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Original Research Article

A Survey-Based Study on the Effect of Allergic Rhinitis on School-Going Children

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Abstract:

Introduction: In one in six people, allergic rhinitis (AR) causes nasal congestion and sneezing. Asthma is one of the diseases that is associated with it. Globally increased AR prevalence affects children's academic performance and well-being. To lessen its negative impact on health and school attendance, effective management is essential. Effective treatments include immunotherapy and sublingual steroids. Reducing the negative effects of AR on children's lives requires prompt action

Aim and Objectives: The objective is to evaluate the impact of allergic rhinitis on school-age children by conducting a study based on surveys.

Method: A cross-sectional study was conducted during the period of one year with students from rural high school children in Jaipur. Allergy rhinitis (AR) prevalence and quality of life were compared to healthy peers. We cluster-sampled 341 children out of 3000. Participant demographics, AR symptoms (as measured by the SFAR and ARYA scales), and SF-36 quality-of-life measures were all included in the study. Participants underwent basic sampling and included both AR and healthy peers.

Result: Children with allergic rhinitis (AR) demonstrated distinct characteristics compared to those without AR. AR children were older (13.65 vs. 12.05 years) and had a higher prevalence of asthma (10.00% vs. 12.29%) and eczema (2.50% vs. 2.99%). AR children also exhibited significantly higher IgE levels (102.58 vs. 5.6 ng/mL) and eosinophil counts (14.2 vs. 0.5), indicating an active allergic response. While quality of life scores varied, AR did not significantly impact mental health domains, suggesting a multifaceted influence of AR on children's health. These findings underscore the clinical and immunological disparities associated with AR, highlighting its significance in pediatric health.

Conclusion: This study concluded that the prevalence of AR in the sample is 11.73% and significantly affects quality of life (QoL) and the incidence of related symptoms and disorders in high school children

Keywords: "allergic rhinitis (AR)", Asthma, eczema, noses, sneezing, itchy eyes and tobacco smoke.

Introduction

About one in six people suffer from allergic rhinitis (AR), an atopic ailment that manifests as nasal obstruction, clear nasal discharge, sneezing, postnasal drip, and nasal irritation. In addition to its nasal symptoms, AR is linked to significant morbidity, lost productivity, and medical costs. The united airway concept has redefined AR, which was previously thought to just affect the nasal airway, as a component of a larger systemic allergic response that shares pathological similarities with diseases including asthma and atopic dermatitis. AR displays patterns that are either seasonal (intermittent) or perennial (chronic), with roughly twenty percent of the population being categorised as seasonal, forty percent as perennial, and the other forty percent exhibiting characteristics from both classifications [1,2].

When exposed to allergens, AR appears as swelling of the nasal cavity. Allergen inhalation causes the body's immune system to become sensitized, which in turn causes an IgE-mediated inflammatory reaction. This chain reaction results in histamine, prostaglandins, and leukotrienes being released, which causes symptoms like itching, congestion, and sneezing. Then comes the late-phase reaction, marked by inflammatory activity, which makes congestion and edema in the nasal cavity worse [3,1]. Figure 1 shows the Pathophysiology of Allergic Rhinitis.

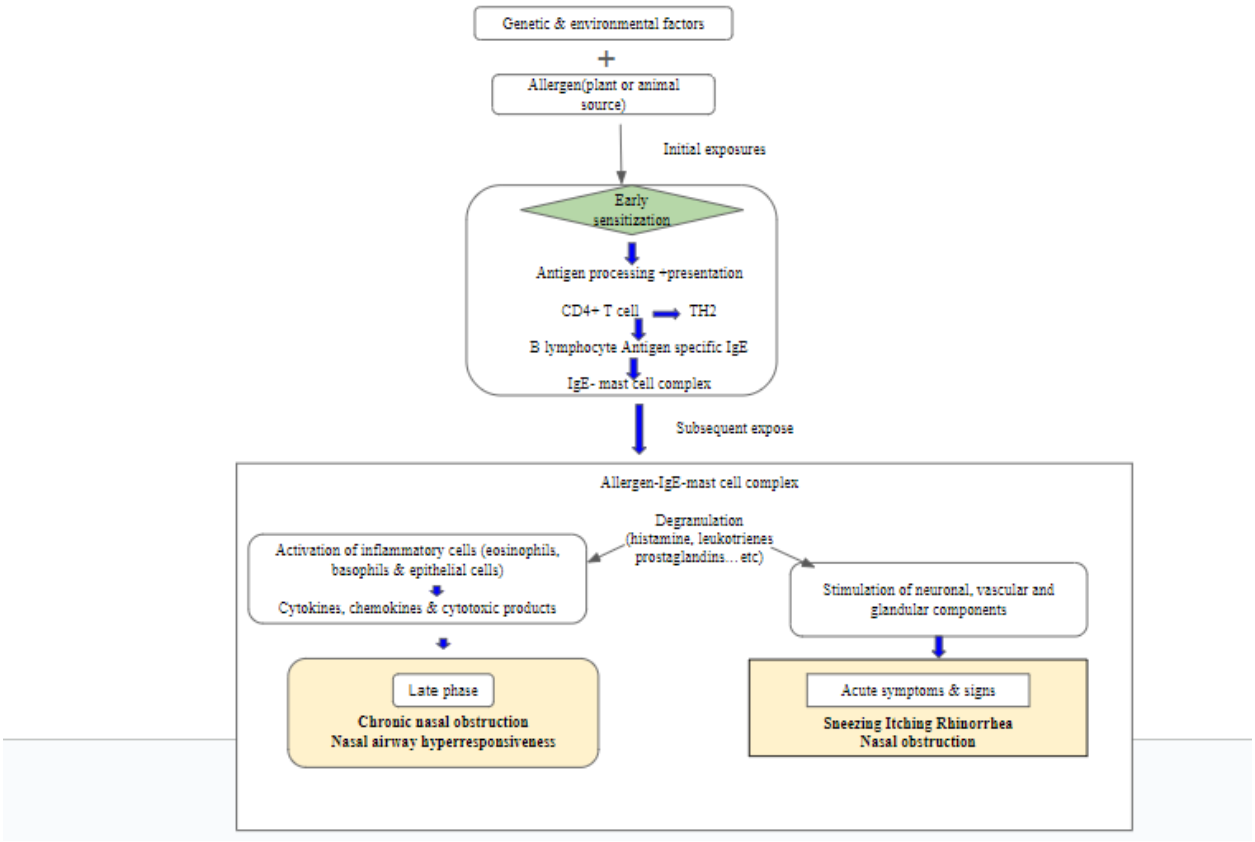

Figure 1: Pathophysiology of Allergic Rhinitis

AR symptoms can range from sneezing and runny or stuffy nose to nasal itching, coughing, painful or itchy throat, itchy and swollen eyes, under eye circles under the eyes, headaches on a regular basis, rashes, and extreme exhaustion. These varied expressions illustrate how inflammation caused by allergies affects different organs and physiological processes on a systemic level [1,4]. The global prevalence of AR is alarmingly rising, which suggests that there is an expanding global health crisis. This trend is supported by recent data from other parts of Asia, which show prevalence rates in the population as a whole of seventeen percent and thirty-nine percent, respectively. Interestingly, the incidence of AR shows a rising trend as time passes, with a significant increase in disclosed cases recorded in parts of Asia during six years. Furthermore, data indicates a significant increase in the prevalence of AR during the past ten years in several continents, including Africa, the Asia-Pacific area, Australia, Eastern Europe, Latin America, the Middle East, and Turkey. These results highlight how widespread AR is becoming and how often it occurs globally, necessitating coordinated efforts for efficient treatment and preventative measures [5,6].

Around the world, there is a great deal of regional variation in the overall incidence of AR in school-age children. Research has shown that prevalence rates vary from fifteen percent to 19.4 percent, and that these rates rise noticeably with age. Student sleep, mood, and memory are all negatively impacted by AR in addition to their physical condition. The prevalence rates of lifetime, present, and physician-diagnosed AR were reported to be 44.3 percent, 29.2 percent, and eight percent, respectively, in Istanbul, Turkey. These results highlight how allergic rhinitis affects schoolchildren's well-being in a variety of ways and highlight the need for targeted measures to effectively address this common health issue [7,8].

Children who attend school have severe disruptions in their lives from AR, which negatively impacts their general well-being, academic achievement, and quality of life. AR is closely associated with decreased days without symptoms, worsening symptoms during the day, more frequent use of emergency drugs, and restricted physical activity because of coexisting asthma [9]. It also interferes with daily activities, throws off sleep cycles, and often leads to missed school days, which exacerbates academic difficulties. The negative effects also extend to health-related aspects of life, most notably influencing family dynamics and physical function [10]. Academic success is directly hampered by symptoms like congestion in the nasal passages, sleep problems, and absenteeism, which are common. AR also causes headaches, exhaustion, and cognitive deficits,

which jeopardises schoolchildren's overall health. Therefore, it is critical to prioritise identifying and managing AR effectively to support these youngsters' academic achievement and general health [11].

Because of their maturing immune systems and increased exposure to allergens in school settings, children are more vulnerable to AR. Furthermore, the strong correlation between AR and asthma heightens the risk, as children with the condition have a higher chance of acquiring asthma. Moreover, children with AR frequently require extra therapy, such as inhalation of corticosteroids, and may require hospitalisation for asthma or have drug hypersensitivity. Children's chance of developing allergic reactions is greatly increased when they are exposed to a variety of indoor and outdoor pollutants, such as pollen and house dust mites [12,13].

If AR is not treated, it may seriously compromise children's general health and respiratory health. It has negative effects on children's standard of life and can lead to behavioural problems in addition to medical symptoms. It is critical to comprehend the fundamental mechanics of the disease and how it is related to other illnesses such as asthma. With their few adverse reactions and high effectiveness, intranasal steroid medications are the therapy of choice for persistent AR. IgE-mediated allergic reactions to air in children can also be successfully treated with immunotherapy, especially when administered sublingually. Reducing the negative effects of AR on children's well-being and academic performance requires prompt action and a comprehensive strategy for treatment [14,15].

Method

Research Design: This study conducted a cross-sectional analysis and the study participants were considered from a high rural school children in Jaipur and made up the study's population. The study was conducted during the period of one year and considered patients presented with rhinitis symptoms. Then Skin Prick Test was conducted. The patients showing the negative results were determined for Allergen specific IgE. The patients who shown to have either positive skin prick test or Allergen specific IgE, were considered to have the diagnosis of AR.

Figure 2 shows the flowchart of this diagnostic procedure.

Figure 2: The flowchart showing the process of diagnosis of AR

The survey was carried out in two phases. First, the prevalence of AR was examined, and then the quality of life of AR children was compared to healthy children. The population size was 3000 cluster-sampled was 341. 16 schools were chosen at random among high schools, and all children from one class at each level of study were chosen at random and questioned. Each study participant received the project questionnaire. Three sections comprised the questionnaire. The first component captured student demographics, while the second section provided AR (SFAR) scores. This scale, ranging from 0 to 16, effectively distinguishes outpatients with and without AR, with sensitivity and specificity. This scale is simple and quick to complete. Further questionnaire questions covered tobacco smoke and opium interaction. The third and last component of the questionnaire uses the ARYA scale to measure rhinitis severity. This scale separated children into mild persistent, moderate-severe persistent, mild intermittent, and moderate-severe intermittent AR groups. An intermittent

rating suggested that symptoms were noticed on fewer than 4 days a week or for less than 4 weeks. In addition, patients were split into mild and moderate-to-severe groups according to patterns of sleep and daily activities.

In the second phase of the research, and to investigate the quality of life of children with AR, the SF-36 questionnaire was used. This questionnaire analyses quality of life in eight domains, covering physical well-being, role restriction due to medical issues, overall wellness, vitality, relationships, mental health, role limit due to mental problems, and pain in the body. The overall quality of life score in each domain varies between 0 and 100. A number near to zero implies a poorer quality of life, whereas a score close to 100 suggests a better quality of life. The Farsi version of this questionnaire was accessible and its validity and reliability were validated. children with AR were picked for the questionnaire using simple sampling by referring to the available samples, while healthy classmates were employed as controls.

Inclusion and exclusion criteria

Inclusion: Rural School children aged 5 to 18 years presented with allergic symptoms.

Exclusion

- The study excluded children with chronic illnesses other than allergic rhinitis, those who declined to participate, as well as those who had trouble filling out the questionnaires due to linguistic or cognitive limitations.
- children who missed data collection or did not give informed consent were also eliminated
- We excluded incomplete surveys and missing data from the study.

Statistical Analysis

Statistical analyses, including t-tests and Chi-Square tests, were conducted using SPSS 27 software. The t-test was applied to compare means between two groups, whereas the Chi-Square test investigated the connection between categorical variables. These studies aid in determining the significance of differences or links within the dataset, offering significant insights for further investigation and understanding of the data.

Result

Table 1 presents baseline characteristics of patients included in a study, comparing those without allergic rhinitis (AR) to those with AR. In terms of age, the mean age of patients with AR (13.65 years) was slightly higher than those without AR (12.05 years), although this difference was not statistically significant (p=0.069). Regarding sex distribution, there was a slightly higher proportion of males in both groups, with 70.43% in the without AR group and 72.5% in the with AR group. However, the difference in sex distribution between the two groups was not statistically significant (p=0.085 for males, p=0.094 for females). When comparing body mass index (BMI), patients with AR had a slightly higher mean BMI (23.5) compared to those without AR (22.59), but this difference was not statistically significant (p=0.074). In terms of family history, there were significant differences between the two groups. Patients with AR were more likely to have a family history of asthma (10.00% vs. 12.29%, p<0.001), eczema (2.50% vs. 2.99%, p<0.001), and AR itself (12.50% vs. 0.99%, p<0.001) compared to those without AR.

Table 1: Baseline characteristics of the patients included in this study

Characteristics	Without AR N =301	With AR N =40	P value
Age	12.05±3.59	13.65±2.95	0.069
Sex			
Male	**212 (70.43%)**	**29 (72.5%)**	0.085
Female	**89 (29.56%)**	**11 (27.5)**	0.094
BMI	**22.59**±1.25	**23.5**±1.85	0.074
Family History			
Asthma	37 (12.29%)	4 (10.00%)	<0.001
Eczema	9 (2.99%)	1 (2.50%)	<0.001
AR	3 (0.99%)	5 (12.50%)	<0.001

Table 2 compares allergic rhinitis (AR) symptoms in children with and without AR, as well as their medical history and smoking history. The AR-free group had 301 children tested. Some had runny noses (4.98%), blocked noses (5.64%), sneezing (10.63%), itchy watery eyes (6.97%), asthma (12.29%), eczema (2.99%), and smoking (20.59%).The AR group (40 children) reported more AR symptoms. For example, more children with AR had runny nose (20.00%), blocked nose (12.50%), sneezing (7.5%), and itchy watery eyes (5.00%) than those without AR.A larger percentage of children with AR had a history of asthma (10.00%) than those without AR (12.29%). Only

2.50 percent of AR children experienced eczema, compared to 2.99% of non-AR children. Despite lower incidence, 12.50% of AR children reported smoking contact, compared to 20.59% of non-AR children. Symptom and medical history discrepancies between children with and without AR are unlikely due to chance, as the p-values imply statistical significance. The table shows that AR is linked to certain symptoms, medical disorders, and environmental variables including smoking. Overall, the study found a prevalence of 40 children have been diagnosed with AR with prevalence of 11.73%.

Table 2: Allergic Rhinitis (AR) symptoms in children with and without AR

	Without AR N =301	**With AR N =40**	**P value**
Symptom			
Runny nose	15 (4.98%)	8 (20.00%)	<0.001
Blocked nose	17 (5.64%)	5 (12.50%)	<0.001
Sneezing	32 (10.63%)	3(7.5%)	<0.001
Itchy watery eyes	21 (6.97%)	2 (5.00%)	<0.001
Previous history			
Asthma	37 (12.29%)	4 (10.00%)	<0.001
Eczema	9 (2.99%)	1 (2.50%)	<0.001
AR	3 (0.99%)	5 (12.50%)	<0.001
	85 (28.23%)	5 (12.50%)	<0.001
Contact with smoking	62 (20.59%)	3(7.50%)	<0.001

Table 3 compares SF-36 domain-measured quality of life between children with allergic rhinitis (AR) and those without AR. Regarding physical function, children with AR had a slightly higher average score (80.11 ± 19.22) compared to those without AR (79.19 ± 20.49), and this variation was statistically significant ($p < 0.04$). The two groups did not differ in role limitation-physical, vitality, social functioning, emotional role limitation, or mental health ($p > 0.04$). However, children without AR had significantly higher mean scores in body pain (80.11 ± 19.44) and general health (49.11 ± 21.22) compared to those with AR (79.22 ± 22.65 and 49.88 ± 20.44, respectively) ($p < 0.04$). These data imply that while children with AR may have some disparities in physical function and body pain, their overall quality of life across domains is comparable.

Table 3: Quality of life for AR and non-AR kids

SF-36 Domain	**Without AR mean (±SD)**	**With AR mean (±SD)**	**P Value**
Physical function	79.19 (20.49)	80.11(19.22)	< 0.04
Role limitation-physical	70.11(30.11)	69.44(19.50)	>0.04
Whole Body ache	80.11 (19.44)	79.22(22.65)	<0.04
General health	49.11 (21.22)	49.88(20.44)	>0.04
Vitality	59.44 (19.11)	59.22(19.22)	>0.04
Social functioning	59.79 (20.55)	60.11(20.10)	>0.04
Role limitation-emotional	59.44 (30.11)	59.44(19.44)	>0.04
Metal health	59.44(19.00)	59.44(19.22)	>0.04

Table 4 presents the laboratory features of patients categorized into two groups: those with allergic rhinitis (AR) and those without AR.

When comparing immunoglobulin E (IgE) levels, patients in the AR group had significantly higher levels (102.58) compared to those in the non-AR group (5.6 ± 2.2), with a statistically significant p-value of 0.042. Similarly, the eosinophil count was notably elevated in the AR group (14.2 ± 2.1) compared to the non-AR group (0.5 ± 0.2), with a statistically significant p-value of 0.036. Additionally, eosinophil cationic protein (ECP) levels were significantly higher in the AR group (16.2 ± 2.0) compared to the non-AR group (9.2 ± 2.0), with a p-value of 0.035.

Regarding other laboratory features such as nasal smear and serum tryptase levels, although there were differences between the AR and non-AR groups, these differences did not reach statistical significance (p-values of 0.059 and 0.095, respectively). When examining hematological parameters, including hemoglobin, hematocrit, white blood cell count, and platelet count, there were no statistically significant differences between the AR and non-AR groups, as indicated by p-values greater than 0.05 for each parameter. The laboratory findings suggest that patients with allergic rhinitis exhibit distinct immunological profiles characterized by elevated levels of IgE, eosinophils, and eosinophil cationic protein compared to those without allergic rhinitis. These

findings support the role of allergic mechanisms in the pathophysiology of allergic rhinitis.

Table 4: Laboratory features of the patients in each group

Laboratory Feature	Allergic Rhinitis Group	Without AR Group	P-value
IgE levels	102.58	5.6±2.2	0.042
Eosinophil count	14.2±2.1	0.5±0.2	0.036
Eosinophil cationic protein (ECP)	16.2± 2.0	9.2± 2.0	0.035
Nasal smear	5.1± 1.2	4.9± 1.56	0.059
Serum tryptase levels	10.2± 2.0	0.42± 0.2	
Hemoglobin (g/dL)	13.2 ± 1.0	13.5 ± 0.8	0.0958
Hematocrit (%)	39.5 ± 2.5	40.0 ± 2.0	0.085
White Blood Cells			
- Count (x10^3/µL)	7.8 ± 1.5	8.2 ± 1.2	0.078
- Differential:			
- Neutrophils	4.5 ± 0.9	4.8 ± 0.7	0.08
- Lymphocytes	2.8 ± 0.6	3.0 ± 0.5	0.062
- Monocytes	0.5 ± 0.2	0.6 ± 0.2	0.074
- Eosinophils	0.4 ± 0.3	0.2 ± 0.1	0.096
- Basophils	0.1 ± 0.1	0.1 ± 0.1	0.066
Platelets (x10^3/µL)	250 ± 50	260 ± 45	0.068

Discussion

Children who attend school suffer in their academic performance due to the negative impact of AlR. According to a 2007 study by Walker et al., between thirty-eight percent and forty-three percent of children report having signs and symptoms of seasonal AR during important exam times, which significantly increases the likelihood that grades would suffer [16]. Additionally, Zhong et al. 's (2014) study found that between seventeen percent and twenty percent of middle school and primary school children had AR, which had a negative influence on the children's behavior, ability to think clearly, and quantity of sleep [17]. Furthermore, Vieira et al.'s (2022) empirical research, which was based on actual data, emphasizes the link between poor rhinitis management and reduced academic output [18]. Together, these results highlight the significant effects of AR on school-age children's academic performance [16-18].

According to a study by Roger et al. (2016) [19], AR also significantly reduces productivity, with working and patients suffering overall productivity losses of twenty-one percent and 21.2 percent, respectively, along with twenty-two percent impairments in everyday activities. Furthermore, Song et al. (2015) [8] found that the incidence of AR, which ranges from fifteen percent to 19.4 percent, highlights the widespread effect it has on children' well-being by affecting important factors like sleeping habits, emotional moods, and memory retention. These results highlight how severely AR affects people's ability to operate daily and their general level of existence [19, 8].

The impact of AR symptoms on academic achievement and attendance at school is substantial. According to research by Sanchez et al. (2016), children with symptomatic AR perform worse academically and have higher absenteeism rates than their asymptomatic peers. Notably, the rates of absenteeism were noticeably higher among the individuals displaying respiratory conditions such as rhinitis and/or asthma. These academic difficulties are made worse by allergic rhinitis's effects on children' sleep, mental health, and memory. These results highlight the complex connection between symptoms of AR and academic performance [20].

Children in school are greatly affected by AR symptoms, and the intensity of symptoms is frequently related to an individual's sensitivity to allergens. In general, more severe signs are correlated with perennial AR. There are differences in the frequency of AR among school-aged children, and some of them show sensitivity. Sneezing, rhinorrhea, and nasal blockage are typical symptoms, which are frequently accompanied by allergic rhinoconjunctivitis. Children afflicted exhibit evident emotional anguish; many report moderate to severe impacts and difficulties with everyday activities. Furthermore, a certain percentage of kids miss school because of nasal obstruction. The psychological and physical toll that AR symptoms take on children highlights the necessity for all-encompassing management techniques to lessen their influence on day-to-day activities and school attendance [11,21,22].

There are several social and psychological ramifications associated with AR in children enrolled in school. It is closely associated with increased diagnosis of allergies, breathing problems, wheezing, and allergic hypersensitivity. The intensity of AR symptoms, such as rhinorrhea,

sneezing, and nasal blockage, can seriously interfere with children's sleep and everyday routines. Furthermore, due to nasal problems, AR frequently results in missing classes and ER visits, which negatively affects both general health and academic performance. In addition, lifestyle, genetic, and environmental variables all have an impact on the prevalence of AR, which may have an impact on the behaviour of kids, recall, and degree of sleep. These results highlight the complex effects of AR on school-age children's psychological and social well-being and highlight the need for all-encompassing management strategies to lessen those effects [11,17,21,23].

There are inherent limits to survey-based research on the impact of AR on school-age children. These studies frequently rely on symptoms that people report, which can bring biases and errors that could cause the prevalence of AR to be overestimated or underestimated. Furthermore, self-reporting may not be sufficient to properly capture the effect of AR on a variety of elements of children's daily life, including sleeping habits, mental health, and the ability to think [21]. Furthermore, these studies might be blind to additional important variables that could have a major impact on the onset and extent of AR in kids who are in school, such as genetic and environmental factors. These drawbacks highlight the necessity of thorough and multifaceted research and evaluation methods to fully comprehend the effects of AR on kids' well-being and physical health [21].

Many advances in understanding the causes and consequences of AR have been made throughout the last 20 years, which has resulted in the creation of evidence-based treatment plans. For children who attend school and have been diagnosed with allergic reactions, it is critical to develop a comprehensive treatment plan that addresses the upper as well as the lower airway inflammation. When treating mild intermittent allergic reactions (AR), the therapeutic approach usually starts with avoiding triggers. Next, as supplementary therapy, second-generation dermal or oral allergy medications, nasal saline, or cromoglycate are added. Nasal steroids appear to be the best therapeutic choice for moderate-to-severe AR cases. More importantly, for kids with these co-occurring illnesses, implementing a complete treatment plan that treats AR and asthma simultaneously is essential. Using this method guarantees maximum control and treatment of symptoms, eventually improving the impacted children's general health [22,23].

Conclusion

This study concluded that the prevalence of AR in the sample is 11.73% and allergic rhinitis (AR) significantly affects quality of life (QoL) and the incidence of related symptoms and disorders in high school children of Jaipur. Common AR symptoms, including a stuffy or runny nose, sneezing, and itchy, watery eyes, were more common among AR children than among their non-AR peers. More frequent exposure to secondhand smoke and other co-occurring diseases, including asthma and eczema, was also linked to AR. Despite slight disparities in physical function and physiological pain, children with and without AR had similar SF-36 QoL across domains. These findings emphasise the necessity for thorough AR and symptom treatment to increase children's well-being. This study highlights how allergic rhinitis (AR) impacts high school children in Jaipur, but it does not explain how it affects academic performance and well-being. Future study may examine AR severity, academic outcomes, and psychological aspects including stress and anxiety. Effective AR management in schools needs more research. Allergy education, environmental control, and medical treatment may be implemented in schools. Longitudinal studies could also reveal how AR affects academic performance and quality of life throughout adolescence and maturity.

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