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Original Research Article

Prevalence and academic impact of allergic rhinitis among school-age children in rural Bengaluru: a cross-sectional study

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ABSTRACT

Background: Allergic rhinitis (AR) is a prevalent, but often an underdiagnosed, chronic condition in children, which may have a negative impact on quality of life (QoL) and academic performance. Objectives were to determine the prevalence of AR in Indian school children using the score for AR (SFAR), its impact on QoL using the mini-rhino conjunctivitis QoL questionnaire (Mini-RQLQ), and to assess its effect on studies.
Methods: A descriptive cross-sectional study was conducted among 300 school children (6^{th}-12^{th} grades) in rural Bengaluru from June to August 2025 using parent-assisted SFAR, mini-RQLQ, and academic impact structured questionnaires. Statistical analyses were conducted in SPSS v25. Associations were tested using Chi-square and ANOVA, with $p<0.05$ considered significant.
Results: AR (SFAR≥7) was found in 55 children (18.3%) with prime triggers being cold weather (68%) and house dust (63%). Children with AR experienced sleeper disturbance, fatigue and ocular symptoms at higher rates. AR was significantly associated with impaired concentration (68.5%), reduced class participation (64.3%), and poorer examination performance (70%) compared to non-AR peers ($p<0.001$ for all). Nearly 40% of affected kids had doctor visit.
Conclusions: AR is common in school children of rural Bangalore and causes considerable impact to QoL and academic performance. Regular screening and timely intervention may help to reduce educational and psychosocial impacts.

Keywords: Allergic rhinitis, School children, SFAR, Mini-RQLQ, Academic performance

INTRODUCTION

Allergic rhinitis (AR) is an IgE-mediated inflammatory disorder of the nasal mucosa associated with sneezing, nasal obstruction, running nose and nasal/ocular itching. It exerts a significant disease burden by affecting sleep, cognition and daily activities especially in children. AR often coexists with asthma and other atopic disorders, exacerbating its clinical importance.[1,6]

Worldwide about 10%-40% of children are affected with AR, indicating that it is becoming more common in low- and middle-income countries. Rapid urbanization, increased exposure to indoor allergens, environmental pollution and changing lifestyle patterns have been implicated in this rise. Yet, paediatric AR is underdiagnosed and undertreated, particularly in rural areas with the limited healthcare access as well as awareness.[3-5]

School-going children are a susceptible population, as AR symptoms like nasal obstruction, sleep fragmentation, and daytime drowsiness can impact attention span, memory, and classroom engagement. Although few Indian studies have reported prevalence estimates of the AR, data investigating its joint effect on QoL and scholastic performance in the rural school populations are lacking.

This current study was thus conducted to determine the prevalence of AR, its QoL burden, as well as its academic impact among school-age children in rural Bengaluru using validated screening instruments.[5,7-9]

METHODS

Study design and setting

A descriptive cross-sectional study conducted between June and August 2025 in selected schools of Bengaluru rural district.

Participants and sampling

Students studying in grades 6 to 12 were selected by convenience sampling. Based on an anticipated AR prevalence of 30%, a minimum sample size of 323 was estimated; however, 300 complete responses were available and included in the final analysis.

Inclusion criteria

School-going children between the age of 11-18 years with informed parental consent were included in study.

Exclusion criteria

Children with preexisting diagnosis of chronic systemic illnesses, neuropsychiatric conditions affecting cognition or regular school attendance, or incomplete responses were excluded from the study.

Data collection tools

SFAR score, validated screening tool for epidemiological identification of AR, where a score ≥7 indicates probable AR. Mini-RQLQ score to assesses the impact of AR on nasal, ocular, sleep-related, and emotional domains. Academic impact questionnaire was used for assessing concentration, classroom participation, attendance, productivity, and perceived examination performance. Items adapted from previously published school-based paediatric studies and pretested for clarity.

Procedure

Questionnaire was distributed electronically using Google forms, responses of younger children were obtained with parent assistance to ensure completeness and accuracy. Participation voluntary and anonymous.

Ethical considerations

Ethical approval was obtained from the institutional ethics committee of Akash institute of medical sciences and research centre, Bengaluru. Written informed consent was taken from parents or legal guardians before participation.

Statistical analysis

Data collected was analyzed using SPSS version 25. Descriptive statistics are expressed in frequencies and percentages. Associations between AR status and academic variables were assessed using chi-square tests and ANOVA. A $p<0.05$ was considered statistically significant.

RESULTS

Of the 300 participants, 52.7% were female and 47.3% male. The majority were aged 14-16 years (42.7%) (Tabel 1).

Prevalence and clinical profile of AR

AR (SFAR≥7) was identified in 55 children, showing a prevalence of 18.3% with cold weather and house dust being the most common triggers. Sneezing, nasal congestion, itchy eyes, and sleep disturbance were the predominant symptoms. Only 40% of affected children had a clinical checkup.

QoL impact

Children with AR reported significantly higher disturbances in sleep quality, nasal symptoms, ocular discomfort, and daytime fatigue compared to non-AR peers.

Moderate-to-severe impairment was most commonly noted in sleep disturbance and fatigue-related domains.

Academic impact

Compared to children without AR, those with AR had significantly higher rates of difficulty concentrating (68.5% vs 24.0%), reduced classroom participation (64.3% vs 21.0%), and perceived negative impact on examination performance (70.0% vs 21.5%) ($p<0.001$). Absenteeism showed a weaker association and did not reach statistical significance.

Table 1: Demographic characteristics, (n=300).

Variables	Category	N	Percentage (%)
Age (in years)	11-13	102	34.0
	14-16	128	42.7
	17-18	70	23.3
Gender	Female	158	52.7
	Male	142	47.3

Continued.

Variables	Category	N	Percentage (%)
School grade	6th-8th	112	37.3
	9th-10th	104	34.7
	11th-12th	84	28.0

Table 2: Distribution of mini-RQLQ responses, (n=55).

Symptom/question	Not troubled	Very mildly	Mildly	Moderately	Quite a lot	Very much	Extremely
Difficulty sleeping	110 (36.7)	72 (24)	50 (16.7)	20 (6.7)	30 (10)	10 (3.3)	8 (2.7)
Blow nose frequently	105 (35)	68 (22.7)	45 (15)	33 (11)	34 (11.3)	10 (3.3)	5 (1.7)
Rub eyes/nose	108 (36)	62 (20.7)	50 (16.7)	28 (9.3)	35 (11.7)	9 (3)	8 (2.7)
Nasal congestion	92 (30.7)	70 (23.3)	52 (17.3)	31 (10.3)	33 (11)	15 (5)	7 (2.3)
Sneezing	80 (26.7)	85 (28.3)	45 (15)	30 (10)	35 (11.7)	20 (6.7)	5 (1.7)
Itchy eyes	140 (46.7)	65 (21.7)	38 (12.7)	20 (6.7)	22 (7.3)	12 (4)	3 (1)
Red/watery eyes	145 (48.3)	70 (23.3)	30 (10)	18 (6)	20 (6.7)	10 (3.3)	7 (2.3)
Feeling tired/ lethargic	85 (28.3)	72 (24)	50 (16.7)	33 (11)	35 (11.7)	15 (5)	10 (3.3)
Feeling embarrassed	150 (50)	60 (20)	25 (8.3)	26 (8.7)	25 (8.3)	6 (2)	8 (2.7)

Table 3: Impact of AR on academic performance.

Academic indicator	With AR (%)	Without AR (%)	P value
Feeling tired/lethargic	61.2	20.5	<0.0001
Difficulty concentrating	68.5	24.0	<0.0001
Difficulty participating in class	64.3	21.0	<0.0001
Poor attendance	50.0	19.0	<0.0001
Exam performance affected	70.0	21.5	<0.0001
Drop in productivity	53.5	15.0	<0.0001
Missed classes	35.0	12.0	0.162

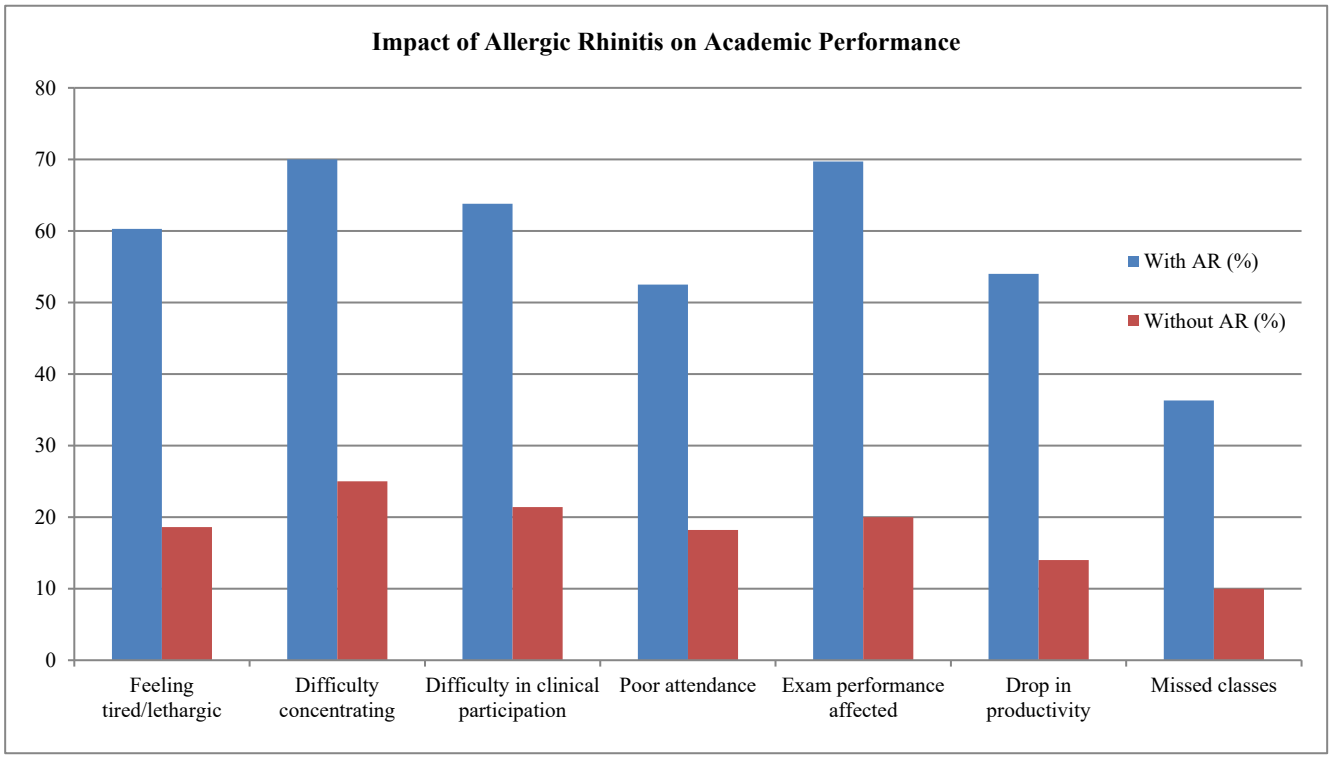

Figure 1: Impact of allergic rhinitis on academic performance.

DISCUSSION

The present study demonstrates an AR prevalence of 18.3% among rural school-going children in Bengaluru, which is comparable with previously reported Indian pediatric prevalence rates ranging from 15% to 25%. The findings underscore that AR is not confined to urban populations and represents a substantial health concern in rural settings as well.[5,9-10]

A key observation of this study is the low rate of healthcare utilization, with fewer than half of affected children having sought medical consultation. This reflects persistent under-recognition of AR by parents and caregivers, often due to misperception of symptoms as recurrent colds or non-serious conditions.[5,11]

The mini-RQLQ findings indicate that AR significantly impairs sleep and induces daytime fatigue. Sleep fragmentation due to nasal obstruction and nocturnal symptoms is a plausible mechanism underlying impaired attention, memory consolidation, and daytime alertness. Additionally, inflammatory mediators and the sedative effects of first-generation antihistamines may further contribute to cognitive impairment.[6,7,11]

The strong association between AR and reduced academic performance observed in this study is consistent with international and Indian literature. Difficulties in concentration, reduced classroom participation, and perceived decline in examination performance were significantly higher among children with AR. These findings highlight that AR is not merely a symptomatic nasal disorder but a condition with meaningful educational and psychosocial implications.[5,6,11]

Notably, demographic variables such as age, gender, and school grade were not significantly associated with AR severity, reinforcing multifactorial nature of the disease. Environmental exposure and individual susceptibility likely play a greater role than demographic factors alone.[3,12]

Limitations

This study has certain limitations. The cross-sectional design precludes causal inference between AR and academic outcomes. Data were based on self-reported and parent-assisted questionnaires, introducing potential recall and reporting bias. Objective diagnostic tests such as skin prick testing or serum IgE estimation were not performed. Additionally, convenience sampling limits generalizability of the findings.

CONCLUSION

Allergic rhinitis is a prevalent and underdiagnosed condition among rural Indian school children and is associated with significant impairment in QoL and academic performance. Incorporation of simple screening tools such as SFAR into school health programs, along with timely medical intervention, may help reduce long-term educational and psychosocial burden of disease.

Recommendations

Routine school-based screening for allergic rhinitis, periodic assessment of QoL using validated tools, awareness programs for parents, teachers, and students, early referral and evidence-based management and environmental control measures to reduce allergen exposure.

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