

## A study of 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 B. J. Medical College and Civil hospital Ahmedabad. The study population consists of 95 asthmatic children aged 3-12 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 95 children 35(36.84%) belonged to controlled group, 30 (31.57%) to uncontrolled group and 30(31.57%) to partially controlled group. There was a significant difference in hsCRP levels between controlled and uncontrolled groups. The mean value of hsCRP in controlled group was  $0.93 \pm 1.3 \text{ mg/L}$  while as in the uncontrolled group it was  $2.73 \pm 2.46 \text{ mg/l}$ . Higher levels of hsCRP were found in the uncontrolled asthma group. **Conclusion:** There is a universal correlation between hsCRP levels and asthma control in children. The objective of study is that 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, 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 asthmatic children contributes to poor control. C-reactive protein (CRP) is a sensitive, non-specific marker of acute or chronic inflammation and tissue damage. CRP is also elevated with low levels of inflammation in patients of asthma.<sup>1-2</sup>

The cytokines Interleukin-1, Interleukin-6 regulate high sensitivity CRP (hsCRP) and play a role in airway inflammation.<sup>4</sup> Elevated

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levels of hsCRP are significantly associated with respiratory function impairment and bronchial hyper-responsiveness.<sup>5</sup> So, it is reasonable to consider the existence of a correlation between asthma control (inflammatory disorder) and hsCRP levels. The objective is to study the correlation of hsCRP levels with degree of asthma control in children.

**Materials & Methods:**

The present study is an observational study conducted in Pediatric asthma clinic of Civil Hospital Ahmedabad from January 2018 to June 2018. Children aged 3 to 12 years with persistent asthma were enrolled in the study. These patients came for regular follow up to the asthma clinic. They were on inhaled corticosteroids therapy. According to severity grading and level of control, dosage and frequency of inhaled corticosteroid were changed regularly in asthma clinic. Children with chronic inflammatory disorders, chronic diseases and malignancies were excluded from the study.

Study population consisted of 95 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. The GINA Science Committee was established in 2002 to review published research on asthma management and prevention, to evaluate the impact of this research on recommendation in GINA documents, and to provide yearly updates to these documents. Children with persistent asthma were divided into three groups depending on levels of control.

The level of asthma control is the extent to which the manifestations of asthma can be observed in the patient, or have been reduced or removed by treatment. It is determined by the interaction between the patient’s genetic background, underlying disease process, the treatment that they are taking, environment, and psychosocial factors.

**Table: 1 GINA assessment of asthma control in children**

Asthma symptoms control			Level of asthma symptom control		
In the past 4 weeks, has the patient had:			Well controlled	Partly controlled	Uncontrolled
• Daytime asthma symptoms more than twice/week?	Yes	No	None of these	1-2 of these	3-4 of these
• Any night waking due to asthma?	Yes	No			
• Reliever needed for symptoms more than twice/week?	Yes	No			
• Any activity limitation due to asthma?	Yes	No			

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

**Results:**

Total 95 children aged 3 to 12 years diagnosed as a persistent asthma and on inhaled corticosteroid therapy regularly were included in study. Among them 42 were females and 53

were males. Children between 3 to 5 years of age were 25, between 5 to 9 years were 32 and between 9 to 12 years were 38 in our study.

On regular follow up in asthma clinic we had categorized children with persistent asthma into Mild, Moderate and Severe grading. We have 56 (58.91%) patients of mild persistent, 31(32.64%) patients of moderate persistent and 8(8.42%) patients of severe persistent asthma in the study.

The study population of 95 asthmatic children who had been on inhaled steroids was also grouped into three categories as per GINA guidelines (Table 2).

**Table: 2 Categorization of study population (n = 95)**

Categories	Number of patients	Percentage of Patients (%)
Uncontrolled	30	31.57
Partially controlled	30	31.57
Controlled	35	36.84

### HsCRP Among categories

The mean hsCRP level among the asthmatic children, in controlled group was 4.27mg/l, partly controlled group was 3.8 mg/l and in controlled group was 1.2 mg/l. There was significant difference (p value-0.006) between uncontrolled and controlled groups.

**Table 3: hsCRP (mg/l) among categories (n=95).**

Categories	Number of patients	hsCRP (mg/l) Mean
Uncontrolled	30	4.27
Partially controlled	30	3.82
Controlled	35	1.20

### Discussion:

In this study total number of children, recruited were 95. There was almost equal distribution of cases in the three groups with 30(31.57%) children in uncontrolled, 35(36.84%) in controlled, and 30(31.57%) in partially 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 1.2mg/l whereas in the uncontrolled group it was 4.2mg/l. Among asthmatic the elevation of CRP was much higher in the uncontrolled group.

Currently the severity of asthma and degree of control in asthmatic children is assessed by past history of day and night time episodes, clinical examination, numbers of hospitalization, Peak expiratory flow rate, etc.

In another study of 55 asthmatic children by Elbehidy et al, hsCRP levels were significantly higher in inhaled corticosteroid unresponsive children and they concluded that the ongoing inflammation of airways contributes to poor control in these children.<sup>4</sup>

However in our study in the partially controlled group, though the CRP values were elevated, 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.<sup>6</sup>

This study was performed in adult population, however similar findings has been obtained in our study in pediatric age group.

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 using hsCRP is a useful baseline investigation and its serial measurements can be taken as a marker for adjusting the dose of inhaled steroids.

### **Conclusion:**

Thus we infer 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 children with persistent asthma.

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