



# Bronchial Asthma in Infants and Children in Arar City, Northern Saudi Arabia

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## ABSTRACT

**Background:** Bronchial asthma frequently occurs in infants and children and it appears as frequent coughing, chest tightness, and distress. **Objective:** To study the risk factors, triggers, and associated conditions of bronchial asthma in infants and children in Arar, Saudi Arabia. **Methods:** An analytical hospital-based cross-sectional study, carried out in the pediatrics department of the maternity and children hospital in Arar city, Northern Saudi Arabia, during the period from 1 August to 31 September 2020. Data were collected by a personal interview with the mothers or caregivers accompanying all infants and children attending the hospital during the study period, and filling a predesigned questionnaire. **Results:** The study included 181 cases of bronchial asthma, 51.9% were males, 40.9% aged between 6 to 10 years old, 33.7% were between 11 to 18 years old, and 25.4% were 5 years old or younger. A family history of asthma was reported in 48.1% and 50.8% reported consanguinity between parents and 53.0% reported repeated exposure to passive smoking. As regards associated conditions; 37.6% reported seasonal flu, 39.2% allergic rhinitis, and 23.2% skin allergy. Regarding asthma triggers; our study reported 60.2% dust, 27.6% cold water, 5.5% physical exercise, 3.3% neurological stress, and only 3.3% cigarette smoke. The main complaint during asthma attacks was cough in 32%, shortening of breath 51.4%, chest tightness 12.2%, and sneezing in 4.4%. However, 62.4% of the cases use corticosteroids regularly. **Conclusion:** In the current study, there was a significant relationship between regularity of asthma attacks with age, regular use of corticosteroids, and repeated exposure to passive smoking while the relation was insignificant with gender and presence of associated comorbidities.

**Key Words:** bronchial asthma, risk factors, triggers, associated conditions, infants, children, Arar, Saudi Arabia.

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## INTRODUCTION

Asthma is a disorder of the bronchial tree characterized by variable and recurring symptoms, inflammatory changes of the bronchial mucosa, easily triggered bronchospasms, and mild to severe obstruction of airflow. The various symptoms of asthma that are caused by the airway inflammation which are usually associated with widespread but variable airflow obstruction. Also, they cause an associated increase in airway responsiveness to a variety of stimuli [1, 2]. With asthma prevalence increasing over the past few decades and higher asthma prevalence in Westernized nations [3, 4] unexplained temporal and geographic variations in asthma prevalence

have also been reported [5, 6].

The other common and affective symptoms of asthma are recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing. These may occur a few times a day or a few times per week. Asthma symptoms may become worse at night or with exercise depending on the person [7].

Bronchial asthma frequently occurs in infants and children and it appears as frequent coughing, chest tightness, and distress. In children, asthma prevalence is substantially higher than in adults [8]. Also, although this reverses around puberty, it varies by sex where in children it is higher among boys [5, 8].

Although asthma begins in childhood, estimates of its

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incidence in the various age groups vary widely. Most children develop asthma before age 8, and almost 50% before age 3, however, it is difficult to assess a real incidence of bronchial asthma before age 5 because of problems in obtaining clinical or epidemiological information and also the association with a variety of factors like recurrent viral infections, gastroesophageal reflux, etc which can induce inflammation and hyperresponsiveness of the airways which can easily be misinterpreted as asthma [9].

Family history and parental smoking have an important impact on asthma and wheezing illnesses in infants and children [10].

Asthma is thought to be caused by a combination of genetic and environmental factors. Exposure to air pollution and allergens and other potential triggers like medications are known as the Environmental factors [11].

It was reported that, due to genetic influence, asthma may start before the age of 12 years old while the asthma after onset age 12 may be because of environmental influence.

By avoiding triggers, such as allergens and irritants, and using inhaled corticosteroids, symptoms can be prevented because there is no cure for asthma.

The long-term prognosis of childhood asthma is less optimistic than previously believed. Approximately, 30% of the patients relapse and become symptomatic in adolescence and in early adulthood after becoming symptom-free [1].

### Rationale

According to the changes in the quality of life and the health hazards of infants and children who suffer from bronchial asthma and their families, it is important to address the current burden of bronchial asthma in infants and children in Arar, Saudi Arabia.

### Study objectives:

This study was conducted to better understand the patterns of bronchial asthma, its risk factors, and etiology in the infants and children in Arar city, Saudi Arabia.

So, our objective is to study the risk factors, triggers, and associated conditions of bronchial asthma in infants and children in Arar, Saudi Arabia.

### METHODS & PARTICIPANTS:

#### Study design and setting:

An analytical hospital-based cross-sectional study, carried out in the pediatrics department of the maternity and children hospital in Arar city, Northern Saudi Arabia, during the period from 1 August to 31 September 2020.

All infants and children attending the hospital during the study period were included in the study.

Inclusions criteria include Saudi infants and children attending the hospital for any cause.

Exclusion criteria include non-Saudi infants and children and refusing persons.

#### Sample Size:

The included sample was calculated using the following formula:

$$N = Z^2 \times P(1-P) / E^2$$

Where:

N = sample size

$Z^2 = 1.96$  (The critical value that divides the central 95% of the Z distribution from the 5% in the tail)

P = the prevalence, of bronchial asthma in infants and children in Arar, Saudi Arabia.

E2 = the margin of error (= width of confidence interval)

Therefore, by calculation, the sample size is equal to 284 cases with a 10% drop-out rate, so the total sample size will be 315 cases.

#### Sampling Technique:

The cases were selected using a systematic random sampling technique. First, the case was chosen randomly from the infants and children attending the hospital. Second, every 3<sup>rd</sup> case was included till the end of the sample (315 cases).

#### Data collection:

Data were collected by a personal interview with the mothers or caregivers accompanying the infants and children attending the pediatric department of the maternity and children hospital, and filling a predesigned questionnaire that included the following items; Gender, age group, family history of asthma, and asthma-related characteristics of the participants as a family history of asthma period of asthma consanguinity between parents' degree of asthma repeated exposure to passive smoking associated comorbidities as seasonal flu, allergic rhinitis, skin allergy regularity of asthma attacks and the main complaint during asthma attacks.

#### Ethical considerations:

Approval to carry out the study was obtained from the Research Ethics Committee of the Northern Border University. Data was anonymous for patient confidentiality and the data is kept safe.

#### Data management and Statistical analysis:

The collected data was entered and analyzed using the Statistical Package for the Social Science (SPSS Inc. Chicago, IL, USA) version 23. Descriptive statistics were performed. Percentages were given for qualitative variables. The determinant factors were determined using the Chi-square test. P-value was considered significant if  $P < 0.05$ .

## RESULTS

Table 1: Shows Gender, age group, family history of asthma, and asthma-related characteristics. It is clear from the table that, the study included 181 cases of bronchial asthma, 51.9% were males, 40.9% aged between 6 to 10 years old, 33.7% were between 11 to 18 years old, and 25.4% were 5 years old or younger. A family history of asthma was reported in 48.1%. Among the cases, 21.0% had a period of asthma of 7 years or longer, 50.8% reported consanguinity between parents. The degree of asthma was moderate in 41.4% of the cases, mild in 30.9%, severe in 22.1%, and highly severe in 5.5%. More than half (53.0%) of the cases reported repeated exposure to passive smoking. In our study; 37.6% of participants reported seasonal flu, 39.2% allergic rhinitis, and 23.2% skin allergy. Regarding asthma triggers; our study reported 60.2% dust, 27.6% cold water, 5.5% physical exercise, 3.3% neurological stress, and only 3.3% cigarette smoke. Around two-thirds (67.4%) had irregular asthmatic attacks, The main complaints during asthma attacks reported in our study were cough 32%, shortening of breath 51.4%, chest tightness 12.2%, and sneezing 4.4% and 62.4% of the cases use corticosteroids regularly. Table 2: Illustrated the relation between regularity of asthma attacks with gender, age group, and asthma-related characteristics. There was a statistically significant relation between regularity of asthma attacks and age group, regular use of corticosteroids, and repeated exposure to passive smoking. On the other hand, there was a statistically insignificant relation with gender, consanguinity between parents, and associated comorbidities.

**Table 1: Gender, age group, family history of asthma, and asthma-related characteristics of the participants, 2020. (N=181)**

Variables	Frequency (N=181)	Percent (%)
<b>Gender</b>		
• Male	94	51.9
• Female	87	48.1
<b>Age group</b>		
• 5years or	46	25.4
• 6 – 10 years	74	40.9
• 11 – 18 years	61	33.7
<b>Family history of asthma</b>		
• Yes	87	48.1
• No	94	51.9
<b>Period of asthma</b>		
• 1 year or less	24	13.3

• 2 – 4 years	66	36.5
• 5 – 6 years	53	29.3
7 years or longer	38	21.0
<b>Consanguinity between parents</b>		
• Yes	92	50.8
• No	89	49.2
<b>Degree of asthma</b>		
• Mild	56	30.9
• Moderate	75	41.4
• Severe	40	22.1
• Highly severe	10	5.5
<b>Repeated exposure to passive smoking</b>		
• Yes	96	53.0
• No	85	47.0
<b>Associated comorbidities</b>		
• Seasonal flu	68	37.6
• Allergic rhinitis	71	39.2
• Skin allergy	42	23.2
<b>The regularity of asthma attacks</b>		
• Regular	59	32.6
• Irregular	122	67.4
<b>Main complaint during asthma attacks</b>		
• Cough	58	32.0
• Shortness of	93	51.4
• Chest tightness	22	12.2
• Sneezing	8	4.4
<b>Symptoms get worse at night</b>		
• Yes	157	86.7
• No	24	13.3
<b>Symptoms get worse after physical exercise</b>		
• Yes	127	70.2
• No	54	29.8
<b>Precipitating factors of asthma attacks</b>		
• Dust	109	60.2
• Cold weather	50	27.6
Physical exercise	10	5.5
• Neurological	6	3.3
• Cigarette smoke	6	3.3
<b>Regular use of corticosteroids</b>		
• Yes	113	62.4
• No	68	37.6

**Table 2: Relation between regularity of asthma attacks with gender, age group, and asthma-related characteristics.**

Characteristics	Responses	Regularity of asthma attacks		Total (N=181)	P-value
		Regular (N=59)	Irregular (N=122)		
Gender	Male	26 44.1%	68 55.7%	94 51.9%	0.094
	Female	33 55.9%	54 44.3%	87 48.1%	
Age group	5years or younger	10 16.9%	36 29.5%	46 25.4%	0.032
	6 – 10 years	32 54.2%	42 34.4%	74 40.9%	
	11 – 18 years	17 28.8%	44 36.1%	61 33.7%	
Consanguinity between parents	Yes	29 49.2%	60 49.2%	89 49.2%	0.562
	No	30 50.8%	62 50.8%	92 50.8%	
Regular use of corticosteroids	Yes	25 42.4%	88 72.1%	113 62.4%	0.0001
	No	34 57.6%	34 27.9%	68 37.6%	
Associated comorbidities	Seasonal flu	22 37.3%	46 37.7%	68 37.6%	0.766
	Allergic rhinitis	25 42.4%	46 37.7%	71 39.2%	
	Skin allergy	12 20.3%	30 24.6%	42 23.2%	
Repeated exposure to passive smoking	Yes	40 67.8%	56 45.9%	96 53.0%	0.004
	No	19 32.2%	66 54.1%	85 47.0%	

**DISCUSSION:**

Asthma is one of the most common chronic diseases in Saudi Arabia [12]. The prevalence of asthma in KSA is higher than in Arab countries and Europe [13, 14]. Local studies show that the incidence of asthma has risen over the past three decades [15, 16]. Our research was conducted to study the causes, risk factors, triggers, and associated conditions of bronchial asthma in infants and children in Arar, Saudi Arabia. Different asthma prevalence rates were reported in different regions in Saudi Arabia with the highest 24% in Gizan followed by Taif 23%, Hail 22%, Al-Gazim 16%, Abha 13%, Dammam 12%, Hofuf 14%, Jeddah 12%, and Riyadh 10% [14].

Regarding asthma triggers; our study reported 60.2% dust, 27.6% cold water, 5.5% physical exercise, 3.3%

neurological stress, and only 3.3% cigarette smoke. Physical activity-induced asthma, parental tobacco smoke, and perfumes & household detergents were the most common asthma aggravating factors reported by other studies in KSA [12]. Another previous study found that indoor air pollution was an important risk factor as the prevalence was higher among those using smoke-producing fuel at home [15, 17-20]. Similar observations were made by Jindal et al [16].

The main complaints during asthma attacks reported in our study were cough 32%, shortening of breath 51.4%, chest tightness 12.2%, and sneezing 4.4%. Children and adolescents with uncontrolled asthma were reported to have more severe symptoms during physical activity than children and adolescents with controlled asthma. It is generally believed that asthmatic children have a frequent interruption of sleep, absences from school, and overstay in hospitals [21]. Another study reported that; among asthmatic children, 72.3% reported cold/rhinitis (54.6%), 63.6% nocturnal dry cough, 50.5% sleep disturbances, and 38.9% speech disturbances in the past 1 year [15]. Another previous study reported 72.7% of asthmatic children and adolescents had cold or rhinitis, (45.5%) of the current asthmatics had >3 episodes of wheezing and 54.5% of them had itching or rashes and nocturnal dry cough [22].

Regarding associated comorbidities; In our study; 37.6% of participants reported seasonal flu, 39.2% allergic rhinitis, and 23.2% skin allergy. Many comorbid conditions were found to be associated with asthma, such as cardiovascular disease, hypertension, diabetes, allergies, obesity, metabolic and endocrine conditions, gastroesophageal reflux disease, and urinary tract conditions. In many previous studies, several comorbidities such as obesity, gastro-esophageal reflux; dysfunctional breathing, and mental disorders that may exacerbate the severity of asthma symptoms are associated with severe asthma in children [21]. This agreed with another study that reported allergic rhinitis and sinusitis are very common comorbidities in patients with asthma, both in children and in adults [23]. As for comorbidities in another Saudi study, only 0.7% had diabetes, with no difference between asthmatics and non-asthmatics. Moreover, self-reported asthmatics had a higher rate of hematological disorders (4.9% vs. 3.6%, p=0.05), allergies-other than asthma (12.2% vs. 4.0%, p<0.001) and genitourinary diseases (2.3% vs 1.1%, p=0.002) [15].

Disagreeing with other studies [15, 24-27] which reported the occurrence of asthma in males more than females, our study revealed no significant correlation between gender and regularity of asthma attacks. Previous literature showed strong links between asthma and lifestyle factors, school behaviors, children’s’ psychological state, and

violence [15]. Poongadan et al. reported that asthmatics watch more TV and have increasing mental stress. They also showed that there is an increasing association between sedentary lifestyle and asthma [28]. Another study reported a higher prevalence among males than females: 11.3% and 7.9%, respectively [29].

However, in our study, results have shown that no significant correlation of bronchial asthma could be established with age. This was also observed by Arora et al. in their study [30]. Another study reported the same results and explained this based on a study by Martin et al. suggesting a prevalence of asthma decreased by up to three-fourth with age [31]. It was observed in a previous study that prevalence is significantly more among those with a family history of bronchial asthma similar to other studies [32, 33]

In the present study, 62.4% of the cases use corticosteroids regularly and regularity of asthma was significant with corticosteroid's use. Another study reported that; in comparison with children and adolescents with controlled asthma, more impaired HR-QoL have been found in children and adolescents with impaired asthma control [12]. The goal of asthma management in children is to control asthma by augmenting lung function, reducing symptoms [34]. It is important to achieve control with a minimum of medication side effects, especially in children. Although long-term use of high-dose systemic corticosteroids increases the risk of systemic side effects such as growth retardation, adrenal suppression, and altered skin and bone metabolism; several children require continuous use of oral corticosteroids to keep asthma controlled [35].

#### CONCLUSION:

In the current study, there was a significant relationship between regularity of asthma attacks with age, regular use of corticosteroids, and repeated exposure to passive smoking while the relation was insignificant with gender and presence of associated comorbidities. So, we recommend health education sessions for mothers and other caregivers about childhood asthma, its risk, and precipitating factors, and drugs used during and between the attacks. we also recommend large-scale community-based screening research to discover all cases of infants and childhood asthma and to study is associated with morbidities, triggers, and use of corticosteroids.

#### Conflict of interest:

authors declared that there was no conflict of interest with any persons or organizations.

#### Budget:

This study was self-funded. There were no funding institutions.

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