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The Course of Life of Patients with Childhood Atopic Dermatitis

Elian E. A. Brenninkmeijer, M.D.,* Catharina M. Legierse, M.D.,* J. Henk Sillevis Smitt, M.D., Ph.D.,* Bob F. Last, Ph.D.,†‡ Martha A. Grootenhuis, Ph.D.,† and Jan D. Bos, M.D., Ph.D., F.R.C.P.*

**Department of Dermatology, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands, †Paediatric Psychosocial Department, Emma Children's Hospital, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands, ‡Department of Developmental Psychology, Faculty of Psychology and Education, The Free University Amsterdam, Amsterdam, The Netherlands*

Abstract: **Atopic dermatitis mainly covers the period of infancy to adulthood, an important period in the development of an individual. The impairment of quality of life and the psychological wellbeing of children with atopic dermatitis have been well documented but so far no data exist about the impact of atopic dermatitis in childhood on fulfilling age-specific developmental tasks and achieving developmental milestones during this period, referred to as the course of life. The aims of this study were to: (i) assess the course of life and define the disease-related consequences in young adult patients with childhood atopic dermatitis and (ii) determine whether the severity of atopic dermatitis is predictive for the course of life, the disease-related consequences and quality of life later in life. Adult patients who grew up with atopic dermatitis were asked to complete a medical history questionnaire, the Skindex-29, the ''course of life'' questionnaire and a subjective disease-specific questionnaire. Patients with severe atopic dermatitis in childhood showed a significant delayed social development in their course of life. The results of the disease-specific questionnaire demonstrated remarkable high percentages of psychosocial consequences and physical discomfort caused by atopic dermatitis in childhood. Patients showed a severely negative impact of atopic dermatitis on their current quality of life. This is the first study that applied the ''course of life'' questionnaire in atopic dermatitis. More insight in the course of life, disease-specific consequences and quality of life of atopic dermatitis is of high importance, especially in case of severe atopic dermatitis.**

Atopic dermatitis (AD) is a chronic relapsing, inflammatory skin disease, characterized by a range of clinical features of which pruritus and typically distributed eczematous lesions are the most essential (1–3). As the result of a twofold to threefold increase in prevalence during the last 3 decades, AD has become one of the

Address correspondence to Elian E. A. Brenninkmeijer, M.D., Department of Dermatology, Academic Medical Center, University of Amsterdam, P.O. Box 22700, 1100 DE Amsterdam, The Netherlands, or e-mail: e.e.brenninkmeijer@amc.uva.nl.

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most common childhood disorders (3–5). Despite the proposal of different sets of diagnostic criteria, so far no definitive gold standard for diagnosing AD has been accepted (6–8).

It is known that AD not only causes physical symptoms such as pruritus, skin discomfort, and sleep disruption, but can also lead to emotional problems and social dysfunction. The annoying physical symptoms, as well as the unpredictable course and intensive treatment of the disease, can have significant impact on the physical and psychological wellbeing of AD patients (9). Moreover, AD patients are affected not only by the disease itself but also by the stigma associated with its visibility (10,11). Chronic skin diseases have always had a major negative impact on a patient's quality of life (QoL), and since 1987 this impact can be measured in a repeatable standardized way (12). Several questionnaires were developed to measure QoL in dermatology, e.g., the Dermatology Life Quality Index, the Children's Dermatology Life Quality Index and the Skindex-29 (13–15). Since then, the impairment of QoL and the psychological wellbeing of children with AD, as well as their parents, has been well documented (16–25).

Atopic dermatitis mainly covers the period of infancy and childhood, an important period in the development of an individual (26). Childhood and in particular the adolescent period is characterized not only by vitality and rapid development, but also by vulnerability. Negative experiences, such as somatic illnesses, may have great impact on later adult life (27). So far in literature no attention has been paid to the long-term impact of childhood AD. Even though suggested by other researchers (18), no retrospective study has yet been performed to investigate the developmental consequences of growing up with AD.

Fulfilling age-specific developmental tasks in childhood as well as achieving developmental milestones in youth, referred to as the "course of life" (CoL), are of great importance to the adjustment in adult life (28–31). In children with a chronic disease, dependence on caretakers is frequently increased, and peer- and school-based activities are often decreased, elements which may affect the achievement of developmental milestones. The impact of AD in childhood on the CoL is not well known.

A hampered CoL was found in young adults with a history of chronic pediatric disease, such as survivors of childhood cancer, patients with end-stage renal disease, anorectal malformations, Hirschsprung disease, and esophageal atresia (30,31). No knowledge exists about the CoL of young AD patients.

The primary aim of this study was to assess the CoL in young adult patients growing up with AD in childhood and compare this with that of a healthy matched control group. Second, we will define the disease-related consequences for AD patients during childhood and we will determine whether severity of AD is predictive for the CoL and the disease-related consequences during childhood. Finally, the current QoL of the patients with AD in childhood is determined. As AD continuously affects the daily life of patients, their CoL is expected to be disturbed. Considering the severity of AD to be of influence on the CoL, patients with severe AD are expected to have a more hampered CoL.

METHODS

Patients and Procedures

This mono-center cross-sectional study was performed at the Department of Dermatology of the Academic Medical Center in Amsterdam, the Netherlands. By computerized search, all patients in the age of 18 to 30 years, with AD in childhood, who visited the outpatient clinic between January 2000 and July 2006, were selected. Diagnosis of AD was based on the U.K. Working Party's diagnostic criteria for AD, namely an itchy skin condition, and three of the following criteria: history of involvement of skin creases, personal history of asthma or hay fever, history of generally dry skin and onset at younger than two years of age (8). Patients with co-morbidity during childhood other than asthma or hay fever and patients unable to understand questionnaires in Dutch were excluded from analysis. All eligible patients were invited by a letter from the research physician and the head of the Dermatology Department, in which they were asked to participate in the study. Patients who did not want to participate were asked to return a non-response form. All participants signed an informed consent form and were asked to fill in the questionnaires anonymously. After completing the questionnaires at home, they could be returned in a freepost envelope provided by the research physician. Nonresponders were once contacted by phone. A control group was recruited through general practitioners in a former study (30).

Measures

All participating patients were asked to complete a medical history questionnaire, the Skindex-2915, a QoL questionnaire, the CoL questionnaire and the subjective disease-specific questionnaire.

The medical history questionnaire is an anamnestic questionnaire concerning the medical history of the AD patient. Fifteen questions were asked retrospectively and 19 were concerning the current situation. The items

include patient characteristics, atopic history, family history, course of disease and current and former therapies. Based on the question about the severity of the AD during childhood, severity was dichotomized into mild to moderate (0) and severe (1). In addition to the medical history, the Skindex-29, a dermatology-specific questionnaire, developed to comprehensively measure the complex effects of a skin disease on a patient's QoL, was used. A composite score of >40 points means a relatively serious negative impact of the skin disease on the current QoL. To improve the support and medical care of patients with AD, patients were asked to report their personal needs.

The CoL questionnaire, developed by the Psychosocial Department of the Emma Children's Hospital, is used to retrospectively assess the achievement of developmental milestones (32). It was developed to be able to investigate the CoL of young adults, aged 18 to 30, who grew up with a chronic or life-threatening disease, and to facilitate comparison with the CoL of peers without history of disease. The items concern behavior characteristics of certain ages, developmental tasks, and the limitations children might encounter when growing up with a chronic disease. The items are divided into five scales: three developmental scales and two risk behavior scales. In this study, we were interested in the three developmental scales: autonomy development (six items, autonomy at home and outside home, e.g., "age of going on holidays without parents"), psychosexual development (four items, love and sexual relations, e.g., "the first time of falling in love"), and social development (12 items, contact with peers at school and in leisure time, e.g., "belonging to a group of friends during secondary school"). A higher score on these scales indicates the achievement of more milestones and the accomplishment of more developmental tasks, which can be seen as an indication of a more favorable CoL.

Apart from the five scales, the CoL questionnaire measures socio-demographic outcomes in young adulthood. The validity and the test–retest reliability ($r \geq 0.86$) of the CoL scales is good (30,32,33). Except for the autonomy scale, in which items concern diverging aspects of autonomy, the internal consistency of the scales is satisfactory (32). The use of scales with moderate internal consistency is acceptable for group comparison, because internal consistency is an indication of random error and has nothing to do with systematic error (bias) (28). The Cronbach's alphas in the population under study were moderate to good as well.

The subjective disease-specific questionnaire consists of 24 retrospective questions concerning AD-related consequences during the primary and secondary school period of AD patients. This questionnaire was developed to obtain an impression of the effects of AD on the patients' daily lives. Item lists were developed from clinical experience and insights of developmental psychology and were based on the CoL questionnaire domains (social en psycho-sexual functioning and autonomy). Items were reviewed and discussed by the team members to ensure appropriateness.

Scores were given on a five-point scale, from "never" (0) to "all the time" (5). Twelve questions concern the primary school period and are about the disease-specific psycho-social impact and the impact of its physical aspects. The items concern feelings of shame, loneliness, protection by parents, and contact with friends. The same questions were asked about the secondary school period.

Statistical Analysis

The Statistical Package for Social Sciences (SPSS) Windows version 11 was used for all analyses. First, missing values were handled according to the guidelines given in the manuals for the relevant questionnaires. Second, Mann–Whitney tests and chi-squared tests were completed to compare responders and nonresponders with regard to age and gender. For the Skindex-29, sum scores ≤ 25, between 26 and 39 and above 40 were determined and these sum scores were correlated with the current AD severity using nonparametric correlation.

Student's *t*-test was conducted to test group differences on the CoL scales. Because the distribution of the scores of the CoL scales was not fully normal, nonparametric Mann–Whitney *U*-tests were also performed to improve reliability. To get insight into the within group differences based on severity additional *t*-test and Mann–Whitney *U*-tests were performed. Furthermore, to gain a detailed insight into the CoL of the AD patients, differences on item level were also calculated for scales on which significant differences between groups were found. Therefore, chi-squared tests were conducted at the frequency distributions of the individual (dichotomized) items.

Additional chi-squared tests were conducted at the frequency distributions of the individual (dichotomized) items for the disease-specific questionnaire for severity of AD. Answers to the items on the disease-specific questionnaire were dichotomized by adding the categories never and seldom (no) and the answers sometimes, often and very often (yes). Items of which the impact was reported (as yes) by $>25\%$ of the patients were considered clinically relevant. Because of the strong explorative nature of our study, priority was given to find phenomena that exist (avoiding type I errors) rather than correcting for multiple testing (avoiding type II errors). Therefore, a significance level $p < 0.05$ was used.

RESULTS

Patients

A total of 165 (60 men [36.4%] and 105 women [63.6%]) patients with AD were asked to complete the set of questionnaires. A total of 117 patients returned their questionnaires (response rate 71%). Of the 48 patients who did not complete the questionnaires, 20 returned the nonresponse form. Most of these nonrespondents declared not to have enough time ($n = 3$), to be currently studying or working abroad ($n = 4$), not to have suffered from AD during primary or secondary school ($n = 3$), or not to be interested in participating ($n = 10$). Twenty-eight of the 165 adults did not respond at all. Comparing the responders to the nonresponders, the nonresponders were younger at time of investigation ($M = 22.9$; SD = 3.53; range 18–29; $p < 0.05$), and the group consisted of a higher percentage of males instead of females (54.2% vs 45.8%, $p < 0.05$).

The data of 117 patients could be used for the analyses: 34 men (29.1%), 83 women (70.9%). Their mean age was 23.4 years (SD = 3.2; range 18–30) and the median age was 23 years. Characteristics of patients are listed in Table 1. Of 108 patients, the item of severity of AD during childhood could be used for analysis. The distribution of severity of AD during childhood did not differ between men and women. Controls consisted of 508 respondents, 239 men (47.0%) and 269 women (53.0%). Mean age 24.2 years (SD = 3.8, range 18.0–30.9) (29).

TABLE 1. *Baseline Characteristics of the Atopic Dermatitis (AD) Patients*

	AD patients ($n = 117$)
Age at study (years)	23.4 (3.2; 18–30)
Age at first diagnosis (years)	3.4 (4.7; 0–17)
Mean duration of AD (years)	20.1 (5.8; 5–30)
Gender	
Male	34 (29.1)
Female	83 (70.9)
AD at time of investigation	
Yes	105 (91.3)
No	10 (8.7)
Severity of AD at time of investigation	
None/mild	20 (20.4)
Moderate	49 (50.0)
Severe	29 (29.6)
Severity of AD during childhood	
Mild	0 (0)
Moderate	34 (29.1)
Severe	74 (63.2)
Treatment at time of investigation	
Corticosteroids	68 (58.1)
Immunomodulators	28 (23.9)
Systemic therapy (e.g., prednisone)	4 (3.4)
Other health problems	
Asthma	47 (42.0)
Hay fever	72 (67.9)
Conjunctivitis	78 (69.0)
Other	13 (11.3)
Family atopy	
AD	44 (38.3)
Asthma	47 (40.9)
Hay fever	63 (54.8)

Values are expressed as mean (SD; range) or *n* (%).

TABLE 2. *Outcomes of the Quality of Life (Skindex-29) for Total Group of Atopic Dermatitis (AD) Patients and Current Disease Severity*

	Total AD patients	None/ mild AD	Moderate AD	Severe AD
Total sum score ≥40	56 (48.7)	4 (22.8)	22 (48.9)	19* (82.6)
Total sum score 26–39	31 (26.5)	8 (44.4)	14 (31.1)	4* (17.4)
Total sum score ≤25	28 (23.9)	6 (33.3)	9 (20.0)	0* (0.0)

Values are expressed as *n* (%).
*Strong correlation for disease severity between QoL and current disease severity ($r = 0.518$, $p < 0.001$).

Quality of Life

The results of the current QoL measured by the Skindex-29 are presented in Table 2. A percentage of 48.7% of patients with AD showed a severely negative impact of AD on their current QoL (critical score ≥40). We found a strong correlation between the reported disease severity and the QoL ($r = 0.518$, $p < 0.001$).

In answer to our question for the need of support and medical care, majority of patients reported a clear need for more information about treatment regimens (87%), improvement of personal guidance and advice of the physician during their treatment (85%), contact with fellow-sufferers (52%), and psychological support (68%).

Course of life

As a group, patients with AD in childhood did not differ significantly from the control group on milestones in developmental domains of the CoL questionnaire (Table 3). However, within group differences were found for severity. Patients who grew up with severe AD in childhood showed significant delayed social development compared to patients who grew up with AD in childhood ($p < 0.001$). Besides, severe AD showed to have a significant delayed social development compared with the control group ($p < 0.05$).

The frequency tables of the individual items of the social development scale of the CoL questionnaire show the milestones for which patients with moderate AD in childhood differed significantly from patients with severe AD in childhood (Table 4). They differed on six of 10 items of the social development scale. During primary

TABLE 3. *Comparison Between Total Group of Atopic Dermatitis (AD) Patients, Controls, and Disease Severity on the Three Scales of the Course of Life (CoL) Questionnaire*

	Total AD patients (n = 117)	Control group (n = 508)	Moderate AD (n = 34)	Severe AD (n = 74)	Severe AD (n = 74)	Control group (n = 508)
Autonomy development	9.33 (1.26)	9.45 (1.48)	9.61 (1.31)	9.15 (1.22)	9.15 (1.22)	9.45 (1.48)
Psycho-sexual development	7.25 (1.07)	7.14 (1.15)	7.36 (1.03)	7.17 (1.11)	7.17 (1.11)	7.14 (1.15)
Social development	20.78 (2.48)	20.96 (2.47)	21.97** (1.64)	20.22 (2.70)	20.22* (2.70)	20.96 (2.47)

Values are expressed as mean (SD).
*$p < 0.05$ Mann–Whitney U-test comparison between severe AD and control group.
**$p < 0.001$ Mann–Whitney U-test comparison between moderate and severe AD.

TABLE 4. *Frequencies, Percentages, and Differences of the Social Development Scale of the Course of Life (CoL) Questionnaire Between Moderate and Severe Atopic Dermatitis (AD), and Between Severe AD and Controls*

	Moderate AD	Severe AD	p-Value*	Controls	p-Value**
At least 1 year of membership in a sports club, primary school					
Yes	28 (82.4)	53 (71.6)	0.23	427 (84.2)	< 0.01
No	6 (17.6)	21 (28.4)		80 (15.8)	
No. friends in 1–3 grade, primary school					
< 4	5 (14.7)	26 (35.1)	< 0.05	187 (37.0)	0.76
4 or more	29 (85.3)	48 (64.0)		319 (63.0)	
No. friends in 4–6 grade, primary school					
< 4	5 (14.7)	23 (31.1)	0.06	156 (30.9)	0.97
4 or more	29 (85.3)	51 (68.9)		349 (69.1)	
Best friend, primary school					
Yes	27 (79.4)	59 (80.8)	0.86	377 (74.0)	0.22
No	7 (20.6)	14 (19.2)		131 (25.8)	
Most of time playing with..., primary school					
Friends	34 (100)	54 (76.1)	< 0.001	436 (87.6)	< 0.01
Brothers and/or sisters, parents, on your own	0 (0)	17 (23.9)		62 (12.4)	
At least 1 year of membership in a sports club, secondary school					
Yes	22 (66.7)	36 (50.0)	0.08	373 (73.6)	< 0.001
No	11 (33.3)	36 (50.0)		134 (26.4)	
No. friends, secondary school					
< 4	4 (12.1)	22 (30.1)	< 0.05	154 (30.4)	0.96
4 or more	29 (87.9)	51 (69.9)		352 (69.6)	
Best friend, secondary school					
Yes	24 (72.7)	53 (72.6)	0.59	372 (73.5)	0.87
No	9 (27.3)	20 (27.4)		134 (26.5)	
Belonging to a group of friends, secondary school					
Yes	31 (93.9)	55 (76.4)	< 0.05	403 (80.6)	0.40
No	2 (6.1)	17 (23.6)		97 (19.4)	
Leisure time mainly with..., secondary school					
Friends	32 (97.0)	54 (76.1)	< 0.01	430 (85.1)	< 0.05
Siblings, parents, alone	1 (3.0)	17 (23.9)		75 (14.9)	
Going out to a bar or disco, secondary school					
Sometimes/often	32 (94.1)	55 (77.5)	< 0.05	430 (84.8)	0.11
Never	2 (5.9)	16 (22.5)		77 (15.2)	

Values are expressed as n (%).
*p-Value for moderate versus severe AD.
**p-Value for severe AD versus control group.

and secondary school, patients with severe AD in childhood had a lower number of friends ($p < 0.05$; $p < 0.05$), and a lower percentage of children spent their leisure time with their friends than patients with moderate AD in childhood ($p < 0.001$; $p < 0.01$). Furthermore, patients with severe AD in childhood less often belonged to a group of friends ($p < 0.05$), and less often went to a bar or disco during secondary school than patients with moderate AD ($p < 0.05$), and, compared with their healthy peers, patients with severe AD less often reported to have been member of a sports club during their primary and secondary school period ($p < 0.01$; $p < 0.001$).

Disease-Specific Questionnaire

Considering the clinical relevant items (of which the impact was reported by >25% of the patients), the outcomes of the disease-specific questionnaire show that

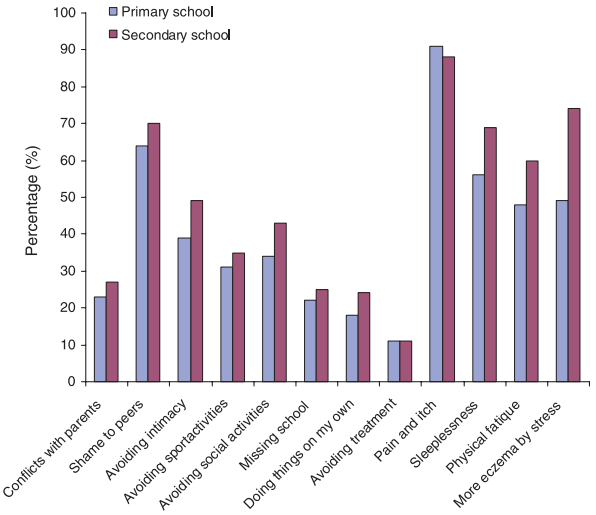

Figure 1. Total percentages of atopic dermatitis (AD) patients reporting impact on the disease-specific questionnaire.

the majority of the patients experienced negative impact and discomfort caused by their AD during their primary and secondary school period (Fig. 1). The majority of patients with AD in childhood confirmed their AD led to shame to peers during primary and secondary school: 63.6% and 70.0%, respectively. In addition, considerable percentages are shown with respect to avoidance of intimacy (39.1% and 49.1%), social activities (31.5% and 35.1%), and sports activities (34.5% and 43.2%) during primary and secondary school. A clinical relevance for school absence (25.2%) and doing things on their own (24.3%) was shown during secondary school. With respect to physical aspects of AD, high percentages of discomfort during primary and secondary school are observed; pain and itch (90.7% and 88.1%), sleeplessness (56.5% and 69.2%), physical fatigue (48.1% and 60.2%), and more eczema by stress (49.1% and 74.1%).

The results of the differences between patients with moderate AD and severe AD during childhood within the disease-specific questionnaire are presented in Table 5. In four items of the disease-specific questionnaire, those having had moderate AD differed significantly from those having had severe AD during childhood. Compared with patients with moderate AD, patients with severe AD during childhood more often missed out on primary and secondary school because of suffering from AD ($p < 0.05$; $p < 0.10$). Patients with severe AD in childhood spent more time on their own during their secondary school period than patients with moderate AD ($p < 0.05$). Furthermore, results about the physical aspects of AD during primary and secondary school showed that patients with severe AD during childhood more often suffered from physical fatigue than patients with moderate AD during childhood ($p < 0.01$; $p < 0.05$).

TABLE 5. *Frequencies, Percentages, and Differences Between Patients with Moderate and Severe Atopic Dermatitis (AD) with Respect to the Disease-Specific Questionnaire*

	Moderate AD	Severe AD	p-Value
Thinking about my primary school and my eczema, it led to			
Conflicts with my parents			
No	25 (78.1)	55 (75.3)	0.76
Yes	7 (21.9)	18 (24.7)	
Shame to peers			
No	14 (43.8)	24 (32.9)	0.29
Yes	18 (56.3)	49 (67.1)	
Avoiding intimacy			
No	24 (75.0)	40 (54.8)	0.05
Yes	8 (25.0)	30 (45.2)	
Avoiding social activities			
No	25 (78.1)	45 (64.3)	0.16
Yes	7 (21.9)	25 (35.7)	
Avoiding sport activities			
No	25 (78.1)	44 (60.3)	0.08
Yes	7 (21.9)	29 (39.7)	
Missing school			
No	29 (90.6)	52 (71.2)	< 0.05
Yes	3 (9.4)	21 (28.8)	
Doing things on my own			
No	29 (90.6)	56 (77.8)	0.12
Yes	3 (9.4)	16 (22.2)	
Avoiding treatment			
No	31 (96.9)	62 (84.9)	0.08
Yes	1 (3.1)	11 (15.1)	
Thinking about my secondary school and my eczema, it led to			
Conflicts with my parents			
No	26 (78.8)	50 (69.4)	0.32
Yes	7 (21.2)	22 (30.6)	
Shame to peers			
No	11 (34.4)	18 (24.7)	0.30
Yes	21 (65.6)	55 (75.3)	
Avoiding intimacy			
No	21 (63.6)	32 (44.4)	0.07
Yes	12 (36.4)	40 (55.6)	
Avoiding social activities			
No	25 (75.8)	43 (58.9)	0.09
Yes	8 (24.2)	30 (41.1)	
Avoiding sport activities			
No	22 (66.7)	37 (50.7)	0.12
Yes	11 (33.3)	36 (49.3)	
Missing school			
No	28 (84.8)	51 (69.9)	0.10
Yes	5 (15.2)	22 (30.1)	
Doing things on my own			
No	29 (87.9)	50 (68.5)	< 0.05
Yes	4 (12.1)	23 (31.5)	
Avoiding treatment			
No	31 (93.9)	64 (87.7)	0.50
Yes	2 (6.1)	9 (12.3)	
Thinking about my primary school and my eczema, I suffered from			
Pain and itch			
No	3 (9.7)	6 (8.3)	1.00
Yes	28 (90.3)	66 (91.7)	
Sleeplessness			
No	12 (38.7)	31 (43.1)	0.68
Yes	19 (61.3)	41 (56.9)	
Physical fatigue			
No	22 (71.0)	31 (43.1)	< 0.01
Yes	9 (29.0)	41 (56.9)	
More eczema caused by stress			
No	16 (55.2)	35 (48.6)	0.55
Yes	13 (44.8)	37 (51.4)	

TABLE 5. *Continued*

	Moderate AD	Severe AD	p-Value
Thinking about my secondary school and my eczema, I suffered from			
Pain and itch			
Yes	5 (15.6)	8 (11.1)	0.52
No	27 (84.4)	64 (88.9)	
Sleeplessness			
Yes	10 (32.3)	22 (30.6)	0.86
No	21 (67.7)	50 (69.4)	
Physical fatigue			
Yes	18 (56.3)	25 (34.7)	< 0.05
No	14 (43.8)	47 (65.3)	
More eczema caused by stress			
Yes	8 (25.8)	19 (26.4)	0.95
No	23 (74.2)	53 (73.6)	

Values are expressed as *n* (%).

DISCUSSION

This is the first study that considered the CoL of young adults with AD in childhood. The primary aim of this study was the assessment of the CoL in young adult patients who grew up with AD in comparison with age-matched peers without AD. In our study, the CoL of young adult patients with AD in childhood was found not to be hampered in comparison with age and sex-matched peers without a history of AD. Regarding the whole group of young adult patients with a history of AD, the same milestones have been achieved with respect to autonomy development, social development and psycho-sexual development. A clear explanation for this cannot be given, but it can be reasoned that patients having (severe) AD adapted their lifestyles and learned to cope with their difficulties during their childhood.

When examining differences between patients varying in disease severity, a clear difference was demonstrated in achieving milestones of social development between moderate AD and severe AD. Patients with severe AD in childhood had fewer friends and spent less leisure time with their friends during primary school and secondary school compared with patients with moderate AD.

Comparing patients with severe AD with their healthy controls, a significant difference in social development can be shown which appeared to be delayed for patients with severe AD. Compared with their healthy peers, patients growing up with severe AD less often took membership in a sports club during their primary and secondary school period. From a developmental psychological point of view the fulfilling of age-specific developmental tasks in childhood is of great importance to the adjustment in adult life (34,35). With these results our expectation concerning the severity of AD to be predictive for the CoL has been confirmed.

Our second aim was to define the disease-related consequences during childhood for young AD patients. Although no hampered CoL in young adult patients with a history of AD as a group was demonstrated, we found that the majority of patients with AD during childhood experienced negative impact and discomfort caused by their AD. Results show that up to 70% of the patients suffered from feelings of shame to peers during primary and secondary school. In addition, increasing avoidance of intimacy, social and sports activities was reported by the patients. These results can be explained by psychological, physical, and social aspects and consequences caused by AD. Our data are in line with former research showing AD is related with increased risk of developing psychological difficulties (e.g., shame and anger caused by their eczema) as well as behavioral problems (e.g., increased dependency, fearfulness, and increased sick leave for school-aged children with AD) (10,16,20).

Our results indicated that physical symptoms of AD are of great impact to patients with AD during primary and secondary school. A high percentage of patients suffered from pruritus, sleeplessness, fatigue, and increased eczema by stress. Pruritus resulting in sleeplessness is a widely mentioned problem caused by AD (9,10,22,36). It is known that patients with AD awake more often, sleep less through the night and report more daytime fatigue (37,38). Fatigue has been demonstrated to be closely related to physical symptoms of itching and a worse clinical skin status in patients with AD, possibly indicating that fatigue is a consequence of sleep disturbances because of an active disease process and high levels of itching (37,39,40). In addition, fatigue has a common psychological component, which results from the perceived stress and experienced impairment of the chronic skin condition. Furthermore, a growing number of reports support the association between psychological stress and skin condition in AD (41–43).

Our final aim was to determine whether severity of AD is predictive for the disease-related consequences during childhood. A clear difference was demonstrated between moderate AD and severe AD in several items of the disease-specific questionnaire. Patients with severe AD during childhood showed more absence on primary and secondary school and spent more often time on their own during their secondary school period. Furthermore, patients with severe AD during childhood more often suffered from physical fatigue than patients with moderate AD during childhood. These findings underline that the severity of AD is important in defining the disease-related consequences for young AD patients.

In addition to this, the results of the Skindex-29 showed that 49% of patients reported a severely negative impact of AD on their current QoL. The majority of patients reported a clear need for more information about treatment, personal guidance, advice of the

physician during their treatment and contact with fellow-sufferers during the childhood with AD, which clearly indicates the importance of a personal approach to and treatment strategy for each AD patient.

In this article, the results were described of the first research on the CoL in young adults who grew up with AD. Although this study gained useful insights, several limitations were encountered. First, concept "CoL" is more comprehensive than the milestones covered by the CoL questionnaire. The fact that the CoL is measured retrospectively limits the range of topics. To prevent bias caused by memory, the questions are factual and do not go further back than to the primary school period. The test–retest reliability has proven to be satisfactory, so we can conclude that the retrospective reporting about milestones is rather reliable. Second, because the questionnaires should be completed by the patients with a history of AD themselves, another cause of bias arises. It is likely that patients report to have achieved more milestones than was actually the case to prove that they have succeeded in getting over their disease. Third, the disease-specific questionnaire is a new questionnaire which needs more validation. The final limitation stresses the problem of subjectivity of the disease severity in childhood, as it was self-reported. However, strong correlation could be shown between the self-reported current severity and the Skindex-29, which indicates the self-reported disease severity is rather reliable. Nevertheless, we want to point out that the outcomes of this questionnaire are of clinical importance. In further research, it will be worthwhile to investigate the consequences of a delayed CoL for the adjustment in young adulthood, e.g., QoL and social demographic outcomes. Furthermore is seems important to study developmental consequences prospectively and related to objectively determined severity.

This study has demonstrated the importance of the issue of CoL and disease-specific consequences during childhood as reported by adult patients with AD in childhood. It illustrated that adult patients with AD in childhood as a group have achieved the same milestones as their healthy peers. But attention has to be paid to patients with severe AD in childhood, as they demonstrated to have achieved fewer milestones concerning social development. A clear notion of negative impact and discomfort during childhood caused by AD was proven by the outcomes of the disease-specific questionnaire. Knowledge about possible gaps in the CoL and the disease-specific consequences could be useful in clinical practice because it enables health care providers, and especially dermatologists to aim for the most favorable CoL and support of patients suffering from AD, both during as well as after treatment. Especially in cases of severe AD, dermatologists should not only be attentive to the physical aspects but also to the psychological and social aspects of AD. In conclusion, we believe that in clinical care a systematic evaluation of physical and psychosocial consequences in patients with AD is warranted.

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