

“To Study the Correlation of Serum Ige and Absolute Eosinophil Count Levels with The Severity Of Childhood Asthma”

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I. Introduction

Among the allergic diseases, asthma is one of the most common chronic pulmonary disorders. For asthma there is no cure but its symptoms can be controlled with effective treatment and management.

Asthma is a disease characterized by recurrent attacks of breathlessness and wheezing that vary in severity and frequency from person to person. It is a respiratory condition marked by attacks of spasm in the bronchi of the lungs, causing difficulty in breathing. It is usually connected to allergic reaction or other forms of hypersensitivity. This condition is due to inflammation of the air passages in the lungs and affects the sensitivity of the nerve endings in the airways so they become easily irritated. In an attack, the lining of the passages swell causing the airways to narrow and reducing the flow of air in and out of the lungs (Godfrey, 1985).

Allergy involves the production of a special class of antibody called immunoglobulin E. (IgE) which has only been found in mammals. These antibodies are bound to specific cells called mast cells, found in the skin, lungs and in many other tissues.

In biology IgE is a class of antibody that plays an important role in allergy and is especially associated with type I hypersensitivity. The serum level of IgE is 0.0003 mg/ml the lowest of all other types of antibodies.

METHODS-

Study Design: - Cross sectional Observational clinical study

Duration : - November 2015 to October 2016 (1 year)

Place : - Geetanjali medical college and hospital, Udaipur

II. Source Of Data

Diagnosis of bronchial asthma was based on definition given in GINA guidelines.

Asthmatic children aged between 6 and 18 years, registered in asthma clinics attached to Geetanjali medical college, a minimum number of 116 children were included in the study period from November 2015 to October 2016. Severity of asthma was done according to GINA guidelines as follows.

Severity of asthma according toGINA guidelines as follow:

	CLASSIFICATION OF ASTHMA SEVERITY			
	Intermittent	Persistent		
		Mild	Moderate	Severe
COMPONENTS OF SEVERITY				
Daytime symptoms	≤2 days/weeks	>2 days/weeks but not daily	Daily	Throughout the day
Nighttime awakenings:				
Age ≥6 years	≤2/month	3-4/month	>1/weeks but not nightly	Often 7/weeks
Short-acting β ₂ -agonist use for symptoms (not for prevention of exercise-induced bronchospasm)	≤2 days/weeks	>2 days/weeks but not daily and not more than 1on any day	Daily	Several times per day
Interference with normal activity	None	Minor limitation	Some limitation	Extreme limitation
Lung function:				
FEV ₁ % predicted, age ≥6 yr	Normal between exacerbations >80% predicted	≥80% predicted	60-80% predicted	<60% predicted

	CLASSIFICATION OF ASTHMA SEVERITY			
	Intermittent	Persistent		
		Mild	Moderate	Severe
FEV₁/FVC ratio⁽¹⁾:				
Age 6- 11 yr	>85%	>80%	75-80%	<75%
Age ≥12 yr	Normal	Normal	Reduced 5%	Reduced >5%

Diagnosis of asthma will be done according to GINA guideline:

documented airflow limitation	FEV ₁ /FVC is reduced (< 0.90)
Positive bronchodilator(BD) reversibility test	Children :increase in FEV ₁ of > 12% predicted
Excessive variability in twice daily PEF over 2 weeks	daily diurnal PEF variability > 13%

III. Methods And Collection Of Data

Sample size:-

Sample size 116

$$N = \frac{(Z_{1-\alpha/2})^2 P(1-P)}{d^2}$$

(Z)- Z Statistic for 95% confidence limit (1.96)

P=Prevalence base on review of literature (8.2%)

d= absolute error (5%)

N=115.6 ~ 116

IV. Inclusion Criteria

Asthmatic children between 6 and 18 years fulfilling GINA guidelines

V. Exclusion Criteria

Presence of Heart disease

Presence of Malabsorption syndrome

Congenital lung and thorax malformation.

VI. Intervention/Assessment To Be Done Methodology

All consecutive patients attending OPD /INDOR were diagnosed fulfilling the GINA guidelines were enrolled in study.

Procedure:

A hospital based cross sectional prospective study was conducted at Geetanjali Medical College hospital. Diagnosis of asthma was confirmed by GINA guidelines all confirmed 116 cases were taken for further study. After giving brief introduction about the study to parents/children and consent was taken. Patient’s name, age, sex, and duration of symptoms were noted. A detailed history was taken of each case regarding the duration of asthma symptoms, frequency, and severity of exacerbations. Spirometer (HELIUS 401 peak flow meter) was used for procedure and diagnosis were done as per above mentioned diagnostic criteria by resident doctor. Patient was categorized according to Severity of asthma by spirometer values in accordance with the GINA guideline. After categorize following sample were sent.

1. Serum IgE:

Venous clotted blood of 2ml was used for measuring serum IgE levels, using commercially available Diagnostics ELISA kit (LILAC). It is a solid phase enzyme linked immunosorbent assay based on the sandwich technique.

2. Absolute eosinophil count:

Venous EDTA blood was subjected to automated analyzer (HORIBA) for Absolute eosinophil count and confirmed by peripheral smear (made by technician and examined by pathologist).

VII. Result & Discussion

All the children in the present study were between 6-18 years of age. Among the asthmatic children registered, maximum cases with severe variety were of the age of 10-11 years followed by 6-7 years and 8-9 and 12-13 years. Similar types of results were obtained by several researchers. Sonnenschein et al. (2012) conducted a meta-analysis of 147,252 children of 31 birth cohorts from Europe and reported younger gestational age at birth and higher infant weight gain to be associated with higher risk of preschool (1-4 years) wheezing and school-age (5-10 years) asthma. In addition, Cline et al. (1989) reported the higher total serum IgE levels associated with asthma in the age group of 8–14 years.

Table 1: Prevalence of asthma with the age of children

Age (years)	Frequency	Percent
6-7	24	20.68
8-9	23	19.82
10-11	29	25.00
12-13	23	19.82
14-15	12	10.34
16-17	5	4.31
Total	116	100

As shown in table 1 most common age group experience the asthmatics attacks are (10-11) years followed by (6-7) years then (8-9 and 12-13) years.

Present study suggested that frequency of cases more in male children than female one i.e. 69.83% and 30.17% respectively. In this study, males were nearly twice the number of females, indicating that the male gender is one of the important risk factors for childhood asthma. This result is similar to those of the study done by Ahmed et al (1999) in Wad Medani Paediatrics hospital in 1999. Gupta D et al,(2001) in Chandigarh, studied the prevalence of asthma and its association with environmental factors, where males had more prevalence than females.

Table 2: Sex wise incidences

Sex	Frequency	Percent
Male	81	69.83
Female	35	30.17
Total	116	100

In our study, dust is triggering factor in maximum cases (40%), followed by cold air (30%), URTI (22%) and Smoking (8%). This result was almost similar to results given by Ahmed et al. (1999). Respiratory infections before the age of 1 year were found to be positively associated with the risk of asthma after the age of 5 years and the association was stronger among those who were born with a gestation age of <28 weeks (Montgomery et al., 2013).

Table 3: Trigger factors of Asthma

Factors	Frequency	Percent
Dust	46	40
cold air	35	30
URTI	25	22
Smoking	10	8.00
Total	116	100

URTI: Upper respiratory tract infection

Table no. 3 showed that, maximum prevalence of asthma attack observed via trigger factor dust and cold air. While 25 cases of asthma triggered by URTI and rest of 10 triggered by smoking.

In our most common symptoms associated with asthma were shortness of breath, cough, wheeze, fever and in some cases cyanosis. Results suggested that wheeze and cough were most common symptoms associated

with asthma i.e. 26% and 36% patients respectively. Associated symptoms like shortness of breath, fever, and cyanosis were observed in 21%, 16% and 2% patients respectively. Kumar GS et al. (2014) studied the associated symptoms of asthma in school going children of urban Puducherry, India. He found that most of the children belonged to the 12-13 years age group (58.2%) and were males (63.5%). Prevalence of ever bronchial asthma was found to be 5.3% and 4.2% had a current episode of asthma during the last 1-year period. About 72.7% of current asthmatics had cold or rhinitis. Hyrkas et al (2014) studied that the main associated symptoms were cough and cold (70% cases). According to European respiratory society (2008) and British guideline on the management of asthma (2016), the main associated symptoms of asthma are cough, SOB, wheeze and fever.

Table 4: Associated symptoms & sign

Symptoms & sign	Frequency	Percent
Cough	42	36.00
Sob	24	21.00
Wheeze	30	26.00
Fever	18	16.00
Cyanosis	2	2.00

Sob: Shortness of breath;

As shown in table 4, wheeze and cough were observed in maximum case of asthma i.e. in 30 and 42 patients respectively, which is followed by Sob, fever, and cyanosis i.e. 24, 18, 2 respectively. Cyanosis was observed in 2 of the patient experienced severe attack of asthma.

In our study both IgE and AEC levels increased with the increase in severity of asthma ($P < 0.001$). The IgE levels ranged 357-712 IU/ml and AEC ranged 172-917 in patients with severe asthma, which was higher as compared to cases with intermittent, mild and moderate asthma. Rise in serum IgE level was statistically more significant ($P < 0.001$).

Similar study was done by Kartasamita et al. 1994. They observed total serum IgE and eosinophil count in children suffering from asthma. Maximum patients with severe asthma have IgE range of 259-589 IU/ml and AEC level of 98-672.

Table 5: Correlation of serum IgE and Absolute Eosinophil count levels with the severity

Severity	IgE level (IU/ml)	Mean value (IU/ml) /STD	P-value	Absolute Eosinophil counts	Mean Absolute Eosinophilic counts/STD	Chi-square value	p-value
Intermittent	58-295	56.71/37.30	<0.001	24-142	235.86/154.94	401.90	P = <0.01
Mild	81-445	90.21/28.57	<0.001	52-140	257.21/157.39	702.71	P = <0.01
Moderate	101-655	178.88/66.01	<0.001	52-140	272.82/169.78	2394.87	P = <0.01
Severe	357-712	259.86/341.09	<0.001	172-917	315.57/194.99	14156.46	P = <0.01

As shown in table 14, Chi-square test had been used to find the significance of study parameters on categorical scale between the two groups. Both IgE and AEC significantly ($p < 0.001$) increase with the severity of asthma.

VIII. Conclusion

1. The present study revealed that most of the asthmatic children belonged to 10-11 years of age.
2. In this study, males were nearly twice the number of females, indicating that the male gender is one of the important risk factors for childhood asthma.
3. Asthma is classified as intermittent, mild, moderate & severe according to the severity of symptoms. Maximum children were observed with moderate persistent asthma (38.80%), followed by severe, mild and intermittent asthma i.e. 35.34%, 19.82% and 6.04% cases respectively.
4. The commonest triggering factors which stimulated the asthma in the present study were dust, cold air, upper respiratory tract infection and smoking. In maximum cases (40%), dust was the triggering factor followed by cold air (30%), URTI (22%) and Smoking (8%).

5. In this study, 31.04% cases had positive family history of asthma.
6. Atopic history suggested that 22% patients had history of allergy in both the parents and 9% had history of allergy in single parent. Thus asthma is more prevalent in children with both parents having allergic disease rather than single one.
7. There was direct relation found between occurrences of rhinitis with severity of asthma. 11% cases among rhinitic children had severe persistent asthma
8. In the present study 46% cases were observed to be without medication history, whereas in rest of the cases, medication history was present.
9. Correlation of severity of asthma with medication history depends on the present medication and absence of any previous medication history. Intermittent (5%), mild (16%) and moderate (29%) persistent asthma was observed in cases with medication history, while severe cases of asthma were observed without any medication history (29%).
10. Most common symptoms associated with asthma were shortness of breath, cough, wheeze, fever and in some cases cyanosis. Results suggested that wheeze and cough were most common symptoms associated with asthma i.e. 26% and 36% patients respectively. Associated symptoms like shortness of breath, fever, and cyanosis were observed in 21%, 16% and 2% patients respectively.
11. The present study suggests that there was significant rise in serum IgE level with increase in severity of asthma ($p < 0.001$).
12. Mean Absolute eosinophil count (AEC) also increased with the severity of asthma ($p < 0.01$).
13. Maximum patients with family history of allergy had IgE titre in the range of 296-445 IU/ml, this was high in comparison to those who had no family history (91-324 IU/ml)
14. Regarding AEC count, maximum patients with family history had raised AEC (52-140). Patients with no family history of allergy had low AEC (24-101).
15. In our study both IgE and AEC levels increased with the increase in severity of asthma, but increase in serum IgE was statistically more significant ($P < 0.001$).

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