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Epidemiology of Food Allergies in Children with Asthma in Gorgan, Northern Iran: a Cross-Sectional Population-Based Study

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Abstract

Background: Food allergy is a risk factor for asthma. In this study, we investigated the prevalence of food allergy in children with asthma.

Methods: This cross-sectional study included 200 children with asthma selected through available sampling; and was conducted in Taleghani Children's Referral Hospital, Gorgan, Northern Iran, from 2014 to 2016. Greer® (USA) Skin Prick test (SPT) was used to recognize food allergens in all participating children. A questionnaire recorded children's demographics. Statistical analysis was based on t-tests and chi-square using SPSS 16.

Results: The children's mean age was 10.29 ± 4.06 years. One hundred three children (51.5%) were females. The SPT of garlic, banana, kiwifruit, soybean, tomato, peanut, wheat, and walnut was significantly different between age groups ($p<0.05$). No statistically significant differences in food allergens were found between different genders, different age groups, and between the two groups of breastfeeding only and breastfeeding plus complimentary food. Allergy to curry powder, peanut, garlic, egg, and pepper was detected to be significantly higher than to other food allergens, ($p<0.05$). Atopia was detected in approximately all participants (99.5%).

Conclusion: Atopia seems to be an associated condition in asthmatic children. Allergy to curry powder, peanut, garlic, egg, and pepper, was significantly higher than other food allergies in children with asthma in Gorgan, Northern Iran.

Key Words: Allergen, Allergy prevalence, Asthma, Comorbidity, Food hypersensitivity.

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1- INTRODUCTION

Asthma is a common health problem that affects all age groups. It is the most prevalent chronic disease of childhood; epidemiological studies have shown that up to 20% of children between the ages of six and seven experience an episode of wheezing per year; in adults, the overall incidence is reported to be up to 21% (1-4).

Food allergy is characterized by an abnormal immune response leading to the development of symptoms upon exposure to that food. Children with asthma are several times more likely to develop severe allergic reactions to foods than children without asthma; the prevalence is 1-35% according to previous reports (5-8).

In addition, children with allergies to more than one kind of food are more likely to be admitted to the emergency room or hospitalized (9-14).

The most common foods that cause allergies in children are eggs, milk, peanuts, tree nuts, certain fruits including kiwi, and certain edible seeds like sesame and poppy seeds as well as soybeans, wheat, and rice (15, 16).

Asthma is worse in children with food allergy; so a better asthma control may require attention to food allergy (2, 14, 17).

The current study aimed to determine the prevalence of food allergies in Iranian asthmatic children to provide data for further necessary plans to improve the quality of life of this population.

2- MATERIALS AND METHODS

2-1. Sampling

In this cross-sectional study, based on calculating sample size formula, and through available sampling, 200 subjects aged less than 18 years were selected to be diagnosed by a pediatric allergist for asthma. The diagnosis was conducted based on the 2015 Global Initiative of Asthma (GINA) guideline (18). All samples were recruited from the Taleghani Children's Referral Hospital, Gorgan, Iran, between March 2014 and September 2016.

2-2. Inclusion and exclusion criteria

Inclusion criteria were the presence of clinical signs and symptoms of asthma for at least four weeks, not taking antihistamine-containing drugs for at least one week before the test so that the patient's positive control test with histamine shows positive results, and absence of dermographism. Those patients who did not fit the mentioned criteria were excluded.

2-3. Procedure

Patients diagnosed with asthma for at least 3 months who met the inclusion criteria were recruited in the study. They (patients or their parents as needed) completed a questionnaire containing demographic items and underwent a skin test.

The main food allergens included in the Greer® skin Prick test (SPT) panel (USA) were garlic, banana, kiwifruit, fish, pepper, cow milk, egg, soybean, tomato, peanut, wheat, sesame, walnut, shrimp, and curry. After cleaning the skin with alcohol, a small drop of each allergen agent was placed on the skin. If the diameter of flare and wheels were greater than 10 and 3 mm, respectively, within 15-20 minutes, the test was considered positive (2); bumps from skin reaction usually subsided within a few hours. The student t-test and chi-square in SPSS 16 were used for data analysis and a p-value<0.05 was considered significant.

3- RESULTS

The study was performed on 200 children with asthma with a mean age of 10.29± 4.06 (range 1-18 years); 103 children (51.5%) were females. Thirty-four children (17%) were exclusively breastfed. The mean birth weight of the participating

children was 3071.5±224.7 grams, ranging from 2700 to 3700 grams.

Three (1.5%) children had a family history of hyperreactive airway disease (HRAD), 4 (2%) patients had a history of food allergy, 28 (14%) patients had a history of urticaria, 19 (9.5%) patients had a history of eczema, 65 (32.5%) patients had a history of perennial allergic rhinitis, 18 (9%) patients had a history of seasonal allergic rhinitis, 25 (12.5%) patients had a history of mixed allergic rhinitis, and only 1 patient (0.5%) had no family history of atopic rhinitis.

The details of SPT results by age, gender, breastfeeding, and birth-weight are given in **Table 1**.

Table-1: Details of Prick skin test

Variable	Gender (%)		Breastfeed (%)		Age (years) (%)		Birth-weight (Kilograms) (%)		Total (%)
Allergens *	F	M	Yes	No	10≤	10>	3>	3≤	
Garlic	18(56.3)	14(43.8)	5(15.6)	27(84.4)	9(28.1)	23(71.9)	19(59.4)	13(40.6)	32 (16)
Banana	8(61.5)	5(38.5)	4(30.8)	9(69.2)	11(84.6)	2(15.4)	8(61.5)	5(38.5)	13(6.5)
Kiwifruit	8(57.1)	6(42.9)	2(14.3)	12(85.7)	4(28.6)	10(71.4)	7(50)	7(50)	14(7)
Fish	4(28.6)	10(71.4)	1(7.1)	13(92.9)	6(42.9)	8(57.1)	9(64.3)	5(35.7)	14(7)
Pepper	8(34.8)	15(65.2)	3(13)	20(87)	8(34.8)	15(65.2)	16(69.6)	7(30.4)	23(11.5)
Cow milk	3(75)	1(25)	1(25)	3(75)	2(50)	2(50)	3(75)	1(25)	4(2)
Egg	17(53.1)	15(46.9)	6(18.8)	26(81.3)	14(43.8)	18(56.3)	15(46.9)	17(53.1)	32(16)
Soybean	1(14.3)	6(85.7)	2(28.6)	5(71.4)	2(28.6)	5(71.4)	3(42.9)	4)(57.1)	7(3.5)
Tomato	13(59.1)	9(40.9)	3(13.6)	19(86.4)	8(36.4)	14(63.6)	13(59.1)	9(40.9)	22(11)
Peanut	29(61.7)	18(38.3)	10(21.3)	37(78.7)	18(38.3)	29(61.7)	28(59.6)	19(40.4)	47(23.5)
Wheat	7(43.8)	9(56.3)	1(6.3)	15(93.8)	6(37.5)	10(62.5)	9(56.30	7(43.8)	16(8)
Sesame	3(50)	3(50)	2(33.3)	4(66.7)	3(50)	3(50)	2(33.3)	4(66.7)	6(3)
Walnut	13(68.4)	6(31.6)	3(1.8)	16(84.2)	8(42.1)	11(57.9)	13(68.4)	6(31.60	19(9.5)
Shrimp	1(100)	-/-	-/-	1(100)	1(100)	-/-	1(100)	-/-	1(0.5)
Curry	25(46.3)	29(53.7)	10(18.5)	44(81.5)	27(50)	27(50)	28(51.9)	26(48.1)	54(27)

* Greer® (USA) food allergens

We found that allergy to curry, peanut, garlic, egg, and pepper was significantly higher in the participating children with asthma ($p<0.05$) in comparison to non-asthmatic cases.

Some differences in SPT results were observed between the males and females, but the difference was not statistically significant for any of the studied allergens ($p>0.05$).

In terms of breastfeeding, for bananas, milkweed, soybeans, sesame, and shrimp, the difference between the two types of nutrition (breastfeeding only and breastfeeding plus complimentary food) was not significant ($p>0.05$).

The difference between the two age groups was not significant ($p>0.05$) in regard to fish, pepper, eggs, cow's milk, sesame, walnut, shrimp, and curry, but a statistically significant difference was observed in skin hypersensitivity reaction between the age groups in regard to garlic, banana, kiwifruit, soybean, tomato, peanut, wheat, and walnut ($p<0.05$).

The two birth-weight groups did not also significantly differ in none of the studied allergens ($p>0.05$).

Furthermore, we found that all children with a positive reaction to the SPT had a positive family history of atopia. Only one child (3.1%) for egg and one child (4.5%)

for tomato did not report any family history of atopia.

4- DISCUSSION

In our findings, we noted that all participants had atopia. SPT for garlic, banana, kiwifruit, soybean, tomato, peanut, wheat and walnut was statistically significant between the age groups. Breastfeeding plus complimentary food. Allergies to curry powder, peanut, garlic, egg and pepper were detected to be significantly higher than other food allergens.

Children with asthma are expected to have more food allergies than the general population; about 30% of children with moderate to severe atopic dermatitis and 10% of children with asthma have food allergies (19, 20). In the literature, like our results, allergic rhinitis is the most frequently reported allergic disease coexisting with asthma (21, 22). In a previous study, 66-90% of children with asthma had an allergic condition other than asthma (23-25). In our study, nearly all of the participants had a history of allergies; the most common was allergic rhinitis (65%). Allergies to eggs and cow's milk were more common in young children, while allergies to fish and peanuts were more common in older children (26). However, our study did not show any significant relationship between age and food allergies. A previous report stated that the most frequently allergen in children was banana (45%); their predominant symptom was wheezing (54%); SPT was detected positive in 76 cases (24.9%); family history of atopy and age at introduction of complementary nourishments were meaningfully associated with food allergy (27). In line with our results, a previous study reported that 35.9% of participants had an allergic reaction to at least one of the following foods, including wheat, rice, eggs, soybeans; milk, and peanuts; on the contrary, they showed that the prevalence of food allergy in asthmatic children is linked to atopic disease, history of allergic disease in relatives, duration of breastfeeding, age of disease onset, complementary feeding, the age of onset of asthma, birth weight, sex and consumption of pasteurized milk before the age of one year (24,28-30). In another study, no significant association between food allergy and duration of breastfeeding was detected after 6.5 years of follow-up (31). As previous studies have reported contradictory results regarding the association between asthma and breastfeeding or complementary food consumption, we made a comparison in terms of breastfeeding, based on which we found no significant relationship between food allergy and exclusive breastfeeding. Food allergies can affect both sexes. Although some previous studies have reported that food allergies develop more frequently in women, especially after puberty (34-37), we did not observe any gender-related predominance. In regard to age, some studies have reported that most cases of food allergy are developed during the second year of life, while some others have demonstrated that the occurrence of food allergies increased over time (16, 35). In the present study, no significant relationship was found between age and food allergy. According to our results, low birth weight is not associated with the development of food allergies in childhood (39); previous studies have also provided little evidence to clarify the relationship between low birth weight infants and food allergies (26, 40-42).

Our study could imply that atopia nearly always co-exists with athma in northern Iran and some of allergens mentioned above are predominantly present in asthmatic participants; these findings can help the medical system in developing the health staffs' educational programs and promoting health policies to be more alert for further measurements. In addition, our

report would provide primary data for better clinical care.

4-1. Limitations of the study

There are some limitations including lack of the participants' early childhood or perinatal allergic status. Also a larger number of participants in future studies might expand and validate our findings.

5- CONCLUSION

Children with asthma are more likely to have allergies. In addition, food allergy in children with asthma should be taken into account for optimal assessment and management of patients with asthma. Our study provided a general view on the prevalence of food allergies among children in Gorgan (Northern Iran). As mentioned in our results, allergies to curry, peanuts, garlic, eggs and pepper were more prevalent than other food allergies in children with asthma. At last, it is suggested that further studies be conducted to clarify and explain the association between birth weight and food allergy.

6- ETHICAL CONSIDERATIONS

Written informed consent was obtained from the participants' parents. All stages of the current study were performed according to the Helsinki declaration of research and approved by the local ethics committee in Golestan University of Medical Sciences, Gorgan, and Northern Iran.

(Ethics registration ID: IR.GOUMS.REC.1395.148)

7- CONFLICT OF INTEREST

None.

8- ACKNOWLEDGEMENTS

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