

EVALUATION OF THE RELATIONSHIP BETWEEN PET EXPOSURE IN EARLY CHILDHOOD AND ASTHMA/ALLERGIC DISEASES IN CHILDREN: A CROSS-SECTIONAL STUDY

Erken Çocukluk Döneminde Evcil Hayvanlara Maruz Kalma ile Çocuklarda Astım/Alerjik Hastalıklar Arasındaki İlişkinin Değerlendirilmesi: Kesitsel Bir Çalışma

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ABSTRACT

Objective: The study aims to elucidate the relationship between pet exposure from the intrauterine period until the age of 9, and the diagnosis of asthma and allergic diseases, and to evaluate the effect of cat, dog, and bird exposure on patients.

Material and Methods: The study was conducted in a cross-sectional, prospective design by administering a survey via social media between 1 June 2020 and 31 August 2020, in patients between 1 month and 18 years old. Patients were reached through social media. After obtaining informed consent, a survey about pet ownership prepared by the researcher was questioned. Those with chronic diseases other than asthma and allergic rhinitis (epilepsy, congenital heart disease, neuromuscular diseases, suppurative lung diseases, etc.) were excluded from the study. The International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire was performed.

Results: A total of 234 children were included with 27.40% (n=64) of children diagnosed with asthma or asthmatic bronchitis or allergic bronchitis. Further 34.20% (n=80) of children diagnosed as flu or hay fever or allergic rhinitis (AR). Children having at least one pet in their home at any point of their life were 79.90% (n=187) of children. Patients having pets, and cats tended to have more asthma diagnosis. Patients having dog and birds tended to have fewer asthma diagnosis. Patient having birds also tended to have fewer AR diagnosis. Patients having dog, and birds, were observed to have a more increased risk for asthma, and AR diagnosis, if their parents were smoking. Patients having cats were observed to have a more increased risk for AR diagnosis, if their parents have allergic diseases.

Conclusion: As a result of our study, the risk of developing asthma and AR varies depending on the exposure of different animal groups at different stages of life.

Keywords: Child, asthma, allergic rhinitis, pet

ÖZ

Amaç: Çalışmanın amacı, intrauterin dönemden 9 yaşına kadar evcil hayvan maruziyetinin astım ve alerjik hastalıkların tanısı ile ilişkisini ortaya koymak ve kedi, köpek ve kuş maruziyetinin hastalar üzerindeki etkisini değerlendirmektir.

Gereç ve Yöntemler: Çalışma, 1 Haziran 2020 ile 31 Ağustos 2020 tarihleri arasında 1 ay ile 18 yaş arasındaki hastalara sosyal medya üzerinden anket uygulanarak kesitsel, prospektif bir olarak yürütülmüştür. Hastalara sosyal medya üzerinden ulaşılmıştır. Bilgilendirilmiş onam alındıktan sonra araştırmacı tarafından hazırlanan evcil hayvan sahipliğine ilişkin anket sorgulanmıştır. Astım ve AR dışındaki kronik hastalıkları olanlar (epilepsi, konjenital kalp hastalığı, nöromusküler hastalıklar, süpüratif akciğer hastalıkları vb.) çalışmadan hariç tutulmuştur. Uluslararası Çocukluk Çağı Astım ve Alerji Çalışması (ISAAC) anketi uygulanmıştır.

Bulgular: Çalışmaya toplam 234 hasta dâhil edildi; bunların %27.40'ı (n=64) hekim tarafından astım veya astımlı bronşit veya alerjik bronşit olarak teşhis edildi. Ayrıca %34.20'si (n=80) grip veya saman nezlesi veya alerjik rinit tanılarını aldı. Yaşamlarının herhangi bir noktasında evlerinde en az bir evcil hayvanı olan çocukların oranı %79.90'dı (n=187). Evcil hayvanı ve kedisi olan hastalarda astım tanısı daha fazla görüldü. Köpek ve kuş besleyen hastalarda ise astım tanısı daha az görüldü. Kuş sahibi olan hastalarda da AR tanısı daha az olma eğilimindeydi. Köpek ve kuş besleyen hastaların ebeveynlerinin sigara içmesi durumunda astım ve AR tanısı alma riskinin daha fazla olduğu görüldü. Kedi sahibi olan hastaların ebeveynlerinde alerjik hastalık varsa AR tanısı alma riskinin daha yüksek olduğu görüldü.

Sonuç: Çalışmamızın sonucunda, farklı hayvan gruplarının farklı yaşam dönemlerinde maruziyetlerine bağlı olarak astım ve alerjik rinit geliştirme riskinin değiştiği ortaya çıkmıştır.

Anahtar Kelimeler: Çocuk, astım, alerjik rinit, evcil hayvan



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INTRODUCTION

Asthma is the most common chronic disease in children and is a heterogeneous disease often characterized by chronic airway inflammation. The symptoms (cough, shortness of breath or chest tightness, rhonchus, wheezing) are variable and correlate with expiratory flow limitation (1).

Asthma is defined as a complex genetic disorder with strong environmental influence. Asthma represents a dysfunctional interaction with our genes and the environment to which individuals are exposed, particularly in fetal and early infant life. Multiple environmental risk factors such as air pollution, exposure to smoke, and pets, have been identified to increase the risk of developing asthma (2).

The relationship between allergen exposure and sensitization in children depends on the allergen, allergen dose, duration of exposure, age of the child at the exposure period, and possibly genetic factors. House dust mites (HDM), pets (cats, dogs), cockroaches, and mold fungi have been identified as risk factors for indoor allergens (3).

Studies investigating the role of allergens have shown that exposure to these allergens at an early age may be protective against allergic sensitization and asthma development, while others have suggested that such exposure may increase the risk of allergic sensitization. The literature on this topic is characterized by a limited number of controversial studies (3-7).

The study aims to elucidate the relationship between pet exposure from the intrauterine period until the age of 9, and the diagnosis of asthma and allergic diseases, and to evaluate the effect of cat, dog, and bird exposure on patients.

MATERIALS AND METHODS

The study was conducted in a cross-sectional, prospective design by administering a survey via social media between 1 June 2020 and 31 August 2020 in children between 1 month and 18 years of age. Patients were reached through social media. Page accounts that publish information about symptoms, clinical findings, diagnostic tests, and treatments regarding allergy, pages where patients with allergic diseases are active and share information on this subject, and pages with pet owners on Facebook were preferred.

After obtaining informed consent electronically, participants' parents were asked to complete a survey about pet ownership prepared by the researcher. Those with chronic diseases other than asthma and AR (epilepsy, congenital heart disease, neuromuscular diseases, suppurative lung diseases, etc.) were excluded from the study. The International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire and a questionnaire about the presence and exposure of pets

that were prepared by researchers were performed (8). Parents of the patients were asked whether their children have had animals at home at any age since the pregnancy, whether they had cats, dogs, birds, goats/sheep, cows/buffalos, the number of animals they owned, and whether they had removed the animals they owned from their homes after allergic symptoms were observed, and a survey prepared by the researcher was also applied, asking whether parents or their children gave up owning animals due to fear of allergic symptoms.

Data were collected about the patient's age, gender, birth characteristics, accompanying asthma, AR, eczema, and other chronic diseases, family history of accompanying atopic disease, and the presence of allergic disease using the patient's ISAAC questionnaire, the presence of a pet cat, bird and/or dog; if so, the time of exposure, questioning the exposure in three groups as pregnancy period, before 1 year of age and after 1 year of age. The effects of pet exposure from the intrauterine period up to the ages of 9 were evaluated.

This study was approved by the Ministry of Health, Ankara Bilkent City Hospital Ethics Committee No. 1 (E1-20-746). Informed consent was taken from the patient's parents.

Statistical analysis

SPSS 22 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. Results were expressed as percentiles (absolute numbers), means and standard deviations, or as medians and interquartile ranges (IQRs) as required. A chi-square test was performed to compare the categorical variables. Logistic regression was used to predict the categorical dependent variable. $p < 0.05$ was considered to be statistically significant.

RESULTS

A total of 234 children were involved with 56.40% (n=132) male. The median age of the children was 32.5 months (IQR:14.7-70 months). Family members having the allergic disease were 65.40% (n=153) of the patients, and the most frequent member was a mother with 42.70% (n=100). Sociodemographic characteristics of children, and parents are shown in Table 1.

Mothers and fathers were smoking with 17.90% (n=42), and 26.90% (n=63) of children, respectively. Children who were born via cesarean section were preterm, and low birth weight were 68.80% (n=161), 9.80% (n=29), and 7.70% (n=18) of children, respectively. Children who had been feeding only with breastfeeding until the 4th month, and feeding with formula before the 4th month were 17.90% (n=42), and 25.60% (n=60) of children, respectively. Children who had gone to kindergarten were 41.90% (n=98) of children, and the median age of going to kindergarten was 3 years of age (IQR:2-4). Heavy vehicles such as trucks or lorries passed through

their street every day in 26% (n=63) of children. Children having dampness, mold, and humidity, having cockroaches, heaters, and stoves in their home in the first year of the child's life were 15% (n=35), 6.80% (n=16), 40.60% (n=95), and 6% (n=14) of children, respectively (Table 2).

Pet ownership

Children having at least one pet in their home at any point of her/his life were 79.90% (n=187) of the children. Children having cat, dog, bird, goat and/or sheep, and cow and/or buffalo were 45.30% (n=106), 32.10% (n=75), 26.10% (n=61), 1.70% (n=4), and 2.60% (n=6) of the children, respectively. The average number, and characteristics of their pets according to the contact age of children were shown in Tables 3A and 3B.

Allergic symptoms:

Children having a wheezing, wheezing, or whistling sound from his/her chest (lungs) from birth to this age at least one time, and in the past 1 year were 50.90% (n=119), and 35% (n=82) of the children, respectively (Table 2).

Children had a runny nose, stuffy nose, itchy nose, or sneezing, without a cold, cold, or flu infection at least one time from birth to the current age, and in the past year were 56% (n=131), and 32.90% (n=77) of the children, respectively (Table 2).

Diagnosis of asthma and AR among children

Children diagnosed with asthma or asthmatic bronchitis or allergic bronchitis by the doctor were 27.40% (n=64) of the children, and those diagnosed with flu or hay fever or AR by the doctor were 34.20% (n=80) of the children (Table 2).

The association between pet ownership and allergic diseases

Patients having pets, and cats tended to have more asthma diagnosis (p=<0.05). Patients having dog and birds tended to have fewer asthma diagnosis (p=<0.05). Patients having birds also tended to have fewer AR diagnosis (p=<0.05). There was no statistically significant difference between having asthma, and AR, and having sheep, and/or goats and having cows and /or buffalo (Table 4A).

Table 1: Characteristics of study population

Gender	
Male, n (%)	132 (56.40)
Female/male	0.77
Age (months), mean, median, IQR, min-max	48.6, 32.5, 14.7-70, 1-216
Living place, n (%)	
Small Town	14 (6)
City	211 (90.20)
Village	9 (3.80)
Child number, mean, median, min-max	1.3, 1, 1-3
Which child is your child that you filled out the questionnaire? n (%)	
First child	208 (88.90)
Second child	21 (9)
Third child	5 (2.10)
Family members having allergic disease, n (%)	
Mothers	100 (42.70)
Fathers	76 (32.50)
Others	34 (14.60)
Mother's education, n (%)	
Primary school	7 (3)
High school	36 (15.40)
University	191 (86.40)
Father's education, n (%)	
Primary school	12 (5.10)
High school	45 (19.20)
University	177 (75.60)
Having removed a pet from your home because of a complaint of child and/or parents.	29 (12.40)
Having given up on getting a pet because child or parents will have complaints.	61 (26.10)

Table 2: Evaluation of ISAAC questionnaire

	n (%)
Child ever having a wheezing, wheezing or whistling sound from his/her chest (lungs) from birth to this age	119 (50.90)
Child having any wheezing, wheezing or whistling sounds (for whatever reason) from their chest (lungs) in the past 1 year	82 (35)
Having doctors told that your child has asthma or asthmatic bronchitis or allergic bronchitis from births to this age, n (%)	64 (27.40)
Your child having a runny nose, stuffy nose, itchy nose, or sneezing, without a cold, cold, or flu infection at any time from birth to this age	131 (56)
Your child having a runny, stuffy nose, itchy nose or sneezing while they were not sick, ie without a cold, cold or flu infection in the past year	113 (48.30)
Your child having a runny nose, stuffy nose, itchy nose, or sneezing, along with red, itchy, or watery eyes in the past year	77 (32.90)
Having doctors ever told you that your child has flu or hay fever or allergic rhinitis or allergic rhinitis from births to this age	80 (34.20)
Information about smoking exposure	
Mothers smoking	42 (17.90)
During pregnancy	14 (6.50)
During the entire life of child	16 (6.80)
During the first year of child	11 (4.70)
During the past year of child's life	21 (9)
Never	174 (74.30)
Fathers smoking	63 (26.90)
During pregnancy	3.8 (5.10)
During the entire life of child	29 (12.40)
During the first year of child	29 (12.40)
During the past year of child's life	20 (8.50)
Never	160 (68)
Other family members smoking	22 (9.40)
Number of people living at home, mean, median, min-max	3.5, 3, 2-7
Number of the rooms in the home, mean, median, min-max	3.9, 4, 2-8
Information about birth characteristics of child	
Via normal vaginal delivery, n (%)	73 (31.20)
Via cesarean section, n (%)	161 (68.80)
Birth before 37 weeks, n (%)	29 (9.80)
Birth >37 weeks, n (%)	205 (87.60)
Birth weight, n (%)	
<2500 kg	18 (7.70)
2500-4000 kg	204 (87.20)
>4000 kg	12 (5.10)
Those who have twins or triplets, n (%)	4 (1.70)
Child feeding with only breastfeeding, n (%)	
After 1 year	62 (26.50)
Before 4 months	42 (17.90)
Between 4-6 months	59 (25.20)
Between 6-12 months	71 (30.30)
Child starting time feeding with formula, n (%)	
Before 4 months	60 (25.60)
Between 4-6 months	23 (9.80)
After 6 months	33 (14.10)
Never	118 (50.40)
Child starting time feeding with complementary food, n (%)	
Before 4 months	5 (2.10)
Between 4-6 months	75 (32.10)
After 6 months	154 (65.80)
Child had gone to kindergarten, n (%)	98 (41.90)
Age of children started to go to kindergarten, years, mean, median, IQR, min-max	2.97, 3, 2-4, 1-6
Years of children had gone to kindergarten, years, mean, median, IQR, min-max	2, 2, 1-3, 1-6
How often do heavy vehicles such as trucks or lorries pass through your street or street during the week? n (%)	
Rarely	115 (49.10)
Every day, every time of the day passes	27 (11.50)
Every day passes often	63 (26)
Never	29 (12.40)
Were there any dampness, mold and humidity, which are risk factors for allergic diseases, in your house? n (%)	
Never	134 (57.30)
In the first year of child	35 (15)
In the past year of child	24 (10.30)
Were there any cockroach, which are risk factors for allergic diseases, in your house? n (%)	
Never	143 (61.10)
In the first year of child	16 (6.80)
In the past year of child	9 (3.80)
Were there any heater, which are risk factors for allergic diseases, in your house? n (%)	
Never	54 (23.10)
In the first year of child	95 (40.60)
In the past year of child	104 (44.40)
Were there any stove, which are risk factors for allergic diseases, in your house? n (%)	
Never	134 (57.30)
In the first year of child	14 (6)
In the past year of child	15 (6.40)

Table 3A: Characteristics of their pets

Child not having any pets in your home at any point in her/his life.	47 (20.10%)
Child having any pets in your home at any point in her/his life.	187 (79.90%)
Having cat	106 (45.30%)
Having dog	75 (32.10%)
Having bird	61 (26.100%)
Having goat and/or sheep	4 (1.70%)
Having cow and/or buffalo	6 (2.60%)
At a time, cat average number in your home, mean, median, min-max	1.7, 1, 1-10
At a time, dog average number in your home, mean, median, min-max	1.4, 1, 1-10
At a time, bird average number in your home, mean, median, min-max	1.3, 1, 1-6
At a time, goat and/or sheep average number in your home, mean, median, min-max	9, 10, 4-10
At a time, cow and/or buffalo average number in your home, mean, median, min-max	6.7, 10, 1-10

Table 3B: Characteristics of their pets first adopted, according to the age of child

	Cat	Dog	Bird	Goat and/or Sheep	Cow and/or buffalo
Age below 3 years	29 (12.40%)	22 (9.40%)	15 (6.40%)	4 (1.70%)	3 (1.30%)
During pregnancy	62 (26.50%)	48 (20.50%)	22 (9.40%)	3 (1.30%)	3 (1.30%)
In the first 12 months	38 (16.20%)	33 (14.10%)	20 (8.50%)	3 (1.30%)	4 (1.70%)
During 1 years old	28 (12%)	26 (11.10%)	14 (6%)	3 (1.30%)	2 (0.90%)
During 2 years old	28 (12%)	23 (9.80%)	14 (6%)	4 (1.70%)	3 (1.30%)
During 3 years old	22 (9.40%)	19 (8.10%)	14 (6%)	3 (1.30%)	2 (0.90%)
Age between 3-6 years	31 (13.20%)	25 (10.70%)	21 (9%)	3 (1.30%)	2 (0.90%)
Age between 6-9 years	24 (10.30%)	15 (6.40%)	12 (5.10%)	0	1 (0.40%)

Table 4A: Associations between pet type/group, and having asthma, and allergic rhinitis diagnosis

	Having asthma				Having allergic rhinitis			
	Crude Odds Ratio		Adjusted Odds Ratio**		Crude Odds Ratio		Adjusted odds ratio**	
	B (95%CI)	ExpB (%)	B (95%CI)	ExpB (%)	B (95%CI)	ExpB (%)	B(95%CI)	ExpB (%)
Having pets	1.28* (1.84-7.02)	3.60 (260)	-	-	0.33 (0.72-2.70)	1.40 (40)	-	-
Having cat	0.84* (1.15-4.71)	2.3 (130)	0.48 (0.77-3.42)	1.62 (62)	0.35 (0.76-2.63)	1.42 (42)	0.10 (0.54-2.23)	1.10 (10)
Having dog	-0.52 (0.291.18)	0.59 (-41)	-0.751* (0.21-1.01)	0.47 (-53)	0.57 (0.92-3.37)	1.76 (76)	0.417 (0.75-3.03)	1.51 (51)
Having bird	-0.96* (0.188-0.772)	0.38 (-62)	-1.12* (0.14-0.72)	0.32 (-68)	-1.087* (0.17-0.64)	0.33 (-67)	-1.05 (0.16-0.72)*	0.35 (-65)
Having goats and/or sheep	-0.144 (0.088-8.55)	0.866 (-13.4)	0.61 (0.16-20.3)	1.84 (84)	0.38 (0.14-14.36)	1.46 (46)	0.72 (0.18-22.6)	2.05 (105)
Having cow and/or buffalo	-0.567 (0.1-3.2)	0.567 (-43)	-1.00 (0.057-.37)	0.36 (-64)	-0.03 (0.17-5.43)	0.96 (4)	-0.46 (0.09-4.04)	0.63 (-37)

*Boldface: p value<0.05, ExpB: Odds ratio

Adjusted for all animal types

Patients having dog, and birds, were observed to have a more increased risk for asthma, and AR diagnosis, if their parents were smoking (p=<0.05). Patients having cats were observed to have more increased risk for AR diagnosis, if their parents have allergic diseases

(p=<0.05). There was no statistically significant difference between having asthma and AR diagnosis and having pets in regards of gender, age, having pet during pregnancy, and number of siblings (Table 4B).

Table 4B: Associations between pet type/group, and having asthma, and allergic rhinitis diagnosis

	Adjusted PR**(95%CI)							
	Having pets		Having Cat		Having Dog		Having bird	
	Having asthma	Having AR	Having asthma	Having AR	Having asthma	Having AR	Having asthma	Having AR
Gender	-0.39 (0.31-1.42)	-0.52 (0.48-1.86)	-0.31 (0.22-2.35)	-0.52 (0.23-1.52)	-1.07 (0.10-1.16)	-0.56 (0.17-1.90)	0.42 (0.39-5.91)	-0.78 (0.10-1.97)
Age	-0.20 (0.13-4.77)	-0.803 (0.08-2.31)	-1.55 (0.023-1.92)	-1.94 (0.01-1.58)	19.79 (0.0-)	19 (0-)	-0.73 (0.02-9.23)	-20.7 (0-)
Having a pet during pregnancy	-0.28 (0.34-1.62)	-0.82 (0.21-0.88)	-0.11 (0.26-2.99)	-0.20 (0.29-2.21)	-0.57 (0.14-2.22)	-1.04 (0.08-1.49)	0.32 (0.40-4.74)	-1.21 (0.07-1.17)
Smoking	0.57 (0.87-3.60)	0.33 (0.73-2.66)	0.27 (0.45-3.37)	0.36 (0.61-3.41)	1.15 (1.11-8.96)*	1.45 (1.43-12.84)*	1.94 (1.62-29.88)*	1.71 (1.13-27.21)*
Family history of allergy	0.16 (0.54-2.57)	0.62 (0.90-3.83)	0.30 (0.36-5.03)	1.28 (1.14-11.41)*	0.05 (0.31-3.56)	0.25 (0.37-4.42)	0.42 (0.44-5.21)	1.28 (0.92-14.06)
Number of siblings	0.11 (0.54-2.57)	0.48 (0.24-10.63)	2.13 (0.45-156.97)	0.72 (0.11-35.3)	22.7 (0.0-)	22.0 (0-)	1.43 (0.09-21.01)	0.70 (0.13-30.31)

*Boldface: p value<0.05, ExPB: Odds ratio

**Adjusted for gender, age, having a pet during pregnancy, smoking, family history of allergy, number of older and younger siblings

Children whose parents removed and had given up getting a pet from their home because of a complaint of child and/or parents were 12.40% (n=29), and 26.10% (n=61) of children, respectively (Table 1). There was a statistically significant difference between children having asthma and AR diagnosis by doctor, and children whose parents had given on getting a pet (p=0.003 and, 0.000, respectively).

DISCUSSION

A total of 234 patients were included with 27.40% (n=64) of children diagnosed with asthma, asthmatic bronchitis or allergic bronchitis by a doctor. Patients having pets, and cats tended to have more asthma diagnosis. Patients having dog and birds tended to have fewer asthma diagnosis. Patients having birds also tended to have fewer AR diagnosis. Patients having dog and bird, were observed to have a more increased risk for asthma, and AR diagnosis, if their parents were smoking. Patients having cats were observed to have a more increased risk for AR diagnosis, if their parents have allergic diseases. Twenty-nine (12.40%) children's parents had removed a pet from their home because of a complaint of child and/or parents. There was a statistically significant difference between children having asthma and AR diagnosis by doctor, and children whose parents had given on getting a pet (p=0.003 and, <0.001, respectively). In a study, among 5141 adolescents, it was observed that any pet-keeping (birds, cats, dogs) was associated with a higher prevalence of asthma-related symptoms, including wheezing, night dry cough, and exercise-induced wheezing in the past year, and severe asthma was significantly higher in bird and cat keepers (9). In our study, there was no statistically significant difference between having an asthma diagnosis by doctor and having a pet during

pregnancy. Having a pet at home during pregnancy may protect against childhood asthma. Among 7360 children, it was observed that exposure to a pet in early childhood significantly increased the risk of current wheezing on 812 children, early and current contact with cats were observed to be associated with reduced risk of wheezing, and current contact with dogs was inversely associated with diagnosed hay fever and asthma (10). Unlike this finding, in a meta-analysis, 77,434 mother-child dyads were analyzed from 9 cohorts. It was observed that early-life cat and dog ownership in themselves did not increase the risk of school-age asthma (11). According to Tutino et al., among 5 birth-cohorts, 9149 children, it was observed that the rs2305480 G allele was associated with an increased risk of persistent wheezing, and among dog owners, rs2305480 G was no longer associated with an increased risk of persistent wheeze (or asthma). Early-life environmental exposures may therefore attenuate and be protective likelihood of asthma in those carrying 17q12-21 risk alleles (12). In 11 prospective birth cohorts, among 22.000 children, it was observed that pet ownership in early life did not appear to either increase or reduce the risk of asthma or AR symptoms in children aged 6-10 years (13). In a study, among 1231 children, having a cat during and after the first year of life reduced the risk of AR, and having a dog had no significant effect on AR (14). Having a pet at home during pregnancy may protect against AR. In another study, among 1816 children, it was observed that in-utero exposure to pets was associated with an increased risk of asthma and respiratory conditions (15). The reason why these studies gave different results from other studies may be that they shared a very large meta-analysis data from birth-cohort studies. There are studies in the literature on this subject that give different results. More cohort

studies need to be conducted in the future as they can provide more reliable and guiding results on this subject.

Among different studies, it was observed that the stool microbiota of children living with pets differed from those without pet exposure (16-20). Exposure to diverse bacteria in the first of year life, especially in the first weeks of life, has led some to suggest that we shift from the “hygiene” to the “microbial” hypothesis of allergen protection (21-22). According to Ownby et al., it was observed that exposures to certain pet-associated microbes, especially in the neonatal period, differ and develop the child's immune system, and this in turn reduces the risk of allergic sensitization and disease (23). In another study, it was observed that high endotoxin exposure in the presence of multiple dogs was associated with reduced wheezing in infants (24). Further studies are needed to investigate and provide preventive therapies with the knowledge of the interaction of pet and human microbiota.

The limitations of this study are that, since it was conducted through social media, the participation of parents of children whose children had symptoms and/or diagnosis of allergic bronchitis and/or AR was higher than that of parents of healthy children. In our study, 50.90% of children experienced wheezing symptoms once in their lives, which is higher than the expected rate in society. In addition, the fact that pet-owning parents showed more interest in the study and more pet owners participated in the study than the normal population is a limitation of the study. Additionally, the possibility of recall bias in self-reported data on pet exposure and allergic symptoms was also a limitation of our study. However, the risks and/or benefits of keeping a pet have been the subject of several studies, and studies examining associations of early-life cat and dog ownership with childhood asthma have reported inconsistent results. We believe that our study will shed light on this important issue, which still needs further research.

As a result of our study, the risk of developing asthma and AR varies depending on the exposure of different animal groups at different stages of life. More studies on prospective cohort studies with larger sample sizes and objective measures of pet exposure and allergic outcomes are needed.

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Concept/Design: EC, Analysis: EC, EDM, Data Collection: APM, EC, Writer: APM, EC, Critical Review: EC, Approver: EC, EDM, MT

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