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Original Research Article

Evaluation of High Sensitivity C-Reactive Protein in Patients Diagnosed with Asthma: Comparative Analysis

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Abstract

Background and Aim: The first acute-phase protein to be described is called C-reactive protein (CRP), and it is a very sensitive systemic marker of tissue damage, infection, and inflammation. Raised CRP levels have been linked favourably to existing asthma, respiratory impairment, and bronchial hyperresponsiveness. In this investigation, we assessed the connection between the blood CRP level and inflammation among asthmatic patients.

Material and Methods: The study's participants were split into two groups: A control group of 41 healthy individuals and 41 asthmatic patients makes up the study group. The best measurements of forced expiratory volume (FEV1) and peak expiratory flow rate (PEFR) were taken using the Spirolab, MIR, and 3 ml of blood was drawn for the assessment of hs-CRP. The serum was separated using the hs-CRP detection kit (nephelometry) by Genrui Biotech. Inc., and in accordance with the protocols, the reference range for the two groups' hs-CRP levels was determined.

Results: In comparison to the control group, asthma sufferers' FEV1 and PEFR were significantly lower. When the values of the hs-CRP in the two groups were compared, it was discovered that the study group's value was higher than the control group's. Compared to asthmatic individuals with stable clinical condition, those whose levels were measured after an acute exacerbation had more pronounced hs-CRP elevations. In the current investigation, adult asthmatic patients' hs-CRP levels were considerably greater than those of middle-aged patients.

Conclusion: Future studies on the impact on the long-term result may be useful in limiting the undesirable and irreversible changes of asthma. Hs-CRP can be considered a good biomarker for assessing the severity and stability of asthma.

Keywords: Asthma, C-reactive protein, Forced Expiratory Volume, Peak Expiratory Flow Rate.

Introduction

Over 315 million people worldwide suffer from bronchial asthma, a common lung condition that is seriously detrimental to their health. Mast cells, eosinophils, and T lymphocytes in particular have a role in the chronic inflammatory condition of the airways known as asthma. People who are sensitive to this inflammation frequently experience chest tightness, dyspnea, coughing, and wheezing bouts, especially at night or in the morning [1,2].

Over 180,000 people die from this illness worldwide each year. There are between 15 and 20 million asthmatics in India. In addition to local inflammation, bronchial asthma patients are more likely to have severe inflammation, illness aggravation, and even mortality due to persistent subacute inflammation of the airways with hyperresponsiveness [3,4].

An elevated level of plasma fibrinogen and serum amyloid A points to the possibility that asthma is accompanied with systemic inflammation. Asthma exacerbations and severe inflammation are brought on by the remodelling process, which also causes airway constriction, oedema, bronchial hyperresponsiveness, and hypersecretion. Numerous studies have demonstrated a correlation between the inflammatory process in asthma and the disease's severity and impairment of pulmonary function [5,6].

The primary physiological hallmark of asthma is reversible airflow restriction and systemic inflammation. Even mild and moderate asthma are linked to inflammation of the airway wall, aberrant buildup of inflammatory cells, and hyperresponsiveness of the airways. Inflammation is not just present in severe asthma [7,8].

C-reactive protein (CRP) is a -globulin whose production is elevated during acute illness and which helps to activate the complement system. It is named C because it precipitates fraction C of the pneumococci extract, which affects variables like erythrocyte sedimentation rate (ESR) [9].

The first acute-phase protein to be described is called C-reactive protein (CRP), and it is a very sensitive systemic marker of tissue damage, infection, and inflammation. Although other cells, such as alveolar macrophages, may also create CRP under the direction of cytokines, primarily interleukin-6, hepatocytes make and secrete it more frequently (IL-6) [10].

Airway inflammation and hyperresponsiveness, which are characteristics of asthma, are mediated by a variety of cells, cytokines, and mediators. Asthma also has systemic inflammation, as seen by elevated plasma fibrinogen and serum amyloid A levels, in addition to local inflammation. Since there is a link between serum hs-CRP levels and asthma severity, hs-CRP may theoretically also be a useful diagnostic for diagnosing systemic inflammation in asthma [11,12].

According to numerous studies, elevated CRP levels and asthma are positively correlated. Raised CRP levels have been linked favorably to existing asthma, respiratory impairment, and bronchial hyperresponsiveness. In this investigation, we assessed the connection between the blood CRP level and inflammation among asthmatic patients.

Material and Methods

The present study was done in the medical college and associated hospital. The study period was for 6 months. The institutional ethical committee was informed about the study and the ethical clearance was obtained prior to the start of the study. A total of 82 patients who were diagnosed as asthma were included in the study. The mean age of the included patients was found to be 42.5 ± 15.9

Based on the medical and the physical examination and history the asthma was diagnosed in the included patients. In patients with history of smoking, for 20 min they were administered with 2 puffs of metered dose salbutamol inhalation or a half a milliliter of salbutamol solution diluted in 3 ml of isotonic saline; was given through electrical nebulizer and if the 15% improvement was obtained than the diagnosis of asthma was confirmed.

The exclusion criteria followed in the study was as follows: those with acute respiratory infection, those with a clinical suggestion of chronic obstructive pulmonary disease and a history of pulmonary tuberculosis, patients with features suggestive of bronchiectasis, any patient with other chronic non-respiratory condition including cardiac failure, renal, and liver problem, and patients with connective tissue diseases.

The control group consists of 41 patients, with 18 males and 26 females in the control groups. The mean age of included patients was found to be 43.9 ± 25.5 years Full history and physical examination was done for patients and control groups, asthma severity assessed according to GINA (Global Initiative of Asthma) classification into three grades:

Mild asthma

Well controlled with short-acting bronchododilator alone or with low-dose inhaled corticosteroids (ICSs) or leukotriene antagonists.

Moderate asthma

Well controlled with low-dose ICS/long-acting beta 2-agonists (LABA).

Severe asthma

It needed high-dose ICS/LABA to improve the symptomatology or failure of these measures.

The best readings of forced expiratory volume (FEV1) and peak expiratory flow rate (PEFR) were taken using the Spirolab, MIR, and 3 ml of blood was drawn for the assessment of hs-CRP. The serum was separated using the hs-CRP detection kit (nephelometry) by Genrui Biotech. Inc., and in accordance with the protocols, the reference range for the two groups' hs-CRP levels was determined. Using the t-test, Chi-square tests, and Persons correlation®, statistical analysis was carried out. A difference with a P value of 0.05 or below is regarded as statistically significant.

Results

The study's participants were split into two groups: A control group of 41 healthy subjects and 41 asthmatic patients makes up the study group. Regarding age, gender, smoking, and BMI, there were no significant differences between the patient and control groups in the study population's demographics; however, the proportion of patients with a history of another allergic condition was significantly higher in the asthma group than in the control group. In comparison to the control group, asthma sufferers' FEV1 and PEFR were significantly lower.

When the values of the two groups' hs-CRPs were compared, it was revealed that the study group's value was higher than the control group's [Table 1]. Compared to asthmatic individuals with stable clinical status, those whose levels were measured after an acute exacerbation had more pronounced hs-CRP elevations. In the current study, adult asthmatic patients' hs-CRP levels were significantly higher than those of middle-aged patients.

Table 1: Comparison of hs- CRP of the study group and control groups

Groups	CRP level	P value
Study group	7.94±6.46	0.002
Control group	12.91±7.61	
Stable Patients	10.95±7.14	0.003
Acute exacerbation	15.91±7.42	

Discussion

Serum levels of hs-CRP have been found to be higher in patients with acute asthma compared to healthy controls, and no significant relationships between hs-CRP levels and markers of pulmonary function, total serum IgE levels, white blood cell count, or eosinophil count have been discovered [13].

It is generally recognized that airway inflammation plays a significant role in asthma. Asthma may also have systemic inflammation in addition to the inflammation of the airways. The nonspecific acute-phase reaction to the majority of inflammatory and infectious conditions includes the generation of CRP. When a person appears to be healthy, problems involving low-grade inflammation may be detected with high-sensitivity CRP testing [14].

Healthy men's hs-CRP values vary from 0.3 to 8.6 mg/L, whereas healthy women who aren't on hormone replacement treatment have values between 0.2 and 9.1 mg/L. Raised CRP levels have been linked favourably to existing asthma, respiratory impairment, and bronchial hyperresponsiveness [15].

The airway mucosa undergoes inflammatory alterations in asthma. It is widely known that local inflammation plays a significant role in the pathophysiology of asthma. However, there is little information on whether or whether systemic inflammation is also linked to asthma. SAA and fibrinogen in particular were sensitive indicators of systemic inflammation that were positively and significantly correlated with the occurrence of asthma. The findings of this study showed a positive link between increasing serum hs-CRP concentration and asthma severity, with patients with asthma having considerably higher serum hs-CRP concentration than healthy controls. In this study, not only was the positivity of hs-CRP higher in asthmatic as compared to the healthy control but also the serum level was significantly higher, and even those asthmatic during a stable state were found to have higher results as compared to the cont. Other authors support the positive correlation of the level of hs-CRP and the disease activity that was assessed by different methods including symptoms questionnaires and spirometric assessment.

Conclusions

Future investigations on the impact on the long-term result may be useful in limiting the undesirable and irreversible changes of asthma. Hs-CRP can be considered a good biomarker for assessing the severity and stability of asthma.

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