Prevalence Of Asthma And Allergic Disorders Among Children In Duzce, Turkey: ISAAC Phase One

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Citation

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Abstract

Background: Allergic conditions, especially asthma, seem to be increasingly common worldwide. The International Study of Asthma and Allergies in Childhood (ISAAC) was designed to allow comparisons between populations in different country. According to the series of ISAAC written questionnaires, it has been reported that there has been an increase in the prevalence of asthma and other atopic disorders in the world. As developing countries adopt an industrialized style of living, an increase in asthma prevalence can be expected. The development of asthma is determined by complex interactions between genetic and environmental factors. This cross-section study was undertaken to evaluate the prevalence of asthma, asthma-related symptoms and allergic disorders in childhood in the city of Duzce-Turkey.

Methods: In total, 2330 ISAAC standardized questionnaires were completed by doctors questioning the mothers of children suffering from asthma or asthma-related symptoms. All children aged 6-16 years were included in this study.

Results: At the end of the study, the prevalence of childhood asthma diagnosed by physicians in Duzce was 6.4%, allergic rhinitis was 3.35% and eczema was 2.8%; these percentages were compared with other cities in Turkey and other countries. In the asthma group, prevalence rates of asthma were significantly higher in boys than in girls. The prevalence of asthma-related symptoms and, in addition, living conditions affecting prevalence of asthma was evaluated in this survey.

Conclusions: This survey shows that the variability in prevalence of childhood asthma between different countries is also seen in the different cities of Turkey. Turkey has different geographic regions, and thus the variability in prevalence is likely due to environmental factors.

INTRODUCTION

Asthma is a very common chronic illness affecting children, and it is a major global health problem in developed countries ([1,2,3]). A consistent trend for higher prevalence of wheezing and asthma in more affluent westernized societies has been shown repeatedly ([4]). Among children, higher prevalence rates have been found in industrialized Western countries than in developing countries in Asia and Africa ([5]). In the Middle East, asthma prevalence is reported to be lower than in developed countries ([6,7,8]).

Despite modern treatment approaches recommending usage of potent anti-inflammatory (corticosteroid) drugs, asthma prevalence, morbidity and mortality in childhood are all increasing worldwide ([2], [9,10,11]). Several studies from different parts of the world that used serial questionnaires surveys are reporting an increased prevalence of asthma, and also that there is wide variability in prevalence between populations ([12], [13]). It appears that differences in asthma prevalence between population groups are due to differential exposure to environmental factors; genetic variation alone could not account for the rise in the prevalence of disease over a few decades ([10]). Allergen exposure in early life appears to correlate with sensitization and expression of asthma and atopy. Lifestyle factors, including diet and ambient air quality may be disease modifiers ([14]). These differences may be real or they may reflect study methodology ([15]).

The etiology of these conditions remains poorly understood, despite a large volume of clinical and epidemiological research within populations that has been directed at

explaining why some individuals and not others develop asthma and allergies ([16]). Numerous surveys have been conducted in various countries, and there is a large body of literature on the subject ([12]). At the moment, there is considerable interest in the international comparison of asthma prevalence, stimulated by the growing evidence of an increment in the frequency ([17]). Numerous studies have assessed the epidemiology of asthma on the basis of morbidity and mortality data or from questionnaires ([15]). The International Study of Asthma and Allergies in Childhood (ISAAC) was the first study carried out worldwide using standardized questionnaires in order to create a reliable global map of childhood allergy. Phase one of the ISAAC developed simple methods for measuring the prevalence of childhood asthma, allergic rhinitis and atopic eczema for international comparisons, suitable for different geographical locations and languages ([16]).

There have been some epidemiological studies carried out in other parts of Turkey but never in Duzce or west of the Black Sea region. The aim of this study was to investigate the prevalence of asthma, allergic rhinitis and atopic eczema in children in Duzce and to test for a difference in asthma prevalence between other cities in Turkey and other countries. This prevalence survey was made by physicians using a parent-respondent questionnaire that is a standard written questionnaire designed for the ISAAC ([18]). In addition, some factors that influence the asthma and atopic status in childhood were assessed.

METHODS

Düzce is located in the west of the Black Sea region of Turkey and near the capital of Ankara. It is a small city, and the population is composed of different groups who come from other part of Turkey, such as the middle, east of the Black Sea, east Anatolia, southeast Anatolia and middle Anatolia. There was an earthquake in Duzce in November 1999. After the disaster, approximately 60-70% of the people have changed their place of residence from urban to rural, and their socio-economical status is lower than before the disaster.

We used a parent response questionnaire based on the ISAAC questions to investigate the prevalence of asthma and allergic diseases. For standardization of the research method, we adapted the most expanded and recommended ISAAC questionnaire. Therefore, the core ISAAC questionnaires were translated from English to Turkish before starting this study. Thus, some important words, such as wheezing, were adapted to the local terminology to ensure the best comprehension possible.

In order to determine asthma prevalence in 6-16 year old children, 2330 standard ISAAC questionnaires were completed by doctors interviewing randomly selected parents in Duzce between May 2001-April 2002. In addition the risk factors which could influence asthma, such as sex, smoking at home, presence of animals at home (cat, dog, bird), place of residence (urban, rural), type of dwelling (house in a village, prefab house, flat and special house), number of siblings and people living in the house, and annual family income were determined and recorded.

For the epidemiologic definition of asthma, parent-reporting of diagnosed asthma with a physician's confirmation was used. In general, physicians used the terms “allergic bronchitis” or “spastic bronchitis” instead of “asthma”. For this reason, both of these terms were accepted as asthma in this study.

The ISAAC questionnaire included questions to establish the following points: whether the child had been diagnosed as having asthma or eczema by a physician either during the last 12 months or before and whether seasonal or perennial rhinitis or wheezing had been observed by the parents.

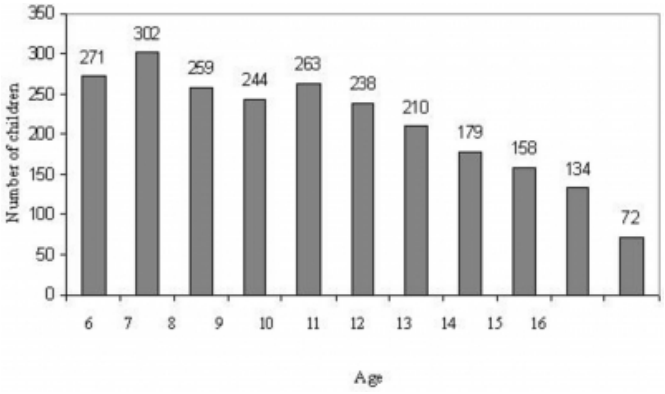
Statistical analyses were performed with the SPSS for Windows statistic program and Epi Info 6.0 program. Statistical significance of differences was assessed by the chi-square test, and odds ratios (ORs) were calculated to evaluate the various independent variables. The frequencies procedure was used for cross tabulation and odds ratios. For all analyses p values of <0.05 were regarded as statistically significant.

RESULTS

In total 2330 of the questionnaires were completed by doctors. The distribution of the study group according to age is shown in Graphic 1. In the study, 1171 (50.3%) were boys, 1159 (49.7%) were girls, and the mean age of the study group was found to be 10.2±0.20 years. There was no statistical difference between these two groups according to age.

Figure 1

Graphic 1: Distribution of study group according to age.



The parent-reported prevalence of asthma, respiratory symptoms and allergic disorders based on the ISAAC questionnaire is summarized in Table 1. A total of 571 (24.5%) children had a history of wheezing at any time, and 189 (8.1%) had a history of wheezing in the last 12 months. In this study, the total number of children diagnosed by a physician as having asthma was found to be 149 and the prevalence was 6.4%. Distribution of asthmatic and non-asthmatic children according to age is shown in Graphic 2. The prevalence of allergic rhinitis and eczema were respectively 3.35% and 2.8%.

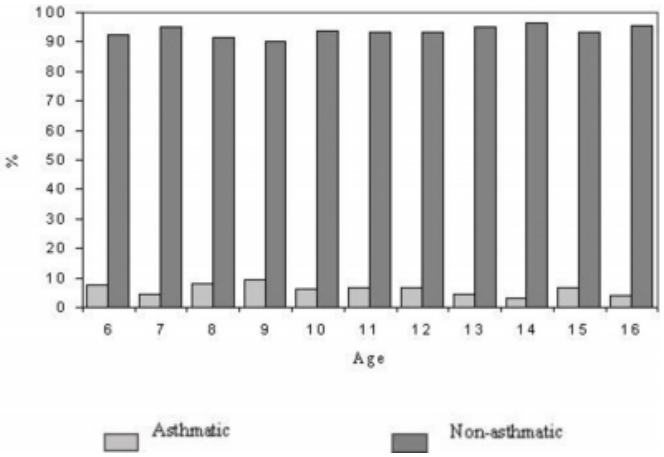
Figure 2

Table 1: Prevalence of asthma, respiratory symptoms and allergic disorders.

Symptoms	% (n)	CI % 95
Wheezing ever	24.5 (571)	22.8-26.2
Wheezing in the last 12 months	8.1 (189)	7 - 9.2
Speech limited by wheezing in the last 12 months	2.7 (64)	2 - 3.4
Sleep disturbed by wheezing in the last 12 months		
< 1 / week	4.8 (111)	3.9 - 5.7
> 1 / week	0.2 (4)	0.02 - 0.38
Wheezing attacks in the last 12 months		
1-3 kez	6 (139)	5.9 - 6.1
4-12 kez	2 (47)	1.4 - 2.6
>12 kez	0.1 (2)	0.06 - 0.14
Physician-diagnosed asthma	6.4 (149)	6.3 - 6.5
Exercise-related wheezing in the last 12 months	4.7 (109)	3.8 - 5.6
Dry cough at night in the last 12 months	12.7 (295)	11.3 - 14.1
Allergic rhinitis	3.35 (78)	2.25-4.45
Eczema	2.8 (66)	2.1-3.5

Figure 3

Graphic 2: Distribution of asthmatic and non-asthmatic children according to age



In the asthma group, 87 (%58.4) were boys, 62 (%41.6) were girls, and the mean age was found to be 9.8±0.22 years. The age-related prevalence of asthma is shown in Table 2. The highest prevalence was found at the age of 9 years old and the lowest prevalence at the age of 16 years old. The ratio of boys to girls in asthma group was found to be 1.4:1. There was significant difference between boys and girls in the asthma group. Distribution of sex according to age in the asthma group is shown in Graphic 3. There was significant difference between boys and girls in the 8-year-old group.

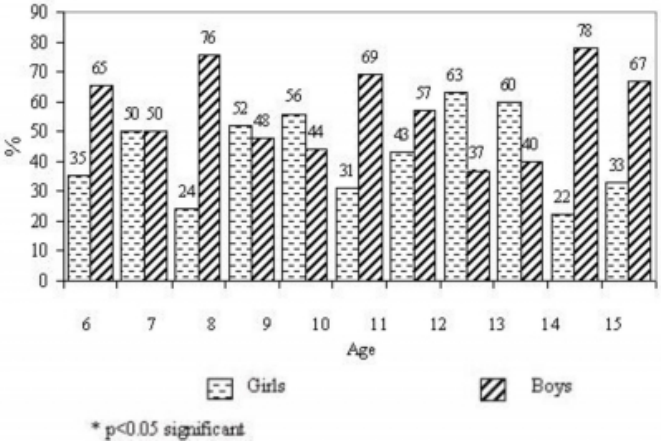
Figure 4

Table 2: Age-related prevalence of asthma.

Age	6	7	8	9	10	11	12	13	14	15	16	Total
No. of patient	20	14	21	23	16	16	14	8	5	9	3	149
%	13.4	9.4	14.1	15.4	10.7	10.7	9.4	5.4	3.4	6.1	2	100 %

Figure 5

Graphic 3: Distribution of sex according to age in the asthma group.



* p<0.05 significant

The living conditions affecting the prevalence of asthma are indicated in Table 3. There was no statistically significant difference between asthmatics and non-asthmatics children according to smoking at home, presence of animals at home, place of residence (urban, rural), and annual family income. But the factors of living in a flat, having one sibling, and having four or fewer people living in the same house were found to significantly affect the asthmatic group.

Figure 6

Table 3: Living conditions affecting prevalence of asthma

	Asthmatic % (n)	Non-asthmatic % (n)	OR	CI % 95	P
Smoking at home	60.4 (90)	72.0 (1571)	0.61	0.31<OR<1.18	0.119
Animals at home	11.4 (17)	13.1 (286)	0.83	0.31<OR<2.09	0.671
Place of residence					
Urban	59.7 (89)	56.6 (1234)	0.878	0.626<OR<1.232	0.452
Rural	40.3 (60)	43.4 (947)			
Type of house					
Village	10.7 (16)	17.9 (390)	0.570	0.22<OR<1.44	0.206
Prefab	44.3 (66)	40.9 (893)	1.150	0.64<OR<2.09	0.618
Flat	18.8 (28)	9.3 (203)	2.230	0.99<OR<4.88	0.029*
Special	26.2 (39)	31.9 (695)	0.750	0.38<OR<1.46	0.366
Number of siblings					
≤ 1	74.5 (111)	46.6 (1016)	3.271	1.75<OR<6.13	0.000 **
≥ 2	25.5 (38)	53.4 (1165)			
Number of household					
≤ 4	63.0 (94)	39.6 (864)	2.606	1.398<OR<4.856	0.002 **
≥ 5	37.0 (55)	60.4 (1317)			
Annual family income	29.5 (44)	26.8 (584)	1.13	0.53<OR<2.39	0.730
<1400 (dollar)	51.0 (76)	50.6 (1103)	1.03	0.52<OR<2.03	0.938
1400 – 3000	12.1 (18)	18.2 (398)	0.62	0.21<OR<1.72	0.329
3000 – 5000	7.4 (11)	4.4 (96)	1.73	0.39<OR<6.47	0.384
>5000					

* p<0.05 significant , ** p<0.005 significant

DISCUSSION

Pediatric asthma is a major health problem worldwide and represents a huge burden on families and society. It accounts for a large number of lost school days and may deprive the child of both academic achievement and social interaction ([2]). Serial studies suggest that the prevalence of asthma and allergic diseases in children are increasing in industrialized regions, and also there is wide variability in the prevalence between populations ([13], [18]). A critical element in the development of childhood asthma is maturation of the child's immune system. Understanding the genetic and environmental factors that regulate the maturation of the immune response during early life will greatly enhance the development of strategies for the primary and secondary prevention of asthma ([19]). Genetic factors, predominantly allergic sensitization (atopy) and parental history of asthma as well as environmental stimuli, are key components in the development of asthma ([20]).

ISAAC Phase one has provided an excellent opportunity to determine and compare the prevalence of asthma and other allergic conditions in different populations of the world. It is a simple method that can be employed in a standardized way at minimal cost. Here, we report data from 2330 written questionnaires completed by doctors for children aged 6-16 years.

In this study, the prevalence of asthma in childhood was found to be 6.4% in Duzce, which is in the west of the Black Sea region (Table 1). According to other studies performed in Turkey, the prevalence of asthma in childhood was found to be 9.8% in Istanbul ([12]), 6.9% in Ankara ([21]), 7.8% in Bursa ([22]), 4.8% in Izmir ([23]) and 14.1% in Diyarbakir ([24]). Duzce is near Ankara, which is the capital of Turkey, and the prevalence rate of asthma is similar but different from other cities. The different prevalence ratios obtained in these cities can be explained by the climate, by the level of air pollution and by different levels of exposure to allergens. Turkey is a large country with different geographic regions. The different prevalence ratios obtained in these cities can be explained by the climate, by the level of air pollution and by different levels of exposure to allergens.

The prevalence of asthma varies worldwide, possibly because of different exposure to respiratory infection, indoor and outdoor pollution, lifestyle and diet. Certain risk factors appear to predispose children to developing asthma and atopic disease, including incidence and severity of wheezing, atopy, maternal smoking, and number of fever episodes ([2]). If we take into consideration the worldwide epidemiologic study done in 1998 by the ISAAC Steering Committee ([16]), the asthma prevalence was found to be lower than Duzce in countries surrounding Turkey for children in the 13-14 age group, respectively (Table 4), 4.5% in Athens (Greece), 2.6% in Tehran (Iran), and in countries around the Black Sea, 2.4% in Moscow (Russia), 3.7% in Cluj (Romania). On the other hand, the prevalence rate was higher than Duzce in Mediterranean countries for children in the 13-14 age group, respectively, 11.3% in Roma (Italy), 11.1% in Barcelona (Spain), 12.1% in Casablanca (Morocco), 11.1% in Malta (Malta), and 11.6% in Beirut (Lebanon) ([16]). This variability in the prevalence rates may be related to differences in racial composition, health facilities, environmental factors and climate. Evidence from the ISAAC study also showed that the distribution of childhood asthma varies between global populations from less than 2% to approximately 33% of the population (16, [25]).

Figure 7

Table 4: Comparison of the prevalence of asthma and symptoms with the international study made by ISAAC protocol.

	Asthma	Wheezing in the last year	Dry cough at night
Duzce (Turkey)	6.4	8.1	12.7
Athens (Greece)	4.5	3.7	6.7
Tehran (Iran)	2.6	12.4	14.6
Moscow (Russia)	2.4	4.4	5.6
Cluj (Romania)	3.7	3.0	4.4
Roma (Italy)	11.3	9.8	23.0
Barcelona (Spain)	11.1	14.3	20.5
Casablanca (Morocco)	12.1	9.9	19.8
Malta (Malta)	11.1	16.0	31.8
Beirut (Lebanon)	11.6	14.4	22.4

The reasons for these differences are still obscure. Genetic, lifestyle or environmental factors may account for these variations in the prevalence of asthma and other atopic diseases between ethnic groups ([26]). It is unclear why the variation in the prevalence of asthma is so large. One theory involves a greater understanding of hygiene and healthcare in the western world, which may lead to a different exposure to infection early in life. Consequently, this may render the immune system susceptible to an atopic response ([2]). The variability in the prevalence of asthma between populations may be determined mainly by environmental and lifestyle differences rather than genetic differences. There are many possible combinations of environmental characteristics and socio-economic status that affect the prevalence of asthma in childhood ([10], [13], [16]).

Among other explanatory factors, ethnicity was found to be associated with different prevalence rates of asthma and atopy in childhood. In Kabesch's study that was conducted on German children, of which 7% were either of Turkish nationality born in Munich or had moved there during the first year of life. They found a significant difference in the prevalence of asthma and asthma-related symptoms between Turkish and German children. The prevalence of asthma was found to be lower in Turkish children than in German children (5.3 versus 9.4%). Atopic dermatitis was reported to be 1.6% in Turkish children whereas it was 13.9% in German children, and there was a significant difference between the two groups. Variations in the genetic background of different ethnic groups may explain the differences in the prevalence of childhood asthma and atopic diseases ([26]). In addition, diet and lifestyle may also explain the differences between the populations.

When symptom prevalence was assessed (Table 1), wheezing in the last 12 months, 8.1%, and dry cough at night in the last 12 months, 12.7%, were found to be higher than other symptoms in the present study. These findings were very important in diagnosis of asthma. The present findings were consistent with the results of prevalence of asthma in other countries, which were mentioned above (Table 4). Only in Tehran, despite the fact that the prevalence of asthma was found lower than Duzce, was the prevalence of wheezing in the last year and dry cough at night found to be higher than Duzce. Physician-diagnosed asthma found lower in Tehran might point that the diagnosis of asthma in childhood was lower in there or the questionnaires were completed by children and parents in the study of ISAAC ([16]), so symptoms might be exaggerated.

In this survey, the factors of living in a flat, having one sibling, and living with four or fewer people in the same house were found to be statistically significant in the asthmatic group. This finding was similar to the findings in previously reported studies (Table 3). As determined in the previous studies, family size, improved hygiene and living in a house with comfort might be associated with higher risk of asthma because of declining exposure to infection. An inverse relationship between family size and manifestations of allergy has been found consistently throughout childhood ([14], [27]).

After the earthquake, in November 1999, approximately 60-70% of people left their house and began to live in the rural area surrounding Duzce and they are still living there. We could not find a significant difference relating to place of residence between asthmatic and non-asthmatic groups (Table 3). However, one factor associated with urban living, which could exacerbate existing asthma is particulate and nitrogen dioxide air pollution from motor vehicle emissions ([10], [28]).

In the previous studies, male sex was reported as a risk factor for asthma in childhood ([2], [29]). According to the results of this study, prevalence of asthma was found to be significantly higher in boys than in girls (1.4:1), and this was compatible with the literature. Although, there are differences in the results of studies concerning the prevalence of asthma and allergic disorders, not only between different countries but also between different regions of the same country, by using a standardized international method, the actual values may be obtained.

CONCLUSION

In conclusion, the differences in the prevalence of asthma and allergic disorders in childhood between different countries are also seen in the different cities of Turkey. In different regions of the same country, the difference in

prevalence of asthma shows that environmental factors are as important as genetic factors. This geographical difference probably affects lifestyle and diet of the people apart from changes in climate and aeroallergens. Also the worldwide variations in rates suggest that environmental factors are critical to the development of asthma. As known, in development of asthma, interaction of genetic and environmental factors are very important.

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