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Correlation between Human Serum Immunoglobulin A and Complement Component receptor 1 (C5aR1) to Chronic Obstructive Pulmonary, Asthma and Tonsillitis Diseases

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Abstract

Aim of the study: assess the level of immunoglobulin A, IgA, Complement protein C5a in Chronic Obstructive Pulmonary COPD, Asthmatic, and Tonsillitis patients.

Material and methods: 98 samples were collected from patients aged (5 years old to older than 45 years) of different sexes, as well as samples, collected from 10 healthy people as control group in an immunological study. Serum concentration was done according to human IgA Bioassay Technology Laboratory Enzyme-Linked Immunosorbent Assay (ELISA) - Kits Cat.No E0189Hu and Complement Component C5a R1 Enzyme-Linked Immunosorbent Assay (ELISA) Kit Cat. No. E6576Hu.

Results: of the current study showed that the concentration of antibody A (IgA >20ng/ml) was higher in males by (62.5%) compared to females and that the highest concentration was found in the age group greater than 45 by (31.8%)) with a significant difference between the remaining age groups at the level of probability (p > 0.05) and concentration of antibody A (IgA >20ng/ml) was high in all patients, and asthma constituted the highest percentage of increase in antibody A concentration by (32.65%) compared to the control samples with the presence of Significant difference at the level of probability (p > 0.05). the study also showed that Complement Component C5a R1 was high in all disease cases, and the increase was equal in percentage (6.8%) for the distribution of concentrations on patient samples with a significant difference between healthy and sick patients at the level of probability (p > 0.05) and it was high in males only with a percentage of (23.8 and that). The highest concentration was found in the two age groups (5-14and44-35) with a percentage of (6.8%) with no significant difference between the remaining age groups at the level of probability (p > 0.05).

CONCLUSION:Asthma patients affected by the immune changes accompanying the disease compared to patients with Tonsillitis and COPD. High level of antibody concentration ,C5 in all diseased conditions, most affected by Asthmatic patients.

Key words: Asthma ,COPD, Tonsillitis ,IgA,C5a, Complement Component C5a R1 (C5aR1).

Introduction

Chronic obstructive pulmonary disease (COPD) is defined as a blockage in the airway with shortness of breath and difficulty, as it is considered one of the most important diseases that cause death (1). It usually affects men more than women in about 7.6% (2). COPD includes a group of different diseases such as chronic bronchitis and obstructive airway and lung (3) a patient with COPD suffers from a long-term reduced airflow to the lungs (4). Clinically, COPD shows difficulty in passing air, chest tightness, coughing and wheezing. An increase in COPD leads to more lung inflammation and a decrease in biological lung function that ends up affecting lifestyle and may increase rapid death (5). This disease results in a reduction in the total surface area available for gas exchange and, as a consequence, hypoxemia, and the formation of swollen lesions leading to air retention and respiratory distress (6). The GINA: Global Initiative for Asthma defines asthma as a chronic inflammatory disorder of the airways in which many cells and cellular components play a role. Chronic inflammation is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing, especially at night or early in the morning. These episodes are usually associated with widespread, but variable,

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obstruction of intrapulmonary airflow that often can be reversed either spontaneously or with treatment (7). . One of the clinical features of asthma is the presence of Eosinophilic asthma (8).The phenotype of Neutropenic asthma is not well clear (9), and the increase in the number of neutrophils in the sputum of Neutrophilic asthma patients from 40% to 76% of sputum cells, (10). Myeloperoxidase and eosin peroxidase play Role in allergic asthma patients (11). The global asthma burden will rise by 100 million people due to a growing Westernized lifestyle and urbanization in developing countries (12). The palatine tonsil is a lympho- epithelial organ that belongs to the integrative mucosal immune system (13), usually similar to the organized lymphoid tissue found in the alimentary canal (14). And lung (15). Waldeyer, 1884 was the first to describe the lymphoid tissue loop in the human pharynx and describe the stromal nasopharyngeal tonsils, the paired tubal tonsils and the lingual tonsils (16). When bacteria and viruses affect the respiratory system and the tonsils, inflammation of the so-called tonsillitis occurs as an immune reaction that begins with the appearance of sore throat, and painful swallowing, which causes swelling of the throat tissues and obstructs the passage of air to and from the respiratory system. When infection, the tonsils become swollen and red with a grayish layer or yellow on its surface (17) Studies in various animal models have shown that C5a can affect many of the pathogenic features of COPD (18) A study found that the level of c5a concentration was high in COPD patients compared to healthy controls (19). Pharmacological targeting of C5aR significantly increases Th2 immunity in study models of mice with allergic asthma (20). Various studies reported that serum levels of immunoglobulin A was low in patients with Tonsillitis (21).Therefore, the aim of this investigation is to Determin complement concentration serum level and its receptor C5aR1 and Human Serum Immunoglobulin A in bacteria in tonsillitis/asthma/COPD) using ELISA technique.

Materials and Methods

Venous human blood was obtained from patients attending Basra General Hospital and diagnosed by Dr. Ziad Tariq Malghouth for Pulmonary and Respiratory Diseases. 98 blood /serum samples were collected, divided by type of disease, age and gender, 88 samples were patients and 10 samples were healthy (as control group). And the distribution of samples was as follows:

1- Twenty-nine samples of COPD patients
2- Thirty-four samples of Asthmatic patients
3- Twenty-five samples of Tonsillitis patients
4- Ten samples as a control group from healthy people who do not suffer from diseases

All study samples ranged in age from (5 years to more than 45 years old), the number of males was (62) and the number of females was (26) Five ml. of whole blood was collected from both patients and healthy people and were placed in a tube containing separating gel without sterile anticoagulant and left at room temperature for 10 minutes to coagulate and centrifuged at 1400 rpm for 3 minutes to obtain pure serum, which was separated into several sterile Eppendorf tubes and kept at 4 °C for later use. In an immunological study. Serum concentration was done according to human IgA Bioassay Technology Laboratory Enzyme-Linked Immunosorbent Assay (ELISA) - Kits Cat.No E0189Hu and Complement Component C5a R1 Enzyme-Linked Immunosorbent Assay (ELISA) Kit Cat. No. E6576Hu.

Statistical analysis

Statistical data analysis of the (SPSS) digital package. It was calculated for Percentages using the chi-square test (X^2) when probability (0.05).

Result

Distribution of antibody A concentration by age group and sex was shown in Table 1, and illustrate that the concentration of antibody A (IgA >20ng/ml) was higher in males by (62.5%) compared to females and that the highest concentration was found in the age group greater than 45 by (31.8%)) with a significant difference between the remaining age groups at the level of probability ($p > 0.05$), and the Distribution of total Immunoglobulin A concentration by type of the disease . Furthermore, the results of the

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current study, which are shown in Table 2, showed that the concentration of antibody A (IgA >20ng/ml) was high in all patients, and the Asthma patients constituted the highest percentage of increase in antibody A concentration by (32.65%) compared to the control group with the presence of significant difference at the level of probability (p >0.05). The results of the study presented in Table 3 showed a clear significant difference between Tonsillitis, Asthma and COPD, and there is no significant difference between Asthma and COPD at the level of probability (p > 0.05).

Table (1): Distribution of antibody A concentration by age group and sex

Sex	Sample No.	IgA >20 ng/ml
Male	(%70) 62	(62.5%) 55
Female	(29.5%) 26	(19.3%) 17
Total	(100%) 88	(81.8%) 72
Age		
5-14	(20.4%)18	(7.9%) 7
15-24	(%7.9)7	(6.8%) 6
34-25	(%28.4) 25	(7.9%)7
44-35	(%11.3)10	(%7.9)7
≥ 45	(31.8%)28	(31.8%)28
Total	(%100) 88	(62.5%) 55

Table (2): Distribution of total Immunoglobulin A concentration by type of disease

Type of Disease	Sample No.	IgA < 20 ng/ml
Asthma	(%34.69)34	(32.65 %) 32
COPD	(29.59%)29	(%1.632)16
Tonsillitis	(25.51%)25	(%21.42) 21
Control	(10.20 %)10	0
Total	98 (100%)	(% 77.56) 76

Table (3): Describes the relationship of the three diseases with the rate of antibody A concentration

Type of Disease	Total IgA concentration level mean ± SE (Unit)
Asthma	205.64 ± 161.98^{B}
COPD	174.16 ± 108.48^{B}
Tonsillitis	316.31 ± 183.21^{A}
Duncan test : similar letter means there is no significant difference (P ≥ 0.05)	

The results of the current study shown in Table 4 showed that the concentration of (C5a R1>150ngl) is high in all diseased cases, and the increase is equal in percentages (6.8%) for the distribution of concentrations on the samples of patients with a significant difference between healthy and patients at the level of Probability (p > 0.05).

The results of the current study illustrated in Table 5 showed that the concentration of (C5a R1>150ngl) was high in males only, at a rate of (23.8%) compared to females, and that the highest concentration was found in the both age groups (5-14 and 44-35). by (6.8%) with no significant difference between the remaining age groups at the level of probability (p >0.05).

The results of the current study shown in Table 6 also showed an increase in the concentrations of complement protein receptors in patients with Tonsillitis, and there was no significant difference between Asthma and COPD at the level of probability (p > 0.05).

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Table (4): Distribution of C5a R1 concentration on the study samples by type of disease

Type of Disease	Sample No.	C5 a R >150 ng/ml
Asthma	(%34.69)34	(6.8%)6
COPD	(29.59%)29	(6.8%)6
Tonsillitis	(25.51%)25	(6.8%)6
Control	(10.20 %)10	0
Total	98 (100%)	(20.4%)18

Table (5): Distribution of C5a R1 concentration on study samples by gender and age group

Sex	Sample No.	C5 a R >150 ng/ml
Male	(%70) 62	(23.8%)21
Female	(29.5%) 26	0
Total	(100%) 88	(23.8%)21
Age		
5-14	(20.4%)18	(6.8%) 6
15-24	(%7.9)7	0
34-25	(%28.4) 25	0
44-35	(%11.3)10	(6.8%) 5
≥ 45	(31.8%)28	(5.6%) 6
Total	(%100) 88	(19.3) 17

Table (6): The relationship of the three diseases with the average concentration of C5a R1

Type of Disease	Total C5 a R1 concentration level mean ± SE (Unit)
Asthma	42.40 ± 58.15^{A}
COPD	7.09 ± 4.31^{B}
Tonsillitis	6.68 ± 2.21^{B}
Duncan test: similar NO. mean there is no significant difference (P > 0.05)	

Discussion

The results of the current study showed an increase in the level of antibody A concentration in asthma by (32.65%). The current study is in agreement with another study that was conducted confirming the relationship between the severity of asthma and the concentration of antibody A in patients (22). A study stated that infants are more susceptible to asthma and increase allergy symptoms when the concentration of antibody A decreases (23), and weak immune response to antibody A may cause an increase in the development of allergic diseases and asthma (24). The increased incidence of asthma may be attributed to the fact that the antibody A binding to the mucous membranes may be insufficient to prevent the entry of allergens through the mucous membrane, which leads to increased exposure to foreign antigens and thus increased exposure to allergies and exacerbation of asthma (25). The results of the current study showed a high level of antibody A concentration when infected with tonsillitis (21.42%). The results are consistent with a study conducted by (26), where a high level of antibody concentration was found in case of chronic tonsillitis and the reason was attributed to the Continuity and increase in the concentration of the antibody to the increase in the presence of antigens leading to the rise of antibodies as an immune response to repeated infection, and it was found (27) a decrease in the concentration of antibody A after 12-14 months after the removal process. While it was found(28)a decrease in concentration after one month of the operation, which may be attributed to the stability of the humoral immune response and the time of its occurrence after removing the tonsils(29). The results of the current study showed that the lowest concentration of antibody A was in COPD, and the study was in agreement

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with a study conducted on a number of patients with COPD, as a low concentration of antibody was found in one of the patients with IgA (<7mg/dL) compared to 25 other patients who had IgA levels. Subnormal antibody IgA ≤70 mg/dL.(30). The results of the current study showed that the highest concentration of antibody A was found in the age group greater than 45 by (31.8%) and the results of the study are consistent with other studies that found a high concentration of antibody A in the blood serum at old ages compared with young people (31) This may be due to what a number of studies have indicated, perhaps exposure to psychological and physical stress and lack of physical activity or lack of sleep in the elderly leads to an increase in the concentration of the antibody A(32). The results of the current study showed that the serum concentration of antibody A was high in males by (62.5%) compared to females The results of the study agree with a study that was conducted, which found that the concentration of men was 20% higher than that of females (31). The reason may be that the difference between males and females may be related to genetic and environmental factors as shown in previous studies (33). The results of the current study showed that the concentration of (>150ng/l C5a R1) is slightly elevated in all diseased cases, and the increase is equal in percentage (6.8%) for the distribution of concentrations on the samples of patients. In multiple studies, an increase in the proportion of complementary serum proteins was found in the case of hypersensitivity pneumonia (34). This increase in the concentration of C5a protein is due to the fact that the complement system proteins are usually stable when the infection is stable and increase in the case of infection activity and exacerbation. It was found in the alveolar fluid that an increase in the rise of complement protein Ca was found when inflammatory conditions occurred in the lung bronchoalveolar lavage fluid (BALF) (35). The results of the current study showed that the concentration of (ng/l >150 C5a R1/) was high in males only at a rate of (23.8%) compared to females, and that the highest concentration was found in the two age groups (5-14/44-35) by (6.8%). The results of the study agreed with another study that found that C5 was higher in males and less by 14% in females, and the concentration was high in the elderly ($P < 0.001$) (36). The variation in ratios between females and males is attributed to genetic factors or factors Hormonal, as hormones influence the mechanism of the immune reaction (37)Roach *et al* is clear that there are significant differences between the levels of concentrations of complement system proteins in young people (1-19 years) and between males and females (38).

CONCLUSION

Asthma patients affected by the immune changes accompanying the disease compared to patients with
Tonsillitis and COPD. High level of antibody concentration, C5 in all diseased conditions, most affected by Asthmatic patients.

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العلاقة بين الغلوبولين المناعي البشري A في المصل ومستقبل البروتين المتمم C5a R1 بمرض داء الانسداد الرئوي المزمن والربو والتهاب اللوزتين

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الخلاصة

الهدف من الدراسة: تقييم مستوى الغلوبولين المناعي IgA ، والبروتين التكميلي C5a لدى مرضى الانسداد الرئوي المزمن ، مرضى الربو ، والتهاب اللوزتين.

المواد وطرق العمل: تم جمع 98 عينة من مرضى تتراوح أعمارهم (من 5 سنوات إلى أكبر من 45 سنة) من مختلف الجنسين ، وكذلك عينات تم جمعها من 10 أشخاص أصحاء كمجموعة ضابطة في دراسة مناعية. تم إجراء معرفة مستوى تركيز المصل وفقًا لمقايسة الممتز المناعي المرتبط بالإنزيم المرتبط بالإنزيم (ELISA) البشري IgA Bioassay Technology - مجموعات Cat.No E0189Hu والمكون التكميلي C5a R1 المرتبط بالإنزيم (Cat E6576Hu .ELISA Kit).

النتائج: أظهرت الدراسة الحالية أن تركيز الجسم المضاد IgA (A> 20ml / ng) كان أعلى عند الذكور بنسبة (62.5٪) مقارنة بالإناث وأن أعلى تركيز وجد في الفئة العمرية الأكبر من 45 بنسبة (31.8٪) مع وجود فرق معنوي بين الفئات العمرية المتبقية عند مستوى الاحتمال (p> 0.05) وتركيز الجسم المضاد IgA(A> 20ml / ng) كان مرتفعًا في جميع المرضى ، وشكل الربو أعلى نسبة زيادة في الجسم المضاد A التركيز بنسبة (32.65٪) مقارنة بعينات التحكم مع وجود فرق معنوي عند مستوى الاحتمال (p> 0.05). كما أظهرت الدراسة أن المكون التكميلي C5a R1 كان مرتفعا في جميع الحالات المرضية ، وكانت الزيادة متساوية بنسبة (6.8٪) لتوزيع التراكيز على عينات المرضى مع وجود فرق معنوي بين المرضى الأصحاء والمرضى عند مستوى الاحتمال (p>0.05). كما أوضحت الدراسة أن المكون التكميلي C5a R1 كان مرتفعا في جميع الحالات المرضية ، وكانت الزيادة متساوية في النسبة المئوية (6.8٪) لتوزيع التراكيز على عينات المرضى مع وجود فرق معنوي بين المرضى الأصحاء والمرضى عند مستوى الاحتمال (p> 0.05) وكانت مرتفعة عند الذكور فقط بنسبة (23.8%). أعلى تركيز وجد في الفئتين العمريتين (5-14 و 35-44) وبنسبة (6.8٪) مع عدم وجود فرق معنوي بين الفئات العمرية المتبقية عند مستوى الاحتمال (p> 0.05).

الاستنتاج: يتأثر مرضى الربو بالتغيرات المناعية المصاحبة للمرض مقارنة بمرضى التهاب اللوزتين ومرض الانسداد الرئوي المزمن. مستوى عالي من تركيز الأجسام المضادة C5 في جميع الحالات المرضية ، والأكثر تضرراً من مرضى الربو.

الكلمات المفتاحية : الربو ، مرض الانسداد الرئوي المزمن ، التهاب اللوزتين ، الجسم المضاد A، البروتين المتمم الخامس C5.