

Original Article**The prevalence of asthma and allergic disorders  
among school children in Gorgan**

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**Abstract**

**BACKGROUND:** The prevalence of allergy and asthma among children is increasing in many countries. However, such inclination has not been completely cleared in North of Iran. This study was carried out to evaluate the prevalence of asthma and allergic diseases in school children in Gorgan and also to evaluate the association between allergies and sex, family history of atopic disorders, and personal symptomatic atopy.

**METHODS:** This was a cross-sectional study and the study population included 2800 school children aged 12 to 13 (53% female and 47% male). All participants completed an ISAAC (International Study of Asthma and Allergies in Childhood) written questionnaire.

**RESULTS:** Among the selected children, 7% were asthmatic, 19% had eczema during the last 6 months, and 35.3% had rhinitis. Family history of allergy included 8.4% asthma, 22.1% rhinitis and 12% eczema.

**CONCLUSIONS:** The prevalence of asthma is higher in boys compared with girls. There was a strong relation between family history of atopy and allergic diseases and asthma in children.

**KEY WORDS:** Asthma, allergy, prevalence, children.

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The prevalence of allergy and asthma demonstrates a global discrepancy as a consequence of diverse interaction between genetic factors (such as ethnic composition, allergic sensitization and family history of allergic disorders) and environmental risk factors (exposure to indoor and outdoor allergens, nature of weather, level of air pollution, daily life, cigarette smoking and diet). It is not clear why there is such a huge difference in the prevalence of allergy in different parts of the

world. Previous studies on the prevalence rates around the world have yielded inconsistent results; e.g. the allergy prevalence rates in the western European countries are high but in Eastern Europe and developing countries are low<sup>1</sup>. Considerable researches indicated that the prevalence of asthma and allergic diseases in childhood are increasing in many western societies, particularly in industrialized regions<sup>2</sup>. Numerous studies have assessed the epidemiology of asthma on the basis of morbidity and

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mortality data. The International Study of Asthma and Allergies in Childhood (ISAAC) was the first study carried out worldwide using standardized questionnaires in order to create a reliable global map of childhood allergy. ISAAC is a unique project which has attracted worldwide interests and unprecedented large scale participation. The ISAAC project comprises three phases. Phase one of the ISAAC developed simple methods for measuring the prevalence of childhood asthma, allergic rhinitis and atopic eczema for international comparisons, suitable for different geographical locations and languages. The results provided a framework for studies between populations in contrast with the environments which are likely to yield new clues about the etiology of asthma and allergic disorders<sup>3</sup>. Because few studies have been conducted on this subject in North of Iran, this study is crucial in determining the prevalence and frequency of asthma and allergic diseases among children of Gorgan.

## Methods

The present study was cross-sectional. The study was carried out in 2003 in the city of Gorgan in the center of Golestan province, located in the Southeast of the Caspian Sea. Gorgan had an estimated population of 241,177 in 2005. In general, this city has a moderate and humid climate. Subjects were 2800 school children aged 12 to 13 years including 1484 female and 1316 male selected from 60 elementary schools with cluster sampling method. The school selection within the sampling frame was representative of the geographical regions, devoid of choice by urban or rural residence or variations in socioeconomic conditions. After obtaining consent from the school authorities, all children with eligible age range were invited for participation in the study. Only those children whose parents gave written consents were included. The questionnaires were distributed to children at schools and each question was explained to them by professionally trained interviewers. All participants completed written altered Persian questionnaires

according to the phase I of the ISAAC in the classroom and returned it on the same day. Children aged 12 to 13 were selected in this study because signs of allergic disorders are more apparent among them than in other age groups. In addition, they were able to self-complete the written questionnaires according to ISAAC protocol. The ISAAC written questionnaires asked for the information on demography, symptoms of wheeze, asthma, rhinitis and eczema<sup>3</sup>. The children, who had been previously diagnosed as having asthma by a physician during the last 12 months, were considered as asthmatic or "ever had asthma". Positive answers to the question that "Have you ever had wheezing or whistling in the chest at any time in the past?" were regarded as "Ever wheezed". Those children, who answered yes to the question of the presence of an itchy relapsing skin rash in the last 12 months that had affected their skin creases, were considered to have atopic eczema. Positive answers to the following question were considered for rhinoconjunctivitis: "In the last 12 months, have you had a problem with sneezing or a running or blocked nose when you did not have a cold or flu?" For considering exercise related wheeze, positive answer to the following question was required: "In the last 12 months, has your chest sounded wheezy during or after exercise?" Positive answers to the question "Have you had wheezing in the chest in the last 12 months?" were regarded as "current wheeze". "Current" symptoms referred to symptoms in the past 12 months. Additional questions on parental smoking at home were determined and recorded. Collected data were analyzed with the Epi-Info statistical software (CDC-USA) and statistical significance of difference was assessed by t-test and chi-square test.

## Results

To estimate the frequencies of allergic diseases among school children of Gorgan, we collected and analyzed data from questionnaires. Among 2800 children, 7% were asthmatic, 28.8% had current wheeze and 19% had eczema during the last 6 months. The proportions of wheezing approximately were the

same in both sexes but within asthmatic cases percentage of boys (56.5%) were greater than girls (43.5%). Rhinitis was the most frequent allergic disease, affecting 35.5% of respondents. Both rhinitis in the past 12 months and eczema were associated with current asthma in children ( $P = 0$ ). Among those school children with asthma, prevalence of other allergic disorders such as wheezing, rhinitis, eczema and dry cough were 41.2%, 49.5%, 30% and 43.3%, respectively. Moreover, in children suffered from eczema symptoms, the frequency of dry cough, wheezing and rhinitis were 46.1%, 45.5% and 61.0%, respectively. As the table 1 indicates, there was a relation between sex and

asthma in children aged 12 in Gorgan. According to gender, the prevalence of asthma symptoms was significantly higher in males ( $P = 0.005$ ). Also our findings revealed the relation between 12-month prevalence of wheeze and sex ( $P = 0.0001$ ). The frequency of asthma in boys was more than in girls. In contrast, there was no significant difference between the two sexes in wheeze ( $P = 0.15$ ), dry cough ( $P = 0.95$ ), eczema ( $P = 0.3$ ) and rhinitis ( $P = 0.5$ ). As the table 2 indicates, there was a strong association between family history of atopy (asthma or rhinitis or eczema) and various allergic diseases in children.

**Table 1.** The overall and gender difference in the prevalence (%) of self-reported asthma symptoms and Atopic disorders in 12-13 year-old school children.

	Boys (N = 1316)	CI 95%	Girls (N = 1484)	CI 95%	Total (N = 2800)	CI 95%
Ever Wheezed	31.8	29.3 - 34.4	29.4	27.1 - 31.8	30.5	28.8 - 32.3
12-month prevalence of: - Any Wheeze	23.1	20.8 - 25.6	17.5	15.6 - 19.6	20.1	18.6 - 21.7
- Four or more wheeze	8.2	6.4 - 10.6	7.4	5.6 - 9.6	7.8	6.5 - 9.4
- Wheeze disturbs sleep	3.7	2.8 - 5.0	4.5	3.5 - 5.8	4.2	3.4 - 5.0
- Wheeze limiting speech	11.6	9.9 - 13.6	11.9	10.3 - 13.8	11.8	10.6 - 13.1
- Exercise wheeze	26.9	24.5 - 29.4	29.4	27.0 - 31.8	28.2	26.5 - 29.9
- Night cough	27.3	24.9 - 29.9	27.4	25.2 - 29.8	27.4	25.7 - 29.1
Ever had asthma	8.5	7.0 - 10.2	5.8	4.6 - 7.1	7.0	6.1 - 8.1
Atopic eczema	19.8	17.7 - 22.1	18.3	16.3 - 20.4	19.0	17.6 - 20.5

**Table 2.** Association between family history of atopy and allergic disorders in children in Gorgan.

	Asthma in children			Eczema in children			Rhinitis in children		
	With	Without	P	With	Without	P	With	Without	P
Positive Family history of Asthma	27.7%	6.9%	0	11.6%	7.5%	0.002	9.3%	7.8%	0.09
Positive Family history of Eczema	21.2%	11.2%	0	31.5%	7.2%	0	20.6%	7.2%	0
Positive Family history of Rhinitis	30.2%	21.5%	0	37.4%	18.3%	0	41.2%	11.4%	0

## Discussion

According to the results of this study, the prevalence of 'ever had asthma' and '12-month prevalence of four or more wheeze' in 12 to 13 year-old children was found to be 7% and 7.8%

respectively in Gorgan. As indicated by other studies performed in Iran, the mean estimated national prevalence of "wheezing in the last 12 months" or "current asthma" in this age group was found to be 5.5% (range: 5.1-7.5%)<sup>4</sup>. The

prevalence of 'ever had asthma' in the other cities of Iran on the basis of ISAAC written questionnaires in 13 to 14 year-old school children was found to be from 2.1% to 20.3%<sup>5-11</sup>. The prevalence of current asthma in Gorgan is greater than the mean estimated national prevalence. Since Iran is a big country with diverse geographic areas, the dissimilar prevalence ratios achieved in different cities can be explained by the type of weather, the level of air pollution and the diverse levels of contact to allergens and genetic factors. When results of the current study are compared to other studies in the Middle East and Central Asia, we understand that the frequency of current asthma in Gorgan is approximately at the peak level<sup>4</sup>. Frequency rate of asthma in Gorgan with regard to global condition is in the region of intermediate position. The worldwide prevalence of current wheeze studied in 155 centers ranged from 2.1 to 32.2%<sup>1</sup>.

The prevalence of eczema in Gorgan comparing to the worldwide outcomes is at its highest point. The worldwide mean frequency rate of eczema symptoms was 7.6% (range: 0.1 to 19.9), and the prevalence value of symptoms of atopic eczema in children aged 13 to 14 in Iran was reported to be 2.6%<sup>12,13</sup>. Similar to several studies, hay fever was the most frequent atopic disorder among children in Gorgan. According to the results of the worldwide data, the mean prevalence rate of rhinitis symptoms in children aged 13 to 14 was 13.7% (range: 1.6% to 39.7%)<sup>14-20</sup>. It is unclear why the variation in the prevalence of asthma and allergic disorders is so large. Presently, two theories have linked changes in environmental factors to observe the trends in asthma and allergy epidemiology. The first theory, the "hygiene hypothesis," was introduced in 1989 by Strachan which postulates that changes in the infectious environment and in the pattern of microbial exposure of children associated with westernization are critical factors underlying the increasing severity and prevalence of atopic disorders. According to this hypothesis, environmental exposures that promote a generalized suppression of Th2 cytokines and trigger strong Th1 responses are becoming increasingly less common<sup>21</sup>. The second theory, "immunotolerance

hypothesis" suggests that early high levels of exposure to allergens reduce risks by potentiating the regulatory capacity of the immune system<sup>22</sup>.

In keeping with the results in the majority of the studies, boys have significantly higher prevalence of asthma than girls<sup>8</sup>. Likewise, one interesting finding in this study indicated that the '12-month prevalence of any wheeze' in boys was higher than in their female counterparts. A number of previous studies have reported a male predominance of asthma and atopic conditions before puberty and a female dominance after puberty<sup>23,24</sup>. The exact mechanisms underlying this male predominance are unclear. The higher prevalence of asthma in boys could be due to their smaller airways compared to lung size of the girls<sup>25</sup>. However, whenever wheeze, atopic eczema, dry cough at night and allergic rhinitis were considered, the sex difference became less obvious. On the other hand, girls generally showed a slightly more prevalence than boys in this age group for wheeze with exercise (1:0.81) and wheeze-disturbed sleep (1:0.72). Our results also indicated a strong relationship between allergic rhinitis and eczema with childhood asthma. The results of the current study were in agreement with the results of many studies confirming that pediatric asthma is powerfully related to other allergic disorders<sup>26-28</sup>. Moreover, the results of current research concerning association between family history of atopy and allergic disorders in children supported other studies. Many studies also have demonstrated that inheritance plays a key role in asthma; thus, occurrence of asthma among parents is a significant predictor of asthma in their children<sup>29,30</sup>.

Our study had some limitations; namely recalling bias in cross-sectional questionnaires and the lack of objective laboratory measures. The prevalence of asthma was not possible to be measured precisely for the lack of apparent explanation of the situation and the lack of present standardized criteria. However, most estimates of asthma have been based on data from questionnaires with questions concerning symptoms or preceding diagnosis of asthma.

Diagnosis of asthma by a medical doctor is generally considered as a gold standard for epidemiologic definition of asthma.

### Conclusion

Our results demonstrate that Gorgan is a city with relatively moderate prevalence of asthma, allergic rhinitis, and atopic eczema in children compared with other countries where the ISAAC study is done. The prevalence of asthma is higher in boys compared with girls.

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