Original Article

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Correlation of Chronic Obstructive Pulmonary Disease severity with C-Reative Protien levels in patients at tertiary care Hospital

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ABSTRACT

Objective: To determine the correlation of chronic obstructive pulmonary disease (COPD) severity and C-reactive protein (CRP) among patients at tertiary care Hospital.

Methodology: This cross-sectional study was conducted at Medicine department of Isra University Hospital Hyderabad. All the patients of chronic pulmonary disease either of gender were included. The severity of the disease was assessed as per GOLD standards criteria as mild, moderate, severe and very severe based on spirometry. After taking informed consent, 3 ml blood sample was taken from each patient for C - reactive protein measurement. All the data was recorded in the proforma.

Results: Total of 101 patients were studied; their mean age was 56.59±13.35 years. Males were in majority 94.06%. 43.6% patients had mild COPD, 25.7% had moderate, 20.7% had severe and 9.9% patients had very severe COPD.
There was a significant association between the severity of disease and elevated CRP level, p-value 0.001. A strong positive correlation was found between C - reactive protein level and chronic pulmonary disease, r-value 0.726 and p-value 0.005.

Conclusion: Elevated serum level of CRP is a predictive factor for COPD as an inflammatory biomarker because it increases in chronic obstructive pulmonary disease patients causing a systemic chronic inflammatory process.

Key Words: COPD, CRP, Severity score.

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Introduction

Chronic obstructive pulmonary disease (COPD) is a treatable and common disease distinguished by a persistent and limited airflow, which is generally progressive and correlated with a raised chronic inflammatory response within the lung and the airways to lethal gases or elements.[1] It has been made evident by studies that inflammation contributes significantly to COPD-related pathogenesis. Furthermore, evidence showed that in COPD's final stages, long after smoking cessation, the smoking-induced inflammatory response in the initial stages of COPD still continues.[2,3] Studies have revealed that the correlation between smoking intensity and diminished pulmonary functions exhibits a rise in COPD with the rise in patient's age, thus proving a direct association between COPD and smoking.[2,3] Therefore literature exhibited the features that can possibly result in the patients' mortality due to COPD in follow-up period of 1 year following worsening or in extended follow-ups,

for example a stable COPD's follow-up of 5 years.[4-6] Though, the most diverse levels of laboratory and clinical features variously act in the mortality of subjects over time.[4] COPD is a key health challenge globally that results in limitation of airflow, which often progresses gradually over years. The circulating CRP's serum levels are generally raised among stable COPD cases, however CRP is frequently employed, clinically as the marker for acute systemic inflammatory response like acute worsening of COPD.[7,8]. The measurements of CRP can possibly be prognostic marker which could provide better estimation contrasted to traditional parameters in assessing the moderate to mild stable COPD, and therefore the CRP measurements can possibly assist in further accurate detection of subjects at high risk for morbidity or mortality.[7,8] The WHO reported that COPD has caused 2,660,000 deaths globally.[3] The Prevalence in the United States, among adults, is projected around 13.9%, which makes it the 4th leading factor of mortality and morbidity. Pakistani textile workers have been reported with higher rates of COPD and chronic bronchitis.[9,10] A study found no significant association between serum concentrations of fibrinogen or CRP and arterial 02 saturation and the disease severity.[11] On other hand various studies have established that acute worsening of COPD suggests raised concentration of CRP and alteration of further inflammatory parameters.[12,13] The baseline CRP's prognostic contribution in COPD is provocative.[14] After these controversial findings this study has been conducted to assess the correlation between severity of chronic obstructive pulmonary disease and C-reactive protein.

Methodology

This cross-sectional study was carried out at department of medicine of Isra University Hospital Hyderabad. The study was done from March 2017 to March 2018. COPD was 7.0 %, with the least proportions of disease severity, 95 % CI, and 5 % error bond, [16] calculated by the statistical formula, our sample size is about 101. This research included all individuals with COPD. Informed consent of the participants of the study was received. Disease frequency in cases was graded by a trained pulmonologist as per the GOLD standard criteria as Mild (FEV1≥ 80%), moderate (<80% to 50%), severe (<50% to 30%) and very severe (<30%) based on spirometry. Upon approval, 3 cc of blood was collected for CRP analysis from a peripheral vein from within elbow by a 3 cc syringe. In a cold box (lab standard technique), extracted blood samples (drawn twice) were brought to laboratory. The levels of serum CRP were measured by nephelometry (Minineph, made in the UK). The technician, who was blind to the study population, analyzed blood specimens of all participants in the same lab by the same kit. The investigator filled in the proforma especially designed for data analysis based on laboratory findings. The data analysis was accomplished using SPSS version 21.0

Results

Overall 101 patients (94.06% males and 5.94% females) with COPD were studies. Patient's age average was 56.59±13.35 years and the mean CRP level was 22.87±12.20 mg / L. (Table I)

COPD incidence was graded according to GOLD standards and there were 43.56% cases with mild COPD, 25.74% patients had moderate COPD, 20.79% patients had severe and 9.9% patients were found with very severe COPD. (Figure 1)

There was a significant link was seen in the elevated level of CRP and severity of COPD (p=0.001), in terms of categorical contrast. The linear relation of CRP was seen between severity of COPD and CRP level (p=0.001), it was found that the mean of the CRP was markedly higher in severe and very severe COPD according to GOLD classification. (Table II)

Table I: Patients distribution according to age (n=101)

Statistics	Frequency	Percentage
Age		
≤40	75	14.85%
41 to 50	23	22.77%
51 to 60	20	19.80%
61 to 70	27	26.73%
>70	16	15.84%

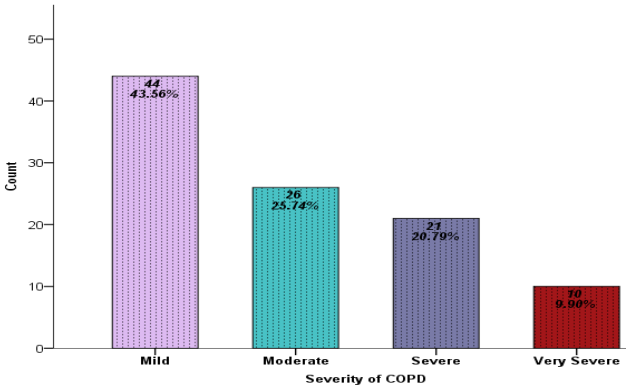

Figure 1. Severity of COPD according to GOLD classification (n=101)

Table II: Association between CRP and COPD (n=101)

CRP Level (mg/L)	Severity of COPD by gold Criteria				Total	P-value
	Mild	Moderate	Severe	Very Severe		
At the time of admission						
3 to 5 (mg/L)	3(6.8%)	0(0%)	0(0%)	0(0%)	**3**	
5 to 10 (mg/L)	14(31.8%)	1(3.8%)	0(0%)	0(0%)	**15**	**0.001**
>10 (mg/L)	27(61.4%)	25(96.2%)	21(100%)	10(100%)	**83**	
Mean	14.44±8.63	23.47±5.87	29.04±8.05	45.40±7.51		0.0005
At Discharge						
1 to 3 (mg/L)	5(11.4%)	1(3.8%)	3(14.3%)	0(0%)	**9**	
3 to 5 (mg/L)	9(20.5%)	1(3.8%)	2(9.5%)	0(0%)	**12**	**0.002**
5 to 10 (mg/L)	19(43.2%)	7(26.9%)	2(9.5%)	1(10%)	**29**	
>10 (mg/L)	11(25%)	17(65.4%)	14(66.7%)	9(90%)	**51**	
Mean	7.52±4.04	12.15±4.41	11.38±5.93	20.68±8.57		0.0005

There was a significant positive association between CRP and COPD incidence as shown in Figures 2.

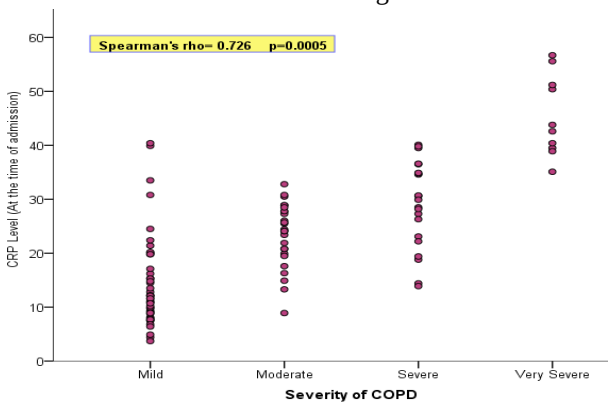

Figure 2. Correlation between CRP level and COPD (n=101)

Discussion

COPD is a key factor associated with progressive mortality and morbidity in developed and underdeveloped countries. CRP is an inflammatory marker, which increased among COPD patients and therefore known as a prognostic factor for COPD progression.[16] In present study the patients' average age was 56.6±13 years and there was 94.06% were males and 5.94% were females. Similarly, in study of Samareh-Fekri et al[15] COPD patients' mean age was 62.6 ±11.4 and there were 28 males (95.3%) and 3 females (9.7%). Kumar R et[17] also reported that out of total cases 58.65% were male and 41.34% were female and most common age groups were 50-70 years among 60.88% patients. Gupta et al.[18] also observed that COPD patients' mean age was 59.4 ± 11.7 years and male ratio was higher as compare to female.

In this study average CRP at admission was higher as 22.87±12.20 mg/L and at discharge, it was observed as10.81±6.37 mg/L respectively. While in the study of Tofan F et al[19] observed that hs-CRP levels higher than 100 mg/ml at admission and highly associated with risk of adverse outcome.

In the present study according to COPD classification, there were 43.56% patients were observed with mild COPD, moderate 25.74%, severe 20.79% and very severe COPD was seen in 9.9%. Samareh-Fekri et al[15] study, the disease severity as per GOLD standards 3 cases was mild in (9.7%), in 10 cases moderate (32.2%), in 7 cases severe (22.6%) and very severe in 11 cases (35.5%). Simonovska L et al[20] done classification of COPD patients by (GOLD) and observed that out of all study cases 13 with mild, 20 with moderate, 32 with severe and 15 with very severe airways obstruction. CRP, an inflammatory indicator in COPD cases, is being assessed progressively.

In the present study, in terms of categorical association a significant positive correlation was noticed in the COPD severity and CRP level (p=0.001). Comparable findings were also documented from Netherlands, by Broekhuizen et al, as the serum concentration of CRP was greater contrasted to normal range in COPD cases (p=0.03).[21] Highashimoto et al, and Wedzicha et al. reported that the fibrinogen and CRP serum concentrations were greater among COPD cases than controls.[22,23] A study of Yende et al.[24] documented that in cases with the obstructive pattern within their spirometry, considerably higher CRP serum concentration was found than the normal subjects (p<0.0001). Pinto-Plata et al.[25] documented that significantly greater CRP concentration in COPD cases

as 5.03±1.51mg/L as compared to controls as 2.24±1.04mg/L, (P<0.001). Chronic obstarting pulmonary disease is the major risk for thrombotic mishaps particularly thromboembolism and deep thrombophlebitis. Several studies have reported that thromboembolic incidents in these cases did not result from diminished mobility alone. The raised serum concentration of inflammatory factors primarily fibrinogen and IL-6 also contributes incidentally. Both the Fibrinogen and IL-6 are measured as precoagulation biomarkers, in addition thrombotic mishaps occur in response to vascular endothelial inflammatory response and raised serum concentration of precoagulation biomarkers such as fibrinogen.[21]

Conclusion

The elevated serum concentration of CRP is a predictive factor for COPD; it rises in COPD cases resulting in a systemic chronic inflammatory process and elevating the likelihood of cerebrovascular and cardiovascular accidents, osteoporosis, and cachexia. These complications lead to elevated morbidity and mortality and a diminished survival rate. Thus, the measurement of CRP serum level is recommended in COPD cases in the course of their regular clinical visits. Subjects with greater concentrations of CRP must be taken into account for further aggressive treatment. Moreover, they have advised opium consumption, smoking cessation and rehabilitation therapy. Lifestyle modification and pharmacologic therapy are also suggested for these subjects in order to diminish the associated complications and raise their survival rates.

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