

A Retrospective Analysis of Asthma Management in Children, Including Treatment Strategies, Outcomes, and Readmission RatesVaibhav¹, Gaurav Kumar Sharma², Bipin Kumar Verma³, Sanjeev Kumar⁴, Dhananjay Kumar⁵¹Senior Resident, Paediatrics, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India²Senior Resident, Paediatrics, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India³Professor, Paediatrics, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India⁴Associate Professor, Paediatrics, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India⁵Associate Professor, Paediatrics, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

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Corresponding author: Dr. Gaurav Kumar Sharma

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Abstract**Background:** Asthma is one of the most common chronic respiratory disorders affecting children worldwide and is associated with significant morbidity, frequent hospital admissions, and impaired quality of life. Asthma management is crucial to decrease the severity of asthma, clinical outcomes, and recurrent hospitalizations in children. Hospital-based asthma management offers opportunities for a retrospective analysis, which gives insight into the treatment of asthma, outcomes, and readmission among children.**Methods:** A retrospective observational study was carried out in the Department of Pediatrics of BMIMS from June 2025 to February 2026. The number of pediatric patients included in the study is about 120 patients with asthma. The data were collected from the medical records, admission registers and treatment sheets of the hospital. Demographic data, clinical presentation, treatment modalities, treatment outcomes, duration of hospital stay, and the history of readmission were analyzed. Microsoft Excel and SPSS software were used to analyze statistical data.**Results:** Nebulized salbutamol and corticosteroid combination therapy were the most commonly used treatment methods, followed by oxygen support in severe cases. The clinical improvement was observed in the majority of the patients (90%) and were discharged successfully, with a small fraction of patients admitted to the ICU. The average duration of hospitalization was 4.2 ± 1.8 days. Poor medication adherence, environmental triggers and severe asthma were found to be important associated risk factors for readmission, which occurred in 18.3% of patients.**Conclusion:** This study showed that with proper care and management of asthma such as bronchodilator use, and giving of steroid, there was significant improvement in clinical outcome for pediatric patients. Despite this, poor adherence, environmental exposure, and severe disease were still associated with readmission, underscoring the critical role of ongoing follow-up, patient education, and asthma management strategies.**Keywords:** Pediatric Asthma, Retrospective Study, Readmission Rates, Bronchodilators, Corticosteroids, Pediatric Respiratory Disease.**DOI:** 10.25258/ijcpr.18.5.183This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Asthma is an ongoing condition of inflammation in the airways of the lung which causes repeated attacks of wheezing, windedness, chest tightness and coughing, that can be mild or severe and occur often or infrequently [1]. The disease develops as a result of the inflammation of the airways and hyperresponsiveness of the airways, followed by

reversible obstruction of air flow, due to allergens, infections, environmental pollutions, exercise or genetic disposition [2]. Asthma in children is regarded as one of the most prevalent chronic respiratory diseases and is a significant public health problem globally. Pathophysiology of asthma is associated with bronchial mucosa inflammation,

excessive mucous production, airway edema, bronchial smooth muscle contraction, narrowing of air passages and difficulty in breathing [3,4]. Across the world, millions of children suffer from asthma and it is becoming more common in low and middle-income countries [5]. Pollution, poor environment, and lack of disease awareness are the major reasons for the increased hospital visits and school absenteeism due to pediatric asthma in India, particularly among the urban and semi-urban residents [6].

Pediatric asthma is also clinically very significant, being associated to high morbidity and regular admissions to the emergency room among children. Recurrent asthma attacks can affect children's and families' physical activity, sleep, and school attendance, as well as their social and emotional functioning, which can impact quality of life [7,8]. These severe exacerbations may result in more hospitalizations and strain healthcare systems. The management, therefore, is crucial to avoid complications and to minimize re-hospitalization.

There is multiple treatment are used for paediatric asthma. Salbutamol is used frequently to open up the breathing passages when bronchospasm is a sudden occurrence [9]. Inhaled Corticosteroids are medicines that are used for the long-term control of asthma to prevent exacerbations and lower airway inflammation and are considered the foundation of long-term asthma control [10]. Nebulized drug delivery is commonly used in hospitalized children for the treatment of an acute attack. Also prescribed, in moderate-to-severe cases, are combination medications of long-acting bronchodilators and corticosteroids. Children often use oxygen therapy when they have severe respiratory distress and are experiencing hypoxemia [11,12].

The prevalence of paediatric asthma is on the rise and asthma-related hospitalisations have also been on the increase, underscoring the need to assess current treatment practices and clinical outcomes. The effectiveness of treatment and the factors associated with readmission are critical to the management of the disease and to reduce burden of care. Although asthma is becoming a more common condition, there have been few retrospective studies carried out in regional tertiary-care centres like BMIMS.

This study is designed to analyse asthma management strategies, treatment outcomes, and readmission rates of children in this setting.

Objectives

- To recognize the common approaches used in the treatment of asthma in children.
- To assess the treatment effect in children with asthma.
- To determine hospital readmission rates.

- To determine factors related to re-admission.

Materials and Methods

Study Design: The present study was a retrospective observational type study to assess the management of asthma in children. A retrospective study was selected to evaluate the previously collected clinical data concerning treatment, outcomes and hospital readmissions in children with asthma.

Study Setting: The study was conducted in the Department of Pediatrics, BMIMS, a tertiary care teaching hospital which provides specialized pediatric healthcare services to the patients from surrounding urban and rural areas.

Study Duration: The study was carried out from June 2025 to February 2026. The medical records of eligible pediatric asthma patients admitted over this time period were reviewed and analysed.

Study Population: Children with the diagnosis of asthma were admitted to the paediatric department during the study period were included in the study population. Patients who had a diagnosis of asthma and experienced symptoms of wheezing, shortness of breath, coughing, and chest tightness were included in the analysis.

Sample Size: A total of approximately 150 pediatric patients were included in the study. The sample size was based on eligible patient data that was available during the period of the study.

Inclusion Criteria: The study included children aged 1–14 who had been diagnosed with asthma and complete medical records. For patients who were admitted for exacerbation of asthma and those who were treated in the pediatric department during the study period, were considered eligible for participation.

Exclusion Criteria: Patients with incomplete or missing medical records were excluded from the study. Children who had a diagnosis of chronic pulmonary diseases other than asthma (e.g., TB or CF) and those who had congenital respiratory disorders were also excluded to avoid confounding factors.

Data Collection: Medical records, treatment sheets and admission registers in the pediatrics department were used for the collection of data from hospital records, which were done retrospectively. The clinical results were assessed for the following variables: patient age, gender, severity of asthma, patient symptoms, treatment, hospital stay, clinical outcome, and history of hospital readmission. Details were also recorded about the use of bronchodilators, corticosteroids, nebulization treatments, oxygen, and combination treatments.

Outcome Measures: The main measures of the study were clinical improvement following after treatment and hospital readmission rates in children with asthma. Secondary outcomes were length of hospital stay and patient's response to various treatments given during admission.

Statistical Analysis: Data obtained were entered in MS Excel and analysed with SPSS software.

Data have been summarized using descriptive statistical methods like frequencies, percentages, means and standard deviations. Where appropriate, inferential statistical tests were used including the Chi-square test and t-test to establish associations between variables. A p value < 0.05 was deemed statistically significant.

Ethical Considerations: Due to the study being conducted, institutional ethical approval was

obtained before the study initiated. Patient's privacy and confidentiality were considered at all times and all the information collected was utilized only for academic and research purposes.

Results

Demographic Characteristics: The present retrospective study was carried out on 120 children with the diagnosis of asthma at BMIMS. Most of the patients were in the age group 6-10 years, 41.7% of the study population, followed by 11-12 years age group. Admissions of children below 5 years of age were fewer in number.

The gender distribution showed that there were more male patients than female patients, suggesting that male patients were more common in terms of asthma-related admissions over the study period.

Table 1: Demographic Characteristics of Pediatric Asthma Patients

Variable	Category	Frequency (n)	Percentage (%)
Age Group	1-5 years	28	23.3
	6-10 years	50	41.7
	11-12 years	30	25.0
	12-14 years	12	10.0
Gender	Male	72	60.0
	Female	48	40.0

Clinical Presentation: Wheezing was the most common clinical symptom among the children with asthma (91.7%), followed by cough and breathlessness. Fever was reported in a relatively low number of patients and was primarily seen in those with respiratory tract infections in the context of an acute exacerbation of asthma.

Table 2: Clinical Presentation of Patients

Clinical Symptom	Frequency (n)	Percentage (%)
Wheezing	110	91.7
Cough	102	85.0
Breathlessness	96	80.0
Fever	38	31.7

Treatment Strategies Used: The treatment modalities vary based on the severity of asthma and clinical condition of patients. Nebulized salbutamol was the most common treatment strategy followed by corticosteroid therapy. In severe cases with

respiratory distress and hypoxemia, oxygen therapy was given. Bronchodilators and steroids were also frequently used in combination therapies in cases of moderate to severe asthma exacerbation.

Table 3: Treatment Strategies Used in Pediatric Asthma Patients

Treatment Strategy	Frequency (n)	Percentage (%)
Nebulized Salbutamol	112	93.3
Corticosteroids	98	81.7
Antibiotics	52	43.3
Oxygen Therapy	40	33.3
Combination Therapy	76	63.3

Clinical Outcomes: After treatment most pediatric patients have improved clinically and were successfully discharged. A few patients needed admission to the intensive care unit because of high

requirement for supplemental oxygen and antibiotic resistance to the initial treatment. The average duration of hospital stay was found to be 4.2 ± 1.8 days.

Table 4: Clinical Outcomes of Pediatric Asthma Patients

Clinical Outcome	Frequency (n)	Percentage (%)
Improved and Discharged	108	90.0
ICU Transfer	8	6.7
Referred to Higher Center	4	3.3
Variable	Mean \pm SD	
Duration of Hospital Stay (days)	4.2 \pm 1.8	

Readmission Rates: During the study period, 22 out of the total study group were re-admitted with recurrent asthma exacerbations. Most readmissions were in the first three months following discharge.

Poor medication adherence, exposure to environmental allergens and severe asthma symptoms are key shared risk factors for repeated admissions.

Table 5: Readmission Rates

Variable	Frequency (n)	Percentage (%)
Total Readmissions	22	18.3
Readmission within 1 month	6	5.0
Readmission within 1–3 months	10	8.3
Readmission after 3 months	6	5.0

Table 6: Associated Risk Factors

Associated Risk Factors	Frequency (n)
Poor Medication Adherence	12
Environmental Allergen Exposure	9
Severe Persistent Asthma	7
Respiratory Infections	6

Statistical Findings: A significant association was found between severe asthma and increased risk of ICU admission ($p < 0.05$) by statistical analysis. Similarly, poor medication adherence was also statistically significantly associated with increased readmission rates for pediatric patients. Combination therapy was found to be associated to better clinical outcomes and shorter hospital stay in cases of moderate to severe asthma. There were no statistically significant differences ($p > 0.05$) in the rates of hospitalizations for males and females children.

Discussion

The current retrospective study aimed to assess the various treatment approaches, response and readmission rate of children admitted with asthma to BMIMS. The results indicated that use of nebulized salbutamol and corticosteroids was the most frequent treatment methods in the treatment of pediatric asthma. Nebulization therapy provided rapid symptomatic relief by improving airway patency and reducing bronchospasm, while corticosteroids played a major role in controlling airway inflammation and preventing severe exacerbations. In moderate-to-severe cases of asthma, combination medication with bronchodilators and corticosteroids was also commonly used, reflecting the recognised treatment guidelines for asthma.

The clinical effectiveness of the therapies applied in the study was good, with the majority of patients successfully discharged after treatment, and

significant improvement reported. A small number of children had to be admitted to the intensive care unit (ICU) because of their initial poor response to treatment and severe respiratory distress. The mean hospital stay was relatively short, which indicated good control of the disease and effective care of patients in hospital. In all, the study's results suggest that prompt intervention and suitable drug treatment played a beneficial role in better clinical outcomes in children with asthma.

Comparison with Previous Studies: The findings of the present study are similar to the previous pediatric asthma studies carried out in India and other countries. Previous [13] has also found that bronchodilators and inhaled and systemic corticosteroids continue to be the mainstay of asthma treatment in children. The current study observed an admission rate that was similar to those found in other tertiary-care centers located in the region, in which recurrent admissions are often linked to poor asthma control and poor follow-up.

Widespread use of corticosteroid for the treatment of paediatric asthma has also been reported in the past, as it is effective at controlling the inflammation of the airways and preventing the frequency of attacks [14]. This study's average length of hospital stay was comparable to those in other retrospective studies, in which the majority of children with asthma spent three to five days in hospital depending on the severity of their asthma and their response to care. The similarities in these findings further validate the current results and underscores the continued need

for evidence-based asthma management protocols in the care of children.

Factors Affecting Readmission: The study found that there were several causes for pediatric asthma patients being readmitted to the hospital. Poor medication adherence was a key risk factor, particularly for children who did not adhere to prescribed inhaled medications after leaving the hospital. Dust, exposure to smoke, seasonal allergens and air pollution were also identified as environmental triggers that can result in a higher risk of recurrent asthma exacerbations and multiple hospital visits.

Severe persistent asthma was another key factor associated with readmission, with these patients needing more intensive treatment and monitoring. Disease management outcomes were also appeared to be related to socio-economic conditions [15].

Recurrent complications of asthma were more common in families who had not been aware of health care options for the disease, poor access to medications or poor follow-up care. The results highlight the need for more extensive education and ongoing monitoring of asthma, to lower the rates of pediatric asthma readmissions.

Limitations: Although the study offers useful information for managing paediatric asthma, there are some limitations to be noted.

The study design was retrospective, relying on existing hospital records which means that in some instances the records may have been incomplete or missing information. The study was limited to a single tertiary-care centre limiting the generalizability of the findings to other healthcare settings or populations. Furthermore, due to the relatively small sample size, there may have been other risk factors that were not identified for outcomes and rates of return for asthma. Further prospective multicenter trials are recommended in the future with larger sample sizes for more generalized and comprehensive results.

Conclusion

A retrospective study was conducted to analyse the management strategies, treatment outcomes, and readmission rate of the pediatric population who were hospitalized at BMIMS for asthma. It was found that the use of nebulized bronchodilators, corticosteroids and dual drugs were the most commonly used treatment modalities and were associated with a good clinical response in most patients. A majority of children made substantial gains and were successfully discharged, with a small number needing intensive care management.

The study also identified those patients who were readmitted to the hospital, with poor medication adherence, environmental triggers, and severe

asthma being a significant factors. The results highlight the need for proper follow-up services, counseling of patients and compliance with treatment in order to minimize the risk of re-hospitalization for asthma exacerbation. In summary, appropriate asthma management strategies combined with early intervention and education for caregivers can produce a significant positive impact on pediatric asthma outcomes. A large-scale, multicenter study is suggested for future prospective studies to gain insight for the long-term effects and improve asthma management in children.

Recommendations: The results of the current study clearly support the strengthening of asthma education for children and caregivers and to enhance asthma awareness of how to manage the disease, use inhalers and avoid environmental factors. Regular follow-up monitoring should be encouraged to assess treatment response and identify patients at risk of recurrent exacerbations. Healthcare providers should also remind patients to take prescribed inhaled medication and provide adequate counseling before discharge.

Early intervention should also be undertaken to limit the impact of asthma attacks and the number of re-admissions to hospital. Standardized pediatric asthma management guidelines and periodic clinical evaluations can further enhance outcomes of asthma management. Larger prospective studies across multiple health care centers in the future are recommended to provide more general evidence for the management of pediatric asthma and long-term outcomes.

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