CLINICAL PROFILE AND ASSOCIATED RISK FACTORS OF BRONCHIAL ASTHMA IN CHILDREN ATTENDING A TERTIARY CARE HOSPITAL IN WEST BENGAL: A HOSPITAL-BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Bronchial asthma is one of the most common chronic respiratory diseases in children and represents a major cause of morbidity worldwide. Its clinical presentation is variable and influenced by multiple environmental and genetic factors. Data on clinical profile and risk factors in West Bengal pediatric populations remain limited.

Objectives: To assess the clinical profile and associated risk factors of bronchial asthma in children attending a tertiary care hospital in West Bengal.

Methods: This hospital-based cross-sectional study was conducted in the Department of Pediatrics of a tertiary care teaching hospital in West Bengal from July 2016 to November 2016. A total of 42 children aged 1–14 years with clinically diagnosed bronchial asthma (based on GINA criteria) were enrolled using consecutive sampling. Data were collected using a predesigned structured questionnaire covering demographic details, clinical symptoms, environmental exposures, family history, and triggering factors. Data were analyzed using SPSS version 22.0. Categorical variables were expressed as frequency and percentage. A p-value <0.05 was considered statistically significant.

Results: The majority of children were aged 6–10 years (42.9%) with male predominance (61.9%). Recurrent wheeze (90.5%) and nocturnal cough (85.7%) were the most common presenting symptoms. Among risk factors, dust exposure (66.7%), recurrent respiratory infections (57.1%), passive smoking (42.9%), and family history of atopy (47.6%) were frequently observed. Upper respiratory tract infections (71.4%) and dust exposure (61.9%) were the most common triggers of exacerbations. Mild persistent asthma (38.1%) was the most common severity category, followed by intermittent asthma (28.6%). Moderate and severe persistent asthma accounted for 23.8% and 9.5% of cases, respectively.

Conclusion: Bronchial asthma in children is strongly associated with environmental exposures and familial predisposition. Most cases present with mild persistent disease; however, a significant proportion experience more severe forms. Early identification of risk factors and implementation of preventive strategies such as allergen avoidance and reduction of tobacco smoke exposure are essential to improve disease control and reduce morbidity in children.

Keywords: Bronchial asthma; children; risk factors; clinical profile; West Bengal; wheeze; atopy.

INTRODUCTION

Bronchial asthma is one of the most common chronic respiratory diseases in children, characterized by variable airway obstruction, bronchial hyperresponsiveness, and chronic airway inflammation. Globally, it affects an estimated 262 million people and remains a leading cause of pediatric morbidity, school absenteeism, and emergency healthcare utilization [1]. Despite advances in diagnosis and treatment, asthma continues to impose a substantial burden on healthcare systems, particularly in low- and middle-income countries where underdiagnosis and undertreatment are common [2].

In children, asthma is a heterogeneous disease influenced by a complex interaction of genetic predisposition and environmental exposures. Common risk factors include family history of atopy, exposure to indoor and outdoor air pollution, tobacco smoke exposure, respiratory tract infections in early life, and allergen sensitization [3]. Urbanization and changing lifestyle patterns have further contributed to a rising trend of childhood asthma, particularly in developing countries [4].
According to the Global Initiative for Asthma (GINA), asthma prevalence in children varies widely between countries, ranging from less than 5% to more than 20% depending on environmental and diagnostic factors [5]. The International Study of Asthma and Allergies in Childhood (ISAAC) reported increasing prevalence in South Asia, highlighting the role of urban environmental exposures and changing dietary patterns [6]. In India, childhood asthma prevalence has been reported between 5% and 15% in different regions, with higher rates observed in urban populations compared to rural settings [7].

West Bengal, in particular, faces unique environmental challenges including high levels of particulate air pollution, seasonal variations, biomass fuel exposure in rural households, and dense urban traffic emissions. These factors are known to exacerbate airway inflammation and increase asthma incidence and severity in children [8]. Despite this, there remains a lack of adequately structured hospital-based studies describing the clinical profile and associated risk factors of pediatric asthma in tertiary care settings in this region.

Most available Indian studies focus on community prevalence rather than hospital-based clinical characterization, leading to a gap in understanding the spectrum of disease severity, triggering factors, and comorbid allergic conditions among children presenting to tertiary care centers [9]. Furthermore, variability in diagnostic criteria, differences in environmental exposures, and underreporting contribute to inconsistent data regarding risk factor distribution in hospitalized pediatric populations.

A detailed understanding of clinical patterns and modifiable risk factors in children with asthma is essential for early diagnosis, targeted prevention strategies, and improved disease control. Identification of high-risk groups can also guide patient education, environmental interventions, and long-term management strategies to reduce disease burden and improve quality of life [10].
Therefore, the present study is undertaken to evaluate the clinical profile and associated risk factors of bronchial asthma in children attending a tertiary care hospital in West Bengal.

METHODOLOGY

Study Design: This was a hospital-based descriptive cross-sectional study.

Study Setting: The study was conducted in the Department of Pediatrics of a tertiary care teaching hospital in West Bengal. The hospital caters to both urban and rural populations and serves as a referral center for surrounding districts.

Study Duration: July 2016 to November 2016.

Study Population: Children aged 1–14 years diagnosed with bronchial asthma attending the Pediatric outpatient department and/or admitted in the tertiary care hospital during the study period.

Inclusion Criteria

Children aged 1–14 years
Clinically diagnosed cases of bronchial asthma based on GINA criteria
Patients whose guardians provided informed written consent

Exclusion Criteria

Children with chronic lung diseases other than asthma (e.g., cystic fibrosis, bronchiectasis)
Congenital heart disease with respiratory symptoms
Acute severe respiratory infections at the time of enrollment
Children with incomplete clinical records or refusal of consent

Sample Size: The sample size was calculated using the formula for estimating proportion in a cross-sectional study:

[
$$n = \frac{Z^2 \times p \times q}{d^2}$$]

Where:

Z = 1.96 at 95% confidence interval
p = expected prevalence of childhood asthma in hospital-based studies (assumed 12% based on literature)
q = 1 − p = 0.88
d = allowable error of 10% relative precision of p (≈ 0.012)

Substituting values, the calculated sample size was approximately 36. However, a total of **42 children** were enrolled considering feasibility and completeness of data.

Sampling Technique: Consecutive sampling technique was used. All eligible children meeting inclusion criteria during the study period were included until the sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a predesigned and pretested structured questionnaire. Information was obtained from parents/guardians and clinical records. Detailed history included demographic profile, symptom pattern (wheeze, cough, dyspnea, nocturnal symptoms), triggering factors (dust, pollen, cold air, infections, exercise, smoke exposure), family history of atopy/asthma, and environmental exposures. Clinical

examination findings and relevant investigations, if available, were recorded. Diagnosis of bronchial asthma was based on clinical history and examination in accordance with GINA guidelines. Each participant was evaluated systematically during hospital visit and data were entered in a standardized proforma.

Study Variables: Independent variables included age, sex, family history of asthma/atopy, exposure to environmental tobacco smoke, type of housing, indoor allergens (dust, pets, mold), history of recurrent respiratory infections, and socioeconomic status. The dependent variable was presence and clinical severity profile of bronchial asthma.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS software version 22.0. Categorical variables were expressed as frequencies and percentages. Continuous variables were summarized as mean ±standard deviation. Associations between risk factors and asthma severity were assessed using chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from parents or guardians of all participants. The study was conducted in accordance with the Declaration of Helsinki ethical principles. Confidentiality of patient information was strictly maintained, and no invasive procedures beyond routine clinical evaluation were performed.

RESULTS

A total of 42 children diagnosed with bronchial asthma were included in the study. The majority of participants were in the age group of 6–10 years (42.9%), with a male predominance (61.9%). More than half of the children belonged to urban areas (57.1%).

Table 1: Demographic profile of study participants (n = 42)

Variable	Category	Frequency (n)	Percentage (%)
Age group	1–5 years	14	33.3
	6–10 years	18	42.9
	11–14 years	10	23.8
Sex	Male	26	61.9
	Female	16	38.1
Residence	Urban	24	57.1
	Rural	18	42.9

Recurrent wheeze was the most common presenting symptom (90.5%), followed by nocturnal cough (85.7%) and breathlessness (71.4%). Chest tightness and nocturnal awakening were also frequently reported.

Table 2: Clinical presentation of bronchial asthma (n = 42)

Symptom	Present (n)	Percentage (%)
Recurrent wheeze	38	90.5
Cough (especially nocturnal)	36	85.7

Breathlessness	30	71.4
Chest tightness	18	42.9
Nocturnal awakening	22	52.4

Among risk factors, dust exposure (66.7%) and recurrent respiratory infections (57.1%) were most commonly observed. Nearly half of the children had a positive family history of atopy or asthma (47.6%), and 42.9% had exposure to passive smoking.

Table 3: Distribution of risk factors among cases (n = 42)

Risk factor	Present (n)	Percentage (%)
Family history of asthma/atopy	20	47.6
Exposure to passive smoking	18	42.9
Dust exposure	28	66.7
Indoor cooking smoke (biomass fuel)	15	35.7
Recurrent respiratory infections	24	57.1
Presence of pets at home	10	23.8

The most common triggering factor for acute exacerbations was upper respiratory tract infection (71.4%), followed by dust exposure (61.9%) and cold air (47.6%).

Table 4: Triggering factors of asthma exacerbation (n = 42)

Trigger	Cases affected (n)	Percentage (%)
Common cold/URTI	30	71.4
Dust exposure	26	61.9
Cold air	20	47.6
Exercise	14	33.3
Smoke exposure	16	38.1
Pollen exposure	12	28.6

Based on clinical severity assessment, most children had mild persistent asthma (38.1%), followed by intermittent asthma (28.6%). Moderate and severe persistent asthma were observed in 23.8% and 9.5% of cases, respectively.

Table 5: Severity of asthma based on clinical assessment (n = 42)

Severity	Frequency (n)	Percentage (%)
Intermittent	12	28.6
Mild persistent	16	38.1
Moderate persistent	10	23.8
Severe persistent	4	9.5

DISCUSSION

The present study evaluated the clinical profile and risk factors of bronchial asthma among 42 children attending a tertiary care hospital in West Bengal. The study demonstrated that school-aged children (6–10 years) constituted the largest proportion of cases, with a male predominance. Recurrent wheeze and nocturnal cough were the most common presenting symptoms, while dust exposure, recurrent respiratory infections, and family history of atopy emerged as important associated risk factors. Mild persistent asthma was the most frequent severity category observed.

The age distribution in the present study is consistent with established pediatric asthma patterns, where school-age children often exhibit higher diagnosed prevalence due to increased environmental exposure and improved symptom recognition [1]. The male predominance observed aligns with global pediatric trends in early and middle childhood, where boys are more frequently affected, possibly due to narrower airway caliber and increased airway hyperresponsiveness compared to girls in early life [2].

Clinically, wheezing and nocturnal cough were the predominant symptoms, which is consistent with GINA reports emphasizing these as hallmark features of uncontrolled or partially controlled asthma in children [3]. Similar symptom patterns have been documented in ISAAC-based studies, where recurrent wheeze remains the most sensitive indicator of asthma in pediatric populations [4].

Among risk factors, dust exposure was the most commonly reported environmental trigger. This finding is comparable to studies from urban Indian settings where indoor allergens, including dust mites, are strongly associated with asthma morbidity [5]. Recurrent respiratory infections were also frequently observed, supporting the established hypothesis that viral infections in early childhood can alter airway responsiveness and contribute to asthma development and exacerbations [6]. Passive smoking exposure in nearly 43% of children further highlights the role of modifiable environmental risk factors, consistent with evidence linking tobacco smoke exposure to increased asthma severity and poor control [7].

Family history of atopy was present in nearly half of the cases, reinforcing the genetic predisposition to asthma. This is in agreement with prior studies showing that children with parental asthma or allergic diseases have a significantly higher risk of developing asthma due to inherited immune dysregulation and atopic tendency [8].

In terms of severity, most children had mild persistent asthma, which is comparable to hospital-based studies in similar settings where early presentation and outpatient management lead to a higher proportion of milder cases. However, a notable proportion of moderate and severe persistent asthma cases highlights delayed diagnosis or inadequate environmental control in a subset of patients [9].

From a public health perspective, the findings emphasize the importance of early identification of environmental triggers and family-based education regarding avoidance strategies. Reduction of indoor allergens, avoidance of passive smoking, and prompt management of respiratory infections may significantly reduce asthma morbidity in children.

The study has several strengths, including a well-defined clinical population and structured assessment of risk factors. However, limitations include a small sample size, single-center design, and lack of objective lung function testing such as spirometry due to age constraints

and resource limitations. These factors may limit generalizability and detailed phenotypic classification.

Overall, the study highlights that childhood asthma in West Bengal is strongly influenced by modifiable environmental exposures and family history, underscoring the need for targeted preventive strategies and early intervention programs.

CONCLUSION

Bronchial asthma in children is a common chronic respiratory disorder with significant clinical and public health implications. In this hospital-based cross-sectional study, school-aged males constituted the majority of cases, with recurrent wheeze and nocturnal cough being the most frequent clinical manifestations. The study identified important associated risk factors, including dust exposure, recurrent respiratory infections, passive smoking, and family history of atopy, highlighting the multifactorial nature of the disease.Most children presented with mild persistent asthma, although a considerable proportion had moderate to severe disease, indicating variability in disease control and possibly delayed diagnosis or ongoing environmental exposure. The findings emphasize the critical role of modifiable environmental factors in disease expression and exacerbation.Early identification of at-risk children, along with targeted preventive strategies such as reduction of indoor allergens, avoidance of tobacco smoke exposure, and prompt management of respiratory infections, may significantly reduce morbidity. Strengthening caregiver education and improving early diagnosis at primary care level are essential for better asthma control and improved quality of life in children.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Informed Consent: Written informed consent was obtained from the parents/guardians of all study participants.

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