



## PREVALENCE OF FOOD ALLERGENS IN DIFFERENT AGE GROUPS IN AND AROUND POLLACHI, COIMBATORE, TAMIL NADU, SOUTH INDIA

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### ABSTRACT

This study is conducted to know the prevalence of food allergens among the 196 atopic patients (105 males and 91 females) who have visited Asthma Research Centre, Pollachi. These patients are divided into six groups namely, Group-A consists 2 to 5 years of age, Group-B is 6 to 10 years, Group-C is 11 to 20 years, Group-D is 21 to 30 years, Group-E is 31 to 50 years and Group-F is 51 years of age and above. Presence of food allergens is tested using the Euroline test kit. Analysis of the results show the main food allergens in various age groups are potato, crab, and peanut. Allergy to cow's milk, egg, and milk powder are negligible. In group A and B, more males are affected, in group C and D males and females are equally affected, in group E more females are affected, and in group F again more males are affected. In Western countries, the main allergens are milk, egg, peanut, chicken, soya and fish. This results suggest that the allergens vary from place to place.

**KEYWORDS :** *Prevalence – Atopic diseases – Food allergens – In and around Pollachi – Euroline Test kit*



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## INTRODUCTION

Asthma – is a chronic inflammation of the airways in which the inflammation will be a central event that leads to the development of the bronchial hyperreactivity and asthmatic symptoms.<sup>1</sup> Food is an important factor in causing allergic diseases like asthma, urticaria, rhinitis etc. It is found that 6 to 8% of infants and about 1.5% of adults are allergic to food.<sup>2</sup> Children are reported to be more sensitive to foods than adults and ingestion of highly allergic food has caused death in children, adolescents and adults.<sup>3,4</sup> The main food allergens are peanuts and nuts. They are more sensitive to ingestion of minute quantities of food allergens<sup>5,4</sup> and even the inhalation of food allergens present in the air or in the cooking fumes.<sup>6,7,8</sup> Even the chemical substances like sulphates, sulphites, processing of fish, dried fruits, vegetables, potatoes, wine, beer, bottled lemon or lime juice, pickled foods are found in triggering the asthma.<sup>9</sup> Among the primary school children, the prevalence of asthma and airway hyper-responsiveness were 5.9% and 8.3%, in West Germany when compared to the former East Germany where it was 3.9% and 5.5% respectively.<sup>10</sup> In Belmont, New South Wales, Australia, the prevalence of wheeze was 10.4% in 1982 and it was increased to 27.6% in 1992.<sup>11</sup> The prevalence of wheeze or asthma in ethnic Chinese children in Hongkong and in a nearby city in the Southern China was 11.6% and 1.9% respectively.<sup>12</sup> These regional variations strongly support the views that the factors related to life style which includes food intake, or the local environment which mostly influence the risk of developing asthma. Adverse reactions to food is divided into toxic reaction and non-toxic reactions. The non-toxic reactions are divided as non-immune mediated and immune mediated. And these are called food allergic reactions. Food allergy is an IgE mediated type 1 hypersensitivity reaction which leads to the symptoms within the hours of ingesting the food<sup>13</sup> - causing lip, tongue, and throat burning or itching, nausea, abdominal cramps, diarrhoea, and erythema. Sometimes it causes asthma, shortness of breath, fast heart rate, panic, and confusion and rarely causes anaphylactic reaction.<sup>14,15</sup> Asthma appears to be an important risk factor for such type of allergy.<sup>16</sup> It has been estimated that less than 10% of asthmatics have noticed their symptoms are provoked by certain foods or drinks.<sup>3,17</sup> 37% of the children with atopic dermatitis have food allergy.<sup>18</sup> Food sensitivity is a delayed immune response which is mainly IgG mediated, that includes chronic symptoms like gut pain, diarrhoea, constipation or anxiety. Because the reactions are very subtle and delayed for hours, day or more, IgG mediated food allergies are very difficult to recognize.<sup>13</sup> In Spain, egg albumin, cow's milk, and peanuts are the common food allergens in children in the age group of 2 years. After 4 years, vegetable allergens such as nuts, fruits and legumes are most frequent.<sup>19</sup> In Swiss children, the foods most frequently incriminated are egg, milk and peanuts.<sup>20</sup> All food allergens commonly affected the children under the age of six years.<sup>21</sup> According to Bhattacharya<sup>22</sup> in India the most important food allergens are milk, eggs, fish, peanuts, soyabean, yeast, cheese, wheat, rice, and chocolates which may cause asthma. Hence, a study has been undertaken to know the prevalence of food

allergens in the allergic patients in and around Pollachi, Coimbatore District, TamilNadu.

## MATERIALS AND METHODS

### Sample selection

The one hundred and ninety six patients (105 males and 91 females), suffering from atopic diseases, who attended Asthma Research and Treatment Centre, Pollachi were selected for the study. It was also ascertained that they satisfied the following inclusion criteria for the study.

### Inclusion criteria

- Definite history of at least three attacks of 'wheezing' or asthmatic attack.
- Definite history of wheezing, tested by a physician or self administered medications such as inhalers, rotahaler or nebulisation.
- History of treatment by physician for atopic diseases such as asthma, Allergic rhinitis, urticaria etc, after the clinical diagnosis.
- Family history of atopic diseases.
- Increased total immunoglobulin E level in the serum (> 100 IU/ml) estimated by ELISA test
- History of hypersensitivity to any food allergens.

These patients were from both urban and rural areas. The duration of the disease varied from 3 months to more than 10 years.

### Case History

All patients were thoroughly examined and the detail report about the history of wheezing and treatment were recorded in case sheets. If the history of wheezing was noted, other details such as duration of suffering, whether it was diurnal or nocturnal, the number and frequency of attacks, were noted down. History of exposure to potential allergens such as cat, or dog hair, and dander, food allergens such as peanut, chicken, fish, egg, milk etc, were also noted down in the case sheets. Intake of medications including the use of inhaler, rotahaler, and nebulizer were recorded.

### Collection of blood sample

Blood samples were collected after explaining to the patients, and getting their consent. Patient's blood pressure was checked and thorough medical examination was carried out. Using 5 ml Sterile syringe, 3 ml of blood was collected by venipuncture under the strict aseptic precautions. The blood from the syringe was transferred to the 10ml sterile bottles and centrifuged to separate the serum. This serum was used to estimate the total immunoglobulin E by the ELISA kit and specific IgE concentration by the Euroline test kit.

### ELISA test

The measurement of total Immunoglobulin E was carried out by using the Enzyme Linked Immunosorbent Assay (ELISA) kit (Code: GP009).

### Assay Procedure

The assay was done as per the instructions from the manufacturer (Omega Diagnostic, UK). To start with the required number of strips were assembled. 100µl of

each standard, and positive control were dispensed. 20µl of each sample to be tested was dispensed into the corresponding wells, and 80µl of sample diluent was added to each well to make 1 in 5 dilutions. The assay plate was incubated for 60 min at the room temperature. Then the well contents were decanted, and the wells were washed for 3 times manually with the wash buffer. Each well was dispensed with 100µl of conjugate, and incubated for 30 min at the room temperature. After 30 min, the well contents were discarded and washed 4 times carefully so that the wells were empty but did not dry out. Then 100µl of TMB substrate was rapidly added into each well and incubated for 10 min after which 100µl of stop solution was added to each well. The Optical Density (OD) was read at 450nm in a microplate reader (Robonic) within 10 min.

#### **Estimation of specific IgE concentration in serum by the Euroline test kit**

The Euroline test kit (Code No DP 3421-1601E) provided a semi-quantitative, in vitro assay for measuring the human IgE antibodies present as in the serum or plasma. The test kit contained microplate strips coated with the parallel lines of 21 different allergen extracts. The test strips were first moistened

with the universal buffer, and then incubated for 5 min by placing it in a rocking shaker. After that they were incubated with the patient's serum for 60 min in the rocking shaker at the room temperature. Then the strips were washed with the universal buffer solution and the test strips were incubated with 1 ml enzyme conjugate for 60 min in the rocking shaker. After washing with the universal buffer, the test strips were incubated with the chromogen substrate for 10 min. The fluid was aspirated off from the incubation channel, and the strips were washed with the distilled water. After the strips were completely dried, digital evaluation was done by creating the Euroline scan program.

#### **Interpretation of Results**

The Euroline test was a semiquantitative method. In order to evaluate the signals, the band positions and intensity of staining were taken into consideration. By comparing the incubated strips, the food allergens which were against to IgE antibodies and presented, was identified. In Euroline scan, the intensity of bands was calculated in the EAST classes of 0-6. The number denoted the classes of concentrations are detailed below:

**Table 1**  
**The measurement range in the EAST system in the classes from 0 - 6.**

Class	Concentration(ku/l)	Result
0	<0.35	No specific antibodies detected.
1	0.35	Very low antibody titre, frequently no clinical symptoms where the sensitisation was present .
2	0.7	Low antibody titre, existing, sensitisation, frequently,with the clinical symptoms, in the upper range of the class.
3	3.5	Significant antibody titre, clinical symptoms,usually present.
4	17.5	High antibody titre,almost with the clinical symptoms.
5	50	Very high antibody titre
6	>100	Very high antibody titre

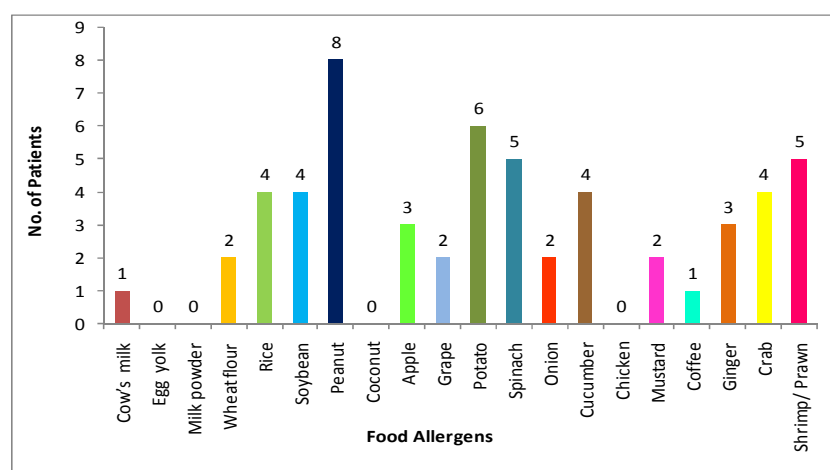
## **RESULTS**

#### **Age wise classification of the patients**

The patients (196) who participated in the study were divided into six groups, namely Group A – 2 to 5 years of age, Group B – 6 to 10 years, Group C 11 to 20 years, Group D – 21 to 30 years, Group E – 31 to 50 years, and Group F – 51 years and above.

#### **Group A - 2 to 5 years**

Total number of children examined for the study are 12. Among them 9 are males and 3 females. Out of 12 children 8 are allergic to peanut, 6 are allergic to potato and 5 children to shrimp/prawn and spinach each (Figure 1).



**Figure 1**  
**Major food allergens in the group A (2 – 5 years)**

**Table 2**  
**Prevalence of food allergens in the group A (2 – 5 years)**

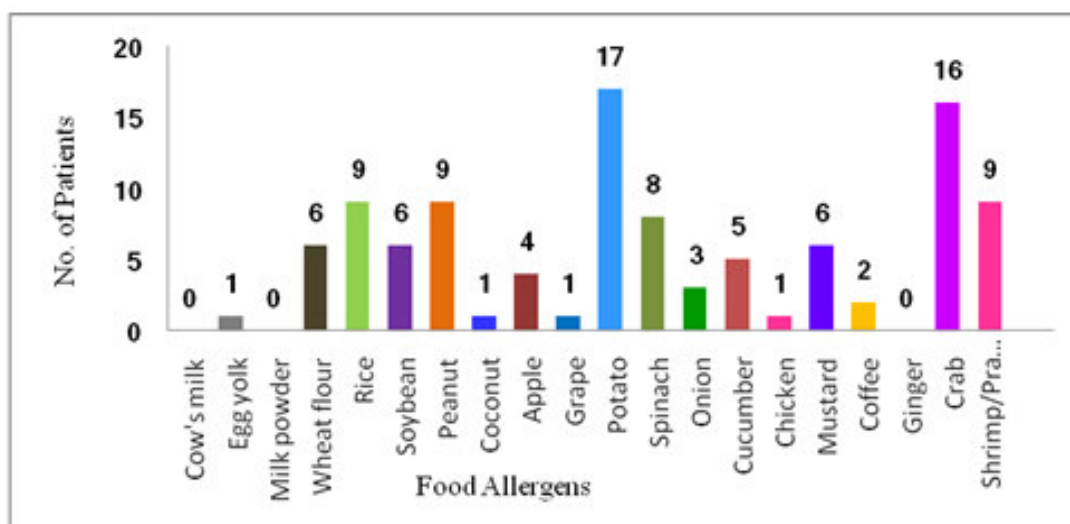
S.No.	ID.No.	Age (Years)	Sex (M/F)	Total IgE(IU/ml)	BA / AR	Specific IgE																														
						Duration of	Cow's milk	Egg yolk	Milk powder	Wheat flour	Rice	Soybean	Peanut	Coconut	Apple	Grape	Potato	Spinach	Onion	Cucumber	Chicken	Mustard	Coffee	Ginger	Crab	Shrimp/ Prawn	CCD Marker									
1	22	2	M	183	BA	2	-	-	-	-	1	1	1	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	10	2	M	1097	BA	1	-	-	-	-	2	3	2	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	2	
3	88	3	M	77	BA	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4	10	3	M	804	BA	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	6	4	M	833	BA	1/2	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
6	52	4	M	833	BA	1	-	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	
7	4	3	M	1165	BA	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	70	1/2	M	1212	BA	1/2	-	-	-	3	4	4	4	-	2	1	5	3	2	2	-	3	-	1	3	-	5	-	-	-	-	-	-	-		
9	15	5	M	1212	BA	1	1	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	
10	30	5	M	1363	BA & AR	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	53	5	M	1294	BA	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	12	2	F	1399	BA	1	-	-	-	4	5	5	3	-	3	1	5	4	2	2	-	3	-	1	3	-	5	-	-	-	-	-	-	-	-	
13	99	2	F	67	BA	2	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	94	7	F	1205	BA	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

IgE - Immunoglobulin E, BA - Bronchial Asthma, AR - Allergic Rhinitis, CCD Marker – Cross reactive Carbohydrate Determinant Marker, The number denotes the classes of concentration in the food allergens.

Surprisingly, excepting the one child, rest of the children are not allergic to cow's milk, egg yolk or milk powder. Invariably in all the children the total immunoglobulin 'E' level is markedly raised. In this group, more male children are affected than the female children (Table 2).

#### Group B - 6 to 10 years

There are 23 children – 14 males and 9 females. One male child (ID.31) is allergic to egg yolk. None of the female children are allergic to cow's milk, egg yolk and milk powder. 74 percent of the children in this age group are allergic to potato followed by crab 69%, and to shrimp/prawn, peanut and rice 39% (Figure 2). The total immunoglobulin E level is increased in all the children.



**Figure 2**  
**Major food allergens in the group B (6 – 10 years)**

**Table 3**  
**Prevalence of food allergens in the group B (6 – 10 years)**

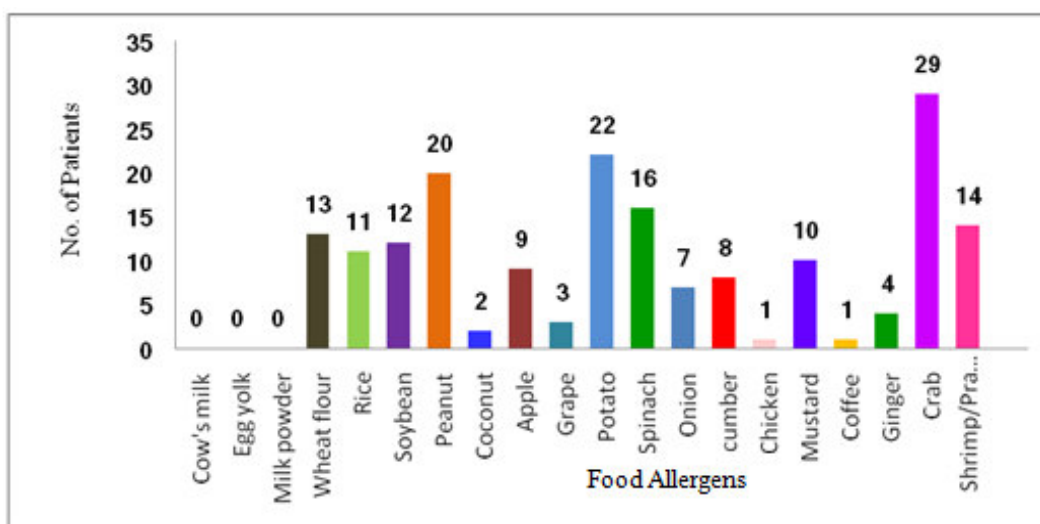
S.No.	ID.No.	Age (Years)	Sex (M/F)	Total IgE(IU/ml)	BA / AR	Duration of suffering (Yrs)	Specific IgE																			
							Cow's milk	Egg yolk	Milk powder	Wheat flour	Rice	Soybean	Peanut	Coconut	Apple	Grape	Potato	Spinach	Onion	Cucumber	Chicken	Mustard	Coffee	Ginger	Crab	Shrimp/ Prawn
1	72	6	M	1182	BA	3 Mo	-	-	1	2	3	2	-	-	-	-	3	1	-	1	-	-	-	5	4	4
2	44	6	M	199	BA	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	66	7	M	791	BA	6	-	-	3	4	3	4	-	-	-	-	5	3	1	2	-	-	4	-	-	5
4	32	7	M	970	BA	1	-	-	-	1	2	1	4	-	-	-	2	-	2	-	3	-	5	5	-	-
5	262-77	7	M	1195	BA	1	-	-	1	1	2	1	-	-	-	-	-	2	1	-	-	-	1	1	2	2
6	68	8	M	279	BA	6	-	-	-	1	-	1	-	-	-	-	2	1	-	-	-	-	3	-	-	2
7	36	8	M	394	BA	2	-	-	-	-	1	1	-	-	-	-	2	1	-	-	-	-	-	-	-	3
8	85	8	M	1254	BA	7	-	-	-	1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	1	2
9	35	8	M	160	BA	3	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
10	31	8	M	1040	BA	3	-	1	-	2	-	-	-	-	-	-	4	2	-	-	-	-	5	1	5	
11	236-77	9	M	334	BA & AR	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	64	10	M	145	BA	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5	5	-	-
13	65	10	M	381	BA	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	3	-	-	-
14	100	10	M	258	BA	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	98	6	F	556	BA	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	68	6	F	1290	BA	4	-	-	1	1	-	-	-	-	-	-	2	1	1	1	-	-	1	-	1	3
17	62	7	F	539	BA	3	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	2	3	2
18	84	8	F	136	BA	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	1
19	115	8	F	1321	BA	1	-	-	3	3	2	3	-	-	-	-	1	4	3	1	1	-	2	-	5	4
20	55	9	F	1130	BA	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	3	-	2	2
21	108	9	F	165	BA	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
22	24	10	F	1112	BA	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-
23	73	10	F	1476	BA & AR	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2

IgE - Immunoglobulin E  
 BA - Bronchial Asthma  
 AR - Allergic Rhinitis  
 CCD Marker – Cross reactive Carbohydrate Determinant Marker  
 The number denotes the classes of concentration in the food allergens.

Children in this group are more prone to food allergens. The duration of suffering has no influence upon either on the total Immunoglobulin 'E' level or the number of food allergens. For instance, in case of 6 year old male child with the ID.No 72, the duration of suffering from the bronchial asthma is only for 3 months, but the total IgE level is 1182 IU/ml and this child is allergic to wheat flour, rice, soyabeans, peanut, potato, spinach, cucumber, mustard, crab and shrimp/prawn. But in the child, aged about 8 years with the ID.No 236-77, suffering from the bronchial asthma for 7 years, the total IgE is only 334 IU/ml and no food allergen is detected. Except one female child, none of the remaining 22 children are allergic to chicken (Table 3). While in the 2-5 years of age group, peanut and potato are the common food allergens, in 6-10 years of age group, the most common food allergens are the potato and crab. Here also more number of male children are affected.

#### Group - C 11 to 20 years

In this age group, there are 39 children (21 males and 18 females). Surprisingly, none of the 39 children are allergic to the cow's milk, egg yolk and milk powder.



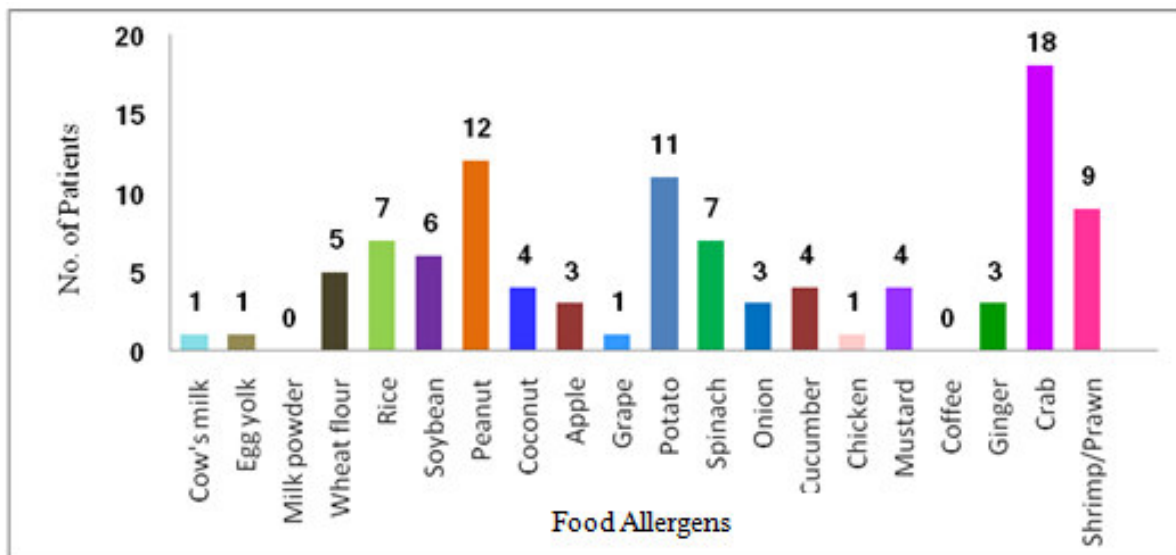
**Figure 3**  
**Major food allergens in the group C (11 – 20 years)**



Twenty nine children (74%) are allergic to crab, 22 children (56%) to potato, 20 children (51%) to peanut and 14 children (33%) are allergic to wheat flour and spinach each (Figure 3). A variety of antigens are shared by the several crustaceans, including shrimp/prawns, crabs, lobsters, and crayfish. Skin prick tests and RASTs indicated the extensive - cross reactivity among the fish species.<sup>23</sup> The duration of suffering either from the bronchial asthma or allergic rhinitis are not having any influence upon the specific food allergens (Table 4).

#### Group - D 21 to 30 years

There are 37 allergic persons - 20 males and 17 females. Out of 37 persons in group D, one male is allergic to cow's milk and one female is allergic to egg yolk. 18 persons (48.6%) are allergic to crab, 12 persons (32%) to peanut, 11 persons (29.7%) to potato and 9 persons (24%) are to shrimp and prawn (crustaceans) (Figure 4).



**Figure 4**  
**Major food allergens in the group D (21 –30 years)**

Here also the duration of suffering from the allergic disorder has no influence upon the number of food allergens to which the patient is allergic.

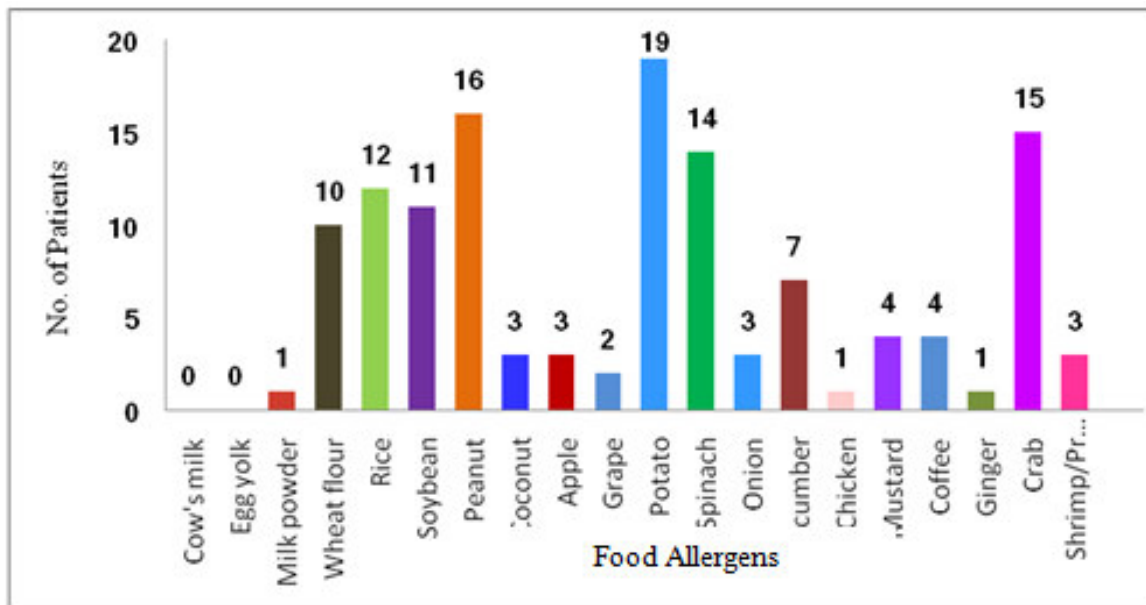




For example, the patients with the ID.No 60, 92, 74, 217 - 45, who are suffering from the allergic disorders for one year and less than one year, are allergic to 13, 7, 9 and 14 food allergens respectively. At the same time, patients with the ID.No 107, 46, 82, 244 - 46, 246 - 61 who are suffering from the allergic diseases for 5 to 10 years are allergic to one or two (0-2) food allergens only. No patient is allergic to milk powder and only one male person is allergic to chicken. In this age group it appear that the males are affected with the more number of food allergens. Males and females are affected by food allergens more or less equally (Table 5).

#### Group - E 31 to 50 years

In this age group, there are 51 persons- 21 males and 30 females. It is observed that, after 30 years of age, more females are affected by the food allergens than males. Surprisingly, the most common allergen is potato (37%) followed by peanut (31%), crab (29%) and spinach (27%) (Figure 5).



**Figure 5**  
**Major food allergens in the group E (31 – 50 years)**

The other important food allergens in this group are rice (23.5%), soyabean (21.5%), and wheat flour (19.6%). In the Western countries, the seven common food allergens in adults are milk, egg, peanut, wheat flour, soyabean, fish and nuts (Eigenmann 2000).<sup>20</sup> But in this study, cow's milk, egg yolk, and milk powder are not shown in causing the food allergy in the 2 years old children to 50 years old adult.

**Table 6**  
**Prevalence of food allergens in the group E (31 – 50 years)**

S.No	ID.No	Age (Years)	Sex (M/F)	Total IgE (IU/ml)	BA / AR	Duration of suffering (yrs)	Specific IgE															CCD Marker				
							Cow's milk	Egg yolk	Milk powder	Wheat flour	Rice	Soybean	Peanut	Coconut	Apple	Grape	Potato	Spinach	Onion	Cucumber	Chicken		Mustard	Coffee	Ginger	Crab
1	27	31	M	620	AR	1½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	-	
2	71	31	M	843	BA	10	-	-	1	4	5	5	5	1	3	1	5	4	2	3	-	3	1	1	2	5
3	59	31	M	123	AR	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	88	32	M	1110	BA&AR	10	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
5	112	34	M	253	AR	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	80	36	M	144	AR	6m	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3
7	37	38	M	1125	BA	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
8	31	38	M	659	BA	3	-	-	-	2	2	2	2	-	-	-	3	2	-	1	-	-	-	-	-	-
9	19	40	M	236	BA	10	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
10	23	41	M	1197	BA	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	103	41	M	1019	BA	4	-	-	-	2	2	1	2	-	-	-	3	1	-	-	-	-	-	-	4	1
12	81	41	M	1398	BA	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	47	41	M	240	BA	10	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
14	244-27	41	M	173	AR	1	-	-	-	1	2	2	1	-	-	-	3	2	-	-	-	-	-	-	-	2
15	82	41	M	230	BA	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
16	91	42	M	159	AR	3	-	-	-	1	2	2	2	-	-	-	2	2	-	-	-	-	-	-	-	1
17	98	42	M	61	BA&AR	10	-	-	-	-	-	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-
18	107	45	M	66	AR	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	25	49	M	339	BA&AR	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	236-67	49	M	35	BA	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	257-18	49	M	163	BA&AR	1½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
22	263-83	32	F	339	AR	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	35	32	F	1209	AR	10	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-
24	50	32	F	330	BA	4	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2
25	34	32	F	497	AR	16	-	-	-	2	2	1	1	-	-	-	2	1	-	-	-	-	-	-	-	2
26	108	33	F	1393	BA&AR	10	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
27	45	33	F	17	BA	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	104	33	F	112	BA	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	72	33	F	114	BA	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	78	34	F	1380	BA	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	232-83	34	F	869	BA	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	79	34	F	421	BA	7	-	-	-	4	4	4	4	-	2	1	4	3	2	2	-	3	-	-	2	4
33	105	35	F	819	AR	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	89	35	F	1130	BA	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
35	76	35	F	114	AR	5	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	3
36	67	37	F	256	BA	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	28	37	F	1266	BA	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
38	91	37	F	135	AR	2m	-	-	-	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3
39	27	37	F	390	BA&AR	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	101	38	F	14	BA	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

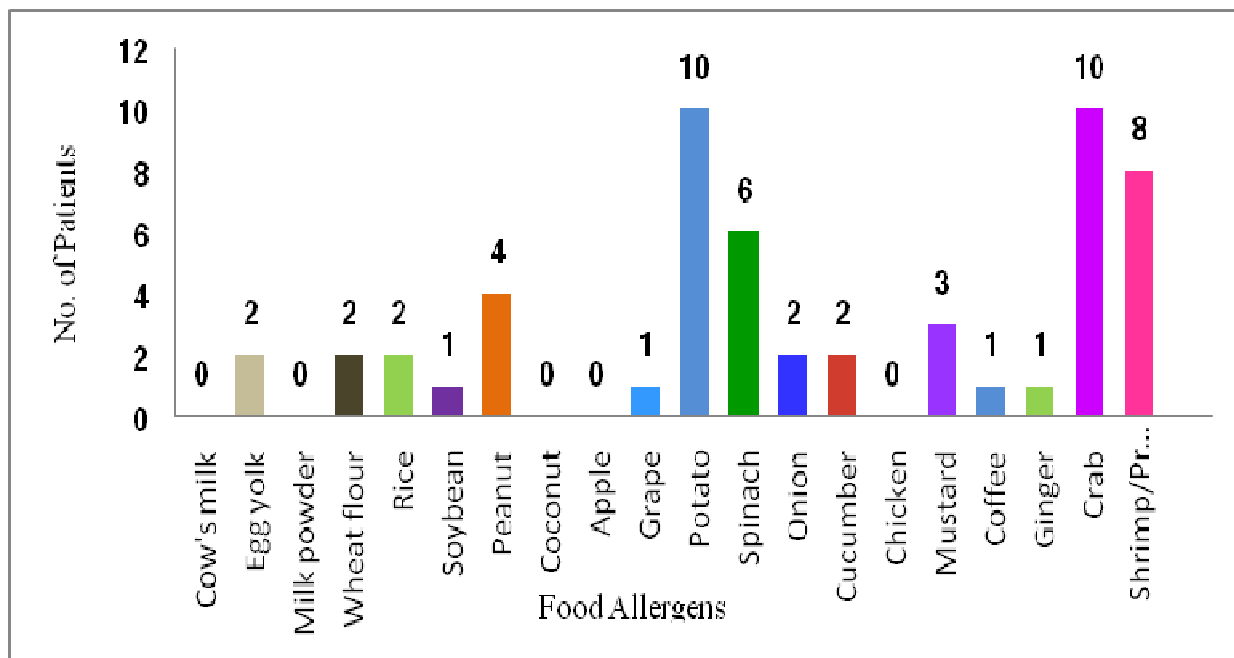
41	57	38	F	145	BA	1½	-	-	1	2	2	2	-	-	3	1	-	-	-	-	-	-	-	-	4
42	80	40	F	1339	BA	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
43	47	40	F	689	BA&AR	2m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
44	58	40	F	20	BA&AR	1	-	-	1	2	2	2	-	-	-	3	1	-	-	-	-	-	-	-	3
45	232-84	41	F	1304	AR	5	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	1
46	33	44	F	42	BA	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47	232-70	45	F	430	AR	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	275-21	45	F	1076	BA	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	56	46	F	267	AR	1½	-	-	-	1	1	2	-	-	-	1	1	-	-	-	-	-	-	-	-
50	262-81	47	F	1115	BA	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
51	92	47	F	1442	BA	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**IgE - Immunoglobulin E, BA - Bronchial Asthma, AR - Allergic Rhinitis, CCD Marker – Cross reactive Carbohydrate Determinant Marker**  
**The number denotes the classes of concentration in the food allergens.**

The duration of suffering from the bronchial asthma, allergic rhinitis etc, is not having any influence upon the serum specific IgE level and the number of food allergens affected. For example, in patients with the ID.No 72, 78, 108, 35, 232-70, 235-21 and 92, although the patients are suffering from the allergic disorders (bronchial asthma, allergic rhinitis, urticaria etc.,) for more than 10 years, and their total immunoglobulin E level is very much raised, they are not affected by any food allergens - if at all affected, it is by only one food allergen with the class-I specific IgE concentration (Table 6).

#### Group - F 51 years and Above

In this age group, there are 34 persons - 20 males and 14 females. Above 50 years of age, more males are affected than females. But in both males and females, the specific IgE concentration for food allergens is between the class - 1 and 2 and rarely the class 3 and 5. The most common food allergens in this group are potato (29%) and crab (29%) followed by shrimp/prawn (23.5%); spinach (17.6%) and peanut (11.7%) (Figure 6).



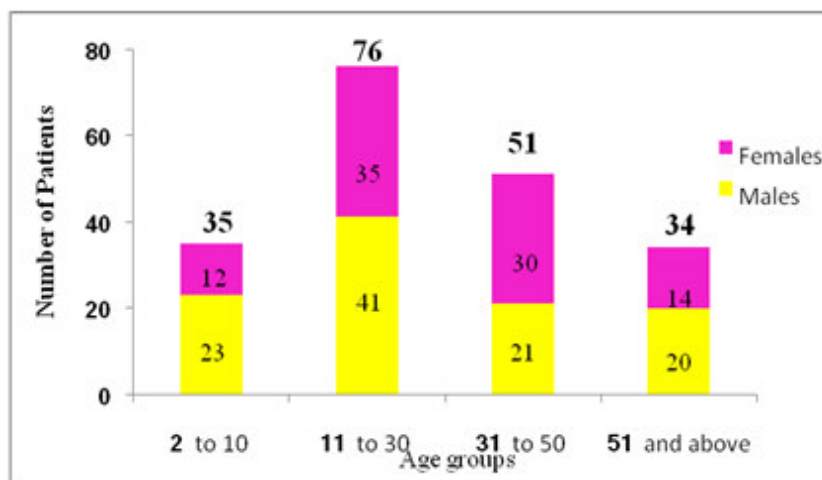
**Figure 6**  
**Major food allergens in the group F (51 years and above)**

**Table 7**  
**Prevalence of food allergens in the group F (51 years and above)**

S.No.	ID.No.	Age (Years)	Sex (M/F)	Total IgE (IU/ml)	BA / AR	Duration of suffering (Yrs)	Specific IgE																			
							Cow's milk	Egg yolk	milk powder	Wheat flour	Rice	Soybean	Peanut	Coconut	Apple	Grape	Potato	Spinach	Onion	Cucumber	Chicken	Mustard	Coffee	Ginger	Crab	Shrimp/Prawn
1	203-61	53	M	872	BA	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	2	1
2	94	54	M	225	BA	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	118	55	M	1276	AR	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	26	55	M	1056	BA	20	-	-	2	2	1	2	-	-	-	2	2	-	1	-	-	-	-	1	3	3
5	77	55	M	606	BA	10	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	110	57	M	1200	BA	20	-	-	-	-	-	-	-	-	-	2	1	1	1	-	1	-	-	1	1	-
7	232-77	58	M	619	BA	7	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	3	1	-
8	30	58	M	207	AR	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
9	101	58	M	945	BA	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
10	71	61	M	220	BA	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
11	241-30	61	M	101	BA	15	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
12	98	63	M	1372	AR	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	78	65	M	149	BA	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	25	66	M	159	BA	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	36	67	M	206	BA	2½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
16	31	67	M	142	BA	1	-	-	-	1	2	-	1	-	-	2	3	-	1	-	-	-	-	2	1	3
17	228-77	70	M	308	BA	3	-	-	-	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-	-
18	84	73	M	1264	BA	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	56	79	M	110	BA	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	53	82	M	286	BA	6m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	109	51	F	605	AR	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	35	51	F	255	BA	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
23	60	52	F	1265	BA	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
24	106	55	F	215	BA	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	112	56	F	69	BA	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	59	58	F	105	BA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	110	59	F	1282	BA&AR	6	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
28	43	60	F	511	BA	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
29	217-33	60	F	20	BA	6m	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	3	1
30	41	60	F	141	BA	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	236-84	63	F	443	BA	30	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	-
32	27	65	F	130	BA	15	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	50	65	F	87	BA	6m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	49	82	F	142	BA	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**IgE - Immunoglobulin E, BA - Bronchial Asthma, AR - Allergic Rhinitis, CCD Marker – Cross reactive Carbohydrate Determinant Marker**  
 The number denotes the classes of concentration in the food allergens.

Here again, the duration of suffering from the atopic diseases and the serum level of total immunoglobulin E, has a little influence upon the food allergens and the concentration of specific IgE level in the serum. For instance, in patients with the ID No 35, 60, 43, 236-84, 77, 101, 241-30, although they are suffering from the atopic diseases for more than 10 years, they are affected by either one or two food allergens with the class - 1 or 2 concentration of the specific IgE in the serum (Table 7).



**Figure 7**  
**Distribution of male and female allergic patients in the different age groups**

In this study, in the Group A and B (2 years to 10 years) more males are affected than females; In the Group C and D, (11 years to 30 years) males and females are more or less equally affected; in the Group E, (31 years to 50 years) more females are affected, and in Group F, again more males are affected by the food allergens (Figure 7).

## DISCUSSION

In this study, the main food allergens were peanut and potato in 2 to 5 years of age group and potato and crab in 6 to 10 years of age group. But, in United states the children under 2 years of age, the common food allergens were egg, milk, peanut, soya beans and wheat.<sup>25</sup> In Spain, egg white protein was the most common food allergen followed by cow's milk and peanuts in children under the 2 years of age. After 4 years, sensitivity to vegetable allergens such as nuts, fruits and legumes were most frequent.<sup>19</sup> In Swiss, children<sup>20</sup> the most frequently incriminated food allergens were egg, milk and peanut. In the study of Bock et al.,<sup>27</sup> the main food allergens were peanut followed by nuts, milk powder, egg yolk and soya bean by 3 years of age and older. From this, it was evident that the food allergens varies in the children of Western countries when compared to our children of that age group. In our study cow's milk, egg yolk, milk powder and chicken were not the important food allergens as in the case of children in the Western countries. Out of 35 children in the age group of 2 years to 10 years, only one child was allergic to cow's milk, one child to egg yolk and rest of the children were not allergic to cow's milk, egg yolk and milk powder. Even other age group subjects (from 11 years to 51 years and above) were also not allergic to cow's milk, egg yolk, and milk powder. Incidentally, it was noticed that the persons who did not eat crab, fish and prawn were also allergic to crab and shrimp/prawn. The specificity of IgE tests with

foods was affected by the existence of homologous food allergens which induced cross-reactive IgE. Various clinical cross-reactivity was noticed among the botanically - related fruits, different nuts, mammalian foods and sea foods than the cereals, grains and legumes.<sup>24</sup> Shrimp antigen II which was heat stable,<sup>26</sup> and the variety of other antigens were shared by several crustaceans, including shrimp, prawns, crabs, lobsters, and crayfish. It may be the reason the patients who had not eaten crabs and prawns were allergic to these food substances. Rao et al.,<sup>28</sup> in their study on prevalence of food allergen in Bangalore with 118 persons reported that the main food allergens were the crab, potato and peanut. It was in line with this study. But other few prevalent allergens in their study were coffee (60 persons), chicken (58 persons), apple (57 persons) and grape (52 persons), which differed markedly with the results of this study.

## CONCLUSION

From this study it was evident that the food allergens differed in various age groups of our subjects. Hence the sound knowledge of food allergens prevalent in that area is essential to diagnose and treat the food allergy and atopic diseases. Prevention of 'food allergy' is the first goal of every allergologist.

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## CONFLICT OF INTEREST

Conflict of interest declared none.

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