doi • 10.5578/tt.2025021114
Tuberk Toraks 2025;73(2):89-101
Received: 06.05.2025 • Accepted: 22.05.2025

RESEARCH ARTICLE

Asthma frequency and features in adults with isolated cat allergy: A retrospective study in a tertiary centre

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Cite this article as: *Görgülü Akın B, Özdel Öztürk B, Bayrak Durmaz MS, Kalkan F, Soyyiğit Ş. Asthma frequency and features in adults with isolated cat allergy: A retrospective study in a tertiary centre. Tuberk Toraks 2025;73(2):89-101.*

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Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ABSTRACT

Asthma frequency and features in adults with isolated cat allergy: A retrospective study in a tertiary centre

Introduction: *Cat is a source of allergens that can cause allergic rhinitis (AR), conjunctivitis and/or asthma. This study aimed to compare demographic characteristics, frequency of asthma development, duration of asthma development, and characteristics of the patients with AR and with AR/asthma in adult patients who have adopted a cat in adulthood and have allergic symptoms after exposure to cats.*

Materials and Methods: *Symptoms, physical examination findings, complete blood count, skin prick test (SPT) and/or specific immunoglobulin E (sp IgE) and pulmonary function test results of adult cat owners with allergic symptoms due to isolated cat allergy between January 2021 and February 2025 were retrospectively evaluated.*

Results: *Isolated cat allergy was detected by SPT and/or sp IgE measurement in 203 patients with allergic symptoms. Median age of the patients was 29 (18-69) years. A total of 71 patients (35%) experienced asthma and AR/conjunctivitis symptoms upon exposure to cat allergens. Only patients with AR/conjunctivitis had been exposed to cat for median 24 (12-180) months. In patients with AR/conjunctivitis and asthma, median duration of cat exposure was 36 (12-300) months. Patients with AR/conjunctivitis developed allergic symptoms after a median of 13.5 (11-120) months following cat exposure. In patients with asthma, asthma symptoms developed after a median of 24 (11-150) months. The severity of AR increased as the number of cats exposed to, cat sp IgE level, total IgE level and eosinophil count increased. Median eosinophil count in patients with a history of asthma attacks was 470 (110-990) and was statistically significantly higher than in patients without a history of attacks (p= 0.014).*

Conclusion: *Cats have become one of the major allergens in our country in recent years. The number of patients presenting to allergy clinics with allergic*

symptoms after having encountered cats is increasing day by day. These patients should be advised to stay away from cats, if possible, but patients who do not agree to stay away from cats should be closely monitored for the development of asthma.

Key words: *Allergic rhinitis; asthma; cat allergy*

ÖZ

İzole kedi alerjisi olan yetişkinlerde astım sıklığı ve özellikleri: Retrospektif bir çalışma

Giriş: *Kedi, alerjik rinit (AR), konjonktivit ve/veya astıma neden olabilen bir alerjendir. Bu çalışmada, yetişkinlik döneminde kedi edinmiş ve kediye maruz kaldıktan sonra alerjik semptomları olan yetişkin hastaların demografik özelliklerini, astım gelişme sıklığını, astım gelişme süresini, AR'li ve AR/astımlı hastaların özelliklerini karşılaştırmayı amaçladık.*

Materyal ve Metod: *Ocak 2021-Şubat 2025 tarihleri arasında izole kedi alerjisine bağlı alerjik semptomları olan yetişkin hastaların semptomları, fizik muayene bulguları, tam kan sayımı, deri prik testi (DPT) ve/veya spesifik immünoglobulin E (sp IgE) ve solunum fonksiyon testi sonuçları retrospektif olarak değerlendirildi.*

Bulgular: *Alerjik semptomları olan 203 hastada DPT ve/veya sp IgE ölçümü ile izole kedi alerjisi tespit edildi. Hastaların ortanca yaşı 29 (18-69) yıldı. Toplam 71 (%35) hasta kedi alerjenlerine maruz kaldıktan sonra astım ve AR/konjonktivit semptomları ortaya çıktı. Sadece AR/konjonktiviti olan hastalar ortanca 24 (12-180) ay boyunca kediye maruz kalmıştır. Alerjik rinit/konjonktivit ve astımı olan hastalarda kediye maruz kalma süresi ortanca 36 (12-300) aydı. Alerjik rinit/konjonktiviti olan hastalarda kediye maruz kaldıktan ortalama 13.5 (11-120) ay sonra alerjik semptomlar gelişmiştir. Astımlı hastalarda, astım semptomları medyan 24 (11-150) ay sonra gelişmiştir. Maruz kalınan kedi sayısı, kedi sp IgE düzeyi, toplam IgE düzeyi ve eozinofil sayısı arttıkça AR'nin şiddeti de artmıştır. Astım atağı öyküsü olan hastalarda ortanca eozinofil sayısı 470 (110-990) idi ve atak öyküsü olmayan hastalara göre istatistiksel olarak anlamlı derecede yüksekti (p= 0.014).*

Sonuç: *Kediler son yıllarda ülkemizdeki en önemli alerjenlerden biri haline gelmiştir. Kedilerle temas sonrası alerjik semptomlarla alerji kliniklerine başvuran hasta sayısı her geçen gün artmaktadır. Bu hastalara mümkünse kedilerden uzak durmaları önerilmeli, ancak kedilerden uzak durmayı kabul etmeyen hastalar astım gelişimi açısından yakından izlenmelidir.*

Anahtar kelimeler: *Alerjik rinit; astım; kedi alerjisi*

INTRODUCTION

Allergic rhinitis (AR) is the most common form of non-infectious rhinitis. It affects 10-30% of adults and 40% of children, causing symptoms such as nasal discharge, congestion, itching and sneezing (1). Patients with AR also have conjunctivitis often. AR is a reaction of the nasal mucosa to allergens such as pollens, house dust mites or animal dander. A plethora of epidemiological studies have demonstrated an increase in the global prevalence of AR (2,3). AR symptoms are not life-threatening but uncomfortable for patients. They symptoms affect school and work performance and quality of life of patients and are significant personal and social burdens (4).

Asthma is a chronic disease characterized by attacks of shortness of breath or coughing. The basis of the disease is hypersensitivity of the airways. As a result of this hypersensitivity, bronchi become narrower, there is oedema of the bronchial wall and an increase in sputum production. It is characterized by complaints such as shortness of breath and a feeling of pressure in the chest after stimuli such as dust, smoke and allergens (5). Asthma and AR are recognized as one airway and one disease. Asthma is common in patients with AR. Controlling asthma becomes difficult in the presence of AR (5,6).

Cat is a source of allergens that can cause AR, conjunctivitis and/or asthma. It has become an important allergen especially in recent years with the increase in cat ownership rates in developed countries (5,7). Following house dust mites and pollens, cats represent the third most prevalent allergen that has been demonstrated to induce AR, conjunctivitis and/or asthma. Patients who experience allergic symptoms after exposure to a cat should avoid contact with the cat to prevent symptoms (1,5,7). In patients with suspected cat allergy, a complete blood count, skin prick test (SPT) and/or allergen-specific immunoglobulin E (sp IgE) are recommended as routine tests. In addition, pulmonary function tests (PFTs) with reversibility are recommended in guidelines in patients with respiratory complaints such as shortness of breath and wheezing (1,7-9).

In our study, we aimed to retrospectively compare demographic characteristics, frequency of asthma development, duration of asthma development, and characteristics of the patients with AR and with AR and asthma in adult patients who have adopted a cat in adulthood and have allergic symptoms after exposure to cats.

MATERIALS and METHODS

Study design

In our study, symptoms, physical examination findings, complete blood count, SPT and/or sp IgE and PFT results of adult cat owners with allergic symptoms due to isolated cat allergy who applied to our outpatient clinic between January 2021 and February 2025 were retrospectively evaluated through the hospital information management system.

A total of 203 adults with isolated cat allergy were included in the study, in accordance with the tenets of the Declaration of Helsinki after receiving approval from the local ethics committee of Ankara Bilkent City Hospital (Approval number: TABED 25-1053). Medical records were retrospectively analyzed and the following information was obtained: Age, sex, comorbidities, family history, allergic symptoms, rhinitis severity, asthma control test (ACT), laboratory tests (Complete blood count and total IgE), SPTs and/or sp IgE and PFT results.

Only patients with AR, conjunctivitis and/or asthma who adopted a cat in adulthood and whose symptoms started in adulthood were included in the study. Patients under 18 years of age and patients with AR, conjunctivitis and/or asthma with multiple allergen sensitization were not included in this study. Patients without AR, conjunctivitis and/or asthma were also excluded.

Assessment of cat allergen sensitization

Sensitization in adult patients was evaluated through in vivo testing using SPTs and/or in vitro testing measuring cat sp IgE levels. Cat sp IgE levels were analysed using the Immulite 2000 system (Siemens Healthcare Diagnostics, Tarrytown, NY). A level of cat sp IgE ≥0.35 kU/L was considered positive for cat sensitization. Cat sp IgE levels were grouped as low positive (0.35-0.69 kU/L), positive (0.7-3.49 kU/L), high positive (3.5-17.49 kU/L) and very high positive (17.5-100 kU/L) according to our laboratory reference ranges (10).

SPT was performed using commercially available allergen extracts (Lofarma, Milano, Italy). Antihistamines (AHs) were discontinued one week prior to SPT testing in order to reduce any potential interference with the results. SPT was performed on the volar surface of the forearm. Following a 15-minute interval, skin reactions were recorded. A positive outcome was deemed to have occurred if the mean wheal diameter (The mean of the longest diameter and the orthogonal diameter) was ≥3 mm greater than that of the negative control (11,12).

Assessment in terms of asthma diagnosis

Since patients with cat allergen sensitization have a risk factor for the development of asthma, patients underwent bronchodilator reversibility testing. In the early reversibility test, 400 mcg bronchodilator (Salbutamol) was given to the patient after baseline PFT and the PFT was performed again after 15-20 minutes. An improvement of 200 mL and 12% in forced expiratory volume in one second (FEV_1) after bronchodilator was considered positive. Late reversibility test was performed in the patient who was still suspected of having asthma despite the negative early reversibility test. The patient was treated with inhaled corticosteroids (ICS) for 15 days and was be re-evaluated after treatment. An improvement of 200 mL and 12% in FEV_1 was considered positive (5,9,13).

Forced vital capacity (FVC) is the amount of air expelled from the lungs during the forced expiratory maneuver after the maximum inspiration at the end of the tidal breath volume. Forced expiratory flow between 25% and 75% of vital capacity (FEF_{25-75}%) is a PFT parameter used in the evaluation of small airway disease (14). In addition to FEV_1, FVC and FEF_{25-75}% values were recorded in PFTs.

Asthma was diagnosed if the patient's symptoms were compatible with asthma and PFTs supported asthma. Since bronchial provocation test (BPT) could not be performed technically in our hospital, BPT was not performed in any patient.

Assessment of the severity of AR

According to the Allergic Rhinitis and Its Impact on Asthma (ARIA) classification, the severity of AR in adults and children was determined by the severity of symptoms, the patient's activities and was categorized as mild and moderate-severe according to the extent to which quality of life was affected. If the patient's symptoms lasted less than four days per week or less than four weeks, the patient was considered to have intermittent AR. Persistent AR was deemed if symptoms persisted more than four days per week and longer than four weeks (1).

Visual analog scale (VAS) score was additionally used to determine the severity of AR. For severity of AR according to the VAS, it is usually graded as no symptoms 0 points and most intense symptoms 10 points (10 cm scale) (15). The severity of AR was considered severe if the VAS score was above 5. In instances where the VAS score was 5 or below, the severity of AR was categorized as mild. According to the severity of AR, medical treatment was initiated in accordance with the recommendations of ARIA guideline (1,16).

Assessment of asthma control and severity

In the follow-up of asthmatic patients, it is necessary to review the response to treatment at the physician's referral and to evaluate asthma according to these results and to reorganize the treatment according to the asthma status. Asthma control has two components: Symptom control and assessment of future risks (9). ACT was performed to assess the control of the patient's symptoms in the last four weeks. An ACT score of 5-15 points was considered as uncontrolled asthma, 16-19 points as poorly controlled asthma, and 20-25 points as well-controlled asthma (9).

Currently, the severity of asthma is retrospectively classified according to the minimum medication requirement to control symptoms and attacks (9,17). In a patient with asthma control for at least three months, asthma control was considered mild asthma if asthma control could be achieved with step 1-2 treatment, moderate asthma if asthma control could be achieved with step three treatment, and severe asthma if asthma control could be achieved with step 4-5 treatment or if asthma could not be controlled despite these treatments (9).

In line with the recommendations of the Global Asthma Initiative (GINA) guidelines and our national guidelines, cat allergen-sensitive patients diagnosed with asthma received medical treatment at the appropriate step for their asthma severity (9,18).

Statistical Analysis

Data analysis was performed using the SPSS 11.5 for Windows software package (SPSS Inc., Chicago, IL, USA). Descriptive statistics for nominal data are presented as counts and percentages, and quantitative data are presented either as mean ± standard deviations (SD) or medians and range, [Minimum (min)-maximum (max)] depending on assumptions of normality based on visual (Histograms and probability graphs) and analytical methods (Kolmogorov-Smirnov and Shapiro-Wilk tests). The chi-square or Fisher's exact test was used to compare categorical variables, as appropriate. Spearman rho correlation analysis was used to determine the relationship between two continuous variables with non-normal distribution. In order to analyze the linear relationship between two normally distributed continuous variables, Pearson correlation analysis was used. All p-values below 0.05 were considered significant.

RESULTS

General specialties of the study population

Isolated cat allergen sensitization was detected by SPT and/or sp IgE measurement in 203 patients with allergic symptoms due to cat contact who presented to our outpatient clinic between January 2021 and February 2025. Patients with sensitization to any additional allergen such as mites or pollen were excluded to exclude confounding allergic factors.

Of the 203 patients, 152 (74.9%) were females. Median age of the patients was 29 (Range= 18-69) years. A total of 71 patients (35%) experienced asthma and AR/conjunctivitis symptoms upon exposure to cat allergens, and in these patients, the diagnosis of asthma was confirmed by PFTs. Median age of the patients with asthma was 30 (Range= 19-65) years. In patients with only AR/conjunctivitis symptoms and no asthma, the median age was 29 (Range= 18-69) years. There was no statistical difference in age between the two groups (p= 0.106). Most of the patients who owned cats were university graduates. Smoking and alcohol consumption were not found to have a statistically significant association with asthma (p= 0.452 and p= 0.203, respectively).

Endocrine disorders were the most common comorbidity in both groups. Asthma was also present in all three patients with nasal polyps. The association between the presence of nasal polyps and the development of asthma was statistically significant (p= 0.001). The vast majority of our patients had the cat in their home. Six of the patients were veterinarians, of whom 4 (67%) had been diagnosed with asthma and 2 (33%) had not. The detailed results about sociodemographic characteristics are presented in Table 1.

Table 1. Comparison of the patients with AR/conjunctivitis alone and the patients with AR/conjunctivitis and asthma in terms of sociodemographic characteristics

Parameters	Diagnosis		p
	AR/conjunctivitis (n= 132)	AR/conjunctivitis and asthma (n= 71)	
Age (years) [median (min-max)]	29 (18-69)	30 (19-65)	0.106
Sex [n (%)]			
Female	96 (63)	56 (37)	
Male	36 (71)	15 (29)	0.215
Occupation [n (%)]			
Housewife	30 (59)	21 (41)	
Civil servant	48 (62)	30 (38)	
Employee	9 (75)	3 (25)	0.484
Retired	4 (67)	2 (33)	
Student	41 (73)	15 (27)	
Education [n (%)]			
Secondary school	7 (87)	1 (13)	
High school	39 (62)	24 (38)	0.359
University	86 (65)	46 (35)	
Comorbidities [n (%)]			
Cardiovascular	8 (67)	4 (33)	
Endocrine	16 (61)	10 (39)	
Rheumatologic	3 (75)	1 (25)	
Gastroenterologic	5 (71)	2 (29)	0.790
Malignancy	0	1 (100)	
Neurologic	1 (50)	1 (50)	
History of allergic diseases [n (%)]			
Urticaria	1 (33)	2 (67)	
Nasal polyps	0	3 (100)	**0.001***
History of smoking [n (%)]	36 (67)	16 (33)	0.452
History of alcohol consumption [n (%)]	9 (53)	7 (47)	0.203
History of allergic diseases in childhood [n (%)]	14 (70)	6 (30)	0.411
Family history of allergic diseases [n (%)]	45 (70)	20 (30)	0.242
Veterinarian [n (%)]	2 (33)	4 (67)	0.114
Where was the contact with the cat? [n (%)]			
Home	121 (64)	68 (36)	
Workplace	11 (79)	3 (21)	0.212

*p< 0.05 was considered significant.
AR: Allergic rhinitis, Min: Minimum, Max: Maximum.

Clinical symptomatic characteristics of the study population

Only patients with AR/conjunctivitis had been exposed to cat for median 24 (Range= 12-180) months. In patients with AR/conjunctivitis and asthma, median duration of cat exposure was 36 (Range= 12-300) months. The difference between both groups was statistically significant (p= 0.004). Many of the patients only had one cat in their home.

Median duration of allergic symptoms in patients with AR/conjunctivitis was 10.5 (Range= 1-60) months and with AR/conjunctivitis and asthma was 12 (Range= 1-150) months. Patients with AR/conjunctivitis developed allergic symptoms a median of 13.5 (Range= 11-120) months after cat exposure. In patients with concomitant asthma, asthma symptoms developed after a median of 24 (Range= 11-150) months.

Runny nose, nasal congestion, itchy eye, runny eyes were statistically significantly higher in patients with AR/conjunctivitis (p= 0.029, 0.030, 0.001, <0.001, <0.001, respectively). Cough and shortness of breath were statistically significantly more frequent in the group with asthma (p= <0.001, <0.001, respectively). Post-nasal discharge was statistically significantly higher in patients with AR/conjunctivitis and asthma (p< 0.001). Detailed results about clinical symptomatic characteristics of the study population are presented in Table 2.

Table 2. Comparison of the patients with AR/conjunctivitis alone and the patients with AR/conjunctivitis and asthma in terms of clinical symptomatic characteristics

Parameters	**Diagnosis**		**p**
	AR/conjunctivitis (n= 132)	**AR/conjunctivitis and asthma (n= 71)**	
Duration of exposure with the cat (months) [median (min-max)]	24 (12-180)	36 (12-300)	0.004*
How many cats did the patient have? [median (min-max)]	1 (1-10)	1 (1-10)	1.0
Duration of allergic symptoms (months) [median (min-max)]	10.5 (1-60)	12 (1-150)	0.075
With other animals at home [n (%)]	5 (56)	4 (44)	0.389
Itchy nose [n (%)]			
Yes	125 (64)	70 (36)	0.164
No	7 (87)	1 (13)	
Runny nose [n (%)]			
Yes	123 (63)	71 (37)	**0.029***
No	9 (100)	0	
Nasal congestion [n (%)]			
Yes	109 (62)	66 (38)	0.030*
No	23 (82)	5 (18)	
Sneezing [n (%)]			
Yes	127 (64)	71 (36)	0.113
No	5 (100)	0	
Itchy ear [n (%)]			
Yes	75 (57)	57 (53)	**0.001***
No	57 (80)	14 (20)	
Itchy eyes [n (%)]			
Yes	76 (55)	62 (45)	**<0.001***
No	56 (86)	9 (14)	
Runny eyes [n (%)]			
Yes	67 (52)	60 (48)	**<0.001***
No	65 (86)	11 (14)	
Itchy throat [n (%)]			
Yes	56 (50)	56 (50)	**<0.001***
No	76 (84)	15 (16)	
Post-nasal discharge [n (%)]			
Yes	69 (51)	68 (49)	**<0.001***
No	63 (96)	3 (4)	
Cough [n (%)]			
Yes	55 (44)	69 (56)	**<0.001***
No	77 (98)	2 (2)	
Shortness of breath [n (%)]			
Yes	9 (12)	66 (88)	**<0.001***
No	123 (96)	5 (4)	

*p< 0.05 was considered significant.

AR: Allergic rhinitis, Min: Minimum, Max: Maximum.

The results of testing of the study population

Median total IgE level in the group with AR/conjunctivitis was 80 kU/L (Range= 5-1775). In the group with concomitant asthma, median total IgE level was 126 kU/L (Range= 12-1852). Total IgE level was statistically significantly higher in the group with asthma (p= 0.010). Median cat sp IgE levels of patients with AR/conjunctivitis was 5.46 kU/L (Range= 0.37-100). In the group with concomitant asthma, median cat sp IgE levels was 23 kU/L (Range= 0.38-100). The difference between the two groups was statistically significant (p= 0.003). When categorized by cat sp IgE, there was no statistically significant difference in asthma between the groups (p= 0.052). Median wheal diameter on SPT was 5 mm (Range= 4-20) in the group with AR/conjunctivitis alone. On the other hand, in the group with concomitant asthma, median wheal diameter on SPT was 5 mm (Range= 4-13) (p= 0.104). Median eosinophil count in the group with AR/conjunctivitis was 230 cells/mm^3 (Range= 20-1580). In the group with concomitant asthma, median eosinophil count was 460 cells/mm^3 (Range= 110-990). Eosinophil count was statistically significantly higher in the group with asthma (p< 0.001). As expected, pulmonary function values were significantly lower in patients with asthma compared to the other group. Detailed results about the results of testing of the study population are presented in Table 3.

Severity of AR and treatments given to the patients

According to the ARIA classification, 58% of the patients had severe persistent AR. Mild persistent AR was the second most common. Most of the patients were affected from the cat throughout the year (Figure 1). Patients with intermittent symptoms were those who did not have a cat at the home but had a cat at the home of relatives or friends or at the work.

Median VAS score was 7 (Range= 2-10). Median VAS score was 6 (Range= 2-10) in the group with AR/conjunctivitis alone. On the other hand, in the group with concomitant asthma, median VAS score was 8 (Range= 5-10). VAS score was statistically significantly higher in the group with asthma (p< 0.001). The most common treatment (n= 117, 58%) given by physicians to patients with AR/conjunctivitis was a combination

Table 3. Comparison of the patients with AR/conjunctivitis alone and the patients with AR/conjunctivitis and asthma in terms of the results of testing

Parameters	Diagnosis		p
	AR/conjunctivitis (n= 132)	AR/conjunctivitis and asthma (n= 71)	
Cat sp IgE levels (kU/L) [median (min-max)]	5.46 (0.37-100)	23 (0.38-100)	**0.003***
Category of cat sp IgE levels [n (%)]			
Low positive	11 (65)	6 (35)	
Positive	24 (75)	8 (25)	
High positive	36 (73)	13 (27)	0.052
Very high positive	32 (52)	30 (48)	
Wheal diameter on SPT (mm) [median (min-max)]	5 (4-20)	5 (4-13)	0.104
Eosinophil (cells/mm^3) [median (min-max)]	230 (20-1580)	460 (110-990)	**<0.001***
Basophil (cells/mm^3) [median (min-max)]	40 (5-120)	40 (10-90)	0.494
Total IgE (kU/L) [median (min-max)]	80 (5-1775)	126 (12-1852)	**0.010***
FEV_{-1} (L) [median (min-max)]	3.5 (1.86-5.52)	2.68 (2.28-4.51)	**<0.001***
FEV_{-1} (%) [median (min-max)]	99 (80-140)	83 (59-129)	**<0.001***
FVC (L) [median (min-max)]	4 (2.27-6.07)	3.2 (1.56-5.81)	**<0.001***
FVC (%) [median (min-max)]	99 (73-137)	89 (62-133))	**<0.001***
FEV_{-1}/FVC [median (min-max)]	88 (76-116)	78 (65-97)	**<0.001***
FEF_{25-75} % [median (min-max)]	82 (59-139)	68 (40-134)	**<0.001***

*p< 0.05 was considered significant.

AR: Allergic rhinitis, Min: Minimum, Max: Maximum, FEF: Forced expiratory flow, FEV_1: Forced expiratory volume in one second, FVC: Forced vital capacity, sp IgE: Specific immunoglobulin E.

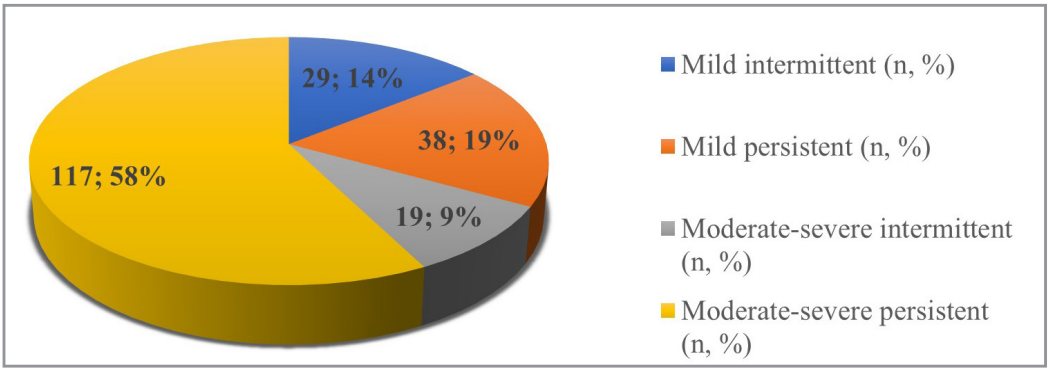

Figure 1. Severity of allergic rhinitis.

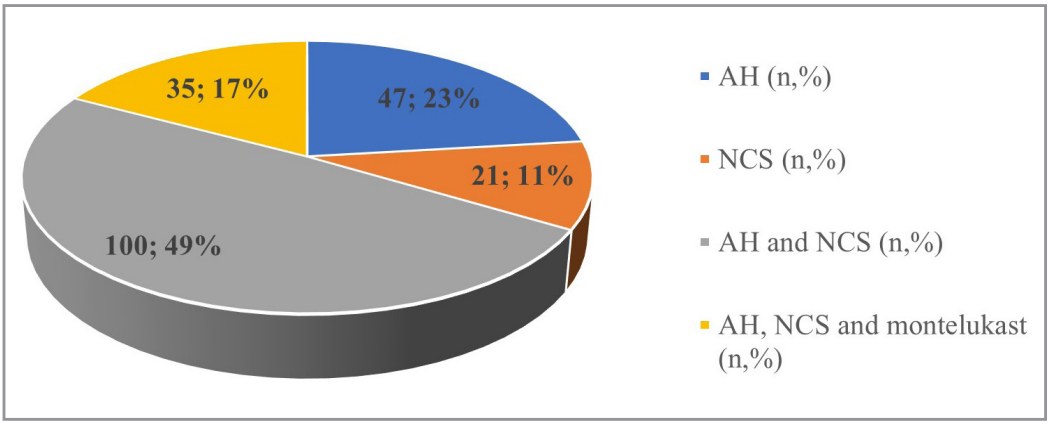

Figure 2. Treatments given to the patients with AR/conjunctivitis.
AH: Antihistamine, NCS: Nasal corticosteroid.

of nasal corticosteroids and oral AHs. Treatments given to the patients are shown in Figure 2.

Treatments and asthma control in the patients with asthma

According to the GINA guidelines, 39% (n= 27) of the patients with asthma were receiving step 3 asthma treatment, 34% (n= 24) were receiving step 2. Omalizumab (Step 5) was given to only one patient. Step therapy that asthmatic patients receive is given in detail in Figure 3.

In the group with concomitant asthma, median ACT score was 19 (Range= 9-25). Only 48% (n= 34) of the patients had well-controlled asthma and 16% (n= 11) of the patients had uncontrolled asthma. The remaining 36% (n= 25) had poorly controlled asthma. There were 25 patients with a history of a presentation to the emergency department due to an asthma attack and these patients had a history of steroid treatment. Median eosinophil count in patients with a history of asthma attacks was 470 (110-990) and was statistically significantly higher than in patients without a history of attacks (p= 0.014).

Evaluation of the factors affecting rhinitis severity and asthma control

Spearman's rho analysis revealed a weak positive correlation between VAS score and duration of cat exposure (r= 0.282, p< 0.001). The severity of rhinitis increased as the duration of cat exposure increased. AS score increased as the number of cats exposed to, cat sp IgE level, total IgE level and eosinophil count increased. Although there was a weak correlation with these values, it was statistically significant (r= 0.215, p= 0.002; r= 0.380, p< 0.001; r= 0.391, p< 0.001; r= 0.445, p< 0.001, respectively). No statistically significant correlation was found between wheal diameter and VAS score (r= 0.135, p= 0.294). Correlation analysis results are given in detail in Table 4.

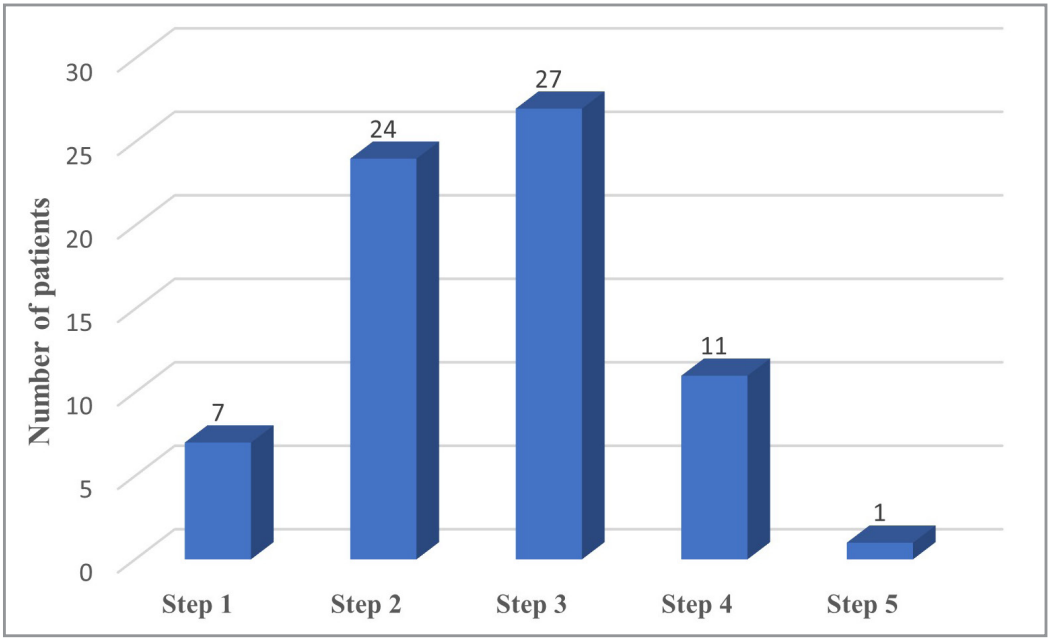

Figure 3. The step therapy that the patients with asthma receive according to the GINA guideline.

Table 4. Determination of the correlation between rhinitis severity (VAS score) and other parameters

VAS	Duration of cat contact	Number of cats	Cat sp IgE level	Total IgE level	Wheal diameter	Eosinophil count
Correlation co-efficient*	+0.282	+0.215	+0.380	+0.391	+0.135	+0.445
p	**<0.001**	**0.002**	**<0.001**	**<0.001**	0.294	**<0.001**

p< 0.05 was considered significant, *Spearman's rho.
sp IgE: Specific immunoglobulin E, VAS: Visual analog scale.

Table 5. Determination of the correlation between ACT and other parameters

ACT	Duration of cat contact	Number of cats	Cat sp IgE level	Total IgE level	Wheal diameter	Eosinophil count
Correlation co-efficient*	-0.024	+0.015	-0.379	-0.364	+0.074	-0.202
p	0.846	0.904	**0.004**	**0.006**	0.719	0.097

p< 0.05 was considered significant, *Spearman's rho.
ACT: Asthma control test, sp IgE: Specific immunoglobulin E.

Spearman's rho analysis revealed a weak negative correlation between ACT score and cat sp IgE, total IgE levels (r= -0.379, p= 0.004; r= -0.364, p= 0.006, respectively). No statistically significant correlation was found between ACT score and other parameters. Correlation analysis results are given in detail in Table 5.

DISCUSSION

In this study, we evaluated the characteristics of patients with isolated cat allergen sensitization and investigated factors associated with the severity of AR and asthma control. Our findings demonstrated that a higher total IgE, sp IgE levels, and eosinophil counts were significantly associated with the presence of asthma and with more severe AR symptoms. Furthermore, longer duration of cat exposure correlated with increased symptom severity, suggesting that chronic exposure may exacerbate allergic responses. These results contribute to the growing body of evidence highlighting the role of cat allergen exposure in the development of allergic diseases.

In recent years, the rate of cat adoptions has increased in our country. In the studies, it was found that cat owners and cat sensitisation increased after the coronavirus disease-2019 (COVID-19) pandemic (19-22). Allergic symptoms may occur with increased indoor cat contact. Cat sensitization may be followed by asthma. Our study is the first study to investigate the characteristics and risk factors associated with developing AR/conjunctivitis and/or asthma in cat owners during adulthood.

It was observed that the majority of our study group consisted of young age, university graduate female patients. We believe that the isolation of modern life (Home office working pattern), increasingly stressful lifestyles and the stress of being confined to home due to the pandemic are the reasons for the increase in the incidence of cat allergy. Many studies have shown that pets have a positive effect on people's psychological well-being (23-25). For this reason, patients may adopt cats. As countries develop and sociodemographic level increases, cat ownership rates increase (26,27). Therefore, in our study, the majority of the patient population was educated with high socioeconomic status.

In the studies, findings on the relation between cat exposure and asthma are inconsistent. Most studies have investigated the effect of cat exposure during childhood on the development of asthma (28-31). One study found that being exposed to cats in the first year of life may reduce subsequent risk of allergic sensitization to multiple allergens during childhood (30). In another study, it was found that cumulative allergen exposure from cat ownership and regular cat contact during childhood contribute to sensitization development up to the school age (29).

There are not many studies on the development of AR/conjunctivitis and/or asthma in patients who started exposure with cats in adulthood. In our study, 71 patients (35%) developed asthma after cat exposure. The onset of allergic symptoms was recorded 13.5 months on average after exposure to cats among the patients diagnosed with AR/conjunctivitis. For patients with concomitant asthma, median onset of asthma symptoms was recorded as 24 months. One study suggested that cat allergen concentrations higher than 8 µg/g in settled house dust cause exacerbation of allergic respiratory symptoms. However, in another study, the proposed 8 µg/g threshold of cat allergen concentrations for the exacerbation of allergic and respiratory symptoms was not confirmed in a general European adult population (32). When all these findings are evaluated, we think that many different factors affect the time for respiratory symptoms to appear after cat exposure. Nevertheless, our study indicated that the longer an individual is exposed to cats during adulthood, the more likely they are to experience symptoms of rhinitis and the development of asthma.

Sensitization to cats, especially in adulthood, is an important risk factor for allergic symptoms and asthma development. Some studies have also shown that the risk of asthma attacks is high in these patients (33,34). Although there are studies showing that exposure to cats in early childhood is protective against allergic diseases, we think that exposure starting in adulthood may increase the risk of allergic diseases (35,36). In our study, we found that AR/conjunctivitis symptoms developed first after cat exposure, and asthma symptoms were added approximately one year after AR/conjunctivitis symptoms began. For this reason, cat owners should be closely monitored for the risk of developing asthma after AR/conjunctivitis symptoms begin. Long-term adult cohort studies are needed to clarify the relationship between cat exposure and allergic diseases.

In patients with allergic symptoms after exposure to cats, measuring total IgE and cat sp IgE is a very important step in diagnosis. Allergen levels are naturally higher in cat households, with the major allergen Fel d1 being the most important biomarker not only for sensitization (IgE, positive SPT) but for risk of clinically relevant cat allergy and asthma (37). We did not perform molecular diagnostic methods or Fel d1 measurement in our study. However, we found that the levels of both total IgE and cat sp IgE were statistically significantly higher in patients with asthma. In addition, the severity of AR/conjunctivitis (VAS scores) also increased as total IgE and cat sp IgE levels of the patients increased although the correlation coefficient was weak. Conversely, as total IgE and cat sp IgE of the patients increased, asthma control (ACT scores) decreased. We believe that the levels of total IgE and cat sp IgE may be useful in predicting the severity of AR/conjunctivitis symptoms and controlling asthma. A study published in 2019 found that variation in total IgE was weakly associated with asthma control (38). In some studies, sp IgE

levels to common inhalant allergens have been shown to be a good predictor of childhood asthma onset and persistence and lung function decline (39,40).

Another biomarker in the context of asthma and allergic diseases is the blood eosinophil count. Many studies have shown that it is elevated in allergic diseases and is an important marker in predicting asthma prognosis (41-43). In our study, we found that the blood eosinophil count was statistically significantly higher in the group with asthma. Furthermore, an increase in blood eosinophil counts was observed to correspond with an escalation in the severity of rhinitis symptoms (VAS scores). At the same time, we found that blood eosinophil counts were statistically significantly higher in those with a history of asthma attacks, even during the attack-free period. However, interestingly, we did not find a statistically significant correlation between blood eosinophil count and asthma control (ACT scores). Our findings indicated that while the blood eosinophil count does not directly impact asthma control, it is associated with an increased risk of rhinitis severity and asthma attack. A study of 3.162 patients has revealed an association between elevated blood eosinophils and asthma attacks (44). In a meta-analysis study, it has been shown that the blood eosinophil counts ≥200 cells/μL were associated with asthma attacks (45).

The strength of our study is its status as the first investigation of its kind in our country, with the objective of identifying the factors that influence the development of asthma in adult patients who are sensitive to cats. However, there are some limitations to our study. The first of these limitations is that our study is retrospective and there is no long-term follow-up of the patients. In this respect, long-term follow-up cohort studies with large patient numbers are necessary. The second limitation of this study is that the results are not supported by molecular allergy diagnostic tests. If Fel d1 levels could be measured, perhaps a stronger correlation between rhinitis severity and asthma control could be found. Another limitation of our study is that the study does not include extensive data on cat species and cat allergen concentrations in the home.

In conclusion, cats have become one of the major allergens in our country in recent years following sociological changes and the COVID-19 pandemic. The number of patients presenting to allergy clinics with allergic symptoms after having encountered cats is increasing day by day. These patients should be advised to stay away from cats, if possible, but patients who do not agree to stay away from cats should be closely monitored for the development of asthma.

Ethical Committee Approval: This study was approved by the Scientific and Ethical Review Board for Medical Research (TABED) of Ankara Bilken City Hospital No. 1 (Decision no: TABED 1-25-1053, Date: 26.02.2025).

CONFLICT of INTEREST

The authors declare that they have no conflict of interest.

AUTHORSHIP CONTRIBUTIONS

Concept/Design: All of authors

Analys/Interpretation: All of authors

Data acqusition: All of authors

Writing: All of authors

Clinical Revision: All of authors

Final Approval: All of authors

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