

ORIGINAL ARTICLE

Year : 2020 | Volume : 34 | Issue : 1 | Page : 39--42

Sensitization to indoor allergens in children with bronchial asthma

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Abstract

BACKGROUND: Children with asthma have a high prevalence of environmental allergies. Sensitization to various allergens, especially to indoor allergens is crucial for effective measures for asthma management. Indian data on allergic sensitization in children is scarce, necessitating the need of the study. **METHODS:** A Cross-sectional study was conducted to determine the indoor allergen sensitization in 100 asthmatic children aged 5 to 15 yrs. They underwent skin prick test for indoor allergen house dust mite cockroach, cat, dog dander, house fly, candida, aspergillus, and mosquito. **RESULTS:** In the study sensitization to house dust mite was 93%. 39% were sensitized to Candida 36% to cockroach, 23% housefly and 22% to dog dander and Aspergillus and 13% to mosquito and cat dander. Allergen sensitivity rate for atleast one allergen was 94% which was significant. Mean No. of allergens for which sensitization was seen is 2.57 ± 1.77 . Comorbidities were present in 35% of cases. 7% had urticarial and allergic conjunctivitis each. **CONCLUSION:** Asthmatic children showed high sensitization to indoor allergen and the most common allergen found was house dust mite

How to cite this article:

Chauhan K, Srivastava S, Prasad R. Sensitization to indoor allergens in children with bronchial asthma. Indian J Allergy Asthma Immunol 2020;34:39-42

How to cite this URL:

Chauhan K, Srivastava S, Prasad R. Sensitization to indoor allergens in children with bronchial asthma. Indian J Allergy Asthma Immunol [serial online] 2020 [cited 2020 Aug 1];34:39-42

Available from: <http://www.ijaai.in/text.asp?2020/34/1/39/289058>

Full Text

Introduction

Asthma is a chronic inflammatory disease of the airways, characterized by airway hyper-responsiveness which is an exaggerated airway-narrowing response to triggers, such as allergens and exercise. It leads to the recurrent symptoms such as wheezing, dyspnea chest tightness, and coughing. Symptom episodes are associated with widespread, but variable, airflow obstruction within the lungs that is usually reversible with appropriate asthma treatment.[1] The prevalence of asthma and allergy in children is showing an increasing trend throughout the world for the past few decades. The findings of the International Study of Asthma and Allergies in Childhood have shown wide variations in the prevalence of symptoms of asthma, allergic rhinitis, and conjunctivitis across the world. Various studies from India have reported a prevalence of asthma varying from 3.5% to 29.5%.[2],[3],[4] The higher susceptibility of children in the urban environment to asthma is due to the higher exposure to various indoor allergens[5] and an early sensitization to them.[6],[7] Sources of indoor allergens include house dust mite (HDM), cockroaches, cat, dog, house fly, fungi, molds, etc., which are the risk factors in the pathogenesis of asthma.[8],[9] Sensitization to some common household allergens include dust mite,[10],[11] cat, and cockroach. HDM is a cosmopolitan pyroglyphidae that lives in human habitation. These small arthropods feed on human skin scales and are found in beds, mattresses, carpets, and furniture, which are sensitive to low humidity and extreme temperature.[12],[13] In children, higher cockroach allergen exposure in bedrooms is associated with an increased likelihood of positive cockroach skin test response.[9],[11]

The cat allergen is found in saliva, skin, and fur; this allergen can also readily be carried into homes without cats on clothes and shoes and may persist for some days, thus it is not easy to completely get rid of this allergen.[14] Sensitization to household and indoor allergens in children between 5 and 15 years is a modifiable risk factor. Early sensitization to HDM as early as in the 1st months of life, leads to asthma in children later.[15]

Documentation of sensitization is crucial to enable effective implementation of measures to prevent asthma. Sensitization profile among children can be assessed by skin-prick test which is a gold standard. Many studies showing allergen sensitization among children with asthma worldwide. However, there are few such studies from India; hence, we planned to assess indoor allergen sensitization in children with asthma.

Materials and Methods

A cross-sectional study was done after the institutional ethical clearance and written informed consent from the parents in asthma and allergy clinic of a teaching hospital. Children aged 5–15 years and known case of bronchial asthma were included. Children on oral steroid therapy and immunosuppressants, with severe acute malnutrition, having acute exacerbation, and lower respiratory tract infections were excluded. Those on antihistaminic medications (if any) were asked to withhold for 72 h. Inhalers/intranasal medications were continued.

Skin-prick testing (SPT) was performed by standardized allergens from Merck Specialties Pvt. Ltd., Mumbai. SPT was done on the volar surface of forearm.[11] Skin was cleaned with alcohol and allowed to dry.[11] Histamine acid phosphate, glycerinated-buffered saline, and allergens extracts are placed at 2 cm apart to avoid false-positive results and each one was numbered with gel pen. Prick through the drop of allergen done without inducing bleeding. A new lancet was utilized for each allergen.

The results of skin-prick test examined after 15 min. It was considered positive when wheal size is >3 mm in diameter and negative if wheal size is <3 mm.[11] It is measured with a standardized skin testing reaction gauge. The results are observed and noted by the primary investigator and he supervisor.

Statistical analysis

Sample size has been calculated using the following formula:

[INLINE:1]

Z is the constant with the value of 1.96 at 95% confidence and 80% power of the study.

The results are presented in frequencies, percentages, and mean $\pm$ standard deviation. The Chi-square test was used to compare the categorical variables. $P < 0.05$ was considered statistically significant. All the analysis was carried out using SPSS (Statistical Package for Social Sciences, IBM, SPSS Statistics, USA) Version 20.0 statistical Analysis Software.

Results

During the study period, 100 children were recruited. The mean age of children was 9.41 ± 3.10 [Table 1]. There were no significant differences in the sensitization pattern according to gender and place of residence [Table 2] and [Table 3]. In children, 43% had partially controlled asthma and 33% had well controlled, 24% had uncontrolled asthma. Comorbidities were present in 35% of cases. Seven percent had urticaria and allergic conjunctivitis each. Ninety-three percent sensitization was observed for HDM, 39% for Candida 36% for cockroach, 23% for house fly, 22% for dog dander, and Aspergillus, respectively, 13% for mosquito and cat dander, respectively [Table 4]. Overall, allergen positivity rate (at least against one allergen) was 94% in asthmatics [Table 5]. Mean No. of allergens for which sensitization was seen was 2.57 ± 1.77 . {Table 1}{Table 2}{Table 3}{Table 4}{Table 5}

Discussion

In our study, sensitization to indoor allergens was present in asthmatic children. Maximum sensitization was observed against HDM (93%) followed by Candida (39%), cockroach (36%), house fly (23%), dog dander and Aspergillus (22% each), mosquito (13%), and cat dander (13%), respectively. Sensitization to HDM was high in infants with allergic disorders. Children with positive skin-prick test are at a higher risk of development of asthma than those with negative test.[16] In our study, 54% of children were aged between 5 and 9 years, and mean age of was 9.40 ± 3.10 years, 68% were males. Among some Similar study done by Alkhater (2017) in asthmatic children in Saudi Arabia, with similar demographic profile. Lucknow being a highly populated with increasing urbanization and temperature being humid could have an effect on sensitization to the indoor allergens.

Comorbid conditions (allergic rhinitis and allergic dermatitis) were present in 35% of cases and urticaria and allergic conjunctivitis were present in 7% asthmatics each. Coexisting comorbid conditions were quite common in children with bronchial asthma. Surdu et al.[17] in their study reported the presence of comorbidities in 64.3% cases. Beck Af et al[18] too found comorbidities like allergic rhinitis in 63.6% of their study sample. The possible reason for high sensitization to the indoor allergens could be the level of exposure to the allergens due to place of residence being a highly populated and humid. McHugh and MacGinnitie too in their study evaluated sensitization against cockroaches/mice, dogs, cats, and dust mites and found the odds of asthma as well as eczema to be higher in cases showing any positive skin test (odd's ratio (OR) ranging from 1.4 to 1.5). Mere increase in number of allergens being tested does not increase the chances of overall allergen sensitization (at least one positive).

In present study, the proportion of those two or more allergen sensitization rates was 67%. Mean allergen sensitization frequency was 2.57 ± 1.77 . Multiple allergen sensitization is a common phenomenon among asthma cases. We found 27% positivity for at least one allergen while maximum positivity for three or more allergens was 40%. This knowledge regarding the common indoor allergens could alter the progression and achieve better asthma control. The present study also highlighted the need to understand the allergen sensitization pattern in the local context. Further studies that include more variables such as duration of exposure to different allergens and allergens sensitization on a larger sample size are needed.

Conclusion

Asthmatic children have a high sensitivity toward different indoor allergens. HDM, Candida, and cockroach were the most common allergens.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Saturday, August 1, 2020

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