

## Serum C-reactive Protein level and its Relation with Forced Vital Capacity in Stable COPD Male Subjects

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Chronic obstructive pulmonary disease (COPD) affects primarily the lungs but it is now recognized as a disease with systemic repercussions, and associated with chronic inflammation. Serum C-reactive protein level considered as an inflammatory biomarker and a predictive factor for extra-pulmonary complications of COPD. To observe serum C-reactive protein level and its relation with Forced Vital Capacity (FVC) value in stable COPD male subjects. This cross sectional study was conducted in the Department of Physiology, Dhaka Medical College, Dhaka during the period from January 2013 to December 2013. Hundred stable COPD male subjects aged 40 - 60 years were selected as study group from Outpatient Department of Respiratory Medicine of Dhaka Medical College Hospital. Age matched 100 apparently healthy male were studied as control. Serum CRP level was measured by immunometric assay and FVC was measured by computed digital spirometry. For statistical analysis, unpaired Student's 't' test and Pearson's correlation coefficient (r) test were performed. Serum CRP level was significantly (p<0.001) higher and FVC was significantly lower in stable COPD male subjects than control. Serum CRP level showed non significant negative correlation with percentage of predicted value of FVC. From this study it can be concludes that, serum CRP level increase and is negatively correlated with FVC in stable COPD male subjects.

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**Key words:** C-reactive protein, Chronic obstructive pulmonary disease, Forced vital capacity

### Introduction

Chronic obstructive pulmonary disease (COPD) is defined as a preventable and treatable disease with some significant extra pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressed and associated with an abnormal inflammatory response of the lung to noxious particles and gases.<sup>1</sup> The anticipated rise in morbidity and mortality from COPD will be the greatest in Asian and African countries.<sup>2</sup>

Chronic obstructive pulmonary disease (COPD), one of the leading health problems in developed countries. It is a multisystem disease that starts with lung morphology and function impairment and progresses to multiple systemic manifestations such as systemic inflammation<sup>3</sup> and this inflammation can be measured by acute phase proteins such as C-reactive protein.<sup>4</sup> The inflammatory process may extend beyond the pulmonary system, resulting in a state of persistent low grade systemic inflammation which has been implicated in various complication of COPD including cachexia,<sup>5</sup> ischaemic heart disease<sup>6</sup> and arrhythmias.<sup>7</sup>

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C-reactive protein (CRP) is the major human acute phase protein and sensitive indicator of inflammation occurring in the body.<sup>8</sup> It is synthesized mainly by the liver and is regulated to a large extent by the pro-inflammatory cytokine interleukin-6 and also by Tumor necrosis factor- $\alpha$ .<sup>9</sup> Again non hepatic production of CRP may locally produce in the inflamed lung.<sup>10</sup>

In a study researcher found that serum CRP level was significantly higher in COPD patients than that of control subjects which confirmed low grade systemic inflammation in the stable phase of the disease.<sup>11</sup> Several studies have done abroad to observe the association between serum CRP level and lung function status in male subjects with stable COPD patients but the relationships are still debatable. With best of our knowledge, in Bangladesh very few published data has been available about this topic, though large number of subjects in our country is affected by COPD every year. So, early detection of serum CRP level in COPD subjects may utilize as a background information in creating awareness to the clinician about the severity of the disease and helpful in preventing its complications.

### Methods

This cross sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka during the period from January 2013 to December 2013. The study protocol of was approved by the Ethical Review Committee of Dhaka Medical College, Dhaka. Hundred males aged 40 to 60 years with stable COPD were selected by purposive sampling from the Outpatient Department of Respiratory Medicine of Dhaka Medical College Hospital, Dhaka. Age matched hundred apparently healthy male selected as control group for comparison. Subjects with abnormal ECG, liver function and kidney function were excluded from

study. After selection of subjects the aim, objective and benefit and risk of this study were explained to all subjects with a careful and friendly attitude. If they agreed then a written informed consent was collected from them. Then a thorough clinical examination of all subjects was done. All information was recorded in a data sheet. With all aseptic precautions 5 ml of venous blood was collected from each study subject. After centrifuged supernatant serum was collected in labeled eppendorf tube and was kept frozen at  $-20^{\circ}$  c until analysis. Serum C-reactive protein was assessed by Sandwich format Immunometric method in the Department of Pathology, Dhaka Medical College. For FVC, Spirometry was done in the Department of Physiology, Dhaka Medical College, Dhaka. All the data then analyzed by unpaired Student's 't' test and Pearson's correlation-coefficient (r) test as applicable for statistical analysis. P value of  $<0.05$  was accepted as level of significance.

### Results

The mean ( $\pm$ SD) serum C-reactive protein level was significantly higher in stable COPD male group than that of healthy control group (Table I).

The mean ( $\pm$ SD) predicted value of FVC was almost similar in both groups. But the mean ( $\pm$ SD) measured value and percentage of predicted values in stable COPD group was significantly lower than that of healthy control group (Table II).

Table I: Serum C-reactive protein level in both groups (n=200)

Groups	C-reactive protein mg/L
Control (n=100)	2.86 $\pm$ 0.83
Stable COPD male subjects(n=100)	18.24 $\pm$ 20.97***

Results are expressed as Mean $\pm$ SD

Unpaired Student's't' test was performed to compare between groups.

\*\*\*= Significance at  $P < 0.001$

n = Number of subjects

Table II: Forced Vital Capacity in both groups (n=200)

Group	FVC measured value (liter)	FVC predicted value (liter)	FVC Percentage of predicted value (%)
Control (n=100)	2.46±0.28	3.12±0.32	78.92±2.90
Stable COPD male subjects (n=100)	1.40±0.41***	3.30±0.49	41.78±10.10***

Results are expressed as Mean±SD

Unpaired Student's 't' test was performed to compare between groups.

\*\*\*= Significance at P < 0.001

n = Number of subjects

Here serum CRP level showed negative correlation ( $r = -0.074$ ) with percentage of predicted value of FVC which was not statistically significant (figure 1).

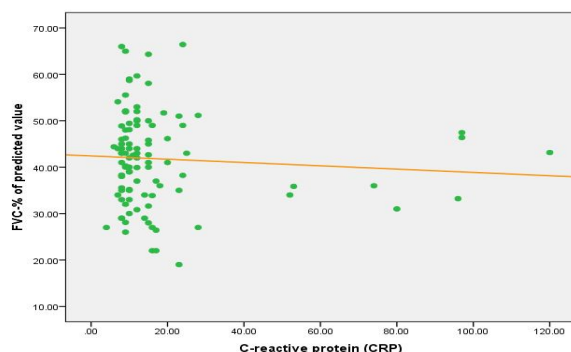


Fig 1. Correlation between CRP and percentage of predicted value of FVC in male with stable COPD

(n=100).

$r = -0.074$ ,  $p = 0.466$

## Discussion

In the present study, the serum C-reactive protein (CRP) level was higher in stable COPD male subjects than that of the healthy control group and the result was highly significant ( $p < 0.001$ ). Similar findings were

reported by many researchers of different countries.<sup>11-14</sup> Again in the present study the measured value and percentage of predicted value of FVC was significantly lower in stable COPD male subjects than those of apparently healthy control. There was no significant difference in predicted value of FVC between two groups. These findings were in agreement with the study of many researchers.<sup>15-18</sup> On the other hand, serum CRP level showed negative correlation with percentage of predicted value of FVC in study group, which was not statistically significant. The result of this study was consistency with the results of other researcher.<sup>19</sup> But some researcher found significant correlation between CRP and FVC in their study.<sup>20</sup>

It has been suggested that, in COPD airflow limitation and abnormal inflammatory response of the lungs occur may be due to inhalation of noxious particles and gases.<sup>21</sup> There is also local damage of small airways thereby causing decline in lung functions.<sup>22</sup> Other suggested that, the chemokines and cytokines produced by pulmonary stromal cells increase in peripheral circulation and may play a major role in the development of systemic inflammation. They cause endothelial dysfunction and increase pulmonary vascular filtration. Persistent inflammation in the lungs causes lung tissue damage and increase acute phase protein (CRP), which is associated with decline lung functions in stable COPD patients.<sup>23</sup>

In the present study, serum CRP level increases in stable COPD male subjects may be due to secretion of proinflammatory cytokines by lung macrophages, bronchial epithelial cells and stromal cells. Again, FVC is also decrease in study group may be due to persistent inflammation and oxidative stress in the lung tissues and airways. But the exact mechanism is not known. Again a negative correlation was also observed between serum

CRP level and percentage of predicted value of FVC. These correlations further support the findings of the present study.

### Conclusion

From the result of this study it has been observed that, stable COPD male subjects with high serum C-reactive protein level and lower FVC may be at a higher risk of cardiovascular complications. Therefore, routine screening of serum CRP level in stable COPD male subjects may be regarded as a biomarker of low-grade systemic inflammation and can be used as a predictive factor for further complications in COPD subjects.

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