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Serum FcαRI (CD89) and Atopic Dermatitis: A Novel Investigation into Associations with White Blood Cell Subsets

Bandar I.A. AL-Shammari **Rojan G.M. AL-Allaff**

University of Mosul/ College of Science/ Department of Biology/ Mosul/ Iraq

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corresponding author:
Bandar I.A. AL-Shammari
baandaar97@gmail.co
Rojan G.M. AL-Allaff
rojsbio57@uomosul.edu.iq

ABSTRACT

Eczema, another name for atopic dermatitis (AD), is a chronic inflammatory skin disease that causes redness and irritation. It is a common disorder affecting individuals of all ages. The human IgA Fc receptor (FcαRI/CD89) is expressed on myeloid cells, such as monocytes/macrophages, eosinophils, and neutrophils, and can trigger various immunological effector processes. The study aims to assess the concentration of FcαRI in patients with chronic atopic dermatitis, including children and adults. The study sought to evaluate the relationship between FcαRI levels and white blood cell counts using a regression coefficient test. A total of 110 AD patients (aged 1-30 years) were recruited from hospitals in Mosul city between October 2024 and February 2025. Participants were categorized into two age groups: Children (1-15 years, n=38) and adults (16-30 years, n=32), along with age-matched healthy controls (n=40). Blood samples were analyzed for FcαRI levels using ELISA and for WBC counts through CBC analysis. The results demonstrated significantly elevated FcαRI levels in AD patients compared to controls ($p \leq 0.05$), with children exhibiting higher concentrations than adults. Regression analysis identified significant correlations between FcαRI levels and WBC subpopulations. Elevated FcαRI levels in AD patients indicate immune hyperactivity and increased immune complex formation, contributing to chronic inflammation and exacerbation of AD symptoms. Suggesting a decrease in FcαRI expression with age. This suggests that FcαRI may play a role in inflammatory cell recruitment and immune regulation in AD. FcαRI may serve as a valuable biomarker for assessing the severity and progression of atopic dermatitis.

Keywords: Atopic dermatitis, FcαRI, CD89, IgA, anti-inflammatory.

INTRODUCTION

Atopic dermatitis (AD), or atopic eczema, is a chronic inflammatory skin disease. It affects infants and children (15-30%) however, AD can persist or even develop again in adolescence and adulthood and makes up (2-8%) of infections, making it a lifelong disease in some individuals (Tanei and Hasegawa, 2022). AD is caused by an interaction and interference between genetic, immune and environmental factors, working to destroy the skin barrier and facilitate the penetration of allergens, microbes and irritants into the interior, which leads to sensitization and activation of the immune system (Packi *et al*., 2023). The characteristic symptoms of AD are a weakening of the skin barrier, its dryness, redness of the skin and itching (Pappa *et al.*, 2022).

Since immunoglobulin type A is the most abundant in the body and the main representative of the skin and the majority of its presence in the secretory tissues, staphylococcal bacteria (*Staphlococcus aureus*) are also considered one of the most common types of bacteria that cause injuries and damage to skin tissues in addition to other bacterial species, as explained by (Younus and Essa, 2022) study.

FcαRI (CD89) IgA monomer sIgA through the Fc Alpha I receptor (FcαRI) performs important immune functions and binds IgA immune complexes to mediate immune responses, including phagocytosis, cytokine secretion, and regulation of microbial communities. FcαRI plays dual roles: Anti-inflammatory (inhibiting TLR activation) and pro-inflammatory (stimulating neutrophil activation upon cross-linking) (Gleeson *et al*., 2024).

Myeloid cells, such as intestinal dendritic cells, intestinal dendritic cells, neutrophils, eosinophils, eosinophils, monocytes, and some macrophages, express FcαRI receptors on their surface (Breedveld and van Egmond, 2019). Their function is associated with the activation of multiple signaling pathways, including the immune tyrosine receptor (ITAMi), the immune tyrosine receptor-based activation promoter (ITAMa), and others, resulting in an anti-inflammatory reaction (Ben Mkaddam *et al.*, 2013; Aleyd *et al.*, 2014).

The function of free Fc alpha receptor I (FcαRI) in the serum of AD disease patients has not been comprehensively studied. The Fcα receptor, or CD89, has been observed to play an important role in regulating immune responses (Herr *et al.,* 2003).

Chronic AD has been observed with systemic immune dysregulation, including elevated and possibly altered immunoglobulin A (IgA) levels. Increased free Fc alpha may reflect increased immune activation or a compensatory mechanism to regulate inflammation. However, elevated serum levels of free FcαRI may cause IgA binding, leading to the formation of immune complexes that promote inflammation and activate immune cells. The chronic inflammation seen in AD disease may be exacerbated by this mechanism. The appearance of immune complexes in the blood may contribute to the activation of complement's role in cytolysis and thus exacerbate injury and the development of autoimmune diseases (Bos *et al.,* 2022).

However, there are no specific studies linking serum-free FcαRI levels to chronic atopic dermatitis, necessitating further research to clarify this relationship. Therefore, this study was designed to assess the concentration of FcαRI (CD89) in patients with chronic atopic dermatitis, which includes children and adults. Furthermore, the study aimed to evaluate the relationship between FcαRI (CD89) levels and their effect on white blood cell counts using a regression coefficient test.

MATERIALS AND METHODS

Study area: Clinical samples were collected from patients coming to hospitals consultations (Al-Salam educational-Ibn-Sina-Mosul general) in the city of Mosul. For the period between (10/10/2024-1/2/2025). The required tests and practical experiments were carried out in the laboratories of the department of biology at the college of science-university of Mosul, and advanced immunology laboratories in the mentioned hospitals.

Study Cases: (110) blood samples were collected for a group of individuals aged between (1-30) years, and divided into four groups: The first group included: Pediatric patient group with a number of (38) patients of both sexes (male/female) ranging in age from (1-15) years, diagnosed with

atopic dermatitis. The first group of patients corresponds to the control sample group, which included (20) children of both sexes (male/female) aged between (1-15) years, healthy and do not suffer from any chronic or immune diseases or any symptoms of disease or health ailments, and do not undergo treatment with any kind of antibiotics and other medications or dietary supplements. As for the second group, it included (32) adult patients of both sexes (male/female) aged between (16-30) years, diagnosed with atopic dermatitis. The second group of patients corresponds to the control sample group consisting of (20) individuals of both sexes (male/female) aged between (16-30) years, healthy and do not suffer from any chronic or immune diseases or any pathological symptoms or health ailments, and do not undergo treatment with any kind of antibiotics and other medications or dietary supplements.

Blood and serum collection:

5ml of venous blood was withdrawn from all the study samples using sterile medical syringes of 5ml capacity, and distributed to two test tubes, the first test tube was of the anticoagulant EDTA type and an amount of 2ml of the blood sample was placed in it, then gently shaken to homogenize the blood and conduct a complete blood count CBC, the remaining of the blood sample was in an amount of 3ml was placed in the second test tube, which was of the gel tube type, which is used to separate the serum by a centrifuge at 4500 rpm, for 10 minutes, The serum was then distributed in small plastic tubes of Eppendorf tubes and then frozen at (-20C) to measure the concentration of autoantibodies against the receptor FcαRI CD/89 of IgA.

Measurement of the concentration of autoantibodies against the receptor FcαRI CD/89 of IgA:

This immunological examination was carried out by the American-made ELISA microplate reader device from the BIOTEK company.

Principle: This dual sandwich-ELISA principle is used in the pre-prepared ELISA (enzyme-linked immunosorbent assay) kit. The human FcαRI CD/89 antibody has already been added to the ELISA mini-plate that comes with this kit. The wells of the ELISA tablets were filled with samples (or standards for all control and patient study subjects, respectively) and combined with the specific antibody. Each plate received successive additions of antibody to detect biotin-specific FcαRI CD/89 human Fcα/89 biotin and Avidin-Horseradish Peroxidase (HRP), and was then incubated before cleaning the free components. A standard solution was added to each pit. Only pits containing human FcαRI CD/89, biotinylated antibody, and Avidin-HRP will be shown in blue. The stop solution was added to terminate the enzyme base reaction, and the color changed to yellow. At 450 nm, the optical density (OD) was measured using a spectrophotometer. The concentration of human FcαRI CD/89 is directly proportional to the OD value. The concentration of human FcαRI CD/89 in the samples was determined by comparing the standard curve and monomeric fraction of the samples (Tabatabaei and Ahmed, 2022).

Complete blood count (CBC) examination:

The Japanese-made (SYSMEX-KX/21N) device was used to perform a complete blood count (CBC) test and measure the percentage of white blood cell counts in peripheral blood. The total number of white blood cells and the differential number of each of the cells (Neutrophils, Lymphocytes, Monocytes, Eosinophils, Basophiles) were measured.

Principle: Blood samples were drawn in this study for all patient and control groups, placed in the EDTA tube, mixed well and the device was turned on, the patient's information was confirmed through the electronic panel (name, age and type of examination required), the EDTA tube containing venous blood was placed under the needle needles of the device and a certain amount of blood was withdrawn by the device to make the required measurement and the result was displayed on the screen and then pulled out paper.

Ethical considerations:

Before conducting the study, ethical permission was obtained from the Nineveh health department/research and development division, preceded by an official request approved by the scientific council at the faculty of science/University of Mosul. The study submitted to the requirements of public ethics stipulated internationally and by the Helsinki convention. Before

participating, the participants signed the permission form to participate, provided that all their information was completely confidential and only for scientific research. The tests mentioned in this study were provided free to the participants.

Statistical analysis:

The ANOVA variance analysis test was conducted to test the level of morale among the study groups and compare them with the control sample, in addition to conducting a regression coefficient test to find the impact of some factors on the study variables through the use of the SPSS program. 24 at a morale level of P≤ 0.05 (Kim, 2017).

Results and discussion:

The results of our study showed a significant increase in the amount of FcαRI of IgA in AD patients in the age group (1-15) compared to the equivalent control group at a significant difference of 0.000 when the *$P\ value \leq 0.05$, as shown in the following (Table 1).

Table 1: Statistical indicators represented by sample numbers, arithmetic mean, standard deviation, minimum and maximum values, of FcαRI of IgA in patients (1-15)

Variable	Group (1-15)	N. Sample	Mean± SD	Extreme value	P-value
FCαRI of IgA ng/ml	Patient	38	6.49 ± 7.02	1.83 - 35.76	0.000
	Control	20	2.08 ± 0.43	1.65 - 2.76	

*$P \leq 0.05$

Neutrophils, eosinophils, monocytes, and macrophages are examples of myeloid cells that express the transmembrane receptor FcαRI, also known as CD89. It is the main receptor for immunoglobulin A (IgA), the most prevalent antibody on the mucosal surfaces of AD patients. and is elevated above normal levels in cases of skin destruction or immune disorders (Lydia *et al.,* 2012). For this reason, in our study, we observe higher than normal rates in children with AD.

FcαRI is released as a soluble form (sCD89) as a defensive immune response in cases of inflammation. Because of its high affinity for IgA, this receptor is able to form complexes with it. The more these immune complexes are formed, the larger they become, contributing to increased tissue deposition and inflammation, making it difficult to clear naturally, as is the case in AD disease (Bakema and Egmond, 2011). This was very evident in our study, which was consistent with the previous study.

Many cellular functions, including phagocytosis, generation of reactive oxygen species, and secretion of inflammatory mediators such as leukotriene B4 and interleukin 8, are activated when IgA immune complexes or pathogens with IgA-oponized IgA crosslink with FcαRI., and these processes contribute significantly to inflammatory responses and tissue damage due to their dysregulation (Van Delft *et al.,* 2023). This is a clue as to why the levels of these receptors were higher in the children with AD enrolled in our study.

Fcα-RI receptors mediate anti-inflammatory effects via ITAMi signaling, suggesting an important homeostatic role. When IgA immune complexes cross-link Fcα-RI receptors, they activate cells that express Fcα-RI, such as neutrophils, monocytes, and CD103+ dendritic cells, which causes pro-inflammatory reactions (Mkaddem *et al.,* 2017).

The results of the study also showed a significant increase in the amount of FcαRI of IgA in AD patients in the age group (16-30) compared to the equivalent control group at a significant difference of 0.007 when the *P value is ≤ 0.05, as shown in the following (Table 2).

Table 2: Statistical indicators represented by sample numbers, arithmetic mean, standard deviation, minimum and maximum values, of FcαRI of IgA in patients (16-30).

Variable	Group (16-30)	N. Sample	Mean± SD	Extreme value	P-value
FCαRI of IgA ng/ml	Patient	32	2.77±1.34	1.13-6.82	0.007
	Control	20	1.82±0.94	0.79-3.69	

*$P \leq 0.05$

Since these receptors have high affinity and specificity for IgA antibodies, the more IgA, the more receptors there are to organize a proper immune response to them. This explains why patients with chronic AD disease have higher concentrations of FCαRI. This is consistent with the following study which indicates that the role of IgA must be high, as the average daily production of IgA in adults is higher than the average production of all other antibody classes combined (66 mg/kg/day). This explains why high levels of IgA are found in the tissues of patients with atopic dermatitis and other allergic diseases (Mestecky and Hammarström, 2007).

According to our research, the ratio in adults is lower than in children, despite being higher than normal, because the levels of FCαRI for IgA are inversely proportional to age and decline with age. That aligns with what (Dzidic *et al*., 2017; Kim *et al.,* 2017). Who claimed that the correlation between low IgA levels and a less varied microbiota shows that IgA also plays a significant role in the development of allergic diseases. However, there has been conflicting research on the relationship between IgA levels, allergies and asthma. The association was inversely correlated with disease severity in children. Serum IgA in adults was negatively correlated with both airway hyper-responsiveness and sensitivity to house dust mites.

After binding to FcαRI, IgA is crucial for the removal of pathogens. When aberrant IgA is present, it can negatively impact human health. When autoimmune diseases occur, the constant interaction between IgA-FcαRI leads to the activation of immune cells and causes tissue damage, destruction of skin layers, and increased disease severity, and our study proved this conclusion in accordance with (Ven der Steen *et al.*, 2009).

Influence relationship analysis:

The results of the analysis of the effect relationship showed the following:

A. Sample patients for category (1-15):

1. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (WBCc cell/μL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probability value, which amounted to (0.000) and is less than (0.05).
2. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Neutrophils) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probabilistic value, which amounted to (0.000) and is less than (0.05).
3. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Lymphocytes cell/μL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probabilistic value, which amounted to (0.000) and is less than (0.05).
4. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Monocytes cell/μL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probabilistic value, which amounted to (0.000) and is less than (0.05).
5. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Eosinophils cell/μL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probability value, which amounted to (0.000) and is less than (0.05).
6. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Basophils cell/μL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probability value, which amounted to (0.000) and is less than (0.05). As shown in (Table 3) and Figs. (1, 2, 3, 4, 5, 6) respectively

Table 3: The relationship of the impact analysis of the independent variable FCαRI of IgA in the group (1–15) of study variables.

Independent variable	Dependent variable	Best relationship	Equation	Bi		P-value (b_1)
				b_0	b_1	
Fcα RI of IgA ng/ml	WBCc cell/µl	Compound	$Y = b_0 * (b_1\text{^}X)$	10377.89	0.994	0.000
	Neutrophils cell/µl	Compound	$Y = b_0 * (b_1\text{^}X)$	4198.19	0.997	0.000
	Lymphocytes cell/µl	Compound	$Y = b_0 * (b_1\text{^}X)$	4277.92	0.986	0.000
	Monocytes cell/µl	Compound	$Y = b_0 * (b_1\text{^}X)$	808.456	0.997	0.000
	Eosinophils cell/µl	Compound	$Y = b_0 * (b_1\text{^}X)$	252.026	1.022	0.000
	Basophils cell/µl	Compound	$Y = b_0 * (b_1\text{^}X)$	44.073	1.012	0.000

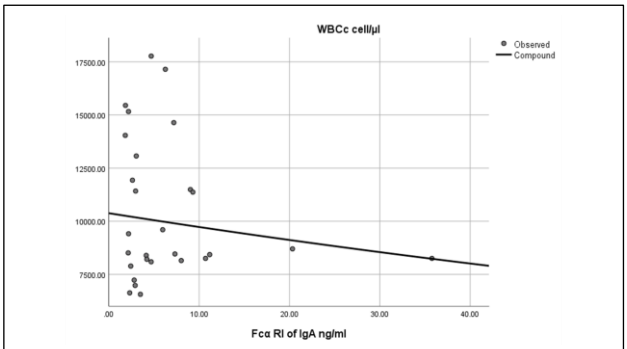

Fig. 1: Linear regression coefficient between FCαRI and WBC count for category (1-15).

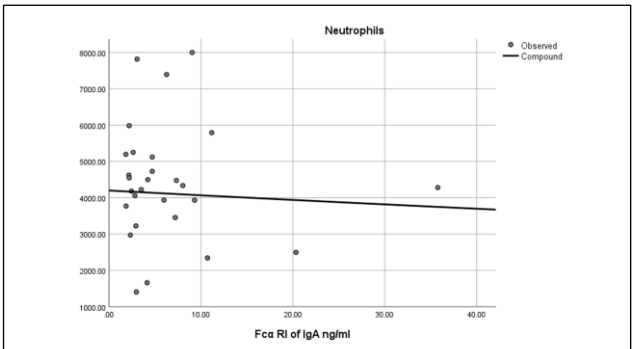

Fig. 2: Linear regression coefficient between FCαRI and absolute numbers of neutrophils for category (1-15).

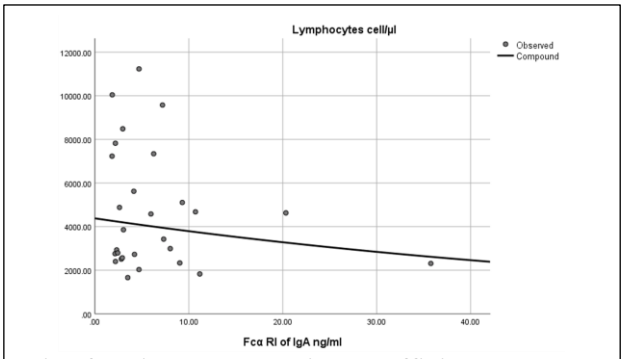

Fig. 3: Linear regression coefficient between FCαRI and absolute numbers of Lymphocytes for category (1-15).

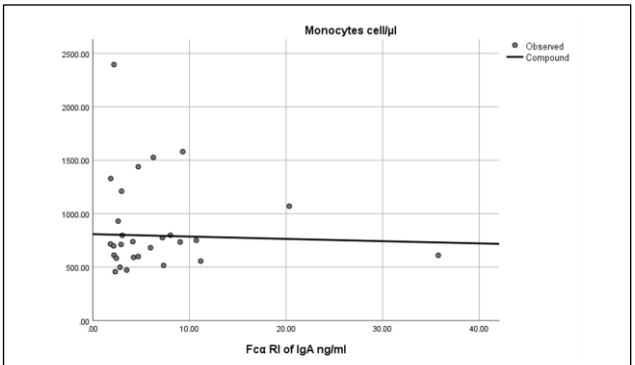

Fig. 4: Linear regression coefficient between FCαRI and absolute numbers of Monocytes for category (1-15).

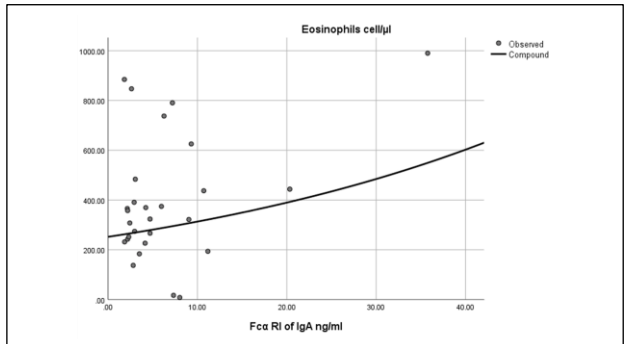

Fig. 5: Linear regression coefficient between FCαRI and absolute numbers of Eosinophils for category (1-15).

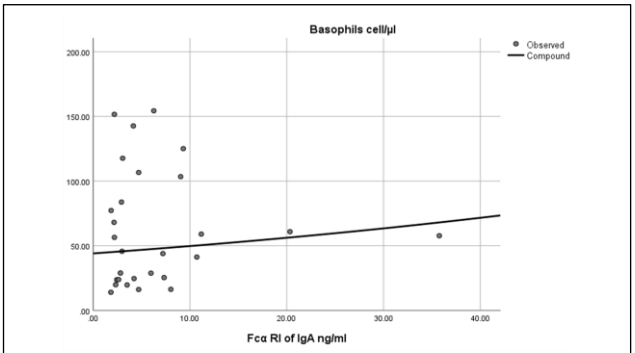

Fig. 6: Linear regression coefficient between FCαRI and absolute numbers of Basophils for category (1-15).

B. Sample patients for category (16-30):

1. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (WBCc cell/µL) is a nonlinear relationship of the Power type (Power) and is significant in terms of the probability value, which amounted to (0.002) and is less than (0.05).
2. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Neutrophils) is a linear relationship of the Linear type and is significant in terms of the probabilistic value, which amounted to (0.002) and is less than (0.05).
3. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Lymphocytes cell/µL) is a nonlinear relationship of the S type (S-curve) and is significant in terms of the probabilistic value, which amounted to (0.033) and is less than (0.05).
4. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Monocytes cell/µL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probabilistic value, which amounted to (0.000) and is less than (0.05).
5. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Eosinophils cell/µL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probability value, which amounted to (0.000) and is less than (0.05).
6. The effect relationship of the independent variable (FCαRI of IgA ng/ml) in the dependent variable (Basophils cell/µL) is a nonlinear relationship of the combined type (Compound) and is significant in terms of the probability value, which amounted to (0.000) and is less than (0.05). As shown in (Table 4) and Figs. (1,2,3,4,5,6) respectively.

Table 4: The regression coefficient independent variable FCαRI of IgA in the group (16-30) of study variables.

Independent variable	Dependent variable	Best relationship	Equation	Bi		P-value (b_1)
				b_0	b_1	
FcαRI of IgA ng/ml	WBCc cell/µl	Power	Y= b0* (X**b1)	10399.91	-0.341	0.002
	Neutrophils cell/µl	Linear	Y=b0+(b1*X)	5798.83	-569.34	0.002
	Lymphocytes cell/µl	S	Y=e**(b0+(b1/X))	7.50	0.761	0.033
	Monocytes cell/µl	Compound	$Y=b_0*(b_1\text{^}X)$	640.28	0.975	0.000
	Eosinophils cell/µl	Compound	$Y=b_0*(b_1\text{^}X)$	308.17	0.823	0.000
	Basophils cell/µl	Compound	$Y=b_0*(b_1\text{^}X)$	42.73	0.958	0.000

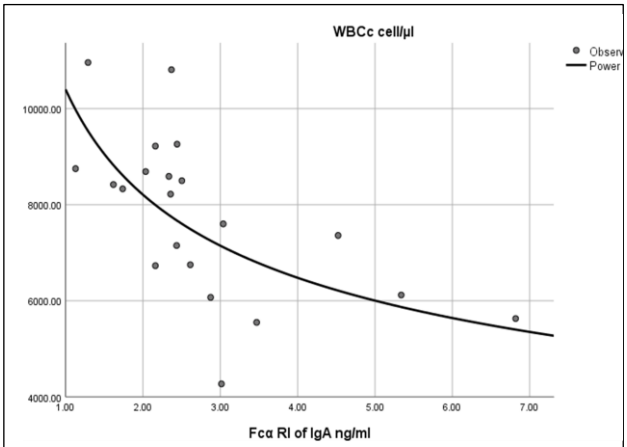

Fig. 1: Linear regression coefficient between FCαRI and white blood cell count for category (16-30).

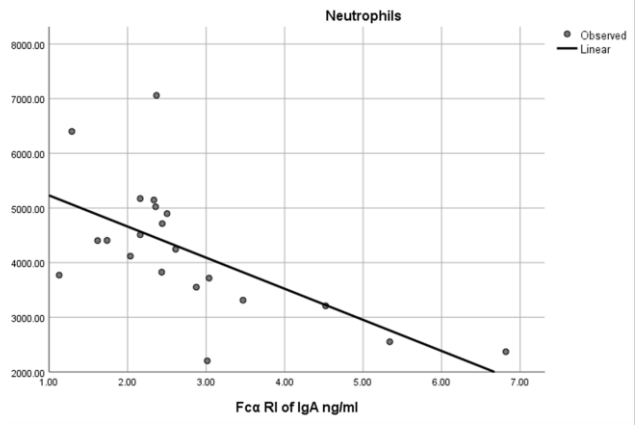

Fig. 2: Linear regression coefficient between FCαRI and absolute numbers of neutrophils for category (16-30).

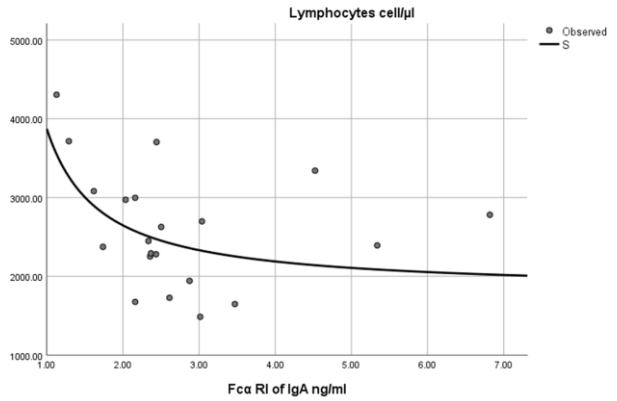

Fig. 3: Linear regression coefficient between FCαRI and absolute numbers of Lymphocytes for category (16-30).

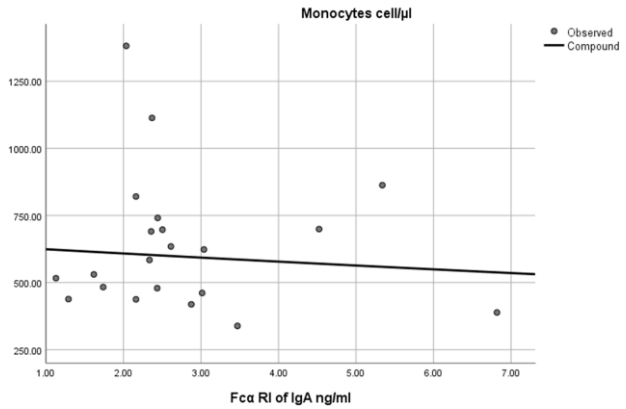

Fig. 4: Linear regression coefficient between FCαRI and absolute numbers of monocytes for category (16-30).

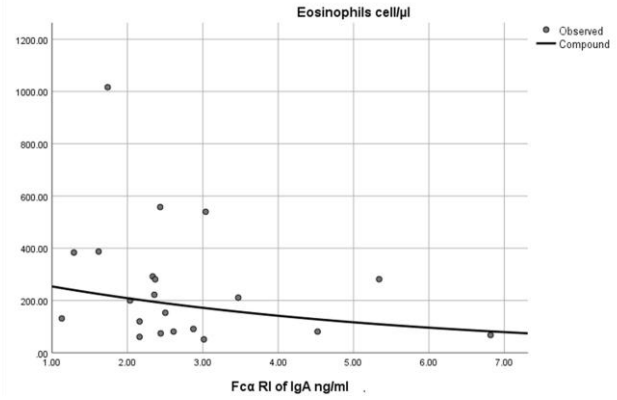

Fig. 5: Linear regression coefficient between FCαRI and absolute numbers of Eosinophils for category (16-30).

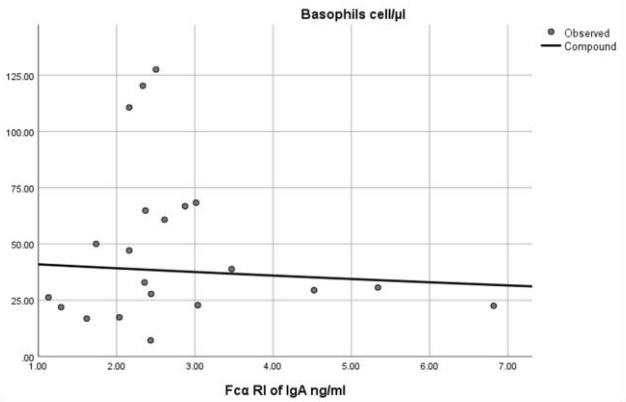

Fig. 6: Linear regression coefficient between FCαRI and absolute numbers of Basophils for category (16-30).

FcαRI is expressed on neutrophils, monocytes, and eosinophils, suggesting its potential involvement in immune responses. However, few studies have directly linked free FcαRI levels to white blood cell counts in patients with atopic dermatitis. However, this chronic inflammation may be associated with systemic inflammation, resulting in elevated C-reactive protein (CRP) levels. CRP, in turn, influences the dynamics of white blood cells in terms of number and activity, as demonstrated by the significant correlation between the two markers in the results (Shin and Greer, 2015).

FcαRI is estimated to be expressed at approximately 66,000 molecules per neutrophil. Interleukin-8 (IL-8), granulocyte-macrophage colony-stimulating factor (GM-CSF), tumor necrosis factor-alpha (TNF-α), and N-formylmethionyl-leucyl-phenylalanine (fMLP) are inflammatory mediators that can increase their expression. IgA immune complexes that cross-link FcαRI cause neutrophil activation, which results in phagocytosis, the release of cytokines, reactive oxygen species (ROS), and neutrophil extracellular traps (NETs). These processes contribute to pathogen elimination but may also cause tissue damage in inflammatory conditions (Klein *et al*., 2000).

FcαRI engagement triggers the release of leukotriene B4 (LTB4), a chemoattractant that promotes neutrophil migration to sites of inflammation. This creates a positive feedback loop for neutrophil recruitment (Behrens *et al*., 2023).

Our study agrees with the study of (AL-Allaff and AL-Tobje, 2017). which showed that the number of white blood cells, especially neutrophils, is disturbed and abnormal in people subjected to various life stresses, and this is an important factor that must be taken care of in Atopic patients.

Excessive activation of neutrophils through FcαRI can lead to tissue damage in autoimmune or inflammatory diseases. For example, in Linear IgA Bullous Disease (LABD), IgA autoantibodies interacting with FcαRI result in massive neutrophil accumulation and severe tissue damage. While free FcαRI does not directly interact with lymphocytes, its role in activating other immune cells (e.g., monocytes and dendritic cells) indirectly impacts lymphocyte function and systemic inflammation in AD. This suggests a potential link between elevated free FcαRI levels and the dysregulated immune environment involving lymphocytes in AD (Brandt and Serezani, 2017).

There are subsets of dendritic cells that express FcαRI. IgA immune complexes that cross-link FcαRI on dendritic cells encourage antigen presentation through MHC class II and trigger the release of cytokines like TGF-β and IL-10, which are essential for B-cell activation and IgA isotype switching. FcαRI-activated monocytes can promote B-cell migration and IgA isotype switching through cytokine signaling. This suggests that while FcαRI is not directly expressed on B lymphocytes, it influences their function via intermediary cells. FcαRI-mediated activation of dendritic cells can lead to the recruitment of T lymphocytes through antigen presentation and cytokine release. This highlights an indirect role for FcαRI in modulating T-cell responses. The pro-inflammatory environment created by FcαRI activation (e.g., release of TNF-α, IL-1β, and IL-6) can influence lymphocyte behavior, including their recruitment and activation in inflammatory or autoimmune conditions (Pasquier *et al.,* 2004).

FcαRI is expressed on subsets of monocytes, particularly those involved in immune responses. It mediates interactions with IgA immune complexes, leading to monocyte activation. FcαRI activation on monocytes also stimulates the release of pro-inflammatory cytokines such as TNF-α and IL-6. These cytokines contribute to inflammation and immune regulation. Furthermore, FcαRI-stimulated monocytes can promote B cell migration and IgA class recombination, highlighting their role in adaptive immunity. FcαRI expression and activation on monocytes are also influenced by ambient IgA levels. Increased serum IgA stabilizes FcαRI expression, enhancing its function. Increased free FcαRI in the serum correlates with enhanced monocyte activation and pro-inflammatory cytokine production in atopic dermatitis. This relationship highlights the role of FcαRI in driving monocyte-mediated inflammation and contributing to the pathophysiology of AD (Hansen *et al.,* 2019).

The association between increased serum free FcαRI (CD89) and eosinophils and basophils in atopic dermatitis (AD) is linked to their roles in immune dysfunction and inflammation. FcαRI is expressed on eosinophils and basophils, and its activation can affect their function in atopic dermatitis. The relationship between free FcαRI and eosinophils in atopic dermatitis involves eosinophil activation, increased numbers in peripheral blood, and increased skin lesions. By enhancing eosinophil activation through IgA immune complexes, increased free FcαRI may encourage the release of inflammatory mediators like eosinophil-derived cytokines (like IL-5 and IL-13). which exacerbate Th2-mediated inflammation. Elevated eosinophil levels are a biomarker of atopic dermatitis severity. Mendelian randomization studies show a positive association between increased eosinophil counts and the risk of atopic dermatitis, suggesting that eosinophils contribute causally to disease progression (Zeng-Yan-Ou *et al.*, 2022).

Rare granular cells called basophils are crucial to allergic inflammation. IgE activates basophils in atopic dermatitis, potentially through IgA-FcαRI interactions, causing the release of histamine and IL-4 (which encourages Th2 differentiation). proteases, and eicosanoids (Siracusa *et al.*, 2013). Our study was also consistent with the variation in absolute lymphocyte counts in people with autoimmune diseases that was evident in the research presented by (AL-Allaff and Al-Shahery, 2017).

Mendelian randomization studies reveal a positive association between increased basophil counts and the risk of developing AD. Activated basophils contribute to the itching, barrier dysfunction, and inflammation characteristic of AD. Although FcαRI is expressed on basophils, its specific contribution to the inflammation caused by basophils in AD remains unclear. However, free FcαRI may indirectly amplify basophil activation through IgA immune complexes (Zeng-Yan-Ou *et al.,* 2022).

Immune disorders in patients with autoimmune diseases have been shown to have genetic underpinnings, according to a recent study by (Ali and AL-Allaff, 2022).

This study also agreed with the study conducted by (Al-Tobje, 2013) that white blood cell levels are abnormal and disturbed in people with autoimmune diseases such as AD.

Significant differences between age groups, such as the maturity of the immune system and the different degree of its development between children and adults, the inflammatory status of patients, the different degrees of ulceration, and the different duration of hospitalization between age groups, must be taken into account, and these details overshadowed the difference in the types of relationships and regression coefficient tests that were fully reflected in the sensitization status and immune response.

CONCLUSIONS

The study found a significant increase in the concentration of FcαRI (CD89) in the blood of atopic dermatitis (AD) patients compared to control groups. This increase was more pronounced in children (1-15 years old) than in adults (16-30 years old).

High FcαRI levels in AD patients indicate immune hyperactivity and increased immune complex formation, leading to chronic inflammation and worsening of atopic dermatitis symptoms.

Younger patients (1-15 years old) had significantly higher FcαRI levels than adults, suggesting that FcαRI expression decreases with age.

Statistical analysis showed a significant correlation between FcαRI levels and white blood cell counts, including neutrophils, lymphocytes, monocytes, eosinophils, and basophils. This suggests that FcαRI may influence inflammatory cell recruitment and immune regulation in AD.

Since FcαRI levels are associated with immune cell activity and inflammatory responses, it may be a useful biomarker for assessing the severity and progression of atopic dermatitis.

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FcαRI (CD89) المصلي والتهاب الجلد التأتبي: تحقيق جديد في الارتباطات مع المجموعات الفرعية لخلايا الدم البيضاء

بندر ابراهيم عايف الشمري روجان غانم العلاف

قسم علوم الحياة/ كلية العلوم/ جامعة الموصل/ العراق

الملخص

الإكزيما، وهي اسم آخر لالتهاب الجلد التأتبي (AD)، مرض جلدي التهابي مزمن يُسبب احمرارًا وتهيجًا. وهو اضطراب شائع يُصيب الأفراد من جميع الأعمار. يُعبَّر عن مستقبل IgA Fc البشري (FcαRI/CD89) على الخلايا النخاعية، مثل الخلايا الوحيدة/ البلعمية، والحمضات، والعدلات، ويمكن أن يُحفِّز عمليات مناعية مُختلفة. هدفت الدراسة الى تقييم تركيز FcαRI لدى مرضىAD المزمن، بما في ذلك الأطفال والبالغين، وسعت إلى تقييم العلاقة بين مستويات FcαRI وعدد خلايا الدم البيضاء باستخدام اختبار معامل الانحدار. تم تنظيم 110 مريضاً مصاباً بمرض AD (تتراوح أعمارهم بين 1 و30 عاماً) من مستشفيات مدينة الموصل بين أكتوبر 2024 وفبراير 2025. تم تصنيف المشاركين إلى فئتين عمريتين: الأطفال (1−15 عامًا، عددهم 38) والبالغين (16−30 عاماً، عددهم 32)، مقابل مجموعة سيطرة مطابقة للعمر (عددهم 40). تم تحليل عينات الدم لتقييم مستويات FcαRI باستخدام تقنية ELISA ولعد خلايا الدم البيضاء من خلال تحليل تعداد الدم الكامل. أظهرت النتائج ارتفاعًا كبيرًا في مستويات FcαRI لدى مرضى AD مقارنة بالضوابط ($p \leq 0.05$)، حيث أظهر الأطفال تراكيز أعلى من البالغين. حدد تحليل الانحدار ارتباطات مهمة بين مستويات FcαRI ومجموعات خلايا الدم البيضاء الفرعية. تشير مستويات FcαRI المرتفعة لدى مرضىADإلى فرط نشاط المناعة وزيادة تكوين المعقدات المناعية، مما يساهم في الالتهاب المزمن وتفاقم أعراض AD. مما يشير إلى انخفاض في تعبير FcαRI مع التقدم في السن. وتبين أن FcαRI قد يلعب دورًا في تجنيد الخلايا الالتهابية وتنظيم المناعة في مرض AD. قد يكون FcαRI بمثابة مؤشر حيوي قيّم لتقييم شدة وتطور AD.

الكلمات الدالة: التهاب الجلد التأتبي، FcαRI، CD89، مضاد للالتهابات، الأجسام المضادة الذاتية.