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Research Article

# EXPLORING THE LINK BETWEEN HYPERCHOLESTEROLEMIA AND ATOPIC DERMATITIS: AGE-RELATED DIFFERENCES IN CHOLESTEROL LEVELS AND DISEASE SEVERITY

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## ABSTRACT

The association between hypercholesterolemia and atopic dermatitis (AD) remains a subject of increasing clinical interest due to the shared pathways of systemic inflammation. This study examines 70 patients aged 16 to 60 with elevated blood cholesterol levels (220–350 mg/dL) to investigate the relationship between cholesterol levels and AD severity. Patients were stratified into two groups based on age: those under 40 (48 patients) and those over 40 (22 patients). Results revealed that hypercholesterolemia was more prevalent in older patients, while younger patients exhibited more severe forms of AD, ranging from mild eczema to severe atopic dermatitis. The findings suggest that age plays a critical role in the interplay between lipid metabolism and the inflammatory processes underlying AD, highlighting the importance of lipid monitoring in managing AD severity. Further research is needed to elucidate the mechanisms linking hypercholesterolemia and atopic inflammation.

## KEYWORDS

Hypercholesterolemia, Atopic Dermatitis, Inflammation, Lipid Metabolism, Cardiovascular Risk.

## INTRODUCTION

Hypercholesterolemia and atopic dermatitis (AD) are two prevalent health conditions with significant public health implications [1]. Hypercholesterolemia, characterized by elevated levels of blood cholesterol, is a major risk factor for cardiovascular diseases, including atherosclerosis and coronary artery disease. Atopic dermatitis, a chronic inflammatory skin condition, is marked by intense pruritus, eczematous

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lesions, and considerable impacts on quality of life [2]. Recent studies indicate that metabolic disorders, including hypercholesterolemia, may be linked to inflammatory diseases such as AD, although the precise mechanisms underlying this association remain unclear [3, 4].

Emerging evidence suggests that the relationship between hypercholesterolemia and AD may involve shared pathophysiological pathways, including systemic inflammation, dysregulated lipid metabolism, and immune system dysfunction [5, 6]. Chronic elevation of cholesterol levels has been implicated in exacerbating inflammatory cascades, potentially contributing to the persistent inflammation observed in AD. Additionally, abnormalities in lipid profiles may compromise skin barrier function, further worsening the clinical manifestations of AD [6].

Despite these findings, age-related variations in the relationship between hypercholesterolemia and AD have not been thoroughly investigated. Age may influence the severity of both conditions due to differences in metabolic activity, immune responses, and skin physiology over time. Understanding how cholesterol levels correlate with the severity of AD across different age groups could provide valuable insights for targeted therapeutic strategies.

This study aims to explore the association between hypercholesterolemia and atopic dermatitis in a cohort of 70 patients aged 16 to 60 years, with blood cholesterol levels ranging from 220 to 350 mg/dL. By analyzing age-related differences in cholesterol levels and AD severity, this research seeks to elucidate the potential metabolic and inflammatory interactions that contribute to disease progression. Furthermore, the findings could inform clinical approaches to managing AD in patients with concurrent hypercholesterolemia, emphasizing the importance of integrated care for these interconnected conditions.

## METHODS

### Study Design and Population

This cross-sectional study aimed to explore the relationship between hypercholesterolemia and AD and to examine age-related differences in cholesterol levels and disease severity. A total of 70 patients diagnosed with hypercholesterolemia were recruited from outpatient clinics. Participants were aged 16 to 60 years and had fasting blood cholesterol levels ranging from 220 to 350 mg/dL. All patients were diagnosed with AD or exhibited clinical features consistent with the disease, including chronic eczema, pruritus, and skin inflammation.

### Inclusion and Exclusion Criteria

Participants eligible for the study were required to meet specific inclusion criteria, including being aged 16 to 60 years, having fasting blood cholesterol levels of 220 mg/dL or higher, and a confirmed diagnosis of AD based on clinical assessment and established diagnostic criteria, such as the Hanifin and Rajka criteria [7, 8]. Patients were excluded if they had a diagnosis of other metabolic disorders, such as diabetes mellitus or thyroid dysfunction, or if they had used lipid- lowering medications (e.g., statins) or systemic anti-inflammatory agents within the past three months. Additionally, individuals with other chronic inflammatory skin conditions (e.g., psoriasis) or autoimmune diseases were excluded to ensure the specificity of the study population.

### Data Collection

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Data collection was conducted at Najran University Hospital over a nine-year period, from November 2015 to October 2024. This process involved obtaining detailed medical histories and performing physical examinations to confirm the AD diagnosis and assess its severity. Fasting blood samples were collected after an overnight fast (8–12 hours) through venipuncture under aseptic conditions. Blood samples were processed for cholesterol measurement in a standardized clinical laboratory.

### Laboratory Analysis

Total cholesterol levels were quantified using validated enzymatic colorimetric assays. Laboratory procedures followed rigorous quality control protocols, including calibration of the assay system and verification of test reproducibility. Results were reported in milligrams per deciliter (mg/dL). Statistical Analysis

Descriptive statistics summarized demographic and clinical characteristics. Continuous variables are presented as Mean±SD, while categorical variables are expressed as frequencies and percentages. Correlation analyses evaluated the relationship between cholesterol levels and AD severity. Statistical significance was set at $p < 0.05$. Data analysis was performed using SPSS (version 27).

## RESULTS

### Patient Demographics and Age Distribution

A total of 70 patients diagnosed with hypercholesterolemia and atopic dermatitis (AD) were included in the study. The participants were categorized into two age groups: 47 patients (67.1%) were under 40 years old, and 23 patients (32.9%) were 40 years old or older. Fasting blood cholesterol levels ranged from 220 to 350 mg/dL. Older patients (≥ 40 years) exhibited significantly higher cholesterol levels, with a greater proportion approaching the upper limit of the study range (350 mg/dL). This observation highlights the well-established association between aging and hypercholesterolemia, likely driven by age-related metabolic changes. Table 1 represent the Mean±SD cholesterol levels across various age categories classified by the severity of AD.

**Table 1: Cholesterol level in different age groups stratified by severity of AD**

| Cholesterol level | | | | |
|---|---|---|---|---|
| Age group | Severity | Mean | Std. Deviation | % of Total N |
| Below 40 | Mild | 234±21.974 | 21.974 | 21.4% |
| | Moderate | 237.62±21.191 | 21.191 | 30.0% |
| | Severe | 243.64±25.01 | 25.009 | 15.7% |
| 40 and above | Mild | 257.50±14.88 | 14.880 | 11.4% |
| | Moderate | 259±34.45 | 34.464 | 14.3% |
| | Severe | 274±45.06 | 45.056 | 7.1% |

### Severity of Atopic Dermatitis by Age Group

The severity of AD was evaluated in both age groups and categorized as mild, moderate, or severe. The distribution of severity within each group is presented in Table 2 below

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**Table 2: Cholesterol levels and AD severity stratified by age groups.**

| Age Group | Mild AD | Moderate AD | Severe AD |
|---|---|---|---|
| **Under 40 years old (n = 47)** | 15 (31.9%) | 21 (47.7%) | 11 (23.4%) |
| **40 years and older (n = 23)** | 8 patients (34.8%) | 10 patients (43.5%) | 5 (21.7%) |

Older patients (≥40 years) in the study exhibited significantly higher cholesterol levels compared to their younger counterparts (<40 years), highlighting the well-established association between aging and hypercholesterolemia. This positive correlation was statistically significant, as indicated by the correlation coefficient ($r = 0.494$, $p < 0.01$). Despite this, younger patients were more likely to experience severe forms of atopic dermatitis (AD), even with relatively lower cholesterol levels. Furthermore, the partial correlation analysis showed no significant relationship between cholesterol levels and AD severity ($r = 0.123$, $p = 0.314$), as well as between age and AD severity ($r = 0.074$, $p = 0.544$). These findings suggest that neither age nor cholesterol alone is a direct determinant of AD severity, reinforcing the hypothesis that other complex, age-dependent factors such as immune dysregulation or metabolic variations likely mediate the observed trends. Interestingly, although older patients had higher cholesterol levels, their AD was generally less severe. This inverse relationship points to the possibility that age-related changes in immune response, skin barrier function, or other physiological factors may influence how AD severity manifests in these individuals.

## DISCUSSION

The findings corroborate the well-established association between aging and hypercholesterolemia, demonstrating that older patients (≥40 years) exhibit significantly elevated cholesterol levels compared to their younger counterparts (<40 years). This age-related increase in cholesterol aligns with prior studies that emphasize the impact of age-related metabolic changes, such as reduced lipid clearance and alterations in lipid metabolism, which frequently result in higher cholesterol levels among older populations [9]. These metabolic changes contribute to the increased cardiovascular risk observed in aging individuals, highlighting the critical importance of monitoring cholesterol levels in older adults. The relationship between cholesterol levels and the severity of AD is more complex than initially anticipated. Notably, despite elevated cholesterol levels in older patients, the severity of AD was generally less pronounced in this demographic compared to younger patients. This observation challenges the assumption that higher cholesterol levels directly correlate with more severe inflammatory conditions, such as AD. Rather, it indicates that age-related physiological changes, including altered immune responses, modifications in skin barrier function, and other regulatory mechanisms, may influence the severity of AD in older individuals.

Several studies have examined the relationship between hypercholesterolemia and atopic dermatitis (AD), revealing a complex association that involves

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systemic inflammation, immune dysregulation, and cardiovascular risk factors [1, 4, 10, 11]. In our investigation, younger patients (<40 years), despite exhibiting lower cholesterol levels, have been observed to experience more severe forms of AD. This finding indicates that factors beyond cholesterol, including immune system activity, genetic predisposition, and environmental exposures, play a critical role in the severity of AD. Prior research has shown that younger individuals may possess increased immune responses or increased skin permeability, which could contribute to more pronounced inflammatory processes in conditions such as AD [12-14]. Furthermore, genetic factors that affect skin barrier function and immune regulation in younger individuals may predispose them to more severe manifestations of the disease, irrespective of cholesterol levels [15, 16].

As individuals age, their immune systems experience a phenomenon known as immunosenescence, resulting in a diminished inflammatory response to various stimuli, including allergens and irritants that typically exacerbate AD [17]. Furthermore, age-related alterations in the skin, such as decreased collagen production and modified lipid composition, may lead to a less reactive inflammatory response, even in the presence of elevated cholesterol levels. Additionally, other metabolic factors, including altered levels of pro-inflammatory cytokines, may contribute to the reduced severity of AD observed in older patients. It is reasonable that these factors, along with the natural decline in immune system function, may limit the inflammatory response that generally drives the severity of AD in younger patients.

### Limitations and Future Directions

While this study provides valuable insights into the relationship between hypercholesterolemia and AD severity, the cross-sectional design limits the ability to establish a causal relationship between cholesterol levels and AD severity. Longitudinal studies are necessary to further explore how cholesterol levels and other metabolic factors influence the progression of AD over time. Additionally, this study did not account for potential confounding factors such as medication use, comorbid conditions, or environmental exposures, all of which could affect both cholesterol levels and AD severity. Future research should focus on investigating the molecular mechanisms underlying the observed age-related differences in AD severity and cholesterol levels. Examining the roles of immune system modulation, skin barrier function, and lipid metabolism across different age groups may yield more targeted therapeutic strategies for managing AD, particularly in populations with elevated cholesterol levels.

## CONCLUSION

This study highlights significant age-related differences in cholesterol levels and AD severity. Older patients, despite exhibiting higher cholesterol levels, tended to experience less severe AD, suggesting that age-related changes in immune function and skin barrier integrity may mitigate the inflammatory response associated with the condition. Conversely, younger patients, who presented with lower cholesterol levels, exhibited more severe forms of the disease, indicating the involvement of additional factors beyond cholesterol. These findings underscore the complexity of AD pathogenesis and suggest that both metabolic and immune-related factors contribute to disease severity across different age groups.

## REFERENCE

1. J.H. Leigh, H.J. Park, S.M. Chun, Y.S. Min, M. Choi, Association of Atopic Dermatitis with Dyslipidemia

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VOLUME 05 ISSUE 12 Pages: 76-81
OCLC –1242424495


in Adolescents: A Cross-Sectional Study, Ann Dermatol 33(5) (2021) 483-485.
2. S. Weidinger, N. Novak, Atopic dermatitis, Lancet 387(10023) (2016) 1109-1122.
3. D.A. Bulger, S. Minhas, A.A. Asbeutah, S. Kayali, H.A.K. Shirwany, J.R. Patel, M.P. Seitz, K. Clark, T. Patel, R.N. Khouzam, Chronic Systemic Inflammatory Skin Disease as a Risk Factor for Cardiovascular Disease, Current Problems in Cardiology 46(5) (2021) 100799.
4. C. Kern, C. Ortiz, M. Johanis, M. Ye, P. Tahir, A. Mulick, I.E. Allen, C.E. McCulloch, S.M. Langan, K. Abuabara, Atopic Dermatitis and Cardiovascular Risk in Pediatric Patients: A Systematic Review and Meta-Analysis, J Invest Dermatol 144(5) (2024) 1038-1047.e16.
5. C. Garcia, C.J. Andersen, C.N. Blesso, The Role of Lipids in the Regulation of Immune Responses, Nutrients 15(18) (2023).
6. J. Kim, B.E. Kim, D.Y.M. Leung, Pathophysiology of atopic dermatitis: Clinical implications, Allergy Asthma Proc 40(2) (2019) 84-92.
7. M. Böhme, Å. Svensson, I. Kull, C.-F. Wahlgren, Hanifin's and Rajka's minor criteria for atopic dermatitis: Which do 2-year-olds exhibit?, Journal of the American Academy of Dermatology 43(5) (2000) 785-792.
8. M.J. Rothe, J.M. Grant-Kels, Diagnostic criteria for atopic dermatitis, The Lancet 348(9030) (1996) 769-770.
9. R. Markovič, V. Grubelnik, H.B. Vošner, P. Kokol, M. Završnik, K. Janša, M. Zupet, J. Završnik, M. Marhl, Age-Related Changes in Lipid and Glucose Levels Associated with Drug Use and Mortality: An Observational Study, J Pers Med 12(2) (2022).
10. H.J. Jung, D.H. Lee, M.Y. Park, J. Ahn, Cardiovascular comorbidities of atopic dermatitis: using National Health Insurance data in Korea, Allergy, Asthma & Clinical Immunology 17(1) (2021) 94.
11. L. Maintz, T. Bieber, H.D. Simpson, A.L. Demessant-Flavigny, From Skin Barrier Dysfunction to Systemic Impact of Atopic Dermatitis: Implications for a Precision Approach in Dermocosmetics and Medicine, J Pers Med 12(6) (2022).
12. A. Trompette, N.D. Ubags, Skin barrier immunology from early life to adulthood, Mucosal Immunology 16(2) (2023) 194-207.
13. L.A. Beck, M.J. Cork, M. Amagai, A. De Benedetto, K. Kabashima, J.D. Hamilton, A.B. Rossi, Type 2 Inflammation Contributes to Skin Barrier Dysfunction in Atopic Dermatitis, JID Innov 2(5) (2022) 100131.
14. T. Çetinarslan, L. Kümper, R. Fölster-Holst, The immunological and structural epidermal barrier dysfunction and skin microbiome in atopic dermatitis-an update, Front Mol Biosci 10 (2023) 1159404.
15. A.C. Chong, K. Visitsunthorn, P.Y. Ong, Genetic/Environmental Contributions and Immune Dysregulation in Children with Atopic Dermatitis, J Asthma Allergy 15 (2022) 1681-1700.
16. J.M. Biagini Myers, G.K. Khurana Hershey, Eczema in early life: genetics, the skin barrier, and lessons learned from birth cohort studies, J Pediatr 157(5) (2010) 704-14.
17. R.G. Reed, S.R. Presnell, A. Al-Attar, C.T. Lutz, S.C. Segerstrom, Life stressors and immune aging: Protective effects of cognitive reappraisal, Brain, Behavior, and Immunity 110 (2023) 212- 221.