

Exploring the Risk Factors of Childhood Asthma among Pediatric Patients: Insights from a Tertiary Care Hospital in Khyber Pakhtunkhwa

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ABSTRACT

Background: Childhood asthma represents a significant health challenge globally, with millions of children affected by this chronic respiratory condition. While asthma can arise from a complex interplay of genetic and environmental factors, understanding the specific risk factors prevalent in distinct regions is crucial for effective prevention and management strategies.

Objective: The present study was conducted with the aim to find out the risk factors of asthma in children.

Methodology: This case-control study was conducted at the department of pulmonology and Department of Paediatric medicine Qazi Hussain Ahmad Medical Complex, Nowshera from January 2018 to February 2021 after taking permission from the ethical committee of the institute. Data was gathered on the proforma designed for our study. The risk was determined employing the odds ratio.

Results: In this study, 402 participants were enrolled in which 202 participants were asthmatic and 200 were non asthmatic. Out of 402 individuals 242 (60%) were male and 160 (40%) were females. Hospitalizations in asthmatic children were more prevalent than those for non-asthmatic kids ($p < 0.0001$). The majority of urban asthmatic children have a history of asthma in their parents ($p < 0.0001$) and or allergic rhinitis. Compared to children without asthma, 38.1% of them had at least one smoker in their family and were weaned earlier (OR=12.4, 95% CI = 1.3 – 4.4, $p = 0.01$).

Conclusion: Childhood asthma was highly correlated with family history of allergic rhinitis and asthma. Living in an urban area, having parents who smoke, and weaning children deprived early from breast milk were the major risk factors. The findings emphasize the necessity of informing parents about the dangers of smoking and the onset of asthma at an early age.

Keywords: Children; Asthma; Allergic Rhinitis

Introduction

Childhood asthma remains a significant global health challenge, affecting millions of children worldwide. This chronic respiratory condition is characterized by inflammation and narrowing of the airways, leading to recurrent episodes of wheezing, coughing, chest tightness, and shortness of breath. Its prevalence and impact on public health systems are particularly pronounced in low- and middle-income countries, where environmental pollution, inadequate healthcare access, and socio-economic disparities exacerbate the burden of disease.

While asthma affects children across diverse socio-cultural and environmental contexts, its prevalence and risk factors vary geographically. Understanding these risk factors is essential for effective prevention, management, and control of childhood asthma. Numerous factors contribute to the development and exacerbation of asthma in children, including genetic predisposition, environmental exposures (such as air pollution and allergens), respiratory infections, and socio-economic determinants (such as poverty and inadequate access to healthcare).

Asthma affects children all over the globe and over the past 2 years, there has been a significant rise in the frequency of allergies and asthma in general, especially in kids.¹ Its incidence varies around the world. As an example, the prevalence of wheeze in children aged 6-7 is 4.1 percent in Indonesia whereas in Costa Rica it is 32.1 percent.^{2,3} The incidence of asthma in Brazil, among boys and girls aged 6 to 7 years is 7.3% and 4.9%, correspondingly and 9.8 percent and 10.2 percent among those with age of 13 to 14 years.³ According to a current research, the asthma frequency is 4 to 20 % in various regions of India.^{4,5} A study conducted in 1997 on the incidence of asthma among Pakistani students showed that ten percent of them had the disease. When same research was conducted again in 2006, the results showed that the frequency went up to 18 percent among children in the 13 to 14 age range.⁶ Specifically in non-developed countries of the world the incidence of asthma continues to increase and its prevalence in Pakistan is 4 to 5 percent.⁷

Despite advances in asthma research and management, there remains a need for comprehensive studies focusing on the specific risk factors prevalent in various regions. This knowledge gap impedes efforts to develop targeted interventions and strategies tailored to the unique needs of children in different geographical settings.

To address this gap in knowledge, this study investigates the risk factors of childhood asthma among patients attending a tertiary care hospital in Khyber Pakhtunkhwa. By focusing on children in a tertiary care setting, we aim to elucidate the socio-cultural, environmental, and health-

care-related factors contributing to the burden of childhood asthma in KP. The findings of this study can inform evidence-based interventions and policies tailored to the unique context of Khyber Pakhtunkhwa, ultimately reducing the prevalence and impact of childhood asthma in this region.

Objective

The present study was conducted with the aim of the current study was to find out the risk factors of asthma in children.

Methodology

This case-control study was conducted at the department of pulmonology and Department of Paediatric Medicine, Qazi Hussain Ahmad Medical Complex, Nowshera from January 2018 to February 2021 after taking permission from the ethical committee of the institute. A total of 402 children aged who visited the hospital were enrolled. There were 202 children in the patient group who were asthmatic, and there were 200 children in the control group who did not have asthma. Participant aged were from 12 months to 8 years and medically diagnose asthma on X-ray physical examination were included in the study. Children of similar age participated as the controls, and they came into the hospital's pediatrics department instantly as the index case was chosen. The controls were to be identical ages (± 3 months) of the relevant individual and not have any history of respiratory conditions or wheezing episodes. After they granted permission to take part in the study a member of the study team filled out the questionnaire and conducted interviews with the parents in their native tongue. Data was collected on height, weight at birth, current weight, and family history of atopy, environment (both internal and external pollutants), breastfeeding history, morbidity (asthma attack conditions, clinical symptoms, hospital), and management (asthma therapy received, medical follow-up). The latter parameters applied to the children who had asthma. To compare qualitative variables, Fisher's exact test or Pearson's chi-square test was used. Quantitative variables were analyzed using the Wilcoxon test. At $p < 0.05$, differences were considered notable. By computing Odds Ratios (OR) and corresponding intervals of confidence (CI) for each tested factor, the significance of association between asthma and risk variables was assessed.

Results

In this study, 402 participants were enrolled in which 202 participants were asthmatic and 200 were non asthmatic. The mean age of the asthmatic group was 35.9 ± 17.7

Table 1. General risk factors for Asthma occurrence among study cases

Factors	Asthmatic children N =202 (%)	Control group N=200 (%)	Odd Ratio (95% CI)	P-value
Exclusively breast fed (4-6 months)	71 (35.1)	46 (23)	2.2 (1.1-4.3)	<0.05
Early weaning (before 4 months)	125 (61.8)	81 (40.5)	12.4 (1.3-4.4)	<0.01
Born in slum area	180 (89.1)	161 (80.5)	3.2 (1.0-12.1)	<0.05
Resident of slum area	104 (51.4)	29 (14.5)	16.6 (3.1-14.6)	<0.0001
Living in flat or covered houses	170 (84.1)	118 (59)	5 (2.3-11.1)	<0.0001
Animal at home	57 (28.2)	59 (29.5)	0.9 (0.4-1.8)	NS
Carpet at home	48 (23.7)	27 (13.5)	2 (0.9-4.4)	NS

months and control group had 38.1 ± 18.9 . out of 402 individuals 242 (60%) were male and 160 (40%) were females (Figure 1).

Among study cases, 16 (7.9%) of the children with asthma were born weighing less than 2500g, compared to 25 (12.3%) in the children in the control group. Less than half of children (42.1%) visited a doctor on a regular basis for their asthma, and 56.2 percent took medication as

recommended.

Between the exclusively breast feeding and asthma there was a close relationship (OR 2.2, 95% CI 1.1 - 4.3, $p = 0.05$). Place of birth and asthma was significantly associated with OR 3.2, 95% CI 1.0 - 12.1 $p < 0.05$ and asthma was also associated significantly with individual's residence (OR 6.63, 95% CI 3.1-14.6, $p = 0.0001$). Just 14.5% of the children in the control group children and

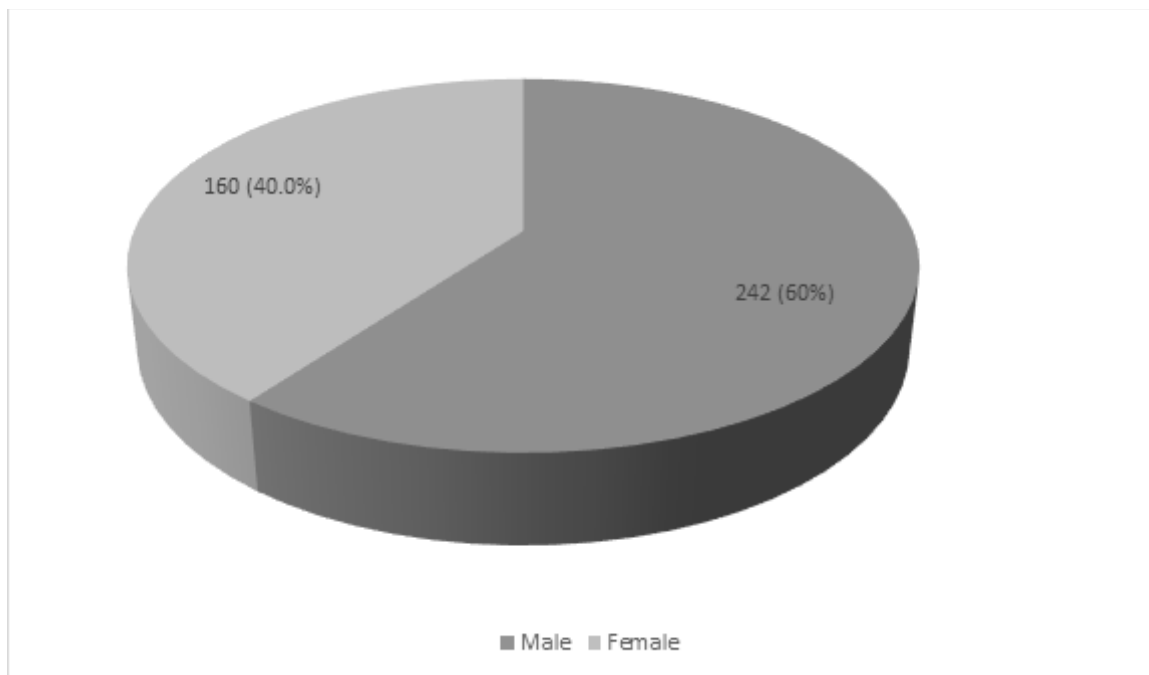


Figure 1. Gender distribution of study cases

51.4% of the asthmatic boys resided in inner cities. Of the children with asthma, 23.7% lived in homes with at least one carpet, compared to 13.5% in kids without asthma (OR 2, 95% CI 0.9 - 4.4, $p = 0.06$) (Table 1). There was a strong correlation between asthma and having a smoker in the house, whether it is a parent, sibling, or other family member ($p < 0.05$). Both groups had equal numbers of pets at home, most notably dogs and cats. Children with asthma were more probable to have an atopy family history. Children with asthma were significantly greater odds to have a history of asthma in their parents ($p < 0.0001$) and rhinitis ($p = 0.005$) (Table 2). The frequency of atopic dermatitis in the parents of the two kid groups did not differ. 61.8% of the children with asthma were weaned before the age of four months, compared to 40.5% of the youngsters in the control group ($p < 0.01$). Individuals who weren't previously hospitalized and those who had at least one hospitalization showed equal frequencies of each risk factor. The residence setting did not appear to be a significant risk factor.

Discussion

The frequency of asthma is higher in developed nations. Diet and environmental variables might account for the variation in childhood asthma frequency. As a result of Pakistan's quick economic growth and the fact that numerous of its cities are upgrading at varying rates, asthma is becoming more common there. The current study was conducted to evaluate the risk factors of asthma in children. In the current study all the participant were of the same genetic background but the incidence of asthma was varied. This may be due to different environmental factors.

In our study, children with asthma were more probable to

have an atopy family history. Children with asthma were significantly greater odds to have a history of asthma in their parents ($p < 0.0001$) and rhinitis ($p = 0.005$). There is a correlation between parental asthma and children asthma, according to several studies.^{8,9} According to Ahya et al. 47% of children with asthma have a family history of the disease.¹⁰ Sheikh et al. reported that 50% of their asthmatic children were with family history of asthma.¹¹ The current findings support these conclusions. The major risk factor is maternal asthma. According to Waheed et al., 66% had a positive family history, 86% had allergic rhinitis, and 15% had eczema.¹² Increasingly, proof points to environmental factors as the cause of asthma. In our study, Place of birth and asthma was significantly associated and asthma was also associated significantly with individual's residence. Just 14.5% of the children in the control group children and 51.4% of the asthmatic boys resided in inner cities. In accordance with our study, in Africa, kids who live in cities are more likely than those who reside in rural regions to suffer from asthma.¹³ Unlike what is observed in rural areas, wheezing and exercise-induced bronchospasm are substantially linked to atopic sensitization in urban areas, as in Western countries.¹⁴ Living on farms protects children from developing atopic disorders and asthma, most likely due to bacterial endotoxins. The significance of living location and lifestyle is demonstrated by the twice or thrice increase in the occurrence of breathing problems in children who came to Australia 5–14 years ago from nations where asthma was not common.¹⁵ There is mounting evidence linking high rates of hospital admissions linked to asthma to issues of socioeconomic disadvantage, such as inadequate living conditions and metropolitan regions with inadequate healthcare facilities.¹⁶ According to Fahim et al., 81% of asthmatics resided in small, crowded homes with a big family

Table 2. Family associated risk factors for occurrence of Asthma in study cases

Risk elements	Asthmatic children N =202 (%)	Control group N=200 (%)	Odd Ratio (95% CI)	P-value
Asthma in parents	141 (69.8)	30 (14.8)	26.7 (10.8-68.3)	<0.0001
Allergic rhinitis Children	32 (15.8)	30 (14.8)	4 (1.2-13.3)	<0.01
Atopic dermatitis in parents	12 (5.9)	5 (2.4)	-	NS
Smoking father	68 (33.6)	42 (20.7)	- 1.87 (0.93-3.74)	0.06
Smoking mother	19 (9.4)	7 (3.4)	3.2 (0.76-15.4)	0.06
Smoking by any person at home	77 (38.1)	22 (10.8)	2.2 (1.1-4.2)	<0.05

crammed into one poorly ventilated room.¹⁷

In our study, there was a strong correlation between asthma and having a smoker in the house, whether it is a parent, sibling, or other family member ($p < 0.05$). One risk factor that is certainly linked to the early onset of asthma in childhood is tobacco use.¹⁸ If a mother smokes, her risk increases, particularly if she smokes while she is pregnant. According to Waheed et al., 36.59% of asthmatic individuals have been exposed to cigarette smoke.¹² When parent or maternal smoking was taken into separate consideration, there was little correlation between asthma and smoking. The existence of a smoker in the baby's immediate family were substantially linked to asthma when all conceivable combinations relating to "parental smoking" (her mother solely, dad only, or both) were taken into consideration. In our study, Of the children with asthma, 23.7% lived in homes with at least one carpet, compared to 13.5% in kids without asthma in our study. This aligns with research conducted on populations in the West. It was discovered that children who had been sensitized more than once in the first three years of their lives had been exposed to noticeably greater amounts of dust allergen.⁸ While atopic sensitization to certain allergens is linked to indoor allergen exposure, asthma was not shown to be connected with this phenomenon.⁶ The majority of research has demonstrated that being sensitized to dust mites raises the chance of wheezing. In a cross-sectional study involving 2164 children ages 8 to 18, Palmer et al. discovered a correlation between a moderate *Ascaris lumbricoides* infection and a higher incidence of asthma, pneumo-allergen sensitization, and bronchial hyperactivity to methacholin.¹⁹ On the other hand, persistent parasite infection and bacterial and viral infections in early childhood can lower a child's chance of developing atopy and allergy disorders.²⁰ Perhaps due to domestic animals are less limited to the home, the study found no significant association between having animals in the home and asthma. According to Waheed et al., 18.28% of people had pets or animals.¹² According to the current study's findings, asthma development was linked to the lack of exclusive breastfeeding. Zeiger et al. conducted a comprehensive evaluation of sixteen investigations, of which nine prospective investigations demonstrated benefit and seven studies shown no impact.²¹ Breastfeeding was most protective against wheeze and lower respiratory disease in the early stages of infancy, according to a research by Wright et al.²² Breastfeeding reduces the exposure to and gastrointestinal absorption of food allergens, which may lessen allergy sensitivity. Human newborns have been shown to benefit from the protective effects of milk produced by human immunoglobulins, especially serum IgA, which block the absorption of antigenic compounds.²³ Its unknown how breastfeeding and asthma are linked. The study conducted by

Tucson revealed that the association between breastfeeding and recurrent asthma attacks or wheeze varies depending on the child's age, the mother's asthma status, and the presence or absence of atopy. Therefore, before the age of two years, breastfeeding protected against chronic wheeze.^{22,24} Breastfeeding does not prevent or even lessen a child's risk of atopy and asthma, as demonstrated by Sears et al.²⁵ On the other hand, regardless of the length of breastfeeding, Oddy et al. reported that it lowers the incidence of asthma in early children.²⁶ It has been discovered that exclusive breastfeeding for more than four months protects Australian children against atopy, wheezing, and asthma.²⁷ In Pakistan, breastfeeding is a prevalent practice that is more common in rural regions. The average breastfeeding time lasts between 18 and 24 months. All of the children who were the subject of the study were breastfed. The children with asthma, however, were weaned much earlier than the rest of the children. This study had various limitations. It was a hospital based study enrolled patients with severe diseases. In order to find a meaningful difference for low prevalence characteristics like having dogs at home, the sample size was too small. The lack of an allergy study was one of the study limitations.

Conclusion

Childhood asthma was highly correlated with family history of allergic rhinitis and asthma. Living in an urban area, having parents who smoke, and weaning children deprived early from breast milk were the major risk factors. The findings emphasize the necessity of informing parents about the dangers of smoking and the onset of asthma at an early age.

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