

Food allergy among children under 12 years of mothers attending a well baby clinic at an AL-Eskan primary health care center, Makkah Al-Mokarramah, 2013

Nehal Khalid Damanhori

Alnawaria Primary Health Care Center, Ministry of Health, Makkah, Kingdom of Saudi Arabia.
Correspondence to: Nehal Khalid Damanhori, E-mail: nanakd1@hotmail.com

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Abstract

Background: Food allergy results in rapid onset of multisystem and potentially life-threatening complications in the acute phase, as well as it can severely impact a child's lifestyle in the long term.

Objectives: To determine the prevalence and factors associated with food allergy among children (<12 years) of mothers attending a well baby clinic at an Al-Eskan Primary Health Care (PHC) center, Makkah Al-Mokarramah, Kingdom of Saudi Arabia (KSA), 2013.

Materials and Methods: A cross-sectional descriptive study was carried out that included all mothers with children (<12 years) attended the well baby clinic at Al-Eskan PHC center during the study period (September, 2013), Makkah Al-Mokarramah, KSA. A self-administered questionnaire was used for data collection. It was developed by the researcher, using up to date sources of National Institute of Allergy and Infectious Diseases, as well as by reviewing previous studies. The questionnaire consists of five parts: demographic data for the mothers and children, family history of allergy, nutritional history of children, presence of food allergy, and detailed questions about the child affected by food allergy.

Results: The study included 182 mothers; their ages ranged between 19 and 47 years with a mean of 31 years and standard deviation of 6.6 years. Majority of them (82.4%) were Saudi. The prevalence of food allergy among children under the age of 12 years was 22.5%. Children with family histories of eczema (37.5%) or food allergy (38.1%) reported significantly higher rate of food allergy; 41.4% of affected children were in the age group 1–5 years and more than half of them (51.2%) were females. Almost two-thirds of them (63.4%) had the first attack of food allergy at the age of 1 year or less. Past-food allergy, asthma, eczema, and allergic rhinitis were reported among 75.6%, 31.7%, 14.6%, and 14.6% allergic children, respectively. Itching was the most common reported symptom (53.7%) followed by skin rash (48.4%) and skin dryness (26.8%). The common reported allergic foods were milk, egg, and banana (31.7%) followed by mango and chocolate (26.8%), strawberry (19.5%), and fish (12.2%).

Conclusions: The prevalence of mother-reported food allergy among children under 12-year old in the well baby clinic at the Al-Eskan PHC center, Makkah Al-Mokarramah, KSA, was 22.5%. The most common reported foods responsible for allergy were milk, egg, and banana. Skin symptoms were the commonly reported symptoms among the affected children. Family history of food allergy and eczema as well as introducing bottle feeding immediately after delivery were found to be significantly associated with higher rates of food allergy among children. History of allergy after first bottle feeding as well as history of allergy after weaning were significantly associated with food allergy in children.

KEY WORDS: Food, allergy, children, prevalence, risk factors, Saudi Arabia

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Introduction

The prevalence and burden of diseases associated with food allergies (FAs) are increasing throughout the world; however, they seem to increasingly affect countries with a formerly low prevalence. Consideration and diagnosis of FAs is important as it could affect a child's diet and care at school

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and home, and is recognized to be associated with anxiety of parents, family, and care takers.^[1]

Food allergy, defined as an adverse immune response to food proteins, affects as many as 6% of young children and 3%–4% of adults. Food-induced allergic reactions are responsible for a variety of symptoms involving the skin, gastrointestinal tract and respiratory tract, and might be caused by IgE-mediated and non-IgE-mediated (cellular) mechanisms. Although any food can provoke a reaction, relatively few foods are responsible for the majority of significant food-induced allergic reactions; these are milk, egg, peanuts, tree nuts, fish, and shellfish.^[2]

Data from nationally representative health and health care surveys indicate increases in reported FA estimates among US children.^[3] Most FA is acquired in the first or second year of life. The peak prevalence of FA is approximately 6%–8% at 1 year of age, although rates as high as 10% have been reported.^[2–5]

Most children lose their sensitivity to most allergenic foods (egg, milk, wheat, soya) within the first 5 years of life.^[6] Early studies of peanut allergy suggested that clinical reactivity was persistent.^[7] However, it is now realized that up to one-quarter of patients become tolerant over time.^[8] Seafood allergy is considered to be persistent in most cases.^[9–11]

Dietary factors can influence the prevalence of FAs in a population. For example, peanut allergy is one of the most common FAs reported in the USA,^[12] whereas seafood is a common food allergen in Hong Kong and sesame a major food allergen for children in Israel.^[13,14]

As a practical approach to the evaluation of FA in a patient, two broad types of FA can be distinguished based on the timing of the clinical reaction in relation to the food exposure. Clinical features include immediate reactions occurring within minutes (usually up to 2 h) of ingestion (e.g., anaphylaxis, angioedema, urticaria, and vomiting) and delayed reactions that occur over hours to days. These delayed reactions commonly involve the gastrointestinal tract (e.g., food protein-induced enteropathy, proctocolitis, or eosinophilic oesophagitis) or skin (eczema).^[15]

Food-induced anaphylaxis is defined as an IgE-mediated hypersensitivity reaction to an ingested food that results in rapid onset of multisystem and potentially life-threatening symptoms. FA is the most common cause of anaphylaxis in children, and by most estimates, the prevalence of FAs in children living in developed nations is increasing. Anaphylaxis has been defined as an acute allergic reaction involving two or more organ systems or hypotension alone.^[16]

Data from the anaphylaxis registry of German-speaking countries with regard to the provoking allergens and treatment modalities of anaphylaxis in children and adolescents show that within the registered cases the most frequently affected organ systems for children and adolescents were the skin (89%) and the respiratory tract (87%) followed by symptoms of the cardiovascular system (47%) and the gastrointestinal tract (43%).^[17] Although any food can cause anaphylaxis, the most commonly implicated foods for severe allergic reactions are peanuts, tree nuts, fish, and shellfish.^[18]

Asthma and environmental allergies are more common in children with FA. Approximately 30% of children with FA have asthma and respiratory allergy, compared with 10% of children without FA.^[19] There also appears to be a significant association between atopic dermatitis and food hypersensitivity, with approximately 40% of infants and young children with moderate-to-severe atopic dermatitis demonstrating FAs.^[20,21]

The correct diagnosis of FA should decrease the incidence of adverse food reactions that are a result of true FAs and help to prevent the unnecessary exclusion of foods that are safe and that should be eaten as part of a normal, healthy diet. The history should help determine whether the mechanism is IgE mediated or non-IgE mediated. If the history is suggestive of IgE-mediated reactions, the child or young person should be offered a skin-prick test (SPT) and/or blood tests for specific IgE antibodies to the suspected foods and likely co-allergens. Atopy patch testing should not be used. Oral food challenges may also be necessary to aid the diagnosis. These should not be performed in primary care if an IgE-mediated reaction is likely. If the history is suggestive of non-IgE-mediated reactions, elimination and reintroduction of the suspected allergen is recommended. The suspected allergen should be eliminated from the diet and reintroduced after 2–6 weeks of elimination. A recurrence of symptoms on reintroduction is necessary to confirm the diagnosis. Children and young people with severe systemic reactions should be referred to secondary care and the reintroduction of the suspected allergen may need to take place in that setting.^[22]

This study aimed to assess the magnitude of FA and its associated factors as a health problem among children.

Materials and Methods

A cross-sectional descriptive study was conducted in Al-Eskan Primary Health Care (PHC) center, Makkah Al-Mokarramah, Kingdom of Saudi Arabia (KSA). In Makkah Region, there are 10 hospitals and 76 governmental (MOH) PHC centers, 30 of them in Makkah proper (Makkah Al-Mokarramah) (Saudi Arabia Ministry of Health official website http://www.moh.gov.sa/Lstatistics/indi_phc.html). Al-Eskan PHC center is a training center providing all PHC services including well baby clinics.

All mothers of children (<12 years) attending the well baby clinic at Al-Eskan PHC center during the study period (September, 2013), Makkah Al-Mokarramah, KSA, constituted the study sample provided that they had infants <1 year of age ($n = 182$).

A self-administered questionnaire was used for data collection. It was developed by the researcher using the following sources: up to date resources of National Institute of Allergy and Infectious Diseases and by reviewing previous studies. It was validated by three consultants; one immunologist, one consultant in family and community medicine, and one consultant in allergy and family medicine. It consisted of demographic data (of mother and child), family history of

Table 1: Association between family history of allergic diseases and food allergy among children under 12 years

Family history of allergic diseases	Food allergy		χ^2 (<i>p</i> -value)
	Yes N = 41 N (%)	No N = 141 N (%)	
Family history of Eczema			
Yes (<i>n</i> = 40)	15 (37.5)	25 (62.5)	6.59 (0.010)
No (<i>n</i> = 142)	26 (18.3)	116 (81.7)	
Family history of food allergy			
Yes (<i>n</i> = 42)	16 (38.1)	26 (61.9)	7.58 (0.006)
No (<i>n</i> = 140)	25 (17.9)	115 (82.1)	
Family history of contact allergy			
Yes (<i>n</i> = 11)	4 (36.4)	7 (63.6)	0.216*
No (<i>n</i> = 171)	37 (21.6)	134 (78.4)	
Family history of urticaria			
Yes (<i>n</i> = 7)	2 (28.6)	5 (71.4)	0.494*
No (<i>n</i> = 175)	39 (22.3)	136 (77.7)	
Family history of asthma			
Yes (<i>n</i> = 57)	16 (28.1)	41 (71.9)	1.46 (0.227)
No (<i>n</i> = 125)	25 (20.0)	100 (80.0)	
Family history of drug allergy			
Yes (<i>n</i> = 14)	4 (28.6)	10 (71.4)	0.390*
No (<i>n</i> = 168)	37 (22.0)	131 (78.0)	
Family history of eye allergy			
Yes (<i>n</i> = 18)	7 (38.9)	11 (61.1)	3.06 (0.080)
No (<i>n</i> = 164)	34 (20.7)	130 (79.3)	
Family history of allergic rhinitis			
Yes (<i>n</i> = 58)	18 (31.0)	40 (69.0)	3.53 (0.060)
No (<i>n</i> = 124)	23 (18.5)	101 (81.5)	
Family history of angioedema			
Yes (<i>n</i> = 7)	3 (42.9)	4 (57.1)	0.191*
No (<i>n</i> = 175)	38 (21.7)	137 (78.3)	
Family history of anaphylaxis			
Yes (<i>n</i> = 1)	1 (100)	0 (0.0)	0.225*
No (<i>n</i> = 181)	40 (22.1)	141 (77.9)	

* Fisher's exact test.

allergy, nutritional history of child, presence of FA, and detailed questions about the child affected by FA and included time of first affection, number of affected siblings, route of sensitization, time needed to develop the reaction, history of allergy, clinical features of allergic reaction, type of allergenic food, and associated factors.

The self-administered questionnaires were given to the target mothers by the researcher before or after leaving the well baby clinic, where measurements such as height, weight and head circumference were performed by the responsible nurse for the clinic, and then questionnaires were collected from them by the researcher again before they went to the vaccination room.

Written permissions from the higher authorities from the Ministry of Health, the Joint Program of Family Medicine, Makkah, and director of Al-Esban PHCC were obtained before conducting the study. Permission from each eligible mother to participate in the study was also taken (both verbal and written consents were taken from each participant).

Data entry and analysis was carried out by using Statistical Package of the Social Sciences (SPSS), version 20. For descriptive statistic, frequency and percentage were used. Continuous variables were presented as means and standard deviation. A χ^2 -test was used to test for the association and/or difference between categorical variables. Fisher's exact test was applied for small frequencies instead χ^2 -test. A *p*-value of <0.05 was considered statistically significant.

Results

The study included 182 mothers, their ages ranged between 19 and 47 years with a mean of 31 years and standard deviation of 6.6 years. Majority of them (82.4%) were Saudi.

Almost a third of participants reported family history of allergic rhinitis (31.9%) or asthma (31.3%) whereas family history of eczema or FA was reported by 22% and 23.1%

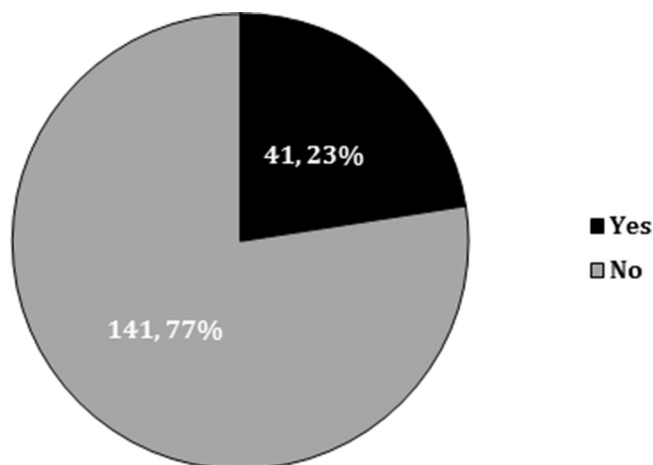


Figure 1: Prevalence of food allergy among children (<12 years), Makkah Al-Mokarramah, 2013.

of them. Family history of eye allergy or contact allergy was reported by 9.9% and 6% of them. Table 1 shows that children with family history of eczema reported significantly higher rate of FA compared to those without such family history (37.5% versus 18.3%). This difference was statistically significant ($p = 0.010$). Similarly, children with family history of FA reported significantly higher rate of FA compared to those without such family history (38.1% versus 17.9%). The difference was statistically significant ($p = 0.006$). Family history of contact allergy, urticaria, asthma, drug allergy, eye allergy, allergic rhinitis, angioedema, and anaphylaxis was not significantly associated with FA among children under 12 years.

From Figure 1, it is evident that the prevalence of FA among children under 12 years in Al-Eskan PHC center, Makkah Al-Mokarramah, is 22.5%. There was no significant association between nationality of mothers and history of FA among their children younger than 12 years.

More than 40% of affected children (41.4%) were in the age group between 1 and 5 years. Almost two-thirds of them (63.4%) had the first attack of FA at the age of 1 year or less whereas 26.8% had it for the first time between the age 1 and 3 years. Slightly more than half of them (51.2%) were females. Among 19.5% of them, other siblings were also affected. The majority of FA cases (95.1%) got it through eating whereas 7.3% and 2.4% got it through smelling or contact, respectively. Among slightly more than half of FA cases (51.2%), the duration between food intake and appearance of allergic symptoms ranged between 10 min and 1 h whereas among 48.8% of them this duration was in days. Almost a third of allergic children (29.3%) were breastfed whereas almost two-thirds of them (63.4%) were mixed feeders (breast milk and bottle). The majority of them (85.4%) reported intake of colostrums. Slightly more than half of them (51.2%) reported bottle feeding immediately after delivery. Among those who used bottle for feeding, 15.8% reported allergy after first bottle feeding. More than half of the

Table 2: Symptoms of food allergy among affected children ($n = 41$)

Clinical symptoms	Categories	Frequency	Percentage
Skin symptoms	Itching	22	53.7
	Dryness	11	26.8
	Rash	20	48.4
	Urticaria	6	14.6
	Angioedema	2	4.9
Chest symptoms	Chest tightness	3	7.3
	Dyspnea	8	19.5
	Cough	4	9.8
Nasal symptoms	Rhinorrhea	3	7.3
	Sneezing	3	7.3
	Nasal obstruction	4	10.3
	Nasal itching	2	5.1
Eye symptoms	Tearing	3	7.3
	Eye itching	1	2.4
	Eye redness	3	7.3
	Eyelid swelling	1	2.4
Digestive symptoms	Abdominal pain	4	9.8
	Diarrhea	5	12.2
	Nausea and vomiting	7	17.1
Anaphylaxis		0	0.0

allergic children (55.3%) changed the type of bottle feeding. Regarding weaning age, it was 4 months among 36.6% of them whereas it was 6 months among 41.5% of them and more than 1 year among only 7.3% of them. Allergy after weaning was reported among 9.8% of allergic children. Past-food allergy, asthma, eczema, and allergic rhinitis were reported among 75.6%, 31.7%, 14.6%, and 14.6% of allergic children, respectively.

As shown in Table 2, itching was the most common reported symptom (53.7%) followed by skin rash (48.4%) and skin dryness (26.8%). Dyspnea, nausea, and vomiting and urticaria were reported among 19.5%, 17.1%, and 14.6% of allergic children, respectively. Anaphylaxis was not reported among allergic children.

As shown in Figure 2, the most common reported allergic foods were milk, egg, and banana (31.7%) followed by mango and chocolate (26.8%), strawberry (19.5%), and fish (12.2%).

Gender of children was not significantly associated with FA. As shown in Table 3, first bottle feeding immediately after delivery was significantly associated with higher rate of FA among children compared to starting first bottle feeding from days to months after delivery or no bottle feeding at all (38.2% versus 16.5% and 12.5%, respectively). The difference was statistically significant ($p < 0.005$). History of allergy after first bottle feeding as well as history of allergy after weaning were significantly associated with lower rate of FA ($p = 0.013$ and 0.024). FA decreased by heating of food among 7.3%

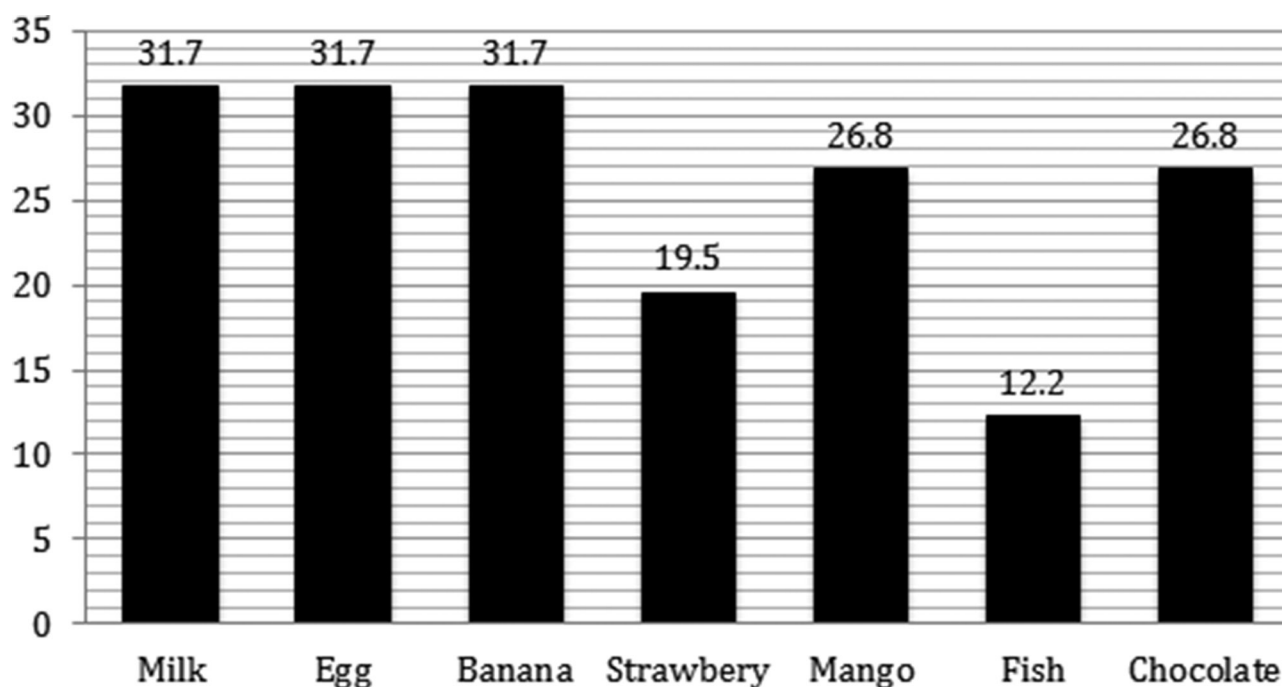


Figure 2: Common food stuffs causing allergy among children (<12 years), Makkah Al-Mokarramah, 2013.

cases of allergy. Five allergic children (12.2%) reported refusing of allergic food. FA increased with increasing the amount of allergic food among 39% of allergic children whereas it increased by increasing physical activity or intake of drugs/herbs among 4.9% and 2.4% of them, respectively [Table 4].

Discussion

The prevalence of FA among children in this study was 22.5%, which appears small but expected. This might be due to the selection of age group (children 12 years and less) as a study population, which was chosen to see the variation of prevalence between the different age groups. Comparing with other studies, it was found that the prevalence of FA in the current study was higher than that reported in the USA (3%–8%)^[23] as well as figures reported in studies conducted in China,^[24] Thailand,^[25] Turkey,^[26] Israel^[14], and Sweden^[27]. This could be attributed to the use of blood tests to narrow the suspected cases in those studies. However, this prevalence is close to figures reported in other studies.^[28–31]

In the study conducted in Makkah Al-Mokarramah, KSA, 2009, a retrospective evaluation of a specific IgE (sIgE) test results to common food allergens of 80 patients with suspected FA was done. The study group was selected from all pediatric and adult patients referred due to allergic disorders with the suspicion of FA to Al Borg Laboratory, Makkah Al-Mokarramah. sIgE food test were evaluated as negative in eight (10%) patients.^[32] The top five food allergens

were cocoa (22; 27.5%), peanuts (14; 17.5%), egg white (12; 15%), milk (10; 12.5%), and strawberry (9; 11.3%), which is almost similar to that found in our study. Another similarity with the present study is that it was conducted in the same study area (Makkah Al-Mokarramah). However, that study disagrees with the current study in the chosen study population as it included different study groups, including various ages (children and adults) and persons with several underlying allergic conditions (atopic dermatitis, urticaria/angioedema, and bronchial asthma). Another disagreement with that study is the method used (IgE testing) as tests used to support the diagnosis for the suspected cases.

In Jeddah, the prevalence of clinical sensitivity to food was 29% among asthmatic patients,^[33] which is higher than that found in the current study although it was conducted in the same country. These disagreements might be attributed to the chosen high-risk population (asthmatics) and larger sample size (1341 asthmatic patients). Another disagreement is that the setting of the study, as the study conducted in Jeddah was performed in the hospital setting in contrast to our study that was conducted in a primary care setting. El-Rab^[34] in a study of 217 patients with asthma, rhinitis, and urticaria in Riyadh, Saudi Arabia, found 17.5% to have specific IgE antibodies to various foods, which is almost matching with the prevalence reported in the current study. However, its slightly lower rate might be attributed to the use of blood tests that narrowed the diagnosis for the suspected cases. Also it is similar to the current study in that the most common food allergens found were milk and eggs. However, in

Table 3: Factors associated with food allergy among affected children

Associated factors	Food allergy		χ^2 (p-value)
	Yes N = 41 N (%)	No N = 141 N (%)	
Main method of feeding			
Breastfeeding (n = 37)	12 (32.4)	25 (67.6)	
Bottle feeding (n = 12)	3 (25.0)	9 (75.0)	2.80
Mixed (n = 133)	26 (19.5)	107 (80.5)	(0.247)
Colostrum intake			
Yes (n = 147)	35 (23.8)	112 (76.2)	0.725
No (n = 35)	6 (17.1)	29 (82.9)	(0.396)
Home smoker			
Yes	16 (28.6)	40 (71.4)	1.69
No	25 (19.8)	101 (80.2)	(0.193)
Mode of delivery			
Normal vaginal (n = 131)	27 (20.6)	104 (79.4)	0.98
Caesarean section (n = 51)	14 (27.5)	37 (72.5)	(0.321)
First bottle feeding			
Immediately after delivery (n = 55)	21 (38.2)	34 (61.8)	
From days to months after (n = 103)	17 (16.5)	86 (83.5)	11.25
Not taken at all (n = 24)	3 (12.5)	21 (87.5)	(0.004)
Allergy after first bottle feeding (n = 158)			
Yes (n = 10)	6 (60.0)	4 (40.0)	
No (n = 148)	32 (21.6)	116 (78.4)	0.013*
Changing type of bottle feeding			
Yes (n = 72)	21 (29.2)	51 (70.8)	1.90
No (n = 86)	17 (19.8)	69 (80.2)	(0.169)
Weaning age			
4 months (n = 90)	15 (16.7)	75 (83.3)	
6 months (n = 69)	17 (24.6)	52 (75.4)	
8 months (n = 13)	3 (23.1)	10 (76.9)	
1 year (n = 6)	3 (50.0)	3 (50.0)	10.86
>1 year (n = 4)	3 (75.0)	1 (25.0)	(0.028)
Allergy after weaning			
Yes (n = 6)	4 (66.7)	2 (33.3)	
No (n = 176)	37 (21.0)	139 (79.0)	0.024*

* Fisher's exact test

Table 4: Factors affecting allergy among allergic children (n = 41)

	Frequency	Percentage
Food allergy decrease by heating of food	3	7.3
Child's refusal of allergic food	5	12.2
Food allergy increase with:		
Physical activity	2	4.9
Increase amount of food	16	39.0
Intake of drugs, herbs or vitamins before or after intake of allergic drugs	1	2.4

contrast to the current study, they used patients with different allergic diseases as a study population. In a study conducted among schoolchildren aged 6–9 years in Al-Ain city, UAE, the

used tool was physician's diagnosis of FA through questionnaires answered with their parents, which is similar to the tool used in our study and similarly it needed more evaluation to confirm the suspected cases. The prevalence of FA among those children was 8%.^[35] In contrast to our study, the study population was the primary school children (aged 6–9 years). In a study conducted to determine the prevalence, importance, and the order of frequency of IgE-mediated food allergens among infants and young children (0–2 years) in Israel, patients with suspected IgE-mediated food allergic reactions were recruited for further evaluation (detailed questionnaire and SPT). The overall prevalence of clinically relevant IgE-mediated food allergic reactions among these patients is estimated to be 1.2%. Anaphylaxis was the presenting symptom in 14 of 78 (18%) including 6 sesame-induced cases. A history of other atopic diseases was reported in 27 (35%) patients. In

addition, 22 (28%) had a history of atopy in first-degree family members, which is in agreement with the current study.^[14] The similarity with the current study is that it was done in the same setting (primary care setting). However, the prevalence of allergic cases according to that study is lower than that found in our study, and this is might be again as a result of using the confirmatory blood tests. Another disagreement with the current study is the chosen age group as a study population, as that study targeted the infants and young children (age 1–2 years), which was appropriate as most of acquired FA is during first and second years of life.

A study in Turkey conducted to investigate the prevalence and characteristics of IgE-mediated FAs established the prevalence of FA using double-blind, placebo-controlled food challenge (DBPCFCs). The estimated prevalence of parental-reported IgE-mediated FA was 5.7% (156/2739) (95% confidence interval (CI), 4.83%–6.57%). The confirmed prevalence of IgE-mediated FA by DBPCFC in 6- to 9-year-old urban schoolchildren living in the eastern Black Sea region of Turkey was 0.80%,^[26] which is in disagreement with the prevalence found in the current study, and this again might be attributed to the diagnostic tool used (blood tests and challenge test). However, using such test (challenge test) in primary care setting is warranted and need to be performed in specialized clinic and with specific precautions.

In Lithuania, a study was conducted to assess the prevalence and pattern of self-reported adverse reactions to food and FAs among primary schoolchildren in Vilnius followed by an objective confirmative laboratory analysis of blood samples for the diagnosis of FA. FA was diagnosed in 16.4% of children, which is almost matching to the prevalence of the current study. However, in contrast to our study, boys had experienced FA more frequently than girls.^[36]

According to the current study, most of the affected children (41.4%) were in the age group between 1 and 5 years and almost two-thirds of them had the first attack at the age of 1 year or less, which is similar to the other studies conducted in the USA.^[2–5]

In the present study, the most commonly reported foods responsible for allergy were milk, egg, and banana. In the USA, peanut allergy was one of the most common FAs reported^[12] whereas seafood was a common food allergen in Hong Kong,^[13] and sesame was a major food allergen for children in Israel.^[14] In Turkey, beef was found to be one of the most common food allergens.^[27] Similar to the current study, the most common FAs in the Saudi study (which was conducted in Makkah Al-Mokarramah, at Al-Borj Laboratory) were milk and egg. However, cocoa and strawberry were unexpected to be on the top of the list according to that study.^[32] Recently, allergy to cocoa was found due to the milk part of it, which is again similar to the result of our study. In Riyadh, IgE antibodies specific for different foods were detected in 17.5% of food allergic patients. Reactions to peanut (22.6%), egg white (14.5), and cow's milk (12.9%) were very prominent.^[34] Another study of patients attending an outpatient allergy clinic in Riyadh, Saudi Arabia, found 13% to be sensitized to date

fruits.^[37] In a study conducted in the UAE among schoolchildren aged 6–9 years, it was found that eggs, fruits, and fish were the main allergies reported.^[35] In China, egg and cow's milk were the most common food allergens, which caused skin and gastrointestinal symptoms in most infants.^[38]

Asthma and environmental allergies are more common in children with FA. In the current study, more than 31% of children with FA had asthma and 14.6% had allergic rhinitis or eczema. The same has been reported by most of US studies.^[19] In Jeddah, the prevalence of clinical sensitivity to food was 29% among asthmatic patients.^[33] Similarly, the prevalence in Riyadh was 17.5% among patients with different allergic diseases (asthma, urticaria, and allergic rhinitis).^[34]

In the current study, skin was the most commonly reported affected system (itching (53.7%) followed by skin rash (48.4%) and skin dryness (26.8%)). Dyspnea, nausea, and vomiting and urticaria were reported among 19.5%, 17.1%, and 14.6% of allergic children. Similarly, in China, a study conducted among children and teenagers revealed that skin symptoms were the most commonly reported symptoms among those affected children (36.1% had urticaria and/or angioedema and 22.4% had eczema exacerbations). Combined gastrointestinal symptoms accounted for 20.8% cases. In contrast to the current study, anaphylaxis was reported among 15.6% of them,^[24] which is in disagreement with findings of the present study as we did not find any case of anaphylaxis. This could be explained partly by underdiagnosis and underreporting.

In this study, a significant association between family history of FA and FA was found. Similarly, in a study conducted in Al-Ain city (UAE) included primary school children, significant associations were found between childhood FA and a history of personal allergy (atopic dermatitis, asthma, or allergic rhino-conjunctivitis) or immediate family members with FA or other allergic diseases.^[39]

Regarding associated factors, according to the present study, cesarean delivery was reported among almost one-third of children affected by FA. However, it was not significantly associated with FA. Similarly, in a study conducted in Norway, there was no increased risk for FA in the first 2 years of life in children delivered by caesarean section.^[31]

Some allergy prevention guidelines favor 4–6 months of exclusive breastfeeding, compared with the WHO's recommendation of 6 months, because of potential benefit from tolerance to solid foods during a theoretical 'window of opportunity' between 4 and 6 months of age.^[40–42] Some specialists have proposed a compromise: starting to introduce solid foods at 4 months of age while continuing to breast-feed until an infant is at least 6 months of age.^[43] One recent prospective cohort study showed that introducing solid foods before 6 months of age was associated with decreased cases of asthma, allergic rhinitis, and atopic sensitization at 5 years of age.^[44] The same study reported that the total duration of breastfeeding was more important in preventing these allergic conditions than exclusive breastfeeding. In accordance with these findings, the present research proved that most patients

found with delayed weaning to 4–6 months and it was not associated with higher rates of FA predicted after entry of the first solid food during this period, which was statistically significant. More researches need to be conducted to confirm these findings. An article published in 2013 by the American Academy of Allergy, Asthma and Immunology has similarly focused on breastfeeding for 4–6 months of age and the introduction of complementary foods during the same interval in preventing allergy.^[45]

In the present study, introducing bottle feeding immediately after delivery and its relation with the development of FA was discussed. However, further researches are needed to compare different types of formulas and their relations with more allergic cases.

Among important limitations of this study, we relied on mother's history, which could lead to over- or underestimation of the prevalence. In addition, due to limited resources, diagnosis of FA was not confirmed by laboratory investigations (serum IgE).

Conclusions

The prevalence of mother-reported FA among children under 12 years in the well baby clinic at Al-Eskan PHC center, Makkah Al-Mokarramah, KSA, was 22.5%. The most common reported foods responsible for allergy were milk, egg, and banana. Skin symptom was commonly reported symptoms among affected children. Family history of FA and eczema as well as introducing bottle feeding immediately after delivery were found to be significantly associated with higher rates of food-allergic children. History of allergy after first bottle feeding as well as history of allergy after weaning were significantly associated with higher FA in children.

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