Prevalence of asthma and other allergic disorders among schoolchildren in Diyarbakır, Turkey

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This study was performed to describe the prevalence rates of allergic diseases among children in southeast Anatolia. A questionnaire survey of children six to 15 years old was conducted using a modified version of the Turkish translated ISAAC protocol, with additional questions concerning sociodemographic and environmental characteristics of children that could be potential risk factors for allergic disorders. Questionnaires were distributed to parents of all children aged below 11 years and to children themselves aged over 11 for completion. A total of 3,040 children returned the questionnaires. The lifetime prevalence rates of asthma, wheezing, allergic rhinitis and atopic dermatitis were 14.1%, 22.4%, 12.9%, and 7.8%, respectively. The prevalence of wheezing, rhinitis and chronic rash in the last 12 months were 14.7%, 39.9%, and 11.8%, respectively. The prevalence rates of symptoms and diagnoses of allergic disorders were similar in boys and girls. Passive smoking, pet ownership, number of household and socioeconomic status were not significant risk factors for allergic diseases. Family history of atopy was the most prominent risk factor for all types of allergic diseases. high prevalence rates of asthma, rhinitis and eczema exist among schoolchildren in southeast Anatolia.

Key words: asthma, atopy, childhood, prevalence, Turkey.

In order to remove the differences regarding methodological issues in asthma prevalence studies, the International Studies of Asthma and Allergic Diseases (ISAAC) constituted a standard questionnaire[1]. Application of ISAAC protocol enabled comparison of the results derived from studies in various parts of the world. Thus, by using the standard ISAAC questionnaire in studies on asthma prevalence, differences regarding prevalence of asthma cannot be explained by differences in methodology.

Asthma prevalence studies in children suggest a high prevalence of asthma in the United Kingdom and Australia, moderate prevalence rates in many of the western countries and low prevalence rates in Eastern Europe and developing countries[2-7]. Moreover, the prevalence of asthma varies between different centers within the same country[6-8]. The reasons for these differences are still contradictory. Genetic, lifestyle and environmental factors may play a role in these variations[9-12]. There are various populations with different sociodemographic characteristics in distinct part of Turkey. These demographic variations and accompanying environmental factors may be responsible for the different results derived from asthma prevalence studies in the north, west and central parts of Turkey[13-18]. To our knowledge no study has been performed to date concerning the prevalence of asthma and other allergic diseases in southeast Anatolia using the ISAAC questionnaire.

In this study, a survey, using the ISAAC questionnaire, was performed to evaluate the prevalence of asthma, allergic rhinitis and eczema, and some relevant potential risk factors including age, gender, passive smoking, pet ownership, family history of atopy and socioeconomic status among children living in southeast Anatolia as their native region.

Material and Methods

A cross-sectional study was conducted between September 1999 and April 2000 using the ISAAC methodology. A Turkish translated modified version of the ISAAC questionnaire, validated by previous studies[15,17], was distributed through schools to the parents of 1,800 children aged 6-10 years. An additional 1,700 questionnaires were given to children aged 11-15 years, for self-completion. Thus, a total of 3,500 questionnaires were given to children from 15 different primary schools in Diyarbakır, a province in the southeast of Turkey. We obtained a list of schools from the Department of National Education in Diyarbakır. Schools participating in survey were selected by stratified randomization method.

Questions concerning sociodemographic characteristics, symptoms and diagnoses of asthma and other allergic disorders and their possible risk factors were included in the questionnaire. Since our study population consisted of children with different sociodemographic characteristics from different parts of the country, a response to the question "what is your homeland?" was requested in order to determine the native characteristics. Since there is no single word to encompass the meaning of wheezing, "wheeze" was translated into Turkish as "whistling sound coming from the chest".

Children whose parents or who themselves reported asthma were classified as "asthma ever" in the text and Tables. In southeast Anatolia, "allergic bronchitis" is commonly used interchangeably with asthma by physicians to preclude parental anxiety. Although we believe that most of the children labeled as "allergic bronchitis" in reality have asthma, we evaluated allergic bronchitis with a different question. Thus, one of our additional questions was "Has your child or you ever had allergic bronchitis?" On a separate page, questions concerning potential risk factors for asthma and other allergic symptoms were added to the ISAAC questionnaire (see Appendix). These questions were concerning the number of siblings and household, mean number of cigarettes smoked at home/day, the presence of dampness and of a pet at home and the type of heating system. In order to evaluate the socioeconomic status of the families, the highest degree of paternal education was also assessed. The family history of allergic diseases was assessed by four different questions enquiring "Have father, mother, siblings, or any other family member ever suffered from asthma, hay fever, or eczema?".

Statistical Analysis: Prevalence rates were calculated, and chi-square test and odds ratios were used to assess the differences between the two groups. A multivariate logistic regression analysis was used to estimate risk factors for asthma and other allergic diseases. Estimates of the odds ratio (OR) and 95% confidence intervals (95% CI) were based on the asymptomatic likelihood theory. A p value less than 0.05 was considered as significant. The SPSS software package version 7.5 was used for all statistical analyses.

Appendix: Additional Questions to Turkish Translated ISAAC Questionnaire

1. What is your homeland?
2. How many siblings does child have?
3. How many persons live in your house?
4. Does anyone smoke in your house?
5. Is father a smoker?
6. Is mother a smoker?
7. What is the mean number of cigarettes smoked daily in your house?
8. Has your house been moldy from dampness?
9. Which heating system is mainly used in your house?
10. Do you have pets in your house and, if yes, which pets are these? (in two questions).
11. What is the highest education degree of father and mother? (in two questions).
12. Have father, mother, siblings or other family members ever suffered from asthma, hay fever, eczema, or allergic rhinitis? (in four questions).

Results

Of the 3,500 questionnaires, 3,085 (88.1%) were returned. Fourty-five questionnaires were excluded from the analysis as they were incomplete. Thus, data from 3,040 children were eligible for final analysis.

Of all children, 72.1% were from urban Diyarbakır, 10.3% from surrounding towns of Diyarbakır, 6.2% from rural areas transported for education from villages and 9.0% from other administrative provinces of southeast Anatolia. Only 73 children (2.4%) were from other regions of Turkey.

The mean (± SD) age of the children was 10.7 ± 2.6 years. The male to female ratio was 1.40. Children were mainly aged 7-9 years and 12-14 years. The age and gender distribution of the study population is shown in Table I.

Table I. Distribution of Study Population According to Age and Gender

Age (years)	Boys n (%)*	Girls n (%)*	Total n (%)*
6	12 (0.4)	25 (0.8)	37 (1.2)
7	238 (7.8)	218 (7.2)	456 (15.0)
8	277 (9.1)	231 (7.6)	508 (16.7)
9	126 (4.2)	89 (2.9)	215 (7.1)
10	40 (1.3)	39 (1.3)	79 (2.6)
11	71 (2.3)	75 (2.5)	146 (4.8)
12	346 (11.4)	299 (9.8)	645 (21.2)
13	373 (12.3)	222 (7.3)	595 (19.6)
14	199 (6.5)	54 (1.8)	253 (8.3)
15	90 (3.0)	16 (0.5)	106 (3.5)
Total	1772 (58.3)	1268 (41.7)	3040 (100.0)

* % of total study population.

The cumulative and current (last 12 months) prevalence of allergic diseases, as well as the prevalence rates of symptoms, diagnoses and treatment related to asthma in boys and girls are given in Tables II-V. In our study population, the lifetime prevalence rates of various symptoms and diagnoses were as follows: wheezing, 22.4%; self-reported asthma, 14.1%; hay fever, 12.9%; eczema, 7.8%; and allergic bronchitis, 5.8%. The current (in the past year) prevalence rates were: wheezing, 14.7%; weezing with exercise 9.8%; rhinitis, 39.9%, associated conjunctivitis, 18.9%; itchy rash, 11.8%; drug usage for asthma and wheezing, 6.9%; and hospital admissions due to wheezing, 2.6%. With acceptance of most of allergic bronchitis cases as asthma, the prevalence of asthma ever would reach 19.9%. Except for male predominance of wheezing in the past year and wheezing with exercise ($p = 0.011$ and $p = 0.033$, respectively), prevalence rates of symptoms related to asthma were similar in boys and girls ($p > 0.05$) (Table II). There was no significant difference between boys and girls in the prevalence rates of symptoms and diagnoses concerning rhinitis and eczema (Table IV). The combination of asthma, eczema and rhinitis was seen in 1.5% of girls, 1.4% of boys and 1.4% of all children; whereas 25.7% of girls, 26.7% of boys and 26.3% of all children had asthma or eczema or rhinitis. Allergic rhinitis (hay fever) was reported by 31.5% of boys and 34.1% of girls with asthma, respectively. Atopic eczema was reported by 17.8% and 26.8% of boys and girls with asthma, respectively. The families of 529 children (17.4%) had pets at home, with birds the most common (228 families, 7.5%), and cat (73 families, 2.4%) the second most common. The parents of 2,003 (65.9%) children were reported to be smoking at home. There was no significant difference between the children reported to have or not have asthma in terms of the number of the household or siblings or the mean number of cigarettes smoked daily at home ($p > 0.05$, data not shown). The type of heating system and parental educational status were different in children with and without asthma ($p < 0.05$). Children with asthma had more frequent exposure to heating with wood or coal stove than that of the children without asthma (56.9% vs. 50.4%, respectively, $p < 0.001$). The frequency of more educated father (high school and over) was found to be higher in the families of children without asthma than those of children with asthma (42.6% vs. 38.6%, respectively, $p < 0.001$). Tables V, VI and VII show the association between various ymptoms and potential risk factors. There was no association between exposure to passive smoking at home and asthma, ever wheezing or wheezing with exercise ($p > 0.05$). Family history of atopic disease was reported for mothers in 654 families (21.5%), for fathers in 401 families (13.2%), and for a family member other tan parents and siblings in 623 families (20.5%). History of atopic heredity was the most outstanding and consistent risk factor for all allergic conditions (Table V-VII).

With logistic regression analysis, family history of atopic disease was found as a significant risk factor for almost all symptoms and diagnoses of allergic diseases in children. In addition to history of atopic heredity, dampness at home was found to be a ristk factor for ever asthma; smoking at home for ever rhinitis; and number of household, dampness and central heating (odds ratio = 0.64, 95% CI = 0.43-0.94, $p = 0.024$) for ever hay fever. The number of household and dampness were also additional risk factors for ever eczema (Table VII).

Table II. Prevalence (%) of Symptoms and Diagnosis of Allergic Respiratory Diseases Among Boys and Girls

Symptoms	Boys* (n=1772)	Girls* (n=1268)	Total (n=3040)	*P value
Ever wheezed	22.4	22.5	22.4	NS
Wheezed in the past year	15.8	13.2	14.7	0.011
Number of episodes				
< 4	8.5	8.2	8.4	
4-12	3.1	2.8	3.0	NS
> 12	3.8	2.0	3.3	
Sleep disturbance	10.6	9.2	10.0	NS
Severe episode	5.2	5.7	5.4	NS
Ever had asthma	14.8	13.2	14.1	NS
Wheezing with exercise in the past year	10.5	8.1	9.8	0.033
Night cough	35.2	35.2	35.2	NS
Allergic bronchitis	6.3	5.0	5.8	NS

NS: Not significant.

Table III. Frequency (%) of Positive Responses Regarding Asthma Treatment in the Past Year in Both Genders (p > 0.05)

Questions regarding asthma treatment	Boys (n=1772)	Girls (n=1268)	Total (n=3040)
Medicine for asthma and wheezing	6.6	7.3	6.9
Medicine for exercise-related wheezing	1.4	1.2	1.3
Written plan for asthma	1.9	2.2	2.0
Peak flow meter usage at home	1.4	2.0	1.6
Visits for wheezing	5.8	5.1	5.5
Visits for asthma check-up	2.3	2.3	2.3
Hospital admissions due to wheezing	2.8	2.4	2.6
Visits to paramedical person	3.0	2.7	2.9
Allergy injection for asthma	3.2	4.1	3.6
School days missed	6.7	7.0	6.8

Table IV. Prevalence (%) Symptoms Related to Rhinitis and Eczema in Boys and Girls (p > 0.05)

Symptoms	Boys (n=1772)	Girls (n=1268)	Total (n=3040)
Rhinitis			
Ever had rhinitis	51.6	49.2	50.6
Rhinitis in the past year	39.8	39.9	39.9
Associated itchy eye in the past year	18.2	19.8	18.9
Season			
Spring	6.6	5.0	5.9
Summer	4.6	4.1	4.4
Autumn	10.3	10.8	10.5
Winter	19.2	18.7	19.0
Interference with daily activity			
Not at all	8.5	9.0	8.7
Little	24.0	22.2	23.3
Moderate	8.2	6.6	7.5
Severe	3.8	4.3	4.0
Ever had hay fever	13.1	12.5	1.29
Eczema			
Chronic itcy rash ever	14.4	14.5	14.4
Chronic rash in the past year	11.6	12.0	11.8
Chronic rash with typical distribution	9.3	10.2	9.7
Healing in the past year	8.3	9.8	8.9
Sleep disturbance due to itch	9.0	8.8	8.9
Ever had eczema	7.1	8.8	7.8

Table V. Prevalence (%) of Potential Risk Factors Related to Ever Asthma Response

Risk factors	Ever Asthma Yes* (n=430) %	Ever Asthma No* (n=2610) %	OR (95% CI)	*P value
Father smoking	60.7	57.6	1.14 (0.79-1.63)	0.53
Mother smoking	22.3	20.3	1.13 (0.74-1.08)	0.58
Smoking at home	69.3	65.3	1.20 (0.83-1.75)	0.35
Daily number of cigarettes smoked at home > 10	18.8	15.7	1.14 (0.72-1.79)	0.55
Dampness in the house	16.1	9.7	1.79 (1.09-2.91)	0.03
Pet ownership	17.0	19.3	0.85 (0.53-1.36)	0.56
Highly educated parents (high school and over)	38.5	42.9	0.83 (0.58-1.19)	0.36
Household > 5	65.1	60.5	1.23 (0.85-1.79)	0.30
Siblings > 2	62.6	59.6	1.12 (0.78-1.59)	0.59
Male gender	61.2	57.9	1.15 (0.93-1.41)	0.22

OR : Odds ratio.
CI : Confidence interval.
* : According to χ^2 test.

Table VI. Effects of Family History of Atopy on Reported Wheezing, Asthma, Ever Rhinitis, Hay Fever, Chronic Itchy Rash and Eczema

	Maternal history of atopy OR (95% CI)	Paternal history of atopy OR (95% CI)	History of atopy other than perants Or (95% CI)
Asthma ever	2.22 (1.52-3.24)	3.55 (2.34-5.37)	1.71 (1.14-2.56)
Wheeze ever	2.15 (1.54-2.99)	2.84 (1.94-4.15)	1.94 (1.37-2.76)
Rhinitis ever	2.20 (1.63-2.98)	2.90 (1.99-4.22)	2.35 (1.71-3.23)
Hay fever	2.96 (2.03-4.31)	3.41 (2.23-5.19)	1.96 (1.32-2.93)
Chronic rash ever	1.69 (1.14-2.50)	2.49 (1.62-3.84)	1.54 (1.02-2.33)
Eczema ever	2.54 (1.56-4.11)	4.12 (2.47-6.88)	2.43 (1.48-4.01)

OR : Odds ratio.
CI : Confidence interval.

Table VII: Significant Risk Factors on Reported Symptoms of Allergic Diseases Using Logistic Regression Analysis [OR (CI)]

Symptoms	Dampress at home	Paternal history of atopy	Maternal history of atopy	Number of household
Ever wheezed		2.81 (1.91-4.16)***	1.99 (1.39-2.87)**	
Ever asthma	1.80 (1.08-3.02)*	3.50 (2.29-5.35)***	2.01 (1.32-3.06)**	
Ever rhinitis		3.14 (2.14-4.61)***	1.94 (1.39-2.70)**	
Ever hay fever	1.73 (1.04-2.89)**	3.13 (2.03-4.81)***	2.66 (1.77-3.99)***	1.08 (1.01-1.16)*
Chronic rash		2.71 (1.74-4.21)***	1.66 (1.08-2.56)*	
Ever eczema	1.66 (1.08-2.56)**	4.40 (2.59-7.47)***	1.88 (1.09-3.22)*	1.12 (1.03-1.22)**

OR : Odds ratio.
CI : Confidence interval.
*** : $p < 0.001$, ** : $p < 0.01$, * : $p < 0.05$.

Discussion

The results of this study demonstrated that the prevalence of asthma and other allergic diseases differs in the southeast of Turkey from that seen in other parts of the country. Asthma and eczema were significantly more common among children in Diyarbakır than in some other parts of Turkey. However, the prevalence of hay fever was similar to the results of studies conducted in Ankara, Samsun and Edirne[13,14,16].

Although the ISAAC questionnaire has been tested and validated[1] and its validity and repeatability have been confirmed in relation to bronchial hyperreactivity[19] and physician-diagnosed asthma[20], some methodological problems may still exist. One problem is about

the questions concerning the lifetime prevalence and doctors' diagnoses of allergic diseases, which are subject to recall bias and may reflect the attitude of the parents toward health issues and the accesibility of the health care system, which may be worse in our region than in western regions of Turkey. Another problem may be related to hay fever. Since the term "hay fever" is not a very commonly used expression in the Turkish language, questions concerning hay fever may have resulted in an over reporting of common cold symptoms rather than symptoms of allergic rhinitis in children. Finally, the term allergic bronchitis is frequently used interchangeably with asthma by most physicians in Turkey. Although an objective of the survey was not to differentiate allergic and viral components of rhinitis, the questionnaire has been validated previously, with the combination of itchy eyes in addition to nasal symptoms being found to be most closely related to allergic sensitization. Of the total study population, 18.9% had associated itchy eye together with rhinitis in the past year. Thus, nearly half of the reported prevalence of 39.9% for rhinitis in the past year may be of viral origin.

Season of response has been shown to bias rhinitis, especially in the spring/early summer, but not eczema or most asthma symptoms. Our study was conducted between November and April, before the start of the pollen season. Thus, seasonal bias might have been eliminated in our study.

There was not any gender difference in respiratory symptoms in our study. Although some studies reported a male predominance of asthma symptoms in 5-7-year-old children, self-completed questionnaires in older children generally showed a female predominance of asthma symptoms[4]. Previous studies have shown a higher incidence of atopy in boys compared with girls at age 12. Anderson et al.[21] suggested that by 16 years, the sex ratio reverses. Equal distribution of symptoms between boys and girls in our study may be explained by the fact that 57.4% of our study population consisted of children aged over 11 years, and among adolescent children, boys might tend to underestimate, and girls overestimate, the severity of disease.

We found a strong association between reported asthma symptoms and symptoms of allergic rhinitis and eczema. Considering the association of allergic rhinitis and eczema with asthma in children, Anderson et al.[21] showed that it was a characteristic feature of atopic trait. We found atopic heredity as the most prominent risk factor for all allergic diseases studied. We did not find parental smoking or smoking at home as risk factors for asthma, wheezing, rhinitis or eczema in our study. Although the percentage of children exposed to parental smoking was higher in children reported to have asthma and wheezing than in others, this difference was not statistically significant (Table VI). This may be the result of widespread parental smoking, since 71.1% of the parents of our study population smoked at home. Comparing our study with other studies performed in other parts of Turkey, our prevalence rates of asthma, rhinitis and eczema were similar to those of the study conducted in Edirne, and were higher than reported rates of studies in Ankara, İstanbul and Samsun[13,17]. In those studies, prevalence of asthma was reported as 6.9-8.1% in Ankara, 10.2% in Samsun, 9.8 in İstanbul, and 16.4% in Edirne. However, when compared with the results of a recent study from England, our prevalence rates were significantly lower, except for ever rhinitis and hay fever. In that study from England, prevalence rate of ever asthma was 22.7%, ever wheeze 29.6%, ever eczema 27.8%, current rhinitis 20.5% and hay fever 10.1%[4].

High socioeconomic status and "western" lifestyle were supposed to be responsible for high prevalence of asthma and oher allergic diseases. The results of our study were contradictory, since the socioeconomic levels of our study population were lower than in other parts of Turkey and our prevalence of asthma was higher than in other regions of the country. In a recent study, no statistically significant association was determined between the prevalence of asthma, rhinitis and atopic dermatitis and socioeconomic status in children 6 to 7 years of age in Spain[22]. Thus, we can suggest that our high prevalence rates may be derived from genetic factors, i.e. atopic heredity. Genetic and environmental factors might account for the difference in the prevalence of asthma and other allergic diseases between different regions of the same country[10].

The results of this study demonstrate a high prevalence of asthma and rhinitis in southeast Anatolia. More than 25% of children were found to have at least one allergic disease and 23% had more than one. This highlights the importance of allergic diseases in children of this region.

In conclusion, our study provides a description of the scale and distribution of asthma, rhinitis and eczema in 6-15 year-old children from the southeast of Turkey. The study would be a suitable baseline source for future trends in the prevalence rates, diagnoses and severity of asthma, rhinitis and eczema among these children.

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