

Prevalence and Risk Factors of Allergic Rhinitis in Primary School Students of Isfahan, Iran

Abstract

Background: Allergic rhinitis (AR) is one of the most common chronic diseases of childhood. Different studies have indicated an increasing prevalence of AR worldwide. The most common complaints of the patients are itching, tearing eyes, and rhinorrhea. The present study aims to assess the prevalence and risk factors of AR among 6–7-year-old children of Isfahan Province, Iran. **Materials and Methods:** This cross-sectional study conducted on 973 67-year-old primary school students of Isfahan Province in 2016. The study was conducted based on the International Study of Asthma and Allergies in Childhood questionnaire. **Results:** This study was conducted on 322 (33.1%) 6-year-old and 651 (66.9%) 7-year-old students. A total of 563 (57.9%) and 410 (42.1%) students were male and female, respectively. AR was diagnosed in 397 (40.8%) cases that 190 (47.8%) and 130 (32.7%) showed seasonal and permanent AR, respectively. A percentage of 44.7% of 6-year-old and 38.9% of 7-year-old ($P = 0.04$) students, 42.1% of males and 39% of females ($P = 0.336$), had AR; however, the percentages were not significant ($P = 0.005$). Exposure to smoking, plants, and domestic association with AR was not significant ($P = 0.317$, $P = 0.863$, and $P = 0.253$, respectively), but infancy breastfeeding association was significant ($P = 0.015$). Residence in the second area of Isfahan city was accompanied by higher prevalence of AR ($P = 0.006$). **Conclusion:** The prevalence of AR was considerably higher in Isfahan as one of the largest cities of Iran. It was significantly associated with age, infancy milk feeding, and area of residence but not with sex, smoking, plant, and domestic exposure.

Keywords: Allergic rhinitis, International Study of Asthma and Allergies in Childhood, prevalence, risk factors, students

Introduction

Allergic rhinitis (AR) is one of the most common chronic diseases of childhood. Different studies have indicated an increasing prevalence of AR worldwide.^[1] The prevalence of AR has increased dramatically in industrialized countries, while this rate is less in developing and third world countries as well as rural regions. This probably shows a stronger effect of environmental factors in comparison to genetics.^[1,2] This prevalence affects 20%–40% of children and adolescents.^[3,4]

Intermittent or seasonal AR (SAR) occurs in the specific period of year or deteriorates in a period (mixed type), while in permanent type (permanent AR [PAR]), symptoms exist during the whole year.^[1,3]

Atopy, climate, and environmental conditions are influential factors on AR. Temperate

climate, pollens, spores of mildew, and pollination of plants, grasses, and meadows are the main allergens found in SAR, while PAR is mostly associated with household allergens, including mites, dust, molds, animal waste, and dog and cat allergens.^[5]

In general, atopy, urbanization, high levels of bloodstream IgE, early initiation of supplementary feeding, exposure to smoke, and higher rate of exposure to household allergens are the main factors of AR incidence.^[6,7]

Neglecting the symptoms of this disorder in children can significantly lead to lower quality of life, irritable behavior, and low-quality school-related functions. On the other hand, these children are considerably more susceptible to asthma, sinusitis, conjunctivitis, behavioral irritation, school training dysfunction as well as dental and oral development dysfunction.^[1,8]

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Due to our knowledge, no study has been conducted in Isfahan into prevalence and risk factors of AR, thus considering the importance of early diagnosis of AR and its following effects on children's quality of life; we aimed to assess the prevalence and risk factors of AR among 6–7-year-old children of Isfahan Province, Iran.

Materials and Methods

This is a cross-sectional study conducted on 973 primary school students of Isfahan Province in 2016.

Six- and seven-year-old students with at least 1-year living in Isfahan who were willing to participate in the study were included in the study.

The study population was chosen by reoffering to five areas of Isfahan Province Ministry of Education-related areas. Lists of schools under control of each area were provided, and then based on the population of each area, schools were chosen using cluster randomization method, and then, the study participants were randomly chosen using cluster randomization method again.

Consent forms for participating and all needed information about the study were given to the patients. This study was approved based on 25139 IRCT code from the Research Council and the Ethics Committee of the School of Medicine of Isfahan University of Medical Sciences.

The study was designed based on the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire, and another form consisted of questions about demographic information of children,^[9] which was completed by students' parents who were interviewed by a reference medical student responsible for this study. Then, diagnosis of AR was made by a reference pediatric allergy subspecialist.

The obtained information was analyzed using IBM-United States SPSS 20 (SPSS 20; IBM SPSS, Chicago, IL, USA). Descriptive data were reported in mean \pm standard deviation. Chi-square test and independent *t*-test were used for analytic findings. $P < 0.05$ was considered significant.

Results

This study was conducted on 973 students aged 6–7 years in Isfahan Province. The study population included 322 (33.1%) children aged 6 years and 651 (66.9%) students aged 7 years. A total of 563 (57.9%) and 410 (42.1%) students were male and female, respectively. Table 1 presents the patients' demographic information.

In the study population, AR was diagnosed in 397 (40.8%) and 351 (36%) of all students having the symptoms of rhinitis over the preceding year. Based on our statistical analysis, 42.1% of those who suffered from this condition were male and the other 39% of females ($P = 0.336$)

Table 1: Demographic information of study population

Demographic information and Risk factors	Frequency (%)
Age (years)	
6	322 (33.1)
7	651 (66.9)
Gender	
Male	563 (57.9)
Female	410 (42.1)
Smoking exposure	
Total number	823 (84.6)
Father smoking	149 (15.3)
Mother smoking	0
Both parents smoking	1 (0.1)
Exposure to flower and plants	
Yes	461 (47.4)
No	512 (52.6)
Exposure to domestic animals	
Yes	158 (16.2)
No	815 (83.8)
Infancy milk feeding	
Only breastfeeding	794 (81.6)
Breastfeeding and formula	170 (17.5)
Breastfeeding/formula and cow	9 (0.9)

had AR; however, the percentages were not statistically significant ($P = 0.005$). Symptoms such as itch and watery eyes were reported in 97 (10%) of cases. Daily activity was affected by AR in 84 students (8.7%). Hay fever diagnosed by the physician was reported by 84 (8.7%) of the students [Table 2].

Based on the school area, 53 (5.4%), 321 (33%), 233 (23.9%), 236 (24.3%), and 130 (13.4%) lived in the first, second, third, fourth, and fifth areas. AR was diagnosed in 397 (40.8%) cases that 190 (47.8%) and 130 (32.7%) showed SAR and PAR, respectively. The remaining students (19.5%) mentioned that they did not exactly know the correct answer.

Table 3 demonstrates the association of the assessed factors with AR. A statistically significant higher rate of AR existed among 7-year-old students in comparison to 6-year-old cases ($P = 0.04$). As the table shows, 308 (38.8%) students were fed only by the breast milk; 83 (48.8%) students were fed by both breast milk and infant formula, and 6 (66.7%) students were fed by the mixture of the breast milk and infant formula and whole cow's milk [Table 2]. As a result, the infants with only breastfeeding had less AR ($P = 0.015$). A total of 339 (41.3%) students with AR had exposure to smoking. A total of 190 (41.2%) of the affected children had houseplants in their houses and 58 (36.7%) of them had pets. The association of AR with exposure to smoking, house plants, and pets was not significant ($P = 0.317$, $P = 0.863$, and $P = 0.253$, respectively). Age and infancy milk feeding were related to AR but not to other factors.

Table 4 presents association of school area with AR. The highest number of students with presentation of AR was seen in the second, while higher percentage was seen in the fifth area ($P = 0.006$).

Discussion

Based on the studies conducted worldwide, the prevalence of AR is from 2.2% to 24.2% among 6–7-year-old

Table 2: Assessment of rhinitis symptoms regarding gender distribution

Symptoms	Boys (%)	Girls (%)	Total (%)	P
Lifetime rhinitis	237 (42.1)	160 (39)	397 (40.8)	0.336
Rhinitis in the past 12 months	205 (36.4)	146 (35.5)	351 (36)	0.499
Itchy eyes in the past 12 months	59 (10.5)	38 (9.2)	97 (10)	0.796
Rhinitis interfering with daily activity	162 (28.7)	112 (27.3)	274 (28.1)	0.068
Hay fever	63 (11.2)	21 (5.1)	84 (8.7)	0.005

Table 3: Assessment of risk factor's association with allergic rhinitis

Risk factors	AR, n (%)		P
	Positive	Negative	
Age (years)			
6	144 (44.7)	178 (55.3)	0.04
7	253 (38.9)	398 (61.1)	
Sex			
Male	237 (42.1)	326 (57.9)	0.336
Female	160 (39)	250 (61)	
Smoking exposure			
Yes	339 (41.3)	482 (58.7)	0.317
No	55 (36.9)	94 (63.1)	
Exposure to flower and plants			
Yes	190 (41.2)	271 (58.8)	0.863
No	207 (40.7)	302 (59.3)	
Exposure to domestic animals			
Yes	58 (36.7)	100 (63.3)	0.253
No	339 (41.6)	476 (58.4)	
Infancy milk feeding			
Only breastfeeding	308 (38.8)	486 (61.2)	0.015
Breastfeeding and formula	83 (48.8)	87 (51.2)	
Breastfeeding/formula and cow	6 (66.7)	3 (33.3)	

AR: Allergic rhinitis

Table 4: Association of school area with allergic rhinitis

Area	AR (%)		P
	Yes	No	
One	19 (35.8)	34 (64.2)	0.006
Two	137 (42.7)	184 (57.3)	
Three	78 (33.5)	155 (66.5)	
Four	94 (39.8)	142 (60.2)	
Five	69 (53.1)	61 (46.9)	

AR: Allergic rhinitis

children.^[1] In the current study, we assessed approximately 1000 students of Isfahan city, a large city of Iran, regarding the diagnosis of AR in 6–7-year-old elementary schoolchildren. Based on the findings of our study, 39% of our population showed AR. Other studies conducted in the Iranian society indicated prevalence of 17% in elementary school students of Sari,^[10] one of the largest cities of north of Iran, and 31.9% among 6–7-year-old school students, similar to our studied population in Kashan,^[11] another city located in center of Iran. In addition, the study of Mohammadzadeh *et al.* conducted in the large population of north of Babylon showed over 14% of AR in 6–7-year-old elementary school students.^[12] Findings of all the mentioned studies above conducted in Iran were considerably higher than what was presented by studies conducted in different regions of Croatia among their 6–7 and 13–14-year-old schoolchildren^[13,14] as well as 6–7-year-old school students of Spain.^[15] The study conducted by Georgy *et al.* in north of Africa showed 15.3% of rhino conjunctivitis prevalence in their study population.^[16] This higher rate found in studies of Iran may show impact of genetics on the higher incidence of AR in Iran's population. On the other hand, considerable higher rates presented in Isfahan and Kashan at the center of Iran may show more significant impact of environmental factors on the incidence of AR. In fact, it can be hypothesized that semi-deserted and deserted climate may be associated with presentation of AR. Another point about this disorder is neglecting symptoms in children that can be accompanied by underestimation of diagnosis.^[1,8]

The findings of the current study based on the ISAAC questionnaire showed a statistically significant higher rate of AR among 7-year-old students in comparison to 6-year-old cases. This finding may have occurred due to the higher number of 7-year-old studied students and is inconsistent with the findings of multi-country cross-sectional surveys conducted by Asher *et al.* showing lower prevalence of AR by getting older. Furthermore, it should be mentioned that they presented this hypothesis in a wider range of age not only in 1-year age difference.^[17]

The other finding was sex association of AR. Similar to other studies,^[10,18,19] we found higher prevalence of AR among boys, but it was not statistically significant. The findings of one study conducted in Isfahan in 2018 on high school students are in contrast to ours as they found a significantly higher rate of females affected by AR.^[20]

The remained assessed factors, including smoking, flower and plants and domestic exposure were not significantly associated with AR, but status of infancy milk feeding was significantly associated with AR diagnosis, and those who were fed only with breast milk showed fewer symptoms. This may have occurred due to two factors; the first one is presence of various antibodies in mothers' milk that can act as a preventive factor and the second one is children's exposure to new environmental

antigens existing in the formula and especially cow's milk. The important point that should not be neglected is the notable higher number of cases breastfed only in their infancy in comparison to other two groups. A study conducted by Safari and Jarri in Hamedan presented no association of infancy milk feeding and plants' exposure with AR, but domestic exposure had a statistically significant relation.^[21]

The last finding of our study was about students' area and AR presentation that we found a significant higher rate of AR among students living in the second area of Isfahan. In addition, more than half of the fifth area students were diagnosed with AR, but the others were somewhat similar. This study is the first one in which the study population was divided into various regions of residence. Finding the reasons of different prevalence in different regions of Isfahan needs more epidemiologic studies according to risk factors of AR such as environmental factors (climatic and air quality), types of allergen exposure, and lifestyles (dwellings, exotic foods, pets, and furnishings).^[22,23]

In one study conducted by Momen *et al.* on junior high school students, girls significantly showed higher rates of lifetime rhinitis.^[20] The mentioned differences between their study and ours may be attributed to the age range assessed in two studies. Hormonal changes following puberty may be responsible for these differences found between the two groups.

Conclusion

According to the findings of the current study, the prevalence of AR was considerably higher in Isfahan city, one of the largest cities of Iran, in comparison to other cities and communities. Moreover, AR was significantly associated with age, infancy milk feeding, and area of residence but not with sex and smoking, plant, and domestic exposure.

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Conflicts of interest

There are no conflicts of interest.

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