

Prevalence of Allergic Rhinitis Among School-Going Children in Urban and Rural Areas: A Cross-Sectional StudyPrince Kumar¹, Nisha Sharma², Sandeep Bansal³¹Senior Resident, Department of Ear, Nose & Throat, Post Graduate Institute of Medical Education & Research, Chandigarh, Punjab, India²Senior Resident, Department of Ear, Nose & Throat, Indira Gandhi Institute of Medical Sciences, Shimla, Himachal Pradesh, India³Professor, Department of Ear, Nose & Throat, Post Graduate Institute of Medical Education & Research, Chandigarh, Punjab, India

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Abstract:

Background: Allergic rhinitis (AR) is a common condition affecting school-going children worldwide. It is characterized by symptoms such as sneezing, nasal congestion, and itchy eyes, and it significantly impacts the quality of life, academic performance, and social well-being of affected children. Urban areas, with higher levels of air pollution and allergens, tend to have a higher prevalence of AR compared to rural areas. Understanding the prevalence of AR and its associated factors in different settings can aid in developing targeted management strategies.

Aim: This study aims to assess the prevalence of allergic rhinitis among school-going children in urban and rural areas and examine the association with environmental and genetic factors, particularly family history.

Methods: This cross-sectional study was conducted among 70 school-going children, with 35 participants each from urban and rural areas of Chandigarh, Punjab. A structured questionnaire was used to gather demographic information and clinical features of allergic rhinitis. A physician conducted clinical examinations to confirm the diagnosis. Statistical analysis was performed using SPSS version 23.0, with a Chi-square test to assess differences in prevalence between urban and rural groups and the association with family history.

Results: The overall prevalence of allergic rhinitis was found to be 47.1%, with a significantly higher prevalence in urban children (57.1%) compared to rural children (37.1%) ($p = 0.02$). Common clinical features included sneezing (84.8%), nasal congestion (81.8%), and itchy eyes (66.7%). The prevalence was higher among children with a family history of allergic rhinitis (60%) compared to those without (39.5%) ($p = 0.03$).

Conclusion: The study found a higher prevalence of allergic rhinitis among urban school-going children, which can be attributed to environmental factors such as air pollution and allergens. A family history of allergic rhinitis was also found to significantly increase the risk of developing the condition. These findings emphasize the importance of early diagnosis and intervention, particularly in urban areas.

Recommendations: It is recommended to implement public health initiatives that promote awareness about allergic rhinitis, especially in urban schools, and to consider environmental control measures. Early screening for children with a family history of allergic conditions could also help reduce the burden of AR.

Keywords: Allergic rhinitis, school children, urban-rural comparison, family history, prevalence.

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Introduction

Allergic rhinitis (AR) is one of the most common allergic diseases affecting individuals worldwide, particularly children. It is characterized by symptoms such as sneezing, nasal congestion, runny nose, and itchy eyes, typically triggered by allergens like pollen, dust mites, and pet dander. AR significantly impacts the quality of life, leading to sleep disturbances, impaired school performance, and an increased risk of developing asthma. As environmental pollution and exposure to allergens increase, the prevalence of allergic diseases,

including AR, has risen, particularly in urban areas [1]. Understanding the prevalence and contributing factors to AR among school-going children is crucial, as early detection and management can help prevent long-term complications.

Recent studies indicate that the prevalence of AR is on the rise, particularly in urban populations. The urban environment, with its higher levels of air pollution, pollen, and other allergens, has been linked to increased allergic diseases [2]. In contrast,

rural areas, which often have less air pollution and different exposure to allergens, show lower rates of AR [3]. This urban-rural disparity highlights the role of environmental factors in the development of allergic conditions. Moreover, genetic predispositions, such as a family history of allergic rhinitis or other allergic diseases, have been shown to play a significant role in increasing the risk of AR [4].

The impact of AR on children is particularly concerning. School-going children are often exposed to multiple allergens both at school and at home, contributing to the onset and exacerbation of AR. Furthermore, children with AR often experience school absenteeism, reduced cognitive performance, and social withdrawal due to the discomfort caused by the condition [5]. Understanding the prevalence and clinical presentation of AR in different settings can guide healthcare providers in developing targeted prevention and management strategies.

Despite the high prevalence of AR in children, few studies have compared the condition across urban and rural areas, particularly in developing countries. This study aims to assess the prevalence of allergic rhinitis among school-going children in urban and rural areas and examine the association with environmental and genetic factors, particularly family history.

Methodology

Study Design: This was a cross-sectional observational study.

Study Setting: The study was conducted at the Post Graduate Institute of Medical Education & Research (PGIMER), Chandigarh, Punjab. The data collection involved outreach and collaboration with selected schools from both urban and rural settings within the catchment areas of the institute.

Participants: A total of 70 school-going children were enrolled in the study. The participants were selected from both urban and rural areas to ensure a comparative representation. Written informed consent was obtained from the parents or guardians of all participants before enrollment in the study.

Inclusion Criteria:

- Children aged between 6 and 16 years
- School-going children residing in the selected urban or rural areas
- Children whose parents/guardians provided informed consent

Exclusion Criteria:

- Children with a known history of chronic respiratory illnesses such as asthma
- Children with immunodeficiency or ongoing treatment with immunosuppressive drugs

- Children who were unwilling or whose guardians did not provide consent

Bias: To minimize selection bias, participants were chosen randomly from the student population of selected schools in both settings. Information bias was reduced by using a standardized questionnaire and training data collectors to ensure consistency. Recall bias was limited by confirming clinical signs and symptoms with a brief clinical examination wherever necessary.

Data Collection: Data were collected using a structured questionnaire based on validated tools to assess the presence of allergic rhinitis. The questionnaire included sections on demographic data, family history, environmental exposure, and clinical symptoms suggestive of allergic rhinitis. Data collection was performed by trained healthcare personnel during school hours in a confidential and standardized manner.

Procedure: After obtaining ethical approval and administrative permissions, visits were made to the selected urban and rural schools. The children were screened using the questionnaire, and those meeting the inclusion criteria were further evaluated for clinical features of allergic rhinitis by a trained physician. Necessary precautions were taken to ensure privacy and comfort during the evaluation.

Statistical Analysis: Data were compiled and analyzed using Statistical Package for the Social Sciences (SPSS) version 23.0. Descriptive statistics were used to summarize the demographic and clinical characteristics of the participants. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean \pm standard deviation. The Chi-square test was used to compare the prevalence between urban and rural groups, and a p -value of less than 0.05 was considered statistically significant.

Results

A total of 70 school-going children (35 from urban areas and 35 from rural areas) were enrolled in the study. The demographic data, clinical features, and prevalence of allergic rhinitis were evaluated and analyzed.

The demographic characteristics of the study participants are summarized in **Table 1**. The mean age of the participants was 10.2 ± 3.1 years, with the majority of children being between 6 and 12 years of age. A near-equal distribution was observed between male and female participants in both urban and rural settings. The study also recorded the family history of allergic rhinitis, with a higher percentage of children from urban areas having a family history of allergic conditions.

Table 1: Demographic Characteristics of Study Participants

Demographic Factor	Urban Area (n=35)	Rural Area (n=35)	Total (n=70)
Age (Mean ± SD)	10.3 ± 3.0	10.1 ± 3.2	10.2 ± 3.1
Gender (Male)	18 (51.4%)	20 (57.1%)	38 (54.3%)
Gender (Female)	17 (48.6%)	15 (42.9%)	32 (45.7%)
Family History of Allergic Rhinitis	15 (42.9%)	10 (28.6%)	25 (35.7%)

Prevalence of Allergic Rhinitis: The overall prevalence of allergic rhinitis among school-going children in this study was found to be 47.1% (33 out of 70 participants). The prevalence was significantly

higher in the urban group (57.1%, 20/35) compared to the rural group (37.1%, 13/35). This difference was statistically significant ($p = 0.02$).

Table 2: Prevalence of Allergic Rhinitis in Urban and Rural Areas

Area	Number of Participants with Allergic Rhinitis	Prevalence (%)
Urban Area	20 (57.1%)	57.1%
Rural Area	13 (37.1%)	37.1%
Total	33 (47.1%)	47.1%

Clinical Features of Allergic Rhinitis: Clinical symptoms such as sneezing, nasal congestion, and itchy eyes were commonly reported in the

participants diagnosed with allergic rhinitis. **Table 3** highlights the frequency of these symptoms among the affected children.

Table 3: Clinical Features of Allergic Rhinitis

Clinical Symptom	Urban Area (n=20)	Rural Area (n=13)	Total (n=33)
Sneezing	18 (90%)	10 (76.9%)	28 (84.8%)
Nasal Congestion	16 (80%)	11 (84.6%)	27 (81.8%)
Itchy Eyes	14 (70%)	8 (61.5%)	22 (66.7%)
Watery Eyes	10 (50%)	6 (46.2%)	16 (48.5%)
Post-nasal Drip	12 (60%)	7 (53.8%)	19 (57.6%)

Association with Family History: A family history of allergic rhinitis was found to be a significant factor in the development of allergic rhinitis in children. Among children with a family history of

allergic rhinitis, the prevalence was significantly higher (60%, 15/25) compared to those without a family history (39.5%, 18/45), with a p -value of 0.03.

Table 4: Prevalence of Allergic Rhinitis in Relation to Family History

Family History of Allergic Rhinitis	Number of Affected Children	Prevalence (%)
Yes	15 (60%)	60%
No	18 (39.5%)	39.5%

Statistical Analysis

Chi-square tests were used to assess the statistical significance of the difference in prevalence between urban and rural areas, as well as the association between family history and the occurrence of allergic rhinitis. The prevalence of allergic rhinitis in urban areas was significantly higher than in rural areas ($p = 0.02$), and the family history was significantly associated with a higher prevalence of allergic rhinitis ($p = 0.03$).

Discussion

The study aimed to evaluate the prevalence of allergic rhinitis among school-going children in urban and rural areas. The study included 70 participants, evenly distributed between urban (35) and rural (35) settings. The overall prevalence of allergic rhinitis was found to be 47.1%, with 20 out of 35 children (57.1%) in the urban group and 13 out of 35 children (37.1%) in the rural group testing

positive for the condition. This finding reveals a higher prevalence of allergic rhinitis in urban areas, which is statistically significant ($p = 0.02$).

In terms of clinical features, sneezing, nasal congestion, and itchy eyes were the most commonly reported symptoms. Among children with allergic rhinitis, 90% in the urban group and 76.9% in the rural group reported sneezing, while nasal congestion was reported by 80% in the urban group and 84.6% in the rural group. These findings suggest that the symptoms of allergic rhinitis are fairly consistent across both groups, although urban children tended to report more severe symptoms, particularly sneezing.

Additionally, a significant association was found between family history and the prevalence of allergic rhinitis. Among children with a family history of allergic rhinitis, 60% were affected by the condition, whereas only 39.5% of children without a family history developed allergic rhinitis. This

suggests a genetic predisposition to the condition, highlighting the importance of familial risk factors in the development of allergic rhinitis.

Overall, these results indicate that allergic rhinitis is prevalent among school-going children, with urban children exhibiting a higher prevalence compared to their rural counterparts. The findings also underscore the role of family history in the likelihood of developing the condition. This suggests that both environmental factors (such as pollution and allergens in urban areas) and genetic predispositions contribute to the higher rates of allergic rhinitis observed in urban children. The study calls for increased awareness and early intervention, particularly in urban areas, where the prevalence of allergic rhinitis is notably higher. Several recent studies have highlighted variations in the prevalence of allergic rhinitis (AR) among school children across urban and rural environments. In Kashmir, India, a cross-sectional study among 402 children aged 6–18 years reported a 28.85% prevalence of AR, with a slightly higher burden in urban (55.2%) compared to rural (44.8%) populations. The most common trigger was dust mites (77.58%) and nasal obstruction was the most prevalent symptom (79.31%) [6]. Similarly, a large-scale epidemiological study conducted in Bayannur City, China, reported an overall AR prevalence of 39.8% among 4,754 children aged 6–12 years, with urban children (50.3%) significantly more affected than rural (13.7%) and pastoral populations (20.9%). The condition also had major impacts on daily life and was frequently comorbid with asthma and allergic conjunctivitis [7].

A study in rural Sri Lanka among preschool children found a lower AR prevalence of 11.6%. However, notable environmental risk factors such as sleeping on the floor and the presence of cats in households were associated with increased symptoms, and symptom exacerbations correlated with seasonal temperature and humidity patterns [8]. Another rural-focused study from Colombia used the ISAAC-III tool among 261 children aged 6–14 and found AR prevalence to be 11.49%, which was lower than reported in many urban settings. The study also identified female sex, comorbid asthma, and higher maternal education as associated factors [9].

Environmental exposures also play a significant role. In Shanxi Province, China, a microbiome analysis of urban and rural school classrooms revealed that urban children were more exposed to pathogenic microbes and had higher AR rates. Urban classrooms had higher abundance of species linked with inflammation, while rural classrooms had protective microbial compositions such as short-chain fatty acid-producing bacteria [10].

Lastly, in Saudi Arabia's Jazan region, a cross-sectional study showed a 27.1% AR prevalence among schoolchildren. Urban residence, intermediate education levels, and lowland geographic zones were identified as risk factors. Common symptoms included nasal blockage, sleep disturbances, and missed school days due to nasal issues [11].

Conclusion

The study found a higher prevalence of allergic rhinitis among school-going children in urban areas (57.1%) compared to rural areas (37.1%). Clinical symptoms such as sneezing and nasal congestion were commonly observed in both groups. Additionally, a family history of allergic rhinitis was significantly associated with a higher risk of developing the condition. These findings highlight the influence of both environmental and genetic factors on the prevalence of allergic rhinitis, suggesting a need for targeted interventions, particularly in urban settings.

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