

The Prevalence of Asthma and Allergic Symptoms in Manisa, Turkey (A Western City from a Country Bridging Asia and Europe)

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SUMMARY The aim of this study was to determine the prevalence of asthma and allergic symptoms in Manisa city center, Turkey, to evaluate the determinants effective on those values, and to review the prevalence rates reported from different parts of the country. Data were collected from 610 households and complete interviews were conducted with 1,336 adults over 18 years of age by using European Community Respiratory Health Survey-ECRHS questionnaire. The prevalences of current asthma, cumulative asthma and asthma-like symptoms were found in 1.2, 1.0 and 25.0%, respectively, of the 20-44 years age group and the prevalences of allergic rhinitis, allergic dermatitis and family atopy were found in 14.5, 10.9, and 15.2%, respectively, in all age group. Wheezing with breathlessness, wheezing without cold, woken up with shortness of breath and woken up with cold were reported by 9.1%, 6.9%, 6% and 16.1% of the study population, respectively. Gender, age, active or passive smoking, family atopy and home condition effect on prevalence of asthma and allergic symptoms. In this study prevalence of asthma correlated with the studies reporting low prevalence rates of Turkey.

Asthma is a worldwide disease with a varying prevalence among different countries and populations.¹ Different prevalence rates from various parts of Turkey have been reported (Fig. 1).²⁻¹² The aim of this study is to determine the current and cumulative prevalence of asthma and allergic symptoms in Manisa city center, Turkey, to evaluate the determinants on those values and to review the prevalence rates reported from different parts of the country.

MATERIALS AND METHODS

Study area, samples and sampling method

Manisa is one of the biggest industrialized cities in Turkey located on the Aegean Zone without

any seashore and with Mediterranean climate. Level of pollution is high especially in winter. Average income of the population is moderate.

The primary health care system of Turkey is well defined in which the country is divided into health center districts, fully covering the total population of the country. Every month of June, each health center updates the size of their target population by visiting on a house to house basis (annual census). This gives the opportunity of sample selection in representative population studies. A

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health center district is also further divided into a number of small districts, which are called “midwife districts” with a coverage of of 2,000-3,000 population.

Household records of the nine health centers of Manisa city were used to determine sample size of

study group. The mid-year census of Manisa city was 218,314 in the year 2000. Sample size was calculated as 1505 over 18 age year (prevalence of asthma 2.0%, confidence interval \pm 1.0%, type 1 error 5% and design effect 2).

Probability proportional to size sampling ap-

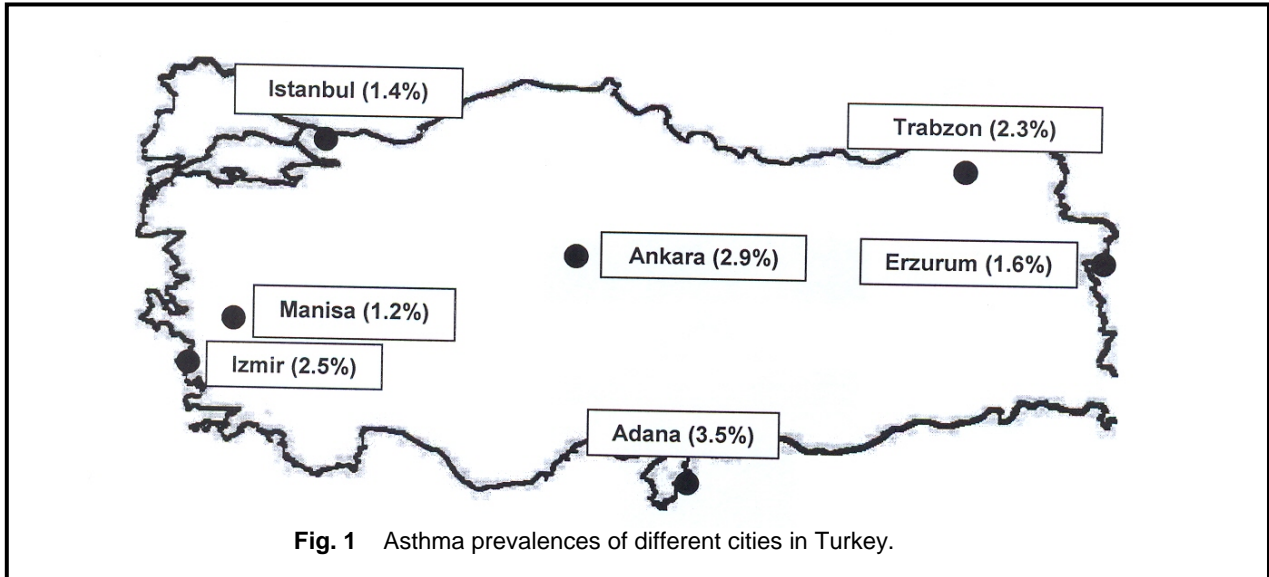


Fig. 1 Asthma prevalences of different cities in Turkey.

Table 1 ECRHS questionnaires and definitions

Questionnaires	
1.	Have you suffered wheezing in your chest at any time in the past year?
1.1.	Were you at all breathless during the wheezing?
1.2.	Have you had this wheezing or whistling when you did not have a cold?
2.	Have you woken up with a feeling of tightness in your chest at any time in the past year?
3.	Have you been woken by an attack of shortness of breath at any time in the past year?
4.	Have you been woken by an attack of coughing at any time in the past year?
5.	Have you had an attack of asthma in the past year?
6.	Have you had an attack of asthma at any time in your life?
7.	Are you currently taking any medication (inhalers, aerosols or tablets) for asthma?
8.	Do you have or have you ever had any nasal allergies, including hay fever?
9.	Do you have or have you ever had any itching dermatitis and/or eczema?
10.	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 question 5 or 7
Cumulative asthma	Subjects answered “YES” to question 6
Asthma-like symptoms	Subjects answered “YES” to either question 1 and/or 2 and/or 3 and/or 4
Non-infectious rhinitis	Subjects answered “YES” to question 8
Itching dermatitis and/or eczema	Subjects answered “YES” to question 9
Family histories of atopy	Subjects answered “YES” to question 10

proach was used in the selection of the study sample. Sample selections were undertaken in three stages. Sampling units of the first stage were districts that differed in population size. The frame for selection of the primary sampling units included nine Health Center Districts' population records. The second stage of selection involved the list of midwife sub-districts (n = 82) of varying population size as sampling units, for each of the health centers. The sample of the study was allocated to 63 clusters of ten households per cluster. In the third stage of sample selection, 63 clusters were allocated to the midwife sub-districts proportionally to their population. The initial households of each of the clusters were chosen at random, and the rest of the households were determined systematically by every fifth household for each cluster. All adults over 18 who were present in the household on the night before the interview, were eligible for this study. Of the 1,680 selected households, 8.6% were considered as unoccupied and 2.7% of study group refused an interview.

Data were collected from 610 households and complete interviews were conducted with 1,336 adults over 18. The data were collected by face to face interviews by physicians who were trained about the questionnaire. The questionnaire consists of a sociodemographic questionnaire and European Community Respiratory Health Survey–ECRHS

questionnaire (Table 1).¹³ The questionnaire was translated into Turkish and the terminology was described in detail by physicians. Core family was defined as a family with mother, father and children. Large family was defined as a family who lived together with one or two grandparents or relatives. Poor education was defined as literate, graduated from primary and secondary schools. Well education was defined as a graduate from high school or university. A place with a census higher than 10,000 and lower than 10,000 was named as urban and rural, respectively. Inappropriate house type was defined as a house without a sewer system. Humidity was evaluated by asking and detecting the presence of mold and dankness in ceiling. Family atopy was defined as family with first-degree relatives suffering any allergic diseases and/or symptoms (asthma and/or hay fever and/or eczema).

Allergic (non-infectious) rhinitis and allergic (itching) dermatitis and/or eczema were evaluated for all study group (subjects). Current asthma, cumulative asthma, asthma-like symptoms were evaluated for 765 adults between 20-44 years old as advised in ECRHS questionnaire.

Statistical analyses

The data were analyzed by SPSS for Windows 10.0 statistical package program.

Table 2 Distribution of respiratory and allergic symptoms in the study population

	Men (%) n = 617	Women (%) n = 719	Total (%) n = 1,336
Symptoms in the past year			
Wheezing with breathlessness	6.7	11.3	9.1
Wheezing without cold	5.7	8	6.9
Woken up with chest tightness	5.4	8.3	6.9
Woken up with shortness of breath	5.4	6.5	6
Woken up with cough	14.4	17.6	16.1
Asthma attack ever	1.1	1	1.1
Asthma attack in the past year	0.5	1.3	0.9
Use of medicine of asthma	0	1.3	0.7
Any allergic symptom			
Nasal allergies (including hay fever)	10.3	17.6	14.1
Itching dermatitis and/or eczema	8.7	13.4	11.1
Atopy	13	18.1	15.7

Univariate and multivariate odds ratios (OR) (logistic regression models) were used for statistical comparisons.

RESULTS

The mean age was 40.74 ± 16.11 years in total group. Seven percent of study population were < 19 years, 57% were 20-44 years old and 36% were > 45 years. The study subjects were 46.2% male and 53.8% females.

Table 2 shows the distribution of allergic and respiratory symptoms in the study population. Wheezing with breathlessness, wheezing without

cold, woken up with shortness of breath, and woken up with cold were found in 9.1, 6.9, 6 and 16.1%, respectively.

The prevalence of current asthma, cumulative asthma, asthma-like symptoms were found in 1.2, 1.0, 25.0% of 20-44 years group, respectively, and allergic rhinitis, allergic dermatitis, family atopy were found in 14.5, 10.9, and 15.2% of the total group, respectively.

The percentage of current, cumulative asthma, asthma-like symptoms, allergic rhinitis and dermatitis according to different determinants, and

Table 3 The percentages of current asthma according to different determinants and risk ratios in univariate and multivariate models

Determinants (n)	%	Univariate OR (% 95 CI)	p value	Multivariate OR (% 95 CI)	p value
Gender					
Men (368)	0.5	Reference			
Women (397)	1.8	3.28 (0.67-15.91)			
Age groups					
< 30 (447)	1.3	Reference			
> 30 (318)	1.1	0.88 (0.23-3.33)			
Family type					
Core (650)	0.9	Reference			
Large (115)	2.6	2.87 (0.70-11.66)			
Education					
Poorly (517)	1	Reference			
Well (248)	1.2	1.67 (0.44-6.30)			
The place (up to 12 years)*					
Rural (273)	0.7	Reference			
Urban (486)	1.4	1.98 (0.40-9.59)			
House type					
Inappropriate (91)	-	NA			
Apartment (674)	1.3				
Humidity					
No (473)	0.6	Reference		Reference	
Yes (292)	2.1	3.28 (0.81-13.24)		4.67 (1.08-20.10)	<i>p</i> < 0.05
Smoking status					
Non-smoker (395)	1.3	Reference			
Ex-smoker (54)	1.9	1.47 (0.16-12.84)			
Smoker (316)	0.9	0.74 (0.17-3.15)			
Passive smoking					
No (245)	2.4	Reference		Reference	
Yes (520)	0.6	0.23 (0.05-0.93)	<i>p</i> < 0.05	0.15 (0.03-0.67)	<i>p</i> < 0.05
Family atopy					
No (645)	0.5	Reference		Reference	
Yes (120)	5	11.26 (2.77-45.68)	<i>p</i> < 0.05	12.64 (3.02-52.86)	<i>p</i> < 0.05

*Six patients who lived outside Turkey until 12 years old were missing.

risk ratios in univariate and multivariate models are shown in Tables 3-7.

Overall prevalence of asthma and allergic symptoms was higher in women and in subjects > 30 years old, and it was statistically significant in asthma-like symptoms, allergic dermatitis and rhinitis in multivariate analyses. Prevalence of asthma-like symptoms and cumulative asthma were high in large family members. Education and the place of living till 12 years were not significant determinants in multivariate analyses. The prevalence of current asthma, cumulative asthma, asthma-like symptoms and allergic dermatitis were higher in the subjects living in apartments but multivariate risks were significant only in asthma-like symptoms. In subjects living in humid houses, prevalence rates of current and cumulative asthma and asthma-like symptoms were significantly higher.

The prevalence rates of current and cumulative asthma were low in smokers and passive smoking exposure. But asthma-like symptoms were significantly higher in ex-smokers, current smokers and passive smokers. Allergic symptoms such as allergic rhinitis and dermatitis were higher in ex-smokers and current smokers.

The prevalence of current asthma, asthma-like symptoms, allergic rhinitis and dermatitis were significantly higher in the presence of family atopy.

DISCUSSION

The prevalences of asthma and allergic disease differ among different geographical localizations. This difference is explained by the heterogeneity in genetic factors as well as environmental conditions.¹⁴

Table 4 The percentages of cumulative asthma according to different determinants and risk ratios in univariate and multivariate models

Determinant (n)	%	Univariate OR (% 95 CI)	p values	Multivariate OR (% 95 CI)	p values
Gender					
Men (368)	1.1	Reference			
Women (397)	1	0.92 (0.23-3.73)			
Age groups					
< 30 (447)	0.6	Reference			
> 30 (318)	1.3	2.15 (0.43-10.72)			
Family type					
Core (650)	0.6	Reference		Reference	
Large (115)	3.5	5.82 (1.43-23.61)	p < 0.05	6.19 (1.45-26.28)	p < 0.05
Education					
Poorly (517)	1.2	Reference			
Well (248)	0.8	0.69 (0.13-3.45)			
The place (upt ot 12 years)*					
Rural (273)	0.7	Reference			
Urban (486)	1.2	1.69 (0.34-8.45)			
House type					
Inappropriate (91)	-	NA			
Apartment (674)	1.2				
Humidity					
No (473)	0.4	Reference		Reference	
Yes (292)	2.1	4.94 (0.99-24.64)		5.52 (1.06-28.67)	p < 0.05
Smoking status					
Non-smoker (395)	1.5	Reference			
Ex-smoker (54)	0	0.98 (0.97-0.99)			
Smoker (316)	0.6	0.41 (0.08-2.06)			
Passive smoking					
No (245)	2.0	Reference		Reference	
Yes (520)	0.6	0.27 (0.06-1.17)		0.17 (0.03-0.76)	p < 0.05
Family atopy					
No (645)	0.8	Reference			
Yes (120)	2.5	3.28 (0.77-13.92)			

*Six patients who lived outside Turkey until 12 years old were missing.

Turkey, a country having lands both in Asia and Europe, with many different climates and ethnic populations, undoubtedly has various prevalence rates. Turkey is surrounded by sea in three directions, having rainy climate in northern, Mediterranean climate in western and southern, and cold and rough climate in eastern and inner parts. Western and northwestern parts are industrialized. Manisa is a western and industrialized city having high air pollution. The results of ECRHS questionnaire-based studies reported from Turkey are shown on Turkey's map in Fig. 1.⁷⁻¹²

The prevalence of current asthma in our study (1.2%) is correlated with the low prevalence rates of our country.^{8,9} This low prevalence

rate may be explained by the fact that Manisa has a low humidity level and the city industrial zone is located outside the city center.

The ECRHS questionnaire-based studies reported from European countries have different prevalence rates. In Greece, Germany, Russia, Spain and Sweden, the prevalence of asthma was 2.4%, 2.0-11.9%, 7.2%, 5.53% and 7%, respectively.^{1,15-18} These values obtained from different countries also differ very much as mentioned above. In Turkish, there is no single word explaining "wheezing". This may be a reason for low asthma prevalence in Turkey and in other countries which do not speak English.

Table 5 The percentages of asthma-like symptoms according to different determinants and risk ratios in univariate and multivariate models.

Determinant (n)	%	Univariate OR (% 95 CI)	p values	Multivariate OR (% 95 CI)	p values
Gender					
Men (368)	22.3	Reference		Reference	
Women (397)	27.5	1.32 (0.94-1.83)		1.77 (1.21-2.60)	<i>p</i> < 0.05
Age group					
< 30 (447)	21.1	Reference		Reference	
> 30 (318)	27.7	1.43 (1.02-2.02)	<i>p</i> < 0.05	1.40 (0.97-2.03)	
Family type					
Core (650)	23.4	Reference		Reference	
Large (115)	33.9	1.68 (1.09-2.57)	<i>p</i> < 0.05	1.58 (0.99-2.53)	
Education					
Poorly (517)	24.4	Reference			
Well (248)	26.2	1.10 (0.77-1.55)			
The place (upt to 12 years)*					
Rural (273)	23.1	Reference			
Urban (486)	25.9	1.16 (0.82-1.65)			
House type					
Inappropriate (91)	8.8	Reference		Reference	
Apartment (674)	27.2	3.86 (1.83-8.14)	<i>p</i> < 0.05	4.32 (1.96-9.49)	<i>p</i> < 0.05
Humidity					
No (473)	23	Reference		Reference	
Yes (292)	28.1	1.30 (0.93-1.81)		1.49 (1.03-2.15)	<i>p</i> < 0.05
Smoking status					
Non-smoker (395)	16.2	Reference		Reference	
Ex-smoker (54)	40.7	3.55 (1.94-6.51)	<i>p</i> < 0.05	3.57 (1.88-6.78)	<i>p</i> < 0.05
Smoker (316)	33.2	2.57 (1.80-3.67)	<i>p</i> < 0.05	2.99 (2.00-4.46)	<i>p</i> < 0.05
Passive Smoking					
No (245)	18.6	Reference			
Yes (520)	28.3	1.80 (1.23-2.62)	<i>p</i> < 0.05		
Family atopy					
No (645)	21.7	Reference		Reference	
Yes (120)	42.5	2.66 (1.77-4.00)	<i>p</i> < 0.05	2.14 (1.39-3.30)	<i>p</i> < 0.05

*Six patients who lived outside Turkey until 12 years old were missing.

Overall prevalence of asthma and allergic symptoms was higher in women and > 30 years, and it was statistically significant in asthma-like symptoms, allergic dermatitis and rhinitis. Asthma prevalence in women is known to be higher than men after puberty.¹⁹ It was also high in our study although the difference was not significant statistically. Female gender has a significant risk especially in terms of asthma-like symptoms, allergic rhinitis and dermatitis.

Family atopy is known to be the most important factor in allergic diseases.^{20,21} This is also obtained in our study. Various correlations between family size and atopy has been reported in different studies.^{20,21} Large family was found to have more risk to asthma-like symptoms and cumulative asthma in our study. But in another study from our country, atopic status was found to be correlated with lower sibling size.³ The large family term in our study is defined as the family living together with grandparents and other relatives. Traditionally, there are many families in Turkey living together with grandparents and some other relatives. This is one of the distinct characteristics of Turkish families from

other countries. This may be the reason of the difference as well as the fact that the number of smokers and the exposure of passive smoking increase in such families.

The place of living in childhood has been reported to have different effects on the development of atopy. According to hygiene hypothesis, the lack of exposure to infections such as tuberculosis, measles and diphtheria in early childhood may increase the risk of developing atopic disorders such as asthma.²²⁻²⁶ Allergic diseases are also known to be increased in urban and in a study from our country, this has been confirmed.² But in a study from another part of Turkey, allergy was found to be lower in urban.³ In our study we did not find any difference between urban and rural regions.

House type may also have some impact on atopy. We found that asthma-like symptoms were more common in apartment house type. Many similar results are present in literature. Poor housing conditions such as humidity also contribute to increase the asthma and asthma-like symptoms.²⁰

Table 6 The percentages of allergic dermatitis according to different determinants and risk ratios in univariate and multivariate models

Determinants (n)	%	Univariate OR (95% CI)	p values	Multivariate OR (95% CI)	p values
Gender					
Men (617)	8.3	Reference		Reference	
Women (719)	13.2	1.69 (1.18-2.42)	p < 0.05	2.12 (1.49-3.01)	p < 0.05
Age group*					
18-40 (724)	10.2	Reference		Reference	
40-65 (470)	12.1	1.21 (0.84-1.74)		1.91 (1.14-3.19)	p < 0.05
> 65 (139)	12.8	1.06 (0.59-1.91)			
House type					
Inappropriate (144)	6.3	Reference			
Apartment (1,192)	11.5	1.94 (0.96-3.91)			
Smoking status					
Non-smoker (738)	10.0	Reference		Reference	
Ex-smoker (132)	18.2	1.99 (1.20-3.29)	p < 0.05	1.53 (1.07-2.20)	p < 0.05
Smoker (466)	10.3	1.03 (0.70-1.51)		1.85 (1.11-3.09)	p < 0.05
Family atopy					
No (1,133)	7.9	Reference		Reference	
Yes (203)	28.1	4.58 (3.14-6.66)	p < 0.05	2.60 (1.81-3.74)	p < 0.05

*Three patients who did not know the exact birth dates were not evaluated statistically.

Smoking increased the risk of asthma-like symptoms by three times and most smokers are male, so this gender difference in asthma-like symptoms becomes more attractive with this fact. Ex-smokers had more risk of asthma-like symptoms than the current smokers. Asthma-like symptoms in smokers is definitely due to smoking but these symptoms of non or ex-smokers are therefore more significant. In the two studies performed among university students by an interval of five years increasing ratios of both smokers and asthma prevalence has been reported. Kalyoncu⁴ mentioned this significance and speculated this as “healthy smoker effect”.

It was found that the asthma prevalence was lower in subjects exposed to environmental tobacco smoke. Asthmatics have tendency to avoid smoking. Therefore, symptomatic female non-smokers should be further followed up.

The prevalence of allergic rhinitis in our country was 12.7-28% in our country.^{4,5} In Greece, Germany and Russia, the prevalence of allergic

rhinitis was 18.4, 9.5-40.9 and 9.9%, respectively.^{1,15,16}

In this study the prevalence of asthma in Manisa is correlated with the low prevalence rates of the whole country. Gender, age, active or passive smoking, family atopy and home condition might have impacts on the prevalence of asthma and allergic symptoms.

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Table 7 The percentages of allergic rhinitis according to different determinants and risk ratios in univariate and multivariate models

Determinant (n)	%	Univariate OR (95% CI)	p values	Multivariate OR (95% CI)	p values
Gender					
Men (617)	10.4	Reference		Reference	
Women (719)	18.1	1.91 (1.38-2.63)	$p < 0.05$	2.12 (1.49-3.01)	$p < 0.05$
Age groups*					
18-40 (724)	13.8	Reference		Reference	
40-65 (470)	15.3	1.12 (0.81-1.56)		1.68 (1.07-2.62)	$p < 0.05$
> 65 (139)	15.1	1.11 (0.66-1.84)			
Smoking status					
Non-smoker (738)	13.1	Ref		Reference	
Ex-smoker (132)	18.9	1.54 (0.95-2.50)		1.53 (1.07-2.20)	$p < 0.05$
Smoker (466)	15.5	1.20 (0.86-1.67)		1.85 (1.11-3.09)	$p < 0.05$
Passives smoking					
No (501)	12.4	Reference			
Yes (1835)	15.8	1.33 (0.96-1.83)			
Family atopy					
No (1133)	12	Reference		Reference	
Yes (203)	28.6	2.93 (2.06-4.17)	$p < 0.05$	2.60 (1.81-3.74)	$p < 0.05$

*Three patients who did not know the exact birth dates were not evaluated statistically.

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