

## FREQUENCY OF COMMON FOOD ALLERGENS AMONG PATIENTS REFERRED TO A TERTIARY CARE CENTER

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### ABSTRACT

**Objective:** To identify and determine the frequency of different food allergens among subjects having symptoms of food allergy.

**Study Design:** Cross-sectional study.

**Place and Duration of Study:** Immunology department, Armed Forces Institute of Pathology, from Jan 2015 to Dec 2015.

**Methodology:** A total number of 149 patients, who were referred to department of Immunology with different symptoms of food allergy were included in this study. Food allergen specific IgE antibodies were done by immunoblot assay using kit from Euroimmun Medizinischelabor diagnostika AG Germany (India panel).

**Results:** Out of total 149 patients, 72 (48.3%) were males and 77 (51.7%) females. The age of patients was in the range of 5 years to 82 years. Total 56 (37.6%) patients [31 males (43%) and 25 (32%) females] showed positive reactions to 18 food allergens out of 20 in the test panel. Most common food allergens in our patients were related to seafood, crab 39 (70%), prawns 26 (46%), followed by potato 14 (25%) and ginger 9 (16%) respectively. Other common allergens were cow milk 6 (10%), peanut 5 (9%), apple 5 (9%), egg yolk 4 (7%), mustard 4 (7%) and soya bean 4 (7%). Our study showed no reaction to rice and coconut food allergens.

**Conclusion:** Our study focused on the frequency of food allergens in our population. In this study crab and prawns were the commonest food allergens whereas rice, coconut, Peanut and tree nut allergies are rare in our population whereas in western world, Peanut and tree nut allergies are more common. Efforts must be made to increase the availability of tests for food allergy and standardization of the procedures along with identification of risk and protective factors within the region.

**Keywords:** Allergen specific IgE antibodies, Anaphylaxis, Food allergy.

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### INTRODUCTION

Food allergy is an immune-mediated adverse reaction which occurs in response to a certain food and is absent during avoidance<sup>1</sup>. The food allergies can be divided into three types on the basis of immune mediated response into IgE mediated, non IgE mediated or a mixture of both. The most frequently occurring food allergy is IgE mediated (4-7% in children and 1-2% of adults), which requires prior sensitization to food allergens and produce allergic symptoms on reexposure to that food<sup>1</sup>. T-cell-mediated processes predominate in non-IgE-mediated food allergy<sup>1</sup>. Different body organs can be affected by food

allergies including respiratory tract, gut, skin and cardiovascular system<sup>2</sup>, with various symptoms of food allergies which include abdominal pain, lip, tongue and throat burning or itching, nausea, vomiting, asthma, shortness of breath, tachycardia and confusion<sup>3</sup>.

A number of risk factors including gender (male children), genetics (familial associations), race/ethnicity (more Asian and black children are affected than white childrens)<sup>4</sup>, vitamin D deficiency, atopy, obesity, reduced consumption of omega-3-polyunsaturated fatty acids and antioxidants are thought to be important in development of food allergy<sup>2</sup>. There are more than 170 foods, identified to produce the allergic symptoms and most common foods are peanuts, eggs, wheat, milk, nuts (e.g., almonds, cashews, hazel-

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nuts, walnuts), soybeans, fish, crab, prawn and potato<sup>4</sup>.

Food allergy affects about 2-10% of the world population<sup>2</sup>. In USA, 8% of children have food allergies whereas 4% of adults are affected with food allergies. The logic behind this increase is not clear but life style and environmental changes along with modernization have the responsibility. The prevalence of food mediated anaphylaxis is also expanded in the industrialized world specifically the USA, UK and Australia<sup>5,6</sup>.

Our study includes detailed medical history, dietary history, examination and testing for specific antibodies of IgE class against food allergens. Approach to management depends upon patient education, allergen evasion and immediate treatment of allergic reactions.

## METHODOLOGY

A cross sectional study was conducted at the department of Immunology, Armed Forces Institute of Pathology, Rawalpindi, from January 2015 to December 2015. A total number of 149 patients referred from different hospitals of Rawalpindi and Islamabad with symptoms of food allergy were included in this study and patients of inhalation allergy were excluded after taking history. The study was approved by ethical committee of AFIP Rawalpindi. Three ml blood sample were taken in plain or gel tube by non-probability consecutive sampling. Food allergen specific IgE antibodies were done by immunoblot assay using kit from EUROIMMUN Medizinischelabor diagnostika AG Germany (India panel), as recommended in manufacturer's instructions. The test kit yields a semi-quantitative in-vitro assay for human IgE antibodies to food allergens in serum or plasma. This kit comprises of strips, coated with parallel lines of twenty different allergen extracts. Reactions were categorized into weak positive, positive and negative reactions by two independent immunologists. Frequency and percentages of each allergen and in relation to age and gender were calculated for qualitative variables. Age, gender,

allergens and antibody reactions were recorded in SPSS version 23.

## RESULTS

Out of total 149 patients 72 (48.3%) were males and 77 (51.7 %) females. The age of patients was in the range of 5 years to 82 years (mean age 39 years). Total 56 (37.6%) [31 males and 25 females] individual out of 149 showed weak to strong positive reactions to different food allergens (table). Most common food allergens in our patients were related to seafood, crab 39 (70%), prawns 26 (46%), followed by potato 14 (25%) and ginger 9 (16%) respectively. Other common allergens like cow milk 6 (10%), peanut 5 (9%), apple 5 (9%), egg yolk 4 (7%), mustard 4 (7%), soya bean 4 (7%), Grape 3 (5%), spinach 3 (5%), chicken 3 (5%), milk powder 2 (3%), Wheat flour 2 (3%), onion 1 (2%) and cucumber 1 (2%). Our study showed no reaction to rice and coconut food allergens. Frequencies of all allergens are shown in bar chart (figure).

The positive reaction to different allergens appeared in 56 individuals and implicated 18

**Table: Frequencies and percentages of positive reactions to food allergens.**

Gender	Frequency of positive reactions	Percentage of positive reactions
Male	31	43
Female	25	32

food allergens out of 20 included in the test panel. Most individuals were allergic to crab, prawn, potato, ginger, cow milk and peanut.

## DISCUSSION

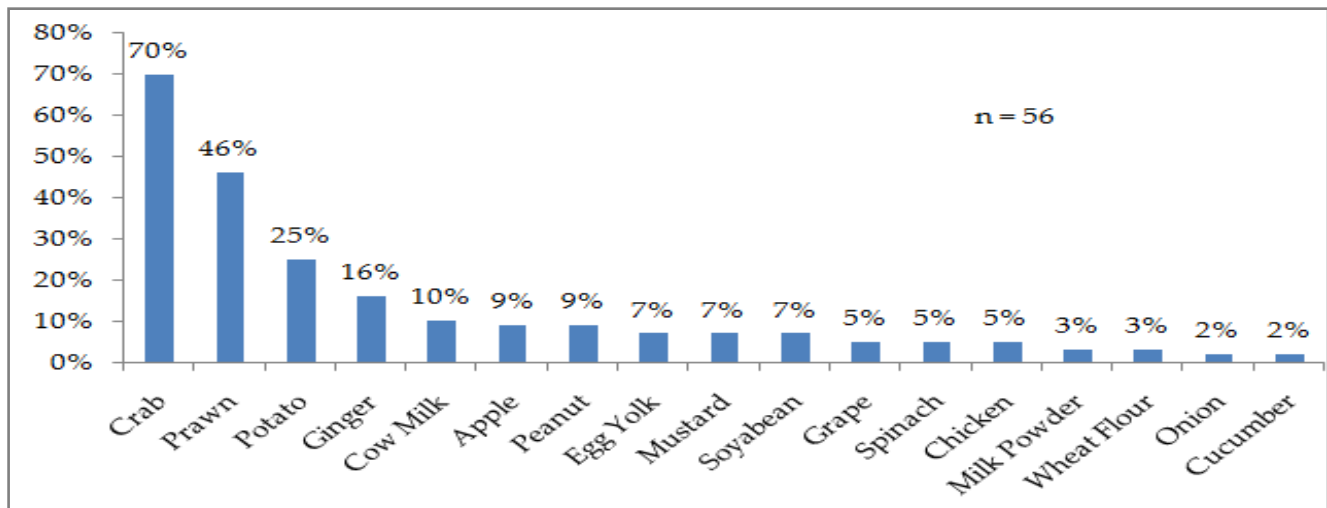
Food allergy is an immune-mediated adverse reaction which occurs in response to a certain food and divided into three types on the basis of immune mediated response into IgE mediated, non IgE mediated or a mixture of both. The most frequently occurring food allergy is IgE mediated which requires prior sensitization to food allergens and produce allergic symptoms on re-exposure to that food. Different body organs can be affected including respiratory tract, gut, skin and cardiovascular system, with various

symptoms of food allergies which include abdominal pain, lip, tongue and throat burning or itching, nausea, vomiting, asthma, shortness of breath, fast heart rate and confusion.

When an Iranian study compared with our results, Iranian study conducted at allergy clinics in Iran, 371 patients [200 (53.9%) male, 171 (46.1%) female] were studied<sup>5</sup>. The age of the participants was three months to eighteen years<sup>5</sup>. The frequent allergen in individuals with declining frequency were egg yolk (14%) and cow's

compared to the western countries for unknown reasons<sup>8,9</sup>.

In another study by Soller *et al* surveyed 9667 subjects, asymptomatic and symptomatic individuals showed tree nuts (1.7%), peanut (1.8%) and cow's milk (2.2%) were the most repeated allergens in children, and vegetables (1.3%), fruits (1.6%) and shellfish (1.9%) were the most frequent allergens in adults<sup>9</sup>. Our study result was different and includes only symptomatic individuals.



**Figure: Percentage positivity of different food allergens in 56 sensitized individuals.**

milk (10%)<sup>6</sup>. In our study cow milk allergy was 10%, similar to Iranian population and egg yolk allergy was 7%, which was double in Iranian study.

When we compare our results with an Indian study (800 patients) which include mostly vegetables food allergens and prawn were positive in 33.3% of patients<sup>7</sup>. Prawn allergy was 46% in our patients which is high as compare to Indian population. This high prawn allergy in our population is because majority of Hindu population is usually vegetarian.

In Asia frequency of food allergy is equivalent to the western world, but various kinds of food allergens differ among population<sup>8</sup>. The common food allergen is shellfish due to larger availability of sea food in Asia. Peanut allergy prevalence is very small in our population as

National Institute of Allergy and Infectious Disease Guideline data of USA adult population suggests that the shellfish (such as shrimp, crayfish, lobster and crab) peanut, tree nut and fish whereas food allergens in our patients were commonly related to seafood, crab and prawns, followed by potato and ginger<sup>10-12</sup>.

In infants and children, the most frequent foods that cause allergic reactions are eggs, milk, peanut, tree nuts, soy and wheat<sup>13-15</sup>. Results when compared with USA population are same as with crab and prawn but peanut allergy is not common in Pakistani population.

The Australian health survey conducted in 2014 in children and adults estimated that children's have common allergies to peanut (2.9%), tree nut (1.3%), fish and prawn (0.5%) whereas adults develop allergies commonly to prawn

(2.4%), peanut (1.1%), tree nut and fish (0.8%)<sup>16</sup>. In our study small population of children was included whereas adult have common allergies to crab and prawn but peanut allergy is very uncommon in our population.

A retrospective study of food allergy prevalence was conducted in UK, by using electronic health records (EHRs) of patients with food allergy from 2000 to 2013. Total 2.7 million patients with different symptoms of food allergy were tested and 97,482 patients (3.6%) with 1 or more food allergies were identified. The prevalence of food allergy was higher in females (4.2% vs 2.9%;  $p < 0.001$ ) and Asians (4.3% vs 3.6%;  $p < 0.001$ ). The most common food allergen identified were shellfish (0.9%), fruit or vegetable (0.7%), dairy (0.5%), and peanut (0.5%)<sup>17,18</sup>. In our study more male patients were positive as compared to female but this observation was based on small number of patients and requires large data study.

### RECOMMENDATION

Approach to management depends upon patient education, allergen evasion and immediate treatment of allergic reaction, as desensitization has limited role in the food allergy management, children diagnosed with food allergy should receive nutritional counseling and regular growth monitoring, systematic studies with sufficient sample size are required to determine the true prevalence in our population and government should make policy for allergen declarations on packed food.

### CONCLUSION

In our population sea food allergy was common which was less common in western world, while the case is vice versa in the case of Peanut and tree nut allergies. There was difference in food allergy in different age groups and in various regions is because of different dietary habits, genetic factors and cultural norms. This study was conducted on small scale with limited food allergens and must be analyzed with large population and more number of food allergens.

Efforts must be made to increase the availability of tests for food allergy and standardization of the procedures along with identification of risk and protective factors within the region.

### CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

### REFERENCES

1. Turnbull JL, Adams HN, Gorard DA. The diagnosis and management of food allergy and food intolerances. *Aliment Pharmacol Ther* 2015; 41(1): 3-25.
2. Sicherer SH, Sampson HA. Food allergy: Epidemiology, pathogenesis, diagnosis, and treatment. *J Allergy Clin Immunol* 2014; 133(2): 291-307.
3. Sicherer SH, Morrow EH, Sampson HA. Dose-response in double-blind, placebo-controlled oral food challenges in children with atopic dermatitis. *J Allergy Clin Immunol* 2000; 105(3): 582-86.
4. Irene J. Food allergies in developing and emerging economies: need for comprehensive data on prevalence rates. *Clin Transl Allergy* 2012; 2(1): 21-25.
5. Ahanchian H, Jafari S, Behmanesh F. Epidemiological survey of pediatric food allergy in Mashhad in Northeast Iran. *Electron Physician* 2016; 8(1): 1727-32.
6. Chandra RK. Food allergy and nutrition in early life: implications for later health. *Proc Nutr Soc* 2000; 59(2): 273-77.
7. Jyotshna M, Mahasweta D, Indrani R, Soma C, Nimai C, Swati G. Immediate hypersensitivity to common food allergens: an investigation on food sensitization in respiratory allergic patients of Calcutta. *Ind World Allerg Organ J* 2009; 2(1): 9-12.
8. Alison J, Meera T, Bee W. Food allergy in Asia: how does it compare. *Asia Pac Allerg* 2013; 3(1): 3-14.
9. Sicherer SH, Wood RA, Vickery BP, Perry TT, Jones SM, Leung DY et al. Impact of Allergic Reactions on Food-Specific IgE Concentrations and Skin Test Results. *J Allerg Clin Immunol Pract* 2016; 4(2): 239-45.
10. Sampson HA, Muñoz-Furlong A, Campbell RL, Adkinson NF, Bock SA, Branum A, et al. Second symposium on the definition and management of anaphylaxis: summary report - Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium. *J Allergy Clin Immunol* 2006; 117(2): 391-97.
11. Boyce JA, Assaad A, Burks AW. Guidelines for the diagnosis and management of food allergy in the United States: report of the NIAID-sponsored expert panel. *J Allerg Clin Immunol* 2010; 126(1): S1-S8.
12. Rona RJ, Keil T, Summers C. The prevalence of food allergy: a meta-analysis. *J Allerg Clin Immunol* 2007; 120(3): 638-46.
13. Chafen JJ, Newberry SJ, Riedl MA, Bravata DM, Maglione M, Suttorp MJ, et al. Diagnosing and managing common food allergies: a systematic review. *J Am Med Assoc* 2010; 303(18): 1848-56.
14. Werfel T. Food allergy in adulthood. *Federal Health Gazette - Health Research - Health Protection, Germany* 2016; 59(6): 737-44.
15. Perry TT, Pesek RD. Clinical manifestations of food allergy. *Pediatr Ann* 2013; 42(6): 96-101.
16. Tang ML, Mullins RJ. Food allergy: is prevalence increasing? *Int Med J* 2017; 47(3): 256-61.
17. Acker WW, Plasek JM, Blumenthal KG. Prevalence of food allergies and intolerances documented in electronic health records. *J Allergy Clin Immunol* 2017; 140(6): 1587-91.
18. Topaz M, Goss F, Blumenthal K, Lai K, Seger DL, Slight SP, et al. Towards improved drug allergy alerts: Multidisciplinary expert recommendations. *Int J Med Inform* 2017; 97(1): 353-55.