patients having metabolic syndrome on the basis of polysomnography

in a tertiary care centre in western India.

MATERIAL AND METHODS:

Study design: A cross sectional study

Study subjects: Patients attending the OPD of Department of Respiratory Medicine and Department of General Medicine in a tertiary care centre in western India

Study duration: 18 months. (January 2021-June2022)

Sample size: 86 patients attending the OPD of Department of Respiratory Medicine and Department of General Medicine in a tertiary care centre in western India

INCLUSION CRITERIA:

Patients were included on the basis of International Diabetes Federation criteria. According to the new **IDF criteria**[7] for a person to be defined as having the metabolic syndrome they must have:

Central obesity – defined as waist circumference >90 cm for men and > 80 cm for women

Plus, any two of the following four factors:

1. Raised TG level >150mg/dl or specific treatment for this lipid abnormality
2. Reduced HDL cholesterol < 40mg/dl for males and < 50 mg/dl for females or specific treatment for this lipid abnormality
3. Raised B.P systolic >130 mmHg or diastolic >85 mmHg or treatment for previously diagnosed hypertension.
4. Raised FBG >100mg/dl or previously diagnosed type 2 diabetes

EXCLUSION CRITERIA-

- Critically ill patients
- Patients with end stage organ disease and malignancy
- Pregnant women
- Unwilling patients

Patient Data Recording

1. Clinical history
2. BMI (weight in kg/height in m^2)
3. Blood pressure (recorded after at least 5 minutes of rest in both arms sitting/supine position).
4. Blood samples of 5 ml drawn after 12 hours overnight fasting for the measurement of lipid profile and fasting plasma glucose.

Diagnosis of OSA

1. OSA is defined as apnoea-hypopnoea index (AHI) > 5 that is more than five episodes per hour of cessation of breathing for at least 10 seconds.
2. Apnea were defined by an 80% or greater reduction in the airflow signal with persistent respiratory effort lasting 10 seconds or longer.
3. Hypopneas were defined as a 30% or greater reduction in the airflow signal with persistent respiratory effort lasting at least 10 seconds associated with a desaturation of 4% or greater.

Diagnosis of metabolic syndrome

Central obesity is defined as waist circumference ≥ 90 cm for males and ≥ 80 cm for females.

Plus, any two of the following:

1. Raised triglycerides > 150mg/dl, or specific treatment for this lipid abnormality Reduced HDL cholesterol < 40mg/dl in males and < 50 mg/dl in females or specific treatment for this lipid abnormality.
2. Raised blood pressure: systolic blood pressure ≥ 130mmHg or diastolic blood pressure ≥ 85 mmHg.
3. Raised fasting plasma glucose ≥ 100 mg/dl, or previously diagnosed diabetes mellitus.

Data Analysis:

Data was analysed using Microsoft excel 2007 and statistical software Epi Info 7.

RESULTS

Basic demographic characteristics:

- Out of 86 patients included, there 65 (75.6%) were males and 21 (24.4%) female patients.
- Middle aged patients were predominant with a mean age of 59.9 ± 9.04 years and most of them were in the age group of 46-55 years.
- Smoking history was present in 33 patients in our study and while the majority (n=53) were non-smokers. No co-relation was seen in patients with positive history of smoking and severity of OSA on the basis of AHI.
- No predilection to a particular occupation was seen in our study.

Prevalence of symptoms and severity of OSA in metabolic syndrome:

- Mean Epworth sleepiness score was calculated for each group according to the AHI. Although the mean values did not correlate with the severity of OSA, but an ESS of more than 10 in a patient requires further work up for obstructive sleep apnea. ESS is an easy and reliable tool for the same.
- Excessive day time sleepiness was seen in all 86 patients, 43 patients were snorers and witnessed apneas seen in 34 patients. EDS and snoring were found to be associated with higher AHI in our study.
- Mean BMI was found to be 32.52 kg/m^2 and maximum BMI observed was 42.4 kg/m^2. Body mass index of patients >30 kg/m^2 was significantly associated with severity of OSA for the moderate and severe OSA groups
- The mean waist circumference was 107.1 cm and waist hip ratio of all 86 patients was more than 1.

- Minimum neck circumference noted was 36 cm and maximum 47 cm and the mean value was 40.3 ± 3.10 cm for males. Neck circumference more than 17 inches in males was significantly associated with higher AHI. In case of females, mean NC was 39.35 ± 2.48 cm but NC of more than 16 inches which was found in 11 females, did not correlate with severity of OSA.
- Majority of patients in our study had moderate OSA(n=34) followed by mild (n=27) and severe OSA (n=25).
- Mean Systolic blood pressure ranged from 138.53 ± 11.50 to 138 ± 8.84 mmHg and diastolic blood pressure ranged from 82.60 ± 8.99 to 87.06 ± 11.04 mmHg for all three groups (mild, moderate and severe).
- Mean of fasting blood levels values mean ranged from 117 ± 15.92 to 124.83± 33.32 mg/dl for all three groups.
- Mean triglyceride level was 183.94 ± 27.09 to 189.08 ± 33.54 mg/dl and levels for HDL ranged from 37.48 ± 4.71 to 39.36 ± 4.83 mg/dl for all three groups.
- Maximum number of patients (n=56;65.11%) were found to have increased waist circumference along with diabetes and hyperlipidaemia followed by the hypertension and hyperlipidaemia group (n=42;48.43%) then diabetes and hypertension group (n=38;44.18%). All the four components of metabolic syndrome were found in 34.88%(n=30).
- Hyperlipidaemia with either hypertension or diabetes mellitus was found to be significantly correlated with the severity of OSA and the over-lap of either of these two conditions was associated with higher AHI in our study population.

DISCUSSION

- Morbid obesity is correlated to the syndrome of hypoventilation. The syndrome of obesity hypoventilation may be accompanied by obstructive sleep apnea and may lead to significant clinical problems.[3] The syndrome of obesity and hypoventilation is characterized by findings from the history and physical examination. Patients suffer from sleepiness and they sleep during the day when they are not involved in any specific activity.
- Patients with coexisting sleep apnea snore so heavily that their snoring is characterized as heroic by their partners. Morbid obesity is the main physical finding. Other findings are the plethoric facies, the short and thick neck, the small oropharynx, rales, cyanosis and symptoms of right cardiac insufficiency, such as increased pressure in the jugular veins, hepatomegaly and pedal oedema.
- Thus, patients with obstructive sleep apnea have hypertension, high fasting blood glucose levels, increased waist circumference, low HDL cholesterol and high triglycerides and many other characteristics, including sympathetic activation, endothelial dysfunction, systemic inflammation, hypercoagulation and insulin resistance[3].
- A positive relationship was observed between the apnea/hypopnea index, body weight, body mass index, skinfold thickness, lipid percentage in whole body weight, blood glucose levels, uric acid, fibrinogen levels and leptin levels in men examined for possible apnea hypopnea.
- The relationship between the apnea/hypopnea index and leptin levels disappeared when it was corrected for factors, which are indices of obesity. The exogenous administration of testosterone exacerbates obstructive sleep apnea while hormone replacement therapy with oestrogens in postmenopausal women may protect from obstructive sleep apnea.

SUMMARY AND CONCLUSION:

- To summarize, metabolic syndrome is an important marker and predictor of OSA when combined with symptoms of the patient and use of ESS. A middle-aged male patient having MS who has history of snoring and ESS >10 may likely be suffering from OSA. Neck circumference, BMI >30 kg/m^2 is significantly related to the severity of OSA. Individual components of MS may significantly impact the severity of OSA and as observed in our study a combination of two parameters of MS may be associated with higher AHI.
- The entanglement of MS, its individual components and its association with the severity of OSA requires further studies, to make the diagnosis of OSA easier so that early and efficient treatment can be provided to these patients.

LIMITATIONS: The study has all the limitations of a cross sectional study. Since the study was done in western India with specific settings, the study results cannot be generalised.

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CONFLICT OF INTEREST: None declared

ETHICAL APPROVAL: The study was approved by the Institutional Ethics Committee

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