Original article

Sesame seed sensitization in a group of atopic Egyptian children

Background: *There are no published data on the prevalence of sesame allergy/sensitization in Egypt.* ***Objective:*** *In this pilot study, we thought to estimate the frequency of sesame seed sensitization in a group of atopic Egyptian infants and children.* ***Methods:*** *We consecutively enrolled 90 patients with physician diagnosed allergic disease. The study measurements included clinical evaluation for the site and duration of allergy, history suggestive of sesame seed allergy, and family history of allergy, as well as skin prick testing (SPT) using a commercial sesame extract, and serum sesame specific IgE (SpIgE) estimation.* ***Results:*** *None of the studied patients reported symptoms suggestive of sesame seed allergy. Nevertheless, two children (2.2%) showed positive SPT response to sesame (wheal diameter ≥ 3 mm above the negative control). Only one of them had a wheal diameter which exceeded that of the histamine control. The serum sesame SpIgE exceeded 0.35 IU/ml in all subjects [range = 0.35 - 3.0 IU/ml; median (IQR) = 0.9 (0.6) IU/ml]. Serum sesame SpIgE was significantly increased in patients with history of recurrent urticaria (p=0.03).* ***Conclusion:*** *Sesame seed sensitization is not uncommon in atopic Egyptian children. It can be associated with any clinical form of allergy and the causal relationship needs meticulous evaluation. Wider scale population-based studies are needed to assess the prevalence of sesame allergy and its clinical correlates in our country.*

Keywords: Food allegry, sesame, atopic children.

Elham Hossny, Dalia El-Ghoneimy, Dina Soliman*, Samar Ahmad.

*Pediatric Allergy and Immunology Unit, Children's Hospital, *Department of Clinical Pathology, Ain Shams University, Cairo, Egypt*

Correspondence:
Elham Hossny, MD, PhD. 40A Baghdad Street, Cairo 11341, Egypt.
Cell: +2010 744 8085
Fax: +202 3304 5060
E-mail: elham.hossny@gmail.com

INTRODUCTION

Sesame is commonly used in Middle Eastern dishes, bakery products, dips, salad dressings, and vegetarian foods. In addition, sesame oil is used extensively in the pharmaceutical and cosmetic industries. This increasing consumption of sesame might be one of the reasons for the growing frequency of reported cases of sesame-induced allergic reactions. In fact, various types of reactions have been reported, including IgE-mediated allergy and anaphylaxis, occupational reactions, and even non-IgE mediated reactions.[1] Sesame seed allergy is common in many countries, including Israel, Japan, the United States, and some European countries. A prevalence study of immediate hypersensitivity in Australian children found that sesame was in fourth place, following egg, milk and peanut, and was more common than that to any single tree nut studied**.** Among Israeli children, sesame was the third most common food causing sensitization following egg and cow's milk, and it was second only to cow's milk as a leading cause of anaphylaxis that is potentially fatal**.** The European Commission (EC) and Canadian Food Inspection Agency (CFIA) have added sesame to the list of major food allergens for food labelling purposes.[2] Sesame food allergy tends to appear early in life, but unlike cow's milk and egg allergy, persists in 80% of the cases.[3] Severe allergic reactions to sesame are becoming increasingly frequent especially among young children and can sometimes result in anaphylaxis.[4, 5] Anaphylaxis was the presenting feature of sesame allergy in one third of 30 Israeli children. Most of these children were found to have atopic background and five of them had a first degree relative with sesame allergy. In 30% of these children, the allergy had resolved in an average of 2.8 years.[6]

The evaluation of a child with suspected allergy to sesame seed should include a careful history taking, skin prick testing (SPT), measurement of serum-specific IgE, and, confirmation by an oral food challenge.[7,8] However, specific immunoglobulin E (SpIgE) is not yet a reliable measure for the exclusion of sesame food allergy.[3] Published values on positive SPT and specific IgE values vary from one series to another depending on several factors.[9,10-13] Cut-off values do not always have general acceptability and

sometimes need to be individualized in the context of clinical impression.[14]

Because published data on sesame allergy from Egypt are lacking, we were stimulated to conduct this pilot study on the frequency of sesame seed allergy in a group of atopic Egyptian children suffering from various allergic disorders in order to estimate its significance in the precipitation of their symptoms.

METHODS

Study Population:

This cross-sectional study comprised 90 children with physician-diagnosed allergic diseases. They were enrolled consecutively after getting an informed consent from the parents or care-givers. The study protocol gained acceptance from the local ethics committee.

Inclusion criteria:

- Age at enrollment between 1 and 18 years.
- A physician made diagnosis of allergic diseases such as asthma, allergic rhinitis, urticaria, and/or eczema.

Exclusion criteria:

- Patients who cannot stop antihistamine therapy.
- Extensive skin lesions, scars and positive dermatographism.

Study Measurements

All patients included in the study were subjected to the following:

1. Clinical evaluation

Detailed history was taken for the possible precipitating factors, sesame consumption (starting age of consumption), duration of breast feeding, and family history of allergy. Patients were subjected to a general clinical examination, as well as chest, skin, and ENT examination to verify the diagnosis.

2. Skin prick testing

Skin prick test (SPT) was performed for each patient using a commercial common sesame allergen extract, positive histamine control, and negative control (Omega Laboratories, Montréal, Canada). First generation short-acting anti-histamines were avoided for at least 72 hours and second generation antihistamines were avoided for at least 5 days before testing. The test sites were marked and labelled at least 3 cm apart to avoid the overlapping of positive skin reactions. The marked site was dropped by the allergen and gently pricked by sterile skin test lancet. Positive and negative control solutions were similarly applied. The patient waited for at least 20 minutes before interpretation of the results. Largest and orthogonal diameters of any resultant wheal and flare were measured. A wheal of 3 mm or more above the negative control was taken as a positive result.[15]

3. Laboratory investigations

Serum total IgE was measured by quantitative enzyme linked immunosorbent assay (ELISA) (Medix Biotech, Inc., Agenzyme Company, Industrial Road, San Carios, CA, USA). The concentration of the IgE antibodies can be determined from the measured OD using the standard curve which is calibrated against the international reference preparation for human IgE. A serum IgE level was considered elevated if it exceeded the highest reference value for age.[16]

Serum sesame specific IgE assay was measured by quantitative ELISA (RIDASCREEN specific IgE, R-Biopharm AG, Darmstadt, Germany). According to the manufacturer, sesame specific IgE was considered detectable at levels above 0.35 IU/ml, increased when ranged from 0.7 to 3.49 IU/ml, and very increased from 3.5 to 99.99 IU/ml.

Complete blood counting was done using Beckman Coulter Counter (HmX Hematology Analyzer, Coulter Corporation, Miami, FI 33116-9015) and differential count for blood by blood film.

We could not get parental consent to perform an oral sesame seed challenge in patients with positive SPT to sesame and elevated serum sesame SpIgE.

Statistical Methods:

Standard computer program SPSS for Windows, release 15.0 (SPSS Inc, USA) was used for data entry and analysis. All numeric variables were expressed as mean ± standard deviation (SD). Comparison of continues variables between two groups was done using student t test for normally distributed variables and Mann Whitney test for nonparametric variables. Chi-square (χ^2) and Fisher exact tests were used to compare frequency of qualitative variables among the different groups as appropriate. Spearman's correlation test was used for correlating non-parametric variables. For all tests a probability (p) less than 0.05 was considered significant.

RESULTS

This study sample comprised 57 males (63.3%) and 33 females (36.7%). Their ages ranged between one and 15 years [median: 6 and mean (SD): 6.2 ±3.5 years]. None of the subjects gave a history suggestive of sesame allergy and all of them started consuming sesame containing foods before the age of two years, however, mothers failed to recall the exact age of introduction into their children during early infancy.

The diagnoses included bronchial asthma with or without allergic rhinitis in 79 children, urticaria in 7, combined two or three of the aforementioned allergic diseases in 4 children. Seventy-two percent of the studied children had family history of allergy; however, none had a family history suggestive of sesame allergy.

SPT to common sesame extract was positive (wheal diameter 3 mm above the negative control) in two children; one of them had a wheal diameter of 7 mm. He was a male infant, 2 years old, with recurrent urticaria. Another 2 year old girl had a sesame SPT wheal diameter of 5 mm. She had a diagnosis of moderate persistent bronchial asthma.

All studied children had serum sesame seed SpIgE > 0.35 IU/ml with a mean of (0.96 ± 0.5 IU/ml) and a range of (0.35 - 3 IU/ml). Of those, 63 children had increased SpIgE with a mean (SD): 1.1(0.4), while 27 had just detectable SpIgE with a mean (SD): 0.5(0.09). Serum sesame SpIgE was not affected by the gender of the studied sample (X^2 = 0.3, p = 0.6).

The level of serum sesame SpIgE varied significantly with the diagnosis of the studied atopic children. While all patients (100%) with urticaria had increased serum sesame SpIgE, only 25% of patients with combined urticaria and respiratory allergy and 69.6% with respiratory allergy alone demonstrated the same finding (table 1). The results of serum sesame SpIgE did not vary significantly with asthma severity in our series (X^2 = 1.9 and p = 0.6).

The serum sesame SpIgE results did not vary significantly with total IgE and AEC levels (table 2). No significant correlations could be elicited between age and the studied numerical data including the absolute eosinophilic count or total and serum sesame seed specific IgE.

Table 1. Variation of the results of serum sesame SpIgE with the type of allergic disease.

Diagnosis	Detectable serum sesame SpIgE n (%*) = 27 (30%)	Increased serum sesame SpIgE n (%*) = 63 (70%)	x^2	P
Urticaria	0	7	6.7	0.03*
Urticaria+BA or AR	3	1		
BA& /or AR	24	55		

P<0.05: Significant, BA: Bronchial asthma, AR: Allergic rhinitis, SpIgE: Specific immunoglobulin E

Table 2. Variation of the studied laboratory data with the results of serum sesame SpIgE.

	Detectable serum sesame SpIgE n (%*) = 27 (30%)	Increased serum sesame SpIgE n (%*) = 63 (70%)	P
AEC Median (range)	130(0-860)	100(0-860)	0.2
Total IgE (Iu/ml) Median (range)	43(10-538)	50 (0-1240)	0.8

P>0.05:Non-Significant, AEC: Absolute eosinophilic count, SpIgE: Specific immunoglobulin E.

DISCUSSION

While serum sesame specific IgE was detectable (>0.35 IU/ml) in every child enrolled, the SPT to sesame was positive in two patients (2.2 %) only. However, none of these patients reported allergic symptoms on the intake of sesame or its products. The presence of sesame sensitization does not necessarily reflect clinical sesame allergy. The positive detection of serum sesame SpIgE (>0.35 IU/ml) in the whole samples may suggest that this level may not be a valid indicator of sesame sensitization in our community. Moreover, none of our patients had a specific IgE value (>3.5 IU/ml) which holds a significant positive predictive value for the diagnosis of sesame allergy.[17]

The prevalence of sesame sensitization was reported to be 2.14% and 12.8% in French children with clinically confirmed food allergic reactions and Israeli children with suspected food allergy, respectively.[18, 19] On the other hand, it has been reported that the prevalence of sesame allergy is 0.1% in the United States population according to

2008 data.[20] One potential explanation for increased frequency of sesame sensitization in Israel is the earlier exposure to sesame (Tahini) in the diets of infants, which is often given because of its high caloric content.[3, 19]

A positive SPT to sesame can be an incidental laboratory finding and part of the patients may not have clinical food allergy, as with other foods. SPT is a reliable method of excluding IgE-mediated food allergies.[3, 19] The negative predictive accuracy is generally greater than 90%; however, the positive predictive accuracy is generally less than 50%, which limits clinical interpretation of positive skin test results.[21] Interestingly, a recent prospective study reported that 60% of skin sensitive (wheal diameter ≥ 4 mm) asymptomatic subjects developed clinical allergy later. These results suggested that a positive prick/puncture test result in an asymptomatic person may predict subsequent clinical allergy.[22] It has been reported that a sesame-specific IgE < 0.35 IU/ml was useful in excluding a diagnosis of sesame allergy.[23] On the other hand, patients with a sesame-specific IgE exceeding this value may not have sesame allergy where serum sesame specific IgE > 0.15 IU/ml was demonstrated in 75% of patients with sesame sensitization rather than allergy.[3]

A positive RAST for serum sesame SpIgE was defined as >0.35 IU/ml which demonstrated 80% sensitivity, 32% specificity, 21% PPV, and 88% NPV. While a sesame RAST >3.50 IU/ml demonstrated specificity > 90%. However, positive sesame-specific IgE level and positive sesame SPT are not good predictors of true sesame allergy as determined by the gold standard test of an oral sesame challenge.[17]

It has been suggested that if a patient clearly tolerates sesame, it is not warranted to obtain a sesame-specific IgE. Alternatively, if the patient's history is truly convincing of a significant allergic reaction to sesame, regardless of the SPT result or sesame-specific IgE level, the patient should be considered allergic, because anaphylaxis to sesame has been described with negative SPT and IgE levels.[24]

The current study did not demonstrate a gender influence on the frequency of sesame sensitization. However, male predominance was observed in the whole studied sample, as most of our studied allergic patients were prepubertal. A previous study reported that males outnumber females in children with sesame allergy (41% boys versus 27% girls).[18]

A family history of food allergy or other atopic disorder increases the risk of developing a food allergy.[25] The family history of allergy in the current study did not influence sesame sensitization. It is possible that the effect on sensitization does not match the reported data on food allergy. Our findings are also limited by the sample size.

Cross reactivity with hazelnuts and peanuts was described owing to the presence of a major common allergen (Oleosins).[3] However; none of our patients gave a history of allergy on exposure to neither hazelnuts nor peanuts.

Our patients with urticaria (100%) had increased serum sesame SpIgE in comparison to 69.6% and 25% of those with respiratory allergy or combined urticaria and respiratory allergy respectively. Derby et al[18] reported that 89% of sesame reactors reported other atopic conditions including asthma (62%), eczema (63%), and allergic rhinitis (40%).

This is just a pilot study that tried to evaluate the necessity of screening atopic Egyptian children for sesame seed sensitization. The study limitations include the small sample size and the fact that it is not population-based but rather traces the rates of sesame sensitization in physician-diagnosed allergic patients.

In conclusion, the screening for sesame seed sensitization is worthwhile in atopic Egyptian children. Patients with increased sesame SpIgE and/or positive SPT may be target for oral food challenges to objectively detect sesame allergy and might be candidates for follow up to monitor any future reactions on exposure to higher consumption. Testing these children to cross reactive allergens such as peanuts and hazelnuts might be indicated. Wider scale population-based studies are needed to outline the prevalence of sesame sensitization and/or allergy and its clinical correlates.

REFERENCES

1. **Caminiti L, Vita D, Passalacqua G et al.** Tahini, a little known sesame-containing food, as an unexpected cause of severe allergic reaction. J Investig Allergol Clin Immunol 2006: 16(5): 308-10.

2. **Gangur V, Kelly C, Navuluri L.** Sesame allergy: a growing food allergy of global proportions? Ann Allergy Asthma Immunol 2005: 95(1): 4-11.

3. **Cohen A, Goldberg M, Levy B et al.** Sesame food allergy and sensitization in children: the natural history and long-term follow-up. Pediatr Allergy Immunol 2007: 18 (3): 217-23.

4. **Guenova E, Genova S, Voykov B et al.** Immunoglobulin E-mediated anaphylaxis to sesame. WAO Journal 2008: 1(8):134.

5. **Panizzolo C, Tura M, Barbato A.** Anaphylaxis to sesame seeds. Eur Ann Allergy Clin Immunol 2005: 37(1): 34-5.

6. **Aronov D, Somekh E, Dalal E I.** The outcome of food allergy among infants and children in Israel. WAO Journal 2007: S295.

7. **Sampson HA.** Clinical practice. Peanut allergy. N Engl J Med 2002: 346(17):1294-9.

8. **Al-Ahmed N, Alsowaidi S, Vadas P.** Peanut allergy: an overview. Allergy Asthma Clin Immunol 2008: 4(4):139-43.

9. **Ben-Shoshan M, Harrington DW, Soller L et al.** A population-based study on peanut, tree nut, fish, shellfish, and sesame allergy prevalence in Canada. J Allergy Clin Immunol 2010: 125(6):1327-35.

10. **Bahna SL.** Reflections on current food allergy controversies: specific IgE test application, patch testing, eosinophilic esophagitis, and probiotics. Allergy Asthma Proc 2008: 29(5): 447-52.

11. **Roberts G, Lack G.** Diagnosing peanut allergy with skin prick and specific IgE testing. J Allergy Clin Immunol 2005: 115(6):1291-6.

12. **Sampson HA.** Utility of food-specific IgE concentrations in predicting symptomatic food allergy. J Allergy Clin Immunol 2001: 107(5):891-6.

13. **Sicherer SH, Sampson HA. Food allergy.** J Allergy Clin Immunol 2010: 125(2Suppl 2): S116-25.

14. **Wainstein BK, Yee A, Jelley D et al.** Combining skin prick, immediate skin application and specific-IgE testing in the diagnosis of peanut allergy in children. Pediatr Allergy Immunol 2007: 18(3): 231-9.

15. **Bernstein IL, Li JT, Bernstein ID et al.** Allergy diagnostic testing: An updated practice parameter. Ann of Asthma, Allergy and Immunol 2008: 100(3Suppl 3): S1-148.

16. **Geaghan SM.** Normal blood values: selected reference values for neonatal, pediatric and adult populations. In: Hoffman R, Benz EJ, Shattil SJ et al, eds. Hematology basic principles and practice. 3rd ed. Philadelphia: Churchill Livingstone 2000: 2520-8.

17. **Permaul P, Stutius LM, Sheehan WJ et al.** Sesame allergy: role of specific IgE and skin prick testing in predicting food challenge results. Allergy Asthma Proc 2009: 30(6): 643-8.

18. **Derby CJ, Gowland MH, Hourihane JO.** Sesame allergy in Britain: A questionnaire survey of members of the Anaphylaxis Campaign. Pediatr Allergy Immunol 2005: 16(2): 171–5.

19. **Aaronov D, Tasher D, Levine A et al.** Natural history of food allergy in infants and children in Israel. Ann Allergy Asthma Immunol 2008: 101(6): 637-40.

20. **Dalal I, Binson I, Levine A et al.** The pattern of sesame sensitivity among infants and children. Pediatr Allergy Immunol 2003:14(4):312–6.

21. **Sicherer SH, Muñoz-Furlong A, Godbold JH et al.** US prevalence of self-reported peanut, tree nut and sesame allergy: 11 year follow up. J Allergy Clin Immunol 2010: 125(6): 1322-6.

22. **Sicherer SH, Kaliner MA, Atkins D et al.** Food allergies. Available at http/www.emedicine.medscape.com. Last updated on Mar 7, 2012. Accessed on Mar 13, 2012.

23. **Bodtger U, Poulsen LK, Malling HJ.** Asymptomatic skin sensitization to birch predicts later development of birch pollen allergy in adults: a 3-year follow-up study. J Allergy Clin Immunol 2003: 111(1):149-54.

24. **Zavalkoff S, Kagan R, Joseph L et al.** The value of sesame-specific IgE levels in predicting sesame allergy. J Allergy Clin Immunol 2008: 121(6):1508-10.

25. **Kurowski K, Boxer RW.** Food allergies: detection and management. Am Fam Physician 2008: 77(12): 1678–86.