Correlation between Total Serum Immunoglobulin E (IgE) and Absolute Eosinophil Count (AEC) in Allergic Diseases In Children

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Abstract :

Allergy, is a clinical expression of soluble factors like IgE, histamine or eosinophils found in serum or plasma of such patients. The products that are responsible for allergy are called as Allergens. Allergens normally induce IgE production which leads to type 1 hypersensitivity response on subsequent exposure to the same allergen. The target organs are mostly nose, lung, skin and gastrointestinal tract. Atopy is also considered as a triad of Atopic dermatitis, allergic rhinitis and bronchial asthma. Raised serum IgE and AEC are proven indicators of allergic phenomenon. Various studies showed relationship between serum Immunoglobulin E level and total eosinophil count in population suffering from allergic diseases. Serum total Immunoglobulin E, total eosinophil count and specific IgE are all helpful for the diagnosis and treatment of allergic diseases. **Objectives:** 1.To Evaluate Serum total IgE level in children with allergic diseases. 2. To Evaluate Absolute Eosinophil Count (AEC) in children with allergic diseases. 3. To Correlate Serum total Immunoglobulin E Level and Absolute Eosinophil Count (AEC) with allergic diseases. **Methodology:** Cross sectional study with 100 children in the age group 2-12 years with nasopharyngeal allergies (like bronchial asthma and atopic rhinitis) and skin allergies (like atopic dermatitis, urticaria) ,eye allergies were enrolled and serum IgE levels and AEC levels was done. **Results:** In present study Absolute eosinophil count was raised in 58% of cases Serum IgE was raised in 54% of cases. In present study, of 58% cases with raised Absolute eosinophil count 81% (47 cases) showed raised serum IgE levels. **Conclusion:** Absolute eosinophil count and serum Total IgE has been considered as a significant marker of allergic state and can be used as a marker of allergic response in atopic individuals. Raised serum IgE and AEC are more in nasobronchial allergy as compare to other systemic allergies. The elevated level of serum total IgE and Absolute Eosinophil Count both shows Significant Correlation thus can be considered as a dependable laboratory investigation in diagnosing and categorizing allergic diseases.

Keywords: IgE, Absolute eosinophil count, hypersensitivity.

Introduction:

Allergy is an altered state of reactivity to common environmental antigens.[1] "The term allergy is derived from Greek word "allos" means others and "ergon" means reaction to describe hypersensitivity reaction.[2] Atopy is also considered as a triad of Atopic dermatitis, allergic rhinitis and bronchial asthma. The term 'ATOPIC MARCH' is in use to describe the common pattern in which patient develops Atopic dermatitis early in life, asthma in youth, and rhinitis in adulthood.[3] Allergic diseases such as rhinitis, bronchial asthma and atopic dermatitis are common illnesses and are more common in pediatric populations. About 20-30% of Indian population suffers from at least one allergic disease.[4] Allergic disease can develop at any age as hereditary plays a key role in deciding who will develop it. Most of the allergic diseases show strong familial predisposition and manifest as hyper responsiveness to an allergen. The risk of a child developing an allergic disorder if one parent has the disorder is 50% and the risk increases to 66% if both parents have the disorder.[1] Furthermore maternal family history of allergic diseases has a greater effect than paternal history. The incidence of these allergies has been increasing worldwide over the past few years.

Allergic diseases are characterized by increase in Serum IgE levels and this process is called as Atopy (type 1 hypersensitivity reaction). Amongst all the types of immunoglobulins serum levels of IgE are the lowest, roughly 0.0003 mg/ml.[5] IgE concentration at birth is about 0.22 IU/ml.[6] Thus as IgE is a mediator of allergic response and quantitative measurements of serum total IgE with other clinical indicators is very useful in clinical diagnosis of atopic diseases. However testing for total IgE does not identify specific allergies. IgE levels also increases in non-allergic conditions like immunodeficiency disorder, malignancies.[7]

Raised Peripheral Absolute Eosinophil Counts (AEC) suggests an allergic etiology of disease but is also increased in various parasitic infections, skin disorders, immunologic reactions, drug intake, neoplasms like myeloproliferative disorders and secondary to other malignancy

Methodology:

A Cross Sectional Study was conducted in 100 Children between 2- 12 years of age with Positive history/ evidence of allergic disease attending Pediatric ward and OPD of Dr. D.Y. Patil Medical College and Hospital, Pune from October 2017 – October 2019. Children with Preexisting Lung Disease, Preexisting Heart Disease and Preexisting Immuno Deficiency were excluded. Informed and written consent of all the patients or parents/guardian were taken. Detailed history was taken in each patient and proper clinical examination was done as per 'Performa'.

Blood sample was drawn aseptically for necessary laboratory investigation (CBC, AEC, Serum Immunoglobulin E level) had been done. Blood AEC level was calculated as Total leucocyte count (TLC) multiplied by percentage of eosinophils. Normal AEC level is less than 450 cells/ul.[8] Serum IgE level was done by fully automated bidirectionally interfaced Chemi Luminescent Immune Assay method (C.L.I.A). The normal values of serum IgE level in children of different age groups.[9]

MS EXCEL was used for data entry and analysis was done using SPSS17 software. Qualitative data was presented as Frequency and Proportion. Quantitative data was presented as Mean and Standard deviation (SD). Chi Square Test was applied for statistical analysis.

Results:

In present study Out of total 100 cases 70 cases were Male (70%) and 30 cases were Female (30%) showing Male predominance and maximum number of cases were of 6-9 years of age (39%) followed by 2-5 years of age (37%), 10-12 years of age (24%).

Table 1: Presenting complaints of cases in study group

Complaints	No. of cases (n=100)	Percentage (%)
Cough	63	63
Difficulty in breathing	49	49
Running nose	23	23
Sneezing	19	19
Itching	14	14
Rashes all over body	13	13
Watering & congestion of eyes	13	13

Most common presenting complaint was Cough (63%) followed by Difficulty in breathing (49%), Running nose (23%) and Sneezing (19%) and other less common complaints was Itching, rashes, watering and congestion of eyes.

Table 2: Allergic profile wise distribution of cases in study group

Allergic Profile	No. of cases (n=100)	Percentage (%)
Perennial occurrence	71	71
Seasonal occurrence	48	48
H/O of exposure to allergens	28	28
Pets at home	5	5

Most of the cases showed Perennial occurrence (71%) followed by Seasonal occurrence (48%).28% cases had history of exposure to allergens like dust, smoke etc. and 5% cases had pets in their home.

Table 3: Distribution of cases with Family history of allergy in study group

Family history	No. of cases (n=100)	Percentage (%)
Yes	42	42
No	58	58
Total	100	100

Above table shows that 42% cases had positive Family history of allergy and 58% cases did not had family history of allergy.

Table 4: Association between diagnosis and AEC in study group

Diagnosis	AEC (cells/ul)				Total
	>450 (Raised)		<450 (Normal)		
Bronchial asthma	35	61%	22	39%	57
Rhinitis	9	45%	11	55%	20
Conjunctivitis	4	40%	6	60%	10
Dermatitis	6	75%	2	25%	8
Urticaria	4	80%	1	20%	5
Total	58		42		100

Chi-square = 4.93, P=0.293

Out of 57 Bronchial asthma cases AEC was raised in 35 (61%) cases, 20 Rhinitis cases AEC was raised in 9(45%) cases, out of 10 Conjunctivitis cases AEC was raised in 4(40%) cases, out of 8 Dermatitis cases AEC was raised in 6(75%) cases, and out of 5 Urticaria cases AEC was raised in 4(80%) cases. On comparing raised AEC in different diagnostic group it showed Statistically Insignificant change with p value of 0.293.

Table 5: Association between diagnosis and IgE in study group

Diagnosis	IgE				Total
	Raised		Normal		
Bronchial asthma	44	77.1%	13	22.9%	57
Rhinitis	10	50%	10	50%	20
Conjunctivitis	4	40%	6	60%	10
Dermatitis	6	75%	2	25%	8
Urticaria	3	60%	2	40%	5
Total	67		33		100

Chi-square = 8.93, P=0.063

Table 5 shows that out of 57 bronchial asthma cases 44(77.1%) had raised serum IgE levels and out of 20 rhinitis cases 10(50%) had raised serum IgE levels, out of 10 conjunctivitis cases 4(40%) had raised serum IgE levels, out of 8 dermatitis cases 6(75%) had raised serum IgE levels, out of 5 Urticaria cases 3(60%) had raised serum IgE levels. Chi-square test was applied the value is 8.93 and p value is 0.063 which is Statistically insignificant.

Table 6: Comparison of IgE and AEC according to diagnosis in study group

Diagnosis	n	IgE		AEC (cells/ul)	
		Mean	SD	Mean	SD
Bronchial asthma	57	1147.96	1.66	739.56	616.479
Rhinitis	20	414.47	437.41	463.10	355.829
Conjunctivitis	10	347.68	529.31	439.40	296.922
Dermatitis	8	553.96	475.99	577.50	256.261
Urticaria	5	329.02	252.72	524.40	255.956
F Value		1.97		1.58	
P Value		0.11		0.18	

In the present study the Mean serum IgE was 1147.96 in bronchial asthma cases, 414.47 in rhinitis cases, 347.68 in conjunctivitis cases, 553.96 in dermatitis cases, 329.02 in urticarial cases. Mean AEC was 739.56 in bronchial asthma cases, 463.10 in rhinitis cases, 439.4 in conjunctivitis cases, 577.50 in dermatitis cases, 524.40 in urticarial cases. On comparing Serum IgE and AEC in different diagnostic group it showed statistically insignificant changes with **p value of 0.11 and 0.18** respectively.

Table 7: Association between both raised AEC and Serum Total IgE in study group

AEC (cells/ul)	IgE		Total (n=100)
	Raised	Normal	
>450 (Raised)	47	11	58
<450 (Normal)	7	35	42
Total	54	46	100

Chi-square = 40.63, P<0.000

Above table shows that in present study both AEC and Serum Total IgE was raised in 47 cases. Raised AEC and Raised serum IgE has significant association with **p value < 0.0001.**

Table 8: Correlation between both Raised Serum Total IgE and AEC in study group

Correlation between Both raised IgE and	r Value	P Value
AEC	0.78	<0.0001

Above table shows that in present study there is significant correlation between raised serum Total IgE and raised AEC in pediatric patients with allergic disease with **p value <0.0001.**

Discussion:

In present study incidence of allergic diseases was found to be 70% in males and 30% in females with male predominance and with Male: Female ratio of 2.3:1. Most studies on incidence of allergic diseases showed that the incidence is higher in boys than in girls in the first decade of life. Study conducted by Ravindra Et Al[8] and Midyat et al[10] also showed that the incidence of allergic diseases was more in males than female with Male: Female of 1.5:1 and 1.6:1 respectively. The most common presenting symptom was cough (63%) and difficulty in breathing (49%) followed by running nose, cold and sneezing. Few patients presented with itching, rashes over body and watering and congestion of eyes. There is a 42% incidence of family history amongst the subjects of the present study thus showing association of family atopy as a risk factor for the development of allergic diseases in children. Study conducted by G S Chaudhary et al[9] found that 63.3% of cases had history of allergy in family. 71% of cases showed perennial occurrence of allergic diseases and 48% had episodes of allergic disease with seasonal variations thus showing weather change as a risk factor for the development of allergic disorders. 56% cases showed raised total leucocyte count and 44% cases showed normal total leucocyte count. Thus there is no significance of increase in WBC count in allergic conditions. Comparison of WBC count in different allergic conditions (Bronchial Asthma, Rhinitis, Conjunctivitis, Dermatitis, Urticaria) also did not show any significant changes with p value of 0.31.

In the present study, Absolute eosinophil count was raised in 58% of cases and serum IgE was raised in 54% of cases with different allergic conditions. Thus in present study AEC and serum IgE were raised in higher number of cases but it is statistically not significant with p value of 0.29 and 0.063 respectively. Similar study conducted by Gharagozlou M et al[11] out of 232 cases of asthma and allergic rhinitis total serum IgE was raised in 54% cases and not raised in 46% cases. Thus serum total IgE which has been considered as a significant marker of allergic diseases and rises with different allergic condition, but does not show significant change with different allergic conditions. In present study out of 58% cases with raised Absolute eosinophil count 81% (47 cases) showed raised serum IgE levels. Thus, on comparison of raised Absolute eosinophil count with raised total serum IgE by chi-square test, we found significant correlation($r = 0.78$ and p value < 0.001) is present between raised serum IgE and raised AEC. And correlation between serum IgE and AEC in bronchial asthma and allergic rhinitis cases was also statistically significant with r value 0.77 and 0.88 respectively and p value < 0.0001.

Conclusion:

Absolute eosinophil count and serum Total IgE has been considered as a significant marker of allergic state and can be used as a marker of allergic response in atopic individuals. Raised serum IgE and AEC are more in nasobronchial allergy as compare to other systemic allergies. The elevated level of serum Total IgE and Absolute Eosinophil Count both shows Significant Correlation thus can be considered as a dependable laboratory investigation in diagnosing and categorizing allergic diseases.

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