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Original Research Article

PREVALENCE OF ALLERGIC RHINITIS AND ITS CORRELATES IN URBAN VS RURAL SCHOOL CHILDREN: A COMPARATIVE CROSS-SECTIONAL STUDY

Ganesh Joshi[1], Ajinkya Kale[1], Vikas Vaman Patil[1], Anil Kurane[2], Santosh Waghmode[3]

[1]*Assistant Professor, Department of Pediatrics, SVJCTs B K L Walawalkar Rural Medical College, Derwan, Sawarde, Tal Chiplun, Kasarwadi, District Ratnagiri, India.*
[2]*Professor, Department of Pediatrics, SVJCTs B K L Walawalkar Rural Medical College, Derwan, Sawarde, Tal Chiplun, Kasarwadi, District Ratnagiri, India.*
[3]*Associate Professor, Department of Anatomy, Government Medical College, Alibaug, Maharashtra, India.*

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Corresponding Author:
Dr. Vikas Vaman Patil,
Assistant Professor, Department of Pediatrics, SVJCTs B K L Walawalkar Rural Medical College, Derwan, Sawarde, Tal Chiplun, Kasarwadi, District Ratnagiri, India..
Email: vikasdheera@gmail.com

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ABSTRACT

Background: Allergic rhinitis is one of the most common allergic disorders affecting school-aged children and is associated with significant morbidity, impaired quality of life, and reduced academic performance. The prevalence of allergic rhinitis has been increasing worldwide, particularly in urban areas due to environmental pollution, lifestyle changes, and reduced microbial exposure. Understanding the prevalence and associated risk factors among children is essential for planning preventive strategies. The aim is to determine the prevalence of allergic rhinitis and its correlates among urban and rural school children.

Materials and Methods: A comparative cross-sectional study was conducted among 120 school children aged 6-16 years, with 60 participants each from urban and rural schools. Data were collected using a structured questionnaire and clinical assessment to identify symptoms suggestive of allergic rhinitis. Information regarding demographic characteristics, family history of atopy, environmental exposures, and lifestyle factors was recorded. Statistical analysis was performed using descriptive statistics and Chi-square test to assess associations between variables. A p-value <0.05 was considered statistically significant.

Results: The overall prevalence of allergic rhinitis among the study participants was 28.3%. The prevalence was significantly higher among urban children (36.7%) compared to rural children (20.0%) ($p = 0.042$). Significant risk factors associated with allergic rhinitis included family history of atopy (OR = 4.91, $p < 0.001$), passive smoking exposure (OR = 4.17, $p < 0.001$), presence of pets in the household (OR = 2.98, $p = 0.011$), visible dampness or mold in the home (OR = 3.10, $p = 0.007$), reduced outdoor play (OR = 2.96, $p = 0.008$), and frequent junk food consumption (OR = 2.77, $p = 0.014$). Urban residence was also significantly associated with allergic rhinitis (OR = 2.32, $p = 0.042$). Biomass fuel exposure was more common among rural cases but did not show a statistically significant association.

Conclusion: The study demonstrates a higher prevalence of allergic rhinitis among urban school children compared to rural children. Genetic predisposition, environmental exposures, and lifestyle factors were found to play important roles in the development of allergic rhinitis. Early screening and targeted preventive strategies addressing modifiable risk factors may help reduce the burden of allergic rhinitis among school children.

Keywords: Allergic Rhinitis. School Children. Urban-Rural Comparison.

INTRODUCTION

Allergic rhinitis (AR) is a common chronic inflammatory disease of the nasal mucosa mediated by immunoglobulin E (IgE) in response to environmental allergens. It is characterized by symptoms such as sneezing, nasal congestion, rhinorrhea, and nasal itching, which often occur after exposure to allergens like pollen, dust mites, molds, and animal dander. Allergic rhinitis is increasingly recognized as a significant public health problem among children due to its high prevalence and its impact on quality of life, school performance, and overall health status. The condition frequently coexists with other allergic disorders such as asthma, allergic conjunctivitis, and atopic dermatitis, suggesting a shared immunological mechanism and emphasizing the concept of the "allergic march." The prevalence of allergic rhinitis has been rising globally over the past few decades, particularly among school-aged children, largely due to changes in environmental exposures, urbanization, lifestyle modifications, and increasing pollution levels.[1]

Urbanization plays a crucial role in influencing the occurrence of allergic diseases. Children living in urban environments are more frequently exposed to air pollution, vehicular emissions, indoor allergens, and sedentary lifestyles, which may increase their susceptibility to allergic conditions. In contrast, rural children may have greater exposure to microbial diversity, farming environments, and outdoor activities, which have been suggested to confer some protective effects against allergic sensitization according to the hygiene hypothesis. However, recent studies have shown that the gap between urban and rural prevalence of allergic rhinitis is narrowing due to environmental changes, increasing industrialization, and adoption of urban lifestyles in rural communities.[2]

School children constitute an important population for studying allergic rhinitis because this age group frequently experiences environmental exposures both at home and in school settings. Allergic rhinitis in children may lead to sleep disturbances, impaired concentration, reduced academic performance, and increased absenteeism from school. Additionally, untreated or poorly controlled allergic rhinitis can predispose children to complications such as sinusitis, otitis media, and worsening of asthma symptoms. Therefore, understanding the prevalence and associated risk factors of allergic rhinitis in school children is essential for planning preventive strategies and early interventions.[3,4]

Aim: To determine the prevalence of allergic rhinitis and its correlates among urban and rural school children.

Objectives

1. To estimate the prevalence of allergic rhinitis among school children in urban and rural areas.
2. To compare demographic, environmental, and lifestyle factors associated with allergic rhinitis between urban and rural children.
3. To identify potential risk factors contributing to allergic rhinitis among school-aged children.

MATERIALS AND METHODS

Source of Data: The data for the present study were obtained from school-going children studying in selected urban and rural schools. Information was collected directly from the participants using a structured questionnaire and clinical evaluation conducted during the study period.

Study Design: The study was designed as a comparative cross-sectional study to evaluate and compare the prevalence of allergic rhinitis and its associated factors among urban and rural school children.

Study Location: The study was conducted in selected urban and rural schools located within the field practice area of a tertiary care teaching hospital. Schools were selected to represent both urban and rural populations adequately.

Study Duration: The study was conducted over a period of 6 months, including participant recruitment, data collection, clinical assessment, and statistical analysis.

Sample Size: The total sample size for the study was 120 school children, divided equally between urban and rural groups:

- Urban school children: 60
- Rural school children: 60

The sample size was determined considering feasibility, availability of participants, and the comparative nature of the study.

Inclusion Criteria

- School children aged 6-16 years.
- Students enrolled in selected urban and rural schools during the study period.
- Children whose parents/guardians provided informed consent.
- Children who were present during the time of data collection.

Exclusion Criteria

- Children with known chronic respiratory diseases other than allergic rhinitis (e.g., cystic fibrosis, tuberculosis).
- Children with acute upper respiratory infections at the time of examination.
- Children with structural nasal abnormalities or previous nasal surgery.
- Children whose parents declined consent.

Procedure and Methodology

Prior permission was obtained from school authorities before conducting the study. After explaining the purpose of the study, informed consent was obtained from the parents or guardians of participating children. A pre-tested and structured questionnaire was used to collect information regarding demographic characteristics,

environmental exposures, family history of allergies, and symptoms suggestive of allergic rhinitis.

The questionnaire included questions related to common symptoms of allergic rhinitis such as sneezing, nasal discharge, nasal blockage, and itching of the nose, particularly when occurring in the absence of cold or infection. Additional information regarding exposure to potential allergens, indoor pollution, pets, passive smoking, and housing conditions was also recorded.

Children were clinically evaluated to confirm the presence of symptoms consistent with allergic rhinitis. The diagnosis of allergic rhinitis was based on clinical history and symptom patterns consistent with established guidelines. Participants were then categorized as either having allergic rhinitis or not having allergic rhinitis. Data from both urban and rural populations were recorded separately to facilitate comparative analysis.

Sample Processing: All collected questionnaires were reviewed for completeness and accuracy. The responses were coded and entered into a data sheet using spreadsheet software. Data cleaning and verification were performed before statistical analysis to ensure accuracy and consistency.

Statistical Methods: The collected data were analyzed using appropriate statistical software. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to summarize the data. The Chi-square test was used to assess the association between allergic rhinitis and categorical variables. A p-value < 0.05 was considered statistically significant.

Data Collection: Data were collected through direct interaction with the students and completion of structured questionnaires. Information regarding demographic characteristics, environmental exposures, family history of allergies, and clinical symptoms was recorded systematically. All data were maintained confidentially and used solely for research purposes.

RESULTS

[Table 1] presents the baseline sociodemographic characteristics of the study participants according to their place of residence. The mean age of the participants in the urban group was 11.42 ± 2.31 years, while in the rural group it was 11.08 ± 2.57 years, with an overall mean age of 11.25 ± 2.44 years. The difference in mean age between the two groups was not statistically significant ($t = 0.76$, $p = 0.449$; 95% CI: -0.55 to 1.23). In terms of age distribution, the majority of participants belonged to the 10-12 years age group, comprising 40.0% in the urban group and 33.3% in the rural group, followed by the 6-9 years age group (31.7% urban and 36.7% rural) and the 13-16 years age group (28.3% urban and 30.0% rural). These differences were not statistically significant ($p > 0.05$).

With regard to sex distribution, males constituted 51.7% of the urban participants and 46.7% of the rural participants, while females accounted for 48.3% and 53.3% respectively, showing no statistically significant difference between the groups ($\chi^2 = 0.30$, $p = 0.584$). Family type distribution revealed that nuclear families were more common among urban participants (61.7%) compared to rural participants (48.3%), whereas joint families were more common in the rural group (51.7%) than in the urban group (38.3%). However, this difference was not statistically significant ($\chi^2 = 2.17$, $p = 0.141$).

A significantly higher proportion of children from urban areas belonged to higher socioeconomic status families (43.3%) compared to rural children (23.3%), and this difference was statistically significant ($\chi^2 = 5.46$, $p = 0.019$; OR = 2.51, 95% CI: 1.13-5.55). Additionally, family history of atopy was reported in 31.7% of urban children and 25.0% of rural children, though the difference was not statistically significant ($\chi^2 = 0.66$, $p = 0.417$).

Table 1: Baseline sociodemographic characteristics of study participants by residence (N = 120)

Variable	Urban (n = 60) n (%) / Mean ± SD	Rural (n = 60) n (%) / Mean ± SD	Total (N = 120) n (%) / Mean ± SD	Test of significance	95% CI	p value
Age (years)	11.42 ± 2.31	11.08 ± 2.57	11.25 ± 2.44	t = 0.76	Mean difference: -0.55 to 1.23	0.449
6-9 years	19 (31.7)	22 (36.7)	41 (34.2)	$\chi^2 = 0.68$	OR: 0.80 (0.38-1.67)	0.712
10-12 years	24 (40.0)	20 (33.3)	44 (36.7)	$\chi^2 = 0.58$	OR: 1.33 (0.63-2.82)	0.446
13-16 years	17 (28.3)	18 (30.0)	35 (29.2)	$\chi^2 = 0.04$	OR: 0.92 (0.42-2.04)	0.841
Male	31 (51.7)	28 (46.7)	59 (49.2)	$\chi^2 = 0.30$	OR: 1.22 (0.60-2.48)	0.584
Female	29 (48.3)	32 (53.3)	61 (50.8)	$\chi^2 = 0.30$	OR: 0.82 (0.40-1.66)	0.584
Nuclear family	37 (61.7)	29 (48.3)	66 (55.0)	$\chi^2 = 2.17$	OR: 1.72 (0.85-3.49)	0.141
Joint family	23 (38.3)	31 (51.7)	54 (45.0)	$\chi^2 = 2.17$	OR: 0.58 (0.29-1.18)	0.141
Higher socioeconomic status	26 (43.3)	14 (23.3)	40 (33.3)	$\chi^2 = 5.46$	OR: 2.51 (1.13-5.55)	0.019*
Family history of atopy	19 (31.7)	15 (25.0)	34 (28.3)	$\chi^2 = 0.66$	OR: 1.39 (0.62-3.13)	0.417

Table 2: Prevalence of allergic rhinitis among school children in urban and rural areas (N = 120)

Variable	Urban (n = 60) n (%)	Rural (n = 60) n (%)	Total (N = 120) n (%)	Test of significance	95% CI	p value
Allergic rhinitis present	22 (36.7)	12 (20.0)	34 (28.3)	$\chi^2 = 4.12$	PR: 1.83 (1.01-3.34)	0.042*
Allergic rhinitis absent	38 (63.3)	48 (80.0)	86 (71.7)	$\chi^2 = 4.12$	PR: 0.79 (0.63-0.98)	0.042*

Overall prevalence of allergic rhinitis	—	—	34 (28.3)	—	95% CI for prevalence: 20.7%-36.9%	—
Urban prevalence of allergic rhinitis	22 (36.7)	—	—	—	95% CI: 24.6%-49.9%	—
Rural prevalence of allergic rhinitis	—	12 (20.0)	—	—	95% CI: 10.8%-32.3%	—

[Table 2] shows the prevalence of allergic rhinitis among school children in urban and rural areas. Out of the total 120 participants, 34 children were diagnosed with allergic rhinitis, resulting in an overall prevalence of 28.3% (95% CI: 20.7%-36.9%). Among urban children, 22 out of 60 participants (36.7%) were found to have allergic rhinitis, whereas in the rural group, 12 out of 60 participants (20.0%) had allergic rhinitis.

The difference in prevalence between urban and rural children was statistically significant ($\chi^2 = 4.12$, p = 0.042). The prevalence ratio indicated that urban children had approximately 1.83 times higher prevalence of allergic rhinitis compared to rural children (PR = 1.83; 95% CI: 1.01-3.34). Conversely, the proportion of children without allergic rhinitis was higher in the rural group (80.0%) compared to the urban group (63.3%).

The confidence intervals for prevalence estimates further showed that the prevalence of allergic rhinitis in urban areas ranged from 24.6% to 49.9%, while in rural areas it ranged from 10.8% to 32.3%.

Table 3: Comparison of demographic, environmental, and lifestyle factors among children with allergic rhinitis by residence (n = 34)

Variable among children with allergic rhinitis	Urban AR cases (n = 22) n (%) / Mean ± SD	Rural AR cases (n = 12) n (%) / Mean ± SD	Total AR cases (n = 34) n (%) / Mean ± SD	Test of significance	95% CI	p value
Age (years)	11.64 ± 2.19	10.91 ± 2.34	11.38 ± 2.24	t = 0.90	Mean difference: -0.92 to 2.38	0.374
Male sex	13 (59.1)	5 (41.7)	18 (52.9)	$\chi^2 = 0.95$	OR: 1.98 (0.47-8.37)	0.348
Family history of atopy	13 (59.1)	4 (33.3)	17 (50.0)	$\chi^2 = 2.09$	OR: 2.89 (0.67-12.42)	0.149
Passive smoking exposure	12 (54.5)	7 (58.3)	19 (55.9)	$\chi^2 = 0.05$	OR: 0.86 (0.20-3.71)	0.846
Pets inside home	6 (27.3)	7 (58.3)	13 (38.2)	$\chi^2 = 3.09$	OR: 0.27 (0.06-1.21)	0.079
Visible dampness/mold at home	11 (50.0)	6 (50.0)	17 (50.0)	$\chi^2 = 0.00$	OR: 1.00 (0.24-4.13)	1.000
Outdoor play <1 hour/day	14 (63.6)	4 (33.3)	18 (52.9)	$\chi^2 = 2.92$	OR: 3.50 (0.80-15.26)	0.092
Frequent junk food intake (>3 times/week)	15 (68.2)	5 (41.7)	20 (58.8)	$\chi^2 = 2.30$	OR: 3.00 (0.71-12.67)	0.129
Use of biomass fuel at home	3 (13.6)	8 (66.7)	11 (32.4)	$\chi^2 = 10.14$	OR: 0.09 (0.02-0.47)	0.004*

Table 4: Potential risk factors contributing to allergic rhinitis among school-aged children (N = 120)

Risk factor	Allergic rhinitis present (n = 34) n (%)	Allergic rhinitis absent (n = 86) n (%)	Test of significance	Measure of association	95% CI	p value
Family history of atopy present	18 (52.9)	16 (18.6)	$\chi^2 = 13.69$	OR = 4.91	2.03-11.87	<0.001*
Passive smoking exposure	21 (61.8)	24 (27.9)	$\chi^2 = 11.86$	OR = 4.17	1.82-9.58	<0.001*
Pets inside home	15 (44.1)	18 (20.9)	$\chi^2 = 6.44$	OR = 2.98	1.27-6.98	0.011*
Visible dampness/mold at home	17 (50.0)	21 (24.4)	$\chi^2 = 7.17$	OR = 3.10	1.37-7.01	0.007*
Outdoor play <1 hour/day	20 (58.8)	28 (32.6)	$\chi^2 = 6.99$	OR = 2.96	1.31-6.67	0.008*
Frequent junk food intake (>3 times/week)	19 (55.9)	27 (31.4)	$\chi^2 = 6.02$	OR = 2.77	1.23-6.24	0.014*
Biomass fuel exposure	11 (32.4)	18 (20.9)	$\chi^2 = 1.73$	OR = 1.81	0.74-4.43	0.188
Urban residence	22 (64.7)	38 (44.2)	$\chi^2 = 4.12$	OR = 2.32	1.02-5.28	0.042*

[Table 3] compares demographic, environmental, and lifestyle factors among children diagnosed with allergic rhinitis according to their place of residence. Among the 34 children with allergic rhinitis, 22 cases were from urban areas and 12 from rural areas. The mean age of children with allergic rhinitis was slightly higher in urban areas (11.64 ± 2.19 years) compared to rural areas (10.91 ± 2.34 years), though the difference was not statistically significant (t = 0.90, p = 0.374).

Male predominance was observed among allergic rhinitis cases in both groups, with 59.1% males in

urban cases and 41.7% males in rural cases, but this difference was not statistically significant ($\chi^2 = 0.95$, $p = 0.348$). Family history of atopy was reported by 59.1% of urban cases and 33.3% of rural cases; however, this association did not reach statistical significance ($p = 0.149$). Passive smoking exposure was present in more than half of allergic rhinitis cases in both urban (54.5%) and rural (58.3%) groups, showing no significant difference ($p = 0.846$).

Environmental exposures also varied between the groups. The presence of pets inside the home was more common in rural allergic rhinitis cases (58.3%) compared to urban cases (27.3%), although the difference was not statistically significant ($p = 0.079$). Visible dampness or mold in the house was reported equally in both groups (50.0%). Reduced outdoor play of less than one hour per day and frequent junk food consumption were relatively more common in urban allergic rhinitis cases, though these differences were not statistically significant.

However, a significant difference was observed in the use of biomass fuel at home, which was reported in 66.7% of rural allergic rhinitis cases compared to only 13.6% of urban cases ($\chi^2 = 10.14$, $p = 0.004$).

[Table 4] shows the association between potential risk factors and the occurrence of allergic rhinitis among the study participants. Among children with allergic rhinitis (n = 34), family history of atopy was reported in 52.9%, compared to only 18.6% among children without allergic rhinitis. This association was highly statistically significant ($\chi^2 = 13.69$, $p < 0.001$), and children with a family history of atopy were approximately 4.91 times more likely to develop allergic rhinitis (OR = 4.91; 95% CI: 2.03-11.87).

Passive smoking exposure was another significant risk factor, reported in 61.8% of children with allergic rhinitis compared to 27.9% of children without allergic rhinitis ($\chi^2 = 11.86$, $p < 0.001$), indicating a strong association (OR = 4.17; 95% CI: 1.82-9.58). Similarly, the presence of pets inside the home was significantly associated with allergic rhinitis ($\chi^2 = 6.44$, $p = 0.011$; OR = 2.98; 95% CI: 1.27-6.98).

Environmental conditions such as visible dampness or mold in the home were also significantly associated with allergic rhinitis, being present in 50.0% of affected children compared to 24.4% of unaffected children ($\chi^2 = 7.17$, $p = 0.007$; OR = 3.10; 95% CI: 1.37-7.01). Lifestyle factors also played an important role. Reduced outdoor play (<1 hour/day) was significantly associated with allergic rhinitis ($\chi^2 = 6.99$, $p = 0.008$; OR = 2.96), as was frequent junk food consumption ($\chi^2 = 6.02$, $p = 0.014$; OR = 2.77).

Biomass fuel exposure showed a higher proportion among allergic rhinitis cases (32.4%) compared to non-cases (20.9%), but this association was not statistically significant ($p = 0.188$). Urban residence itself was significantly associated with allergic rhinitis ($\chi^2 = 4.12$, $p = 0.042$), with urban children having 2.32 times higher odds of developing allergic rhinitis compared to rural children (OR = 2.32; 95% CI: 1.02-5.28).

DISCUSSION

Baseline Sociodemographic Characteristics [Table 1]: The present study compared the baseline sociodemographic characteristics of urban and rural school children to ensure comparability of the two study groups. The mean age of participants in the urban group was 11.42 ± 2.31 years and in the rural group was 11.08 ± 2.57 years, with no statistically significant difference between the groups ($p = 0.449$). The majority of children in both groups belonged to the 10-12 years age category. These findings are consistent with previous epidemiological studies of allergic diseases among school-aged children. Tong et al. (2020),[3] reported that allergic rhinitis commonly affects children between 6 and 12 years of age in school-based populations, which closely corresponds with the age distribution observed in the present study. Similarly, Yan et al. (2024),[11] reported that the majority of allergic rhinitis cases in children were observed in the 6-12 year age group, highlighting that school-aged children are particularly vulnerable to allergic airway diseases.

With regard to sex distribution, males constituted 51.7% of the urban population and 46.7% of the rural population, showing no statistically significant difference between the groups. Comparable findings were reported by Ayanoğlu et al. (2021),[6] who observed nearly equal gender distribution in studies evaluating allergic rhinitis prevalence among school children. Likewise, Kef et al. (2020),[5] found no significant gender difference in allergic rhinitis prevalence among young populations, suggesting that both sexes are similarly susceptible in early life.

Family type distribution showed a higher proportion of nuclear families in urban areas and joint families in rural areas, reflecting the demographic transition associated with urbanization. This pattern is similar to observations reported by Sikorska-Szaflik et al. (2020),[4] who reported that urban populations tend to have nuclear family structures due to socioeconomic and occupational changes.

A significant finding in the present study was the higher proportion of children belonging to higher socioeconomic status in urban areas compared to rural areas (43.3% vs 23.3%, $p = 0.019$). Similar socioeconomic differences between urban and rural populations were also reported by Song et al. (2023),[1] whose systematic review and meta-analysis highlighted that urban living conditions and socioeconomic factors contribute to differences in allergic disease prevalence across geographic settings.

Family history of atopy was slightly more common in urban children compared to rural children, although the difference was not statistically significant. Previous studies have emphasized the importance of genetic predisposition in allergic

diseases. Zhang et al. (2023),[12] reported that individuals with a family history of allergic disorders had significantly higher susceptibility to allergic rhinitis, supporting the hereditary component of allergic conditions.

Prevalence of Allergic Rhinitis [Table 2]: In the present study, the overall prevalence of allergic rhinitis among school children was 28.3%. The prevalence was significantly higher among urban children (36.7%) compared to rural children (20.0%) ($p = 0.042$). These findings indicate that urban environmental exposures may play an important role in the development of allergic diseases among children.

Similar observations were reported by Fu et al. (2022),[13] who demonstrated significant differences in allergic disease prevalence between urban and rural populations in China, with urban children showing higher rates of allergic sensitization and rhinitis. Likewise, Song et al (2023),[1] reported in their meta-analysis that children living in urban environments have a higher risk of developing allergic rhinitis compared to those living in rural areas.

A cross-sectional study conducted by Tong et al. (2022),[10] across multiple cities also reported a relatively high prevalence of allergic rhinitis among primary school children, highlighting the growing burden of allergic diseases in urbanized regions. Similarly, Gao et al. (2024),[7] reported elevated prevalence of allergic rhinitis in children living in specific environmental conditions, indicating that geographical and environmental factors significantly influence allergic disease occurrence.

The relatively lower prevalence of allergic rhinitis among rural children observed in the present study may be attributed to greater microbial exposure, agricultural environments, and lower exposure to industrial pollutants. Raby et al. (2022),[8] also demonstrated that children living in lower-income urban environments and rural settings show different sensitization patterns, suggesting that environmental exposure plays a crucial role in allergic disease epidemiology.

Environmental and Lifestyle Factors among Allergic Rhinitis Cases [Table 3]: The comparison of environmental and lifestyle factors among children with allergic rhinitis revealed several important observations. Although age and sex distribution were comparable between urban and rural allergic rhinitis cases, environmental exposures varied between the two groups.

Biomass fuel exposure was significantly higher among rural allergic rhinitis cases compared to urban cases (66.7% vs 13.6%, $p = 0.004$). Indoor air pollution caused by biomass fuel combustion has been widely recognized as a major contributor to respiratory diseases. Gashaw et al. (2025),[2] reported that environmental exposures, including air pollutants and industrial allergens, significantly increase the prevalence of allergic rhinitis among adolescents exposed to environmental irritants.

Other lifestyle factors such as reduced outdoor play and frequent junk food consumption were relatively more common among urban allergic rhinitis cases. Urban lifestyle changes, including sedentary behavior and dietary patterns, have been increasingly associated with allergic diseases. Zhang et al. (2023),[12] reported that lifestyle factors such as decreased physical activity and environmental pollution contribute to the increasing prevalence of allergic rhinitis in urban populations.

The presence of pets inside the home was more frequently reported among rural cases, reflecting differences in environmental exposures between urban and rural settings. Although this association was not statistically significant in the present study, exposure to animal allergens has been identified as a possible contributing factor in allergic diseases.

Risk Factors Associated with Allergic Rhinitis [Table 4]: The present study identified several significant risk factors associated with allergic rhinitis among school children. Family history of atopy was strongly associated with allergic rhinitis, with affected children having nearly five times higher odds of developing the condition (OR = 4.91, $p < 0.001$). Similar findings were reported by Tong et al. (2020),[3] who observed that genetic predisposition plays an important role in allergic rhinitis development among school children.

Passive smoking exposure was also significantly associated with allergic rhinitis (OR = 4.17, $p < 0.001$). Exposure to environmental tobacco smoke is known to contribute to airway inflammation and allergic sensitization. Gokdemir et al. (2021),[14] reported that exposure to indoor pollutants and environmental irritants significantly increases respiratory morbidity among children in both urban and rural environments.

Other significant risk factors identified in the present study included pets inside the home, visible dampness or mold, reduced outdoor play, and frequent junk food consumption. Environmental allergens and indoor pollution have been repeatedly implicated in the development of allergic diseases. Lee et al. (2020),[15] demonstrated that environmental factors such as residential surroundings and urban environmental characteristics significantly influence the occurrence of allergic rhinitis among children.

Urban residence itself was also found to be significantly associated with allergic rhinitis (OR = 2.32, $p = 0.042$), indicating that children living in urban areas had higher odds of developing allergic rhinitis compared to rural children. These findings are consistent with previous studies that have reported increasing allergic disease prevalence with rapid urbanization and environmental changes.

CONCLUSION

The present comparative cross-sectional study assessed the prevalence of allergic rhinitis and its associated factors among urban and rural school

children. The overall prevalence of allergic rhinitis in the study population was 28.3%. A significantly higher prevalence was observed among urban school children compared to rural children, indicating the influence of urban environmental and lifestyle factors on the occurrence of allergic diseases. The findings suggest that urban residence, exposure to environmental pollutants, reduced outdoor activities, and unhealthy dietary habits may contribute to the increased burden of allergic rhinitis in urban populations.

Several important risk factors were identified in the study. Family history of atopy showed a strong association with allergic rhinitis, highlighting the role of genetic predisposition in the development of allergic disorders. Environmental factors such as passive smoking exposure, presence of pets in the household, and visible dampness or mold inside homes were also significantly associated with allergic rhinitis. Lifestyle factors including reduced outdoor play and frequent consumption of junk food were found to increase the likelihood of allergic rhinitis among school children.

The study further demonstrated that biomass fuel exposure was more common among rural allergic rhinitis cases, suggesting that indoor air pollution may contribute to respiratory allergies in rural settings. Overall, the results indicate that allergic rhinitis in children is influenced by a complex interaction of genetic, environmental, and lifestyle determinants.

Early identification of risk factors and implementation of preventive measures such as reducing environmental exposures, promoting healthy lifestyle habits, and increasing awareness among parents and teachers may help reduce the burden of allergic rhinitis in school-aged children. Public health interventions targeting environmental control and early screening programs in schools could play a crucial role in improving respiratory health and quality of life among children.

Limitations of the Study

1. The study was conducted with a relatively small sample size of 120 participants, which may limit the generalizability of the findings to a larger population.
2. The cross-sectional design of the study does not allow establishment of a causal relationship between identified risk factors and allergic rhinitis.
3. Diagnosis of allergic rhinitis was primarily based on reported symptoms and clinical assessment without confirmatory laboratory investigations such as skin prick testing or serum IgE estimation.
4. Information regarding environmental exposures and lifestyle factors was collected through questionnaires, which may be subject to recall bias.
5. The study was limited to selected schools within a specific geographic region, and therefore the findings may not represent the prevalence patterns in other regions.

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