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## Pet Exposure and the Symptoms of Asthma, Allergic Rhinitis and Eczema in 6-7 Years Old Children

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### ABSTRACT

Allergic diseases are frequent in children and their prevalence and severity differ in the different regions of the world. The association between pet ownership in childhood and subsequent asthma and sensitization is very controversial.

In our survey conducted with standardized method (International Study of Asthma and Allergies in Childhood), 3200 children 6-7 years old were questioned regarding asthma, allergic rhinitis and eczema.

The prevalence of Attacks and shortness of breath with wheezing during last 12 months in the children who had exposure to pets in the first year of life was 34.3% that was less than children who had not exposure (OR=3.06, 95% confidence interval [CI] 1.14-8.21, P=0.021). Also during the past 12 months the prevalence of night dry coughs, allergic rhinitis symptoms and eczema symptoms in those who had pet exposure in the first year of their life was lower than the children did not have it. However there was no significant difference in some other symptoms of asthma in two groups.

Our findings suggest that pet exposure in the first year of life can have a protective effect on asthma, allergic rhinitis and eczema.

**Keywords:** Allergic Rhinitis; Asthma; Eczema; Pet Exposure

### INTRODUCTION

The prevalence of childhood asthma and atopy is rising<sup>1</sup> with major implications for health care in terms

of morbidity.<sup>2</sup> Domestic animals, like cats, dogs, and rodents, release allergens in their secretions, excretions, and dander's.<sup>3</sup> A consensus of opinion is growing that animal allergens can play a significant role in the development of asthma, although some studies have suggested that early contact with pets may prevent the development of allergy and asthma in children.<sup>4</sup> If child is sensitive to such allergens, removal of the animal from the patient environment has been recommended

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as an effective method to reduce exposure. However, children often refuse to give up their pets, then physician have to administer drugs and provide help of various allergen control measures<sup>5</sup>. Because of wide habits of keeping exposure to domestic animals in residential environments which result to frequent exposure, it is of importance to study the extent of exposure in various distinct areas and to investigate the impact of different exposure patterns on the occurrence of allergic diseases. A number of studies on asthma in relation to exposure to animals have been reported.<sup>6,7</sup> To our knowledge there is no study on the effects of early intermittent contact with pets on development of allergic asthma among Iranian children. Thus we designed and performed this study to determine the pattern and influence of domestic animals exposure in Iranian children population.

**PATIENTS AND METHODS**

This study was an analytic cross sectional research that implemented on age groups of 6-7 years old in the Yazd City. Cluster sampling was applied and each school was used as a cluster. Sample size was accounted by  $P=4\%$  (prevalence of asthma),  $\alpha= 0.05$  and  $d=0.01$  was 1476. Regarding to coefficient clustering and missing data, required sample size was set to 3200. Our questionnaire was designed on the basis of ISAAC- phase 1 (International Study of Asthma and Allergies in Childhood); then the validity and reliability of the translated questionnaire were tested. Questionnaires were completed by parents of children in 222 primary schools randomly selected in 1382-83. Pet exposure during the first year of life and symptoms of asthma and Allergy in the children was considered by the question " In your child's first year of life did he/she have regular (at least once a week)contact with farm animals (e.g. cattle, pigs, goats, sheep or poultry) ". The key asthma questions used

were those on 'wheeze ever', 'wheeze in the last 12 months', and 'asthma ever'. The key rhinitis questions used were those on 'nose problems ever (sneezing or runny/blocked nose)', 'nose problems in the past 12 months', and 'nose problems with itchy-watery eyes in the past 12 months'. The key eczema questions used were those on 'eczema ever', 'itchy rash ever' (coming and going for  $\geq 6$  months), and 'rash in the last 12 months'. The data were first analyzed by Epi6 software and after being controlled, it was translated into SPSS 11.5 software. The results were then analyzed by using Chi-Square, Fisher-Exact tests. Cross tabulation was applied in order to assess differences in prevalence of atopic disease.

**RESULTS**

2714 children in the age group of 6-7 years old were included in the study. The prevalence of Attacks of breath shortness with wheeze during last 12 months in the children who had exposure to pets in the first year of life was 34.3% which was less than children who had not exposure (OR=3.06, 95%confidence interval [CI] 1.14-8.21,  $P=0.021$ ). Also the prevalence of night dry coughs during past 12 months was 26.3% which is less than of the children who did not have exposure to pets in the first year of life (OR=1.61, 95%CI=1.26-2.04,  $P=0.001$ ). The prevalence of allergic rhinitis symptoms (Ever sneezing, runny, or blocked nose) in those who had exposure in the first year of their life was 27.7% which is lower than the children who did not have it ( $P=0.001$ , 95%CI=1.36-2.23, OR=1.74). and the prevalence of eczema symptoms (itchy skin rash with at least 6 months cure and recurrence) in those who had exposure in the first year of their life was 30.8% which is lower than the children did not have it ( $P=0.001$ , 95%CI=1.39-2.70, OR=1.94). However there was no significant difference in some other symptoms of asthma in two groups.

**Table 1. Ever wheezing, previous 12 month wheezing, till asthma, exercise induced wheezing in the children age 6-7 years old**

The record of	Pet exposure during the first year of life				
	Yes N (%)	No N (%)	P value	95% CI	OR
Ever wheezing	57 (10.7)	477 (89.3)	0.994	0.72-1.36	0.99
Previous 12 month wheezing	28 (49.1)	29 (50.4)	0.681	0.49-1.70	0.91
Till asthma	20 (3.8)	502 (96.2)	0.979	0.60-1.74	1.03
Exercise induced wheezing	34 (6.6)	481 (96.4)	0.364	0.81-1.86	1.23

**Table 2. Attacks of shortness of breath with wheeze, dry cough, ever sneezing, runny or blocked nose and itchy skin rash with at least 6 months cure and recurrence in the children age 6-7 years old**

The record of	Pet exposure during the first year of life				
	Yes N (%)	No N (%)	P value	95% CI	OR
Attacks of shortness of breath with wheeze	12 (34.3)	23 (65.7)	0.021	1.14-8.21	3.06
Dry cough	125 (26.3)	351 (73.7)	0.001	1.26-2.04	1.61
Ever sneezing, runny or blocked nose	117 (27.7)	306 (72.3)	0.001	1.36-2.23	1.74
Itchy skin rash with at least 6 month cure & recurrence	61 (30.8)	137 (69.2)	0.001	1.39-2.7	1.94

## DISCUSSION

In our study, Attacks of shortness of breath with wheezing during last 12 months in children of 6-7 years old who had exposure to pets in the first year of life was less frequent. Also the prevalence of the dry coughs in the last year was lower in the children who had pet exposure in the first year of their life. Also in our study pet exposure resulted in lower prevalence of rhinitis and eczema symptoms in children. Thus we can conclude that pet exposure in the first year of life can have a protective effect on asthma, allergic rhinitis and eczema, and there was no statistical significance between other symptoms of these diseases relating to pet exposure. These findings are similar to some other studies. Paloma Campo, et al<sup>8</sup> concluded that an environment with many dogs and high levels of endotoxin may result in reduced wheezing in infancy. Norbck, et al<sup>9</sup> concluded that Growing up on the countryside was associated with less asthma, eczema, and allergy. Oberle et al<sup>10</sup> concluded that Allowing cats to be in the child's bedroom from the first year of life because of intensive exposure of child to such allergens appears to prevent the development of childhood asthma. Melsom, et al<sup>11</sup> concluded that the risk of asthma in Nepalese children was lower in subjects exposed to cattle kept inside the house. In other studies there are an inverse reports. Timo and colleagues<sup>12</sup> concluded that early-life exposure to cats increases the risk of asthma whereas exposure to dogs is protective. Their findings suggest that intermittent fetal and early-life exposure to farm animals increases the risk of allergic asthma in urban children visiting farms. Burr and her colleagues<sup>13</sup> concluded that Furry pets were associated with rhinitis and wheeze, occurring with no connection rather than with colds. Brunekreff et al,<sup>14</sup> Ibrahim et al, Anyo et al,<sup>15</sup> Liccardi et al,<sup>16</sup> Litonjua

et al,<sup>17</sup> Suzuki et al<sup>18</sup> showed that current pet ownership was associated with respiratory symptoms such as asthma, chronic cough, chronic wheezing, rhinitis, and eczema. Some other studies<sup>19,20</sup> did not find any relationship between pet exposure and asthma, allergic rhinitis and eczema symptoms

The association between pet ownership in childhood and subsequent asthma and sensitization is very controversial.<sup>21</sup>

One of the most widely discussed explanations for the occasionally conflicting results regarding the relationship between pet exposure and allergic diseases in children are based on the hygiene hypothesis.<sup>22</sup> This hypothesis explains that early contact with microbial substances (as measured by the endotoxin levels in the environment) is associated with the suppression of immunoglobulin E (IgE) antibody production, resulting in a decreased risk for allergic diseases. According to that hypothesis, as a result of increasing hygiene, our immune system is not exposed to microbes sufficiently early in life and, then it starts to overreact to harmless substances. This theory is supported by the results of several studies indicating the presence of animals and especially the presence of dogs in households was associated with increased levels of airborne endotoxin and higher endotoxin concentrations in settled house dust.<sup>23,24</sup> Furthermore, some studies have reported an association between higher levels of house-dust endotoxin and reduced risk of atopic diseases in early childhood.<sup>25,26</sup>

Martinez contend that microbes or their products stimulate the developing immune system in the direction of a T<sub>H</sub>1 response, whereas lack of exposure to these substances results in a default to a preexisting T<sub>H</sub>2 pattern<sup>27</sup> During early childhood there is a transition from the fetal TH2 cytokine phenotype to the adult TH1 cytokine phenotype. The timing of this

transition is influenced by both environmental and genetic factors. Microbial exposure is thought to be the major environmental trigger for the maturation of immune responses in the newborn.<sup>28</sup> It must be emphasized that there are also several studies indicating both a doubtful effect and harmful effects of pet exposure in households.

It is notable that that different study designs (cross-sectional, case-control, cohort), geographic differences, outcome measures (eczema, asthma, wheeze, hay fever, atopic sensitization, etc), the type of allergen exposure and etc make our judgment difficult.

We had some limitations related to the study design. We had no opportunity to measure serum IgE levels or to perform skin prick tests. Our definition of atopic asthma/wheeze therefore had to be based on the presence of other symptoms of atopic disease. Although based on other studies the majority of children who had been diagnosed with hay fever were found to have increased IgE levels<sup>29</sup> or positive skin prick tests.<sup>30, 31</sup> Therefore we can claim that these symptoms are the most specific diagnostic symptoms that we could take by questionnaire.

A possible source of bias in our study is selection bias although we tried to minimize this problem by clustering of schools. Information bias can be a potential problem in questionnaire studies, when no clinical diagnosis or objective exposure assessment is performed. The study is sharing this weakness with other large questionnaire studies on asthma, for example, the phase I of the ISAAC study.

It is obvious that implementing randomized control trials can better discriminate the exact influence of exposure to such allergens but of course this kind of design due to potentially harmful possible effects of exposure to such allergens are not ethically permitted.

## CONCLUSION

We found that pet exposure in the first year of life can have a protective effect on allergic symptoms such as asthma, allergic rhinitis and eczema.

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