

Sensitization to Aeroallergens in Preschool Children with Respiratory Problems in Ankara, Turkey

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Abstract

Background: It is known that allergic sensitization is the most important risk factor in children for asthma as well as for rhinitis. It is likely that subjects genetically prone to sensitization require prolonged exposure to an allergen for development of symptoms of respiratory allergy. **Objective:** We examined the sensitization profile among preschool-aged children living in or nearby Ankara for at least six months. **Methods:** Our study group was comprised of all pediatric patients referred for respiratory symptoms to our outpatient department between May 2003 and May 2005. Among the 2680 patients referred who were under five years of age, we found 1480 patients who had a history of recurrent wheezing within this study population. We included 588 preschool-aged children with aeroallergen sensitization on skin prick tests (SPT) in this analysis. **Results:** Allergy to house dust mites (HDM, 46.3%) was the most prevalent sensitization, followed by allergy to pollens, *Alternaria*, cockroach and cats (29.9%, 7.9%, 2.8% and 1.6%, respectively) in the entire population. Among our patients, 58.1% had monoallergy and 41.9% had allergy to two or more allergens on SPT. Monosensitization rates in children with asthma, asthma with rhinitis and rhinitis were found as 79.1%, 14.1% and 6.7%, respectively. **Conclusion:** For preschool-aged children in this region, the most common allergen is HDM and the major allergen related to asthma is *Alternaria*. Our study may suggest that allergic airway inflammation starts at a very early stage in childhood asthma.

Keywords: preschool age, atopy, asthma, skin prick test

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Atopy is defined as the genetic propensity to develop immunoglobulin (Ig) E antibodies in response to exposure to allergens and may be assessed by skin prick test (SPT) response to common allergens [1,2]. Atopic diseases are complex and multifactorial since their development and phenotypic expression depend on interaction between genetic factors, environmental exposure to allergens and nonspecific adjuvant factors. Environmental aeroallergens may trigger IgE-mediated allergic inflammation at nasal and bronchial mucosa and eventually may lead to the development of allergic rhinitis and asthma [3]. It is known that allergic sensitization is the most important risk factor

in children for asthma as well as for rhinitis [4]. It is likely that subjects genetically prone to sensitization require prolonged exposure to an allergen for development of symptoms of respiratory allergy. The majority of children who become sensitized to aeroallergens during the first three years of life develop asthma later in life, whereas the risk of developing asthma in children who become sensitized to common aeroallergens after the age of 8-10 years is not much higher than that of children who do not become sensitized [5]. We had reported for the first time results of allergic sensitization in school-aged children between 6-16 years of age living in Ankara who had respiratory complaints [6]. To date, there has been no study on sensitization and respiratory disease in Turkish preschool-aged children in our region. Therefore, in the present study, we made a retrospective analysis of the sensitization profile among preschool-aged children living in or nearby Ankara for at least six months.

METHODS

Subjects

Our study group was comprised of all pediatric patients referred for respiratory symptoms to our outpatient department at Gazi University Hospital Pediatric Allergy and Asthma Department between May 2003 and May 2005. Among the 2680 patients referred who were under five years of age, we identified 1480 patients who had a history of recurrent respiratory symptoms. Children with wheezing due to cow milk allergy, cystic fibrosis, and bronchopulmonary dysplasia were excluded. We included 588 of 1480 young children with aeroallergen sensitization on SPT in the final analysis. The children who fulfilled "asthma predictive index" were defined as asthma [7]. Allergic rhinitis was diagnosed with aeroallergen sensitization on SPT together with suitable nasal and/or eye symptoms.

Skin prick tests (SPT)

Skin prick tests (SPT) were performed on the back in preschool-aged children using standard skin prick meth-

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Table 1. Demographic and clinical characteristics of young children with respiratory diseases compared to allergic factors

	All patients n=588		Asthma n= 436		Asthma + allergic rhinitis n=116		Allergic rhinitis n=36	
	n	%	n	%	n	%	n	%
Girls	305	51.8	225	51.6	63	54.3	17	47.2
Age (months)	28.3±16		26.7±15.8		35.9±15.4		41.2±14.8	
Postnatal tobacco exposure	225	38.2	174	39.9	40	34.4	11	30.5
Family history	235	39.9	175	40.1	45	38.7	15	41.6
Atopic dermatitis	153	26.0	109	25.2	37	32.7	7	19.4
Sensitized to one allergen	177	30.1	140	79.0	25	14.1	12	6.7
Grass	53	29.9	44	83.0	6	11.3	3	
Cereals	9	5.0	3		4		2	
Weed	8	4.5	2		4		2	
Tree	3	1.6	0		2		1	
House-dust mite	82	46.3*	72	87.8	6	7.3	4	
<i>Alternaria</i>	14	7.9	13	92.8**	1		0	
Cockroach	5	2.8	4		1		0	
Cat	3	1.6	2		1		0	

*p= 0.026 when compared with the sensitized to one allergen children, **p= 0.014 when compared with the asthma group, Data is presented as mean±standard deviation

od. The tests were carried out with standardized allergen extracts against the following eight most common aeroallergens: house dust mites (HDM) (*Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*), grass mix, weed mix, cereal mix, tree mix, cockroach, *Alternaria*, and cat (Stallergens, France). Histamine hydrochloride 10 mg/ml and allergen diluents were used as positive and negative controls, respectively. The allergen panel used for SPT was not changed throughout the study period. A mean wheal diameter of at least 3 mm greater than that of the negative control was considered positive. Any child with such a response to one or more allergens was defined as atopic.

Statistical analysis

Data were analyzed using SPSS 11.5 program. Continuous variables were presented as mean ± standard deviation. Categorical variables were shown using percentages. The distribution of monosensitization was compared using chi-square test among different groups and by McNemar test within the same group. A p value of less than 0.05 was considered statistically significant.

RESULTS

Five hundred and eighty-eight young children with recurrent respiratory problems who had a positive skin prick

response were evaluated retrospectively. Of these patients, 305 (51.8%) were girls and 283 (48.2%) were boys (Table 1). The age of the patients ranged between 1-60 months (mean 28.3± 16.1 months). Four hundred and thirty-six (74.1%) patients had asthma, 36 (6.1%) had allergic rhinitis, and 116 (19.7%) had allergic rhinitis with asthma. The mean age of children diagnosed as asthma was lower than that of children with rhinitis with or without asthma.

The prevalence of different aeroallergen sensitizations in the whole study population and in each diagnostic group is illustrated in Table 1. Allergy to HDM (46.3%) was the most prevalent sensitization, followed by allergy to grass pollens, *Alternaria*, cockroach and cat dander (29.9%, 7.9%, 2.8% and 1.6%, respectively) among the 588 young children (Figure 1). Among our patients, 30.1% had sensitization to one aeroallergen and 69.9% had allergy to two or more allergens on SPT. The rates of children sensitized to one allergen with asthma, asthma concomitant with rhinitis and only allergic rhinitis were found as 79.1%, 14.1% and 6.7%, respectively. Polysensitization was found in 69.9% of children in the analysis and was more common in children with allergic rhinitis with or without asthma. There were no children sensitized to more than four aeroallergens, but 148 (25.1%) children were found

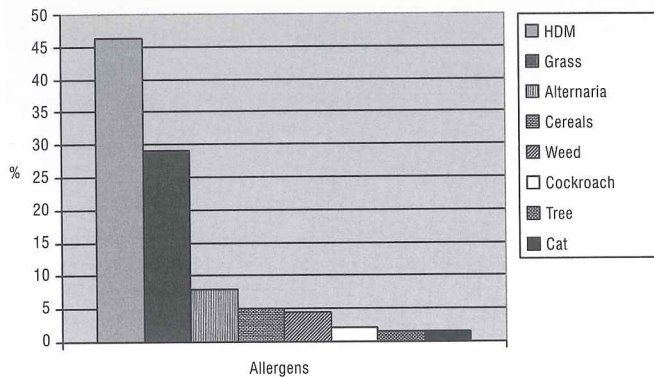


Figure 1. Epidermal skin test results in the preschool children with respiratory problems (HDM:House dust mite).

to have atopy to four aeroallergens on SPT. There were 136 (23.1%) and 127 (21.5%) children sensitized to three and two aeroallergens, respectively.

When we analyzed the sensitization to one allergen in the different diagnostic groups, sensitization to *Alternaria* was found in only asthmatic children (92.8%). Sensitization to HDM, grass pollen, cereals, weed, cockroach and cat were found as 87.8%, 83.0%, 33.3%, 25.0%, 80.0%, and 66.6%, respectively, in the asthmatic group (Table 1). Pollens were the most common allergens on SPT in children with rhinitis with or without asthma.

DISCUSSION

This retrospective analysis demonstrated that aeroallergen sensitization was found in more than one third of young children with recurrent respiratory symptoms (588/1480) referred to a tertiary allergy clinic. Interestingly, polysensitization was more frequent than monosensitization (69.9% vs 30.1%) among atopic children less than five years old. The most frequent aeroallergen detected by SPT was HDM. Asthma was the most frequent diagnosis among aeroallergen-sensitized infants and young children with recurrent respiratory symptoms. Sensitization to *Alternaria* was found in only asthmatic children.

Age-dependent tendency to acquire aeroallergen sensitization is a well-known phenomenon. In epidemiologic studies, the rate of aeroallergen sensitization was reported between 22.1-74% among young children with recurrent respiratory symptoms [8-12]. Clinical studies also report more or less similar results to those of epidemiologic studies considering the aeroallergen sensitization in infants and children with recurrent wheezing [2,13-15]. In one of these studies, Silvestri et al. found that 29.8% of children aged 5 months to 4 years with respiratory symptoms had at least one positive skin prick response to the four most common classes of airborne allergens [14]. In another study, 88 out of 196 (45%) infants and children with a diagnosis of

infantile asthma had skin prick positivity to one of the inhalant allergens [15]. In accord with these results, we also determined that 38.8% of children aged less than five years with recurrent respiratory symptoms had sensitization to one of the aeroallergens on SPT, and most of the sensitized children belonged to the asthma group (93.8%).

The effect of environmental factors on the development of atopic sensitization cannot be underestimated, as the prevalence of monosensitization tends to decrease while that of polysensitization increases over time. Therefore, sensitization to one allergen is usually more common in the young ages [14]. In Silvestri's study, the authors reported that the rates of mono- and polysensitization among children 5 months to 4 years of age with respiratory symptoms were 63% and 37%, respectively. Although the prevalence of polysensitization also increased with age among our patients aged between 1-60 months, the rate of polysensitization was still higher than that of monosensitization. This result is difficult to explain; however, it may be due to different factors: genetic propensity of our study population that may be more prone to multiple allergen sensitization, or environmental factors of our region with its great variety of plants.

Epidemiological studies have demonstrated that indoor aeroallergens, especially HDM, are the most commonly demonstrated in both young children with recurrent respiratory problems and those with asthma [16,17]. Vargas et al. showed that a total of 29% of the children aged 1 to 3 years with asthma had a positive skin test result to HDM [9]. In another study, sensitization to HDM was reported in 24.3% of children aged 5 months-4 years with atopic asthma [14]. We also identified HDM as the most frequent aeroallergen (46.3%) among children aged 1-60 months with recurrent respiratory symptoms. In our analysis, when monosensitization was considered, *Alternaria* was found as the most frequent sensitization among asthmatic children followed by HDM (92.8% and 87.8%, respectively). In a longitudinal birth cohort study (Tucson), sensitization to *Alternaria* was shown to be associated with both the presence and new onset of asthma. *Alternaria* is both an indoor and outdoor aeroallergen and the prevalence of sensitization to *Alternaria* appears to vary with climate. Peat et al. examined sensitivity to *Alternaria* in different climatic regions of Australia and demonstrated that in the less humid interior portions of the country, sensitivity to *Alternaria* was more likely to be associated with asthma than sensitivity to HDM [18]. Our region is far from the sea and the less humid central portion of Anatolia, which may explain why we found *Alternaria* as the most frequent allergen among asthmatic young children in our analysis.

Sensitization to outdoor allergens appears to be less common among young children [19]. Among our young children with recurrent respiratory symptoms, grass pollen was found as the second most frequent allergen (29.9%) after HDM. This result may be explained by higher exposure to indoor rather than outdoor allergens in younger ages. Other less frequently detected aeroallergens in our analysis were cockroach and cat (2.8% and 1.6%, respectively). Children from low socioeconomic background were found to be at a four-fold risk of being exposed to cockroach allergen in their bedrooms compared with the children from middle- or high-income families [20-22]. Although individual measures of socioeconomic status were not investigated in our study, all children were living in Ankara, the capital of Turkey, with a well-known characteristic of habitants as mostly employed and covered under the social security system. Cat sensitivity was reported between 13.8% [15] to 22.2% [14] in young asthmatic children in western countries. It was found as 10.2% in a recent study conducted among children 2-16 years of age with asthma in Ankara [23]. In our analysis, sensitivity to cat dander was much less frequent (1.6%). Two factors might have influenced this result: the first is the low incidence of domestic pets in Turkey and the second is the low rate of skin reactivity among preschool children [24].

There is only limited data about the prevalence rate of allergic rhinitis in young children. This is because allergic rhinitis presents several diagnostic challenges, especially in young children. In one epidemiologic study, the prevalence of doctor-diagnosed allergic rhinitis was found as 4% among 1121 children aged between 3-5 years [25]. In the present analysis, 6.1% of the children had a diagnosis of allergic rhinitis. Although our study is not epidemiologic, we believe that this analysis contributes to the knowledge about the allergic rhinitis prevalence in this age group. Clinical studies report the prevalence of rhinitis concomitant with asthma as between 19-94% of school-aged children [26,27]. This comorbidity is especially important in the young age group, in which doctor-diagnosed allergic rhinitis is considered as one of the minor criteria in predicting asthma [7]. In our analysis, we found that more than one-fifth of asthmatic children aged between 1-60 months had concomitant allergic rhinitis.

Our study included the first SPT findings in young children with respiratory diseases (asthma and/or rhinitis) in Ankara, Turkey. In our region, the most common allergen is HDM and the major allergen related to asthma is *Alternaria* in young children. Our study may suggest that allergic airway inflammation starts at a very early stage in childhood asthma. Although skin reactivity is lower in

young versus older children, SPTs in this young age group are reasonably reliable not only to confirm children with asthma but also to guide their treatment.

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