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Original Article

A Study on the Clinical Profile of Patients with Chronic Obstructive Pulmonary Disease (COPD) with Special Reference to C-Reactive Protein Level

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ABSTRACT

Introduction: Chronic obstructive pulmonary disease (COPD) is a progressive inflammatory airway disease characterized by irreversible airflow limitation and systemic manifestations. There is growing evidence that the progression of disease is driven by systemic inflammation. CRP, an acute phase reactant, has been proposed as a potential biomarker of systemic inflammation in COPD.

Objectives

1. To study clinical profile of patients of COPD.
2. To assess the serum CRP level in stable COPD patients.
3. To know the correlation between CRP levels and severity of COPD.

Material and Methods: This hospital based observational study was conducted in Department of General Medicine and Department of Pulmonary Medicine, Gauhati Medical College and Hospital for a period of one year from July 2017 to June 2018. We enrolled a total of 140 diagnosed COPD patients. Detailed clinical history, physical examination, spirometry, 6-minute walk distance (6MWD), BODE index assessment and estimation of serum CRP were done. Patients were classified according to the GOLD classification.

Results: The mean age of study population was 57.56±12.02 years with male preponderance (76.43%). The most frequent symptom was dyspnoea (91.42%). Majority of patients were GOLD stage III (42.14%) Mean CRP level increased with severity of disease from GOLD stage I to IV. A significant positive correlation was observed between CRP level and BODE index and 6MWD decreased with disease severity.

Conclusion: In the stable disease, COPD is characterized by marked systemic inflammation. Serum CRP level was positively correlated with disease severity and BODE index, suggesting that CRP level can be a useful inflammatory biomarker and a prognostic indicator in COPD patients.

Keywords: *COPD, CRP, systemic inflammation, GOLD stage, BODE index, 6MWD.*

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic progressive respiratory disorder, which is characterized by the presence of persistent airflow limitation that is not fully reversible. It is related to the chronic inflammatory response of the lungs to injurious particles and gases and is one of the major causes of morbidity and mortality worldwide [1]. Chronic bronchitis and emphysema are part of COPD and the disease adds significantly to the healthcare burden due to recurrent exacerbations, hospitalizations, disability and premature mortality [2].

Cigarette smoking is the major risk factor for COPD, but exposure to biomass fuel smoke, occupational pollutants, recurrent respiratory infections, and genetic susceptibility also contribute significantly to the development of the disease [3]. Recent

studies have shown that COPD is not only a pulmonary disorder but a systemic inflammatory disease involving multiple organs and systems [4].

In COPD systemic inflammation is mediated by inflammatory cells such as neutrophils, macrophages and lymphocytes. These cells secrete inflammatory mediators including tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), fibrinogen, and C-reactive protein (CRP) [5]. CRP is an acute phase reactant synthesized by hepatocytes in response to inflammatory cytokines and is an important biomarker of systemic inflammation [6].

Elevated CRP in stable COPD has been associated with decline in lung function, reduced exercise tolerance, increased frequency of exacerbations, poor quality of life and increased mortality [7]. Therefore, serum CRP has been identified as a potential biomarker for the assessment of disease severity and prognosis of COPD [8].

Several studies have evaluated systemic inflammatory markers in COPD. There is limited data regarding correlation between CRP levels and severity of COPD among Indian patients. Hence the present study "A Study on the Clinical Profile of Patients with Chronic Obstructive Pulmonary Disease (COPD) with Special Reference to C-Reactive Protein Level" was undertaken.

AIM AND OBJECTIVE

1. To study the clinical profile of the patients with COPD.
2. To determine the serum CRP levels in patients of COPD.
3. To assess the correlation between CRP level and severity of COPD.

MATERIALS AND METHODS

Study Design

Hospital-based observational study.

Study Setting

Department of General Medicine and Department of Pulmonary Medicine, Gauhati Medical College and Hospital, Guwahati.

Study Duration

1 July 2017 to 30 June 2018.

Sample Size

A total of 140 diagnosed COPD patients were included in the study.

Inclusion Criteria

- Diagnosed COPD patients
- Age >12 years

Exclusion Criteria

- Acute exacerbation within previous 4 weeks
- Bronchiectasis, tuberculosis, malignancy, inflammatory disorders
- Alpha-1 antitrypsin deficiency
- Oral corticosteroid use within previous 12 weeks

Data Collection

Detailed history, clinical examination, smoking history, spirometry, serum CRP estimation, BODE index and 6MWD assessment were performed.

Spirometry

COPD severity was classified according to GOLD criteria.

Statistical Analysis

Data analysis was performed using MS Excel and GraphPad InStat software. Pearson correlation coefficient and one-way ANOVA were used. P value <0.05 was considered statistically significant.

RESULTS

Table 1: Age Distribution of Study Population

Age Group (Years)	Number	Percentage
30–40	16	11.43%

40–50	14	10.00%
50–60	49	35.00%
>60	61	43.57%

Mean age: 57.56±12.02 years
Most patients belonged to the elderly age group (>60 years), reflecting the chronic progressive nature of COPD and cumulative exposure to risk factors such as smoking and biomass fuel exposure.

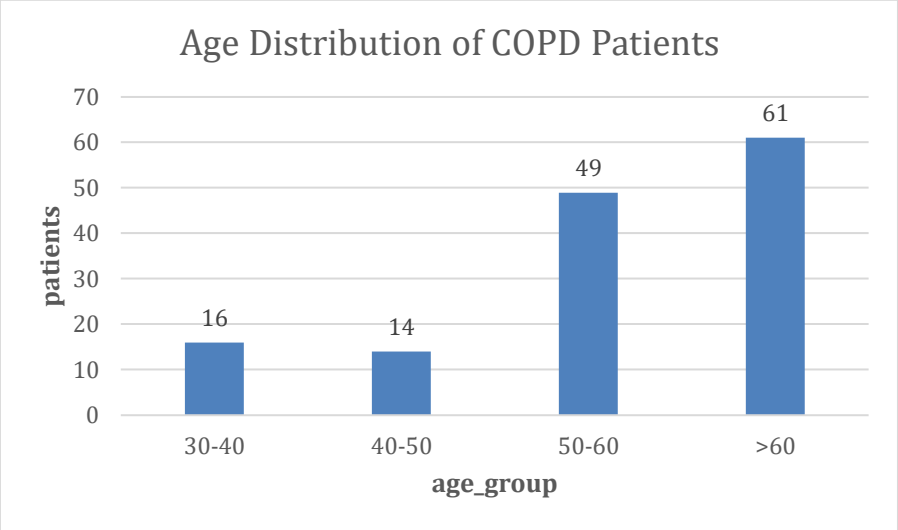

Fig 1: Age Distribution of COPD Patients

Table 2: Sex Distribution

Sex	Number	Percentage
Male	107	76.43%
Female	33	23.57%

Male predominance was observed, likely due to higher smoking prevalence and occupational exposure among men.

Table 3: Smoking Status

Smoking Status	Number	Percentage
Active Smokers	56	40.00%
Ex-smokers	33	23.57%
Non-smokers	51	36.43%

Smoking remained the major risk factor. However, a significant proportion of non-smokers suggests the contribution of biomass fuel exposure and environmental pollutants.

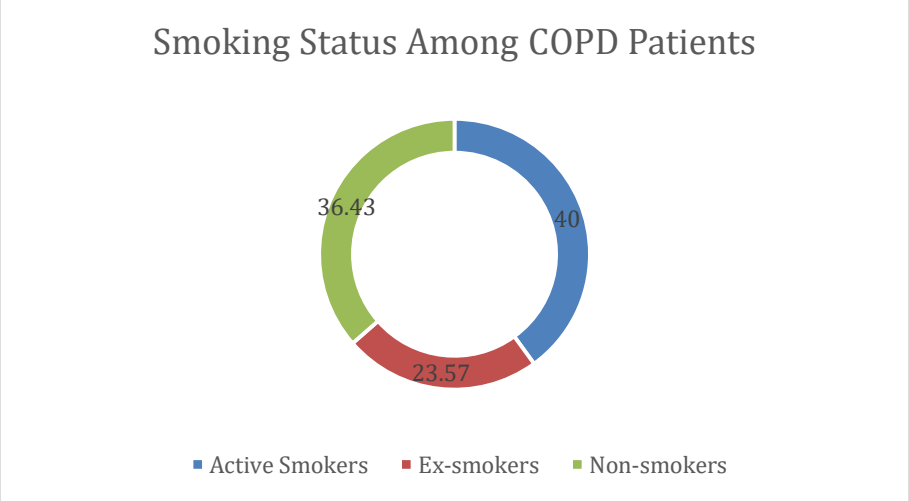

Fig 2: Smoking Status Among COPD Patients

Table 4: Clinical Presentation

Clinical Feature	Number	Percentage
Shortness of Breath	128	91.42%
Cough	114	81.42%
Sputum Production	38	27.14%
Wheeze	73	52.14%
Fatigue	54	38.57%
Anorexia	46	32.85%

Dyspnoea and cough were the predominant symptoms, highlighting chronic airway obstruction and impaired pulmonary function.

Table 5: Distribution According to GOLD Stage

GOLD Stage	Number	Percentage
Stage I	12	8.57%
Stage II	42	30.00%
Stage III	59	42.14%
Stage IV	27	19.29%

Most patients presented in advanced stages, indicating delayed diagnosis and poor awareness regarding COPD.

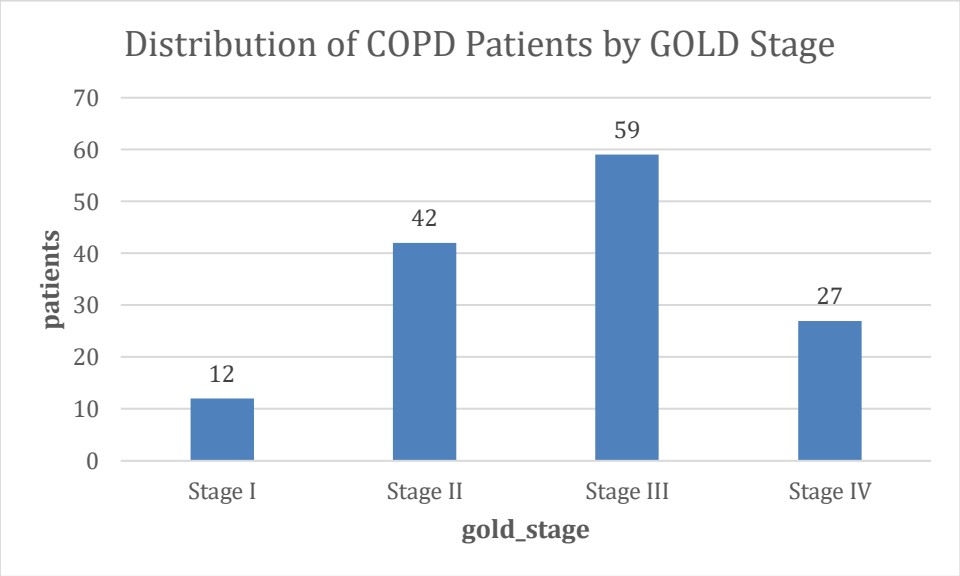

Fig 3: Distribution of COPD Patients by GOLD Stage

Table 6: Mean 6-Minute Walk Distance (6MWD)

GOLD Stage	Mean 6MWD (m)
Stage I	358.75
Stage II	238.47
Stage III	214.30
Stage IV	195.07

A progressive decline in exercise tolerance was observed with increasing disease severity, indicating worsening functional impairment.

Table 7: Mean CRP Level According to GOLD Stage

GOLD Stage	Mean CRP (mg/L)
Stage I	4.78±1.24
Stage II	5.84±2.28
Stage III	6.50±1.78
Stage IV	7.70±1.67

Serum CRP level increased progressively with worsening GOLD stage, suggesting enhanced systemic inflammation in severe COPD.

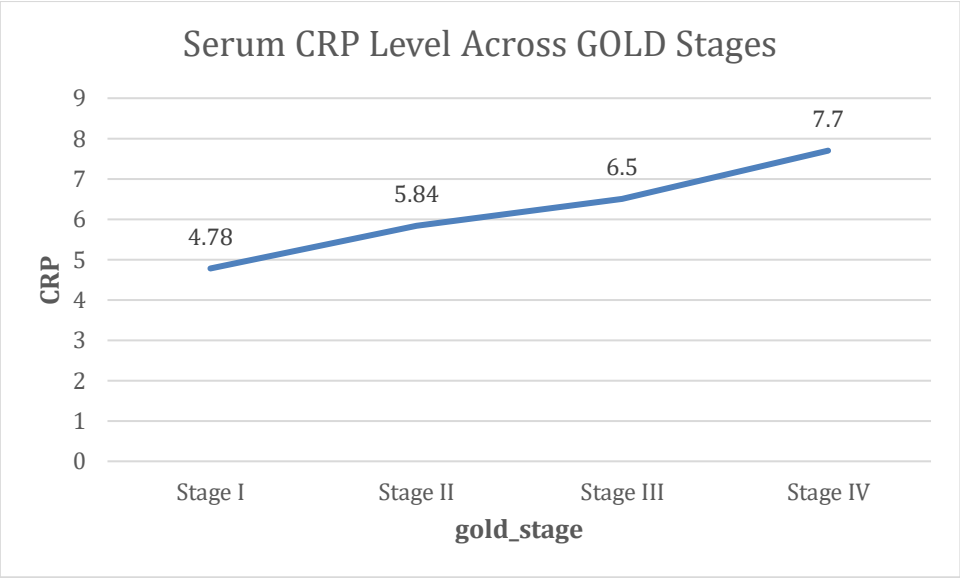

Fig 8: Serum CRP Level Across GOLD Stages

Table 8: BODE Index According to GOLD Stage

GOLD Stage	Mean BODE Index
Stage I	1.00±0.74
Stage II	3.45±1.08
Stage III	5.64±1.01
Stage IV	6.48±0.84

Higher BODE index scores in advanced COPD stages reflected worsening nutritional status, airflow obstruction, dyspnoea, and exercise limitation.

DISCUSSIONS

The present study was done among 140 COPD patients admitted to Gauhati Medical College and Hospital to study the clinical profile of COPD patients and to find out the relation between serum CRP level and severity of disease.

The mean age of the patients was 57.56±12.02 years and most of the patients were in age group of above 60 years. Similar results were reported by Kolsum et al. and Dhar et al. with mean age of 63.78±8.32 years and 62.06±8.72 years respectively [9,10]. This decline in lung function with aging [11] may be due to the increasing prevalence of COPD in elderly individuals, the cumulative exposure to smoking, environmental pollutants, and the increasing prevalence of comorbidities. In the present study males were 76.43% of the study population with a male to female ratio of 3.2:1. Similarly, in the studies of Baldi et al., Serapinas et al., and Oliveira et al., a male predominance was found [12-14]. This may be because of higher smoking prevalence and occupational exposure among males. However, the frequency of COPD in females and non-smokers suggests a significant role of biomass fuel exposure and indoor air pollution in disease pathogenesis [15].

In the present study smoking was found to be a major risk factor with 40% active smokers and 23.57% ex-smokers. Similar results have been reported by Terzikhan et al. and Josephs et al. [16,17]. Cigarette smoke induces oxidative stress, chronic airway inflammation, mucus hypersecretion and protease-antiprotease imbalance leading to airway remodeling and emphysematous destruction [18].

Dyspnoea was the most common presenting symptom, followed by cough, wheeze and sputum production. This distribution of symptoms was similar to that reported by Oliveira et al. and Kamdar and Patel [14,19]. Dyspnoea is a reflection of progressive airflow obstruction, hyperinflation, impaired gas exchange and reduced respiratory muscle efficiency [20].

Most patients in this study were in GOLD stage III, suggesting that most COPD patients present late in the course of disease. Similar findings were reported by Safka et al. , Casanova et al. , and Chhabra et al. [21-23]. Delayed presentation may be associated with poor disease awareness, underdiagnosis and socioeconomic limitations.

6-minute walk distance (6MWD) decreased progressively with increasing GOLD stage. Mean 6MWD reduced from 358.75 metres in GOLD stage I to 195.07 metres in GOLD stage IV. [22,24]. Similar results were reported by Prakash et al. and Casanova et al. . In COPD patients the reduced exercise tolerance may be caused by airflow limitation, skeletal muscle dysfunction, chronic hypoxemia, nutritional depletion and systemic inflammation [25].

A significant finding of the current study was the gradual rise in serum CRP levels with increasing severity of COPD. The mean CRP increased from 4.78±1.24 mg/L in GOLD stage I to 7.7±1.67 mg/L in GOLD stage IV. Similar findings were reported by Karadag et al, Folchini et al and Khan et al [26-28]. Elevated CRP levels indicate the presence of persistent systemic inflammation even in clinically stable patients with COPD.

In COPD, chronic inflammation is driven by the activation of neutrophils and macrophages, which release cytokines such as IL-6 and TNF-α. These cytokines stimulate the liver to produce CRP [5]. Chronic inflammation is associated with systemic manifestations including skeletal muscle dysfunction, cardiovascular disease, cachexia, osteoporosis and reduced exercise capacity [29].

The present study also showed a positive correlation between serum CRP level and BODE index. The BODE index is multidimensional prognostic marker in COPD, combining body mass index, airflow obstruction, dyspnoea and exercise capacity [30]. Higher BODE scores are associated with increased CRP levels, suggesting that systemic inflammation is an important contributor to disease progression and functional decline.

This study's findings have significant clinical implications. CRP estimation using serum is inexpensive, readily available and can be used as a useful biomarker for assessment of disease severity as well as prognosis in COPD patients. Early identification of patients with elevated inflammatory markers may be useful for aggressive risk factor modification, pulmonary rehabilitation, smoking cessation, nutritional support and closer follow-up [31].

However, there were some limitations of the study: It was an observational study in a hospital setting and may not represent the general population. There was no long term follow up and other inflammatory biomarkers such as IL-6 and TNF-α were not tested. Larger multicentric prospective studies are recommended in the future.

CONCLUSION

1. COPD predominantly occurs in old men and smokers.
2. The most common presenting symptoms are dyspnoea and cough.
3. The majority of patients are in advanced GOLD stages.
4. Exercise tolerance decreases progressively with increasing disease severity.
5. Serum CRP level increased significantly with increasing severity of COPD.
6. CRP is positively correlated with BODE index and may be a useful inflammatory biomarker in stable COPD.
7. Early detection and treatment of systemic inflammation may improve prognosis and quality of life in COPD patients.

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