



## ALLERGEN PROFILE OF PATIENTS FROM CENTRAL KERALA, INDIA

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### ABSTRACT

Allergic disorders manifest in various forms like allergic rhinitis, asthma, skin allergy and allergic conjunctivitis. The current study was done in a tertiary care centre at Kochi with an objective to study the pattern of allergens tested positive in suspected atopic patients from central Kerala, southern India. Information was collected from health information system regarding all atopic patients in whom allergic skin prick test was done for aeroallergens and food allergens during Jan 1<sup>st</sup> 2012 to December 31<sup>st</sup> 2013. Most Common allergic disease for which testing was done was for Asthma (69.8%) followed by Allergic Rhinitis (59.7%). Housefly was the most common allergen observed 53.26% (74/139) followed by rice grain dust 47.5% (66/139). Insect allergens were more common in all conditions as compared to other allergens. Prawn was the most common food allergen identified. Regional variation exists in the pattern of allergic disease manifestation and nature of allergens.

**KEY WORDS:** Allergens, Skin prick test, type 1 allergy, allergen avoidance



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## INTRODUCTION

Prevalence of nasobronchial allergy is increasing globally. It is estimated that over 20% of the world's population suffer from IgE mediated allergic disorders which include allergic rhinitis, asthma, allergic conjunctivitis or skin allergy. The definitive diagnosis of allergy requires identification of allergen, establishment of causal relationship between exposure to allergens and manifestation of symptoms.<sup>1</sup> Allergic diseases are diagnosed by taking a detailed history, clinical examination, and other appropriate laboratory tests. The primary test for the diagnosis of immunoglobulin E (IgE) mediated allergy is skin prick test (SPT). Allergic skin test is a reliable and cheap technique for diagnosis of IgE mediated allergic diseases which was first described by Dr. Charles Blackley in 1867.<sup>2</sup> Allergic rhinitis (AR), asthma, and atopic dermatitis (AD) arise from the exposure of a sensitized individual to single or multiple aeroallergens.<sup>3</sup> Though allergic manifestations occur irrespective of age, it mostly affects children and young adults. It leads to decrease in sleep, learning difficulties and lack of concentration which may reduce their quality of life and cause psychosocial stress. It gives huge financial and psychological stress to parents also. Distribution of aeroallergens vary depending on geographical area, climate and vegetations.<sup>3</sup> The current study was done in a tertiary care centre at Kochi with an objective to study the pattern of allergens tested positive in suspected atopic patients from central Kerala, southern India. The study also aimed to describe the allergen profile and symptoms with each district in central Kerala and to find out the distribution of different allergens among allergic disease spectrum. The information would be useful to find out the diverse allergen profile in these districts which are having significant differences in environment ranging from rural coastal area to highly industrialised urban areas.

## MATERIALS AND METHODS

The study was done in allergy clinic in the department of pulmonary medicine, Amrita Institute of Medical Science, Kochi, Kerala. It is a tertiary care teaching hospital with annual patient turnover of over 800,000 outpatients and nearly 50,000 inpatients. Hospital has a robust health information system with details like present and past history of patients, all investigations and details of treatment given to all patients. This was a retrospective study. All atopic patients in whom allergic skin prick test was done for aeroallergens and food allergens during Jan 1<sup>st</sup> 2012 to December 31<sup>st</sup> 2013 coming from districts of central Kerala were included.

Patients from districts other than central Kerala and patients less than five year of age were excluded. Central Kerala is constituted by Alappuzha, Idukki, Ernakulam, Kottayam and Thrissur districts. Alappuzha is predominantly coastal region, Idukki a high range, Kottayam with predominant rubber plantations, Ernakulam a highly industrialised district and Thrissur with a rural-urban mix. A total of 139 patients were eligible to be included in the study. Allergic skin Prick test and interpretation was done in the institution for each patient as per Global Allergy and Asthma European Network (GA<sup>2</sup> LEN) protocol.<sup>4</sup> Specific allergen extract panel manufactured by Bio products and diagnostics private Ltd. was used to do the tests. Negative control solution used in the department was buffered saline and positive control was 1 mg/ml histamine hydrochloride 2 ml 1:10 solution. Allergen panel in the institution contained 30 antigens out of which 20 for aeroallergens and 10 for food allergens. Allergic skin prick test reports of patients who presented with atopic manifestations like Asthma, allergic rhinitis, skin allergy or allergic conjunctivitis, obtained from hospital health information system of all patients over the two years were analysed. The study protocol was approved by the Institutional Ethics Committee (AIMS 20/06/16). Data was entered in Microsoft Excel 2007 and was analysed using SPSS (Statistical Package for Social Sciences) version 15 for Microsoft Windows. Frequency and percentages were calculated for allergen profile district wise and disease wise. Mixed Allergy was defined as more than two allergic diseases apart from combination of asthma and allergic rhinitis. Skin Allergy included atopic dermatitis, Urticaria, angioedema and eczema.

## RESULTS

Of the 139 patients included in the study, 79 were females and 60 males. Nine patients had no sensitisation with any allergens in the food and aeroallergen panel studied. Most Common allergic disease for which testing was done was for Asthma (69.8%) followed by Allergic rhinitis (59.7%). 24.46% of cases had a combination of bronchial asthma and allergic rhinitis. Mixed allergic disease constituted 33.81% of the study population. Allergic conjunctivitis was least common allergic disease. Paediatric population (5-18 yr) was the major age group who came forward for Allergic skin test; least number of patients came in age group of more than 51 yrs. Age and gender distribution of the study participants were given in Table 1.

**Table 1**  
**Age and gender distribution of the study population**

Age	Male	Female	Total
5y-18 yr	27(57.4%)	20(42.55%)	47(33.81%)
19yr-35yr	18(43.9%)	23(56.09%)	41(29.5%)
36 yr-50 yr	13(37.14%)	22(62.86%)	35(25.18%)
>51yrs	2(0.125%)	14(87.5%)	16(11.51%)
Total	60(43.16%)	79(56.83%)	139(100%)

*Pure asthma was the most common allergic disease among patients presented from Ernakulam (65.4%), Kottayam (64.7%), Alappuzha (79.49%) and Thrissur (76%). The proportion of asthmatics presented from Idukki was less (33.3%). Proportion of skin allergy was higher from Idukki (66.67%), as compared to all other districts. The district wise distribution of allergic diseases was given in Table 2.*

**Table 2**  
**District wise distribution of allergic diseases**

Disease	Ernakulam	Idukki	Kottayam	Thrissur	Alappuzha	Total
Asthma	34(35.05%)	2(2.06%)	11(11.34%)	19(19.59%)	31(31.95%)	97
Allergic Rhinitis	29(34.94%)	4(4.82%)	12(14.46%)	14(16.87%)	24(28.91%)	83
Allergic Rhinitis&Asthma	13(38.24%)	1(2.94%)	5(14.71%)	8(23.53%)	7(20.59%)	34
Skin allergy	15(37.5%)	4(10.0%)	5(12.5%)	8(20.0%)	8(20.0%)	40
Allergic Conjunctivitis	11(40.74%)	1(3.70%)	1(3.70%)	6(22.22%)	0(0.0%)	27
Mixed	16(34.04%)	3(6.38%)	5(10.64%)	7(14.89%)	16(34.04%)	47

Housefly was the most common allergen observed 53.26% (74/139) followed by Rice grain dust 47.5% (66/139). Among tested allergens insect allergens were more common. The proportion of people allergic to insects was as follows: house fly (53.2%) followed by ant (41.7%), mosquito and cockroach male (37.4%). Among aeroallergen rice grain dust was more common (47.5%) followed by cotton dust (31.7%), old paper dust (28.1%) and house dust (23.0%). Among danders cat dander was more common (22.3%). Among fungal antigens *Aspergillus niger* was more common (16.5%) Food allergy test was done in 131 patients where prawn allergy was more common 22.90% ie

(30/131) followed by potato 19.08 % (25/131). Most common antigen found among patients from Ernakulam district was House fly (61.5%) followed by Rice grain dust (51.9%). Most common antigen among patients from Kottayam district was Rice grain, mosquito, accasia and cockroach male (35.3% each). In Idukki district Rice grain, Cotton and Ants constituted 66.7% each. In Alappuzha district Rice grain dust, Cotton dust and House fly (41.0%) were more common. In Thrissur district most common antigen was Rice grain dust (52.0%). The details of district wise allergen profile were given in Table 3.

**Table 3**  
**District wise distribution of aeroallergens**

Aeroallergen	Ernakulam	Kottayam	Alappuzha	Idukki	Thrissur	Total
House Dust	12(23.1%)	2(11.8%)	11(28.2%)	2(33.3%)	5(20.0%)	32(23.0%)
Rice Grain Dust	27(51.9%)	6(35.3%)	16(41.0%)	4(66.7%)	13(52.0%)	66(47.5%)
Old paper Dust	15(28.8%)	1(5.9%)	11(28.2%)	2(33.3%)	10(40.0%)	39(28.1%)
Cotton Dust	16(30.8%)	3(17.6%)	16(41.0%)	4(66.7%)	5(20.0%)	44(31.7%)
Cat dander	12(23.1%)	4(23.5%)	8(20.5%)	2(33.3%)	5(20%)	31(22.3%)
Dog Dander	12(23.1%)	2(11.8%)	12(20.5%)	0(0.0%)	2(8.0%)	28(20.1%)
Cow Dander	8(15.4%)	3(17.6%)	8(20.5%)	1(16.7%)	7(28.0%)	27(19.4%)
Pigeon	12(23.1%)	3(17.6%)	8(20.5%)	2(33.3%)	6(24.0%)	31(22.3%)
Mixed feather	9(17.3%)	3(23.5%)	9(23.1%)	2(33.3%)	4(16.0%)	27(19.4%)
House Dust mite	12(23.1%)	4(23.5%)	9(23.1%)	2(33.33%)	5(20.0%)	32(23.0%)
Cockroach male	23(44.2%)	6(35.3%)	14(35.9%)	2(33.33%)	7(28.0%)	52(37.4%)
Mosquito	21(40.4%)	6(35.3%)	15(38.5%)	2(33.33%)	8(32.0%)	52(37.4%)
Housefly	32(61.5%)	12(70.6%)	16(41.0%)	2(33.33%)	12(48.0%)	74(53.2%)
Ant	20(38.5%)	10(58.8%)	14(35.9%)	4(66.7%)	10(40.0%)	58(41.7%)
Accasia	10(19.2%)	6(35.3%)	6(15.4%)	2(33.33%)	5(20.0%)	29(20.9%)
Caricca papaya	9(17.3%)	1(5.9%)	4(10.3%)	1(16.7%)	1(4.0%)	16(11.5%)
Asperg.Fumigatus	4(7.7%)	0(0.0%)	7(17.9%)	2(33.33%)	1(4.0%)	14(10.1%)
Aspergillus Niger	10(19.2%)	1(5.9%)	7(17.9%)	2(33.33%)	3(12.0%)	23(16.5%)
Aspergillus Mixed	8(15.4%)	3(11.8%)	4(10.3%)	2(50.0%)	4(16.0%)	21(15.1%)
Aspergillus flavus	8(15.4%)	2(11.1%)	4(10.3%)	3(16.7%)	1(4.0%)	18(12.9%)

The most common sensitised antigen in Asthma subgroups were housefly (58.14%) and Rice grain dust (52.33%) while the pattern was similar for Allergic rhinitis also with House Fly (67.10%) and rice grain dust(55.26%). Most Common antigen in Asthma with Allergic rhinitis was House dust (43.75%) and old paper dust (41.03%). In people with skin allergy, the most common antigens was mixed feather (37.04%) where as in allergic conjunctivitis it was cat dander (29.03%) and caricca papaya (29.41%). Common antigens for mixed allergic diseases were mosquito (71.15%) and old paper dust was 56.41%. The distribution of allergens by disease type was shown in Table 4.

**Table 4**  
**Distribution of aeroallergens among atopic subgroups**

Allergens	Asthma	Allergic Rhinitis	Skin Allergy	Allergic Conjunctivitis	Asthma &Allergic Rhinitis	Mixed	Total
House Dust	28(32.56%)	22(28.94%)	7(21.88%)	6(18.75%)	14(43.75%)	8(25%)	32
Rice GrainDust	45(52.33%)	42(55.26%)	18(27.27%)	15(22.73%)	19(28.79%)	24(36.3%)	66
Old paper Dust	25(29.07%)	25(32.89%)	8(20.51%)	7(17.98%)	16(41.03%)	22(56.4%)	39
Cotton Dust	30(34.88%)	26(34.21%)	12(27.27%)	11(25%)	13(29.55%)	13(29.5%)	44
Cat dander	30(34.88%)	19(25.0%)	7(22.58%)	9(29.03%)	7(22.58%)	11(35.4%)	31
Dog Dander	23(26.74%)	15(19.74%)	8(27.59%)	7(24.13%)	5(17.24%)	10(34.4%)	29
Cow Dander	19(22.09%)	17(22.37%)	7(25.93%)	7(25.93%)	9(33.33%)	7(25.93%)	27
Pigeon	23(26.74%)	17(22.37%)	7(22.58%)	7(22.58%)	11(35.48%)	8(25.81%)	31
Mixed feather	18(20.93%)	13(17.10%)	10(37.04%)	5(18.52%)	5(18.52%)	9(33.33%)	27
HouseDustmite	21(24.42%)	25(32.89%)	6(18.18%)	8(24.24%)	12(36.36%)	11(33.3%)	33
Cockroach male	35(40.69%)	35(46.05%)	12(23.08%)	11(21.15%)	17(32.69%)	16(30.7%)	52
Mosquito	36(41.86%)	36(47.37%)	11(21.15%)	10(19.23%)	14(26.92%)	37(71.1%)	52
Housefly	50(58.14%)	51(67.10%)	15(20.27%)	13(17.57%)	23(31.08%)	18(24.3%)	74
Ant	39(45.35%)	38(50.0%)	12(20.69%)	8(13.79%)	19(32.76%)	15(25.8%)	58

Accasia	19(22.09%)	16(21.05%)	7(23.33%)	5(16.67%)	7(23.33%)	5(16.67%)	30
Caricca papaya	11(12.79%)	10(13.16%)	4(23.53%)	5(29.41%)	5(29.41%)	5(29.41%)	17
Asp.Fumigatus	10(11.63%)	6(7.9%)	4(28.57%)	2(14.29%)	3(21.43%)	3(21.43%)	14
Asp.Niger	16(18.60%)	9(11.84%)	6(26.09%)	2(8.7%)	4(17.39%)	4(17.39%)	23
Asp.Mixed	13(15.12%)	10(13.16%)	7(33.33%)	2(9.52%)	5(23.81%)	5(23.81%)	21
Asp.Flavus	10(11.63%)	10(13.16%)	5(27.78%)	3(16.67%)	6(33.33%)	3(16.67%)	18

**Most Common food allergen in Asthma, Allergic rhinitis, Allergic conjunctivitis and mixed allergic disease was prawn. In people with skin allergy most common antigen found was fish.**

**Table 5**  
**Distribution of food allergens by disease type**

Food Allergens	Asthma	Allergic Rhinitis	Skin Allergy	Allergic Conjunctivitis	Mixed	Total
Banana	9(56.25%)	10(62.5%)	4(25%)	3(18.75%)	8(50%)	16
Egg	12(70.59%)	12(70.59%)	2(11.76%)	6(35.29%)	12(70.59%)	17
Fish	17(77.27%)	11(50%)	7(31.82%)	5(22.73%)	12(52.55%)	22
Prawn	24(82.76%)	21(72.41%)	8(27.59%)	7(24.13%)	20(68.97%)	29
Milk	13(68.42%)	8(42.11%)	3(15.79%)	5(26.32%)	12(63.12%)	19
Chicken	8(53.33%)	12(80%)	4(26.67%)	5(33.33%)	11(73.33%)	15
Mutton	7(63.64%)	6(54.55%)	5(45.45%)	2(18.18%)	7(63.64%)	11
Lemon	9(56.25%)	11(68.75%)	6(37.5%)	4(25%)	9(56.25%)	16
Wheat	18(78.26%)	15(65.22%)	6(28.09%)	7(30.43%)	15(65.22%)	23
Potato	20(83.33%)	12(50%)	6(25%)	4(16.67%)	14(58.33%)	24

## DISCUSSION

In the present study, majority of the patients suffering from allergic symptoms belonged to the age group of 5-18 years. The above finding was supported by studies done by Giridhar BH *et al.*<sup>1</sup>, Chaubey BS, Heda HR<sup>5</sup> and Rajendra Prasad *et al.*<sup>6</sup> Male to Female ratio was 1: 1.33 which is comparable with 1: 1.5 as per Rasool R *et al.*<sup>7</sup> In the current study, 93.52% (130/139) had positive allergic reaction at least to one antigen. Moghtaderi M *et al.* described sensitisation for 74.5% sensitisation to at least one tested antigens<sup>3</sup>. Giridhar BH *et al.* reported 87.5%<sup>1</sup> and Rao P *et al.*<sup>8</sup> described 80% sensitivity to at least one antigen. The differences could also be due to the selection criteria for allergen testing or could be due to the variation in the panels used. Out of the atopic symptoms observed Asthma constituted major part of atopic disease (69.8%) followed by allergic Rhinitis (59.7%). Asthma and allergic rhinitis together constituted 24.46%. Mixed allergic manifestation were there in 33.1% of cases. Salem H Tamemi *et al.* described 39.2% of cases of Asthma, 6.3% of Allergic Rhinitis, 1.9 % of allergic conjunctivitis.<sup>9</sup> Recent surveys carried out in India revealed 20 to 30% of the population suffer from allergic rhinitis and 15% develop asthma.<sup>10</sup> Rajendraprasad *et al.* reported in their study that 33.33% suffered from Asthma and 62.04 % showing asthma with Allergic rhinitis.<sup>6</sup> It is a proven fact that geographical distribution significantly affect the incidence of allergic disease.<sup>11</sup> Overall all diseases in allergic spectrum were more common in Ernakulam district. Ernakulam is one of the most industrialised urban district in Kerala. This is comparable with several previous studies which support that Allergic disease are more common in urban areas. Air pollution is often reported to be associated with morning cough, bronchitis, and respiratory symptoms including asthma.<sup>12</sup> It is evident that climate change influences the development of asthma and allergic respiratory diseases and influences pollen and mould productions that induce allergic manifestations. Plants flower earlier in urban areas than in corresponding rural areas with earlier

pollination of about 2–4 days.<sup>13</sup> There may also be local-area variation in exposure to farm dust, tree, grass, and other plant allergens in rural areas. Variation in indoor air quality is also an important issue, especially in poor residential areas and public housing. Most common allergen obtained in the study was insects- housefly followed by ant and Cockroach male. It is assumed that insect allergy may be a significant causative factor in clinical allergic respiratory disease, especially of the seasonal type.<sup>14</sup> This finding was supported by Giridhar B.H *et al.* which showed common offending antigens were insects mainly cockroach male.<sup>1</sup> A good number of fungal allergens were also implicated in causation of allergic symptoms in this study in which aspergillus niger was found to be more common. There are many studies from India which reported fungal allergens in indoor and outdoor air which cause allergenicity.<sup>15-17</sup> This is a hospital based study and does not necessarily represent the true picture in the community. Strengths of the study include data from a robust health information system. The study adds to the understanding of allergen profiles and its geographic variations among people with allergic conditions.

## CONCLUSION

The current study was done in a tertiary care centre at Kochi with an objective to study the pattern of allergens tested positive in suspected atopic patients from central Kerala and found that regional variation exists in the pattern of allergic disease manifestation and nature of allergens. Housefly was the most common allergen observed followed by rice grain dust. Insect allergens were more common in all conditions as compared to other allergens. Prawn was the most common food allergen identified.

## CONFLICT OF INTEREST

No Conflict of interest to declare.

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