

ORIGINAL RESEARCH

Pattern of Aeroallergen Sensitization in Children with Respiratory Allergy in North Indian Population

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ABSTRACT

Background: Allergic diseases affects lives of more than one billion people worldwide⁽¹⁾. Aeroallergen sensitization can be evaluated using either skin testing or measuring specific IgE to these aeroallergens. Skin prick testing (SPT) is an easy, cost-effective and convenient approach to identify sensitization to allergens.

Objective: To determine the pattern of sensitization to various aeroallergens and prevalence of atopy in children with respiratory allergy.

Method: We performed a hospital based prospective observational study, conducted at Paediatric OPD, Santokba Durlabhji Memorial Hospital, Jaipur, India. Total 140 children of age 6 years to 18 years diagnosed with Respiratory allergy (Allergic rhinitis & Asthma) were enrolled. Skin prick test using 18 aeroallergens (indoor & outdoor) were performed as per standard protocol.

Result: Among the total cases around 77% (n=108) were having positive skin test for one or more allergens, most common allergens were HDM (35%), cockroach (32.2%), Mosquito (32.1%), Grain dust (22.1%) and Heloptelia (20%).

Conclusion: SPT is the most convenient, cost-effective, sensitive and standardized method for detecting allergen sensitivity and should be used in all children with allergic disorders to demonstrate the atopy. More than 50% of children in our study had sensitization to one or more aeroallergens suggesting atopy; sensitization was most commonly seen to HDM antigen.

Keywords: Skin Prick Test, Rajasthan, Aeroallergen, Asthma, Allergic rhinitis, House Dust Mite

INTRODUCTION

Allergic diseases affects lives of more than one billion people worldwide⁽¹⁾, Asthma and allergic rhinitis are common among them. 14% children experience asthma symptoms according to global asthma report⁽²⁾. Allergy once considered diseases of rich and of western world, is now increasingly affecting middle income group and poor people in the developing countries. Prevalence of asthma in India estimated to range from 3% to 38%^(3,4).

Asthma is a diversified disease and characterized by chronic airway inflammation, which is defined by the history of typical respiratory symptoms like wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, along with variable expiratory airflow limitation⁽⁵⁾. Allergic rhinitis (AR) considered as the commonest allergic disease afflicting 10 to 30% population globally and more than 50% of atopies in India⁽⁶⁾.

Skin prick test (SPT) is a standardized test widely used in the diagnosis of suspected cases of IgE mediated allergy. It is considered as the gold standard in the diagnosis of allergy⁽⁷⁾. Generally accepted indications for SPT include allergic rhinitis, asthma, atopic dermatitis, suspected food allergies, latex allergy, and conditions in which specific IgE is suggested to play a role in the pathogenesis.

Aeroallergen sensitization is a risk factor in the development of childhood allergies like asthma, and most commonly implicated allergens are house dust mite (HDM), cockroach, and pollens⁽⁸⁻¹²⁾. Skin prick testing (SPT) is an easy, cost-effective and convenient approach to identify sensitization to allergens. SPT detects the presence of allergen specific IgE bound to mast cells by eliciting mast cell degranulation to the specific allergen being tested⁽¹³⁾.

The aim of our study was to determine the prevalence of sensitivity to aeroallergens among patients with respiratory allergies i.e. Asthma and AR, in Rajasthan, northern part of India. For better diagnosis and treatment of allergic patients, the knowledge about sensitization to these aeroallergens in particular geographical area is a great importance guide for clinicians.

MATERIALS AND METHODS

This was a prospective, observational study conducted at SantokbaDurlabhji Memorial Hospital, Jaipur, Rajasthan, India. 140 children with allergic disease (Asthma & AR) were enrolled between October 2018 to June 2019. After ethical clearance, cases were enrolled as per inclusion criteria and socio-demographic data along with detailed relevant history were obtained.

All subjects divided in to 2 disease groups: Asthma and Allergic rhinitis, after detailed medical history and physical examination. Diagnosis Of Asthma was established by GINA guideline 2018⁽⁵⁾: Characteristics symptoms pattern on history and evidence of variable airflow limitations (spirometry/reversibility test). Diagnosis of AR by ARIA guideline 2007⁽⁷⁾: Based on symptomatology- rhinorrhea, nasal blockage, nasal itching and sneezing, which are reversible spontaneously or with treatment.

Skin Prick Test: After detailed history and examination clinical diagnosis of allergic rhinitis and asthma being made (ARIA and GINA guidelines). SPT has been performed for 18 aeroallergen: **Outdoor Allergens:** *Holooptelia*, *Amaranthus spinosus*, *Argemone maxicana*, *Brassica* sps., *Chenopodium album*, *Ricinus comunis*, *Parthenium* sps., *Zea mays*, *Cynadondactilon* and Grain dust while **Indoor allergens were:** Male & female cockroach, Mosquito, House Dust Mites (*D. Farinae*, *D. Ptronysinus*), *Alternaria*, Cat dander & Dog dander. Standard allergen extracts were used prepared by Alcure pharma, Delhi. Skin pricks were done using standard protocol with a sterile lancet under all aseptic precautions. Histamine is used as positive control and Normal saline as negative control. Test results are read after 15-20 minutes. An emergency kit (containing inj. Adrenaline, Hydrocortisone, Chlorpheniramine) was always there at testing site for management of any adverse reaction. Test was considered positive if wheal in any of the allergens was 3 mm or more than the positive control.

All statistical analyses were done using Medcalc 16.4 statistical software. Correlation between quantitative variables has been assessed by using Pearson's / spearman correlation coefficient as applicable

RESULTS

Total 140 children with respiratory allergy (Asthma & AR) were enrolled for the study. The following observations were made:

Table 1 shows basic demographic & geographic data of study subjects. Half of the cases were diagnosed as Asthma predominantly and half as Allergic rhinitis predominantly. Children enrolled were mostly of age group 6 to 15 yrs (93.6%, n= 131). There is statistically significant difference (p= 0.008) seen in the prevalence of asthma and AR i.e. the asthma is more prevalent in younger children (80%, n= 56) as compared to AR (58.6%, n= 41). 78.6% (n=110) were male and 21.4% (n=30) female participated in the study. 55.7% (n= 78) cases were from rural background and 44.3% (n= 62) from urban.

Table 2 depicts the skin test reactivity in AR & asthma groups. 77.1% (108) cases of both AR and Asthma showed positive skin test to at least 1 aeroallergen or more. Both groups showed equal skin reactivity in our study, no significant difference seen in both study group.

Table 3 illustrates the prevalence of different aeroallergens in the patients. Common allergens in our study were HDM (n=49, 45.3%), Cockroach (n= 45, 41.7%), mosquito (n=45, 41.7%), Grain dust (n=31, 28.7%) and Holoptelea (n=28, 25.9%).

Table 4 shows the prevalence of allergens according to periodic pattern of disease. Mosquito (n=38, 42.7%) & HDM (n=37, 41.6%) were the commonest allergen in perennial group of subjects while in seasonal group, Holoptelea (n=18, 35.3%) & grain dust (n=14, 27.4%) were the commonest ones.

Table 1: Baseline characteristics of study subjects

Age(years)	N	(%)
6 – 10	97	69.3
11 – 18	43	30.7
Gender		
Female	30	21.4
Male	110	78.6
Residence		
Rural	78	55.7
Urban	62	44.3
Family History		
Positive	61	43.6
Negative	79	56.4
Diagnosis		
Asthma	70	50
AR	70	50

Table 2: Skin prick test positivity among study subjects

Skin prick test	Allergic rhinitis		Asthma		Total	
	N	%	N	%	N	%
Negative	16	22.9	16	22.9	32	22.9
Positive	54	77.1	54	77.1	108	77.1
Total	70	100	70	100	140	100

Chi-square = 0.041 with 1 degree of freedom; P = 0.840

Table 3: Distribution of study subjects according to prevalence of allergens sensitivity

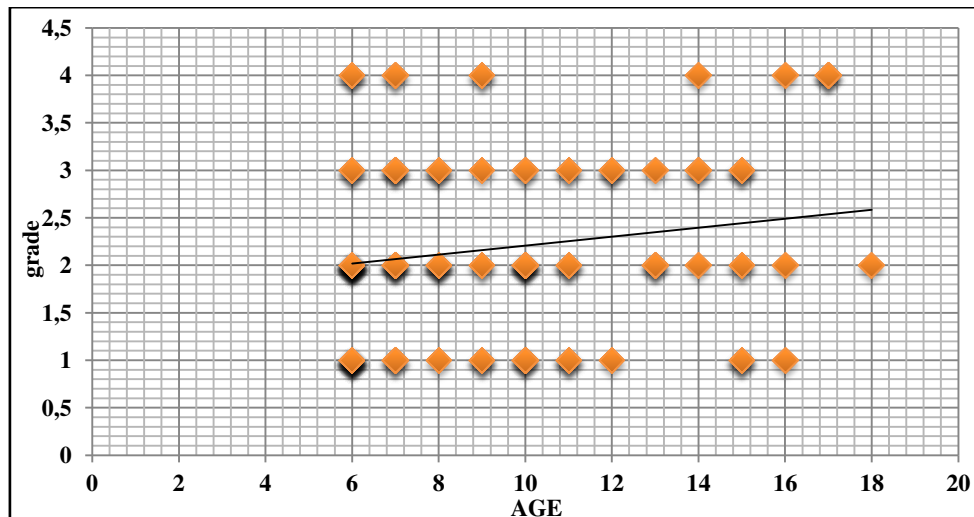
Allergens	Rural N (%)	Urban N (%)	Total N (%)
Alternaria	2 (2.6)	4 (6.4)	6 (4.3)
Argimone	2 (2.6)	3 (4.8)	5 (3.6)

Brassica	3 (3.8)	7 (11.3)	10 (7.1)
Chenopodium	9 (11.5)	6 (9.7)	15 (10.7)
Cockroch(f,m,both)	26 (33.3)	19 (30.6)	45 (32.1)
Cynadon	4 (5.1)	11 (17.7)	15 (10.7)
Grain dust	20 (25.6)	11 (17.7)	31 (22.1)
Holoptlea	12 (15.4)	16 (25.8)	28 (20)
HDM(Df,Dp,both)	28 (35.9)	21 (33.9)	49 (35)
Mosquito	28 (35.9)	17 (27.4)	45 (32.1)
Ricinus	7 (9)	6 (9.7)	13 (9.3)
Zea mays	8 (10.2)	4 (6.4)	12 (8.6)
Amaranthus	4 (5.1)	4 (6.4)	8 (5.7)
Dog dander	3 (3.8)	3 (4.8)	6 (4.3)
Parthenium	8 (10.2)	5 (8)	13 (9.3)
TOTAL (N)	78	62	140

Table 4: Distribution of allergens according to periodicity of illness

Allergens	SeasonalN (%)	ParennialN (%)
Alternaria	1 (1.9)	4 (4.5)
Argimone	4 (7.8)	1 (1.1)
Brassica	5 (9.8)	4 (4.5)
Chenopodium	11 (21.6)	4 (4.5)
Cockroch(f,m,both)	13 (25.5)	31 (34.8)
Cynadon	10 (19.6)	5 (5.6)
Grain dust	14 (27.4)	18 (20.2)
Holoptlea	18 (35.3)	7 (7.8)
HDM(Df,Dp,both)	11 (21.6)	37 (41.6)
Mosquito	7 (13.7)	38 (42.7)
Ricinus	9 (17.6)	4 (4.5)
Zea mays	9 (17.6)	3 (3.4)
Amaranthus	7 (13.7)	1 (1.1)
Dog dander	3 (5.9)	3 (3.4)
Parthenium	6 (11.8)	8 (9)

Graph 1: Demonstrates the correlation between age of study subjects and grading of SPT.



DISCUSSION

This study was carried out to determine correlation between total serum IgE level and TEC with skin prick test for 18 common aeroallergens in children with allergic rhinitis and asthma. A total 140 pediatric patients (70 AR & 70 Asthma), who presented at Pediatric OPD at a tertiary care centre in Rajasthan, India, with respiratory allergy were enrolled for the study.

In present study, total 140 patients of aged 6 to 18 yrs were enrolled. Most of the cases were below 10 yrs of age. In this study, there is a significant difference observed between age distribution of AR and Asthma groups as the Asthma is more prevalent in younger age group in comparison to AR. 80% of Asthma cases were of age group 6 to 10 yrs. Similar age distribution for Asthma was observed in study by Jain et al⁽¹⁵⁾ and Bayram et al⁽¹⁶⁾ who found the prevalence of Asthma more in younger age group. Male- female ratio of study subjects was around 4:1 for this study, 78.9% participates were male. 57.1 % of cases of AR and 54.3 % of cases diagnosed as Asthma were from rural background. In a study by Lama et al⁽¹⁷⁾ their 80% of subjects with Asthma were from rural background.

In this study of total 140 subjects, we performed skin prick testing using 18 aeroallergens and was positive of various grades with 1 or more allergens in 77.1% of cases (n= 108). Both the study groups, AR & Asthma showed equal incidence of SPT positivity (77.1% each), no significant difference was seen in both groups. Study by Ibekwe et al⁽¹⁴⁾ in 96 allergic patients of Negeria, showed similar results with SPT i.e. 77% SPT positivity (n= 74). Various studies from India and abroad showed high prevalence of SPT positivity. Studies like Siroux et al⁽¹⁸⁾ found 88.2% (n= 122) SPT positivity, Raj et al⁽¹⁹⁾ 55.6% (n= 100), Prasad et al⁽²⁰⁾ 89.5% (n= 43) and kumar et al⁽²¹⁾ showed 71.3% (n= 3040) SPT positive in their respective studies.

In our study, we found that the commonest offending allergen in was House Dust Mite (41.4%, n= 49) and Cockroach (32.9%,n= 23) in AR patients, followed by mosquito (32.1%,n= 45), grain dust (22.1%,n= 31) and haloptelia (20%,n= 28).

Many Indian study showed the similar pattern of allergen sensitization with common allergens. Study by Prasad et al⁽²⁰⁾ found the common offending allergens were insects (21.8%,n= 10), In Syna et al⁽¹⁰⁾ study from South India, HDM was the commonest offending allergen (33%,n= 20) similar to our study.Raj et al⁽¹⁹⁾ found some different pattern of prevalence of sensitization in North India. In their study, Housefly was the commonest allergen, not HDM.

CONCLUSION

In our study, we showed the importance of indoor and outdoor, aeroallergens in patients with allergy in north India. The variation in the prevalence of aeroallergen reactivities in a different region is due to different aerobiological condition and different flora and fauna in the specific region. Avoidance of HDM, Cockroach and mosquitoes may result in better control of symptoms in allergic patients. This study will also help in the selection of the panel of most common aeroallergens for SPT and best species of allergens for immunotherapy in this area.

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