



A case control study of hsCRP as a marker in assessing severity of asthma

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Abstract

Introduction: In asthma, not only local but also systemic inflammation occurs and hs-CRP may play a role in the pathogenesis of asthma. The C-reactive protein (CRP) its capacity to precipitate the somatic C-polysaccharide of *Streptococcus pneumoniae* is an exquisitely sensitive non-specific marker of acute inflammation and tissue damage

Material and Methods: This is prospective and descriptive study patients were conducted among patients with asthma presented for follow-up examination in outpatient Department of Pulmonary Medicine, Kurnool Medical College from January 2018 to December 2018. The patients were on maintenance treatment including inhaled corticosteroids and bronchodilators according to the guideline treatment of asthma.

Result: In our present study, a total of 75 patients were included, most of the patients were 51-70 years i.e., 39 out of 75 (52.0%), followed by 31-50 years, i.e., 26 out of 75 (34.6%) in case group. On the other hand, 38 out of 75 (50.6%) followed by 29 out of 75 (38.6%) in control group. The mean hs CRP of Case group patients are 3.83 ± 0.92 mg/L and in control group patients 0.77 ± 0.23 mg/L. Pulmonary function test using Spirometer was done in all the patients (case and control). The FEV1 values are compared against hsCRP values. Statistical significance is assessed using Spearman's correlation. Case group patients showing highly significant negative correlation of hsCRP with FEV1.

Conclusion: The results of this study indicated increased serum hsCRP concentration in asthma compared to controls. Increased serum hs-CRP correlates positively with severity of asthma and thus can be considered as a tool in predicting asthma status.

Keywords: c-reactive protein, asthma, forced expiratory volume

Introduction

The C-reactive protein (CRP) its capacity to precipitate the somatic C-polysaccharide of *Streptococcus pneumoniae* is an exquisitely sensitive non-specific marker of acute inflammation and tissue damage [1]. The CRP is predominantly synthesised in the liver and is regulated by pro-inflammatory cytokines, primarily the tumour necrosis factor-alpha and interleukin-6 (IL-6). During an acute-phase response, there is a rapid increase in the production of CRP (10,000-fold), resulting in the release of elevated quantities into the circulation. The CRP may serve as a general scavenger protein and play an important role in opsonisation, phagocytosis, and cell-mediated cytotoxicity. The CRP can also act as a potent proinflammatory agent and activates the classical complement cascade by binding directly to the complement fragment C1q [2].

Standard assays for CRP lack the sensitivity needed to determine the levels of inflammation, and thus, clinical utility of standard CRP evaluation is extremely limited. Recent improvements have resulted in a new generation of highly sensitive assays that can detect the CRP at levels 100-fold lower than the earlier assays [3]. The CRP determined using a highly sensitive assay is referred to as high sensitivity-CRP (hs-CRP). Using hs-CRP, assessment of conditions indicative of chronic, low-grade inflammation is now possible. Large-scale prospective studies have demonstrated

that hs-CRP is a strong independent predictor of future myocardial infarction, stroke, peripheral arterial disease and sudden cardiac death among healthy men and women, and recurrent events and death in patients with acute or stable coronary syndromes [4].

Also, low-level inflammation, as indicated by increased hs-CRP serum concentrations, has been described in both chronic obstructive pulmonary lung diseases (COPD) and asthma [5]. As asthma is characterised by variable degrees of airway inflammation, cytokines such as IL-1, IL-6 and nuclear factor κ - β , which regulate hs-CRP had a role in airway inflammation [6]. So it is reasonable to consider that there may be a direct association between severity of inflammation and level of hs-CRP level.

In asthma, not only local but also systemic inflammation occurs and hs-CRP may play a role in the pathogenesis of asthma [7]. In one study, hs-CRP was significantly higher in all asthmatics compared to healthy controls and in uncontrolled asthmatics hs-CRP was significantly higher than other asthmatic children. One study who found higher serum hs-CRP levels in children with uncontrolled asthma compared to the levels in children with controlled asthma and healthy ones [8].

Material and Methods

This is prospective and descriptive study patients were derived among patients with asthma presented for follow -up examination in outpatient Department of Pulmonary Medicine, Kurnool Medical College from January 2018 to December 2018. The patients were on maintenance treatment including inhaled corticosteroids and bronchodilators according to the guideline treatment of asthma [10].

All eligible patients were included except those with COPD, bronchiectasis, pulmonary infection, connective tissue diseases, vasculitis, coexistent acute or chronic localized or systemic infection or inflammatory conditions at respiratory or musculoskeletal, gastrointestinal, urinary tract and gastrointestinal systems as well as patients with malignancies and history of inflammatory disease.

The subjects of the control group were selected among the healthy personals of the same hospital that had not asthma. Similar exclusion criteria were also applied to the control group. Diagnosis of asthma was confirmed based on clinical features and pulmonary function test. All patients received standard treatment to achieve control. The level of control of asthma was determined using ACT.

Serum CRP was measured by ELISA method according to the manufacturer’s instruction using a high sensitive CRP kit which serum levels less than 1 mg/L were considered normal.

Statistical Analysis

In statistical analysis, the serum hs-CRP was compared between patients and controls Parametric and non-parametric Mann-Whitney U tests were used for comparison of variables with and without normal distribution respectively. The chi square test with calculation of odds ratio (OR) and 95% confidence interval (95% CI) was used for association and Spearman test was used for determination of correlation.

Result

In our present study, a total of 75 patients were included out of which 43 (57.3%) were males and 32 (42.6%) were females in case group, on the other hand 41 (54.6%) were males and 34 (45.3%) were females in control group (table-1).

Table 1: Distribution of gender

Gender	Case		Control	
	No. of patients	Percentage	No. of patients	Percentage
Male	43	57.3	41	54.6
Female	32	42.6	34	45.3
Total	75	100	75	100

Table 2: Distribution of different age groups of patients

Age	Case		Control	
	No. of patients	Percentage	No. of patients	Percentage
18-30 years	4	5.3	3	4.0
31-50 years	26	34.6	29	38.6
51-70 years	39	52.0	38	50.6
>71 years	6	8.0	5	6.6
Total	75	100	65	100

In table 2, in our study, most of the patients were 51-70 years i.e., 39 out of 75 (52.0%), followed by 31-50 years, i.e., 26 out of 75

(34.6%) in case group. On the other hand, 38 out of 75 (50.6%) followed by 29 out of 75 (38.6%) in control group

Table 3: Distribution of hsCRP of between two groups of patients

hsCRP (mg/L)	Case (n=65)	Control (n=65)
	Mean ±SD	Mean ±SD
	3.83±0.92	0.77±0.23

In table 3, the mean hs CRP of Case group patients are 3.83±0.92 mg/L and in control group patients 0.77±0.23 mg/L.

Table 4: Distribution of Pulmonary function (FEV1) between two groups of patients

FEV1%	Case (n=65)	Control (n=65)
	Mean ±SD	Mean ±SD
	63.73±6.84	82.58±7.58
FVC	71.36±6.34	94.63±8.43

Table 5: Comparison of Pulmonary function and hsCRP using Spearman correlation

FEV1%	Case (n=65)	
	r	p-value
	-0.534	0.0001

In table 5, pulmonary function test using Spirometer was s done in all the patients (case and control). The FEV1 values are compared against hsCRP values. Statistical significance is assessed using Spearman’s correlation. Case group patients showing highly significant negative correlation of hsCRP with FEV1.

Discussion

In asthma, the significance of airway inflammation has been recognised. Other than the airway inflammation, systemic inflammation may also exist in asthma. The pertinence of high sensitivity assays for hs-CRP, which is known to be a sensitive marker of low-grade systemic inflammation, has not been completely concentrated in asthma. Studies have endeavoured to approve the utilization of hs-CRP as a surrogate marker of airway inflammation in bronchial asthma. The findings by Raita Y *et al.* [9] cross-sectional revealed the serum hs-CRP levels in steroid-credulous and steroid- inhaling in adult non-smoker patients with asthma and healthy controls. Recent investigations have shown increased levels of hs-CRP both in asthma and exacerbations of COPD and it was even recognized in the steady statement of COPD [10].

The relationship between hs-CRP levels and the severity of asthma has been appeared in two past studies [11]. There was a positive connection only within severe asthmatic patients in the investigation by Corlateanu an *et al* [12]. Considering the past investigations, the relationship between levels of hs-CRP and the severity of asthma shows that CRP is a proinflammatory agent [13]. Severity of asthma connects decidedly with the asthmatic inflammation [14]. Significant contrasts in hs-CRP levels between subjects with severe asthma and controls without respiratory symptoms have recently shown in one investigation [15]. Interestingly, Takemura *et al.*, hs-CRP levels were just inclined in steroid- naive patients contrasted with controls [16]. Also, serum hs-CRP levels in moderate asthmatic cases were significantly

higher than in mild ones in our study.

A significant difference was resolved between asthmatic subjects and controls as far as PFT. But no significant difference PFT and the levels of hs-CRP of the asthmatic patients in our study; like the past reports by Qian *et al.* Conflicting, there was positive connection between the degrees of PFT and hs-CRP as per the reports by Takemura *et al.*,^[17].

This issue is important because elevated serum CRP not only indicates lung inflammation but also an important predictor of future development of cardiovascular events. The clinical significance of serum hs-CRP measurement in asthma is not limited to its potential in estimating disease severity or evaluating the efficacy of treatment but also provides additional data in predicting future burden regarding cardiovascular morbidity and mortality. Although the association of high serum CRP and subsequent cardiovascular events in COPD has been shown, this association in asthma has not been documented and requires further studies^[18].

Conclusion

The results of this study indicated increased serum hsCRP concentration in asthma compared to controls. Increased serum hs-CRP correlates positively with severity of asthma and thus can be considered as a tool in predicting asthma status.

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