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PREVALENCE OF ASTHMA SYMPTOMS AMONG TURKISH CYPRIOT SCHOOLCHILDREN*

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SUMMARY: Kalaycı Ö, Saraçlar Y, Şekerel BE, Adalıoğlu G, Kuyucu S, Ergör G, Bozer HK, Tuncer A. (Allergy and Asthma Unit, Department of Pediatrics, Hacettepe University Faculty of Medicine, Ankara, Turkey). Prevalence of asthma symptoms among Turkish Cypriot schoolchildren. Turk J Pediatr 1999; 41: 413-420.

We assessed the prevalence of symptoms suggestive of asthma in Turkish Cypriot schoolchildren and the associated risk factors using a slightly modified version of the ISAAC (International Study of Asthma and Allergies in Childhood) questionnaire. The questionnaire and questions regarding risk factors were issued to the parents of 2,822 children aged six to 14 years. The response rate was 89.6 percent. The cumulative and 12-month prevalence of wheezing were 14.7 and 4.8 percent, respectively. The prevalance of physician-diagnosed asthma was 11:4 percent. Family history of atopy was the strongest risk factor for "ever wheezing" (odds ratio [OR] 1.71, 95% confidence interval [CI] 1.52-1.92) and physician-diagnosed asthma (OR 1.71, CI 1.53-1.93). This study demonstrates that symptoms suggestive of asthma are quite common and constitute a major health problem in Northern Cyprus. *Key words: bronchial asthma, ISAAC questionnaire, wheezing.*

Asthma, as the most common disease of childhood[1] poses a mojor social and economic threat, especially in developing countries where health care sources are quite limited. Therefore, as one of the initial steps for planning national health care policies, it is essential to determine the extent, i.e. the prevalence, of asthma within a given country. Although it is one of the most populous islands in the Mediterranean, a survey of the medical literature failed to reveal any data about the prevalence of asthma in Cyprus, which has a Turkish Cypriot population of 201,300 according to the 1996 census.

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Toward enabling international and temporal comparisons of childhood asthma, a standardized written questionnaire, the ISAAC (International Study of Asthma and Allergies in Childhood) questionnaire, was developed, and many studies using this protocol have already appeared in the medical literature[2-5]. The purpose of this study was to determine the prevalence of symptoms that are suggestive of asthma in a large sample (n=2,529) of Turkish Cypriot children using a modified version of the ISAAC questionnaire. We also attempted to document the relationship between asthma-like symptoms and some potential risk factors, including age, gender, passive smoking, pet ownership, family history of atopy, and socioeconomic status.

Material and Methods

Study population: The study was conducted in April 1997 in 16 schools in the Turkish Republic of Northern Cyprus. The country is divided into three administrative cities with a total student population of 26,653 attending the first eight grades. Using the stratified sampling method[6] and taking 15 percent, according to the result of a recently completed survey in Ankara[4] as the expected rate of cumulative prevalence, the number of students that would be representative of each region was calculated. Schools were selected randomly until the determined number of students was reached within each region. If, however, the result of the random selection produced a number that exceeded the originally calculated number of students, the former population was included in the survey, thus resulting in a larger sample size than calculated of 2,529 children whose parents returned the questionnaire.

Questionnaire: Turkish translation of the ISAAC protocol, similar to the one used previously in Ankara and Melbourne[4,7], was used. In this questionnaire, ISAAC questions are supplemented with six additional questions (see Appendix). As there is no equivalent for the word "wheeze" in the Turkish language, it was translated as a "whistling sound coming from the chest". This translation was previously validated in the prevalence study in Ankara[4].

On a separate page, questions regarding some potential risk factors for asthma-like symptoms, including passive smoking, pet ownership, family history of atopy, and socio-economic status, were added to the questionnaire. Family history of atopy was considered positive if at least one of the first-degree relatives had physician-diagnosed asthma, allergic rhinoconjunctivitis or atopic dermatitis. In order to determine the socioeconomic level of the family, a previously developed composite index was calculated[4]. The total score had a minimum of 1 and a maximum of 16.

Statistical analysis: Results are expressed as the percentage of positive responses to each question. Ninety-five percent confidence intervals (95% CI)

APPENDIX

Respiratory Symptoms Questionnaire

1. Has your child ever had wheezing or whistling in the chest at any time in the past?
2. Has your child ever had asthma?

If yes to question 1 or question 2, then:

3. In the last 12 months, has your child had a wheezing or asthma attack?
4. In the last 12 months, how frequent were the wheezing attacks?
5. In the last 12 months, has any wheezing attack woken your child at night?
6. In the last 12 months, has any wheezing attack been severe enough to limit speech to only one or two words at a time?

Everyone to answer the following questions:

7. In the last 12 months, has your child sounded wheezy during or after exercise?
8. In the last 12 months, has your child had a dry cough at night? (apart from a cough associated with a cold or chest infection).
9. In the last 12 months, has your child usually brought up any phlegm or mucus from the chest, first thing in the morning?
10. In the last 12 months, has your child woken with a feeling of tightness in the chest first thing in the morning?
11. In the last 12 months, has your child had tightness in the chest or become short of breath when near animals, feathers or dust?
12. In the last 12 months, has your child been treated at any time with any of the following medications? (Ventolin, Salbutol, Salbulin, Bricanyl, Pulmicort, Flixotide, Becloforte, Becotide, Intal, Kromolin, Zaditen, Kofilin, Teo kap, Theo-dur, Aminokardol)

At any time in the past:

13. Has your child ever suffered from bronchitis?
14. Has your child ever suffered from wheezing with bronchitis or with a cold?

were calculated using simple random sample methods. Prevalence of wheezing, asthma and risk factors are calculated with 95% CI. Logistic regression analysis was done using backward elimination method. All analyses were done using the SPSS 6.0 package program.

Results

Of the 2,822 questionnaires that were issued, 2,529 were returned, with a response rate of 89.6 percent. Age and gender distribution of the study population are summarized in Table I. The age range was six to 14 years. The number of boys and girls were almost equal with a girl/boy ratio of 0.97.

Table I: Age and Gender Distribution of the Study Population

Age (years)	Boys n (% of boys)	Girls n (% of girls)	Total n (% of total)
6	134 (10.4)	128 (10.3)	262 (10.4)
7	138 (10.8)	103 (8.3)	241 (9.5)
8	104 (8.1)	109 (8.7)	213 (8.4)
9	141 (11.0)	135 (10.8)	276 (10.9)
10	132 (10.3)	126 (10.1)	258 (10.2)
11	139 (10.8)	130 (10.4)	269 (10.6)
12	162 (12.6)	185 (14.8)	347 (13.7)
13	189 (14.7)	182 (14.6)	371 (14.7)
14	144 (11.2)	148 (11.9)	292 (11.6)
Total	1283 (50.7)	1246 (49.3)	2529 (100.0)

Cumulative and 12-month prevalence rates of asthma symptoms and risk factors reported by the parents are summarized in Tables II and III. Family history of atopy appears to be the strongest risk factor both for "ever wheezing" (OR=1.71, 95% CI=1.52-1.92) and physician-diagnosed asthma (OR=1.71, 95% CI=1.53-1.93). Interestingly, it is not a risk factor for "wheezing in the past 12 months" (current wheezing). Increasing age seems to be associated with a slightly increased risk for physician-diagnosed asthma (OR=1.08, 95% CI=1.05-1.14). Female gender was associated with a lower risk of "ever wheezing" and physician-diagnosed asthma (OR=0.85 and 95% CI=0.76-0.96 for both). Parental smoking, socioeconomic level and pet (cat, dog and bird) ownership did not appear to be risk factors for asthma-related symptoms for Turkish children in Northern Cyprus.

Utilization of this validated standardized questionnaire enables regional and international comparisons to be made. Two studies conducted with expanded versions of the ISAAC questionnaire in Ankara[4] and İstanbul[5], Turkey, have shown variable prevalence rates compared to those obtained in the present study. Although cumalative wheezing and current wheezing prevalences in Northern Cyprus (14.7 and 4.8%, respectively) and Ankara (14.4 and 4.7%, respectively) were similar, the values obtained in the İstanbul study (15.1 and 8.2%, respectively) were rather different. However, prevalence of physician-diagnosed asthma in Northern Cyprus (11.4%) was higher than in İstanbul (9.8%) and Ankara (8.1%). Additionally, bronchodilator use was more prevalent in Cyprus than in Ankara (11.1 vs 5.0%). These results suggest that wheezing is more readily recognized as a sign of bronchial asthma, and that bronchodilators are more

Table II: Responses of Parents Regarding Their Children's Respiratory Symptoms*

Symptoms	Boys (n=1283)	Girls (n=1249)	Total (n=2529
Ever whezed	16.5 (14.5-18.5)	12.9 (11.0-14.8)	14.7 (13.3-16.1)
Ever asthma	12.8 (11.0-14.6)	10.00 (8.3-117)	11.4 (10.2-12.6)
Symptoms in past 12 months			
Wheezing	5.5 (4.3-6.8)	4.1 (3.0-5.2)	4.8 (4.0-5.6)
Number of episodes:			
<4	4.1 (3.0-5.1)	2.6 (1.7-3.4)	3 3 (2.6-4.0)
4-12	0.5 (0.1-0.8)	0.9 (0.4-1.4)	0.7 (0.4-1.0)
>12	0.6 (0.2-1.0)	0.3 (0.0-0.6)	0.4 (0.2-0.7)
Sleep disturbance	2.8 (1.9-3.7)	2.6 (1.7-3.5)	2.7 (2.1-3.3)
Severe episode	1.8 (1.1-2.5)	1.8 (1.1-2.5)	1.8 (1.3-2.3)
Exercise-induced wheezing	6.1 (4.8-7.7)	5.6 (4.3-6.9)	5.9 (5.0-6.8)
Night cough	23.9 (21.6-26.2)	24.6 (22.2-27.0)	24.4 (22.5-25.9)
Morning tightness	2.9 (2.0-3.8)	3.0 (2.1-4.0)	3.0 (2.3-3.7)
Morning mucus	17.7 (15.6-19.8)	19.5 (17.3-21.7)	18.6 (17.1-20.1)
Wheezing with allergens	2.8 (1.9-3.7)	3.9 (2.8-5.0)	3.3 (2.6-4.0)
Use of bronchodilators	12.1 (10.3-13.9)	10.0 (8.3-11.7)	11.1 (9.9-12.3)
Bronchitis			
Ever	26.1 (23.7-28.5)	21.9 (19.6-24.2)	24.0 (22.3-25.7)
Wheezing with cold or bronchitis	17.5 (15.4-19.6)	15.2 (13.2-17.2)	16.4 (15.0-17.8)

* Values are the percent (95% confidence intervals) of boys/girls and total number of children completing a questionnaire and responding postively.

Table I: Age and Gender Distribution of the Study Population

	Girls n (% of girls)	Boys n (% of boys)	Total n (% of total)
Family atopy	430 (34.5)	411 (32.0)	841 (33.3)
Pet ownership	728 (58.4)	806 (62.8)	1534 (60.7)
Parental smoking	839 (67.3)	871 (67.9)	1710 (67.6)
Socioeconomic status			
Low (Score 1-6)	345 (27.7)	365 (28.5)	710 (28.1)
Moderate (Score 7-11)	751 (60.3)	755 (58.9)	1506 (59.6)
High (Score 12-16)	150 (12.0)	163 (12.7)	313 (12.4)

frequently administered by the physicians in Northern Cyprus. Other asthma surveys in Turkey have produced significantly different prevalance rates[8-10]. In one of these epidemiologic surveys, Kalyoncu et al.[9] found a cumulative wheezing prevalence of 23.3 and current wheezing prevalence of 11.9 percent among 6-to 12-year-old children in Ankara. However, this study was conducted including 1,226 children attending one single school and, therefore, may not be representative of the population. Due to the differences in methodology, it is quite difficult to compare these figures with those obtained by the ISAAC protocol.

We attempted with this study and the one conducted in Ankara[4] to estimate the role of allergens in asthma-related symptoms. Out of 121 children who wheezed within the last 12 months in Northern Cyprus, 83 (69% of the wheezers) were reported to have wheezed because of the allergens. In Ankara, on the other hand, only 44 percent of the current wheezing was thought by the parents to be due to allergens. This suggests that children are exposed to higher concentrations of allergens in Northern Cyprus. This would be expected since Cyprus has a significantly more humid climate. Another possible explanation would be exposure to higher levels of animal antigens. Pet ownership was more common in Northern Cyprus (60.7%) than in Ankara (21.4%). However, it did not turn out to be a risk factor for wheezing. It should be noted that the ISAAC questionnaire takes into account only animals, feathers and dust as possible allergens, excluding pollens from this list. Generally, allargens are assumed to be a more important contributing factor than the number obtained in this survey[11,12]. The results of the second phase of the ISAAC protocol[13] is expected to shed some light on this question.

The figure obtained for bronchitis in children, similar to that found in Ankara[4], was quite high (24.0%). Although no official figure is available for the prevalence of bronchitis in Cyprus, its prevalence in children is generally estimated to be low. Since there is no gold standard for the diagnosis of either asthma or bronchitis, it may be diffucult to differentiate between the two entities, simply by using responses to standard questionnaires. We think that the inability to distinguish between bronchitis and asthma is one of the main limitations of questionnaire-based methodologies.

An international comparison indicates that the cumulative and one-year prevalences of wheezing found among Turkish Cypriot children (14.7 and 4.8, respectively) are lower than those reported for Bochum (33 and 20%), West Sussex (48 and 29%), Wellington (44 and 28%), Adelaide (40 and 29%) and Sydney (45 and 30%)[2], but are close to that reported for St. Gallen[3]. In another Mediterranean island, Malta, an ISAAC study conducted among 13 to 15-year-old children showed that the prevalences of cumulative wheezing and current

wheezing were 27.9 and 16 percent, respectively[14]. These rates are much higher than the corresponding values of the present study. This is surprising, since both the Maltese Islands and Cyprus are located within the Mediterranean zone with similar climatic and ecological properties. On the other hand, resultant outdoor pollution from busy Maltese roads was determined to be a risk factor for "ever wheezing" and nocturnal cough in that study. However, outdoor pollution has not yet become a serious problem in Northern Cyprus, which may explain the observed differences between these two island. Recently, the results of the global (worldwide) ISAAC Phase One study, in which 721,601 children from 56 countries were studied, have been reported[15]. There were marked variations in the prevalence of asthma symptoms, with up to 15-fold differences between countries, the attempted explanations for which were environmental factors.

The prevalence of wheezing in the last 12 months in Northern Cyprus (4.8%) is quite low when compared to global values that ranged from 4.1 to 32.1 percent in the 6-7 years of age group and 2.1 to 32.2 percent in. 13-14 years of age group. Countries that had 12-month prevalence of wheezing under 10 percent were found mainly in Asia, Northern Africa, Eastern Europe and the Eastern Mediterranean regions, and those over 20 percent were found mainly in the United Kingdom, Australasia, North America and Latin America. These values support the hypothesis that a "western life style" is associated with a high prevalence of childhood asthma. We believe that the second phase of this study will provide clues in clarifying some of the factors that are responsible for differences in observed prevalence rates.

In our survey, family history of atopy emerged as the most significant risk factor for wheezing, lending further support to the hereditary basis of the disease. Although this study showed that passive smoking is a significant health problem (67.6%) for Turkish Cypriot children, it failed to demonstrate an association to asthma-related symptoms. Similarly, no association was found between pet ownership and socioeconomic status. However, as this is a point prevalence study, the findings regarding passive smoking, pet ownership and socioeconomic status reflect only the current time point and do not provide data about antecedent conditions. They should, therefore, be interpreted with caution.

In conclusion, this study shows that bronchial asthma is an important public health problem for Turkish Cypriot children and should be a major concern upon formulation of health care policies. Public and medical education programs should be strongly advocated in an effort to increase awareness of the disease and thus decrease the social and economic burden imposed by this common condition.

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