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A STUDY ON PREVALENCE OF METABOLIC SYNDROME IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of morbidity and mortality, often accompanied by Metabolic Syndrome, a cluster of cardiovascular disease and type 2 diabetes risk factors. Metabolic syndrome in patients with COPD and the contribution to severity are research questions of interest. A 6-month cross-sectional study was conducted at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences. Adult patients with COPD were recruited and demographic data, smoking history and Metabolic syndrome components (waist circumference, blood pressure, fasting glucose, triglycerides, HDL cholesterol) were recorded. Metabolic syndrome was defined if the patients had three or more of five International Diabetes Federation (IDF) and NCEP ATP III guideline criteria. Data was analyzed in MS Excel, and association comparisons were conducted by utilizing chi-square tests. 52.2% of 113 COPD patients were with Metabolic syndrome. The most common components identified were low HDL cholesterol (23.7%), Waist Circumference (22.8%), Hypertension (19.2%), Impaired Fasting blood glucose (17.4%), and high Triglycerides (16.9%). Metabolic syndrome, gender (females), smoking status (passive smokers), and metabolic components were of high correlation. There was no correlation with COPD duration or family history. The incidence of metabolic syndrome is very high in COPD patients, who predominantly are females. Poor prognosis of COPD, raised cardiovascular morbidity, is associated with Metabolic syndrome. Screening for all COPD patients for Metabolic syndrome is a standard procedure and is necessary for early intervention, disease control and quality of life. Combination therapy in the context of COPD is the treatment of choice.

Keywords: COPD, Metabolic Syndrome, CVD, International Diabetes Federation.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a reversible condition characterized by chronic respiratory symptoms and irreversible airflow limitation. It is primarily caused by smoking and environmental exposures, leading to an abnormal inflammatory response to harmful particles or gases[1]. COPD significantly contributes to morbidity and mortality, diminishing quality of life and causing preventable deaths. Globally, it remains a leading cause of both morbidity and mortality[2]. In addition to its respiratory impact, COPD has most often been linked with other comorbid conditions, especially the metabolic syndrome[3]. Metabolic Syndrome is a cluster of conditions that are associated with each other and consist of abdominal obesity, dyslipidemia (increased triglycerides and decreased levels of HDL cholesterol), elevated blood pressure, and disturbed glucose metabolism, and all these are risk factors for CVD and T2DM[4].

Over the past decade, the correlation between COPD and metabolic syndrome has gained significant interest. As a global health concern, COPD not only presents with pulmonary symptoms but also frequently coexists with systemic conditions, including cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM), making it an intriguing topic of study worldwide. High metabolic syndrome prevalence in patients with COPD than in the general population[5] and increased metabolic syndrome prevalence with severe COPD is also indicated by research. Knowledge of the association is the basis for the identification of high-risk patients and the application of appropriate interventions. Severity of COPD, based on the grading by the GOLD (Global Initiative for Chronic Obstructive Lung Disease) stages[6], affects metabolic syndrome prevalence with worsening severity increasing over higher prevalence[7].

The pathophysiologic mechanisms connecting COPD and metabolic syndrome are multifactorial and complex. Both of them have systemic inflammation, oxidative stress, and insulin resistance as crucial components[8]. Smoking, being one of the central risk factors for COPD, has also been found to cause insulin resistance, thereby raising the risk for metabolic syndrome[9]. Moreover, patients with both COPD and metabolic syndrome also have compromised respiratory function, lower quality of life, and increased exacerbations[10].

Although the prevalence of metabolic syndrome in COPD is also widely reported, its clinical relevance is unknown. Early intervention and treatment would enhance metabolic as well as pulmonary parameters too, finally leading to enhanced patient outcomes[11]. Our study aims to determine the prevalence of metabolic syndrome in COPD patients as well as risk factors driving towards its formation and thus attaining informative data on both diseases and enhancing patient outcomes.

MATERIALS AND METHODS

A 6-month cross-sectional observational study was performed at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation. The Institutional Ethics Committee (IEC) approved the protocol for the study, and written informed consent was taken from all subjects. Adult volunteers aged 40 years and above, male and female, who were clinically diagnosed with any grade of COPD, were enrolled. Exclusion was among individuals with chronic respiratory diseases like asthma, cancer, severe comorbidities, pulmonary tuberculosis, or those who were not willing to give informed consent or data. Following written informed consent, demographic information like age, gender, smoking status, occupation, and family history was noted on a prepared data collection form. Metabolic syndrome indices like blood pressure, waist Circumference, fasting blood sugar, triglycerides (TGs), and high-density lipoprotein cholesterol (HDL-C) levels were also quantified. Metabolic syndrome was diagnosed if the patient had ≥ three out of the five criteria of the International Diabetes Federation (IDF)[12] & NCEPATP III[13] , i.e., abdominal obesity, high blood pressure, high fasting blood glucose, high triglycerides, and low HDL-Cholesterol. Statistical analysis was carried out using MS Excel, wherein categorical variables were presented as percentages and continuous variables as mean with standard deviation. Chi-square tests were used to determine associations of metabolic syndrome with categorical study variables and to determine associations of the severity of COPD with components of metabolic syndrome, and significance was set at a p-value of less than 0.05.

RESULTS

There were a total of 113 patients. Of them, 52.2% (59 patients) had metabolic syndrome and 47.8% (54 patients) did not have metabolic syndrome. The distribution of the patients with and without Metabolic Syndrome is outlined in the Table1.

The prevalence of components of metabolic syndrome among COPD patients is represented in Table 2. Decreased HDL & Waist circumference was the most common components occurring in 23.7% & 22.8% of patients. Hypertension was noted in 19.2% of patients, followed by Impaired fasting blood glucose (17.4%), and Elevated Triglycerides (16.9%).

The baseline data of the COPD patients recruited in our study, presented in Table 3, indicate wide variation in terms of age, height, weight, and BMI among the volunteers. This shows the wide-ranging nature of persons suffering from COPD with the variation in composition of the body and physical appearance that could vary the disease severity and its treatment.

Table 4 presents the frequency of metabolic syndrome components among COPD patients. Most patients had 2 or 3 components, with 30.1% and 26.5% of patients respectively. Fewer patients had either 0 or 5 components, whereas 1, 4, and 5 components were present in 15.9%, 15.9%, and 9.7% of patients, respectively.

Table 5 illustrates the demographic, clinical, and metabolic syndrome features among

COPD patients. Strong associations were noted between metabolic syndrome and gender (more prevalent in females), smoking status (more prevalent in passive smokers), hypertension, waist circumference, fasting blood sugar, low HDL, and elevated triglycerides, all with p-values < 0.05, signifying strong associations. Age, COPD duration, family history, and BMI had no significant association with metabolic syndrome (p-values > 0.05). These results indicate that some clinical and demographic variables are highly associated with the occurrence of metabolic syndrome in patients with COPD.

Table 1: Proportion of Metabolic Syndrome in Patients with COPD

METABOLIC SYNDROME	NUMBER OF PATIENTS	PERCENTAGE (%)
PRESENT	59	52.2
ABSENT	54	47.8

Table2: Prevalence of Metabolic Syndrome Components

METABOLIC SYNDROME COMPONENT	PREVALENCE (%)
HYPERTENSION	19.2
IMPAIRED FASTING BLOOD GLUCOSE	17.4
WAIST CIRCUMFERENCE	22.8
ELEVATED TRIGLYCERIDES	16.9
LOW HDL CHOLESTEROL	23.7

Table 3: Base Line Characteristics of COPD Patients in Our Study

Variable	Total	Minimum	Maximum	Mean	Standard deviation
AGE (years)	113	40	89	62.6	11.5
HEIGHT (cm)	113	140	181	160.7	7.6
WEIGHT (kg)	113	32	112	64.6	13
BMI (kg/m²)	113	12	39	24.9	4.8

Table 4: Frequency of Metabolic Syndrome in COPD Patients

METABOLIC SYNDROME CRITERIA	FREQUENCY	PERCENTAGE (%)
0	2	1.8
1	18	15.9
2	34	30.1
3	30	26.5
4	18	15.9
5	11	9.7

Table 5: Distribution of Demographic, Clinical, and Metabolic Syndrome Characteristics in COPD Patients

Parameter	Metabolic Syndrome (Yes)	Total	Chi-Square Value	P-Value
Age Group				
40-50 Years	11 (18.6%)	19		
51-60 Years	20 (33.9%)	32		
61-70 Years	10 (16.9%)	31		
>70 Years	18 (30.5%)	31	6.966	0.073
Gender				
Male	23 (39.0%)	65	17.37	<0.0001
Female	36 (61.0%)	48		
Smoking Status				
Active smokers	10 (16.9%)	30		
Passive smokers	25 (42.4%)	34		
Ex smokers	11 (18.6%)	24		
Non smokers	13 (22.0%)	25	10.87	0.012
Hypertension	41 (69.5%)	60	13.32	<0.001
Waist Circumference	50 (84.7%)	64	39.72	<0.0001
Fasting Blood Sugar	38 (64.4%)	56	10.89	<0.001
HDL (Low Levels)	52 (88.1%)	72	31.84	<0.0001
Triglycerides (High Levels)	36 (61.0%)	49	15.67	<0.0001
Duration of COPD				
<5 Years	40 (67.8%)	72		
5-10 Years	15 (25.4%)	32		
>10 Years	4 (6.8%)	9	0.906	0.636
Family History				
Yes	11 (18.6%)	16		
No	48 (81.4%)	97	2.043	0.153
BMI (>=25 kg/m²)				
Yes	31 (52.5%)	56		
No	28 (47.5%)	57	0.440	0.507

DISCUSSION

In this research, it was seen that COPD was more common in men (57.5%) compared to women (42.5%), also observed by Bhattacharyya et al. (2023)[14] and Priyadarshi et al. (2020)[15], with the condition appearing to be higher in men. This is most likely due to excessive smoking and occupational exposure. However, in comparison with COPD patients with metabolic syndrome, prevalence in females (61.0%) was greater compared to males (39.0%) ($p < 0.0001$), which accords with studies in which higher prevalence of metabolic syndrome occurred among females despite having a higher prevalence of COPD among males as a group. These conclusions indicate that women with COPD could be at increased metabolic risk through gender-specific determinants, including the influence of hormones and fat patterning differences, and thus emphasize the importance of specialized health planning.

Comparison with the baseline values, the presentation age of COPD patients in this study was 62.6 years, a rate nearly identical to that of Priyadarshi et al., i.e., 61.8 years, and 65 years by Bhattacharyya et al., which indicates COPD is, on average, diagnosed in middle-aged and older people. A BMI of 24.9 kg/m² supports results of other studies like Bhattacharyya et al. (25.1 kg/m²) and Priyadarshi et al. (24.6 kg/m²) indicating that BMI in patients with COPD is normal or slightly above normal. But it also reported a significantly raised waist circumference (90.9 cm) in metabolic syndrome patients, consistent with Bhattacharyya et al. and Priyadarshi et al., who indicated abdominal obesity as the greatest metabolic risk factor in COPD.

52.2% of patients with COPD were identified as having metabolic syndrome by the studies, which is similar to Bhattacharyya et al. (48%) and Priyadarshi et al. (51.7%).High prevalence rate in the studies indicates that there is strong correlation between COPD and metabolic syndrome and the need for frequent metabolic screening in COPD management as well. The most prevalent components of metabolic syndrome in the present study were reduced HDL cholesterol (23.7%), Waist circumference (22.8%), elevated blood pressure (19.2%), elevated triglycerides (16.9%), and elevated fasting blood glucose (17.4%). All outcomes were consistent with outcomes of the previous studies, where dyslipidemia and abdominal obesity have been determined to be typical manifestations, validating the necessity for specific management of lipid and weight disturbances in patients with COPD in order to prevent cardiovascular disorders.

The status of smoking was the strongest predictor of the presence of metabolic syndrome. Passive smokers (42.4%), ex-smokers (18.6%), and current smokers (16.9%) were in the greatest proportion of metabolic syndrome, a finding also documented by Bhattacharyya et al. and Priyadarshi et al. The metabolic effects of smoking thus seem to be persistent even after abstinence from smoking, suggesting that abstinence from smoking, though crucial, cannot completely eradicate metabolic risk.

CONCLUSION

This study demonstrates the strong correlation of COPD with metabolic syndrome, highlighting the importance of managing metabolic disorders in COPD patients. While COPD is prevalent in men, as per our findings, metabolic syndrome is prevalent in female COPD patients, which suggests that hormonal and fat distribution differences might predispose women to metabolic disorders. Key determinants of metabolic syndrome in our patient included abdominal obesity, reduced HDL cholesterol, elevated triglycerides, and increased blood pressure, all being determinants of increased cardiovascular risk and add to the overall wellbeing of COPD patients. Our findings are in agreement with other global studies, validating the hypothesis that metabolic syndrome not only occurs in combination with COPD but also is capable of aggravating the disease to produce more harmful symptoms and accelerate lung function decline. This validates the importance of treating metabolic syndrome in conjunction with the management of COPD for the purposes of improving patient prognosis as well as quality of life. In addition, the research recommends frequent metabolic screening of COPD patients because the detection and treatment of metabolic complications at an early point will prevent further complications like diabetes and cardiovascular disease. Even when the patient quits smoking, metabolic syndrome remains a problem, and therefore management of metabolic risk factors in COPD patients must be done on a continuous basis. In summary, this article emphasizes the necessity of a comprehensive treatment regimen for COPD that addresses not only respiratory symptoms but also metabolic syndrome management by interventions such as weight loss, physical exercise, and blood pressure and cholesterol control. By targeting both the pulmonary and metabolic components of COPD, doctors are then better equipped to design more effective regimens of treatment to minimize risk and

enhance overall health and well-being of individuals with COPD.

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CONFLICTS OF INTEREST
The authors declare that no competing interest exists.

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