

Study of Prevalence of Obstructive Sleep Apnea in Patients With Metabolic Syndrome

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Abstract: Obstructive sleep apnoea (OSA) is the most common sleep disorder being diagnosed. It is a chronic condition that is characterized by repetitive episodes of the upper airway obstruction resulting in intermittent hypoxia and sleep fragmentation caused by arousals. Obstructive sleep apnea syndrome has been associated with an increased incidence of hypertension, stroke, and cardiovascular disease.

Aim and Objectives: The aim was to determine the prevalence of Obstructive sleep apnoea in patients with metabolic syndrome and to determine whether OSA is associated with various components of metabolic syndrome.

Methods: A hospital based cross-sectional study among 30 patients diagnosed with metabolic syndrome at department of endocrinology, Andhra Medical College, who were evaluated for OSA at Government Hospital for Chest and Communicable Diseases (GHCCD), Andhra medical college, Visakhapatnam, between March 2013 and September 2014 were included in the study.

Results: out of 30 patients with metabolic syndrome, 18 were males and 12 were females. Of 30, 22 had OSA while 8 had no OSA. Among 22 OSA patients, 6, 3 and 13 patients have mild, moderate and severe OSA respectively. 19 out of 22 patients with hypertension, 14 out of 19 patients with diabetes, 17 out of 22 patients with hyper triglyceridemia and 10 out of 15 patients with low HDL levels have OSA.

Conclusion: In conclusion, OSA is highly common in patients with metabolic syndrome and there was a significant association between components of MS and OSA. Early detection and treatment of OSA in MS can prevent the development of cardiovascular complications. Thus need for screening metabolic syndrome patients for undiagnosed OSA has been reinforced by this study.

Keywords: OSA (Obstructive sleep apnoea), MS (Metabolic syndrome)

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I. Introduction

Short sleep duration and poor quality of sleep, increasingly common in our modern society, have many effects on our endocrine and metabolic function. Sleep is a major buffer for hormone release, glucose regulation and cardiovascular function [1]. Sleep-disordered breathing (SDB) disrupts sleep pattern and quality. Obstructive sleep apnoea (OSA) is the most common sleep disorder being diagnosed. It is a chronic condition that is characterized by repetitive episodes of the upper airway obstruction resulting in intermittent hypoxia and sleep fragmentation caused by arousals. Obstructive sleep apnea syndrome has been associated with an increased incidence of hypertension, stroke, and cardiovascular disease [2]. Metabolic syndrome (MS) was first described as a cluster of metabolic abnormalities, with insulin resistance as the central pathophysiological feature, and it was labelled as "Syndrome X" [3]. It is characterized by hypertension, abdominal obesity, increased triglycerides and blood glucose and decreased HDL cholesterol. Metabolic syndrome is associated with an increased risk for the development of type 2 diabetes mellitus and cardiovascular disease [4].

There is a growing recognition of the common coexistence of OSA and various metabolic disorders besides obesity, and the association of OSA and the metabolic syndrome was coined “syndrome Z” a decade ago [5]. Early CPAP treatment has produced some beneficial effects on individual metabolic components of MS hence identification and treatment of OSA in patients with MS is essential [6]. There is clear evidence that sleep apnoea treatment both improves the symptoms of sleep apnoea, particularly excessive daytime sleepiness, and lowers blood pressure. There is some evidence that treatment also reduces cardiovascular disease risk and may sometimes improve diabetes control [7]. OSA in patients with metabolic syndrome is an important issue for research as the prevalence of obesity is increasing worldwide and with this prevalence of OSA and MS will also increase tremendously. Therefore, the aim of the present study was to establish the prevalence of OSA in consecutive patients with a diagnosis of MS. There is a need for further studies to reconfirm results on Indian population.

II. Aims And Objectives

2.1 Aim of the study

The aim was to determine the prevalence of Obstructive sleep apnoea in patients with metabolic syndrome.

2.2 Objectives of the study

1. To evaluate patients with metabolic syndrome for OSA
2. To determine whether OSA is associated with various components of metabolic syndrome

III. Materials And Methods

It is a hospital based cross-sectional study where 30 patients diagnosed with metabolic syndrome at department of endocrinology, Andhra Medical College, who were evaluated for OSA at Government Hospital for Chest and Communicable Diseases (GHCCD), Andhra medical college, Visakhapatnam, between March 2013 and September 2014 were included in the study.

3.1 Inclusion criteria

Patients fulfilling IDF [8] (International Diabetic Federation) criteria for metabolic syndrome.

3.2 Exclusion criteria

1. Critically ill patients
2. Patients with end stage organ disease and malignancy
3. Pregnant women
4. Children
5. Patients with Hypothyroidism
6. Patients using sedative and hypnotic medicines
7. Patients with COPD (Chronic Obstructive Pulmonary Disease)

3.3 Diagnosis of Metabolic Syndrome

According to new **IDF criteria** [8] 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 (Indian population).

3.4 Plus Any Two of The Following Four Factors

1. Raised TG level: ≥ 150 mg/dl, or specific treatment for this lipid abnormality
2. Reduced HDL cholesterol: <40 mg/dl in males and < 50 mg/dl in females, or specific treatment for this lipid abnormality
3. Raised blood pressure: systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg, or treatment of previously diagnosed hypertension
4. Raised fasting plasma glucose (FPG) ≥ 100 mg/dl, or previously diagnosed type 2 diabetes

3.5 Diagnosis of OSA

OSA is defined as apnea-hypopnea index (AHI) > 5 per hour sleep [9]. Apneas were defined as 90% or greater reduction in the airflow signal lasting 10 seconds or longer. Hypopneas were defined as a 30% or greater reduction in the airflow signal lasting at least 10 seconds and associated with a desaturation of 3% or greater.

OSA severity is defined as mild for AHI ≥ 5 and <15 , moderate for AHI ≥ 15 and ≤ 30 , and severe for AHI > 30 /hr.

IV. Data Analysis

The relation between the individual variables, which are discrete, final score, and the primary end points were calculated by the area under the receiver-operator curve (ROC). A ‘P’ value <0.05 was considered statistically significant. The relation between categorical variables and primary end points of the study were calculated by Fischer’s ‘t’ test

V. Results And Observations

The study consisted of 30 patients, out of which 18 (60%) were males and 12 (40%) were females. The mean age of the study population was 48.23 ± 15 years (range 18-70 years). The mean BMI of the study population was 32.39 ± 3.77 . The mean waist circumference and the mean neck circumference of the study population were 107.93 ± 12.17 cm and 15.35 ± 1.13 inches respectively. All the patients had central obesity, 22 (73.33%) patients have hypertension, 19 (63.33%) patients have diabetes mellitus, 22 (73.33%) have hypertriglyceridemia and 15 (50%) patients have low HDL cholesterol levels. Of 30 patients, 22 had OSA while 8 had no OSA. Among 22 patients with OSA 13 were males and 9 were females. In the present study, out of the 22 patients with OSA, 6 (27%) had mild OSA, 3 (14%) had moderate OSA and 13 (59%) had severe OSA. Of 22 patients with hypertension in the study population, 19 had OSA. Among 19 patients with diabetes in the study population, 14 had OSA. Similarly, among 22 patients with hyper triglyceridemia and 15 patients with low HDL levels in the study population, 17 and 10 patients have OSA respectively. Majority of patients with OSA belong to 41-60 yr age group. The mean BMI of the OSA patients in this study was 33.77 ± 3.12 . The mean waist circumference and the mean neck circumference of the OSA patients in this study were 110.95 ± 11.07 cm and 15.72 inches respectively. The mean systolic blood pressure among OSA patients was 146.81 ± 15.23 mm of Hg. The mean fasting blood sugar value, triglycerides and HDL cholesterol levels among OSA patients were 135.45 mg/dl, 170.31mg/dl and 43.95 mg/dl respectively. After analysing the results, body mass index, waist circumference and neck circumference were found to be significantly higher in OSA group compared to non-OSA group. The mean values of systolic blood pressure, FBS, triglycerides were significantly higher in OSA patients compared to non-OSA patients. The association between HDL cholesterol levels and OSA was not statistically significant.

Table 1: Mean values of various patient variables in the study population

Variable	OSA	NO OSA	P value
BMI (kg/m ²)	33.77±3.12	28.60±2.69	0.005
Waist circumference (cm)	110.95±11.07	98.12±10.39	0.01
Neck circumference (inches)	15.72	14.31	0.001
Systolic BP (mm Hg)	146.81±15.23	125 ±13.09	0.001
FBS(mg/dl)	135.45±46.05	109.37±26.94	0.05
Triglycerides(mg/dl)	170.31±24.05	151.12±28.89	0.0001
HDL(mg/dl)	43.95(range 33-57)	44.5 (range 35-58)	0.86

Table 2: Mean values of individual components of metabolic syndrome in different OSA groups

Component of MS	Mild OSA	Moderate OSA	Severe OSA
Systolic BP (mmHg)	143.33	146.66	148.46
FBS (mg/dl)	115.66	137.33	144.15
Triglycerides (mg/dl)	156.16	173.33	176.15
HDL (mg/dl)	45.66	44.33	43.07

Table 3: Association of individual components of MS with OSA

Component of metabolic syndrome	Total	OSA (n=22)	No-OSA (n=8)	P value
Hypertension	22	19 (86.36%)	3 (13.63%)	0.04
Diabetes	19	14 (73.68%)	5 (26.32%)	0.91
Hypertriglyceridemia	22	17 (77.27%)	5 (22.73%)	0.41
Low HDL	15	10 (66.00%)	5 (34.00%)	0.52

All the patients in the study group were divided into three groups according to the number of criteria they fulfilled for the diagnosis of metabolic syndrome. Patients who met 3 out of 5 criteria for metabolic syndrome (central obesity + any two of the remaining criteria) were included in group-A. Group-B patients were those who met 4 criteria for metabolic syndrome (central obesity + any 3 of the remaining criteria). Patients who

met all the criteria of metabolic syndrome were included in group-C. Out of 30 patients in the total study population 18 belonged to Group-A, 6 belonged to Group-B and 6 belonged to Group-C. 12 (66.66%) among group A, 4 (66.66%) among group B and 6 (100%) among group C have OSA.

Table 4: Number of patients with and without OSA in different groups of metabolic syndrome.

Metabolic syndrome groups	OSA (n=22)	No OSA (n=8)	Total (n=30)
Group-A	12 (66.66%)	6 (33.34%)	18
Group-B	4 (66.66%)	2 (33.34%)	6
Group-C	6 (100%)	0 (0%)	6

VI. Discussion

Obstructive sleep apnea (OSA) and the metabolic syndrome (MS) have a strong association with each other owing to their common feature of obesity, but an association independent of obesity has been demonstrated in several studies. There is also evidence, of varying strengths, from epidemiologic and clinical studies, for the independent association between OSA and individual core components of the metabolic syndrome, including hypertension, insulin resistance and dyslipidemia. Repeated episodes of obstructed breathing result in intermittent hypoxemia with reoxygenation and disturbed sleep architecture with sleep fragmentation and sleep loss, which may lead to a plethora of downstream cellular events altering metabolism (Figure 1). Since both OSA and MS are associated with obesity, it is conceivable that OSA is frequent among patients with MS. A number of intermediary mechanisms and an armamentarium of mediators may take part in generating cardiometabolic dysfunction in OSA. The study was undertaken with an aim to establish the prevalence of OSA in consecutive patients with MS. From the results it was observed that, out of 30 patients with metabolic syndrome, 22 had OSA; of which 27% had mild OSA, 14% had moderate OSA and 59% had severe OSA. 13 out of 18 males and 9 out of 12 females have OSA. Analysing the individual components of metabolic syndrome, it was observed that the mean systolic blood pressure, FBS and triglycerides were higher in the OSA group when compared with non-OSA group and it is statistically significant whereas the mean HDL was lower in the OSA group than non-OSA group but this difference is not significant. Also, the mean systolic blood pressure, FBS and triglycerides were more in severe OSA patients when compared to mild and moderate OSA patients. And the mean HDL cholesterol level is lower in severe OSA patients when compared to those of mild and moderate OSA patients. Majority of patients with OSA belonged to BMI of 35.0 to 39.9 kg/m². OSA incidence was increased with increase in BMI. All the patients who had moderate to severe obesity had OSA.

From table 4, it was observed that patients with more components of metabolic syndrome, more is the chance of having OSA. The present study demonstrated high prevalence of OSA in patients with MS. Still it is largely under-recognised among MS patients. OSA is just not a local condition of upper airway but is associated with increased cardiovascular and cerebrovascular morbidity. It is independently associated with all components of MS resulting in increased metabolic and cardiovascular burden. Treatment of OSA with CPAP has shown to decrease cardiovascular morbidity and mortality by reducing blood pressure, dyslipidemia, visceral fat distribution and improving insulin resistance. Therefore it is recommended that every patient with metabolic syndrome should undergo diagnostic sleep study irrespective of sleep symptoms, since prompt diagnosis and management of OSA will reduce cardiovascular morbidity and mortality. The results obtained in this study were similar to those that were observed in other studies conducted by Luciano F. Drager et al (2010) [10] and Kazuo Chin et al [11]. The main strength of the present study is the study design, since consecutive patients with metabolic syndrome underwent polysomnography, regardless of their sleep complaints and OSA was diagnosed by overnight, supervised, in-hospital PSG study. The study has few limitations too. Being a cross sectional nature of the study, cause-effect relationship between OSA and individual components of metabolic syndrome cannot be established. Another limitation of the present study was the observation of non-significant association between OSA and HDL-cholesterol. The absence of difference may be due to small sample size. Therefore, longitudinal studies with large sample size are required for better and accurate results and to prove whether OSA precedes and cause MS or vice versa.

VII. Conclusion

In conclusion, OSA is highly common in patients with metabolic syndrome and there was a significant association between components of MS and OSA. Early detection and treatment of OSA in MS can prevent the development of cardiovascular complications. Thus need for screening metabolic syndrome patients for undiagnosed OSA has been reinforced by this study.

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