

## A STUDY OF ALLERGIC SENSITIZATION TO EIGHT COMMON ALLERGENS IN PEDIATRIC PATIENTS WITH NASOBRONCHIAL ALLERGY

Rajesh Tikkas<sup>1</sup>, Lokendra Dave<sup>2</sup>, Priyanka Choudhary<sup>3</sup>, Rashmi Dwivedi<sup>4</sup>, Ravi Dohre<sup>5</sup>

### HOW TO CITE THIS ARTICLE:

Rajesh Tikkas, Lokendra Dave, Priyanka Choudhary, Rashmi Dwivedi, Ravi Dohre. "A Study of Allergic Sensitization to Eight Common Allergens in Pediatric Patients with Nasobronchial Allergy". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 63, August 06; Page: 11001-11007, DOI: 10.14260/jemds/2015/1586

**ABSTRACT:** This observational study was done in Department of Pediatrics to see the sensitization pattern among 128 allergic children clinically identified. Eight common Allergens were selected for Skin Prick Testing (SPT). Results were analysed and correlated with other clinical factors. Overall, SPT positivity to one or more Allergen was found in 85.71% of study population. All common Allergen in decreasing order of proportion of sensitivity were cockroach(61.71%), house dust (58.59%), holoptelea (52.34%), prosothis (52.34%), parthenium (47.65%), A. fumigates (48.43%), A. alternata (42.96%), A. niger (38.28%). It was also found that 111 (86.7%) patients had positive response to atleast 1 Allergen and poly-sensitization was more common, observed in 78.9% patients. As Burlingtonent clinical score increase from <8 to >8, there is increase in SPT positivity with different Allergens, but there is no rational trend between higher scores (8-12, 13-20 and >20) and SPT positivity. Group of patients, who shows seasonal variation of symptoms, family history of Allergy and residing in industrial areas etc, also showed variable SPT sensitization pattern.

**KEYWORDS:** Skin prick test, sensitization, Allergens, Pediatric patients.

**INTRODUCTION:** The concept of Allergy was introduced by Clemens von Pirquet in 1906.<sup>(1)</sup> Kimishige<sup>(2)</sup> and co-workers were the first to isolate and describe IgE in 1960 that was the major breakthrough in the understanding the mechanism of Allergy. Philip Gell and Coombs,<sup>(3)</sup> designed the scheme of four type of hypersensitivity reaction known as type I to type IV.<sup>(4)</sup> The word Allergy was restricted to type I hypersensitivity. Asthma and Allergic conditions such as Allergic rhinitis are major public health problems, prevalence is 10-30% in different geographical areas, according to the World Allergy Organization report.<sup>(5)</sup> In our country 20-30% of population suffers from Allergic rhinitis<sup>(6)</sup> and about 1/3 of them suffer from Bronchial Asthma. There are numbers of Allergen groups, that may cause Allergic symptoms, like pollen grains fungal spores, insect debris, house dust mites, animal dander, chemicals, and foods etc.<sup>(6-9)</sup>

Among these pollen grains and fungal spores are the most important Allergens in the air.<sup>(8-10)</sup> Allergic disorders are diagnosed by number of tests including skin Allergy testing and serum Allergy testing which is bioassay that detect presence of Allergen specific IgE on patients' blood/ mast cells.<sup>(2)</sup> Allergy skin testing can be percutaneous (Scratch, puncture or prick technique) and intradermal technique.<sup>[11,12]</sup> Skin Prick Testing technique have good sensitivity and specificity<sup>[13]</sup> to find out common Allergen in Pediatric patients. Common Allergens for children are house dust, cockroach, parthenium, holoptelea, prosothis, aspergillus fumigates, aspergillus niger, alternaria alternata.<sup>(6-9)</sup> In our study we tried to find out the correlation between clinical suspicion of Allergy and Allergy skin prick testing (SPT), as well as direct correlation between increasing symptoms of Allergy and proportionate positivity of SPT.

## ORIGINAL ARTICLE

---

Seasonal variations, history of Allergy in first degree relations, and residing in polluted industrial area are factors likely to have strong effect on Allergic symptoms and common Allergen sensitization positivity. We tried to observe this too.

### AIM AND OBJECTIVES:

1. To study of pattern of atopic sensitization to eight common Allergens in pediatric patients with Allergic diseases with the help of standard skin prick testing.
2. To observe the effect of other factors on this, like seasonal infections and exacerbation of symptoms, allergic first degree relative, residing in industrial areas etc.

**MATERIAL AND METHODS:** This study is observational study conducted in the Department of Pediatrics, Gandhi Medical College Bhopal. Study plan was approved by institutional ethical committee. Total 186 patients were initially enrolled for study in which clinical scoring was done, BURLINGTONENT clinical questionnaire<sup>(14)</sup> was performed, and total 128 patients (Male n=63(49.21%) and female=65(50.78%), with probable nasobronchial Allergy were identified and rest of the patients were dropped out. On the basis of outcome of burlingtonent questionnaire, patients were categorised into 4 categories/ groups: (1) Score < 8= Allergy is unlikely, (2) Score 8-12 = Allergy is possible, (3) Score 13-20= Allergy is probable and (4) Score>20= Allergy is very likely. After detailed history and clinical examination, Allergy skin prick testing was done in these children. Volar aspect of forearm was the site for skin prick testing and results of wheal and flare were assessed at 20 minutes. Only 8 common,<sup>(6-9)</sup> Allergens studied were house dust, cockroach, parthenium, holoptelea, prosothis, aspergillus fumigates, aspergillus niger, alternaria alternate. Buffered saline (-) and histamine (+) was used as control. Data was collected, tabulated, and analyzed using pearson's chi square test. P values <0.05 were considered statistically significant.

**RESULT AND ANALYSIS:** All patients were from 5-15 years age group, with mean age of 8±2.5 years (male mean age 8.4±2.4 and female 7.6±2.6 years). In the studied population, there is no major gender differences, as male n=63(49.21%) and female n=65(50.78%). More than 76% of patients belongs to scoring >8 Burlingtonent clinical scoring system i.e. Allergy is possible/probable or very likely, as is showed in table no 1.

Although grossly, there is no significant difference in sensitivity pattern to different Allergens, most common Allergen in decreasing order of proportion of sensitivity is cockroach, house dust, holoptelea, prosothis, parthenium, A. fumigates, A. alternata, A. niger. As we can see in table no 2.

Further, it is clear in Table 3, that N= 111(86.7%) of patients had positive response to atleast 1 Allergen and poly-sensitization was common, observed in 78.9% patients.

As score increase from <8 to >8, there is increase in SPT positivity with different Allergens, but there is no rational trend between scores (8-12, 13-20 and >20). This observation can be seen in the table no 4.

As can be seen in table no 5, we also found the significant correlation among history of Allergy in close blood relatives and SPT positivity for house dust and prosothis (p value being 0.042 and 0.049). In patients with seasonal variation/ infections, there has been strong correlation between SPT positivity and most Allergen except house dust, parthnium, A niger (p value is non-significant i.e. 0.087, 0.106, and. 0075 respectively, as compare to cockrocach p-0.003, holoptelea p-0.002, prosothis p-0.002. A.fumigatus p-0.001, A.alternata p-0.019.) In patients living in industrial area, the significant correlation is seen in only cockroach and parthenium (p-0.016 and 0.026 respectively).

## ORIGINAL ARTICLE

Burlingtonent Score	<8	8-12	13-20	>20
Patients	30	18	51	29
%	23.43	14	39.84	22.65

Table 1: Patient characteristics

Sl. No.	Name of Antigen	No. of test of Negative Reaction (+1,+2)	No. of test of Positive Reaction(+3,+4)	% of Positive Reaction (+3,+4)
1	House dust	53	75	58.59
2	Cockroach	49	79	61.71
3	Parthenium	67	61	47.65
4	Holoptelea	61	67	52.34
5	Prosopis	61	67	52.34
6	A. Fumigatus	66	62	48.43
7	A. Niger	79	49	38.28
8	A. Alternate	73	55	42.96

Table 2: Allergy skin prick test to common Allergens; overall trend

Sl. No.	SPT Response	No. of Patients	%
1	Negative	17	13.3
2	Mono-sensitization	10	7.8
3	Poly-sensitization	101	78.9
	<b>Total</b>	<b>128</b>	<b>100.0</b>

Table 3: Frequency of positivity of SPT response in all patients

Sl. No.	Antigen	<8	8-12	13-20	>20	Total Positive	Total Positivity %
1	House dust	5	12	36	22	75	58.59
2	Cockroach	7	13	39	20	79	61.71
3	Parthenium	3	10	32	16	61	47.65
4	Holoptelea,	0	13	36	18	67	53.34
5	Prosopis	1	13	33	20	67	52.34
6	A.fumigatus	1	10	33	18	62	48.43
7	A.niger	0	7	27	16	49	38.28
8	A.alternata	2	10	27	15	55	42.96
	<b>Total</b>	<b>30</b>	<b>18</b>	<b>51</b>	<b>29</b>	<b>128</b>	

Table 4: Correlation between burlingtonent clinical questionnaire and Allergy sensitivity test positivity

Allergen	h/o Allergy in Close Relation% (with+/without-)	Residing near Industrial area% (with+/without-)	Seasonal infections/ Variation (with+/without-)
House dust	+67.74	+69.23	+62.63
House dust	-50	-57.39	-44.83
Cockroach	+66.13	+92.31	+68.69
Cockroach	-57.58	-58.26	-37.93
Parthenium	+53.23	+76.92	+51.52
Parthenium	-42.42	-44.35	-34.48
Holoptelea	+59.68	+69.23	+59.60
Holoptelea	-45.46	-50.43	-27.59
Prosopis	+61.29	+69.23	+59.60
Prosopis	-43.94	-50.43	-27.59
A.fumigatus	+56.45	+69.23	+58.59
A.fumigatus	-40.91	-46.08	-13.79
A.niger	+46.77	+61.54	+42.42
A.niger	-30.30	-35.65	-24.14
A.alternata	+51.61	+46.15	+48.48
A.alternata	-34.85	-42.61	-24.14

Table 5: Correlation between allergic sensitization and other factors

**DISCUSSION:** We studied eight most common Allergen which were also studied by Singh et al<sup>(6)</sup> and Shivpuri et al.<sup>(7)</sup> Total 1024 Allergy skin prick test with 8 Allergen in 128 patients with symptoms suggestive of Allergy, had been done. Among pollen Allergens, commonest Allergens in decreasing order were holoptelea (52.34%), prosopis (52.34%) and parthenium (47.65%). Almost all fungal Allergens have shown equal trend and positivity trend was following, in decreasing order A. fumigatus (48.43%), A.alternata (42.9%) and A.niger (38.28%). Shivpuri et al<sup>(7)</sup>, Agashe SN,<sup>(15)</sup> Rajendra Prasad et al<sup>(8)</sup> studied number of Allergens including ours and their observations also favour and almost similar to our results of positivity and correlation.

It was seen in this study that there is significant positive correlation between clinical suspicion of Allergy i.e >8 score group, above three fourth of all patients were having score more than 8 and sensitization to common Allergens but there is no rational trend between clinical scores and SPT positivity in group score 8-12, 13-20 and >20. This observation is similar to the study of Warrington RJ<sup>(16)</sup> in which no significant correlation is seen between SPT positivity and severity of clinical reaction/ allergic manifestations.

Our study demonstrated that only 7.8% of patients were mono-sensitized against any single Allergen and other 78.9% were poly-sensitized to more than one Allergen, one Iranian study, previously had shown that over 90% of allergic rhinitis patients were poly-sensitized while another study in Poland report that 85% of patients had hypersensitivity to more than one Allergen. <sup>(17)</sup>

In our study 111(86.71%) patients were found sensitive to aeroallergens but 17(13.28%) had negative SPT. Probably, this negative reaction might be due to sensitization to a particular Allergen which have not been tested in our study or yet not identified. Similar high percentage of sensitization

## ORIGINAL ARTICLE

---

were also shown in two other studies done by Valero A<sup>(18)</sup> and Charpin D,<sup>(19)</sup> and they reported 81% and 92% positivity respectively.

In present study, over all SPT positive reaction to 1 or more Allergens is about 85.71% and commonest Allergens were cockroach (61.71%), house dust (58.59%), *Holoptelea* (52.34%), *prosposis* (52.34%), *A. fumigatus* (48.43%), *parthenium* (47.65%), *A. alternate* (42.96%) *A. niger* (38.28%). In similar study done by Prasad et al<sup>(8)</sup> most common Allergens were insects(21.8%), dust (11.9%), pollen (7.8%). Duc J et al in 1986<sup>(9)</sup> also determined frequency of hypersensitivity to Allergens in rhinitis and bronchial asthma and it was house dust (50%), grass pollen (46%), house dust mite(38%). Hendricks et al<sup>(10)</sup> also studied the Allergens SPT positivity in asthmatic patients and results were pollen (66%), animal danders (38%) and *A.fumigatus* (16%). Above studies shows that there is variable positive reaction to SPT and in most of studies reaction of positivity is not similar. This could be due to differences in geographical areas, where different flora and fauna may exist.

In our study it was seen that there is statistically significant positive correlation between positive SPT to House dust, *prosposis*, and positive history with other associated affecting factors. In a study done by Girihdar et al,<sup>(20)</sup> similar results were seen. Chhabra et al 1999<sup>(21)</sup> had reported a strong association between a family history of atopic disorder and the prevalence of asthma as well as other allergic disorders.

Our study shows statistical significant correlation between seasonal symptomatic variations with SPT positivity to common Allergen with cockroach, *holoptelea*, *prosposis*, *A. fumigatus* and *A alternate*. In a study done by Choi SI et al,<sup>(22)</sup> they also demonstrated seasonal variation in Allergy symptoms correlated with SPT positivity for number of Allergens, especially for pollens.

In our study, there was significant correlation observed between SPT positivity to cockroach, *parthenium* and patients living around industrial area. In a study by Suh M et al,<sup>(23)</sup> the difference in prevalence of allergic diseases among industrial and non-industrial area was not statistically significant. Mortimer K et al<sup>(24)</sup> reported that air pollution does not increase the risk of Atopy but it exacerbates symptoms in already sensitized people. Brauer et al <sup>(25)</sup> analyzed effect of exposure of non-asthmatic children to air pollution, during the first four years of life and found positive correlation with wheeze and childhood asthma onset.

**CONCLUSION:** This study has shown relation between eight common Allergens and pattern of sensitization in Pediatric patients. There is strong correlation between clinical suspicion of Allergy and SPT positivity but there is no definite correlation between increasing symptoms and proportionate SPT positivity. It is also seen in our study that some Allergens, but not all, have significant correlation with seasonal variations, residing near industrial area and history of Allergy among close relatives. We need to conduct further studies with more number of Allergens to find out there relation in a broader perspective. These results may help and guide to improve the quality of life in Pediatric allergic patients with help of strategies of counselling, Allergens avoidance and immunotherapy.

### REFERENCES:

1. Clemens Peter Pirquet Von Casentico allergie munch med wochenschr 53: 1457
2. Ishizaka K (ed): Regulation of the IgE Antibody Response. Chem Immunol Allergy. Basel, Karger, 1982, vol 32, pp 1-7

## ORIGINAL ARTICLE

---

3. Gell PGH, Coombs RRA, eds. *Clinical Aspects of Immunology*. 1st ed. Oxford, England: Blackwell; 1963.
4. Ten RM, Klein JS, Frigas E (1995) Allergy testing. *Mayo Clin Proc* 70(8): 783- 784. Pmid 7630219
5. Pawankar R, Canonica GW, Holgate ST, et al. world Allergy organization white book on Allergy 2011-2012 executive summary.
6. Singh SB, and Shahi S. Aero Allergens in Clinical Practice of Allergy in India- ARIA Asia pacific Work shop Report. *Asian pacific journal of Allergy and immunology* (2008)26: 245-256.
7. Shivpuri DN, Clinically important pollens, fungal and insect Allergens for nasobronchial Allergy patients in India. *Aspects Allergy Appl Immunol* 1980; 13: 19-23.
8. Prashad R, Kumar R, Verma SK, et al A study of Skin Sensitivity to Various Allergens by Intradermal Tests in patients of Bronchial Asthma. *Indian J Allergy Asthma Immunol*. 2001; 15(1): 17-21.
9. Duc J, Kolly M, Pecoud A, Frequency of Allergens involved in rhinitis and bronchial asthma in adults. *Schwetz Med wochenschr*. 1986; 116(36): 1205-10.
10. Hendrick Dj, davies RJ, D'souza M, Peppys J. An analysis of skin prick test reactions in 656 asthmatic patients. *Thorax* 1975; 130: 2-8.
11. Basomba A, Sastre A, Pelaez A, Romar A, Campos A, Garcia-Villalmanzo A. Standardization of the prick test. A comparative study of three methods. *Allergy* 1985; 40: 395-9.
12. Indrajana T, Spieksma FT, Voorhorst R. Comparative study of the intracutaneous, scratch and prick tests in Allergy. *Ann Allergy* 1971; 29: 639-50.
13. Allergy Diagnostic Testing - World Allergy Organization.  
[www.worldAllergy.org/professional/allergic...center/Allergy\\_diagnostic](http://www.worldAllergy.org/professional/allergic...center/Allergy_diagnostic)
14. Douglas E, Henrich MD, Jennifer K. Berge, MD Burlington Ear, Nose, Throat PC. West Burlington Iowa. <http://www.Burlingtonent.com/files/Allergy-Questionare.pdf> West Burlington Iowa 1225 south Gear, Avenuesuite255, West Burlington, Iowa, 52655
15. Agashe SN. Public awareness of Allergens. *India J Allergy Asthma Immunol* 2003; 17: 33.
16. Warrington RJ et al. Lack of correlation between severity of clinical Symptoms, Skin Test Reactivity, and Radioallergosorbent Test Result. *Section of Allergy and Clinical Immunology, Volume 2, Number 2, Summer 2006*.
17. Gniazdowaka B, Doroszewka G, Doroszevska W, Hypersensitivity to weed pollen Allergens in the region of Bygdoszcz. *Pneumol alergol pol*. 1993; 61(7-8): 367-72.
18. Valero A et al. A study of Spain and Portugal. *J Investig Allergol Clin Immunol* 2009; Vol. 19(3): 167-172
19. Charpin D, Veruloet D, Lanteaume A, et al. survey in general population. *Rev Mal Respir*. 1989; 6(4): 325-328.
20. Giridhar BH, Sandeep K, Alok K Verma et al. Vol 2 issue 1 Jan – March 2012 ISSN 2249-4995.
21. Chhabra SK, Gupta CK, Chhabra P, Rajpal S. Risk factors for development of bronchial asthma in children in Delhi. *Ann Allergy Asthma Immunol*. 1999; 83: 385–90.
22. Choi SI, et al. Seasonal Variation in Skin Sensitivity to AeroAllergens. *Allergy Asthma Immunol. Res* 2013 September; 5(5): 301-308.
23. Suh M et al. Prevalence of allergic diseases among Korean school age children: A National wide Cross sectional questionnaire Study. *J Korean Med Sci* 2011; 26: 332-338.

## ORIGINAL ARTICLE

24. Mortimer K et al. Life time exposure to Air Pollution and Allergic Sensitization in Children with Asthma. Journal of Asthma, 45: 474-881, 2008.
25. Brauer M et al. Air Pollution from Traffic and the Development Am J Respir Crit Care Med Vol 166. 1092-1098, 2002.

### AUTHORS:

1. Rajesh Tikkas
2. Lokendra Dave
3. Priyanka Choudhary
4. Rashmi Dwivedi
5. Ravi Dohre

### PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Paediatrics, Gandhi Medical College, Bhopal.
2. Professor, Department of TB Chest, Gandhi Medical College, Bhopal.
3. Resident, Department of Paediatrics, Gandhi Medical College, Bhopal.

### FINANCIAL OR OTHER

**COMPETING INTERESTS:** None

3. Professor, Department of Paediatrics, Gandhi Medical College, Bhopal.
4. Junior Resident, Department of TB Chest, Gandhi Medical College, Bhopal.

### NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Lokendra Dave,  
Professor,  
Department of TB Chest,  
Gandhi Medical College, Bhopal.  
E-mail: drlokendradave@yahoo.com

Date of Submission: 03/07/2015.  
Date of Peer Review: 04/07/2015.  
Date of Acceptance: 16/07/2015.  
Date of Publishing: 05/08/2015.