

**A STUDY OF ASSOCIATION BETWEEN METABOLIC SYNDROME AND COPD**Lokendra Dave<sup>1</sup>, Swapnil Garde<sup>2</sup>, Ozair Ahmad Ansari<sup>3</sup>, Nishant Shrivastava<sup>4</sup>, V. K. Sharma<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT:** Objective: To evaluate the association between metabolic syndrome and Chronic obstructive Pulmonary Disease. **METHODOLOGY:** This was a prospective – observational cross sectional, analytical study, conducted in Department of Chest-TB and Medicine, Gandhi Medical College, Hamidia Hospital, Bhopal from November 2012 to December 2013. Patient having chronic obstructive pulmonary disease were subjected to this study. Age and sex matched controls were selected randomly. Purpose of study was explained and informed consent was obtained. **RESULTS:** Distribution of metabolic syndrome among COPD patients, according to sex (male: female) was 6:1 whereas 2.2:1 in controls (male preponderance). 42% of COPD patients and 22% of control participants presented 3 or more determinants of the metabolic syndrome. Mean FBS was significantly different from controls with mean FBS value of 119.6±39.39 and 90.16±25.26 respectively. Mean abdominal girth, systolic BP, diastolic BP, HDL levels, triglyceride and BMI were not significantly different between cases and controls. **CONCLUSION:** This study showed that there is strong association of COPD with metabolic syndrome.

**KEYWORDS:** COPD, Metabolic syndrome.

**INTRODUCTION:** Chronic obstructive pulmonary disease (COPD) is characterized by an inappropriate/excessive inflammatory response of the lungs to respiratory pollutants, mainly tobacco smoking.<sup>(1)</sup> It is increasingly recognized that, many patients with COPD have co-morbidities that have a major impact on quality of life and survival. Airflow limitation and particularly hyperinflation affect cardiac function and gas exchange. Inflammatory mediators in the circulation may contribute to skeletal muscle wasting and cachexia and may initiate or worsen co-morbidities such as ischemic heart disease, heart failure, osteoporosis, normocytic anemia, diabetes, metabolic syndrome, and depression.<sup>(2)</sup>

The metabolic syndrome (syndrome X, insulin resistance syndrome) consists of constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus (DM). The major features of the metabolic syndrome include central obesity, Hypertriglyceridemia, low density lipoprotein, cholesterol, hyperglycemia and hypertension.<sup>(3)</sup> The prevalence of this syndrome is high among Asians, including Indians and is rising, particularly with the adoption of a modernized life style.

For each of these, the potential mechanisms and clinical implications are discussed and areas requiring further research are highlighted. In a study conducted by Watz H et al, metabolic syndrome was found in almost half of the patients having COPD irrespective of disease stage and was associated with markers of systemic inflammation particularly the pro inflammatory cytokines Tumor necrosis factor- $\alpha$  (TNF-  $\alpha$ ), interleukin (IL-6) C-reactive protein (CRP) and fibrinogen. In a recent study conducted in Canada by Marquis Karine et-al, shows that metabolic syndrome was shown to be present in 47% of COPD patients.<sup>(4)</sup>

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The effect of the co-existence of COPD and metabolic syndrome on adipose tissue hormones and insulin resistance as well as the differences between COPD patients with and without metabolic syndrome have not been adequately studied<sup>3</sup>. There is increasing body of evidence that systemic inflammation is related to the pathogenesis of both COPD and Metabolic Syndrome. The proposition of this study was based on the same concept.

**METHODOLOGY:** The study was conducted in Department of Chest TB and Medicine, Gandhi Medical College, Hamidia Hospital, Bhopal from November 2012 to December 2013. It was a prospective – observational, cross sectional, analytical study on 50 chronic obstructive pulmonary disease (COPD also termed as COAD) patients and 50 age and sex matched controls from hospital staff and OPD patients having no cardiorespiratory history. Permission of departmental ethical committee was obtained, purpose of study was explained to study subjects and informed consent was obtained.

Inclusion criteria: Patients diagnosed with chronic obstructive pulmonary disease based on GOLD (global initiative for Lung Disease) guidelines,<sup>(5)</sup> on the basis of history, clinical examination and investigations.

Exclusion criteria for this study are as follows:

- Asthma.
- Other chronic respiratory disorder.
- Malignancy.
- Active pulmonary tuberculosis.
- Acute exacerbation/systemic corticosteroids in last 3 months.
- Known case of ischemic heart disease/hypertension/ diabetes mellitus type II/Chronic Renal Failure.

Demographic determinants (age, sex), personal habits (smoking, alcohol, tobacco), physical examination and anthropometric measurements were recorded.

Blood sample was taken for biochemical investigations, spirometry was performed and chest radiography was carried out for each patient.

Diagnostic criteria of various parameter of metabolic syndrome <sup>(6)</sup> [National Cholesterol Education Programme: Adult Treatment Plan III]

Abdominal obesity	:	Male >90cm (For south Asian men) Female > 80cm (For south Asian Women)
Blood pressure	:	systolic>130mmhg, or Diastolic >85mmhg.
Fasting blood sugar	:	>100mg/dl
Triglyceride level	:	>150mg/dl
High Density level proteins	:	<40mg/dl

Differences in the prevalence were tested by chi square tests for statistical significance and mean values between cases and controls were tested by Unpaired “t” test.

**RESULTS:** Mean age of the cases was 54.8±5 years. Age wise distribution of patients showed that maximum number of COPD patients belong to 51-60 years age group[N=21] and the number of patients were in the age group 40-50 years and 60-70 years were 14 and 15 respectively.

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The finding may be suggestive of that COPD is a disease of late onset and is a chronic process. Male and female ratio in the cases was 1.94:1(33 M and 17F), whereas control 32M and 18F (1.78:1). Among COPD cases, 12 males were smokers, rest all non-smokers.

Total 42% of COPD patients and 22% of control participants presented 3 or more determinants of the metabolic syndrome and distribution of metabolic syndrome in cases according to sex (male: female) was 6:1 and 2.2:1 in controls. Prevalence of metabolic syndrome was found more in males (36%) as compared to females (6%) where as in control group the prevalence was 16% and 6% respectively. This variation may be because the cases were diagnosed COPD patients and its prevalence is more in males.

Parameters meeting criteria for metabolic syndrome IN CASES	No of cases of COPD having following parameters in diagnostic range	No of controls having following parameters in diagnostic range	Chi - square	p-value
Blood pressure	25	15	4.176	.041
Triglyceride	23	12	5.319	.0211
HDL	35	20	9.091	.0026
Abdominal Girth	18	12	1.714	.1904
Fasting blood Sugar	33	12	17.82	.00001

**TABLE 1: PREVALENCE OF METABOLIC SYNDROME IN COPD PATIENTS**

BMI	COPD cases	Control	chi square	p-value
<18	9	2	7.067	.0689
18.01-24.99	26	36		
25.00-29.99	14	10		
30	01	02		

**TABLE 2: DISTRIBUTION OF BMI AMONGST CASES**

Mean of Parameters	Cases	controls
Average abdominal Girth	78.545± 12.0069	72.19±9.8767
Average Systolic Pressure	126.04±19.03	118±21.32
Average Diastolic Pressure	79.36± 10.93	77.68±13.29
Average HDL	37.22±9.00	52.08±7.07
Average FBS	119.6±39.39	90.16±25.26
Average Triglyceride	136.04±52.6	135.38±25.59
Average BMI	22.28±3.6	22.789±3.3

**TABLE 3: COMPARISON OF MEAN OF PARAMETERS BETWEEN CASES AND CONTROLS**

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STAGEING of COPD	STAGE 1	STAGE 2	STAGE 3	STAGE 4
Mean BMI	22.36	21.00	26.07	22.7
Mean abdominal girth	79.55	73.22	82.42	73, 5
Mean Fasting blood sugar	106.7	130.8	113.52	156.42
Mean triglyceride	134	129.66	140.82	127.42
Mean HDL	40.1	39	36.26	33.42
Mean systolic blood pressure	120.8	137.33	131.91	132.28
Mean diastolic blood pressure	76.4	82.66	84.43	82.28

**TABLE 4: DISTRIBUTION OF MEAN OF PARAMETERS ACCORDING TO GOLD STAGE OF COPD**

Above tables shows that there is significant difference in the number of cases and controls with significant p values for blood pressure, triglyceride, High Density Lipid proteins and fasting blood sugar. There was lack of significant results for abdominal girth when compared between the cases and controls. On comparing the BMI of cases and controls by applying Chi square the results were insignificant.

Fasting blood sugar appears to be better predictor of metabolic syndrome than other parameters as mean FBS was significantly different from controls with mean FBS of  $119.6 \pm 39.39$  and  $90.16 \pm 25.26$  respectively. Mean abdominal girth, systolic BP, diastolic BP, HDL levels, triglyceride and BMI were not significantly different between cases and controls. These parameters are not directly related to the staging of COPD. However the fasting blood sugar levels have shown increasing trend with increase in the stages of COPD.

**DISCUSSION:** Chronic obstructive pulmonary disease, metabolic syndrome and diabetes mellitus are common and under-diagnosed medical conditions. It is predicted that chronic obstructive pulmonary disease (COPD) will be the third leading cause of death worldwide by 2020. The health care burden of this disease is even greater if we consider the significant impact of chronic obstructive pulmonary disease on the cardiovascular morbidity and mortality.

Epidemiological data suggest that certain co-morbid diseases including diabetes are much more common in patients with COPD and are associated with a worse COPD outcome.<sup>(5)</sup> As shown by Cazzola et al., patients with COPD have a higher burden of Type II D.Mellitus. Sode et al showed that patients with COPD have a greater burden of not only DM but also of myocardial infarction, lung cancer, depression and hip fracture. In contrast to these findings, korean researchers did not find any association between COPD and greater DM prevalence, which may be related to high percentage of underweight subjects in the studied population.<sup>(6)</sup>

In a study titled "Prevalence of metabolic syndrome and gender differences", a comparative study involving 500 subjects, data was collected from National Institute of Medical Sciences (NIMS) hospital and controls from general population during 2010-11. Metabolic syndrome was present in both women and men corresponding to 29% and 23% of women's and men's sample respectively. The prevalence was higher in women than in men.<sup>(7)</sup> The present study findings are contradictory to the above mentioned study.

Mean value of Fasting blood sugar in cases and controls was  $119 \pm 39.39$  and  $90.16 \pm 25.26$  respectively in this study. The difference was found in COPD patients showing raised fasting blood

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sugar (i.e. >100 mg/dl) which was equal to 33; whereas, 12 healthy controls had raised FBS (>100 mg/dl). These results were significant as p value was <0.05.

In the present study 42% of cases and 22% of control participants presented 3 or more determinants of the metabolic syndrome. Marquis enrolled 38 subjects with COPD and 34 coworkers to test whether metabolic syndrome and its components were more common in COPD patients. Over all 47% of COPD patients had 3 or more metabolic syndrome components in comparison with 25% of control subjects.<sup>(8)</sup>

An epidemiological study has shown strong association between metabolic syndrome and airway obstructive disease. They also concluded that metabolic syndrome was identified in approximately 20% of patients with COPD and this correlated most closely with central obesity.<sup>(9)</sup> Hence, the results of our study are similar to the discussed other research activities in context of the prevalence of metabolic syndrome in Chronic obstructive disease.

### CONCLUSION AND RECOMMENDATIONS:

1. Total 42% of chronic obstructive pulmonary disease (COPD) patients were found to be suffering from metabolic syndrome as compared to 22% in control population (significant association).
2. Distribution of metabolic syndrome among COPD patients, according to sex (male: female) was 6:1 whereas 2.2:1 in controls (male preponderance in both groups).
3. Other parameters defining metabolic syndrome like higher fasting blood sugar levels (FBS), high blood pressure (systolic and diastolic), low-HDL, and raised triglyceride all were found to be significantly different from the control subjects with p values [ $<0.05$ ], which suggest strong association of metabolic syndrome with COPD.
4. Fasting blood sugar appears to be better predictor of metabolic syndrome among patient suffering from COPD.
5. Limitation of the present study is that sample size for cases is small and also the control population may not be representative of our general population. But, this being a short preliminary study, its results should further be confirmed in future by further detailed studies.
6. It is recommended that while evaluating any patient of COPD in all stages, one should try to see the other co-morbidities like parameters of metabolic syndrome in addition to investigating from cardio-respiratory point of view, because these parameters in future may contribute to development of severe pulmonary as well as extra-pulmonary conditions, which may lead to increased mortality of these patients.
7. It is likely that cause of metabolic syndrome may be TNF alpha and IL-6 induced which require further study to consolidate the results. However a long prospective study is needed to observe the survival benefit.

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