

# PREVALENCE OF ASTHMA, RELATED SYMPTOMS AND RISK FACTORS IN CHILDREN YOUNGER THAN 5 YEARS

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**Abstract-** Asthma is the most prevalent chronic disease in childhood. To determine the prevalence of asthma and related symptoms in children younger than 5 years, a survey was performed by interviewing mothers of 617 children during spring 2001. The interview comprised of two parts. The first part contained children characteristics including age, sex, maternal age at the child birth, child history of atopy, maternal history of smoking during pregnancy, existence of household smoker, history of family asthma or family atopy. The second part contained asthma section of the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. The overall cumulative and 12 month prevalences of wheezing were 21.9% and 19.4%, respectively. The prevalences of exercise-induced wheezing, dry cough without respiratory infections or physician-diagnosed asthma were 18.9%, 11.8% and 3.9%, respectively. Multiple logistic regression analysis showed a higher prevalence of history of wheezing or exercise-induced wheezing in male sex and in the children with positive history of atopy. Persistent cough unrelated to respiratory infections was strongly associated with the positive history of atopy in the children or maternal age at the child birth less than 20 yr or more than 30 yr. Furthermore a physician-diagnosed asthma was significantly associated with positive history of atopy in child. The results suggest a relatively high prevalence of history of wheezing or current and exercise-induced wheezing, but underdiagnosis of asthma among studied children needs more studies to be confirmed.  
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**Key Words:** Asthma, Wheezing, ISAAC, Prevalence, Severity, Risk factors

## INTRODUCTION

Asthma is a diffuse obstructive lung disease with two characteristics: hypersensitivity of the airways to a variety of stimuli and a high degree of reversibility of the obstructive process. It is the most frequent cause of chronic illnesses in childhood and is the leading cause of admission in children hospitals (1, 2). Despite that recurrent episodes of wheezing or coughing especially if triggered or exacerbated by viral infections, inhaled allergens or exercise are highly suggestive of asthma, there is no widely accepted definition for asthma or an objective

measurement of asthma prevalence suitable for use in children (1). Therefore the International Study of Asthma and Allergies in Children (ISAAC) questionnaire was designed in 1992 as a standard method to describe the prevalence and severity of asthma, rhinitis and eczema in children living in different areas of the world (3-5).

Many reports are accessible about the prevalence and severity of asthma and its risk factors among school age children, however only a few studies on the epidemiology of asthma and related symptoms in children younger than 5 years have been carried out, especially in Iran.

The present study was performed in children younger than 5 years in south of Tehran, the capital of Iran, to determine the prevalence and severity of asthma, its related symptoms and some of its possible risk factors.

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## MATERIALS AND METHODS

Subjects were children younger than 5 years (<60 mo) who attended 6 health centers in the southern area of Tehran. The city has more than 13 million inhabitants. It lies 1150 meter above sea level, has a temperate climate with temperature range of -5 to 42°C and contains the largest number of cars in the country. The southern area consists mostly of mid and low socioeconomic classes. There are 33 health centers in south of Tehran from which 6 health centers were selected randomly.

Children younger than 5 years attended the health centers for receiving health services including vaccination or growth control or they accompanied their mothers who were receiving prenatal cares, family planning services or health educations. About 100 children younger than 5 years from each center took part in this cross-sectional study during spring 2001. The sampling method was convenient. Children's mothers underwent an interview which comprised of two sections. The first section composed of children characteristics including age, sex, maternal age at the child birth, history of maternal smoking during the pregnancy, having household smoker, history of asthma or atopy in the first degree relatives of the child and history of atopy in the child. The second section included Persian translation of asthma section of ISSAC questionnaire which concentrated on past and current (in the past 12 months) wheezing episodes, wheezing frequency, sleep disturbance and speech limitation during attacks (only in children who had started speaking), exercise induced wheezing (only in children older than 18 months), persistent cough unrelated to respiratory infections in past 12 months and a physician-diagnosed asthma. In children with current wheezing episodes, severity of attacks was assessed by asking about the number of wheezing episodes and severity of each attack (based on sleep disturbance or speech limitation during attacks) in the last 12 months. For all children both sections were completed by a trained interviewer. This method was applied because of the low educational level of some of the mothers. Descriptive analysis and multiple logistic regression were performed on the data collected using SPSS for Windows (version 10).

## RESULTS

A total of 611 children younger than 5 years were assessed in the present study. Distributions of studied characters are summarized in table 1.

The most common asthma related symptoms reported by children's mothers were history of wheezing (21.9%), current wheezing (19.4%), exercise induced wheezing (12%), persistent cough unrelated to respiratory infections in the past 12 months (8.4%) and physician-diagnosed asthma (3.8%).

The results of distribution of physician-diagnosed asthma and asthma related symptoms by studied characteristics are shown in table 2. Of 120 children who had current wheezing, 95 children (79.1%) had 1-3 attacks, 14 children (11%) had 4-12 attacks and 11 children (9.24%) had more than 12 attacks in the past 12 months.

**Table 1.** Distribution of studied characteristics in the population

Character	Number (Percent)
Sex	
Male	329 (53.3)
Female	288 (46.7)
Age (mo)	
< 9	205 (33.2)
≥ 9	412 (66.8)
Maternal age (yr)	
< 20	102 (16.5)
20-30	407 (66)
> 30	108 (17.5)
Child atopy	
Yes	55 (8.9)
No	562 (91.2)
Maternal smoking during pregnancy	
Yes	4 (0.65)
No	613 (99.35)
Having household smoker	
Yes	150 (24.3)
No	467 (75.7)
Family asthma	
Yes	19 (3.1)
No	598 (96.9)
Family atopy	
Yes	161 (26)
No	456 (74)

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**Table 2.** Distribution of asthma related symptoms and physician diagnosed asthma by the studied characters in population\*

Symptom	Sex		Age†		Maternal age		Child atopy‡		Household smoker		Family asthma§		Family atopy¶	
	M	F	< 9	≥ 9	≤ 30	> 30	Yes	No	Yes	No	Yes	No	Yes	No
History of wheezing (n=135)	61.5	38.5	31.9	68.1	85.2	14.8	13.3	86.7	25.9	74.1	2.2	97.7	34.8	65.2
Current wheezing (n=120)	60	40	35.8	64.2	84.2	15.8	15	85	25.8	74.2	2.5	97.5	35	65
Exercise induced wheezing (n=52)	61.5	38.5	0	100	86.5	13.5	15.4	84.6	30.8	69.2	3.8	96.2	38.5	61.5
Persistent cough (n=73)	58.9	41.1	32.9	67.1	84.9	15.1	16.4	83.6	19.2	80.8	6.8	93.2	32.9	67.1
Physician-diagnosed asthma (n=24)	62.5	37.5	16.7	83.3	79.2	20.8	29.2	70.8	29.2	70.8	8.3	91.7	33.3	66.7

\* Data are given as percent.

† Month.

‡ Showing symptoms of hay fever or eczema.

§ Physician-diagnosed asthma in the first degree relatives of the child.

¶ Physician-diagnosed asthma or symptoms of hay fever or eczema in first degree relatives of the child.

Of these children, 20 (16.6%) had sleep disturbance and 10 (8.3%) had speech limitation during attacks (Table 3). To evaluate the effects of each character on the prevalence of physician-diagnosed asthma and related symptoms, multivariate analysis was performed. Logistic regression analysis showed prevalence of positive history of wheezing and exercise induced wheezing were significantly higher in males (odds ratio [OR] 0.68, 95% confidence interval [CI]: 0.46-1.01, OR 0.53, CI: 0.28-1.01, respectively).

The prevalence of history of wheezing, exercise-induced wheezing, persistent cough unrelated to respiratory infections and a physician-diagnosed asthma were strongly associated with the positive history of atopy in the child (OR: 1.83, CI: 0.98-3.40, OR: 4.08, CI:1.41-11.82, OR: 2.27, CI:1.08-4.77 and OR:4.47, CI:1.61-12.4, respectively). Moreover the children with mothers older than 30 years or younger than 20 years at the child birth had significantly higher prevalence of persistent cough unrelated to respiratory infections (OR: 2.29, CI: 1.09-4.81).

**Table 3.** Distribution of reported symptoms indicating severity of asthma by studied characteristics\*

Symptom	Sex		Age †		Maternal age‡		Household smoker	
	M	F	< 9	≥ 9	≤ 30	> 30	Yes	No
Number of wheezing episode								
1-3	82	75	74.4	81.8	12.1	12.1	77.4	80
4-12	9.2	14.6	9.4	13	71	63.6	16.1	10
> 12	8.3	10.4	16.2	5.2	16.9	36.4	6.5	10
Woken by wheeze								
Never	82	86.5	88.3	81.5	84.7	72.7	74.2	87
Yes	18	13.5	11.7	18.5	15.3	27.3	25.8	13
Limitation of speech during weezing attack								
No	93.8	80.4	95.4	91.3	92.7	90.9	88.6	94
Yes	6.2	9.6	4.6	8.7	7.3	9.1	11.4	6

\*Data are given as percent.

†Months.

‡Years.

## DISCUSSION

In general the data showed the prevalence of physician-diagnosed asthma being lower than the prevalence of asthma related symptoms, suggesting that asthma was underdiagnosed. The prevalence of physician diagnosed asthma in present study (3.8%) is very similar to the figure in East Germany (3.9%) (6) and United State (3.5%) (7), but it is lower than the figure in West Germany (5.9%) (6) and in New South Wales (10.4%) (8). Despite similarity between our figures and results of some other reports, it seems to be an underestimation for a number of reasons. First of all, use of different diagnostic criteria for asthma can cause the variations in the reported prevalence of physician diagnosed asthma. Second, many parents are not aware of diagnosis of asthma in their children, because some physicians do not use the terminology of asthma as the diagnosis to the parents, instead they use other terms like allergic bronchitis, respiratory allergy or sensitivity that actually are misleading. Third, the physicians are reluctant to label a child as asthmatic because of the unpredictable course of asthma in children. It has been mentioned in the literature that about 50% of all asthmatic children are virtually free of symptoms within 10-20 years. The prevalence of ever wheezing in a study in Tuscon, Arisona was 49.5% among children younger than 6 years (9) and in a study in Melbourne was 46% among children younger than 7 years (10), which are much higher than our figure. On the other hand, the prevalence of history of wheezing in our study is higher than the figure in New South Wales (8). One explanation for these differences might be the recall bias of the mothers in our study. Another cause is probably the mild to moderate severity of wheezing attacks in the majority of the affected children in our study (almost 90%) which causes the attacks being overlooked by the parents.

The figure of current wheezing reported by the parents is close to the result of a report from Melbourne (23%) (10), however it is in contrast to the figures in children in urban and rural Ethiopia (3.4%) (11) or in New South Wales (3%) (8). We found prevalence of exercise-induced wheezing to be much more than the figure in preschool children in New

South Wales (1.5%) (8). It seems that this question needs some revision in our society. Doing exercise in preschool children especially in our society is not a regular defined activity and the meaning of exercise in this age group is simply playing. Despite explanation of this symptom by the interviewer to the parents, it seemed that some parents had interpreted playing induced panting as wheezing. For solving these problems showing an actual case who having this symptom as a video-presentation to parents prior to interviewing could be very helpful in getting more reliable data.

According to present study the prevalence of persistent cough (8.4%) is higher than the figure in New South Wales study (3%) (8). It is noteworthy that there are many differential diagnosis for persistent cough in preschool children in addition to asthma, including post nasal discharge, aspiration of foreign body, tuberculosis, whooping cough, gastroesophageal reflux, TE fistula and immune deficiency. Furthermore, productive cough is not a very common symptom in preschool children. Therefore it is difficult for parents to recall only the dry persistent cough of their child unrelated to respiratory infections in the past 12 months. In order to obtain more accurate and reliable data about this symptom, it is recommended to design questions with emphasis on duration of coughing, type of pharmacologic therapies used for relieving it and the child's response to the treatments.

Overall, settlement of studied populations in different geographical areas, which influence not only environmental factors but also genetics, could explain these dissimilarities between our findings and the results of other studies with regard to the prevalence of asthma and related symptoms in children younger than 5 years. Male sex has been mentioned as a risk factor for asthma in several papers (7, 11-13), however, like a study in urban Ethiopia (14), we found only positive history of atopy as a significant risk factor. Morgan and Martinez showed exposure to environmental tobacco smoke was a common risk factor for asthma (12), but in accordance with a study performed by Sherman *et al.* (15) we did not find such a relationship. One of the reasons might be the content of the related question, "having household smoker in close relatives who live

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with the child at home". Asking the question in this way "having indoor smoker at the child living place" might get more relevant data about the child's history of tobacco smoke exposure.

We showed that male sex and positive history of atopy were rather strong independent factors for positive history of wheezing, which is in agreement with Morgan and Martinez report about male sex (12). Stein *et al.* showed that maternal prenatal smoking had significant association with current wheezing (16); however, in our study only 4 mothers (0.65%) had positive history of smoking during the pregnancy, therefore we were not able to assess this factor. Furthermore none of our studied risk factors had significant effect on current wheezing.

In conclusion, some recommendations can be made: 1) The reliability, validity and reproducibility of ISSAC questionnaire in Iranian preschool children should be determined after its translation to Persian language, 2) It is necessary to design larger general population-based studies not only in Tehran but also in the whole country to obtain the prevalence of asthma among preschool children, and 3) Performing pulmonary function tests in the children could help to assess the reliability of the parent's responses to ISAAC questionnaire with regard to asthma and related symptoms.

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