

The spectrum of aeroallergen sensitization in children with wheeze-at a tertiary care centre

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DOI: [10.36347/sjams.2020.v08i12.046](https://doi.org/10.36347/sjams.2020.v08i12.046)

| Received: 12.11.2020 | Accepted: 21.12.2020 | Published: 31.12.2020

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Abstract

Original Research Article

Introduction: Aeroallergens may trigger symptoms in sensitized children with asthma. Documentation of sensitization is crucial to enable effective implementation of measures to prevent asthma exacerbations. To document the sensitization patterns of very young children (≤ 2 years) with asthma. **Materials and Methods:** It is observational study conducted in a pediatric population of area of Tertiary care teaching hospital over a period of 1 year. Children with recurrent (4 or more episodes of wheezing in past one year) ages between 2 years to 10 years with sample size: n=60. After a, thorough medical history and physical examination, a written questionnaire was completed for each patient. Children with recurrent wheeze, who fall in inclusion criteria are subjected to skin prick tests for different aeroallergens listed below. **Results:** The total number of the patients included in the study was 110 patients, of the 69 (62.72%) male and 41 (37.27%) female. The study group is divided into three age groups, 2-4 Years (29.09%), 5- 7 Years (44.54%) and 8-10 Years (29.09%). The frequency of each group. Out of 110 children in the study, 73 children were found sensitive to at least one aeroallergen and 37 were no sensitivity for all aeroallergens. Out of the 41 males (56.16%) and 32 (43.83) female sensitive to at least one of the aeroallergens and 20 (54.05%) male and 17 (45.94%) female was no sensitivity for all aeroallergens. Moreover, 33 (45.20%) of patients with positive tests were in the age group 5-7 years and 23 (31.20%) were in the age group of 8-10 Yrs. Only 17 (23.28%) were found in the age group 2-4 years. The highest prevalence of positive skin reaction was recorded for mite allergens among them *Dermatophytosis pteronyssinus* (50.68%), *D. farinae* (31.50%). **Conclusion:** In children the sensitivity to indoor allergens is more prevalent than sensitivity to outdoor allergens. Sensitivity to pollen was found in older children more than 5 years of age.

Keywords: Allergens, Wheezing, Paediatric population, Dust mites.

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INTRODUCTION

Determining sensitivity to allergens is essential in diagnosing and predicting children with allergic diseases. [1] According to allergen type, sensitization to allergens could be different during a lifetime. Nowadays, sensitization to pollen is increasing in children globally, and pollen allergy is strongly associated with a significant number of hospital visits worldwide. [2]

Meanwhile, chronic cough is defined as a cough that lasts more than four weeks in children. Because chronic cough may be the sole presenting symptom of an underlying chronic respiratory illness in children, it is common reason parents visit respiratory specialists for evaluation for their children. [3] Previous researches suggest that chronic cough in children may often be from allergic diseases, such as asthma and allergic rhinitis (AR), and almost 70% of children with

a chronic cough had used asthma medications. [4] Therefore, children with chronic cough may inappropriately use asthma medications if there is a misdiagnosis. Despite the significance of chronic cough as a possible indicator of allergic disease or chronic lung disease in children, most studies of children examined those who were under four years old or attended child care centers, not school-aged children. Therefore, chronic cough risk factors and etiology in school-aged children remain poorly understood with causative triggers. From these results, we postulate that sensitization to pollen may be related to chronic cough in children. [5,6]

However, to our knowledge, no comprehensive studies to date have assessed a relationship between sensitization to aeroallergen and chronic cough in school-aged children from the general population. Therefore, the purpose of our study was to

shed light on the relationship between sensitization to aeroallergens including pollen, house-dust mite (HDM), and animal dander and chronic cough to use skin prick tests (SPTs) and questionnaires. Also, we identify the relationships to chronic cough with the demographic or environmental characteristics, including gender, allergic comorbidities, family history, and exposure to tobacco smoke and mold, and estimate the prevalence of chronic cough in school-aged children.

Documentation of aeroallergen sensitization is important because of its role in pathogenesis and acute asthma exacerbation. Allergen Immunotherapy can also be instituted based on the allergy skin prick test results.

This study was conducted in view of the crucial importance of aeroallergens in childhood. The purpose of this study was to determine the prevalence of sensitization to common aeroallergens in children with residing in our region and to elucidate the association of aeroallergen sensitization with severity.

MATERIALS AND METHODS

This is prospective and observational study conducted among paediatric population of tertiary care Teaching Hospital over a period of 1 year.

Inclusion criteria

Subjects in the age group of 2 to 10 years of either gender with frequent wheezers (>4 episodes in past one year.

Exclusion criteria

Refusal of guardians to give consent. Demographic or any skin lesions was excluded during the physical check-up before SPT. Subjects with SPT positive to one or more aeroallergens but negative to histamine control also excluded.

Assessment tools

A standardized panel of SPT was performed at the clinic for all patients suspected of sensitization to aeroallergens and included 11 common aeroallergens: timothy grass, birch, poplar, cedar, cat, dog, house dust

mite (*Dermatophagoides pteronyssinus* and *Dermatophagoides farina*), alternaria, aspergillus, hormodendrum, and penicillium. SPTs to other allergens were performed when required by history and included, among others, horse, rabbit, cockroach, other pollens and food extracts, but were not included in the analysis because of the small number of patients tested with each allergen. Allergen extracts for skin tests were purchased from Omega Laboratories Ltd. (Montreal, Canada). Among them, only timothy grass, cat, *Dermatophagoides pteronyssinus* and *Dermatophagoides farina* extracts were standardized.

SPTs were performed by pulmonary function laboratory technicians under the supervision of the clinic allergists using a standardized technique. A drop of each allergen extracts along with a drop from the positive (histamine) and negative (normal saline) controls was applied to the skin and then the skin was punctured through the drop using a standardized lancet. The test was read 15 min later by the technician. A positive test was defined as an induration of at least 3 mm greater than the negative control within 15 min of application of the extract. Atopy was defined as having at least one positive skin test. Mono-sensitization was defined as sensitization to one aeroallergen of the panel of 11, oligo-sensitization as sensitization to 2–3, and poly-sensitization as sensitization to 4 or more aeroallergens.

Statistical methods

Data were analyzed using descriptive statistics using mean and standard deviations (SD) or median and interquartile ranges for continuous data, and proportions and percentages for categorical data.

RESULTS

The total number of the patients included in the study was 110 patients, of the 69 (62.72%) male and 41 (37.27%) female. The study group is divided into three age groups, 2-4 Years (29.09%), 5- 7 Years (44.54%) and 8-10 Years (29.09%). The frequency of each group is shown in Table-1

Table 1: Distribution of Study Subject (N=130)

Variable	Frequency	Percentage (%)
Sex		
Male	69	62.72
Female	41	37.27
Age		
2-4Years	33	29.09
5-7Years	49	44.54
8-10 Years	32	29.09

Table 2: Association of Study Variables and allergen sensitization

Variable	Sensitivity Present		No Sensitivity		χ^2 -Value	p-value
	No.	Percentage (%)	No.	Percentage (%)		
Gender						
Male	41	56.16	20	54.05	0.214	0.475 NS
Female	32	43.83	17	45.94		
Age						
2-4 Years	17	23.28	16	43.24	1.074	0.025 S
5-7 Years	33	45.20	13	35.13		
8-10 Years	23	31.50	08	21.62		

Out of 110 children in the study, 73 children were found sensitive to at least one aeroallergen and 37 were no sensitivity for all aeroallergens. Out of the 41 males (56.16%) and 32 (43.83) female sensitive to at least one of the aeroallergens and 20 (54.05%) male and 17 (45.94%) female was no sensitivity for all

aeroallergens. Moreover, 33 (45.20%) of patients with positive tests were in the age group 5-7 years and 23 (31.20%) were in the age group of 8-10 Yrs. Only 17 (23.28%) were found in the age group 2-4 years in Table 2.

Table 3: Skin sensitivity to allergens

Allergens	No. of Patients	Percentage
D. pteronyssinus	37	50.68
D. farinae	23	31.50
Parthenium hysterophorus	05	6.84
Cockroach	03	4.10
Aspergillus fumigatus	02	2.73
Alternaria alternate	01	1.36
Cat Epithelia	01	1.36
Dog Epithelia	01	1.36

The highest prevalence of positive skin reaction was recorded for mite allergens among them *Dermatophytosis pteronyssinus* (50.68%), *D. farinae* (31.50%), Among Fungi group, *Aspergillus fumigates* (2.73%), *Alternaria alternate* (1.36%), Cat epithelia and Dog epithelia showed positive in 1 (1.36%) case respectively. Among Pollen group *Parthenium hysterophorus* (6.84%). The frequency of positive tests to an individual allergen is depicted in the table 3.

rhinitis children. In our study, we found that the prevalence of sensitizing to cat-dog dander significantly increased. In this regard, we presumed that the descending proportion of House dust mites sensitization may be associated with the ascending trend of sensitization to other allergens, such as cat-dog dander. More data would be needed and a long-term prospective study would be of great importance in revealing reasons behind changes. [14]

DISCUSSION

In the present study, we revealed some interesting changes of the aeroallergens sensitization spectrum in children with Allergic rhinitis. The prevalence of aeroallergens sensitization was steadily increasing in the past decade in India, as reported by others. [8] House dust mites was targeted as the most common aeroallergen for either adult or children Allergic rhinitis in southern India. [9] Located in the subtropical zone and having a hot and humid weather, Guangzhou has provided a perfect environment for House dust mites to raise and reproduce, as high humidity and ambient temperatures were reported to be optimal conditions for House dust mites propagation. Concentration of House dust mites met its peak in August indoors. [10]

Although a slightly decreasing trend was revealed by us in the 10-year observation, House dust mites sensitization still held the majority in Allergic

The significantly increased trend of cat-dog dander suggested that pets' aeroallergens might be a critical factor for prevention and treatment of allergic diseases in the urbanization regions in the future. The reason to that might attribute to the rapid development of economy and changes of lifestyle in recent years, which leads to the process of industrialization and urbanization, especially in regions of southern India. Currently, the proportion of families that chose to keep cats and dogs as pets also raised, largely increasing the risk of exposure to cat-dog dander allergens. [15] Having household pets at home was found to be a risk factor for inducing airway diseases. The more contacts one person has with pet allergens, the more possibility he or she develops a symptom of airway hyper-reactivity. [16] However, the European PASTURE project (Protection against Allergy-Study in Rural Environments) has suggested that pet keeping, especially cats and dogs, in early stage of one's life was inversely related to the development of allergic

symptoms. [17] These contradictory findings suggested that pet allergens sensitization might have a complicated mechanism and affected by multiple factors. [18]

In addition, age was also found to affect the distribution of allergens sensitization. Boulet et al had suggested that the sensitization of all allergens tended to increase and reached its highest degree in young adults. [19] Sensitization to other allergens in our study except for House dust mites and cockroach showed no significant difference as age increased. The reason to that remained unclear. More cases from different medical centers were needed in our future study to find out the relationship between age and the prevalence of aeroallergen sensitization. [20,21]

Due to the imperfect family doctor system, patients who developed symptoms tended to visit a first-class hospital for getting more accurate diagnosis and better therapeutic options in India. Thus, the patients enrolled in our study had a relatively high representation of the general population with nasal hyper-reactivity in India. Yet, based on the fact that our study was a single-center study, more caution should be paid before applying our findings to children with Allergic rhinitis in other regions. Furthermore, as a retrospective study focusing mostly on the positive rates of serum sIgE, the degree of severity of the patients' disease and their exposure to allergen were not considered in this study.

CONCLUSION

The sensitivity to aeroallergens increases with age. In children the sensitivity to indoor allergens is more prevalent than sensitivity to outdoor allergens. Sensitivity to pollen was found in older children more than 5 years of age. Furthermore, this study may also be helpful in controlling or avoiding allergens causing allergic disease.

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