

An Observational Study of Allergic Rhinitis and Asthma: Assessing Severity and Co-Occurrence

Arpit D. Prajapati¹, Trupti Savariya^{2*}¹ Second Year ENT DNB Resident, GMERS Medical College Dharpur, Patan, Gujarat, India² M.S. ENT, Consultant, Maruti Hospital, Morbi, Gujarat, India

Received: 17-08-2023 / Revised: 22-09-2023 / Accepted: 18-10-2023

Corresponding Author: Dr Trupti Savariya

Conflict of interest: Nil

Abstract:

Introduction: Allergic rhinitis and asthma are prevalent respiratory conditions with a known association, often referred to as the "united airway disease." This connection is of particular interest in India, where the burden of these conditions has been on the rise, especially among adolescents. While their co-occurrence is well-documented, the underlying mechanisms of their interplay remain the subject of ongoing investigation. The allergic march theory suggests a bidirectional relationship, where allergic rhinitis may influence the development of asthma, and asthma can exacerbate rhinitis. Our study aims to assess the severity of allergic rhinitis and its correlation with asthma, providing valuable insights for comprehensive therapeutic approaches.

Material and Methods: This year-long observational study, conducted at a tertiary care center, investigated the co-occurrence and severity of allergic rhinitis (AR) and asthma in a cohort of 70 patients aged six and older. AR and asthma diagnoses followed established criteria and guidelines (ARIA, GINA, and NAEPP). Diagnostic investigations included anterior rhinoscopy, nasal endoscopy, and spirometry. Data analysis done using Chi-Square and Spearman's Rho correlation tests to explore associations and correlations.

Results: This study, comprising 70 patients, exhibited diverse age distribution, with 41.43% falling within the 19-30 years group, emphasizing the relevance of young adults in assessing allergic rhinitis and asthma prevalence. Males accounted for roughly 54% of participants, while females constituted around 45.71%, showing a slightly higher male presence. In our study, 27.14% had a history of allergic rhinitis, 18.57% had asthma, and 7.14% had atopic dermatitis. The majority, 70%, experienced seasonal allergic rhinitis, with watery runny nose being the most common symptom at 61.43%. Importantly, we observed a significant positive correlation (Spearman's rho $r=0.311$, $p<0.01$) between the severity of allergic rhinitis and asthma, indicating a corresponding increase in severity between the two conditions.

Conclusion: The correlation observed between allergic rhinitis and asthma severity in our study underscores their intertwined nature, shedding light on potential common pathogenesis. Treating them as a united airway disease could offer holistic therapeutic opportunities.

Keywords: Allergic Rhinitis, Asthma, Severity, Co-occurrence.

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 and asthma are two common respiratory conditions that affect millions of individuals worldwide, and their coexistence has long been a subject of clinical and scientific interest.[1] Allergic rhinitis, characterized by inflammation of the nasal mucosa in response to allergen exposure, is a prevalent condition that significantly impairs the quality of life of affected individuals.[2] Asthma, on the other hand, is a chronic respiratory disorder marked by airway inflammation and bronchial hyperresponsiveness, often triggered by a variety of environmental factors, including allergens.[3] The relationship between these two conditions is not merely

coincidental; rather, there exists a complex interplay between them.[4]

India, housing approximately 20% of the world's population with 1.35 billion people, has witnessed a notable rise in non-communicable allergic diseases like allergic rhinitis (AR) and asthma in recent decades.[5] Recent data indicate that around 22% of Indian adolescents currently experience AR.[6,7] Nonetheless, due to a scarcity of comprehensive epidemiological studies, especially in rural and suburban regions, this figure may not accurately reflect the actual disease burden in the country.

The co-occurrence of allergic rhinitis and asthma, frequently referred to as the "united airway disease," has been widely recognized in clinical practice.[8] It is estimated that up to 80% of individuals with asthma also have concomitant allergic rhinitis.[9] While the association between these conditions is well-established, the precise mechanisms underlying their relationship remain the subject of ongoing investigation.[4] The allergic march theory postulates that allergic rhinitis may serve as a precursor or contributor to asthma, with the inflammatory processes in the upper airways influencing those in the lower airways.[10] Conversely, asthma symptoms may exacerbate rhinitis, forming a vicious cycle of airway inflammation.[11]

Understanding the interplay between allergic rhinitis and asthma is not only crucial for advancing our knowledge of these diseases but also holds significant clinical implications.[12] Effective management of one condition may have a positive impact on the other, potentially leading to improved patient outcomes and reduced healthcare costs.[13] Therefore, this study seeks to provide valuable insights into the association between the severity of allergic rhinitis and the development and progression of asthma, paving the way for more targeted and holistic therapeutic approaches in the management of these common respiratory disorders.

Material and Methods

This cross-sectional observational study was conducted at a tertiary care center, spanning a comprehensive one-year duration from January 2022 to December 2022. Within the purview of this study, our dedicated cohort comprised 70 patients who were methodically diagnosed with the dual burden of allergic rhinitis (AR) and asthma. These individuals, aged six years and older, were selected to represent a demographic range, considering the relevance of both pediatric and adult populations in comprehending the interplay between these two prevalent respiratory conditions.

In alignment with established diagnostic criteria, AR was identified in patients experiencing consistent and bothersome symptoms, such as anterior or posterior rhinorrhea, persistent sneezing, nasal obstruction, and pruritus (itching) of the nasal passages, occurring for two or more consecutive days, with each episode lasting over one hour on most days. The assessment of AR severity was conducted in consonance with the comprehensive guidelines provided by the Allergic Rhinitis and its Impact on Asthma (ARIA).

Asthma diagnosis, an integral facet of this study, was based on a thorough evaluation of patients exhibiting hallmark symptoms, including recurrent wheezing, shortness of breath, chest tightness, and

cough, each manifesting with varying intensity and time-dependent fluctuations. The corroborative factor for asthma diagnosis also rested on the presence of variable expiratory airflow limitation, thereby adhering to the diagnostic criteria specified in the Global Initiative for Asthma (GINA) and the National Asthma Education and Prevention Program (NAEPP) guidelines.[14]

In order to provide an understanding of the patients' clinical presentations, an array of diagnostic investigations was conducted, encompassing anterior rhinoscopy, diagnostic nasal endoscopy, and spirometry. These methods allowed for a detailed assessment of the upper and lower airways, enabling us to explore any potential anatomical or physiological correlations. Regrettably, due to logistical and financial constraints that occasionally pose challenges in clinical research, we were unable to perform skin prick tests and measure serum-specific immunoglobulin E (IgE) levels, although these assessments remain valuable for further characterizing allergic responses.

The collected data was recorded and entered into Microsoft Excel, and the subsequent analysis was carried out employing IBM SPSS version 21.1. Categorical data was methodically tabulated, illustrating frequency and percentage distributions, and the association between relevant variables was explored utilizing the Chi-Square test. Furthermore, we investigated the correlation between these variables by employing the Spearman's Rho correlation test, a widely recognized statistical approach. Our threshold for statistical significance was set at a p-value of <0.05, ensuring the reliability and accuracy of our findings.

Results

In present study, the mean age of the patients was 35.34 ± 21.6 year, representing a broad age range. Within our study cohort of 70 patients, a substantial proportion, 41.43%, belonged to the 19-30 years age group, suggesting the relevance of assessing the prevalence of allergic rhinitis and asthma in young adults. Additionally, 27.14% of patients fell within the 31-40 years age category, highlighting the significance of middle-aged individuals in our analysis. The diversity in age, with 10% under 18 years, 12.86% between 41-50 years, and 8.57% over 50 years, underscores the importance of considering various age groups for a comprehensive evaluation of these conditions. (Fig. 1) In our study, males accounted for roughly 54% of the participants, while females constituted around 45.71%, demonstrating a slightly higher presence of males.

In our study of 70 patients, the history of atopy revealed that 27.14% had a history of allergic rhinitis, 18.57% had asthma, and 7.14% had atopic dermatitis. Regarding smoking status, 32.86% were

nonsmokers, 5.71% were ex-smokers, and 24.29% were current smokers. In terms of exposure to trigger factors, 27.14% were exposed to passive

smoke, 10% to biomass fuel, 20% to pets/animals, and 5.71% to mould/fungus, providing valuable insights into the patient profiles in our study.

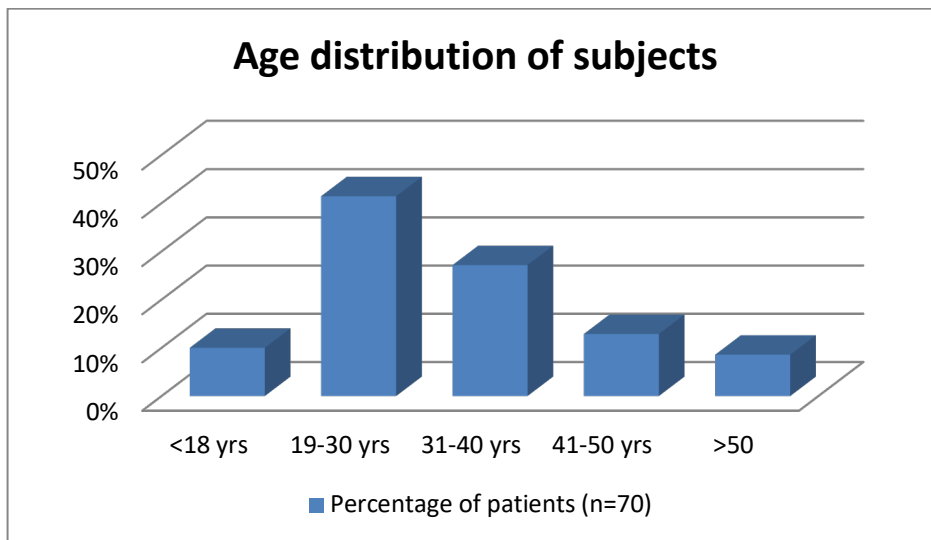


Figure 1: Age distribution of subjects

The majority of the patients, 49 out of 70 (70%), experienced seasonal allergic rhinitis (AR), while the remaining 19 patients (27.14%) had perennial AR, indicating a significant prevalence of seasonal symptoms in the study population. Table 1 shows the prevalence of allergic rhinitis symptoms, with watery runny nose being the most common at 61.43%.

Table 1: Prevalence of allergic rhinitis symptoms

Symptoms	Frequency (n=70)	Percentage (%)
Sneezing	38	54.29%
Itchy Nose	21	30%
Blocked Nose	37	52.86%
Watery runny Nose	43	61.43%
Red Itchy eyes	19	27.14%

The study examined the correlation between the severity of allergic rhinitis (AR) and asthma in 70 patients. The data revealed a significant positive correlation (Spearman's rho $r=0.311$, $p<0.01$) between the severity of AR and asthma, suggesting that as the severity of one condition increased, there was a corresponding increase in the severity of the other. (Fig 2)

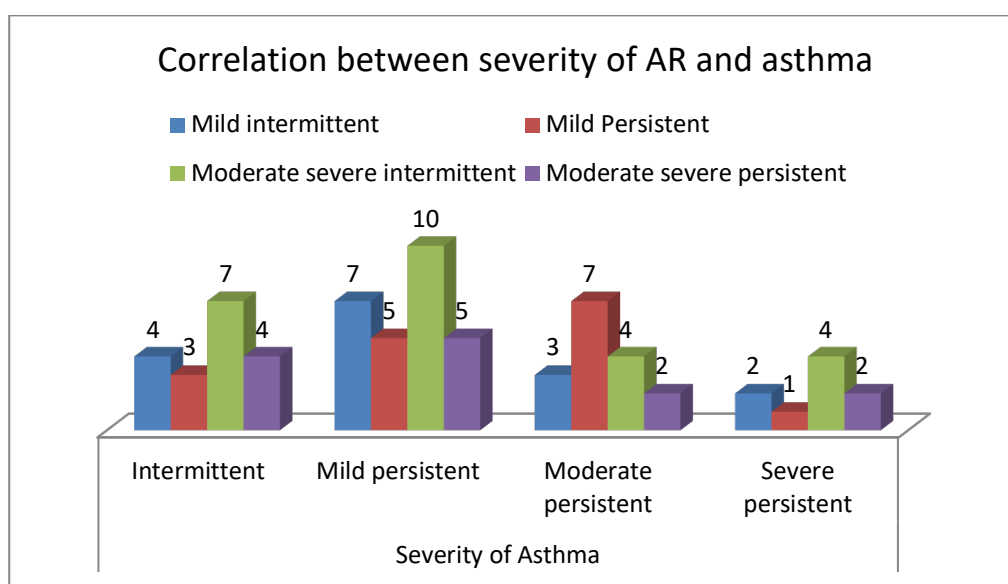


Figure 2: Correlation between severity of AR and asthma

Discussion

In our study, we observed a wide age distribution, with a mean age of 35.34 years. The majority of patients, 41.43%, fell within the 19-30 years age group, indicating the significance of evaluating young adults in the context of allergic rhinitis and asthma. Similarly, Lee et al.'s[15] study reported an average age of 18.4 years for men and 22.8 years for women, while Shekharappa and Rohini[16] noted that the majority of their patients were in the 20-40 age group. Another study by Navarro et al.[17], which included 942 subjects, the mean age of 35.5 years and 63% female participants, we observe some differences. While the mean age in Navarro et al.'s[17] study is quite similar to our study's mean age, the gender distribution differs. These variations in age distribution among different studies underscore the importance of considering age-specific risk factors and management strategies, especially given that the impact and prevalence of allergic rhinitis and asthma may differ across age groups.

Our study revealed that approximately 54% of participants were male, while roughly 45.71% were female. This gender distribution was consistent with Shekharappa et al.'s study, which reported 48.3% males and 51.7% females. In contrast, study 1 by Banjar et al.[18] had a sample comprising 43% males and 57% females. Lee et al.[15] included 675 men and 480 women in their study. Navarro et al.[17] had a significantly higher proportion of female participants (63%) compared to our study and the other studies discussed. These variations in gender distribution across studies highlight the potential influence of gender-specific factors on the prevalence and management of allergic rhinitis and asthma. These variations in gender ratios across studies highlight the importance of understanding how gender-specific factors may influence the prevalence and severity of allergic rhinitis and asthma.

Our study, conducted with 70 patients, delves into the intricate connection between the severity of allergic rhinitis (AR) and asthma. Analyzing the distribution of AR and asthma severity within our cohort, we uncovered noteworthy insights. We observed that 25.71% of our participants had intermittent AR, 38.57% experienced mild persistent AR, 22.86% had moderate persistent AR, and 12.86% faced severe persistent AR. In the realm of asthma, 22.86% had mild intermittent asthma, 22.86% exhibited mild persistent asthma, 35.71% struggled with moderate severe intermittent asthma, and 18.57% grappled with moderate-severe persistent asthma. Our findings indicate a significant positive correlation (Spearman's rho $r=0.311$, $p<0.01$) between the severity of AR and asthma, illustrating that as the severity of one condition increased, the other followed suit. This correlation

highlights the complex interplay between AR and asthma and emphasizes the need for a holistic approach to their assessment and management.

Our findings align with those from previous research, adding to the collective understanding of this relationship. The variability in AR severity classifications observed in our study is consistent with the complexity in categorizing AR severity precisely, an issue also noted in other research. Our findings underscore the prevalence of persistent AR, particularly in the Asian population, as demonstrated in Pawankar et al.'s[19] study. In a Western country, Bousquet et al.[20] found that persistent AR patients (29%) experienced more severe symptoms than those with intermittent AR. This finding aligns with our results and underscores the importance of recognizing differences in AR severity. The study by Antonicelli et al.[21] in France highlights the complexity of AR classifications and discrepancies between the ARIA classification and the classical one. This complexity reinforces the challenges in precisely categorizing AR severity, as observed in our study.

The correlation between AR and asthma severity, as revealed in our study and supported by the findings of Shekharappa and Rohini[16], reinforces the strong link between these two conditions. Additionally, the study conducted by Navarro et al.[17] further validates this correlation, highlighting its importance in patient care. Ponte et al.[22] found a positive correlation, with patients having moderate to severe rhinitis experiencing a 3.8-fold increase in emergency room visits and a 12.7-fold higher likelihood of uncontrolled asthma. Sasaki et al.[23] observed uncontrolled asthma in 9.2% of pediatric patients without rhinitis, 15.3% with mild-moderate rhinitis, and 29.2% with severe rhinitis. Kumar et al.'s[24] study on children aged 5 to 15 revealed a 58% AR prevalence in children with asthma, with 56% experiencing intermittent and 44% having persistent AR, associated with poor asthma control.

In our study of 70 patients, a significant portion had allergic rhinitis, asthma, and atopic dermatitis. Smoking status and exposure to triggers were also noted. Chinnakannan et al.[25] reported a 13.6% AR point prevalence and a 2% sinusitis prevalence in childhood asthma, with significant associations between AR, sinusitis, family history, and asthma severity. Jaggi et al.'s[26] survey across ten Indian cities confirmed the link between AR and asthma, associated with personal and family history of atopy, passive smoking, exposure to biomass fuel, pets at home, and increasing asthma severity. These findings collectively emphasize the complex interplay between AR and asthma, reinforcing the importance of comprehensive assessments and tailored management strategies.

The complexity in categorizing AR severity, as noted in our study, is consistent with previous observations.[16–19] The strong correlation between AR and asthma severity, as evident in our research and supported by other studies, emphasizes the importance of this link in patient care. Additionally, the positive correlation between more severe rhinitis and uncontrolled asthma, as demonstrated in other studies, underscores the critical role of assessing and managing both conditions comprehensively.

Incorporating our data, we found a significant proportion of patients with allergic rhinitis, asthma, and atopic dermatitis, along with variations in smoking status and exposure to trigger factors. These findings align with the broader research landscape, emphasizing the complex interplay between AR and asthma and the need for tailored management strategies.

Our study has several limitations worth noting. Firstly, the relatively small sample size of 70 patients might limit the generalizability of our findings to broader populations. Additionally, the study's duration might not capture potential seasonal variations in allergic rhinitis and asthma. Furthermore, our study relied on self-reported data, which could introduce recall and reporting biases. Finally, while we identified a significant correlation between allergic rhinitis and asthma severity, our study's cross-sectional design prevents us from establishing causal relationships or assessing long-term outcomes. Despite these limitations, our study contributes valuable insights into the interplay between allergic rhinitis and asthma.

Conclusion

In conclusion, our study underscores the significant positive correlation between the severity of allergic rhinitis and asthma. Our findings highlight the complex interplay between these conditions, emphasizing the need for a holistic approach to their assessment and management. Our study reinforces the correlation between the severity of AR and asthma, supporting the notion that they are closely intertwined conditions. It underscores the need for a holistic approach to evaluating and treating patients with these conditions, as well as the importance of considering various demographic factors in this context.

Bibliography

1. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens W, Togias A, et al. Allergic rhinitis and its impact on asthma (ARIA). 2008. *Allergy*. 2008;63:8–160.
2. Kakli HA, Riley TD. Allergic rhinitis. *Primary Care: Clinics in Office Practice*. 2016;43(3):465–75.
3. O'byrne P, Postma D. The many faces of airway inflammation: asthma and chronic obstructive pulmonary disease. *American journal of respiratory and critical care medicine*. 1999;159(supplement_2):S1–63.
4. Braunstahl GJ, Hellings PW. Allergic rhinitis and asthma: the link further unraveled. *Current opinion in pulmonary medicine*. 2003;9(1):46–51.
5. Moitra S, Mahesh PA, Moitra S. Allergic rhinitis in India. *Clinical & Experimental Allergy*. 2023;
6. Mahesh PA, Moitra S, Mabalirajan U, Garg M, Malamardi S, Vedanthan PK, et al. Allergic diseases in India—Prevalence, risk factors and current challenges. *Clinical & Experimental Allergy*. 2023;53(3):276–94.
7. Krishna MT, Mahesh PA, Vedanthan P, Moitra S, Mehta V, Christopher DJ. An appraisal of allergic disorders in India and an urgent call for action. *World Allergy Organization Journal*. 2020;13(7):100446.
8. Bellanti JA, Settipane RA. United airway disease. In *OceanSide Publications*; 2014. p. 355.
9. Price D, Zhang Q, Kocevar V, Yin D, Thomas M. Effect of a concomitant diagnosis of allergic rhinitis on asthma-related health care use by adults. *Clinical & Experimental Allergy*. 2005;35(3):282–7.
10. Zeldin DC, Eggleston P, Chapman M, Piedimonte G, Renz H, Peden D. How exposures to biologics influence the induction and incidence of asthma. *Environmental health perspectives*. 2006;114(4):620–6.
11. Eifan AO, Durham SR. Pathogenesis of rhinitis. *Clinical & Experimental Allergy*. 2016;46(9):1139–51.
12. Casale TB, Dykewicz MS. Clinical implications of the allergic rhinitis-asthma link. *The American journal of the medical sciences*. 2004;327(3):127–38.
13. Marple BF, Fornadley JA, Patel AA, Fineman SM, Fromer L, Krouse JH, et al. Keys to successful management of patients with allergic rhinitis: focus on patient confidence, compliance, and satisfaction. *Otolaryngology-Head and Neck Surgery*. 2007;136(6):S107–24.
14. Tan LD, Alismail A, Ariue B. Asthma guidelines: comparison of the national heart, lung, and blood institute expert panel report 4 with global initiative for asthma 2021. *Current opinion in pulmonary medicine*. 2022;28(3):234–44.
15. Lee CH, Jang JH, Lee HJ, Kim IT, Chu MJ, Kim CD, et al. Clinical characteristics of allergic rhinitis according to allergic rhinitis and its impact on asthma guidelines. *Clinical and experimental otorhinolaryngology*. 2008;1(4):196–200.

16. Shekharappa MK, Rohini DU. A cross sectional observational study of severity of allergic rhinitis and its impact on asthma. *International Journal of Otorhinolaryngology and Head and Neck Surgery*. 2020;6(3):547–50.
17. Navarro A, Valero A, Juliá B, Quirce S. Coexistence of asthma and allergic rhinitis in adult patients attending allergy clinics: ONEAIR study. *J Investig Allergol Clin Immunol*. 2008;18(4):233–8.
18. Banjar SA, Assiri RA, Alshehri GA, Binyousef FH, Alaudah TI, Alawam AS, et al. The Impact of Allergic Rhinitis on Asthma and Its Effect on the Quality of Life of Asthmatic Patients. *Cureus*. 2023;15(3).
19. Pawankar R. Allergic rhinitis and asthma: the link, the new ARIA classification and global approaches to treatment. *Current Opinion in Allergy and Clinical Immunology*. 2004;4(1):1–4.
20. Bousquet P, Bousquet-Rouanet L, Co Minh H, Urbinelli R, Allaert F, Demoly P. ARIA (Allergic Rhinitis and Its Impact on Asthma) classification of allergic rhinitis severity in clinical practice in France. *International archives of allergy and immunology*. 2007;143(3):163–9.
21. Antonicelli L, Micucci C, Voltolini S, Feliziani V, Senna G, Di Blasi P, et al. Allergic rhinitis and asthma comorbidity: ARIA classification of rhinitis does not correlate with the prevalence of asthma. *Clinical & Experimental Allergy*. 2007;37(6):954–60.
22. Ponte EV, Franco R, Nascimento HF do, Souza-Machado A, Cunha S, Barreto ML, et al. Lack of control of severe asthma is associated with co-existence of moderate-to-severe rhinitis. *Allergy*. 2008;63(5):564–9.
23. Sasaki M, Yoshida K, Adachi Y, Furukawa M, Itazawa T, Odajima H, et al. Factors associated with asthma control in children: findings from a national Web-based survey. *Pediatric Allergy and Immunology*. 2014;25(8):804–9.
24. Kumar AP, Vinayaka H, Premkumar P. A clinical study of the prevalence and impact of allergic rhinitis in children with asthma. *Indian Journal of Child Health*. 2017;367–9.
25. Chinnakkannan SK, Singh M, Das RR, Mathew JL, Saxena AK. Association of allergic rhinitis and sinusitis with childhood asthma. *Indian pediatrics*. 2017;54:21–4.
26. Jaggi V, Dalal A, Ramesh B, Tikkiwal S, Chaudhry A, Kothari N, et al. Coexistence of allergic rhinitis and asthma in Indian patients: The CARAS survey. *Lung India: Official Organ of Indian Chest Society*. 2019;36(5):411.