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## The Frequency of Asthma and Allergy Symptoms in Adults and its Related Factors

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### ABSTRACT

**Objectives:** The aim of this study was to determine the frequency of asthma and allergy symptoms and their relationship with sociodemographic factors in hospital admissions.

**Methods:** This cross-sectional study was conducted among a population of non-asthmatics aged 18–64 years who applied to the hospital between November 2020 and April 2021. The data of the study were collected through a sociodemographic form, asthma screening questionnaire, and an allergy questionnaire.

**Results:** Of the 398 participants, 271 (68.1%) were female, and the mean age was 38.4±13.1 years. Of the participants, 45 (11.3%) have asthma, and 98 (24.6%) have allergy. In multivariable binary logistic regression analysis, the likelihood of asthma symptoms increased with education declining (OR=0.656, 95% CI=0.516–0.834, p=0.001). Moreover, the likelihood of allergy was found to be higher in those with a family history of asthma (OR=2.877, 95%CI=1.456–5.685, and p=0.002), and those getting younger (OR=0.969, 95%CI=0.950–0.988, and p=0.002).

**Conclusion:** While asthma symptoms were less common in the study group, allergy symptoms were more common, and patients were living without a diagnosis. To increase awareness of asthma and allergy in society, education should be given by the health personnel, and messages should be given through mass media.

**Keywords:** Adult, allergy and immunology, asthma

### INTRODUCTION

Asthma manifests as signs of respiratory airflow limitation and respiratory symptoms such as shortness of breath, chest tightness, coughing, and wheezing.<sup>[1]</sup> Asthma is one of the most common chronic conditions in developed and developing countries. Since the incidence of asthma has increased over the years, it is among the major public health problems. In 2017, there were approximately 272.7 million asthmatics worldwide and 10.6 million years lost due to disability (YLD). The number of asthma-related YLD days in the world increased by 19.3% from 2007 to 2017.<sup>[2]</sup> It is thought that 250,000 people die annually from asthma worldwide. It is estimated that 100 million new cases of asthma will occur by 2025. About 82% of asthma-related fatalities result from manageable or controllable factors.<sup>[3]</sup> It is estimated that there are approximately 4 million asthma patients in Türkiye. Socioeconomic factors influence the prevalence of the occurrence of the disease.<sup>[4,5]</sup> Genetics, age, and gender have been closely related to asthma. It has been reported that the prevalence of asthma in adults and children has increased compared to studies conducted in the past 60 years.<sup>[6]</sup> To eliminate the effects of increasing asthma and prevent the appearance of the effects, it is necessary to recognize risk factors and risk groups.<sup>[3,4,6]</sup> Asthma affects society economically and socially. When calcu-

lating the cost caused by asthma, it should be considered health expenditures, labor loss (patient and environment), and premature deaths from asthma. There is a significant data deficiency problem in our country in this regard.<sup>[7]</sup>

The European community respiratory health survey (ECRHS) was used throughout adult asthma studies in Türkiye.<sup>[8,9]</sup> According to these studies, the prevalence of asthma in adults was 1.2–9.4%, and the prevalence of asthma and similar symptoms was 9.8–27.3%. In most of the regional and national studies conducted in Türkiye, the prevalence of asthma was found to be lower than the prevalence of asthma and similar symptoms.<sup>[10,11]</sup> In a study involving 70 the World Health Organization (WHO) member countries in 2012, the current prevalence of asthma and similar symptoms in Türkiye was 11.34%, while the prevalence of doctor-diagnosed asthma was 2.06%. According to the results of the study, the prevalence of wheezing symptoms was 8.61%, and the prevalence of asthma symptoms was 4.27% worldwide. According to the results of the research, the prevalence of doctor-diagnosed asthma in Europe was higher than the prevalence of doctor-diagnosed asthma in Türkiye. The difference between the prevalence of asthma with wheezing symptoms and the prevalence of doctor-diagnosed asthma was found to be higher in Türkiye compared to other countries.<sup>[10]</sup>

The increase in atopic sensitivity is directly proportional to the increase in the incidence of asthma and other allergic diseases such as allergic rhinitis and eczema in the world.<sup>[8]</sup> Allergic disease is also increasing due to increased exposure to allergens. According to the World Allergy Organization, 1.39 billion people worldwide have allergic diseases.<sup>[9]</sup>

The increase in the frequency of allergic diseases has become a serious and important health problem worldwide.<sup>[3,10]</sup> Allergic diseases can be affected by industrialization, urbanization, and the increase in the nuclear family lifestyle in our country and the world. The incidence of allergic diseases begins to increase at an earlier age in individuals for environmental and genetic reasons. It was observed that allergic diseases increased in childhood and began to decrease at a later age. The rate of increase in allergic diseases and the problems that come with them has been increasing in recent years. Allergy incidence is approximately 20–30% in those with a family history of allergies and 10% in those without an allergy history.<sup>[11]</sup> In studies conducted in Türkiye on allergic rhinitis, the incidence of allergic rhinitis was found to be between 1.6% and 27.5% in adults.<sup>[12]</sup>

While there is an asthma screening questionnaire (ASQ) used for asthma screening in children in Türkiye, there is no

ASQ used in adults.<sup>[13]</sup> In this study, the frequency of asthma and allergy symptoms seen in adults will be determined by survey forms prepared according to the literature, and suspicious cases will be directed to the physician. It was also intended to raise awareness among study participants about asthma and allergy diseases.

The aim of the study was to examine the frequency of asthma and allergy symptoms and their relationship with sociodemographic factors in non-asthmatic hospital admissions.

## METHOD

This cross-sectional study was conducted in the 18–64 age group who applied to Kayseri City Hospital between November 2020 and April 2021. Individuals who could not have verbal communication abilities, as well as those diagnosed with asthma or chronic obstructive pulmonary disease, were excluded from this study.

The sample size was calculated using the G-Power 3.1 program. When calculating the sample size,  $\alpha=0.05$ , asthma prevalence  $p=0.1$ , effect size=0.1, and power=0.95, the minimum sample size was calculated as 164 people, and the study involved 398 individuals.<sup>[10]</sup>

Questionnaires consisting of sociodemographic data, an ASQ based on the literature, and questions on allergy symptoms (three questions) were administered to all patients. Questionnaires were administered by the researcher using the face-to-face interview technique. The application of the questionnaire takes approximately 15–20 min.

ASQ: It is a simplified 6-point survey developed at the University of South Florida.<sup>[14]</sup> The survey consists of six questions in the form of yes-or-no answers. Questions 1 and 2 evaluate cough, while questions three through six assess four aspects of asthma symptoms. These are cough, chest tightness, wheezing, and shortness of breath, which are common symptoms of asthma when provoked. Each of the first two questions is worth 2 points, and each response to all other questions is worth 1 point. ASQ's total score ranges from 0 to 20. According to the ASQ score in the patients,  $\geq 4$  were identified as suspected asthma patients. The scale cutoff point was  $\geq 4$  points, and sensitivity (96%), and selectivity (100%) were found to be deemed sufficient.

Body mass index (BMI) ( $\text{kg}/\text{m}^2$ ) was classified as 18.5–24.9 as normal, 25.0–29.9 as overweight, and 30.0 and over as obese.<sup>[15]</sup>

The Statistical Package for the Social Sciences 25 program was used to analyze the research data. Descriptive statis-

tics were expressed as the mean and standard deviation for continuous data and frequency and percentage for categorical data. The Chi-square test was used for categorical data. The variables that were found to be important according to the ASQ test of sociodemographic characteristics were analyzed by the binary logistic regression backward elimination method. In all tests, a value of  $p < 0.05$  was considered significant.

## RESULTS

A total of 398 patients were included in the study. Among the study participants, with a mean age of  $38.4 \pm 13.1$  years and a mean BMI of  $25.9 \pm 4.7$  kg/m<sup>2</sup>. The sociodemographic characteristics of the participants are summarized in Table 1.

Forty-five (11.3%) of the patients were found to have asthma symptoms. The sociodemographic characteristics of the participants according to asthma symptoms are summarized in Table 2.

The frequency of allergy was found to be 98 (24.6%). In the study, 2 out of 3 allergy-related symptoms and 46 (11.6%) of the patients diagnosed with allergy by the doctor were considered to be allergic. Based on allergy-related symptoms, 97 patients (24.4%) reported experiencing "Difficulty breathing due to dust and pollen," 95 patients (23.9%) described "Itchy, runny, and congested nose," while 85 patients (21.4%) indicated "Itchy and watery eyes." Sociodemographic characteristics of the participants according to allergy symptoms are summarized in Table 3.

According to the regression analysis, it was determined that the risk of asthma increased only with an increase in education level. Gender, age, BMI, income level, and smoking status included in the model were not significant with asthma ( $p=0.569$ ,  $p=0.542$ ,  $p=0.638$ , and  $p=0.339$ , respectively). Factors associated with asthma and allergy symptoms are summarized in Table 4.

## DISCUSSION

In this study, the frequency of asthma and allergy symptoms and their relationship with sociodemographic factors was investigated in patients aged 18–64 years who applied to the hospital. The frequency of asthma symptoms was 11.3%, and the frequency of allergy was 24.6%. According to the logistic regression analysis, it was determined that the risk of asthma increased only with a decrease in education level.

In this study, the frequency of asthma symptoms was similar to the prevalence found in studies conducted in Türkiye.<sup>[9]</sup> The reason for the high frequency of asthma symptoms may have been caused when individuals did not know the full

**Table 1.** Socio-demographic characteristics of the participants

	n (%)
Gender	
Male	127 (31.9)
Female	271 (68.1)
Age groups	
18–29 years	129 (32.4)
30–39 years	113 (28.4)
40–49 years	60 (15.1)
50–59 years	55 (13.8)
≥60 years	41 (10.3)
Marital status	
Married	259 (65.1)
Single	114 (28.6)
Widow	25 (6.3)
Education levels	
Illiterate/elementary school	81 (20.4)
Secondary school	79 (19.8)
High school	111 (27.9)
University	127 (31.9)
BMI groups	
Normal	194 (48.7)
Overweight	127 (31.9)
Obese	77 (19.4)
Smoking status	
Never smoke	90 (22.6)
Quit	236 (59.3)
Current smoking	72 (18.1)
Income levels	
<2500 TL	31 (7.8)
2500–3999 TL	132 (33.2)
4000–5999 TL	158 (39.7)
≥6000 TL	77 (19.3)
Presence of allergies	
No	300 (75.4)
Yes	98 (24.6)
Asthma in family	
No	357 (89.7)
Yes	41 (10.3)

BMI: Body mass index; TL: Turkish Lira.

symptoms of asthma. The reason for the high frequency of asthma symptoms may be caused when individuals do not fully understand the asthma disease and its symptoms. The reason for the difference between doctor-diagnosed asthma and asthma symptoms is that there are patients who have asthma symptoms but live without a diagnosis of asthma.

**Table 2.** Socio-demographic characteristics of the participants according to asthma symptoms

	Asthma		p
	Present (n=45)	Absent (n=353)	
Gender			
Male	20 (44.4)	107 (30.3)	0.055
Female	25 (55.6)	246 (68.7)	
Age groups			
18–29 years	7 (15.5)	122 (34.6)	<0.001
30–39 years	6 (13.5)	107 (30.3)	
40–49 years	14 (31.1)	46 (13.0)	
50–59 years	10 (22.2)	45 (12.7)	
≥60 years	8 (17.7)	33 (9.4)	
Marital status			
Married	35 (77.8)	224 (63.4)	0.164
Single	8 (17.7)	106 (30.0)	
Widow	2 (4.5)	23 (6.6)	
Education levels			
Illiterate/elementary school	16 (35.6)	65 (18.4)	0.001
Secondary school	14 (31.1)	65 (18.4)	
High school	10 (22.2)	101 (28.6)	
University	5 (11.1)	122 (34.6)	
BMI groups			
Normal	19 (42.2)	175 (49.6)	0.542
Overweight	15 (33.4)	113 (32.0)	
Obese	11 (24.4)	65 (18.4)	
Smoking status			
Never smoke	20 (44.5)	79 (22.7)	0.035
Quit	14 (31.1)	216 (60.9)	
Current smoking	11 (24.4)	58 (16.4)	
Income levels			
<2500 TL	2 (4.5)	29 (8.3)	<0.001
2500–3999 TL	27 (60.0)	105 (29.6)	
4000–5999 TL	13 (28.8)	145 (41.2)	
≥6000 TL	3 (6.7)	74 (20.9)	
Presence of allergies			
No	36 (80.0)	264 (74.8)	0.445
Yes	9 (20.0)	89 (25.2)	
Asthma in family			
No	42 (93.3)	315 (89.2)	0.394
Yes	3 (6.7)	38 (10.8)	

BMI: Body mass index; TL: Turkish Lira.

Data are presented as n (%).

Chi-square test.

Asthma and similar symptoms were more common in women than in men, and their frequency increased with increasing age.<sup>[16]</sup> One study noted that women had a high-

**Table 3.** Sociodemographic characteristics of the participants according to allergy symptoms

	Allergy		p
	Present (n=98)	Absent (n=300)	
Gender			
Male	23 (23.5)	104 (34.5)	0.039
Female	75 (76.5)	196 (65.5)	
Age groups			
18–29 years	44 (44.9)	85 (28.4)	0.011
30–39 years	29 (29.7)	84 (28.0)	
40–49 years	11 (11.2)	49 (16.3)	
50–59 years	7 (7.1)	48 (16.0)	
≥60 years	7 (7.1)	34 (11.3)	
Marital status			
Married	50 (51.0)	209 (69.6)	0.002
Single	41 (41.8)	73 (24.3)	
Widow	7 (7.2)	18 (15.1)	
Education levels			
Illiterate/elementary school	15 (15.3)	66 (22.0)	0.011
Secondary school	11 (11.2)	68 (22.7)	
High school	31 (31.6)	80 (26.7)	
University	41 (41.9)	86 (28.6)	
BMI groups			
Normal	51 (52.0)	143 (47.6)	0.241
Overweight	25 (25.5)	102 (34.0)	
Obese	22 (22.5)	55 (18.4)	
Smoking status			
Never smoke	63 (64.3)	68 (22.6)	0.329
Quit	13 (13.3)	173 (57.6)	
Current smoking	22 (22.4)	59 (20.8)	
Income levels			
<2500 TL	11 (11.2)	20 (6.6)	0.004
2500–3999 TL	23 (23.5)	109 (36.3)	
4000–5999 TL	35 (35.7)	123 (41.0)	
≥6000 TL	29 (29.6)	48 (16.1)	
Asthma in family			
No	79 (80.6)	278 (92.6)	<0.001
Yes	19 (19.4)	22 (7.4)	

BMI: Body mass index; TL: Turkish Lira.

Data are presented as n (%).

Chi-square test.

er prevalence of asthma-like symptoms, such as waking up with chest compression, waking up with shortness of breath, and waking up with a cough. It was also found that those between the ages of 70 and 79 and those with low educational levels had a high prevalence of asthma attacks

**Table 4.** Factors associated with asthma and allergy symptoms

	B	SE	p	O.R.	95% C.I.	
					Lower bound	Upper bound
<b>Asthma*</b>						
Level of education	-0.422	0.130	0.001	0.656	0.516	0.834
Constant	-0.793	0.480	0.074	0.452		
<b>Allergy†</b>						
Asthma in the family (Ref=Absence)	1.057	0.347	0.002	2.877	1.456	5.685
Age	-0.032	0.010	0.002	0.969	0.950	0.988
Constant	-0.432	0.450	0.337	0.649		

\*Independent variables: Categorical; gender and smoking status, continuous/ordinal: age, education level, income level. Goodness of fit Hosmer and Lemeshow test  $\chi^2=5.23$   $df=7$ ,  $p=0.632$ , Nagelkerke  $R^2=0.080$ .

†Independent variables: Categorical; asthma in the family, gender, marital status, Continuous/ordinal: age, education level, income level. Goodness of fit Hosmer and Lemeshow test  $\chi^2=8.16$ ,  $df=8$ ,  $p=0.418$ , Nagelkerke  $R^2=0.093$ . Binary logistic regression analysis.

and asthma and similar symptoms.<sup>[17]</sup> In our study, asthma-like symptoms increased with age. A study of the relationship between wheezing and the literacy status of Daloğlu et al.<sup>[16]</sup> indicated that non-literate people had a higher frequency of wheezing. In our study, the risk of asthma was found to be higher in those with low education levels, and this is consistent with the literature information.

Data from 70 WHO member countries, according to the World Health Survey study, the prevalence of doctor-diagnosed asthma worldwide is 4.3%, and wheezing symptom prevalence is 8.6%. In Türkiye, the prevalence of asthma with a doctor's diagnosis is 2.1%, and the prevalence of wheezing symptoms is 11.3%. In Türkiye, the difference between the prevalence of wheezing symptoms of asthma and the prevalence of doctor-diagnosed asthma was found to be higher than in other countries.<sup>[12]</sup> ECRHS has been used to research asthma patients in Türkiye. According to the data obtained, it has been reported that the prevalence of asthma in the 20–44 age group in our country was between 2.2% and 9.4%, and the prevalence of asthma-like symptoms was between 9.8% and 27.3%.<sup>[18,19]</sup> Although the rate of asthma and similar symptoms was significantly higher in Denizli province between the ages of 20 and 49, the diagnosed asthma rate and drug use rate were found to be below.<sup>[16]</sup>

Those who were diagnosed with allergies by the doctor or who said that there are 2 out of 3 allergy-related symptoms were identified as allergies in our study. In our study, the frequency of allergy was 24.6%. In studies on the frequency of allergic rhinitis, it has been reported that the frequency is 7% in Northern European countries, 27.6% in Australia, and 9–21% in South America.<sup>[15]</sup> According to studies carried

out in the past 10 years, it is thought that the prevalence of allergic rhinitis is increasing in Türkiye.<sup>[20]</sup> The prevalence of allergic rhinitis is approximately 10% and can vary.<sup>[21]</sup>

According to multivariable logistic regression analysis, the probability of allergy is higher in those with a family history of asthma, and getting younger, the probability of allergy also increases. The presence of allergy was not found to be significant according to gender, marital status, education level, and income level. Environmental factors are effective in the occurrence and variety of allergic diseases.<sup>[22]</sup> Among the important risk factors for allergic rhinitis, allergy history in the family, genetic factors, exposure to a sensitive allergen, smoking, and exposure to unclean air factor are considered. It has been found that the symptoms that occur in allergic rhinitis are generally at the age of 20 and below.<sup>[23]</sup> In our research, it was found that the frequency of allergies increased with decreasing age. In studies conducted in Türkiye on allergic rhinitis, the prevalence of allergic rhinitis was found to be between 2.9% and 39.9% in children and 1.6–27.5% in adults.<sup>[20]</sup> In our study, the decrease in allergy prevalence with age was similar to the literature information.

It has been stated that the gender factor shown among the risk factors for allergic rhinitis has emerged in different results in the studies. In our study, it was found that the gender factor is associated with allergies and is more common in females. However, when a generalization was made, it was observed that the incidence of allergic rhinitis in men before puberty and in women after puberty was high.<sup>[24,25]</sup> The prevalence of allergic rhinitis was found to be 16.1% in Denizli province and was found to be more common in women than in men.<sup>[16]</sup> In a multicenter study in Türkiye, it

was found that allergic rhinitis is more common in women than in men.<sup>[26]</sup> Smoking at home increases atopy status.<sup>[27]</sup> In a study conducted in Türkiye, the relationship between smoking and inhaled allergens was examined, and it was stated that smoking is important in the inhaled allergen group. The incidence of allergic rhinitis was higher in smokers.<sup>[26]</sup> However, there was no significant relationship between smoking and allergies in our study.

Allergic rhinitis is not a serious health problem in itself but is an important risk factor as it may cause diseases such as asthma, sinusitis, and otitis in the future.<sup>[21]</sup> Individuals with allergies are thought to be candidates for future asthma patients. In the latter period, 10–40% of patients with allergic rhinitis may be diagnosed with asthma.<sup>[28]</sup> About 80% of asthmatic patients have allergic rhinitis.<sup>[29]</sup> It has been reported that allergic rhinitis is present in all studies on the presence of allergic rhinitis in asthma patients in Türkiye.<sup>[30]</sup> The prevalence of allergic rhinitis is higher than the prevalence of asthma, and it is known that its incidence is increasing throughout the world. Asthma and allergic rhinitis are usually seen together, and allergic rhinitis adversely affects the control of asthma.<sup>[31,32]</sup>

Since the research was carried out only on patients admitted to Kayseri City Hospital, it does not contain any information about people who do not apply to the hospital. Therefore, the results of the research can only be generalized to hospital admissions. In addition, since the research was carried out during the COVID-19 pandemic, it is thought that patients with asthma and allergies may have fewer applications.

## CONCLUSION

People with allergy symptoms should be evaluated by physicians about the presence of asthma in the family. It may be recommended to avoid exposure to allergens and to regulate environmental conditions affecting asthma.

### Disclosures

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

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**Ethics Committee Approval:** The study was approved by the Yozgat Bozok University Ethics Committee (Approval date: September 21, 2020, and Approval number: 14/05).

**Authorship Contributions:** Concept – M.K., G.Y.; Design – M.K., G.Y.; Supervision – M.K., G.Y.; Materials – M.K., G.Y.; Data collection &/or processing – G.Y.; Analysis and/or interpretation – M.K.; Literature search – M.K., G.Y.; Writing – M.K., G.Y.; Critical review – M.K., G.Y.

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