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RESEARCH ARTICLE

DISTRIBUTION AND PREVALENCE OF SPECIFIC IgE ANTIBODIES IN FOOD ALLERGY SUSPECTED PATIENTS IN LEBANON

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ABSTRACT

Background: Food allergy is a worldwide serious public health issue. The aim of this study was to determine the most frequent food allergen causing IgE-mediated hypersensitivity reactions in Lebanese patients of different ages.

Methods: 1182 patients showing symptoms of food allergy were screened for specific IgE antibodies to 35 food allergens using Euro Immune blot assay test.

Results: The major cause of hypersensitivity in 1 to 10 years old patients was Cows' Milk where it was: Soybean in 11 to 20 years old patients; Beef in 21 to 30 years old patients; Potato in 31 to 40 years old patients; and Shell fish mix in patients more than 40 years old. Further, a significant correlation between presence/absence of specific IgE and total serum IgE levels was absent.

Conclusion: We define the most common food allergens between different age groups of Lebanese patients which is significant for public health in Lebanon.

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INTRODUCTION

Food is an essential part of human life; however, in some cases, it can cause life threatening allergies. Food allergy is defined as an adverse health effect arising from a specific immune response that occurs upon exposure to a given food (Boyce, 2000). Food allergies can affect any organ system, but most frequently involve the gastrointestinal system, the skin and the respiratory system. Most major food allergens are water-soluble glycoproteins that are relatively stable to heat, acid, and proteases and, therefore, digest slowly. Some food allergens are also capable of acting directly as an adjuvant and promoting a TH 2 immune response and IgE production in susceptible individuals. Following uptake, allergen cross-linking of IgE on mast cells along the upper or lower gastrointestinal tract can induce localized smooth muscle contraction and vasodilation and involve symptoms that can vary from low grade atopic symptoms (eczema, asthma, and rhinitis) and malabsorption manifestations ("faltering growth" and diarrhea) to acute life threatening anaphylaxis. Knowledge of the spectrum of food allergies is, therefore, important in

order to identify patients at risk for severe or life-threatening allergic reactions. Therapies capable of curing or preventing food allergy are yet unavailable. The therapeutic procedure involves treatment of symptoms and avoiding exposure to food allergen. A large number of foods have been described to cause food allergy where some are more common than others (Boyce, 2000). Allergies to egg, milk, soy and wheat which are more common during childhood are bypassed, and thus, less frequent in adults (Bird *et al.*, 2015). On the other hand, allergies to peanut, fish and crustacean shellfish are more prevalent in adults and usually persists throughout life (Sicherer and Sampson, 2014). Food allergy has shown increase in worldwide prevalence over the past decades where it reached about 6%, thus representing a critical public health problem. Determination of epidemiology and prevalence of food allergy is usually based on either self-reported allergic reactions or clinically-mediated allergic tests. The gold standard for definite Food allergy diagnosis is double-blind Placebo-controlled food challenge (DBPCFC) test (Carrard *et al.*, 2015). However, food specific-serum IgE levels as well as -allergic symptoms are also beneficial and commonly used for diagnosing IgE-mediated food allergy. Since little information is available about the prevalence of food allergy in Lebanon, we estimated, in the present study, the most frequent food allergens as revealed by positive food-specific IgEs among Lebanese patients.

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Table 1. Prevalence of IgE-mediated food sensitization among studied patients

Age	Number of tested patients	Number of patients with food-specific IgE antibodies	% of patients with food-specific IgE antibodies
1 to 10 years	472	234	45 %
11 to 20 years	209	84	16.15 %
21 to 30 years	77	30	5.76%
31 to 40 years	91	41	7.88 %
41 to 50 years	152	63	12.11%
Above 50 years	181	68	13.10 %
Total	1182	520	100 %

Table 2: Percentage of the most frequent specific IgE antibodies among different group ages

Age	Number of patients with positive specific IgE antibodies	% of most frequent specific IgE antibodies
1 to 10 years	171	Cow's milk (73.07%)
11 to 20 years	80	Soybean (96.15%)
21 to 30 years	24	Beef (80%)
31 to 40 years	31	Potato (75.6%)
41 to 50 years	55	Shell fish (87.3%)
Above 50 years	61	Shell fish (89.7%)

Table 3. Total serum IgE of 510 different patients being positive or negative for food allergen-specific IgE antibodies

Total IgE	Number of patients examined for Total IgE	Patients with positive specific IgE	Patients with negative specific IgE
Total IgE below 295 kU/l	330	110 (33.3%)	220 (66.7%)
Total IgE above 295 kU/l	180	70 (38.8%)	110 (61.2%)
Total	510	180(35.3 %)	330 (64.7%)

METHODS

This work was conducted in accordance with the Declaration of Helsinki (1964) and after obtaining approval of the local patient safety and risk management committee of the "Raee hospital" (Lebanon). Informed consent was obtained from all patients included in this study. In this cross-sectional study, 1182 patients, with suggestive symptoms of IgE-mediated food allergy, visited the laboratories of Raee hospital in the south of Lebanon between January 2014 till December 2017 and were examined for food allergen-specific IgE immunoglobulin following physician's request. Blood was withdrawn from the patients and the serum was separated and stored at -80°C till time of usage. The samples were assayed for the presence/absence of food allergen-specific IgE immunoglobulin. Thirty six food allergens including Egg White, Cow Milk, Crab, Shrimp, Soybean, Tuna, Salmon, Fish Mix 3, Wheat Flour, Rice, Sesame, Pea, Peanut, Almond, Nut mix 4, Baker yeast, Beef, Chicken, Strawberry, Apple, Kiwi, Peach, Citrus Mix 3, Tomato, Carrot, Potato, Garlic, Onion, Parsley, Avocado, ChickPea, Corn, Thyme, Spice Mix2, Orange and Shell Fish Mix 2 were selected due to their importance in the Lebanese population dietary regimen. Determination of allergen-specific IgE in serum was carried out using EuroImmun immune blot assays following manufacturer's recommendations. This test is an in vitro semi quantitative method enabling measurement of allergen levels in serum. Total IgE levels were measured using AIA-1800 Immunoassay Analyzer (Tosoh Bioscience) following manufacturer's recommendations (normal IgE range <290 kU/l). To study the relationship between total and specific IgE levels, chi square (χ^2) test was carried out. P value < 0.05 was considered significant.

RESULTS

This study included 1182 food allergy-suspected patients, 604 females and 578 males, of different ages (Table 1).

Of the 1182 examined patients, 520 (44%) patients showed specific IgE antibodies to at least one of the tested food allergens. Among these, 234 (45%) were of age 1 to 10 years, 84 (16.15%) (of age 11 to 20 years), 30 (5.76%) (of age 21 to 30 years), 41 (7.88%) (of age 31 to 40 years), 63 (12.11%) (of age 41 to 50 years) and 68 (13.10%) (of age above than 50 years) (Table 1). Among patients of age 1 to 10 years, IgE antibodies specific to cow's milk were the most frequent (detected in 171 out of 234 patients; 73.07%) (Table 2). IgEs specific to Soybean, Beef and Potato were most common between 11 to 20 years patients (detected in 80 out of 84 patients; 96.15%), 21 to 30 years patients (detected in 24 out of 30 patients; 80%) and 31 to 40 years patients (detected in 31 out of 41 patients; 75.6%), respectively (Table 2). Shell fish mix-specific IgE antibodies were most prevalent among 41 to 50 years old patients (detected in 55 out of 63 patients; 87.3%) as well as patients above than 50 years (61 out of 68; 89.7%) (Table 2). We also checked whether a direct correlation exists between specific IgE levels and total serum IgE. Out of the 1182 studied patients, 510 were examined in terms of their total IgE levels (Table 3). Intriguingly, 110 patients were negative for specific IgE antibodies but showed total IgE levels > 295 kU/l (Table 3). On the other hand, 15 patients [out of 110 patients showing total IgE levels < 295 kU/l] exhibited very low total IgE amounts (<8 kU/l) despite being positive for specific IgEs (Table 3). These observations indicate that no significant correlation ($\chi^2=1.574$, $P=0.2$) exist between the total and specific IgE levels.

DISCUSSION

Food allergy represents a serious public health problem affecting people of all ages. Food allergy is characterized by a number of clinical signs ranging from limited responses involving the skin, nose and eyes to severe fatal anaphylactic reactions. Food allergy prevalence has increased during the past decades especially in western countries like United States, Australia and Canada (Tang and Mullins, 2017). In food-allergic patients, IgE antibody could be raised against a

specific food component, mainly proteins. Even though any food protein could trigger an allergic reaction, only a certain number of foods account for most of the allergic reactions observed worldwide (Rona *et al.*, 2017). The frequency of food allergies and the abundance of allergens are tightly associated with the nutritional habits of different populations over the world. For instance, Peanut is the most prevalent allergen in United States (Sicherer *et al.*, 2003) whilst cow's milk- and hen's egg-mediated hypersensitivities are the most common food allergies in Japan (Imamura *et al.*, 2008). In Spain and Portugal, the most common food allergen is fish (Crespo *et al.*, 1995), in France it is Mustard (Rancé *et al.*, 2000), in Scandenvia it is tree nuts (Eriksson *et al.*, 2014) where in Italy, sea food and cow's milk are most frequent (Novembre *et al.*, 1998). Little information is available about Food allergy prevalence in the Middle East region. For instance, seafood and nuts are the most frequent allergens in United Arab Emirates (UAE) (John *et al.*, 2014). In the present study, we determined the prevalence of 35 food allergens, Egg White, Cow Milk, Crab, Shrimp, Tuna, Salmon, Fish Mix 3, Wheat Flour, Rice, Sesame, Pea, Peanut, Almond, Nut mix 4, Baker yeast, Beef, Chicken, Strawberry, Apple, Kiwi, Peach, Citrus Mix 3, Tomato, Carrot, Potato, Garlic, Onion, Parsley, Avocado, ChickPea, Corn, Thyme, Spice Mix2, Orange and Shell Fish Mix 2, among differently aged Lebanese patients. A first output of this study was that IgE-mediated sensitization was most prevalent among infant between 1 to 10 years old (45%) but least frequent among adults of 21 to 30 years old (5.76%). Nowadays, it is well described that food allergies occur at higher rates among children than among adults (Chafen *et al.*, 2010). Given that complications resulting from food allergy could prevent child's growth or can be even worse, life threatening, defining the most common food allergens for children and applying a restricted diet are, therefore, crucial. The decrease of food allergy frequency in adults could be explained by the efficiency of the gut barrier that will be improved with maturity as well as the robust adults' immune systems. A second major output of this study was that IgE-mediated sensitization in patients of different age groups is triggered by different foods, with Cow' milk (in infants of 1 to years old), Soybean (in children of 11 to 20 years old), Beef (in adults of 21 to 30 years old), Potato (in adults of 31 to 40 years old) and shell fish (in adults of above 40 years old), being the major triggers of IgE-mediated sensitization. In agreement with our observations, Irani *et al.* previously reported that milk is the most common allergen in Lebanese infants and children (Irani *et al.*, 2011). Moreover Irani *et al.* indicate that Peanut, Soy beans and fish are among the most frequent allergens among the Lebanese population¹⁵. Altogether, Irani *et al.* 2015 observations and our findings would account for better understanding of the food allergy issue among the whole Lebanese population. A third output of this study was that a significant correlation between specific and total serum IgE pools is lacking. Our results revealed, on one hand, cases where total IgE levels were high despite absence of food allergen-specific IgE and, on the other hand, cases where total IgE levels were very low despite the presence of food allergen-specific IgE antibodies. Therefore, it is indispensable to perform allergen specific IgE test as a screen for food allergy, regardless of total IgE concentration i.e., Low total IgE count does not exclude the presence of allergen specific IgE.

Conclusion

In conclusion, our results would help to determine the most common food allergens causing IgE-mediated hypersensitivity among the different age groups of Lebanese population, thus having a positive impact on public health in Lebanon.

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REFERENCES

- Boyce, J. A. *et al.* Guidelines for the diagnosis and management of food allergy in the United States: Report of the NIAID-sponsored expert panel. *Journal of Allergy and Clinical Immunology*, 126, (Elsevier Ltd, 2010).
- Bird, J. A., Lack, G. and Perry, T. T. Clinical Management of Food Allergy. *J. Allergy Clin. Immunol. Pract.*, 3, 1–11 (2015).
- Sicherer, S. H. and Sampson, H. A. Food allergy: Epidemiology, pathogenesis, diagnosis, and treatment. *J. Allergy Clin. Immunol.*, 133, 291–307.e5 (2014).
- Carrard, A., Rizzuti, D. and Sokollik, C. Update on food allergy. *Allergy Eur. J. Allergy Clin. Immunol.* 70, 1511–1520 (2015).
- Tang, M. L. K. and Mullins, R. J. Food allergy: is prevalence increasing? *Intern. Med. J.*, 47, 256–261 (2017).
- Rona, R. J. *et al.* The prevalence of food allergy: A meta-analysis. *J. Allergy Clin. Immunol.*, 120, 638–646 (2007).
- Sicherer, S. H., Muñoz-Furlong, A. and Sampson, H. A. 2003. Prevalence of peanut and tree nut allergy in the United States determined by means of a random digit dial telephone survey: a 5-year follow-up study. *J. Allergy Clin. Immunol.*, 112, 1203–7.
- Imamura, T., Kanagawa, Y. and Ebisawa, M. A survey of patients with self-reported severe food allergies in Japan. *Pediatr. Allergy Immunol.*, 19, 270–274 (2008).
- Crespo, J. F., Pascual, C., Burks, A. W., Helm, R. M. and Esteban, M. M. Frequency of food allergy in a pediatric population from Spain. *Pediatr. Allergy Immunol.*, 6, 39–43 (1995).
- Rancé, F., Dutau, G. and Abbal, M. Mustard allergy in children. *Allergy*, 55, 496–500 (2000).
- Eriksson, N. E. *et al.* 2004. Self-reported food hypersensitivity in Sweden, Denmark, Estonia, Lithuania, and Russia. *J. Investig. Allergol. Clin. Immunol.* 14, 70–9.
- Novembre, E. *et al.* 1998. Anaphylaxis in children: clinical and allergologic features. *Pediatrics* 101, E8.
- John, L. J. *et al.* 2014. Prevalence of Allergies among University Students: A Study from Ajman, United Arab Emirates. *ISRN Allergy* 2014, 502052.
- Chafen, J. J. S. *et al.* 2010. Diagnosing and Managing Common Food Allergies. *JAMA* 303, 1848.
- Irani, C., Maalouly, G., Germanos, M. and Kazma, H. 2011. Food allergy in Lebanon: is sesame seed the "middle eastern" peanut. *World Allergy Organ., J.* 4, 1–3.
