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A cross sectional study on the prevalence of metabolic syndrome in chronic pulmonary disease patients in tertiary care centre

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Abstract
Introduction: Metabolic Syndrome comprises a group of risk factors for Cardio vascular disease, Diabetes mellitus and components of Central obesity, Hypertriglyceridemia, Hypertension, low levels of HDL cholesterol and Glucose intolerance. This syndrome is also known as syndrome X. COPD is characterised by obstruction to the airflow that is not fully reversible. Systemic inflammation plays an important role in development of both Metabolic Syndrome and COPD.
Aims and objectives: To determine the prevalence of Metabolic syndrome in patients with Chronic Obstructive Pulmonary Disease. Detailed history was taken and all the patients underwent stage 1, stage 2, Stage 3 and stage 4 COPD respectively.
Results: The prevalence of Metabolic Syndrome was 20%, 53.6 %, 54.5 %, 14.3 % in stage 1, stage 2, stage 3 and stage 4 COPD respectively.
Conclusion: The prevalence of Metabolic Syndrome in stage two and three COPD patients was 53.8% and stage 1 and 4 was 18.2% with significant difference between the two groups. So every COPD patient attending Pulmonary Medicine outpatient department must be screened for Metabolic Syndrome particularly in stage two and stage three as they are at increased risk for developing of Metabolic Syndrome. Hypertension, Diabetes and Dyslipidemia were the most common components, so screening for non-communicable diseases which is already implemented in our department should be strengthened to identify COPD patients with undiagnosed Hypertension, Dyslipidemia and Diabetes mellitus.

Keywords: metabolic syndrome, syndrome x

Introduction
Metabolic Syndrome comprises a group of risk factors for Cardio vascular disease, Diabetes mellitus and components of Central obesity, Hypertriglyceridemia, Hypertension, low levels of HDL cholesterol and Glucose intolerance [1]. This syndrome is also known as syndrome X, the insulin resistance syndrome, the deadly quartet, or the obesity dyslipidemia syndrome [2].
Persons with metabolic syndrome are 3 times more likely to develop myocardial infarction and stroke than persons without Metabolic Syndrome and two times more likely to die from MI/STROKE and five times more likely to develop diabetes. Obesity is the most important component of the syndrome which most likely occurs before the development of other components of the syndrome [3, 4, 5]. Atleast 3 out of 5 components is needed to diagnose the Metabolic Syndrome. COPD is characterised by obstruction to the airflow that is not fully reversible and there is no other explanation for the obstruction. According to the Global Burden of Disease Study, there are 25 million cases of COPD patients till 2016. Smoking is the one of the important risk factor for thedevelopment of COPD [6, 7, 8, 9]. Systemic inflammation plays an important role in development of both Metabolic Syndrome and COPD. As said earlier, Metabolic Syndrome being the most important factor in development of diabetes and MI, there is an increased need on social and medical perspective for early diagnosis and management of Metabolic Syndrome in COPD patients,Thereby we can advise people regarding life style modifications and early treatment, thus reducing the morbidity and mortality in COPD patients. So this study is conducted to find the prevalence of Metabolic Syndrome in COPD patients [10, 11, 12].

Aims and Objectives
To determine the prevalence of Metabolic syndrome in patients with Chronic Obstructive Pulmonary Disease.

Materials and Methods
This study is a cross sectional study and was conducted among 50 COPD patients who attended Pulmonary Medicine outpatient department in Maharaja Agarsen Medical College, Agroha.

Inclusion Criteria
Patients more than 40 years of age diagnosed as COPD based on Global initiative for chronic obstructive pulmonary disease (GOLD) guidelines, history, clinical examination, and pulmonary function test and without exacerbations are included in the study

Exclusion Criteria
1. Patients denying consent.
2. Presence of asthma or other chronic respiratory diseases.
3. Presence of malignancy or serious comorbidities that prevents the study completion.
4. Patients with active pulmonary tuberculosis
5. Patients with acute exacerbation of COPD and/or use of systemic corticosteroids in the preceding 3 months.
6. Patients with known cardio vascular diseases

Methodology

The participating patients were given detailed information about the study and their willingness to participate in the study was confirmed. Informed consent was obtained from the patients. Following which detailed history and examination was done in the patients who were meeting the inclusion criteria and does not fit in any exclusion criteria were selected and allowed to participate in the study.

Total 50 COPD patients were included in the study. Detailed history regarding occupation, income, smoking, diabetes, hypertension, recent exacerbation were asked in detail. Anthropometric measurements like weight, height were measured, chest x ray and electrocardiogram was taken for all the patients. Patients socio-economic status was assessed and they were classified according to the modified kuppuswamy scale. Patients who smoked more than 100 cigarettes in their lifetime was considered as a smoker. After eliciting detailed history, all the patients underwent spirometry procedure before and after bronchodilator therapy and classified according to the GOLD guidelines.

Spirometry

Spirometry is the objective measurement of airflow limitation.

Preparation

1. The supervisor needs training in quality performance and technique
2. Maximal patient effort is needed to avoid underestimation of values

Drugs used for bronchodilatation

1. 400 micrograms of short acting beta 2 agonist – FEV1 should be measured after 10-15 minutes.
2. 160 micrograms of short acting anti cholinergics – FEV1 should be measure after 30-45 minutes.

Performance

1. The pause between inspiration and expiration should be less than one second
2. The recording should go on long enough for a volume plateau to be reached
3. FEV1 and FVC is the largest value obtained from any of the 3 technically correct curves
4. Presence of post bronchodilator FEV1/FVC<0.7 confirms the airflow obstruction.

Spirometry Findings in Obstructive Lung Disease

1. FEV1/FVC ratio <0.70
2. FEV1< 80% predicted
3. 3.FEV 25-75% <60% predicted

Restrictive lung disease findings in spirometry

1. FEV1/FVC ≥ 0.8
2. FVC < 80% predicted

Table 1: Global initiative for obstructive lung disease (Gold) staging for severity of COPD

Stage	Severity	Post bronchodilator fev1
1	MILD	FEV1≥ 80% PREDICTED
2	Moderate	50%≥FEV1<80% Predicted
3	Severe	30%≥FEV1<50% Predicted
4	Very Severe	FEV1<30% Predicted

Results

In our study, the study population predominantly consisted of male patients because of the important risk factor smoking, it is most common among males than females, hence COPD is more common in males than females.

Table 2

Gender	No. of COPD patients
MALE	41
FEMALE	09

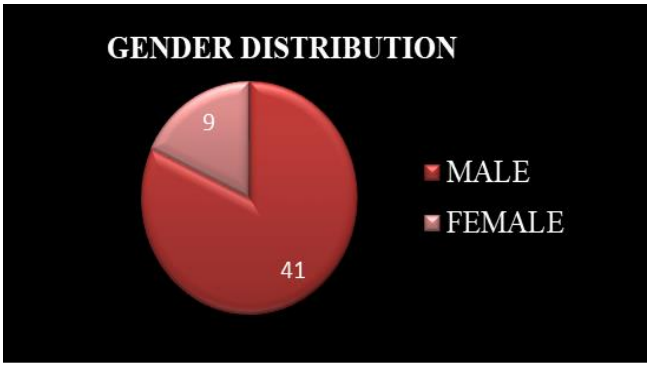

Fig 1

In our study mean systolic and diastolic blood pressure is 131.29± SD 14.451 mmHg and 83.64± SD 8.102 mm Hg respectively. Minimum and maximum blood glucose values is 69 and 128 mg/dl respectively and Mean Fasting Glucose is 99.56 ± SD11.735 mg/dl. Minimum and Maximum Total cholesterol and Triglycerides levels is 88 and 265 mg/dl and 101 and 254 mg/dl Respectively. Mean HDL, LDL and VLDL cholesterol level in our population are 40.92,88.55 and 31.638 mg/dl respectively. Total WBC count in our study population was 7195 cells /cu mm and Minimum and Maximum values of 3100 and 13300 cells/cu mm respectively.

Distribution of COPD Patients According To Gold Severity Classification

Table 3

Gold Staging	Severity	No. of COPD Patients
Stage 1	Mild	08
Stage 2	Moderate	28
Stage 3	Severe	11
Stage 4	Very SEVERE	03
	Total	50

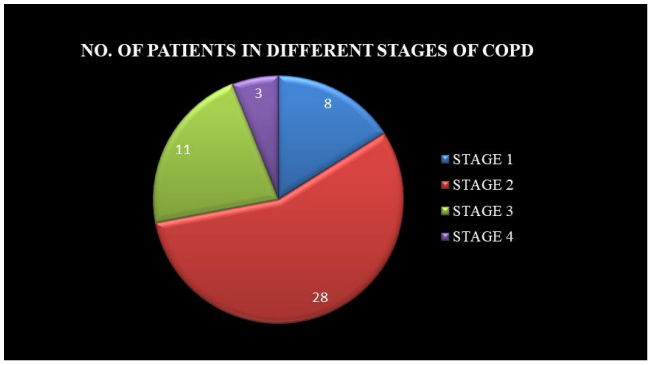

Fig 2

Prevalence of Metabolic Syndrome in COPD Patients

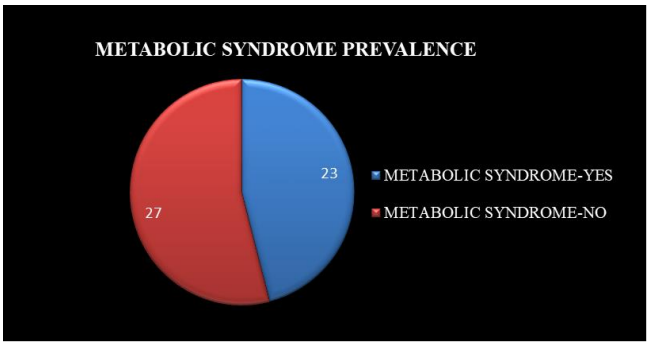

Fig 3

In our study population Metabolic Syndrome was prevalent in 46% of COPD patients which indicates that three or more components of Metabolic Syndrome were present in these patients.

Prevalence of metabolic syndrome in different COPD stages

Table 3

Gold staging	Metabolic Syndrome -yes	Metabolic Syndrome-no	Total
Stage 1	2	6	08
Stage 2	15	13	28
Stage 3	6	5	11
Stage 4	0	3	03
Total	23	27	50

Socio Economic Class and Metabolic Syndrome Modified kuppusamy socio economic scale

Table 4

Total score	Socio economic class
26-29	Upper (I)
16-25	Upper Middle (II)
11-15	Lower Middle (III)
5-10	Upper Lower (IV)
<5	Lower (V)

Table 5

Socio Economic Class	Metabolic Syndrome–yes	Metabolic Syndrome–no	Total
Lower Middle (III)	4	8	12
Upper Lower (IV)	10	10	20
Lower (V)	9	9	18

Smoking and Metabolic Syndrome

Table 6

Smoking	Metabolic Syndrome-Yes	Metabolic Syndrome–No	Total
YES	16	20	36
NO	7	7	14
Total	23	27	50

Metabolic Syndrome was almost equally prevalent in both smoking and non-smoking COPD patients. There is statistically NO significant difference in prevalence of Metabolic Syndrome between smoking COPD and non-smoking COPD patients in our study.

Hypertension versus metabolic syndrome

Table 7

Hypertension	Metabolic Syndrome-Yes	Metabolic Syndrome-No	Total
Yes	14	11	25
No	9	16	25
Total	23	27	50

Prevalence of Metabolic Syndrome Components in COPD Patients

Table 8

Metabolic syndrome Component	Prevalence
Hypertension	50%
Impaired fasting glucose	50%
Abdominal obesity	44%
Elevated triglycerides	50%
Low HDL cholesterol	48%

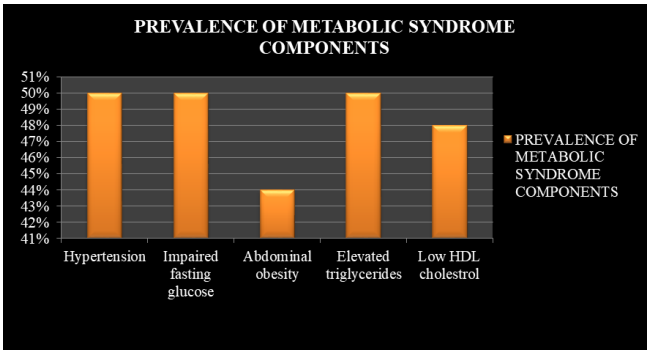

Fig 4

Discussion

Gender distribution

In our study, the study population predominantly consists of male patients because the important risk factor smoking is most common among males than females. Hence COPD is more in males compared to females. A study by Neveen Mahmoud Ameen et al [13] all the study population was only males but in a study by Marie-Kathrin Breyer et al[14] 59% of study population were male subjects.

Staging of copd in our study population

In our study maximum number of patients are from stage two and three consisting 78% study population. In a study by vujic et al [15] stage two and three patients consists of 41.8 and 38.8% respectively which is similar to our study population. In that study stage 1 and 4 consists of 6.1% and 13.3% respectively. But in our study it was 15% and 7% respectively. The possible explanation for low number of stage 1 patients are delay in seeking medical advice and delay in diagnosing the disease. More the disease severity more chance of hospitalization in intensive care unit is the reason for low number of stage 4 study population in our study.

Prevalence of metabolic syndrome in COPD patients

In our study population Metabolic Syndrome was prevalent in 46% of COPD patients which indicates three or more

components of Metabolic Syndrome were present in these patients. A study by marie kathrin bayer et al [14] the prevalence was 57% which higher prevalence compared to our study but lokendra Dave et al [16] study it was 42% similar to our study.

Distribution of metabolic syndrome components in copd patients

In our study, patients who had one or two component of the Metabolic Syndrome may develop Metabolic Syndrome in near future and increases the cardio vascular disease risk in these patients. Hence screening for Metabolic Syndrome is needed in these patients.

Prevalence of Metabolic Syndrome in Different COPD Stages

The prevalence of Metabolic Syndrome was 20%, 53.6 %, 54.5 %,14.3 % in stage 1, stage 2, stage 3 and stage 4 COPD respectively. In a study by Therese Ghatas et al [17] it was 40%, 53.40%, 30%, 28.50% in stage 1, stage 2, stage 3 and stage 4 COPD respectively. The incidence was higher in stage 1 and stage 2 compared to our study in which incidence was higher in stage 2 and stage 3 COPD patients. There is statistically significant different between prevalence of Metabolic Syndrome between COPD stages 2 and 3 and stages 1 and 4 with p value 0.003.In our study the prevalence of Metabolic Syndrome in stage 2 and 3 was 53.8 % and stage 1 and 4 was 18.2% with significant difference p value 0.003. This significant prevalence of Metabolic Syndrome indicates the importance for Metabolic Syndrome screening in stage two and three COPD patients for Metabolic Syndrome. Various studies conducted across the world has confirmed the above findings.

Metabolic syndrome versus socioeconomic class

In our study most of the study population were in upper lower and lower socio economic class (IV and V). Low socio economic status is one of the important risk factors for COPD due to overcrowding and repeated respiratory tract infections which corresponds well with our study population.

Smoking and metabolic syndrome

Metabolic Syndrome was almost equally prevalent in both smoking and non-smoking COPD patients. But various studies had found that Metabolic Syndrome was significantly higher in smoking COPD patients than patients without smoking.

Hypertension versus metabolic syndrome

In a study by therese ghatas[17] hypertension was prevalent in 70.4% COPD patients and in another study by naveen mahmoud ameen et al[13] it was 31.4%. In our study the prevalence of hypertension was 50% and prevalence of Metabolic Syndrome was 54% in that 50% of hypertensive COPD patients and 38% in non-hypertensive patients.

Conclusion and Recommendations

In our Study the prevalence of Abdominal obesity, Hypertension, Impaired Fasting Glucose, Elevated Triglycerides, Low HDL cholesterol are 44%, 50%, 50%, 50%, 48% respectively. Compared to other studies conducted across the world where abdominal obesity was the most common component. In our study Hypertension, Diabetes and Dyslipidemia were the most common components. So screening for non-communicable diseases which is already implemented in our department should be strengthened to identify COPD patients with undiagnosed Hypertension, Dyslipidemia and diabetes mellitus.

The prevalence of Abdominal Obesity, Hypertension, Fasting Blood Glucose, Elevated Triglycerides, Low HDL cholesterol were higher in patients with Metabolic Syndrome than patients without Metabolic Syndrome with significant difference between two groups. Hence COPD patients with Dyslipidemia, Impaired Fasting Glucose /Diabetes Mellitus and Hypertension should be started on ideal antihypertensive drugs, oral hypoglycaemic drugs/insulin and lipid lowering drugs early and should be counseled regarding life style modifications and dietary habits to prevent the cardiovascular disease and chronic complications of diabetes and hypertension and by implementing these measures we can reduce morbidity and mortality in COPD patients. One last and most important factor related to both COPD patients and Metabolic Syndrome is smoking and physical inactivity, so every patient should be counselled regarding ill effects of smoking and physical inactivity and measures should be taken to avoid smoking and advised regarding regular physical exercise.

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