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The immunological profile of Asthma and Allergic rhinitis

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ABSTRACT

Background and purpose: Asthma and allergic rhinitis frequently occurred together, they share similar epidemiological, pathophysiological and genetic backgrounds. Many types of inflammatory cells and mediators are involved in these disorders. Most patients with asthma also have rhinitis, and the same inflammatory cells and mechanisms are present in bronchial and nasal mucosa, thus leading to the concept of 'one airway, one disease'. This concept is further substantiated by evidence of nasal inflammation in asthma, and bronchial inflammation and hyper-responsiveness in rhinitis. It is widely recognized that interrelated mechanisms contribute across the asthma-rhinitis disease spectrum. Of particular note is that the same pro-inflammatory mediators (e.g. cysteinyl leukotriens, cytokines, and histamine) are involved in nasal and bronchial inflammation, in patients with rhinitis and asthma.

Materials and methods: This is a cross sectional study which was carried out on 200 patients (100 patients with bronchial asthma and 100 patients with allergic rhinitis) at the ***Asthma and Allergy Institute*** in Baghdad, from February 2007 to July 2007, and fifty participants as a control group. Spirometry was performed with the goal of recording as precise as possible of spirometry measures forced expiratory volume in one second (FEV1) and forced vital capacity (FVC).

Results: Asthma and allergic rhinitis showed the same age distribution, as the majority of cases occurred between the age of 5 and 35 years, but There was a highly significant difference ($p<0.01$) in gender distribution between the two disorders, with a male predominance in asthma and female predominance in allergic rhinitis. The highest proportion of positive skin reaction had been registered towards the allergens (D1+D2, M1 and Bermoda) , 91%, 83% and 72 % of the asthmatic group respectively, and the allergens D1+D2, Bermoda and plantain in the percentage of 56.4 %, 55.4%, 51.5% respectively in the rhinitis group. The current data elicited a highly significant difference ($p< 0.01$) in the mean serum concentration of specific IgE antibodies against (D1, D2, M1, M2, M3, M4, M5, M6, and W10 allergens in the asthmatic in comparison with the rhinitis group, but the mean serum concentration of specific IgE antibodies fail to mount a significant level ($p >0.05$) against G2, G5, W6, T1 and T3 allergens when comparing the asthmatic versus rhinitis group.

Conclusion: Asthma and allergic rhinitis are characterized by similar inflammatory response which is present in the entire airway mucosa.

Keyword: ELISA, **IgE**, LAR

INTRODUCTION

Atopy is derived from a Greek word ATOPOS: meaning out of the place [1]. It refers to a tendency to develop exaggerated immunoglobulin E (IgE) response to common environmental allergens like, house dust mites, grass, and pets. Local allergic rhinitis (LAR) is a clinical entity characterized by a localized allergic response in the nasal mucosa in the absence of evidence of systemic atopy [2,3,4]. By definition, patients with LAR have negative skin tests and/or in vitro tests for IgE , there is no evidence to suggest that LAR is a precursor to allergic rhinitis since follow-up does not show the evolution to typical allergic rhinitis in these patients [5] Allergen immunotherapy involves the subcutaneous administration of gradually increasing quantities of the patient's relevant allergens until a doseis reached that is effective in inducing immunologic tolerance to the allergen immunotherapy is an effective treatment for allergic rhinitis, particularly for patients with intermittent (seasonal) allergic rhinitis caused by pollens, including tree, grass

and ragweed pollens [6,7,8,9]. Sublingual immunotherapy is a way of desensitizing patients and involves placing a tablet of allergen extract under the tongue until it is dissolved. It is currently available for the treatment of grass and ragweed allergy, as well as house dust mite-induced allergic rhinitis (with or without conjunctivitis). At present, four sublingual tablet immunotherapy products are available in Canada: Oralair®, Grastek®, Ragwitek® and Acarizax™ [10,11,12,13].

The aim of the study: The aims of the study were to define the immunological differences between allergic asthma and allergic rhinitis cases in regards to: Eosinophil count, total IgE levels, specific IgE levels, serum immunoglobulin's levels, serum complement component (C3,C4)levels , interleukin 4 and interleukin 10 levels.

Material and methods: Allergen extract types used in skin test are manufactured in Stallergen Company in France.

Methods: Skin Test: was done for the patients and the control. It was performed according to the standard method described by: Pepys 1975, using aqueous allergen extracts supplied by: Stallergen (France), and by the Iraqi labs for the production of vaccine and sera in Baghdad. The panel of 14type of allergen was used. (HDM, D1, D2, M1, M2, M3,M4 ,G2 ,G5, W6, W10, T1, T3, Control positive and negative.

The intardermal test was done with HDM, D1, and D2 only. On the volar aspect of the forearm. The skin must be clean, free of eczema or any other defect. After cleaning the forearm skin with alcohol, soaked cotton and letting it to dry. A grid is marked with a pen with 3 cm intervals in adult and 2cm in children. The pattern follows corresponding list of allergen extracts in concentration of (1x10 of index of reactivity IR), intracutaneously using 1ml syringe through 26 gauge needle. The syringe was placed at an angle of 45 degree to the forearm; needles bevel was downwards facing the skin and penetrating entirely not going deeper than the superficial layer of the skin. A volume of approximately 0.2ml of extract was gently injected to produce a small superficial bulb, the reaction was read after 15 min. a positive result is a skin weal more than 2 mm greater than that observed with the negative control solution. The result of the skin test should be interpreted in the light of the clinical history.(7)

Prick skin test: was performed by placing a drop of allergen extract of a concentration (1x10 IR), on the volar aspect of the forearm. The next drop was placed approximately 3 cm apart. A disposable hypodermic needle (25-27 gauge), was passed through the drop and inserted into the epidermal surface at a low angle with the bevel facing upwards, the needle tip was gently lifted upwards to elevate a small portion of the epidermis without inducing bleeding , the needle was then withdrawn and the solution gently wiped away. The result was also read after 15 min according to the diameter of the reaction zone. In both types of skin test a positive control (histamine hydrochlorate 10mg/ml and a negative control phenol were used).(8)

Statistical Analysis: The suitable statistical methods were used in order to analyze and assess the results, these include the followings:

1- Descriptive Statistics:
A) Statistical tables including observed frequencies with their percentages.
B) Summary statistic of the readings distribution (mean, SD & minimum & maximum).
C) Graphical presentation by (bar - charts). 2 – Inferential Statistics:

These were used to accept or reject the statistical hypotheses, they include the followings:

A) Chi-square $\chi 2$. B) Repeated (t-test).
Note: The comparison of significant (P-value) in any test were:
S= Significant difference ($P<0.05$).
HS= Highly Significant difference ($P<0.01$).
NS= Non significant Difference ($P>0.05$) .

Results: Age Distribution of Patients Included in the Study:

Demonstrate that the age range of the patients in both diseases were from 5years to more than 64years of age,
In the asthmatic patients, the data showed that the most common affected age group was (5-14) years (30%) and the least affected age group was >64 years (4%). In patients with AR, the highest affected age group was (15-24) years (30%), and the lowest affected age group was those > 64 years (1%). There is a significant difference in age distribution in both allergic asthma and AR ($p<0.01$). While there was no significant difference between asthma and

AR age distribution (P>0.05) shown that on Table (1) and figure (1).

Table 1: Age Distribution of Patients .

Age group		Asthma		Rhinitis	
5-14	N	30	0.00 Highly Sig. (P<0.01)	27	0.00 Highly Sig. (P<0.01)
	%	30		27	
15-24	N	14		30	
	%	14		30	
25-34	N	26		21	
	%	26		21	
35-44	N	10		13	
	%	10		13	
45-54	N	10		5	
	%	10		5	
55-64	N	6		3	
	%	6		3	
>64	N	4		1	
	%	4		1	
Total	N	100		100	
	%	100		100	
Asthma Vs Rhinitis		0.115 Non Sig. (P>0.05)			

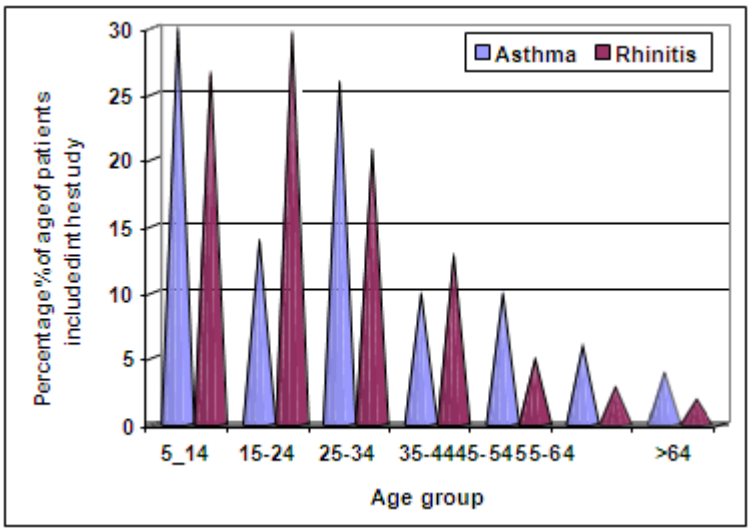

Figure 1: The chart Age Distribution of Patients.

Gender Distribution of Patients Included in the Study: we notice that patients suffering from allergic asthma, the percentage of male patients was higher in comparison with female patients, (56% Vs 44%) with non significant difference (P>0.05). Opposite results were obtained in AR, The percentage of female patients was higher than males (67% Vs 33%) with significant difference (p<0.01). Comparing the gender distribution of patients with asthma and AR, a highly significant difference was found (p<0.01) between these two diseases. Shown that on Table(2) and figure (2).

Table 2: Gender Distribution of Patients.

Gender		Asthma		Rhinitis	
Male	N	56	0.230	33	0.00 Highly Sig. (P<0.01)
	%	56		33	
Female	N	44	Non Sig. (P>0.05)	67	
	%	44		67	
Total	N	100		100	
	%	100		100	
Asthma Vs Rhinitis		0.00 Highly Sig. (P<0.01)			

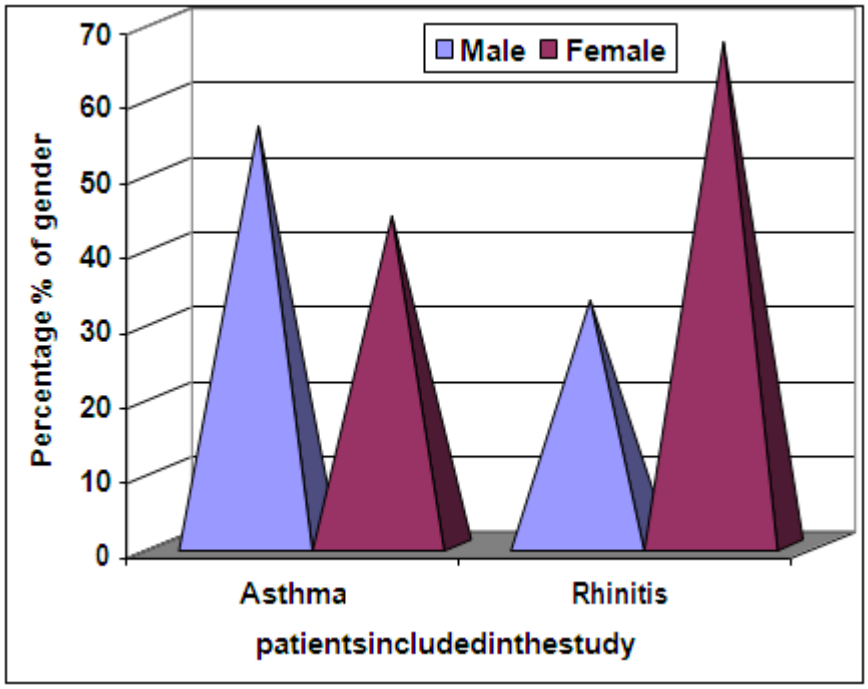

Figure 2: The chart Gender Distribution of Patients

DISCUSSION

The results of this study, demonstrated that both AA and AR are still affecting all age groups and the majority of cases occurred between the ages 5-45 years, and tend to diminish gradually with aging. The data showed, that the number and percentage of asthmatic patients with the age groups 5-14 years and 25-34 years were higher when compared with the remaining age groups (HS p<0.01). While in AR the age groups 15-24 years and 5- 14 years were higher than other age groups with (HS p <0.01).

The results demonstrated a non-significant difference in age distribution of patients with AA and AR.

These observations are in agreement with the findings of other investigators as Bjorksten et al [14], Couwnberge et al [15], Al-Shartslify [16] and Al-Taee [17], who stated that the signs and symptoms of AA and AR generally appear before the fourth decade of life and decrease with old age. However, other studies conducted by Yawn et al [18] and Kasuba [19], showed that AA and AR can begin at any age group and the onset is usually during childhood and adolescence.

The decreased incidence of allergic diseases among older subjects is related to an absolute decrease in the number of cells capable for releasing mediators in response to specific stimulation and also to decrease in the level of serum total and specific IgE [20].

Concerning the Gender distribution there was male predominance in AA patients and female predominance in AR patients with a highly significant difference in gender distribution between the AA and AR.

These results agreed with previous studies that reported a male predominance in AA, Fadhil [13], Burney and Javis [21], and El-Gamal et al [22]. Also these results agreed with Norman's study [23], who found a female predominance in AR by 60- 80% for all age groups, but this disagreed with Osslon et al study [24], who observed an equal gender distribution in AR patients in all age groups.

Comparison of Immunoglobulin Level among All Groups: Total IgE level:

The data demonstrated significant differences in the mean concentration of total serum IgE level between the three studied groups. IgE is produced by plasma cell, predominantly in lymphoid tissue adjacent to the respiratory and gastrointestinal tracts. Its concentration at birth is about 0.22 IU/ml. Adult levels are reached by the age of 10-15 years and decline after the age of 70 years. Healthy non allergic adults have an expected IgE of up to 120 IU/ml [25]. In fact, increased IgE is observed in only 30% of patients with AR and 60% of patients with AA. Conversely, IgE may also be increased in conditions like allergic bronchopulmonary aspergillosis, immunodeficiency, lymphoma, parasitic disease, HIV, alcoholism, smoking and sever burns (IgE is present in extremely small amounts in serum, its concentration may increases in response to specific stimuli. thus in the years immediately following its identification by Ischizaka and colleagues in 1966, many authors documented extremely wide range of serum total IgE value present in different study groups.

In this study the mean of total serum IgE level in all asthmatic patients was significantly higher than AR group and the healthy control. These findings were also reported by Burrws et al [26] and Bentley et al [27] and AL-Diwan et al [28], they all found that the highest values of total IgE were in asthmatics in comparison with AR patients.

CONCLUSION

This study assesses the relation between asthma and allergic rhinitis. The findings reinforce the concept that upper airway disorders may affect directly the lower airways.

The current data implies the following conclusions:

1- Non significant difference in the age distribution of patients was recorded between the asthmatic and allergic rhinitis group, as the majority of cases occurred between the age of 5 and 35 years, and tends to diminish gradually with age.
2- The predominance of males was obvious in the asthmatic, while female predominance was reported in allergic rhinitis group. Thus eliciting a highly significant difference between the two groups statistically.
3- Significantly high levels of serum total IgE antibodies values were demonstrated in patients with asthma as compared with allergic rhinitis group.
4- Although higher levels of serum IgA, IgG and IgM were recorded in asthmatics than in patients with allergic rhinitis, they did not attain the significance levels

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