

Original Research Article

A study on correlation of serum IgE levels with diagnosis and severity of asthma in children

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ABSTRACT

Background: Asthma is a chronic inflammatory airway disorder which increases bronchial hyperreactivity to various allergens and irritants characterized by narrowing of airways. Immunoglobulin E (Ig E) plays major role in the pathogenesis of asthma which is produced due to dysregulation of type 2 T helper lymphocytes (Th2) induced cytokines in genetically susceptible individual after exposing to allergens or irritants. The aim of this study was to estimate serum Ig E level in children between 3-12 years of age and to correlate it with the clinical diagnosis and severity of asthma.

Methods: A prospective interventional study was done over a period of one year, enrolling 81 children aged between 3-12 years, who were newly diagnosed cases of asthma attending asthma clinic in a tertiary care pediatric government hospital. Serum IgE level was estimated and its correlation with the severity of asthma was assessed.

Results: The mean Absolute Eosinophil Count (AEC) of the study was 305.85 ± 188.40 cells /mm³. Mean Ig E level was increased in asthmatic children (874.59 ± 287 IU/ml). Mean serum Ig E level in mild intermittent asthma was 247.92 ± 89.50 IU/ml, in mild persistent asthma was 742.95 ± 306.78 IU/ml, in moderate persistent asthma was 1142 ± 196.88 IU/ml and in severe persistent asthma was 1790 ± 121.50 IU/ml. The increasing level of serum Ig E was found to be statistically significant ($p < 0.05$) with increasing grading of asthma.

Conclusions: Elevated serum IgE levels support clinical diagnosis of asthma in children and can predict severity of asthma and can be used to counsel parents for better compliance in the management of bronchial asthma.

Keywords: Asthma, Children, Diagnosis, Grading, IgE level

INTRODUCTION

'Asthma' is a Greek word which means to exhale with open mouth, to pant. The Global Strategy for Asthma Management and Prevention Guidelines defines asthma as 'a chronic inflammatory disorder of the airways associated with increased airway hyper-responsiveness, recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night/early morning'. Numerous studies conducted in different countries have reported an increase in asthma prevalence of approximately 50% per decade.¹ Genetic and

environmental triggers play major role in development of asthma.

Allergic diseases including asthma are characterized by an increase of serum Immunoglobulin E (IgE) level.^{2,3} Allergic inflammation is mediated by IgE antibodies. IgE plays a central role in the initiation and propagation of the inflammatory cascade and thus the allergic response.⁴

Indeed, recent studies reveal that IgE, through its high affinity IgE receptors, is a critical regulator of Th2 responses.² The monoclonal antibody developed against

IgE used in the treatment of asthma indicates IgE plays a major role in the pathogenesis of asthma.

Based on the pathogenesis of asthma we had taken up this study to estimate serum IgE level and to obtain a relationship between serum IgE level and severity of asthma in children between 3-12 years of age and to fill the diagnostic gap in diagnosing and classifying the severity of asthma in children.

METHODS

A prospective interventional study was conducted over a period of one year from August 2016 to July 2017. Children between 3 to 12 years of age, who were newly diagnosed cases of bronchial asthma attending asthma clinic in a tertiary care government pediatric hospital, Telangana were enrolled in the study. The diagnosis and grading the severity of asthma was based on Global Initiative for Asthma (GINA) 2015 guidelines.⁵

Exclusion criteria

- Children with lower respiratory tract infections
- Immuno-compromised children
- Any other chronic medical or surgical disorders

Ethical committee approval was taken. Parents and children were given information regarding the study and informed consent was taken. All the children with asthma were divided into four groups namely mild intermittent asthma, mild persistent asthma, moderate persistent asthma and severe persistent asthma based on the severity of their symptoms. Complete blood count, AEC and serum IgE level were done in all cases. Total serum IgE level was estimated by fluorescent enzyme immunoassay and AEC was done by automated coulter counter technique. Levels of Ig E were compared with normal values for various age groups.⁶

Statistical analysis

Data was collected on a pre-structured proforma and entered into Excel sheet. Statistical package for the social sciences (SPSS) software, version 19 was used for statistical analysis. Descriptive statistics like mean, median, standard deviation and proportions were calculated for all the variables. Chi-square test was used to find the significance of study parameters on categorical scale between the two groups. p value < 0.05 was considered significant.

RESULTS

A total of 81 cases were included in the study and the mean age of the children was 6.8 years. 64% children with asthma were between 3years to 6years. Distribution of cases based on age is depicted in Chart 1. The male to female ratio was found to be almost 1.4:1 with slight male predominance. There was a preponderance of 47

cases (58%) from urban population when compared to rural population.

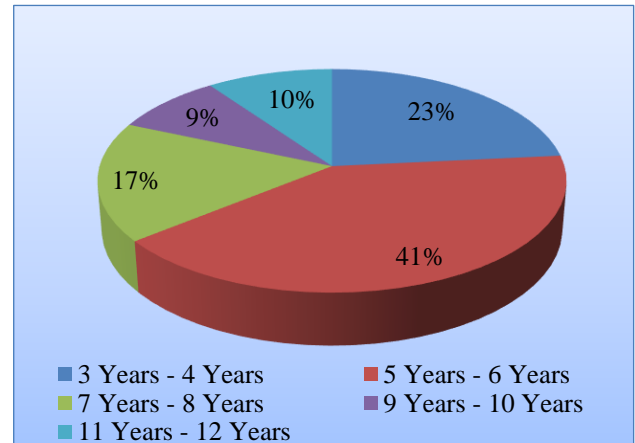


Figure 1: Distribution of cases according to age.

A positive history of allergy was found in 48 (59.2 %) cases, of which dust allergy alone accounted for 24 (50%) cases and food allergy in 8 (17%) cases. Out of 81 cases, 14 (17.28 %) cases were mild intermittent asthma, 23 (28.4 %) cases were mild persistent asthma, 36 (44.4 %) cases were moderate persistent asthma and 8 (9.9 %) cases were severe persistent asthma. Majority of children (59%) were from lower socio-economic class. Allergic rhinitis was found to be associated in 38% of cases and was the most common co-morbid condition. Sinusitis and eczema were found to be associated in 8.6% and 9.8% of cases respectively.

Table 1: Distribution of cases based on severity and serum IgE levels.

Severity of asthma	Mean Ig E levels (IU/ml)	Confidence level (95%)	p - value
Mild intermittent	247.92±89.50	51.67	<0.05
Mild persistent	742.95±306.78	132.66	<0.001
Moderate persistent	1142±196.88	79.52	<0.001
Severe persistent	1790±121.50	101.58	<0.001

The mean AEC level was 265.50±66.85 cells/mm³ for mild intermittent cases, 274.67±98.97 cells/mm³ for mild persistent cases, 331.50±73.64 cells/mm³ for moderate persistent cases and 451.25±210.67 cell/mm³ for severe persistent cases.

Mean AEC was increasing with severity of asthma and was statistically significant. The distribution of serum Ig E levels based on the severity of cases is illustrated in Table 1. The increasing level of serum Ig E was found to be statistically significant (p<0.05) with increasing grading of asthma when compared between the groups.

DISCUSSION

Asthma is a chronic disorder of airways, in recent decades prevalence of childhood asthma has increased worldwide. In the present study, male to female ratio was 1.4: 1, which was similar to the study done by Uyan et al in which asthma was found to be significantly higher in boys than in girls (1.4:1).⁷ In the present study, urban predominance was seen which was in accordance with the study by Srinivasa et al and Chaudhary et al.^{8,9}

The present study observed 45.67 % of the cases with a family history of asthma similarly Stephanie J et al observed greater associations between childhood asthma and family history of asthma.¹⁰ We found allergic rhinitis was common comorbid condition seen in asthmatic children as was observed by studies done by Bisaccioni et al and Sanja Dimitrijevic et al.^{11,12} In present study, 59% children belonged to low socioeconomic class, 31% children were from middle socio-economic class and 10% were from upper socioeconomic class. Many studies reported asthma to be more prevalent among low socioeconomic class children.^{13,14,15} In Chaudhary et al study the mean AEC was significantly higher in asthma cases (746.63±492.02 cells/mm³) as compared to healthy children (220.23±121.69 cells/mm³) as was observed in the present study.⁹

In bronchial asthma, IgE is thought to play an important role in the development of bronchial hyper-responsiveness.^{16,17} The present study also revealed increased mean serum IgE levels (range: 247-1747 IU/ml) and correlated well with severity of asthma. These findings were consistent with studies done by Ching et al, Chandran et al and Chaudhary et al.^{18,19,9} In Thirunavukkarasu Sandeep et al study mean IgE levels ranged from 151.95 IU/ml in normal subjects to 1045.32 IU/ml in severe asthmatics and they also observed that IgE levels were increased as the severity of asthma was increased.²⁰ Limitations of present study were small population and it is not a case control study as the serum IgE level was an invasive, costly and time-consuming test.

CONCLUSION

Mean serum IgE level was increased with increasing severity of asthma indicating asthma is an allergic disorder. Hence, serum IgE level can be considered as reliable laboratory investigation in diagnosing asthma and categorizing its severity. Parents can also be counselled to start the inhalers and for regular follow up as compliance is of utmost importance in managing these cases.

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