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ORIGINAL ARTICLE

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Establishing the degree of control in patients with atopic dermatitis with the atopic dermatitis control tool (ADCT)

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Abstract
Background: Atopic dermatitis (AD) is a disease of multifactorial etiology that affects the quality of life of those afflicted.
Objective: The degree of control of patients with AD over 12 years of age was determined with the Atopic Dermatitis Control Instrument (ADCT).
Material and Methods: This observational, cross-sectional, descriptive study included patients with AD who were evaluated with a self-administered instrument, the ADCT. Pearson's Chi square and Student's *t*-tests were used for categorical variables. The association between continuous variables was analyzed with the Pearson and Spearman correlations.
Results: A total of 55 patients with AD were included—42 women (76.4%) and 13 men (23.6%). The median age was 24 years (12-63). Regarding the degree of disease control, it was adequate in 23 (41.8%) patients and inadequate in 32 (58.2%). The patient's sex, age, work activity, residence, and level of education were not statistically significant factors for the degree of control. The most prevalent comorbidity was allergic rhinitis with a higher percentage in those with adequate control ($p = 0.049$). Treatment with corticosteroids was associated with good disease control ($p < 0.001$). A high positive correlation ($r = 0.770$, $p < 0.001$) was found between the SCORAD score and the ADCT score for symptom control. SCORAD and POEM scores showed a direct proportional relationship ($r = 0.791$; $p < 0.001$)
Conclusions: The ADCT allowed us to determine the degree of control of atopic dermatitis and develop treatment strategies.

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Introduction

Atopic dermatitis (AD), an allergic skin condition, may significantly impact the quality of life across psychosocial, emotional, work, and economic domains.[1] Validated tools are available to assess clinical signs, affected areas, and subjective symptoms, essential for determining appropriate therapy and disease control.[2]

The ADCT (Atopic Dermatitis Control Instrument) is a brief, easily administered tool that predicts disease burden reliably during clinical consultation.[3] In Latin America, AD affects 1 to 20% of the population, with increasing prevalence.[1] In Mexico, it affects 10.1% of children and 3% of adults.[4] In Monterrey, the prevalence is 4.2%, with symptoms appearing in 60% of patients in their first year of life and remission before age 16 in 70% of cases.[5-7]

Disease control involves reducing severity, preventing outbreaks, and improving quality of life.[8] Instruments, such as the Atopic Dermatitis Severity Index (SCORAD) and the Patient-Oriented Eczema Measurement (POEM), are available; however, the data obtained from these tools are the result of the doctor's report. They do not consider the holistic perception that the patient has regarding disease control.[8]

The ADCT published in 2019[3] consists of six questions that evaluate various aspects of AD control, including symptom severity, itching intensity, discomfort level, impact on sleep and daily activities, and mood. Two separate studies have confirmed its validity and reliability.[3]

First, the validity of the ADCT tool was evaluated in a study published in November 2019. It was concluded that it was a reliable tool for evaluating disease control.[8] Another study in March 2021, with 1606 patients, found ADCT to be more effective than POEM in predicting disease burden.[9]

These studies confirm that ADCT is valid and reliable in ensuring AD control, offering the potential to objectively identify changes in disease activity and improve patient monitoring. However, due to its recent development, there's a lack of studies utilizing it in clinical practice, highlighting the relevance of the present research.

Material and Methods

A self-administered questionnaire was applied to 55 patients over 12 years of age from the outpatient consult of the Allergy Service at the University Hospital "Dr. José Eleuterio González" in Monterrey, Mexico. They were diagnosed with AD (mild, moderate, or severe) and included in the study from October 2022 to August 2023. Demographic data included sex, age, education, occupation, geographical area, body mass index, and allergic comorbidities (allergic rhinitis, allergic rhinoconjunctivitis, asthma, and AD). The study was authorized by the Ethics Committee of the Faculty of Medicine of the Autonomous University of Nuevo León with number AL22-00006.

After verbal consent was provided, the ADCT was applied to determine disease control. The SCORAD index and the POEM scale were used to establish disease severity. A proportion estimation formula was used in a finite sample.

Descriptive statistics analyzed demographic data. Inferential statistics assessed sample distribution using the Kolmogorov-Smirnov test. Categorical variables were compared using Pearson's Chi square test or Fisher's exact test. Student's *t*-test compared independent groups. Pearson correlation coefficients identified the degree of association between continuous variables. A p-value ≤ 0.05 and a 95% confidence interval were considered statistically significant. The SPSS statistical software version 25 was used for data analysis.

Results

Of the 55 patients diagnosed with AD, 38 (69%) were subsequent patients and 17 (31%) were first-time patients. There were 42 women (76.4%) and 13 men (23.6%) with a median age of 24 years (IQR 16–37). The minimum age was 12 and the maximum age was 63. Around 54.5% of the participants had university-level education (Table 1).

Regarding clinical characteristics with regard to body mass index (BMI; p = 0.913), participants who were considered underweight were 12.70%, normal weight were 32.70%, overweight were 30.90%, and obese were 23.60%. Allergic comorbidities were more frequent than nonallergic comorbidities (76.7% vs. 7.3%). The most common allergic comorbidity was allergic rhinitis (61.8%) followed by allergic rhinoconjunctivitis (20%), asthma (18.20%), and urticaria (5.5%). Regarding the most prevalent severity levels of allergic comorbidities, mild intermittent

Table 1 Demographic statistics.

Characteristics	Total	Control level		P
		Adequate	Inadequate	
Female gender	76.4%	73.9%	78.1%	0.717
Age	24 (16–37)	24 (13–36)	23.5 (16.2–39.5)	0.584
Employed	30.9%	26.1%	34.4%	0.512
Education level				0.967
Primary school	3.6%	4.30%	3.10%	
Secondary school	30.9%	30.40%	31.30%	
High school	10.9%	13.00%	9.40%	
University	54.5%	52.20%	56.30%	

U Mann–Whitney, χ^2, and student's *t*-test. Quantitative variables are reported as median (interquartile range).

allergic rhinitis was most common (43.6%), followed by mild moderate severe rhinoconjunctivitis (9.10%) and controlled asthma (10.9%). The treatments that patients received were creams (67.3%), topical corticosteroids (49.10%), and calcineurin inhibitors (9.10%).

SCORAD values are presented as medians (IQR). The median SCORAD score was 25.2 (12–34). The overall mean POEM was 10.5 ± 7.1. Participants were distributed into two groups according to the degree of disease control: adequate, 23 patients (41.8%) and inadequate, 32 patients (58.2%). Female gender (73.9% in the adequate control group and 78.1% in the inadequate control group; $p = 0.717$) predominated in both groups (Table 1). The median age was 23.5 years (IQR= 16.2–39.5) in those with inadequate control and 24 (IQR= 13–36) ($p = 0.584$) in those with adequate control. Among occupationally active patients, 26.1% had adequate control and 34.4% had inadequate control ($p = 0.512$). The patient's level of education was not a statistically significant factor for the degree of disease control.

Regarding the clinical characteristics of the study population and its relationship with the degree of control of AD (Table 2), underweight BMI occurred in 17.40% of the adequate control group and 9.40% of the inadequate control group. Normal weight BMI occurred in 30.40% of the adequate control group and 34.40% in the inadequate control group. In overweight individuals, BMI was 21.70% in the adequate control group and 37.5% in the group without adequate control. Obesity was present in 30.40% of the adequate control group and 18.80% of the inadequate control group. The means between the control groups were not substantially different (adequate: 25.9 ± 5.9 vs. inadequate: 25.8 ± 4.6). The overall mean was 25.8 ± 5.1. The most frequent category (32.7%) was "normal weight." However, in those with an ADCT value ≥7, overweight was more common (37.50%) and in those with a score <7, normal weight and obesity were most common (30.4%).

Regarding allergic comorbidities, allergic rhinitis was prevalent in the adequate control group with 78.30% and with 50% in the inadequate control group ($p = 0.049$). Intermittent mild allergic rhinitis affected 56.50% of patients with adequate control and 34.40% of patients with inadequate control. Persistent mild allergic rhinitis occurred in 13% of patients with adequate control and 9.40% of patients with inadequate control. Intermittent mild allergic rhinitis was the most predominant in those with an ADCT score <7 (47.8%).

Rhinoconjunctivitis affected 17.40% of patients with adequate control and 21.90% of those with inadequate control. Mild intermittent rhinoconjunctivitis affected 8.70% of patients with adequate control and 6.30% of those with

Table 2 Clinical characteristics.

Variable	Total	Control Level		*P*
		Adequate	Inadequate	
BMI				0.913
Underweight	12.70%	17.40%	9.40%	
Normal weight	32.70%	30.40%	34.40%	
Overweight	30.90%	21.70%	37.50%	
Obesity	23.60%	30.40%	18.80%	
Comorbidities				
Allergic rhinitis	61.80%	78.30%	50.00%	0.049
Mild intermittent	43.60%	56.50%	34.40%	
Mild persistent	10.90%	13.00%	9.40%	
Moderate-severe Persistent	7.30%	8.70%	6.30%	
Rhinoconjunctivitis	20%	17.40%	21.90%	0.745
Mild intermittent	7.30%	8.70%	6.30%	
Mild persistent	3.60%	0.00%	6.30%	
Moderate severe Persistent	9.10%	8.70%	9.40%	
asthma	18.20%	17.40%	18.80%	1
Uncontrolled asthma	7.3%	4.3%	9.40%	
Controlled asthma	10.9%	13.00%	9.40%	
Urticaria	5.5%	8.70%	3.10%	0.565
Nonallergic comorbidity	7.3%	0.00%	12.50%	0.131
Treatment				
Topical corticosteroids	49.10%	21.70%	68.80%	<0.001
Emollients	67.30%	73.90%	62.50%	0.374
Calcineurin inhibitors (Tacrolimus)	9.10%	4.30%	12.50%	0.387
SCORAD	25.2(12-34)	13(2.2-25.1)	29(22.1-45.1)	<0.001
POEM	10.5 ± 7.1	4.8 ± 4.7	14.6 ± 5.7	<0.001

Fisher's exact test, χ^2, U Mann–Whitney, and student's *t*-test. Quantitative variables are reported as mean (standard deviation) and median (interquartile range).

inadequate control. Persistent mild rhinoconjunctivitis was more frequent in the inadequate control group (6.30%) compared to the adequate control group (0.00%). In the moderate to severe persistent category, 8.70% of patients with adequate control and 9.40% of those with inadequate control exhibited this condition.

Asthma occurred in 17.40% of patients with adequate control and in 18.80% of patients with inadequate control (*P* = 1.000). Uncontrolled asthma most frequently affected the inadequate control group (9.40%). Controlled asthma was more common in the adequate control group (13.00%). Of the patients with controlled asthma (10.9%), the majority also had AD with adequate control (13%). Urticaria occurred in 8.70% in the adequate control group and 3.10% in the inadequate control group (*p* = 0.565).

No nonallergic comorbidities were present in the adequate control group, while they were present in 12.50% in the inadequate control group (*p* = 0.131) (Table 2). Only four individuals suffered a nonallergic comorbidity, and all were in the inadequate control group (*p* = 0.131). Comorbidities were not more frequent in those with a high BMI and almost all underweight and obese patients had allergic rhinitis. In general, age was higher in those who suffered a comorbidity, except for those with allergic rhinitis.

Regarding treatment, the use of topical corticosteroids was significantly higher in the inadequate control group (68.80%) compared to the adequate control group (21.70%) (p < 0.001). Creams were more commonly used in patients with adequate control (73.90%) than inadequate control (62.50%). The use of calcineurin inhibitors was lower in patients with adequate control (4.30%) than inadequate control (12.50%).

The SCORAD score in the adequate control group was 13 (IQR = 2.2-25.1) and in those with inadequate control was 29 (IQR = 22.1-45.1) (P < 0.001). The mean POEM in the adequate control group was 4.8 (SD ± 4.7) and in the inadequate control group was 14.6 (± 5.7) (*p* < 0.001).

Those who attended a subsequent consultation at the Allergy and Immunology Department of the University Hospital had more favorable scores for ADCT, POEM, and SCORAD (Figure 1); even more so if they had >2 follow-up visits. Patients with good disease control had lower POEM and SCORAD scores (Table 2).

A Pearson correlation was performed between the ADCT and POEM scores to correlate the degree of control of patients with AD and the result of the POEM scale for disease severity. We found a high positive correlation (r = 0.861) with a *p* < 0.001 (Figure 2A). Similarly, a high positive correlation (r = 0.770 [P < 0.001]) was found between the SCORAD and the ADCT (Figure 2B). Likewise, the SCORAD and POEM showed a direct proportional relationship with an r = 0.791 and *p*-value < 0.001 (Figure 2C).

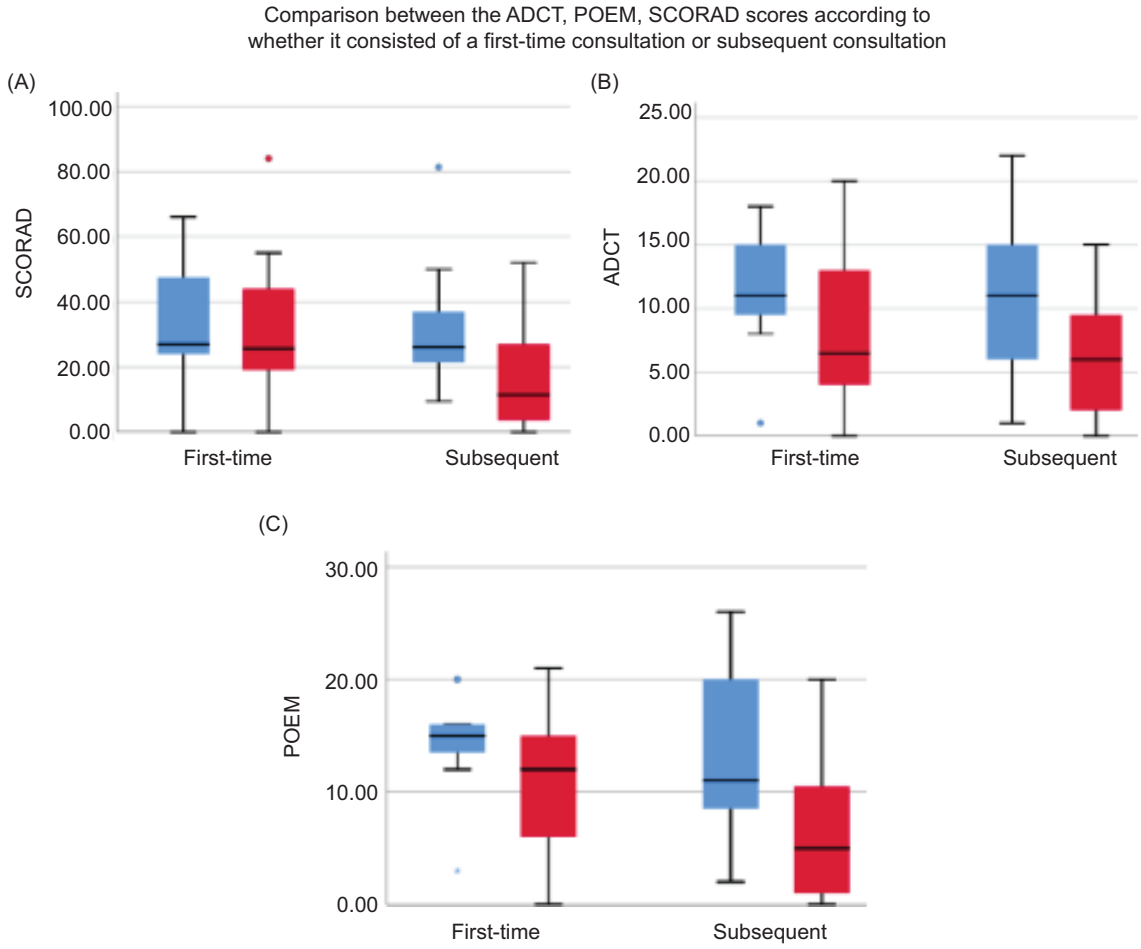

Figure 1 Box plots of SCORAD (A), ADCT (B), and POEM (C) scores (blue and red colors).

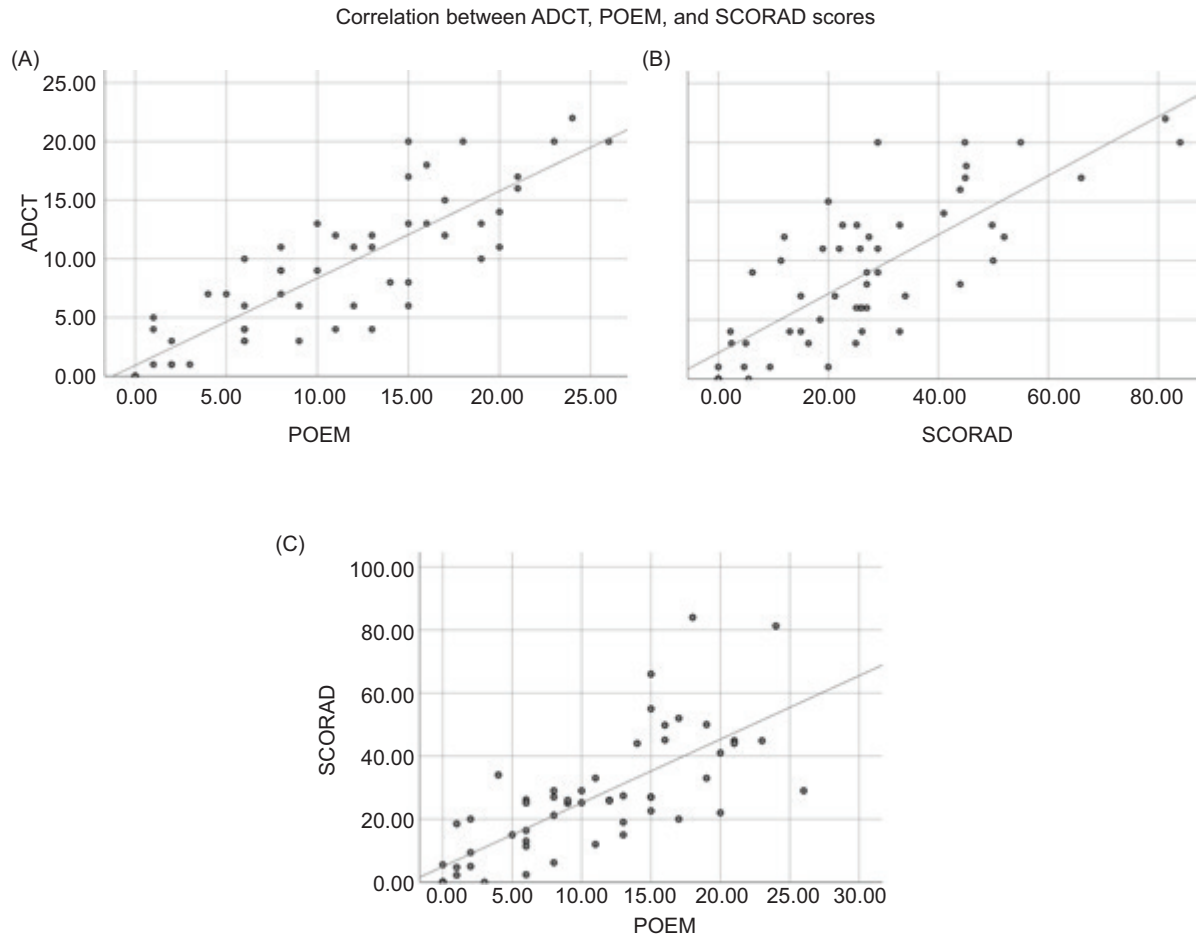

Figure 2 Scatter plots between the ADCT and POEM score (A), ADCT and SCORAD score (B), and POEM and SCORAD score (C).

The Spearman correlation coefficient between the variables age and ADCT (r = 0.099 [p = 0.473]), SCORAD (r = −0.027 [p = 0.846]), and POEM (r = 0.063 [p = 0.646]) did not show a statistically significant association). According to the rho values, the trend was toward a null correlation.

Discussion

The ADCT scale was used in AD patients in this study. Analysis revealed no association between sociodemographic characteristics and the control level assessed by this instrument. Even when correlating age with the ADCT, POEM, and SCORAD, a score of r < 0.1 was obtained for all three. This finding implies a null correlation. In addition, the p-value was greater than 0.05. A larger sample and group homogenization may be needed to further investigate any potential associations.

Various studies have been carried out to determine the most effective way to measure the degree of disease control in patients with AD, using tools such as the ADCT. One study evaluated seven instruments to recommend a measurement approach. They found the ADCT to be the most recommended, with only 10% disagreement among voters.[10] Two systematic reviews assessed the development, reliability, validity, and responsiveness of various tools, concluding that the ADCT was sufficiently developed and validated to be recommended as a patient-reported outcome instrument.[11,12]

Regarding allergic comorbidities, the most frequent was allergic rhinitis (61.8%) and, when comparing its prevalence between groups, a p = 0.049 was found, indicating an association with the degree of disease control. This coincides with other studies, such as that of Oosterhavena et al. where allergic rhinitis was the most prevalent comorbidity (55.8%).[13]

Regarding BMI, when correlated with the degree of control using Kendall's Tau-c, it resulted in a value of −0.001 (p = 0.993), suggesting that there is no correlation. It was also observed that most of the scores on the applied scales were favorable for those with normal weight and, even more so, in those who attended subsequent consultation; however, a statistically significant p-value was not found when comparing groups with the Kruskal- Wallis test and ANOVA (Figure 3). According to the BMI, the scores fluctuated more in those who did not have a subsequent consultation than in those who did. This finding may imply that, when monitoring clinical care, the BMI could be related to the scores on the severity scales and disease control.

Patients with normal weight had fewer prescriptions for corticosteroids and/or creams. Among those using calcineurin inhibitors (three patients on proactive therapy

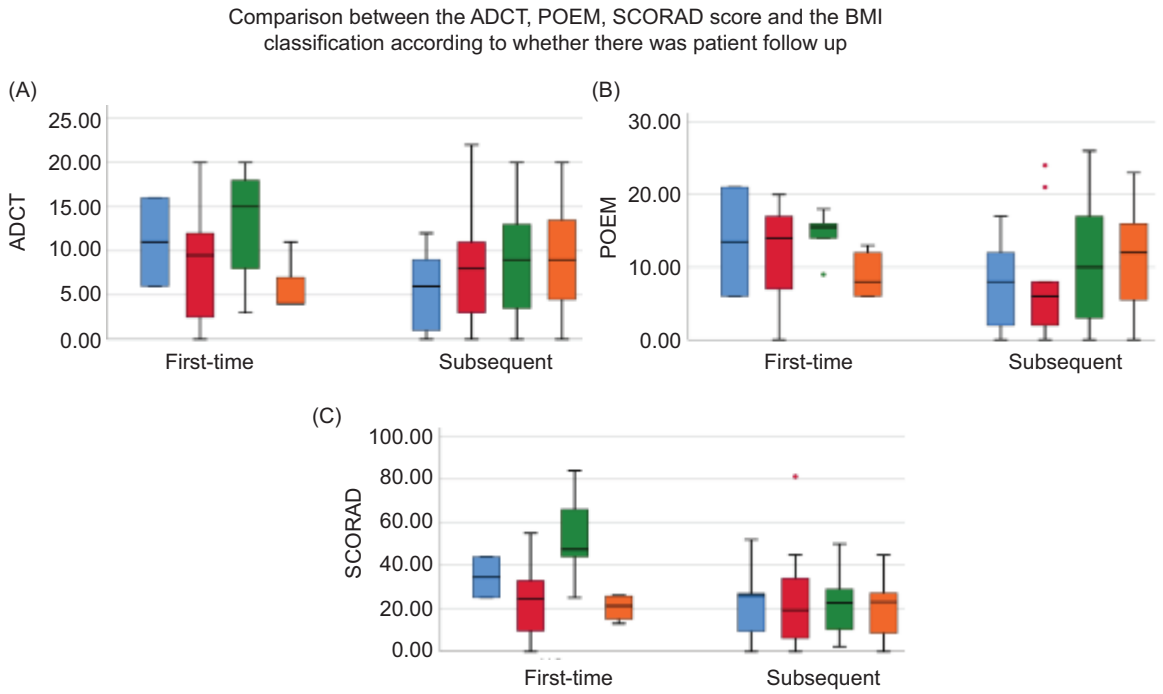

Figure 3 Box plot of ADCT (A), POEM (B) and SCORAD (C) scores and BMI.

and one on active therapy), no distinct distribution pattern was observed, except for notably older median ages (40 [12–57] and 23.5 [16.7–36]). The median age for patients using topical corticosteroids (24 [14–36]) was higher than for those without (22.5 [17.5–38]), with less dispersed quartile values. The same was observed in the prescription of creams with a median of 28 (15–37.5) and 21.5 (16–24.5).

The mean ADCT in this study was 8.7 ± 6.1, similar to what was reported in an investigation carried out in Mexico City (8.31 ± 4.92) in a population similar to that in this work. They even reported percentages of patients with adequate (42.9%) and inadequate (57.1%) control, very similar to those in this research (41.8% and 58.2%, respectively). Regarding the POEM (11.83 ± 7.34) and SCORAD (37.77 ± 17.32) scores, they were a little higher compared to those reported in this work, 10.5 and 25.2, respectively.[14]

Higher ADCT values are reported in other articles worldwide, such as the RELIEVE-AD study carried out in the United States by Kimball et al., who reported an average of 15.2. Their population had more comorbidities, was older, and used different treatments.[15] Another investigation carried out in France by the Lille University Hospital divided its population according to whether or not they had good AD control according to their ADCT values; 71.4% were in good control. In addition to their results, unlike those in this research, they found statistical significance when comparing characteristics such as age and type of treatment.[16]

A longitudinal study carried out by the University of Oregon to validate the ADCT compared the scores obtained by this tool with those obtained by others, contrasting it with the Dermatology Life Quality Index (DLQI) and the Patient Global Assessment of Disease (PGAD). They achieved a Spearman correlation index of 0.543 (p = <0.001) and 0.489 (p = <0.001), respectively, denoting a moderate positive correlation, similar to that found in this work when comparing with other scales.[17]

The results of the POEM and ADCT scales of this research exhibited a very strong positive correlation (r = 0.861), similar to that reported in research carried out by the University of Helsinki (r = 0.748). This finding was greater than that between ADCT and SCORAD (r = 0.770), possibly because they measure different disease aspects.[18] POEM and SCORAD showed a strong correlation (r = 0.791). These results align with those from a study conducted by the pharmaceutical company Pierre Fabre in France, which reported an r = 0.640,[19-21] as well as with another study from the George Washington School of Medicine, which reported an r = 0.560.[22-24]

Conclusion

The profile of the patient with controlled AD, based on the demographic data and findings of this study, was a median age of 24 years with female predominance (73.9%). Regarding clinical characteristics, when BMI was considered normal or obese, allergic rhinitis was prevalent, with mild intermittent allergic rhinitis being the most common. Regarding treatment, there was a less frequent use of corticosteroids and a greater use of creams, and less disease severity, according to the SCORAD and POEM scores.

Regarding the profile of the patient with uncontrolled disease, the age ranged from 16 to 39 years, with a median of 24 years. There was also a predominance of the female gender. Regarding clinical characteristics, the majority of the patients were overweight, and they suffered from rhinoconjunctivitis and asthma than from controlled AD, and the incidence of allergic rhinitis was less. They used more

topical corticosteroids and calcineurin inhibitors. The findings were also characterized by greater disease severity, with a higher SCORAD and POEM score compared to the adequate control group.

This research indicates that the ADCT correlates strongly with established tools for assessing AD, such as the Patient Oriented Eczema Measure and the Scoring Atopic Dermatitis.

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Author Contributions

All authors contributed equally to this article.

Conflict of interest

The authors declare no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

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