



ORIGINAL ARTICLE

The prevalences of allergic diseases in rural and urban areas are similar

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Abstract

Background: In this study, we aimed to detect the influence of environmental and socioeconomic factors for asthma, allergic rhinitis, and eczema among children aged 6–18 years.

Method: Two each of schools located in urban and in rural areas were included in the study. Children in these schools were asked to respond to 32 questions in total, including demographic and socioeconomic features and the questions of the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire form.

Results: The average age of children included in the study was 11.5 ± 3.3 years, and the ratio of boys (55.4%) to girls (44.6%) was 1.2/1. The prevalence of asthma was found as 11.5%, allergic rhinitis as 22.1%, and eczema as 10.7%. Asthma (21.9%), allergic rhinitis (44.3%) and eczema (19.8%) were more frequent in cases which had family history of atopy ($p < 0.001$). Although there were differences between regions regarding income and educational levels, number of persons in the household, duration of breast feeding, and dietary habits, these variants were found inconclusive for the development of asthma. The risk of progression to asthma and atopic diseases decreased as age increased and the educational level of the father increased.

Conclusion: According to our results, atopic diseases can be considered frequent in Konya, history of atopy in the family is the most predictive factor and the effects of rural or urban factors are not obvious in atopic disease development.

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Introduction

Asthma and allergic diseases remain among the important problems affecting life in childhood. In developing

countries, it has emerged as a public issue in view of the high treatment costs, especially in the last 30 years.^{1–3} Knowledge about the prevalence of the disease should be effective in its prevention and in the determination of treatment strategies. Genetic and environmental factors are cited in disease development. Different prevalences between regions observed in the past can be attributed at least in part to the use of different survey sheets. In recent years, more accurate data have been obtained with

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the International Study of Asthma and Allergy in Childhood (ISAAC) form, which was enhanced for this reason.⁴ The prevalence of asthma varies between countries and sometimes even between regions in the same geographical area.^{5–7} Several international studies compare the prevalence of asthma in urban and rural areas, with all finding lower asthma prevalence in rural areas. There is likely to be some explanations for the decreased prevalence of asthma in rural areas, including the higher beneficial exposure of rural populations to farming in general and endotoxin.⁸ This could give us some chances to evaluate the effects of rural versus urban on the prevalence of allergic diseases.

Turkey presents vast geographic, economic and climatic diversities. Konya, the sixth largest city in Turkey, with a population of approximately two million, is located in Central Anatolia, with a predominant terrestrial climate.⁹ We aimed to collect data about asthma, allergic rhinitis, and eczema estimated prevalences, to determine the effects of rural and urban area on prevalences in the Konya region and to compare the data with results obtained from other regions.

Patients and method

The study was conducted in 2007 in Konya, and included 738 children aged between 6–18 years. We divided the whole city into four areas according to socioeconomic and environmental conditions. One school was randomly selected for each region, and a total of four schools were included in the study (two in the city centre, two from rural areas). Student lists were obtained from the school directory. The students included in the study were selected randomly as every fourth student from the student number list. Questionnaires containing 32 questions about the socioeconomic status of the family, dietary habits of the family, and the questions included in ISAAC form were distributed. Detailed information was given to the class teachers and the students about the aims of the survey, contents of the questionnaire, and how to complete the questionnaires. Survey forms were to be completed and signed by the parents, and any forms returned unsigned were excluded. The forms were collected four days after their distribution.

In the survey form, income level of the family, number of persons of the household, educational levels of the parents, employment status of the parents, duration of breast feeding, dietary habits, tobacco smoke exposure and school success levels were queried. The ISAAC survey form adapted to Turkish, which was practiced in previous Turkish prevalence studies, was used to question the prevalences of asthma, allergic rhinitis, and eczema.⁴ Incomes were classified into three groups as 'lower than 350 USD', 'between 350–1000 USD' and 'higher than 1000 USD'. Dietary habits were classified into three groups as 'meat predominant', 'vegetable predominant' and 'farinaceous'. School success was categorised into three groups according to the parents' reports as good, intermediate and poor. Asthma was defined as asthma diagnosed by a doctor or a diagnosis of allergic bronchitis and/or ≥ 3 bronchitis episodes, and wheezing or whistling in the chest or asthma crisis in the last 12 months. Allergic rhinitis was based on a positive to questions about having had a problem with sneezing, or a runny or blocked

nose during last six months when the child did not have a common cold or flu. Eczema was defined as recurrent erythema, and itching or rash on the body without fever in the last six months.^{7,10} Familial atopy was defined as positive history or diagnosis of asthma, rhinitis, and/or eczema in one or both of the parents. Overall atopy was defined as at least one of asthma, allergic rhinitis or eczema as described above.

Statistical analysis

Analysis of the data was performed using the *Statistical Package for the Social Sciences for Windows* (SPSS 11.0) program. Chi-square test was used for the statistical analysis of variables between groups; Student-t test and one-way ANOVA test for continuous variables; and multivariate logistic regression analysis model for risk analysis. P values below 0.05 were considered statistically significant in all analyses, and confidence interval (CI) was accepted as 95%.

Results

Of the 738 forms that were distributed, 634 (85.9%) were recollected, and 27 of these were excluded from the study because they were not countersigned by the parents. Three hundred and fifty-four (58.3%) children lived in the city centre and 253 (41.7%) in the rural areas. Demographic features of the children are summarised in Table 1. Differences were determined in educational and income levels of the family, number of persons in the household, dietary habits of the children, and duration of breastfeeding between the schools included in the study ($p < 0.01$). At least one wheezing attack was determined in 22.7%, asthma in 11.5%, allergic rhinitis in 22.1% and eczema in 11.7% of the children (Table 2). There was no difference between the urban and rural areas in terms of asthma, allergic rhinitis, eczema, and bronchitis prevalence ($p > 0.05$). In children with atopy history in their families (31.6%), 29.2% had asthma ($p < 0.001$; odds ratio [OR]: 11.7; 95% confidence interval [CI]: 6.3–21.8), 44.3% had allergic rhinitis ($p < 0.001$; OR: 5.9; 95% CI: 3.9–8.9), 19.8% had eczema ($p < 0.001$; OR: 3.5; 95% CI: 2.1–6), and cumulatively 62.6% had atopy ($p < 0.001$; OR: 7.9, 95% CI: 5.3–11.6). There were no differences in the presence of asthma, allergic rhinitis, and eczema with a positive history of familial atopy between rural and urban areas (Table 3).

When the influences of age, sex, dietary habits, school success, family education, and income levels on asthma and atopy development in children were evaluated with multivariate logistic regression analysis, the most important risk factor was family history of atopy ($p < 0.0001$; OR: 6.2, 95% CI: 2.4–15.9). Moreover, as age increased ($p = 0.003$; OR: 0.8, 95% CI: 0.8–0.9) and paternal educational level increased, atopy prevalence seemed to decrease (primary education versus secondary/higher education, $p = 0.028$; OR: 1.9, 95% CI: 1.1–3.5).

Discussion

Asthma and atopy remain among the important health problems in our country as in the rest of the world. They cause a decrease in life quality and impairment in school success for school-aged children. The annual cost of asthma per patient

Table 1 Demographic characteristics of the children.

	Urban (n = 354) %	Rural (n = 253) %	Overall (n = 607) %
Age*	10.0 ± 2.3	13.7 ± 3.6	11.5 ± 3.4
Sex (female/male)*	49.2/50.8	38.3/61.7	44.6/55.4
<i>No. of persons in the household *</i>			
< 5	40.4	23.3	33.3
≥ 5	59.6	76.7	51.2
<i>Income level *</i>			
0–350 USD	58.5	81.4	68
350– 1000 USD	37.9	16.6	29.0
> 1000 USD	3.7	2.0	3.0
<i>Maternal education*</i>			
University	2.3	0.0	1.3
Secondary–high school	12.4	5.9	9.7
Primary	78.5	84.2	80.9
Illiterate	6.8	9.9	8.1
<i>Paternal education*</i>			
University	12.4	1.6	7.9
Secondary–high school	35.3	15.0	26.9
Primary	50.3	79.8	62.6
Illiterate	2.0	3.6	2.6
<i>Mother working**</i>	4.8	6.3	5.4
<i>Father working*</i>	87.6	69.2	79.9
<i>Duration of breastfeeding (months) *</i>			
0–4	25.7	22.5	24.4
4–12	33.6	39.5	36.1
> 12	40.7	37.9	39.5
<i>Dietary habit ‡</i>			
Predominantly meat	18.4	18.6	18.5
Predominantly vegetable	62.7	57.3	60.5
Predominantly farinaceous	18.9	24.1	21.1
<i>School success*</i>			
Good	68.1	56.1	63.1
Intermediate	30.8	41.5	35.3
Poor	1.1	2.4	1.6
<i>Passive smoking[†]</i>	69.2	68.4	68.9

* p < 0.01; ** p = 0.41; ‡ p = 0.27; † p = 0.82

can reach 1600 US dollars and this is a burden for the economy in developing countries like Turkey.³ Many risk factors which seem to cause the development of asthma and allergic disease have been emphasised, and conflicting results of various studies have been reported. Several risk factors, such as genetic factors; dietary habits; high socioeconomic level; environmental conditions; exposure to smoking; and contact with animals have been cited for asthma and atopy development.^{11–14}

Prevalences of asthma and allergic diseases vary according to countries and regions.¹⁵ It is more obvious in the countries in which economic, socio-cultural and environmental conditions are non-homogeneous, as in Turkey.^{5,7} Konya, covering some 38,257 square kilometres, is the largest city in Turkey by area, and its mean altitude is 1016 metres. It accounts for 2.7% of the country's population, and the mean income level is under the country's average (9a).

A study including 13–18 year-old children conducted in Afyon, a neighbouring city to Konya, determined lower asthma, allergic rhinitis, and eczema prevalences (16a). In Ankara, Saraclar et al.¹⁷ reported asthma prevalence as 14.4% in 1997, while Demir et al.⁶ reported asthma prevalence as 6.4% in 2002. In the studies performed in the western region of Turkey, asthma prevalence was reported between 13.7–16.4%,^{7,13,18,19} while in the north of Turkey, the prevalence ranged between 5.6–14.5%.^{10,11,20} It is remarkable that asthma was determined as 14.1% in Diyarbakır²¹ versus 1.9% in Şanlıurfa,⁵ which are located in the southeast of Turkey.

It has been emphasised in many studies that asthma and atopic diseases are more prevalent in industrial populations.¹⁵ It is an expected result that environmental conditions, self-care and dietary habits, which can change according to income levels, will affect the disease

Table 2 Self-reported prevalence of asthma, its related symptoms, allergic rhinitis and eczema by centres.

	Urban (n = 354) %	Rural (n = 253) %	Overall (n = 607) %	p
<i>Wheezing ever</i>	5.9	5.1	5.6	0.67
<i>Doctor-diagnosed asthma</i>	10.5	7.1	9.1	0.16
<i>Wheezing or asthma attack in the last 12 months</i>	5.6	6.3	5.9	0.79
<i>Exercise-induced wheezing in the last 12 months</i>	7.1	7.5	7.2	0.83
<i>Asthma attack at night in the last 12 months</i>	3.4	4.0	3.6	0.71
<i>Night cough in the last 12 months</i>	20.3	24.9	22.2	0.18
<i>Asthma drug usage in the last 12 months</i>	2.5	4.3	3.3	0.22
<i>Doctor-diagnosed bronchitis</i>	23.7	21.3	22.7	0.78
<i>Asthma</i>	12.7	9.9	11.5	0.28
<i>Allergic rhinitis</i>	22.6	21.3	22.1	0.71
<i>Eczema</i>	12.4	8.3	10.7	0.11
<i>Overall atopy of cases*</i>	32.2	30.0	31.3	0.57
<i>Family history of</i>				
Asthma	21.5	19.0	20.4	0.45
Allergic rhinitis	16.1	13.8	15.2	0.44
Skin allergy	10.2	11.5	10.7	0.61
Overall atopy of the family*	33.3	29.2	31.6	0.28

* : Overall atopy was defined as diagnosis of at least one of asthma, allergic rhinitis, or eczema

prevalence. Many researches declared that asthma and atopic diseases were more prevalent in urban versus rural cities. Most hypotheses about low prevalence of asthma with rural regions depend on the hygiene hypothesis. Exposures to endotoxin and farm animal contact are higher for the rural children. Air pollutants including some gases, particulates, and other organic compounds, some sources (vehicular traffic, and industry) are more prevalent in urban regions, whereas others (combustion of organic fuels in the home) are more prevalent in rural regions.⁸ For instance, it is reported that asthma prevalence increases in populations with low income.²³ However, Akcakaya et al.¹⁸ stressed that economic and environmental conditions have no effect on asthma development, as emphasised in our study. Although there are many cultural and socioeconomic differences between the west and east of Turkey, it is surprising to see similar high asthma prevalence in Diyarbakir (southeast) as observed in the western cities.²¹ One study reports that changing of life conditions has no effect on the prevalences of asthma and allergic diseases, it was determined that asthma prevalence was lower in Turkish children living in Germany when compared to German children.²²

In many studies, it has been emphasised that the most important risk factor for asthma and allergic disease development is genetic susceptibility.^{5,7,10,14,23,24} In our study, when many risk factors (sex, socioeconomic level, number of persons in the household, living in the city centre, dietary

habits) were evaluated, the most important risk factor for asthma/atopy development seemed to be family history of atopy. We determined that asthma was found in 29.2%, allergic rhinitis in 44.3%, and eczema in 19.8% of children with atopy history in their families (31.6% of all children). Dold et al.²⁴ showed in their studies that asthma appears in 15% of children with asthma history in their families, and with asthma history in the father in particular, this ratio reaches 23%; atopic dermatitis develops in 38% of children with atopic dermatitis in their families. In our study, although no effect of environmental factors on atopy prevalence was found, more frequent atopy prevalence was detected in children of families in which the paternal educational level was low. It is possible that atopic families will recognise their child's disease more easily because of their similar symptoms or prior knowledge about the disease. This sensitivity and awareness of atopic families about their diseases may cause the disease prevalence to appear more frequent than it is in reality.

It is known that families with lower income and socio-cultural levels may provide a more exaggerated history with the expectation of finding a better solution for their children's disease. In addition, patient density and the pressure of time faced by doctors when treating their patients may cause asthma and atopy diagnoses to be overlooked. In a field study performed by Anlar et al.,¹¹ wheezing prevalence was determined as 21.3%, but doctor- diagnosed asthma was

Table 3 Comparison of asthma, allergic rhinitis and eczema presence with positive history of familial atopy between rural and urban areas.

	Urban (n = 118)	Rural (n = 74)	Total (n = 192)	p
Asthma n(%)	37 (31.4)	19 (25.7)	56 (29.2)	0.71
Allergic rhinitis n(%)	53 (44.9)	32 (43.2)	85 (44.3)	0.82
Eczema n(%)	25 (21.2)	13 (17.6)	38 (19.8)	0.54
Total n(%)	73 (61.9)	46 (62.2)	119 (62.0)	0.97

2.3% using the ISAAC survey form, leading us to think that there are many children who have not yet been diagnosed. In the Konya region, asthma prevalence diagnosed by a doctor (9.1%) and asthma prevalence according to ISAAC questionnaire (11.5%) data was determined to be similar. It is possible that the educational meetings intended for doctors related to asthma and atopy, which have been conducted continually in Konya and the attention given this subject by the mass media and newspapers in recent years may have contributed to the greater awareness of these illnesses by both the public as well as by doctors.

This study is important since it is the first study conducted in Konya using the ISAAC survey form and it can provide a basis for studies that will have broader involvement. The inadequate aspects of our study are the scarce numbers of children included in the study and the fact that there were not face-to-face interviews. The low power of the sample size may explain the lack of significant differences between rural and urban areas. In conclusion, we have shown that atopic diseases are seen frequently in Konya. History of atopy in the family is the most predictive factor and the effects of rural or urban factors are not obvious in atopic disease development. Larger studies using standard survey forms are needed in our local region and throughout the country.

Conflict of interest

The authors declare no conflict of interest.

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