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Original Research Article

Association of C-reactive protein with bronchial asthma

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Abstract: Asthma is a syndrome characterized by airflow obstruction that varies markedly both spontaneously and with treatment. Elevated C-reactive protein is known to be a predictor of adverse events in cardiovascular disease and is increasingly used as a surrogate marker of systemic inflammation in diverse conditions. On the other hand, systematic use of spirometry is critical in assessing the severity of asthma. Worldwide studies show that serum-CRP has negative correlation with spirometric lung function, while few other studies show no significant relation. The objective of the study was to explore whether serum-CRP levels bear any relationship with the severity of bronchial asthma or not. A cross-sectional study has been conducted including total 49 patients of bronchial asthma, of age between 18-65 years and both the sexes attending OPD and ward of Department of Respiratory Medicine, RIMS, Imphal. Computerized spirometry has been used for doing Pulmonary Function Test. For measuring s-CRP, agglutination test using CRP kit has been used. A p-value of <0.5 has been taken as statistically significant. Pearson's correlation coefficient between prebronchodilator FEV_1 and CRP level is -.800, the p value being .01, which means that there is significant negative correlation between prebronchodilator FEV_1 (taken in percentage of predicted value) and s-CRP level. As FEV_1 value directly indicates the severity of bronchial asthma, s-CRP can be considered as a good predictor of bronchial asthma severity.

Keywords: bronchial asthma, C - reactive protein, spirometry, pulmonary function test, FEV_1

INTRODUCTION:

Asthma is a syndrome characterized by airflow obstruction that varies markedly both spontaneously and with treatment. Asthmatics harbor a special type of inflammation in the airways that makes them more responsive than non asthmatics to a wide range of triggers, leading to excessive narrowing with consequent reduced airflow and symptomatic wheezing and dyspnea. Narrowing of the airways is usually reversible, but in some patients with chronic asthma there may be an element of irreversible airflow obstruction. Asthma is one of the most common chronic diseases globally and currently affects approximately 300 million people worldwide [1].

Elevated CRP is known to be a predictor of adverse events in cardiovascular disease and is increasingly used as a surrogate marker of systemic inflammation in diverse conditions. The association of elevated CRP with poor lung function indices was first observed a few years ago in population surveys. CRP was discovered in humans in 1930 as a serum component that binds the C polysaccharide of Streptococcus pneumoniae (hence CRP). CRP is also a member of diverse class of defence molecules called the acute phase proteins, which includes structurally unrelated mannose binding protein and fibrinogen. Levels of acute phase proteins rise rapidly, and often dramatically, during infection and after injury, in that case, CRP levels can increase well over 1000 fold in serious infection when spill over of

inflammatory mediators into the blood, especially interleukin(IL)-6 and IL-1beta, triggers its production in the liver. However, nonhepatic production of CRP by monocytes and lymphocytes has also been demonstrated and it is possible that some CRP is made locally in the inflammed lung, an issue that can be quickly resolved immunohistochemically [2].

Systematic use of spirometry is critical in assessing the severity of asthma, the patient's responses to therapy and the disorder's course over a lifetime. Spirometry records airflow from fully inflated lungs. Expiratory airflow can be expressed as volume over time or as flow over volume. Among so many, only two measurements obtained from spirometry are of clinical value. These are the forced vital capacity (FVC), which is the volume of air that can be exhaled from fully inflated lungs, and the forced expiratory volume in one second (FEV_1). Spirometry values are usually normal between asthma attacks, but may be dramatically abnormal during life-threatening attacks. Both FEV_1 (airflow) and FVC (air volume) can be compromised due to airway narrowing, inflammatory and bronchospastic factors and mucus plugging, which can shut off some of the small (or even large) airways [3].

A significant relationship has been found between increased CRP levels and respiratory symptoms, such as wheeze, attacks of breathlessness after effort and nocturnal cough. Another study brought into focus the triad of asthma, high BMI and high CRP [4].

According to some studies, serum CRP can be an airway inflammation predictor in bronchial asthma, while some others showing that serum concentration of CRP is not a good marker of bronchial hyper responsiveness. We would, therefore, like to explore its role in our study population and also whether serum CRP levels bear any relationship with the severity of the disease as reflected in the functional lung impairment assessed by spirometry.

MATERIAL AND METHODS:

Study design:

This is a cross-sectional study.

Study setting:

The study has been carried out in the Department of Physiology and Department of Respiratory Medicine, Regional Institute of Medical Sciences (RIMS), Imphal.

Study population:

49 patients of bronchial asthma of age 18-65 years and both the genders attending OPD and ward of Department of Respiratory Medicine, RIMS, Imphal from December 2015- December2016

Inclusion criteria:

Asthmatic patients of both the genders between the ages of 18-65 years who attend Respiratory Medicine OPD (Out Patient Department) and Respiratory Medicine Ward of Regional Institute of Medical Sciences (RIMS), Imphal have been included in the study.

Exclusion criteria:

Patients with associated diseases like cardiovascular diseases, arthritis, hypertension (atherosclerosis), diabetes mellitus, obesity, certain cancer i.e, colon cancer and lymphoma, irritable bowel disease, burn, bleeding disorders, viral infection, patients on aspirin or warfarin, HIV patients and patients on steroid therapy have been excluded.

Study tools:

1. Computerised spirometer- Model Helios 401/701, Recorders and Medicare System, ISO 901:2008, Chandigarh
2. Rhelax CRP kit of Tulip Diagnostics (P) Ltd, Goa

Plan for statistical analysis:

Data collected have been checked for completeness and consistency and then analysed using SPSS Version 21. Descriptive statistics like mean, standard deviation, percentages have been used. P value of <0.05 has been taken as significant.

Approval of Institutional Ethics Committee:

After approval of the Institutional Ethics Committee, RIMS, Imphal, the study has been conducted.

RESULTS:

Figure 1 is showing that 57% of the study population is male and females being 43%. According to figure 2, most of the study population (82%) has no history of smoking. As shown in figure 3, no of patients having pre-bronchodilator value between 51-65% is 12, that having 20-35% and 66-80% are 10 in each group. Table 4 is showing the average serum CRP level of different groups according to their pre-bronchodilator FEV_1 values. The group having worst pre-bronchodilator FEV_1 value, that is, between 20-35%, is having the worst average s-CRP level, that is, 18mg/dl. Pearson's correlation coefficient between pre-bronchodilator FVC and s-CRP level is -.615, p value being 0.01, indicating significant negative correlation between these two

parameters. At the same time, Pearson's correlation coefficient between prebronchodilator FEV_1 and CRP level is -.800, p value being .01 which signifies negative correlation between prebronchodilator FEV1 (taken in percentage of predicted value) and s-CRP level.

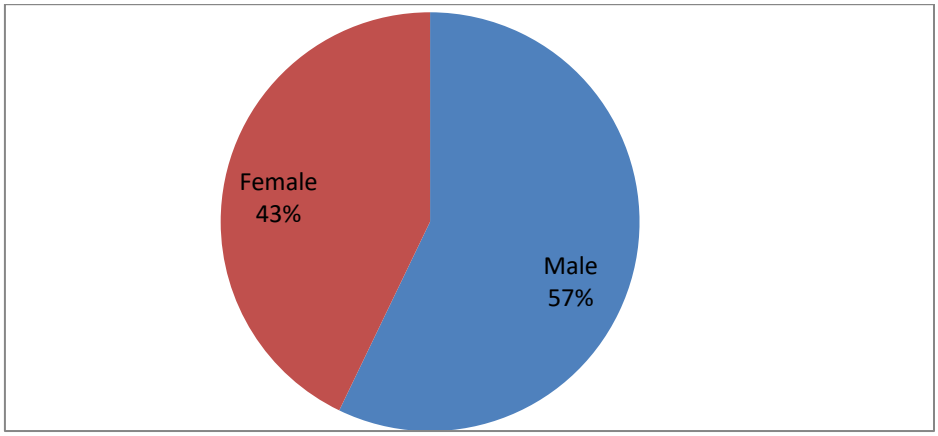

Fig 1: Male-Female ratio

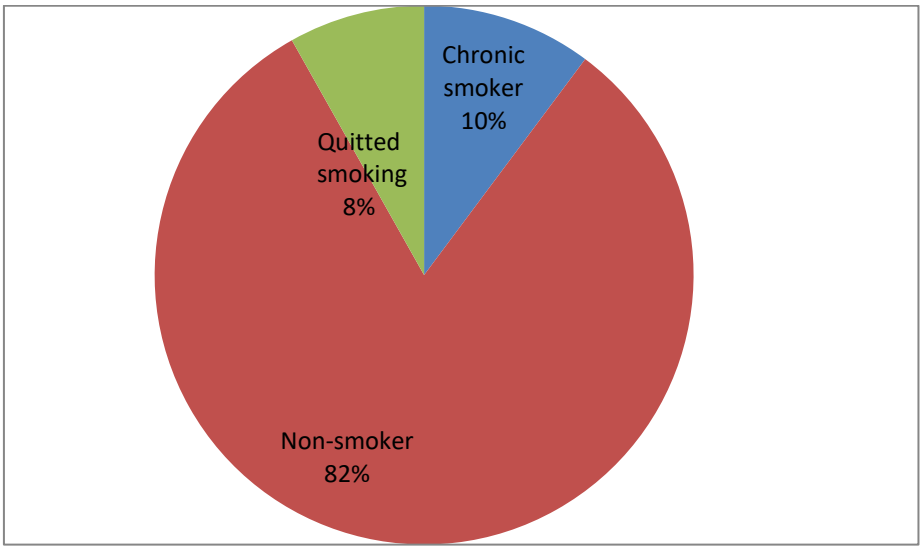

Fig 2: Smoking history of the study population

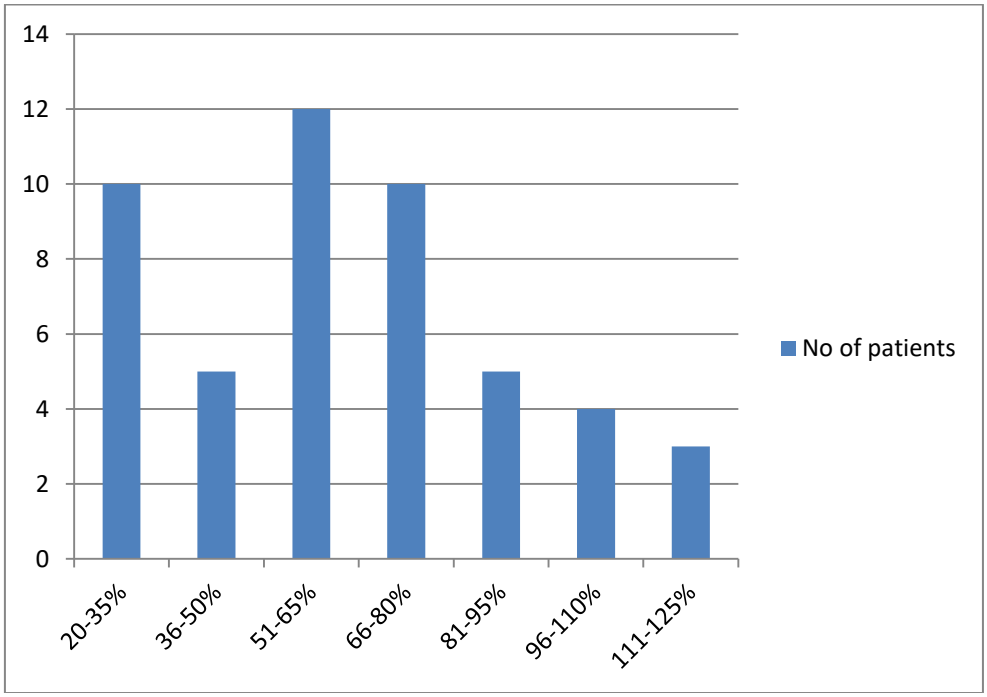

Fig 3: Pre-bronchodilator FEV_1 vs no of patients

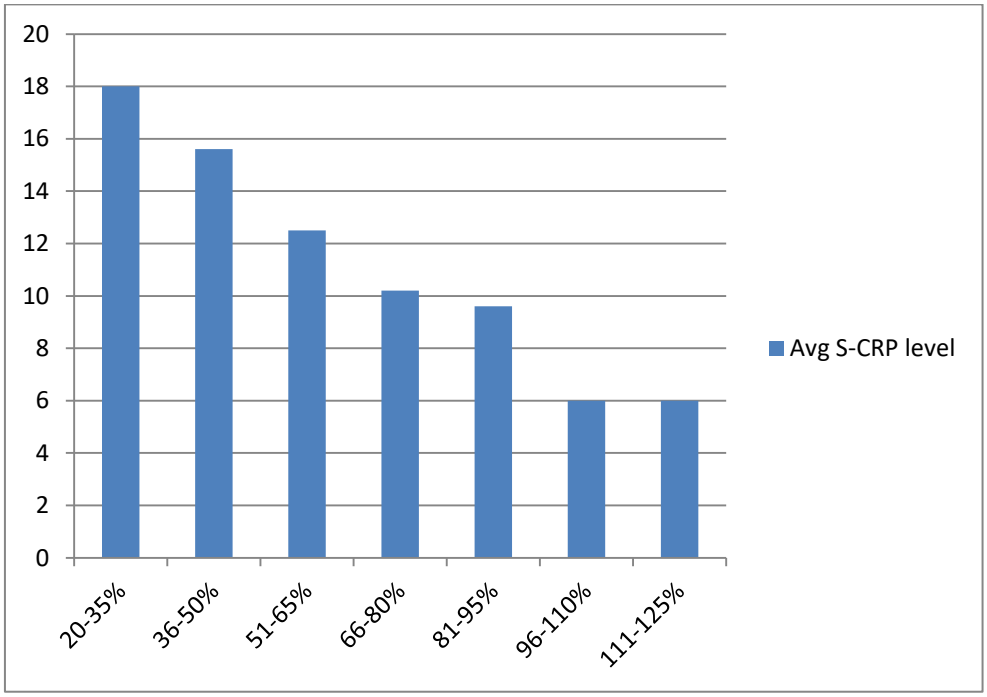

Fig 4: Average s-CRP level vs pre-bronchodilator FEV_1 value

DISCUSSION:

Asthma is one of the heterogenous complex inflammatory diseases. Low grade systemic inflammation is probably the cause of a part of the manifestations in asthma**.** Important management goals in asthmatic patients include achievement of asthma control and suppression of airway inflammation. Worldwide studies show that serum-CRP has negative correlation with spirometric lung function, while few other studies show no significant relation [5].

Previously it has been found that asthma is a disorder associated with increased plasma CRP levels independent of various other factors [6]. Some researchers came to the conclusion that serum hs-CRP may be a useful marker of airway inflammation in non smoking asthmatic patients without complications, such as heart disease, hypertension, hyperlipidaemia, chronic obstructive pulmonary disease or infection [7]. Another study showed that increases in CRP levels over time were associated with a steeper FEV_1 decline [8]. These findings are in accordance with our study, as we also found significant negative correlation between PFT and s-CRP.

CONCLUSION:

As FVC and FEV_1 value directly indicates the severity of bronchial asthma, s-CRP can be considered as a good predictor of bronchial asthma severity.

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