

## Review Article

# Food Allergens and Aero Allergens Sensitisation

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**Introduction:** Atopic asthma and allergy is characterized by allergic sensitisation with onset early in life along with a positive family history of allergy and may have coexistent atopic dermatitis or allergic rhinitis with asthma.

**Objectives:** To study the allergen sensitisation profile of children above 2 years of age attending asthma clinic at Cheluvamba Hospital, Mysuru, India.

**Method:** Skin prick test was performed for 40 allergens in asthmatic children attending allergy clinic at Cheluvamba Hospital, Mysuru. Children with a history of anti-histaminic intake and other drugs affecting skin sensitisation in the past 4 weeks were excluded.

**Results:** Skin prick test was performed on 300 subjects with a mean age of  $8.6 \pm 4.17$  years, with male: female ratio of 1.63:1. 171 (57%) children were sensitised to at least 1 allergen. 112 (37.3%) were sensitised to 2-5 allergens while 30 (10%) were sensitised to more than 5 allergens. Amongst the sensitised individuals, most common allergen was house dust mite (48.5%). Among the indoor aeroallergens, 83 (27.7%) subjects were sensitised to dust mite, 63 (21%) to cockroach, 21 (7%) to cat, 20 (6.6%) to moulds, 9 (3%) to dog dander. Among the outdoor aeroallergens, 24 (8%) subjects were sensitised to weed (Parthenium and careless weed), 16 (5.3%) to Bermuda grass, 13 (4.3%) to pine mix, 10 (3.3%) to Timothy grass and 9 (3%) to horse epithelium. Most common food allergens were shrimp in 27 (9%) and lobster in 24 (8%). 16 (5.3%) children were sensitised to egg white, 9 (3%) to milk, 8 each to soya bean and cocoa bean, 7 to wheat and 6 to peanut.

**Conclusions:** Amongst children attending allergy clinic at Cheluvamba Hospital, Mysuru, India, more than half were sensitised to at least one allergen. The most common aeroallergen was the house dust mite, while the most common food allergens were shrimp and lobster.

**Keywords:** Food Allergens; Aero Allergens; Sensitisation

## Introduction

In India, a rising trend of asthma prevalence from 5% in 2002 to 10.3% in 2010 was noted, and in Mysuru from 4% in 1998 to 17.4% in 2013 [1-3]. Skin Prick Testing (SPT) elicits mast cell degranulation thus detecting presence of mast cell bound allergen specific IgE [4]. SPT therefore detects that the child is "sensitised". Child may or may not have clinical features of allergy on exposure to that allergen. Hence, always SPT must be interpreted in the context of clinical history. "Sensitisation" is an immunological term, "allergy" is a clinical term.

## Objectives

To study the allergen sensitization profile of children above 2 years of age attending allergy clinic at Cheluvamba Hospital, Mysuru, India.

## Method

This study was carried out at the Cheluvamba Hospital, a tertiary care teaching hospital in southern India. Children belonging to age group of 2-18 years, who attended allergy clinic, were included. Children who had taken anti-histamines, systemic steroids, tricyclic antidepressants or any other drug which reacts with skin reaction for

allergens in the past 4 weeks were excluded from the study. SPT was done using 40 allergens over the volar aspect of the forearm and/or on the back of the patient in the interscapular area. Drop of each allergen was placed 3 cm apart and then was pricked with a lancet. Saline was taken as negative control and histamine as positive control. Allergens were obtained from Allcure Pharma New Delhi. Test was considered positive if wheal in the allergens was  $\geq 3$  mm than the negative control [5]. Institutional Ethics Committee clearance was obtained. Sample size was calculated based on the prevalence of 8% of asthma amongst children attending our asthma clinic at 0.05 significance level using the formula,  $\text{sample size} = Z^2 pq/d^2$ , where  $Z=1.96$ ,  $p$  is the prevalence of disease,  $d=95\%$  confidence interval,  $q=1-p$ , which was calculated as 113. Written informed consent was obtained from parents. Data were entered using Microsoft Excel. Chi-square test was used for testing difference in proportions for categorical variables.  $p < 0.05$  was considered significant.

## Results

SPT was performed on 300 subjects with a mean age of  $8.6 \pm 4.17$  years and a male: female ratio of 1.63:1. There were 92 children between 2 years to 5 years of age of which 16 were episodic viral wheezers and 76 were multi trigger wheezers. Amongst children more than 5 years old, 16 had intermittent asthma, 41 had mild

**Table 1:** Sensitisation to indoor aeroallergens and sex distribution.

Indoor aero allergen	Male	Female	Total No. (%)	Chi square	p-value
House dust mite	50	33	83 (27.7)		
Cockroach	40	23	63 (21.0)		
Cat	13	8	21 (07.0)	4.35	0.113
Dog dander	7	2	09 (03.0)		
Moulds	17	3	20 (06.6)		

**Table 2:** Sensitisation to outdoor aeroallergens and sex distribution.

Outdoor aeroallergen	Male	Female	Total No. (%)	Chi square	p-value
Weed (Parthenium, Careless weed)	13	11	24 (08.0)		
Bermuda grass	8	8	16 (05.3)		
Pine Mix	8	5	13 (04.3)	7.65	0.265
Timothy grass	8	2	10 (03.3)		
Horse epithelium	6	3	09 (03.0)		

**Table 3:** Sensitisation to food allergens and sex distribution.

Food allergen	Male	Female	Total No. (%)	Chi square	p-value
Shrimp	19	8	27 (09.0)		
Lobster	16	8	24 (08.0)		
Egg white	12	4	16 (05.3)		
Milk	3	6	09 (03.0)	8.99	0.174
Soya bean	5	3	08 (02.6)		
Cocoa Bean	5	3	08 (02.6)		
Wheat	2	5	07 (02.3)		
Peanut	4	2	06 (02.0)		

persistent asthma, 121 had moderate persistent asthma and 30 had severe persistent asthma. Associated allergic rhinitis was seen in 101 patients of which 34 had mild persistent allergic rhinitis and 67 had moderate to severe persistent allergic rhinitis. Most common allergen was house dust mite (27.7%). Among the indoor aeroallergens, 83 (27.7%) subjects were sensitized to dust mite, 63 (21%) to cockroach, 21 (7%) to cat, 20 (6.6%) to moulds, 9 (3%) to dog dander as shown in Table 1.

Among the outdoor aeroallergens, 24 (8%) subjects were sensitised to weed (Parthenium and careless weed), 16 (5.3%) to Bermuda grass, 13 (4.3%) to pine mix, 10 (3.3%) to Timothy grass, 9 (3%) to horse epithelium as shown in Table 2.

Most common food allergens were shrimp in 27 (9%) and lobster in 24 (8%). 16 (5.3%) children were sensitized to egg white, 9 (3%) to milk, 8 each to soya bean and cocoa bean, 7 to wheat and 6 to peanut (Table 3).

171 (57%) children were sensitized to at least 1 allergen. 112 (37.3%) were sensitized to more than 1 allergen, while 30 (10%) were sensitized to >5 allergens as shown in Table 4. Of the 129 (43%) subjects who were not sensitised to any allergen, 56 were ≤ 5 years (23<3 years), 30 belonged to 6–10 year age group and 43 were >10 years. Though as the age advances there was more incidence of sensitisation, it was not statistically significant (p=0.689) as shown in Table 5. There was no statistical difference in gender distribution of

**Table 4:** Sensitization to a number of allergens and sex distribution.

Number of allergens	Male	Female	Total No. (%)	Chi square	p-value
1	105	66	171 (57.0)		
2-5	66	47	113 (37.3)	0.255	0.88
>5	18	12	30 (10.0)		

**Table 5:** Absence of sensitisation to a single allergen.

Age group	Male	Female	Total No. (%)	Chi square	p-value
≤5 years	34	22	56 (43.4)		
6-10 years	21	9	30 (23.3)		
>10 years	27	16	43 (33.3)	0.744	0.689
Total	82	47	129		

**Table 6:** Age and gender distribution of study subjects with atopy.

Age group	Sensitised	Male	Female	Chi square	p-value
≤5 years	36	24	12		
6-10 years	63	34	29	1.55	0.461
>10 years	72	43	29		
Total	171	101	70		

allergens sensitisation (p=0.461) as shown in Table 6.

## Discussion

In our study, 57% of children were sensitised to one or more allergens. Prevalence of childhood atopic asthmatics varies from 45 to 79% [6]. A panel of 40 common allergens was utilised for SPT. The most common allergen causing sensitisation was the house dust mite. Few studies have assessed sensitisation to insects in asthmatics [7-9]. Some infrequent causes of allergic sensitization may erroneously be dismissed as mere irritations. In a study by high prevalence of sensitisation to mite (75%) and pathenium (30%) was noted [10]. A study by Sharma S, et al in 2006 found pollen and fungi as important sensitisers [11]. Allergenicity may be determined by the composition of the allergen extract used which may vary with different manufacturers [12]. Sensitization to house dust mite is incriminated in the development of asthma and allergic rhinitis [13]. Allergen sensitization in early years of life is associated with lung function loss at school age [14]. House dust mite has been found to be the commonest allergen [15]. House dust mite allergy is also related to increased asthma severity [16]. A study by allergic rhinitis/asthma found house dust mite allergy in 65-70% [17]. Evidence on correlation of severity of asthma with sensitisation is conflicting [18-20]. This is so because, acute exacerbation and severity of asthma can be due to numerous factors apart from allergen exposure.

### Clinical implications of doing skin prick tests are

- If patient is symptomatic, avoidance of allergens helps in better control of asthma.
- This helps in choice of allergen for immunotherapy.
- Sensitization to aeroallergens is a major criteria and sensitisation to egg, milk or peanut is a minor criteria in Modified Asthma Predictive Index for young children to develop Asthma in future life.
- Most often parents perceive that most foods trigger asthma

and lead to undue restriction of all types of food in their child and eventually leading to malnutrition in the child. Negative skin prick testing rules out food allergy in such patients and helps in counselling the parents as they themselves can see objectively absence of skin reaction to suspected allergens.

- According to GINA guidelines 2019, confirmed food allergy is a risk factor for asthma related deaths and elimination of offending allergen is known to prevent exacerbation

Limitations of our study are that the study was not a population based study, so our results may not be generalizable. A better sample size is needed to get statistically significant data.

## Conclusions

In children attending allergy clinic at Cheluvamba Hospital, Mysuru, India, more than half were sensitised to at least one allergen. The most common aeroallergen was the house dust mite while the most common food allergens were shrimp and lobster.

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