

Overview and Allergic Sensitization of Atopic Dermatitis in a Lebanese Population: A Cross-sectional Study

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Abstract

Background: Atopic Dermatitis (AD) is a chronic relapsing inflammatory skin condition. Incidence of AD has increased 2- to 3-fold in the western world, impacting approximately 15% to 20% of children and 1% to 3% of adults worldwide. Local epidemiologic data is scarce and limited to children or adolescents.

Objective: The study aims to determine the prevalence of eczema among Lebanese adolescents and identify demographic and clinical characteristics associated with eczema.

Methods: This is retrospective study that includes patients of all ages who were diagnosed with atopic dermatitis in 2018 at a tertiary Allergy and Immunology center over the course of one year. Data were collected from medical records, including demographic characteristics, disease severity, treatment modalities, allergic comorbidities and sensitization profiles. Bivariate analyses were conducted to examine associations between AD severity and factors such as age, sex, medication use, comorbid conditions and allergen sensitization.

Results: Among 850 patients, 135 (15.88%) presented with AD as diagnosed clinically by the Allergy/Immunology specialist. The mean age of the participants was 21.50 ± 17.31 years, with 78 (58.2%) females, 71(52.5%) above age 13. Fifty-eight (43.3%) presented with mild disease and 76 (56.7%) with moderate-severe disease. The mean IgE level was 403.15 ± 626.32 . All were treated according to the Task Force Practice Parameter. The results of the bivariate analysis of factors associated with the disease severity, showed that a higher percentage of children who had moderate-severe disease severity used topical steroids (89.6% vs. 10.4%) and topical immunosuppressors (87.5% vs. 12.5%), whereas a higher percentage of patients who had mild disease severity (61.4% vs. 38.6%) presented with asthma. A significantly higher percentage of older females (61.5% vs. 38.5%), age 13 years old or above had moderate-severe AD (60.5% vs. 39.5%), had dust mites' sensitization (74.2% vs. 25.8%). Patients aged ≤ 12 years were more likely to have food allergy (68.0% vs. 32.0%) in particular cow's milk sensitization (84.6% vs. 15.4%)

Conclusion: In our study, Atopic Dermatitis is found to be common in young adults. Its severity may be associated with dust mite's sensitization in adolescents and adults and with food allergy in particular cow's milk in younger age. Asthma was found to be present in mild disease.

Keywords: Atopic dermatitis • Allergic sensitization • Dust mites • Cow's milk • Atopic dermatitis in Lebanon

Introduction

Atopic Dermatitis (AD) is a chronic, pruritic inflammatory skin condition that typically begins in infancy or childhood and follows a relapsing-remitting course. Its prevalence in industrialized nations ranges from 10% to 30% in children and 2% to 10% in adults, reflecting a two- to threefold increase over recent decades [1]. AD is part of the broader spectrum of allergic diseases, which are driven by aberrant IgE-mediated immune responses to environmental allergens and are associated with symptoms such as conjunctival irritation, sneezing and

nasal congestion and cough and pruritic skin lesions. These disorders result from a complex interplay of genetic susceptibility and environmental exposures, particularly at epithelial barrier sites [2]. Epidemiological data highlight the significant burden of AD on health-related quality of life. A multinational survey conducted across 12 Asia-Pacific countries revealed that individuals with AD experience substantial impairments in both mental and physical well-being. Identification of modifiable risk factors is thus crucial for informing prevention strategies and reducing disease burden [3]. The etiology of AD is multifactorial, involving genetic predisposition, immune dysregulation and environmental triggers [4]. Among these, tobacco smoke exposure has been implicated as a risk factor in the development and exacerbation of AD. Tobacco smoke induces TNF- α production, which promotes IgE synthesis by B-cells and compromises host defense mechanisms, thereby facilitating skin inflammation. A two-sample Mendelian randomization study demonstrated a causal relationship between smoking and increased risk of AD [3]. Furthermore, data from the TREAT germany registry (June 2016–April 2020) showed that smoking in AD patients was independently associated with more severe disease, including heightened pruritus, increased oozing and crusting and fewer weeks of well-controlled symptoms [5]. Urban living environments have also been associated with higher AD prevalence compared to rural settings, even among populations with similar genetic backgrounds [6]. Allergen sensitization also plays a critical role in disease severity. A study from the Mechanisms of Progression from Atopic

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Received: 21 July, 2025, Manuscript No. JPD-25-168065; **Editor Assigned:** 23 July, 2025, PreQC No. P-168065; **Reviewed:** 11 August, 2025, QC No. Q-168065; **Revised:** 25 September, 2025, Manuscript No. R-168065; **Published:** 10 October, 2025, DOI:10.37421/2684-4281.2025.12.509

Dermatitis to Asthma in Children cohort found that sensitization to peanut, egg, cat and dog allergens was associated with greater skin barrier dysfunction measured by elevated transepidermal water loss and reduced filaggrin expression and more severe AD compared to children with no sensitization or sensitization to other allergens [7]. Comorbid atopic conditions such as asthma frequently co-occur with AD. In a cross-sectional study involving 502 patients aged 4.8 to 79.9 years, asthma was significantly more prevalent among those with severe AD (52.4%) than those with mild disease (33.1%, $P=0.001$). However, no significant differences were observed between severity groups regarding the prevalence of allergic rhinitis, allergic conjunctivitis, food allergies, or peanut allergy [8]. Local epidemiologic data is scarce and limited to children or adolescents. This is a cross-sectional study of all patients of all ages visiting one Allergy/Immunology tertiary center for any allergic diseases consultation in 2018. The objective of this review is to investigate the percentage of those presenting for AD, severity and management and association of AD with other allergic comorbidities. Among 850 patients, 135 (21%) presented with AD. The Allergy/Immunology specialist made the clinical diagnosis according to symptoms (pruritis) and type of rash.

Methods

Study design and setting

This is a retrospective cross-sectional study conducted at a tertiary Allergy and Immunology center in Lebanon.

Participants and eligibility criteria: Participants included patients of all ages who presented to the clinic in 2018 and were diagnosed with atopic dermatitis by an American board-certified allergist. Diagnosis was based on clinical evaluation in accordance with the 2023 American Academy of Allergy, Asthma & Immunology/American College of Allergy and Asthma & Immunology Joint Task Force on Practice Parameters using GRADE- and Institute of Medicine–based recommendations [9].

Data sources and measurements: Data were collected through review of password-protected electronic medical records and anonymized for analysis, after IRB approval was obtained. Extracted data included demographic information, clinical notes, laboratory tests related to allergy (total and specific IgE levels) and severity assessment using the SCORAD (Scoring Atopic Dermatitis) index and validated scoring tools [10,11].

Variables: The primary outcome was AD severity, categorized as mild or moderate-severe. Independent variables included demographic characteristics

(age, gender), presence of allergic comorbidities (asthma, allergic rhinitis and food allergies), medication use (topical/oral steroids, immunosuppressants, antihistamines), sensitization to specific allergens (e.g., cow’s milk, dust mites) and total serum IgE levels.

Sample size: Out of 850 patients seen during the study period, 135 (15.8%) were diagnosed with AD and included in the analysis.

Statistical analysis: Descriptive statistics were used to summarize participant characteristics. Bivariate analyses (chi-square test for categorical variables and t-test for continuous variables) were performed to assess associations between AD severity and potential predictors. A p -value<0.05 was considered statistically significant. Analyses were conducted using SPSS version.

Results

Sociodemographic characteristics

Among 850 patients evaluated in the Allergy/Immunology tertiary center during 2018, 135 (15.8%) were diagnosed clinically with Atopic Dermatitis (AD). The mean age of the participants was 21.50 ± 17.31 years, with 78 (58.2%) females. Moreover, 58 (43.3%) with mild disease severity and 76 (56.7%) with moderate-severe disease severity. Finally, the mean IgE level was 403.15 ± 626.32 IU/mL (Table 1).

Bivariate analysis of factors associated with the disease severity

Bivariate analysis demonstrated that the use of topical corticosteroids and topical immunosuppressants was significantly associated with moderate to severe disease. Among patients with moderate-severe AD, 89.6% used topical corticosteroids compared to 10.4% of those with mild AD ($p<0.001$) and 87.5% used topical immunosuppressants vs. 12.5% of those with mild disease ($p<0.001$). Conversely, asthma and/or allergic rhinitis were more common among patients with mild AD (61.4%) compared to those with moderate-severe disease (38.6%, $p<0.001$). No significant associations were found between AD severity and gender, use of oral steroids, antihistamines, food allergy, or most allergen sensitizations (Tables 2 and 3).

Age-related differences

Patients aged 13 years or older were significantly more likely to be female (61.5% vs. 38.5%, $p=0.019$), have moderate-severe AD (60.5% vs. 39.5%, $p=0.045$), use oral steroids (75.0% vs. 25.0%, $p=0.032$) and use

Table 1. Characteristics of patients with Atopic Dermatitis (AD).

Variable	Value
Number of patients with AD	135/850
Prevalence of AD in this population	15.8%
Mean age (years)	21.50 ± 17.31
Female	78 (58.2%)
Male	57 (41.8%)
Mild	58 (43.3%)
Moderate-Severe	76 (56.7%)
Mean IgE level (IU/mL)	403.15 ± 626.32
Use of topical corticosteroids	67 (49.6%)
Use of topical immunosuppressants	56 (41.5%)
History of asthma/allergic rhinitis	70 (51.9%)
Food allergy	25 (18.5%)
Dust mites sensitization	31 (23.0%)
Cow’s milk sensitization	13 (9.6%)

Table 2. Bivariate analysis of factors associated with the disease severity.

Variable	Mild Severity	Moderate-Severe	p
Gender	Male	26 (46.4%)	0.534
	Female	32 (41.0%)	
Oral steroids	No	53 (46.5%)	0.074
	Yes	5 (25.0%)	
Topical steroids	No	51 (76.1%)	<0.001
	Yes	7 (10.4%)	
Topical immunosuppressors	No	51 (65.4%)	<0.001
	Yes	7 (12.5%)	
Antihistamine	No	13 (48.1%)	0.568
	Yes	45 (42.1%)	
Asthma/allergic rhinitis	No	15 (23.4%)	<0.001
	Yes	43 (61.4%)	
Food allergy	No	49 (45.0%)	0.415
	Yes	9 (36.0%)	
Oral immunosuppressors	No	58 (43.9%)	0.213
	Yes	0 (0%)	
History of childhood atopic dermatitis	No	6 (37.5%)	0.619
	Yes	52 (44.1%)	

Table 3. Bivariate analysis of allergens associated with the disease severity.

Variable	Mild Severity	Moderate-Severe	p
Cow's milk	No	54 (44.6%)	0.338
	Yes	4 (30.8%)	
Cat	No	58 (43.6%)	0.381
	Yes	0 (0%)	
Dust mites	No	45 (43.7%)	0.863
	Yes	13 (41.9%)	
Peanut	No	57 (44.2%)	0.284
	Yes	1 (20.0%)	
Eggs	No	57 (44.2%)	0.284
	Yes	1 (20.0%)	
Tree pollen	No	56 (42.4%)	0.186
	Yes	2 (100%)	
Pollen parietaria	No	54 (42.2%)	0.402
	Yes	4 (66.7%)	
Sesame	No	58 (43.6%)	1
	Yes	0 (0%)	
Pollen grass	No	56 (43.1%)	1
	Yes	2 (50.0%)	
Dog	No	57 (43.2%)	1
	Yes	1 (50.0%)	
Latex	No	56 (42.4%)	0.186
	Yes	2 (100%)	
Age (in years)	19.48 ± 16.94	23.04 ± 17.54	0.153
IgE	295.75 ± 411.96	473.29 ± 729.02	0.543

topical corticosteroids (64.2% vs. 35.8%, p=0.009). Sensitization to dust mites was also more common among adolescents and adults (74.2% vs. 25.8%, p=0.007). In contrast, children aged ≤ 12 years were more likely to have food allergies (68.0% vs. 32.0%, p=0.020), particularly cow's milk allergy (84.6%

vs. 15.4%, p=0.004). A history of childhood atopic dermatitis was also more frequently reported among younger patients (50.8% vs. 49.2%, p=0.016) (Tables 4 and 5). No significant associations with age were observed for other allergens, asthma/allergic rhinitis, or total serum IgE levels.

Table 4. Bivariate analysis of factors associated with age.

Variable	Age (≤ 12 years)	Age (13+ years)	p
Gender	Male	32 (58.9%)	0.019
	Female	30 (38.5%)	
Severity of the disease	Mild	33 (56.9%)	0.045
	Moderate-severe	30 (39.5%)	
Oral steroids	No	58 (50.9%)	0.032
	Yes	5 (25.0%)	
Topical steroids	No	39 (58.2%)	0.009
	Yes	24 (35.8%)	
Topical immunosuppressants	No	38 (48.7%)	0.641
	Yes	25 (44.6%)	
Antihistamine	No	14 (51.9%)	0.573
	Yes	49 (45.8%)	
Asthma/allergic rhinitis	No	28 (43.8%)	0.469
	Yes	35 (50.0%)	
Food allergy	No	46 (42.2%)	0.020
	Yes	17 (68.0%)	
Oral immunosuppressants	No	63 (47.7%)	0.180
	Yes	0 (0%)	
History of childhood atopic dermatitis	No	3 (18.8%)	0.016
	Yes	60 (50.8%)	

Table 5. Bivariate analysis of allergens associated with age.

Variable	Age (≤ 12 years)	Age (13+ years)	p
Cow's milk	No	52 (43.0%)	0.004
	Yes	11 (84.6%)	
Cat	No	63 (47.4%)	0.344
	Yes	0 (0%)	
Dust mites	No	55 (53.4%)	0.007
	Yes	8 (25.8%)	
Peanut	No	60 (46.5%)	0.553
	Yes	3 (60.0%)	
Eggs	No	60 (46.5%)	0.553
	Yes	3 (60.0%)	
Tree pollen	No	62 (47.0%)	0.932
	Yes	1 (50.0%)	
Pollen parietaria	No	62 (48.4%)	0.128
	Yes	1 (16.7%)	
Sesame	No	63 (47.4%)	0.344
	Yes	0 (0%)	
Pollen grass	No	62 (47.7%)	0.370
	Yes	1 (25.0%)	
Dog	No	62 (47.0%)	0.932
	Yes	1 (50.0%)	
Latex	No	62 (47.0%)	0.932
	Yes	1 (50.0%)	
IgE	348.68 ± 599.49	436.92 ± 646.04	0.460

Discussion

In this cross-sectional study of patients evaluated at a tertiary Allergy/Immunology center in Lebanon, Atopic Dermatitis (AD) was diagnosed in 135 (15.8%) among 850 patients, affecting both children and adults. The prevalence aligns with global estimates, which suggest that AD affects up to 20% of children and 1-10% of adults worldwide, though this is among the first studies to explore

this burden across a wide age range in the Lebanese population. Our findings indicate that more than half of the patients had moderate to severe AD, with disease severity being significantly associated with treatment patterns and allergic comorbidities. Specifically, the use of topical corticosteroids and topical immunosuppressant was strongly associated with more severe disease, likely reflecting standard clinical practice where such therapies are escalated for patients with more extensive or persistent symptoms. Interestingly, asthma and/or allergic rhinitis were more frequently reported in patients with mild AD,

contrasting with existing literature that typically shows stronger associations between AD severity and the presence of other atopic conditions such as asthma. For example, Finnish cross-sectional study [8], reported significantly higher rates of asthma among patients with severe AD compared to those with milder disease [8]. One possible explanation for our contrasting finding could be differences in the timing of diagnosis or control of comorbid conditions, or the presence of distinct AD phenotypes in our population. Age also emerged as an important factor modifying clinical and allergic profiles. Older patients (≥ 13 years) were more likely to have moderate-severe disease, use systemic or topical treatments and demonstrate sensitization to dust mites. In contrast, younger patients (≤ 12 years) were more likely to report food allergies, particularly to cow's milk, supporting previous studies that show food sensitization is more prominent in pediatric AD and tends to decrease with age [12]. This age-related pattern reinforces the importance of tailoring diagnostic and management approaches based on patient age.

We did not find a statistically significant association between AD severity and total IgE levels or sensitization to most individual allergens beyond dust mites and cow's milk. This may be due to the wide variability of IgE levels and small numbers sensitized to certain allergens, limiting statistical power. Nevertheless, the strong association between dust mite sensitization and moderate-severe disease in adolescents and adults is in line with the literature showing a role for inhalant allergens in perpetuating skin inflammation and barrier dysfunction [13,14]. It is important to emphasize the role of therapy in the management of atopic dermatitis. The main therapeutic objectives include reducing inflammation and itch, repairing the skin barrier and improving overall quality of life. Long-term maintenance treatment focuses on minimizing transepidermal water loss, reestablishing epidermal barrier integrity and sustaining adequate skin hydration [15]. In Middle Eastern countries, the majority of patients with Atopic Dermatitis (AD) present with mild-to-moderate disease rather than severe forms. For this population, Topical Calcineurin Inhibitors (TCIs) are recommended as an effective treatment option. Notably, the American Academy of Dermatology (AAD), along with European and German guidelines, advocate for the preferential use of TCIs over Topical Corticosteroids (TCS) for long-term management in sensitive skin areas [16]. However, A Survey of Three Physician Specialties in the Middle East showed that despite guideline recommendations favoring topical calcineurin inhibitors for sensitive areas, Topical Corticosteroids (TCSs) remained the most commonly used treatment among patients with mild-to-moderate atopic dermatitis, reported in 57% of cases. In Lebanon and the UAE, topical PDE4 inhibitors were prescribed to 9% and 8% of patients with mild-to-moderate atopic dermatitis, respectively. Topical PDE4 inhibitors, such as crisaborole, offer a promising long-term option for enhancing the management of atopic dermatitis. For moderate-to-severe cases, oral corticosteroids were identified by physicians as the second most commonly used treatment, administered to over one-third (36%) of patients

For the treatment of mild-to-moderate atopic dermatitis, emollients and Topical Corticosteroids (TCSs) emerged as the most frequently preferred options among physicians, including dermatologists. These were followed by Topical Calcineurin Inhibitors (TCIs), oral corticosteroids, topical PDE4 inhibitors and other available therapies [17]. Nonetheless, Topical Corticosteroids (TCSs) are typically avoided on sensitive areas of the skin due to their risk of inducing atrophy and further impairing the epidermal barrier function. It is important to recognize that "corticophobia" is a widespread concern across cultures, which can hinder treatment adherence and adversely affect clinical outcomes in patients with atopic dermatitis [16]. Narrowband ultraviolet B (nbUVB, 311 nm) is a first-line phototherapy option for atopic dermatitis and has been shown to exert a steroid-sparing effect [15]. Antihistamines have demonstrated limited effectiveness in managing atopic dermatitis and their use is not recommended by the 2014 guidelines of the American Academy of Dermatology (AAD). Despite globally consistent treatment guidelines for atopic dermatitis, implementation in the Middle East remains challenging, with regional non-adherence hindering optimal care. For instance, although crisaborole is recommended by the 2018 AD Yardstick guidelines for mild-to-moderate disease, it remains poorly recognized among surveyed Middle Eastern physicians [17].

Strength and Limitation

A major strength of this study is its inclusion of both pediatric and adult patients from a real-world clinical setting, allowing for age-based comparisons of atopic dermatitis characteristics. Additionally, diagnoses were made by a specialist, increasing the reliability of clinical classification. Importantly, this is one of the few studies to explore atopic dermatitis in a Lebanese population, providing valuable regional epidemiologic data where such research is currently limited. However, some limitations should be acknowledged. First, the cross-sectional design precludes conclusions about causality. Second, data were extracted from medical records, which may introduce information bias. Finally, the single-center nature of the study may limit generalizability to the broader Lebanese or Middle Eastern population.

Conclusion

Atopic dermatitis is a prevalent condition among patients presenting to allergy clinics in Lebanon, affecting a broad age range and presenting with variable severity. Moderate to severe disease was associated with increased use of topical treatments and dust mite sensitization in adolescents and adults, while food allergies, especially cow's milk, were more common among younger children. These findings underscore the need for age-specific evaluation and management strategies and highlight potential targets for prevention and education campaigns in the Lebanese population.

Acknowledgement

None.

Conflict of Interest

None.

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How to cite this article: Irani, Carla, Souheil Hallit, Marilyn Karam and Candie Jammal, et al. "Overview and Allergic Sensitization of Atopic Dermatitis in a Lebanese Population: A Cross-sectional Study." *J Dermatol Dis* 12 (2025): 509.