

# CHILDHOOD ASTHMA AND RISK FACTORS IN KSA (CROSS SECTIONAL STUDY)

## Abstract

The purpose of this study is to determine the relationship between different variables (namely: age group, gender, risk factors like having a smoking parent, allergic rhinitis, skin allergy, food allergy, and family history of atopy) and the diagnosis of childhood asthma. Also, the purpose is to determine the prevalence of asthma among the pediatric sample taken in the study, and the prevalence of the different symptoms and complication among this population.

A significant relationship was found between childhood asthma and age group, allergic rhinitis, skin allergy, food allergy, and family history of atopy. The results are concordant, in most parts of this study, with the previous studies in different times and regions, done for the nearly similar purposes.

## **Introduction**

Asthma is a chronic inflammatory disorder of the airways characterized by an airflow obstruction. Among pediatric population aged 5-17 years, asthma accounts for a loss of 10 million school days annually and costs caretakers \$726.1 million per year because of work absence.

## **Symptomatology**

Signs and symptoms of asthma are various. Despite, they can be commonly included in the following:

**Wheezing:** which is a musical, high-pitched whistling sound caused by turbulence of the airflow. Wheezing is one of the most common asthma symptoms. It occurs usually during exhalation.

**Cough:** which is often non-productive and non-paroxysmal. It may also co-exist with wheezing. Cough at night or with exercise may be the only symptom of asthma, especially in cases of exercise-induced or nocturnal asthma. In such cases, children tend to cough after midnight, or during the early morning hours.

**Shortness of breath** is also a common symptom of asthma, especially present during the asthmatic attack itself.

**Chest tightness** may be present with or without other symptoms of asthma. This is especially in exercise-induced or nocturnal asthma

In an acute episode of asthma, symptoms can vary depending on the severity of the episode. Infants and young children suffering a severe episode show the following characteristics: Breathless during rest, no interest in feeding, sitting upright, talking in words, and agitation.

With imminent respiratory arrest, the child displays the aforementioned symptoms and is also drowsy and confused. However, adolescents may not have these symptoms until they are in frank respiratory failure.

## Physical examination

Findings during a severe episode include the following: tachypnea (RR > 30 breaths per min), use of accessory muscles of respiration, suprasternal retractions, tachycardia > 120 bpm, loud biphasic (expiratory and inspiratory) wheezing, pulsus paradoxus, O<sub>2</sub> saturation > 91% on RA.

Findings in status asthmaticus with imminent respiratory arrest include the following:

Paradoxical thoracoabdominal movement, absent wheezing, severe hypoxemia, bradycardia, absent pulsus paradoxus.

## Diagnosis

Diagnostic tests of asthma include the following:

Pulmonary function tests (PFTs): Spirometry and plethysmography.

Exercise challenge: Involves baseline spirometry followed by exercise on a treadmill or bicycle to a heart rate greater than 60% of the predicted maximum, with monitoring of the electrocardiogram and oxyhemoglobin saturation.

Fraction of exhaled nitric oxide (FeNO) testing: Noninvasive marker of airway inflammation.

Radiography: Reveals hyperinflation and increased bronchial markings; radiography may also show evidence of parenchymal disease, atelectasis, pneumonia, congenital anomaly, or a foreign body

Allergy testing: Can identify allergic factors that may significantly contribute to asthma

Histologic evaluation of the airways: Typically reveal infiltration with inflammatory cells, narrowing of airway lumina, bronchial and bronchiolar epithelial denudation, and mucus plugs

## Management

Guidelines from the National Asthma Education and Prevention Program emphasize the following components of asthma care:

**Assessment and monitoring:** In order to assess asthma control and adjust therapy, impairment and risk must be assessed; because asthma varies over time, follow-up every

2-6 weeks is initially necessary (when gaining control of the disease), and then every 1-6 months thereafter.

**Education:** Self-management education should focus on teaching patients the importance of recognizing their own level of control and signs of progressively worsening asthma symptoms; educational strategies should also focus on environmental control and avoidance strategies, as well as on medication use and adherence (eg, correct inhaler techniques and use of other devices)

### **Control of environmental factors and comorbid conditions**

#### **Pharmacologic treatment**

Pharmacologic asthma management includes the use of agents for control and agents for relief. Control agents include the following: Inhaled corticosteroids (ICS), inhaled cromolyn or nedocromil, long-acting bronchodilators, theophylline, leukotriene modifiers, anti-immunoglobulin E (IgE) antibodies (omalizumab), interleukin inhibitors (eg, mepolizumab, benralizumab, dupilumab).

Relief medications include the following: short-acting bronchodilators (SABA), systemic corticosteroids, and short-acting muscarinic antagonists (SAMA) like ipratropium.

## Literature review

### Age of presentation:

According to the most recent evidence, age of diagnosis for most cases of childhood asthma is before 5 years of age, with more than half developing the symptoms of asthma before 3 years of age. This finding could be misleading in some degree because of difficulty of performing diagnostic tests for asthma on pediatric population.

### Common symptoms of first presentation:

Frequent coughing, wheezing, and congestion are among the top common symptoms of presentation of asthma in childhood. Viral infections can be a trigger of asthmatic attacks in children.

### Chart 1. Relationship between asthma and different associations:

Study	Year	Result
Asthma and gender: The female lung	2016	Asthma is more prevalent in females than in males
Health effects of passive smoking. 3. Parental smoking and prevalence of respiratory symptoms and asthma in school age children.	1997	Exposure to smoke from either parents, increases prevalence and symptoms of asthma in pediatric populations.
The natural course of atopic dermatitis from birth	2007	Early atopic dermatitis is associated with asthma at school age, but in many of these asthmatic

to age 7 years and the association with asthma		children, wheezing manifests before or with the onset of atopic dermatitis.
Food allergy and asthma—what is the link?	2003	Food allergy is a significant risk factor associated with asthma, and a risk factor for more severe asthmatic attacks and complications.
Allergic rhinobronchitis: The asthma–allergic rhinitis link	1999	Allergic rhinitis has a strong association with asthma, both allergic and non-allergic types, with stronger link with the allergic one, and maybe the same mechanisms involved.
Family History of Asthma and Atopy: In-depth Analyses of the Impact on Asthma and Wheeze in 7- to 8-Year-Old Children	2007	Family history of asthma and atopy is associated with prevalence of asthma in siblings

UNDER PEER REVIEW

## **Methodology**

### **Study design:**

This is an analytical cross-sectional study.

### **Study Setting and period:**

This is an analytical cross-sectional study conducted at universities, hospitals, malls of the KSA from February 2021 until October 2021

### **Study population and sampling:**

Study participants:

Inclusion criteria; Parents of children who are less than 13 years of age.

Exclusion criteria; none.

### **Sampling method and size:**

The study is carried out by questionnaire. Randomly selected sample is sized 640 cases.

## **Measurements**

### **Explanatory variables:**

1. Sociodemographic characteristics: Child's age category, gender, and child housing.
2. Disease-related information: risk factors including passive smoking, co-existent or history of atopy, family history of atopy. Other variables include diagnosis of asthma in childhood, age at diagnosis, First presentation symptom, and different complications of asthma.

**Outcome measures:**

The outcome measure is by counting the ratio of the number of patients suffering from childhood asthma, and associated risk factors, symptoms of presentation, and complications of asthma.

**Prevalence study:** was carried out to test the questionnaire if easily understood and well-responded by the participants. Data from the cross-sectional study was used to calculate the sample size.

**Data Management and Analysis plan:**

Data is entered and analyzed using SPSS version 25.0. Descriptive statistics are performed and categorical data are displayed as frequencies and percentages, while measures of central tendencies and measures and dispersion are used to summarize continuous variables. Univariate and multivariate analysis are performed to investigate association between depression, and risk factors, and associated diseases. Statistical significance is set at a P value of 0.05 or less.

**Ethical considerations:**

Administrative approval is sought from the unit of biomedical ethics research committee. Ethical approval is sought from the ethical committee of the faculty of medicine, King Abdulaziz University. An informed consent is sought from the participants.



## Results

### Descriptive Data:

Sample size is 640 cases. Age categories are as follows: <1 year: 49 (7.7%), 1-3 years: 138 (21.6%), 4-6 years: 136 (21.3%), 7-10 years: 155 (24.2%), 11-12 years: 162 (25.2%). Sex distribution is as follows: 333 (52%) males, and 307 (48%) females. 587 (91.7%) are living in the same house with their parents.

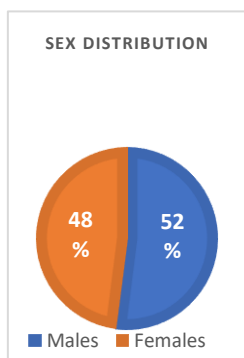


Fig 1. Sex distribution

As for risk factors, 217 (33.9%) have at least one smoking parent, 164 (25.6%) have a history of food allergy, 177 (27.7%) have a history of allergic rhinitis, and 334 (52.2%) have a family history of atopy. 80 (9.4%) have an established diagnosis of childhood asthma.

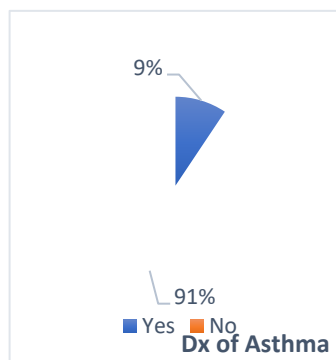
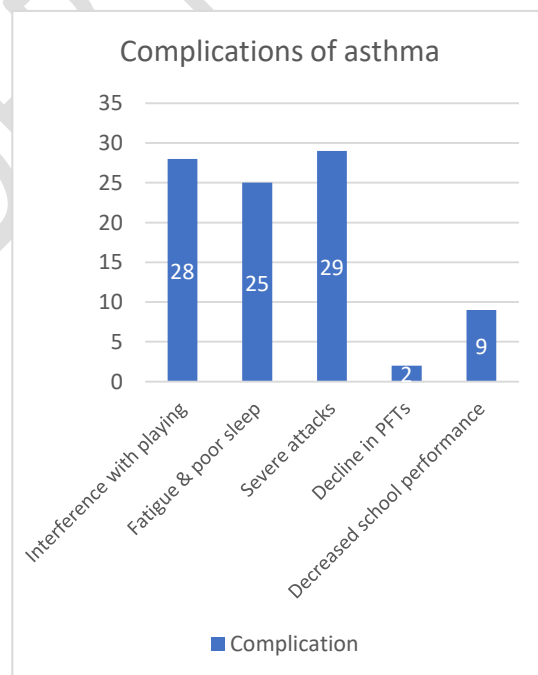


Fig 2. Dx of Asthma

**Among 60 cases diagnosed with asthma:**

Age of diagnosis was at: < 1 year in 16 cases (26.7%), 1-5 years in 35 cases (36.7%), 6-10 years in 10 cases (16.7%), and 11-12 years in 12 cases (20%). First presentation of asthma was: wheezing in 12 cases (20%), frequent coughing in 18 cases (30%), bouts of cough or wheezes worsening with flu or cold in 6 cases (10%), trouble sleeping in 6 cases (10%), fatigue due to poor sleep in 5 cases (8.3%), delayed recovery of bronchitis in 1 case (1.7%), shortness of breath in 7 cases (11.7%), chest congestion or tightness in 4 cases (6.7%), and trouble breathing hampering daily activities in 1 case (1.7%). When their parents were asked if they are given regular treatment, 5 cases (8.3%) never received regular treatment, 7 cases (11.7%) receive their treatment seldom, 13 (21.7%) often, and 35 (58.3%) do always. As for complications, they shown in the side-shown figure.



### Fig 3. Complications of asthma

**Chart 2. Association of Childhood asthma with different variables:**

Variable		Diagnosed with asthma (Chi-square)	P-value
Age group	< 1 year	3	0.006
	1-3 years	8	
	4-6 years	12	
	7-10 years	10	
	11-12 years	27	
Gender	Male	32	0.892
	Female	28	
Smoking parent	Yes	26	0.116
	No	34	
Skin allergy	Yes	26	0.002
	No	34	
Food allergy	Yes	27	0.000
	No	33	
Allergic rhinitis	Yes	48	0.000
	No	12	
FHx of atopy	Yes	48	0.000
	No	12	0.000

Association is studied between diagnosis of asthma, and age group, gender, and risk factors like having a smoking parent, skin allergy, food allergy and family history of atopy. All of these associations have significant statistical relationship with the diagnosis of asthma except for gender and having a smoking parent.

## **Discussion:**

The results of this study are concordant, in some parts, with the results of previous different studies discussing the same associations, between childhood asthma and different variables including age, gender, risk factors like having a smoking parent, food or skin allergies, allergic rhinitis and family history of atopy. In some parts of study, there is insignificant statistical relationship, this could be due to unequal distribution of cases, sampling errors and bias.

There was a significant association between age group and childhood asthma presence among cases involved in this study. This matches well with the results of other studies stating that significant variance of such variables.

Also, in this study, there is a significant relationship between certain risk factors and diagnosis of childhood asthma. Of these variables, “having a smoking parent” didn’t show any statistical significance. On the other hand, a significant relationship was found with having allergies (skin, food), or family history of atopy. This was also concordant with the results of previous studies done in the same purpose that is to study the relationship with asthma in childhood period. They have shown significant relationship between such variables, and diagnosis of childhood asthma.

## Conclusion:

Childhood asthma has an obvious relationship with different variables and conditions, significantly with age, risk factors like skin allergy, food allergy and allergic rhinitis, and family history of atopy among siblings.

## References

- 1- Scott JP, Peters-Golden M. Antileukotriene agents for the treatment of lung disease. *American journal of respiratory and critical care medicine*. 2013 Sep 1;188(5):538-44.
- 2- Jindal SK, ed. (2011). *Textbook of pulmonary and critical care medicine*. New Delhi: Jaypee Brothers Medical Publishers. p. 242. ISBN 978-93-5025-073-0. Archived from the original on 2016-04-24.
- 3- Miller RL, Ho SM. Environmental epigenetics and asthma: current concepts and call for studies. *American journal of respiratory and critical care medicine*. 2008 Mar 15;177(6):567-73.
- 4- Cook DG, Strachan DP. Health effects of passive smoking. 3. Parental smoking and prevalence of respiratory symptoms and asthma in school age children. *Thorax*. 1997 Dec 1;52(12):1081-94.
- 5- Pignataro FS, Bonini M, Forgiione A, Melandri S, Usmani OS. Asthma and gender: the female lung. *Pharmacological research*. 2017 May 1;119:384-90.
- 6- Illi S, von Mutius E, Lau S, Nickel R, Grüber C, Niggemann B, Wahn U, Multicenter Allergy Study Group. The natural course of atopic dermatitis from birth to age 7 years and the association with asthma. *Journal of Allergy and Clinical Immunology*. 2004 May 1;113(5):925-31.
- 7- Roberts G, Lack G. Food allergy and asthma—what is the link?. *Paediatric respiratory reviews*. 2003 Sep 1;4(3):205-12.
- 8- Simons FE. Allergic rhinobronchitis: the asthma–allergic rhinitis link. *Journal of allergy and clinical immunology*. 1999 Sep 1;104(3):534-40.
- 9- Pediatric Asthma: Practice Essentials, Background, Pathophysiology [Internet]. *Emedicine.medscape.com*. 2021 [cited 31 October 2021]. Available from: <https://emedicine.medscape.com/article/1000997-overview>