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Rising trend of allergic rhinitis prevalence among Turkish schoolchildren

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ABSTRACT

Objectives: To assess the time trends and possible risk factors associated with allergic rhinitis symptoms in schoolchildren from Denizli, Turkey.
Method: Two identical cross-sectional surveys were performed in the 13- to 14-yr age group at intervals of six years using ISAAC questionnaire. Possible risk factors were also asked and the children completed questionnaires by self.
Results: A total of 4078 children (response rate 75%) in the 2008 and 3004 children (response rate, 93.8%) in 2002 were included. The lifetime prevalence of rhinitis, 12-month prevalence of rhinitis, prevalence of associated itchy eye in the previous 12 months and doctor diagnosed allergic rhinitis prevalence were increased from 34.2% to 49.4% (POR = 1.87, 95% CI = 47.8–50.9 and $p \leq 0.001$), from 23.5.0% to 32.9% (POR = 1.59, 95% CI = 31.4–34.3 and $p \leq 0.001$), from 9.6% to 14.9% (POR = 1.64, 95% CI = 13.8–16.0 and $p \leq 0.001$), and from 4.3% to 7% (POR = 1.67, 95% CI = 6.2–7.8 and $p \leq 0.001$) respectively. Severe interference with daily activity in the previous 12 months did not change. In multivariate analysis, history of family atopy, stuffed toys, high annual family income, presence of allergy in mother, father and accompaniment of children to their parents after school hours in textile industry were found as risk factors in 2008 study.
Conclusion: The prevalence of allergic rhinitis increased significantly in 2008. Family history of atopy, stuffed toys, high annual family income and accompaniment of children to their parents in textile industry were found as risk factors for doctor diagnosed allergic rhinitis.

1. Introduction

Allergic rhinitis (AR) is one of the most common and of chronic diseases in all age groups [1–3]. It is an allergic inflammation of the nasal airways and characterized by sneezing, itchy and watery eyes, swelling and inflammation of the nasal mucosa [4]. Symptoms between individuals vary severely. There is no worldwide accepted criterion for the diagnosis of AR [5]. ISAAC phase 1 was designed to evaluate and to compare prevalence and risk factors for AR and other allergic diseases in children from different countries and centers of countries throughout the world. ISAAC phase 3 was designed to analyze time trends in the prevalence of these allergic diseases in countries and centers of countries which were participated to ISAAC phase 1 [5,6]. The ISAAC study showed that there was variability in the prevalence of AR between countries and between regions of the same country. Differences may be due to environmental and socioeconomic factors and/or may be related to awareness of the disease [7,8]. Children in the 13- to 14-yr age group from 155 centers in 56 countries were participated to the ISAAC Phase I, and variations in the prevalence of symptoms of AR between centers worldwide were more than 20-times (ranged from 3.2 to 66.6%) [9]. In phase 3, 106 centers from 66 countries were participated to the study. In this study, a slight increase in prevalence of rhino conjunctivitis was observed worldwide. And, it was seen that the variations were larger among the centers than countries [9].

The first study using ISAAC methodology (phase 1) was carried out on the 13–14 age group in 2002 in Denizli, Turkey. Prevalence

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of lifetime rhinitis, prevalence of rhinitis in the last 12 months, prevalence of associated itchy eye in the last 12 months, prevalence of severe interference with daily activity in the last 12 months and prevalence of lifetime doctor diagnosed AR were 34.2%, 23.2%, 9.6%, 7.4% and 4.3% respectively. The aims of current study were to determine whether the prevalence of AR is changing in 13–14-yr-old school children attending the same school in Denizli, Turkey and to assess possible risk factors of AR. We compared the results of current study with the results of study conducted in the year 2002 using same questionnaire in the same age group.

2. Method

2.1. The place of the research

Denizli is a growing industrial city in the southwestern part of Turkey with an area of 11,868 km^2 and population of nearly 943,000 people. Textile and marble industry is important for the development of Denizli [10]. In summers, the weather is hot and it rarely gets cold in winter. Springs and autumns are rainy and warm in Denizli [10].

2.2. Questionnaire

The standardized core symptom questionnaire for rhinitis is as follows for 13–14-yr-old children [11]:

All questions are about problems which occur when you DO NOT have a cold or the flu.

1. Have you ever had a problem with sneezing, or a runny, or blocked nose when you DID NOT have a cold or the flu? Yes No

   IF YOU HAVE ANSWERED "NO" PLEASE SKIP TO QUESTION 6
2. In the past 12 months, have you had a problem with sneezing, or a runny, or blocked nose when you DID NOT have a cold or the flu? Yes No

   IF YOU HAVE ANSWERED "NO" PLEASE SKIP TO QUESTION 6
3. 3. In the past 12 months, has this nose problem been accompanied by itchy-watery eyes? Yes No
4. In which of the past 12 months did this nose problem occur? (Please tick any which apply)

   January May September February June October March July November April August December
5. In the past 12 months, how much did this nose problem interfere with your daily activities?

   Not at all A little A moderate amount A lot
6. Have you ever had hay fever? Yes No

The written questionnaire was translated into Turkish for self-completion by the 13–14-yr-old following the ISAAC protocol. So far, many studies have been conducted in Turkey using the ISAAC questionnaire [12–14]. Therefore, it is well known and confirmed by Turkish studies.

In addition to ISAAC questionnaire, there were questions about demographic and environmental characteristics of children that could be potential risk factors for AR. In 2002 study, sex, atopic family history, active smoking, smoking of child's father or mother, presence of domestic animals, stuffed toys, education level of child's mother or father, annual family income, number of people living at home, sharing bedroom, heating system, bathed in sunlight house were asked. In addition to questions asked in 2002 study other questions (member of the family with atopic disease, kind of domestic animal, kind of bird, place of the animal in the house, whether mother or father is working in textile and/or marble industry or not, accompaniment of children to their parents after school hours in textile and/or marble industry) were also asked in 2008 study.

2.3. Statistical analysis

Statistical analysis included percentages, odds ratios (OR), 95% confidence interval (95% CI) and chi-squared test. Prevalence estimates were calculated by dividing positive responses to the given question by the total number of completed questionnaires. The 95% CI of these prevalence rates was also calculated. According to ISAAC policy, missing and inconsistent responses were included in the prevalence calculations, but excluded from subsequent bivariate analysis [15,16]. To compare the differences in prevalence rates between the two studies, chi-squared test and prevalence odds ratios (POR) with 95% CI were performed. The relation between risk factors and doctor diagnosed AR prevalence was performed by univariate analysis using chi squared tests and univariate odds ratio (uOR) and its 95% CI. $p < 0.05$ was considered significant. Significant factors from the univariate analysis for new risk factors were taken into multivariate logistic regression analysis to assess the independent effects of risk factors on doctor diagnosed AR with adjusted odds ratio (aOR) and its 95% CI. The SPSS software package version 12 for Windows (SPSS, Chicago, IL, USA) was used for all statistical analyses.

3. Results

3.1. Prevalence results

In the 2002 study, 3004 questionnaires were completed while 4078 questionnaires were completed in the 2008 study, with an overall 93.8% and 75% response, respectively. The study groups included 1505 boys (50.1%) in 2002 and 2175 boys (53.3%) in 2008 (Table 1). Prevalence of lifetime rhinitis, of rhinitis in the last 12 months, of associated itchy eye in the last 12 months, of severe interference with daily activity in the last 12 months and of lifetime doctor diagnosed AR were 34.2%, 23.2%, 9.6%, 7.4% and 4.3% in 2002 and 49.4%, 32.9%, 14.9%, 7.1% and 7% in 2008 studies respectively (Table 2). The overall lifetime prevalence of rhinitis increased from 34.2% to 49.4% (POR = 1.87, 95% CI = 47.8–50.9 and $p \leq 0.001$), the overall 12-month prevalence of rhinitis increased from 23.5.0% to 32.9% (POR = 1.59, 95% CI = 31.4–34.3 and $p \leq 0.001$) and associated itchy eye in the previous 12 months increased from 9.6% to 14.9% (POR = 1.64, 95% CI = 13.8–16.0 and $p \leq 0.001$). However, severe interference with daily activity in the previous 12 months decreased from 7.4% to 7.1% (POR = 0.95, 95% CI = 6.3–7.9 and $p = 0.63$) whereas doctor diagnosed AR prevalence increased significantly from 4.3% to 7.0% (POR = 1.67, 95% CI = 6.2–7.8 and $p \leq 0.001$).

3.2. Risk factors

In 2008 study, family history of atopy, stuffed toys, high annual family income, heating system, an allergic person in the family, accompaniment of children to their parents after school hours in textile industry, whether father or mother is working in marble

Table 1
Demographic data in the 2002 and 2008 surveys.

Sex	2002 survey (phase I)	2008 survey (phase III)
Male (*n*, %)	1505 (50.1)	2175 (53.3)
Female (*n*, %)	1499 (49.9)	1903 (46.7)
Age (year)	13–14	13–14
Race	Caucasian	Caucasian
Number of schools	16	16