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Short Communication

Study of food allergy among university students in Japan

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ABSTRACT

Background: Allergens that cause food allergy vary considerably according to race, environment, dietary habits and age. However, data on the actual situation of food allergy in young adult students are limited in Japan. The aim of the present study was to investigate the actual situation of food allergy in young adults.

Methods: Food allergy was examined, along with the presence or absence of allergic rhinitis, atopic dermatitis and bronchial asthma complicating food allergy, in 2053 Japanese university students.

Results: Food allergy was noted in 5.2% of subjects, with a higher prevalence in female students. In terms of the causative allergen, the rank order of incidence was egg, buckwheat, shrimp, crab, mackerel, milk, yam, beef fat, shellfish and other foods. In comparison with Western countries, the incidence of allergy to buckwheat and seafood tended to be higher. Among students with a food allergy, the proportion of those with allergic rhinitis, atopic dermatitis and bronchial asthma was 45.8, 29.0 and 12.1%, respectively, showing higher prevalences than in students without any food allergy.

Conclusion: In the future, the number of young adults with food allergy complicated by other allergic diseases will increase and measures against this issue seem to be necessary.

Key words: allergic rhinitis, atopic dermatitis, bronchial asthma, food allergy, university students.

INTRODUCTION

In many cases, food allergy appears during infancy and anaphylactic reactions are frequently recognized. Hence, food allergy in infancy tends to receive more attention. Food allergy in infancy is known to spontaneously remit with growth in many cases. However, food allergy sometimes develops in childhood or later and is frequently recognized in young adults as well.^{1–7} Allergens that cause food allergy vary considerably according to race, environment, dietary habits and age.^{2–8} However, data on the actual situation of food allergy in young adult students are limited in Japan.⁹

In Showa University, a medical school, because residential food services are available to the first-year students, food allergy in students has been investigated and countermeasures against it have been devised. Accordingly, students in the Faculties of Medicine, Dentistry and Pharmaceutical Sciences were surveyed to clarify the actual situation of food allergy in young adults.

METHODS

Design, samples and data collection

The subjects were 2073 students in their first to sixth years in the Faculties of Medicine, Dentistry and Pharmaceutical Sciences at Showa University who responded to a questionnaire about allergy and were interviewed by physicians during health examinations. The survey was conducted in May 1999. The subjects consisted of 633 students in the first to sixth years of the Faculty of Medicine, 616 in the first to sixth years of the Faculty of Dentistry and 824 in the first to fourth years of the Faculty of Pharmaceutical Sciences. The feedback rate, defined in terms of a response to all items on the questionnaire, was 2053 (99.0%), with a mean age of 22.0 years (range 18–41 years; 1011 males, mean age 22.4 years; 1042 females, mean age 21.7 years). The content of the questionnaire survey and interview by physicians during medical examinations was as follows.

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1. The presence or absence of food allergy diagnosed by allergists due to definitive causal foods. The manifestations of food allergy were anaphylactic shock, urticaria, angioedema, diarrhea, vomiting and abdominal pain. The causal foods were confirmed by either radioallergosorbent tests (RAST) or food challenge test. Classes of RAST of more than class 2 were assessed as positive. The food challenges were done by open food challenge tests.
2. The kind of food causing the allergy.
3. The presence or absence of a food allergy persisting at the time of the survey.
4. The presence or absence of diagnoses of allergic rhinitis, bronchial asthma or atopic dermatitis by allergists.

The items described above were surveyed during the interviews. Allergic rhinitis in the present study included seasonal and non-seasonal types. Moreover, the presence or absence of concomitant allergic rhinitis, bronchial asthma or atopic dermatitis in patients with food allergy was also examined.

This study was approved by the Ethics Committee of Showa University.

Statistical analysis

The significance of differences was assessed by the χ^2 test and the χ^2 value, odds ratio (OR), 95% confidence intervals (CI) and *P* values were obtained. Fisher's exact probability was used when the number of patients was small. *P* < 0.05 was considered significant. Statistical analysis was performed with spss 10.0 J software (SPSS, Tokyo, Japan).

RESULTS

Background factors of food allergy

Among the 2053 students examined, food allergy was noted in 107 (5.2%). Forty-one of 1011 males (4.1%) and 66 of 1042 females (6.3%) demonstrated food allergy, indicating a significantly higher prevalence in females than in males ($\chi^2 = 4.941$, OR = 0.63, 95% CI 0.420–0.929, *P* = 0.0262).

Food allergen

Among the 107 patients with food allergy, the incidence by causative allergen (including severe cases) is shown in Table 1. One hundred and thirty-nine allergens of 107 students were confirmed with RAST (111 cases) or open food challenge tests (28 cases).

Table 1 Percentages of 139 allergens in 107 students with food allergy

Food allergen	No. cases	(%)
Egg	27/139	(19.4)
Buckwheat	16/139	(11.5)
Shrimp	13/139	(9.4)
Crab	9/139	(6.5)
Mackerel	8/139	(5.6)
Milk	4/139	(2.9)
Yam	4/139	(2.9)
Beef fat	4/139	(2.9)
Shellfish	3/139	(2.1)
Mango	3/139	(2.1)
Roe	2/139	(1.4)
Bamboo shoots	2/139	(1.4)
Oyster	2/139	(1.4)
Sea urchin	2/139	(1.4)
Fermented soybean	2/139	(1.4)
Meat	2/139	(1.4)
Kiwi fruit	2/139	(1.4)
Others*	34/139	(22.7)

*Others includes striped marlin, burdock, lotus root, spinach, onion, broccoli, cauliflower, papaya, peach, apple, pineapple, citron, herbs, coffee.

Food allergy and other allergic diseases

The proportion of students with allergic rhinitis, atopic dermatitis and bronchial asthma complicating food allergy was examined. Among all the students, the proportion of students with allergic rhinitis, atopic dermatitis and bronchial asthma was 28.7% (589/2053), 10.3% (212/2053) and 4.5% (92/2053), respectively. Among students without food allergy, the proportion of students with allergic rhinitis, atopic dermatitis and bronchial asthma was 27.7% (540/1946), 9.3% (181/1946) and 4.1% (79/1946), respectively. In contrast, among students with food allergy, the proportion of students with allergic rhinitis, atopic dermatitis and bronchial asthma was 45.8% (49/107), 29.0% (31/107) and 12.1% (13/107), respectively. The proportion of students with concomitant allergic rhinitis among those with food allergy tended to be higher than that among students without food allergy ($\chi^2 = 32.506$, OR = 3.04, 95% CI 2.092–4.430, *P* = 0.0000). Similarly, the proportion of students with concomitant atopic dermatitis among those with food allergy tended to be higher than that among students without food allergy ($\chi^2 = 47.309$, OR = 4.39, 95% CI 2.907–6.616, *P* = 0.0000). The proportion of students with concomitant bronchial asthma among those with food allergy also tended to be higher than

Table 2 Percentage of allergic rhinitis, atopic dermatitis and asthma in students with and without food allergy

	Rhinitis	Dermatitis	Asthma
Food allergy (+)	45.3% (49/107)*	29.0% (31/107)*	12.1% (13/107)*
Food allergy (-)	27.8% (540/1946)	9.3% (181/1946)	4.1% (79/1946)

* $P < 0.001$ compared with students without food allergy.

that among students without food allergy ($\chi^2 = 14.808$, OR = 3.41, 95% CI 1.894–6.128, $P = 0.0005$; Table 2).

DISCUSSION

This survey of food allergy in college students in Japan revealed that the prevalence of food allergy in young adults was as high as that in infancy and childhood previously reported.⁹ In the present survey, the prevalence of food allergy was 5.2%. In a report of a questionnaire survey in students of national universities by Suzuki *et al.* in 1997,⁹ food allergy was noted in 1.82% of male students, 2.65% of female students and 2.13% of all students. Hence, it is speculated that patients with food allergy in Japan comprise approximately 2–5% of those aged approximately 20 years.

In this series, the prevalence of food allergy in female students was 6.3%, significantly higher than that in male students (4.1%). In a report by Suzuki *et al.*,⁹ a higher prevalence of food allergy in females was also noted. However, a study of mainly children in Japan by Iikura *et al.*¹⁰ demonstrated that the prevalence of food allergy was nearly twice as high in males as in females, although the reason for the gender difference between children and young adults was unclear.

A nationwide survey in Japan in 1997 by Iikura *et al.*¹⁰ showed that the order of incidence of food allergy was egg/egg products (52.3%) > milk/milk products (31.8%) > seafood (10.6%) > wheat (6.8%) > snacks (6.1%), beans (6.1%) > chicken (4.5%), vegetables (4.5%), nuts (4.5%) > buckwheat (3.8%) > other meat (3.0%) in 1336 subjects consisting mainly of children who consulted hospitals. Our present study of food allergy mainly examined healthy students, using a method differing from that of the survey of Iikura *et al.* Although egg allergy that had appeared during childhood and persisted comprised the highest proportion of cases in the present study, the incidence was 19.4%, which was lower than that in childhood. In addition, allergy to seafoods, such as shrimp (9.4%), crab (6.5%), mackerel (5.6%), shellfish (2.1%), oyster (1.4%), sea urchin (1.4%) and roe (1.4%), was

frequently noted. Allergy to milk/milk products or wheat was less frequent, suggesting desensitization to food allergy in childhood or later, causing differences in food allergy between children and young adults. With respect to the prognosis of food allergy in infancy, Eggleston¹ reported that the natural course of food allergy was favorable and the remission rate was 71% in patients showing onset at age 3 years or less, significantly higher than 31% in patients showing onset at age 3 years or more. In terms of the causal food, the remission rates were high for egg, milk, soybean and fruits. Concerning the prognosis of food allergy, it has been reported that intake of allergen-elimination diets increased the proportion of symptom-free patients, even those showing positive RAST results, and food ingestion became possible at 1–2 years of age.^{11–14} Regarding the relationship between food allergy and atopic dermatitis, some patients were reported to show remission with age, excluding those allergic to buckwheat.^{2,3,15–19} These findings are considered responsible for the difference in the causal foods of food allergy between children and young adults.

In relation to other allergic diseases, concomitant allergic rhinitis (45.8%) and atopic dermatitis (29%) were noted in many cases, as reported previously,^{2,3,11–19} but the incidence of concomitant bronchial asthma was comparatively low (12.1%). Allergic march, in which infants with food allergy develop allergic symptoms such as atopic dermatitis, allergic rhinitis and bronchial asthma in succession, has become an issue of concern.^{11–19} It has been postulated that infants with food allergy are liable to develop asthma in the future.^{11–19} To prevent asthma, the importance of coping with mites has been suggested and it is considered essential to inhibit allergic march triggered by food allergy by taking various measures during childhood.^{12–19} The authors of those studies suggest measures against mites such as cleaning of the dormitory, considering that coping with mites is important in terms of preventing the development of other allergies complicating food allergy.

In the US and UK, milk, egg, peanuts, soy, wheat, fish and nuts are common causal foods of food allergy.^{8,20,21}

It has been suggested that dietary habits different from those in Western countries may be involved in the higher incidence of allergy to seafood. However, dietary habits vary in each country, thereby causing differences in food allergens, and, in France and Spain, where raw seafood is often eaten,^{21,22} the incidence of food allergy to seafood is as high as that in Japan.

Just as the habit of eating raw fish, like sushi, in Japan has become a worldwide practice, opportunities to eat different kinds of foods in various countries in the world will probably increase in the future. Hence, it seems crucial to understand the actual situation of food allergy in all countries and to accumulate further studies.

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