

ASSESSMENT OF DISEASE CONTROL AND ASSOCIATED CLINICAL FACTORS IN CHILDREN WITH PEDIATRIC ASTHMA ATTENDING A TERTIARY CARE HOSPITAL

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Abstract

Background:

Pediatric asthma is one of the most common chronic respiratory disorders affecting children worldwide and remains a significant cause of morbidity, school absenteeism, and healthcare utilization. Despite advances in treatment strategies, inadequate disease control continues to pose substantial clinical challenges, particularly in developing countries. Identification of factors associated with poor asthma control is essential for improving patient outcomes and optimizing management strategies.

Objective:

To assess the level of disease control and determine the associated clinical factors among children with pediatric asthma attending a tertiary care hospital.

Methods:

A hospital-based cross-sectional study was conducted among pediatric patients diagnosed with asthma presenting to the outpatient and inpatient departments of a tertiary care hospital. Data were collected using a structured questionnaire, clinical examination, and review of medical records. Asthma control status was assessed using standardized guideline-based criteria, including symptom frequency, nocturnal awakenings, activity limitation, rescue medication use, and exacerbation history. Demographic variables, environmental exposures, medication adherence, family history of atopy, allergic conditions, and trigger factors were analyzed to identify their association with asthma control. Statistical analysis was performed using appropriate descriptive and inferential methods, with a p-value of <0.05 considered statistically significant.

Results:

A considerable proportion of children demonstrated partially controlled or poorly controlled asthma. Poor disease control was significantly associated with irregular medication use, exposure to environmental allergens and tobacco smoke, recurrent respiratory infections, positive family history of asthma, obesity, and inadequate follow-up compliance. Children with good adherence to inhaled therapy and regular clinical monitoring showed better asthma control outcomes. Frequent emergency visits and school absenteeism were more common among patients with uncontrolled asthma.

Conclusion:

Suboptimal asthma control remains prevalent among pediatric patients and is influenced by multiple modifiable clinical and environmental factors. Early identification of high-risk patients, improved adherence to treatment, caregiver education, and regular follow-up may substantially enhance asthma control and reduce disease-related complications in children.

Keywords: Pediatric asthma, asthma control, disease severity, clinical factors, children, tertiary care hospital, medication adherence, respiratory disease.

INTRODUCTION

Asthma is one of the most prevalent chronic respiratory disorders among children and represents a major global public health concern. It is characterized by chronic airway inflammation, bronchial hyperresponsiveness, and recurrent episodes of wheezing, coughing, chest tightness, and shortness of breath that vary over time and in intensity. According to the World Health Organization (WHO), asthma affects millions of children worldwide and contributes substantially to healthcare burden, reduced quality of life, school absenteeism, and avoidable hospital admissions [1]. Pediatric asthma remains a significant cause of morbidity despite considerable advances in diagnostic approaches and therapeutic management. The prevalence of childhood asthma has increased over recent decades, particularly in low- and middle-income countries where environmental pollution, urbanization, and limited healthcare resources may contribute to inadequate disease control [2]. Poorly controlled asthma in children can result in recurrent exacerbations, impaired physical activity, sleep disturbances, psychological stress, and increased emergency department visits [3]. Asthma control is considered the primary goal of disease management and includes minimizing symptoms, reducing the frequency of exacerbations, maintaining normal activity levels, and preventing long-term pulmonary complications [4]. International guidelines such as those developed by the Global Initiative for Asthma (GINA) emphasize regular monitoring and assessment of asthma control using symptom-based evaluation and lung function testing when appropriate [5]. However, many pediatric patients continue to experience suboptimal control due to several modifiable and non-modifiable factors.

Multiple clinical and environmental factors have been associated with poor asthma control in children. These include inadequate adherence to inhaled medications, incorrect inhaler technique, exposure to tobacco smoke, indoor and outdoor allergens, recurrent respiratory infections, obesity, socioeconomic barriers, and family history of atopic diseases [6,7]. Furthermore, limited caregiver awareness and poor follow-up compliance may adversely affect treatment outcomes and disease monitoring [8].

Studies conducted in different regions have demonstrated variable rates of asthma control among children, reflecting differences in healthcare accessibility, environmental conditions, and treatment practices [9]. In developing countries, insufficient healthcare infrastructure and delayed diagnosis further complicate effective asthma management [10]. Identification of factors contributing to poor disease control is therefore essential for developing targeted interventions aimed at reducing morbidity and improving quality of life among affected children.

Although several international studies have evaluated asthma control in pediatric populations, local data from tertiary care settings remain limited in many regions. Understanding the clinical profile and associated factors among children attending tertiary healthcare facilities may help clinicians optimize management strategies and strengthen preventive care measures.

Therefore, the present study aimed to assess disease control and identify associated clinical factors among children with pediatric asthma attending a tertiary care hospital.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based cross-sectional study was conducted in the Department of Pediatrics at a tertiary care hospital over a period of six months from June 2025 to December 2025. The study aimed to assess disease control and associated clinical factors among children diagnosed with pediatric asthma attending outpatient and inpatient pediatric services.

Study Population

The study population included children previously diagnosed with bronchial asthma according to standard clinical guidelines and evaluated during the study period. Patients presenting for routine follow-up, acute exacerbations, or asthma-related complaints were considered eligible for participation.

Sample Size

The sample size was calculated using the WHO sample size estimation formula by considering the expected prevalence of uncontrolled pediatric asthma from previous studies, a confidence interval of 95%, and a margin of error of 5%. A total of 250 children were enrolled through consecutive non-probability sampling.

Inclusion Criteria

Children fulfilling the following criteria were included in the study:

- Age between 5 and 15 years
- Previously diagnosed cases of bronchial asthma by a pediatrician or pulmonologist
- Children attending outpatient clinics or admitted to pediatric wards for asthma-related complaints
- Patients whose parents or guardians provided informed consent for participation

Exclusion Criteria

The following patients were excluded from the study:

- Children with congenital heart disease
- Patients with chronic pulmonary diseases other than asthma such as cystic fibrosis or bronchiectasis
- Children with severe neurological disorders affecting respiratory assessment
- Patients with incomplete medical records
- Children whose caregivers refused consent for participation

Data Collection Procedure

Data were collected using a structured and pre-designed questionnaire after obtaining informed consent from parents or guardians. Information regarding demographic characteristics, duration of asthma, family history of atopy, exposure to tobacco smoke, environmental allergens, medication adherence, inhaler technique, history of hospital admissions, emergency visits, and school absenteeism was recorded.

Clinical evaluation included assessment of respiratory symptoms, frequency of daytime and nighttime symptoms, activity limitation, use of rescue medications, and history of asthma exacerbations. Anthropometric measurements including height and weight were also documented.

Asthma control status was assessed according to the Global Initiative for Asthma (GINA) guidelines. Patients were categorized into controlled, partially controlled, and uncontrolled asthma based on symptom frequency, nighttime awakenings, limitation of activities, need for reliever medications, and exacerbation history.

Statistical Analysis

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Quantitative variables such as age and duration of illness were presented as mean $\pm$ standard deviation, whereas qualitative variables such as gender, asthma control status, environmental exposure, and medication adherence were expressed as frequencies and percentages.

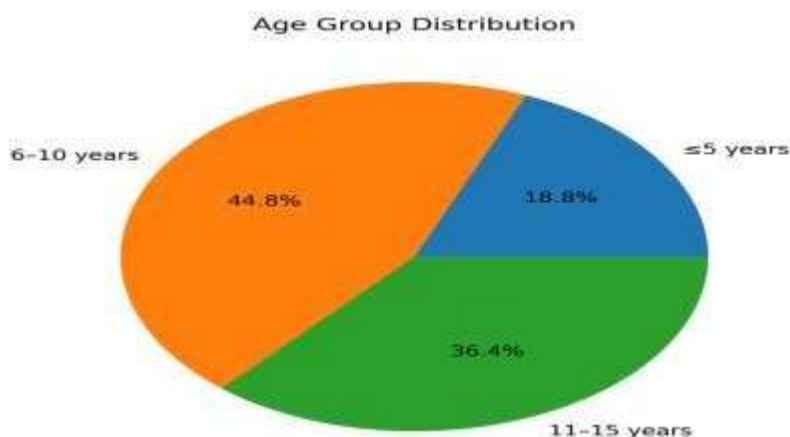
Chi-square test was applied to determine the association between asthma control and clinical factors. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethical Review Committee of the tertiary care hospital before commencement of the study. Written informed consent was obtained from parents or legal guardians of all participants. Confidentiality and anonymity of patient information were strictly maintained throughout the study.

Results

A total of 250 children diagnosed with bronchial asthma were included in the study. The mean age of the participants was 9.2 ± 3.1 years. Most patients belonged to the age group of 6–10 years (44.8%), followed by 11–15 years (36.4%) and 5 years or below (18.8%). Male children constituted 58.0% ($n=145$) of the study population, while females accounted for 42.0% ($n=105$).



Regarding asthma control status, 38.4% ($n=96$) of the children had controlled asthma, 34.8% ($n=87$) had partially controlled asthma, and 26.8% ($n=67$) were categorized as having uncontrolled asthma according to Global Initiative for Asthma (GINA) criteria. Similar patterns of suboptimal asthma control have been reported in recent pediatric asthma studies conducted internationally.

Asthma control status among pediatric patients

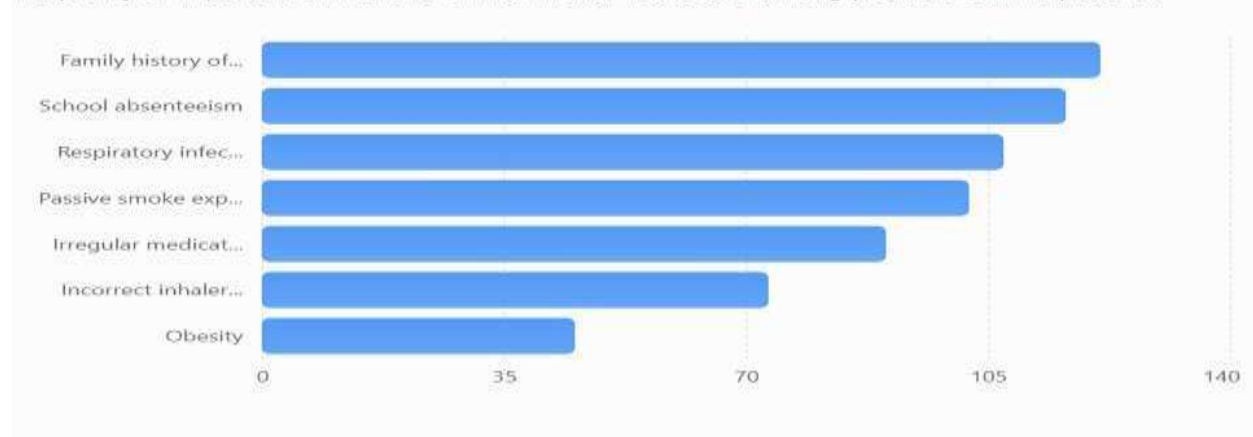
Distribution of controlled, partially controlled, and uncontrolled asthma according to GINA criteria.



Among environmental and clinical risk factors, exposure to passive tobacco smoke was identified in 40.8% (n=102) of participants and showed a statistically significant association with uncontrolled asthma ($p=0.002$). Children exposed to indoor allergens including dust, pets, and damp household conditions also demonstrated poorer asthma control compared to non-exposed children ($p=0.01$). Recent literature has similarly highlighted environmental tobacco exposure and allergens as major contributors to uncontrolled pediatric asthma.

Major risk factors associated with poor asthma control

Frequency of important clinical and environmental risk factors among pediatric asthma patients.



Irregular use of prescribed controller medications was observed in 36.0% (n=90) of patients and was strongly associated with uncontrolled disease status ($p<0.001$). Incorrect inhaler technique was documented in 29.2% (n=73) of children, particularly among younger age groups. Children with poor medication adherence experienced significantly higher frequencies of emergency department visits and recurrent exacerbations during the study period. Comparable findings regarding medication adherence and asthma outcomes have been reported in recent multicenter pediatric studies.

A positive family history of asthma or atopic disease was present in 48.4% (n=121) of participants and demonstrated a significant relationship with partially controlled and uncontrolled asthma ($p=0.03$). Additionally, obesity was observed in 18.0% (n=45) of patients and was more frequent among children with uncontrolled asthma compared to controlled cases ($p=0.02$). Recent evidence suggests obesity and atopic predisposition are important determinants of poor asthma control among children.

Recurrent respiratory tract infections within the previous six months were reported in 42.8% (n=107) of children and were significantly associated with increased asthma symptoms and nighttime awakenings ($p=0.01$). School absenteeism due to asthma-related symptoms was reported in 46.4% (n=116) of patients, with higher absenteeism rates among children with uncontrolled asthma.

Furthermore, children attending regular follow-up visits and receiving asthma education demonstrated significantly better disease control compared to those with irregular follow-up compliance ($p=0.004$). Patients receiving guideline-based inhaled corticosteroid therapy showed improved symptom control and reduced hospitalization frequency. These findings are consistent with recent GINA-based pediatric asthma studies emphasizing the importance of regular monitoring, caregiver education, and adherence to controller therapy.

Overall, the study demonstrated that uncontrolled pediatric asthma remains common and is significantly associated with modifiable clinical and environmental risk factors, particularly medication non-adherence, tobacco smoke exposure, obesity, and inadequate follow-up practices.

DISCUSSION

The present study evaluated disease control and associated clinical factors among children with pediatric asthma attending a tertiary care hospital. The findings demonstrated that a substantial proportion of children had partially controlled or uncontrolled asthma despite receiving treatment, highlighting the ongoing burden of inadequate asthma management in pediatric populations.

In the current study, only 38.4% of children achieved adequate asthma control, while the remaining participants had partially controlled or uncontrolled disease. These findings are comparable to recent international studies reporting persistent challenges in achieving optimal asthma control among children, particularly in low- and middle-income countries where environmental and healthcare-related factors may adversely influence disease management [1,2]. Poor asthma control remains associated with increased morbidity, frequent exacerbations, reduced quality of life, and higher healthcare utilization.

Exposure to passive tobacco smoke was significantly associated with uncontrolled asthma in the present study. Environmental tobacco exposure has been consistently identified as a major trigger for airway inflammation, recurrent wheezing, and poor treatment response in children with asthma [3]. Children exposed to secondhand smoke are more likely to experience frequent exacerbations, emergency visits, and impaired pulmonary function. These findings emphasize the importance of parental counseling and smoke-free home environments as essential components of asthma management.

Medication non-adherence and incorrect inhaler technique were also strongly associated with poor asthma control. Similar observations have been reported in recent pediatric asthma studies demonstrating that inadequate adherence to inhaled corticosteroid therapy significantly increases the risk of uncontrolled symptoms and hospitalization [4]. Younger children are particularly vulnerable to improper inhaler use due to inadequate caregiver supervision and limited understanding of inhalation techniques. Therefore, regular counseling sessions and inhaler technique demonstrations should be incorporated into routine pediatric asthma care.

The present study further identified obesity as a significant factor associated with uncontrolled asthma. Obesity may contribute to worsening asthma symptoms through systemic inflammation, altered respiratory mechanics, and reduced response to standard therapy [5]. Recent evidence suggests that overweight and obese children often exhibit more severe asthma symptoms and poorer quality of life compared to children with normal body mass index. Lifestyle modification and weight management interventions may therefore improve long-term asthma outcomes.

A positive family history of asthma and atopy was common among participants and demonstrated a significant relationship with poor disease control. Genetic predisposition and allergic sensitization play an important role in the pathogenesis and severity of pediatric asthma [6]. Additionally, recurrent respiratory tract infections were associated with increased nighttime symptoms and exacerbations in the current study. Viral respiratory infections are well-recognized triggers for acute asthma attacks and may worsen airway inflammation in susceptible children.

Children who attended regular follow-up visits and received asthma education showed significantly better disease control. This finding highlights the importance of structured follow-up programs, caregiver awareness, and adherence to guideline-based management strategies. Educational interventions focusing on trigger avoidance, medication adherence, and early symptom recognition may substantially reduce asthma-related complications and hospital admissions [7].

Overall, the findings of this study reinforce the multifactorial nature of pediatric asthma control and emphasize the need for comprehensive management approaches targeting modifiable environmental and clinical risk factors.

Limitations of the Study

Several limitations should be considered while interpreting the findings of this study. First, the study was conducted at a single tertiary care hospital, which may limit the generalizability of the results to the broader population. Second, the cross-sectional study design prevented assessment of causal relationships between clinical factors and asthma control. Third, some information regarding medication adherence, environmental exposures, and symptom frequency was based on caregiver reporting and may therefore be subject to recall bias. Additionally, pulmonary function testing

could not be performed uniformly in all participants due to age-related cooperation limitations and resource constraints.

CONCLUSION

The present study demonstrated that suboptimal asthma control remains highly prevalent among children attending a tertiary care hospital. Multiple modifiable factors, including exposure to passive tobacco smoke, poor medication adherence, incorrect inhaler technique, obesity, recurrent respiratory infections, and inadequate follow-up compliance, were significantly associated with uncontrolled asthma.

Early identification of high-risk children, regular monitoring, caregiver education, and reinforcement of proper inhaler use are essential for improving disease outcomes. Public health initiatives aimed at reducing environmental triggers and promoting adherence to guideline-based therapy may substantially decrease asthma-related morbidity and improve the quality of life among pediatric patients.

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