Strategies for preventing and managing allergic reactions to food in Japanese educational facilities such as kindergartens and schools

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Abstract

Following reports of a Japanese student who died of an allergic reaction to a school lunch, strategies aimed at food allergy prevention have been examined in settings such as day nurseries, kindergartens, and schools. We conducted a questionnaire survey of educational staff members attending an instructional meeting about food allergy, aiming to formulate strategies likely to benefit affected children. Although most attendees had basic knowledge of food allergy, more than 90% reported anxiety or stress over the management of allergic children. Furthermore, 94% reported anxiety over using an adrenaline auto injector (EpiPen®) for allergic symptoms at school, with uncertainty over timing of use being the most frequent reason. The presentation at the meeting promoted knowledge regarding food allergy, but if did not significantly reduce attendees' anxiety or stress. Teacher confidence and the quality of life of children with food allergies might be improved by better knowledge of individual children's states of health at kindergartens and schools, implementation of EpiPen®-based plans for symptom control, ongoing information programs for educators, and improved liaisons between schools and community health facilities.

Key words: school, food allergy, EpiPen®, anaphylaxis, allergen ingestion

Introduction

At the end of 2012, a student in Chofu City (Tokyo) died of an allergic reaction to a school lunch. In addition to devastation for the affected family, the child's death had a marked impact on Japanese society, compelling health care professionals, politicians, and school teachers to take note of food allergy as a social problem. In June 2014, the Basic Law on Measures against Allergic Diseases was enacted.

With the growth of interest in food allergy at kindergartens and schools, requests for our instructional sessions about food allergy and adrenaline auto injector use have increased annually. However, we needed to understand the barriers to food allergy control at schools, to more effectively employ our medical knowledge about food allergy. In this study, we investigated the current status of food allergy control at kindergartens and schools, and reviewed future strategies.

Subjects and Methods

Subjects

The subjects were 221 kindergarten and school workers who participated in educational meetings at 7 locations where we received a request of the presentation about food allergy and how to use EpiPen®. Attendees included 75 men and 146 women. Ages were 20 to 29 years in 54
subjects, 30 to 39 in 55, 40 to 49 in 31, and 50 to 59 in 67. The age was unclear in 14. Occupational categories included 139 teachers, 34 school nurses, 22 managers, and 26 other workers.

Methods
A questionnaire survey was conducted before and after our presentation about food allergy at kindergartens and schools. Replies were evaluated, and then compared between the 2 time points. The presentation took 1 hour and covered 6 items (Table 1).

The questionnaire consisted of questions concerning stress or anxiety over managing children with food allergy, school lunches, and knowledge about food allergy and anaphylaxis (Table 2). Questions were answered using a multiple-choice format. Subjects were also invited to write some responses. We compared the results of the questionnaire survey after the presentations with those preceding the meetings, and assessed changes in participants' knowledge.

Results
Results concerning stress or anxiety over managing children with food allergy are shown in Figure 1. Subjects who selected "stressful" or "slightly stressful" accounted for 90%, indicating that most teachers felt anxious, or that managing children with food allergy was stressful. As for knowledge regarding food allergy (Figure 2), subjects who selected “know” or “know a little” to all questions accounted for more than 50% before the presentation, and so attendees knew something about food allergy. For a question concerning knowledge of measures for food allergic anaphylaxis, the multiple choice answer

![Fig. 1 Stress or anxiety over managing children with food allergy (Before presentation)](image-url)
"know" was selected by the lowest number. Only a small proportion of attendees considered themselves familiar with specific strategies, even when they possessed knowledge about food allergy and anaphylaxis. Anxiety related to the use of an adrenaline auto injector (EpiPen®) at school is shown in Figure 3. Before the presentation, anxiety over EpiPen® use for symptoms at school was reported by 94% of attendees (Figure 3a). The most frequent reason given for the anxiety was "timing of use unclear", followed by concern about possible adverse reactions if administration is conducted incorrectly (Figure 3b).

Changes in knowledge reported after the presentation are presented in Figure 4. Items for which a high proportion of subjects reported some knowledge before the presentation showed little change after the presentation. However, knowledge of measures for food allergic anaphylaxis and how to use EpiPen® showed a significant increase in the proportion of attendees responding with "know" or "know a little" after the presentations, suggesting that the meetings are useful for imparting such knowledge. With respect to changes in anxiety or stress after the meetings (Figure 5), the meetings somewhat reduced anxiety or stress but the reduction was not significant. The overall results suggest that managing children with food allergy is likely to cause anxiety or stress in school personnel (Figure 5).

Fig. 2 Knowledge about food allergy (Before presentation)
Subjects who selected "know" or "know a little" in response to all questions accounted for more than 50% before the presentation attendees knew something about food allergy. For the question concerning knowledge of measures for food allergic anaphylaxis, the multiple choice answer "know" was selected by the lowest number.

Fig. 3 Anxieties over using EpiPen® at school (Before presentation)
3-a Almost all attendees (94%) felt anxiety over using EpiPen® for food allergic reactions at school before the presentation.
3-b The most frequent reason given for anxiety was "timing of use unclear", followed by concerns about possible adverse reactions if administration is performed incorrectly.

Fig. 4 Changes in knowledge
Knowledge of measures for food allergic anaphylaxis and how to use EpiPen® showed a significant increase in the proportion of attendees responding with "know" or "know a little" after the presentations.

Fig. 5 Change in stress or anxiety over managing children with food allergy
The meetings somewhat reduced anxiety or stress, but the reduction was not significant.
Discussion

According to the results of a survey regarding allergy conducted by the Ministry of Education, Culture, Sports, Science and Technology in 2013, the prevalence of food allergy among school children was 4.5% (1.7 times higher than in 2004). Furthermore, 0.5% (3.6 times higher than in 2004) had a history of anaphylaxis. The prevalence was higher than generally recognized, showing an increase. As one would expect given that food allergy is related to the diet, a large number of attacks triggered by allergens in school lunches have been reported. Additionally, studies have indicated a reduced quality of life (QOL), involving school activities and lunch periods, in comparison with children with non-food allergies.

The results of our present questionnaire survey showed that teachers had some knowledge regarding food allergy. Since allergic symptoms may develop during school hours, teachers are encouraged to administer first aid on site, including the use of EpiPen®. However, anxiety over its use did not resolve even after participation in the meetings. Nonetheless, EpiPen® administers the only drug effective against anaphylaxis. Delayed administration is associated with mortality or other poor outcomes. In Japan, the Ministry of Health, Labor and Welfare clarified that the non-physician use of EpiPen® in emergencies at kindergartens and schools does not violate the Medical Practitioners' Act. Promotion of such use is an urgent priority. In our survey, anxiety over EpiPen® use involved the timing of administration. Acquiring knowledge based on guidelines can overcome this difficulty. To this end, ongoing update sessions should be conducted regularly for school personnel. Simulation training would be a worthwhile addition to these sessions, and could be implemented within 2 years. We identified the possibility of adverse reactions related to use, as an additional cause of anxiety. Importantly, recovery from such reactions was achieved in all patients according to a survey conducted in Japan. Presentation of those results to session participants may address this source of anxiety.

As described above, EpiPen® is the main treatment for food allergy symptoms. However, its use is limited to children weighing 15 kg or more. In those weighing 14 kg or less, such injections may prove irreparably harmful. In kindergarten children, the prevalence of food allergy is much greater than in school children. For management of food allergy symptoms in young children weighing less than 15 kg, strategies not involving EpiPen® are necessary. In addition, not all school children with food allergy symptoms require EpiPen®. Strategies appropriate for such milder attacks also are important. In this study, we were not able to investigate whether there were any differences in stress levels among members of the kindergarten and school staff regarding the presence or absence of children of EpiPen®-use recommended age. In Japan, EpiPen® is the only drug that can be prescribed for anaphylaxis. In Europe and the US, several types of drugs other than EpiPen® are on the market; these drugs are also indicated for use in children weighing 15 kg or over. Nursing infants are considered unlikely to be at high risk for acute allergic symptoms induced by inadvertent allergen ingestion. However, the possibility of the occurrence of such events is expected to be higher among infants than school children; caution must thus be exercised.

Recent increases in the prevalence of allergic diseases such as food allergies are a matter of global concern; various measures have been taken in Europe and the US. In the US, the Centers for Disease Control and Prevention (CDC) set guidelines for food allergy management in schools (foodallergy.org/file/cdc-guidelines.pdf) in 2013, which contain detailed information on food allergies and their management. In Europe, the number of children with food allergies has also been increasing; the presence of children at risk of developing anaphylaxis has been confirmed in approximately two thirds of the schools in Europe. Nevertheless, school teachers do not fully understand the importance of EpiPen® use in children suffering from anaphylaxis. With such a background, risk assessment based on correct diagnosis and the preparation of action plans in advance for anaphylaxis cases are needed.

As for overall strategies, accurate information must be made available on allergies of individual children, permitting individualized precautions. Measures are needed to prevent inadvertent allergen ingestion or food contamination during school lunches and activities, teachers should practice precautions as a team, and work together with other school staff, hospitals,
and emergency services, considering themselves partners in an emergency system. The establishment of such a cooperative approach may reduce teachers’ anxiety. As a result, children with food allergy and their families will enjoy the kindergarten and school experience more fully.

Another limitation of this study, besides that mentioned above, is the issue of the appropriateness of our investigative methods. This is attributable to the lack of established indicators to measure stress levels in kindergarten and school staff members who are responsible for allergy management in children with food allergies. For objective stress assessment, employing QOL measurement scales for other diseases is considered to be an option. We intend to establish such methodologies and to continuously implement measures against food allergies, aiming for a society where children with allergies can live safely without anxiety.

COI: All authors report no conflict of interest related to this manuscript.

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