



Original Research Article

Evaluation of levels of absolute eosinophil count in blood and serum IgE in patients with Atopic dermatitis

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ABSTRACT

Background: • Atopic dermatitis is a chronic relapsing disease of the skin, common in infants and children. • Defects in the function of skin barrier, reoccurring skin infections and allergen sensitization are associated. • Features: itch, rash on extensors and face, lichenification in flexures, family or personal history of atopic diseases. • In this study, the relation between severity of AD, serum IgE levels & AEC in blood is found out.

Materials and Methods: Our case control study was done in the Department of Dermatology, Venereology and Leprosy, Shadan Institute of Medical Sciences, Hyderabad from October 2019–October 2020. A total of 50 patients, of all age groups, with atopic dermatitis visiting the hospital were enrolled. 50 age matched healthy controls were also included.

Inclusion criteria: Age range: 6 months to 40 years

Exclusion criteria: • Patients receiving any systemic drug (homeopathic, ayurvedic, unani and allopathic), oral contraceptives, hormonal therapies. • Patients who are immunocompromised, pregnant, lactating, with cancer, systemic and autoimmune diseases

Method: • A thorough clinical history inclusive of age of onset, personal and family history of atopic diseases, duration of illness is taken. • Physical examination was done to find the severity (SCORAD index) and the body surface area involved (Wallace's Rule of Nine). • Blood tests were done to find the AEC values and IgE levels in each patient.

Result: The onset of disease was seen in patients from 4 months of age to 20 years with an average of 4.8 years. Out of the 50 patients in the study, males and females were 19 and 31 respectively. In patients with AD, the mean AEC was 673 and the mean IgE levels were 301.9 whereas in controls, it was 125 and 31 respectively. Thus, the laboratory workup showed raised values in majority patients with AD.

Conclusion: The study showed that AEC and serum IgE levels had a correlation with the severity of atopic dermatitis. History of allergic rhinitis was found to be significantly associated with these parameters in the patients.

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1. Introduction

Atopic dermatitis (AD)/ Atopic eczema (AE) is an itchy, chronic or chronically relapsing inflammatory skin condition that often starts in early childhood (usually before 2 years of age).^{1,2}

Defects in the function of skin barrier, reoccurring skin infections and allergen sensitization are associated.

Clinical features: itch, rash on extensors and face in early age, lichenification in flexures, family or personal history of atopic diseases: rhinitis, asthma, atopic dermatitis.³

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1.1. Etiopathogenesis

1. Genetics: Immune response genes (CD14, RANTES, toll like receptors) and Dysfunctional genes of the skin barrier (genes for loricrin, filaggrin gene FLG, proteases).⁴
2. Immune Dysregulation: Increased Th2-derived cytokine activity, increased serum IgE levels, increased expression of IgE receptor FcεR1 on Langerhans cells and dendritic cells.⁵
3. Microbial Colonization.⁶
4. Hygiene Hypothesis
5. Triggers: Temperature, humidity, food allergens, aeroallergens etc.⁷

The severity of AD is somehow correlated with IgE values and AEC, but this is not consistent. Therefore, in this study, the relation between severity of AD, serum IgE levels & absolute eosinophil count in blood is found out.

1.2. Mechanism

1. AD is due to skin barrier defects, immune dysregulation, and increased responses to allergens occurring because of varied interactions between genetic susceptibility genes.
2. Skin barrier function is markedly decreased because of reduced ceramide, downregulation of genes in the cornified envelope (filaggrin and loricrin), enhanced transepidermal water loss and more endogenous proteolytic enzymes.^{8,9}
3. Allergen absorption in skin and microbial colonization occur due to changes in the epidermis
4. Epidermal hyperplasia is mild with perivascular T cell infiltrate in unaffected skin of AD patients
5. Epidermis shows intercellular edema (spongiosis) in acute lesions. Activated memory T cells with CD3, CD4, and CD45 RO are seen in the dermis.
6. Hyperplastic epidermis with elongated rete ridges, minimal spongiosis, and prominent hyperkeratosis is seen in chronic lesions.
7. Proinflammatory cytokines and chemokines are expressed in atopic skin inflammation.
8. In Acute AD, there is production of T helper 2(Th2) cytokines (IL-4, IL-13) with IgE synthesis and expression of adhesion molecules on endothelial cells
9. In chronic AD, increased IL-5 production is seen that helps in eosinophil development and survival. Increased granulocyte macrophage colony-stimulating factor in AD inhibits monocyte apoptosis, leading to persistent AD.
10. Cutaneous T cell attracting chemokine [CTACK] is upregulated in AD that attracts cutaneous lymphoid antigen (CLA)+ CC chemokine receptor 10+ (CCR10+).¹⁰

11. There are 2 types of IgE receptor-bearing (FcεR1) myeloid dendritic cells in AD- Langerhans cells & IDEC-inflammatory dendritic epidermal cells. Proinflammatory signals are released on FcεR1 stimulation that amplifies the allergic immune response.
12. CD4 or CD8 expression on the skin homing CLA+ T cells in peripheral blood secrete IL-5 and IL-13, that induce IgE synthesis and increase eosinophil survival.¹¹

Due to little evidence on the correlation of eosinophil levels and serum IgE and severity of AD our aim of study was to assess the same.

2. Materials and Methods

Our case control study was done in the Department of Dermatology, Venereology and Leprosy, Shadan Institute of Medical Sciences, Hyderabad from October 2019- October 2020. A total of 50 patients, of all age groups, with atopic dermatitis visiting the hospital were enrolled. 50 age matched healthy controls were also included in the study.

2.1. Inclusion criteria

1. Age range: 6 months to 40 years
2. Patients who gave their consent
3. Both males and females

2.2. Exclusion criteria

1. Patients who did not give consent.
2. Patients receiving any systemic drug (homeopathic, ayurvedic, unani and allopathic).
3. Patients receiving oral contraceptives, hormonal therapies.
4. Patients who are immunocompromised, pregnant and lactating.
5. Patients with cancer, systemic and autoimmune disorders.

2.3. Methods

A thorough clinical history inclusive of the age of onset, personal and family history of atopic diseases, duration of illness is taken

Physical examination was done to find the severity (SCORAD index) and the body surface area involved(Wallace's Rule of Nine)

Prior to enrolment, Written consent was taken from the subjects or their parents

Severity of atopic dermatitis is measured by a scoring system- The SCORAD index (SCORing Atopic Dermatitis)¹²

The 5 signs include Erythema, Excoriations, crust formation, edema, Vesicles with scoring from 0-4 in each

- 0: not seen/absent
- 1: mildly present
- 2: moderate but not severe
- 3: Severe.¹³

Blood tests were done to find the AEC values and IgE levels in each patient.

The range and mean values of various parameters like age of onset, number of attacks, body surface area involved, and the blood counts were measured.

3. Result

The onset of the disease was seen in patients from 4 months of age to 20 years with an average of about 4.8 years.

Out of the 50 patients in the study, males and females were 19 and 31 respectively and amongst the controls, males and females were 23 and 27 respectively.

The SCORAD index(maximum value-15 and minimum value-0) was within a range of 10 to 1 with a mean of 5.7

The percentage of body surface area involved was recorded with an average of 8.2

The average of the number of disease attacks in patient was 5.

The mean calculated for the duration of present illness was 3.6 months

In patients with atopic dermatitis the AEC was in the range 55 to 2980, with a mean of 673, and in controls ranged from 15 to 536 with a mean of 125.

Serum IgE levels were in range 36-1540 IU, mean of 301.9 in patients, and range 10-112 IU, mean 31 in controls.

The serum IgE levels, AEC and severity of atopic dermatitis showed significant association with history of allergic rhinitis individually.

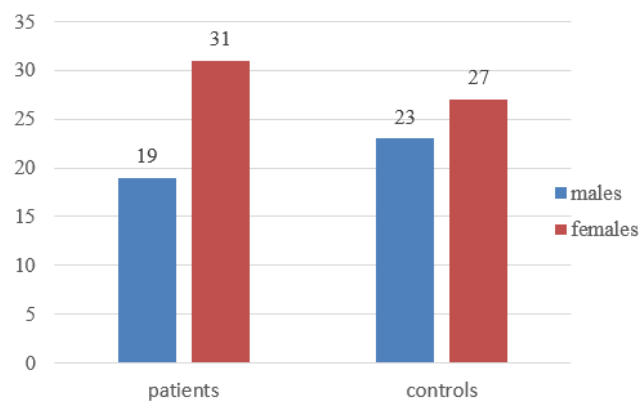


Fig. 1: Proportion of male and female in the study

4. Discussion

The mean age of onset, as shown in various studies, was 4.3 months in the infantile group, and was 4.1 years in the childhood group.¹⁴ Our study had a similar finding to that

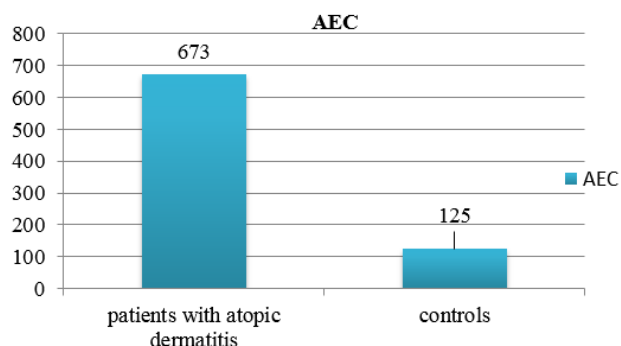


Fig. 2: Levels of Absolute eosinophil count(AEC) in patients with AD compared with controls

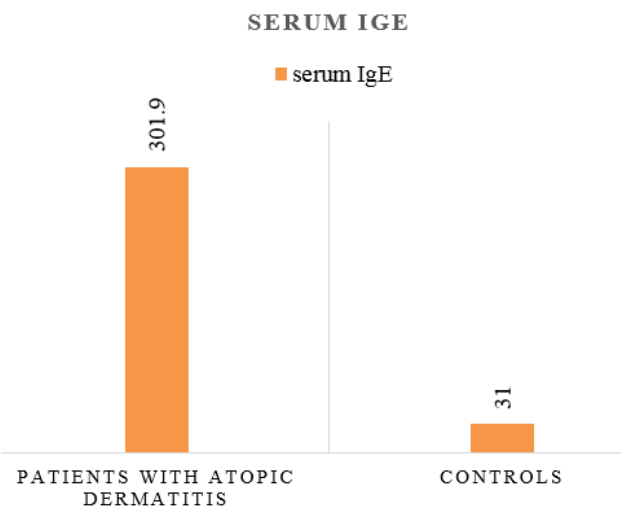


Fig. 3: Levels of serum IgE in patients with AD comparedwith controls

of childhood AD i.e. mean age at onset of AD was found to be 4.8years

We also found that in patients with AD, the mean AEC was 673 and the mean IgE levels were 301.9 whereas in controls, it was 125 and 31 respectively. Thus, the laboratory workup showed raised values in majority patients with AD.

A study in Japan found that the eosinophil count correlated with the disease severity roughly.¹⁵ In severe cases of AD with a personal or family history of atopy, high eosinophil counts was seen, while normal or slightly elevated levels were seen in severe cases of AD with no personal or family history of atopy. Thus, proposed that personal or family history of atopy and disease severity are responsible for high eosinophil levels in atopic dermatitis. Likewise, we found that both AEC and IgE had a correlation with severity of the disease. Also, history of allergic rhinitis was found to be significantly associated with these parameters in the patients.

An increased response of TH2 cytokines with a decrease in interferon-gamma (IFN-gamma) production is associated with the elevated IgE response and eosinophilia in AD patients.

The clinical activity of AD (SCORAD index) illustrated in the study can be used as both measure of haematological irregularities and also prognostic indicator in the majority of patients.

5. Conclusion

The study, thus, revealed that the AEC count and the IgE levels were significantly higher in patients with AD than in controls. Also, serum IgE and AEC levels in atopic dermatitis correlated with its severity. History of allergic rhinitis was found to be significantly associated with these parameters in the patients

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7. Conflict of Interest

The authors declare they have no conflict of interest.

References

- Darsow U, Lubbe J, Taieb A, Seidenari S, Wollenberg A, Calza AM, et al. Position paper on diagnosis and treatment of atopic dermatitis. *J Eur Acad Dermatol Venereol*. 2005;19(3):286-95. doi:10.1111/j.1468-3083.2005.01249.x.
- Williams HC. Clinical practice. Atopic dermatitis. *N Engl J Med*. 2005;352(22):2314-24.
- Cork MJ. Epidermal barrier dysfunction in atopic dermatitis. *J Invest Dermatol*. 2009;129:1892.
- Askenase PW. Effector and regulatory molecules and mechanisms in delayed type hypersensitivity. In: Middleton E, Reed C, Ellis E, editors. *Allergy: principles and practice*. 5th edn. St. Louis: Mosby; 1998. p. 323-41.
- Vestergaard C, Bang K, Gesser B, Yoneyama H, Matsushima K, Larsen CG, et al. A Th2 Chemokine, TARC, Produced by Keratinocytes May Recruit CLA+CCR4+ Lymphocytes into Lesional Atopic Dermatitis Skin. *J Invest Dermatol*. 2000;115(4):640-6. doi:10.1046/j.1523-1747.2000.00115.x.
- White MI, Mobel WC. Consequences of colonization and infection by *Staphylococcus aureus* in atopic dermatitis. *Clin Exp Dermatol*. 1986;11:34.
- Abraham A, Kaimal S. Atopic dermatitis. In: Sacchidanand S, editor. *IADVL Textbook of Dermatology*. 4th edn. Mumbai: Bhalani publishing house; 2015.
- Cork MJ. Epidermal barrier dysfunction in atopic dermatitis. *J Invest Dermatol*. 2009;129:1892.
- O'regan GM, Sandilands A, IrwinMcLean WH, Irvine AD. Filaggrin in atopic dermatitis. *J Allergy Clin Immunol*. 2008;122(4):689-93.
- Piletta PA. Circulating skin-homing T cells in atopic dermatitis. Selective up-regulation of HLA-DR, interleukin-2R, and CD30 and decrease after combined UV-A and UV-B phototherapy. *Arch Dermatol*. 1996;132(10):1171-6. doi:10.1001/archderm.132.10.1171.
- Leung DYM, Eichenfield LF, Boguniewicz M. Atopic dermatitis (Atopic eczema). In: Kang S, Amagai M, Bruckner A, editors. *Fitzpatrick's Dermatology*. 9th edn. United States of America: Palatino LT Std by Cenveo® Publisher Services; 2019.
- Hanifin J, Rajka G. Diagnostic features of atopic dermatitis. *Acta Derm Venereol Suppl (Stockh)*. 1980;92:44-7.
- Dhar S, Malakar R, Chattopadhyay S, Dhar S, Banerjee R, Ghosh A, et al. Correlation of the severity of atopic dermatitis with absolute eosinophil counts in peripheral blood and serum IgE levels. *Indian J Dermatol, Venereol Leprol*. 2005;71(4):246-9. doi:10.4103/0378-6323.16615.
- Dhar S, Kanwar AJ. Epidemiology and clinical pattern of atopic dermatitis in a North Indian pediatric population. *Pediatr Dermatol*. 1998;15(5):347-51. doi:10.1046/j.1525-1470.1998.1998015347.x.
- Uehara M, Izukura R, Sawai T. Blood eosinophilia in atopic dermatitis. *Clin Exp Dermatol*. 1990;15(4):264-6. doi:10.1111/j.1365-2230.1990.tb02086.x.

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