

# The Relationship between Asthma Risk Factors and its Severity in Children with Asthma Referred to Asthma and Allergy Clinics

Hamidreza Houshmand\*

Department of Allergy and Clinical Immunology, Urmia University of Medical Sciences, Province, Iran

\*Corresponding author: Hamidreza Houshmand, Department of Allergy and Clinical Immunology, Urmia University of Medical Sciences, Province, Iran, Tel: 00989143433913; E-mail: hamidreza.houshmnd@gmail.com

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## Abstract

**Introduction:** Asthma reversible obstruction of small and large airways is different due to increased sensitivity to immunological stimuli, which manifests itself in the form of frequent and intermittent attacks of cough, shortness of breath, chest heaviness and wheezing. Both the prevalence and severity of asthma have increased in many countries in recent decades. According to statistics, the prevalence of this disease in the world is 3-35%. This statistic in Iran is between 7.2-4.3% and the average prevalence of asthma symptoms in the whole country is 14.1%

**Materials and methods:** Asthma is the most common chronic disease in children and is less common in adults. About 90% of cases of asthma occur in childhood, which indicates the effect of internal and environmental risk factors for asthma in childhood. These factors include genetic predisposition, increased airway response, atopy, gender, and possibly race.

**Results:** Out of 200 children with asthma studied, (53.5%) were 107 boys and (46.5%) were 93 girls. The mean age of the total number of children was 8.8 2 2.1 years.

**Discussion:** This study investigated the relationship between asthma risk factors such as obesity and disease severity in 200 children with asthma in Urmia. Our findings showed that 53.5% of children with mild asthma, 34.5% of children with moderate asthma and 12% of children with severe asthma.

**Conclusion:** In this descriptive analytical cross-sectional study to investigate the relationship between asthma risk factors and its severity in children with asthma referred to the asthma and allergy clinics of Urmia university of medical sciences during the years 1300-1499, the findings show 53.5% of children with mild asthma, 34.5% of children with moderate asthma and 12% of children with severe asthma. Also, 82% of children had a normal BMI and 18% were obese.

**Keywords:** Asthma; Immunological stimuli; Endocrine diseases, Cardiovascular diseases

## Introduction

Asthma reversible obstruction of small and large airways is different due to increased sensitivity to immunological stimuli, which manifests itself in the form of frequent and intermittent attacks of cough, shortness of breath, chest heaviness and wheezing [1]. Both the prevalence and severity of asthma have increased in many countries in recent decades. According to statistics, the prevalence of this disease in the world is 3-35%. This statistic in Iran is between 7.2-4.3% and the average prevalence of asthma symptoms in the whole country is 14.1%. Asthma is the most common chronic disease in children and is less common in adults. About 90% of cases of asthma occur in childhood, which indicates the effect of internal and environmental risk factors for asthma in childhood. These factors include genetic predisposition, increased airway response, atopy, gender, and possibly race. Environmental factors include allergens inside and outside the home, occupational allergens, unwanted exposure to secondhand smoke, respiratory infections, and possibly obesity. The disease, which affects children of all ages, has a negative impact on their quality of life and academic performance. The prevalence of this disease is increasing in all societies, especially in developing countries, and in children, which can be due to increased urbanization and subsequent changes. Obesity in children is mainly related to asthma and the existence of a link between asthma and obesity has been proven in some studies on children [2]. Also, studies have shown that weight gain can increase the risk of asthma in adolescents and children. Some research conducted among patients with asthma has shown that weight loss in this group of patients can improve their lung condition, symptoms and health status. However, the association between obesity and asthma has always been debated in other studies because some research has shown that the association between asthma and obesity may be due to a misunderstanding of the presence of tiny noises when breathing at night in people who are obese. Obesity can cause asthma by altering the anatomy and function of the lungs, such as dysfunction of the respiratory tract muscles

in the chest, inflammation of the airways, and dysfunction of the circulatory system in the lungs. On the other hand, studies conducted in different populations have considered other factors such as age, sex and mother's education in pediatric asthma. Birth characteristics such as gestational age, type of delivery and birth weight are also among the factors that their impact on pediatric asthma has always been confirmed or rejected by various studies in this field. The discrepancy between studies on the effect of the above factors on pediatric asthma underscores the need to examine the relationship between them and pediatric asthma in indigenous populations [3]. Therefore, the aim of this study was to investigate the relationship between asthma risk factors and its severity in children with asthma referred to asthma and allergy clinics of Urmia university of medical sciences.

## Literature Review

### Methodology

This study was a descriptive-analytical cross-sectional study. The statistical population of this study included kidneys in children with asthma referred to asthma and allergy clinics of Urmia university of medical sciences during 1399-1400. In this study, the sample size was calculated to be equal to 200 children. The Cochran's formula was used to determine the sample size as follows [4].

- N: Statistical population of the study (N=416).
- p: Probability of having the desired attribute (p=0.5).
- q: Probability of not having the desired attribute (q=0.5).
- d: Optimal probable accuracy equal to half the confidence interval (d=0.05).
- z: Degree or 95% confidence interval (z=1.96).

Samples were selected by simple random sampling from children with asthma referred to asthma and allergy clinics of Urmia university of medical sciences during the years 1399-1499, to complete the sample size and entered the study. The aim of this cross-sectional study was to investigate the relationship between asthma risk factors and its severity in children with asthma referred to asthma and allergy clinics of Urmia university of medical sciences.

**Inclusion criteria:** Age range 6 to 12 years with asthma.

**Exclusion criteria:** Chronic respiratory diseases (other than asthma) and non-respiratory diseases, cystic fibrosis, metabolic diseases such as diabetes and endocrine diseases, cardiovascular diseases, physical disabilities with delayed percentile growth below 3%, suffering from mental and psychological retardation, unwillingness to participate in the study. After the approval of the ethics committee of Urmia university of medical sciences and considering the inclusion and exclusion criteria, a total of 200 children aged 6 to 12 years with asthma were admitted to the asthma and allergy clinics of Urmia university of medical sciences entered the study. Initially, written consent was obtained from the children's parents to enter the study. The study checklist, which included the following 4 sections, was then completed for each child:

- Demographic information including age, sex and education of the mother.
- Birth information including gestational age, type of delivery and birth weight.
- BMI information.
- Asthma information including clinical signs, use of inhaled beta-agonist, FEV1 and asthma severity.

**Gestational age included two categories:** Preterm (gestational age equal to or less than 37 weeks) and term (gestational age more than 37 weeks). The type of delivery was considered to include two types of vaginal normal delivery and cesarean section. Birth weight was divided into four categories: very low (less than 1,500 grams), low (between 1,500 and 2,500 grams) and normal (between 2,500 and 4,000 grams), and high (more than 4,000 grams). For BMI, two groups of obese children (BMI percentage above 95) and normal weight children (BMI percentage between 3 and 95) were considered [5]. To measure BMI, 1600 RASAI digital body scale co scales and the following formula were used:

$$\text{Metric system formula} = (\text{Weight (kg)}) / (\text{Height (m)})^2$$

Clinical signs including shortness of breath, coughing during and at night, as well as daily symptoms were considered. Use/non-use and frequency of use of inhaled beta-agonists were recorded. FEV1 was also calculated. Asthma severity was divided into three categories, mild, moderate, and severe, according to the Australian national asthma campaign based on clinical signs, medications used, and pulmonary function test, including FEV1: Mild asthma had occasional symptoms that did not occur during walking and at night, medications were used less than twice a week, and FEV1 was above 80. In moderate asthma, symptoms were common, occurring less than once a week when walking or at night, medications were used frequently, and FEV1 was between 80-60%. In severe asthma, there were symptoms every day and the symptoms were more than once a week when sleeping and walking, inhaled beta-agonist drugs were used more than 3 to 4 times a week, and FEV1 would be less than 60. All devices were calibrated before use. Also, all examinations were performed by a specialist. All experiments that required interpretation were performed by two separate experts blindly. Finally, the obtained data were entered into SPSS version 26 statistical analysis software and statistically analyzed to investigate the relationship between asthma severity and the desired variables.

### Data analysis method

The statistical program used was SPSS. First, the normal distribution of data was investigated using the Kolmogorov-Smirnov test [6]. Qualitative data were reported as frequency (percentage) and normal quantitative data as mean standard deviation. *Chi-square* test and Spearman correlation test were used to examine the relationship between variables. P-value less than 0.05 were considered statistically significant.

## Results

Out of 200 children with asthma studied, (53.5%) were 107 boys and (46.5%) were 93 girls. The mean age of the total

number of children was 8.8  $\pm$  2.1 years. Overall, the majority of mothers of children (49%) had undergraduate education. The level of education of the mother by gender. Out of 200 children with asthma studied, 91.5% were born term and 8.5% preterm. In total, 54.5% of children were born by cesarean section and 45.5% by normal vaginal delivery. The type of delivery by gender and also, in total, the majority of children (68%) had a normal birth weight. Birth weight by sex of the 200 children with asthma studied, 82% had a normal BMI and 18% were obese. BMI by gender is given in Table 3-4. Out of 200 children with asthma studied, 99% reported cough, 20.5% shortness of breath, 58% of these symptoms during walking and night, and 28.5% of daily symptoms. Clinical signs by gender regarding inhaled beta-agonists, all children reported using it, with 32% consuming it less than twice a week, 17% more than 4 times a week, and 51% occasionally. The frequency of use of inhaled beta-agonists by gender regarding FEV1, a total of 53.5% of FEV1 children were above 80%, 34.5% of FEV1 children were between 80-60%, and 12% of FEV1 children were less than 60%. FEV1 by gender finally, regarding the severity of asthma, a total of 53.5% of children with mild asthma, 34.5% of children with moderate asthma and 12% of children with severe asthma. Asthma severity is listed by gender is examining the relationship between asthma severity and gender of all children by *Chi-square* test showed no significant relationship was observed between asthma severity and gender of children ( $P=0.192$ ). Examining the relationship between asthma severity and age of children by Spearman correlation test, showed no significant relationship was observed between asthma severity and total age of children ( $P=0.592$ ). There was no significant relationship between asthma severity with age of boys ( $P=0.198$ ) and girls ( $P=0.569$ ). Examining the relationship between asthma severity and maternal education by Spearman correlation test, no significant relationship was observed between asthma severity and maternal education of all children ( $P=0.954$ ). There was no significant relationship between the severity of asthma with the education of boys ( $P=0.852$ ) and girls ( $P=0.733$ ). Examining the relationship between asthma severity and gestational age by *Chi-square* test, a significant relationship was observed between asthma severity and gestational age of all children ( $P<0.05$ ), so that most children born as preterm had moderate or severe asthma. There was a significant relationship between asthma severity and gestational age of boys ( $P<0.05$ ) and girls ( $P<0.05$ ), so that in both groups of children born with preterm had moderate or severe asthma. By examining the relationship between asthma severity and type of delivery by *Chi-square* test is a significant relationship was observed between asthma severity and type of delivery of all children ( $P<0.05$ ), so that most children born with cesarean delivery had moderate or severe asthma. There was a significant relationship between the severity of asthma with the type of delivery in boys ( $P<0.05$ ) and girls ( $P<0.05$ ), so that in both groups of children born by cesarean section had moderate or severe asthma. Examining the relationship between asthma severity and birth weight by Spearman correlation test, no significant relationship was observed between asthma severity and total birth weight of children ( $P=0.567$ ). There was no significant relationship between asthma severity and birth weight of boys ( $P=0.761$ ) and girls ( $P=0.591$ ). Examining the relationship between asthma

severity and BMI by *Chi-square* test showed a significant relationship was observed between asthma severity and BMI of all children ( $P<0.05$ ), so that the most obese children had moderate or severe asthma. There was a significant relationship between the severity of asthma with BMI of boys ( $P<0.05$ ) and girls ( $P<0.05$ ), so that in both groups of obese children had Moderate or Severe asthma.

## Discussion

This study investigated the relationship between asthma risk factors such as obesity and disease severity in 200 children with asthma in Urmia. Our findings showed that 53.5% of children with mild asthma, 34.5% of children with moderate asthma and 12% of children with severe asthma. Obesity is an important factor in asthma and asthma complications in children. The main reason for the effect of obesity on asthma is still unknown. Decreased pulmonary function or altered immunological balance, such as increased proinflammatory cytokines along with diet, gastroesophageal reflux, and the mechanical effects of obesity have been suggested as possible mechanisms by which obesity can lead to asthma. Obesity can also exacerbate asthma, atopy and impaired response to treatment. Obesity in children with asthma can also further block airflow and reduce the response to inhaled corticosteroids [7]. Thus, obesity in children with asthma can be associated with challenges such as reduced response to control therapy and reduced quality of life compared to children with normal weight asthma. As the prevalence of obesity and asthma in children increases, physicians working in the field of asthma should consider weight loss as the main factor in controlling the disease for obese children. There is ample evidence that weight loss interventions can play an important role in improving asthma outcomes. In the present study, 82% of children had a normal BMI and 18% were obese. There was a significant relationship between asthma severity and BMI in both boys and girls with asthma, so that most obese children had Moderate or Severe asthma. In a study by Tafti, et al., It was found that there is a significant relationship between asthma severity and BMI in children with asthma, so that the prevalence of severe asthma in obese children is high. A study by Lang, et al. Showed that the risk for asthma increased among obese children. Another study by Lang showed that obesity increases the risk of exacerbating asthma in children or worsens the normal course of asthma in children. In a study by Kajbaf, et al., It was found that there is a strong association between asthma symptoms with overweight and obesity in both sexes among children with asthma. In the present study, the mean age of children was  $1/2 \pm 8/8$  years, of which 53.5% were boys and 46.5% were girls. The majority of mothers of children (49%) had undergraduate education. The higher prevalence of boys with asthma compared to girls has also been mentioned in reference books and various studies. According to our findings, there was no significant relationship between asthma severity and age, sex and mother's education of children. In the study of Tafti, et al. no significant difference was found between the severity of asthma and the age, sex and level of education of mothers of children with asthma. However, in the study of Kajbaf, et al. it was stated that the severity of childhood asthma was higher in boys than girls and also the

severity of asthma decreased with increasing age of children, fetal status and early childhood also play an important role in asthma and allergic diseases. Short pregnancy and preterm delivery can impair fetal development, reduce pulmonary development and thus increase susceptibility and respiratory diseases in the child. In the present study, 91.5% of children were born preterm and 8.5% preterm. There was a significant relationship between the severity of asthma and gestational age in both boys and girls with asthma, so that most children born with preterm had Moderate or Severe asthma. However, in the study of Ghaffari, et al., Which was conducted with a much smaller sample size than our study, no significant relationship was observed between the severity of pediatric asthma and gestational age. However, studies by Zhang, et al., Matheson, et al. and He, et al. have strongly confirmed the association between preterm children and their asthma severity. Researchers also believe that natural childbirth prepares the baby for life outside the uterus, as respiratory problems have been shown to be less common in normal birth. Also, the release of fluid into the lungs during a normal birth causes the secretion of catecholamines in the baby's body, which play an important role in lung health. Labor pain also plays an important role in the birth process, preparing the baby to breathe outside the uterus. However, cesarean delivery is associated with an increased risk of asthma. Although the mechanism involved is unclear, it has been suggested that general anesthesia used in cesarean section reduces the infant's respiratory oxygen supply and sometimes requires medication to treat the problem. In addition, cesarean delivery is associated with a higher prevalence of asthma and atopic disease due to less contact with microbes and stimulation of T cell helper (T helper 2) which causes atopic reaction. In the present study, 54.5% of children were born by cesarean section and 45.5% by normal vaginal delivery. There was a significant relationship between the severity of asthma and the type of delivery in both groups of boys and girls with asthma, so that most children born by cesarean section had moderate or severe asthma. Although some studies in countries where cesarean section rates are very low have not reported an association between asthma and delivery method. However, a study by Ghaffari, et al found that maternal vaginal delivery could reduce or prevent the risk of pediatric asthma. Studies by Rusconi, et al. and Sevelsted, et al. also reported a significant association between pediatric asthma and cesarean delivery. On the other hand, there are conflicting results in studies on the relationship between birth weight and asthma. In the present study, the majority of children (68%) had a normal birth weight (between 2500 and 4000 g). There was no significant relationship between asthma severity and birth weight in any of the groups of boys and girls with asthma. In the study of Tafti, et al., No significant difference was found between the severity of asthma and the birth weight of children with asthma. However, in the study of Heidarzadeh Arani, et al., A significant relationship was reported between high birth

weight and the severity of pediatric asthma; in this study, contrary to our study, preterm infants who were often underweight at birth were excluded from the study, which may be due to differences in findings. Given that the severity of childhood asthma may be influenced by other factors such as milk consumption during infancy, co-morbidities, and family economic status, similar studies on the relationship between pediatric asthma severity and these factors are recommended.

## Conclusion

In this descriptive-analytical cross-sectional study to investigate the relationship between asthma risk factors and its severity in children with asthma referred to the asthma and allergy clinics of Urmia university of medical sciences during the years 1300-1499, the findings show 53.5% of children with mild asthma, 34.5% of children with moderate asthma and 12% of children with severe asthma. Also, 82% of children had a normal BMI and 18% were obese. There was a significant relationship between asthma severity with BMI, gestational age and type of delivery in both boys and girls with asthma, so that most obese, preterm, and cesarean section children had moderate or severe asthma. There was no significant relationship between asthma severity with age, sex, maternal education, and birth weight of children.

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