

## An Epidemiological Study to Determine the Effect of Allergic Rhinitis in School-Aged Children

Vandana Sharma

Senior Resident, Department of ENT, IGIMS, Patna, Bihar, India

Received: 02-10-2023 / Revised: 15-11-2023 / Accepted: 25-12-2023

Corresponding Author: Dr. Vandana Sharma

Conflict of interest: Nil

### Abstract

**Aim:** To determine the prevalence and assess the effect of allergic rhinitis in school-aged children.

**Material and Methods:** Present retrospective study was conducted in the Department of ENT, IGIMS, Patna, Bihar, India from February 2019 to December 2019. A total of 350 students were taken for the study including both male and female students. All students were interviewed. The information was collected from them through interview using a questionnaire after taking informed consent. A detailed clinical history and physical examination was done. Questions were asked regarding the demographic profile, socioeconomic status and residential address. All the school going children in the age group of 6-18 years including both male and female students presented with one or more of the following symptoms: Nasal obstruction, Watery rhinorrhoea, Sneezing, Itching nose, Pharyngeal pruritis, Itching eyes and Itching nose.

**Results:** The prevalence of allergic rhinitis was found to be 27.10% among school going children. The percentage of allergic rhinitis in male and females was 55.7% and 43.2% respectively. The percentage of allergic rhinitis in school going children was 51.5% in urban and 48.4% in rural population of school going children. The percentage having persistent allergic rhinitis was 59.5% and intermittent rhinitis was in 39.4%. The symptoms in the school going children was found to be Sneezing in 68.42%, watery rhinorrhoea in 65.2%, nasal obstruction in 78.9%, itching of nose in 49.4%, itching eyes in 61% and pharyngeal pruritic in 26.31%. The chest symptoms were found to be cough in 27.05%, nocturnal waking in 17.24%, occasional wheezing in 13.79% and chest tightness in 8.62%. (Table 4) The distribution of skin prick test was found to be dust mite in 75.4%, pollen in 66.2%, moulds in 14.5%, only dust mite in 24.4%, only pollen in 18.1%, only mould in 9.10%, dust mite + pollen in 42.90%, dust mite +moulds in 5.85% and dust mite + pollen + moulds in 3.9%.

**Conclusion:** The prevalence of allergic rhinitis shows a significant rise in last few years, more common in rural areas, and existing as co-morbidity in a significant proportion of children demanding a comprehensive strategic approach to deal with them. Further, the results indicated that rhinitis symptoms are also associated with a high frequency of asthma symptoms.

**Key Words:** allergic rhinitis, asthma, children,

This 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

Allergic rhinitis (AR) is a common chronic condition affecting the nasal mucosa due to exposure to allergens. Among school-going children, AR is particularly significant due to its impact on quality of life, academic performance, and overall health. The prevalence of AR in this demographic is on the rise globally, necessitating an in-depth understanding of its epidemiology, pathophysiology, clinical features, and management strategies. [1,2] The prevalence of allergic rhinitis among school-going children has increased over the past few decades. Studies suggest that up to 40% of children globally are affected by AR, with variations based on geographic, environmental, and genetic factors. Urbanization, pollution, and lifestyle changes are significant contributors to this rising

trend. For instance, a study conducted in urban China reported a prevalence rate of 30% among children aged 6-14 years. Allergic rhinitis is an IgE-mediated inflammatory response to inhaled allergens such as pollen, dust mites, animal dander, and mould. Upon exposure to these allergens, sensitized individuals experience an immediate hypersensitivity reaction characterized by the release of histamines, leukotrienes, and other inflammatory mediators from mast cells. [3,4] This results in symptoms such as nasal congestion, rhinorrhoea, sneezing, and itching. Chronic inflammation can lead to complications like sinusitis and otitis media, further affecting the child's health and well-being. Children with AR typically present with a constellation of symptoms that include

persistent sneezing, nasal congestion, clear nasal discharge, and nasal itching. [5] These symptoms often lead to mouth breathing, snoring, and a characteristic "allergic salute" – a habitual upward rubbing of the nose. AR can significantly impair sleep quality, leading to daytime fatigue, irritability, and difficulty concentrating in school, thus affecting academic performance and social interactions. The burden of AR extends beyond physical symptoms, impacting the emotional and social aspects of a child's life. Children with AR may experience anxiety, depression, and social isolation due to the chronic nature of their symptoms and the stigma associated with frequent sneezing or a runny nose. Moreover, sleep disturbances caused by AR can lead to poor academic performance and cognitive impairments, highlighting the need for effective management strategies. [6,7] The diagnosis of AR in children primarily relies on a thorough clinical history and physical examination. Key indicators include a family history of atopy, seasonal variation in symptoms, and the presence of comorbid conditions such as asthma or eczema. Diagnostic tests, such as skin prick tests and specific IgE blood tests, can help identify the specific allergens responsible for triggering symptoms. Nasal cytology may also be used to detect eosinophilia, indicative of allergic inflammation. Management of AR involves a combination of allergen avoidance, pharmacotherapy, and immunotherapy. Allergen avoidance measures include using air purifiers, encasing bedding in allergen-proof covers, and minimizing exposure to known triggers. Pharmacological treatment typically involves antihistamines, intranasal corticosteroids, and leukotriene receptor antagonists, which help alleviate symptoms and control inflammation. [8-10]

### Material and Methods

Present cross-sectional study was conducted in the Department of ENT, IGIMS, Patna, Bihar, India from February 2019 to December 2019. A total of 350 students were taken for the study including both male and female students. All students were interviewed. The information was collected from them through interview using a questionnaire after taking informed consent. A detailed clinical history and physical examination was done. Questions were asked regarding the demographic profile, socioeconomic status and residential address. All the school going children in the age group of 6-18 years including both male and female students presented with one or more of the following symptoms: Nasal obstruction, Watery rhinorrhoea, Sneezing, Itching nose, Pharyngeal pruritis, Itching eyes and Itching nose.

Each of the above symptoms was scored as described by Wilson et al 2001.

0. Absence of a given symptom
1. Significant symptoms, mild, well tolerated
2. Well defined, discomforting, and affecting activities that require high concentration
3. High intensity barely tolerated hindering daily activities and sleep.

Total score for each patient was calculated separately.

Detailed general and physical examination was done. Detailed otorhinolaryngological examination was done which included: Anterior rhinoscopy, otoscopy, oral examination, nasal endoscopy, neck examination tuning fork tests, impedance audiometry, Base line investigations, complete hemogram, Specific investigations, Total serum IgE levels, Blood and eosinophil count were investigated.

**Spirometry:** Computed assisted spirometry was done to diagnose the asthma. The parameters used were FEV1/FEF25-75 and FVC. Short acting bronchodilator was given to patients to confirm asthma. An improvement of 10% in FEV1 was taken for inclusion criteria.

**Imaging:** NCCT PNS was done in school going children with allergic rhinitis with chronic rhinosinusitis with asthma. Chest x-ray was done in patients with deranged spirometry parameters. All the patients were started on inhalational nasal corticosteroid (fluticasone). Patients were put on.

### Statistical analysis

The data were analysed using SPSS version 22 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

### Results

The prevalence of allergic rhinitis was found to be 27.10% among school going children. The percentage of allergic rhinitis in male and females was 55.7% and 43.2% respectively. (Table 1) The percentage of allergic rhinitis in school going children was 51.5% in urban and 48.4% in rural population of school going children. (Table 2) The percentage having persistent allergic rhinitis was 59.5% and intermittent rhinitis was in 39.4%. The symptoms in the school going children was found to be Sneezing in 68.42%, watery rhinorrhoea in 65.2%, nasal obstruction in 78.9%, itching of nose in 49.4%, itching eyes in 61% and pharyngeal pruritic in 26.31%. (Table 3) The chest symptoms were found to be cough in 27.05%, nocturnal waking in 17.24%, occasional wheezing in 13.79% and chest tightness in 8.62%. (Table 4) The distribution of skin prick test was found to be dust mite in 75.4%, pollen in 66.2%, moulds in 14.5%, only dust mite in

24.4%, only pollen in 18.1%, only mould in 9.10%, dust mite + pollen in 42.90%, dust mite +moulds in 5.85% and dust mite + pollen + moulds in 3.9%.

**Table 1: Gender distribution of school going children presenting with symptoms of allergic rhinitis (n=95)**

Gender	Number	%
Male	53	55.7
Female	42	44.2
Total	95	100

**Table 2: Geographical distribution of school going children presenting with symptoms of allergic rhinitis (n=95)**

Area	Number	%
Urban	49	51.5
Rural	46	48.4
Total	95	100

**Table 3: Distribution of school going children with allergic rhinitis as per symptomatology (n=95)**

Symptoms	Number	%
Sneezing	65	68.42
Watery rhinorrhoea	62	65.2
Nasal obstruction	75	78.9
Itching nose	47	49.4
Itching eyes	58	61
Pharyngeal pruritis	25	26.31

**Table 4: Distribution of chest symptoms suggestive of latent asthma in school going children with allergic rhinitis (n=95)**

Chest Symptoms	Number	%
Cough	24	25.2
Nocturnal waking	15	16.6
Occasional wheezing	12	12.6
Chest tightness	7	7.3

## Discussion

This study was conducted for a period of 14 months in patients who met the criteria of allergic rhinitis as per the predetermined proforma was included in the study. Allergic rhinitis is a part of systemic disease complex whose prevalence has risen over the last 10 years and ranks among top 5 chronic medical conditions, affecting 10-40% of the population. [9] In the current study out of 350 patients of rhinitis 95 patients were found to have allergic rhinitis, As such the prevalence in this study was found to be 27.1%. Epidemiological studies demonstrate discernible global variation in the prevalence rates of rhinitis symptoms, which might be positive or negative by allergy tests. Self-reported seasonal or perennial rhinitis symptoms significantly overestimate the prevalence of AR well-defined by a positive history and positive allergy tests. However, positive allergy tests are also common in those without self-reported rhinitis symptoms. [10] Dykewicz et al reported in their study the prevalence of 10-30% in adults and upto 42% of children. [11] Thus the results of our

study are consistent with the above discussed studies. incidence between ages of 13-19 years. [12] In the present study it was observed that allergic rhinitis was prevalent more frequently in 2nd decade of life. 2nd and 3rd decade accounting for more than 2/3rd of patients, reflecting that children and young adults are the most affected group. Cruz et al, on publications between 2000 and 2005 on allergic rhinitis and its associated co morbidity (bronchial asthma) also found highest incidence rate of allergic rhinitis, in both genders from 17-22 years. [13] Allergic rhinitis is more common in males than females. It was reported that the prevalence of parallel allergic rhinitis and asthma displays a strong male predominance in childhood and appears to switch to a female predominance in adolescents. [14] Cross-sectional study suggested that allergy prevalence in childhood is higher in boys compared to girls, but it remains uncertain whether this inequality changes after puberty. [15] The increase in allergic rhinitis has been observed over last few decades and is more common in developed countries and increase in prevalence is seen with urbanization

of non-westernized societies. [16] Many possible factors suggested such as lifestyle changes, increased exposure to allergens, pollution and irritants, diminution of protective nutrients, decrease in infections (hygiene hypothesis), and stress has been implicated. [17,18] Fahrlander et al in their study found reduced incidence of seasonal allergic rhinitis sensitization in farmers children compared to their peers living in the same village in a non-farming family. These epidemiological studies are in accordance with the findings of current study. [19] Allergic rhinitis has been recognized as a significant risk factor for adult onset asthma. This result was expected and is consistent with previous studies in the literature. [20-22] International studies have demonstrated a varying association between rhinitis and asthma with a range of 40% to 90%. Asthma and rhinitis often represent a spectrum of the same disease (the one-airway hypothesis). The association between asthma and rhinitis is related to several factors, including the neural nasal-bronchial interaction, disturbances of the nasal mucosa warming and humidification functions, drainage of irritant and inflammatory materials into the lungs and the presence of similar cellular infiltrates and proinflammatory mediators in both the upper and lower airways.

### Conclusion

The prevalence of allergic rhinitis shows a significant rise in last few years, more common in rural areas, and existing as co-morbidity in a significant proportion of children demanding a comprehensive strategic approach to deal with them. Further, the results indicated that rhinitis symptoms are also associated with a high frequency of asthma symptoms.

### References

- Bousquet J, Schünemann HJ, Togias A, et al. Next-generation ARIA care pathways for rhinitis and asthma: A model for multimorbid chronic diseases. *Clin Transl Allergy*. 2019;9:44. DOI: 10.1186/s13601-019-0289-6.
- Zheng M, Wang X, Bo M, et al. Prevalence of Allergic Rhinitis Among Children in Urban and Rural Areas of China: A Meta-analysis. *Asia Pac Allergy*. 2019;9(3). DOI: 10.5415/apalergy.2019.9.e25.
- Greiner AN, Hellings PW, Rotiroti G, Scadding GK. Allergic rhinitis. *Lancet*. 2011;378(9809):2112-2122. DOI:10.1016/S0140-6736(11)60130-X.
- Nathan RA, Meltzer EO, Seiner JC, Storms W. Prevalence of Sleep Disturbances and Sleep-Disordered Breathing in Adults and Children with Asthma. *Allergy Asthma Proc*. 2019;40(4):258-264. DOI:10.2500/aap.2019.40.4212.
- Canonica GW, Bachert C, Hellings P, et al. Allergen Immunotherapy: Toward Evidence-Based Prescription. *J Allergy Clin Immunol*. 2018; 141(5):1938-1948.e1. DOI: 10.1016/j.jaci.2018.02.024.
- Pawankar R, Bunnag C, Khaltayev N, Bousquet J. Allergic Rhinitis and Its Impact on Asthma in Asia Pacific and the ARIA Update. *World Allergy Organ J*. 2012;5(Suppl 3). DOI: 10.1097/WOX.0b013e3182664e74.
- Brożek JL, Bousquet J, Agache I, et al. Allergic Rhinitis and Its Impact on Asthma (ARIA) guidelines-2016 revision. *J Allergy Clin Immunol*. 2017;140(4):950-958. DOI: 10.1016/j.jaci.2017.03.050.
- Devillier P, Bousquet J, Salvator H, et al. Allergy Management in Allergic Rhinitis Using Mobile Technology. *Curr Allergy Asthma Rep*. 2020;20(8):35. DOI: 10.1007/s11882-020-00927-8.
- Creticos PS, Maloney J, Bernstein DI, et al. Randomized Controlled Trial of House Dust Mite Sublingual Immunotherapy Tablet in North American Children. *J Allergy Clin Immunol*. 2016;138(6):1631-1638.e1. DOI: 10.1016/j.jaci.2016.03.038.
- Pereira C, Loureiro C, Cordeiro CR, et al. Personalized Medicine in Allergic Rhinitis: Novel Approaches and New Technologies. *Curr Allergy Asthma Rep*. 2018;18(12):66. DOI: 10.1007/s11882-018-0825-1.
- Soto MTS, Patiño A, Nowak D, Radon K. Prevalence of asthma, rhinitis and eczema symptoms in rural and urban school-aged children from Oropeza Province - Bolivia: a cross-sectional study. *BMC Pulmonary Med*. 2014;14:40.
- Jáuregui I, Mullol J, Dávila I, Ferrer M, Bartra J, del Cuvillo A, et al. Allergic rhinitis and school performance. *J Investig Allergol Clin Immunol*. 2009;19 Suppl 1:32-9.
- Magnan A, Meunier JP, Saugnac C, Gasteau J, Neukirch F. Frequency and impact of allergic rhinitis in asthma patients in everyday general medical practice: a French observational cross-sectional study. *Allergy*. 2008;63(3):292-8.
- Fröhlich, Matthias, et al. "Is there a sex-shift in prevalence of allergic rhinitis and comorbid asthma from childhood to adulthood? A meta-analysis." *Clinical and Translational Allergy*, Vol. 7, No. 1, 2017, p. 44.
- Keller, Theresa, et al. "The sex-shift in single disease and multimorbid asthma and rhinitis during puberty-a study by MedALL." *Allergy*, 2017.
- Wright Al, Holberg CJ, Martinez FD, Halonen M, Morgan W, Taussig LM. Epidemiology of physician diagnosed Allergic rhinitis in childhood. *Pediatrics*. 1994;94:895-9014.

17. Demoly P, Bousquet PJ. Links between allergic rhinitis and asthma still reinforced. *Allergy*. 2008;63:251-4.
18. Braun-Fahrlander C, Gassner M, Grize L, Neu U, Sennhauser FH, Varonier HS, et al. Prevalence of hay fever and allergic sensitization in farmers children and their peers living in the same rural community (Swiss study). *Clin Experimental Allergy*. 1999;29: 28-34.
19. Demoly P, Allaert FA, Lecasble M, Bousquet J; PRAGMA. Validation of classification of ARIA (Allergic rhinitis and its impact on asthma). *Allergy*. 2003;58:672-5.
20. Spector SL, Bernstein IL, Li JT, Berger WE, Kaliner MA, Schuller DE, et al. Parameters for the diagnosis and management of sinusitis. *J Allergy Clin Immunol* 1998;102:S107-S44.
21. Shamsain MH, Shamsian N. Prevalence and severity of asthma, rhinitis, and atopic eczema in 13- to 14-year-old schoolchildren from the northeast of England. *Ann Allergy Asthma Immunol* 2001;86:428-32.
22. Sichletidis L, Chloros D, Tsiotsios I, Gioulekas D, Kyriazis G, Spyrtos D, et al. The prevalence of allergic asthma and rhinitis in children of Polichni, Thessaloniki. *Allergol Immunopathol (Madr)* 2004;32:59-63.