International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-1-04*

CRP CORRELATION WITH DISEASE SEVERITY IN PATIENTS WITH COPD

Dr. Dheeraj Sharma[1], Dr Amit kumar[2], Dr. Pooja Yadav[3], Jyoti[4]*

[1]Assistant Professor, dept of Respiratory Medicine, SP Medical College, Bikaner
[2]Senior medical officer, District Hospital, Sri Ganganagar
[3]Consultant Physician, dept of Medicine, KRMH, Chomu
[4]MBBS, Sardar Patel Medical College, Bikaner

Correspondence:
Dr. Pooja Yadav

Received: **November 15, 2026**
Revised: **December 18 , 2026**
Accepted: **December 31, 2026**
Published: **January 10, 2026**

Abstract

INTRODUCTION: Chronic obstructive pulmonary disease (COPD) is a major public health problem and represents a leading cause of chronic morbidity and mortality worldwide. ***AIM:*** To determine serum c-reactive protein correlation with disease severity in patients with chronic obstructive pulmonary disease. ***METHODOLOGY:*** The present study was designed as a hospital-based cross-sectional observational study conducted over a period of six months in the Department of Respiratory Medicine at S.P. Medical College, bikaner and KRMH, chomu. ***RESULT:*** The study showed that most COPD patients were elderly, had significant smoking exposure, presented with severe dyspnea, and belonged to advanced GOLD stages, with a majority demonstrating elevated serum CRP levels. A statistically significant increase in mean CRP levels was observed with increasing GOLD stage, indicating greater systemic inflammation with disease severity. ***CONCLUSION:*** Serum CRP levels are significantly raised in stable COPD patients and show a strong positive association with disease severity as assessed by GOLD staging. CRP can therefore serve as a useful inflammatory biomarker for assessing severity and prognosticating outcomes in COPD.

Keywords: Chronic obstructive pulmonary disease, CRP, GOLD staging.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major public health problem and represents a leading cause of chronic morbidity and mortality worldwide. It is a chronic inflammatory disease characterized by persistent respiratory symptoms and progressive airflow limitation that is not fully reversible.1 The airflow limitation is usually the result of chronic inflammation affecting the airways, lung parenchyma, and pulmonary vasculature following prolonged exposure to harmful particles or gases, most commonly tobacco smoke. Patients typically present with symptoms such as chronic cough, sputum production, and dyspnea, especially on exertion2. Early detection of COPD is essential, as timely intervention can slow disease progression and improve quality of life.According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD), COPD is defined as "a chronic inflammatory disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases."3 GOLD has also classified COPD into four stages based on spirometric assessment, primarily using post-bronchodilator forced expiratory volume in one second (FEV_1), which helps in determining disease severity and guiding management.The World Health Organization estimates that nearly 65 million people worldwide suffer from moderate to severe COPD, accounting for approximately 5% of all global deaths4,5. COPD is currently the third leading cause of death globally, highlighting its immense disease burden. Beyond its pulmonary manifestations, COPD is now recognized as a systemic disease with multiple extrapulmonary effects that significantly influence prognosis and survival.6Chronic inflammation is a central feature of COPD pathogenesis. Inhalation of noxious particles triggers an inflammatory cascade involving neutrophils, macrophages, lymphocytes, and various inflammatory mediators within the lungs7. Importantly, this inflammatory response is not confined to the respiratory system. A persistent low-grade systemic inflammation is commonly observed in COPD patients and is

believed to contribute to disease progression, frequent exacerbations, skeletal muscle dysfunction, cardiovascular complications, and increased mortality.Among the circulating inflammatory biomarkers, C-reactive protein (CRP) has gained considerable attention due to its stability, reproducibility, and clinical relevance4. CRP is an acute-phase reactant synthesized by the liver in response to pro-inflammatory cytokines, particularly interleukin-6.8 Several studies have demonstrated elevated CRP levels in patients with stable COPD as well as during acute exacerbations. Increased CRP levels have been associated with reduced lung function, poorer exercise tolerance, diminished quality of life, and a higher risk of hospitalization and all-cause mortality9.Smoking, the most common etiological factor for COPD, independently contributes to elevated serum CRP levels, further amplifying systemic inflammation. The presence of raised CRP in COPD patients, even in the absence of overt infection or cardiovascular disease, supports the concept that systemic inflammation is an intrinsic component of the disease10. Therefore, measurement of CRP may serve as a simple and useful biomarker to assess inflammatory burden, disease severity, and prognosis in patients with COPD.

AIM

To determine serum c-reactive protein correlation with disease severity in patients with chronic obstructive pulmonary disease

MATERIALS AND METHODS

The present study was designed as a hospital-based cross-sectional observational study conducted over a period of six months in the Department of Respiratory Medicine at S.P. Medical College and P.B.M. Hospital, Bikaner. Patients attending the outpatient and inpatient services of the department during the study period were screened for eligibility. A systematic random sampling method was employed to select participants, ensuring an unbiased and representative sample of the study population. All selected participants were informed in detail about the nature and purpose of the study, and written informed consent was obtained prior to their enrollment.Patients who were diagnosed cases of chronic obstructive pulmonary disease (COPD) based on clinical evaluation and relevant investigations were included in the study. Only those individuals who willingly provided informed consent were enrolled. Patients were excluded if they had any other acute or chronic infectious conditions, as such illnesses could independently influence inflammatory markers and confound the study results. In addition, patients with known comorbid conditions such as diabetes mellitus, hypertension, or coronary artery disease were excluded due to their established association with systemic inflammation. Patients who did not provide informed consent were also excluded from the study. This strict inclusion and exclusion criteria helped ensure homogeneity of the study population and improved the validity of the observations.

RESULTS

Table 1. Age wise distribution of study subject

Age in yrs	No of cases	Percentage
<45 yrs	02	02.00
45-60 yrs	35	35.00
>60 yrs	63	63.00
Total	100	100.00

Table no 1 shows that maximum patients were found >60 yrs age group.

Table 2. Symptoms wise distribution of study subject

Symptoms	No of cases	Percentage
Breathlessness	100	100.00
Expectoration	60	60.00
Cough	70	70.00
Wheezing	18	18.00
Chest pain	30	30.00

In present study, all patients were present with breathlessness, 70.00% patients were present with cough, 60.00% patients were present with expectoration. 30.00% patients were present with chest pain and 18.00% patients were present with wheezing.

Table 3. Pack /year wise distribution of study subject

PACK/YR	No of cases	Percentage
0-10 PACK/YR	4	4.00
11-20 PACK/YR	8	8.00
21-30 PACK/YR	62	62.00
>30 PACK/YR	16	16.00
Total	90	90.00

Maximum patients were used 21-30 PACK/YR. The mean PACK/YR was 24.44±6.23.

Table 4. mMRC wise distribution of study subject

mMRC grade	No of cases	Percentage
0	0	0.00
1	0	0.00
2	0	0.00
3	32	32.00
4	68	68.00
Total	100	100.00

Maximum patients (68.00%) were from grade 4 followed by 32.00% patients were from grade 3.

Table 5. GOLD criteria wise distribution of study subject

GOLD stage	No of cases	Percentage
A	14	14.00
B	6	6.00
E	80	80.00
Total	100	100.00

Out of the total 100 cases studied, the majority belonged to GOLD stage E, accounting for 80% of the cases, indicating a high burden of severe disease. GOLD stage A constituted 14%, while stage B represented the smallest proportion at 6% of cases.

Table 6. CRP level in the study population

CRP level (mg/dl)	No of cases	Percentage
<6	10	10.00
7-9	14	14.00
10-12	34	34.00
>13	42	42.00

In present study, maximum patients (42.00%) CRP level was >13mg/dl followed by 34.00% patients CRP level was 10-12mg/dl, 14.00% patients CRP level was 7-9 mg/dl and 10.00% patients CRP level was <6 mg/dl. Mean CRP level was 16.32±2.97 mg/dl.

Table 7. Association between CRP level and GOLD criteria

GOLD stage	Mean CRP level (mg/dl)		p-value
	Mean	SD	
A	11.02	5.01	0.001
B	18.36	6.23	
E	29.17	8.60	

The difference in the distribution of CRP level among levels of Gold staging was statistically significant (p =0.001).

DISCUSSION

In this study, among the study population, 63.00% of the subjects were in >60.00 years age group followed by 35.00% subjects each in 45 – 60 years and 5.00% in less than 45.00years age group. There is an increase of COPD patients over age, which is explained by the effect of age in the COPD manifestation.

In the present study, breathlessness was the most common presenting symptom and was observed in all patients (100%). Cough was reported by 70% of cases, indicating its frequent association with chronic obstructive pulmonary disease. Expectoration was present in 60% of patients, reflecting chronic airway inflammation and mucus hypersecretion. Chest pain was reported by 30% of cases, which may be related to associated respiratory muscle strain or comorbid conditions. Wheezing was comparatively less common and was noted in 18% of patients.

In the present study, the majority of patients had a smoking exposure of 21–30 pack-years, accounting for 62% of the cases. A smaller proportion of patients, 16%, reported a smoking history of more than 30 pack-years, indicating heavy long-term exposure. Smoking exposure of 11–20 pack-years was observed in 8% of the study population. Only 4% of patients had a relatively lower exposure of 0–10 pack-years. These findings highlight that most COPD patients had a moderate to high cumulative smoking exposure.

Assessment of dyspnea using the modified Medical Research Council (mMRC) scale showed that none of the patients belonged to grades 0, 1, or 2. A total of

32% of patients were classified under mMRC grade 3, indicating significant limitation of physical activity due to breathlessness. The majority of patients, accounting for 68%, had severe dyspnea corresponding to mMRC grade 4. This distribution suggests that most patients presented at an advanced stage of symptomatic disease. The absence of lower mMRC grades reflects delayed healthcare-seeking behavior.

Based on GOLD classification, the majority of patients in the present study belonged to stage c, accounting for 80% cases , indicating severe disease with high symptoms burden and risk of exacerbations.A smaller number of patients were classified under stage A (14%), representing milder disease. Only 6% of patients belonged to stage B. This distribution suggests that most patients presented with moderate to severe COPD.

Analysis of serum C-reactive protein (CRP) levels revealed that the majority of patients had elevated inflammatory markers. CRP levels greater than 13 mg/dL were observed in 42% of cases, representing the largest group. Levels between 10–12 mg/dL were seen in 34% of patients, indicating moderate systemic inflammation. A smaller proportion of patients (14%) had CRP levels in the range of 7–9 mg/dL. Only 10% of cases had CRP levels below 6 mg/dL.

The mean serum CRP levels showed a progressive increase with advancing GOLD stage, indicating a rising systemic inflammatory burden with disease severity. Patients in GOLD stage A had a mean CRP level of 11.02 ± 5.01 mg/dL. A higher mean CRP level of 18.36 ± 6.23 mg/dL was observed in patients belonging to stage B. In stage E the mean CRO further increased to 29.17±8.60 mg/dl.This trend was statistically significant ($p = 0.001$), demonstrating a strong association between GOLD stage and serum CRP levels.

The main finding of the present study is that CRP levels are raised in stable COPD patients independent of smoking behavior and history of biomass exposure. Augsti et al11 also demonstrate higher CRP levels were related to low FEV1% predicted, SpO2 and 6MWD and to high MMRC levels among the prognostic predictors of the disease, in concordance with the previous reports 87 and moreover indicate that serum CRP levels are most strongly related to BODE index and concomitant systemic hypertension.

With the growing awareness of COPD being a complex disease involving several organs with a clearly established low-grade systemic inflammation, biomarkers have been more focus of interest in clarifying the pathogenesis and progression of COPD as well as in designing new therapeutic targets for the disease. Elevated serum CRP levels indicating a low grade persistent systemic inflammation in COPD patients was first described in early 2000's. 88-89 Then direct relationship between CRP levels and important prognostic clinical variables in stable COPD patients was reported in 2006 by de Torres et al12 .They published that CRP levels in stable COPD patients are associated with arterial oxygen tension, 6MWD, FEV1, FVC, inspiratory capacity/total lung capacity, GOLD stage of the disease and BODE index

CONCLUSION

The present study demonstrates that chronic obstructive pulmonary disease predominantly affects the elderly population and is commonly associated with significant smoking exposure, advanced dyspnea, and severe disease stages at presentation. Most patients belonged to higher mMRC grades and advanced GOLD stages, reflecting delayed diagnosis and healthcare-seeking behavior. Serum C-reactive protein levels were elevated in a large proportion of stable COPD patients, indicating the presence of persistent low-grade systemic inflammation. A clear and statistically significant rise in mean CRP levels was observed with increasing GOLD stage, suggesting a strong association between systemic inflammation and disease severity. These findings support the role of CRP as a simple, reliable biomarker for assessing inflammatory burden and severity in COPD. Our study shows COPD as a systemic inflammatory disease and highlights the potential utility of serum CRP in prognostication and disease monitoring.

REFERENCES

1.Marshall SM. Screening for microalbuminuria: Which measurement? Diabetic Med. 1991;8:706–11.
2.CogoA, Ciaccia A, Legorini C, Grimaldi A, Milani G. Proteinuria in COPD patients with and without respiratory failure. Chest. 2003;123:652–3.
3.Polatli M, Cakir A, Cildag O, Bolaman AZ, Yenisey C, Yenicerioglu Y. Microalbuminuria, von Willebrand factor and fibrinogen levels as markers of the severity in COPD exacerbation. J Thromb Thrombolysis. 2008;26:97–102.
4.Barr RG, Mesia-Vela S, Austin JH, Basner RC, Keller BM, Reeves AP, et al. Impaired flow-mediated dilation is associated with low pulmonary function and emphysema in ex-smokers: The Emphysema and Cancer Action Project (EMCAP) Study. Am J RespirCrit Care Med. 2007;176:1200–7.
5. Ibsen H, Olsen MH, Wachtell K, Borch-Johnsen K, Lindholm LH, Mogensen CE, et al. Reduction in albuminuria translates to reduction in cardiovascular events in hypertensive patients: Losartan intervention for endpoint reduction in hypertension study. Hypertension. 2005;45:198–202.
6.Bartolomé R. Celli, Jadwiga A. Wedzicha et al.(2019) Update on Clinical Aspects of Chronic Obstructive Pulmonary Disease. N Engl J Med 2019;381:1257-66.
7.Global initiative for chronic obstructive lung disease. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease.

2007; available from www.goldcopd.com: accessed Aug 8, 2019

8.American lung association epidemiology and statistics unit. Trends in COPD (chronic bronchitis and emphysema) : morbidity and mortality , 2013.

9.BOLD. Burden of Obstructive Lung Disease initiative webpage, published by Imperial college London. http://www.boldstudy.org/

10.Lamprecht B, McBumieMA, Vollmer WM et al. COPD in never smokers: results from the population based burden of obstructive lung disease study. Chest 2011; 139(4):752-63.

11.Agusti A, Faner R. Lung function trajectories in health and disease. Lancet Respir Med 2019; 7: 358-64.

12.de Torres JP, Cordoba-Lanus E, López-Aguilar C, et al.C-reactive protein levels and clinically important predictive outcomes in stable COPD patients. EurRespir J 2006;27:902-7