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Metabolic Profile and Its Components among COPD Patients - A Cross Sectional Study in a tertiary Care Hospital

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) frequently coexists with metabolic abnormalities, contributing significantly to morbidity.

Aim: To evaluate metabolic parameters among COPD patients and compare these parameters between patients with and without metabolic syndrome (Met S).

Methods: This cross-sectional study included 110 stable COPD patients diagnosed per GOLD 2023 guidelines. Mets was diagnosed using IDF criteria. Anthropometric measurements, lipid profile, blood glucose, and blood pressure were compared.

Results: Met S prevalence was 49.09%. Patients with Met S had significantly higher BMI, waist circumference, triglycerides, and glucose levels, with significantly lower HDL levels.

Conclusion: COPD patients exhibit substantial metabolic burden, underscoring the importance of routine metabolic evaluation.

Keywords: Chronic, Obstructive, Pulmonary, Metabolic, Inflammatory

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a complex chronic inflammatory condition characterized by persistent respiratory symptoms and airflow limitation. It is now well established that COPD is not merely a localized airway disease but a systemic dis order with widespread metabolic and inflammatory consequences[1]. Systemic inflammation, oxidative stress, skeletal muscle dysfunction, physical inactivity, chronic hypoxia, and long-standing smoking combine to produce a pro-at hero genic and metabolic milieu[2-4].

Metabolic Syndrome (Met S)-A cluster including central obesity, elevated triglycerides, reduced HDL, hypertension, and impaired glucose regulation frequently coexists with COPD[5]. Shared mechanisms include:

- **Chronic systemic inflammation**: Elevated IL-6, TNF - α, CRP increase insulin resistance and at hero genic lipid metabolism[1,6].
- **Oxidative stress**: Generated by smoking and chronic airflow limitation impairs endothelial and metabolic pathways[7].
- **Physical inactivity**: Worsens weight gain, dyslipidemia, and glucose dysregulation[8].
- **Corticosteroid exposure**: May contribute to visceral obesity and hyper glycemic. Global estimates suggest the prevalence of Met S in COPD ranges 40–65%[4,9]. whereas Indian data indicate values between 45 – 70 %, higher than the general population[7,10,11]. Overlap of COPD and Met S increases cardio vascular mortality, exacerbation frequency, hospitalization risk, and declines in lung function[12].

Given the high cardio metabolic burden among Indian COPD patients, it is essential to evaluate metabolic components in detail. This study provides a comprehensive analysis of the anthropometric, metabolic, smoking, and pulmonary function parameters in COPD patients with and without Met S.

Materials and Methods

This was a hospital-based cross-sectional study conducted among 110 clinically stable COPD patients attending the Institute of Respiratory Diseases, SMS Medical College, Jaipur (2022–2023). COPD was diagnosed as per GOLD 2023 guidelines. Patients with acute exacerbations, heart failure, stroke, pregnancy, or those taking lipid-lowering medications were excluded. Data collected included BMI, waist circumference, blood pressure, random blood sugar (RBS), serum triglycerides, and HDL cholesterol. Metabolic syndrome was diagnosed using IDF criteria, requiring ≥3 out of 5 metabolic components.

Results

Table 1: Age and Gender Distribution of COPD Patients

Age Group	Male (N)	Female (N)	Total
40–50 years	8	0	8
51–60 years	28	8	36
61–70 years	37	5	42
>70 years	24	0	24
Total	97	13	110

Table 2: Distribution of Metabolic Syndrome among COPD Patients.

Metabolic Syndrome	Male	Female	Total
Yes	41	13	54
No	56	0	56

Table 3: Comparison of RBS (random blood sugar level in mg/dl) and blood Pressure in COPD patients with and without metabolic syndrome.

Variable		Metabolic syndrome (+) N-54	Metabolic syndrome (-) N-56	Level of significance (DOF-108)
RBS (in mg/dl)	Mean	128.15	103.07	T value- 3.9
	SD	30.7	35.5	P value-0.001(S)
BP				
Variable		Metabolic syndrome (+) N-54	Metabolic syndrome (-) N-56	Level of significance(DOF-108)
SBP	Mean	136.74	133.93	T value- 1.423
	SD	10.8	9.8	P value-0.158(NS)
DBP	Mean	87.9	85.52	T value- 1.176
	SD	7.7	12.8	P value- 0.0242(NS)

Table 4: Comparison of BMI in COPD patients with and without metabolic syndrome.

BMI	Met S+	Met S-
≤24.9	15	27
25–29.9	26	26
≥30	13	3

Table 5: Comparison of Triglyceride level (in mg/dl) and HDL (in mg/dl) in COPD patients with and without metabolic syndrome.

Variable		Metabolic syndrome (+) N-54	Metabolic syndrome (-) N-56	Level of significance (DOF-108)
Triglyceride level (in mg/dl)	Mean	194.35	132.52	T value- 5.798
	SD	69.131	39.158	P value-<0.01(S)
HDL (in mg/dl)	Mean	40.64	47.66	T value- 4.018
	SD	9.79	8.51	P value- < 0.001(S)

Table 6: Complete Biochemical Parameters

Parameter	Met S (+) Mean ± SD	Met S (–) Mean ± SD	P-value
Triglyceride	194.35 ± 28.5	132.52 ± 20.4	<0.01
HDL (mg/dl)	40.64 ± 7.10	47.66 ± 6.40	<0.001
RBS (mg/dL)	128.15 ± 25.4	103.07 ± 18.3	<0.01

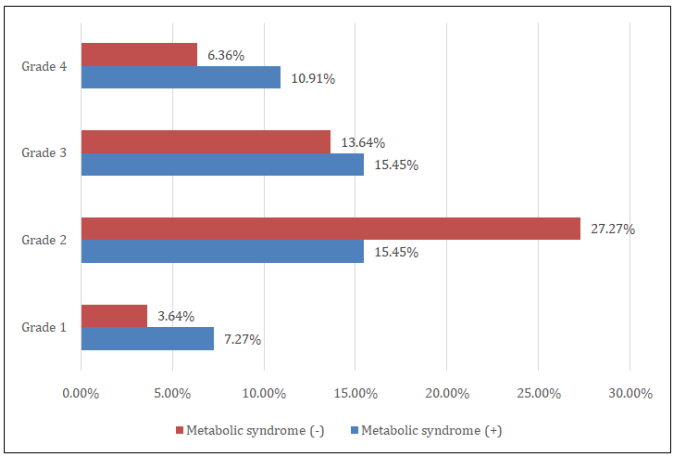
Table 7: Lung Function Parameters.

Parameter	Met S (+)	Met S (-)	p-value
FEV_1/FVC (%)	56.64 ± 9.10	60.81 ± 5.52	<0.05
FEV_1 (% predicted)	Lower	Higher	-

Table 8: Comparison of severity of airflow obstruction as per (GOLD criteria) between patients with and without metabolic syndrome

Severity grading	Metabolic syndrome (+)		Metabolic syndrome (-)		Total	
Grade 1	8	7.27%	4	3.64%	12	10.91%
Grade 2	17	15.45%	30	27.27%	47	42.73%
Grade 3	17	15.45%	15	13.64%	32	29.09%
Grade 4	12	10.91%	7	6.36%	19	17.27%
Total	54	49.09%	56	50.91	110	100%
Level of significance: Chi square-6.63 and p value-0.096 (NS)						

Figure 1: Comparison of severity of air flow obstruction as per (GOLD criteria) between patients with and without metabolic syndrome.



Discussion

This study demonstrates a remarkably high prevalence of metabolic abnormalities in COPD patients, with nearly half fulfilling the criteria for metabolic syndrome. Central obesity, hyper triglyceridemia, reduced HDL levels, and elevated blood glucose were significantly more common in patients with MetS. These findings are consistent with national and international studies, which also report metabolic syndrome rates ranging from 40% to 65% among COPD populations.

Above table depicts the Comparison of RBS (in mg/dl) between COPD patients with and without metabolic syndrome.

The mean RBS (in mg/dl) of COPD patients with metabolic syndrome (128.15 ± 30.7) was significantly higher than that of patients without metabolic syndrome (103.07 ± .5.5). This is evident from the independent t-test performed, where the p-value (<0.05) indicates a significant difference in RBS (in mg/dl) between patients with and without metabolic syndrome.

The strong association between smoking burden and metabolic abnormalities observed in the dataset further supports existing evidence that smoking aggravates systemic inflammation, insulin resistance, and dyslipidemia. These metabolic derangements may accelerate lung function decline, there by worsening disease outcomes.

The presence of Met S in COPD patients calls for a multidisciplinary treatment strategy that integrates respiratory care with cardiovascular and metabolic risk management. Early identification and treatment of metabolic abnormalities may help reduce morbidity, lower exacerbation risk, and improve overall quality of life for COPD patients.

Demographically, the study population consisted of a higher proportion of males (88.18%) compared to females (11.82%). This demographic distribution is consistent with existing literature[59], which found COPD in 90% of males and 10% of females. Most patients fell

within the age group of 61-70 years (38.18%), followed by the 51-60 years group (32.73%), indicating that COPD is primarily a disease of older adults, which corresponds with the typical age of onset and progression of chronic respiratory conditions. Hariprasath K et al. also reported that COPD is higher in the age group of 61-70 years (50%), followed by the 51-60 years group (22%), which indicates that our study patients were similar to the existing norms.

In our study, COPD was more prevalent in males of the age group of 61-70 years (38.14%), whereas in females in the age group of 51-60 years (61.53%), which indicates a higher prevalence of COPD among older males, likely due to higher smoking rates and occupational exposures in men[8].

Prevalence of Metabolic Syndrome in COPD patients

Our findings revealed a significant prevalence of metabolic syndrome (MetS) among COPD patients, with 49.09% meeting the criteria for MetS, highlighting a considerable burden of this co morbidity in this population. This prevalence aligns with previous studies, particularly those conducted in India. For instance, Sahoo et al. reported a prevalence of 42.1% in eastern India, while Chooriath et al. found 43.5% in the southern Indian population. Another study in south India by Priyadharshini et al. indicated a higher prevalence of 54% among COPD patients. Kumar et al. reported a prevalence of 57% in a North Indian cohort. Hariprasath K et al. observed a slightly higher prevalence (62%) than our findings; however, this overestimation may be attributed to their smaller sample size (n=50), which affects the robustness of their conclusions.

Patients with metabolic syndrome also had significantly higher body weight, BMI and waist circumference than those without metabolic syndrome. Central obesity is a key component of the IDF definition and reflects visceral adiposity, which promotes chronic low-grade inflammation, insulin resistance and release of adipokines that may further aggravate systemic inflammation in COPD. Similar observations have been reported by Fekete et al., Priyadharshini et al., and Watz et al., who demonstrated that obesity and increased waist circumference are associated with poorer exercise capacity, reduced quality of life and increased cardiovascular risk among COPD patients.

Bio chemically, triglyceride levels were significantly higher whereas HDL cholesterol levels were significantly lower in the Met S group. This dyslipidemia pattern is characteristic of metabolic syndrome and has been consistently reported in previous Indian studies.

Persistent systemic inflammation, oxidative stress and smoking-induced endothelial dysfunction contribute to abnormal lipid metabolism in COPD, thereby increasing the risk of atherosclerotic cardiovascular disease.

Random blood glucose levels were also significantly elevated in patients with metabolic syndrome, supporting the close association between COPD and impaired glucose metabolism. Chronic inflammation mediated by cytokines such as TNF-α and IL-6 promotes insulin resistance, while physical inactivity and intermittent corticosteroid exposure may further worsen glycemic control. Early recognition of glucose abnormalities therefore becomes essential in routine COPD care.

Smoking history and cumulative smoking exposure were significantly greater among patients with metabolic syndrome. Cigarette smoke is a major source of oxidative stress and systemic inflammation, contributing

simultaneously to airway remodeling and metabolic dysregulation.

These findings reinforce smoking cessation as one of the most effective interventions for improving both respiratory and cardio metabolic outcomes.

Pulmonary function analysis demonstrated a significantly lower FEV1/FVC ratio in COPD patients with metabolic syndrome, indicating relatively greater airflow limitation. Although the distribution of GOLD stages was not statistically different between groups, a higher proportion of severe disease was observed among patients with Met S. This suggests that metabolic abnormalities may adversely influence disease progression even when categorical GOLD staging does not demonstrate statistical significance, a finding comparable with several previous observational studies.

Conclusion

In conclusion, the study reveals a significant association between Chronic Obstructive Pulmonary Disease (COPD) and metabolic syndrome (Met S) among patients at the Institute of Respiratory Diseases. With a prevalence of 49.09%, Met S is notably common in COPD patients, affecting nearly half of the study's participants.

Although no significant association was found between Met S and the different GOLD stages of COPD severity, the findings underline the need for holistic approaches to COPD management. These should incorporate metabolic screening and targeted interventions for Met S, given its prevalence and impact on respiratory health. The results highlight the necessity for integrated management strategies to optimize health outcomes in COPD patients with coexisting metabolic syndrome.

References

1. Barnes PJ. Inflammatory mechanisms in COPD. J Allergy Clin Immunol. 2016.
2. Chooriath A, et al. Metabolic syndrome in COPD. Lung India. 2015.
3. Fabbri LM, et al. COPD as a systemic disease. Eur Respir J. 2008.
4. Jo YS, et al. Metabolic syndrome in COPD. Res pirology. 2013.
5. Watz H, et al. Metabolic and cardio vascular co morbidities in COPD. Chest. 2009.
6. Maniscalco M, et al. Systemic inflammation in COPD and Met S. Pulm Pharmacol Ther. 2018.
7. Priyadharshini R, et al. Metabolic abnormalities in COPD. J Assoc Physicians India. 2018.
8. Hariprasath R, et al. Prevalence of MetS in COPD patients. Int J Med Res Rev. 2017.
9. Singh S, et al. Metabolic syndrome among Indian COPD patients. Lung India. 2019.
10. Acharyya A, et al. Metabolic syndrome in COPD. J Clin Diagn Res. 2014.
11. Grover S, et al. Smoking and metabolic dys function. Indian Heart J. 2017.
12. Chen W, et al. Metabolic syndrome and lung function decline. Chest. 2018.