

# Prevalence and Comorbidity of Allergic Eczema, Rhinitis, and Asthma in a City in Western Turkey

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## ■ Abstract

*Background:* Allergic diseases co-occur in many patients. There is no published population-based epidemiologic study about allergic diseases in Turkey.

*Objective:* The aim of this population-based study was to investigate the prevalence of allergic eczema, allergic rhinitis, and asthma and their co-occurrence in Manisa.

*Methods:* The sample size was calculated using an estimated prevalence of ever wheezing for the analyzed age group. Interviews were conducted with 725 children. The survey instrument consisted of a set of sociodemographic questions plus the questionnaire of the International Study of Asthma and Allergies in Childhood.

*Results:* The mean (SD) age of the children studied was 8.94 (5.16) years. The prevalence of ever having allergic eczema was 4.7% whereas that of current allergic eczema was 3.2%. Current allergic rhinitis and allergic conjunctivitis were present in 14.5% and 13%, respectively. Asthma was reported in 14.7% of the children older than 3 years of age while the prevalence of physician-diagnosed asthma was 7.9%. The burden of allergy was 27.1%. The prevalence of concomitant eczema and rhinitis was 1.9%. Among children aged between 3 and 17 years, 1.5% and 4.7% had asthma along with eczema and rhinitis respectively. Asthma was significantly more common in children with rhinitis (31.5% vs 11.8%;  $P < .01$ ; odds ratio [OR], 3.45). Asthma was diagnosed in 28.1% of children with eczema and 14% of children without eczema ( $P = .03$ ; OR, 2.41).

*Conclusions:* Atopic diseases seem to significantly increase the risk of developing another atopic disease with ORs that range from 2.4 to 3.4.

**Key words:** Allergic eczema. Allergic rhinitis. Asthma. Prevalence. Comorbidity.

## ■ Resumen

*Antecedentes:* En muchos pacientes se da la coexistencia de diferentes enfermedades alérgicas. En Turquía no existen estudios epidemiológicos de población publicados sobre las enfermedades alérgicas.

*Objetivo:* La finalidad de este estudio de población es estudiar la prevalencia del eccema alérgico, la rinitis alérgica y el asma, y su coexistencia en Manisa.

*Métodos:* El tamaño de la muestra se calculó utilizando una prevalencia aproximada de sibilancia recurrente para el grupo de edad examinado. Se entrevistó a 725 niños. El instrumento de la encuesta constó de un conjunto de cuestiones sociodemográficas, además del cuestionario del Estudio Internacional del Asma y Alergias en la Infancia.

*Resultados:* la media (DE) de edad de los niños examinados fue de 8,94 (5,16) años. La prevalencia de haber tenido eccema alérgico alguna vez fue del 4,7 %, mientras que la de presentar eccema alérgico en el momento de la encuesta fue del 3,2 %. La rinitis alérgica y la conjuntivitis alérgica en el momento de la encuesta estuvieron presentes en un 14,5 % y un 13 %, respectivamente. El asma se observó en el 14,7 % de los niños mayores de 3 años de edad, mientras que la prevalencia del asma diagnosticada por un médico fue del 7,9 %. La carga alérgica fue del 27,1 %. La prevalencia del eccema y la rinitis concomitantes fue del 1,9 %. Entre los niños con edades comprendidas entre los 3 y 17 años, el 1,5 % y el 4,7 % presentaban asma junto con eccema y rinitis, respectivamente. El asma fue significativamente más frecuente en niños con rinitis (31,5 % frente a 11,8 %;  $P < 0,01$ ; cociente de posibilidades [CP], 3,45). Se diagnosticó asma al 28,1 % de los niños con eccema y al 14 % de los niños sin eccema ( $P = 0,03$ ; CP, 2,41).

*Conclusiones:* Parece que las enfermedades atópicas aumentan significativamente el riesgo de desarrollar otra enfermedad atópica, con unos cocientes de posibilidades que van de 2,4 a 3,4.

*Palabras clave:* Eccema alérgico. Rinitis alérgica. Asma. Prevalencia. Comorbilidad.

## Introduction

Allergy is a systemic inflammatory phenomenon leading to many diseases that affect various tissues or organs, resulting especially in such diseases as atopic dermatitis, allergic rhinitis, asthma, and food allergy [1]. Allergic diseases are the most common chronic childhood disorders and they continue to increase in frequency [2], affecting general medical and pediatric practice as well as the socioeconomic status of populations and families. It has been suggested that the progression of clinical signs of allergic eczema, asthma, and allergic rhinitis follow each other in time and may co-occur [1,3]. Generally allergic eczema is the first manifestation of atopic sensitization, appearing mostly during the first year of life, while allergic rhinitis does not usually manifest until the age of 2 years [4,5]. It is widely accepted that eczema, rhinitis, and asthma are major allergic syndromes in childhood and that comorbidity is observed [6]. Allergic rhinitis has been found in 75% of patients with atopic asthma [3]. This comorbidity has been attributed to a common mechanism of altered immunologic mechanisms favoring a systemic response of type 2 helper T cell cytokines to environmental allergens [7].

The International Study of Asthma and Allergies in Childhood (ISAAC) has provided a questionnaire that is now widely used in epidemiologic surveys of allergies around the world [8-11]. Determining the epidemiology of allergic diseases allows for evaluation of trends and risk factors which may contribute to studies of pathogenesis. There is no published population-based epidemiologic study on this issue for Turkey though there are many epidemiologic studies performed in samples of school children and of different occupational groups [2,11,12].

The aim of this population-based study was to investigate the prevalence of allergic eczema, rhinitis, and asthma and their co-occurrence in Manisa, a city in western Turkey.

## Methods

### *Study Sample and Sampling Method*

The study was conducted in Manisa, a city located in the mountains of the Aegean region of Turkey. The mid-year census of Manisa for 2000 indicated the city had 218314 inhabitants.

The primary health care system of Turkey distributes the total population into health center districts. Each health care center updates records every June by means of house visits (annual census). This allows representative sampling for population studies. A health center district is also further

divided into a number of "midwife subdistricts," each of which has a population of 2000 to 3000 inhabitants.

The sample size was calculated using an estimated prevalence of 20% for ever wheezing for the analyzed age group. A 95% confidence interval (CI), a precision of 4.0% and a design effect of 2 were used. The minimum sample size required was calculated to be 768 individuals. According to the records of health care centers, that sample size meant that the number of households sampled would be approximately 630.

A sampling approach of probability proportional to size was used in the selection of the study sample. Sampling was undertaken in 3 stages. The sampling units of the first stage were districts that differed in population size. The frame for selection of the primary sampling units included the population records of 9 health center districts. The second stage of selection involved the list of midwife subdistricts (n=82). The sample was allocated to 63 clusters of 10 households per cluster. In the third stage of sample selection, each midwife subdistricts was allocated a number of clusters in proportion to its population. The initial households of each of the clusters were chosen at random, and the rest of the households were determined systematically. All children under the age of 17 years who were present in the household on the night before the interview were eligible for this study. Of the 630 selected households, 8.6% (n=54) were considered unoccupied; 2.7% (n=17) of the study group refused the interview.

The definition of asthmatic child required the child to be over 3 years old (n=619) whereas the entire sample (n=725) was included in the analysis when asthma was not involved.

### *Data Collection*

Data was collected from 559 households and complete interviews were conducted for 725 children younger than 17 years of age. Data was collected in face-to-face interviews by pediatricians trained in the use of the questionnaire, which consisted of sociodemographic questions (sex, birth date, gestational age, type of labor, health problems in the first few days after birth, duration of breastfeeding if given) plus the ISAAC questionnaire on allergic rhinitis, eczema and asthma. The questionnaire had been translated into Turkish and terminology was described in detail by physicians.

### *Definitions*

Current allergic rhinitis was defined by sneezing or nasal blockage during the last 12 months at a time when the child did not have a cold or the flu. Allergic eczema was defined by itching longer than 6 months. Current allergic eczema was indicated by itching during the last 12 months and asthma was either doctor-diagnosed disease and/or wheezing during the last 12 months in patients above 3 years of age.

## Statistics

Data was analyzed with SPSS for Windows, version 13.0. The  $\chi^2$  test was used for statistical comparisons of the prevalences of asthma as well as of the prevalences of co-occurrence of allergic rhinitis, asthma or allergic eczema ever in different age groups. The value of  $P$  for trend was used for comparison of frequencies of allergic eczema and rhinitis among different age groups. Crude odds ratios (ORs) and 95% CIs were also calculated to evaluate the relationship between allergic rhinitis, eczema and asthma.

## Results

The characteristics of the study population are shown in Table 1. The prevalence rates of atopic eczema, allergic rhinitis, and asthma are shown in Table 2. When examined in different age groups, both allergic eczema ever and current rhinitis were most prevalent in children over 6 years old. The frequencies were higher in females for both diseases among children aged above 3 years. Among children aged above 3 years, current wheezing was present in 11.1%, exercise induced wheezing in 7.1%, and nighttime symptoms in 5%.

The prevalence of any of the 3 atopic diseases, constituting the burden of allergy in children over the age of 3 years, was 27.1% (20% of children between 3 and 6 years old and 29.2% of children over the age of 6 years;  $P = .03$ ,  $\chi^2$  test). All 3 allergic diseases were present in 0.8% of the children, all of them over the age of 6 years. Asthma was present with eczema in 1.5% of the children and with rhinitis in 4.7% of children aged between 6 and 17 years. Allergic eczema and rhinitis were both present in 1.9% of the children younger than 17 years of age.

Asthma was more common in children with allergic rhinitis (31.5%) than in those without rhinitis (11.8%), and the difference was significant ( $P < .01$ ; OR, 3.45; 95% CI, 2.06-5.76). Similarly, allergic eczema posed a significant risk for development of asthma since 28.1% of children with eczema had asthma compared to 14% of children without eczema ( $P = .03$ ; OR, 2.41; 95% CI, 1.07-5.39). Similarly, the

Table 1. Characteristics of the Study Population (n = 725)

Characteristics	Percentage
Age, y	
0-3	14.6
3.1-6	19.3
≥ 6.1	66.1
Sex	
Male	51.4
Female	48.6
Residence	
Urban	54.9
Suburban	45.1
Mother's educational level	
No school diploma <sup>a</sup>	29.7
Primary or middle school <sup>b</sup>	57.8
High school and over	12.6

<sup>a</sup> This category included mothers who might be either literate or illiterate but who had not formally graduated from a school.

<sup>b</sup> This category included mothers who graduated with either 5 or 8 years of formal schooling.

prevalence of either asthma or allergic rhinitis was significantly higher in children with eczema (56.3% vs 23.2% of those without eczema;  $P < .01$ ; OR, 4.26; 95% CI, 2.06-8.79).

## Discussion

The prevalence of allergic eczema among school children ranges from 3.5% to 7.8% in different parts of Turkey [12,13], consistent with our finding of eczema in 4.7% of our sample, even though our study was a population-based study of children aged younger than 17 years. The prevalence of eczema was considerably lower in our population than in American

Table 2. Prevalence of Allergic Eczema Ever, Current Allergic Rhinitis and Asthma by Age and Gender.

	Allergic Eczema Ever		Allergic Rhinitis		Asthma	
	No. of Patients (%)	$P$	No. of Patients (%)	$P$	No. of Patients (%)	$P$
Age groups						
< 3 y	2/106 (1.9)		13/106 (12.3)		—	
3-6 y	5/140 (3.6) <sup>a</sup>	.07 <sup>a</sup>	12/140 (8.6)	.06 <sup>a</sup>	16/140 (11.4)	.28 <sup>b</sup>
>6 y	27/479 (5.6)		80/479 (16.7)		75/479 (15.7)	
Sex						
Male	13/373 (3.5)	.16 <sup>b</sup>	50/373 (13.4)	.40 <sup>b</sup>	56/327 (17.1)	.09 <sup>b</sup>
Female	21/352 (6.0)		55/352 (15.6)		35/292 (12.0)	
Total	34/725 (4.7)		105/725 (14.5)		91/619 (14.7)	

<sup>a</sup> Age-group comparisons,  $P$  for trend.

<sup>b</sup>  $\chi^2$  test.

children [9] or Dutch adolescents [14], in which populations the rates have been reported to be 17.2% and 37.1%, respectively. The prevalence we found was also lower than the rate of 20% reported for children aged 1 year in the United Kingdom [1], the rate of 11.7% among French adults [10], or the rate of 30.7% among school-aged children in Hong Kong [15]. The prevalence of physician-diagnosed eczema in school children in Ankara, Turkey, has been reported as 3.4% [11] and that rate is close to our results. In our study, eczema was more common in girls, whereas a Swiss study reported a higher prevalence in boys (15.2%) than in girls (14.9%) in 2001 [16].

The prevalence of current rhinitis was higher in our study, at 14.5%, than the cumulative prevalence reported from a different region of Turkey [13]. This may be attributed to regional differences and to the fact that the cited study was performed in school children only. However, the prevalence of rhinitis we observed was significantly lower than the rate reported for school children in Hong Kong and Taiwan (37.4% and 43.6%, respectively) [8,10]. The prevalence of current rhinitis reported for school children in Ankara (30.6%) [11] is also quite higher than the prevalence in our study population. This may be attributed to regional variation since Ankara is located in the middle of Turkey and to the difference in the method of sampling. Girls were found to have higher frequencies of current rhinitis when compared to boys, a finding which was different from that of a study performed in Taiwan in which rhinitis was more common in boys [8].

Previous studies from different parts of Turkey report frequencies of 7.5% to 14.7% for asthma [12,13,17]. The prevalence of asthma in a study of French adults was 13.3% [15], a rate that was similar to the prevalence of our population (14.7%). The much lower prevalence of 7.9% reported for school aged children in Hong Kong [10], however, was the same as the physician-diagnosed asthma prevalence in our population. In a study performed in Taiwan, the prevalence of asthma ever was reported to be 17.2% in children aged 13-14 years old [8], and that rate was similar to our findings. In our study, both allergic eczema ever and current allergic rhinitis were more common in girls, whereas asthma was more common in boys. This finding was different from the study in Taiwan in which a higher prevalence was found in boys [8].

Children with eczema have been reported to have asthma or rhinitis frequently, at rates as high as 34.1% and 57.6%, respectively [5]. In a study that followed 94 children with atopic dermatitis, it was found that rhinitis and asthma developed in 43% and 45%, respectively [18]. In a study from southeast Turkey, 21% of children who visited a hospital with asthma were reported to have allergic eczema [19]. In a French study of adults, having eczema increased the risk of having concurrent asthma and rhinitis, as demonstrated by ORs of 0.72 and 0.24 respectively [15]. In our study, the co-occurrence of ever having had allergic eczema was associated with asthma in 28.1% of cases and with asthma or rhinitis in 56.3%, as indicated by ORs of 2.41 and 4.26, respectively, suggesting that eczema poses a significant risk for developing both diseases. These results are consistent with previous studies [5,18], with the exception of the French study of adults [15]. The co-occurrence or progressive appearance of atopic diseases supports the idea of the march of atopic disease over a lifetime [5]. However, another explanation for these results might be the presence of a common genetic

basis for all these atopic diseases, which manifest at different times of life because of the phenotypical characteristics of each [5,14]. Common chromosomal linkages have been found between allergic eczema and asthma on chromosomes 5, 11, and 13 [14]. Common immunologic characteristics such as elevated immunoglobulin E and eosinophils have also been demonstrated [14]. Moreover, atopic diseases tend to run in families with a predilection for specific symptoms, suggesting a role of phenotype-specific genes [4], and it has been shown that severity of allergic eczema early in life correlates with the prevalence of other allergic diseases [5].

Thirty-eight percent of rhinitis patients have been reported to have asthma and 78% of asthmatics have rhinitis [18], and 44.9% of children with eczema have been found to have asthma [5]; furthermore, in the latter study rhinitis was reported in 75.7% of children with asthma [5]. Rhinitis has twice been associated with an increased risk of asthma at age 11 years, interpreted as the influence of early atopic sensitization on the development of childhood asthma [18]. Allergic rhinitis was found in 75% of patients with atopic asthma and 80% of those with nonatopic asthma [3]. In our study the co-occurrence of rhinitis and asthma was found in 31.5% of children. The risk of having concurrent rhinitis in asthmatic patients in a French adult population was reported to be reflected by an OR of 1.14 [15], lower than our finding of risk for Turkish children in our area. Similarly, current rhinitis was reported to increase the risk of asthma in both atopic and nonatopic children in another Turkish study (ORs, 3.98 and 2.79, respectively) [11]. These levels of risk were consistent with our finding that rhinitis increases the risk of asthma by more than 3-fold. The association between rhinitis and asthma has been suggested to be a result of a common alteration of the immune system that favors type 2 helper T-cell cytokine activation [7]. Moreover nasal and bronchial mucosa share many similarities that may contribute to this comorbidity [3]. Additionally, nasal challenge triggers the release of mediators that cause bronchial constriction in turn [3].

In a study performed in Dutch adolescents, the burden of allergy, describing the presence of any of the atopic diseases, was found to be 26.8% [9]. This was quite similar to the prevalence of 27.1% in our study population. In the same Dutch study, the prevalence of lifetime asthma was 12.9%, a figure that was similar to the 14.7% in our study [9].

In conclusion, the rates of allergic eczema ever and current rhinitis were found to be lower in our setting than in many populations but the prevalence of asthma was comparable. Similarly, the total allergic burden was found to be close to that reported by previous authors. Moreover, it was found that the presence of any single atopic disease significantly increased the risk of having a second one.

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■ *Manuscript received March 16, 2007; accepted for publication May 11, 2007.*

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