CHAPTER 4: PREVALENCE STUDY

4.1 AIM AND OBJECTIVES

4.1.1 Aim of the Study

- The aim of this study was to assess the prevalence and impact of Allergic Rhinitis (AR) among college students in Vadodara city.

4.1.2 Objectives of the Study

- Evaluate the prevalence of Allergic Rhinitis among the student population in Vadodara.
- Identify and analyze any comorbidities associated with Allergic Rhinitis in this demographic.
- Investigate the perceived effects of Allergic Rhinitis on the academic performance.

4.2 JUSTIFICATION OF THE STUDY

Allergic Rhinitis (AR) is a prevalent health concern that impacts a significant portion of the population, particularly among young adults in academic settings. Despite its high prevalence, the specific impacts of AR on college students, a critical demographic in terms of developmental and educational milestones, have not been thoroughly investigated, especially in diverse geographical contexts like Vadodara city.

This study is justified on several grounds:

- *Assessing Prevalence*: Understanding the prevalence of AR among college students in Vadodara city is crucial for healthcare providers and educational institutions to recognize the extent of this issue in a specific, possibly unique, environmental and cultural setting.
- *Identifying Comorbidities*: Investigating comorbidities associated with AR can lead to a

better understanding of the broader health implications for affected students. This knowledge is vital for developing comprehensive treatment and management strategies that address not just AR, but its associated health conditions as well.

- *Evaluating Academic Impact*: AR symptoms can significantly impact cognitive functions and day-to-day activities. By studying the perceived effects of AR on academic activities, the study aims to draw correlations between health and educational performance. This insight is essential for implementing supportive measures in educational environments to assist students suffering from AR.

4.3 RESEARCH QUESTIONS

- What is the prevalence of Allergic Rhinitis among college students in Vadodara city?
- What comorbidities are associated with Allergic Rhinitis in this student population?
- How does Perceived effect of Allergic Rhinitis on academic activity of college students in Vadodara city?

4.4 HYPOTHESIS

- There is a significant prevalence of Allergic Rhinitis among college students in Vadodara city.
- Allergic Rhinitis in these students is associated with notable comorbidities.
- Allergic Rhinitis has a perceived impact on the academic activities of college students in Vadodara city.

4.5 NULL HYPOTHESIS

- There are no significant comorbidities associated with Allergic Rhinitis among these students.

- Allergic Rhinitis does not have a significant perceived impact on the academic performance of college students in Vadodara city.

4.6 MATERIALS AND METHODS

4.6.1 Participants and Methodology

This observational, cross-sectional study focused on students from various institutes and departments across seven universities in Vadodara city, Gujarat. To calculate the sample size, we considered a college student population of ten thousand, a 95% confidence level, and a 2.5% margin of error, which yielded a required sample size of 1332. Factoring in a 5% non-response rate, this number was rounded up to 1398 for robustness. Figure 4.1 illustrates the flow diagram outlining the study selection process.

4.6.2 Ethical Considerations

Prior to commencing the study, ethical approval was obtained from the Institutional Ethical Committee of S-VYASA Bangalore. Participant consent was acquired through Google Forms. Additionally, permission was sought and granted by the heads of the institutes or relevant department personnel before sample collection.

4.6.3 Sampling Method

The study employed a cluster sampling method and was conducted from July 2018 to January 2019. The primary mode of data collection was through a survey questionnaire distributed via Google Form links sent to the students' Android phones. For those students who faced internet access issues or did not possess Android phones or internet connectivity, printed copies of the survey were provided. The data from these printed surveys were subsequently uploaded to ensure comprehensive data collection.

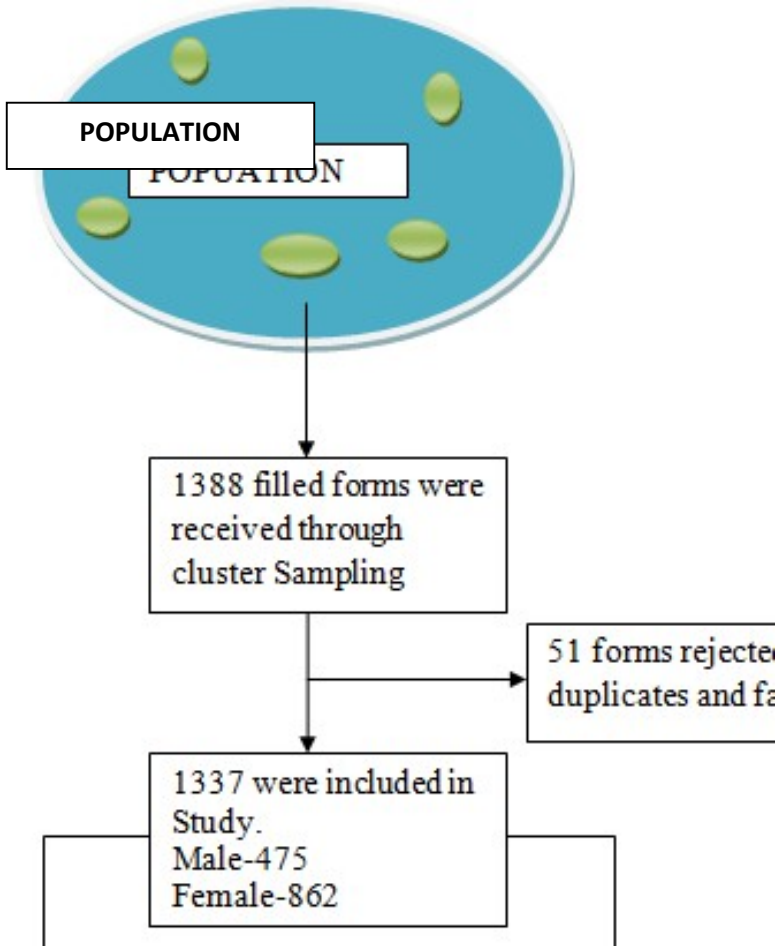

Figure 4.1: ***Flow diagram for study selection process***

4.7 DATA COLLECTION AND ANALYSIS

4.7.1 Data Collection through Google Forms

The data for this study was collected using Google Forms, structured into three distinct sections. The first section gathered demographic details of the participants. The second part consisted of the SFAR (Short Form for Allergic Rhinitis) form, while the final section included a semi-structured questionnaire.

4.7.2 Diagnosis and Scoring of Allergic Rhinitis

The diagnosis of Allergic Rhinitis (AR) was based on the scoring of the SFAR form, which comprises eight questions with scores ranging from 0 to 16. A score of 7 or higher on the SFAR was considered indicative of AR, aligning with the scale's reported sensitivity of 74% and specificity of 83% for scores at or above 7 (Annesi-Maesano et al., 2002).

4.7.3 Analysis of AR Group

In the subsequent analysis, the study delved into the AR group through the semi-structured questionnaire, focusing on bothersome symptoms, associated comorbidities, and the subjective impact of AR on academic activities. To assess the most troublesome symptom, respondents rated their experience of three major symptoms as no problem, minor, moderate, or major problem. For identifying comorbid conditions, a list was provided with an option for multiple selections.

4.7.4 Evaluating Academic Impact

The perceived effect of AR on academic activities due to AR symptoms and associated comorbidities was recorded on a Visual Analogue Scale (VAS), with ratings from 0 to 10. The scale scores were categorized into four levels: 0 indicating no effect, 1-3 indicating a mild effect (awareness of symptoms but no impact on academic activities), 4-7 indicating a moderate effect (some difficulty in academic activities), and 7-10 indicating a severe effect (significant disruption of academic activities) over the past year. It's important to note that all responses were subjective and self-reported, with no documentary proof required from participants.

4.8 STATISTICAL METHODS AND ANALYSIS

4.8.1 Data Entry and Preliminary Checks

The survey data collected was initially entered into a Microsoft Excel worksheet. A thorough check was conducted to identify and rectify any missing details or duplicate entries. This step was followed by the scoring of questionnaires based on responses.

4.8.2 Group Formation and Comparison

Based on the SFAR (Short Form for Allergic Rhinitis) scoring, participants were divided into two groups: the “AR” group (SFAR score ≥7) and the “Non-AR” group (SFAR score <7). These groups were then compared in terms of demographic details (age and gender) as well as reported symptoms.

4.8.3 Analysis of AR Group

The semi-structured questionnaire, which probed the most bothersome symptom, comorbid conditions, and perceived negative impact on academic activities, was analyzed specifically for the AR group. This analysis focused on gaining insights into the direct implications of AR on the students' academic life and overall well-being.

4.8.4 Statistical Testing

For the analysis of categorical variables, the Chi-square test was employed. This statistical test was used to determine the significance of differences between the AR and Non-AR groups in various aspects, including symptom severity, comorbidity prevalence, and academic impact. A p-value of less than 0.05 ($P<0.05$) was considered statistically significant.

4.9 RESULTS

4.9.1 Demography and Prevalence

Study Participants and Data Inclusion

In this observational study, a total of 1388 questionnaire forms were received. After excluding 51 (3.67%) entries due to duplicates or invalid responses, 1337 (96.32%) forms were included in the final analysis. The participant group comprised 862 (64.47%) female and 475 (35.53%) male students, with ages ranging from 16 to 38 years.

Prevalence of Allergic Rhinitis

Based on the SFAR (Short Form for Allergic Rhinitis) scale, 257 students, equating to 19.22% of the participants, scored SFAR≥7 and were consequently categorized as having Allergic Rhinitis (AR) according to the study criteria. The mean age of students diagnosed with AR was 20.37±2.04 years. Within this group, 168 (65.37%) were female with a mean age of 20.29±1.86 years, and 89 (34.63%) were male with a mean age of 20.51±2.33 years.

Non-AR Group

The remaining 1080 students (80.78%), who scored SFAR<7, were categorized as non-AR or otherwise healthy. The average age of these participants was 20.21±2.14 years, with 694 (64.30%) females having a mean age of 20.25±2.14 years, and 386 (35.70%) males with a mean age of 20.15±2.54 years (refer to Table-4.1 for detailed demographics).

		Frequency	Mean Age ± sd
AR	Male	89 (34.63%)	20.51 ±2.33
	Female	168 (65.37%)	20.29 ±1.86
	Total	257 (19.22%)	20.37 ±2.04

NAR	Male	386 (35.7%)	20.15 ±2.54
	Female	694 (64.3%)	20.25 ±2.14
	Total	1080 (80.8%)	20.21 ±2.14
Total	Male	475(35.5%)	20.21 ±2.51
	Female	862 (64.5%)	20.26 ±1.87
	Total	1337 (100%)	20.24 ±2.12

AR=allergic rhinitis; NAR= non allergic rhinitis

Table 4.1: Age and gender distribution in population

4.9.2 SFAR Assessment and Symptom Prevalence

The SFAR (Short Form for Allergic Rhinitis) assesses common AR symptoms over the previous year, including both nasal and ocular symptoms, variants of AR (seasonal and perennial), potential triggering agents, allergy tests (IgE/SPT), clinical diagnosis, and family history of atopic disorders. Participants with an SFAR score of ≥7, indicative of AR, exhibited symptoms such as sneezing (84.05%), runny nose (71.98%), nasal congestion (71.21%), and eye itching or epiphora (78.21%). A significant difference in these symptoms was observed compared to the non-AR group (P<0.01) as detailed in Table-4.2.

	AR (SFAR≥7) n=257	**AR (SFAR<7) n=1080**	**Chi-square score**	**p-value**
Symptoms				
Sneezing	216(84.05%)	287(26.57%)	292.197	0.001*
Runny Nose	185(71.98%)	198(18.33%)	292.347	0.001*
Nose block	183(71.21%)	275(25.46%)	192.88	0.001*
Watery eyes	201(78.21%)	134(12.41%)	478.7	0.001*
Types				
Perennial	100(38.91%)	76(7.04%)	184.502	0.001*
Seasonal	133(51.75%)	469(43.43%)	5.813	0.016
Triggering agents				
House dust and pollen	227(88.33%)	272(25.19%)	352.52	0.001
Perceived allergy	209(81.32%)	131(12.13%)	524.134	0.001
Allergy test done	52(20.23%)	64(5.93%)	53.635	0.001

Positive result	38(73.08%)	8(12.5%)	123.272	0.001
Positive clinical diagnosis	66(25.68%)	31(2.87%)	160.534	0.001
Positive family history	96(37.35%)	101(9.35%)	129.569	0.001
P<0.05 shows significant improvement on the respective parameter/variable.				

Table 4.2: Comparison of occurrence of symptoms and other components of SFAR between AR and without AR groups by using Chi-square test.

4.9.3 Prevalence of AR Variants

The study also separately calculated the prevalence of two variants of AR based on the timing of allergen exposure. Participants who experienced symptoms only during the pollen season, specifically in winter and spring, were classified under Seasonal Allergic Rhinitis (SAR). In contrast, those with symptoms persisting year-round or for more than six months were categorized under Perennial Allergic Rhinitis (PAR). Among the AR-positive participants, 100 (38.91%) presented with PAR, while 133 (51.75%) had SAR. This difference in the prevalence of AR variants was statistically significant compared to the non-AR group (P=0.016), as also presented in Table-4.2.

4.9.4 Identification of Allergens and Awareness in AR Group

Triggering Agents and Allergen Identification

The study identified a range of allergens or provoking agents, including house dust, pollen, seasonal/atmospheric changes, animal dander, wind/cold air, and perfumes or strong smells. Among the SFAR≥7 (AR positive) group, house dust and pollen were reported as triggering agents in 227 (88.33%) participants, while 30 (11.67%) were unable to identify any specific allergen. This finding indicated a significant difference in allergic responses to triggering agents compared to the non-AR group (P<0.01), as shown in Table-4.2.

Allergy Awareness and Testing

The questionnaire further revealed that 209 (81.32%) participants in the AR positive group were aware of their allergies. Additionally, 52 (20.62%) had undergone allergy testing (IgE or SPT), out of which 38 (73.08%) received positive results. This level of awareness and testing differed significantly from the non-AR group ($P<0.01$), as detailed in Table-4.2.

Clinical Diagnosis and Family History

A clinical diagnosis of an atopic condition was found in 66 (25.68%) students within the AR positive group, a significant difference compared to those without AR ($P<0.01$). Furthermore, 96 (37.35%) students in the AR positive group had a positive family history of atopic disorders, such as asthma, allergic rhinitis, or eczema ($P<0.01$), as presented in Table-4. This correlation between family history and the prevalence of AR underscores the potential hereditary aspect of these conditions.

4.9.5 Investigation of Symptoms, Comorbidities, and Academic Impact in AR Group

Bothersome Symptoms Analysis

In the study's focus on the AR group (n=257), sneezing was identified as the most bothersome symptom for 46 (17.89%) students. Runny nose and nasal congestion each were considered the most troublesome for 30 (11.67%) students. Interestingly, 23 (8.95%) of the 257 students were unable to pinpoint the most problematic symptom among sneezing, runny nose, and nasal congestion.

Comorbidity Assessment

The study also investigated comorbid conditions associated with the AR group. It found that 23 (8.94%) students had asthma, 99 (38.52%) experienced frequent headaches, 39 (15.17%) suffered from recurrent coughing, and 65 (25.29%) reported sleep difficulties. Additionally, sinusitis was prevalent in 48 (18.67%) students, otitis media in 4 (1.55%), atopic dermatitis in 10 (3.89%), and laryngitis in 8 (2.11%). Notably, 81 (31.52%) of the 257 students with SFAR≥7 did not report any associated comorbidities (as depicted in Fig-4.2).

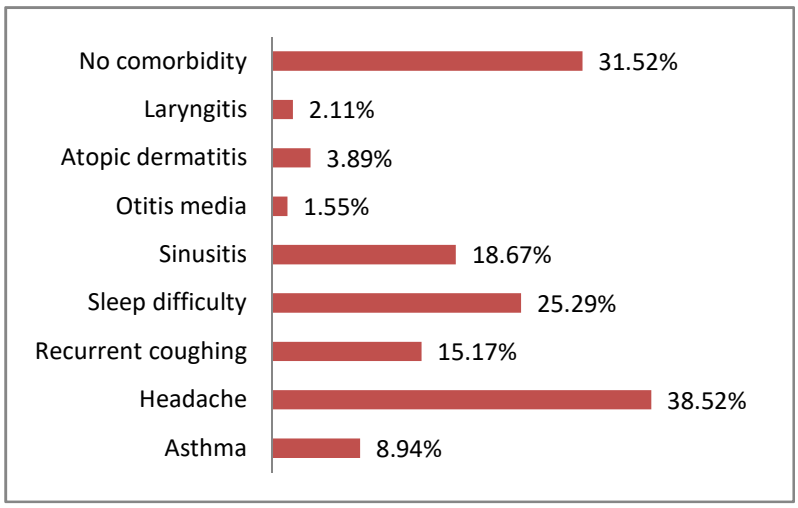

Figure 4.2: Co morbidities associated with AR group

Assessment of AR's Impact on Academic Activity by Gender

To evaluate the impact of Allergic Rhinitis (AR) on academic activities, the study divided the SFAR≥7 group into male and female categories for a comparative analysis.

Among male participants, 13 (14.60%) reported perceiving no effect of AR on their academic activities. Additionally, 24 (27%) experienced a mild effect, 38 (42.70%) a moderate effect, and 14 (5.70%) a severe effect. In contrast, among female students, 32 (19%) reported no effect, 37

(22%) a mild effect, 75 (44.60%) a moderate effect, and 24 (14.30%) a severe effect on their academic activities due to AR.

The analysis revealed that the difference in the perceived impact of AR on academic activities between male and female students was not statistically significant (p-value 0.709). This result indicates that there is no substantial gender difference in the perceived effect of AR on academic activities among college students, as shown in Table-4.3.

	No effect n%	Mild n%	Moderate n%	Severe n%	chi-square	p-value
Male	13(14.60%)	24(27%)	38(42.70%)	14(5.70%)	1.386	0.709
Female	32 (19%)	37(22%)	75(44.60%)	24(14.30%)		
Total	45(17.51%)	61(23.74%)	113(43.97%)	38(14.78%)		

Table 4.3: Perceived effect of Allergic Rhinitis on academic activity

4.10 DISCUSSION

Primary Objective and Secondary Aim

The primary objective of this study was to estimate the prevalence of allergic rhinitis (AR) and related symptoms among college students in Vadodara, a western region of India and the central region of Gujarat. Additionally, the secondary aim was to assess the burden of comorbid conditions and the perceived impact on academic activities among students diagnosed with AR based on the SFAR score.

Prevalence Findings and Comparisons

The study found a self-reported AR prevalence of 19.22% among the participants. This figure aligns closely with a study conducted in Iran, which reported a prevalence of 19.3% (Amizadeh, Safizadeh, Bazargan, & Farrokhdoost, 2013), and is slightly lower than the 29.6% incidence reported in a study from Turkey (Cingi et al., 2011). Interestingly, a significantly higher

prevalence of 47.90% was observed among individuals affected by war noise in Syria (Kakaje, Alhalabi, Alyousbashi, Hamid, & Hosam Aldeen, 2020), suggesting a potential psychological component in the development of the disease.

Indian Context

In India, three survey studies reported AR prevalence, one using the same SFAR tool and two with different methodologies. A pilot study in Eastern India, conducted at the outdoor department of a tertiary care setting, reported a 28% incidence (Paul, R., Bagri, P., Mondal, J., Basu, 2014) using the SFAR tool. Another study in Jaipur found a 24.31% prevalence among children aged 6-18 years (Dara, 2017), while a Delhi-based study reported a lower prevalence of 11.69%, excluding asthma patients (Gaur et al., 2006). These variations in prevalence across different regions of India highlight the influence of environmental and lifestyle factors on AR incidence.

Influence of Environmental Factors

The prevalence of allergy might be influenced by factors such as increased pollen exposure, common around green college campuses, and changes in habitat, as many students move from their homes to hostel campuses during their college years. This study's findings contribute to the broader understanding of AR prevalence among college students in different geographical and environmental settings.

Awareness and Testing Among AR Group Students

In this study, a notable 81.32% of students in the AR group were aware of their allergies. However, only 20.23% had undergone allergy testing, of which 73.08% reported positive results.

These findings can be contrasted with a study from China, where 61.6% of participants who perceived themselves as allergic had positive test results (Di et al., 2016).

Triggering Agents, SAR, and PAR

The study also explored triggering agents and the prevalence of Seasonal Allergic Rhinitis (SAR) and Perennial Allergic Rhinitis (PAR). It was observed that students suffered more from SAR than PAR. Common allergens identified were house dust and pollens, with additional triggers including atmospheric changes, perfumes, air pollution, spices, and animal dander.

Symptoms and Impact on Academic Activities

Regarding AR symptoms, most students identified sneezing as the most bothersome. Previous studies have shown that AR negatively affects work activity (Lamb et al., 2006), students' quality of life (Di et al., 2016), and examination performance (Sheikh et al., 2007). Consistent with these findings, our study revealed that 82.49% of students in the AR group experienced a mild to severe adverse effect of AR on their academic activities, aligning with the previously reported impact of seasonal allergic rhinitis on academic performance (Sheikh et al., 2007). This highlights the significant impact of AR on the daily lives and academic success of affected students.