



A Cross-Sectional Study on the Prevalence and Severity of Bronchial Asthma among School-Going Children Aged 13 -17 Years in Lucknow, Uttar Pradesh

Dr. Guru Naman Singh¹, Dr. Neeti Verma², Dr. Syed Belal Hassan³, Dr. Siraj Ahmad⁴, Dr. Nirpal Kaur⁵, Dr. Samreen Khan⁶

1. Post graduate doctor, department of community medicine, IIMSR, Lucknow
2. Professor, department of community medicine, IIMSR, Lucknow
3. Professor, department of community medicine, IIMSR, Lucknow
4. Professor, department of community medicine, IIMSR, Lucknow
5. Associate Professor, department of community medicine, IIMSR, Lucknow
6. Assistant Professor, department of community medicine, IIMSR, Lucknow

Corresponding author:

Dr. Guru Naman Singh

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KEYWORDS

Bronchial asthma, prevalence, severity, adolescents, school children, Lucknow, ISAAC questionnaire, GINA guidelines.

ABSTRACT:

Background: Bronchial asthma is a common chronic respiratory disorder among children and adolescents, characterised by airway inflammation, wheezing, and breathlessness. Urbanisation, environmental pollution, and genetic factors contribute to the increasing prevalence of this condition. Limited recent data exist on asthma prevalence and severity among adolescents in Lucknow, Uttar Pradesh.

Objective: To assess the prevalence and severity of bronchial asthma among school-going children aged 13–17 years in Lucknow and to evaluate associated demographic and familial risk factors.

Methods: This cross-sectional study was conducted over 18 months (May 2024–December 2025) in selected schools in Lucknow Uttar Pradesh. A total of 425 adolescents were enrolled using systematic random sampling. Data were collected using a pre-tested structured questionnaire based on the International Study of Asthma and Allergies in Childhood (ISAAC). Asthma severity was classified according to Global Initiative for Asthma (GINA) guidelines. Data were analysed using SPSS version 26.0. Descriptive statistics, frequencies, percentages, and Chi-square tests were applied, with $p < 0.05$ considered statistically significant.

INTRODUCTION

Bronchial asthma is a chronic inflammatory disorder of the lower airways, characterized by variable airflow obstruction, bronchial hyperresponsiveness, and recurrent symptoms such as wheezing, breathlessness, chest tightness, and coughing. It significantly affects the quality of life of children and adolescents due to

recurrent exacerbations, school absenteeism, and limitations in physical activities [1].

Globally, the prevalence of childhood asthma has increased over the past few decades, with urbanization, environmental pollution, and lifestyle changes contributing to this rise [2]. The prevalence of asthma in children and adolescents varies widely across regions,



influenced by genetic predisposition, environmental exposures, socio-economic status, and healthcare accessibility [3]. In India, reported prevalence among children ranges from 1% to over 15%, with urban populations typically exhibiting higher rates than rural populations [4,5].

Environmental factors such as air pollution, indoor smoke exposure, allergens, and respiratory infections are known to trigger asthma symptoms and exacerbate disease severity [6,7]. Male children and those with a positive family history of asthma are consistently reported to have higher prevalence rates, highlighting the combined role of genetic and environmental factors [8,9].

Despite these observations, there is a paucity of recent, region-specific data on the prevalence and severity of asthma among adolescents in Lucknow, Uttar Pradesh. Understanding the local prevalence and associated risk factors is essential for planning public health interventions, school-based asthma awareness programs, and targeted preventive strategies.

Therefore, this study was undertaken to estimate the prevalence and severity of bronchial asthma among school-going children aged 13–17 years in Lucknow and to assess associated demographic and environmental risk factors relevant to this population.

MATERIALS AND METHODS

Study Design and Setting

This was a cross-sectional observational study conducted to assess the prevalence and severity of bronchial asthma among school-going children. The study was carried out in selected schools affiliated with Integral Institute of Medical Sciences and Research (IIMSR), Lucknow, Uttar Pradesh, India.

Study Duration

The study was conducted over a period of 1 year, from September 2024 to September 2025.

Study Population

The study population comprised school-going children aged 13–17 years studying in selected schools in the Lucknow district.

Sample Size

Assuming the maximum variability, which is equal to 50% ($p = 0.5$) and taking 95% confidence level with $\pm 6\%$ relative precision, the calculation for required sample size will be as follows:

So, using the formula $n = z^2pq/(p\varepsilon)^2$

- And putting in values as,
- $p = 0.50$ and hence
- $q = 1 - 0.50 = 0.50$;
- $\varepsilon = 0.06$; $z = 1.96$

$$n = (1.96)^2(0.5)(0.5) / (0.5 \times 0.06)^2,$$

$$n = 425$$

Sampling Technique

Schools were selected using [Multistage random Sampling]. Within each selected school, students meeting the eligibility criteria were enrolled using systematic random sampling after obtaining consent.

Inclusion Criteria

- School-going children aged 13–17 years
- Students present on the day of data collection
- Students whose parents/guardians provided written informed consent
- Students who gave assent to participate in the study

Exclusion Criteria

- Children with known chronic respiratory diseases other than asthma (e.g., cystic fibrosis, bronchiectasis).
- Children with acute respiratory infections at the time of survey
- Students unwilling to participate.

Data Collection Tools and Procedure

Data were collected using a pre-designed, pre-tested structured questionnaire. The questionnaire included information on:

- Sociodemographic details (age, sex, class, socioeconomic status)



- History of respiratory symptoms (wheezing, cough, breathlessness, chest tightness)
- Family history of asthma or allergic disorders
- Environmental and lifestyle factors (exposure to dust, smoke, pets, indoor pollution)

The **International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire** (or modified version, if applicable) was used to identify children with bronchial asthma.

Assessment of Asthma Severity

The severity of bronchial asthma was classified based on clinical symptoms and frequency of attacks in accordance with Global Initiative for Asthma (GINA) guidelines, and categorised as:

- Intermittent asthma
- Mild persistent asthma
- Moderate persistent asthma
- Severe persistent asthma

Operational Definition

- Bronchial asthma was defined as a history of recurrent wheezing, breathlessness, chest tightness, or coughing, particularly at night or early morning, with or without a physician's diagnosis.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of Integral Institute of Medical Sciences and Research, Lucknow. Written informed consent was obtained from parents or guardians, and assent was obtained from participating students. Confidentiality and anonymity of participants were strictly maintained.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 26.0.

- Descriptive statistics were used to calculate prevalence.
- Categorical variables were expressed as frequency and percentage.

- Associations between asthma prevalence and risk factors were assessed using the Chi-square test.
- A p-value < 0.05 was considered statistically significant.

RESULTS AND OBSERVATIONS

A total of **425 school-going children aged 13–17 years** were included in the study. The mean age of the participants was **15.1 ± 1.4 years**. Of the total students, **230 (54.1%) were males** and **195 (45.9%) were females**.

Table 1: Distribution of Study Participants by Age and Gender (n = 425)

Age (years)	Male n (%)	Female n (%)	Total n (%)
13–14	72 (16.9)	68 (16.0)	140 (32.9)
15–16	108 (25.4)	92 (21.6)	200 (47.0)
17	50 (11.8)	35 (8.2)	85 (20.0)
Total	230 (54.1)	195 (45.9)	425 (100)

Prevalence of Bronchial Asthma

Out of 425 students, **62 were identified as having bronchial asthma**, giving an overall prevalence of **14.6%**.

Table 2: Prevalence of Bronchial Asthma among Study Participants

Asthma Status	Number (n)	Percentage (%)
Asthma present	62	14.6
Asthma absent	363	85.4
Total	425	100

Association between Asthma and Gender

Bronchial asthma was more prevalent among **males (17.4%)** compared to **females (11.3%)**, and the difference was **statistically significant**.

**Table 3: Association between Gender and Bronchial Asthma**

Gender	Asthma Present n (%)	Asthma Absent n (%)	Total	χ^2	P-value
Male	40 (17.4)	190 (82.6)	230	4.12	0.042
Female	22 (11.3)	173 (88.7)	195		
Total	62	363	425		

$p < 0.05$ – statistically significant

Association between Asthma and Family History

A significantly higher prevalence of asthma was observed among students with a **positive family history of asthma/allergy**.

Table 4: Association between Family History and Bronchial Asthma

Family History	Asthma Present n (%)	Asthma Absent n (%)	Total	χ^2	P-value
Present	30 (30.0)	70 (70.0)	100	28.56	<0.001
Absent	32 (9.8)	293 (90.2)	325		
Total	62	363	425		

Environmental Risk Factors

Exposure to **household smoke (biomass fuel / passive smoking)** showed a statistically significant association with bronchial asthma.

Table 5: Association between Exposure to Smoke and Bronchial Asthma

Smoke Exposure	Asthma Present n (%)	Asthma Absent n (%)	Total	χ^2	P-value
Yes	38 (22.4)	132 (77.6)	170	15.72	<0.001
No	24 (9.4)	231 (90.6)	255		
Total	62	363	425		

Severity of Bronchial Asthma

Among the 62 asthmatic students, **intermittent asthma** was the most common pattern.

Table 6: Distribution of Bronchial Asthma by Severity (n = 62)

Severity Category	Number (n)	Percentage (%)
Intermittent	28	45.2
Mild persistent	18	29.0
Moderate persistent	11	17.7
Severe persistent	5	8.1
Total	62	100

Mean Age Comparison between Asthmatic and Non-Asthmatic Students

The mean age of asthmatic students was slightly higher than non-asthmatic students; however, the difference was **not statistically significant**.

Table 7: Comparison of Mean Age between Asthmatic and Non-Asthmatic Students

Asthma Status	Mean Age (years) \pm SD	t-value	p-value
Asthma present	15.3 \pm 1.2	1.21	0.22
Asthma absent	15.0 \pm 1.4		

DISCUSSION

Bronchial asthma remains one of the most prevalent chronic respiratory conditions affecting children and adolescents worldwide. The present cross-sectional study assessed the prevalence, severity, and associated risk factors of bronchial asthma among school-going adolescents aged 13–17 years in Lucknow, Uttar Pradesh.

In the current study, the overall prevalence of bronchial asthma was 14.6%, which is comparable to the higher range of prevalence reported in urban Indian populations. Similar studies conducted in metropolitan and semi-urban regions of India have reported prevalence rates ranging from 10% to 15%, reflecting the growing burden of asthma associated with



urbanisation, environmental pollution, and changing lifestyles. The relatively high prevalence observed in this study may be attributed to increased exposure to traffic-related air pollution, indoor allergens, and passive smoking in urban settings.

A significantly higher prevalence of asthma was observed among male adolescents compared to females. This finding is consistent with earlier epidemiological studies, which have demonstrated a male predominance in childhood and adolescent asthma. Biological factors such as smaller airway diameter in males during early life, along with hormonal and immunological differences, may explain this gender disparity. However, this difference tends to diminish in adulthood, highlighting the age-related variation in asthma epidemiology.

The present study demonstrated a strong association between positive family history and bronchial asthma, with students having a family history showing a significantly higher prevalence. This finding reinforces the role of genetic susceptibility in the development of asthma. Familial aggregation of asthma and allergic disorders has been widely documented, indicating the influence of shared genetic and environmental factors within households.

Environmental exposure, particularly household smoke exposure, showed a statistically significant association with bronchial asthma. Exposure to biomass fuel, indoor air pollution, and passive smoking are known to exacerbate airway inflammation and increase the risk of asthma development and poor disease control. This highlights the importance of addressing modifiable environmental risk factors through public health interventions and community awareness programs.

Regarding disease severity, intermittent asthma was the most common presentation, followed by mild persistent asthma. Only a small proportion of adolescents had moderate or severe persistent asthma. This distribution suggests that most cases were either mild or early in the disease course, emphasizing the potential benefits of early diagnosis and timely management to prevent disease progression and complications.

Although the mean age of asthmatic students was slightly higher than that of non-asthmatic students, the difference was not statistically significant. This

indicates that asthma prevalence in this age group is not strongly influenced by age within the adolescent range studied.

Overall, the findings underscore the need for regular school-based screening, early identification of high-risk children, and implementation of preventive strategies focusing on environmental control and family education.

CONCLUSION

Bronchial asthma is a common chronic respiratory disorder among adolescents in Lucknow, with a prevalence of 14.6% in the studied population. The condition was more prevalent among males and adolescents with a positive family history of asthma. Environmental exposure to household smoke emerged as a significant modifiable risk factor. Most affected students had intermittent or mild persistent asthma, indicating opportunities for early intervention and effective disease control.

The study highlights the importance of school-based asthma screening programs, awareness initiatives for parents and teachers, and strategies aimed at reducing indoor air pollution. Early diagnosis and appropriate management can significantly reduce asthma-related morbidity and improve the quality of life of affected adolescents.

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