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Evaluation of IGA And IGE In Atopic Dermatitis Paediatric Patients in Relation to the Type of Feeding

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ABSTRACT

Background: *Atopic dermatitis (AD) is a chronic, recurrent inflammatory skin disorder associated with elevated serum immunoglobulin E (IgE) and skin barrier dysfunction, influenced by genetic, environmental, and immunological factors. IgE is a central mediator in allergic inflammatory processes triggered by allergens. Immunoglobulin A (IgA) is the second most abundant serum immunoglobulin and the predominant antibody at mucosal surfaces, playing a crucial role in defending against pathogens and maintaining mucosal homeostasis.* ***Objective:*** *To investigate the relationship of serum IGA and IGE with the haematological parameters in AD patients and to assess how different types of feeding (exclusive breastfeeding versus formula feeding) influence their immunological profiles.* ***Methods:*** *This cross-sectional study included 60 pediatric patients (aged 3 month –13 years) of both genders, divided into two groups: 30 exclusively breastfed and 30 bottle-fed children. Serum IgA and IgE levels were measured, and haematological parameters, including (neutrophil counts, HB, MPV, platelets count), were analysed.* ***Results:*** *Breastfed children had significantly higher serum IgA levels (median = 129 mg/dL, IQR = 71.8) compared to bottle-fed children (median = 86.4 mg/dL, IQR = 39.1; p = 0.0001). IgE levels showed no significant difference between the two groups (p = 0.9). A significant positive correlation was identified between IgE levels and neutrophil count (r = 0.432, p = 0.017).* ***Conclusion:*** *Exclusive breastfeeding in early infancy is associated with higher serum IgA levels, supporting its protective role in mucosal immunity and its potential to reduce allergic sensitization. The positive correlation between IgE and neutrophil count highlights a possible link between allergic markers and innate immune activation.*

Keywords: Atopic dermatitis, Immunoglobulin E (IgE), Immunoglobulin A (IgA).

Article Information

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INTRODUCTION

Atopic dermatitis (AD) is a prevalent, chronic, and complex inflammatory skin disease that results from the interaction of genetic, immunological, and environmental factors, often accompanied by elevated serum IgE levels. AD affects approximately 15–20% of children and 1–3% of adults, with symptoms appearing before the age of five in nearly 95% of cases (1). Over recent decades, the global incidence of AD has shown a steady increase, especially in urban and industrialised regions (2).

Several studies have investigated the relationship between the development of infant feeding type and atopic dermatitis, but the results are still controversial. For example, a Japanese study reported that particularly breastfeeding infants were more likely to develop atopic dermatitis than those who were formula feeding. The risk was found more in children who were breastfed for long periods (3). Similarly, a large cross -sectional study in Korea, which included 10,383 children between 0 to 13 years in Korea, concluded that the risk of AD was doubled in children between 0 to 5 years from long -term breastfeeding.

Conversely, a meta-analysis performed by (4) found that exclusive breastfeeding during the first three months of life was associated with the low risk of subsequent inflammation of childhood, especially in children with a family history of atopic diseases. This scientific dispute emphasises the difference in understanding the true relationship between feeding types and atopic dermatitis. Further research is necessary to clarify this association, especially in light of conflicting results reported in previous studies.

The purpose of this study is to assess the relationship between the type of baby feeding, whether it is exclusive breastfeeding or formulas and it's effect on immune parameters, Changes in atopic dermatitis in paediatric patients.

METHODS

This cross-sectional study was conducted on a total of 60 paediatric patients diagnosed with atopic dermatitis (AD). The participants were classified into two groups based on their early feeding history: 30 children who were exclusively breastfed and 30 who were exclusively bottle-fed during the first six months of life.

The study was carried out from October 2024 to February 2025 at the dermatology outpatient clinic of Al-Najaf Al-Ashraf Hospital, located in Al-Najaf city, Iraq. The study included patients (36 males and 24 females) were clinically diagnosed with atopic dermatitis by a certified dermatologist based on established clinical criteria and characteristic signs and symptoms.

Sociodemographic and personal health information was collected through structured face-to-face interviews conducted with the patient's parents. Inclusion criteria required patients to be between the ages of 3 months and 13 years, newly diagnosed with AD, and with no prior exposure to immunosuppressive therapy. Only children with a clearly documented history of either exclusive breastfeeding or exclusive formula feeding were included. Patients with a history of mixed feeding, any concurrent dermatological or systemic diseases, recent infections, or those receiving immunosuppressive treatment were excluded from the study.

For laboratory analysis, approximately 4–5 ml of venous blood was collected from each participant using disposable 5 ml plastic syringes. The samples were placed in clot activator gel tubes and allowed to clot at room temperature before centrifugation at approximately 5000 rpm for 15 minutes to separate the serum. The serum samples were labeled with the collection time, patient gender, and a unique reference code, then stored at −20°C until analysis. Serum levels of immunoglobulin A (IgA) and immunoglobulin E (IgE) were measured using commercially available kits (Giesse Diagnostics, Italy) and processed with the Genotek Smart 150 analyzer (USA).

Statistical Analysis

All data were entered and analyzed using SPSS Statistics software, version 26. Descriptive statistics were employed to summarize the variables: categorical data (such as sex, age group, and nutritional status) were presented as frequencies and percentages. Continuous variables were described as mean ± standard deviation (SD) if normally distributed or as median and interquartile range (IQR) if not. The Shapiro–Wilk test was used to assess the normality of continuous data distributions. Differences between the breastfeeding and formula-feeding groups were evaluated using the independent samples t-test for normally distributed variables and the Mann–Whitney U test for non-normally distributed variables, including IL-6, IgA, and IgE levels. The Chi-square test was applied to assess associations between categorical variables. Pearson's correlation coefficient was used to determine the strength and direction of linear relationships between continuous variables, including the association between IgE levels and neutrophil count. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 60 pediatric patients with atopic dermatitis were enrolled in this study. Of these, 36 were males (60%) and 24 were females (40%). The children were divided into two equal groups based on their type of infant feeding: 30 breastfed and 30 bottle-fed. The comparison of sociodemographic characteristics between the two groups showed no statistically significant differences in gender distribution (p = 0.3) or age group (p = 0.5). The mean age of the breastfed group was 5.9 ± 3.4 years, while the bottle-fed group had a mean age of 5.8 ± 3.8 years (p = 0.9). Regarding nutritional status, 81.7% of the participants were classified as having normal nutritional status, with no significant difference between the two groups (p = 0.2). The mean Body Mass Index (BMI) was slightly higher in the bottle-fed group (16.8 ± 2) compared to the breastfed group (16 ± 1.6), although this difference was not statistically significant (p = 0.09).

Table 1: Distribution of sociodemographic features among breastfed and bottle-fed children.

Sociodemographic features		Type of feeding		Total	P
		Breast feeding	Bottle feeding		
Sex	Male	20(66.7%)	16(53.3%)	36(60%)	0.3
	Female	10(33.3%)	14(46.7%)	24(40%)	
Age group (years)	0-3	8(26.7%)	12(40%)	20(33.3%)	0.5
	4-6	8(26.7%)	7(23.3%)	15(25%)	
	7-10	8(26.7%)	4(13.3%)	12(20%)	
	11-13	6(20%)	7(23.3%)	13(21.7%)	
Mean age±SD		5.9±3.4	5.8±3.8		0.9
Nutritional status	Normal	25(83.3%)	24(80%)	49(81.7%)	0.2
	Underweight	2(6.7%)	0(0%)	2(3.3%)	
	Overweight	3(10%)	6(20%)	9(15%)	
BMI		16±1.6	16.8±2		0.09

Regarding the haematological profile, no significant differences were found between the two groups. White blood cell count (WBC), haemoglobin (HB), platelet count, mean platelet volume (MPV), and neutrophil count were all similar between breastfed and bottle-fed children, with p-values ranging from 0.5 to 0.8.

Table 2: Comparison of hematological profiles between breastfed and bottle-fed children.

Parameters	Breast feeding Mean±SD	Bottle feeding Mean±SD	P
WBC	8.7±2.2	8.4±2.8	0.6
HB	12.1±1.3	11.9±1.6	0.8
Platelets	320.9±71.6	307.5±73.3	0.5
MPV	8.6±0.7	8.7±0.9	0.6
Neutrophil	4.5±1.8	4.3±1.6	0.6

When comparing immunological markers, the levels of IL-6 and IgE showed no significant difference between the two groups (p = 0.4 and p = 0.9, respectively). However, IgA levels were

significantly higher in the breastfed group (median = 129, IQR = 71.8) compared to the bottle-fed group (median = 86.4, IQR = 39.1) with a highly significant p-value (p = 0.0001).

Table 3: Comparison of IL-6, IgA, and IgE between breastfed and bottle-fed children.

Sociodemographic features		Breast feeding Mean±SD	Bottle feeding Mean±SD	P
Sex	Male	139(65.1)	89.9(41.5)	0.003
	Female	122.5(84.5)	81.3(40.8)	0.05
Age group (years)	0-3	129.1(79.95)	81.3(46.5)	0.1
	4-6	166.9(76.7)	78.5(24.2)	0.05
	7-10	134.95(64.01)	89.8(100.7)	0.2
	11-13	121.8(96.6)	98(34)	0.3
Nutritional status	Normal	125.9(62.6)	89.4(45.6)	0.001
	Underweight	81.8		
	Overweight	149.7	75(33.5)	0.4

Further subgroup analysis was performed to explore the influence of sociodemographic variables on IL-6, IgA, and IgE levels. Across sex, age groups, and nutritional status, IL-6 and IgE levels did not show significant differences between breastfed and bottle-fed children. However, IgA levels were consistently higher in breastfed males compared to bottle-fed males (p = 0.003) and in females (p = 0.05). Similarly, children with normal nutritional status in the breastfed group exhibited significantly higher IgA levels compared to their bottle-fed counterparts (p = 0.001).

Tables 4: comparison of IgA between breastfed and bottlefed children according to sociodemographic variables

Parameters	Breast feeding Median (IQR)	Bottle feeding Median (IQR)	P
IL-6	1.9 (2.2)	2.8 (3.9)	0.4
IgA	129 (71.8)	86.4 (39.1)	0.0001
IgE	96 (239)	121.5 (58.2)	0.9

Table 5: Comparison of IgE between breastfed and bottlefed children according to sociodemographic variables.

Sociodemographic features		Breast feeding Mean±SD	Bottle feeding Mean±SD	P
Sex	Male	91.5(123.5)	123.9 (60.8)	0.3
	Female	191(278.5)	111.5(71.1)	0.2
Age group (years)	0-3	65.6(169.6)	109.5(51.4)	0.5
	4-6	161.5(195.25)	123(76.7)	0.2
	7-10	219.9(524.5)	147.7(590.5)	0.9
	11-13	91.5(98)	120(87)	0.3

Sociodemographic features		Breast feeding Mean±SD	Bottle feeding Mean±SD	P
Nutritional status	Normal	98(245.45)	121.5(64.5)	0.6
	Underweight	217	--	
	Overweight	89.8	212.5(354.03)	0.3

Correlation analyses were conducted to evaluate the relationships between IgA, IgE, and haematological variables in both feeding groups. Among breastfed children, IgE levels were positively correlated with neutrophil count (r = 0.432, p = 0.017).

Tables 6: Correlation of IgE with IL-6, , IgA and haematological variables among breastfed children (n=30).

Parameters	Pearson Correlation (r)	P value
IL-6	0.220	0.243
IgA	0.107	0.575
WBC	0.187	0.321
HB	0.029	0.877
Platelets	-0.179	0.344
MPV	0.154	0.417
Neutrophil	0.432	0.017

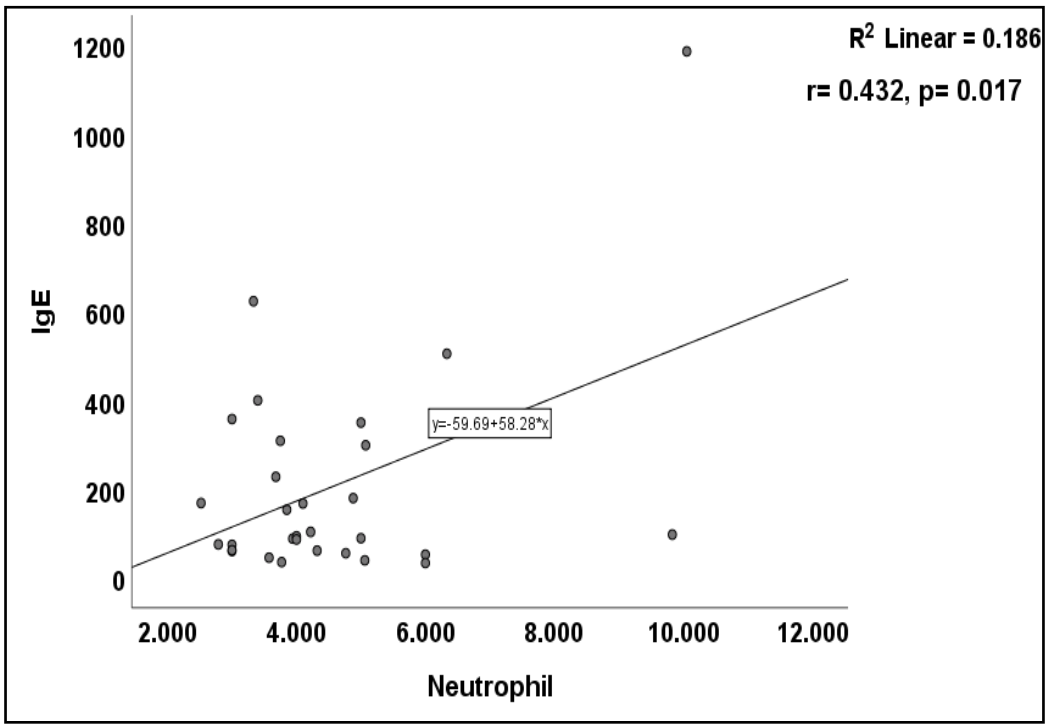

Figure 1: Correlation of neutrophil and IgE among breastfed children (n=30).

While among bottle-fed children no other statistically significant associations were identified between the studied variables.

Table 7: Correlation of IgA with IL-6, IgE and haematological variables among bottle-fed children (n=30).

Parameters	Pearson Correlation (r)	P value
IL-6	-0.175	0.354
IgE	-0.007	0.971
WBC	-0.185	0.329
HB	-0.319	0.086
Platelets	0.076	0.688
MPV	0.251	0.182
Neutrophil	-0.213	0.259

Table 8: Correlation of IgE with IL-6, IgA and haematological variables among bottlefed children (n=30).

Parameters	Pearson Correlation (r)	P value
IL-6	-0.146	0.442
IgA	-0.007	0.971
WBC	0.079	0.677
HB	0.056	0.769
Platelets	0.136	0.473
MPV	0.1	0.6
Neutrophil	0.025	0.896

DISCUSSION

The findings of this study suggest that the type of early infant feeding may not significantly affect the haematological profile or the inflammatory marker IL-6 in children diagnosed with atopic dermatitis (AD). However, a clear difference was observed in IgA levels, which were significantly higher in the breastfed group compared to the bottle-fed group as shown (in table 4). This observation supports previous research that highlights the role of IgA in maintaining mucosal immunity and modulating allergic responses. IGA is known to provide immunological exclusion of the antigen on mucosa surfaces, which reduces the likelihood of IgE allergic sensitization (5). In addition, IgA is considered the most numerous antibody category in mucosal tissue and plays an important role in early immune systems (6)

Several studies have been emphasized on the relationship between IgA levels and the risk of allergic diseases. For example, (7). In addition, the reduction in SIGA secretion is associated with the development of skin and ocular lesions in patients with AD (8). Similarly, Study of (9) discussed a possible relationship between IgA deficiency and high risk of allergic diseases, although the strength of this relationship may depend on genetic and ethnic factors.

Finally, the connection between gut microbiota, IgA, and allergy development has been emphasized in several recent studies. Changes inside the microbiome have been connected to AD via immune system modulation (10), and IgA has been

recommended as a mediator of this association , likely through its role in establishing immune tolerance and preventing allergic sensitization during early years of life (11).

Regarding nutritional status and body mass index (BMI), the results of the current study did not show a statistically significant relationship between feeding types and BMIas shown in (table 1). However, advanced studies have indicated a possible link between overweight conditions and atopic dermatitis risk. Studies report that weight loss intervention in overweight patients was associated with better AD results (12), and due to overweight, both North America and Asia according to study of (13) have shown to increase the prevalence of AD. In addition,Study of (14) highlighted a small but potentially meaningful causal connection between high BMI and AD risk, and supports the importance of weight control in the management of allergic skin conditions. However, another study showed that AD newborns exhibit a progressive growth impairment during the first year of life, regardless of the early feeding method. One independent factor that may have a negative impact on growth is the severity of the condition (15).

High serum IgE tiers are recognised to be associated with AD severity, especially in continuous or extreme instances (16). Furthermore, IgE level are not only affected by disease status however also by age, sex, and environmental factors (17). IgA and IgE are believed to function in balance, and dysregulation of IgA manufacturing can also have an impact on IgE-mediated allergic respnses (18, 19).

The most important circulating leukocytes are neutrophils, which contain grainy cytoplasm and a lob core. They usually have a diameter of 7-10 microns. During homeostasis, neutrophils has a half -life of 13-19 hours; However, in the inflammatory environment or when interacting with other cell types, it can be increased (20, 21). Both congenital and adaptive immunity -Both inflammation is mediated by neutrophils. In addition to phagocytosis, neutrophilic extracellular trap-creation, liberation of granules and secretion of many cytokines and chemokines, neutrophils also act as antigen-presenting cells (22).

It is rarely discussed how neutrophils contribute to pruritus. Histamine, proteases (such as neutrophil elastase and cathepsin S), prostaglandin E2, leukotriene B4, and platelet-activating factor.Neutrophils play a role in etiology of many pruritic conditions, including psoriasis, atopic dermatitis and palmoplantar pustulosis (22).

According to previous studies, atopic dermatitis (AD) has ordinarily been associated with eosinophilic Activity, while neutrophil involvement was traditionally taken into consideration minimum or absent, highlighting distinct inflammatory pathways inside the disease pathogenesis (23,24). Eosinophilic degranulation is believed to play a key function in each allergic reactions and the improvement of AD.

However, the results of this study oppose this established view by demonstrating a strong correlation between serum IgE levels and neutrophilic activity as shown in (figure 1), indicating a potential immunological interaction or regulatory mechanism that may affect all Components in the pathophysiology of atopic disorders (25) . These findings are consistent with earlier research showing that neutrophils in patients with elevated IgE levels exhibit decreased myeloperoxidase activity, diminished phagocytic capacity, and diminished respiratory burst activity — abnormalities that were not corrected by opsonin-regular serum, suggesting an underlying neutrophil dysfunction caused by chronic granulomatous disease (26,27).

Since we didn’t find any result support our study we found a report in an animal model (an analysis of the neutrophilic cells' function in

AD using a mouse model) which indicates that these cells are not only present, but actively promote CXCR3-dependent itching. The absence of neutrophils in this model significantly reduced the scratching behaviour and reduced key features of chronic itching, including skin hyperinnervation and elevated inflammatory mediators . The study identified the CXCL10-CXCR3 axis as a potentially therapeutic goal for dealing with itching in AD (28).

When combined, these results show the increasing knowledge of neutrophils in AD pathogenesis and emphasise the need for multiple research to clarify the biological relationships between high IGE levels, neutrophilic dysfunction and Staphylococcus aureus infections that repeat themselves in AD patients.

CONCLUSION

This study indicates that the early feeding type affects immune -related indicators, especially immunoglobulin A (IGA), but inflammatory markers IL -6 or children with atopic dermatitis (AD) cannot have a significant impact on basic haematological profiles. Breastfeeding patients had high levels of IgA, which may indicate that breastfeeding helps the immune system development and can provide protection against allergic reactions. However, the IGE level and BMI did not make significant changes in both the groups, which highlights the complex character of AD. These results emphasize the need for further studies to understand the variables of early life that affect immune reactions and affect their long-term participation in allergic disorders such as atopic dermatitis.

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Ethical approval

The present study which is conducted by authors ((Eshraq Hiader Hussain) was approved by the local ethics committee at the Department of Dermatology, Al-Najaf Al-Ashraf Hospital.

Statement of permission and conflict of interests

The authors declare that they have obtained all necessary permissions to collect and analyse patient data for research purposes. The authors also declare that there is no conflict of interest regarding the publication of this paper.

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