Original Article

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Prevalence of food allergy in nursery and kindergarten children in Samsun

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Summary

Aim: In recent years, the frequency of food allergy in children has gradually increased. Food allergy affects growth, development and quality of life adversely. There is no enough research in the preschool age group in which food allergy is observed more frequently. In this study, we investigated the prevalence of food allergy in nursery and kindergarten children living in Samsun.

Material and Method: Nursery and kindergarten children living in Samsun were included in this study. A standardized self-administered questionnaire on food allergy was handed out to 2390 parents. We achieved a response rate of 53.5%. The parents of children with suspected food allergy were called by phone to learn detailed history.

Results: The prevalence of food allergy in nursery and kindergarten children in Samsun province was found to be 7.7% (99 subjects). 51.5% of 99 subjects who were found to have food allergy were male. There were no differences between the mean age of children with FA (5.03±1.0) and the healthy children (5.17± 0.86). The prevalence of FA in the three-year-old group was lower than the other age groups. The most common allergic foods were hen's egg (25.3%) and chocolate (21.2%), foods additives (1.2%), strawberry (9.2%), cow milk (7.1%) and nut (4.1%). The most commonly reported systemic reactions against foods were related with skin (53.5%) and gastrointestinal systems (31.4%).

Conclusions: The prevalence of FA was similar to our country and the Asian countries, but lower than the European and American countries. In preschool children with recurrent skin and gastrointestinal tract symptoms, FA should be kept in mind. *(Turk Arch Ped 2013; 48: 288-293)*

Key words: Food allergy, nursery and kindergarten children, prevalence, Samsun

Introduction

Currently, the prevalence of food allergy (FA) is gradually increasing especially in developed Western countries (1,2). This increase has been related with causes including change in diet contents (high rates of antioxidants, fats and high-energy foods), preperation methods of foods (fried, baked or boiled nut), delayed oral contact, maternal and infant diet, contact by topical ways and use of antacids (3,4).

The diagnosis of food allergy is tried to be made by clinical history, physical examination and laboratory tests. Suspicious patients are determined by food exlusion test, food specific IgE (sIgE) response and skin prick test and the diagnosis is made by double-blind placebo controlled food challange which is the gold standard test. While the prevelance of food allergy is high in infants and preschool period (%4-8), it decreases as the age gets older and regresses to approximately 4% in adulthood (5,6). Food allergy may cause to asthma and atopic rhinitis in the advanced ages (7). Studies show that approximately 30% of parents think that their children have food allergy (4).

FA may be observed with different rates depending on nutritional habits and environmental conditions in different

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countries and regions. Turkey is one of the countries where FA is observed with a low rate (8). The rate of mothers who think that their children have FA has been found to be 5.7% in our country. Double-blind placebo controlled food challange test (DBPCCT) was performed in those who had a positive skin prick test (SPT) (33.1%) and FA was found only in 0.8% (8).

Most studies related with food allergy include children above the age of 10 and adults. The preschool period during which food allergy occurs with the highest rate has generally stayed in the background. We could not find any study including the preschool period. In this study, we aimed to determine the prevalence and epidemiological properties of food allergy in nursery and kindergarten children in the center of Samsun province.

Material and Method

This study was conducted within the limits of the province of Samsun in 2009 between January and March. According to the Turkish Statistics Institute data a total of 27 401 children in the age group of 3-6 years live in the center of Samsun province. Our study region is similar to the study region of Orhan et al. (8) in terms of cultural and geographical structure. Food allergy tend to decrease with age (1). In the light of the highest prevelance reported by Orhan et al. (8) (6,8%) and considering a predicted prevalence of 7%, an error margin of 1% and a confidence intrerval of 95% we found that 2280 children would be sufficient. A total of 35 private nurseries and 16 kindergardens were determined within the limits of the province. A total of 2390 children were reached 1271 of whom attended private nurseries in these schools and 1119 of whom attended schools which were dependent on the national Education Directorate. Consent was obtained from the Provincial National Education Directorate Research and Assessement Commission of the governorship of Samsun for the study. Approval was obtained from On dokuz Mayıs University Medical Faculty Local Ethics Committee (with the number of 2009/93 and date of 01.29.2010) for the study.

The study was conducted in three phases.

1st Phase: Standard questionnaire and consent forms were handed out with the assistance of school teachers to be filled out by parents to determine children with FA in nurseries and kindergartens and collected one week later.

Demographic properties were questioned primarily in the questionnaire. It was asked if the child had any complaints in two hours after consuming any food. If the answer was yes, it was questioned which food was taken, which findings were observed [skin findings (peeling, rash, sweating, pruritus etc..), nasal findings (running, pruritus, erythema), respiratory findings (cough, wheezing, dyspnea), ophthalmological findings (redness, itching, watering), gastrointestinal findings (GI) (abdominal pain, vomiting, diarrhea, nausea), laryngeal findings (dysphagia, dysphasia), cardiovascular system findings (tacycardia, hypotension), pallor, sweating, loss of consciousness], which food led to occurence of the findings, if the same symptoms recurred when the same food was taken later, how many times the complaints recurred in the last one year and if a physician made a diagnosis of food allergy. Correspondence addresss was asked from those who answered yes to the questions.

2nd Phase: The questionnaires were assessed and the children with a suspicion of food allergy were determined.

3rd phase: Parents who wished to contact with us and reported their phone numbers were called by phone and interviewed. Detailed interrogation in terms of food allergy was performed. In the second questionnaire questioning, the mother or father was interviewed. Address information, delivery mode and birth weight, period of breastfeeding and consangunity status were recorded. The questionnaire questions which included “Against which food do you think your child has food allergy?, How many people with food allergy are there in your family? Has your child ever been referred to a physician because of food allergy?, At what age did food allergy develop in your child for the first time? How was the diagnosis of food allergy made for your child?, Have you ever awakened with the following complaints in the night?, Have you ever had itching in your skin or palate? If yes, how many times?, Does your child or any member of your family have one or more of the following diseases: hay fever, asthma, eczema (skin diseases), urticaria, migraine (headache), colitis (continuous diarrhea)?, Has your child ever had erythematous, raised, itching rash on his/her skin?, Has your child ever had swelling in his/her face, neck, arms or legs?, Does your child have abdominal distension, flatulence or malaise after eating?” were asked on phone using a language which could be understood by the family. Findings related with the skin, respiratory system, GIS and cardiovascular system were interrogated in detail.

Statistical evaluation

Descriptive statistical analyses of the data belonging to the patients were performed using SPSS 15.0 for Windows program. The predicted prevalence of food allergy was accepted to be 7%, error margin was considered 1% and confidence interval was considered 95% (8). Chi-square

Table 1. Age and gender distribution of the children included in the study

	Total	Food allergy	Healthy	
	(n=1280)	(n=99)	(n=1181)	p
Gender				
Female (%)	46,4	48,5	46,2	0,74
Male (%)	53,6	51,5	53,8	
Age	5,04±0,99	5,03±1,0	5,17±0,86	0,17

test was used for the difference between the groups in terms of food allergy. A p value below 0.05 was considered statistically significant.

Results

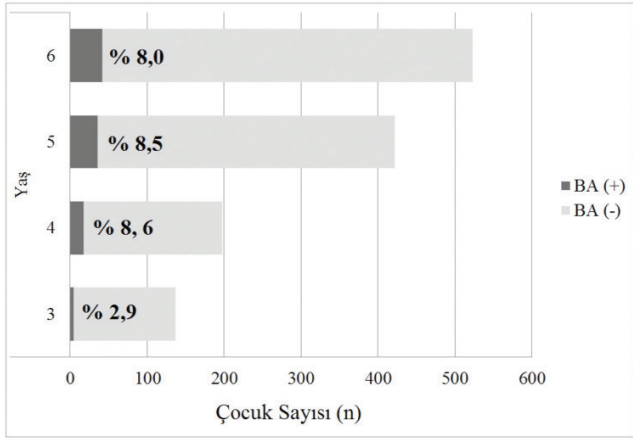
Among 2390 questionnaires handed out, 1280 (53.5%) were completed appropriately and included in the study. 762 (59.5%) of the children who participated in the questionnaire were from nurseries of the Ministry of National Education and 518 (40.5%) were from private kindergartens. Age and gender distributions of the children are shown in Table 1.137 (10.7%) of the children were three years old, 198 (15.5%) were four years old, 422 (33%) were five years old and 523 (40.9%) were six years old. 173 (13.6%) of the parents reported that their child had food allergy findings. 40 of these (3.1%) were excluded, since causes (allergic rhinitis, frequent upper respiratory tract infections, asthma, atopic dermatitis) other than food allergy were predominant. Food allergy was considered in 99 (7.7%) of the remaining 133 (10.3%) children. The parents were called by phone and detailed information was obtained.

4.0% of the children with food allergy were three years old, 17.1% were four years old, 36,3% were five years old and 42.4% were six years old. Food allergy was present in 2.9% of the children who were three years old, in 8.5% of the children who were four years old, in 8.5% of the children who were five years old and in 8.0% of the children who were six years old (Figure 1). It was found that complaints related with food allergy started before the age of three in 57.9% of the children (Table 3). The foods which were most commonly reported to lead to food allergy were egg (25.3%) and chocolate (21.2%) (Figure 2).

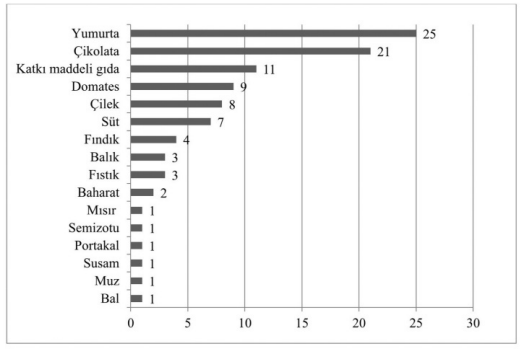
75.8% of the children who had food allergy had skin findings with erythema and itching, 10.1% had cough, 7.1% had nasal symptoms including runny nose and sneeze, 3% had mucosal involvement with itching and redness in the tounge and lips, 8.1% had nausea, 7.1% had vomiting and diarrhea and 10.1% had abdominal pain. Findings related with the skin and GIS were reported with the highest frequency. Findings involving multiple systems were present in 42.5% of the children (Table 2).

A diagnosis of FA was made previously by a physician in 53.5% of the children. It was found that no treatment was administered in 69.7%, antihistaminic drugs were given in 28,3% and steroid was given in 2% when the children were symptomatic. In one of the children who had egg allergy, urticarial eruption occured following combination vaccine. 29.6% of the children who had food allergy had not referred to any healthcare facility before.

In the last one year, the complaints did not recur in 25.3% of the children, recurred for one time in 15.1%, for two times in 19.2%, for three times in 20.3% and for four times or more in 20.2%.



Picture 1. Food allergy rates of the children according to the distribution of age



Şekil 2. Foods found as allergens

Table 2. Findings in children with food allergy

Finding	n (%)
Skin findings	53 (53,5)
Skin + gastrointestinal system findings	31 (31,4)
Skin + respiratory findings	5 (5,1)
Skin + nasal + respiratory findings	4 (4,0)
Gastrointesitnal findings	4 (4,0)
Skin + nasal findings	2 (2,0)
Nasal + Respiratory system findings	1 (1,0)

Table 3. Time of onset of the complaints in the children

Time of onset of the complaints	Number of the children, n (%)
0-6 months	2 (3,5)
6-12 months	3 (5,3)
1-3 years	28 (49,1)
3-6 years	24 (42,1)

Discussion

Food allergy is the immune response which develops against certain foods or food additives. Certain foods including milk, egg, peanut, nut, fish, shellfish, soya and wheat lead to 90% of these reactions (9,10). When allergic reaction develops against these foods, various reactions may be observed around the mouth and lips ranging from itching to death. FA in children tend to decrease with advancing age in contrast to adults (9).

While there are many epidemiological studies on other allergic diseases including asthma, atopic dermatitis and allergic rhinitis, the number of studies related with FA is limited in our country and in the world (8,910,11,12). Food allergy most frequently occurs in the early childhood and the data related with this period are insufficient. Since there are difficulties in performing diagnostic tests and findings are based on clinical observation rather than laboratory values, the diagnosis of FA is difficult and thus investigators head towards older age groups. This study is a clinical study which reflects the prevalence of FA in nursery and kindergarten children aged between 3 and 5 years in Turkey by way of parental reporting.

There are studies showing that the prevalence of FA is increasing markedly in the world and especially in developed countries. In USA, it was reported that FA was present with a rate of 3.9% in 3 milliom children aged below 18 years considering National Health Interview Survey (NHIS) 2007 data and it was found that the prevalence of FA decreased as the age advanced (10,13). It was observed that there was no significant difference between girls and boys in terms of FA frequency. The frequency of food allergy was found to be 1.2-11% for milk, 0.7-7% for egg, 0-2% for peanut and fish and 0-10% for shellfish (9).

Studies have reported substantially different FA rates (Table 4). McBride et al. reported the prevalence of FA reported by parents to be 5-30% in the comprehensive EuroPrevall birth cohort study conducted in 9 European countries which covered the years of 2005-2010 (4). In other studies on the prevalence of food allergy which used a questionnaire, Orhan et al. (8) reported the prevalence to be 5.7% in 3500 school children aged between 6 and 9 in Eastern Black Sea region, Roehr et al. (14) reported the prevalence to be 31.4% in 2354 children aged between 0 and 17 years in Germany and Osterballe et al. (15) reported the prevalence to be 16.6% in individuals aged between 0 and 22 years. In these three studies, the prevalence was found to be 0.8%, 3.5% and 3.3%, respectivley after skin prick test and DBPCCT were performed (16). Differences may be determined between studies because of non-standard questions in questionnaire forms, inclusion of different age groups, different return rates of questionnaire forms and different consciousness and perception states of communities in terms of diseases. On the other hand, substantially different prevalence rates are noted in different communities even if the diagnosis is supported with laboratory methods. Many factors including geographic conditions, nutritional habits and ages of exposure to foods may lead to these differences (5,17).

Table 4. Comparison of prevalence values in the study

	Number of patients (n)	Age group	Questionnaire (%)	SPT, sIgE or DBPCFT (%)
Orhan, Turkey, 2009 (8)	3500	6-9	5,7	0,8
NHIS, ABD, 2007 (13)	3 milyon	0-18	--	3,9
Roerh, Germany, 2004 (14)	2354	0-17	31,4	3,5
Osterbella, Denmark, 2005 (15)	1834	0-22	16,6	3,3
Gelincik, Turkey, 2007 (16)	11816	18-80	9,4	0,3
Obeng BB, Ghana, 2011 (17)	1714	5-16	11	5
Lao-araya M, Tayland, 2012 (20)	452	3-7	9,3	1,1
Bock, ABD, 2000 (21)	480	0-3	28	3,9
Cafferalli, Italy, 2011 (22)	900	5-14	10,5	-
Chen J, China, 2011 (23)	477	0-12	11,3	3,8
Our study	1280	3-6	7,7	---

NHIS: National Health Interview Survey
sIgE: Specific immünoglobulin E
SPT: Skin prick test
DBPCFT: Double-blind placebo-controlled food test

Since there was an influenza epidemic (H5N1) in Samsun during the time when the study was performed and the families did not send their children to school because of the bias which developed in the community, return rates of the questionnaire forms handed out were lower than expected (53.5%). In the literature, return rates in survey studies are generally above 65% (8,16). A low return rate may decrease the strenght of the study to represent the population. However, it was observed that the number of questionnaire forms collected was at an acceptable level with a 7% prevalence prediction, 95% confidence interval and 1.3% error margin. Another problem is the suspicion that the ones who fill out the questionnaire form are only families who carry a concern about disease. However, the fact that the prevalence of FA in the study (5.7%) performed by Orhan et al. (8) which had similar geographic and cultural properties to our region was close to the prevelance found in our study (7.7%) decreased our suspicions about this subject.

In a comprehensive study conducted in an adult age group in İstanbul, the rate of individuals who were thought to have FA was 9.5%, but the actual prevalence of FA was found to be only 0.1% (16). The most important cause for the variance was evaluated to be the varienace in the age groups included in the study. In the study performed by Orhan et al. (8), the most important cause of FA was found to be chocolate (31.6%). In our study, chocolate allergy (21.2%) was in the second order. While the most commonly reported food was fruit in the study performed by Roerh and Osterbella (14,15), it was egg (25.3%) in our study. Egg was in the 5th order with a rate of 6.6% in the study of Roerh (14) and in the 3rd order with a rate of 13.3% in the study of Osterbella (15).

The prevalence of food allergy and food types may show variance between rural and urban areas belonging to the same region (17,18). Although the geographic region was similar, the rate of meat allergy was found to be 14.8% in the study performed by Orhan et al. (8). It was interesting that nut allergy was found with a substantially low rate both in our study and in the study of Orhan et al (8) according to the questionnaire results, although nut is produced most intensively in this the geographic region. In USA, mothers who had a history of atopy were instructed not to eat nut during pregancy and their children were instructed not to eat nut in the first year of life between 1998 and 2000 and it was found that peanut allergy increased two-fold compared to previous periods (19). In England, peanut allergy is observed with a 10-fold higher rate in Jews compared to Jews living in Israel. Peanut is given after the age of 6 months in Israel, while it is given after the age of one in England (20). In the Black Sea region, oral contact with nut propably occurs earlier compared to other regions. Thus, early contact might have caused to early development of tolerance to nut.

Although clinical findings related with food allergy show variance, it is observed that skin and GIS findings are predominant in most studies (8,14,15). Roerh et al. (14) reported the most common findings as skin findings (33,2%), GIS findings (17.9%), oral allergy syndrome (14,1%) and nasal symptoms (11.6%). Osterbella et al. (15) reported the most common findings as skin findings (78.3%), GIS findings (11.6%), oral allergy syndrome (6.6%) and nasal symptoms (3.3%). In the study performed by Obeng et al. (17) which included 1717 children in Gana, it was reported that the children living in rural and urban areas were sensitive to different foods and the most common findings included vomiting and diarrhea, numbness and swelling in the extremities, headache, itching and redness.

Food allergy may lead to severe life-threatening systemic reactions. Although deaths due to food anaphylaxis occur rarely, they may be prevented with sufficient education (21). The information level of teachers related with anaphylaxis in our country is substantially low (22). Especially families and teachers should be educated about the use of ephinephrine needle and they should be informed about what to do in emergencies. It should be emphasized to physicians administration of intramuscular adrenaline is required during the initial intervention in emergencies.

Our study had some important limitations. The fact that the questions in the questionnaire form was extended to a wide period covering all times until that day might have caused the families to remember some conditions as allergy. Similarly, it was observed that FA could be present in only 57% of 173 families who thought that their children had FA. On the other hand, a diagnosis of FA was made by a physician in only 53 of 99 children who were thought to have FA. The fact that standard survey questions have not been developed yet and the high rate of families who did not answer to our questionnaire form in our study may prevent obtaining healthy results. It would be not possible to determine parents who do not recognize the presence of FA in their children with survey studies. Gastrointestinal system findings may become symptomatic hours after food intake. On the other hand, this process may occur even in days in non-IgE mediated or mixed type FA (1,6) . Family response rates may be 10-fold higher compared to actual FA rates. Thus, the time was limited to first two hours considering that a wider coverage time of the questionnaire would increase the possibility of false-positive history. The frequency of food allergy is expected to decrease with advanced age. In our study, the distribution of the children according to age was not homogeneous. The three and four year- old children constituted only 26.2% of the total. This resulted in an outcome such as FA developed more frequently as the age advanced. Increasing the number might lead to better understanding of the difference between age groups. On the other hand, it was observed that the majority of the children exhibited clinical findings in the first three years of life, when the ages at FA onset were considered. Because of high cost of diagnostic methods of FA, the most reasonable method in prevelance studies is to determine potential children with questionnaire forms and by testing these children. In

many studies, 30-fold differences between family reports and actual prevelances of FA have been observed (4,8,23). Therefore, children with a suspicion of FA should be reevaluated with laboratory methods including SPT and DBPCCT to determine the prevelance of FA more accurately in our region.

Conclusively, the prevalence of FA in the province of Samsun was found to be similar to the other regions of our country and Far East countries and lower than Europe and America. Children with a suspicion of FA should be reevaluated with laboratory methods including SPT and DBPCCT to determine the prevelance of FA more accurately in our region. Recurrent skin and GIS findings in pre-school children should be a warning in terms of food allergy. The foods which most commonly cause to allergy vary according to regions and countries. Each region should determine the foods which most commonly lead to allergy and make specific new arrangements for laboratory methods including SPT and specific IgE.

Conflict of interest: None declared.

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