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THE PREVALENCE OF FOOD ALLERGY OF PATIENTS ATTENDING AL-ZAHRAA CENTER FOR ALLERGY AND ASTHMA IN BAGHDAD / AL-KARKH IN 2023

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ABSTRACT

Background: Food allergy (FA) is a growing global public health concern, characterized by immune responses to specific foods that may cause severe reactions, including anaphylaxis. Limited data exists on the prevalence and characteristics of FA in Iraq, necessitating region-specific studies to inform public health strategies. **Objectives:** To assess the prevalence, severity, types of food allergens, and associated demographic factors among patients attending Al-Zahraa Center for Allergy and Asthma in Baghdad/Al-Karkh in 2023. **Patients and Methods:** This cross-sectional study reviewed medical records of (2896) patients who attended Al-Zahraa Center in 2023. Patients underwent IgE blood testing using the POLYCHECK Allergy Diagnostic Kits. Data were analyzed for prevalence, demographic patterns (age, gender), allergen types, seasonal variation, and severity, categorized by IgE antibody concentrations. **Results:** The prevalence of FA was (22.3%), with adults (74.5%) and females (59.4%) being the most affected groups. Seasonal variation showed the highest prevalence in spring (35.13%) and the lowest in autumn (3.25%). Common allergens included meat mix (32%), banana/mango mix (31.3%), and nut mix (19%). Multi-allergen sensitivities were observed in (43.7%) of cases. Severity was categorized based on IgE levels, with higher concentrations correlating with more severe reactions. **Conclusion:** FA affects a significant proportion of patients attending Al-Zahraa Center, with distinct demographic and seasonal patterns. The findings highlight the need for targeted management strategies, improved diagnostic resources, public awareness campaigns, and allergen labeling to address the high burden of FA in Iraq effectively.

KEYWORDS: Food allergy, prevalence, Baghdad, IgE-mediated allergy, allergen sensitivity, public health.

INTRODUCTION

Food allergy (FA) is an adverse health effect resulting from a specific immune response triggered reproducibly by a particular food. It is a growing public health concern and can lead to serious, potentially life-threatening conditions like anaphylaxis, significantly impacting the quality of life.[1, 2] FA can develop at any stage of life, from childhood to old age.[3] Based on immune responses, FA is categorized into IgE-mediated, non-IgE-mediated, or a combination of both.[4] IgE-mediated FAs occur rapidly, affecting multiple organ systems and potentially leading to severe reactions like urticaria, gastrointestinal distress, and anaphylaxis, often triggered by allergens such as peanuts, tree nuts, and milk.[5, 6] Non-IgE-mediated FAs, however, involve delayed gastrointestinal symptoms and conditions like eosinophilic esophagitis (EoE) and food protein-induced enterocolitis syndrome (FPIES), while mixed reactions exhibit combined immediate and delayed symptoms, often involving atopic eczema.[7,8] The prevalence of FA varies globally, influenced by factors such as diet, environment, and healthcare practices, with higher rates in urban areas due to increased exposure to pollutants and allergens.[9] In the United States, approximately 7.6% of children and 10.8% of adults are affected, with IgE-mediated FAs being the most common type.[10] In Australia, FA prevalence is notably high in infants, with rising rates of anaphylaxis and hospital admissions for severe allergic reactions.[11] Limited data exist in Iraq; studies indicate varying prevalence rates, with significant findings in specific populations, such as patients with chronic urticaria in Baghdad, where 88% were found to have positive FA tests[12, 13] The pathophysiology of FA primarily involves an IgE-mediated immune response, where allergens activate helper T cells to produce IgE antibodies. These bind to mast cells and basophils, causing degranulation upon allergen re-exposure, releasing histamine and other inflammatory mediators.[14]

This results in symptoms ranging from mild itching to severe anaphylaxis. Advances in immunology have identified cytokines and immune dysregulation as key contributors to the severity of Fas.[15, 16] Diagnosing FA relies on a detailed medical history, elimination diets, and specific tests like oral food challenges (OFCs), skin prick tests (SPTs), and allergen-specific IgE (sIgE) testing. Emerging biomarkers and genetic studies are enhancing diagnostic accuracy and understanding of FA mechanisms.[17, 18] Management involves strict dietary avoidance of allergens, supported by patient education and access to epinephrine auto-injectors for severe reactions. Food allergen immunotherapy (FA-AIT) offers a promising treatment option, though challenges like long-term desensitization and relapse persist.[19] Recent advancements, such as the FDA's approval of omalizumab, have introduced targeted biological therapies, improving outcomes for individuals with multiple Fas.[20] The aim of study is to evaluate the incidence of food allergies among persons exhibiting allergy symptoms who attended the Al-Zahraa Centre for Allergy and Asthma in Baghdad/Al-Karkh in 2023. To evaluate the severity and classifications of FA. To assess the predominant food allergens in relation to sociodemographic variables (age and gender).

METHOD
Study Design and Setting: This cross-sectional study was conducted at Al-Zahraa Center for Allergy and Asthma in Baghdad/Al-Karkh, reviewing patient records from 2023. The center is one of two main allergy centers in Baghdad, along with an allergy center for infants at the Central Teaching Hospital of Pediatrics.

Study Population and Data Collection: From a total of 2,954 patients attending the center in 2023, 58 with incomplete data were excluded, leaving 2,896 records. Among these, 1,129 patients underwent food allergy (FA) blood testing using the POLYCHECK Allergy Diagnostic Kit, with 646 testing positive and 483 testing negative. Data included patient demographics, type and severity of allergy, and the number of allergic reactions. Key variables were classified as follows

- **Date of Attendance:** Categorized by seasons (Winter, Spring, Summer, Autumn).
- **Sociodemographic Factors:** Age (Children <12 years, Adolescents 13–18 years, Adults 19–64 years, Elderly >65 years) and gender.
- **IgE Antibody Levels:** Classified by concentration and reaction severity.
- **Type of Food Allergens:** Categorized based on a specific coding system for 20 common Iraqi food allergens.

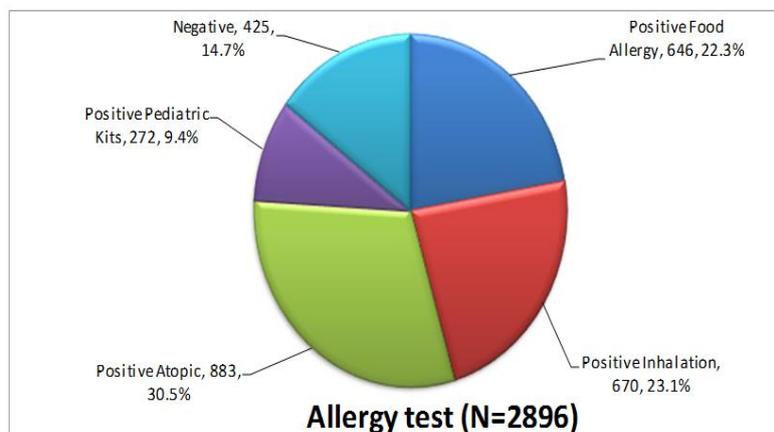**Inclusion and Exclusion Criteria**
- **Inclusion:** Records of patients diagnosed with FA across all ages and genders in 2023.
- **Exclusion:** Incomplete records and unrelated conditions.

Data Management and Analysis: Data were coded and analyzed using IBM SPSS-29. Descriptive statistics (frequencies, percentages, means, standard deviations) were presented in tables and figures. Pearson's Chi-square test, Yates' correction, or Fisher's exact test were applied for significance testing, with a p-value ≤ 0.05 considered statistically significant.

Ethical Considerations: Approval was obtained from the Ethical Scientific Committee of the Iraqi Board for Medical Specialization and Al-Zahraa Center. Data were used exclusively for research purposes and maintained anonymously and confidentially.

RESULTS
This pie chart shows the proportions of allergy types in 2896 patients who attended Al-Zahraa Center for Allergy and Asthma in 2023. 883 patients had positive for atopic allergy (30.5%) which is the largest group. 646 patients (22.3%) were positive for FA, 670 patients (23.1%) were positive for inhalation allergy, 272 patients (9.4%) were positive for pediatric kits and 425 patients (14.7%) had negative results.

Figure 1: The proportions of multiple types of allergy in 2896 patients attended Al-Zahraa Center for Allergy and Asthma in 2023.

The seasonal distribution of FA prevalence among patients at Al-Zahraa Center in 2023, with a significant difference observed across seasons. Spring shows the highest total number of patients (38.97%), with 35.13% of positive cases and 44.09% of negative cases. Autumn has the lowest attendance (4.25%), with a smaller proportion of both positive (3.25%) and negative (5.59%) cases. the distribution of FA results by age and gender at Al-Zahraa Center for Allergy and Asthma in 2023. In **children** (<12 years), out of 127 children (11.2% of the total sample), 93 (73.2%) tested positive, and 34 (26.8%) tested negative for FAs. In **adolescents** (13-18 years), among 105 adolescents (9.3%), 66 (62.9%) were positive, and 39 (37.1%) were negative. In **adults** (19-64 years), which comprises the majority of the sample with 841 individuals (74.5%), 472 (56.1%)

were positive, and 369 (43.9%) were negative. In **elderly** (≥65 years), out of 56 elderly participants (5.0%), 15 (26.8%) were positive, while 41 (73.2%) were negative. In **Males**, out of 467 males (41.4%), 253 (54.2%) tested positive, and 214 (45.8%) tested negative. In **females,** Out of 662 females (58.6%), 393 (59.4%) were positive, and 269 (40.6%) were negative. The differences in positive and negative results by age group are statistically significant ($P=0.0001$), indicating a notable variation in allergy prevalence across age categories. The gender-based differences in positive and negative results are not statistically significant ($P=0.083$). This data shows a significant association between age and FA status, but no significant difference based on gender. As in table 1.

Table 1: Prevalence of positive and negative FA in patients attended Al-Zahraa Center for Allergy and Asthma in each season in 2023 and Distribution of positive and negative FA according to ages and gender in patients attended Al-Zahraa Center for Allergy and Asthma in 2023.

Months		Total (n=1129)		Positive (n=646)		Negative (n=483)	
		No.	%	No.	%	No.	%
Winter		337	29.84%	217	33.59%	120	24.84%
Spring		440	38.97%	227	35.13%	213	44.09%
Summer		304	26.92%	181	28.01%	123	25.46%
Autumn		48	4.25%	21	3.25%	27	5.59%
P value		0.0007					
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.							
		Total (n=1129)		Positive		Negative	
		No.	%	No.	%	No.	%
Age (years)	Children (<12years)	127	11.2%	93	73.2%	34	26.8%
	Adolescent (13-18)	105	9.3%	66	62.9%	39	37.1%
	Adults (19-64)	841	74.5%	472	56.1%	369	43.9%
	Elderly (=>65years)	56	5.0%	15	26.8%	41	73.2%
	Mean±SD (Range)	33.0±16.8 (1-79)		29.8±15.6 (1-78)		37.2±17.5 (1-79)	
P value		0.0001*					
Gender	Male	467	41.4%	253	54.2%	214	45.8%
	Female	662	58.6%	393	59.4%	269	40.6%
P value		0.083					
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.							

The distribution of allergic reactions among the people with positive FA attended Al-Zahraa Center for Allergy and Asthma in 2023 (646). The data is presented in three primary groups based on the number of positive reactions: Positive (1 reaction): This category includes individuals who tested positive for a single allergen. Out of the total 646 participants, 217 (33.6%) fall into this category, indicating that a significant portion of the sample experienced only one allergic reaction. Positive (2-3 reactions): This group represents individuals with a moderate number of allergic reactions, specifically those

who tested positive for two to three allergens. A total of 147 participants (22.7%) belong to this category, suggesting a lesser but notable prevalence of multiple allergic reactions compared to those with a single reaction. Positive (>3 reactions): This category captures individuals with a higher number of positive allergic reactions, specifically those who tested positive for more than three allergens. This group has the largest representation, with 282 participants (43.7%), indicating that a substantial portion of the population experiences multiple allergies. As in table 2.

Table 2: Number of positive reactions to allergic items in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023.

No. of positive reactions to allergic items (n=646)	No. of cases (n=646)	Percentage %
Positive 1 (P1)	217	33.6%
Positive 2-3 (P2-3)	147	22.7%
Positive >3 (P4+)	282	43.7%

Class of antibodies (n=2642)	No. of cases (n=2642)	Percentage %
I	45	1.7%
II	1628	61.6%
III	548	20.7%
IV	178	6.7%
V	75	2.8%
VI	168	6.4%

Table 3 shows Al-Zahraa Centre for Allergy and Asthma patients' FA numbers by age and gender in 2023. It only considers positive test results across ages and genders. Age categories analyzed include children (<12 years), teenagers (13-18 years), adults (19-64 years), and the elderly (≥65 years). A greater percentage of children and adolescents are in lower FA categories (P1 or P2-3). The highest FA (P4+) rate is 44.5% in adults and 44.1% in youngsters. Elderly people had the highest P4+ rate of all age groups at 53.3%. Age-related correlation P-value: 0.831 (insignificant). Men make up 53% of the P4+ group, while women make up 37.7%, suggesting a gender disparity. More women than men are in P1 and P2-3. Males have more severe FA symptoms (P4+) than females (P-value for gender-related association: 0.001). Gender differences in FA severity, especially in the highest severity group (P4+), are statistically significant. Age differences are not. the association between the severity of FAs and variables like age groups, and gender for patients who visited Al-Zahraa Center for Allergy and Asthma in 2023, with only positive test results considered. About age distribution (n=1129), adults (19-64 years) accounted for the majority of cases across all severity levels (ranging from 71.4% to 81.3%), while children (<12 years) showed a moderate presence in levels II (14.6%) and III (15.6%). P-value for age shows no significant association with severity (p=0.968). About gender distribution (n=1129), **males** and females were similarly distributed across severity levels, with males at 50% in level IV+. P-value for gender indicates no significant association with severity (p=0.370).

Table 3: The association between the number of FA with variables like age and gender in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023. The association between the severity of FA and variables like age and gender in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023.

Positive test only		Total	P1		P2-3		P4+	
			No.	%	No.	%	No.	%
Age (years) (n=1129)	Children (<12years)	93	31	33.3%	21	22.6%	41	44.1%
	Adolescent (13-18)	66	26	39.4%	17	25.8%	23	34.8%
	Adults (19-64)	472	156	33.1%	106	22.5%	210	44.5%
	Elderly (=>65years)	15	4	26.7%	3	20.0%	8	53.3%
	P value	0.831						
Gender (n=1129)	Male	253	70	27.7%	49	19.4%	134	53.0%
	Female	393	147	37.4%	98	24.9%	148	37.7%
	P value	0.001*						
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.								

Positive test only		Total	I		II		III		IV+	
			No.	%	No.	%	No.	%	No	%
Age (years) (n=1129)	Children (<12years)	127	2	9.1%	75	14.6%	12	15.6%	4	12.5%
	Adolescent (13-18)	105	3	13.6%	53	10.3%	8	10.4%	2	6.3%
	Adults(19-64)	841	16	72.7%	375	72.8%	55	71.4%	26	81.3%
	Elderly (=>65years)	56	1	4.5%	12	2.3%	2	2.6%	-	-
	P value	0.968								
Gender (n=1129)	Male	253	7	31.8%	196	38.1%	34	44.2%	16	50.0%
	Female	393	15	68.2%	319	61.9%	43	55.8%	16	50.0%
	P value	0.370								
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.										

The number of cases with FA and their corresponding percentages. Meat mix is the most common allergen, affecting 32.0% of the patients. Banana/Mango mix is a close second with 31.3%. The Nut mix and Apple allergies are also significant, representing 19.0% and 18.8%, respectively. Allergens like Soybean, Strawberry, and Baker's yeast are less common, with cases below 5%. As in table 4.

Table 4: Number of patients for each type of FA in patients attended Al-Zahraa Center for Allergy and Asthma in 2023.

Allergens	No. of cases (n=1129)	Percentage %
Meat mix	361	32.0%
Banana/ Mango mix	353	31.3%
Nut mix	214	19.0%
Apple	212	18.8%
Eggplant	191	16.9%
Rice	185	16.4%
Chicken meat	134	11.9%
Sesame	134	11.9%
Citrus mix	126	11.2%
Eggs (egg white/egg yolk mix)	114	10.1%
Tomato	111	9.8%
Cacao (Chocolate)	90	8.0%
Flour mix	86	7.6%
Fish mix	82	7.3%
Celery	81	7.2%
Peach	71	6.3%
Soybean	45	4.0%
Strawberry	30	2.7%
Baker's yeast	11	1.0%
Cow milk	11	1.0%

The prevalence of positive FAs of the first five types to specific allergens like meat mix, banana/mango mix, nut mix, apple, and eggplant across age groups and gender at the Al-Zahraa Center for Allergy and Asthma in 2023. **Children** (<12 years) showed the highest prevalence rates for Meat mix (51.2%), Banana/Mango mix (46.5%) and Apple (33.1%). **Adolescents** (13-18) and **Adults** (19-64) had lower prevalence rates across these allergens, with adults showing a significant prevalence for the banana/mango mix (30.1%). **Elderly** (≥65 years) had the lowest prevalence rates, with meat mix at 10.7% and eggplant at 8.9%. **Males** had a notably higher prevalence of banana/mango mix allergies (30.0%) compared to other allergens. **Females** had a higher rate of allergies to the meat mix (35.8%) and were also slightly more affected by the apple (17.5%) and nut mix (17.1%) compared to males. A significant difference was noted by age in the prevalence of allergies to meat mix, banana/mango mix, and apple (p < 0.05). For gender, significant differences were observed only for the meat mix and eggplant allergies. As Table 5.

Table 5: Prevalence of positive FA to meat mix, banana/mango mix, nut mix, apple and eggplant and their association with age and gender in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023.

		Total	Meat mix		Banana/ Mango mix		Nut mix		Apple		Eggplant	
			No.	%	No.	%	No.	%	No.	%	No.	%
Age (years) (n=1129)	**Children (<12years)**	127	65	51.2%	59	46.5%	21	16.5%	42	33.1%	22	17.3%
	Adolescent (13-18)	105	46	43.8%	31	29.5%	18	17.1%	21	20.0%	15	14.3%
	Adults (19-64)	841	241	28.7%	253	30.1%	168	20.0%	149	17.7%	149	17.7%
	Elderly (=>65years)	56	6	10.7%	7	12.5%	7	12.5%	3	5.4%	5	8.9%
	P value		0.0001*		0.0001*		0.424		0.0001*		0.326	
Gender (n=1129)	**Male**	467	121	25.9%	140	30.0%	101	21.6%	99	21.2%	93	19.9%
	Female	662	237	35.8%	210	31.7%	113	17.1%	116	17.5%	98	14.8%
	P value		0.0001*		0.533		0.054		0.121		0.024*	
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.												

The prevalence of positive FAs of the second five types to rice, chicken meat, sesame, citrus mix, and egg mix (white/yolk), as well as the association of these allergies with age and gender among patients with positive FA tests at Al-Zahraa Center for Allergy and Asthma in 2023. **Children (<12 years)** have the highest prevalence of positive allergies to rice (22.8%) and egg mix (15.0%) compared to other age groups. **Adolescents (13-18 years)** show lower prevalence across all allergens, with the highest being rice (11.4%). **Adults (19-64 years)** represent the largest sample size and show notable positive rates for sesame (13.0%) and chicken meat (12.8%). **Elderly (≥65 years)** show the lowest prevalence across all allergens, with only 7.1% for rice

and decreasing percentages for other allergens. Significant age-associated differences were found for rice (p=0.026) and egg mix (p=0.031). **Males** have a slightly higher prevalence for all allergens compared to **females**, with the most significant difference observed in citrus mix (15.2% in males vs. 8.3% in females, p=0.0001). There were no statistically significant differences for other allergens between genders. As in table 6.

Table 6: Prevalence of positive FA to rice chicken meat, sesame, citrus mix and egg mix (white/yolk) and their association with age and gender in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023.

		Total	Rice		Chicken meat		Sesame		Citrus mix		Egg mix (white/yolk)	
			No.	%	No.	%	No.	%	No.	%	No.	%
Age (years) (n=1129)	Children (<12years)	127	29	22.8%	11	8.7%	14	11.0%	15	11.8%	19	15.0%
	Adolescent (13-18)	105	12	11.4%	11	10.5%	7	6.7%	9	8.6%	15	14.3%
	Adults (19-64)	841	141	16.8%	108	12.8%	109	13.0%	101	12.0%	77	9.2%
	Elderly (=>65years)	56	4	7.1%	6	10.7%	3	5.4%	1	1.8%	2	3.6%
	P value		0.026*		0.529		0.109		0.096		0.031*	
Gender (n=1129)	Male	467	86	18.4%	62	13.3%	64	13.7%	71	15.2%	45	9.6%
	Female	662	10	15.1%	74	11.2%	69	10.4%	55	8.3%	68	10.3%
	P value		0.140		0.286		0.092		0.0001*		0.726	

*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.

Table 7 shows the prevalence of FAs of the third five types to specific allergens (tomato, cacao/chocolate, flour mix, fish mix, and celery) among different age groups and genders of patients who visited Al-Zahraa Center for Allergy and Asthma in 2023. In **children** (<12 years), the highest prevalence is for cacao (14.2%), followed by tomato (8.7%) and fish mix (8.7%). In **adolescents** (13-18), the prevalence for tomato is 7.6%, cacao 9.5%, with lower percentages for other allergens. In **adults** (19-64), tomato has a higher prevalence (10.8%), with a significant allergy to celery (8.3%). In **elderly** (≥65 years), only cacao (7.1%) and fish mix (8.9%) are noted, with no recorded cases for tomato and celery. There is a statistically significant association between age and allergies to tomato (p=0.049), cacao (p=0.015), and celery (p=0.045). In **males**, Tomato (12.8%) shows the highest prevalence, followed by flour mix (9.9%) and celery (9.9%). While in **females**, The highest prevalence is seen in tomato (7.6%), followed by cacao (6.9%) and flour mix (6.0%). Gender differences are statistically significant for allergies to tomato (p=0.003), flour mix (p=0.018), and celery (p=0.003), with males generally showing higher prevalence rates.

Table 7: Prevalence of positive FA to tomato, cocao (chocolate), flour mix, fish mix and celery and their association with age and gender in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023.

		Total	Tomato		Cacao (Chocolate)		Flour mix		Fish mix		Celery	
			No.	%	No.	%	No.	%	No.	%	No.	%
Age (years) (n=1129)	Children (<12years)	127	11	8.7%	18	14.2%	10	7.9%	11	8.7%	6	4.7%
	Adolescent (13-18)	105	8	7.6%	10	9.5%	7	6.7%	5	4.8%	5	4.8%
	Adults (19-64)	841	91	10.8%	53	6.3%	67	8.0%	58	6.9%	70	8.3%
	Elderly (=>65years)	56	-	-	4	7.1%	2	3.6%	5	8.9%	-	-
	P value		0.049*		0.015*		0.660		0.641		0.045*	
Gender (n=1129)	Male	467	60	12.8%	39	8.4%	46	9.9%	35	7.5%	46	9.9%
	Female	662	50	7.6%	46	6.9%	40	6.0%	44	6.6%	35	5.3%
	P value		0.003*		0.379		0.018*		0.582		0.003*	

*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.

Table 8 shows the prevalence of positive FAs of the fourth five types to peach, soybean, strawberry, baker's yeast, and cow's milk, along with their association with age and gender in patients attending Al-Zahraa Center for Allergy and Asthma in 2023. The prevalence of FAs varies by age, but the P values indicate no statistically significant differences between age groups for any of the FAs tested. The highest percentage of positive FAs was found in **adults** for peach (6.5%) and soybean (4.2%). Among the **elderly**, the prevalence of peach allergy was noted at 7.1%, though data for other allergens were not available. A significant difference in the prevalence of peach allergies was observed between genders, with **males** (8.4%) having a higher prevalence than **females** (4.8%) (P = 0.017). No significant differences were

found for other FAs based on gender, as indicated by the

P values.

Table 8: Prevalence of positive FA to peach soybean, strawberry, baker's yeast and cow's milk and their association with age and gender in patients with positive FA tests attended Al-Zahraa Center for Allergy and Asthma in 2023.

		Total	Peach		Soybean		Strawberry		Baker's yeast		Cow's milk	
			No.	%	No.	%	No.	%	No.	%	No.	%
Age (years) (n=1129)	**Children (<12years)**	127	6	4.7%	7	5.5%	3	2.4%	1	0.8%	2	1.6%
	Adolescent (13-18)	105	6	5.7%	3	2.9%	2	1.9%	2	1.9%	-	-
	Adults(19-64)	841	55	6.5%	35	4.2%	25	3.0%	8	1.0%	9	1.1%
	Elderly (=>65years)	56	4	7.1%	-	-	-	-	-	-	-	-
	P value		0.862		0.319		0.547		0.672		0.544	
Gender (n=1129)	**Male**	467	39	8.4%	24	5.1%	15	3.2%	6	1.3%	6	1.3%
	Female	662	32	4.8%	21	3.2%	15	2.3%	5	0.8%	5	0.8%
	P value		0.017*		0.096		0.330		0.372		0.372	
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.												

DISCUSSION

Over the past two decades, food allergies (FAs) have emerged as a significant public health concern globally, affecting individuals across all age groups. While extensive research has been conducted in Western societies, such as the U.S., Australia, and Europe, where FAs are the leading cause of outpatient anaphylaxis, their prevalence and characteristics in other regions remain underexplored.[18,19,21] This study addresses this gap by examining FA prevalence, demographics, and associated factors among patients attending Al-Zahraa Center for Allergy and Asthma in Baghdad during 2023. The study found an FA prevalence of 22.3%, higher than other Middle Eastern studies, including those from Erbil (10–12.35%), Kerbalaa (unspecified prevalence but male-dominated), and Kuwait (5.43%). The variation in prevalence may be due to differences in diagnostic methods, populations studied, or regional dietary practices.[22-24] Comparatively, FA prevalence in the U.S. was reported as 7.6% in children and 10.8% in adults, based on self-reported and physician-confirmed cases. Australia reported a 10% FA prevalence among infants, with higher rates of persistent peanut and tree nut allergies.[18,19,21] The prevalence in Saudi Arabia (19.7%) aligns closely with the current study, while lower rates in Lebanon (3.2% in adults, 4.1% in infants) and Kuwait highlight regional variability.[22,25,26] Seasonal variations were notable, with the highest FA prevalence in spring (35.13%) and the lowest in autumn (3.25%). This seasonal trend may be linked to increased environmental allergens and dietary changes, as observed in Saudi Arabia. However, similar data were not available for comparison in Erbil, Al-Rusafa, or Kerbalaa studies.[23, 27,28] Common allergens in the present study included meat mix (32%), banana/mango mix (31.3%), and nut mix (19%). These differ from allergens reported in Western countries, where peanuts, tree nuts, milk, and shellfish predominate[18,19,20] In the Middle East, allergens like eggs, nuts, and dairy are more common, as seen in Saudi Arabia, Lebanon, and Kuwait.[25,26, 27] Demographically, adults aged 19–64 years had the highest prevalence (74.5%), consistent with global trends indicating higher FA prevalence in adults. Females comprised 59.4% of FA-positive cases, but gender differences were not statistically significant, aligning with findings from the U.S., Saudi Arabia, and Lebanon.[18, 26, 27] Multi-allergen sensitivities were observed in 43.7% of FA-positive patients, suggesting a significant burden of severe and persistent reactions. High IgE antibody levels in this group underscore the potential for severe reactions, consistent with trends in the U.S. and Australia, where multi-FAs and severe reactions like anaphylaxis are rising.[18,21] This study highlights gaps in data regarding allergen types and reaction severity in previous Iraqi studies, such as those from Erbil, Al-Rusafa, and Kerbalaa, underscoring the need for standardized diagnostic approaches.[23,24,28] The findings emphasize the importance of localized strategies to improve FA diagnosis, management, and public awareness in Iraq. Globally, initiatives such as allergen labeling, public education, and research into immunotherapy options have proven effective and could serve as models for similar interventions in Iraq.[21,25,27] This study provides foundational data to support such efforts and encourages further research to address regional variations in FA prevalence and severity.

CONCLUSION

This study at Al-Zahraa Center found a 22.3% prevalence of food allergies (FAs), predominantly affecting adults and children, with meat mix, banana/mango mix, and nut mix as the most common allergens. Regional dietary habits and environmental factors influence FA patterns, differing from Western countries. Seasonal variations highlight the need for targeted preventative measures. Enhanced diagnostic capabilities, public awareness campaigns, allergen labeling, and specialized FA programs are recommended to improve management and reduce FA-related risks in Iraq.

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