

Specific IgE of common foods in Chinese children with eczema

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Food atopy is important but inadequately studied among children with atopic dermatitis (AD). We evaluated whether any association existed between AD severity, quality of life, total IgE, eosinophil counts, and the number of food items sensitized. Specific IgE of ten common food items was measured for a group of consecutive AD patients ($n = 85$) enrolled during a randomized trial and correlated the findings with eczema severity. Twenty-four patients (28%) were negative for any of the ten common food items. The most commonly sensitized foods were shrimp (54%), egg white (43%), wheat (42%), and peanut (41%). Atopy to beef as a protein and orange as a fruit were least common among the food items studied, even among patients positive for 8–9 IgE items. Patients with severe AD (objective SCORAD > 40) were more likely to be positive for at least one of the food items (Yates corrected $p = 0.024$ for ≥ 1 food-specific IgE in severe vs. moderate AD, OR 3.42 and 95% CI 1.15–10.32); and for at least seven of the food items ($p = 0.001$ for ≥ 7 food-specific IgE vs. nil with OR 11.67 and 95% CI 2.29–67.77), respectively. The Spearman coefficients between the number of positive food-specific IgE and total SCORAD, objective SCORAD, area of AD involvement, Children's Dermatology Life Quality Index (CDLQI), total IgE levels, and eosinophil counts were 0.42 ($p < 0.001$), 0.45 ($p < 0.001$), 0.50 ($p < 0.001$), 0.17 ($p = 0.116$), 0.80 ($p < 0.001$), and 0.22 ($p = 0.043$), respectively. Specific IgE levels for beef correlated with all the other food-specific IgE levels, including cow's milk ($\rho = 0.061$, $p < 0.001$) and soy ($\rho = 0.70$, $p < 0.001$). The number of common food items sensitized correlated with disease severity, extent, and total IgE levels. IgE sensitization to beef protein is unlikely in the majority of children with AD, but its serum IgE level is associated with disease severity and risk of sensitization to other foods.

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Atopic dermatitis (AD) is a common chronic relapsing disease in children associated with allergy and IgE elevation (1, 2). As there is no definite cure, alternative therapies are practiced extensively by parents (3, 4). Food has been implicated (4–8), and many parents of children with AD would make many efforts in avoidance strategies, namely, dietary restriction and avoidance. Seafood and beef are the most common foods restricted by Chinese parents in our area (4, 7). Despite the association between AD

severity and high IgE levels (1), there is scanty evidence as to whether the presumed deleterious effects of food allergens are attributed to immune (Type I vs. non-Type I) or non-immune mechanisms (9). Food-specific IgE concentrations have been used in predicting symptomatic food allergy (6, 10–12). However, atopic sensitization to food items and AD severity are less well understood. In this study, we postulated as null hypothesis that atopy (defined as type I, IgE-mediated sensitization) to common foods occurred no

more frequently in patients with more severe AD. Using specific IgE for common food items, we also explored whether AD severity, extent, quality of life, total IgE, and eosinophil counts were associated with the number of items sensitized.

Methods

We evaluated allergen-specific IgE to ten common foods performed for a group of consecutive patients enrolled in a randomized trial between April 2004 and July 2005 at a pediatric dermatology clinic and correlated the findings with AD severity as evaluated using SCORing Atopic Dermatitis (SCORAD) (13–15). Serum concentrations of allergen-specific IgEs to cow's milk, egg white, soybean, wheat, peanut, shrimp, fish, beef, tomato, and orange were measured by fluorescent enzyme immunoassay (AutoCAP, Phadia AB, Uppsala, Sweden). Specific IgE ≥ 0.35 kAU/l was considered positive. These common food allergens were often studied by other researchers as well as by our group (16). Orange as a non-protein food was also included because many parents in our area would avoid this fruit.

The Clinical Research Ethics Committee of the Chinese University of Hong Kong approved this study. Chi-square test was used to compare categorical data. The correlations between food-specific IgE concentrations and SCORAD, CDLQI, and laboratory parameters were analyzed by Spearman coefficients. Patients with undetectable food-specific IgE were assigned values of 0.175 kAU/l (i.e., half of the lower detection limit) to allow for statistical analysis. All comparisons were made two-tailed, and *p*-values < 0.05 were considered to be statistically significant.

Results

There were 85 consecutive patients enrolled in the randomized trial (15). Their mean (s.d.) age and objective SCORAD were 11.7 (3.6) and 44.4 (15.6), respectively. Twenty-four (28%) of the patients were negative for any of the 10 common food items (Fig. 1). The most commonly sensitized foods were shrimp (54%), egg white (43%), wheat (42%), and peanut (41%). Only 18% of 85 children with AD had specific IgE to beef. Beef and orange were the least common food items sensitized, even among patients with eight or nine positive IgE items. The spectrum of food sensitization is similar between the two genders (Fig. 2).

Spectrum of food sensitization in 85 children with AD

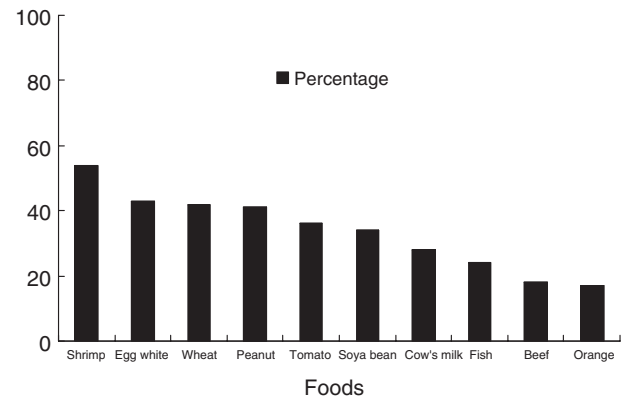


Fig. 1. Spectrum of food sensitization in 85 children with atopic dermatitis (AD).

Patients with severe AD (objective SCORAD > 40) were more likely to be positive for at least one of the food items (Yates corrected $p = 0.024$ for ≥ 1 food-specific IgE in severe vs. moderate AD; OR 3.42 and 95% CI 1.15–10.32); and for at least seven of the food items ($p = 0.001$ for ≥ 7 food-specific IgE vs. nil; OR 11.67 and 95% CI 2.29–67.77), respectively (Table 1).

The Spearman correlation coefficients (ρ) between the number of positive food-specific IgE in our patients and their total SCORAD, objective SCORAD, area of AD involvement, CDLQI, total IgE levels, and eosinophil counts were 0.42 ($p < 0.001$), 0.45 ($p < 0.001$), 0.50 ($p < 0.001$), 0.17 ($p = 0.116$), 0.80 ($p < 0.001$), and 0.22 ($p = 0.043$), respectively. A correlation between the number of positive food-specific IgE with patients' age ($\rho = 0.24$ and $p = 0.028$) was also noted.

Spectrum of food sensitization between gender in children with AD

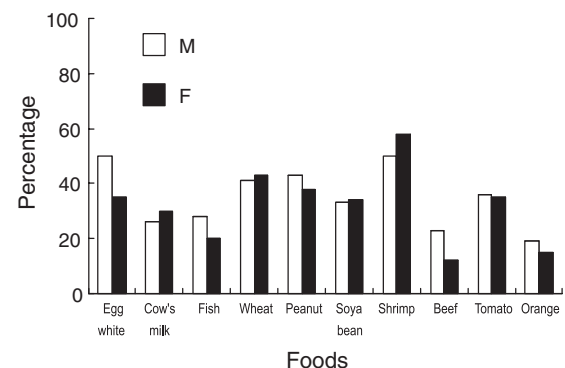


Fig. 2. Spectrum of food sensitization between gender in children with atopic dermatitis (AD).

Table 1. Specific food IgE positivity in children with atopic dermatitis (AD)

Total number of positive food-specific IgE	Number of patients*	
	Objective SCORAD ≤ 40 (moderate)	Objective SCORAD > 40 (severe)
0	15	9
1	7	8
2	4	4
3	4	3
4	0	3
5	1	1
6	1	1
7	0	4
8	0	6
9	2	10
10	1	1

SCORAD, SCORing Atopic Dermatitis.

Yates corrected $p = 0.024$ for ≥ 1 food-specific IgE in severe vs. moderate AD, OR 3.42 and 95% CI 1.15–10.32; $p = 0.001$ for ≥ 7 food-specific IgE vs. nil with OR 11.67 and 95% CI 2.29–67.77.

* $p = 0.011$ by likelihood ratio chi-square for trend between patients with moderate and severe AD.

The serum levels of all the ten food-specific IgEs correlated with objective SCORAD and disease extent (Table 2). Specific IgE levels for beef correlated with all the other food-specific IgE levels, including cow's milk ($\rho = 0.061$, $p < 0.001$) and soy ($\rho = 0.70$, $p < 0.001$).

Discussion

The findings of this study confirm our previous observations with skin prick testing that shrimp, egg white, wheat, and peanut are the common food items that children with AD are sensitized (7, 8, 17). Our findings were also in agreement with other reports (6, 10, 11, 16–18). More importantly, we demonstrated that patients with severe AD were more than double the odds of being sensitized to at least one of these items, and more than ten times the odds of being sensitized

to at least seven of the items. Despite these observations, beef and orange were the least likely sensitized foods. In our locality, parents often practice multiple food avoidance despite the lack of evidence of its efficacy, and a significant proportion of parents would avoid giving beef to their children with AD. This study, together with our previous findings with skin prick testing, may help reassure parents that beef as a protein and orange as a fruit are less sensitizing than the other common food items (7, 8). Beef allergy has been estimated to be between 3% and 6.5% among children with AD, and its incidence is about 0.3% in the general population (19). Nevertheless, beef sensitization does correlate with disease severity, extent, and the odds of multiple sensitization to other foods.

Our study also showed that the number of specific IgE items sensitized was correlated strongly with AD severity, extent of the disease, total serum IgE, and eosinophil counts. Interestingly, the number of food items sensitized is correlated with the age of patients. We speculate that children are exposed to more food items as they grow (8). As was previously observed with skin prick testing, sensitization is not equivalent to allergy. Many patients tolerate the sensitized food without any exacerbation of their AD, and some patients have severe eczema despite avoidance of the sensitized food (7).

We previously reported that multiple food avoidance was a common practice among children with AD (4). This study confirms that multiple food atopies occur in patients with severe AD. Nevertheless, many children are still bothered by the severity of their AD despite multiple food avoidance. Many factors other than food sensitization, such as epidermal barrier function, *Staphylococcus aureus* colonization, and psychosocial issues, are also involved in its pathophysiology (2). Food is but just one facet of consideration in the management of this very complex disease. As pediatricians, we generally discourage the practice of empirical food avoidance especially in children with mild AD and no specific history of disease aggravation with common foods. Dietary practices were usually empirical and advice not sought from a doctor (4). Our findings in the Chinese were different from the UK study of mixed ethnicity which reported that the most common foods omitted were dairy products (48%), eggs (27%), and cow milk (25%) instead of seafood and beef (5). Interestingly, milk sensitization, empirical milk avoidance, or eczema aggravation were all relatively uncommon among the Chinese beyond infancy (4, 8). Only 51% of the UK parents had

Table 2. Correlations among objective SCORing Atopic Dermatitis (SCORAD), disease extent, and serum levels of specific IgE

Food-specific IgE	Objective SCORAD	Extent	Beef-specific IgE
Egg white	0.33*	0.34*	0.58*
Milk	0.30*	0.30**	0.61*
Fish	0.24**	0.22**	0.42*
Wheat	0.42	0.50*	0.64*
Peanut	0.38*	0.45*	0.56*
Soybean	0.44*	0.49*	0.70*
Shrimp	0.30*	0.28**	0.36*
Tomato	0.41*	0.50*	0.45*
Orange	0.30**	0.35*	0.52*
Beef	0.35*	0.35*	N/A

* $p \leq 0.005$.

** $p < 0.05$.

consulted a doctor or dietician before altering their diets, but 39% felt that their skin had improved as a result of this dietary manipulation (5).

This study was a cross-sectional analysis, and patterns of dietary changes were not evaluated. The prevalence patterns were similar to our previous studies by skin prick tests. Importantly, disease severity correlates with the prevalence of sensitization to these foods. Dietary practices are cultural and may vary from country to country (20). De benedictis et al. (16) reported that there is a wide variation in the pattern of allergic sensitization between countries in infants with AD, and data from one country are not necessarily generalizable to other countries. There may be many other food proteins to study, in particular pork and chicken in our area. Nevertheless, the common food proteins are reasonably adequately covered in our study. Instead of giving non-specific dietary advice or adopting guidelines from another culture, it is important to tailor instructions to individuals for optimal compliance. It is important to evaluate whether some of these food items are genuinely allergic or harmful for our patients with AD. Management is sub-optimal if children with food allergy and severe disease continue to consume the culprit food. On the other hand, avoidance of common food materials in children without food allergy could result in food faddism or malnutrition.

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