Relationship between Ig-E levels and Lung Function Tests in Children with Asthma

Jesmin Ara Begum[1], Md Imnul Islam[2], Abdul Matin[3] , Saifun Nahar[4].

Abstract

Asthma is one of the most common chronic disorder in childhood. High levels of Ig E are associated with asthma. The present study was carried out to observe the relation of serum IgE level with lung functions parameters in asthma children and apparently healthy normal children. This cross sectional study was carried out in the out patient department of paediatrics, Dhaka Medical College, Dhaka between January 2010 and June 2010. Total sixty children age ranged from six to fifteen years of both sexes were included in this study. Thirty children suffering from asthma and thirty apparently healthy children with no systemic disorder were taken as study populations. Serum Ig-E levels were measured in all subjects using a standard Immulite assay by Elisa method. Subjects were classified as having high IgE if their total IgE level was greater than or equal to 100 IU /ml .Subjects were classified as having low IgE if their total IgE level was less than 100 IU /ml. Spirometry was conducted on all patients by using Spirolab a new generation spirometer according to American Thoracic Society standards. Data were analyzed by unpaired t test. The mean measured values of FEV1, FVC, FEV1/FVC% were significantly lower in high Ig E (>100 IU/ml)level group in compare to low Ig E(<100 IU/ml) group. These results were similarly reported by other workers of different countries. Higher IgE is related with lower lung function and also there were more chance in symptoms based asthma in our study populations.

Key words : Asthma, IgE level, Children

Introduction

Asthma is one of the most common chronic disorder in childhood. The prevalence of childhood asthma is increasing in both developed and developing countries[1]. Asthma is characterized by reversible airway obstruction, bronchial hyperresponsiveness (BHR) and atopy[2]. The relationship between atopy and asthma is not straightforward. Historically atopy has been used as a poorly defined term to refer to allergic conditions such as hay fever, asthma and eczema which cluster in families. Atopy was defined as a positive response to SPT (at least one wheal 3 mm greater than saline response to a panel of seven aeroallergens) or a total serum IgE >100 I U / ml[3]. Atopy is a nearly universal finding in children with asthma. Exposure to environmental factors, particularly inhalant allergens is commonly reported as a precipitant of acute exacerbations of asthma[4]. IgE is an antibody subclass implicated in airway inflammation and allergic reactions. Higher levels of Ig-E are associated with asthma in both adults and children. IgE also may play a role in modulating the severity of asthma, because previous studies have found associations between high Ig-E levels and greater asthma severity, airway hyperre sponsi veness, and lower baseline lung function[5]. No study so far done in our country in this topic. So the present study was carried out to observe the relation of serum IgE level with lung functions parameters in asthma children and apparently healthy normal children.

Methods

The present cross sectional study was carried out in the out patient department of paediatrics, Dhaka Medical College, Dhaka between January 2010 and June 2010. The study participants were sixty children of six years to fifteen years of age of both sexes. Thirty children suffering from asthma and thirty apparently healthy children with no systemic disorder were taken as study populations. Those patients who had experienced asthma symptoms (wheezing, coughing, and /or shortness of breath) in the previous two years were enrolled in your study.

Serum Ig-E levels were measured in all subjects using a standard Immulite assay by Eliasa method. Subjects were classified as having high IgE if their total IgE level was greater than or equal to 100 IU /ml. Subjects were classified as having low IgE if their total IgE level was less than 100 IU /ml[5].

After selection all the subjects were briefed about the objectives and benefits of the study to ensure

1. *Dr. Jesmin Ara Begum, Associate Professor, Department of Physiology, Ibrahim Medical College.*
2. *Dr. Md Imnul Islam, Assistant Professor, Department of Paediatrics, Dhaka Medical College*
3. *Dr. Abdul Matin, Assistant Professor, Department of Paediatrics, Shaheed Shurawardy Medical ,College.*
4. *Dr. Saifun Nahar, Associate Professor & Head, Department of Anatomy, Holy Family Red Crescent Medical College.*

their voluntary participation. Informed written consent was taken from each subject prior to the study. After selection all the subjects were asked to attend the department of physiology, Ibrahim Medical College, Dhaka for lung function test. All relevant information was recorded in a pre-structured questionnaire.

Spirometry was conducted on all patients by using Spirolab, a new generation spirometer according to American Thoracic Society standards. Subjects with asthma were instructed to withhold their bronchodilator medications for at least eight hours before lung function tests.

Statistical analysis was done using SPSS windows package version 12. All the data were expressed as Mean±SD (Standard deviaion) The comparisons between two groups were done by unpaired t test and Chi square test as applicable.

Results

Table -I shows age, weight and height of the study group. Mean ± SD of age, height and weight in asthma children and in normal children were 7.3 ± 1.77 years, 120.6 ± 12.08 cm, 25.7 ±8.82 kg in case and 8.92 ± 1.93years, 127.27 ±8.94 cm , 30.4 ± 7.85 kg respectively .

Table I

Characteristics of the study children

Parameters	Healthy children (Mean±SD) (n=30)	Asthmatic children (Mean±SD) (n=30)
Age (years)	8.92±1.93	7.30±1.77
Weight (kg)	30.40±7.85	25.70±8.82
Height (cm)	127.27±8.94	120.60±12.08

Table -II shows Ig E level in the study children. High Ig E (>100 IU /ml) were found in forty children's among them twenty nine (29) children in asthma cases and eleven (11) in normal populations. Mean ± SD of Ig E level in asthma cases and in normal children were 111.57 ± 94.39 and 436.73 ± 465.71 respectively. As because the mean value was higher in case group compare to control group the difference between them was statistically highly significant.

Table II

IgE level in the study children

IgE (IU/ml)	Healthy children (n=30) No. (%)	Asthmatic children (n=30) No.(%)	P value[a]
?100	11 (36.7)	29 (96.7)	0.0001***
<100	19 (63.3)	1 (3.3)	
			P value[b]
Mean±SD	111.57±94.39	436.73±465.71	0.0001***
Range	32.00 420.00	38.00 2000.00	

[a]Chi square test

[b]Unpaired Student's 't' test

*** = Significant at P<0.001

Table-III shows relation of High and low Ig E level on lung function test in study population. The mean measured values of FEV1, FVC, FEV_1/FVC% were significantly lower in high Ig E (?100 IU/ml)level group in compare to low Ig E(<100 IU/ml) group.

Table III

Relations of IgE level on lung function test outcome in children

Test/ IgE	n	Measured (Mean±SD)	Predicted (Mean±SD)	Predicted % (Mean)
FEV_1(L/sec)				
Sy100 IU/ml	40	1.07±0.47	1.44±0.47	72.24±13.04
<100 IU/ml	20	1.40±0.39	1.65±0.47	84.86±6.72
P value		0.008**		
FVC (L/sec)				
Sy100 IU/ml	40	1.21±0.53	1.63±0.56	72.92±12.65
<100 IU/ml	20	1.59±0.46	1.86±0.56	85.97±5.81
P value		0.008**		
FEV_1/FVC (%)				
Sy100 IU/ml	40	85.78±5.30	88.85±3.57	96.72±7.35
<100 IU/ml	20	88.56±3.66	89.03±2.44	99.49±3.54
P value		0.039*		

Unpaired Student's 't' test

* = Significant at P<0.05

** = Significant at P<0.01

Discussion

The results of our analysis demonstrate a relation between high Ig E levels and lung function test in children with asthma and apparently healthy normal children. Although asthma has already been shown to be associated with serum Ig E levels[6], our results expand on previous finding by demonstrating that higher Ig E levels were correlated with lower lung function and more severe asthma. In children, there are conflicting results regarding the relationships of asthma severity with serum total Ig. Even when relationships have been established, the statistical significance achieved has often marginal ($p>0.01$)[7,8]. The relationship between total serum Ig E and risk of asthma is well established in children and adults in some sudies[9].

In the present study, high Ig E were found in forty children's among them twenty nine (29) children in cases and eleven (11) in control populations. These finding showed that children with asthma mostly having (96.7%) high Ig E levels. On the other hand children with apparently healthy showed 36.7% high Ig E levels. Burrows et al demonstrated an association between high total serum Ig E and asthma prevalence in their study[10].

The data of of our study showed different parameters of lung function test (FEV1, FVC, FEV1/FVC%) in relation to Ig E levels. Participant with high Ig E had lower baseline values of FEV1, FVC, FEV1/ FVC%, percent of predicted than did those with low Ig E.

In addition, a greater proportion of study subjects with high Ig E had FEV1 < 80% of predicted than did those with low Ig E ($p< 0.008$). These results were similarly reported by other workers of different countries[11,12,13].

Although asthma has already been shown to be associated with serum Ig E levels, our results expand on previous findings by demonstrating that higher Ig E levels were correlated wth lower lung function and more severe asthma.

Conclusion

Higher IgE is related with lower lung function and also there were more chance in symptoms based asthma in our study populations. This suggests that, among subjects with asthma with higher IgE levels the progression to more severe asthma may begin early in life. Although these results will need to be confirmed through additional investigation, we conclude that aggressive treatment of atopic paients with asthma may help prevent further decline in lung function over the life time of a subject with asthma.

Reference

1 ME Penny, S Murad, S S Madrid, T S Herrera, A Pineiro et al. Respiratory symptoms, asthma, exercise test spirometry, and atopy in schhool children from a lima shanty town.Thorax 2001; 56:607-612.

2. TF Leun , GW K Wong, F W S Ko, C W K Lam, T F Fok. Clinical and atopic parameters and airway inflammaory markers in childhood asthma: a factor analysis.Thorax 2005;60: 822-826.

3. WD Carroll, W Lenny, F Child, R C Strange, P W Jones et al. Asthma severity and atopy : how clear is he relationship? Arch Dis Child 2006; 91:405-409.

4. Leonard B Bacharier, Chistopher Dawson, Gordon R Bloomberg, Bruce Bender, Laura Wilson et al. Hospitalization for asthma: Atopic, Pulmonary Function, and psychological correlates among participants in the childhood asthma management programme. Paediatrics 2003;112(2):e85-92.

5. Mariam Naqvi, Shweta Choudhry, Hui- Ju Tasi, Shannon Thyne, Daniel Navarro et al. Association between Ig -E levels and asthma severity among African American, Mexican. and Puerto Rican patients with asthma. J Allergy Clin Immunol 2007; 120:137-43.

6. Sears M , Burrows B , Flannery E , Herbison G ,Hewitt C, Holdaway M .Relation between airway respons iveness and serum IgE in children with asthma and in apparently normal children. N Engl J Med 1991 ; 325 : 1067 -71.

7. Siroux V , Oryszczyn M -P , Paty E , et al . Relatio nships of allergic sensitization, total immun oglobulin E and blood eosinophils to asthma severity in children of the EGGEA study Clin Exp Allergy 2003; 33:746 -51.

8. Wever -Hess J, Kouwenberg JM, Duiverman EJ et al .Risk factors for exacerbations and hospital admissions in asthma of early childhood. Pediatr Pulmonol 2000; 29: 250 -56 .

9. Ponsonby AL , Gatenby P , Glasgow N , et al . Which clinical subgroups within the spectrum of child asthma are attributable to atopy? Chest 2002; 121 :135 -42

10. Burrows B , Martinez F , Halonen M , Barbee R , Cline M , Association of asthma with serum IgE leavels and skin -test reactivity to allergens . N Engl J Med 1989; 320 : 271-7.

11. Borish L C hipps B , Deniz Y , Gujrathi S , Z heng B , Dolan CM . Total serum IgE levels in a large cohort of patients with severe or difficult to - treat asthma. Ann Allergy Asthma Immunol 2005; 95 : 247 -53 .

12. Siroux V , Oryszczyn M-P , Paty E , Kauffmann F , Pison C , Vervolet D, Pin I et al . Relationships of allergic sensitization, total immunoglobulin E and blood eosinophils to asthma sevefity in children of the EGEA sudy . Clin Exp Allergy 2003 Jun ; 33 (6) : 746-51 .

13 M. R. Sears, B .Burrows, G. P. Herbison , E. M. Flannery M . D . Holdaway . Atopy in childhood. III .Relationship with pulmonary function and airway responsiveness .Clinical & Experimental Allergy 2006 ; 23 (11) : 957-963.