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Original Research Article

An observational study on serum IgE levels in patients with atopic dermatitis

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Abstract

Introduction: Atopic dermatitis (AD) is a chronic inflammatory skin disorder characterized by pruritus, erythema, and recurrent flares, affecting nearly 20% of children and 3% of adults. The disease manifests as extrinsic (IgE-associated) or intrinsic (non-IgE-associated) AD, with IgE playing a central role in the pathogenesis of the extrinsic subtype. This study aims to assess the clinical utility of total serum IgE levels in (differentiating extrinsic and intrinsic) AD patients and evaluate its correlation with disease severity.

Materials and Methods: A longitudinal observational study was conducted at a tertiary care hospital's dermatology department between October 2022 and April 2024. A total of 57 patients with atopic dermatitis were studied. Serum IgE levels were measured, and disease severity was assessed using the Investigator's Global Assessment (IGA), Scoring Atopic Dermatitis (SCORAD), and Eczema Area and Severity Index (EASI) scores. A correlation analysis between IgE levels and disease severity scores was performed.

Results: Results showed that 63% of cases had extrinsic AD, with significantly elevated IgE levels (median: 677 IU/mL) compared to intrinsic AD (median: 69.15 IU/mL, $p<0.001$). Disease severity correlated positively with IgE levels, with median IgE increasing from mild (65 IU/mL) to severe AD (2053 IU/mL, $p<0.001$). Strong correlations were observed between IgE levels and SCORAD ($r=0.99$), IGA ($r=0.96$), and EASI ($r=0.99$), all statistically significant ($p<0.05$).

Conclusion: The study highlights the predictive value of IgE in AD severity, exploring its role as a potential biomarker for disease monitoring and targeted therapy. The findings confirm that elevated IgE levels are strongly associated with increased disease severity, particularly in extrinsic AD. We recommend routine measurement of serum IgE levels in AD patients, particularly with extrinsic AD also further large-scale studies to validate the role of IgE as a biomarker are needed.

Keywords: Atopic dermatitis, Serum IgE, Eczema Area, Severity Index

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1. Introduction

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by pruritus, erythema, and recurrent flares.[1,2] It affects nearly 20% of children and 3% of adults, especially in developed countries.[3,4] Its complex pathophysiology involves genetic predisposition, immune dysregulation, barrier dysfunction, and environmental factors. AD presents as either extrinsic which is allergen-associated and has elevated IgE or intrinsic, which is non-allergic and doesn't have elevated IgE.[5] The immune response in AD, particularly extrinsic AD, is Th2 cell-driven, with excessive IgE production. IgE, though present in low concentrations, is crucial in allergic reactions. Upon allergen exposure, IgE bound to mast cells triggers histamine release, causing itching, swelling, and redness. In AD, IgE contributes to both immediate and chronic inflammation, exacerbating symptoms.[6,7,8]

IgE plays a key role in the pathogenesis of extrinsic AD. Upon first exposure to environmental allergens, IgE is produced and binds to mast cells. Re-exposure leads to IgE cross-linking, activating mast cells and triggering degranulation, which releases inflammatory mediators (e.g., histamine, leukotrienes, prostaglandins) that cause symptoms like itching, redness, swelling, and eczema. IgE also contributes to chronic inflammation by promoting cytokine and chemokine release, worsening the inflammatory cycle, and impairing the skin barrier, increasing vulnerability to irritants and allergens, and exacerbating the disease.

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In summary, IgE mediates sensitization, mast cell activation, and chronic inflammation, playing a critical role in AD pathogen, esis. This understanding has led to targeted therapies like omalizumab, an anti-IgE monoclonal antibody.[9-16]

Elevated IgE levels are a hallmark of extrinsic AD and reflect heightened allergic sensitization. Serum IgE measurement is valuable for AD diagnosis, management, and as a biomarker of disease severity, though interpretation can be complex due to various influencing factors. Distinguishing between intrinsic and extrinsic AD is crucial for targeted therapies. Treatments include reducing inflammation, restoring the skin barrier, and managing pruritus. Elevated IgE may warrant therapies like omalizumab (anti-IgE monoclonal antibody), along with other immunosuppressants and emerging treatments targeting IgE regulation.[17-19]

We conducted this study to investigate the clinical utility of total serum IgE levels in patients with atopic dermatitis and assess the predictive value of total serum IgE for identifying the severity of the disease.

2. Materials and Methods

We conducted this longitudinal observational study at the Department of Dermatology, Venereology and Leprosy of a tertiary care teaching hospital between October 2022 and April 2024. The study population consisted of patients with eczematous skin lesions and a history of atopy. A sample size of 57 patients was determined based on prevalence data, accounting for potential sample loss. Inclusion criteria include eczematous lesions of over six weeks' duration, clinical diagnosis, and a history of atopy or allergic rhinitis. Patients unwilling to participate have been excluded. Informed consent from obtained from each patient/guardian. We enrolled patients and collected age and gender details. We performed thorough clinical examinations, recording all findings in a pre-designed proforma. We measured serum IgE levels and determined Investigator's Global Assessment (IGA), Scoring Atopic Dermatitis (SCORAD), and Eczema Area and Severity Index (EASI) scores for every patient.

2.1. Statistical analysis

Descriptive statistics for categorical variables are provided in the form of numbers and percentages. Continuous data are presented as mean (SD), median (IQR) as appropriate. Pearson's correlation test was used to assess the relation between IgE levels and various AD scores. p-value <0.05 was considered statistically significant.

3. Results

We recruited a total of 57 patients diagnosed with AD in the clinic. The mean age of the cases was 31.8 years, and 64.9% were female (**Table 1**). The distribution showed 36 (63.2%) had extrinsic AD and 21(36.8%) intrinsic AD. Disease severity was categorized as 31.6% mild, 42.1% moderate, and 26.3% severe. The IGA scores showed a range, with the most frequent scores being 1 and 2, indicating mild to moderate disease.

Extrinsic AD showed a significantly higher median IgE level (677 IU/mL) compared to intrinsic AD (69.15 IU/mL) (**Table 2**). Also, mild cases had the lowest median IgE (65 IU/mL), followed by moderate (397 IU/mL), and then severe cases (2053 IU/mL)., which exhibited the highest median IgE (**Table 3**).

Table 1: Baseline characteristic of study population (N=57)

Variable	**Result**
Mean ± SD Age in years	31.84±19.85
Gender n (%)	
Female	37 (65)
Male	20 (35)
Type of Atopic Dermatitis n (%)	
Extrinsic	36 (63)
Intrinsic	21 (37)
Severity of disease n (%)	
Mild	18 (32)
Moderate	24 (42)
Severe	15 (26)
IGA score n (%)	
1	18 (32)
2	19 (33)
3	7 (12)
4	12 (21)
5	1 (2)

Table 2: Association of type of atopic dermatitis with IgE level (N=57)

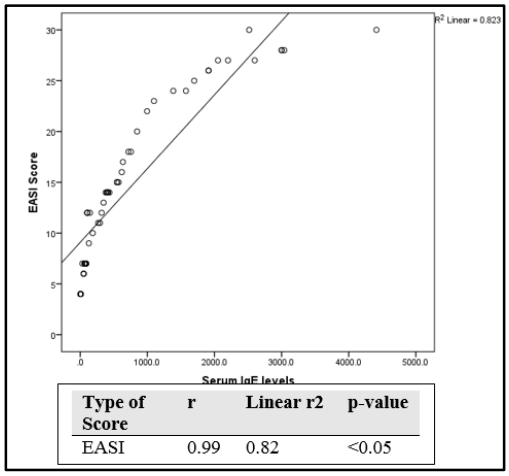
	Extrinsic	**Intrinsic**	**P value**
IgE level (IU/ml)	677 (397-1911)	69.15 (41-86)	**<0.001**

*Data represented in median (IQR)

Table 3: Association of severity of disease with IgE level (N=57)

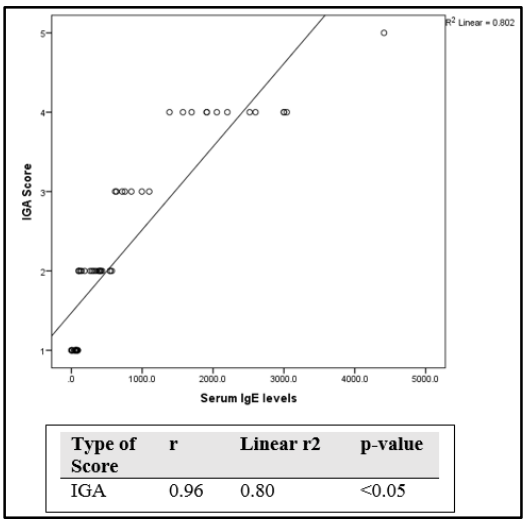
	Mild	**Moderate**	**Severe**	**P value**
IgE level (IU/ml)	65 (26-73)	397 (206-565)	2053 (1575.1-3000)	**<0.001**

*Data represented in median (IQR)



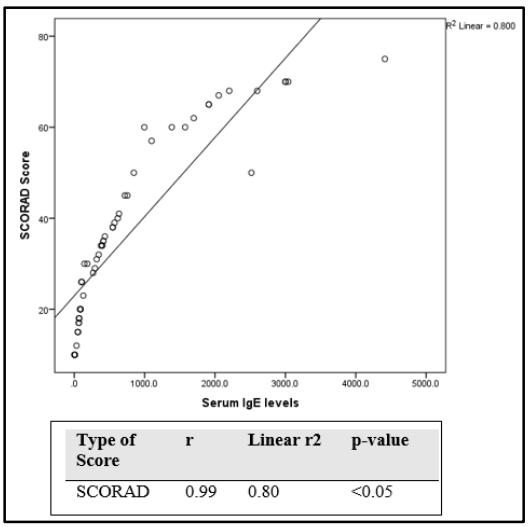
Type of Score	r	Linear r2	p-value
EASI	0.99	0.82	<0.05

Figure 1: Scatterplot showing correlation of IgE level with EASI score



Type of Score	r	Linear r2	p-value
IGA	0.96	0.80	<0.05

Figure 2: Scatterplot showing correlation of IgE level with IgA



Type of Score	r	Linear r2	p-value
SCORAD	0.99	0.80	<0.05

Figure 3: Scatterplot showing correlation of IgE level with SCORAD score

A strong positive correlation was seen between IgE levels and all three clinical scoring systems: SCORAD, IGA, and EASI. The Pearson correlation coefficient (r) was very high (0.96-0.99) for all three scores (**Figure 1**, **Figure 2**, **Figure 3**), with a high Linear R2 score, both of which show a high correlation.

4. Discussion

The presentation of increased IgE in our study, with the increased severity of the disease as seen through increased scores, has also been seen in other studies done in the past and is attributed to the central role of IgE in the disease pathogenesis.[20] The findings are specially marked in the extrinsic AD. Extrinsic AD is mediated by sensitisation to environmental allergens that is dependent on IgE; these patients most often have higher levels of IgE in the circulation. In extrinsic atopic dermatitis, elevated IgE indicates a Th2-driven immune dysregulation. Dendritic cell presentation of antigens to Th2 lymphocytes induces IL-4 and IL-13 release, promoting IgE production. This IgE binds to receptors on mast cells and basophils, triggering degranulation and inflammatory mediator release upon allergen re-exposure. Intrinsic AD, unlike extrinsic, is less IgE-dependent, involving complex gene-environment-immune interactions. While serum IgE may be normal in intrinsic AD, localized IgE or alternative pathways can contribute to inflammation. The rising AD incidence and IgE levels are attributed to environmental factors (pollution, hygiene, diet) promoting Th2 responses and genetic predispositions (e.g., filaggrin mutations) compromising skin barrier function, facilitating allergen sensitisation.[21-26]

Similar to our present research, H. Ott et al.,[5] Park et al.,[27] and Kulthanan et al.[3] have shown that extrinsic AD is associated with significantly elevated total IgE compared to intrinsic AD, which exhibits considerably lower levels. This immunological distinction, observed across various age demographics, emphasizes a key difference in the underlying mechanisms of these two AD subtypes. Moreover, studies such as Kulthanan et al.[30] have also indicated that extrinsic AD is significantly more common than intrinsic AD, and this increased prevalence coincides with the observed higher IgE levels. Similarly, studies by Basnet et al.[13] and Ahmed et al. corroborate our finding of a correlation between AD severity and elevated IgE, however their studies were focussed on children. Dhar et al.[16] and Johnson et al.[31] similarly reported higher IgE in AD patients versus controls, with Johnson et al. linking it to respiratory issues. An East German study showed significantly elevated IgE in AD-affected children. Vaneckova and Bukac et al.[12] found a trend of increasing IgE with AD severity, though some moderate and severe cases had lower levels. Hasmi et al.[8] also documented higher IgE in AD patients. While many studies, including Salva et al.[32] and Thorsteinsdottir et al.,[33] support an association between IgE and AD severity, especially in early-onset cases and those with FLG mutations, findings are not uniform. Gerner

et al.[34] observed early-onset severity but also linked allergic rhinitis and female sex to severity, differing from our results.

Our observation of higher IGE levels in extrinsic AD was similar to the findings seen in other studies like those by H. Ott et al.,[5] Park et al.,[27] and Kulthanan et al.[30] We observed a strong correlation between the severity scores and the IgE levels, as seen with findings from Brenninkmeijer et al.[28] and Fölster-Holst et al.,[29] who also observed milder disease severity in intrinsic AD using SCORAD. However, Kulthanan et al.,[30] using the EASI score in adult-onset AD, found no significant difference in severity between the two subtypes. Conversely, Yang et al.[19] reported that EASI scores did not correlate with subjective AD severity assessments.

5. Limitation

Being a hospital-based study, we had a very small sample size with no comparison group.

6. Conclusion

We did a detailed history taking and IgE measurement, which made the findings of our study strong. Our research demonstrated a clear link between atopic dermatitis severity and serum IgE levels, with more severe cases showing substantially higher IgE. Extrinsic atopic dermatitis patients presented with both elevated IgE and increased disease severity scores compared to those with intrinsic atopic dermatitis, indicating distinct clinical and immunological features. These findings underscore the clinical importance of differentiating between extrinsic and intrinsic atopic dermatitis due to their varied severity and immunological profiles. The observed correlation between IgE and disease severity suggests IgE's potential as a valuable tool for monitoring and managing atopic dermatitis. Future investigations should be done to understand the mechanisms behind these differences and can help to develop tailored treatment approaches for the condition.

7. Conflict of Interest

None.

8. Source of Funding

None.

References

1. De A, Karekar S, Adhav C. Current Burden of Atopic Dermatitis in India: A Systematic Literature Review. Indian J Dermatol. 2023;68(4):487.
2. Langan SM, Irvine AD, Weidinger S. Atopic dermatitis. *Lancet*. 2020;396(10247):345–60.
3. Laughter MR, Maymone MBC, Mashayekhi S, Arents BWM, Karimkhani C, Langan SM, et al. The global burden of atopic dermatitis: Lessons from the Global Burden of Disease Study 1990-2017. *Br J Dermatol*. 2021;184(2):304–9.
4. Hadi HA, Tarmizi AI, Khalid KA, Gajdacs M, Aslam A, Jamshed S. The epidemiology and global burden of atopic dermatitis: A narrative review. *Life (Basel)*. 2021;11:936.
5. Ott H, Stanzel S, Ocklenburg C, Merk HF, Baron JM, Lehmann S. Total serum IgE as a parameter to differentiate between intrinsic and extrinsic atopic dermatitis in children. *Acta Derm Venereol*. 2009;89(3):257-61.
6. Leung DY. Role of IgE in atopic dermatitis. *Curr Opin Immunol*. 1993;5(6):956-62.
7. Priyanka K, Abhirup HR, Badrinath N, Aishwarya KC. Atopic dermatitis and its association with serum immunoglobulin E levels: our experience in KVG medical college and hospital, Karnataka. *Int J Res Dermatol* 2022;8(1):50-6.
8. Hashmi FN, Elaf A, Divya L. Evaluation of levels of absolute eosinophil count in blood and serum IgE in patients with Atopic dermatitis. *IP Indian J Clin Exp Dermatol*. 2021;7(1):66-9.
9. Hamilton RG, Adkinson NF Jr. Clinical laboratory assessment of IgE-dependent hypersensitivity. *J Allergy Clin Immunol*. 2003;111(2 supply):S687–701
10. Wong CY, Yeh KW, Huang JL, Su KW, Tsai MH, Hua MC, Liao SL, Lai SH, Chen LC, Chiu CY. Longitudinal analysis of total serum IgE levels with allergen sensitization and atopic diseases in early childhood. *Sci Rep*. 2020;10(1):21278.
11. Zink A, Gensbaur A, Zirbs M, Seifert F, Suarez IL, Mourantchanian V, Weidinger S, et al. Targeting IgE in Severe Atopic Dermatitis with a Combination of Immunoadsorption and Omalizumab. *Acta Derm Venereol*. 2016;96(1):72-6.
12. Vaneckova J, Bukač J. The severity of atopic dermatitis and the relation to the level of total IgE, onset of atopic dermatitis and family history about atopy. *Food Agricultural Immunol*. 2016;27(5):734-41
13. Binamra Basnet, Saraswoti Neupane, Shristi Shrestha, serum ige levels and severity of atopic dermatitis. *J Univ Coll Med Sci*. 2015:3(3):22-6.
14. Infuhr D, Crameri R, Lamers R, Achatz G. Molecular and cellular targets of anti-IgE antibodies. *Allergy*. 2005;60(8):977–85.
15. Altrichter S, Kriehuber E, Moser J, Valenta R, Kopp T, Stingl G. Serum IgE autoantibodies target keratinocytes in patients with atopic dermatitis. *J Invest Dermatol*. 2008;128(9):2232–9.
16. Dhar S, Malakar R, Chattopadhyay S, Dhar S, Banerjee R, Ghosh A. 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.
17. Bieber T, de la Salle C, Wollenberg A, Hahimi J, Chizzonite R, Ring J, et al. Constitutive expression of the high-affinity receptor for IgE (FceR1) on human Langerhans' cells. *J Exp Med*. 1992;175:1285–90.
18. Park JH, Choi YL, Namkung JH, Kim WS, Lee JH, Park HJ, et al. Characteristics of extrinsic vs. intrinsic atopic dermatitis in infancy: correlations with laboratory variables. *Br J Dermatol*. 2006;155(4):778–83.
19. Yang HJ, Jeon YH, Pyun BY. Evaluation of patient's subjective severity using various scoring system in Korean children with atopic dermatitis. *Asian Pac J Allergy Immunol*. 2010;28(2-3):130–5.
20. Wollenberg A, Thomsen SF, Lacour JP, Jaumont X, Lazarewicz S. Targeting immunoglobulin E in atopic dermatitis: A review of the existing evidence. *World Allergy Organ J*. 2021;14(3):100519.
21. Kostova P, Papochieva V, Miteva D, Georgieva B, Mileva S, Shahid M, et al. Elevated IgE Levels-An Allergy or an Underlying Inborn Error of Immunity in Children with Recurrent Infections? *Antibodies (Basel)*. 2023;12(4):70.
22. Tokura Y. Extrinsic and intrinsic types of atopic dermatitis. *J Dermatol Sci*. 2010;58(1):1–7.
23. Brandt EB, Sivaprasad U. Th2 Cytokines and Atopic Dermatitis. *J Clin Cell Immunol*. 2011;2(3):110.
24. Suárez-Fariñas M, Dhingra N, Gittler J, Shemer A, Cardinale I, de Guzman Strong C, et al. Intrinsic atopic dermatitis shows similar TH2 and higher TH17 immune activation compared with extrinsic atopic dermatitis. *J Allergy Clin Immunol*. 2013;132(2):361–70.
25. Novak N, Bieber T, Leung DY. Immune mechanisms leading to atopic dermatitis. *J Allergy Clin Immunol*. 2003;112(6 Suppl):S128-39.
26. Boguniewicz M, Leung DY. Pathophysiologic mechanisms in atopic dermatitis. *Semin Cutan Med Surg*. 2001;20(4):217–25.

27. Park JH, Choi YL, Namkung JH, Kim WS, Lee JH, Park HJ, et al. Characteristics of extrinsic vs. intrinsic atopic dermatitis in infancy: correlations with laboratory variables. *Br J Dermatol*. 2006;155(4):778-83.
28. Brenninkmeijer EE, Spuls PI, Legierse CM, Lindeboom R, Smitt JH, Bos JD. Clinical differences between atopic and atopiform dermatitis. *J Am Acad Dermatol*. 2008;58(3):407–14.
29. Fölster-Holst R, Pape M, Buss YL, Christophers E, Weichenthal M. Low prevalence of the intrinsic form of atopic dermatitis among adult patients. *Allergy*. 2006;61(5):629-32.
30. Kulthanan K, Boochangkool K, Tuchinda P, Chularojanamontri L. Clinical features of the extrinsic and intrinsic types of adult-onset atopic dermatitis. *Asia Pac Allergy*. 2011;1(2):80-6.
31. Johnson EE, Irons JS, Patterson R, Roberts M. Serum IgE concentration in atopic dermatitis. Relationship to severity of disease and presence of atopic respiratory disease. *J Allergy Clin Immunol.* 1974;54(2):94-9.
32. Salava A, Salo V, Leppänen J, Lauerma A, Remitz A. Factors associated with severity of atopic dermatitis - a Finnish cross-sectional study. *J Eur Acad Dermatol Venereol*. 2022;36(11):2130-9.
33. Thorsteinsdottir S, Stokholm J, Thyssen JP, Nørgaard S, Thorsen J, Chawes BL, et al. Genetic, clinical, and environmental factors associated with persistent atopic dermatitis in childhood. *JAMA Dermatol*. 2019;155(1):50–7.
34. Gerner T, Haugaard JH, Vestergaard C, Deleuran M, Jemec GB, Mortz CG, et al. Disease severity and trigger factors in Danish children with atopic dermatitis: a nationwide study. *J Eur Acad Dermatol Venereol*. 2021;35(4): 948–57.

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