

# Evaluation of the Frequency of Food Allergens by Skin Prick Test in Children with Atopic Dermatitis

Saeedeh Farajzadeh, MD<sup>1</sup>  
 Nasrin Bazargan, MD<sup>2</sup>  
 Armita Shahesmaeili, MD<sup>3</sup>  
 Azam Gholami Shahrababaki, MD<sup>1</sup>  
 Ali Reza Fekri, MD<sup>1</sup>

1. Department of Dermatology  
 2. Department of Pediatric Immunology and Allergy  
 3. Physiology Research Center  
 Afzalipour Hospital, Kerman University of Medical Sciences, Kerman, Iran

Corresponding Author:  
 Saeedeh Farajzadeh, MD  
 Pediatric Dermatology Department  
 Afzalipour Hospital, Kerman University of Medical Sciences, Kerman, Iran  
 Email: safaderm@yahoo.com

Received: April 27, 2010  
 Accepted: June 19, 2010

## Abstract

**Background:** The role of food allergy in atopic dermatitis (AD) is controversial. The aim of this study was to determine the frequency of food allergens in children with AD.

**Method:** Fifty one atopic dermatitis children aged 6 months to 5 years entered our study. The severity of AD was determined by scoring index of AD (SCORAD). Skin prick test (SPT) was done using 15 allergens including the white of the egg, yolk, peanut, kiwi, strawberry, cow's milk, walnut, fish, banana, wheat, orange, tomato, cereals, apple and cocoa.

**Results:** Thirty four patients (66.7%) had a positive reaction to one or more allergens and in 17 patients (33.3%), the SPT was negative to all allergens. Eleven patients (21.6%) had a positive SPT to one food allergen, 9 patients (17.6%) to two allergens, 9 patients (17.6%) to three allergens, 3 patients (5.9%) to four allergens, 1 patient (2%) to seven allergens and 1 patient (2%) to ten allergens. The most common food allergen among 15 allergens was white egg in 19 patients (37.3%). Yolk was the second most common allergen in 11 patients (21.6%). The relationship between the severity of the SPT with AD severity was observed only for cow's milk, which showed a reverse relationship ( $R=-0.337$ ).

**Conclusion:** White egg was the most common allergen in all ages and both sexes. Food allergens may play a role in the pathogenesis of atopic dermatitis. (*Iran J Dermatol 2010;13: 33-36*)

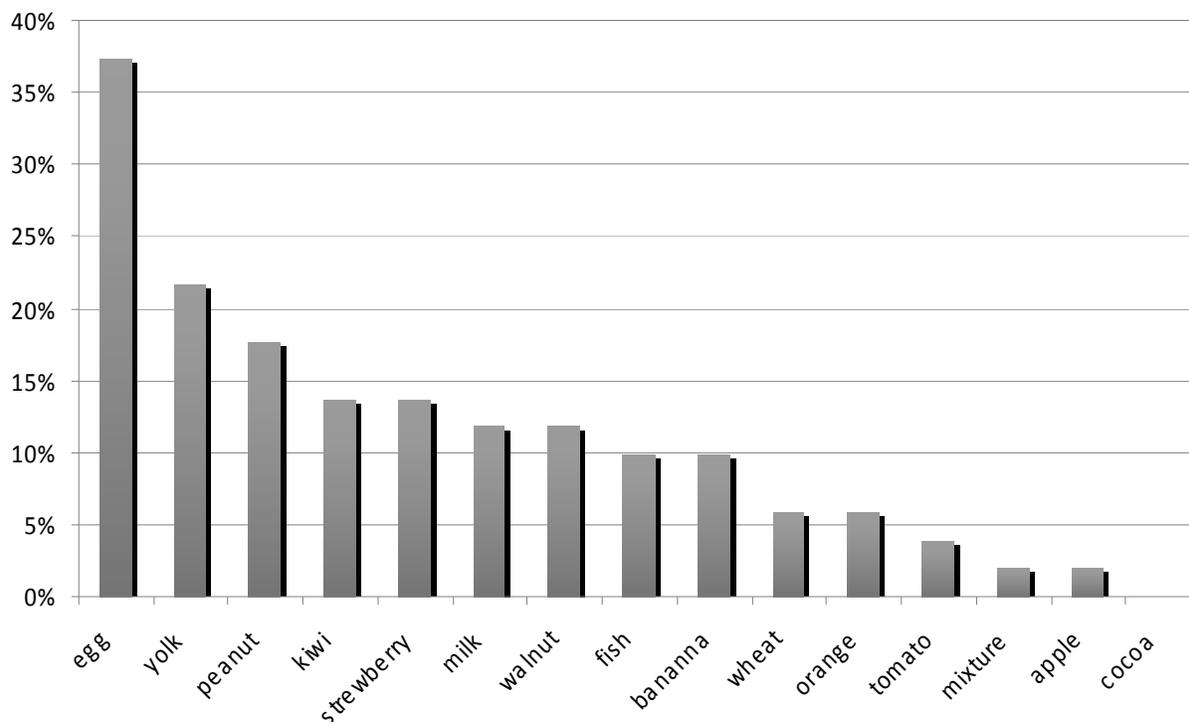
**Key words:** Atopic dermatitis, food allergy, skin prick test, children

## Introduction

Atopic dermatitis (AD) is a complex and multifactorial disease. Food allergy is among possible mechanism<sup>1-4</sup>. The prevalence of AD has increased recently<sup>5</sup>. The immediate and primary manifestations of food allergy include sudden itching, angioedema and erythema; and its delayed and secondary manifestations are aggravation of the eczematous lesions of AD<sup>6</sup>.

The role of food allergens in AD is a controversial issue<sup>7-10</sup>. In some studies, the role of low allergen foods in preventing AD has been postulated<sup>7, 10, 11</sup>, although other studies have shown the relative importance of low allergen foods in the pathogenesis of AD<sup>8,9</sup>. Food hypersensitivity in AD is commonly seen in infants and young children<sup>6</sup>. The diagnosis of food allergy is based on the skin tests such as the skin prick test (SPT) and

atopy patch test; and the presence of specific food IgE<sup>11</sup>. The sensitivity of the atopy patch test is more than SPT (79.6% vs. 46.2%), but SPT is more specific than atopy patch test, 93.2% vs. 81.4%<sup>12</sup>. A survey by Bolinger et al, showed that more than 49% of population study believed that food allergy affected the social activity of their children<sup>13</sup>. Johnston et al, revealed that changes in the diet of AD children resulted in the stable condition of the patients<sup>10</sup>. Several researches have been done regarding the importance of food allergens avoidance in the prevention, control and treatment of the AD. Considering genetic and racial factors which may affect the kind of food allergens involved in the pathogenesis of AD and the high incidence of AD<sup>14</sup>, we conducted this study to determine the frequency of food allergens in Iranian children with AD.



**Figure 1.** The frequency of food allergens in children with atopic dermatitis.

## Patients and Methods

In this cross-sectional study, 51 children aged 6 months to 5 years with atopic dermatitis were investigated. Exclusion criteria were as follows <sup>15</sup>:

1. Anti histamine use within the last 5 days.
2. History of topical or oral steroids use within the last 2 weeks.
3. Consumption of immunosuppressor drugs within the last 3 months.
4. Immunodeficiency diseases
5. Active lesions at the test site
6. Wheezing and dyspnea
6. Fever
7. Active and severe allergic rhinitis

Diagnosis of atopic dermatitis was based on Hanifin and Rajka criteria <sup>16</sup>. A data collection sheet including age, sex, site of lesions, severity of the disease, flexural vs. extensoral form of AD, history of other atopic conditions including asthma and allergic rhinoconjunctivitis, history and type of food allergy, and family history of atopy was completed for all patients. Determination of the severity of atopic dermatitis was based on SCORAD (SCORAD less than 25: mild AD, 25 to 50: moderate AD, above 50: severe AD) <sup>17</sup>. Skin Prick Test (SPT) was performed to diagnose food allergy <sup>18</sup>.

Informed written consents were obtained from the parents or guardians of the children prior to skin prick test (SPT). It was done using standard extracts of 15 allergens (STALLERGENS Company) as shown in figure 1. The tests were done on the volar aspect of the forearm. All SPTs were performed and read by two of the authors. A mean wheal diameter of at least 3mm and a flare diameter of at least 5mm were considered positive, with the reading done after 15 min. A wheal diameter of larger than 10 mm was considered a strongly positive response. Histamine and glycerinated saline controls were also applied as positive and negative controls, respectively.

Statistical analysis was performed using the central tendency measures and dispersion measures, chi square test, mann-whitney test and spearman's correlation coefficient with SPSS 15 software. Statistical significance was set at a P-value of < 0.05.

## Results

A total of 51 children with atopic dermatitis were recruited, 32 (62.7%) males and 19 (37.3%) females. Thirty eight (74.5%) of them were between 6 months and 2 years old and 13 (25.5%) were 2 to 5 years old. AD was mild in 11 patients (21.6%), moderate in 32 patients (62.7%) and

severe in 8 patients (15.7%). The SCORAD mean was  $38.02 \pm 16.38$ , ranging from 7.6 to 81.9. The sites of involvement were head and neck (74.5%), limbs (70.6%), genitalia (33.3%) and trunk (25.5%). Twenty five (49%) children had flexural and 25 (51%) had extensoral involvement. The frequency of the positive history of rhinitis and asthma in children was 5 (9.8%) and 2 (3.9%), respectively. Forty four (86.3%) patients did not report any history of other allergic diseases. The family history of asthma, atopic dermatitis and allergic rhinitis was positive in 7.8%, 5.9% and 2%, respectively.

Thirty four patients (66.7%) had a positive reaction to one or more allergens and in 17 patients (33.3%), the SPT was negative to all allergens. Eleven patients (21.6%) had a positive SPT to one allergen, 9 patients (17.6%) to two allergens, 9 patients (17.6%) to three allergens, 3 patients (5.9%) to four allergens, 1 patient (2%) to seven allergens and 1 patient (2%) to ten allergens. The most common allergen was white egg in 19 patients (37.3%). Yolk was the second most common allergen in 11 patients (21.6%). The frequency of food allergens are shown in figure 1. The most common food allergen was white egg in both male and female patients. A strongly positive response to white egg and yolk occurred only in 1 (2%) patient. There was a reverse relationship between the degree of SPT reactivity (the diameter of wheal and flare) and AD severity only in cow's milk ( $r = -0.337$ ). No relationship was found between the severity of AD and the degree of SPT reactivity. There was no significant association between the degree of SPT reactivity and age, sex and the severity of AD.

## Discussion

The primary aim of determining food allergens in AD is not only for therapeutic reasons, but also for planning a preventive diet<sup>19</sup>. In the present study, 66.7% of the patients had a positive skin prick test to at least one allergen. The most common food allergen was white egg. Yolk and peanut were the second and the third most common allergens, respectively. Also, white egg and yolk were defined as 2 allergens with strongly positive reactions. This is compatible with most of the other studies.

A study by Lever also showed that 70% of the infants under the age of 12 months and 60% of the infants between 12-24 months with AD had a positive radioallergosorbent test (RAST) to egg<sup>20</sup>.

Rennick et al, evaluated 31 food allergens in 59 infants with moderate to severe AD by doing SPT. Of them, 91.5% showed a positive reaction to one or more food allergens. Strongly positive reactions to one or more allergens were seen in 62.7%. White egg was the most common allergen (80%). Not only the frequency of the positive SPT was higher in Rennick study (91.5%) than our study (66.7%), but also the positive reaction to white egg was more in their study (80% vs. 37.3%). These differences in the results can be due to the genetic factors, the type of the diagnostic procedure(s) applied for assessing food allergy or the number of tested allergens. However, the results of this study regarding the frequency of a positive SPT, the most common allergen and the most strongly positive allergen are almost in concordance with the present study.

Estrada et al, in their study on the association between AD and food allergy, showed that young children with allergic reactions to cow's milk, egg, wheat flour, soya, fish and peanut had a greater risk of developing AD. The most frequent food allergens in this study were cow's milk, egg, wheat flour, soya and peanut<sup>21</sup>. Although egg was the second most common allergen in this study, it was among the most common food allergen, similar to our results. In another study by Rowlands et al, the most common food allergens were cow's milk, egg, wheat, soya, peanut and sea foods<sup>8</sup>.

In our study, the most common allergen was egg unlike the two previous studies in which cow's milk was the most common allergen. In a study by Kanny, 90% of the positive reactions to food allergens were related to cow's milk, egg, wheat, peanut, nuts, soya and fish which were nearly in accordance with our study. In the present study, SPT was used to diagnose food allergy. As the negative predictive value of the test was 95%, the negative result of the test was very valuable while the positive predictive value of the test was lower than 50%. So, a positive SPT alone cannot be considered as clinical hypersensitivity<sup>22</sup>. Therefore, it is necessary to confirm a positive SPT with RAST test.

In this assay, SPT results were not re-confirmed by RAST and also the rate of improvement in AD after eliminating the related allergens was not evaluated. The absence of a control group was another limitation of this study. However, the high frequency of food allergy in the present study showed the importance of performing SPT in children with AD.

## Acknowledgment

The authors wish to thank the Physiology Research Center for their statistical assistance with this article.

## References

- Burks AW, James JM, Hiegel A, Wilson G, Wheeler JG, Jones SM, Zuerlein N. Atopic dermatitis and food hypersensitivity reactions. *J Pediatr* 1998; 132: 132-6.
- Chandra RK, Gill B, Kumari S. Food allergy and atopic disease: pathogenesis, diagnosis, prediction of high risk, and prevention. *Ann Allergy* 1993;71: 495-502.
- Hanifin JM, Rogge JL. Staphylococcal infections in patients with atopic dermatitis. *Arch Dermatol* 1997; 113:1383-6.
- Sampson HA, Scanlon SM. Natural history of food hypersensitivity in children with atopic dermatitis. *J Pediatr* 1989;115:23-7.
- Boguniewicz M, Schmid-Grendelmeier P, Leung DY. Atopic dermatitis. *J Allergy Clin Immunol* 2006; 118: 40-43.
- Werfel T. Skin manifestations in food allergy. *Allergy* 2001; 56 (suppl. 67): 98 – 101.
- Rennick GJ, Moore E, Orchard DC. Skin prick testing to food allergens in breast-fed young infants with moderate to severe atopic dermatitis. *Australas J Dermatol* 2006; 47:41-5.
- Rowlands D, Tofte SJ, Hanifin JM. Does food allergy cause atopic dermatitis? Food challenge testing to dissociate eczematous from immediate reactions. *Dermatol Ther* 2006;19: 97-103.
- Consensus conference Management of atopic dermatitis in children. Recommendations (short version). *Eur J Dermatol* 2005;15: 215-23.
- Johnston GA, Bilbao RM, Graham-Brown RA. The use of dietary manipulation by parents of children with atopic dermatitis. *Br J Dermatol* 2004; 150: 1186 – 9.
- Kanny G. Atopic dermatitis in children and food allergy: combination or causality? Should avoidance diets be initiated? *Ann Dermatol Venereol* 2005;132:1S90-103.
- Giusti F, Seidenari S. Patch testing with egg represents a useful integration to diagnosis of egg allergy in children with atopic dermatitis. *Pediatr Dermatol* 2005;22:109-11.
- Bollinger ME, Dahlquist LM, Mudd K, Sonntag C, Dillinger L, McKenna K. The impact of food allergy on the daily activities of children and their families. *Ann Allergy Asthma Immunol* 2006; 96:385-6.
- Farajzadeh S, Esfandiarpour I, Pourhamzeh B. Frequency of skin diseases in children in Kerman. *Iran J Dermatol* 2008;10:320-9.
- Ownby DR. Tests for IgE antibody. In: Bierman CW, Pearlman DS, Shapiro GG, Busse WW (eds). *Allergy, asthma, and Immunology from Infancy to adulthood*. 3rd ed., Philadelphia, Saunders; 1996; 11: 144-55.
- Hanifin JM, Rajka G. Diagnostic features of atopic dermatitis. *Acta Dermatol venereol suppl (Stockh)* 1980; 92(suppl 144):44-7.
- Gelmetti C, Colonna C. The value of SCORAD and beyond. Towards a standardized evaluation of severity? *Allergy* 2004; 59 (suppl 78): 61-5.
- Verstege A, Mehl A, Rolinck-Werninghaus C, Staden U, Nocon M, Beyer K, Niggemann B. The predictive value of the skin prick test weal size for the outcome of oral food challenges. *Clin Exp Allergy* 2005;35:1220-6.
- Beyer K, Teuber SS. Food allergy diagnostics: scientific and unproven procedures. *Curr Opin Allergy Clin Immunol* 2005;5: 261-6.
- Lever R. The role of food in atopic eczema. *J Am Acad Dermatol* 2001;45: S57-60.
- Estrada-Reyes E, Pardo-Castañeda MG, Toledo-Bahena ME, Lerma-Ortiz ML, del Río-Navarro B, Nava-Ocampo AA. A case-control study of food hyper-sensitivity, timing of weaning and family history of allergies in young children with atopic dermatitis. *Allergol Immunopathol (Madr)* 2007;35:101-4.
- Sicherer SH. Manifestations of food allergy: evaluation and management. *Am Fam Physician* 1999;59: 415-24, 429-30.