



Atopic Dermatitis in Children in the General Population: Baseline Characteristics, Medication Use, and Severity Measures in the Rotterdam Eczema Study

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Abstract: Background: Real-life data on severity and treatments in children with atopic dermatitis (AD) are needed to evaluate self-management.

Objectives: To determine severity and use of topical treatments in children with AD in the general population. Furthermore, we aim to determine agreement and correlation between objective and subjective AD severity measures.

Methods: Data were used from the Rotterdam Eczema Study, an observational prospective cohort study with an embedded pragmatic open-label randomized controlled trial. Descriptive statistics were used for baseline characteristics, medication use, and severity. Strength of agreement and correlation were determined using kappa analysis and Pearson correlation.

Results: In total, 367 children (mean age 5.7 years) were recruited. The mean eczema area and severity index (EASI) score was 2.1 (± 3.2) and mean patient-oriented eczema measure (POEM) score was 10.3 (± 6.1). The majority applied emollients on a daily basis (54.9%) and had not used topical corticosteroids (TCSs) over the past week (51%). Based on severity banding of POEM and EASI, 49.9% and 24.9% of the children were undertreated, respectively. No evidence was found for an agreement between EASI and POEM (kappa 0.028, $n=178$, $P=0.451$). A moderate correlation between POEM, EASI, infants' dermatitis quality of life index, and children's dermatology life quality index was found. POEM showed higher correlation with quality of life (QoL) than EASI.

Conclusion: Emollients were used sufficiently in the study population. Based on signs or symptoms, 24.9% and 49.9% of children are undertreated, respectively. POEM scores correlated better with QoL than with EASI scores. We argue that EASI underestimates severity of AD, and treatment based on EASI scores may lead to undertreatment of AD. Treating physicians should be aware of suboptimal use of TCSs.

Capsule Summary

- The majority of the study population applied emollients on a daily basis (63.7%) and had not used topical corticosteroids over the last week (51%).

- Based on signs or symptoms, 24.9% and 49.9% of children are undertreated respectively.
- There is no evidence for an agreement between EASI and POEM.

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INTRODUCTION

Atopic dermatitis (AD) is a common skin disease in the pediatric population.¹ According to guidelines, emollients and topical corticosteroids (TCSs) are the key elements for treatment of mild-to-moderate AD.^{2,3} Actual use of emollients and TCSs may differ from the recommended use and real-life data on emollients and TCS use of children with mild-to-moderate AD are lacking. Data on children dealing with AD in a “real-life” situation are, therefore, of interest to evaluate self-management.

AD is a condition that cannot be cured; treatment aims to reduce symptoms and to improve quality of life (QoL). Different guidelines

advise using emollients generously even when symptoms are not present.^{2–5} However, emollients were underprescribed in Scotland despite children being prescribed a TCS.⁶ Other literature showed that 44% of children with AD in primary care did not use emollients.⁷ Guidelines differ regarding the strength of TCSs recommended during AD flare-ups. They advise using the lowest potency possible,² a short burst with high potency,⁵ or both strategies.³ These different recommendations are often based on the severity of AD.

Severity can be captured by assessing skin symptoms. The impact of AD on daily life can also be measured by determining QoL. The correlation between signs (eczema area and severity index, EASI) and symptoms (patient-oriented eczema measure, POEM) was previously studied in adults with severe AD.⁸ One study by Ridd et al found weak correlations between sign (EASI) and symptom (POEM) measures ($r=0.20$, 95% CI=0.09–0.30, $P<0.001$) in children.⁹ Correlations between QoL and EASI or POEM have not been studied before and are of interest to determine in children with AD in the general population.

The aim of this study was to determine severity of AD in children in the general population by comparing skin signs and QoL, and comparing this with the actual use of topical treatments with emollients and TCSs. Furthermore, the correlation and the agreement of subjective and objective measures in children with AD in the general population will be examined.

METHODS

Study Design

The data were collected in the Rotterdam Eczema Study, an observational prospective cohort study with an embedded pragmatic open-label randomized controlled trial. A detailed description of the study design for the Rotterdam Eczema Study has already been given.¹⁰ The study protocol was approved by the medical ethics committee (MEC) of the Erasmus Medical Centre Rotterdam, the Netherlands (MEC-2017-328). The objective of the Rotterdam Eczema Study trial part was to determine whether initial treatment with a potent TCS is more effective than a mild TCS in the treatment of primary care children with moderate AD flare-ups in the short-term and long-term control of the disease.

In the observational cohort, the aim was to determine the frequency and determinants of AD flare-ups. Inclusion took place from January 2018 until September 2020 through 53 general practices in the Netherlands. Eligible children were recruited using 2 strategies. In the “general practitioner (GP) strategy,” children were eligible for inclusion if they were aged between 3 months and 18 years, had AD diagnosed by a GP, and had received an AD-related consultation or prescription within the previous 12 months. Follow-up of the cohort was 12 months, during which patients received weekly questionnaires. Patients were also visited at baseline, 6, and 12 months follow-up.

In addition, an “open recruitment strategy” was used in January 2020 through social media and regional newspaper. Here, the

same inclusion criteria were applied as in the “GP strategy.” However, children treated by a specialist at the moment of inclusion (ie, dermatologist, pediatrician, or allergist) were also included. Children recruited through open recruitment received the same weekly questionnaires and were only visited at baseline, 6, and 12 months follow-up if they lived near Rotterdam.

Outcome Measures

Baseline data included age, gender, disease severity, QoL, treating physician, and medication use. Severity was captured using sign and symptom measures. We used the EASI and POEM, as advised as outcome measures for clinician-reported signs and patient-reported symptoms on disease severity for both clinical and trial settings by the Harmonizing Outcome Measures for Eczema (HOME) initiative.¹¹ The EASI (range 0–72) is a snapshot measure of visually observed inflammation of the skin, based on the affected area of the body and the intensity of redness, thickness/swelling, scratching, and lichenification.

The POEM (range 0–28) is a measure of the nuisance experienced (disturbed sleep and itching) and skin symptoms due to eczema (bleeding, weeping/oozing clear fluid, or skin that is cracked, flaking off, or feeling dry/rough) in the affected child over the previous week. Depending on the child’s age, QoL was measured with the infants’ dermatitis quality of life Index (IDQOL) (range 0–30) or the children’s dermatology life quality index (CDLQI) (range 0–30). IDQOL and CDLQI are recommended by the HOME initiative to register QoL in trials.¹² See Table 2 for the scales of the measures used.

The EASI was filled in by the physician assistant of the child’s GP or a research assistant from the study team. Afterward, the participants were able to fill out the POEM and additional questions (ie, medication use and QoL) online. The physician and research assistants were trained in using EASI through an online training module based on the HOME training material.

For medication use, patients registered the frequency of emollient used, the type and frequency of TCSs used, and additional medication used in the previous week. For TCS classification, the Dutch classification of TCSs was used as stated in *Farmacotherapeutisch Kompas*, the Dutch compendium for medication.¹³ The classification ranges from mild (class I) to very potent (class IV); see Appendix Table A1 for product names and classification. Undefined TCSs consisted of types of TCSs we could not allocate to 1 of the 4 strengths: for instance, if hydrocortisone was mentioned and we were unable to find out whether acetate or butyrate was meant.

Disease severity, based on POEM or EASI, was compared with the patient-reported actual use of TCSs. Undertreatment was defined as not using a TCS at all, or using a lower strength than recommended, for example, a mild TCSs for treating mild AD, moderate TCSs for treating moderate AD, or a potent TCS for treating severe or very severe AD as outlined in the Dutch GP guideline and the clinical National Institute for Health and Care Excellence guideline for AD in children under 12 years of age.^{2,3}

Statistical Analysis

Data were analyzed using SPSS statistics, version 28. Descriptive statistics were used to describe patient characteristics and outcome measures. Numerical data are presented as a mean with standard deviation (SD) or median with interquartile range (IQR). For categorical data, the number of cases and percentages are presented. Potential significant differences between the 2 treating physician groups were analyzed using the unpaired sample *t*-test, if the assumption of normality was met. The assumption of normality was checked using visualization of the data. Pearson's chi-Squared test was used to compare proportions.

If >20% of cells had an expected count <5, Fisher's exact test was used. Kappa analysis was used to examine the agreement between EASI and POEM severity levels. The Pearson correlation was used to determine the correlation between POEM and EASI, POEM and QoL, and EASI and QoL.

RESULTS

Number of Patients and General Patient Characteristics

In the GP recruitment strategy, ~2300 eligible patients received a letter of invitation (Fig. 1 and Table 1). In total 433 patients/parents replied and accepted the invitation. In the open recruitment strategy, 228 patients reported to be interested in participating. Together, this gave a total of 661 positive replies. Before the study started, approximately one-third decided not to participate after all for unknown reasons (*n*=209). Additional

reasons for dropout were inclusion or exclusion criteria not being met (*n*=20), patients finding the study too stressful (*n*=29), or other reasons (*n*=9).

Finally, a total of 209 patients recruited through the GP strategy and 158 patients recruited through the open recruitment were enrolled for the Rotterdam Eczema Study (*n*=367). In total, 300 children were being treated by their GP and 67 children by a specialist. Of the various specialists, treatment by a dermatologist was reported most frequently (70.1%).

Table 1 provides an overview of the patients' baseline characteristics. The mean age of the population was 5.7 years (SD 5.0). Approximately a quarter of the participants were 0–2 years old (24.8%) or 6–12 years old (24.5%). The GP-treated group contained more teenagers than the specialist-treated group (18.3% vs 6.0%), but there was no significant difference in other age classes. Slightly more than half of the participants were female (54.5%).

Nine percent of the participants had no active lesions at baseline. The GP was the treating physician in 81.7% of all patients.

Severity of AD

The mean EASI score (*n*=192) was 2.1 (SD 3.2), which corresponds with mild AD (Table 2). Based on EASI, 50.5% of patients were categorized as “almost clear” and 44.4% as “mild.” The mean POEM score (*n*=336) in the population was 10.3 ($\pm$ 6.1), which corresponds with moderate severity of AD. Comparing the distribution of severity proportions between the 2 outcome measures, EASI scores were predominantly almost clear and mild (94.9%), whereas POEM scores were predominantly mild, moderate, and severe (88.8%).

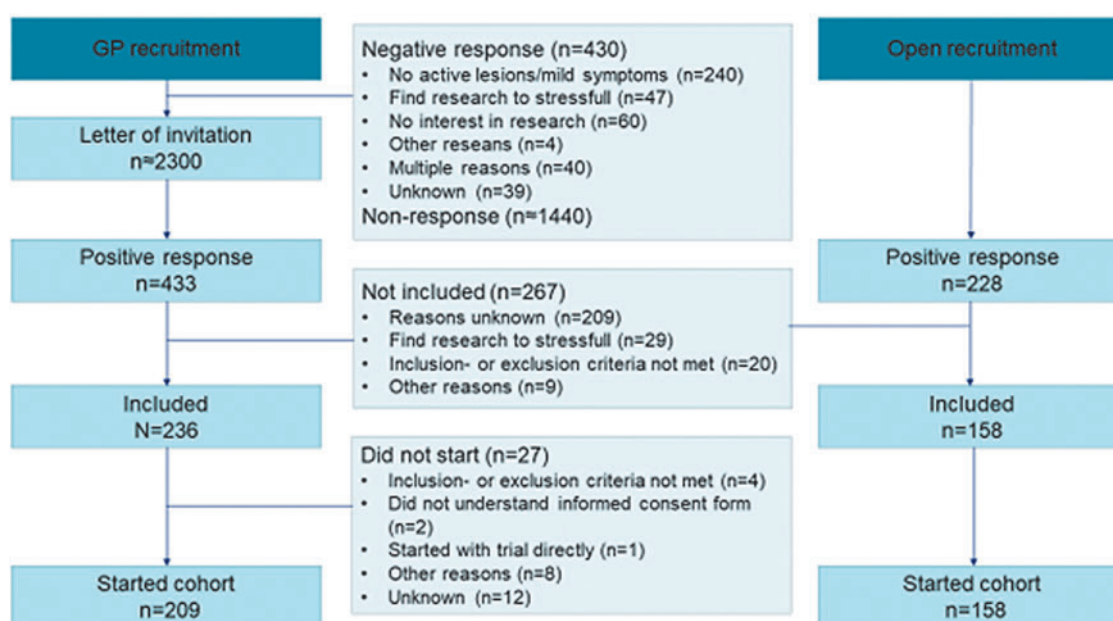


Figure 1. Flow chart showing the recruitment of patients.

TABLE 1. Baseline Characteristics

	Total n = 367 (100%)	General Practitioner n = 300(81.7%)	Specialist n = 67 (18.3%)	P
Age, years				
Mean (SD)	5.7 (5.0)	6.1 (5.1)	4.0 (4.1)	
Median (IQR)	4.0 (2.0–9.0)	4.5 (8)	3.0 (5)	
Developmental phase				
Baby (0–2 years)	91 (24.8%)	69 (23.0%)	22 (32.8%)	0.092
Toddler (2–4 years)	79 (21.5%)	62 (20.7%)	17 (25.4%)	0.397
Preschool (4–6 years)	48 (13.1%)	37 (12.3%)	11 (16.4%)	0.370
School aged (6–12 years)	90 (24.5%)	77 (25.7%)	13 (19.4%)	0.281
Teen (12–18 years)	59 (16.1%)	55 (18.3%)	4 (6.0%)	0.013*
Gender, female	200 (54.5%)	167 (55.7%)	33 (49.3%)	0.341
Localization of atopic dermatitis	(n = 356)	(n = 289)	(n = 67)	
Head and neck	153 (43.0%)	108 (37.4%)	45 (67.2%)	<0.001 [†]
Trunk	127 (35.7%)	87 (30.1%)	40 (59.7%)	<0.001 [†]
Upper extremities	263 (73.9%)	207 (53.3%)	56 (83.4%)	0.045*
Lower extremities	200 (56.2%)	154 (53.3%)	46 (68.7%)	0.022*
No active lesion	32 (9.0%)	31 (10.7%)	1 (1.5%)	0.017*
Treating physician	(n = 367)			
General practitioner	300 (81.7%)	300 (100%)	—	
Dermatologist	47 (12.8%)	—	47 (70.1%)	
Pediatrician	16 (4.4%)	—	16 (23.9%)	
Allergist	4 (1.1%)	—	4 (6.0%)	

Presented as number of cases (percentage) unless stated otherwise. P-values are presented for 2-sided independent samples t-test or Pearson's chi-squared test.

*2-sided significance test $P < 0.05$.

[†]2-sided significance test $P < 0.01$.

IQR, interquartile range; SD, standard deviation.

The mean EASI score for specialist-treated patients ($n = 67$) was twice as high as the score for GP-treated patients ($n = 191$) (4.6 vs 2.0, $P = 0.048$). The mean POEM score in the specialist-treated group was significantly higher than the score for the GP-treated patients (13.2 vs 9.5, $P < 0.001$). Both mean scores correspond to a moderate severity of AD, and this severity was also the most frequent in the overall population (45.5%). The severity band of “almost clear” was significantly more frequent in GP-treated patients than in specialist-treated patients (13.4 vs 1.5%, $P = 0.001$), whereas severe symptoms were less frequent in GP-treated patients (12.6% vs 32.8%, $P < 0.001$).

Topical Treatment of Emollients and TCSs

Questions about the use of topical treatment only concerned the week of inclusion (Table 3). Overall, 86.3% of the children used emollients. 54.9% applied them on a daily basis, which was observed significantly more in specialist-treated patients (82.1% vs 48.1%, $P < 0.001$). Regarding TCSs, 49% of all children used them. Among children using TCSs, the majority used moderate TCSs (43.9%) and the next in line was potent TCSs (25.0%). Six patients used a combination of different strengths of TCSs.

Potent TCS was used more often in the specialist-treated group (34.7% vs 20.9%, $P < 0.001$). Regarding additional medication, use of systemic antihistamines was most frequent (6.6%). Other

medication was used by 12.8% of the children (eg, acetaminophen, laxatives, and methylphenidate) and only 4 (1.2%) used a topical calcineurin inhibitor.

Undertreatment Based on POEM and EASI Scores

Tables 4 and 5 present the severity banding of the POEM and EASI scores plotted against TCS use.

Undertreatment was defined as not using a TCS at all, or using a lower strength than recommended, for example, a mild TCS for treating mild AD, moderate TCS for treating moderate AD, or a potent TCS for treating severe or very severe AD. The undertreatment rates for the POEM are approximately evenly divided throughout the severity categories of mild (61%), moderate (54.6%), and severe (67.9%). There is a difference between the severity categories of mild (50%), moderate (33%), and severe (100%) in the case of the EASI score. In total, 49.9% of the children were undertreated based on POEM and 24.9% of the children based on EASI.

Agreement Between Objective and Subjective Outcome Measures

Table 6 gives the relationship between EASI and POEM. Overall, there was agreement in 46 of the 156 children (29.5%). POEM was usually higher (more severe) than EASI. Almost two-thirds of the

TABLE 2. Severity and Quality of Life Measures

	Total n = 367 (100%)	General Practitioner n = 300 (81.7%)	Specialist n = 67 (18.3%)	P
Patient-oriented eczema measure (0–28)				
Mean (SD)	10.3 (6.1)	9.5 (5.9)	13.2 (5.7)	<0.001 [†]
Median (IQR)	10.0 (5.3–15.0)	9.0 (5.0–14.0)	13.0 (8.0–18.0)	
Severity banding (n = 336)		(n = 269)	(n = 67)	
Almost clear (0–2)	37 (11.0%)	36 (13.4%)	1 (1.5%)	0.010*
Mild (3–7)	88 (26.2%)	77 (28.6%)	11 (16.4%)	0.109
Moderate (8–16)	153 (45.5%)	121 (45.0%)	32 (47.8%)	0.265
Severe (17–24)	56 (16.7%)	34 (12.6%)	22 (32.8%)	<0.001 [†]
Very severe (25–28)	2 (0.6%)	1 (0.4%)	1 (1.5%)	0.244 [‡]
Eczema area and severity index (0–72)				
Mean (SD)	2.1 (3.2)	2.0 (3.2)	4.6 (3.2)	0.048*
Median (IQR)	1.0 (0.4–2.6)	1.0 (0.4–2.4)	4.0 (1.5–5.4)	
Severity banding (n = 198)		(n = 191)	(n = 7)	
Almost clear (0–1)	100 (50.5%)	99 (51.8%)	1 (14.3%)	<0.001 [†]
Mild (1.1–7)	88 (44.4%)	83 (43.5%)	5 (71.4%)	<0.001 [†]
Moderate (7.1–21)	9 (4.5%)	8 (4.2%)	1 (14.3%)	1.000 [‡]
Severe (21.1–50)	1 (0.5%)	1 (0.5%)	0 (0.0%)	1.000 [‡]
Very severe (50.1–72)	0 (0.0%)	—	—	—
Infants' dermatitis quality of life index (0–30)				
Mean (SD)	4.8 (3.7)	4.0 (3.2)	7.4 (3.8)	<0.001 [†]
Median (IQR)	4.0 (2.0–7.0)	3.0 (2.0–5.0)	7.0 (4.0–9.0)	
Severity banding (n = 158)		(n = 120)	(n = 38)	
No effect (0–1)	28 (17.7%)	27 (22.5%)	1 (2.6%)	0.036*
Small effect (2–5)	76 (48.1%)	64 (53.3%)	12 (31.6%)	0.532
Moderate effect (6–10)	41 (25.9%)	23 (19.2%)	18 (47.4%)	<0.003 [†]
Very large effect (11–20)	13 (8.2%)	6 (5.0%)	7 (18.4%)	0.003 ^{†,‡}
Extremely large effect (21–30)	0 (0.0%)	—	—	—
Children's dermatology life quality index				
Mean (SD)	5.6 (4.8)	5.1 (4.6)	8.3 (5.3)	0.001 [†]
Median (IQR)	4.0 (2.0–7.0)	4.0 (2.0–7.0)	6.5 (4.0–12.75)	
Severity banding (n = 174)		(n = 146)	(n = 28)	
No effect (0–1)	31 (17.8%)	30 (20.5%)	1 (3.6%)	0.024*
Small effect (2–6)	87 (50.0%)	74 (50.7%)	13 (46.6%)	0.360
Moderate effect (7–12)	41 (23.6%)	34 (23.3%)	7 (25.0%)	0.835
Very large effect (13–18)	10 (5.7%)	4 (2.7%)	6 (21.4%)	0.003 ^{†,‡}
Extremely large effect (19–30)	5 (2.9%)	4 (2.7%)	1 (3.6%)	1.000 [‡]

Presented as number of cases (percentage) unless stated otherwise. P-values are presented for 2-sided independent samples t-test or Pearson's chi-squared test.

*2-sided significance test $P < 0.05$.

[†]2-sided significance test $P < 0.01$.

[‡]>20% of cells with an expected count <5.

IQR, interquartile range; SD, standard deviation.

67 children who scored “mild” on the EASI scale scored “moderate” (n = 46) or “severe” (n = 3) on the POEM scale. Thus, most children were either underclassified by EASI or overclassified by POEM. The kappa's coefficient for EASI and POEM was 0.028, n = 178, $P = 0.451$, indicating almost no agreement.

Correlation Between Eczema Severity Measures and QoL

The correlations between EASI, POEM, IDQOL, and CDLQI were all moderate and statistically significant (Table 7). The POEM score had a higher correlation with QoL than the EASI score.

DISCUSSION

Summary

In the Rotterdam Eczema Study, we studied the severity and treatment of AD in children in the general population. In our study, the vast majority were treated by a GP and most children had a moderate disease severity based on the subjective POEM score. The objective EASI score showed lower scores overall than the POEM. In patients using emollients, the majority applied emollients on a daily basis. Almost half of all patients reported using TCSs over the last week. If TCS was used, moderate TCS was used most often, followed by potent TCSs.

TABLE 3. Medication Use

	Total n = 367 (100%)	General Practitioner n = 300 (81.7%)	Specialist n = 67 (18.3%)	P
Emollient use in past week	(n = 355)	(n = 268)	(n = 67)	
Did not use	46 (13.7%)	42 (15.7%)	4 (6.0%)	0.073
1–2 days/week	39 (11.6%)	37 (13.8%)	2 (3.0%)	0.025*
3–4 days/week	43 (12.8%)	40 (14.9%)	3 (4.5%)	0.042*
5–6 days/week	23 (6.9%)	20 (7.5%)	3 (4.5%)	0.780*
Daily	184 (54.9%)	129 (48.1%)	55 (82.1%)	<0.001 [†]
Topical corticosteroids use in past week	(n = 355)	(n = 268)	(n = 67)	
Did not use	171 (51.0%)	154 (57.5%)	17 (25.4%)	<0.001 [†]
1–2 days/week	58 (17.3%)	43 (16.0%)	15 (22.4%)	0.102
3–4 days/week	51 (15.2%)	35 (13.1%)	16 (23.9%)	0.009 [†]
5–6 days/week	23 (6.9%)	16 (6.0%)	7 (10.4%)	0.158*
Daily	32 (9.6%)	20 (7.5%)	12 (17.9%)	0.003 [†]
Potency	(n = 164)	(n = 115)	(n = 49)	
Mild	33 (20.1%)	29 (25.2%)	4 (8.2%)	0.339
Moderate	72 (43.9%)	53 (46.1%)	19 (38.8%)	0.046*
Potent	41 (25.0%)	24 (20.9%)	17 (34.7%)	<0.001 [†]
Very potent	3 (1.8%)	1 (0.9%)	2 (4.1%)	0.087*
Combination	6 (3.7%)	3 (2.6%)	3 (6.1%)	0.077*
Undefined	9 (5.5%)	5 (4.3%)	4 (8.2%)	0.062*
Other medication	(n = 355)	(n = 268)	(n = 67)	
Topical calcineurin inhibitor	4 (1.2%)	3 (1.1%)	1 (1.5%)	1.000*
Systemic antihistamine	22 (6.6%)	10 (3.7%)	12 (17.9%)	<0.001 ^{†,‡}
Asthma medication	13 (3.9%)	8 (3.0%)	5 (7.5%)	0.147*
Other medication	43 (12.8%)	34 (12.7%)	9 (13.4%)	0.870

Presented as number of cases (percentage) unless stated otherwise. P-values using 2-sided Pearson's chi-squared test.

*2-sided significance test $P < 0.05$.

[†]2-sided significance test, $P < 0.01$.

[‡]> 20% of cells with an expected count <5.

IQR, interquartile range; SD, standard deviation.

When considering AD severity banding, half of the children were undertreated based on POEM and a quarter based on EASI by not using the corresponding strength of TCSs. The undertreatment rates for the POEM were approximately evenly divided throughout the severity categories but there was a discrepancy between the severity categories of the EASI score. Children's subjective measurement of AD severity was usually higher (more severe) than the objective severity. Correlations

between POEM, EASI, IDQOL, and CDLQI were all moderate. There was no agreement (kappa 0.028, $P = 0.451$) between EASI and POEM.

Strengths and Limitations

The study's strength is that both the EASI score and the type of TCSs used provide information about the severity of the AD in

TABLE 4. Patient-Oriented Eczema Measure 5-Point Scale and Topical Corticosteroids Use Cross-Tabulation

TCS Use	POEM 5-Point Scale					Total
	Clear or Almost Clear	Mild	Moderate	Severe	Very Severe	
No TCS used	33	54	65	19	0	171
Mild, class I	1	7	18	7	0	33
Moderate, class II	3	16	42	11	0	72
Combination, classes I–II	0	1	3	1	1	6
Potent, class III	0	7	20	13	1	41
Very potent, class IV	0	1	0	2	0	3
Other/undefined TCSs	0	2	4	3	0	9
Total	37	88	152	56	2	355
% Undertreatment	0	61.4	54.6	67.9	50	49.9

Orange = undertreatment based on POEM scale.

POEM, patient-oriented eczema measurement; TCSs, topical corticosteroids.

TABLE 5. Eczema Area and Severity Index 5-Point Scale and Topical Corticosteroids Use Cross-Tabulation

TCS use	EASI 5-Point Scale				
	Clear or Almost Clear	Mild	Moderate	Severe	Total
> TCS used	69	40	2	0	111
Mild, class I	3	10	1	1	15
Moderate, class II	10	22	1	0	33
Combination, classes I–II	2	0	0	0	2
Potent, class III	3	6	2	0	11
Combination, classes III–IV	0	0	1	0	1
Other/undefined TCSs	0	2	2	0	4
Total	87	80	9	1	177
% Undertreatment	0	50.0	33.3	100	24.9

Orange = undertreatment based on EASI scale.

EASI, eczema area and severity index; TCSs, topical corticosteroids.

children in the general population. Also, the patient-reported use of emollients and TCSs gives insight into the self-management of children with AD.

A limitation of the study is that only 10% (n=367) of the children who received an invitation from their GP were included in the study. This may have led to selection bias. Possibly, mostly children with relatively severe AD were included and perhaps the real-life burden of disease in general practice is milder than was seen in this cohort. Furthermore, it is possible that mostly children with relatively high treatment adherence were included and

TABLE 6. Cross-Tabulation of Eczema Area and Severity Index and Patient-Oriented Eczema Measure 5-Point Scales

	POEM 5-Point Scale					
EASI 5-Point Scale	Clear or Almost Clear	Mild	Moderate	Severe	Very Severe	Total
Clear or almost clear	28	35	18	1	0	82
Mild	3	15	46	3	0	67
Moderate	0	0	2	3	1	6
Severe	0	0	0	1	0	1
Very severe	0	0	0	0	0	0
Total	31	50	66	8	1	156

Orange = underclassification based on EASI scale, green = agreement between EASI and POEM.

EASI, eczema area and severity index; POEM, patient-oriented eczema measurement.

TABLE 7. Correlation Matrix for Subjective and Objective Eczema Measures at Baseline, Using Spearman's Coefficient with P-Value for 2-Sided Test

	EASI	POEM	IDQOL
EASI	1		
POEM	0.583, <0.001*	1	
IDQOL	0.405, <0.001*	0.583, <0.001*	1
CDLQI	0.446, <0.001*	0.598, <0.001*	—

*Significance level <0.01.

CDLQI, children's dermatology quality of life index; EASI, eczema area and severity index; IDQOL, infants' dermatitis quality of life index; POEM, patient-oriented eczema measurement.

emollients were actually used less in daily practice. Also, the relatively small population has led to relatively small severity groups in the EASI score and the calculated undertreatment percentages are, therefore, difficult to assess.

Patients recruited through general practice were excluded if their treating physician was a hospital-based specialist. This may have led to selection bias by including only children treated by a GP, whereas in contrast 67 of the 209 patients recruited through open recruitment were treated by a specialist. In the end, patients included in our cohort are representative of children with AD who are treated in daily practice.^{2,14}

The weekly questionnaire was filled out by the parents, the children themselves, or together. Questionnaires filled out by parents alone could have led to overestimation or underestimation of the scores, but is inherent to research with children of this age.

Finally, the COVID-19 pandemic formed a severe limitation to the current study. Attendance for the baseline visit was severely reduced because a majority of baseline visits coincided with the first COVID-19 lockdown, being the key reason for the 46% missing values for the EASI scores. These missing values were not imputed because of its extent and could have reduced the statistical power of the agreement and various correlation tests.

Comparison With Existing Literature

In total 13.7% of patients did not use an emollient in the last week.⁵ This was less than the 44% found by Jacquet et al, despite the same mean POEM scores [10.3 (6.1) vs 10.3 (5.8)]. TCS use was more in concordance in comparison with Jacquet: 49% versus 46% used 1 or more TCSs.⁷ We can conclude that children in our study used emollients more often. This can be caused by selection bias, due to recruitment of a group of children with relatively severe AD and/or high treatment adherence.

More than half of the patients (51%) had not used TCSs in the last week, whereas overall disease severity was moderate according to the POEM score. Half of the children were not using the appropriate strength of TCSs based on the POEM score. This raises the question whether these children were underusing TCSs

because of suboptimal self-management, because they underestimated their AD severity, or because the POEM score overestimated the AD severity. A systematic review on qualitative research exploring views and experiences of people with AD and parents/caregivers of children with AD showed that AD can be difficult to manage due to treatment hesitancy and burden and misperceptions about the long-term character of AD.¹⁵

This could also be applicable to our participants and their parents. Another explanation could be that patients/parents may not be receiving comprehensive education on applying TCSs. Previous qualitative research has shown that GPs provide limited advice on the use of TCSs.¹⁶ Possibly, a combination of underestimating AD and undereducation of patients/carers contributes to these numbers of undertreatment.

The Dutch GP guideline of AD advocates a mild TCS for treating mild-to-moderate AD.² However, our data showed that most children with mild AD according to POEM or EASI did not use a TCS. Maybe children and parents were unaware of the true severity of the AD or refrained from using TCSs. Various studies show that parents are worried about side effects of TCSs, which leads to nonadherence.^{17,18}

The correlation between EASI and POEM was examined in a study by Ridd et al, which found a Spearman's correlation coefficient of 0.20. Children for this study were also recruited through general practice and the mean disease severity using POEM was 8.8 (5.9).⁹ In our study, the correlation found was 0.583. These results differ from the results of Ridd et al even though the disease severity is similar. This could be explained by the fact that in our study, the EASI measure was scored by a physician assistant of the GP or a research assistant.

Although receiving online training, them being less experienced could have influenced these scores. In the study of Ridd et al, a researcher undertook the objective assessments. The moderate correlation between EASI and POEM could be partially explained by the hypothesis that pruritus may be due to hyperinnervation of the epidermis and is, therefore, not always correlated with "objective" signs.¹⁹

A study by Patel et al examined adults with AD in a dermatology practice. QoL correlated strongly with POEM and moderately with EASI.²⁰ This is in line with our results, although the study population was different and EASI was scored by a dermatologist.

CONCLUSIONS

Although both emollients and TCSs seem to be used optimally, suboptimal treatment, especially in children with moderate AD according to POEM, should be considered present in individual cases. This underuse of the proper TCS strength may partially be explained by underestimation of the severity of AD, by only considering objective signs instead of determining AD severity on patient-reported symptoms. Another explanation could be that parents or GPs are unable to properly assess symptoms and objective signs.

Physicians should know that when treating a patient with AD, symptoms can be more important than signs, especially in a chronic disease and in a real-life context. Fear of using TCSs and limited advice on the use of TCSs by GPs may play an additional role. Treating physicians should be aware of underusing the proper strength of TCSs.

The observed differences between POEM and EASI and the observed differences in implied undertreatment based on POEM and EASI raise the question whether POEM scores overestimate or EASI scores underestimate the AD severity. Considering face validity, the EASI score based on a single moment in time and only based on visual appearance of the skin is likely to produce an underestimate compared with the POEM score based on a period of a week and including the experienced symptoms and nuisance. Since in our study POEM scores correlated better with QoL than with EASI scores, we argue that EASI underestimates the severity of AD and treatment based on EASI scores may lead to undertreatment of AD in children from the general population.

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Appendix

APPENDIX TABLE A1. Topical Corticosteroids, Grouped by Potency	
Mild	Hydrocortisone acetate
Moderate	Triamcinolone acetonide
	Hydrocortisone butyrate
	Clobetasone butyrate
Potent	Betamethasone valerate
	Mometasone furoate
	Fluticasone propionate
Very potent	Clobetasol propionate