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## Prevalence and Severity of Asthmatic Symptoms in Rasht Students: A Report from ISAAC Study

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### ABSTRACT

**Background:** This study is a part of the third phase of "International Study of Asthma and Allergy in Childhood" (ISAAC) which was aimed to study the prevalence and severity of asthma symptoms among children and to compare the result with those of the first phase in Rasht city.

**Materials and Methods:** A descriptive study was performed on 0-7 and 13-14 years old students of Rasht city during 2001-2002. After performing statistical analysis, prevalence of asthma symptoms was evaluated in both sexes and the two age groups by using chi-square test.

**Results:** A total of 6074 students participated in this study. History of wheezing during their life-time and history of recent wheezing were present in 23.3% and 15.4% of students, respectively. Prevalence of this symptom in both situations was significantly higher in male students compared to females. Three hundred forty-nine students (5.7%) were known cases of asthma. Number of asthmatic cases among 6-7 years old students was 1.5 times higher than the other group. Also, prevalence of asthma in boys was 1.6 times higher than girls. Over all, 522 students (8.6%) mentioned a history of wheezing during or after exercise in the past 12 months. This was 3 times higher among 13-14 years old students and 1.9 times higher in boys. Eight hundred thirty-five (13.7%) students had a history of dry cough during the last 12 months and its prevalence was higher in students in the 13-14 years old group and in boys as well.

**Conclusion:** Compared to the results of phase I of this study, the prevalence of known cases of asthma has considerably increased in both age groups. Prevalence of asthma was higher in 6-7 years old boys. There is a wide range of risk factors for development of asthma and its exacerbation in children which requires further investigations to find factors responsible for increased prevalence of this disease in Rasht city. (*Tanaffos* 2008; 7(1): 40-49)

**Key words:** ISAAC, Asthma, Wheezing, Children, Prevalence, Rasht

### INTRODUCTION

Despite the considerable advances in diagnosis and treatment of asthma in children, its prevalence is

increasing in the world specially in those residing in urban areas (1,2) and no specific reason has been found for this trend till now (3). Pediatric asthma is the most common chronic disease of childhood. In America, 6.2 million children under the age of 18 years were affected with asthma in 2004 out of which 4 million developed asthma attacks (4). In a study in

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America, asthma was one of the important reasons for missing school and also children's hospitalizations (2,5). According to the results of another study, almost 50% of asthmatic children are absent from school for at least 6 days of an academic year (6) which results in drop-off of students (7).

In addition to the direct costs of this disease, there are some indirect expenses exposed by it such as non-attendance of parents work (8).

The onset of asthma in 80% of cases is by the 6<sup>th</sup> year and in 95% by the 9<sup>th</sup> year of age. Delay in diagnosis can increase the severity of disease as well as the related morbidity and mortality (7). Precise history taking, clinical examination and spirometry are the best diagnostic methods for asthma (9). Asthma is the most common cause of continuous or recurrent wheezing, cough and dyspnea in children (2). However, its related consequences and irreversible damages can be prevented by early diagnosis and effective treatment.

Considering the importance of asthma in children, numerous studies have been performed in this regard. ISAAC has performed vast standard researches at international level and achieved valuable findings regarding the prevalence and symptoms of this disease (10).

The ISAAC program is comprised of 3 phases. The first phase started in 1991 with the aim of evaluating the causes and prevalence of asthma, allergic rhinoconjunctivitis and atopic eczema in children and the effect of environmental factors on this disease in 156 centers of 56 countries (11). The third phase was performed in the year 2001 and in this phase, more details regarding the symptoms and causes of asthma and allergy in children and the alteration of prevalence of asthma symptoms at the international level were evaluated (12). The results of

these studies can help evaluate the prevalence and severity of asthma in different countries and even in different districts of a country. Different etiologic studies on different environmental factors, life style, genetics and effective health cares can use the results of ISAAC studies (13). ISAAC research group, designed a questionnaire for evaluation of the prevalence of asthma symptoms in children in 3 separate sections.

Following the conduction of phase 1 ISAAC study in Rasht in 1997, the 3<sup>rd</sup> phase of this program was performed in the same city in 2001. Rasht is the center of Gilan province and geographically is located in a low-altitude area in north of Iran. Due to the proximity to the Caspian sea, this city has a humid climate.

This study was a part of the 3<sup>rd</sup> phase conducted in Rasht in 2001 with the aim of evaluating the prevalence and severity of asthmatic symptoms in children and comparing the results with those of phase 1.

## MATERIALS AND METHODS

This descriptive study was performed as a part of the international ISAAC studies during 2001-2002 in Rasht. Data were collected by using a questionnaire.

Our understudy population consisted of Rasht students in 2001 -2002. A total of 6145 male and female elementary and guidance school students were selected. Rasht has 2 districts and we considered each district as a cluster and sampling in each district was performed randomly. Of a total of 63 elementary and 22 guidance school students, only first grade students and among the guidance school students, 7<sup>th</sup> and 8<sup>th</sup> grade students were questioned. A total of 6074 questionnaires were filled and returned, out of which 3065 were from elementary (6-7 years old) and 3009 were from guidance school

students (13-14 years old).

### Measurements

Measurements were performed by using the ISAAC- suggested questionnaire. Eight questions in this questionnaire were related to asthmatic symptoms and their severity. Demographic characteristics of students were collected as well. Also there were several questions regarding the history of wheezing as an important symptom of asthma, time of attacks, their frequency and severity and history of asthma. Questionnaires of the elementary school students were filled out by their parents at home while the guidance school students filled out the questionnaires themselves at the site.

### Statistical Analysis:

The collected data were analyzed by using SPSS software version 11.5. According to ISAAC standard, data entry was performed by 2 different persons in 2 separate shifts. Comparison of the two

sexes and age groups was performed by using the chi-square test.

### RESULTS

A total of 6074 students were enrolled in this study out of which 3065 (50.5%) were 6-7 years old and 3009 (49.5%) 13-14 years old. There were 1347 (44%) boys in the age group of 6-7 years and 1546 (51.5%) boys in the age group of 13-14 years. Overall participation rate for both groups was 99% of all children, 1417 (24.1%) had a history of wheezing and it was significantly higher in males (25.8%) compared to females (22.6%) ( $p < 0.01$ ) but, no significant difference was found between the two age groups. In the 6-7 years old group, prevalence of wheezing was higher in boys ( $p < 0.01$ ). In the 13-14 years old group although boys were affected more than girls, the difference was not significant (Table 1).

Table 1. Prevalence of wheezing according to the age groups and gender in Rasht students in 2003.

Gender	Age	Male			Female			Total	
		6-7 yrs	13-14 yrs	Total	6-7 yrs	13-14 yrs	Total	6-7 yrs	13-14 yrs
symptom									
History of wheezing		331 (25.5%)	393 (26.1%)	724 (25.8%)	353 (21.4%)	339 (23.9%)	692(22.6%)	684 (23.2%)	732 (25%)
*History of wheezing in the last 12 months		224 (21.3%)	268 (28.8%)	492 (24.8%)	242 (18.4%)	200 (19.8%)	442 (19%)	466 (19.7%)	468 (24.1%)
** Frequency of wheezing attacks during the last 12 months		219 (21.8%)	299 (35.5%)	518 (28%)	248 (19.5%)	243 (28.3%)	492 (23%)	467 (20.5%)	542 (31.8%)
*** Sleep disorder due to wheezing in the last 12 months		120 (12.3%)	130 (16.4%)	250 (14.2%)	124 (10.2%)	137 (19.9%)	261 (12.8%)	244 (11.1%)	267 (16.6%)
Speech disorder due to wheezing in the last 12 months		37 (3.8%)	69 (8.7%)	106 (6%)	34 (2.8%)	66 (7.9%)	100 (4.9%)	71 (3.2%)	135 (8.3%)
History of asthma		119 (9.1%)	86 (5.9%)	205 (7.4%)	94 (5.6%)	50 (3.6%)	144 (4.7%)	213 (7.1%)	136 (4.7%)
Wheezing due to exercise during the last 12 months		75 (5.8%)	258 (18.2%)	333 (12.3%)	56 (3.4%)	133 (10.3%)	189 (6.5%)	131 (4.5%)	391 (14.4%)
Nocturnal cough during the last 12 months		130 (10%)	326 (22.6%)	455 (16.6%)	173 (10.5%)	206 (15.4%)	378 (12.7%)	303(10.3%)	532 (19.2%)

\* Valid percent; that is number of positive results among total responses

\*\* History of wheezing for at least once in the last 12 months.

\*\*\* History of sleep disorder due to wheezing for at least once in the last 12 months.

History of wheezing during the last 12 months was positive in 21.77% of children and it was significantly higher in boys (24.8%) compared to girls (19%) ( $p<0.001$ ). In the age group of 13-14 years, prevalence of this symptom was higher in boys ( $p<0.01$ ) (Table 1). Of the total children 817 (20.5%), 140 (3.5%) and 53 (1.3%) had a history of wheezing for 1-3, 4-12 and more than 12 times during the last 12 months, respectively. The remaining had not answered this question or had no history of this symptom.

Regarding the sleep disorders due to wheezing attacks during the last 12 months, 353 (9.3%) students had experienced this symptom in less than one night a week while 158 (4.2%) had experienced it for at least one night a week. The remaining had not answered this question or had no history of this symptom. No significant difference was found in this regard between the two age groups (Table 2).

Speech limitation due to wheezing in the last 12 months was reported in 206 (5.4%) students and was 2 times higher in the age group of 13-14 years compared to 6-7 years. The difference was statistically significant ( $p<0.001$ ). But no significant difference was detected between the sexes (Table 1).

There were 349 (5.9%) known cases of asthma and number of such cases in the age group of 6-7

years was 1.5 times higher than the other group (7.1% versus 4.7%,  $p<0.001$ ) and in boys it was 1.6 times higher than in girls (7.4% in boys versus 4.7% girls,  $p<0.001$ ). Comparing the prevalence of asthma between males and females separately in each age group, its prevalence was significantly higher in boys of both groups ( $p<0.001$  for the elementary students and  $p<0.01$  for the guidance students) (Table 1).

Overall, 552 students (9.3%) reported a history of wheezing during or following exercise in the last 12 months. It was 3 times higher in the age group of 13-14 years (14.4% versus 4.5%,  $p<0.001$ ) and 1.9 times higher in boys (11.5% versus 6%,  $p<0.001$ ).

In comparison of the prevalence of this symptom between both sexes in each age group, its prevalence was significantly higher in boys in both groups ( $p<0.001$  for the guidance students and  $p<0.01$  for the elementary students) (Table 1).

Of all students, 835 (14.6%) had a history of dry cough during the last 12 months which was significantly higher in the age group of 13-14 years (19.2%) compared to the age group of 6-7 years (10.3%) ( $p<0.001$ ) and 16.6% of boys and 12.7% of girls had a history of dry cough ( $p<0.001$ ). In the age group of 13-14 years, prevalence of dry cough was higher in boys ( $p<0.001$ ) (Table 1).

Table 2. Frequency distribution of sleep disorder due to wheezing attacks according to the age group and gender in Rasht students in 2003.

Gender	Age	Male		Female		Total	
		6-7 yrs	13-14 yrs	6-7 yrs	13-14 yrs	6-7 yrs	13-14 yrs
Sleep disorder							
Never		853(87.7%)	660 (83.5%)	1097 (89.8%)	672 (83.1%)	1950 (88.7%)	1332(83.1%)
Less than one night a week		87 (8.9%)	87 (11%)	96 (7.9%)	83 (10.3%)	183 (8.3%)	170 (10.6%)
More than one night a week		33 (3.4%)	43 (5.4%)	28 (2.3%)	54 (6.7%)	61 (2.8%)	97 (6.1%)

## DISCUSSION

The incidence of asthma-like symptoms is increasing in Iran as well as in other countries worldwide (14).

Despite the advances in the pathophysiology, variety and quality of asthma treatment, asthma prevalence and its related morbidity and mortality are increasing (2). Based on our study results, 21.7% of children had a history of recent (during the last 12 months) wheezing. A considerable difference was detected in this regard between the phase 1 and phase 3 of ISAAC study in Rasht and the prevalence of this symptom in 6-7 year old students increased from 5.3% in 1997 to 19.7% in 2003 and in 13-14 year olds from 9.7% to 24.1%.

It is noteworthy that according to ISAAC standards this prevalence has been calculated based on the number of positive results among total students by ISAAC steering committee, but what we presented here is the valid percent which means the number of positive results among the total respondents. This explains the higher prevalence in our reports compared to that of ISAAC steering committee.

While performing this study in Rasht, phase 1 and phase 3 of this study were conducted in Tehran, at the same time, but no significant difference was detected in the prevalence of asthmatic symptoms in Tehran students during this period of time (14). Since there has been no considerable change in the environmental, economical or social status of Rasht students during the period of time between the phase 1 and phase 3 of this study, it seems that this considerable increase in the prevalence of asthmatic symptoms is mostly due to the lack of sufficient experience in conduction of phase 1 of the study.

Some believe that increased prevalence of asthmatic symptoms in the world is due to the increased rate of air pollutants, higher exposure to closed-environment allergens, urbanization and

poverty (2). Of the important risk factors for occurrence of asthmatic symptoms in urban children are exposure to cigarette smoke, inadequate ventilation of closed environments and pets (domestic animals) (15). According to a similar study, prevalence of asthmatic symptoms has a reverse correlation with altitude, yearly temperature alterations and relative humidity of the environment (16).

To stop the ascending trend of asthma prevalence and related morbidity and mortality, prompt diagnosis and treatment as well as preventive measures are required (2).

In this study, recent history of asthma was found mostly in boys and this finding was in accordance with accredited resources (2). A possible reason might be the fact that boys are more likely to be exposed to allergens and outdoor pollutants. No considerable difference was found between the two age groups in the prevalence of wheezing whereas, if we consider wheezing as the most important clinical symptom of asthma, almost 80% of asthmatic patients, manifest the clinical symptoms of the disease before the age of 6 (1).

Severity of asthmatic symptoms was evaluated by 2 questions regarding sleep disorder and speech disorder due to wheezing. Speech disorder due to wheezing was more frequent in the age group of 13-14 years. In comparison with the phase 1 results in Rasht, speech disorder in the age group of 6-7 years had increased from 1.1% in 1997 to 3.2% in 2003 and respectively from 2.3% to 8.3% in the other age group.

In both age groups, wheezing following exercise was more prevalent among boys, that is justifiable considering the fact that boys have more outdoor physical activities than girls. Also, this symptom was more prevented in the 13-14 years old children. This difference might be due to parents' mistake or

forgetfulness in filling out the questionnaires for their 6-7 years old children.

Whereas, in the age group of 13-14 years, questionnaires were filled out by the students themselves and therefore, have a higher accuracy. In comparison with the results of phase 1, a considerable increase was detected in occurrence of this symptom in both age groups as this rate increased from 9.1% in 13-14 year olds in phase 1 to 14.4% in phase 3 and in 6-7 year olds from 1.8% to 4.5%.

Regarding the nocturnal cough as a clinical symptom of asthma, boys and the age group of 13-14 years experienced this symptom more than girls and the other age group. This difference between the two age groups is somehow justified by the fact that the definition of nocturnal cough had been thoroughly explained in the questionnaire to be distinguishable from the cough due to the common cold or pulmonary infection and also the fact that 13-14 year olds filled out the questionnaires themselves and it is obvious that they pay more attention to their clinical symptoms than any body else. In comparison with the phase 1 results in Rasht, prevalence of known cases of asthma has considerably increased in both age groups which means from 4.1% in 1997 to 7.1% in 2003 among the 6-7 year olds and from 2.7% to 4.5% among 13-14 year olds.

In general, known cases of asthma were higher in boys and in the age group 6-7 years and this is a consensus that the prevalence of asthma in under 15 year olds is higher in boys than girls (1.5 to 1) (13). According to the results of different studies, male gender, history of asthma and allergy in parents (17) and even cigarette smoking by expected mothers (18) have important roles in development of pediatric asthma in a child.

There are a wide range of risk factors for asthma and exacerbation of its symptoms in children including outdoor and indoor environmental

pollutants, generic and nutritional factors and also contracting viral infections especially with rhinoviruses.

Every each of the above-mentioned factors requires further investigation to detect the factors responsible for increased prevalence of this disease in Rasht.

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