

Short communication

Scoring atopic dermatitis in infants and young children: distinctive features of the SCORAD index

Background: Atopic dermatitis (AD) affects infants, children, and adults with a wide degree of severity; several scoring systems have been used in trials and clinical practice. Infants and young children have a typical distribution of the lesions, but a correlation among skin surface involvement, intensity and subjective symptoms has not been reported in age groups.

Aims of the study: To evaluate the clinical features of AD in infants and young children, by using the SCORAD index. A simplified scoring method for clinical practice is also discussed.

Methods: The SCORAD index was assessed in 63 infants and young children with AD [mean age ($\pm$ SD) 17.5 $\pm$ 11.15 months]; the single parameters of the index were evaluated, and compared with each other. Serum eosinophil cationic protein (s-ECP) and urinary eosinophil protein X (u-EPX) levels were determined and correlated with the SCORAD index.

Results: The presence of erythema, edema/papulation, and oozing/crust was significantly high in these patients. A strong positive correlation resulted among the three SCORAD index parameters (extent-intensity: $P < 0.001$; extent-subjective symptoms: $P < 0.001$; intensity-subjective symptoms: $P < 0.001$).

S-ECP and u-EPX levels positively correlated to almost every single parameter of the SCORAD index as well as to its total.

Conclusions: Distinctive intensity items were found in infants and young children with AD. A strong correlation resulted among the extent, intensity, and subjective symptoms; each of the three parameters was positively correlated with the total SCORAD. Immunologic parameters positively correlated to each of the SCORAD index items, which remains the gold standard for assessing disease severity in clinical trials.

**N. Pucci¹, E. Novembre¹,
M. G. Cammarata², R. Bernardini¹,
M. G. Monaco¹, C. Calogero¹,
A. Vierucci¹**

¹Allergy and Clinical Immunology Unit, Department of Paediatrics, Anna Meyer Children's Hospital, University of Florence, Florence, Italy; ²Department of Pediatrics, S. Anna Hospital, Ferrara, Italy

Neri Pucci, MD
Allergy and Clinical Immunology Unit,
Department of Paediatrics
Anna Meyer Children's Hospital
Via Luca Giordano 13
50132 Florence
Italy

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Atopic dermatitis (AD) is a chronic inflammatory disease affecting 8.9–20.4% of those born after 1970 (1); the prevalence of AD has increased since World War II and it now affects 10–15% of children at some point during their childhood (1).

The degree of severity may suggest adequate therapeutic options, and may represent a risk factor for developing aeroallergen sensitization and asthma (2). Overall 80% of patients with AD, may develop allergic rhinitis or asthma later in childhood (1).

Numerous scoring systems have been described in literature. The European Task Force on Atopic Dermatitis has developed a composite severity index based on a broad consensus by dermatologists. The resulting SCORAD index (scoring of AD) (3) combines objective symptoms (extent, intensity) and subjective criteria (day-time pruritus and sleep loss). It has been extensively tested in trials, although it seems complicated for a routine clinical setting. Poor agreement has been found between

the SCORAD and other scoring systems in assessing the severity of AD (4). However validity, reliability, sensitivity, and acceptability testing of this scoring system have been widely published (5, 6).

Infants and young children often present a typical distribution of the lesions as well as prevalent signs of the acute phase of inflammation (erythema, edema, oozing), that may correspond to a distinctive immunologic background (1). However, data related to the intensity, extent and subjective symptoms of AD in groups of infants and young children have not been reported.

The purpose of this study is to evaluate the clinical features of AD in infants and young children by using the SCORAD index, and compare the single items with each others and with immunologic parameters. As grading severity of AD is not only useful for researchers but also in everyday clinical practice, a possible simplified scoring method is also evaluated.

Methods

Subjects

We evaluated 63 consecutive infants and young children admitted to a pediatric allergy centre. All children met the diagnostic criteria for AD, as defined by Hanifin and Rajka (7). None of them had other atopic conditions (asthma, rhinitis, conjunctivitis), nor did they receive antihistamines or systemic or topical corticosteroids during the 3 weeks before clinical evaluation.

Clinical scoring system

A single investigator graded the severity of AD, using the SCORAD index (3). This includes the assessment of objective signs (extent and intensity) and subjective symptoms (pruritus, sleep loss), the last value compiled on an analogue scale by the parents. Extent is calculated using the 'rule of nine' and expresses the skin surface area involved. Intensity items are erythema, edema/papulation, oozing/crusts, excoriations, lichenification, and dryness of uninvolved skin (0 to 3 points for each item). The final score is then calculated by using the following equation: $A/5 + 7B/2 + C$ (A = extent; B = intensity; C = subjective symptoms). An objective SCORAD index range lies between 0 and 83. Based on the SCORAD index results, AD has been classified, as reported (8), into mild (<25), moderate (25–50) and severe (≥ 50) forms.

Immunologic parameters

Blood samples were taken upon admission for determination of serum eosinophil cationic protein (s-ECP). (UniCAP ECP, Pharmacia, Uppsala, Sweden). Urinary excretion of eosinophil protein X (EPX) was also measured at the time of clinical evaluation [EPX RIA; Pharmacia, Uppsala, Sweden (9)]; urine was collected with a pediatric urine collector for most children under 2 years, or during micturition. The complete method is described elsewhere (8).

Statistical analysis

All data were elaborated by using a commercially available statistical software package (SPSS, Chicago, IL, USA). Student's *t*-tests for independent samples were used for the comparison of mean values. To assess the linear correlation between variables, the Pearson's correlation coefficient was calculated. Probability values of <0.5 were considered statistically significant.

Results

The age of the 63 children evaluated (37 males and 26 females) was 2–48 months [mean age ($\pm$ SD) 17.5 ± 11.15 months]. The SCORAD index mean ($\pm$ SD) was 37.0 ± 14.16 (range 7–68): 12 (19%) patients

had index values below 25 (mild form); 39 (62%) patients had moderate AD (SCORAD index 25–50); and 12 (19%) patients had severe AD (SCORAD index >50). When a statistical method was used (mild AD: first quintile of the study group; severe AD: fifth quintile of the study group), we obtained SCORAD index cut-off points that were very similar to those established by clinical criteria.

The mean ($\pm$ SD) of skin surface area involvement was 33.0 ± 19.0 (range 1–82); 7.1 ± 2.63 for intensity (range 2–13), and 5.3 ± 3.71 for subjective symptoms (range 0–16). Each intensity and subjective symptom value is reported in Table 1.

A positive correlation resulted between the three parameters of the SCORAD index (Fig. 1), and the total score (SCORAD) was strongly correlated with each item: extent ($P < 0.0001$, $r = 0.79$), intensity ($P < 0.0001$, $r = 0.91$), and subjective symptoms ($P = 0.0001$, $r = 0.71$).

The mean s-ECP value ($\pm$ SD) was 24.6 ± 21.7 μ g/dl; the mean value of u-EPX ($\pm$ SD) was 57.7 ± 51.15 μ g/mmol creatinine. Correlation between the parameters of s-ECP and u-EPX of SCORAD index are reported in Table 2. s-ECP and u-EPX levels were significantly correlated ($P = 0.01$).

Discussion

Atopic dermatitis is a chronic inflammatory relapsing skin disorder. In approximately 50% of patients, this illness develops within the first year of life, and in 30%, between the ages of 1 and 5 years, with increasing case persistence after puberty (10–12). The onset of AD before 4 months of age has been considered a risk factor for sensitization to airborne allergens, and the severity of eczema has been positively associated with the risk of developing asthma (2). Therefore, the assessment of AD severity is crucial not only for research purposes, but also in clinical practice.

In a recent work, 13 AD severity methods were evaluated (6): the SCORAD index was the most extensively tested and evaluated for quality criteria.

The distribution of AD is largely age dependent. In the first 2 years of life (infantile phase), the primary clinical lesions of AD are mainly erythema, edema, oozing and crusting; the areas affected are the head (cheeks and chin are particularly involved), the scalp and extensor areas of the limbs. In the childhood phase (from 2 years to

Table 1. SCORAD index: values of the intensity items and subjective symptom items

	Erythema	Edema/papulation	Oozing/crust	Excoriation	Lichenification	Dryness	Pruritus	Sleep loss
Mean	1.8	1.5	1.5	1.4	0.20	0.56	3.1	2.2
SD	0.77	0.75	0.75	0.83	0.41	0.57	1.87	2.02
Range	0–3	0–3	0–3	0–3	0–1	0–2	0–8	0–8
Positive patients (%)	60/63 (96)	59/63 (94)	57/63 (90)	52/63 (83)	13/63 (20)	30/63 (48)	57/63 (90)	50/63 (70)

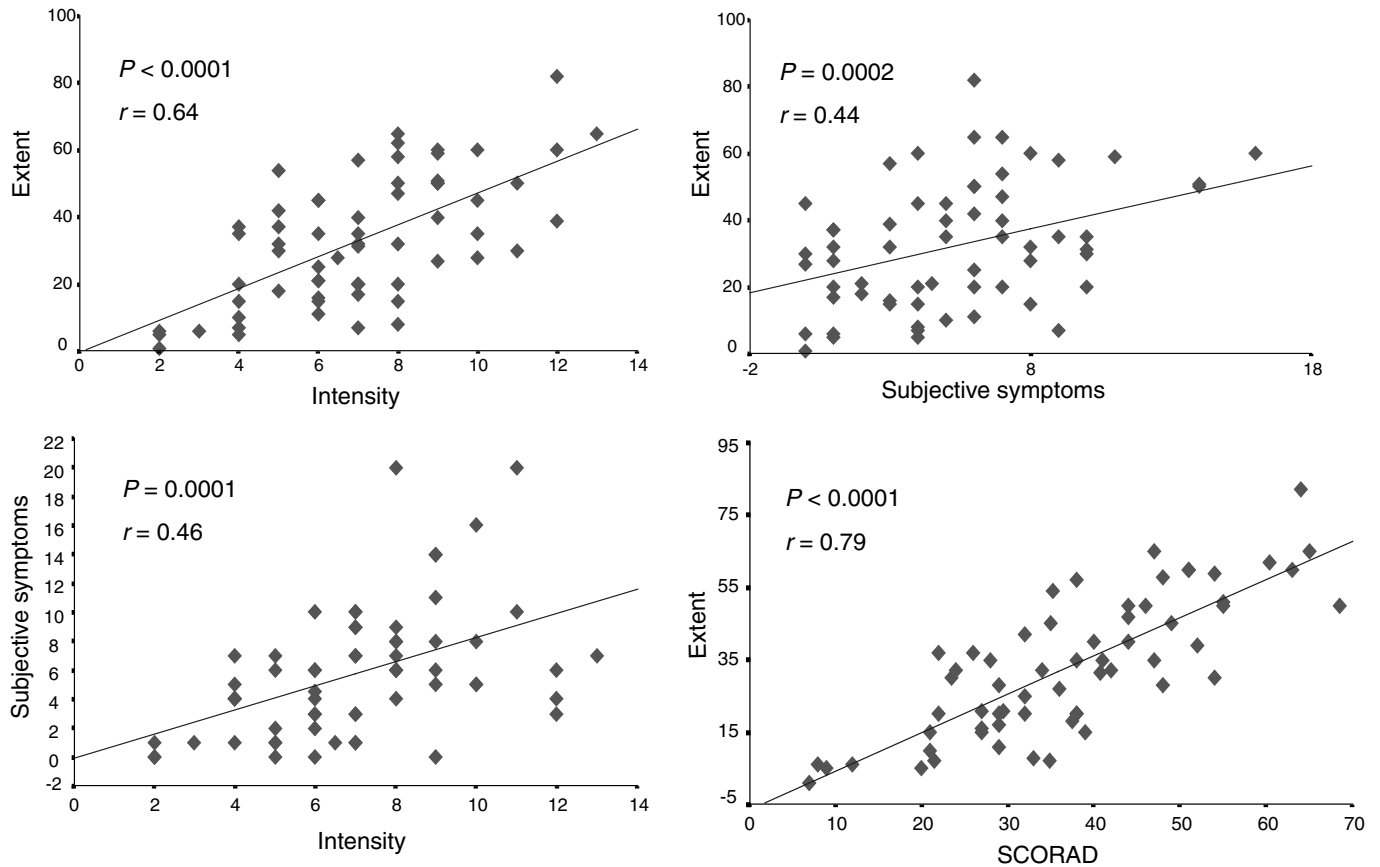


Figure 1. Correlation among each parameter of the SCORAD index, and between skin surface area and total SCORAD index value.

Table 2. Correlation between each parameter of the SCORAD Index and Serum ECP, respectively urinary-EPX levels

S-ECP	P = 0.001 — SCORAD — P = 0.007	
	P = 0.002 — extent — P = 0.004	
	P = 0.003 — intensity — P = 0.08	
	P = 0.007 — sub.sympt. — P = 0.001	u-EPX

puberty), lichenification and dryness are prevalent, primarily affecting hands, feet, and flexural areas such as the wrists, neck and head (perioral and periorbital areas). However, to our knowledge, a clinical evaluation of AD using a scoring system in a selected population of infants and young children has not been reported. In the present study, a severity score of AD has been performed using the SCORAD index in a series of 63 infants and young children. A single investigator has been chosen for scoring AD, as recently suggested (6), in order to avoid problems with inter-observer variation reports for extent and intensity items (3, 5, 13).

Our data demonstrated that about 60% of patients presented a moderate form, 20% a mild form, and 20% a severe form of AD as in our previous report (8). The

intensity score showed higher values for the items in the acute phase of inflammation (especially erythema, edema/papulation, oozing/crust), compared with those in the late phase (lichenification, dryness) (Table 1). It is therefore emphasized that in this subgroup of AD patients, a distinctive immune mechanism is involved: in the acute skin lesions a marked infiltration of Th2 cells has been reported, while in the late phase of AD there is a switch to a Th1 immune response with infiltration of macrophages and eosinophils (1).

Each of the three main items of the SCORAD index (extent, intensity, and subjective symptoms) were positively correlated to each other in our patients (Fig. 1). In other words, when the skin lesions were more extensive, they were also more itchy and intense. Moreover, there was a strong positive correlation between the SCORAD Index results and the extent, intensity and subjective symptoms. This 'internal consistency' has been indicated as a criterion of reliability of a scoring system (6); it has also been referred to in AD patients not selected for age (3), although the data were not shown. These results could allow a single parameter to be taken into account in order to grade the severity of AD, but it seems a crude method, even if applied to single cases in clinical practice.

The severity assessment of subjective symptoms has been a cause of debate among physicians and investigators because of inter-observer variation, especially in multi-center trials; consequently, different from the present study, a severity scale based only on the objective criteria of the SCORAD index has been indicated by the European Task Force on Atopic Dermatitis, to define mild, moderate, and severe AD (5). An objective severity assessment for AD has been recently proposed: this would involve the measurement of transepidermal water loss and stratum corneum hydration (14), without taking subjective symptoms into account. A positive correlation between the SCORAD and s-ECP and u-EPX levels has been reported in children and adult patients (8, 15). In the present study, we confirmed that each item of the SCORAD index, including pruritus and sleep loss, was positively correlated to s-ECP and u-EPX levels (Table 2).

As the subjective score of our patients is obviously established by the parents, we think that it is more 'objective' than that provided by the patients themselves.

Moreover, we believe that subjective symptoms are essential for the evaluation of disease severity, as they allow a quality-of-life assessment of these children and their families.

In conclusion, infants and young children with atopic dermatitis have distinctive intensity items of the SCORAD index, that probably depend on a distinctive immunopathogenesis. A strong correlation resulted among extent, intensity, and subjective symptoms, so that each of the three parameters could represent an index of severity of atopic dermatitis. However, the SCORAD index still remains the gold standard for grading the severity of AD in everyday practice and clinical trials.

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