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The Score for Allergic Rhinitis study in Turkey, 2020

Cemal Cingi[1], Nuray Bayar Muluk[2], Nihat Susaman[3], Nagehan Küçükcan[4], Murat Kar[5], Mustafa Altıntaş[6], Fazilet Altın[7], Sinan Eroğlu[8], Kemal Kef[9], Kağan İpçi[10], Selis Gülseven Güven[11], Senem Kurt Dizdar[12], Serkan Çayır[13], İsmail Salcan[14], Müge Özçelik Korkmaz[5], Aslı Şahin Yılmaz[16], Bülent Topuz[17], Sema Başak[18], Ahmet Ural[19], Bengu Yaldız Çobanoğlu[20], Alper Nabi Erkan[21], Fatih Oğhan[22], Görkem Eskiizmir[23], Burak Ömür Çakır[24], Berna Uslu Coskun[25], Cüneyt Orhan Kara[26], Erdoğan Gültekin[27], Harun Üçüncü[28], Adin Selcuk[29], Emine Elif Altuntaş[30], Kasım Durmuş[30], Samet Özlügedik[31], Sema Zer Toros[32], Özgür Karameşe[32], Tuba Bayındır[33], Müzeyyen Yıldırım Baylan[34], İsmail İynen[35], Orhan Yılmaz[36], Nihat Yılmaz[36], Deniz Avcı[37], Abdulhalim Aysel[38], Cengiz Bal[39], Serdar Başer[40], Ziya Bozkurt[41], Tolgahan Çatlı[42], Erdem Atalay Çetinkaya[43], Fatih Öner[44], Zerrin Özergin Coşkun[45], Denizhan Dizdar[46], Erkan Ekşi[47], Bekir Can Gümüşlü[48], Aşkın Keskin Kaplan[49], Abdullah Kınar[50], Hülya Parıldar[51], Ali Sayed Resuli[52], Erdem Köroğlu[53], Demet Yazıcı[54], Yücel Kurt[55], Muhammet Dilber[56], İbrahim Çukurova[57], Isabella Annesi-Maesano[58]

[1]ENT Department, Eskisehir Osmangazi University School of Medicine, Eskisehir, Turkey
[2]ENT Department, Kırıkkale University School of Medicine, Kırıkkale, Turkey
[3]ENT Clinic, Health Sciences University, Fethi Sekin City Hospital, Elazig, Turkey
[4]ENT Clinic, Çukurova State Hospital, Adana, Turkey
[5]ENT Clinic, Kumluca State Hospital, Antalya, Turkey
[6]ENT Clinic, Serik State Hospital, Antalya, Turkey
[7]ENT Department, Health Sciences University, Sultangazi Haseki Training and Research Hospital, İstanbul, Turkey
[8]ENT Clinic, Bahçelievler State Hospital, İstanbul, Turkey
[9]ENT Clinic, Private Keşan Hospital Edirne, Turkey
[10]ENT Clinic, Koru Private Hospital, Ankara, Turkey
[11]ENT Department, Trakya University School of Medicine, Edirne, Turkey
[12]ENT Department, İstanbul Şişli Hamidiye Etfal Training and Research Hospital, İstanbul, Turkey
[13]ENT Department, Aksaray University School of Medicine, Training and Research Hospital, Aksaray, Turkey
[14]ENT Department, Binali Yıldırım University School of Medicine, Mengücek Gazi Training and Research Hospital, Erzincan, Turkey
[15]ENT Department, Sakarya University School of Medicine, Training and Research Hospital, Sakarya, Turkey
[16]ENT Department, Ümraniye Training and Research Hospital, İstanbul, Turkey
[17]ENT Department, Pamukkale University School of Medicine, Denizli, Turkey
[18]ENT Department, Aydın Adnan Menderes University School of Medicine, Aydın, Turkey
[19]ENT Department, Bolu Abant İzzet Baysal University School of Medicine, Bolu, Turkey
[20]ENT Department, Karadeniz Technical University School of Medicine, Trabzon, Turkey
[21]ENT Department, Başkent Training and Research Center, Adana, Turkey
[22]ENT Department, Kütahya Health Sciences University School of Medicine, Kütahya, Turkey
[23]ENT Department, Manisa Celal Bayar University School of Medicine, Manisa, Turkey
[24]ENT Department, Beykent University School of Medicine, İstanbul, Turkey
[25]ENT Department, İstanbul Şişli Hamidiye Etfal Training and Research Hospital, İstanbul, Turkey
[26]ENT Department, Pamukkale University School of Medicine, Denizli, Turkey
[27]ENT Department, Tekirdağ Namık Kemal University School of Medicine, Tekirdağ, Turkey
[28]ENT Department, Muğla Sıtkı Koçman University School of Medicine, Muğla, Turkey
[29]ENT Department, Bahçeşehir University School of Medicine, İstanbul, Turkey
[30]ENT Department, Sivas Cumhuriyet University School of Medicine, Sivas, Turkey
[31]ENT Department, Ankara Oncology Training and Research Hospital, Ankara, Turkey
[32]ENT Department, Haydarpaşa Numune Training and Research Hospital, İstanbul, Turkey
[33]ENT Department, İnönü University School of Medicine, Malatya, Turkey
[34]ENT Department, Dicle University School of Medicine, Diyarbakır, Turkey
[35]ENT Department, Harran University School of Medicine, Urfa, Turkey
[36]ENT Department, Karabük University School of Medicine, Karabük, Turkey
[37]ENT Clinic, Nevşehir State Hospital, Nevşehir, Turkey
[38]ENT Department, Health Sciences University, İzmir Bozyaka Training and Research Hospital, İzmir, Turkey
[39]Biostatics Department, Eskisehir Osmangazi University School of Medicine, Eskisehir, Turkey
[40]ENT Department, Keçiören Training and Research Hospital, Ankara, Turkey
[41]ENT Clinic, Bahçeşehir University Göztepe Medical Park, İstanbul, Turkey
[42]ENT Department, Health Sciences University İzmir Bozyaka Training and Research Hospital, İzmir, Turkey
[43]ENT Department, Health Sciences University Antalya Training and Research Hospital, Antalya, Turkey
[44]ENT Department, Health Sciences University Erzurum Training and Research Hospital, Erzurum, Turkey
[45]ENT Department, Recep Tayyip Erdoğan University School of Medicine, Rize, Turkey
[46]ENT Clinic, Bahçelievler Medical Park, İstanbul, Turkey
[47]ENT Department, Başkent University Zübeyde Hanım Application and Research Center, İzmir, Turkey
[48]ENT Department, Bağcılar Training and Research Hospital, İstanbul, Turkey
[49]Department of Family Medicine, Maltepe University School of Medicine, İstanbul, Turkey
[50]ENT Clinic, Afyonkarahisar State Hospital, Afyonkarahisar, Turkey
[51]Department of Family Medicine, Health Sciences University, Izmir Tepecik Training and Research Hospital, İzmir, Turkey
[52]ENT Department, Istanbul Yeni Yüzyıl University School of Medicine, Istanbul, Turkey

[53]ENT Department, Health Sciences University, Derince Training and Research Hospital, Kocaeli, Turkey
[54]ENT Department, University of Health Sciences, Adana City Training and Research, Adana, Turkey
[55]ENT Clinic, Finike State Hospital, Antalya, Turkey
[56]Otorhinolaryngology Section, Dilber Private Clinic, İstanbul, Turkey.
[57]ENT Department, Health Sciences University, Tepecik Training and Research Hospital, İzmir, Turkey
[58]Department of Epidemiology of Allergic and Respiratory Diseases, Institute Pierre Louis of Epidemiology and Public Health, INSERM, and UPMC Sorbonne Université, Saint Antoine School of Medicine, Paris, France

Abstract

Objective: This study aimed to determine how prevalent allergic rhinitis (AR) is in Turkey and to compare the current prevalence with the figures obtained 10 years earlier.

Methods: This study included 9,017 participants. The minimum number of participants required from each center was determined via a stratified sampling technique according to regional demographic characteristics as ascertained from the last census. For each region, both men and women were administered the score for allergic rhinitis (SFAR) questionnaire and a score for each participant was calculated based on the responses supplied.

Results: A total of 9,017 individuals (55.3% men and 44.7% women) took part in this study. Of these, 94.4% were urban residents and 5.6% lived in a rural setting. Of the men, 38.5% self-reported as suffering from AR. The corresponding figure in women was 40.5%. The overall prevalence of AR, as deduced on the basis of the SFAR, was found to be 36.7%. Comparing the prevalence in different regions, we found that AR was the least prevalent in the Black Sea region with a frequency of 35.8%. The highest prevalence was in the Mediterranean region, where the prevalence was 37.7%. There was no statistical significance in the apparent differences in prevalence between different geographical regions. Despite this, however, there was a clear increase in the frequency of AR over the preceding decade. This increase was most pronounced in the South-Eastern Anatolian region, where the frequency rose from 21.0% to 36.9%.

Conclusion: Our results indicate that there has been a marked increase in the prevalence of AR in every region in Turkey over the last 10 years. This could be related to living conditions in urban environments. Alterations in lifestyle, urban living, air pollution causing impairments in immune defense mechanisms, and other aspects of modern lifestyles may account for the increase in AR in Turkey.

Keywords: Allergic rhinitis, geographical regions, rural living, score for allergic rhinitis, urban living

Introduction

Allergic rhinitis (AR) is characterized by attacks of sneezing, nasal discharge, a blocked nose, and nasal pruritus. Postnasal drip, coughing, and feelings of irritability and excessive tiredness are also frequent complaints related to AR.[1-3] Difficulty in breathing comfortably during sleep is among the key morbidities in AR.[4,5] Adult patients with AR have an increased frequency of anxiety and depression, do not do well academically, and are less productive than work colleagues. It is reported that they perform even worse than patients with asthma. Their sexual function is also adversely affected, and they experience a lower quality of life.[6-11]

Allergic rhinitis usually develops after exposure to allergenic epitopes that occur seasonally or are present year-round, whether in an indoor or outdoor environment. Pollen of various kinds (notably that from grasses, trees, and wildflowers) are some of the most frequent seasonal triggers of AR. The usual year-round allergenic triggers are house dust mites, pet dander, and mold. In some regions with a tropical or subtropical climate, allergenic pollens may persist throughout the year.[12]

Thus, seasonal AR is generally the result of exposure to tree, grass, or wildflower pollen in susceptible individuals. Pollen release occurs at particular times, which are well known, in different areas. Various vernacular terms such as "cedar fever," "hay fever," or "rose fever" are used to refer to AR. These may sometimes appropriately identify the likely triggering

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Corresponding author:
Nuray Bayar Muluk
Email: *nbayarmuluk@yahoo.com*
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pollen, but could also cause confusion as the true allergen may be a different substance that just happens to coincide with the time of release of a different pollen. Examples of this phenomenon are the release of grass allergens that coincide with the same for rose pollen ("rose fever") and wildflower pollen or mold on cut grass that trigger "hay fever" symptoms. However, the onset and duration of seasonal AR can be predicted reliably when the true allergen is identified.[13]

In temperate or cool regions, allergens found indoors year-round (house dust mites, cockroaches, mold spores, and pet dander) are the typical triggers for perennial AR. In the tropics and subtropics, airborne allergens may persist all year; this is a frequent cause of AR as the pollen season is often lengthy and molds and dust mites occur in most places. Perennial AR can also occur when via employment-linked exposure to an allergen.[14]

Patients usually develop hypersensitivity to one or more airborne allergens before the symptoms of AR develop.[15] Patients are said to be sensitized if skin prick testing or serology indicate the existence of immunoglobulin E to specific allergens. Being sensitized, nonetheless, is not the same as being allergic to a substance as sensitization can exist in the absence of an allergic response to allergenic exposure. Thus, it is a subgroup of those individuals who undergo sensitization who progress to clinical symptoms of an allergy.[16]

Over the preceding 10 years, there have been discussions of why disorders manifesting atopy are becoming more common even as infective diseases are reducing in frequency. It is speculated that the higher quality of healthcare and greater level of hygiene that accompanies economic development plays some role leading to higher allergy levels. Strachan[17] was the first to propose this "hygiene theory" of atopy based on observations that as families got smaller, there was a corresponding rise in the incidence of atopy, including asthma. This initial deduction has since been bolstered by the fact that factors such as greater exposure to infection via older siblings,[18-20] attending a nursery,[21] serological evidence of previous pathogens transmitted via the orofecal route,[22,23] and regular exposure to farm animals prior to reaching 7 years of age[24] all lower the risk of atopy.

The economic costs of atopic illnesses are rising. In addition to its own economic burden, AR is frequently coupled with asthma and sinusitis—two conditions that also impose notable economic costs.[13]

This study evaluated the current prevalence of AR within Turkey. The study included each of the seven regions of the country. The SFAR questionnaire and attributed score and repartition of the items for the SFAR were used in each region.[25]

Methods

This prevalence survey was carried out between February and July 2020 in the seven regions of Turkey. Ethical approval was granted by the Non-invasive Research Ethics Committee at Fırat University (Date: 23.01.2020, Number: 2020/02-25).

Study Design

As the survey was administered in each of the seven regions of Turkey, it aimed at achieving a representative selection of the entire Turkish population. A total of 9,017 participants were enrolled. The seven regions are as follows: the Black Sea region (northern Turkey); Marmara, Aegean, and Mediterranean regions (western Turkey); and Central, Eastern, and South-Eastern Anatolian regions (eastern Turkey) (Figure 1).

A stratified sampling technique was used to permit targeting the smallest sample size that was still representative of the population under study. The data from the latest census were used to set up the strata.[26] The minimum sample size was calculated to achieve a power of 0.78 allowing for a 2% error in the estimated prevalence. The statistical software PASS 11 was used to make this calculation. The results indicated that at least 4,200 men and 4,400 women were needed to ensure representation of the population characteristics. The Cronbach's alpha obtained for the entire sample (n = 9,017) was 0.79.

For each of the seven regions, both male and female participants were administered a questionnaire to obtain the SFAR (Appendix 1)[25] and the attributed score and repartition of the items for the SFAR (Appendix 2).[25] On the basis of the responses given, the SFAR value was calculated for every respondent.

Verbal consent to participate in the study was obtained from each participant prior to the administration of the questionnaire.

Score for Allergic Rhinitis

The SFAR covers the principal symptomatology of AR-nasal congestion, rhinorrhea, sternutation, and ocular pruritus-along with other questions.[25] Scoring for the SFAR is performed by summing the values for each individual response in the questionnaire as explained in Appendix 2. There are points for each section of the questionnaire. The total final score is between 0 and 16.[2] Annesi-Maesano et al.[27] have validated the SFAR. This study used a cutoff of 7 or above to indicate the presence of AR, as per earlier studies.[25]

Statistical Analysis

All statistical analyses of the study data were performed using the Statistical Package for the Social Sciences (SPSS) version 21.0 (IBM SPSS Corp.; Armonk, NY, USA) application. Categorical data were described with percentages and continuous data were expressed as mean plus standard deviation. Cross-tabulated results were assessed for statistical significance using Pearson's chi-square test. One-way analysis of variance was used to compare the mean age of the participants across the different regions. Tukey's test was used for post-hoc intergroup comparisons of mean values. A value of $P < .05$ was taken to indicate statistical significance.

Results

This study enrolled 9,017 individuals, of whom 4,983 were men (55.3%) and 4,034 were women (44.7%). The mean ages of the men and women were 32.66 ± 12.29 years and 33.92 ± 12.39 years, respectively.

Table 1 shows the number of participants and the prevalence of AR for each region in Turkey. The breakdown of participation from each region is as follows: 2,880 (31.9%) from Marmara; 1,386 (15.4%) from Central Anatolia; 1,220 (13.5%) from the Ae-

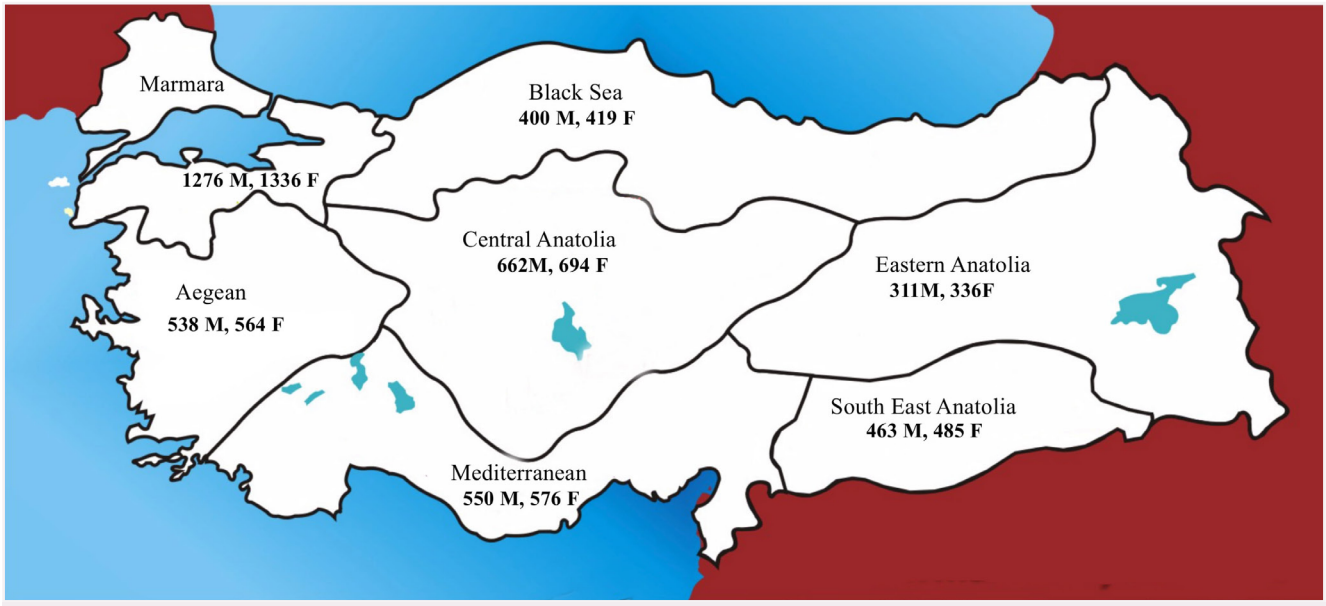

Figure 1. Seven Geographic Regions of Turkey and Corresponding Study Populations

Table 1. Prevalence of Allergic Rhinitis (AR) in Turkey

Geographical Regions		n	%	Prevalence of AR (%)
North	Black Sea	1,081	12.0	35.8
West	Marmara	2,880	31.9	36.6
	Aegean	1,220	13.5	36.8
	Mediterranean	1,150	12.8	37.7
East	Central Anatolia	1,386	15.4	36.1
	Eastern Anatolia	650	7.2	37.5
	South-Eastern Anatolia	650	7.2	36.9
Total		9,017	100.0	36.7

gean; 1,150 (12.8%) from the Mediterranean; 1,081 (12.0%) from the Black Sea; 650 (7.2%) from South-Eastern Anatolia; and 650 (7.2%) from Eastern Anatolia.

When considering Turkey as a whole (n = 9,017), the prevalence of AR-as indicated by the SFAR—is 36.7%. Among the different regions, the Black Sea had the lowest prevalence at 35.8%, whereas the Mediterranean had the highest prevalence at 37.7% (Table 1). There was, however, no statistical difference in the prevalence of AR among the various regions ($P = .97$, $\chi^2 = 1.37$).

The self-reported rate of AR was 38.5% among men and 40.5% among women ($\chi^2 = 4.04$, $P = .040$).

Discussion

AR is an atopic condition that occurs frequently and affects around 10%-25% of the global population.[12] The symptomatology of AR consists of nasal discharge, nasal blockage, nasal pruritus, and sternutation. These symptoms are caused by a patient coming in contact with an allergenic trigger, irrespective of whether they are receiving therapy, and can be reversed. AR is a key condition affecting the airways. It has an appreciable burden of morbidity that results in patients being unable to go about their daily routine and experiencing a declining quality of life.[28]

AR has been steadily increasing in prevalence over the last few decades, particularly in countries with a high level of industrialization and economic development. Currently, however, the precise pathogenic mechanisms underlying allergic disorders is still not known. Researchers believe that there are several factors that may be etiological for AR, including alterations in lifestyle, greater exposure to allergens, increased pollution, and irritants such as tobacco fumes or gases. Other factors are nutritional deficiencies arising from alterations in diet, fewer infective episodes, and greater stress.[12] Both a conducive environment and an atopic diathesis are necessary for AR to develop.[28]

The following are the known risk factors for developing AR:[29-31] (1) a history of allergies in the family (indicating a genetic susceptibility to atopic disorders), (2) being male, (3) being born at a time of high pollen prevalence, (4) being the first child in a family, (5) being prescribed antibiotics at a young age, (6) having a mother who smoked when the patient was an infant, (7) being exposed to allergens such as house dust mites in a building, (8) a serological titer for immunoglobulin E (IgE) exceeding 100 IU/mL up to the age of 6 years, and (9) presence of allergen-specific IgE.

This study aimed to investigate how prevalent AR was in the seven regions of Turkey. There were 9,017 individuals enrolled in the study, of which 4,983 (55.3%) were men and 4,034 (44.7%) were women. The breakdown of participation in each region is as follows: 2,880 (31.9%) from Marmara; 1,386 (15.4%) from Central Anatolia; 1,220 (13.5%) from the Aegean; 1,150 (12.8%) from the Mediterranean; 1,081 (12.0%) from the Black Sea; 650 (7.2%) from South-East Anatolia; and 650 (7.2%) from Eastern Anatolia. With regard to their living environment, 94.4% of the group (8,516 individuals) were urban residents and 5.6% (501 individuals) were rural residents.

When considering Turkey as a whole (n = 9,017), the prevalence of AR-as indicated by the SFAR-is 36.7%. Among the different regions, the Black Sea had the lowest prevalence (35.8%), whereas the Mediterranean had highest prevalence (37.7%) (Table 1). There was, however, no statistical difference in the prevalence of AR among the various regions ($P = .97$, $\chi^2 = 1.37$).

The prevalence of AR is increasing, particularly in cities, across every industrially advanced country. Despite the major economic costs associated with AR via its detrimental effects on academic and occupational performance, the need for medical consultations, treatment costs (both prescription and over-the-counter), and the frequently co-morbid rhinosinusitis and asthma, AR remains both underdiagnosed and undertreated.[13]

The following pollutants are known to be associated with causing and worsening existing atopic disorders that affect the airways: the various oxides of nitrogen, O_3, SO_2, CO, large and small particles in black smoke, and organic compounds with a high volatility.[32-34]

AR that lasts year-round is frequently due to the inhalation of particular indoor allergens. It is common for an individual to spending the majority of their time indoors in early childhood; therefore, if one or more particular allergen(s) are abundant in the home environment, there is an increased risk of a child undergoing allergic sensitization. Neonates who were at increased risk owing to their mother being exposed to house dust mites in their living areas and bedrooms were discovered to have congenitally higher levels of circulating IgE.[35]

Owning a pet animal is associated with a significantly raised chance of undergoing sensitization to antigens from that animal.[36] Households that owned a pet were more at risk of asthma, rhinitis, and allergic dermatitis than households without pets.[37] Many animals secrete proteins that bear epitopes able to provoke severely hypersensitive responses. The most common animals that produce a hypersensitivity reaction are dogs and cats, particularly when they share a bedroom with the owner. Such atopic reactions frequently present as AR and asthma. Thus, it is advised that pets be excluded from an indoor environment if a member of a household presents with continuing atopy linked to their presence.[28]

A 2011 study by our research group looked at the SFAR values in Turkey, which was divided then-as here-into seven regions. The 2011 study enrolled 3,967 individuals and discovered an AR frequency of 29.6%. At that time, the prevalence in the regions differed; the lowest frequency was recorded in South-East Anatolia (21.0%) and the highest in Marmara (36.1%).[25] In this study, the prevalence in South-East Anatolia was 36.9% whereas that in Marmara was 36.6%. There has clearly been a marked increase in AR prevalence in South-East Anatolia over the last decade, considering the increase from 21.0% to 36.9%. Furthermore, the prevalence of AR rose from 22.2% to 37.5% in Eastern Anatolia, from 27.0% to 37.7% in the Mediterranean, from 28.7% to 36.1% in Central Anatolia, from 29.8% to 35.8% in the Black Sea, from 32.1% to 36.8% in the Aegean, and from 36.1 to 36.6% in Marmara .[25] This shows that within a span of 10 years, the prevalence of AR increased in every region of Turkey. One primary reason for this increased prevalence could be the change in living conditions associated with urbanization. The vast majority of the study participants (94.4%) live in an urban setting; merely 5.6% live in rural areas.

Many researchers have suggested that decreases in air quality, alterations in lifestyle, and lower exposure to infection by bacteria or viruses are all factors contributing to a rise in hypersensitivity reactions and are thus causing the more frequent occurrence of AR.[28]

The question of whether there is an association between different levels of air quality and AR prevalence is still unproven. It is, however, known that the volume and quality of air pollution are significant to how atopic disorders develop. Von Mutius et al.[38] have investigated this hypothesis via an epidemiological study of two different German cities that enrolled 7,653 children; 5,030 of these lived in Munich and the remaining 2,623 in Leipzig. The two cities are subject to different types of air pollution; Leipzig is prone to SO_2 fumes generated by combustion of coal and in Munich, cars contribute to air pollution.

Undoubtedly, the pathogenic mechanisms of atopic diseases and those affecting the respiratory system feature air pollution, possibly as the key factor. Certain pollutants may damage the ability of the air passages to defend the body against viral or bacterial infections. They may also be immunotoxic.[34] Pollutants potentially also feature directly or indirectly in the pathological mechanism of atopic disorders and their pathogenesis.[18-21, 39-43]

Epidemiological investigations have repeatedly demonstrated that exposure to bacterially derived toxins is key to becoming tolerant to allergens found everywhere in the environment. This consideration lends weight to the hygiene hypothesis, which postulates that more modern and better living conditions actually lead to an increase in atopic disorders.[28]

Our 2011 study demonstrated that the prevalence of AR was significantly different in the eastern and western portions of Turkey. We suggested at that time that cultural and social differences, as well as varying altitudes, underlay this difference. It is notable that this difference has virtually disappeared within a decade. The different parts of the country may have converged culturally.

Conclusion

Our results indicate that there has been an increase in the prevalence of AR in every region in Turkey over the last 10 years. The reasons for this may be related to urban living conditions. Alterations in lifestyle, urban living, air pollution impairing immune defense mechanisms, and modern lifestyles may account for the

increase in AR in Turkey. Given the significant economic and social burden created by AR, air pollution-which is implicated as a risk factor for AR-should be controlled and natural rural lifestyles should be encouraged.

Ethics Committee Approval: Ethical committee approval was received from the Fırat University Non-invasive Research Ethics Committee (Date: 23.01.2020, Number: 2020/02-25).

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