

Determination the Relationship of Interleukin IL-17 to Peanut Allergy in Basrah Governorate

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Abstract:

In this study Collected 90 samples (74 allergic patients and 16 samples healthy people), during the period from October 2021 to January 2022, with ages ranging from (20-65) years. The current study recorded an increased concentration of IgE in patients at a rate of 76.67% compared with healthy people samples. Also, this study showed an increase in Total IgE antibodies in peanut-allergic patients at a rate of 36.49%. The current study is shown that the females had the highest concentration of IgE antigen-specific to peanuts at a rate of (29.73%) compared with males with significant difference ($p < 0.05$). Moreover, this study recorded that fourth age group had the highest percentage (76.6%) for peanut-allergic compared to the other age groups with a significant difference between them ($p < 0.05$). In contrast, the results recorded a decrease in the concentration of interleukin IL-17A and IL-17F among those peanut-allergic patients.

Keywords— Keywords: Food allergy, IL-17F, IL-17A

I. Introduction

Food allergy is one of the most important allergic diseases and threatens many people's lives. It is provoked by many genetic and immune factors, especially antibodies of the type IgE and some types of cytokines. Cytokines are small glycoproteins with a molecular weight of 30kD, produced by some cell leukocytes, which are regulate immune response and inflammation (Deverman and Patterson, 2009). Recently recognized the third subset of Th cells (Th17) and T regulatory cells which have been categorized, showing different cytokine from T-helper 1 and T-helper 2 cells. Interleukin 17 is a cytokine belonging to the IL-17 family which contains six members as IL-17A, IL-17B, IL-17C, IL-17D, IL-17E, and IL-17F (Chang et al., 2011). IL-17A and IL-17F are a proinflammatory cytokine, homology between them 50%, it is of interest to identify the role of in the pathogenesis of allergic diseases (Reynolds et al., 2010; Jin and Dong 2013). Several studies investigated the role of Th17 cells and IL-17 in allergic diseases and the protective roles of IL-17A, IL-17F in immune responses against these pathogens (Milner et al., 2008). this study aimed to determine the relationship of interleukin 17 with peanut allergy.

II. Materials and Methods:

A-Blood Samples

The current study was conducted using 90 human venous blood samples, which included 74 blood samples from allergic individuals (males and females) with different age groups, living in separate places in Basrah Governorate. in addition to 16 samples were collected for healthy people as control samples. The samples were collected after a full clinical examination from a specialist. additionally a questionnaire form was used to collect people's required information about each participants. The form included the participants number, residence, gender, age, and medical condition in case he suffers from an allergic disease

B- Preparation Peanuts Antigen

Peanuts antigen was prepared as previously reported by L'Hocine and Pitre (2016). Furthermore, The Protein concentration was determined according to Bradford et al. (1976) and was calculated from the standard curve by using the following formula
$$\text{Protein concentration} = (\text{OD} / \text{Slope}) * \text{volume}$$

D-Estimation Specific IgE for peanut antigen:

Evaluation of specific IgE for peanut antigen in all sera was carried out using ELISA assay (Voller et al., 1979).

E- Estimation Total IgE:

Measure the concentration of Total IgE according to the Manufacturer's steps by using an ELISA for allergic patients and healthy people

F- Determination of Interleukin IL-17.

Direct ELISA was used to measure the level of interleukin-17 (IL-17) in the serum of the subjects under study, using a special kit supplied by Technology Laboratory Bioassay/ china

G-Determination of Interleukin IL-17F

Direct ELISA was used to measure the level of interleukin-17 (IL-17) in the serum of the subjects under study, using a special kit (kit) supplied by Technology Laboratory Bioassay/ china

H-Statistical Analysis:

The data were statistically analyzed using the (SPSS) program. qualitative data percentages were calculated by using the chi-square test (X^2) at the probability level (0.05).

III. Results

A-The Studied Samples

The current study, is shown in Table 1 distributed among 22 males (24.4%), 52 females (57.8%), and 16 control samples.

Table (1): Distribution of the study samples by gender and age groups.

Gender	Patients people N (%)	Healthy people N (%)	Total (%)
Male	22 (24.4)	6 (6.7)	28 (31.1)
Female	52 (57.8)	10 (11.1)	62 (68.9)
Total (%)	74 (82.2)	16 (17.8)	90 (100)
Age Groups (Years)			
≥ 28	15 (16.7)	10 (11.1)	25 (27.8)
29 -38	21 (23.3)	3 (3.3)	24 (26.7)
39-48	13 (14.4)	2 (2.2)	14 (15.6)
≤ 49	25 (27.8)	1 (1.1)	26 (28.9)
Total (%)	74 (82.2)	16 (17.8)	90 (100)

B- Quantitative Antibody Levels in Patients and Healthy People

The results of this study in table 2 recorded an increase in the concentration of T. IgE antibody in patients at a rate of 76.67% compared to healthy samples.

Table (2): Quantitative antibody concentration

Level T. IgE IU/cm3	Patients People N 74		Healthy People N 16	
	N	%	N	%
T. IgE <150	5	5.55	16	17.78
T. IgE ≥ 150	69	76.67	0	0
Total (%)	90 (100)			

C- specific - IgE to peanuts antigen-

The current study is shown that the females had the highest concentration of IgE antigen-specific to peanuts at a rate of 29.73% compared with males, and it was found that there was a significant difference of ($p < 0.05$). The fourth age group (49) recorded the highest percentage (6.76%) compared to the other age groups, with a significant difference between them at the level of probability ($p < 0.05$) Table (3).

Table (3): Specific IgE to peanut antigen according gender and age groups

Gender	Patients People N	specific IgE for peanut antigens	
		Allergic People	Non Allergic People
		N (%)	N (%)
Male	22	5 (6.76)	17 (22.97)
Female	52	22 (29.73)	30 (40.54)
Total (%)	74	27 (36.49)	47 (63.51)
Age Groups (Years)			
≥ 28	15	7 (9.46)	8 (10.81)
29 -38	21	7 (9.46)	14 (18.92)
39-48	13	8 (10.81)	5 (6.75)
≤ 49	25	5 (6.76)	20 (27.03)
Total (%)	74	27 (36.49)	47 (63.51)

D-The relationship between T. IgE concentration and peanut antigen sensitivity:

in (Table 4) this study showed an increase of T. IgE antibodies in peanut-allergic patients at a rate of 36.49.

Table (4): quantitative antibody's relationship with patients who are allergic to peanut antigen.

Level T. IgE IU/ml	peanut-allergic patients		Non -peanut-allergic patients	
	N	%	N	%
T. IgE <150	-----	-----	11	14.86
T. IgE ≥ 150	27	36.49	36	48.65
Total (%)	74 (100)			

E- Level of IL-17A in allergic and non-allergic people to peanut antigen:

The results of the current study in Table (5) recorded a decrease in the concentration of interleukin IL-17A among those sensitive to peanut antigen at a rate of 27.78% compared ,with the non-sensitive with a significant difference between them (p < 0.05).

F- Level of IL-17F in allergic and non-allergic people to peanut antigen:

The results in Table (6) recorded a decrease in the concentration of interleukin IL-17F among patients sensitive to peanut antigen at a rate of 30% compared ,with the non-sensitive with a significant difference between them (p < 0.05).

Table (5): Level of IL-17A in allergic and non-allergic people to peanut antigen

Level IL-17A	Study Samples		
	Allergic people N (%)	Non-Allergic people N (%)	Healthy people N (%)
>40	2 (2.22)	8 (8.89)	-----
≤ 40	25 (27.78)	39 (43.33)	16 (17.78)
Total (%)	90 (100)		

Table (6): Level of IL-17F in allergic and non-allergic people to peanut antigen

Level IL-17F	Study Samples		
	Allergic people N (%)	Non-Allergic people N (%)	Healthy people N (%)
>40	-----	44 (48.89)	-----
≤40	27 (30)	3 (3.33)	16 (17.78)
Total (%)	90 (100)		

. IV. Discussion:

The current study showed that 27(36.49%) were allergic to peanuts out of a total of 74 samples, and the percentage of females had the highest of IgE antigen-specific to peanuts (29.73%) compared with males. Most of food allergens are soluble in water, such as glycoproteins, whose molecular weight ranges from 10–70 kDa (Ebo, 2001) and , are characterized by the ability to stimulate the immune system, especially in people with a genetic predisposition. In the production of IgE antibodies, it is the association with those specific IgE antibodies that leads to causing

an allergic reaction (Aalberse, 2000).Several studies in the Middle East have found the prevalence of food allergies. A study conducted in the United Arab Emirates showed that the seafood and nuts are common food allergens (Irani and Maalouly 2015). In their study in Iraq, Erbil Governorate, they observed that the highest prevalence of food allergy to peanuts was (18.42%) in allergic patients, and it was 12.35% in allergic females to peanuts, and it was higher compared to males. Kaya and his group concluded in their 2013 study that peanuts are the most common food allergen mediated by IgE. Also, Shaymaa et al., (2019) studied for other food allergens and showed that overall Seropositivity against kiwifruit allergens was (72.9%). and the study by AL-Mayah et al. (2017) showed that processing shrimp by heating led to an increase in allergen city and antigenicity of shrimp antigen. Loh and Tang (2018) mentioned that allergen-specific immunoglobulin E (sIgE) is important in determining the prevalence of food allergies. They observed through the study a more than 10% increase in food allergy rates in both the West and developing countries. Also, they observed increased levels of IgE in patient s sensitive to different antigens and that the IgE antibody plays a major role in recognizing antigens, since it is responsible for the attack's occurrence and the disease's emergence. Symptoms: Most studies agree that food allergy rates are increasing (Sicherer and Sampson, 2018). The study by Namork et al. (2011) also showed an elevated concentration of IgE-specific antibodies against the peanut antigen.

The results of the current study recorded a decrease in interleukin concentration IL-17F and IL-17A in those sensitive to peanut antigen at a concentration of 40 (IU/ml) and by (30% and 27.78%), respectively, compared with those who are not sensitive. IL-17 activity is closely related to the cells of the innate immune response. This cytokine is essential in protecting against many extracellular pathogens, and it can induce many mediators of the inflammatory reaction through its participation in the proliferation, maturation, and chemical concentration of neutrophils, as the action and height of this cytokine are closely related to the presence of neutrophils (Reynolds et al., 2010). It has a proven neutrophilic role in asthma, as neutrophils are linked to their ability to produce and release many important mediators of inflammatory processes, including ROS and certain enzymes. It has been demonstrated in laboratory experiments that human respiratory epithelial cells enhance inflammation and secretion of mucosal substances and interleukin-8,6 when affected by IL-17A. (Kawaguchi et al. 2001).This study agreed with the study of Baioumy et al. (2021) that there is no significant relationship between interleukin and disease and it cannot be adopted as a predictive immunological indicator of food allergy. The results of the current study agreed with the results of Dhuban et al. (2013), as it was noted that the production of interleukin (IL) 17 was significantly reduced in CD4 + T cells of individuals with food allergies ex vivo in vitro, and the production of IL-17 was found in CD4 cells. The T+ response to all antigens tested was significantly poorer in food-sensitive subjects than in healthy subjects.Żbikowska -Gotz and colleagues (2016) discovered that high and low levels of IL-17A in food allergy patients are primarily associated with increased activity of neutrophilic granulocytes. Moreover, some studies have shown that IL-17A is protective, while IL-17F is pathogenic, in acute colitis caused by sodium dextran sulfate (Yang et al., 2008). The study by Hellings et al. (2003) recorded an increase in the concentration of IL-17 in patients and showed an association IL-17 with the number of neutrophils and the degree of disease severity. We, therefore, believe that reduce IL-17 production in food-allergic patients may be leading to the development of an allergic state

V.CONCLUSION:

In conclut , A decrease concentration of interleukin IL-17F and IL-17A in allergic patients to peanut antigen May be a risk factor for patients

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References

- Aalberse, R. C. (2000). Structural biology of allergens. *Journal of allergy and clinical immunology*, 106(2): 228-238.
- Baioumy, S. A., Sallam, D. E., Abdalgeleel, S. A., Fouad, S. H., Khedr, A. S., & Taha, S. I. (2021). Interleukin-17A serum levels in young patients with atopic dermatitis and food allergy. *European Cytokine Network*, 32(3), 55-63.
- Bradford, M. M. (1976). A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Analytical biochemistry*, 72(1-2), 248-254.
- Chang SH, Dong C. (2011). Signaling of interleukin 17 family cytokines in immunity and inflammation. *Cell Signal*. 23(7):1069 1075.
- Deverman BE, Patterson PH (2009) Cytokines and CNS Development. *Neuron* 64(1): 61-78.
- Dhuban, K. B., d'Hennezel, E., Ben-Shoshan, M., McCusker, C., Clarke, A., Fiset, P., ... & Piccirillo, C. A. (2013). Altered T helper 17 responses in children with food allergy. *International Archives of Allergy and Immunology*, 162(4), 318-322.
- Ebo, D. G., & Stevens, W. J. (2001). IgE-mediated food allergy–extensive review of the literature. *Acta Clinica Belgica*, 56(4): 234-247.
- Hellings, P. W., Kasran, A., Liu, Z., Vandekerckhove, P., Wuyts, A., Overbergh, L., ... & Ceuppens, J. L. (2003). Interleukin-17 orchestrates the granulocyte influx into airways after allergen inhalation in a mouse model of allergic asthma. *American journal of respiratory cell and molecular biology*, 28(1), 42-50.
- Irani, C., & Maalouly, G. (2015). Prevalence of self-reported food allergy in Lebanon: A Middle-Eastern taste. *International scholarly research notices*, 2015, 1-6.
- Jin, W., & Dong, C. (2013). IL-17 cytokines in immunity and inflammation. *Emerging microbes & infections*, 2(1), 1-5.
- Kawaguchi, M., Kokubu, F., Kuga, H., Matsukura, S., Hoshino, H., Ieki, K., ... & Huang, S. K. (2001). Modulation of bronchial epithelial cells by IL-17. *Journal of Allergy and Clinical Immunology*, 108(5), 804-809.
- L'Hocine, L., & Pitre, M. (2016). Quantitative and qualitative optimization of allergen extraction from peanut and selected tree nuts. Part 2. Optimization of buffer and ionic strength using a full factorial experimental design. *Food Chemistry*, 194, 820-827.
- Loh, W., & Tang, M. L. K. (2018). The epidemiology of food allergy in the global context. *International Journal of Environmental Research and Public Health*, 15(9).
- Milner, J. D., Brenchley, J. M., Laurence, A., Freeman, A. F., Hill, B. J., Elias, K. M., ... & Douek, D. C. (2008). Impaired TH17 cell differentiation in subjects with autosomal dominant hyper-IgE syndrome. *Nature*, 452(7188), 773-776.
- Namork, E., Fæste, C. K., Stensby, B. A., Egaas, E., & Løvik, M. (2011). Severe allergic reactions to food in Norway: a ten-year survey of cases reported to the food allergy register. *International journal of environmental research and public health*, 8(8): 3144-3155.
- Reynolds JM, Angkasekwinai P, Dong C. (2010). IL-17 family member cy-tokines: regulation and function in innate immunity. *Cytokine Growth Factor Rev.*;21(6):413-423.
- Shaymaa Jabbar ,Huda Kadhim Kareem, Saad S. Mahdi Al-Amara (2019). Determining the effect of antigens prepared from kiwi fruit on allergic patients in Basra province, Iraq. *Annals of Tropical Medicine and Public Health* 22(09):32-3510. 36295/ASRO.2019.22095
- Sabeeh AL-Mayah, Shaymaa Jabbar Raisan, Noor J A Jouda (2017). Preparation of some allergens from shrimp meat and evaluated of their ability to anaphylaxes in patients suffering from shrimp allergy in Basra province, south of Iraq. *Journal of Medicine, Physiology and Biophysics* ISSN 2422-8427 ,IVol.31, www.iiste.org
- Sicherer, S. H., & Sampson, H. A. (2018). Food allergy: a review and update on epidemiology, pathogenesis, diagnosis, prevention, and management. *Journal of Allergy and Clinical Immunology*, 141(1): 41-58.
- Voller, A., Bidwell, D. E., & Bartlett, A. (1979). The enzyme linked immunosorbent assay (ELISA). A guide with abstracts of microplate applications. Dynatech Europe, Borough House, Rue du Pre..
- Yang, X. O., Chang, S. H., Park, H., Nurieva, R., Shah, B., Acero, L., ... & Dong, C. (2008). Regulation of inflammatory responses by IL-17F. *The Journal of experimental medicine*, 205(5), 1063-1075.

Żbikowska-Gotz, M., Pałgan, K., Gawrońska-Ukleja, E., Kuźmiński, A., Przybyszewski, M., Socha, E., & Bartuzi, Z. (2016). Expression of IL-17A concentration and effector functions of peripheral blood neutrophils in food allergy hypersensitivity patients. *International journal of immunopathology and pharmacology*, 29(1), 90-98.