Original Research Article

To study the correlation of high sensitivity C reactive protein levels with asthma control in children

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ABSTRACT

Background: Childhood asthma appears to be increasing in prevalence despite advancements in the care of asthma. In asthma, local as well as systemic inflammation contributes to the pathogenesis. Thus successful management depends on controlling this inflammation by appropriate doses of inhaled corticosteroids. High sensitivity C reactive protein (hsCRP) is an easily measurable marker of inflammation and its level can be used as a diagnostic tool in assessing control of asthma. The objective of this study was study the correlation of serum hsCRP levels with asthma control in children

Methods: It is an observational study conducted in the Pediatric asthma clinic of a Government Medical College in south India. The study population consisted of 75 asthmatic children aged 5-15 years. Children with persistent asthma were classified into three groups based on GINA guidelines. Serum hsCRP levels were measured in all the three groups.

Results: Among the 75 children 33% belonged to controlled group, 35% to uncontrolled group and 33% to partly controlled group. There was a significant difference in hsCRP levels between controlled and uncontrolled groups. The mean value of hsCRP in controlled group was 0.93 ± 1.3 mg/L whereas in the uncontrolled group it was 2.73 ± 2.46 mg/L. Higher levels of hsCRP were found in the uncontrolled asthma group.

Conclusions: There is an inverse correlation between hsCRP levels and asthma control in children. High hsCRP levels have a potential to be used as a surrogate marker for poor control of asthma and can thus be used as a guide for adjustment of dosage of inhaled corticosteroids.

Keywords: Asthma control, Children, Correlation, GINA guidelines, hsCRP

INTRODUCTION

Incidence of asthma has been increasing in the past few decades thus contributing as a major cause for morbidity in children and causing a substantial burden on families. It still remains largely under diagnosed and undertreated. Continuing airway inflammation in the asthmatic children contributes to poor control. C-reactive protein (CRP) is

an exquisitely sensitive, non-specific marker of acute/chronic inflammation and tissue damage. CRP is also elevated with low levels of inflammation in both chronic obstructive pulmonary disease and asthma.¹⁻³

The cytokines interleukin-1, interleukin-6 regulate high sensitivity CRP (hsCRP) and play a role in airway inflammation.⁴ Elevated levels of hsCRP are significantly

associated with respiratory function impairment and bronchial hyper responsiveness.^{5,6} So it is reasonable to consider the existence of a correlation between asthma control (inflammatory disorder) and hsCRP levels.

In asthma as part of acute phase response to inflammation, there is a rapid production of CRP which serves as a general scavenger protein and helps in opsonisation, phagocytosis and cell mediated cytotoxicity. Thus a positive association is said to be existing between severity of asthma and high sensitivity CRP levels (hsCRP).

The objective was to study the correlation of hsCRP levels with degree of asthma control in children.

METHODS

The present study is an observational study conducted in Pediatric asthma clinic of a Government Medical college in south India from February 2014 to November 2015. Children aged 5 to 15 years with persistent asthma who had been started on inhaled corticosteroids (as per standard of care) for at least the previous 4 weeks were enrolled in the study. Children with chronic inflammatory disorders, chronic systemic diseases and malignancies were not included.

Study population consisted of 75 asthmatic children. After a detailed history and clinical examination, Peak expiratory flow rate (PEFR) was measured by using peak flow meter. Asthma control was assessed based on the parameters of GINA guidelines. Children with persistent asthma were divided into three groups depending on levels of control.

Informed consent was obtained and blood samples were taken for measuring serum hs CRP levels. Under strict aseptic precautions, 5 ml of venous blood was drawn. Serum hs CRP was measured by using immune turbidity assay. Data was analysed for hs CRP levels and the control of asthma and statistical significance of the result was determined.

Statistical analysis

Analysis was done by One way Anova followed by Tukeyhsd method. Chi square test and Correlation was also done.

RESULTS

The study population of 75 asthmatic children who had been on inhaled steroids was grouped into three categories as per GINA guidelines (Table 1).

Table 1: Categorization of study population (n = 75).

Categories	Number of patients
Uncontrolled	26
Partly controlled	24
Controlled	25

HsCRP among categories

The mean hsCRP levels among the asthmatic children, in uncontrolled group was 2.73 mg/L, partly controlled group was 2.09 mg/L and in controlled group was 0.93 mg/L. There was significant difference (p value-0.006) between the groups (Table 2).

Table 2: hsCRP (mg/L) among categories (n = 75).

Categories	Number of patients	Mean	Standard deviation	P value
Uncontrolled	26	2.73	2.46	0.006**
Partly controlled	24	2.09	1.92	
Controlled	25	0.93	1.30	

**highly significant p value.

Dependent variable: hsCRP

In multiple comparisons of hsCRP levels, there was a significant difference (p value 0.005) between controlled and uncontrolled group. But such significant difference was not observed between both partly controlled and uncontrolled group (p value 0.487) or between partly controlled and controlled groups (p value is 0.103) (Table 3).

Table 3: Dependent variable: hs-CRP.

(I) Levels of asthma control	(J) Levels of asthma control	Mean difference (I-J)	Std. error	P value
Uncontrolled	Partly controlled	0.6393	0.55	0.487
	Controlled	1.8015(*)	0.54	0.005**
Partly controlled	Uncontrolled	-0.6393	0.55	0.487
	Controlled	1.1622	0.56	0.103
Controlled	Uncontrolled	-1.8015(*)	0.54	0.005**
	Partly controlled	-1.1622	0.56	0.103

** The mean difference was significant at the .05 level.

DISCUSSION

In this study the total number of children, recruited were 75. There was almost equal distribution of cases in the three groups with 26 (34.7%) children in uncontrolled, 25(33.3%) in controlled, and 24 (32%) in partly controlled group as per GINA guidelines. Serum hsCRP levels measured in the three groups were correlated with levels of asthma control.

In this study there was a statistically significant difference in hsCRP levels between controlled and uncontrolled groups. The mean value of hsCRP in controlled group was 0.93 ± 1.3 mg/L whereas in the uncontrolled group it was 2.73 ± 2.46 mg/L. This fact is also documented in studies by Albanna et al, where in, the authors have found a higher CRP values among the poorly controlled group Kilic H et al in their study of 30 asthmatics. 30 healthy controls found that hsCRP levels were significantly elevated in asthmatic patients as compared to controls.^{7,8} Among asthmatics the elevation of CRP was much higher in the uncontrolled group.

Olafsdottir et al suggested a positive correlation between CRP levels and the degree of pulmonary impairment/ bronchial hyper-responsiveness.⁵

In another study of 55 asthmatic children by Elbehidy et al, hsCRP levels were significantly higher in Inhaled corticosteroid unresponsive children.⁴ They concluded that the ongoing inflammation of airways contributes to poor control in these children.

However in our study in the partly controlled group, though the CRP values were elevated (2.09 mg/L), this was not statistically significant. Probably a larger sample size would be required for accurate analysis. Razi et al in their study of 108 patients concluded that increase in hsCRP levels may be associated with airflow obstruction in acute asthma and can be used as a diagnostic tool for detecting and monitoring airway inflammation.⁹

Persistent inflammation is the prime contributory factor for the symptomatology in uncontrolled asthma. Measurement of hsCRP levels can be useful in assessing the severity of such inflammation. So the evaluation of hsCRP is a useful baseline investigation and its serial measurements can be taken as a marker for adjusting the dose of inhaled steroids. Following the conclusion of this study, in our paediatric asthma clinic we have incorporated serial hsCRP measurement both in the baseline and follow up investigation of asthmatic children.

CONCLUSION

Thus we infer from our study that there is an inverse correlation between hsCRP levels and degree of asthma control. Serial hsCRP measurements can be used as a guide for adjusting the doses of Inhaled corticosteroids in poorly controlled asthmatic children.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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