

# Investigating the Prevalence of Childhood Asthma Symptoms in Khomein Town, Markazi Province, Iran: A Cross-Sectional Study

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## ABSTRACT

Asthma is the most common cause of recurrent wheezing, cough and dyspnea in childhood. Delay in diagnosis and lack of appropriate treatment can cause sustained changes which decrease respiratory capacity of children in future. Therefore, identifying the symptoms relating to asthma is the key for timely diagnosis and treatment of this disease. This study was done to investigate asthma incidence in Khomein and compare it to other cities of Iran susceptible to asthma, including Tehran. The present study was a descriptive cross-sectional one based on standard questionnaire of International Study of Asthma and Allergies in Childhood (ISAAC). For conducting this study, 1621 students of first grade in some primary schools and junior high schools of Khomein were selected through nonrandom sampling and census and were evaluated during 2015-2016. Both groups were studied and evaluated in terms of being affected by asthma and its severity (current and previous wheezing, night-time cough, talking limitation due to coughing or wheezing, exercise-induced wheezing, nocturnal awaking due to cough). Results were analyzed through the chi-square test. The asthma diagnosed in Khomein students by the physician during the study was 3.5% while 73.2% of the children under study had at least one asthma symptom. One eighth of the students under study had severe asthma. Comparing with polluted Tehran and northern cities of Iran, Asthma symptoms incidence was higher in Khomein where the humidity and industrial pollution is less than in those cities and the asthma cases diagnosed by physicians were much fewer than expected asthma incidence.

**Key words:** Asthma, Wheezing, Hypersensitivity, Iran.

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## Introduction

Asthma is the most prevalent chronic disease in childhood and the most common cause of recurrent cough, wheezing, and dyspnea in childhood. Delay in diagnosis and the lack of appropriate treatment can worsen respiratory tract involvement and in long time lead to sustained changes decreasing their respiratory capacity in adulthood. Therefore, identifying asthma symptoms and being aware of the frequency of symptoms relating to childhood asthma are the keys for true diagnosis as well as timely treatment of this disease and play an important role in preventing inappropriate prescription of antibiotics by physicians and they also prevent the abovementioned complications in children. Asthma prevalence is increasing in the world, especially in urban areas. About 50% of school students who suffer from asthma are absent at least 6 days and this might result in their education decline. Besides, this disease not only brings about direct expenses but also some indirect ones appear that include the absence of affected children's parents from their work (Kliegman *et al.*, 2011). An accurate history as well as clinical examination is a main criterion for diagnosing childhood asthma and is used frequently, especially in children younger than 6 years old for whom spirometry is not reliable. In this regard, International Study of Asthma and Allergy in Childhood (ISAAC) and its epidemiologic investigation which has three stages appeared in 1991. It uses standardized questionnaires or face to face interviews to study asthma etiology and epidemiology, allergic rhino-conjunctivitis and eczema in atopic children worldwide. The first stage of ISAAC was done during 1992 to 1996 through which the prevalence of asthma and allergy symptoms all over the world was investigated in 156 centers located in 56 countries. The third stage was done in 2001 through which the causes of asthma and allergy and also the change in asthma symptom prevalence compared to the first phase of ISAAC were evaluated internationally (Elwood *et al.*, 1995). In Iran, too, the same study has been done in regions susceptible of children asthma. For instance, it was done in 2001 in Tehran and in 2007 in Gorgan and Rasht. In 2010 the National Institute of Researching and Treating Asthma and Pulmonary Diseases again did the same study in Tehran in order to investigate the change in childhood asthma prevalence. No similar study has been ever done in Markazi province and Arak city as one of the most polluted cities in Iran with a high potential of producing asthma symptoms. The present study aims at investigating the incidence and severity of childhood asthma symptoms in Khomein and comparing it with Tehran and north of Iran and also some regions of the world where the environment makes children susceptible to asthma.

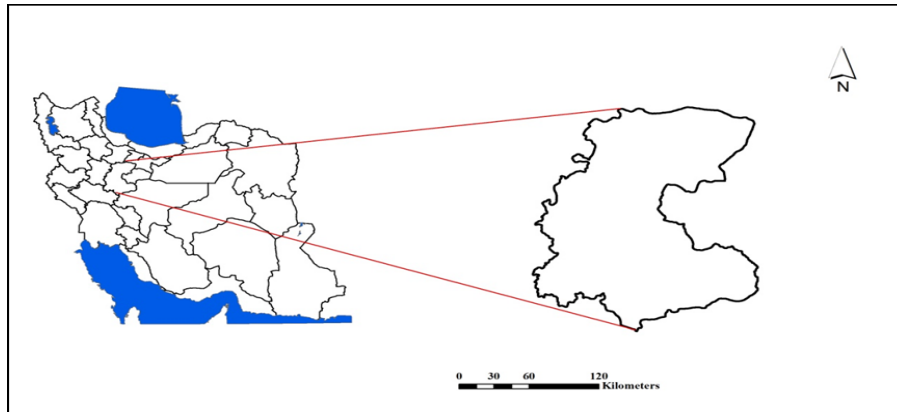
## Materials and Methods

### Study Area

Markazi province is approximately located at the center of Iran (hence the name which literally means central province), bordering with the states of Lorestan, Hamadan, Isfahan, Qom, Tehran, Alborz, and Qazvin. The estimated population of Markazi is 1, 429, 475. The district covers an area of approximately 29126.56 km<sup>2</sup> [Figure 1]. The province comprises of 11 counties (Ashtian, Delijan, Farahan, Khomein, Khondab, Komijan, Mahallat, Saveh, Shazand, Tafresh, Zarandieh) (Source: [http://amar.sci.org.ir/index\\_e.aspx](http://amar.sci.org.ir/index_e.aspx)).

## Data Collection

This descriptive cross-sectional study done through nonrandom sampling and census. The study was done on students of grade one of primary school (6-7 years old) and grade one of junior high school (12-13 years old) in the school year 2015-2016 in Khomein city, Markazi province. It was based on International Study of Asthma and Allergies in Childhood, using the standard ISAAC questionnaire. The students who were living in villages but studying in Khomein and also the students of exceptional schools were eliminated from the study.



**Figure 1.** Location of Markazi Province within Iran

Persian questionnaires (translated by National Institute of Tuberculosis and Respiratory Diseases, Shahid Beheshti University of Medical Sciences, Iran) were distributed among all 1797 grade-one students of primary and junior high schools in Khomein. Each questionnaire was given to the students together with a justifying letter in order for their parents to complete and sign them. Students whose parents were illiterate were not given the questionnaire (no student had this condition). The completed questionnaires were collected by school authorities within at most three days. Among all 1797 students, 1621 people submitted the questionnaires on time (750 grade-one students of primary schools and 871 ones from junior high schools). In this study wheezing during last year, wheezing during previous years, talking limitation due to coughing, exercise-induced wheezing, dry night-time coughs, and nocturnal awaking due to coughing or wheezing were considered as asthma-related symptoms. Children who were claimed by doctors to have asthma during last year were considered as asthmatic cases, and those who had been attacked by wheezing at least once during last year were known as current wheezing cases. Positive answer to the question “Did your child frequently suffer from wheezing or a whistle-like sound when breathing in the past?” was recorded as ever had wheezing, and positive answer to the question “Did your child suffered from wheezing when exercising or after that during last 12 months?” was considered as exercise wheezing. Besides, shortness of breaths, talking limitation due to coughing, and nocturnal awaking due to coughing or wheezing within last year was considered as asthma severity criterion.

## Statistical analysis

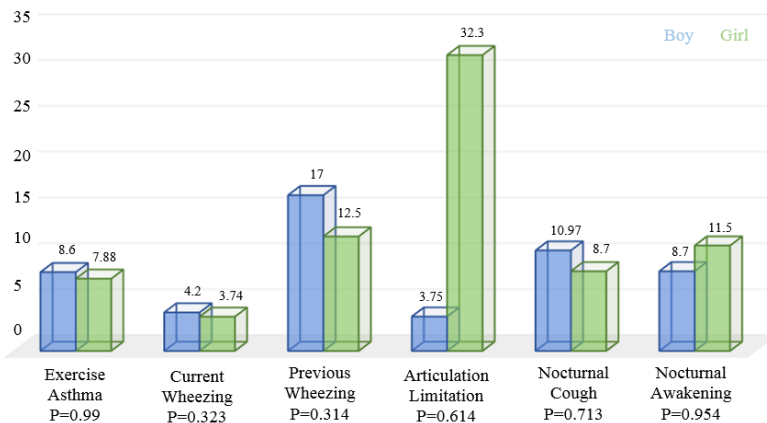
All statistical analyses were carried out using SPSS for windows version 11.5. Statistical evaluation was performed by Chi square test and  $P < 0.05$  was considered significant.

**Findings**

57% of the children under study were boys (924 people) and 43% were girls (697 people). 63% of them were studying in primary schools while 37% were in junior high schools. The total incidence of asthma symptoms in Khomein was 73.2% during last year.

The prevalence of allergic asthma among school students of Khomein was 7.8% within last 12 months (from June 2015 to June 2016). In 3.5% of the children asthma was recognized by physicians as well.

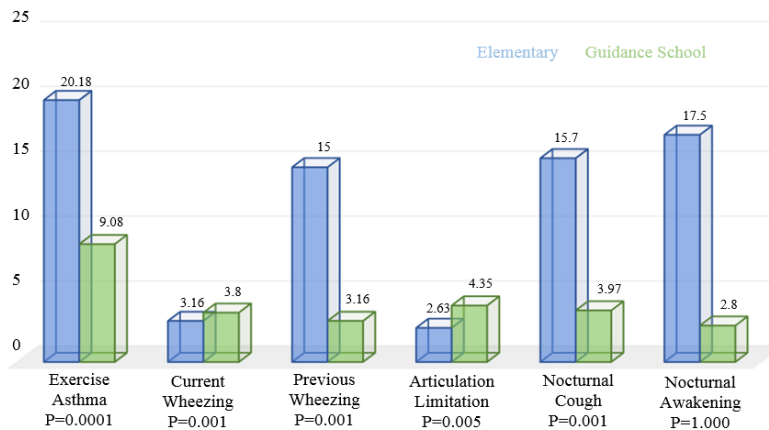
In this study, children’s sex was not a determining factor regarding all childhood asthma symptoms ( $p>0.1$ ) but their ages caused a significant difference between the two groups ( $p<0.001$ ). 11.14% of the students under study (about one eighth) had at least one of the symptoms of severe asthma (shortness of breaths or talking limitation due to coughing, and nocturnal awaking due to coughing or wheezing). The summary of results is shown in diagrams 1 (a comparison of childhood asthma symptoms in male and female students of Khomein during 2015 to 2016) and 2 (a comparison of childhood asthma symptoms in students of primary schools and junior high schools of Khomein during 2015 to 2016) as well as the attached table.



**Diagram 1.** Comparison of asthma-related symptoms in boys and girls in Khomein

**Table1.** Comparison of asthma-related symptoms in first grade elementary and guidance school students and sex and age in Khomein

Age / Sex	Male		Female	
	Age 6-7	Age 13-14	Age 6-7	Age 13-14
<b>Symptoms</b>				
History of wheezing during life	155 (9.5%)	123 (7.5%)	114 (7%)	90 (5.5%)
History of wheezing during one year ago	37 (2.6%)	26 (1.6%)	20 (1.2%)	25 (1.54%)
Sleep dysfunction because of cough or wheezing during one year ago	32 (1.97%)	146 (9%)	33 (2%)	109 (6.7%)
Athletic asthma during one year ago	69 (4.2%)	72 (4.4%)	63 (4.88%)	49 (3%)
Speech dysfunction because of cough or wheezing during one year ago	43 (2.65%)	18 (1.1%)	28 (1.7%)	25 (1.53%)
Nocturnal cough during one year ago	35 (2.1%)	19 (1.7%)	31 (1.91%)	15 (0.9%)
Chest rales in first year of life	69 (4.2%)	60 (3.5 %)	76 (4.6%)	39 (2.4%)
<b>Total</b>	<b>440</b>	<b>464</b>	<b>365</b>	<b>352</b>



**Diagram 2.** Comparison of asthma-related symptoms in first grade elementary and guidance school students in Khomein

## Discussion

In the present study, 73.2% of the children were estimated to have at least one childhood asthma symptom (night-time coughs, talking limitation due to coughing, previous and current wheezing, exercise-induced wheezing and coughing, and nocturnal awaking due to coughing or dyspnea). In a similar research conducted in 2004 in 19 cities of Iran, 61067 children of 6-7 and 11-12 years old were studied in the same way through the use of ISAAC questionnaire. The highest and the lowest percentages of childhood asthma symptoms were found in Tehran (35.4%) and Kerman (2.7%) while the average percentage in Iran was found to be 13.14% (CI 95% 16.30-9.97). In that study the prevalence of asthma-related symptoms was estimated to be higher in Iran than international reports (Mohammadbeigi *et al.*, 2011). Educated parents protect their children better against allergy and asthma and this is due to their knowledge about the disease; so the high prevalence of asthma-related symptoms in Iranian population can be due to the parents' sufficient knowledge (Amiri *et al.*, 2016).

In the present study, 7.8% suffered from current wheezing and about 30% suffered from previous wheezing while in the similar study done in 2007 in Gorgan, they were 20.1% and 7%, respectively (Bazzazi *et al.*, 2007) and in a study done in 2008 in north of Iran reported the previous wheezing as 38.7% (Bazzazi *et al.*, 2007; Mohammadzadeh *et al.*, 2012). In 2010 the National Institute of Researching and Treating Asthma and Pulmonary Diseases conducted a descriptive research to investigate the prevalence of childhood asthma and related symptoms in Tehran through the use of ISAAC questionnaire and as one part of International Study of Asthma and Allergies in Childhood. The study was done on 6127 Tehranian students and it was revealed that 32% of the students had a positive record of wheezing during their lifetime and 19.2% of them were recently attacked by wheezing. Having asthma-susceptible weather conditions due to chemical pollutants and high humidity, Tehran and north of Iran show a high number of childhood asthma cases, but Khomein has cold and dry weather without humidity. However, the number of current and previous wheezing cases in this city is comparable with that of Tehran and north of Iran. Results of another research in Tehran and Rasht in 2001 conducted on 12214 students of 6-7 and 13-14 years old showed that the prevalence of asthma-related symptoms in 13-to-14-

year-old children was higher than in 6-7-year-old children in both cities. However, results of the present study indicate that asthma-related symptoms are more common in 6-to-7-year-old children (51.5% in 6-to-7-year-old children and 49.5% in 13-to-14-year-old ones). The prevalence of exercise-induced asthma in boys studying in grade one of primary schools of Khomain was higher than in three other groups including girls studying in grade one of primary school as well as girls and boys studying in grade one of junior high school, while in 2002 this number was higher in 13-to-14-year-old boys than other three groups in Rasht. In 2010 in Tehran, it was 1.54% in 6-to-7-year-old children and 15.3% in 13-to-14-year-old ones while in Khomein it was 9.08% in 6-to-7-year-old children and 7.44% in 13-to-14-year-old ones. The nocturnal signs in 13-to-14-year-old boys were similar in Tehran and Khomein and they were higher in them than in three other groups (Hassanzadeh *et al.*, 2012). Talking limitations due to wheezing was 16.6% in Khomein but it was only 4.5% in Tehran in 2010. The study done by Gharagosloo *et al.*, in Kashan showed that wheezing frequencies in girls' and boys' lifetime were 10.2% and 18.2%, respectively and wheezing frequencies in girls and boys were 6.9% and 13.1%, respectively within the last 12 months. But in Khomein wheezing frequencies in girls' and boys' lifetime were 12.5% and 17%, respectively and wheezing frequencies in female and male students were 4.2% and 3.6%, respectively within the last 12 months. However, the asthma confirmed by physicians in Rasht in 2008 was 1.6 times more in boys than in girls while in Khomein it was twice more in girls than in boys (boys: 1.5%, girls: 3%) (Gharagosloo *et al.*, 2003). Although countries of Southeast Asia, Brazil and Persian Gulf countries are susceptible of mites' growth due to having hot and humid weather, the study done in 2006 in Brazil showed that the prevalence of asthma-related symptoms were 43.3% and it was considerably less than that of Khomein city (Solé *et al.*, 2006). In 2003 the average prevalence of current wheezing in countries of Southeast Asia including Indonesia, China, Taiwan, Malaysia, South Korea, Singapore, the Philippines, Hong Kong, Thailand, and Japan was estimated to be 7.42% which was comparable to that of Khomein (7.8%) (Ellwood *et al.*, 2001). The last study index in this region related to South Korea in 2011 and it was 5.2% (Lee, 2011). The prevalence of previous wheezing in children was found to be 32.2% in this study and it is higher than that of Kuwait (25.9%) (Behbehani *et al.*, 2000).

The prevalence of asthma confirmed by physicians was found to be 3.5% which is remarkably different from the incidence of asthma-related symptoms found through the standard questionnaire. It is notable to state that this difference is also seen in other similar studies and it might be resulted from the lack of physicians' sufficient knowledge about new definitions of asthma and not using objective para-clinical tests such as spirometry to diagnose asthma cases and this leads to estimate fewer asthma cases. In addition, doing a cross sectional study in a specific season and the error of reminding children's parents when they are completing the questionnaire might lead to higher estimation of asthma-related symptoms at the time of using the questionnaire.

## Conclusion

The percentage of children in Khomein who had at least one sign of "childhood asthma syndrome" at the age of 6 to 12 was higher than national and international averages and it is even about 2.5 times more than that of a polluted city like Tehran. The reason for high prevalence of asthma-related symptoms in Khomein may be that this city is too close to agricultural and animal breeding units and this might lead to easy spread of aerosols

derived from chemical fertilizers and animal excrements. Moreover, the existence of an industrialized town where steams like benzene, sulfur and phosphor dioxide and trioxide are produced can be a cause of asthma-related symptom increase in Khomein. Regarding the considerable difference between the prevalence of asthma diagnosed by physicians (3.5%) and the prevalence of asthma-related symptoms obtained from the questionnaire (73.2%) it is suggested that more training courses of diagnosing and treating asthma be provided in regular training programs of physicians.

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