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Original Article

The prevalence of asthma and allergy among university freshmen in Eskisehir, Turkey

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The aim of this study was to determine the current and cumulative prevalence of asthma, allergic rhinitis, atopic dermatitis and reactivities to allergen skin prick tests (SPT) among university freshmen.

The data at the first stage were collated through the application of the European Community Respiratory Health Survey (-ECRHS- Stage I) questionnaire on 1603 students registering at various faculties and vocational colleges of Osmangazi University in Eskisehir, Turkey, in the academic year 1997–1998. At the second stage a physical examination as well as allergen SPTs were conducted on 151 students.

Of the students within the study group, six (0·4%) had experienced an asthma attack within the previous 12 months, 11 (0·7%) had a past of asthma attacks and 123 (8·1%) reported wheezing attacks within the previous 12 months. The prevalence of asthma-like symptoms, rhinoconjunctivitis and dermatitis were found to be 17·0%, 10·0% and 5·9% respectively. Asthma and asthma-like symptoms were found to be significantly more prevalent among students who smoked. A positive SPT reaction to more than one allergen was found in 14·6% of the students. SPT positivity was 8·3% in asymptomatic students, 27·3% in asthmatic students, 14·5% in those with asthma-like symptoms, 28% in those with non-infectious rhinitis and 7·1% in those with dermatitis. In analysis of logistic regression, a history of atopy, as ascertained in the questionnaire, was seen to have a significant effect on SPT positivity.

The rate of self-reported asthma and/or asthma-like symptoms among newly enrolled freshmen at the Osmangazi University was found to be lower than in other countries. Cigarette smoking was seen to increase such symptoms significantly, in comparison to non-smokers.

Key words: asthma; university students; questionnaire; rhinitis; prevalence; skin prick tests.

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Introduction

Symptomatic atopy (asthma, allergic rhinitis and eczema) is a common disorder. Atopic disorders such as asthma are an increasingly serious cause of morbidity and mortality in many developed countries (1,2). The prevalence of asthma varies widely among various populations and geographical locations.

Population-based studies conducted in the U.S.A. have determined the overall prevalence of active asthma to be 2·6%, while similar studies in other parts of the world have found the prevalence to be as high as 26% (3). Similar studies employing the ECHRS questionnaire in Sweden, Italy and Greece have found current prevalences of asthma to be 3·3%, 3·7% and 2·4%, respectively (4–6). In an ISAAC study the prevalances of asthma ranged from 1·6–3·0% in Albania, Estonia, Iran, Poland and Russia and 20·7–28% in Australia, New Zealand, Singapore and the U.K. (7). Studies conducted in various regions within Turkey have found current prevalences ranging from 0·9%–6·8% (8–11). As with asthma, studies in recent years have suggested that the prevalence of atopy, too, is on the rise (12).

Focard's study from Sweden reports current prevalences for flexural eczema, asthma and allergy symptoms as 3%, 5% and 29%, respectively (13). The current prevalence of rhinoconjunctivitis and flexural eczema were 8% and 0·8% in Turkish university students in Ankara (8).

Several methods have been used for screening a population to identify atopic subjects. The definition of an atopic subject as someone with at least one positive reaction to skin prick tests (SPT) of common allergens has been shown to be appropriate for studying adolescents. Population-based studies on adolescents have shown a high positivity to skin-prick tests among symptomatic subjects

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and 11·9–20·9% positivity among asymptomatic subjects (14,15).

The aim of this study was to determine the prevalence of asthma, asthma-like symptoms, non-infectious rhinitis and dermatitis among a homogeneous group of newly-enrolled university freshmen in Eskisehir, Turkey, and to investigate the correlation between their SPT positivity and the information they gave in the questionnaires.

Materials and methods

STUDY DESIGN

This was a cross-sectional study using a two-step approach. In stage I the screening questionnaire, standardized by the European Community Respiratory Health Survey (ECRHS) (16) and consisting of questions related to rhinitis, eczema, smoking history and family history of atopy (8), was applied. Of 1603 questionnaires administered, 1515 were properly completed (94·5%) and considered suitable for use in our study.

QUESTIONNAIRE

A self-administered questionnaire, consisting of two sections, was used to collect data for the first stage. The first section contained a series of questions soliciting information concerning the student's sociodemographic background. It also contained questions, modelled after those accepted as the standard, concerning the smoking habits of the students (17) and of all individuals living in their household. The second section of the questionnaire obtained information about asthma and asthma-like symptoms, using the ECRHS Stage I form (16). There were also questions in this section concerning allergies of the student and immediate family members (8).

Screening Questionnaire

Q1: Have you suffered wheezing in your chest at any time in the past year?

Q1-1: Were you at all breathless during the wheezing?

Q1-2: Have you had this wheezing or whistling when you did not have a cold?

Q2: Have you woken up with a feeling of tightness in your chest at any time in the past year?

Q3: Have you been woken by an attack of shortness of breath at any time in the past year?

Q4: Have you been woken by an attack of coughing at any time in the past year?

Q5: Have you had an attack of asthma in the past year?

Q6: Have you had an attack of asthma at any time in your life?

Q7: Are you currently taking any medication (inhalers, aerosols or tablets) for asthma

Q8: Do you have or have you ever had any nasal allergies, including hay fever?

Q9: Do you have or have you ever had any itching dermatitis and/or eczema?

Q10: Do any of your first-degree relatives suffer any allergic diseases and/or symptoms (asthma and/or hay fever and/or eczema)?

Definitions

Current asthma: Subjects answered 'Yes' to either Q5 or Q7.

Cumulative asthma: Subjects answered 'Yes' to Q6.

Asthma-like symptoms: Subject answered 'Yes' to Q1 and/or Q2 and/or Q3 and/or Q4.

Noninfectious rhinitis: Subjects answered 'Yes' to Q8

Itching dermatitis and/or eczema: Subjects answered 'Yes' to Q9

Family histories of atopy: Subjects answered 'Yes' to Q10

In the second stage, a random sample of 151 students (9·6%) underwent a physical examination and skin-prick tests. The study design is presented in Fig. 1.

ALLERGY SKIN TESTING

Skin prick test (SPT) screening was performed with a standardized panel (Stallergenes, France) (18) of airborne allergens common in Turkey, in which were used the two types of mite (*dermatophagoides farinae* and *pteronyssimus*), a mixture of four cereals (barley, maize, oat, wheat), a mixture of 12 grasses (bent grass, bermuda grass, bromus, cocksfoot, meadow fescue, meadow grass, oat grass, ryegrass, sweet vernal-grass, timothy, wild oat, yorkshire fog), a weed mixture (cocklebur 10%, daisy 10%, dandelion 10%, dwarf ragweed 25%, golden rod 10% mugwort 25%, wormwood 10%), with histamine (10 mg ml^{-1}) as a positive control and a saline solution as a negative control. Quantitative SPT used with one dilution (20 IR). These were applied using the Pepys prick method (19). The volar surface of each arm was cleaned and allergens were placed at 5 cm intervals. The skin was pricked with a Stallerpoint needle (Stallergenes, France). SPT weals were noted after 20 min and a weal with a mean diameter of 5 mm or more was taken as a positive reaction. Most of the data was collected before and during the spring pollen season.

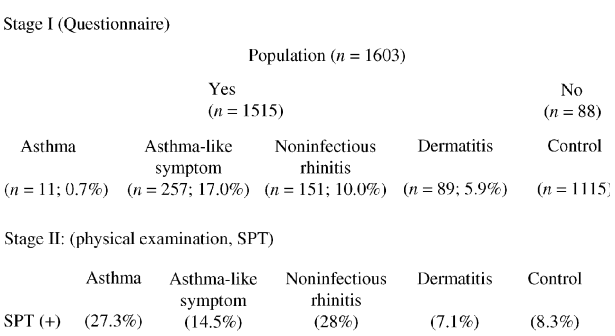

FIG. 1. Flowchart of study design.

STATISTICAL METHODS

Statistical analyses were done using the Statistical Package for the Social Sciences (SPSS). The χ^2 test and Student's *t*-test were used to detect differences between groups; $P<0{\cdot}05$ was considered significant. Data was further evaluated by multivariate analysis, using a logistic regression model. Reference groups were determined for all variables. Odd ratios and 95% confidence levels were calculated (20).

Results

Of the 1515 students who completed the questionnaire, 796 (52·5%) were male and 719 (47·5%) were female. Mean ages were 20·0 years for males and 19·5 years for females. Prevalence of asthma, asthma-like symptoms, non-infectious rhinitis and dermatitis according to sex and smoking status are shown in Table 1.

The prevalence of self-reported asthma was found to be 0·7% (11 subjects; 0·9 in men and 0·6% in women). According to the results of the questionnaire, six students (0·4%) were found to have suffered an asthma attack in the previous year. The prevalance of asthma-like symptoms (wheezing, being woken by an attack of breathlessness and/or cough and/or chest tightness), non-infectious rhinitis and eczema were found to be 17·0%, 10·0% and 5·9%, respectively.

One hundred and twenty-three students (8·1%) were determined to have had wheezing complaints within the previous 12 months. Of these, 78 were male (9·8% of the males) and 45 were female (6·3% of the females). Wheezing symptoms were found to be significantly high, statistically, among males ($P<0{\cdot}01$). Occurrences of being woken by attacks of breathlessness, tightness in the chest, or by an attack of coughing within the previous year were found at the rates 1·3%, 2·8% and 10·0%, respectively.

The number of students reporting an atopic disorder (one or more of asthma, non-infectious rhinitis and dermatitis) in the questionnaire was 216 (14·3%). The eczema rate was 5·4% among females and 6·3% among males. Rhinitis symptoms were found to be 11·1% among the females and 8·9% among the males.

The number of students who had never smoked was 1243 (82·0%), and of current smokers 272 (18·0%, of these 77·9% for males and 22·1% for females). Habitual smoking was found to be significantly high, statistically, among the males, but was lowest among the medical students registered (5·2%). The rates of asthma, and asthma-like symptoms were found to be higher among smokers than non-smokers (Table 1). These findings were statistically significant.

From the total student population surveyed, 73 (4·8%) had first-degree relatives with allergic diseases such as asthma, urticaria, and/or non-infectious rhinitis. According to the information given in the questionnaires, 32.9% of atopic students had positive family histories. Eight point nine percent had no family history of atopy.

In the second stage of the study skin-prick tests (SPT) and physical examinations were done on 151 students. Of the students invited as subjects for the second stage, 74 were female (49%) and 77 were male (51%). Their average age was 19·7 years for the females and 20·0 years for the males. From the point of view of age, gender and smoking status, no difference was noted between the students of the two stages. The study format is presented in Fig. 1 SPT results are shown in Fig. 2.

From the skin prick tests 22 students (14·6%) tested positive to at least one of the common allergens. Of these, 18 were from the symptomatic group and four were asymptomatic. Of those testing positive, 18·2% had had no allergy or allergy-like complaints. Overall in the group undergoing skin prick tests, positivity was 16·9% for males and 12·2% for females. The distribution of the most

TABLE 1. The prevalence of asthma, rhinoconjunctivitis, asthma-like symptoms and dermatitis, by gender and smoking habits (questionnaire data)

	Gender					Smoking status				
	Male		Female		*P*	Non-smoker		Current smoker		*P*
	n	*n*%	*n*	*n*%		*n*	*n*%	*n*	*n*%	
Asthma	7	0·8	4	0·5	0·46	5	0·4	6	2·2	0·001
Attacks of asthma	4	0·5	2	0·25	0·49	3	0·24	3	1·1	0·04
Asthma like symptom	144	18	113	15·7	0·22	174	14	80	29·4	<0·001
Wheeze	78	9·7	45	6·2	0·01	78	6·2	44	16·1	<0·001
Woken by an attack of breathlessness	14	1·7	6	0·83	0·12	12	1	8	2·9	0·007
Waking with tightness in the chest	24	3	19	2·6	0·66	28	2·2	14	5·1	0·006
Woken by an attack of cough	75	9·4	76	10·5	0·46	100	8	49	18	<0·001
Rhinoconjunctivitis	71	8·9	80	11·1	0·15	119	9·6	31	11·4	0·28
Dermatitis	50	6·3	39	5·4	0·48	69	5·6	16	5·9	0·74
Total	796		719			1243		260		

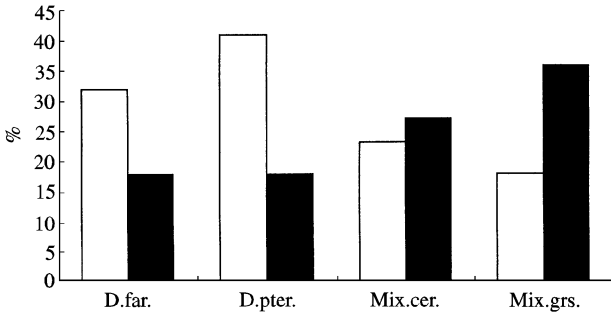

FIG. 2. Common allergens according to sex. D. far: *Dermatophagoides* (D) *farinae*; D. pter: *D. pteronyssinus*; Mix. cer.: mixture of 4 cereals; Mix. grs: mixture of 12 grasses. □: male; ■: female.

common allergens to which students tested positive is given in Fig. 2.

Dermatophagoides pteronissinus (13 students), was found to be the most common allergen. While skin prick test positivity was 21·4% among students who had reported atopy in the questionnaire, the rate was found to be 10·5% (P=0·07) among those reporting no atopy.

SPT positivity was found to be highest among diagnosed asthmatics and rhinitis sufferers, and lowest among dermatitis sufferers. The positivity rate was found to be 27·3% among asthmatics, although the case sample was not sufficient for this figure to show any statistical relation. In the control group, in which symptoms and complaints were absent, 8·3% SPT positivity was found. The lowest SPT positivity was found among the students with dermatitis (7·1%).

In Table 2 the effects on SPT of gender, habitual smoking, passive smoking, family history of atopic disorders and personal history of atopic disorders, as stated in the questionnaire, are evaluated on the logistic regression model.

Discussion

In the present study, we have ascertained the prevalence of asthma, asthma-like symptoms, allergic rhinitis and dermatitis and their correlation to positive skin prick tests (SPT) of common allergens (originating form various regions of Turkey) among newly enrolled freshmen at Osmangazi University in Eskisehir, Turkey.

The current and cumulative prevalences of asthma were determined to be 0·4% and 0·7% respectively. Similar studies employing the ECHRS questionnaire in Sweden, Italy and Greece have found current prevalences of asthma to be 3·3%, 3·7% and 2·4%, respectively (4–6). Studies conducted in various regions within Turkey have found current prevalences ranging from 0·9–6·8% (8–11). Thus, the prevalence of asthma found in our study was lower than those found both in other parts of the world and in this country (21).

The use of questionnaires to obtain data for epidemiological studies leads to a calculation of prevalence rates that is lower than the true values. Thus, these studies generally indicate the lowest possible prevalence rates. Confirming this is the fact that we identified eight new asthma cases from among the subjects called back for the more advanced evaluation at the second stage of our study, who had been unaware of the condition. Many established authors in our country claim that physicians and patients themselves refuse to accept the diagnosis of asthma as a definitive one (8). Some of the reasons for the low number of asthma sufferers found in our study may be the inadequacy of the Public Health System and the misdiagnoses of asthma as infections of the lower bronchial passage. In Taylor's study

TABLE 2. Evaluation, by OR and 95% CI logistic regression analysis, of SPT reactivity against various variables

	SPT positivity (%)	OR	95% CI	P
Atopy in the questionnaire				
Present	21·4	2·64	0·99–7·07	0·05
Absent	10·5			
Family history of atopy				
Present	14·3	1·25	0·24–6·39	0·79
Absent	14·3			
Gender				
Male	16·9	1·35	0·51–3·59	0·54
Female	12·2			
Smoking habits				
Current smoking	20·8	1·31	0·36–4·76	0·68
No smoking	13·4			
Passive smoking				
Yes	16·3	1·14	0·36–3·60	0·82
No	10·6			

(OR: Odds ratio; 95% CI: 95% confidence interval)

(13) the prevalences of asthma, allergic rhinitis and dermatitis were found to be 11·5%, 26% and 8·4%, respectively; in the Björksten study on East European children (22) the prevalences were found to be 1·4–10·8%, 12·6–55·1% and 1·3–48·8%. In our study these were found to be 0·7%, 10·0% and 5·8% respectively. In the former study symptomatic atopy was found to be 32·7%, while in ours it was 14·3%.

The definition of an atopic subject as one with at least one positive reaction to skin prick tests (SPT) was an appropriate definition for this study. SPTs are used worldwide to verify the diagnosis of allergic conditions. We also, in our study, applied SPT both to the students reporting atopy in the questionnaire and to the control group of students stating no such complaints.

It has been stated that SPT positivity is over 80% in asthmatics. In the general population, 11·9–20·9% SPT positivity has been found among asymptomatic individuals (13–14). In our study, though, 27·3% SPT positivity to at least one common allergen was found among asthmatics, 7·1% among those with dermatitis, 28·0% among those with rhinitis and 8·3% among those with no symptoms whatsoever. Mites and grass pollens have been established as the most common allergens (37·6%, 30·3%) and these were also found most common in our study, at 62·5% and 50%. In the study of Droste *et al*. SPT positivity to at least one allergen was found to be 55·4% (23). This is higher than the corresponding result in our study. The reason for a lower SPT positivity in our study may be that we accepted as positive a weal diameter of 5 mm or over, whereas most other studies have accepted 3 mm or over as being a positive reaction.

In Kalyoncu's study 225 of 4331 students had pets, of which 62 were cats, 52 were dogs and the rest were other types of animal. The prevelances of pet ownership were 5·2% (male) and 5·8% (female). The current prevalence of hypersensitivity to domestic animals was 1% (8). In Saraçlar's study on Turkish children the rate of pet ownership was established to be 9·6%, and the rate of allergic conditions in this group was no different from that of the group not keeping pets (9).

Because keeping pets in the home is not common in this country, cat and dog allergens were not included as routine items in our SPT tests. This may be one reason for the low SPT positivity we found.

In the second stage of the study, based on the results of the skin prick test, a positive reaction to one or more allergens was found in only 14% of the students. The finding of the Norrman study was 43% (24), with no significant difference between the sexes. While in that study allergic rhinitis was found to be 17%, in ours self-reported non-infectious rhinitis was found to be 10·0% and atopical rhinitis, 6·7%. Cat allergy was there stated to be the most common allergen, while in our study mites were the most common. Again in that study the most important risk factors for asthma were stated to be gender (being female) and atopy, although they were greatly increased in atopic people whose mothers smoked or had an allergy.

In our study 18·2% of SPT-positive students had reported no allergic complaints; this finding was 17% in the Foucard study (15). In that study, flexural eczema was found to be 8%, contact eczema 3% and non-infectious rhinitis 9%, while in our study itchy eczema was found to be 5·9%.

Baldacci, in his study (25) has found SPT positivity in the population to be 31%, taking a reaction of 3 mm as the threshold, and has found *D. Pteronyssinus* and *Farinae* to be the most common allergens. He found the highest SPT reactivity among young non-smokers. We found SPT positivity to be 20·8% among smokers and 13·4% among non-smokers ($P > 0{\cdot}05$). A significant relationship has been claimed between SPT positivity and the presence of asthma, asthma symptoms and rhinitis, and a significant correlation has been shown in our study too, between SPT positivity and atopic history reported in the questionnaire.

In Sweden prevalences among adults of the 20–46 year group were found to be 24·4% for rhinitis, 2·9% for current asthma and 35·6% for SPT positivity, while birch, grass, cats and dogs were found to be the most common allergens (4,26). Heredity, being of male gender and young age were independently associated with atopy, although no such relationship was shown in our study.

In conclusion, self-reported asthma and/or asthma-like symptoms among newly enrolled freshmen at Osmangazi University were found at a lower rate than in other countries. SPT positivity was found to be highest among asthma and rhinitis sufferers and lowest in the dermatitis sufferer group. Habitual smoking was seen to increase the rate of asthma and asthma-like symptoms. The low asthma prevalence found in this country was considered to be due to the fact that many asthma sufferers have not yet been diagnosed or have been misdiagnosed. It was our conclusion that peripheral doctors and general practitioners are in need of further education on the subject of asthma diagnosis.

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