

The Most Common Allergens in Pediatric Patients in Iraq

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ABSTRACT

Background: The allergic diseases are considered as an abnormal immune system response to harmless environmental stimuli usually proteins. **Objective:** This study aimed to examine the allergen profile in Iraqi children age range 1 to 10 years old. **Methods:** A cross-sectional observational study was conducted during the period from January 2017 to February 2019. Allergic children age ranged from 1 to 10 years old. They were collected from many clinics in Al-Najaf City, Iraq. The pediatric penal kit Polycheck® – Diagnostics was used to reveal to the sensitivity of 20 different allergens.

Results: The number and percentage of allergic children to each allergen were recorded. The inhalant allergens had higher percentage as follow: Mugwort pollen 52%, D. farinae 45%, both Birch and Timothy grass pollens 40%. While the higher percentages of ingested allergens were in Peanut and Apple allergens 31.67%, Carrot 26.67%, Potato's allergens 21.67%, Soya bean 20% and Wheat flour allergens 18.33%. While the egg white showed no allergic sensitivity in all samples of children but the allergic to egg yolk allergens were 8.33%.

Conclusion: Approximately 93% of the children were allergic to at least one inhalant. Studying the rates of allergens in Iraqi environment and its related allergens is an important point in the planning for prevention and control of allergy.

Keywords: Pediatric, Food allergens, Inhalant allergens, Iraq.

INTRODUCTION

The allergic diseases are considered as an abnormal immune system response to harmless environmental stimuli usually proteins⁽¹⁾. Allergic diseases may be linked to many genes that increase susceptibility to allergy⁽²⁾. Allergens are almost always proteins, for a protein antigen to display allergenic activity; it must induce IgE production, which must lead to a type 1 hypersensitivity response on subsequent exposure to the same protein⁽³⁾. The factors that may cause an antigen to become an allergen include: biochemical properties of the allergen, stimulating factors of the innate immune response around the allergen substances at the time of exposure, stability of the allergen in the tissues, digestive system, skin, or mucosa, and the dose and time of stay in lymphatic organs during the interaction with the immune system⁽⁴⁾. The main allergens that account for the most allergic diseases include:

- Ingestible allergens, e.g. peanuts, cow's milk, egg yolk, legumes, seeds, sea food and fruits. Food allergens mostly trigger acute allergic reactions or asthma
- Inhalant allergens, e.g. house dust mites, grass pollens, pet danders and molds mostly trigger asthma, rhinitis and conjunctivitis.
- Insect stings/bites, drugs and natural rubber latex. The first two are the most prevalent^(5, 6)

In an individual, the presence of atopy may be confirmed by high levels of specific IgE or total IgE in the serum or by positive responses to skin-prick test. In an individual, the presence of atopy may be confirmed by high levels of specific IgE or total IgE in the serum or by positive responses to skin-prick test^(7, 8).

The aim of this study was to describe the most common types of allergens in Iraq, because the avoidance

of exposure to allergens considered as cornerstone in the control and prevention of allergic diseases.

PATIENTS AND METHOD

Subjects in the study:

A cross-sectional observational study was performed during period from January 2017 to February 2019. Allergic children age range 1 to 10 years old from many clinics in Al-Najaf City, Iraq. The pediatric penal kit Polycheck®–Diagnostics (Germany) was used to reveal to the sensitivity of 20 different allergens⁽⁹⁾: Peanut, milk, egg white, egg yolk, potatoes, carrot, cod fish, apple, soya beans, wheat flour, birch pollen, timothy grass pollen, mugwort pollen, D. pteronyssinus, D. Farinae, dog epithelia, cat epithelia, horse epithelia and *Cladosporium harbarum*. Table (1) showed test measurement the concentration in (Ku/L) for IgE antibodies against any of the above allergens and the concentrations then converted into scores according.

Table (1): Scoring of IgE concentration as a response to allergen exposure

Concentration (kU/l)	Scores	Explanation
<0.35 KU/l	0	No specific antibodies detection
0.35-<0.7 KU/l	1	Very weak antibody detection
0.7-<3.5 KU/l	2	Weak antibody detection
3.5-<17.5 KU/l	3	Clear antibody detection
17.5-<50 KU/l	4	Strong antibody detection
50-<100 KU/l	5	Very strong antibody detection
>100 KU/l	6	Extreme high antibody titer

kU: Kilo unit

Ethical considerations:

The study concept for human studies was approved from College of Medicine, Jabir Ibn Hayyan Medical University, Iraq by The Institutional Ethics Committee. Additionally, before taking part in the study, each individual gave written informed consent. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The data have been analyzed by the use of Microsoft excel 2015 and SPSS version 26. Correlation has been done between different allergens^(10, 11). The correlations between different allergens have been measurement R= 0.4-0.6 considered as moderate correlation, R = > 0.7

considered as strong correlation, while P-value < 0.05 is considered as significant^(12, 13).

RESULTS

Sixty patients were referred to the lab for detection of the allergens responsible for their allergy.

The table below shows the number and percentage of allergic children to each allergen. Table (2) showed that the inhalant allergens had higher percentage (Mugwort pollen 52%, D.farinae 45%, both Birch and Timothy grass pollens 40%, while the higher percentages of ingested allergens were in Peanut and Apple allergens (31.67%), Carrot 26.67%, potato's allergens 21.67%, Soya bean 20% then Wheat flour allergens 18.33%, the egg white showed no allergic sensitivity in all samples of children in this current study, while the allergic to egg yolk allergens were 8.33%. Table (3) showed that all study personnel were sensitive to at least one allergen.

Table 2: Rates of response of the 60 allergic children to the different allergens.

Allergen	Peanut	Milk	Egg White	Egg Yolk	Potato
Number	19	2	0	5	13
Percent	31.70%	3.30%	0.00%	8.30%	21.70%
Allergen	Carrot	Code fish	Apple	Soya bean	Wheat flour
Number	16	3	19	12	11
Percent	26.70%	5.00%	31.70%	20.00%	18.30%
Allergen	Birch Pollen	Timothy grass pollen	Mugwort pollen	D. pteronyssinus	D. Farinae
Number	24	24	31	18	27
Percent	40.00%	40.00%	51.70%	30.00%	45.00%
Allergen	Dog epithelia	Cat epithelia	Horse epithelia	Asp. fumigatus	Cladosp.herbarum
Number	22	12	17	7	5
Percent	36.70%	20.00%	28.30%	11.70%	8.30%

Table 3: Number of allergens each patient sensitive to them

Number of allergens	Frequency	Percentage
0	0	0.00 %
1-3	31	51.67 %
4-6	14	23.33 %
7-9	5	8.33 %
=> 10	10	16.67 %
Total	60	100 %

In general, 93.3% of the study children were allergic to at least one inhalant allergens, while 56.7% were allergic to at least one food allergens as is seen by figure (1).

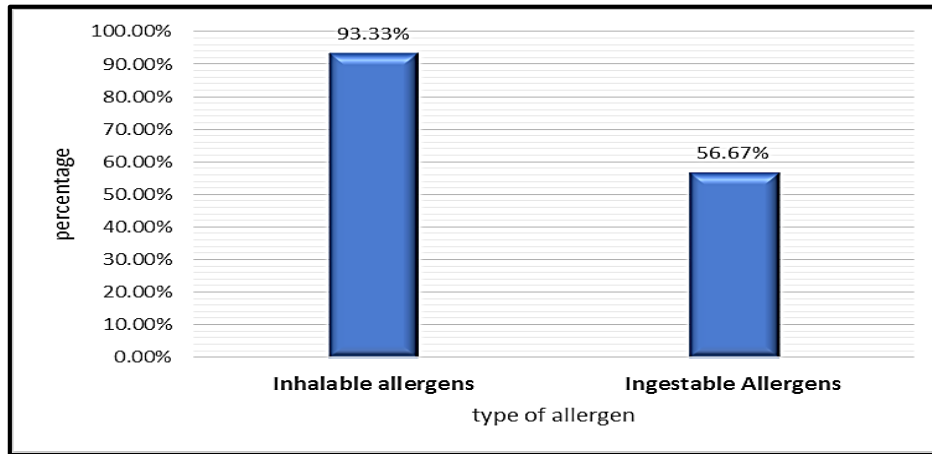


Figure (1): Rates of inhalant and food allergens for the 60 allergic children

The correlations between different allergens have been viewed by tables (4), (5) and (6), in which R=0.4-0.6 considered as moderate correlation, R= > 0.7 considered as strong correlation. While P-value = < 0.05 is considered as significant.

Table (4): Comparison between different allergens for the 60 allergic children

Allergen		Peanuts	Milk	Egg white	Egg yolk	Potato	Carrot	Code fish
Peanuts	P.C	1	-0.109	. ^a	-0.05	.612**	.846**	0.157
	Sig. (2-tailed)		0.406	.	0.703	0.00	0.00	0.23
Milk	P.C	-0.109	1	. ^a	-0.055	-0.083	-0.091	-0.042
	Sig. (2-tailed)	0.406		.	0.679	0.528	0.491	0.752
Eggwhite	P.C	. ^a	. ^a	. ^a	. ^a	. ^a	. ^a	. ^a
	Sig. (2-tailed)	.	.	.	.	.	.	.
Eggyolk	P.C	-0.05	-0.055	. ^a	1	-0.131	-0.059	-0.066
	Sig. (2-tailed)	0.703	0.679	.		0.317	0.654	0.616
Potato	P.C	.612**	-0.083	. ^a	-0.131	1	.762**	-0.1
	Sig. (2-tailed)	0.00	0.528	.	0.317		0	0.445
Carrot	P.C	.846**	-0.091	. ^a	-0.059	.762**	1	0.222
	Sig. (2-tailed)	0.00	0.491	.	0.654	0.00		0.088
Codefish	P.C	0.157	-0.042	. ^a	-0.066	-0.1	0.222	1
	Sig. (2-tailed)	0.23	0.752	.	0.616	0.445	0.088	
Apple	P.C	.653**	-0.104	. ^a	-0.015	.894**	.766**	0.021
	Sig. (2-tailed)	0.00	0.431	.	0.91	0.00	0.00	0.873
Soya	P.C	.712**	-0.069	. ^a	0.032	0.244	.741**	.473**
	Sig. (2-tailed)	0.00	0.599	.	0.809	0.06	0.00	0.00
Wheat flour	P.C	.788**	-0.072	. ^a	-0.05	.625**	.935**	.285*
	Sig. (2-tailed)	0.00	0.586	.	0.702	0.00	0.00	0.027
Birch pollen	P.C	.509**	-0.124	. ^a	-0.158	.545**	.650**	0.143
	Sig. (2-tailed)	0.00	0.347	.	0.227	0.00	0.00	0.274
Timothy grass pollen	P.C	.517**	-0.128	. ^a	-0.202	.613**	.710**	0.157
	Sig. (2-tailed)	0.00	0.331	.	0.122	0.00	0.00	0.231
Mugwort pollen	P.C	.707**	-0.145	. ^a	-0.184	.666**	.816**	0.251
	Sig. (2-tailed)	0.00	0.268	.	0.159	0.00	0.00	0.053
D.pteronyssinus	P.C	.260*	-0.108	. ^a	-0.171	-0.081	0.028	0.051
	Sig. (2-tailed)	0.045	0.412	.	0.193	0.539	0.835	0.7
D.farinae	P.C	0.195	-0.133	. ^a	-0.128	0.125	0.086	-0.08
	Sig. (2-tailed)	0.135	0.312	.	0.331	0.343	0.515	0.546
Dog epithelia	P.C	0.154	-0.11	. ^a	.418**	0.094	0.092	-0.05
	Sig. (2-tailed)	0.241	0.401	.	0.001	0.473	0.486	0.703
Cat epithelia	P.C	0.231	-0.075	. ^a	.425**	0.082	0.201	-0.091
	Sig. (2-tailed)	0.076	0.568	.	0.001	0.532	0.123	0.49
Horse epithelia	P.C	.287*	-0.094	. ^a	.432**	-0.066	.349**	.458**
	Sig. (2-tailed)	0.026	0.474	.	0.001	0.617	0.006	0.00
Asp.fumigatus	P.C	.358**	-0.054	. ^a	0.116	-0.131	.391**	.597**
	Sig. (2-tailed)	0.005	0.68	.	0.376	0.319	0.002	0.000

P.C: Pearson Correlation

Table (5): Pearson correlation between different allergens for the 60 allergic children

Allergen		Apple	Soya	Wheat flour	Birch pollen	Timothy grass pollen	Mugwort pollen	D.pteron yssinus
Peanuts	P.C	.653**	.712**	.788**	.509**	.517**	.707**	.260*
	Sig. (2-tailed)	0.00	0.00	0.00	0.00	0.00	0.00	0.045
Milk	P.C	-0.104	-0.069	-0.072	-0.124	-0.128	-0.145	-0.108
	Sig. (2-tailed)	0.431	0.599	0.586	0.347	0.331	0.268	0.412
Egg white	P.C	.a	.a	.a	.a	.a	.a	.a
	Sig. (2-tailed)	.	.	.	.	.	.	.
Egg yolk	P.C	-0.015	0.032	-0.05	-0.158	-0.202	-0.184	-0.171
	Sig. (2-tailed)	0.91	0.809	0.702	0.227	0.122	0.159	0.193
Potato	P.C	.894**	0.244	.625**	.545**	.613**	.666**	-0.081
	Sig. (2-tailed)	0.00	0.06	0.00	0.00	0.00	0.00	0.539
Carrot	P.C	.766**	.741**	.935**	.650**	.710**	.816**	0.028
	Sig. (2-tailed)	0.00	0.00	0.00	0.00	0.00	0.00	0.835
Code fish	P.C	0.021	.473**	.285*	0.143	0.157	0.251	0.051
	Sig. (2-tailed)	0.873	0.00	0.027	0.274	0.231	0.053	0.7
Apple	P.C	1	.295*	.604**	.576**	.509**	.701**	-0.157
	Sig. (2-tailed)		0.022	0.00	0.00	0.00	0.00	0.232
Soya	P.C	.295*	1	.739**	.445**	.445**	.560**	0.072
	Sig. (2-tailed)	0.022		0.00	0.00	0.00	0.00	0.583
Wheat flour	P.C	.604**	.739**	1	.560**	.763**	.724**	0.094
	Sig. (2-tailed)	0.00	0.00		0.00	0.00	0.00	0.475
Birch pollen	P.C	.576**	.445**	.560**	1	.612**	.872**	-0.06
	Sig. (2-tailed)	0.00	0.00	0.00		0.00	0.00	0.651
Timothy grass pollen	P.C	.509**	.445**	.763**	.612**	1	.643**	-0.025
	Sig. (2-tailed)	0.00	0.00	0.00	0.00		0.00	0.851
Mugwort pollen	P.C	.701**	.560**	.724**	.872**	.643**	1	0.194
	Sig. (2-tailed)	0.00	0.00	0.00	0.00	0.00		0.137
D. pteronyssinus	P.C	-0.157	0.072	0.094	-0.06	-0.025	0.194	1
	Sig. (2-tailed)	0.232	0.583	0.475	0.651	0.851	0.137	
D. farinae	P.C	0.033	0.007	0.11	0.016	0.002	0.229	.807**
	Sig. (2-tailed)	0.802	0.96	0.405	0.904	0.99	0.079	0
Dog epithelia	P.C	0.104	0.011	0.177	0.03	0.072	0.073	0.23
	Sig. (2-tailed)	0.428	0.933	0.175	0.821	0.584	0.581	0.077
Cat epithelia	P.C	0.249	0.217	0.223	0.06	0.002	0.056	-0.137
	Sig. (2-tailed)	0.055	0.097	0.086	0.646	0.986	0.671	0.296
Horse epithelia	P.C	-0.019	.624**	.425**	0.178	0.182	0.21	0.043
	Sig. (2-tailed)	0.883	0.00	0.001	0.175	0.165	0.108	0.743
Asp.fumigatus	P.C	-0.085	.787**	.485**	0.237	0.245	.302*	0.106
	Sig. (2-tailed)	0.52	0.00	0.00	0.068	0.06	0.019	0.422
Cladosp. herbarum	P.C	0.058	.265*	0.111	-0.093	-0.151	-0.104	-0.112
	Sig. (2-tailed)	0.659	0.040	0.400	0.482	0.251	0.431	0.393

P.C: Pearson Correlation

Table (6): Correlation between a food allergen and some children's allergies

Allergen		D.farinae	Dog epithelia	Cat epithelia	Horse epithelia	Asp. fumigatus	Cladosp. herbarum
Peanuts	P.C	0.195	0.154	0.231	.287*	.358**	0.154
	Sig.(2tailed)	0.135	0.241	0.076	0.026	0.005	0.239
Milk	P.C	-0.133	-0.11	-0.075	-0.094	-0.054	-0.053
	Sig.(2tailed)	0.312	0.401	0.568	0.474	0.68	0.687
Egg white	P.C	.a	.a	.a	.a	.a	.a
	Sig.(2tailed)	.	.	.	.	.	.
Egg yolk	P.C	-0.128	.418**	.425**	.432**	0.116	0.084
	Sig.(2tailed)	0.331	0.001	0.001	0.001	0.376	0.523
Potato	P.C	0.125	0.094	0.082	-0.066	-0.131	-0.128
	Sig.(2tailed)	0.343	0.473	0.532	0.617	0.319	0.33
Carrot	P.C	0.086	0.092	0.201	.349**	.391**	0.082
	Sig.(2tailed)	0.515	0.486	0.123	0.006	0.002	0.532
Code fish	P.C	-0.08	-0.05	-0.091	.458**	.597**	-0.064
	Sig.(2tailed)	0.546	0.703	0.49	0.00	0.00	0.625
Apple	P.C	0.033	0.104	0.249	-0.019	-0.085	0.058
	Sig.(2tailed)	0.802	0.428	0.055	0.883	0.52	0.659
Soya	P.C	0.007	-0.011	0.217	.624**	.787**	.265*
	Sig.(2tailed)	0.96	0.933	0.097	0.00	0.00	0.04
Wheat flour	P.C	0.11	0.177	0.223	.425**	.485**	0.111
	Sig.(2tailed)	0.405	0.175	0.086	0.001	0.00	0.4
Birch pollen	P.C	0.016	0.03	0.06	0.178	0.237	-0.093
	Sig.(2tailed)	0.904	0.821	0.646	0.175	0.068	0.482
Timothy grass pollen	P.C	0.002	0.072	0.002	0.182	0.245	-0.151
	Sig.(2tailed)	0.99	0.584	0.986	0.165	0.06	0.251
Mugwort pollen	P.C	0.229	0.073	0.056	0.21	.302*	-0.104
	Sig.(2tailed)	0.079	0.581	0.671	0.108	0.019	0.431
D.pteronysinus	P.C	.807**	0.23	-0.137	0.043	0.106	-0.112
	Sig.(2tailed)	0.00	0.077	0.296	0.743	0.422	0.393
D.farinae	P.C	1	0.052	-0.158	-0.074	-0.035	-0.132
	Sig.(2tailed)		0.692	0.228	0.575	0.788	0.313
Dog epithelia	P.C	0.052	1	.622**	.453**	0.161	0.053
	Sig.(2tailed)	0.692		0.00	0.00	0.219	0.69
Cat epithelia	P.C	-0.158	.622**	1	.395**	.264*	.560**
	Sig.(2tailed)	0.228	0.00		0.002	0.042	0.00
Horse epithelia	P.C	-0.074	.453**	.395**	1	.836**	0.067
	Sig.(2tailed)	0.575	0.00	0.002		0.00	0.61
Asp.fumigatus	P.C	-0.035	0.161	.264*	.836**	1	0.212
	Sig.(2tailed)	0.788	0.219	0.042	0.00		0.104
Cladosp. herbarum	P.C	-0.132	0.053	.560**	0.067	0.212	1
	Sig.(2tailed)	0.313	0.690	0.000	0.610	0.104	

P.C: Pearson Correlation

DISCUSSION

About 30-35% of children in the general population suffer from allergic diseases⁽¹⁴⁾. All the children involved in this study were allergic to at least one allergen. The sensitivity to inhalant allergens were more prevalent than to food allergens in the study sample, which is compatible with other studies in Sweden and USA⁽¹⁵⁾.

The inhalant allergens were more because of air pollution and a lot of farm in Iraq. The higher rates in inhalant allergens were to mugwort pollens, *D. farinae*, birch pollens, timothy grass pollens, dog epithelia, horse epithelia then cat epithelia respectively. While the higher rates in food allergens were to peanuts, apples, carrots, potatoes, soya beans and wheat flour. This called oral allergy syndrome {OAS} which is common with fresh fruits and raw veggies and less common with cooked foods. This explains why common in our study the higher rates of allergens were to peanuts, apples, carrots, because they represent the commonest allergens in Iraqi environment and higher concentration of IgE are related to higher allergens in the environment^(16,17).

Cross reactivity between different allergens “production of IgE in response to one allergen, and then bind to similar proteins in another allergens” have been noticed by assessing the correlation coefficient “r value”⁽¹⁸⁾. R value was high within this study between allergens of plant origin “peanuts, potatoes, carrots, apples, soya bean, wheat flour and pollens” with significant p value. While there were weak correlations between allergens of animal origin “milk, egg yolk and cod fish”, but the egg yolk had a moderate but significant correlation with animal dander “cat, dog and horse epithelia” and the cod fish had a moderate and also significant correlation only with horse epithelia⁽¹⁹⁾.

May be because of highly similar nutrient content of plant food in comparison with animal sources.

For dust mites (*D. pteronyssinus* and *D. farinae*), there were strong and significant correlation between them with no significance with other studied allergens⁽²⁰⁾. There were weak and non-significant correlation between *Asp.famigatus* and *C.herbarum* (which are main indoor moulds), but there were significant correlation between *Asp.famigatus* and peanuts, carrots, cod fish, soya bean, wheat flower and horse epithelia⁽²¹⁾.

Because 50% of people who are allergic to pollen also have {OAS} that mean pollen allergy can cross react with carrots, peanuts and tomato⁽²²⁾.

CONCLUSION

Approximately 93% of the children in Iraq were allergic to at least one inhalant. Studying the rates of allergens in Iraqi environment and its related allergens is an important point in the planning for prevention and control of allergy.

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