

The Score For Allergic Rhinitis study in Turkey

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ABSTRACT

Background: The clinical definition of allergic rhinitis (AR) is difficult to use in epidemiological settings of large populations where it is impossible to obtain the laboratory evidence of each immune response. However, the standardization of the definition of AR in epidemiological studies is of crucial importance. This study was designed to estimate the prevalence of AR in an adult general population with respect to seven distinct geographical regions in Turkey.

Methods: Individuals were evaluated with the Score for Allergic Rhinitis (SFAR) questionnaire for a national cross-sectional study. The Turkish version of the SFAR questionnaire was tested for clarity and sensitivity in a small sample of the general population.

Results: Among the 3967 interviewed subjects, the overall prevalence of AR was 29.6%, with regional variations (from 21.0% in the southeastern Anatolia region to 36.1% in the Marmara region). The prevalence was higher in women and in urban area of residence.

Conclusion: This national survey confirmed the elevated prevalence of AR in Turkey. Our findings may contribute to the formulation of the public health policy and development of preventive and therapeutic strategies for AR in eastern Europe.

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Allergic rhinitis (AR) is a common disorder, which represents a considerable burden both on individual patients and on society. It has great importance because of the prevalence, impact on the quality of life, sleep, and work/school performance, and the links with other comorbidities.^{1,2} It is reported to affect 5–40% of the general population, and its prevalence tends to be rising.³

An important contribution to the investigation of AR is provided by the epidemiological studies conducted in large population-based samples. In such samples (where it is difficult to obtain doctor's evidence of AR or to identify the environmental allergens that are responsible for AR) the aim is discrimination of individuals who have AR and those individuals who are free from the disease.

There are few large-scale population studies on the prevalence of AR in Turkey.^{4,5} The purpose of this study was to obtain recent data on the prevalence of AR in the Turkish adult population, with emphasis on descriptive characteristics such as gender, age, and other epidemiological features with respect to seven distinct geographical regions in Turkey. The clinical definition of AR is difficult to use in epidemiological settings of large populations where it is impossible to obtain the laboratory evidence of each immune response. Further-

more, the standardization of the definition of AR in epidemiological studies is of crucial importance. Consequently, the Score for Allergic Rhinitis (SFAR), which has shown its value in discriminating individuals suffering from AR from those not suffering from it, was used.

METHODS

Study Design

The study was conducted between September 2009 and February 2010. Subjects were selected randomly from the list of inhabitants in the register book of municipalities at the accommodation sites of the surveyors. Overall, 3967 white inhabitants in 44 tertiary referral centers from the 7 main different regions of Turkey, which presumably represent the whole Turkish population in terms of living conditions and geographic background, were enrolled (Fig. 1). Approval from the Ethical Committee was obtained and completion of the questionnaire was considered to imply an informed consent. The study was performed in accordance with the guidelines of the Helsinki Declaration of Human Studies.

Marmara, Aegean, and Mediterranean regions are in the western part of Turkey, and eastern and southeastern Anatolian regions are in the eastern part. The Black Sea region is in the northern side. The number of people for each center was calculated by using a stratified sampling technique. Sample size for the study was calculated by allowing a 2% error in prevalence with 95% confidence interval. Sample sizes for each geographical region were calculated using the last census by stratified sampling method.⁶

Score for Allergic Rhinitis

Individuals were invited to complete the SFAR questionnaire (Appendix A) investigating main symptoms of AR such as blocked nose, runny nose, sneezing, and itchy eyes as well as related factors. The SFAR score was then calculated by summing the scores obtained under the different items of the questionnaire (Appendix B). Each item in the questionnaire was assigned a number of points with a final score ranging from 0 to 16. Annesi-Maesano *et al.* validated the SFAR.⁷ As from previous findings, an SFAR of ≥ 7 is adopted to define the presence of AR in our study. Before initiating the research, the questionnaire was tested for clarity and sensitivity in 120 volunteers, a Cronbach's α reliability coefficient was calculated, and a value of 0.69 was obtained.

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Approved by the Eskisehir Osmangazi University Ethical Committee

The authors have no conflicts to declare pertaining to this article

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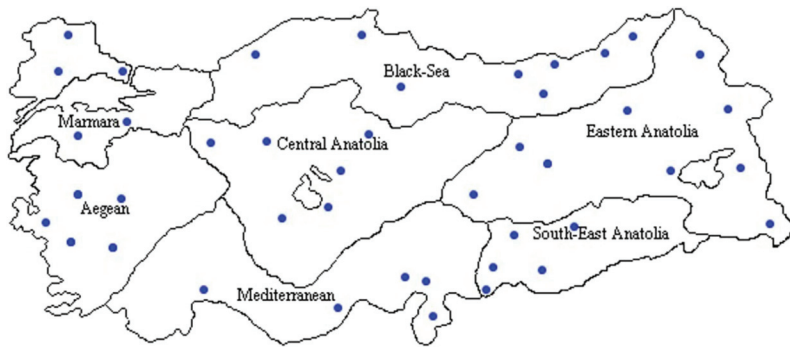


Figure 1. Centers participating in the study and seven geographical regions of Turkey.

The initial part of the questionnaire gathered demographic information. This included the volunteer's name (or initials), age, sex, and the geographical area of residence (rural or urban).

Statistical Analysis

Data were analyzed using the SPSS (Statistical Package for Social Sciences) 17.0 for Windows (SPSS, Inc., Chicago, IL). Percentages or mean $\pm$ SD were used to describe categorical and continuous variables, respectively. The statistical significance of the cross-tabulations was evaluated using Pearson's chi-square tests. The mean ages of patients in different regions were evaluated using analysis of variance test and Tukey *post hoc* test. Values of $p \leq 0.05$ were considered as statistically significant.

RESULTS

A total of 3967 volunteers participated in the study. One thousand nine hundred two were women (mean age, 32.49 ± 10.52 years) and 2065 were men (mean age, 32.77 ± 10.63 years). Of 3967 volunteers, 1015 (25.6%) were from Marmara, 680 (17.1%) were from Central Anatolia, 526 (13.3%) were from Aegean, 504 (12.7%) were from Mediterranean, 500 (12.6%) were from Black Sea, 390 (9.8%) were from southeast Anatolia, and 352 (8.9%) were from eastern Anatolia regions. Geographical concentration in regard to the location of residence of the group was 2457 (61.9%), urban, and 1510 (38.1%), rural. The self-reported prevalence of AR was 28.0% in men and 31.4% in women ($p = 0.019$) and 29.9% in urban and 20.3% in rural ($p = 0.011$) areas. The overall self-reported prevalence was 29.6% for the whole study group. The prevalence of self-reported AR among the geographical regions was highest (36.1%) in the Marmara region. On the contrary, the lowest prevalence of self-reported AR (21.0%) was obtained from the participants living in the southeast Anatolia region of Turkey (Table 1). Statistical significance appeared among geographical regions for the self-reported prevalence of AR ($p = 0.001$). The self-reported prevalence is significantly higher in the Marmara region ($p < 0.001$) and lower in the eastern Anatolia ($p = 0.003$) and south-eastern Anatolia regions ($p < 0.001$) when compared with the overall self-reported prevalence of 29.6%.

The mean age for patients with self-reported AR was 32.59 ± 10.57 years and it was 32.65 ± 10.59 years for patients without reported AR. No statistically significant difference could be found between the two groups ($p = 0.868$). No statistically significant difference could be found in terms of geographical region for average ages of patients with AR ($p = 0.456$).

DISCUSSION

The data of the prevalence of clinically diagnosed AR in the adult population are sparse and between 8.9 and 27.7% in Turkey.^{4,5,8} AR is frequently trivialized (by the patient) and/or unrecognized (by the physician), resulting in the inadequate control of symptoms. The diagnosis rate for AR has only been measured in studies that have

been limited in terms of the studied populations and/or had restricted geographical coverage. The proportion of undiagnosed subjects was relatively high, ranging from 25 to 60%.⁹ The main purpose of the present survey is to estimate the self-reported prevalence of AR in a Turkish adult population, with emphasis on descriptive characteristics and epidemiological features by using a highly validated instrument, the SFAR questionnaire. We had recently published another study on the self-reported prevalence of AR in Turkey.¹⁰ We think that value of SFAR in assessment of AR may affect the interpretation of results, so this survey was performed.

There seems to be a substantial worldwide variation in the prevalence of AR. In a recent study, the prevalence of AR diagnosed by a physician in adults in Europe ranged from 17% (Italy) to 28.5% (Belgium) (Table 2).^{11,12} The Swiss Study on Air Pollution and Lung Disease in Adults studied the prevalence of bronchial asthma, chronic bronchitis and allergic conditions in the adult population of Switzerland.¹³ The prevalence of AR (rhinitis symptoms associated with atopy) was 13.5%; the prevalence of current seasonal AR varied between 9.1% (questionnaire answer and a positive skin-prick test to at least one pollen) and 14.2% (questionnaire answer only). In our study, the diagnosis of AR was based on a score, the SFAR which has been validated to accurately diagnose patients with AR^{7,14} and used in epidemiologic studies.^{7,15,16} Based on the questionnaire, 29.6% of the study population was considered to have AR. It is difficult to compare the present study to the current literature because of differences in the study populations, study methods, and diagnostic definitions used. The gender differences in the present study are in accordance with other studies, showing an increasing proportion of women with AR.

Studies in North America, Europe, Central America, and South Africa have indicated that urbanization, with massive increase in emissions of air pollutants due to industrial growth and motor vehicles, is correlated with the increasing frequency of AR and atopy.¹⁷ On the contrary, the countryside lifestyle and the ingestion of nonpasteurized milk in infancy in rural areas can possibly protect children from the development of allergy.¹⁸ In our study, the self-reported prevalence of AR was 29.9% in urban areas and 20.3% in rural areas ($p = 0.011$). The population living in the southeast Anatolia region and eastern Anatolia region, the areas of the lowest reported and physician-diagnosed AR prevalence, are mainly occupied with stockbreeding and farming. Houses are widely interspersed, and domestic animals (farming and pets) are common. The Marmara region, with the highest reported and physician-diagnosed AR prevalence, has the largest urban population in Turkey.

Statistically significant variations appeared among the geographical regions in our study. This result is not surprising because of the large area of Turkey that contains various geographical and climatic properties. Turkey has coasts on the Mediterranean, Black, and Aegean Seas, with a population of ~67 million. Turkey, with the total area of 814,578 km², is the second largest among countries with part of territory in Europe after Russia. Coastal regions have higher humidity accompanied by relatively hot summers and temperate-rainy

Table 1 Prevalence of allergic rhinitis in Turkey

	Prevalence of AR
Sex (<i>n</i>)	
Male (2065)	28.0%
Female (1902)	31.4%
Area of residence (<i>n</i>)	
Urban (2457)	29.9%
Rural (1510)	20.3%
Geographical regions (<i>n</i>)	
Marmara (1015)	36.1%
Aegean (526)	32.1%
Black Sea (500)	29.8%
Central Anatolia (680)	28.7%
Mediterranean (504)	27.0%
Eastern Anatolia (352)	22.2%
Southeast Anatolia (390)	21.0%

winters. In contrast, inner zones have dry hot summers and cold winters. Macroenvironmental characteristics (climate, altitude, *etc.*) can affect the prevalence of allergic diseases with increasing prevalence rates at higher annual temperatures and at increasing proximity to the sea.¹⁹ In the International Study of Asthma and Allergies in Childhood, which enrolled children from 12 countries of western Europe, climatic differences were associated with asthma, AR, and atopic eczema.²⁰ Increasing temperature seems to induce substantial increases in pollen production from ragweed in experimental conditions.^{21,22} Spore release is generally favored by the high levels of humidity, even if mechanisms of release show differences among fungi species.²³ Outdoor humidity is important not only because of its moisturizing effect, but also because of its promoting effect on the infestation of house-dust mites and molds. This impact was found to facilitate the respiratory symptoms in previous studies.^{24,25} In our study, AR was highest in the Marmara, Aegean, and Black Sea coastal regions, which have high temperature and more humidity. The southeastern Anatolian and eastern Anatolian regions, with their dry and cold climate, have the lowest AR prevalence. The normal mean temperature in the southeastern Anatolian region is 21.5°C during the six summer months (May–October) and 3°C during the six winter months (November–April; 2009 data due to Ministry of Environment and Forestry). Van Velzen *et al.* have reported decreased eosinophil mediator release in patients staying in high-altitude areas.²⁶ In the present study, AR self-reported prevalence was highest in the Marmara region, which is located at sea level. On the other hand, population settlements in eastern Anatolia regions, with the lowest AR prevalence, is 1500–2000 m above sea level, depending on the city center in question.

The present study has several limitations. The primary limitation is that the information gathered from this study was based on perceived symptoms with no clinical and objective confirmation. The definition is based on symptomatology without ear, nose, and throat examination or imaging. It seems that there is an overestimation of AR using questionnaires only and that the attributable fraction of IgE-mediated allergy in patients with a diagnosis of AR by questionnaires is slightly >50%.^{27,28} Thus, studies using questionnaires may overestimate the true prevalence of AR. The third limitation in the present study is that there is no information that can be used to exclude the patients with septum deviation. However, the SFAR has shown to be appropriate to identify individuals suffering from AR in epidemiological settings of large populations where it is impossible to visit everybody individually or to obtain laboratory evidence. Furthermore, the SFAR has shown to be effective in discriminating AR from nonallergic rhinitis by comparison with allergic sensitization according to specific IgE or skin-prick test positivity.^{7,29} We think that our study is useful for comprising population-based data on AR in Turkey. Our study has

Table 2 Prevalence of clinically confirmable allergic rhinitis in Europe as percent (95% confidence interval)

Country	Prevalence
Belgium	28.5 (24.5–32.5)
France	24.5 (21.0–28.0)
Germany	20.6 (16.5–24.6)
Italy	16.9 (12.9–20.9)
Spain	21.5 (18.5–24.4)
United Kingdom	26.0 (20.3–31.7)

also shown that in the absence of a medical visit, the SFAR is a useful standardized questionnaire that helps in screening of AR. It aids in gathering information necessary for the identification of AR in Turkey. It can be used in children as well as in adults. SFAR not only makes an estimation on the prevalence, but also gives useful data on the impact of AR on quality of life.^{30,31} We hope that our study contributes to the existing literature because the knowledge on AR is far from complete and epidemiological studies that provide useful clues toward the interpretation of the allergic diseases are relatively few.

CONCLUSION

This study is one of the largest population-based studies of AR conducted in Turkey. The study reveals that AR is quite common in Turkey, affecting almost one-third of the adults. Our findings may contribute to the formulation of the public health policy and developing the prospective preventive strategies for AR in Turkey.

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APPENDIX A. SCORE FOR ALLERGIC RHINITIS QUESTIONNAIRE

1. In the past 12 months, have you had a problem apart from cold or flu?

a. Sneezing	Yes ()	No ()
b. Runny nose	Yes ()	No ()
c. Blocked nose	Yes ()	No ()
2. In the past 12 months, has this nose problem been accompanied by itchy watery eyes?

Yes ()	No ()
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3. In which of the past 12 months (or in which season) did this nose problem occur?

Jan ()	Feb ()	Mar ()	Apr ()	May ()	June ()
July ()	Aug ()	Sept ()	Oct ()	Nov ()	Dec ()
Alternatively:		Winter ()	Summer ()	Autumn ()	
4. What trigger factors provoke or increase your nose problem?

a. House dust ()		
b. Pollens ()		
c. Animal (cat, dogs) ()		
d. Others (please specify)		
5. Do you think you are allergic?

Yes ()	No ()
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6. Have you already been tested for allergy (skin-prick tests to allergens, IgE)?

Yes ()	No ()
If Yes: Were they positive?	
	Yes ()
	No ()
7. Has a doctor already diagnosed that you suffer/suffered from an allergy (asthma, eczema, allergic rhinitis)?

Yes ()	No ()
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8. Is there anyone in your family who suffers from:

	Father	Mother	Siblings
a. Asthma	Yes ()	No ()	()
b. Eczema	Yes ()	No ()	()
c. Allergic rhinitis	Yes ()	No ()	()

APPENDIX B. ATTRIBUTED SCORE AND REPARTITION OF THE ITEMS FOR THE SCORE FOR ALLERGIC RHINITIS

Items Discriminators	Score (points)	Cumulative Score
Nasal symptoms (blocked, runny nose, and/or sneezing) in the past year	1 for each symptom	3
Months of the year	1 for perennial	4
	1 for pollen season	
Itchy eyes	2	6
Triggers		
Pollens, house-dust mites, and/or dust	2	8
Epithelia (cats and/or dogs)	1	9
Perceived allergic status	2	11
Previous positive allergic tests	2	13
Previous medical diagnosis of allergy	1	14
Familial history of allergy	2	16
Total		16

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