18062 - Serum IgE level with asthma severity in children

by Athar Somro

ABSTRACT

Objectives: To determine the correlation of serum IgE levels with asthma severity in children (2 to 12 years old) presenting to Pediatric Out Door Department, Liaquat National Hospital Karachi.

Study Design: Descriptive Cross-Sectional Study

Place and duration of Study: Department of Pediatrics Medicine, Liaquat National Hospital Karachi from June 2016 to December 2016

Methodology: A total of 106 children with symptoms of airflow obstruction characterized by recurrent cough, difficulty in breathing and wheeze were included in this study. All the study subjects were asked about clinical symptoms and on the basis of that severity of asthma were classified as intermittent, mild, moderate or severe persistant asthma. Blood samples for Serum IgE levels were taken.

Results: - The average age of the children was 6.38± 6.0 years. In this study, intermittent asthma was observed in 24(22.64%) cases. There were 30(28.6%) children with mild asthma, 40(37.74%) children with moderate asthma and severe asthma was found in 12(11.32%) children. The mean IgE concentration was lowest in children with intermittent asthma 277.92±45.87 IU/ml, higher in children with mild persistent asthma 487.47±58.47 IU/ml) and highest in children with moderate and severe persistent asthma 688.75±52.08 and 1078.83±64.10IU/ml. .

Conclusion: Our results support the hypothesis that severity of asthma is reflected by serum IgE levels in children. We found that the mean IgE concentration was highest in children with moderate persistent and severe persistent asthma hence the patients with raised serum IgE levels and their attendants should be counseled and advised to avoid/minimize allergen exposure for better asthma control.

Key Words: Asthma, IgE concentration, bronchoconstriction

Correlation of Serum IgE level with asthma severity in children (2 to 12 years old), presenting to a tertiary care hospital

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Introduction:

Atopy is the most important risk factor for asthma in children, in this condition allergen exposure causes excessive production of IgE antibodies.[1] IgE causes bronchoconstriction by releasing various inflammatory mediators.[2]

High serum IgE level is an indicator of allergen exposure in genetically predisposed individuals.[3] There is a strong relationship between total IgE and asthma prevalence.[4] It is also used to determine the severity and persistence of asthma in later adulthood[5, 6] Serum IgE level can

provide useful information regarding the severity of asthma and persistence of bronchial hyper responsiveness.

Pulmonary function test is the most accurate method of determining air flow obstruction[7], but it is difficult to perform in children. There is an association between Serum IgE levels and the degree of airflow obstruction,[1] hence the severity of asthma can be determined by it. There is no consensus on level of serum IgE in relation to asthma severity; different studies have reported varied levels of IgE. The usually accepted range is from 1.5-100 IU/ml.[9] A strong relationship found between total serum IgE and asthma severity.[10, 11, 12]

Our hypothesis is that the severity of asthma in children can be reflected by serum IgE levels. The study is intended to estimate the current magnitude of asthma severity and IgE level in our local population. The rationale behind it is that there is no consensus on mean IgE level and it varies from study to study.[9-11] The outcome of this study can be used for risk stratification and will help in counselling of patients and attendants. The patients with raised serum IgE levels can then be advised to avoid/minimize allergen exposure for better asthma control.

Objective:

To determine the correlation of serum IgE levels with asthma severity in children (2 to 12 years old) presenting to a tertiary care hospital.

Methodology:

This Cross sectional study was done at Department of Pediatric Medicine, Liaquat National Hospital Karachi from June 2016 to December 2016. Total 106 study subjects were included in the study with Non probability consecutive sampling technique. WHO software for sample size determination was used considering P=13.33%[12], d=6.5%, with 95% confidence level. Inclusion

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Criteria were age between 2 to 12 years of either Sex with symptoms of airflow obstruction characterized by recurrent cough, difficulty in breathing and wheeze.

Children having Known or suspected immunodeficiency, congenital heart disease, Neurologically impaired children (as they are at risk for recurrent aspiration), Lung diseases like Tuberculosis, bronchiectasis, cystic adenomatoid malformation of lung and cystic fibrosis were excluded from study.

Children fulfilling the inclusion criteria were included in the study after taking informed consent from the parents/care takers. All the study subjects were asked about clinical symptoms and on the basis of their responses, severity of asthma (as per operation definition) was classified as intermittent, mild, moderate or severe persistent asthma. Blood samples for Serum IgE levels was drawn by a trained pediatric nurse and sent to the laboratory of Liaquat National Hospital. Serum IgE levels were estimated by automated Chemiluminescence system (The Chiron Diagnostics ACS: 180). The results of Serum IgE were reported by the consultant microbiologist of experience more than 5 years. All data about patients' demographics, history, physical examination, severity of asthma, and Serum IgE level was recorded by principal investigator on a predesigned Performa.

Operational Definitions:

Asthma: Presence of any two or more of the following symptoms of airflow obstruction more than 4 times in the previous year characterized by: cough, shortness of breath/fast breathing or presence of wheeze

Severe persistent asthma: patient with continuous day time symptoms (as stated above) and frequent night symptoms (>3 times per week). [8]

Moderate persistent asthma: patient with daily day time symptoms and night symptoms >1 per week.

Mild persistent asthma: patient with day time symptoms >2 times per week and night symptoms >2 times per month.

Intermittent asthma: patient with day time symptoms ≤2 times per week and night time symptoms <2 times per month.

Data was entered and analyzed in SPSS version 19. Mean ± SD was calculated for quantitative variables i.e. Age, weight, and height, duration of disease and serum IgE level. Frequency and percentage was calculated for qualitative variables i.e. gender and severity of asthma. Stratification was done for gender, age, weight, height and duration of asthma to see the effect of these on severity of asthma and IgE levels, chi square test and one way ANOVA were applied respectively, at 95% CI and p value ≤ 0 .05 was considered as significant.

RESULTS

There were total 106 children in this study. Most of the children were below 10 years of age as presented in Table 1. The average age of the children was 6.38± 6.0 years similarly average weight, height and duration of asthma is also presented in table 2. Out of 106 patients, 59.43% were male and 40.57% were female Table 1. Asthma severity is presented in figure 1. The mean IgE concentration was lowest in children with intermittent asthma 277.92±45.87 IU/ml, higher in children with mild persistent asthma 487.47±58.47 IU/ml) and highest in children with moderate and severe persistent asthma 688.75±52.08 and 1078.83±64.10IU/ml. 95% confidence intervals were also given in table 2. Comparison of mean serum IgE levels among asthma severity with respect to age groups, gender, height, weight and duration of asthma is shown in table 3 to 7. Significant difference of mean serum IgE levels was observed among severity of asthma.

TABLE 1

AGE AND GENDER DISTRIBUTION OF THE PATIENTS

n= 106

Age	Number (Percentage)
2-5 Years	47 (44.34%)
6-10 Years	44 (41.51%)
>10 Years	15 (14.15%)
Gender	
Male	63 (59.43%)
Female	43 (40.57%)

TABLE 2

MEAN SERUM IGE LEVELS IN ASTHMA SEVERITY IN ASTHMATIC CHILDREN

IgE Level (IU/ml)		Intermittent Asthma	Mild Persistent Asthma	Moderate Persistent Asthma	Severe Persistent Asthma
Mean		277.92	487.47	688.75	1078.83
Std. Deviation		45.87	58.47	52.08	64.10
95% Confidence Interval for Mean	Lower Bound	258.55	465.63	672.09	1038.10
	Upper Bound	297.29	509.30	705.41	1119.56

TABLE 3

COMPARISON OF MEAN SERUM IGE LEVELS IN ASTHMA SEVERITY WITH

RESPECT TO AGE GROUPS

Age Groups (Years) and severity of asthma		n	IGE LEVELS		P-Values
			Mean	Std. Deviation	
2 to 5	Intermittent Asthma	11	280.91	33	0.0005

	Mild Persistent Asthma	22	481.05	50.15	
	Moderate Persistent Asthma	11	668.27	39.64	
	Severe Persistent Asthma	3	1094	102.67	
6 to 10	Intermittent Asthma	13	275.38	55.77	0.0005
	Mild Persistent Asthma	7	516.57	77.01	
	Moderate Persistent Asthma	22	681.59	51.09	
	Severe Persistent Asthma	2	1015.5	14.84	
>10	Mild Persistent Asthma	1	425	.-	0.0005
	Moderate Persistent Asthma	7	743.43	37.85	
	Severe Persistent Asthma	7	1090.43	48.72	

One Way ANOVA applied for each age stratification

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TABLE 4

COMPARISON OF MEAN SERUM IGE LEVELS IN ASTHMA SEVERITY WITH

RESPECT TO GENDER

Gender with severity of asthma	n	IGE LEVELS	P-Value

			Mean	Std. Deviation	
Male	Intermittent Asthma	13	273.85	48.741	0.0005
	Mild Persistent Asthma	18	490.17	55.730	
	Moderate Persistent Asthma	26	688.46	51.603	
	Severe Persistent Asthma	6	1082.00	70.529	
Female	Intermittent Asthma	11	282.73	44.066	0.0005
	Mild Persistent Asthma	12	483.42	64.679	
	Moderate Persistent Asthma	14	689.29	54.937	
	Severe Persistent Asthma	6	1075.67	63.579	

TABLE 5

COMPARISON OF MEAN SERUM IGE LEVELS IN ASTHMA SEVERITY WITH

RESPECT TO WEIGHT

Weight with severity of asthma		n	IgE Level (IU/ml)		P-Value
			Mean	Std. Deviation	
<= 16 kg	Intermittent Asthma	14	284.29	35.020	0.0005
	Mild Persistent Asthma	21	490.62	57.630	
	Moderate Persistent Asthma	15	661.53	37.960	
	Severe Persistent Asthma	3	1094.00	102.679	
>16 kg	Intermittent Asthma	10	269.00	58.775	0.0005
	Mild Persistent Asthma	9	480.11	63.268	
	Moderate Persistent Asthma	25	705.08	53.175	
	Severe Persistent Asthma	9	1073.78	53.849	

TABLE 6

COMPARISON OF MEAN SERUM IGE LEVELS IN ASTHMA SEVERITY WITH

RESPECT TO HEIGHT

Height with severity of asthma		n	IgE Level (IU/ml)		P-Value
			Mean	Std. Deviation	
<= 116 cm	Intermittent Asthma	13	284.62	36.427	0.0005
	Mild Persistent Asthma	24	489.13	55.251	
	Moderate Persistent Asthma	12	667.42	37.917	
	Severe Persistent Asthma	3	1094.00	102.679	
>116 cm	Intermittent Asthma	11	270.00	55.857	0.0005

Mild Persistent Asthma	6	480.83	75.634
Moderate Persistent Asthma	28	697.89	55.175
Severe Persistent Asthma	9	1073.78	53.849

TABLE 7

COMPARISON OF MEAN SERUM IGE LEVELS IN ASTHMA SEVERITY WITH

RESPECT TO DURATION OF ASTHMA

		IgE Level (IU/ml)		P-Value
Duration and severity of asthma	n	Mean	Std. Deviation	
<= 24 months Intermittent Asthma	8	282.50	36.93	0.0005

	Mild Persistent Asthma	16	498.19	57.05	
	Moderate Persistent Asthma	19	671.89	46.60	
	Severe Persistent Asthma	6	1076	73.72	
>24 months	Intermittent Asthma	16	275.63	50.72	
	Mild Persistent Asthma	14	475.21	59.73	
	Moderate Persistent Asthma	21	704	53.12	0.0005
	Severe Persistent Asthma	6	1081.67	59.88	

FIGURE 1

FREQUENCY OF SEVERITY OF ASTHMA IN CHILDREN

n=106
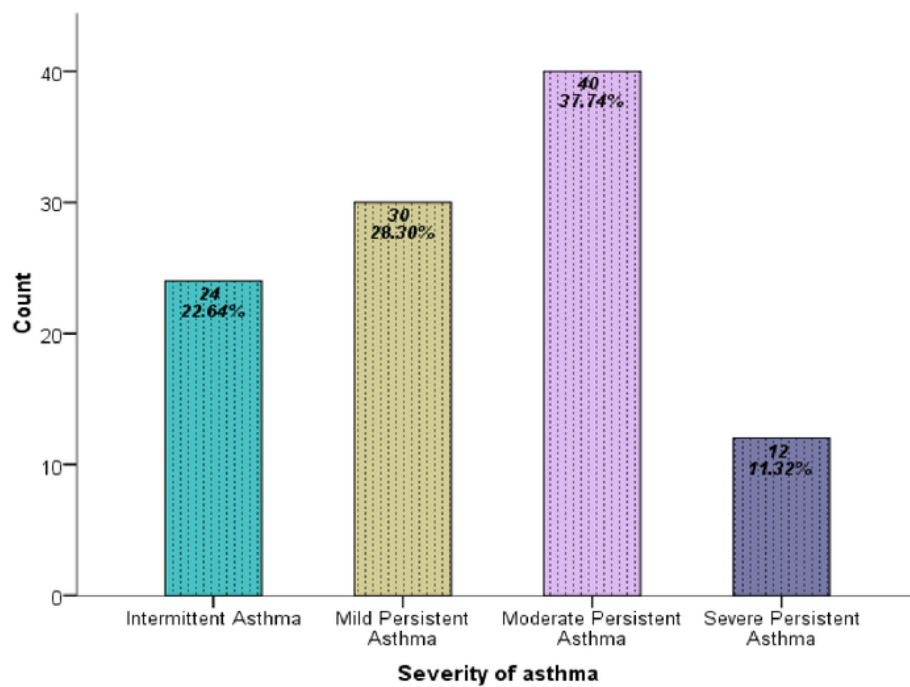
Severity of asthma

DISCUSSION:

Acute exacerbation of asthma is precipitated by environmental factors, like inhalant allergens.[13] IgE is responsible for inflammation of airways and various allergic reactions. Severity of asthma may be modulated by IgE. Ig-E levels are associated with asthma. The combination of reported respiratory symptoms and nonspecific bronchial hyper responsiveness has been shown to correctly identify patients with severe asthma [14]. Serum IgE levels is also related to airway hyperresponsiveness in asymptomatic children [20]. Higher IgE levels may be correlated with lower lung function and more severe asthma attacks [24].

To our knowledge no such kind of study did previously locally or internationally, that correlate serum IgE level with asthma severity in children. In our study the mean IgE concentration was lowest in children with intermittent asthma higher in children with mild persistent asthma and highest in children with moderate and severe persistent asthma, while in an unsimilar international study there was no correlation between serum IgE level and mild to moderate and severe asthma [25], this may be due to different race and allergens in different countries. Another similar international study showed mean values of FEV1, FVC, FEV1/FVC% were significantly lower in high Ig E level group as compared to low Ig E group [26].

In a unsimilar local study there was no significant association of serum total IgE levels with allergy severity [15], these results are different from our study because in this study they checked overall allergic symptoms, not the severity of asthma as related to Serum IgE level. Other local study also revealed positive correlation between serum IgE level and asthma but they did not compared asthma severity [16, 18]. A similar local study showed significant high level of Serum IgE level in poorly controlled asthma children [17] but asthma severity categorization was lacking in

their study. Other similar international study showed correlation between higher asthma severity and higher serum concentration of total IgE [22].

In our study there was no association of Mean Serum IgE level with age, gender, weight, height and duration of asthma. In a similar international study there was no association of age with Serum IgE level [19]. In an unsimilar international study mean Serum IgE levels more in adolescent children [21]. While another unsimilar study showed higher mean Serum IgE levels in males as compared to females [23].

Our study had several limitations. It was a tertiary-care based study, so the most of the children were referred from primary care physicians; there may be bias regarding asthma severity. Socioeconomic characteristics may be different than the general asthma population. Furthermore we did not assess the presence of asthma co-morbidities such as allergic rhinitis that may also affect the severity of asthma.

CONCLUSION:

Our results support the hypothesis that serum IgE levels reflect the severity of asthma in children. We found that the mean IgE concentration was highest in children with moderate and severe persistent asthma hence the patients with raised serum IgE levels and their attendants should be counseled and advised to avoid/minimize allergen exposure for better asthma control.

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