

Garlic and onion sensitization among Saudi patients screened for food allergy: a hospital based study

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Abstract

Background: Detection of specific IgE antibodies against food materials indicates allergic sensitization. Some very widely consumed foods materials such as garlic and onion have rarely been investigated for their allergenic potential.

Objectives: To assess the presence of garlic and onion specific IgE antibodies in patients investigated for food allergy.

Methods: Radioallergosorbent test (RAST) results of 108 patients with clinical suspicion of food allergy who were specifically screened for garlic and onion specific IgE antibodies along with other food allergens were analyzed retrospectively at King Khalid University Hospital between January 2008 and April 2009. This group of patients included 73 males and 35 females with mean age 27+13.2 years. Estimation of garlic and onion specific IgE antibodies was performed by radioallergosorbent test (RAST) using Pharmacia ImmunoCAP 250 analyzer.

Results: Out of the 108 patients 15 (13.8%) had garlic and onion specific IgE antibodies in their sera. Garlic specific IgE antibodies with the RAST scores between one to four were present in 14 and onion specific IgE were detected in 13 patients. For garlic specific IgEs majority of patients (08) had RAST score of one (0.35-0.69 kU/L) and for onion specific IgE antibodies seven patients had RAST score of two (0.70-3.49 kU/L). Among these patients 12 (80%) were found to have coexisting specific IgE antibodies against garlic and onion.

Conclusion: The presence of garlic and onion specific IgE antibodies in a sizeable number of patients indicate sensitization and allergenic potential of these food materials.

Key words: Food allergy, garlic, IgE, Liliaceae, onion, radioallergosorbent test

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Introduction

Food allergy is an adverse immunological response to ingested foods especially the proteins.¹ A number of studies have identified foods most frequently involved in allergic reactions. Among children in the United States the most common food allergies are due to eggs, cow's milk, peanuts, tree nuts, soy, wheat, fish, and shellfish whereas in adults peanuts, tree nuts, fish and shellfish are frequently implicated.²⁻⁵ There are however few studies investigating allergic reactions to some very commonly consumed foods such as garlic and onion that belong to the Liliaceae family of foods.

Apart from garlic and onion, asparagus and leek are the other members of the Liliaceae family. Allergenic cross-reactivity has been detected not only among the members of Liliaceae family⁶ but also between the members of this family and grass pollens.⁷ The Lilaiceae vegetables have been shown to be capable of inducing contact sensitization^{8,9} to an extent that in some countries garlic is being considered next to nickel as an allergen inducing allergic contact dermatitis.¹⁰ Members of Liliaceae family also induce immediate IgE-mediated reactions and among them once again garlic has been shown to be a potent inducer of specific IgE antibodies in the patients.¹¹ There are however only few case reports of raw asparagus causing IgE-mediated contact urticaria,¹² and occupational rhinitis and asthma.¹³ IgE-mediated food allergy due to cooked asparagus ingestion has also been described.¹⁴

In the presence of history suggestive of food allergy the diagnosis is usually made by estimation of food specific IgE antibodies, skin prick test and standardized food challenge.¹⁵ IgE mediated reactivity to food proteins is considered to be a key

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factor mediating inflammatory process in about one third of patients with refractory allergic dermatitis.¹⁶ Measurement of food specific IgE antibodies has already been proposed to be a useful tool for identification of patients who are more likely to react to certain foods and develop clinical signs and symptoms.¹⁷

This study in retrospect examines quantitative assessment of specific IgE against garlic and onion among patients screened for the presence of food allergy.

Methods

Study population

During the period between January 2008 and April 2009 RAST results of 108 Saudi patients irrespective of their age and gender who were screened specifically for garlic and onion specific IgE antibodies along with other food allergens were analyzed retrospectively at King Khalid University Hospital, King Saud University, Riyadh. This group of patients included 73 (67.5%) males and 35 (32.5%) females with the mean age 27 + /- 13.2 years. The number of patients either equal to or less than 18 years was 27 (25%). The indications for requesting the RAST were gastrointestinal disturbances following food ingestion where the main complaints were abdominal cramps, urticaria, contact dermatitis, rhinitis and asthma.

allowed to react for 30 minutes at 37°C. After incubation unbound enzyme-anti-IgE was washed away and the bound complexes were incubated with developing agent (4-methylumbelliferyl-beta-D-galactoside) for 10 minutes. During this time the substrate got cleaved and the fluorescing product 4-methylumbelliferon was released. The reaction was then stopped by adding stop solution. Test response was detected by measuring the fluorescence of the elute. The calibration range for specific IgE was from 0.1 to 100 kU/L. Result was obtained by transforming the response for the patient samples to concentrations in kU/L (kilounits per liter) using the calibration curve. Values lower than 0.35 kU/L were considered negative. Table 1 shows the interpretation of RAST score from 0 to 6 based on quantitative assessment of the specific IgE in kU/L.

Results

Out of the total 108 patient records included in the study 15 (13.8%) patients were found to have garlic and onion specific IgE antibodies. Among them there were 9 males and 6 females. This group of patients included 5 patients with urticaria, 5 with gastrointestinal symptoms, 3 with contact dermatitis and 2 patients with asthma (data not shown).

Figure 1 shows the concentration of allergen specific IgE based on RAST scores. Majority of the

Table 1: Interpretation of RAST scores based on quantitative assessment of specific IgE concentration

RAST Test Score	0	1	2	3	4	5	6
Concentration of specific IgE (kU/L)	<0.35	0.35-0.69	0.70-3.49	3.5-17.49	17.50-49.99	50-100	>100

RAST = Radioallergosorbent test. The ImmunoCAP test demonstrates patient sensitivity to specific allergens in number of kilounits per liter (kU/L).

Measurement of specific IgE

Assessment of allergen specific IgE for garlic and onion was performed by radioallergosorbent test (RAST) using Pharmacia ImmunoCAP 250 analyzer (Phadia, Uppsala, Sweden) in accordance with the recommendations of the manufacturers. Briefly, serum samples were dispensed in cups containing allergen covalently coupled to ImmunoCAP which is a cellulose derivative. Following incubation for 30 minutes the excess of sample was removed by the machine. Enzyme (alpha-galactosidase generating a fluorescent cleavage product)-labeled anti-IgE antibodies were added and the contents were

patients (08) with garlic specific IgE had a RAST score of 1 (0.35-0.69 kU/L) of the antibody followed by 3 with a RAST score of 3 (3.5-17.49 kU/L), two with RAST score of 2 (0.70-3.49 kU/L) and one had a RAST score of 4 (17.5-49.99 kU/L) of garlic specific IgE antibodies. With regards to onion specific IgE antibodies seven patients had RAST score 2 (0.70-3.49 kU/L) of onion specific IgE antibodies followed by three patients with RAST score of 1 (0.35-0.69 kU/L), two patients with RAST score 3 (3.5-17.49 kU/L) and one patient with the RAST score of 4 (17.50-49.99 kU/L) for onion specific IgE antibodies.

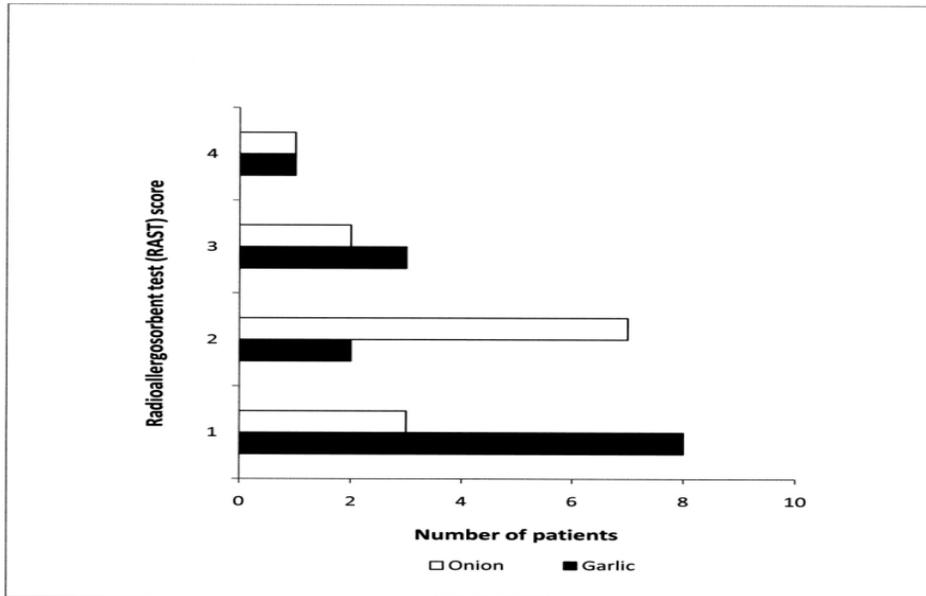


Figure 1: Assessment of garlic and onion specific IgE antibodies in Saudi patients with clinical suspicion of food allergy (n = 15)

Table 2 shows data for distribution of both garlic and onion specific IgE antibodies in patients. Out of the total 15 patients where allergen specific IgE antibodies were detected 12 patients had co-existing garlic and onion specific IgE antibodies. Two patients had only garlic specific IgE antibodies and one had IgE antibodies against onion only. The severity of symptoms in various disorders that patients were suffering from did not reveal any association with the RAST scores.

Table 2: Distribution of garlic and onion specific IgE antibodies among patients with various allergic disorders (n = 15)

Allergen specific IgE	Number of patients	Percentage
Garlic and onion co-existence	12	80
Garlic only	02	13.3
Onion only	01	6

Discussion

Although with relatively low RAST scores in the majority of the individuals garlic and onion specific IgE antibodies were present in 13.8% of the patients investigated in the present study. Data regarding the prevalence of specific IgE antibodies against Liliaceae vegetables in patients with allergic disorders are lacking particularly in Saudi population. Detection

of sensitization to Liliaceae vegetables by skin prick test however has shown that 4.6% of children and 7.7% of adults react to garlic, onion and chive¹⁸ thus providing an indirect evidence for the presence of IgE antibodies against Liliaceae family of vegetables. In the present study the data were obtained from patients with clinical suspicion of food allergy and can therefore be subjected to criticism on the basis of selection bias and may not represent the actual prevalence in general public.

Allergy to garlic can manifest in different forms. Bronchial asthma due to occupational exposure to garlic dust was first reported in 1940¹⁹ and following that only isolated studies have investigated the role of garlic in airway allergy.²⁰⁻²² Skin sensitization due to garlic exposure has ranked garlic among the most potent allergens capable of causing allergic contact dermatitis.²³ Garlic hypersensitivity has also been described as a cause of urticaria.²⁴ Furthermore, consumption of young garlic described as an unripe garlic plant whose bulb has not matured has been incriminated in causing anaphylactic reaction.²⁵ As opposed to cooked garlic consumption of raw garlic has also been reported to induce severe anaphylaxis which was attributed to heat induced degradation of allergenic proteins present in raw garlic²⁶. Though in small numbers the presence of specific IgE antibodies against garlic detected in the present study in a variety of allergic disorders is in agreement with the rather broad

spectrum of garlic related clinical manifestations of allergic disorders.

Despite the large scale consumption of onions, IgE mediated food allergy to onion has rarely been documented. Majority of the patients in the present study had RAST score 2 for specific IgE antibodies against onion. Similar level of specific IgE antibody against onion was detected in a case report of onion mediated anaphylaxis²⁷ indicating that the presence of very high absolute levels of specific IgE antibodies are not a prerequisite for life threatening IgE mediated reactions at least in the case of onion allergy. It is possible that the absolute levels of circulating allergen specific antibodies may not correlate well with the severity of clinical signs and symptoms. The density of the allergen specific IgE antibodies calculated as percent ratio to total IgE has been proposed to be a better measure for assessment and prediction of the severity of the clinical manifestations.²⁸

Among the patients exhibiting RAST reactivity a high percentage (80%) had specific IgE antibodies for both garlic and onion indicating high level of cross reactivity among the two members of Liliaceae family of vegetables. Using RAST inhibition assay allergenic extracts from onion and asparagus have been shown to successfully inhibit garlic RAST assay providing scientific evidence for the existence of cross reactivity among the members of Liliaceae family.²¹ However in another study asparagus was shown to significantly inhibit onion RAST reactivity whereas asparagus RAST was partially inhibited by onion.⁶ The observed discrepancy was explained by the presence of a smaller amount of common allergenic content in onion compared to asparagus. It would be however interesting to further investigate the cross reactivity of Liliaceae family by correlating the presence of the allergen specific IgE antibodies in blood with skin reactivity.

Conclusion

The presence of garlic and onion specific IgE antibodies in a substantial number of patients screened for food allergy indicate the allergenic potential of these food materials. This being a retrospective study was limited by lack of a control group of otherwise healthy asymptomatic individuals for comparative analysis. The observations of the present study however reveal that a sizable number of Saudi patients were sensitized against garlic and onion. This may have an important bearing in

patients with allergies as both the vegetables are almost integral part of daily meals and are being infrequently investigated. Large scale investigations are recommended to further elucidate their role in allergic disorders in general a particularly in food allergy.

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