Section: Chest & TB

Original Research Article

CORRELATION OF CRP WITH OBSERVED CARDIAC EFFECTS IN COPD PATIENTS

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ABSTRACT

Background: COPD is a leading cause of death & morbidity worldwide; by virtue of smoking habits of the population & ever increasing outdoor & indoor air pollution, which is more common & accentuated in semiurban or rural areas due to PARALI burning (smoke resulting fromburning of the crop residue) and availability of lesser medical facility as in the rural areas of bharatpur. It is a well known fact that COPD has lot many friends including cardiovascular disease which is one of the chief contributors to COPD morbidity andmortality. Whether as a comorbidity or as resultant to the respiratory disease it has to be optimally and holistically managed so as to give patient more disease free period & increased survival. Sometimes services of cardiologist are not easily available in all corners & the treating physicians may lack the knowledge to address such concomitant issues, so it's crucial to develop an easily available surrogate marker which can predict Cardiovascular morbidity in COPD patients and timely referrals. CRP is a cheap and easily available such marker, and it has been studied widely in context of COPD but not in context of comorbid cardiac disease in COPD. So this study will serve a gap in this knowledge about use of CRP to predict cardiac disease burden in COPD patient.

Materials and Methods: This study was conducted in RBM Hospital of Sh JP Medical college Bharatpur in Sept 2023- August 24 on 100 clinically & spirometrically diagnosed COPD patients presenting to the OPD & IPD of Chest & TB Department. Main objective was to find out any correlation between raised CRP levels with any observed cardiac effects in these COPD patients. Statistical analysis was done by Chi square & student T test.

Results: Increased CRP is significantly correlated with right sided cardiac dysfunctions mainly Right Atrial and Right Ventricular enlargements and Cor pulmonale. No correlation was established in raised CRP and Left sided cardiac function.

Conclusions: Patients of COPD specially severe and very severe grades should also be screened for presence of cardiac comorbidity as well, as it is the most common cause of morbidity andmortality in COPD patient. In resource limited setting CRP can be used as a surrogate marker of the presence of cardiac disease which requires more specialized care.

Key-words: COPD, Systemic inflammation, Cardiac effects, CRP, Cor Pulmonale.

INTRODUCTION

Definition- COPD is a heterogenous lung condition characterized by chronic respiratory symptoms (Dyspnea, cough, sputum production and/or exacerbations) due to abnormalities of the airways (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent, often progressive, airflow obstruction,[8] (GOLD 24).

Concomitant chronic diseases (multimorbidity) occur frequently in COPD patients, including cardiovascular disease, skeletal muscle dysfunction,

metabolic syndrome, osteoporosis, depression, anxiety and lung cancer. These comorbidities should be actively sought and treated appropriately when present, because they influence health status, hospitalizations and mortality independently of the severity of airflow obstruction due to COPD. Even the chief symptoms, like Cough Wheezing, Dyspnea and fatigue in COPD can be multifactorial and proper evaluation ruling out cardiovascular involvement is crucial.[8] (Gold 24)

Recent intervention studies have revealed how cardiovascular complications exceed respiratory complications in some populations with COPD. Despite the evidence, COPD is not included as a specific entity in the different cardiovascular risk tables and calculators, which leads to an underestimation of risk and insufficient treatment.[9]

As patients with COPD are often multimorbid8 (GOLD 24), lung disease can impair the detection of heart disease.[10]

It is estimated that at least 40% of COPD mortality is due to cardiovascular causes.[16]

The results of the Lung Health Study have already shown how Cardiovascular Disease (CVD) is responsible for 42% of first admissions of COPD patients and 48% of readmissions.[17]

In a large meta-analysis including 27 studies the risk of HF in COPD was 2.57 (95% CI 1.90-3.47), the relative risk of Acute Myocardial Infarction (AMI) in patients with moderate COPD is 1.40, and 3.00 in patients with severe disease compared with people without COPD and COPD is associated with an increased incidence of Ventricular Arrhythmias (VA), Atrial Fibrillation (AF) and Sudden Cardiac Death (SCD).[18]

Therefore, COPD is not only a risk factor for coronary heart disease but could affect all cardiovascular diseases. Data from observational and randomized studies show how cardiovascular mortality can reach up to 39% of all deaths in patients with COPD.[19]

Data from the SUMMIT study showed a ten-fold increase in the risk of suffering a cardiovascular event after exacerbation (RR 9.9, 95% CI 6.6-14.9).[20]

On the other hand, observational studies and clinical practice conditions show that cardiovascular drugs are underused in these patients.[21]

MATERIALS AND METHODS

This study was conducted in RBM Hospital of Sh JP Medical college Bharatpur in 2023-2024on clinically & spirometrically diagnosed COPD patients presenting to the OPD & IPD of Chest & TB Department. On clinical suspicion the patients were subjected to spirometry & classified according to GOLD guidelines. Main objective was to observe any cardiac effects in these patients & to find outany correlation with CRP. Thereafter Cardiac evaluation and various blood tests including Hemogram, CRP, Cholesterol etc were done. The patients were also seen by the cardiologist at the center & run ECG & 2D Echo so as to detect any cardiac disease burden.Overall 100 patients were evaluated and the results examined. Statistical significance was seen through Chi square & student T test.

RESULTS

Observations-There were 88 males & 12 females in the cohort. The study cohort of more male patients reflects the smoking habits of males & exposure patterns to outdoor pollution.

Table 1: Patient distribution according to CRP (C-reactive protein)

CRP (µgm/ml)	No. of Cases	Percentage
<10	44	44%
>10	56	56%
Total	100	100%

Increased CRP titres are seen in systemic inflammatory states like COPD more so with increased degree of inflammation and many studies have validated cut off of 10 microgm/ml.[3,4,5,6,7]

Table 2: Patient distribution according to GOLD staging of COPD

GOLD stage	No. of Cases	Percentage
Stage I	12	12%
Stage II	28	28%
Stage III	42	42%
Stage IV	18	18%
Total	100	100%

This table shows that maximum no. of patients fell under Moderate to Severe stage of COPD.

Table 3: Frequency of clinical features suggestive of Cardiac involvement

Features	No. of Cases	Percentage
Pedal edema	16	16%
Prominent Neck veins	9	9%
Hepatomegaly	6	6%
Orthopnea	5	5%
Any of the above	21	21%

This table shows that most of the patients hadpedal edema which is the most general sign, besides only 5patients had orthopnea which signifies left side of heart involvement.

Table 4: Patient distribution according to their resting Oxygen saturation (SPo2)

Resting SPo2(O2 saturation)	No. of Cases	Percentage
≤88%	44	44%
89-94%	44	44%
≥95%	12	12%
Total	100	100%

This table shows that almost half of the patients showed SPO2 (≤90%).

Table 5: Correlation between SPO2 and blood variables

Resting SPO2	CRP (ug/ml)	Cholesterol (Mg%)	Hemoglobin (Mg%)	Hematocrit
A ≤88 N=44	<20-8 >20-36	199.81± 16.96	12.54%± 1.66	40.76± 5.08
B 89-94 N=44	<20-28 >20-16	189.86± 16.63	12.92± 1.77	40.52± 5.55
C ≥95 N=12	<20-8 >20-4	201.83± 40.22	14.06± 1.02	44.11± 3.21

The A group had significantly higher CRP levels (P value <0.01) with B or C groups, ie inflammatory levels of CRP are seen with lower levels of oxygen saturation (≤88%).

Although lower levels of hemoglobin were also associated with increased CRP titres or to say patients with raised CRP also had lower hemoglobins, P value <0.02 (significant).

Table 6: Correlation of CRP titres with Right sided cardiac findings in ECHO

CRP titre	PH mild	PH mod	PH severe	PHT Total	Rt Atrial Enlarge	RtVentri Enlarge	Cor Pulmo
<10 (n=44)	10 (22.3%)	6 (13.6%)	-	16 (36.4)	4 (9%)	10 (22.7%)	4 (9%)
>10 (n=56)	12 (21.4%)	16 (28.6%)	4 (7%)	32 (57%)	28 (50%)	36 (64.3%)	14 (25%)

All right sided derangements of cardiac function tend to increase significantly with raised titres of CRP. Strongest association was observed with Right atrial enlargement (RAE) followed by increased frequencies of RVE and Cor pulmonale. Pulmonary artery pressure was normal in many patients with raised CRP; (ie intermittent rises of PHTN, like in sleep or exercise did not reflect in this observation) but CRP was raised.

Yet frequency of Severe and Moderate PH increases with the raised titres of CRP.

Table 7: Correlation of CRP titres with Left sided cardiac findings in ECHOCARDIOGRAPHY

CRP titre	LVDD	LVSD	LVH	LVEF	Lt Ventri mass	LA dim	E/A ratio
<10 N=44	24	8	4	56.81± 9.37	111.3± 26.7	32.13± 6.5	0.81± 0.20
>10 N=56	30	8	8	56.17± 9.77	106.2± 20.3	30.95± 6.9	0.83± 0.29

Normal patients in <10ug/ml CRP cohort = 16,Normal patients in >10ug/ml CRP cohort =4.

The above table implies that more cardiac involvement is seen in Cohort of CRP 10ug/ml then <10ug/ml cohort. But no significant association was observedin particular with any individual parameter. This means that some other factors like static/dynamic hyperinflation in the pathogenesis of left sided cardiac effects play a more important role than a linear correlation.

DISCUSSIONS

There are many studies on COPD & Cardiovascular disease, and even more on raised CRP levels,[3,4,5,6,7] and severity or stage of COPD but no study directly observes correlation of CRP with presence of CVD in Preexisting COPD patient. Its common knowledge that CVD contributes to volumes of morbidity & mortality in COPD but when is this serious., ie which patients require more close monitoring or specialized care. CRP titres can fill this gap. In our study unlike any previous study we have found that raised CRP titres have been observed in patients with more severe disease.

The raised CRP level is associated significantly with lower SPO2.

Increased CRP is also seen with increased pack years of smoking and all the right sided cardiac dysfunctions mainly Rt Atrial and Rt. Ventricular enlargements & Cor pulmonale. But no correlation was established in raised CRP and Left sided cardiac dysfunction.

CONCLUSION

All right sided derangements of cardiac function tend to increase significantly with raised titres of CRP. Strongest association was observed with Right atrial enlargement (RAE) followed by increased frequencies of Right Ventricular Enlargement and Cor pulmonale. Pulmonary artery pressure was normal in many patients with raised CRP; (ie intermittent rises of PHTN, like in sleep or exercise did not reflect in this observation). Yet frequency of Severe and Moderate PH increases with the raised titres of CRP, but was not found to be significantly associated.

Left sided cardiac derangements although tend to increase but were not found to be significantly associated with raised titres of CRP.

This signifies that patients of COPD specially severe and very severe grades should also be screened for presence of cardiac comorbidity as well, as it is the most common cause of mortality in COPD patient. In resource limited setting CRP can be used as a surrogate marker of the presence of cardiac disease which requires more specialized care.

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