Original Article

Allergy Burden in Gujarat: A Community Portrait of Adult Experiences

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ABSTRACT

Background: Allergies aren't just a health issue; they disrupt daily life, work, and social interactions. With over a third of adults affected and many unaware of their condition, there's a pressing need for better diagnosis, education, and environmental policies. Addressing allergies means improving lives, not just treating symptoms. Allergic diseases present a significant public health issue in India. The increasing prevalence is attributed to several factors, including environmental, genetic, and lifestyle-related factors. **Objective:** This study aimed to determine the prevalence of self-reported allergic conditions among adults in Vadodara, Gujarat, and assess their associations with environmental and demographic factors. **Material and Methods:** A cross-sectional study was conducted among 474 adults (aged 18–65) using a structured questionnaire based on international health assessment tools. Data on demographics, allergy symptoms, lifestyle factors, and environmental exposures were collected and analyzed. **Results:** The overall prevalence of allergic conditions was 33.7%, with 161 of the 474 participants affected, with allergic rhinitis (23.2%) being the most common, followed by allergic conjunctivitis (11.6%), skin allergies (11.2%), and food allergies (10.5%) and asthma (7.1%). A positive family history was found to be associated with the development of allergies (OR = 4.69, $p < 0.0001$), and the prevalence was significantly higher among urban populations (39.5% vs. 24.0%, OR = 1.8, $p = 0.019$). **Conclusion**: The research indicates a significant prevalence of allergic conditions in Gujarat adults and demonstrates the role of environmental and lifestyle exposures to allergy. The study shows the importance of public health interventions, pollution control measures, and enhanced healthcare resources.

Key words: Adult; Allergy, Prevalence, Urban, Community, Public health

Allergy is an important public health problem, occurring in a considerable fraction of the population. In the Indian subcontinent, the incidence of allergic rhinitis and asthma has been increasingly reported during the last few decades [1]. Studies have estimated that 20–30% of the population in India has at least one allergic disorder, the most prevalent being asthma, allergic rhinitis, atopic dermatitis, food allergy, and drug allergy [2, 3]. All these conditions have a significant healthcare burden and greatly affect quality of life.

India's environmental and socioeconomic conditions further exacerbate the allergy burden. Over 77% of the population is exposed to Particulate Matter (PM) 2.5 levels exceeding national standards, making air pollution a major contributor [4]. Both outdoor pollutants (vehicular and industrial emissions) and indoor pollutants (biomass fuels, mosquito coils) play a critical role in the rising incidence of allergic diseases [5]. Additionally, regional variations in climate, pollen exposure, fungal spores, and agricultural chemicals further influence allergy patterns [6].

Being one of the most industrialized states in India, Gujarat has its own allergy-specific challenges. Urban areas such as Ahmedabad and Surat often have risky air quality, whereas rural areas are exposed to allergens in fertilizers and pesticides [5]. Yet, despite these environmental hazards, there is limited epidemiological evidence regarding allergy prevalence and causative factors in Gujarat. This study addresses this knowledge gap by assessing the prevalence of allergic conditions among adults in Vadodara, Gujarat.

MATERIALS AND METHODS

A cross-sectional study was conducted among 474 adults (aged 18–65) using a structured questionnaire based on international health assessment tools on adult allergy patterns in Gujarat to determine their prevalence rate and related environmental factors at Vadodara. The study was carried out from July 2023 to July 2024. We chose Vadodara as a representative location for the study because of its varied population and extensive

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socioeconomic features. This research includes participants from urban and rural areas to examine how diverse environmental exposures, socioeconomic conditions, and lifestyle factors influence allergy prevalence. Its unique combination of residential, agricultural, and industrial settings guarantees that the results are representative of Gujarat's population.

Inclusion and Exclusion Criteria

Recruitment spanned educational institutions, workplaces, community centres, and health facilities to achieve diverse representation across professional education and income levels among participants. Strict admission and exclusion parameters were instituted to maintain integrity and enhance study reliability. Participants who matched the research criteria needed to reside permanently in Gujarat and belong to the adult age range of 18 to 65.

People suffering from severe systemic medical conditions, such as advanced cardiac problems and respiratory diseases, which affected survey response validity, became part of the exclusion criteria. The study did not include pregnant women because hormones that increase throughout pregnancy can distort allergy response measurements [7].

Sample Size Determination

The sample size for the study was determined using a prevalence estimate from prior research, which suggested a 20% prevalence rate for allergic conditions. We calculated the minimum sample size required to achieve a 95% confidence level and a 5% margin of error using the Cochran formula. This calculation resulted in a minimum sample size of 384 participants.

Participants totalled 474 to compensate for potential non-responses, partially completed surveys, and differences in responses. We increased the sample size because unusable or missing data could have resulted in inadequate study power. Using a bigger sample size allowed the analysis to break down data into specific group comparisons, such as those between urban versus rural populations and different communities.

Data Collection Methods

A structured questionnaire served as the tool to elicit study data about allergic conditions from participants while gathering extensive information across multiple variables. By incorporating 49 items and deploying them through Google Forms, we intended to streamline participant access and maximize response rate. The questionnaire questions resulted from modifications to established international health assessment tools such as the European Community Respiratory Health Survey (ECRHS) and the International Study of Asthma and Allergies in Childhood (ISAAC). The convergence with recognized international benchmarks ensured reliable and flexible analysis results, while research also accounted for unique attributes of Gujarat study subjects [9, 10]. Participants voluntarily completed the questionnaire, as evidenced by their consent through a specific question: “To take part, please select yes and go ahead.”

The questionnaire was divided into sections that covered essential survey elements. The first section considered the demographic variables of age, gender, occupation, socioeconomic status, and location (urban or rural), aiming to discover population-level differences in allergy prevalence concerning social and geographical characteristics. The second dealt with lifestyle factors such as smoking, alcohol, and tobacco use that may affect allergic conditions. The third section reviewed participant medical records, including family allergy history and professional diagnosis records. The survey questioned respondents about accompanying conditions like tuberculosis, which might alter or cloud allergic symptom recognition. The fourth section studied common allergy symptoms, including a runny nose, sneezing, itchy eyes, and skin reactions, and documented how these occurred in participants.

Researchers gained insights into how allergic manifestations affect different populations by collecting data on how often participants experienced these symptoms and for how long they endured them, along with the intensity levels. The fifth section analyzed environmental triggers by investigating participant exposure patterns toward known allergens, which included elements like dust particles, pets, and pollen, in addition to particular ecological surroundings. It covered the seasonal fluctuation of symptoms against monsoon humidity, winter drought, and other climate metrics to detect observable patterns. Additionally, there was an examination of food-related triggers, looking at individual dietary components that could provoke allergic reactions. The last part of the survey assessed the effect allergic symptoms had on participants' daily lives in terms of disruption to activities of daily living, participation in extracurricular activities, and attending work or school.

Screening and Validation

Participants were categorized based on reports of symptoms suggestive of allergic conditions, and those suspected of having allergies were offered further clinical evaluation. This evaluation included a comprehensive medical history review and skin prick tests (SPT), the most widely accepted standard for diagnosing allergen sensitivities [11]. SPT used regional allergen extracts such as pollen, dust mites, mould, and common food allergens. Successful comparative validation studies have boosted the reliability of screening devices, leading to expanded applications in multiple healthcare environments [12].

Ethical Considerations

All procedures adhered to institutional and national ethical standards and the Helsinki Declaration (1975, revised 2000). The institutional ethics committee approved the study.

Informed consent was obtained after providing participants with clear, non-technical information about the study's purpose, procedures, risks, and benefits. Participation was voluntary, with the right to withdraw at any time. Confidentiality was maintained, and results were reported in aggregate. The study upheld the ethical principles of autonomy, beneficence, non-maleficence, and justice.

Data Management and Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics (frequencies, percentages, distributions) summarized demographics and allergy-related variables. Responses were carefully reviewed for completeness, and incomplete or redundant data were excluded. Anonymization was ensured to maintain confidentiality, in line with ethical guidelines.

RESULTS

The prevalence of allergic conditions in our study was 33.69 %. Among 474 participants, 161 had symptoms suggestive of allergy. Among 161 affected individuals, 49 were previously aware of their diagnosis from a doctor. Demographic traits such as gender, age, and residential distribution of the study population are represented in Table 1.

Table 1: Demographic Characteristics of Participants (n=474)

Demographic Variable	Frequency(n)	Percentage (%)
Gender		
Female	247	52.1
Male	227	47.9
Age (years)		
18-24	382	80.6
25-30	72	15.2
Above 30	20	4.2
Residential Area		
Urban	374	78.9
Rural	100	21.1

Table 2: Distribution of Allergic Disorders among the adult population of Gujarat

Allergic Disorders	Frequency(n)	Percentage (%)
Allergic Rhinitis (runny/itchy nose, sneezing, nasal blockage)	110	23.2%
Asthma (wheezing, cough, shortness of breath)	34	7.1%
Allergic Conjunctivitis (itchy/watery eyes, redness of eye)	55	11.6%
Skin Allergy (eczema, rashes, hives)	53	11.18%
Gastrointestinal Allergy (nausea, vomiting, diarrhoea)	50	10.5%
Drug Allergy	1	0.002%

Binary logistic regression analysis found significant correlations between contributing factors and allergy symptoms. A considerably greater frequency of allergy diseases was linked to urban living ($p = 0.019$, OR = 1.8 [1.10-3.03]). Furthermore, the strongest odds ratio ($p < 0.0001$, OR = 4.69 [3.03-7.2]) was found for allergic diseases with a positive family history of allergies. These results imply that genetic predisposition and urban life are essential factors in developing allergy disorders. However, gender did not show statistical significance with the prevalence ($p = 0.050$, OR = 1.4 [0.99-2.15]).

Table 3: Seasonal and environmental triggers for the development of allergic conditions

	Environmental triggers (n=233)	
Trigger type	**Frequency**	**Percentage (%)**
Weather changes	86	53.4
Smoking	34	21.1
Pollen	30	18.6
Perfume	30	18.6
Strong emotional state	23	14.3
Dust	22	13.6
Grass	8	4.96
	Seasonal triggers (n=154)	
Winter	61	37.8
Monsoon	31	19.2
Pre-winter	27	16.77
Spring	15	9.3
Summer	12	7.45
Autumn	8	4.9

We also examined the full scope of allergy effects by surveying how symptoms disrupted participants' everyday tasks and their education-related and social events. Allergic conditions significantly impacted daily life in these cases. Daily activities were most affected (34.8%), followed by work attendance (30.4%) and social gatherings (28.6%). Extracurricular participation and exam performance were also disrupted. These findings highlight the broad influence of allergies on productivity and social engagement.

DISCUSSION

This study assessed the prevalence of allergic conditions and their associations with individual characteristics such as age and sex in a population outside a typical medical setting. As mentioned earlier, the overall prevalence was 33.7%, aligning with global findings, including a self-reported allergy prevalence of 27.3% in Germany [14]. Allergic rhinitis emerged as the most common condition, similar to reports from other countries, where it often co-occurs with asthma [15].

Our study found that allergies were more prevalent in urban areas (39.5%) compared to rural populations (24%), consistent with research from Germany, where rural allergy prevalence

was reported at 24.4% [14]. The higher allergy rates in urban settings are likely due to increased exposure to pollutants, industrial allergens, and processed foods [16]. Conversely, rural residents may face elevated risks related to agricultural chemical exposure. These findings reinforce the need for public health interventions tailored to the distinct risk factors present in both settings.

Commonly reported triggers in our study included smoking, pollen, and perfume. This aligns with global research indicating that industrial pollutants, vehicle emissions, and airborne allergens significantly increase allergy risks. The "Allergic Rhinitis and its Impact on Asthma" (ARIA) framework similarly highlights air pollution and vehicular emissions as key urban allergy drivers. At the same time, in rural areas, exposure to farm-based allergens and chemical pesticides contributes to risk [16]. Additionally, lifestyle factors such as high-fat diets, tobacco use, and physical inactivity further exacerbate allergic conditions [15, 17]. Age- and gender-related differences in allergy prevalence have been widely documented. While our study did not find a statistically significant association with gender [18], global studies suggest variations. For instance, allergic rhinitis and asthma are more common among younger adults (18-45 years) in European and Asian studies [16, 17]. Also, Nigerian studies report a greater prevalence among men (65%) [15]. Such findings would indicate that socioeconomic and environmental influences may be more significant than sex in the causation of allergies. According to previous research, a family history of allergies is a major risk factor for the disease [19]. Our study also demonstrated the same genetic association.

Gujarat's nutritional shift towards processed foods aligns with global trends that add to food allergies [20]. The increasing allergy burden requires active public health measures, such as stricter pollution management, enhanced access to healthcare, and public awareness of allergy-causative agents. Increasing mobile health services, telemedicine, and rural diagnostic centres can help counteract healthcare inequities. Dietary interventions aimed at balanced nutrition and minimizing processed food consumption are also critical in preventing allergy risk.

Despite its valuable insights, our study has several limitations. The reliance on self-reported symptoms and diagnoses may have led to subjective misinterpretation and possible over- or under-reporting. Additionally, while triggers were reported, the absence of allergen-specific diagnostic testing limits the clinical utility of the findings for local allergists. Recruitment from educational institutions, workplaces, and health facilities may have skewed the sample toward more educated or health-aware individuals, potentially inflating prevalence estimates. Future studies should incorporate objective clinical diagnostic methods, more granular allergen identification, and larger, more representative populations. Further, exploring the role of co-morbid health conditions, occupational exposures, and global climate change would provide a more comprehensive understanding of allergy patterns. Multicentred collaborative studies, such as the ISAAC project, provide a strong model for international allergy trend assessment and policy development [16, 17]. Resolving these issues will be important in enhancing allergy management and decreasing the worldwide burden of allergy disorders.

CONCLUSION

This study highlights a considerable allergy burden among adults in Gujarat, with higher prevalence in urban populations and strong associations with environmental exposures, lifestyle factors, and family history. Seasonal changes, pollutants, and lifestyle habits emerged as key triggers, significantly impacting daily life and productivity. Addressing this growing burden requires stronger public health measures, including pollution control, nutrition awareness, improved diagnostic access, and community education. Focused interventions tailored to both urban and rural contexts can help mitigate risks and enhance quality of life. Future studies should use a bigger sample size, objective diagnostic technologies, and multicentric techniques to analyse allergy patterns in Gujarat and beyond.

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