Severity scoring of atopic dermatitis: a comparison of two scoring systems

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ABSTRACT

Background: Atopic dermatitis (AD) is a chronic inflammatory pruritic skin heterogeneous disease, which does not have an objective tool able to permit comparison between patients and to monitor changes due to a specific treatment. Several assessment methods have been developed to evaluate the AD.

Objectives: The aim of this study was to investigate the agreement between two observers in the assessment of the severity of AD applying SCORAD index and EASI in infants and young children with AD. The variations of parameters that compose each score, as well as the inter-observer variation for both scores, were also studied.

Methods: We evaluated 42 infants and young children admitted and followed in a paediatric allergy centre (UNIFESP-EPM). All children met the diagnostic criteria for clinical AD established by Hanifin and Rajka. Two investigators graded the severity of AD, applying the SCORAD index and EASI. The two scoring systems assessed the variation between baseline evaluation and one month after treatment.

Results: Significant correlations were observed comparing both scores for each physician and each evaluation. There were no differences between the mean SCORAD and EASI scores for each physician, in the two evaluations. There was a significant decrease in the mean total SCORAD and EASI score and its components, except for the item Upper Extremities EASI

Conclusion: Both scoring systems for AD are valid, reproducible and responsive in monitoring AD patients. Further studies will be necessary to investigate the development of AD and the best evaluation. SCORAD showed itself to be an excellent score to detect the development of AD, whereas the EASI are suitable to follow up in drug-effect studies of AD for research purposes.

Key words: Atopic dermatitis. Score. Severity. Scoring system.

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INTRODUCTION

Atopic dermatitis (AD) is a chronic inflammatory pruritic skin disease that affects a large number of children and adults in industrialised countries. The onset of AD generally occurs before the first 6 months of life in 45 % of affected children, during the first year of life in 60 %, and before the age of 5 years in at least 85 %. The degree of severity may suggest adequate therapeutic options, and may represent a risk factor for developing aeroallergen sensitisation and asthma[1].

Overall 60 % of patients with severe AD, may develop asthma later in childhood[2],[3]. Children with atopic eczema and with a similar pattern of sensitisation to that of wheezing children (ie, showing any of the less prevalent sensitisation types of wheat, cat, mite, soy, or birch sensitisation) were at increased risk of subsequent asthma[2].

Especially when severe, AD can be extremely disabling, causing major psychological problems, and, in the case of a young child, be overwhelming for the entire family. Children with AD often have behavioural problems such as increased dependency, fearfulness and sleep difficulties[4].

AD is a heterogeneous disease which does not have an objective tool able to permit comparison between patients and to monitor changes due to a specific treatment. Because of this, numerous scoring systems have been described to allow the study of AD and to evaluate its implication on quality of life. Several assessment methods have been developed to evaluate the severity of AD[5-9].

Schmitt et al[10] sought to assess the validity, reliability, sensitivity to change, and ease of use of outcome measurements for atopic eczema. They concluded that only SCORAD, EASI, and POEM perform adequately, therefore these scales should be used in clinical research and for clinical monitoring in future studies.

The European Task Force on AD has developed a composite severity index based on a broad consensus by dermatologists. The resulting SCORAD (Scoring Atopic Dermatitis) index combines objective symptoms (extent and intensity) and subjective criteria (daytime pruritus and sleep loss). It has been extensively tested in trials and validity, reliability, sensitivity, and acceptability testing of this scoring system has been widely published[5].

The Eczema Area and Severity Index (EASI) is another composite index including an assessment of disease extent and percent of body surface area involved, converted to a proportional factor, in four body regions (head and neck, lower limbs, upper limbs and trunk)[11]. EASI was developed to be effective in assessing patients with mild to severe AD, both paediatric and adult therapeutic. This instrument was designed by modifying the general scheme used in the psoriasis area and severity index (PASI) as suggested by Haniffin et al[11].

The current AD scoring system permits defining in numerical terms (objectively) the severity of the disease in a single patient in a more scientific way, and allows detecting changes due to treatment or disease worsening. It is not clear how to choose a certain scoring system for AD and up to now there has been no consensus on this subject, mainly in the scoring system for children.

The purpose of this study is to investigate the agreement between two observers in the assessment of the severity of AD applying the SCORAD index and the EASI in infants and young children with AD. The variations of parameters that compose each score, as well as the inter-observer variation for both scores, were also studied.

PATIENTS AND METHODS

The information needed to calculate the scores was easily obtainable by a clinician. We evaluated 42 infants and young children admitted and followed in a paediatric allergy centre (UNIFESP-EPM) in São Paulo, Brazil. All children met the diagnostic criteria for clinical AD established by Hanifin and Rajka[11].

Two investigators graded the severity of AD, applying the SCORAD index[5] and EASI[11]. The SCORAD index includes the assessment, by a physician, of objective signs (extent and intensity) and of subjective symptoms (pruritus and sleep disturbance) compiled on an analogue scale by the parents. Extent was calculated using the "rule of nine" and expressed the skin surface area involved. Items that were evaluated in the intensity criteria were erythema, oedema/papulation, oozing/crusts, excoriations, lichenification, and dryness of involved skin (from 0 to 3 points for each item). The final score was then calculated using the following equation: A/5 + 7B/2 + C (A = extent; B = intensity; C = subjective symptoms). The SCORAD index range lies between 0 and 103. Based on the SCORAD index results, AD has been classified, as reported, into mild (< 25), moderate (25-50) and severe (> 50) forms[12].

The EASI is also a composite index, including the assessment of disease extent and percent of involved body surface area, converted to a proportional factor (scale from 0 to 6, in four body regions (head and neck, lower limbs, upper limbs, and trunk). The proportion allocated to each body region depends on the patient's age. In patients older than 8 years, proportions are 10 % for head and neck, 20 % for upper extremities, 30 % for trunk and 40 % for lower extremities; in patients aged less than 7 years, proportions are 20 % for head and neck, 20 % for upper extremities, 30 % for trunk and 30 % for lower extremities. The EASI also includes an assessment of erythema (E), infiltration and_or papulation (I), excoriation (Ex) and lichenification (L), each on a scale from 0 to 3. The EASI's minimum score is 0 and the maximum is 72. The algorithm for calculating the EASI uses, for each body region, the sum of the clinical sign scores (E + I + Ex + L) multiplied by the body surface area, multiplied by the proportional factor.

The total EASI score is the sum of the four body-region scores[13].

The two scoring systems assessed the variation between baseline evaluation and 1 month after treatment. All AD children were given topical steroids: medium-dose momethasone or fluticasone twice daily. The topic steroids were applied on average 10 % of total body surface area in patients. Antihistamines (cetrizine or hydroxyzine) were used for relief of symptoms when needed. None of these children received systemic steroids during the study.

All parents and/or guardians have signed the informed consent. This study was approved by the Ethical Committee of Federal University of São Paulo-Escola Paulista de Medicina.

RESULTS

The mean EASI scores (total and components; range) given by physicians A and B, obtained in the two evaluations 4 weeks apart are presented in Table I and IV. There were no differences between the mean scores for each physician, in the two evaluations considering total EASI and its components separately (Table I). However, when the comparison was made between both evaluations for each physician, there was a significant decrease on the mean total EASI score and its components, except for the item Upper Extremities (Table I). Evidence for adequate internal consistency were found for the EASI (Crombach's Alpha 0.944).

Table II shows data referring to the mean SCORAD index (total and components; range) given by the two physicians in two different evaluations. There were no significant differences between physicians comparing each evaluation, except for Intensity item and Total SCORAD. Similar results were observed comparing the mean scores obtained in the two evaluations for each physician (Table II). Evidence for adequate internal consistency were found for the SCORAD (Crombach's Alpha 0.974).

Significant correlations were observed comparing both scores for each physician and each evaluation

Table I

Comparison between mean Eczema Area and Severity Index (EASI) scores (total and segments; range) obtained in two evaluations 4 weeks apart by two physicians (A and B)

	Physician A	Physician B	Wilcoxon (z)	*p*
Head & Neck			**A × B**	
1st evaluation	0.65 (0-14.4)	0.65 (0-13.2)	−0,244	0.807
2nd evaluation	0.10 (0-14.4)	0.20 (0-14.4)	−0,661	0.509
Wilcoxon: 1st × 2nd (z)	−3.972	−2.750		
P	0.000*	0.006*		
Trunk				
1st evaluation	1.65(0-18)	1.05 (0-21,6)	−0.617	0.537
2nd evaluation	0 (0-18)	0 (0-18)	−1.566	0.117
Wilcoxon: 1st × 2nd (z)	−2.194	−1.344		
P	0.028*	0.179		
Upper extremities				
1st evaluation	1.2 (0-12)	1.2 (0-14.4)	−1.416	0.157
2nd evaluation	0.9 (0-7.2)	0.8 (0-7.2)	−0.760	0.939
Wilcoxon: 1st × 2nd (z)	−1.722	−0,853		
P	0.085	0.394		
Lower extremities				
1st evaluation	2.9 (0-24)	2.8 (0-21.6)	−0.950	0.342
2nd evaluation	2.4 (0-20)	1.7 (0-16)	−1.737	0.082
Wilcoxon: 1st × 2nd (z)	−2.039	−2.236		
P	0.041*	0.025*		
Total EASI				
1st evaluation	6.0 (0.3-60)	6.0 (0.3-64.8)	−1.580	0.114
2nd evaluation	4.1 (0-45.6)	3.6 (0-45.9)	−0.410	0.967
Wilcoxon: 1st × 2nd (z)	−3.495	−2.408		
P	0.000*	0.016*		

Table II

**Comparison between mean Scoring Atopic Dermatitis (SCORAD) scores (criteria and total; range)
obtained by two physicians (A e B) in two evaluations 4 weeks apart**

	Physician A	Physician B	Wilcoxon (z)	*p*
Extension			**A × B**	
1st evaluation	12.0 (0-100)	11.0 (0-100)	−1.000	0.317
2nd evaluation	11.0 (0-100)	10,5 (0-100)	−1.000	0.317
Wilcoxon: 1st × 2nd (z)	−1.846	−1.660		
P	0.06	0.09		
Intensity				
1st evaluation	8.5 (0-18)	8.0 (0-18)	−3.251	0.001*
2nd evaluation	7.0 (0-18)	5.0 (0-18)	−2.735	0.006*
Wilcoxon: 1st × 2nd (z)	−4.152	−3.410		
P	0.000*	0.001*		
Subjective Symptoms				
1st evaluation	13.5 (0-25)	13.5 (0-25)	−1.000	0.317
2nd evaluation	13.0 (0-23)	13.0 (0-23)	−1.000	0.317
Wilcoxon: 1st × 2nd (z)	−1.813	−1.623		
P	0.070	0.105		
Total SCORAD				
1st evaluation	46.9 (8.8-95.9)	44.3 (2.2-81)	−3.342	0.001*
2nd evaluation	38.4 (0-88.9)	34.3 (0-90.5)	−2.756	0.006*
Wilcoxon: 1st × 2nd (z)	−4.164	−3.343		
P	0.000*	0.001*		

Table III

**Correlation between Scoring Atopic Dermatitis
(SCORAD) and Eczema Area and Severity Index (EASI)
scores obtained by two physicians in two evaluations
4 week apart**

	Spearman (r)	*p*
Physician A		
1st evaluation	0.881	*< 0.0001*
2nd evaluation	0.930	*< 0.0001*
Physician B		
1st evaluation	0.883	*< 0.0001*
2nd evaluation	0.930	*< 0.0001*

(Table III). Analysis comparing body surface area (BSA) measurements in the two scoring systems showed significant correlation (data not shown).

Statistical analysis

Significant differences of variables compared between two different evaluations for each physician were assessed by Wilcoxon test.

Correlations between SCORAD and EASI scores obtained by two physicians in two different evaluations were assessed by Spearman correlation test. Significant differences of BSA measurements compared between two scoring systems were assessed by Pearson correlation test. Internal consistence for EASI and SCORAD were assessed by Crombach's alpha. Statistical analysis was performed using a software program (SPSS for Windows version 12.0; SPSS Inc). Values of p < 0.05 were considered as significant.

DISCUSSION

Up to now, a clinical evaluation of AD using two scoring systems in a selected population of young children and adolescents in Brazil has not been reported. Since the review by Schmitt et al in 2007, the SCORAD and EASI from 20 different outcome measurements have been adequately validated.

This study shows excellent agreement between observers in the assessment of the overall AD severity using the EASI score. However, more variation between observers in assessing the severity of AD was observed in the SCORAD. Similar results were observed previously by Spriekkelman et al[14].

Table IV

Features of children included in this study

Patient #	Gender	Age (years)	Age of Onset (months)	SCORAD				EASI			
				1st evaluation		2nd evaluation		1st evaluation		2nd evaluation	
				1st Observer	2nd Observer	1st Observer	2nd Observer	1st Observer	2nd Observer	1st Observer	2nd Observer
1	male	6	12	34.2	41.2	21.2	17.7	4.4	6.0	4.8	2.4
2	female	2	9	36.4	43.4	21.7	21.7	0.8	2.4	0.4	0.0
3	female	11	18	69.2	58.7	61.7	58.2	29.7	20.8	12.8	16.1
4	male	2	12	55.7	55.7	70.0	66.5	9.0	9.0	12.0	15.6
5	male	10	34	59.3	59.3	55.7	62.7	7.0	7.2	9.6	9.6
6	male	5	15	36.8	33.3	49.3	42.3	2.0	2.1	4.0	3.0
7	female	6	13	28.3	24.8	24.5	21.0	0.9	0.6	3.5	2.6
8	male	7	21	23.9	23.9	7.0	7.0	0.6	0.6	0.0	0.0
9	female	8	13	44.1	33.6	35.1	24.6	4.9	5.7	1.6	5.8
10	male	6	8	38.0	34.5	24.8	21.3	2.6	2.6	1.5	1.0
11	male	1	6	39.0	35.5	20.6	24.1	6.0	4.8	0.6	1.8
12	male	13	16	53.6	57.1	66.8	63.3	11.9	16.1	11.2	11.2
13	male	8	24	61.3	54.3	60.2	53.2	8.8	6.6	7.7	6.6
14	male	4	22	105.0	98.0	104.0	104.0	48.0	44.0	45.6	44.4
15	male	10	12	56.0	52.5	58.6	58.6	18.0	15.2	17.5	19.6
16	male	10	30	52.0	55.5	30.5	30.5	10.4	17.1	2.4	3.6
17	female	3	8	23.2	23.2	21.8	21.8	0.3	0.3	0.3	0.3
18	female	10	14	50.8	43.8	41.9	31.4	3.0	2.4	2.4	1.2
19	female	12	9	36.9	36.9	33.4	33.4	6.0	6.0	6.0	4.0
20	female	11	16	28.6	25.1	25.1	28.6	2.4	1.8	0.8	2.0
21	male	5	13	87.8	87.8	65.5	69.0	60.0	64.8	13.8	16.1
22	male	4	7	46.8	46.8	38.7	35.2	7.2	9.6	4.0	4.5
23	female	1	8	43.7	47.2	37.5	34.0	7.0	3.1	1.7	1.7
24	male	5	6	94.5	91.0	69.5	59.0	48.0	40.0	15.3	10.8
25	male	4	11	27.9	24.4	12.7	12.7	1.2	1.2	0.2	0.2
26	female	11	10	95.9	88.9	76.6	69.6	39.6	29.7	20.9	18.9
27	female	9	6	44.7	44.7	53.3	53.3	6.0	6.0	12.0	13.6
28	male	9	13	55.5	55.5	50.5	40.0	11.9	11.9	11.2	8.0
29	male	15	11	46.9	32.9	41.9	34.9	4.9	2.8	4.2	2.8
30	male	4	18	8.8	0.0	2.2	0.0	5.4	4.5	1.4	1.4
31	male	10	18	72.5	69.0	61.0	61.0	19.8	12.0	14.4	14.4
32	male	3	6	64.3	57.3	18.8	18.8	4.2	6.3	0.6	0.6
33	male	11	9	34.7	31.2	12.0	12.0	0.8	0.8	0.0	0.0
34	male	12	11	23.3	26.8	11.0	11.0	1.4	2.1	0.0	0.0
35	female	4	6	39.4	42.9	17.0	17.0	0.6	0.9	0.0	0.0
36	female	14	9	64.1	57.1	61.2	68.2	14.4	17.5	12.0	17.1
37	male	12	10	87.5	80.5	87.0	90.5	35.0	33.3	34.0	33.0
38	female	11	16	27.9	24.4	29.6	22.6	1.2	0.8	2.4	1.8
39	male	8	18	51.7	37.7	38.0	34.5	9.0	4.8	5.0	3.6
40	female	9	9	66.4	59.4	61.9	54.9	20.7	16.8	19.8	9.6
41	female	11	12	40.9	40.9	31.9	31.9	3.6	3.6	2.4	2.7
42	male	7	12	82.0	78.5	81.0	81.0	41.4	29.6	40.5	45.9

In our study, two investigators have been chosen for scoring AD to evaluate inter-observer variation reports for extent and intensity items. Each one of the two main items of the SCORAD index (extent and subjective symptoms) was positively correlated to each other in our patients. There was not a positive correlation to each other for Intensity. However, significant variation between baseline evaluation and last evaluation was found in most severity assessment items for the SCORAD, except for Erythema.

However, significant variation between both evaluations was found in most severity assessment items for the EASI. There was no significant variation when we analysed Isolated Extent (upper limbs) (disease extent and percent of body surface area involved) for the EASI. This suggests that these scoring systems are not suitable for follow-up of the Isolated Extent item (upper limbs).

The utility of EASI in detecting changes in disease severity over the course of treatment, and its potential effectiveness in differentiating between treatment potencies has now been assessed in several clinical trial settings[15-19].

Another conclusion from our data is that there was a good agreement between the two scoring systems in the assessment of the overall severity of AD. It is possible to compare results of studies on the overall severity or follow-up data of AD when these different scoring systems have been used.

Previously, it has been shown that measurements of body surface area (BSA) involvement in atopic eczema do not correlate well, representing very poor inter-observer agreement[20]. In contrast, we have observed a significant positive correlation between BSA assessment of SCORAD and EASI.

The EASI score is more elaborate than the SCORAD. In the former scoring system, the intensity is analysed for each body region and depends on the patient's age. On the other hand, the SCORAD index takes into account the extent of AD lesions, the lesions' intensity, and subjective symptoms, pruritus, and sleep disturbance. In the SCORAD each item is evaluated at its average intensity. Subjective symptoms represent 20 % of total SCORAD and are extremely variable (submitted to several situations, environmental exposure).

It appears that each scoring system has its own application in clinical practice and research. When a rough estimate of the severity of AD is needed to evaluate the development of allergic symptoms, a simple and rapid scoring system such as the SCORAD, assessed by a single observer, may be sufficient for this purpose. However, for detection of subtle modifications in the severity of AD, as in drug-effect studies, or for follow-up of the progression of AD for research purposes, a more elaborate scoring system, such as the EASI would be more appropriate to use.

In conclusion, both scoring systems for AD are valid, reproducible and responsive in monitoring Brazilian AD patients. The SCORAD index showed itself to be an excellent score to detect the development of AD, whereas the EASI is suitable to follow up in drug-effect studies of AD for research purposes.

REFERENCES

1. Gustafsson D, Sjoberg O, Foucard T. Development of allergies and asthma in infants and young children with atopic dermatitis – a prospective follow-up to 7 years of age. Allergy. 2000;55:240-245.

2. Illi S, von Mutius E, Lau S, Nickel R, Grüber C MD, Niggemann B et al. The natural course of atopic dermatitis from birth to age 7 years and the association with asthma J Allergy Clin Immunol 2004;113:925-931.

3. Pucci N, Lombardi E, Novembre E, Farina S, Bernardini R, Rossi ME et al. Urinary eosinophil protein X and serum eosinophil cationic protein in infants and young children with atopic dermatitis: correlation with disease activity. J Allergy Clin Immunol. 2000;105:353-7.

4. Ricci G, Bendandi B, Bellini F, Patrizi A, Masi M. Atopic dermatitis: quality of life of young Italian children and their families and correlation with severity score. Pediatr Allergy Immunol. 2007;18:245-50.

5. European Task Force on Atopic Dermatitis. Severity scoring of atopic dermatitis: the SCORAD index. Dermatology 1993;186: 23-31.

6. Berth-Jones J. Six Area, Six Sign Atopic Dermatitis (SASSAD), Severity Score; a simple system for monitoring disease activity in atopic dermatitis. Br J Dermatol. 1996;135 Suppl. 48: 25-30.

7. Costa C, Rilliet A, Nicolet M, Saurat JH. Scoring atopic dermatitis: the simpler the better? Acta Derm Venereol (Stockh) 1989;69:41-5.

8. Bahmer FA, Schaefer J, Schubert HJ. Quantification of the extent and the severity of atopic dermatitis; the ADASI score. (Letter.) Arch Dermatol 1991;127:1239-40.

9. Jochen Schmitt J, Langan S, Williams HC. What are the best outcome measurements for atopic eczema? A systematic review. J Allergy Clin Immunol. 2007;120:1389-98.

10. Schmitt J, Langan S, Williams HC. What are the best outcome measurements for atopic eczema? A systematic review. J Allergy Clin Immunol. 2007;120:1389-98.

11. Hanifin JM, Thurston M, Omoto M, Cherill R, Tofte SJ, Graeber M, the EASI Evaluator Group. The eczema area and severity index (EASI): assessment of reliability in atopic dermatitis. Exp Dermatol. 2001;10:11-18.

12. Pucci N, Lombardi E, Novembre E, Farina S, Bernardini R, Rossi ME et al. Urinary eosinophil protein X and serum eosinophil cationic protein in infants and young children with atopic dermatitis: correlation with disease activity. J Allergy Clin Immunol. 2000;105:353-7.

13. Hanifin JM, Thurston M, Omoto M, Cherill R, Tofte SJ, Graeber M. The eczema area and severity index (EASI): assessment of reliability in atopic dermatitis. EASI Evaluator Group. Exp Dermatol. 2001; 10:11-8.

14. Sprikkelman AB, Tupker RA, Burgerhof H, Schouten JP, Brand PLP, Heymans HAS et al. Severity scoring of atopic dermatitis: a comparison of three scoring systems. Allergy 1997;52: 944-49.

15. Hanifin JM, Ling MR, Langley R, Breneman D, Rafal E. Tacrolimus ointment for the treatment of atopic dermatitis in adult patients: Part I, Efficacy. J Am Acad Dermatol. 2001; 44:S28-S38.

16. Kang S, Lucky A, Pariser D, Lawrence I, Hanifin J, and the Tacrolimus Ointment Study Group. A long-term, noncomparative trial to evaluate the safety of topically applied tacrolimus as treatment of atopic dermatitis in pediatric patients. J Am Acad Dermatol. 2001;44:S58-S64.

17. Paller A, Eichenfield L F, Leung D, Stewart D, Appell M. Topically applied tacrolimus ointment vs. vehicle ointment in pediatric patients with atopic dermatitis. J Am Acad Dermatol. 2001;44:S47-S57.

18. Bieber T, Vick K, Folster-Holst R, Belloni-Fortina A, Stodtler G, Worm M et al. Efficacy and safety of methylprednisolone aceponate ointment 0.1 % compared to tacrolimus 0.03 % in children and adolescents with an acute flare of severe atopic dermatitis. Allergy. 2007;62:184-9.

19. Gong JQ, Lin L, Lin T, Hao F, Zeng FQ, Bi ZG et al. Skin colonization by Staphylococcus aureus in patients with eczema and atopic dermatitis and relevant combined topical therapy: a double-blind multicentre randomized controlled trial. Br J Dermatology. 2006;155:680-7.

20. Charman CR, Venn AJ, Williams HC. Measurement of body surface area involvement in atopic eczema: an impossible task? Br J Dermatology. 1999;140:109-11.