

# Impacts of food allergy on pediatric quality of life

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## Abstract

Food allergy has become a significant global health issue particularly in pediatric populations. A number of recent studies have reported that food allergy dramatically reduced quality of life in affected children and their caregivers. This article aims to discuss impacts of food hypersensitivity on childhood quality of life including potentially life-threatening experiences, malnutritional status and psychological concerns. Finally, this study demonstrated the effective management to prevent mortality and promote children's quality of life in terms of patient education and food allergen immunotherapy.

Food allergy is defined by the National Institute of Allergy and Infectious Disease expert panel as an adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food<sup>(1)</sup> Food allergy has been categorized as immunoglobulin E (IgE)-mediated, non-IgE-mediated, and mixed IgE- and non-IgE-mediated reactions.<sup>(1, 2)</sup> IgE-mediated reactions are represented by an immediate onset of symptoms generally within 2 hours after ingestion of or exposure to the culprit food. Clinical manifestations typically involve the skin, gastrointestinal tract, and respiratory tract.<sup>(2, 3)</sup> Whereas, non-IgE-mediated reactions include food-protein induced enterocolitis syndrome (FPIES), food protein-induced enterocolitis, proctocolitis, and enteropathy syndromes.<sup>(2, 3)</sup> Non-IgE-mediate reactions cause abnormal gastrointestinal conditions such as vomiting, abdominal pain, diarrhea, bloody stool, and failure to thrive.<sup>(3)</sup> Mixed IgE- and non-IgE-mediated reactions can cause atopic dermatitis, a chronic relapsing inflammatory skin disease<sup>(4)</sup> and eosinophilic gastrointestinal disease which

presented with dysphagia, abdominal pain and gastrointestinal bleeding, mostly associated with blood eosinophilia.<sup>(2, 3)</sup>

Up to now, food allergy has become a significant global health concern. The prevalence of food allergy is up to 10% of the population.<sup>(5)</sup> In the past decades, food allergy appears to continue to increase in the past decades.<sup>(1, 5, 6)</sup> The cause for an increase in food allergy is still inconclusive.<sup>(5)</sup> Base on a US cross-sectional survey among children under 18 years of age from 1997 through 2007, the rate of reported food allergy increased significantly from 3.9% to 18% ( $p < 0.01$ ).<sup>(6)</sup> Likewise, a 10-year period study in China that utilized oral food challenge for diagnosing infants with food allergy presented that the prevalence of food allergy increased from 3.5% to 7.7% ( $p = 0.17$ ).<sup>(7)</sup> In Thailand, Lao-araya and colleagues demonstrated the prevalence of IgE-mediated food allergy among preschool children in northern Thailand was more than 11.1% (95% confidence interval: 0.41-2.98%).<sup>(8)</sup>

Food allergy is more slightly common in childhood than adulthood. It has been approximated to affect 6 to 8% of children, compared with 2 to

5% of adults.<sup>(5)</sup> Food allergy commonly starts within 2 years of age and it is mostly outgrown before adolescent years.<sup>(1, 5, 9)</sup> A population-based study in Melbourne showed that more than 10% of 1-year-old infants had positive results for oral food challenge in at least one of the common allergenic foods of infancy.<sup>(10)</sup> The major food allergens in the pediatric population are milk, egg, soy, and wheat.<sup>(2)</sup> These kinds of food are primary ingredients for general complementary food. Children with food allergy greatly suffer not only from food avoidance, but from allergic reactions as well. Interestingly, some studies revealed that food allergy provides greater negative impacts on pediatric quality of life than other chronic diseases. Recent studies demonstrated children with peanut allergy have a poorer quality of life than ones with diabetes mellitus.<sup>(11, 12)</sup> Additionally, Primeau and colleagues found that children with peanut allergy have more deterioration in amounts and quality of daily activities than children with rheumatologic diseases.<sup>(13)</sup> Moreover, patients with multiple food allergies tend to have poor quality of life. According to the survey of 253 parents of food-allergic children, children with more than two food allergies had significant lower quality of life scores compared with those with one or two food allergies.<sup>(14)</sup>

As mention previously, food allergy impairs quality of life in many manners. This essay will discuss impacts of food allergy on pediatric quality of life and clinical management to improve quality of life.

### **Impacts of food allergy on quality of life**

This present article will focus on 3 aspects including potentially life-threatening experiences, malnutritional status and psychological problems.

The first aspect is life-threatening issues. Some children with food allergy might be suffered from life-threatening events including anaphylaxis and food-protein induced enterocolitis syndrome (FPIES). Anaphylaxis is the most severe manifestation of IgE-mediated reactions. The onset of symptoms abruptly develops into life-threatening symptoms, for instance

respiratory distress, abdominal cramping and loss of consciousness.<sup>(1, 15)</sup> The limitation of expressive language skills in young children and the absence of cutaneous manifestation in some pediatric patients makes diagnosis of anaphylaxis markedly challenging, which could lead to mortality.<sup>(16)</sup> The rate of fatal reaction as a result of food anaphylaxis is 1 in 800,000 per year in children.<sup>(17)</sup> Another life-threatening food allergic reaction is FPIES, a severe manifestation of non-IgE-mediated reactions characterized by severe protracted vomiting, diarrhea and lethargy.<sup>(1, 18)</sup> FPIES typically happens in an infancy period and classically resolves before 6 years of age, thus adult population is not likely to be affected by this reaction<sup>(18)</sup>. Considering FPIES typically occurs in young infants, the patients will be vulnerable to severe dehydration and hypotension.<sup>(18-20)</sup>

Secondly, food allergy could contribute to malnutrition in children, since most common allergenic foods, including cow's milk, hen's egg, soy, and wheat, are significant portions of children's diet providing essential nutrients.<sup>(2)</sup> The study of the British Dietetic Association revealed that children with food allergies in UK are more underweight than the general population.<sup>(21)</sup> The most common nutritional disorders in children with food allergy are failure to thrive, micronutrient deficiencies and feeding difficulties.<sup>(22)</sup> Children particularly with multiple food allergies have to avoid many types of food.<sup>(23)</sup> Some of them eat the same ingredients almost every meal which leads to inadequate nutritional intake. Moreover, most parents are afraid to introduce new food to their vulnerable kids because of concern about allergic reactions. Dietary restriction can lead to a shortage of micronutrients, particularly calcium and vitamin D.<sup>(21)</sup> Noimark and colleagues reported a child presented with hypocalcemic seizure and rickets as a result of prolonged breastfeeding, poor weaning, and inadequate dietary supplementation.<sup>(24)</sup> Furthermore, some children who have extreme food avoidance are likely to suffer from kwashiorkor, characterized by extremity swelling in a person suffering from

severe hypoalbuminemia.<sup>(25, 26)</sup> Additionally, the presence of peripheral edema concealing growth failure obscured the clinical features that cause a delay in receiving proper management.<sup>(25)</sup>

Last but not least, children with food allergy may suffer from psychologic problems. Food allergy diagnosis requires children to be aware of their environments at school, sporting events, family parties, and even in their own home<sup>(23)</sup>. Most of them have to prepare their allergen-free food for eating outside their home and miss social activities. For these reasons could make them feel singled out and different from friends. These circumstances can result in social discrimination and bullying issue.<sup>(1, 23, 27, 28)</sup> Shemesh and colleagues demonstrated that 31.5% of the children with food allergy had a history of being bullied, including threats with foods, mainly by their classmates.<sup>(29)</sup> Moreover, some children with IgE-mediated food allergy are likely to encounter life-threatening allergic reactions including respiratory distress, severe abdominal cramping or hypotension. The affected children could be admitted to an intensive care unit for a while and some of them might undergo many invasive procedures such as taking blood samples, drug injections, urinary catheter retaining and even endotracheal intubation. These terrible events could cause post-traumatic stress disorder to the kids.<sup>(30)</sup>

### **Clinical managements in food allergy**

Though strict avoidance of allergenic food is believed to be the most certain way to prevent any allergic reactions, it is particularly difficult to follow and also has chances of accidental exposure and nutritional deficiency.<sup>(31, 32)</sup> Currently, there are many interventions which were proposed for preventing mortality and promoting quality of life. This section will discuss about patient education and immunotherapy.

Patient education is a key factor for treatments of food allergy in all immunological mechanisms.<sup>(32)</sup> Physicians should identify specific types of allergenic food by taking medical histories, investigations including

specific IgE, food-allergen skin tests and/or oral food challenge, a gold standard in the diagnosis of food allergy.<sup>(33)</sup> Then the parents should be informed about a kind of allergenic food and the possibility of cross-reactivities to other food. Caregivers should have basic knowledge about food component and carefully read the food labels before allowing their children to eat. Furthermore, if their children have an accidental exposure to culprit food, parents will know how to deal with it. This is especially important in the case that children develop anaphylaxis. Caregivers must be educated that anaphylaxis may present anywhere with wide range of severity, from urticaria to cardiopulmonary collapse. Thus, parents are supposed to immediately inject adrenaline to their children when an early sign of anaphylaxis appears.<sup>(34)</sup> Evidently, an accurate diagnosis and clear recommendations make patients and families have better qualities of life.<sup>(35)</sup>

Immunotherapy (IT) is an effective treatment for IgE-mediated food allergy. The aims of IT are preventing anaphylaxis and eventually developing tolerance to allergenic food. Generally, most protocols of immunotherapy involve giving gradually increasing amounts of specific food allergen under medical supervision with the goal of developing desensitization and oral tolerance.<sup>(36, 37)</sup> Studies have been done on several types of food IT including subcutaneous, sublingual, oral and epicutaneous routes.<sup>(37, 38)</sup> Subcutaneous immunotherapy showed the effectiveness for desensitization in patients with peanut allergy. Unfortunately, it provides major side effects including repeated systemic reactions in most patients. Therefore, subcutaneous immunotherapy has hardly been used in a current clinical practice.<sup>(39, 40)</sup> Sublingual immunotherapy is found to be safer than oral immunotherapy (OIT) but recent studies showed that it is less efficacious than the oral route.<sup>(41, 42)</sup> Currently, OIT is a promising treatment because it has been the best-studied approach.<sup>(38)</sup> Several studies demonstrated that OIT can result in significant desensitization in most patients.<sup>(37, 41, 43-45)</sup> Presently, OIT has been

effectively used for various allergenic foods including cow's milk, hen's egg, peanut, and wheat.<sup>(46-48)</sup> While epicutaneous immunotherapy, the latest method, is presented as an alternative to OIT.<sup>(38)</sup> Recent clinical trials revealed that the epicutaneous route produced high safety and tolerability particular for peanut allergy.<sup>(49-51)</sup> However, it has been required ongoing studies for longer-term effectiveness.

In conclusion, food allergy has influences over children's lives in many aspects, including the risk of life-threatening experiences, malnutrition, and psychological problems. Two major clinical managements are patient education and immunotherapy. Improving quality of life in children with food allergy requires patient education and cooperation among care givers and pediatric allergists. Immunotherapy is a promising intervention for preventing severe allergic reactions and inducing tolerance to food allergens.

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# ผลกระทบของการแพ้อาหารต่อคุณภาพชีวิตของเด็ก

พญ.ภัค เต็มบุญนาท

การแพ้อาหารเป็นปัญหาสุขภาพที่สำคัญของทุกประเทศทั่วโลกโดยเฉพาะในประชากรเด็ก งานวิจัยพบว่า การแพ้อาหารส่งผลกระทบอย่างมากต่อคุณภาพชีวิตของเด็กและผู้เลี้ยงดู บทความนี้มีวัตถุประสงค์ในการนำเสนอและอภิปรายผลกระทบของการแพ้อาหารต่อคุณภาพชีวิตของเด็กในด้านการดูแลสุขภาพภาวะทุพโภชนาการ และปัญหาสุขภาพจิต รวมถึงวิธีการดูแลรักษาที่มีประสิทธิภาพ ซึ่งประกอบด้วย การให้ความรู้กับผู้ป่วยในการหลีกเลี่ยงอาหารที่แพ้และการปฏิบัติตัวเมื่อเกิดอาการแพ้ และการรักษาการแพ้อาหารด้วยวิธีการปรับภูมิคุ้มกัน (food allergen immunotherapy) เพื่อให้ผู้ป่วยมีคุณภาพชีวิตที่ดีขึ้น

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หน่วยภูมิแพ้ ภูมิคุ้มกันและโรคหอบหืด กลุ่มงานกุมารเวชกรรม สถาบันสุขภาพเด็กแห่งชาติมหาราชินี