

Prevalence of Adverse Food Reactions and Food Allergy among Thai Children

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Introduction: Adverse food reactions are not uncommon among children. Several of these reactions are IgE-mediated. Prevalence of adverse food reactions among Thai children has not been fully explored.

Objectives: The objectives of the study are (1) to determine prevalence of adverse food reactions and food allergy among Thai children, (2) to determine types of foods producing such reactions, (3) to study clinical manifestations of these reactions, and (4) to study various risk factors relating to food adverse reactions among these children.

Material and Method: A total of 656 Thai children were surveyed (188 subjects between 6 months to 3 years of age and 468 subjects between 3 to 6 years of age). The study was a cross-sectional study. Parents answered food allergy questionnaire. Families with children reporting adverse food reactions were invited to participate in further investigation for food allergy with skin prick testings and food challenges.

Results: Forty-one of 656 children (6.25%) were reported to experience prior food reactions by questionnaire survey. Common foods reported to be the cause of reactions among younger children were cow's milk and eggs whereas seafood, particularly shrimp, was the most commonly reported food for older children. Three of 21 children underwent food challenge had positive challenges. Skin prick tests to incriminated food were all positive in these three children. Significant risk factors for developing adverse food reactions among these children were personal allergic history (OR = 4.89, CI 2.2-10.75) and family history of allergy (OR = 2.87, CI 1.42-5.89).

Conclusion: Prevalence of adverse food reactions using food allergy questionnaire was 6.25%. From a limited number of those with positive food challenges, prevalence of IgE-mediated food allergy among this group of Thai children is estimated to be 0.45% (CI 0.01-0.8%).

Keywords: Food allergy, Food hypersensitivity, Children, Seafood, Cow's milk, Egg

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Adverse reactions to foods are not uncommon among general populations both among adults and children. In a prospective follow up of 480 consecutive newborns to their third birthdays in the United States by Bock, 28% of children reported experiences of adverse food reactions⁽¹⁾. Similarly, Young et al, from the UK demonstrated that up to 20% of adults reported reactions from consumption of one type of food or another⁽²⁾. These reported reactions, however, included

food intolerance (non-immunologically mediated) and immunologically mediated reactions (mostly IgE-mediated reactions). For instance, in the study by Bock, only 8% had positive open food challenges with reactions classified as being type-I hypersensitivity reactions⁽¹⁾. The diagnosis of type-I, IgE-mediated food allergy is made by positive skin prick testing to extracts of suspected foods and by positive subsequent food challenges, most commonly by double-blind, placebo-controlled challenges⁽³⁾. Prevalence of food allergy peaks in the early infancy (1-2 years of age) and declines thereafter^(4,5). Food allergy is commonly found among young infants and those with atopic

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tendencies such as atopic dermatitis⁽⁶⁾ and asthma⁽⁷⁾. Common foods producing reactions in infants include milk, egg, and soybean among young infants and peanut, wheat and seafood among older children^(7, 8). Prevalence of food allergy among Caucasian children has been estimated to occur between 1-20%⁽⁹⁾ with approximately 2.5% of newborn infants experiencing hypersensitivity reactions to cow's milk within their first year of life⁽⁷⁾. Prevalence of food hypersensitivity among Asian Children has been less well studied. In a food registry in Japan reported by Ebisawa et al, 1522 immediate food hypersensitivities were reported among Japanese children⁽¹⁰⁾.

It is the objective of our study to study the epidemiology of food hypersensitivity among young Thai children with ages ranged between 6 months to 6 years. To accomplish such goal, a food hypersensitivity questionnaire was used. Families with children reporting to experience adverse food reactions were invited to participate in further testing with allergy prick skin testings and by food challenges. The result of the investigation forms the report of this paper.

Material and Method

Subjects

656 children from 3 months to 6 years of age in Bangkok were surveyed. Younger children (3 months to 3 years of age, 188 subjects) were randomly selected from well baby clinics of the Siriraj Hospital, Bangkok, Thailand, whereas older children (3 to 6 years of age, 468 subjects) were randomly recruited from three kindergartens in Bangkok. All children were well at the time of survey.

Food allergy questionnaire

A 16-item food allergy questionnaire was locally designed with assistance from a world-renowned food allergy specialist (Allen Bock, Denver, USA, personal communication). In addition, demographic data and allergic history of the patients and the family were recorded. The questionnaire was answered by the parents. Families with children reporting adverse food reactions were invited to participate in further diagnostic investigations (i.e., food allergy skin prick tests and food challenges).

Food allergy skin prick test

Standard allergy skin prick tests to commercial food extracts (Center Laboratories, Port Washington, NY) were performed either on back or forearms with histamine (10 mg/ml) and saline controls⁽¹¹⁾.

Wheal and flare reaction were read at 15 minutes. Wheal reactions of equal to 3 mm or greater than saline control were considered positive reactions.

Food challenges

Food challenges were performed when children were completely well and had discontinued antihistamines for at least 72 hours before challenges. Open food challenges were performed by introduction of suspected foods with close observation for any systemic symptoms and signs such as urticarial rash, vomiting, diarrhea, etc. Foods were gradually increased at 1/2 hour interval until a normal serving portion was reached. Standard record form for food reactions were used for follow up to 24 hours after the initial introduction of foods⁽³⁾. Positive reactions were classified as early reaction if occurring within 6 hours and as late reactions if occurring between 6 to 24 hours. Any doubtful reactions to open challenge was followed by a standard double-blind, placebo-controlled food challenge⁽¹²⁾.

Results

Among 656 children surveyed, 188 were in the younger age group (28.6%) whereas 468 were in the older age group (71.3%). There were 287 girls (43.7%) and 369 boys (56.2%).

Positive responses to food questionnaires were documented in 41 children (6.25%). Among these 41 children, 12 were below 3 years of age (12/188, 6.38%) and 29 were between 3-6 years of age (29/468, 6.19%). Details of types of foods causing reactions, amount of foods consumed, types of reactions, time after consumption to the onset of symptoms and symptoms are shown in Table 1.

Cow's milk and eggs were the two most common foods reported causing reactions among young children (5/12 patients-41.6% for each food). Seafoods, accounted for the largest majority of reactions among older children (13/29, 44.8%). Shrimp, in particular, is the most common type of seafood responsible for 27% of serious systemic reactions (swelling of lips and eye, and urticaria). There were equal numbers of reactions from both egg yolk and egg white.

As can be seen from Table 1, the amount of food ingested was relatively small. Together with a relative short duration of time requiring for the development of reaction, most of these reactions were presumably IgE-mediated. This was substantiated by types of reactions comprising immediate responses

Table 1. Type of foods and amount ingested to cause reactions among 41 children. Time from ingestion to onset of reactions as well as reported symptoms and signs were also shown

Type of food	No of Children		Amount of food	Time required	Symptoms and signs
	6 mo-3 year (%)	3-6 year			
1. Cow s milk	5	6	2-8 oz	2 hours-2days	- vomiting, abdominol pain, diarrhea
2. Soybean	-	1	4 oz	-	- vomiting, diarrhea abdominol pain
3. Egg yolk	3	3	1/2-1 egg	30 mins-2 hours	- mouth swelling, vomiting, diarrhea
4. Egg white	2	2	1 bite-1 egg	15 mins-4 hours	- vomiting, diarrhea - mouth and eye swelling
5. Duck	-	1	10 gram	-	- generalized rash
6. Fish	-	2	5 gram	-	- generalized rash
7. Shrimp	-	8	1-3 shrimp	10 mins-4 hours	- chest tightness - mouth and eye swelling urticaria
8. Other seafood (Crab, mollusks squids)	-	3	5-10 grams	15 mins-3 hours	- mouth swelling, generalized rash
9. Junk food	-	2	4-5 pieces	30 mins	- generalized rash
10. Other foods (wheat, peanut MSG)	2	1	-	-	- abdominal pain, vomiting

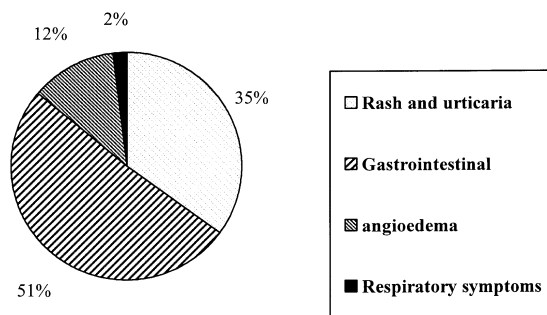


Fig. 1 A pie-diagram showing symptoms of 41 patients with reported adverse food reactions breaking down according to body systems

such as abdominal pain, vomiting, diarrhea, lip and eye swelling, chest tightness and urticarial rash.

Frequencies of symptoms and signs reported is illustrated in Figure 1.

Gastrointestinal symptoms such as nausea, vomiting and diarrhea were the most common symptoms reported (51%) followed by skin rashes (including urticaria) in 35% of cases. Angioedema

involving lips and face were observed in 12%. There was only one patient (2%) reporting chest tightness after consumption of shrimp.

As show in Table 1, most reactions (25/49) were classified as early reactions whereas only 7 children had reactions occurring later than 6 hours (from milk).

Among 49 children reported adverse reactions to foods, only 22 families gave consent to food allergy skin testing and only 20 families agreed to let their children undergo open food challenge test. Only 3 of the 22 children underwent skin testing gave positive reactions. All of whom had positive open food challenges with clear objective signs of IgE-mediated reactions as detailed in Table 2. There was one child with a history of reaction to cow's milk extract and open food challenge in this child resulted in instant vomiting. Subsequent double-blind, food challenge in this subject gave a negative reaction. Extrapolating from the data of positive challenges (and positive skin testings) among the three children out of the total of 656 children, the prevalence of IgE-mediated food reactivity among this population is estimated to be 0.45% (CI 0.01-0.8%).

Table 2. Details of children who gave positive responses to both allergy skin testings and open food challenges

Case No.	Age	Type of food giving positive SPT	Challenged food	Reaction	Time at onset
1.	5 years	shrimp, beef, crab, fish	shrimp	maculopapular rash around mouth, lips	1 hour
2.	5 1/2 years	shrimp, crab, shell-fish	shrimp	nasal congestion, angioedema of eyelids	30 mins
3.	10 months	egg white, egg yolk, cow s milk, wheat	egg white	urticaria on face and trunk	5 mins

We also analyzed the data to determine risk factors among those reporting food reactions (from food questionnaire). Factors including personal and family history of having concomitant allergic disorders (such as asthma, allergic rhinitis, urticaria, drug and food allergy), breast feedings, maternal avoidance milk and egg during pregnancy and time of introduction of supplement food were considered. Among these factors, personal and family history of having concomitant allergic diseases were significant risk factors for having adverse food reactions with OR = 4.89 (CI = 2.2-10.75) and 2.87 (CI = 1.42-5.89) respectively.

Discussion

Our study is the first cross-sectional and wide-scale survey of adverse food reactions in Thailand. The prevalence of adverse food reactions from food questionnaire from this study, although low, concurs with a low prevalence of food allergy (3.89%) among older children (6-12 years of age) surveyed in Bangkok⁽¹³⁾. The number is much lower than that observed among children attending a pediatric clinic in the USA⁽¹⁾ and among adults in Great Britain⁽²⁾. Perhaps, reasons for low prevalence observed in our study were small sample size, particularly among younger children and to our strict criteria for wellness of the child during the enrollment (utilizing well-baby clinic as the site of recruitment). If we included those patients with atopic dermatitis and those with other illnesses related to food reactions (such as gastrointestinal and dermatological manifestation), the prevalence would have been higher.

Since most of the reactions reported in our study occurred within a short-period of time after food ingestion, it is believed that most of the reactions in this study were classified as IgE-mediated hypersensi-

tivity. As in other parts of the world, milk and egg were among the most common foods reported to cause reactions among younger Thai children⁽⁷⁾. Due to cultural practice of introducing fish and other seafood early during childhood, most common foods causing reactions among older children were seafood as in countries with surrounding sea coasts such as the Scandinavia⁽¹⁴⁾. In our study, apparently crustaceans (particularly shrimps) are the most common seafood reported to cause adverse food reactions among older children.

It is intriguing that reaction to peanut was not reported from any participant in our study. As stated earlier, it is possible that we dismissed sick young children and those with atopic tendency from our study. However, lack of peanut reaction among young children was observed in the report from Singapore despite relatively common allergy skin reactions to peanuts among Singaporean children⁽¹⁵⁾. It is also could be due to the fact that peanut is introduced somewhat later in life and to relative scarcity in using peanut butter as ingredients for daily food for infants and children within the Asean region. Most peanuts consumed within this part of the world were prepared by boiling rather than roasting and it has been demonstrated that peanut allergens could have been made more allergenic by roasting than boiling^(16, 17).

Despite the fact that our group has earlier reported a large number of children with wheat anaphylaxis^(18, 19), there was no reported reaction to wheat within this study group. It is again could be due to aforementioned reasons and perhaps wheat hypersensitivity is not a common reaction despite its severe morbidity.

Due to relatively low numbers of children underwent food challenge in this study, prevalence of

IgE-mediated reactions could not be accurately estimated. Nevertheless, the ratio of positive challenges per complaints had been reported to be approximately 30-50%^(3, 8); the ratio of which concurs with the one observed in our study.

In conclusion, in this limited survey, prevalence of adverse food reactions from food allergy questionnaire was 6.25% and the proportion of IgE mediated reaction confirmed by food challenge was 13.63% in children with positive history. Thus, adverse reactions to food among Thai children are not uncommon. A larger scale survey and perhaps collaborative study from pediatric practices in Thailand is needed for confirming the finding in this study.

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อัตราการกระจายของปฏิกิริยาที่ไม่พึงประสงค์จากอาหารและการแพ้อาหารในเด็กไทย

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คำนำ: ปฏิกิริยาที่ไม่พึงประสงค์จากอาหารและการแพ้อาหารพบได้บ่อยในประชากรเด็ก ปฏิกิริยาเหล่านี้ส่วนใหญ่เป็นชนิด IgE-mediated reaction ความชุก (Prevalence) ของปฏิกิริยาเหล่านี้ในเด็กไทยยังไม่ได้รับการศึกษาเท่าที่ควร

วัตถุประสงค์: การศึกษานี้เป็นการศึกษาเพื่อ 1. หาความชุกของปฏิกิริยาอันไม่พึงประสงค์จากอาหารและการแพ้อาหารในเด็กไทย 2. ศึกษาถึงชนิดของอาหารที่ทำให้เกิดปฏิกิริยาเหล่านี้ 3. ศึกษาถึงอาการแบบต่างๆ ที่เกิดขึ้น และ 4. ศึกษาถึงปัจจัยเสี่ยงที่มีความเกี่ยวข้องกับการเกิดปฏิกิริยาเหล่านี้

วัสดุและวิธีการ: ผู้ศึกษาได้ทำการสำรวจเด็กไทย 656 คน (เด็ก 188 คน มีอายุระหว่าง 6 เดือน ถึง 3 ปี และเด็ก 468 คน มีอายุระหว่าง 3-6 ปี) การศึกษาทำโดยให้ผู้ปกครองตอบแบบสอบถามที่ได้สร้างขึ้นใหม่สำหรับสำรวจปฏิกิริยาจากอาหาร สำหรับครอบครัวที่รายงานว่า มีบุตรที่มีปฏิกิริยาต่ออาหาร จะได้รับการเชิญชวนให้เข้าร่วมการศึกษาต่อไป ด้วยการตรวจภูมิแพ้ทางผิวหนังและการตรวจแบบให้รับประทานอาหาร (food challenges)

ผลการศึกษา: จากเด็กทั้งหมด 656 คน มีจำนวน 41 คน (ร้อยละ 6.25) ที่ผู้ปกครองรายงานว่าเคยมีปฏิกิริยาจากอาหารอาหารที่ทำให้เกิดอาการได้บ่อยในเด็กเล็กได้แก่ นมวัวและไข่ไก่ ในขณะที่อาหารทะเล (โดยเฉพาะกุ้ง) เป็นอาหารที่ทำให้เกิดอาการที่ไม่พึงประสงค์ได้บ่อยในเด็กโต ในกลุ่มเด็กจำนวน 21 คนที่ได้รับการตรวจที่เกิดอาการจากการตรวจโดยการรับประทานอาหารที่แพ้ (food challenge) มีเด็ก 3 คนที่เกิดปฏิกิริยาจากการรับประทานอาหาร เด็กทั้ง 3 คนนี้ให้ผลบวกในการตรวจภูมิแพ้ทางผิวหนังต่ออาหารที่ทำให้แพ้ ปัจจัยเสี่ยงที่ทำให้เกิดอาการที่ไม่พึงประสงค์จากอาหารได้แก่ ประวัติภูมิแพ้ในตัวของเด็กเอง (OR=4.89, CI 2.2-10.75) และประวัติภูมิแพ้ในครอบครัว (OR=2.87, CI 1.42-5.89)

สรุป: อัตราการกระจายของปฏิกิริยาอันไม่พึงประสงค์จากอาหารในเด็กกลุ่มที่ได้รับการศึกษาในครั้งนี้เท่ากับร้อยละ 6.25 จากการศึกษานี้พบว่าอัตราการกระจายของปฏิกิริยาชนิด IgE-mediated reaction มีค่าเท่ากับร้อยละ 0.45 (CI 0.01-0.8%)
