Main Article

Prevalence and Pattern of Inhalant Allergens among Allergic Rhinitis Patients in Vellore – A Cross Sectional Study

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Krithiga Sivakumar,[1] Sivakumar Ethirajan,[2] Sivachandrabose K[3]

ABSTRACT

Introduction

Allergic rhinitis is a global health problem but often neglected and its burden, underestimated. Knowledge on its epidemiology is important for its diagnosis and treatment. Hence, this study was conducted to assess the prevalence and pattern of various inhalant allergens among allergic rhinitis patients in Vellore district.

Materials and Methods

Cross sectional study was conducted among 300 adult patients diagnosed with allergic rhinitis in Vellore district, between July - December 2019. Detailed history with a structured questionnaire & skin prick test after informed consent was done. The common inhalant (house dust, cotton dust, aspergillus, pollens, parthenium and cockroach) were tested. Chi square test was done and P<0.05 was considered statistically significant.

Results

Majority,75% (n=225) were allergic to house dust, 68% (n=204) to cockroach and 67% (n=201) to parthenium, 54.3% (n=163) to pollen. 44% (n=132) to cotton dust and 42.7% (n=128) to aspergillus respectively. Middle age group (26-40 years) was commonly affected. Though gender and place of residence showed difference clinically there was no statistical significance.

Conclusion

Prevalence of inhalant allergens is high. Majority affected with house dust and cockroach. Allergic rhinitis varies in accordance with location & environmental conditions. In addition to the well-established pharmacotherapy, self-management after understanding their trigger will help reduce the morbidity.

Keywords

Allergic Rhinitis; Prevalence; Skin Test; Inhalant Allergens

Allergic rhinitis is a global health problem but often neglected and its burden underestimated. Prevalence of allergic rhinitis in Western Europe is about 23% and it affects from 0.8 to 39.7% in the world population. It causes major morbidity and illness worldwide. People from all countries, all ages, both gender and all ethnic groups suffer from rhinitis. Prevalence of rhinitis in India varies from 10 to 50 % .[1,3] The data on the prevalence of rhinitis both in India and other countries is inadequate. Though considered as a minor illness, It is often associated with significant morbidity, loss of productivity, health care expenditure, affecting various aspects of life including social life, school and work and sleep ,causing considerable effect on the individual and the society and also imposes a substantial socioeconomic burden due to reduction in quality of life. Rhinitis, is characterized by inflammation of the lining of the nose and is usually characterized by nasal symptoms such as anterior or posterior rhinorrhoea, nasal blockage, sneezing

1 - Department of Community Medicine, Government Stanley Medical College
2 - Department of ENT, Sri Narayani Hospital & Research Centre
3 - Department of ENT, Thiruvalluvar University

Corresponding author:
Dr Krithiga Sivakumar
email: krithigasivakumar@gmail.com

and itching of the nose.[1] Prevalence of allergic rhinitis is increasing, especially in India.

Allergic rhinitis (AR) is the form of non-infectious rhinitis induced after allergen exposure by an immunoglobulin E (IgE)-mediated inflammation. Aeroallergens causing allergic rhinitis are mainly due to house dust mites (HDM), animal danders, molds and pollens. India, being a tropical country has variety of allergens and Indians are exposed to various allergens especially in inhalational and ingestant route. Urbanization & industrialization leading to outdoor and indoor air pollution also contribute to allergic symptoms. Hence identification of the allergens of particular individual will help to cater the treatment accordingly. Most published literature available are from high-income countries, which may not be valid in low-middle income countries like India due to differences genetic, environmental, and lifestyle factors. Therefore it is a necessary for phenotypic characterization of allergic diseases in Indian population.

Vellore district has heterogenous population with wide exposure to agriculture, tannery industries and urbanisation etc, The present study was attempted due to fill the gap in paucity of the studies on the prevalence and pattern of allergic rhinitis. Hence this study was planned to be conducted with objectives to assess the prevalence and pattern of various inhalant allergens among allergic rhinitis patients in Vellore district, South India.

Materials and Methods

This is a Cross sectional study conducted among 300 patients diagnosed with allergic rhinitis in Vellore district for a period of year between July 2019 to December 2019. Patients above 18 years diagnosed with allergic rhinitis were included in the study. Patients less than 18 years, those with needle phobia, pregnancy, patients with severe asthma, those with anaphylaxis and eczematous lesions, other severe comorbidities were excluded. The sample size was calculated using the following parameters. Prevalence of allergic rhinitis in India- 10% (from literature), 5% precision calculated minimum sample size was 150 with 10% non-response rate, 95% confidence interval. 95% confidence interval and 5% precision (138 +10% non-response rate). Institutional Ethical committee approval was obtained before starting the study. The participation in the study was purely voluntary and all participants were explained about the study. Data was collected and test were administered by trained personnel's only after obtaining informed consent. Study was conducted according to guidelines of ICMR 2017 ethics guidelines and declaration of Helsinki 1975, revised 2008. Confidentiality & privacy of the participants was maintained throughout the study.

Adult patients presenting to ENT OPD with allergic rhinitis were selected after applying appropriate inclusion and exclusion criteria. After explaining the purpose and procedure of the study, written informed consent was obtained from all the study participants. Detailed history of the patient's exposure with allergens was obtained at first visit with a structured questionnaire and were subjected skin prick test to assess the prevalence and pattern of allergy. The common inhalant materials associated with allergic rhinitis such as house dust, cotton dust, aspergillus, pollens, parthenium and cockroach were chosen to be tested in this study. The present work was conducted in ENT clinic functioning at Vellore, Tamilnadu. The present work was conducted by following the standard methodology[16] as given below:

Skin Testing : Allergen exposure in the skin caused degranulation of the mast cells leading to mediator release and wheel and flare reaction. Precautions are to withhold H2 antihistamines 2 days prior to testing, H1 antihistamines 7 days prior and beta blockers to be discontinued. Contraindications are severe anaphylactic reactions, uncontrolled asthma and dermographism for such patients only intradermal testing. Intradermal test was done only in upper arm due to negligible pain and convenience. 70 prick skin tests and 40 intradermal are justified in single test (American College of Asthma Allergy and Immunology). Wheal and flare reaction with maximum diameter of more than 3 mm when compared with controls at 15 minutes is taken as positive. It usually completely disappears over 3 hours.

Skin Prick Testing : The prick skin test was performed by placing a small drop of allergen on the cleansed skin surface and passing a 25-or-26- gauge needle through the antigen at a 45-degree angle. The needle was lightly pressed into the epidermis and then lifted, creating a break in the epidermis without causing bleeding. Test antigens was placed > 2 cm from one another. Various hollow and solid bore needles and blood lancets are available under different trade names.

Interpretation of skin test results : The immediate hypersensitivity reaction was quantified by measuring the diameter of the wheal and associated erythema. Wheal size was found to be more specific than erythema size and to correlate better to clinical symptoms. The results were measured at the peak of the reaction. The peak time for histamine reaction was 8-10 minutes. The peak time for mast cell activators such as opiates was 10-15 minutes. The peak time for most allergen was 15-20 minutes. Positive reactions are any wheals that measure >3mm in diameter more than the negative control. Skin test was not performed in patients who have had a recent severeallergic reaction (i.e., anaphylaxis) because test results are unreliable in theseinstances. Skin testing is usually postponed for 4-6 weeks after the acute event.

Data was entered in MS excel and analysed using SPSS 20. Descriptive statistics such as mean (Sd) / median (IQR) were used to present the continuous variables whereas frequency and percentage was presented for categorical variables. Diagrammatical presentation was also done for the categorical variables. Chi square test was used to assess the association of demographical variables such as age, gender and area with different allergic tests. The p value less than 0.05 was considered as statistically significant variables.

Results

This study was conducted among 300 participants with allergic rhinitis. There was no missing data. The mean age of the study participants was 33.61 ± 11.10.(mean +s.d) Majority 168 (56%) were females. Age distribution of the study participants were as follows, 138(46%) participants belonged to 26-40 years, and 80 (27.33%) were below 25 years, 82 (26.67%) belonged to >41 years. Most of them i,e 193 (64.33%) were urban residents and rest 107 (35.67%) were from rural area (Table I).

Table I: Baseline Demographic Distribution

VARIABLE	n	%
Sex		
Male	**132**	**44.00**
Female	**168**	**56.00**
Age		
<25	**80**	**26.67**
26-40	**138**	**46.00**
>41	**82**	**27.33**
Area		
Urban	**193**	**64.33**
Rural	**107**	**35.67**

Prevalence of aeroallergens

In our study, we observed that the most common aeroallergen was house dust, cockroach and parthenium. Majority i,e 75% (n = 225) were allergic to house dust, 68% (n = 204) were allergic to cockroach and 67% (n = 201) were allergic to parthenium. Almost half the study population 54.3% (n = 163) were allergic to pollen. 44% (n=132) were allergic to cotton dust and 42.7% (n = 128) were allergic to aspergillus respectively (Fig. 1).

In the present study, 300 study participants diagnosed with allergic rhinitis were subjected to skin prick test. The aero-allergens such as house dust, aspergillus, cotton dust, pollen, parthenium and cockroach were tested. Chi square test was applied to find any association with demographic variables and allergens. When age group

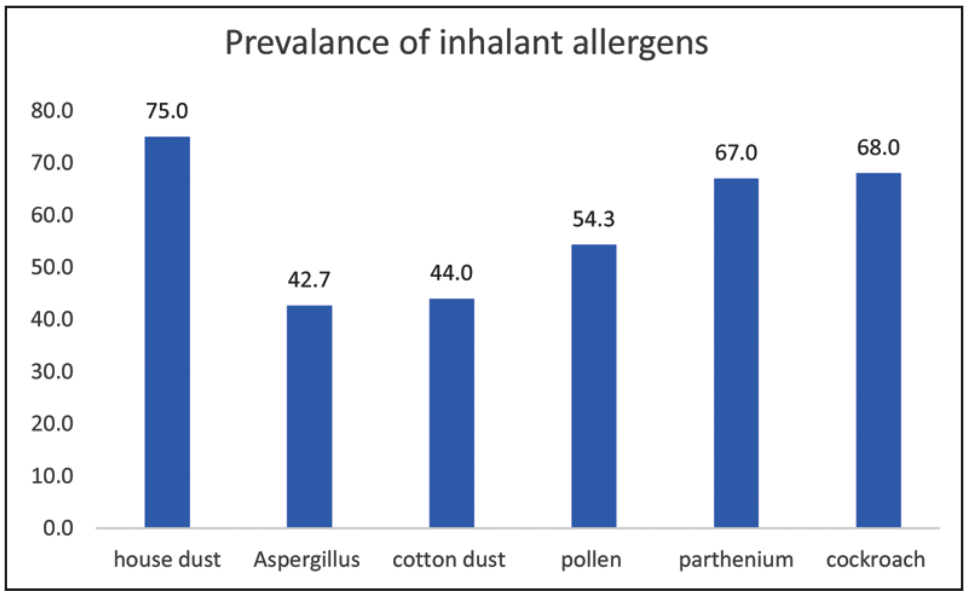

Fig. 1. Prevalence of inhalant allergens

was analysed, it was observed that of those tested positive to the aeroallergens predominantly belonged to age middle age group of 26-40 years. 105 (85.4%) tested positive for House dust, 51 (59.3%) tested positive for Aspergillus, 59(67.8%) tested positive for cotton dust, 75 (76.5 %) of those tested positive for pollen, 97 (85.1%) of those tested positive for parthenium 95 (82.6%) tested for positive for cockroach respectively. Univariate analysis showed statistically significant (p = 0.023) for the people who were tested positive for aspergillus.

Table II: Univariate Analysis of Inhalant Allergens

VARIABLES	HOUSE DUST		P-VALUE	ASPERGILLUS		P-VALUE	COTTON DUST		P-VALUE
	- ve n (%)	+ ve n (%)		- ve n (%)	+ ve n (%)		- ve n (%)	+ ve n (%)	
Age									
< = 25	17 (22.4)	59 (77.6)		16 (30.8)	36 (69.2)		19 (40.4)	28 (59.6)	
26 - 40	18 (14.6)	105 (85.4)	0.376	35 (40.7)	51 (59.3)	0.023	28 (32.2)	59 (67.8)	0.136
> = 41	14 (18.7)	61 (81.3)		9 (18.0)	41 (82.0)		13 (22.4)	45 (77.6)	
Sex									
Male	17 (14.3)	102 (85.7)		26 (34.7)	49 (65.3)		27 (31.8)	58 (68.2)	
Female	32 (20.6)	123 (79.4)	0.173	34 (30.1)	79 (69.9)	0.51	33 (30.8)	74 (69.2)	0.891
Area									
Urban	31(17.9)	142 (82.1)		40 (33.3)	80 (66.7)		37 (30.6)	84 (69.4)	
Rural	18 (18.8)	78 (81.3)	0.866	20 (31.3)	44 (68.8)	0.774	21 (31.3)	46 (68.7)	0.913

Table II: Contd.

Table II (Contd.) : Univariate Analysis of Inhalant Allergens

VARIABLES	POLLENS		P-VALUE	PARTHENIUM		P-VALUE	COCKROACH		P-VALUE
	- ve n (%)	+ ve n (%)		- ve n (%)	+ ve n (%)		- ve n (%)	+ ve n (%)	
Age									
< 25	17(28.3)	43 (71.7)		18 (26.9)	49 (73.1)		8 (13.6)	51 (86.4)	0.594
26 - 40	23 (23.5)	75 (76.5)	0.704	17 (14.9)	97 (85.1)	0.083	20 (17.4)	95 (82.6)	
>= 41	18 (28.6)	45 (71.4)		9 (14.1)	55 (85.9)		8 (12.1)	58 (87.9)	
Sex									
Male	21 (22.1)	74 (77.9)	0.225	21 (20.2)	83 (79.8)	0.434	19 (19.2)	80 (80.8)	0.128
Female	37 (29.4)	89 (70.6)		23 (16.3)	118 (83.7)		17 (12.1)	124 (87.9)	
Area									
Urban	36 (26.1)	102 (73.9)	0.862	28 (18.8)	121 (81.2)	0.651	25 (15.9)	132 (84.1)	0.687
Rural	22 (27.2)	59 (72.8)		15 (16.5)	76 (83.5)		11 (13.9)	68 (86.1)	

When gender was analysed, we observed among the male participants, majority 102 (85.7%) people were positive for house dust and among 155 female participants tested, 123 (79.4%) were positive and the rest were found negative for house dust. It was found, about 58 (68.2%) male participants were positive and 74 (69.2%) female participants were positive for aspergillus. For cotton dust, it was found that about 49 (65.3%) male participants were positive and, 79 (69.9%) female participants were positive. Majority 74 (77.9%) tested positive among males and about 89 (70.6%) females tested positive for pollen. About 83 (79.8%) of males and 118 (83.7 %) of females and 124 (80.8%) and 97 (87.8%) participants tested positive for parthenium and cockroach allergens respectively . When univariate analysis was done, it was no difference among them and not statistically significant (Table II).

When the urban and rural populations were compared, urban people showed more positive than rural area in following allergens namely the house dust 142 (82.1%), pollen 59 (73.9%) and cotton dust 74 (69.4%) and rural people showed more positive than urban in the allergens like of cockroach 68 (86.1%), parthenium 76 (83.5%) and aspergillus 44 (68.8%). While there was no statistical significance observed.

Discussion

Allergic rhinitis being a global health issue and although many studies have been conducted in western countries, emphasis is not given to identify the prevalence and pattern and exposure to allergens especially in lower and middle income groups. With the results obtained, it is quite clear that the magnitude of allergic rhinitis is high enough to be considered as a significant health issue. Causes of allergic rhinitis differ in accordance with locations and different age groups and extent to which individuals are exposed with different allergens. Comprehensive account on allergic rhinitis and its impact among children and adults has been given by many investigators.[5]

In our study, we observed that the most common aeroallergen was house dust, cockroach and parthenium. Majority, 75% were allergic to house dust, 68% were allergic to cockroach and 67% were allergic to parthenium, 54.3% were allergic to pollen. 44% were allergic to cotton dust and 42.7 % were allergic to aspergillus respectively.

According to Kurpp, et al,[15] prevalence of allergy to fungi constitute about 29-30% in atopic individuals and 6% in general population and 25% in allergic asthma cases in the industrialized world. Whereas, in other study[11] that most common allergen reported in house dust mite (32.48%) followed by pollens (27.48%), dust (18.32 %), fungi (10.82%) and insect (9.16). This may be due the difference of exposure in accordance with the environment and living conditions. Pollen exposure is widely known allergen and has been associated to severity of allergic rhinitis.[14,16]

In the present study, allergic rhinitis was found to be more in the age group of 26-40 (46.15%), followed by the age group of more than 40 years (27.28%). Participants who tested positive for aspergillus was statistically significantly in the age groups 26-40 years. While a similar work by Jovilia M. Abong, et al[6] in 2012 reported that the prevalence was highest between the age groups 40-49 years and another study by Jyothirmayi and Kumar[11] found highest prevalence in the age group of 21 to 30 years. It is observed from this study that the age group of 26-40 years are more susceptible for allergic rhinitis. This may be due the reason, they belong to economically productive age group andmay have the higher exposure outdoors and to various allergens in the living and working environment.

When the urban and rural populations compared, we found both urban and rural population were positive to different allergens. Though the pattern for inhalant allergens like house dust, aspergillus, cotton, parthenium and cockroach were slightly different in these two areas. The variations in inhalant allergens among the urban and rural area in the present study was meagre and there was no statistical significance on univariate analysis. In a study by Hameed Ur-Rehman Malik, et al[7] 2012 found that, prevalence of allergy was more for urban area people due to their environment and growing population, industrialization and pollution leading to the predisposition of asthma. While Agarwal et al[8] reported rural people to have more prevalence rate of allergy and asthma than urban people. Our study we found the allergic rhinitis due to inhalant allergens seemed to vary in rural and urban population depending on the participants environment, exposure and lifestyle.

Among the six inhalant allergens, such as house dust, aspergillus, cotton dust, pollen, parthenium and cockroach tested in our study, females tested positive than male population in all inhalant allergens except the pollen exposure in which more male participants tested positive. Cockroach was found predominate compared with other allergens in the present study. Though no statistically significant results were obtained on univariate analysis, a study by young et al[9] reported that the gender distribution of male and female were 84.2% and 85.1%, respectively and the distribution of allergens in both sexes did not differ similar to our finding. While a study by Daniel Zamanfar, et al[10] and another study by Jyothirmayi and Kumar[11] found that male population had higher prevalence rate of allergic rhinitis. In consistent with the present study, many researchers have revealed the general characteristics of allergic rhinitis. A study by Settipane and Lieberman[12] and another study by Cazzoletti, et al,[13] have reported female gender seems to be at higher risk for nonallergic rhinitis but, there is no sex difference in allergic rhinitis. Finding in the present study was clinically significant as were observe more female patients with allergic symptoms in daily practice. Female mostly stay indoors are exposed to common inhalant allergens like house dust, cotton etc.

Further research is needed in this aspect to understand the clear status of allergic rhinitis in India since rhinitis is multifactorial disease and its rapid prevalence increase is unlikely to be only due to genetic cause, but rather changes in environmental factors and complex interactions between them influencing the disease development.

The main strength of the study was it was able to achieve its objectives in short duration with adequate sample size and standard test in resource deficient setting. This is one of few studies about allergic rhinitis in India. Further studies and research in allergic rhinitis is the need of the hour since there is the paucity of information on geographical variation, age and gender and various other factors that may influence it.

The major limitations of the study is that, this is a cross

sectional study, included participants from a ENT clinic using convenient sampling. Hence various other factors which could have been associated with allergic rhinitis could not be ascertained due to time and resource constraints. Community based study with better sampling method would have yielded better generalizability.

Conclusion

It is concluded from this study that allergic rhinitis due to inhalant allergens is very high and middle age group and females are commonly affected but that there is no statistically significant difference when gender, urban and rural area and age group was compared with the inhalant allergens. It is noted that the pattern of allergic rhinitis was found to be different in accordance with the different exposure of inhalant allergens. In addition to the pharmacotherapy which is well established and widely available, self-management after awareness and understanding their trigger by the patients will help reduce its burden to angreat extent. Further research in this area is needed better management of the patients. Emphasis should be laid on understanding the pattern of allergy and exposure to allergens at home and environment. Initiatives should be taken up to have personalized treatment catering to individual patient and thereby improving quality of life and general health of patients.

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