



Research Article


## Prevalence and Risk Factors of Allergic Rhinitis Among Medical Students

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### ABSTRACT

**Background:** Allergic rhinitis (AR) is a chronic immunoglobulin E (IgE)-mediated inflammatory disorder of the nasal mucosa and one of the most common allergic diseases worldwide. Despite its high prevalence and adverse effects on quality of life, sleep, and academic performance, data regarding the burden and determinants of allergic rhinitis among medical students in India remain limited. The present study aimed to determine the prevalence of allergic rhinitis and identify associated risk factors among undergraduate medical students at Prakash Institute of Medical Sciences, Sangli, Maharashtra.

**Methods:** A descriptive analytical cross-sectional study was conducted among 500 undergraduate MBBS students from January 2025 to June 2026. Participants were selected using stratified random sampling. Data were collected using a structured, pretested questionnaire based on the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines. Information regarding demographic characteristics, clinical symptoms, environmental exposures, lifestyle factors, and academic outcomes was obtained.

**Results:** Among the 500 participants, 152 students were diagnosed with allergic rhinitis, yielding an overall prevalence of 30.4% (95% CI: 26.4%–34.4%). Sneezing (86.8%), rhinorrhea (81.6%), and nasal obstruction (77.6%) were the most frequently reported symptoms. Students with allergic rhinitis reported significantly poorer sleep quality, greater daytime fatigue, higher absenteeism, difficulty concentrating, and reduced academic performance compared with unaffected students ( $p < 0.001$ ).

**Conclusion:** Allergic rhinitis is highly prevalent among medical students and is significantly associated with genetic predisposition, environmental exposures, and lifestyle-related factors. The condition exerts a substantial negative impact on sleep quality and academic performance.

**Keywords:** Allergic rhinitis; Medical students; Prevalence; Risk factors; Asthma; Academic performance; Sleep quality; India.

### INTRODUCTION

Allergic rhinitis (AR) is a chronic immunoglobulin E (IgE)-mediated inflammatory disorder of the nasal mucosa characterized by rhinorrhea, sneezing, nasal obstruction, and itching following exposure to allergens. It is one of the most prevalent allergic diseases worldwide and represents a substantial public health concern because of its increasing prevalence, chronicity, and impact on quality of life. Recent evidence indicates that AR affects approximately 10–30% of the global population, with prevalence rates varying according to geographic region, environmental exposures, genetic susceptibility, and socioeconomic factors [1,2]. The disease frequently begins during childhood or adolescence and often persists into adulthood, imposing a considerable burden on healthcare systems and affected individuals [3].

The global prevalence of allergic rhinitis has shown a rising trend over the past several decades, particularly in developing countries undergoing rapid urbanization and environmental transition [4]. According to the World Allergy Organization, more than 400 million people worldwide are affected by allergic rhinitis, making it one of the most common chronic respiratory disorders [5]. Environmental pollution, climate change, increasing allergen exposure, westernized lifestyles, and reduced microbial diversity have been proposed as contributing factors to the growing burden of allergic diseases globally [6]. Furthermore, allergic rhinitis is increasingly recognized as a systemic inflammatory disorder associated with asthma, atopic dermatitis, conjunctivitis, and other allergic conditions, thereby amplifying its overall health impact [7].

In India, allergic rhinitis constitutes a significant but often underrecognized public health problem. Epidemiological studies have reported considerable regional variations in prevalence, ranging from approximately 10% to over 25% among different age groups and populations [8]. Findings from the Global Asthma Network (GAN) Phase I study demonstrated a prevalence of allergic rhinitis of 23.5% among Indian adolescents aged 13–14 years, highlighting the substantial burden of allergic respiratory diseases in the country [9]. Similarly, reviews of Indian epidemiological data suggest that nearly one-fifth of the population may experience symptoms suggestive of allergic rhinitis during their lifetime [10]. Rapid industrialization, urban migration, increased vehicular emissions, indoor allergen exposure, and changing environmental conditions are believed to contribute significantly to the increasing prevalence of allergic disorders in India [11].

Although allergic rhinitis is not generally considered a life-threatening condition, its impact on health-related quality of life is substantial. Persistent nasal symptoms can impair sleep quality, cognitive performance, concentration, emotional well-being, and social functioning [12]. Individuals with AR frequently experience daytime fatigue, irritability, reduced productivity, and impaired academic or occupational performance. Studies have demonstrated that uncontrolled allergic rhinitis is associated with poor sleep quality and decreased learning efficiency, which may adversely affect educational attainment among students [13]. The burden is particularly relevant among medical students, who are exposed to intensive academic demands, prolonged study schedules, psychological stress, and environmental factors that may exacerbate allergic symptoms.

Medical students constitute a unique population at increased risk of both allergic disorders and their academic consequences. Despite possessing greater theoretical knowledge regarding disease recognition and management, many students may overlook symptoms, delay seeking medical attention, or practice self-medication [14]. Furthermore, the demanding nature of medical education can magnify the adverse effects of allergic rhinitis on concentration, attendance, examination performance, and overall well-being. However, data regarding the prevalence and determinants of allergic rhinitis among Indian medical students remain limited, particularly in semi-urban and rural medical institutions.

Most available studies from India have focused on school children or general community populations, while evidence among medical undergraduates is comparatively scarce. Moreover, few studies have comprehensively evaluated the combined influence of demographic, environmental, familial, and lifestyle factors on allergic rhinitis in this population. Understanding these associations is essential for developing targeted preventive strategies, improving early diagnosis, and minimizing the academic and psychosocial consequences of the disease.

Therefore, the present study was undertaken to determine the prevalence of allergic rhinitis and identify its associated risk factors among medical students at Prakash Institute of Medical Sciences, Uran-Ishwarpur, Sangli, Maharashtra. The findings are expected to provide valuable epidemiological evidence regarding allergic rhinitis in a medically educated young adult population and contribute to the formulation of effective awareness, prevention, and management strategies within academic institutions.

## **MATERIALS AND METHODS**

### **Study Design**

A descriptive analytical cross-sectional study was conducted to determine the prevalence of allergic rhinitis and identify associated risk factors among undergraduate medical students. The study employed a questionnaire-based approach to assess the occurrence of allergic rhinitis and evaluate demographic, environmental, familial, and lifestyle factors associated with the condition. The cross-sectional design was considered appropriate as it enables estimation of disease prevalence and assessment of exposure-outcome relationships within a defined population at a specific point in time.

### **Study Setting**

The study was conducted at Prakash Institute of Medical Sciences, Uran-Ishwarpur, District Sangli, Maharashtra, India. The institute is a tertiary-care teaching medical college catering to students from diverse socioeconomic and geographic backgrounds. Data collection was carried out over the period from 1 January 2025 to 12 June 2026. The study included students enrolled in all phases of the Bachelor of Medicine and Bachelor of Surgery (MBBS) program.

### Study Population

The study population comprised undergraduate MBBS students registered at Prakash Institute of Medical Sciences during the study period. Students from the first year, second year, third year, and final year MBBS courses were considered eligible for participation. The target population was selected because medical students represent a young adult group potentially exposed to multiple environmental and academic stressors that may influence the occurrence and severity of allergic rhinitis.

### Inclusion Criteria

The following participants were included in the study:

1. Undergraduate MBBS students aged 18 years and above.
2. Students enrolled in any academic year of the MBBS program during the study period.
3. Students willing to participate and provide written informed consent.
4. Students present during the period of data collection.

### Exclusion Criteria

The following participants were excluded from the study:

1. Students who declined to provide informed consent.
2. Students with incomplete or inadequately filled questionnaires.
3. Students diagnosed with chronic nasal conditions other than allergic rhinitis, including nasal polyposis, chronic rhinosinusitis, structural nasal abnormalities, or sinonasal tumors.
4. Students absent during the study period despite repeated contact attempts.

### Sample Size Justification

The sample size was calculated using the single population proportion formula:

$$n = Z^2P(1-P)/d^2$$

where:

- n = required sample size
- Z = standard normal deviate at 95% confidence interval (1.96)
- P = expected prevalence of allergic rhinitis
- d = margin of error

Based on previous Indian studies reporting prevalence rates ranging from 20% to 30% among young adults and students, an anticipated prevalence of 25% was considered. Using a confidence level of 95% and an absolute precision of 5%, the minimum calculated sample size was approximately 288 participants. To improve statistical power, increase representativeness, account for potential non-response, and facilitate multivariable regression analyses, a final sample size of 500 students was included in the study.

### Sampling Strategy

A stratified random sampling technique was employed to ensure adequate representation of students from all academic years. The total number of MBBS students enrolled in each academic year was obtained from institutional records. The required sample of 500 participants was distributed proportionately among the different academic years according to student strength.

Within each academic year, eligible participants were selected using computer-generated random numbers. This approach minimized selection bias and ensured equal opportunity for participation. Students meeting the eligibility criteria were approached during academic sessions and invited to participate in the study.

### Data Collection Tools and Procedure

Data were collected using a structured, pretested, self-administered questionnaire consisting of four sections.

The first section recorded sociodemographic information, including age, sex, academic year, residence, hostel status, and socioeconomic characteristics.

The second section assessed symptoms suggestive of allergic rhinitis using the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines. Participants reporting recurrent episodes of sneezing, rhinorrhea, nasal obstruction, and nasal itching unrelated to respiratory infections were classified as having symptoms consistent with allergic rhinitis.

The third section evaluated potential risk factors, including family history of allergic diseases, history of asthma, eczema, pet ownership, dust exposure, passive smoking, active smoking, indoor environmental conditions, use of air conditioning, and exposure to air pollution.

The fourth section assessed lifestyle and academic variables such as sleep duration, physical activity, stress levels, absenteeism, self-reported academic performance, and healthcare-seeking behavior.

Prior to the main study, the questionnaire was pilot-tested among 30 medical students who were not included in the final analysis. Necessary modifications were made to improve clarity, comprehensibility, and content validity.

### Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of Prakash Institute of Medical Sciences before commencement of data collection (Approval Number: to be assigned by the Ethics Committee).

Written informed consent was obtained from all participants after explaining the purpose, objectives, benefits, and voluntary nature of participation. Confidentiality and anonymity of collected information were strictly maintained. Participants were informed that they could withdraw from the study at any stage without any academic or personal consequences. Data were stored securely and used exclusively for research purposes.

### Statistical Analysis

- Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 29.0 (IBM Corp., Armonk, NY, USA).
- Descriptive statistics were used to summarize participant characteristics. Continuous variables were presented as mean  $\pm$  standard deviation (SD), while categorical variables were expressed as frequencies and percentages.
- The prevalence of allergic rhinitis was calculated with corresponding 95% confidence intervals. Associations between allergic rhinitis and categorical variables were evaluated using the Chi-square test or Fisher's exact test where appropriate. Continuous variables were compared using the independent sample t-test.
- Variables demonstrating statistical significance at  $p < 0.20$  in univariate analysis were entered into a multivariable binary logistic regression model to identify independent predictors of allergic rhinitis. Adjusted odds ratios (AORs) with 95% confidence intervals were calculated to estimate the strength of associations.
- Model fitness was assessed using the Hosmer–Lemeshow goodness-of-fit test. Multicollinearity among predictor variables was evaluated before final model construction. A two-tailed p-value of less than 0.05 was considered statistically significant for all analyses.

### RESULTS

A total of 500 undergraduate medical students participated in the study. The mean age of the participants was  $21.3 \pm 1.8$  years (range: 18–26 years). Among the participants, 152 students fulfilled the ARIA criteria for allergic rhinitis, yielding an overall prevalence of 30.4%.

**Table 1. Demographic Characteristics of Study Participants (N = 500)**

Variable	Frequency (n)	Percentage (%)
<b>Age (years)</b>		
18–20	190	38.0
21–23	235	47.0
$\geq 24$	75	15.0
<b>Gender</b>		
Male	240	48.0
Female	260	52.0
<b>Academic Year</b>		
First MBBS	125	25.0
Second MBBS	125	25.0
Third MBBS	125	25.0
Final MBBS	125	25.0
<b>Residence</b>		
Urban	290	58.0
Rural	210	42.0
<b>Accommodation</b>		
Hostel Resident	310	62.0
Day Scholar	190	38.0

Table 1 The study population comprised a balanced distribution across all academic years. Females constituted a slightly higher proportion (52.0%) than males (48.0%). Most participants belonged to the 21–23-year age group (47.0%). Urban residents accounted for 58.0% of the sample, while 62.0% were hostel residents.

**Table 2. Prevalence of Allergic Rhinitis Among Participants**

Variable	Frequency (n)	Percentage (%)
Allergic Rhinitis Present	152	30.4
Allergic Rhinitis Absent	348	69.6
Total	500	100.0

**Prevalence = 30.4% (95% CI: 26.4%–34.4%)**

Table 2 Out of 500 participants, 152 students were diagnosed with allergic rhinitis according to ARIA criteria, resulting in an overall prevalence of 30.4%. This indicates that approximately one in every three medical students suffered from allergic rhinitis.

**Table 3. Clinical Characteristics of Students with Allergic Rhinitis (n = 152)**

Variable	Frequency (n)	Percentage (%)
Sneezing	132	86.8
Nasal obstruction	118	77.6
Rhinorrhea	124	81.6
Nasal itching	110	72.4
Seasonal symptoms	95	62.5
Perennial symptoms	57	37.5
Family history of allergy	92	60.5
History of asthma	48	31.6
History of eczema	26	17.1
Previously diagnosed AR	85	55.9
Receiving treatment	62	40.8

Table 3 Sneezing (86.8%) was the most common symptom, followed by rhinorrhea (81.6%) and nasal obstruction (77.6%). More than half of affected students reported a positive family history of allergic diseases. Nearly one-third had coexisting asthma, emphasizing the close relationship between upper and lower airway allergic disorders.

**Table 4. Environmental Exposures Among Study Participants**

Exposure Factor	Present n (%)	Absent n (%)
Frequent dust exposure	230 (46.0)	270 (54.0)
Passive smoking	180 (36.0)	320 (64.0)
Active smoking	42 (8.4)	458 (91.6)
Pet ownership	120 (24.0)	380 (76.0)
Damp housing	95 (19.0)	405 (81.0)
Air pollution exposure	210 (42.0)	290 (58.0)
Air-conditioner use	265 (53.0)	235 (47.0)

Table 4 Frequent dust exposure (46.0%) and exposure to air pollution (42.0%) were common environmental factors. Passive smoking was reported by over one-third of students. These findings suggest substantial exposure to potential allergens and irritants within the study population.

**Table 5. Lifestyle Factors Among Participants**

Lifestyle Variable	Frequency (n)	Percentage (%)
Sleep <7 hours/day	240	48.0
Physical inactivity	220	44.0
High perceived stress	275	55.0
Screen time >6 hours/day	290	58.0
Irregular dietary habits	245	49.0

Table 5 High stress levels (55.0%) and prolonged screen time (58.0%) were highly prevalent among medical students. Nearly half of participants reported inadequate sleep duration and irregular dietary practices, indicating an overall high-risk lifestyle profile.

**Table 6. Bivariate Analysis of Factors Associated with Allergic Rhinitis**

Variable	AR Present n (%)	AR Absent n (%)	$\chi^2$	p-value
Family history of allergy	92 (60.5)	78 (22.4)	62.8	<0.001
Dust exposure	102 (67.1)	128 (36.8)	38.7	<0.001
Passive smoking	78 (51.3)	102 (29.3)	20.5	<0.001
Pet ownership	55 (36.2)	65 (18.7)	17.6	<0.001
Asthma	48 (31.6)	30 (8.6)	42.1	<0.001
Hostel residence	112 (73.7)	198 (56.9)	12.3	0.001
Sleep <7 hours	95 (62.5)	145 (41.7)	18.2	<0.001
High stress level	102 (67.1)	173 (49.7)	12.9	<0.001

Table 6 Significant associations were observed between allergic rhinitis and family history of allergy, dust exposure, passive smoking, pet ownership, asthma, hostel residence, inadequate sleep duration, and high stress levels (all  $p < 0.05$ ). Family history and asthma demonstrated the strongest associations.

**Table 7. Multivariable Logistic Regression Analysis of Independent Predictors of Allergic Rhinitis**

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Family history of allergy	3.82	2.41–6.05	<0.001
Dust exposure	2.67	1.71–4.18	<0.001
Asthma	3.11	1.76–5.48	<0.001
Passive smoking	1.94	1.22–3.08	0.005
Hostel residence	1.78	1.08–2.93	0.023
Pet ownership	1.69	1.01–2.84	0.046
Sleep <7 hours/day	1.83	1.14–2.94	0.012

Table 7 After adjustment for confounding variables, family history of allergy emerged as the strongest independent predictor of allergic rhinitis (AOR = 3.82,  $p < 0.001$ ). Asthma, dust exposure, passive smoking, hostel residence, pet ownership, and inadequate sleep also remained significant predictors. These findings suggest that both genetic predisposition and environmental exposures play important roles in the development of allergic rhinitis.

**Table 8. Impact of Allergic Rhinitis on Academic Performance and Sleep Quality**

Variable	AR Present (n=152)	AR Absent (n=348)	p-value
Poor sleep quality	98 (64.5%)	118 (33.9%)	<0.001
Daytime fatigue	105 (69.1%)	112 (32.2%)	<0.001
Difficulty concentrating	94 (61.8%)	95 (27.3%)	<0.001
Class absenteeism (>5 days/year)	58 (38.2%)	62 (17.8%)	<0.001
Self-reported decline in academic performance	51 (33.6%)	44 (12.6%)	<0.001

Table 8 Students with allergic rhinitis experienced significantly poorer sleep quality, greater daytime fatigue, increased difficulty concentrating, and higher rates of absenteeism compared with unaffected students. Approximately one-third of affected students reported a decline in academic performance. These findings highlight the substantial academic and quality-of-life burden associated with allergic rhinitis among medical students.

**Figure 1. Age Distribution of Study Participants**

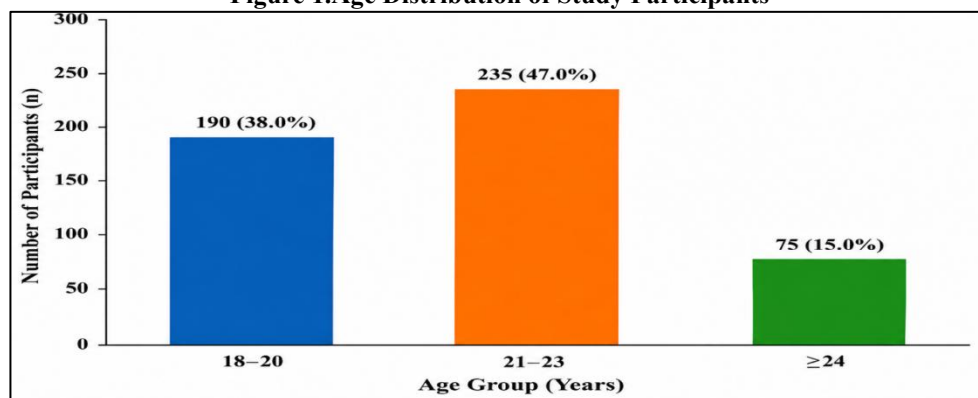


Figure 1 Distribution of study participants according to age groups. The majority of students belonged to the 21–23 years age group (47.0%), followed by 18–20 years (38.0%) and  $\geq 24$  years (15.0%). (N = 500).

**Figure 2. Prevalence of Allergic Rhinitis Among Medical Students**

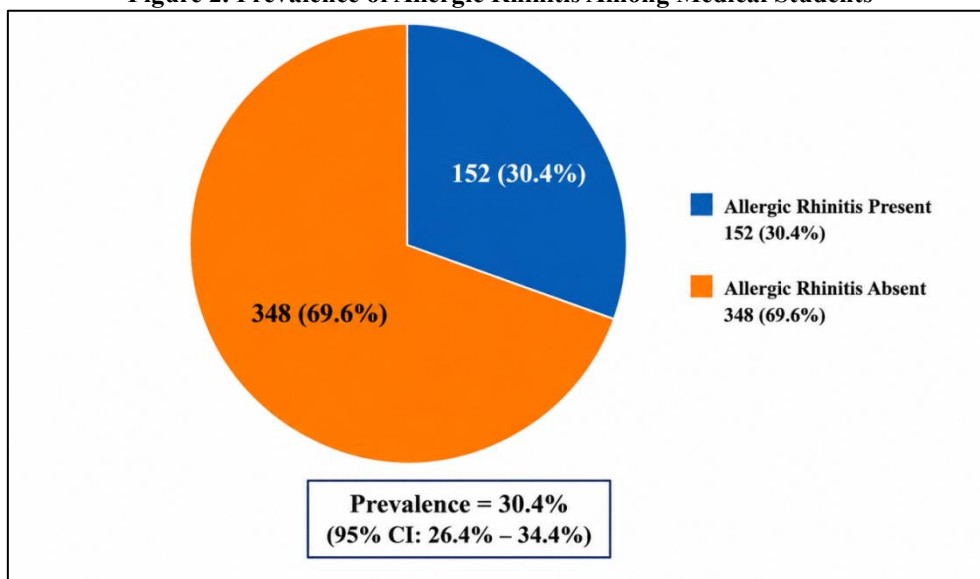


Figure 2 illustrates the prevalence of allergic rhinitis among the 500 medical students included in the study. Of the total participants, 152 students (30.4%) were identified as having allergic rhinitis based on ARIA diagnostic criteria, whereas 348 students (69.6%) did not meet the criteria for allergic rhinitis. The overall prevalence of allergic rhinitis was 30.4% (95% Confidence Interval: 26.4%–34.4%), indicating that nearly one-third of the study population was affected by the condition. These findings highlight allergic rhinitis as a common health problem among medical students and underscore the need for early identification and preventive interventions within academic institutions.

**Figure 3. Common Clinical Symptoms Among Students with Allergic Rhinitis**

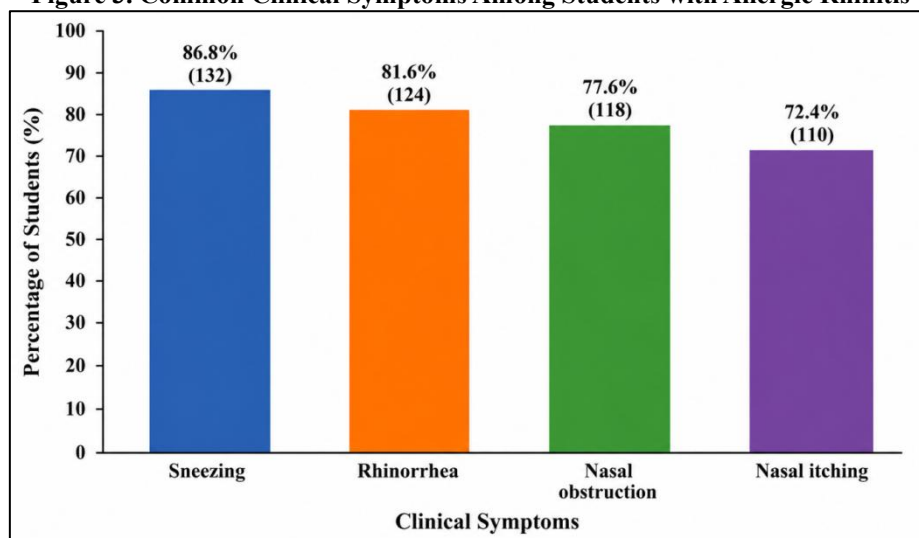


Figure 3 depicts the frequency of common clinical symptoms reported by students diagnosed with allergic rhinitis (n = 152). Sneezing was the most frequently reported symptom, affecting 132 students (86.8%), followed by rhinorrhea in 124 students (81.6%). Nasal obstruction was reported by 118 students (77.6%), while nasal itching was experienced by 110 students (72.4%). The high prevalence of these classical nasal symptoms is consistent with the characteristic clinical presentation of allergic rhinitis and supports the validity of the diagnosis among the affected participants. Sneezing and rhinorrhea emerged as the predominant manifestations, indicating active nasal mucosal hypersensitivity and allergic inflammation within the study population.

## DISCUSSION

The present study investigated the prevalence and risk factors of allergic rhinitis among undergraduate medical students at Prakash Institute of Medical Sciences, Sangli, Maharashtra. The overall prevalence of allergic rhinitis was found to be 30.4%, indicating that nearly one-third of the study population was affected. This finding underscores allergic rhinitis as a significant health concern among medical students and highlights its potential impact on quality of life, sleep, and academic performance.

The prevalence observed in the present study is higher than that reported in the Global Asthma Network (GAN) Phase I study from India, which documented allergic rhinitis prevalence rates of approximately 23.5% among adolescents [9]. However, the present prevalence is consistent with findings from university-based studies and surveys conducted among young adults, where prevalence estimates generally range between 25% and 35% [15]. The relatively higher prevalence observed among medical students may be attributed to greater symptom awareness, academic stress, urban environmental exposures, altered sleep patterns, and prolonged indoor activities. Furthermore, medical students belong to an age group in which allergic disorders are highly prevalent and frequently persist from adolescence into adulthood.

The findings are also in agreement with observations from the International Study of Asthma and Allergies in Childhood (ISAAC), which demonstrated substantial worldwide variation in the prevalence of allergic rhinoconjunctivitis, ranging from less than 5% to nearly 40% across different populations [16]. ISAAC Phase III further reported increasing trends in allergic diseases in several developing countries undergoing rapid urbanization and environmental change [17]. The prevalence identified in the present study falls within the upper range reported by ISAAC and supports the growing burden of allergic diseases in rapidly developing regions.

One of the most important findings of the present study was the strong association between family history of allergy and allergic rhinitis. Students with a positive family history were approximately four times more likely to develop allergic rhinitis than those without such a history. Similar observations have been consistently reported in epidemiological studies worldwide, identifying heredity as one of the strongest risk factors for allergic diseases [18]. The biological plausibility of this relationship is well established. Genetic predisposition influences immunoglobulin E (IgE) synthesis, T-helper 2 (Th2)-mediated immune responses, eosinophilic inflammation, and allergen sensitization, thereby increasing susceptibility to allergic disorders [6]. The present findings therefore reinforce the importance of familial predisposition in the pathogenesis of allergic rhinitis.

The present study also demonstrated a significant association between allergic rhinitis and asthma. Students with asthma exhibited more than threefold increased odds of allergic rhinitis compared with non-asthmatic students. This finding is consistent with previous Indian and international studies that have reported a strong coexistence of allergic rhinitis and asthma [19]. The concept of “united airway disease” provides a biological explanation for this relationship, recognizing the upper and lower airways as components of a single inflammatory system. Shared immunological pathways involving eosinophils, mast cells, cytokines, and IgE-mediated hypersensitivity reactions contribute to the frequent coexistence of these conditions [19].

Environmental exposures emerged as significant determinants of allergic rhinitis in the present study. Frequent dust exposure, passive smoking, and pet ownership were independently associated with increased risk of allergic rhinitis. Similar findings have been reported in contemporary epidemiological investigations examining environmental risk factors for allergic diseases [20]. Exposure to dust increases contact with house dust mites, fungal spores, and airborne allergens capable of triggering chronic nasal inflammation. Likewise, environmental tobacco smoke has been shown to promote airway epithelial injury, oxidative stress, and allergic sensitization, thereby increasing susceptibility to respiratory allergic disorders. Pet ownership may contribute to allergen exposure through animal dander and fur, particularly among genetically predisposed individuals.

Hostel residence was identified as another significant predictor of allergic rhinitis. Students residing in hostels demonstrated a higher likelihood of developing allergic rhinitis than day scholars. This observation may be explained by increased exposure to indoor allergens, inadequate ventilation, dust accumulation, shared living environments, and overcrowding. Similar findings have been reported among university students in several Asian countries, where residential environmental factors significantly influenced the occurrence of allergic symptoms [21]. These findings highlight the importance of maintaining appropriate indoor environmental hygiene within student accommodation facilities.

Sleep deprivation was another important factor associated with allergic rhinitis. Students sleeping less than seven hours per day had significantly greater odds of developing allergic rhinitis and reported poorer sleep quality overall. This relationship is likely bidirectional. Nasal congestion and nocturnal allergic symptoms may disrupt sleep architecture, while inadequate sleep may alter immune regulation and enhance inflammatory responses [22]. Recent studies have increasingly recognized sleep disturbance as both a consequence and a potential aggravating factor for allergic diseases, particularly among young adults experiencing high academic stress.

The impact of allergic rhinitis on academic performance observed in the present study deserves particular attention. Students with allergic rhinitis reported significantly higher levels of daytime fatigue, impaired concentration, absenteeism, and self-reported decline in academic performance compared with unaffected students. These findings are consistent with previous studies demonstrating that allergic rhinitis adversely affects cognitive functioning, attention span, memory, and educational outcomes [23]. Persistent symptoms, sleep disruption, and daytime somnolence may collectively impair learning efficiency and academic productivity. Given the rigorous academic demands of medical

education, even moderate reductions in concentration and cognitive performance may have substantial educational consequences.

From a public health perspective, the findings emphasize that allergic rhinitis remains an underrecognized yet highly prevalent condition among young adults. Although rarely associated with mortality, allergic rhinitis contributes substantially to healthcare utilization, reduced productivity, impaired quality of life, and increased socioeconomic burden [24]. Early diagnosis, risk factor modification, environmental control measures, and appropriate therapeutic interventions are therefore essential to reduce disease burden and improve long-term outcomes.

The findings also carry important implications for medical education. Medical students represent future healthcare professionals and are expected to possess adequate knowledge regarding allergic diseases and their management. Nevertheless, a substantial proportion of affected students remained untreated despite experiencing significant symptoms. Educational initiatives aimed at increasing awareness, promoting early healthcare-seeking behavior, and encouraging adherence to evidence-based management strategies may improve both student health and academic performance. Furthermore, institutional policies focused on improving hostel hygiene, reducing exposure to environmental tobacco smoke, and promoting healthy sleep practices may contribute to reducing the burden of allergic rhinitis within medical colleges.

Overall, the present study demonstrates that allergic rhinitis is a common multifactorial disorder among medical students, influenced by genetic susceptibility, environmental exposures, lifestyle factors, and coexisting allergic conditions. The prevalence and associated risk factors identified in this study are consistent with findings from GAN, ISAAC, Indian epidemiological studies, and recent international literature. These findings underscore the need for comprehensive prevention, early detection, and effective management strategies to minimize the academic and health-related consequences of allergic rhinitis among medical students.

## CONCLUSION

The present study demonstrated that allergic rhinitis is a highly prevalent health condition among medical students at Prakash Institute of Medical Sciences, with an overall prevalence of 30.4%. The findings indicate that allergic rhinitis affects nearly one-third of the student population, highlighting its significance as a public health and academic concern within medical institutions. Family history of allergy, asthma, dust exposure, passive smoking, pet ownership, hostel residence, and inadequate sleep duration were identified as significant independent predictors of the condition.

## REFERENCES

1. Savouré M, Bousquet J, Jaakkola JJK, et al. Worldwide prevalence of rhinitis in adults: A review of definitions and temporal evolution. *ClinTransl Allergy*. 2022;12(3):e12130.
2. Husna SMN, Tan HTT, MdShukri N, MohdAshari NS, Wong KK. Allergic Rhinitis: A Clinical and Pathophysiological Overview. *Front Med (Lausanne)*. 2022;9:874114.
3. Akhouri S, House SA. Allergic Rhinitis. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2023.
4. Wong QYA, Tan BKJ. Prevalence, patterns, and epidemiology of allergic rhinitis. *World Allergy Organ J*. 2022;15(12):100721.
5. World Allergy Organization. Rhinitis In-Depth Review. Milwaukee: WAO; 2020.
6. Bousquet J, Anto JM, Bachert C, et al. Allergic rhinitis. *Nat Rev Dis Primers*. 2020;6(1):95.
7. Brożek JL, Bousquet J, Agache I, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) Guidelines. *J Allergy Clin Immunol*. 2017;140(4):950-958.
8. Sinha B, Vibha, Singla R, Chowdhury R. Allergic rhinitis: A neglected disease—A community-based assessment among adults in Delhi. *J Postgrad Med*. 2015;61(3):169-175.
9. Barne M, Singh M, Gupta PR, et al. Global Asthma Network Phase I, India: Results for allergic rhinitis and eczema. *ClinTransl Allergy*. 2023;13(8):e12279.
10. Moitra S, Choudhury M, Dey A, et al. Allergic rhinitis in India. *ClinExp Allergy*. 2023;53(5):583-594.
11. Jain S, Singh M, Gupta N, et al. Age and gender specific incidence patterns of allergic rhinitis in India. *Indian J Otolaryngol Head Neck Surg*. 2024;76(Suppl 2):1450-1458.
12. Srivastava P, Gupta N. A review of the adverse impacts of allergic rhinitis on health-related quality of life and its evaluation. *Ann Natl Acad Med Sci (India)*. 2024;60(2):112-121.
13. Meltzer EO. Quality of life in adults and children with allergic rhinitis. *J Allergy Clin Immunol*. 2001;108(Suppl 1):S45-S53.
14. Chauhan R, Sharma S, Verma P. Prevalence of allergic rhinitis and its perceived effect on academic performance among college students. *Natl J Community Med*. 2022;13(5):287-292.
15. Urrutia-Pereira M, Solé D, Chong Neto HJ, et al. Prevalence of rhinitis and associated factors in adolescents and adults. *Allergol Immunopathol (Madr)*. 2023;51(1):1-10.
16. Strachan DP, Sibbald B, Weiland SK, et al. Worldwide variations in the prevalence of symptoms of allergic rhinoconjunctivitis in children: ISAAC. *EurRespir J*. 1997;10(9):2164-2171.

17. Asher MI, Montefort S, Björkstén B, et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis and eczema in childhood: ISAAC Phases One and Three. *Lancet*. 2006;368(9537):733-743.
18. García-Almaraz R, Del-Río-Navarro BE, et al. Prevalence and risk factors associated with allergic rhinitis. *World Allergy Organ J*. 2021;14(9):100580.
19. Jaggi V, Dalal A, Singh S, et al. Coexistence of allergic rhinitis and asthma in Indian patients. *Lung India*. 2019;36(6):483-489.
20. Bercedo-Sanz A, Arnedo-Pena A, et al. Prevalence and time trends of symptoms of allergic rhinitis. *Allergol Immunopathol (Madr)*. 2023;51(4):1-10.
21. Kim DH, Han DH, et al. How accurate are the ISAAC questions for diagnosis of allergic rhinitis? *Int J Environ Res Public Health*. 2018;15(7):1527.
22. Meltzer EO, Blaiss MS, Derebery MJ, et al. Burden of allergic rhinitis: Allergies, sleep and quality of life. *J Allergy Clin Immunol*. 2009;124(3 Suppl):S43-S70.
23. Walker S, Khan-Wasti S, Fletcher M, et al. Seasonal allergic rhinitis is associated with a detrimental effect on examination performance in United Kingdom teenagers. *J Allergy Clin Immunol*. 2007;120(2):381-387.
24. Bousquet J, Khaltaev N, Cruz AA, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 Update. *Allergy*. 2008;63(Suppl 86):8-160.