

ORIGINAL ARTICLE

Health-related quality of life in patients with atopic dermatitis

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ABSTRACT

Atopic dermatitis (AD) is a chronic relapsing condition that can have considerable effects on the patients' quality of life (QOL). The aim of this study was to measure the health-related QOL in patients with AD, using generic and specific instruments, to compare the scores obtained by different instruments and to verify the relationship between them. We conducted a cross-sectional study of 132 outpatients with AD. To assess the QOL, Short Form 36 (SF-36), Dermatology Life Quality Index (DLQI) and Children's Dermatology Life Quality Index (CDLQI) were administered. In order to assess the disease severity of AD, we used the Eczema Area and Severity Index (EASI) and physician assessment of disease severity. Stressful life events during the last 12 months were assessed with Paykel's Interview for Recent Life Events. Patients with AD had inferior social functioning and mental health scores compared with the general population. The correlations between the DLQI and SF-36 were found for the mental components of the QOL. Increasing disease severity was associated with greater impairment in QOL in both, children and adults. Our study found the influence of the stressful life events on the role emotional of AD patients. These results demonstrate that AD influences health-related QOL, especially in children. This study supports the decision to use both generic and skin-specific instruments to assess the impact of AD on QOL.

Key words: atopic dermatitis, Children's Dermatology Life Quality Index, Dermatology Life Quality Index, quality of life, Short Form 36.

INTRODUCTION

Atopic dermatitis (AD) is a chronic, relapsing and pruritic inflammatory skin disorder that is commonly present during early infancy and childhood, but can persist or start in adulthood as well.¹ It is a major public health problem worldwide, with a prevalence in children of 15–30% and 2–10% in adults.² There is evidence to suggest that the prevalence of AD in developed countries has increased two- to threefold over the past 30 years and continues to increase.^{3,4}

The consequences of having a skin disease may be more profound concerning the patient's health-related quality of life (HRQOL). The great negative impact of the disease on the quality of life (QOL) of patients with chronic moderate-to-severe AD is well established, affecting them socially, economically and psychologically.⁵ AD is uncomfortable and distressing to patients because of the associated pruritus and unsightly appearance of the lesions.⁶ Children who have AD might suffer from lack of sleep, irritability, daytime tiredness, emotional stress, lowered self-esteem and psychological disturbance.^{7,8} In adults, studies have identified problems such as feelings of shame or embarrassment, anxiety, low confidence and problems with personal, social and work relationships.⁹

The aim of the present study was to measure the HRQOL in patients with AD, using generic and specific instruments, to compare the scores obtained by different instruments and to verify the relationship between them.

METHODS

Patients

One hundred and thirty outpatients with AD, ranging 4–70 years in age were included in the study, and composed of 66 adults from the Department of Dermatology, Military Medical Academy, and the City Department for Skin and Venereal Diseases in Belgrade, and 64 children from the Children's Hospital for Pulmonary Diseases and Tuberculosis, Clinical Center "Dr Dragiša Mišović-Dedinje", Belgrade. The sample was collected from September 2009 to October 2010.

The study was approved by the Medical Faculty Ethics Committee in Belgrade. After the diagnosis of AD was confirmed, each patient was thoroughly informed about the purpose of the study by trained dermatologists. Only those patients who gave their written consent were included in the study. Patients' characteristics such

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as age, sex, age at onset of disease, duration of disease and family history of AD were recorded.

Instruments

Eczema area and severity index

Disease severity in adults and children 8 years of age and older, was evaluated by the Eczema Area and Severity Index (EASI)¹⁰ which involves an assessment of disease extent on a scale of 0–6 in four affected body areas (head/neck, trunk and upper and lower extremities) plus an evaluation of erythema, infiltration/papulation, excoriation and lichenification, each on a scale of 0–3. The sum of these scores composed the EASI, which can range from 0–72 with a high score representing widespread and severe disease. As no cut-off scores have been recommended for the measure, we divided adult patients with AD into three approximately equally-sized groups, based on their EASI score: mild (<7.07), moderate (7.071–15.60) and severe (>15.61).

To determine the clinical severity in children except by EASI, physician assessment of disease severity (mild, moderate and severe) was used.

Patients' self-assessment of HRQOL was measured by three instruments: generic (Medical Outcomes Study Short Form-36 Health Survey [SF-36]),¹¹ and two instruments specifically designed for measuring HRQOL in dermatological patients (Dermatology Life Quality Index [DLQI])¹² and Children's Dermatology Life Quality Index [CDLQI]).¹³

In the present study, children aged 4–16 years completed the CDLQI, and patients aged over 16 years completed the DLQI and the SF-36.

SF-36 health survey

The SF-36 is a self-administered, multidimensional, widely used 36-item generic HRQOL instrument, assessing eight domains of health status, including physical functioning (PF, 10 items), usual physical role activities (RP, four items), bodily pain (BP, two items), general health perceptions (GH, five items), vitality (VT, four items), social functioning (SF, two items), usual emotional role activities (RE, three items) and mental health (MH, five items).^{14,15}

All scores on the SF-36 are standardized on a scale of 0–100, with higher scores indicating a better HRQOL. We used the cross-culturally validated Serbian version of the SF-36.¹⁶ The reliability of the SF-36, as measured by Cronbach's alpha coefficient, was similar (0.73) to the suggested value of 0.70.¹⁷

The SF-36 mean scores were calculated for the whole adult population. Because the SF-36 reference values were not available for the general Serbian population, for the purpose of comparison, we used the SF-36 scores for the general Croatian population¹⁸ (Serbia and Croatia are former Yugoslav republics).

Dermatology Life Quality Index

The DLQI is a simple, compact, dermatology-specific questionnaire designed for use in adults (i.e. patients aged >16 years) and it is applicable to patients with any skin disease. It measures how much a skin problem has affected the life of the patient over a previous 7-day period. The instrument consists of 10 questions,

six dimensions, related to symptoms and feelings, daily activities, leisure, work or school, personal relationships, and treatment. Each question has four response categories ("not at all", "a little", "a lot" and "very much") corresponding to scores of 0, 1, 2 and 3, respectively. The DLQI is the total score of all questions, with a maximum score of 30 and a minimum score of 0. The higher the score, the more QOL is impaired. The DLQI can also be expressed as a percentage of the maximum possible score of 30.¹²

We used the Serbian version of the DLQI.¹⁹ All scales showed good internal consistency with mean Cronbach's alpha coefficient of 0.84. The DLQI mean scores were calculated for the whole adult population.

Children's Dermatology Life Quality Index

The CDLQI aims to measure the impact of skin disease on children's QOL. It was designed to be completed by the child, from 4–16 years of age, with the help of an adult (parent). It represents the modification of the DLQI, as the DLQI contains the questions only related to adults.¹³ The CDLQI addresses the impact of the skin disease on domains like those of the DLQI, except the question about sexual activity, while including the question about sleep. Scoring is also similar, with response options in the CDLQI of "not at all" (0), "only a little" (1), "quite a lot" (2) and "very much" (3). Calculation of the CDLQI is the same as that for the DLQI. We used the Serbian version of the CDLQI.²⁰ The CDLQI mean scores were calculated for the whole child population.

Data on stressful life events were obtained by Paykel's Interview for Recent Life Events, a semi-structured interview covering 63 specific and clearly defined life events,²¹ listed according to the level of their unpredictability and unpleasantness, with a level 1 event indicating extreme long-term threat and the bottom choice on the scale indicating the smallest long-term threat.

Statistical analysis

Continuous variables were expressed as mean $\pm$ standard deviation (SD) and categorical variables through frequency and percentage. EASI and physician-assessed disease severity were used as a proxy for clinical condition of the patient. Student's *t*-test was used to assess the differences between mean DLQI and CDLQI scores, and the mean clinical severity scores (EASI) for adults and children. We used the χ^2 -test to compare severity of the disease (mild, moderate and severe) in children and adults.

To compare DLQI/CDLQI scores by disease severity levels (mild, moderate and severe), we used one-way ANOVA. Spearman's rho (ρ) correlation coefficient was used to determine the relationships between clinical severity (EASI) and QOL (DLQI and SF-36 scales in adults and CDLQI scales in children).

Fourteen multiple linear regression models (i.e. one for each of eight SF-36 and six for each DLQI subscale) were used to determine whether SF-36 and DLQI scores were related to several independent variables, such as age, sex, EASI, age at onset of the disease, family history of AD and stressful life events.

A two-tailed *P*-value of 0.05 or less was considered significant. All statistical analyses were performed with the Statistical Package for the Social Sciences ver. 17.0.

RESULTS

The demographic and clinical data of 130 patients (66 adults and 64 children) enrolled in the study are shown in Table 1.

There was significant difference between children and adults related to EASI overall score, with children showing more severe disease than adults ($t = -0.538$; d.f. = 89; $P = 0.000$). However, no statistically significant difference in clinical disease severity was seen between adults and children when we divided them into three groups: mild, moderate and severe (Table 1). Significant difference was found between DLQI and CDLQI mean scores. Children with AD showed significantly impaired HRQOL compared with the adult AD patients ($t = -5.296$; d.f. = 128; $P = 0.024$).

The DLQI and CDLQI scores corresponded well with disease severity (Fig. 1). Increasing disease severity was associated with greater impairment in HRQOL. Mean (SD) DLQI scores were 4.64

(4.19) for mild, 7.43 (3.16) for moderate and 10.13 (5.96) for severe AD, while mean (SD) CDLQI scores were 5.46 (2.70) for mild, 12.31 (4.62) for moderate and 18.47 (4.86) for severe AD. In adults, significant differences were found only between DLQI scores for mild and severe AD, while in children significant differences were found between CDLQI scores for all disease severity levels ($P < 0.01$) (Fig. 1).

The strong correlation was observed between clinical severity (EASI) and all CDLQI subscales with Spearman's correlation coefficients ranging 0.60–0.74 (Table 2). The highest correlations were seen for personal relationships and leisure ($\rho = 0.81$; $P < 0.01$), school or holiday and leisure ($\rho = 0.75$; $P < 0.01$), and sleep, symptoms and feelings ($\rho = 0.69$; $P < 0.01$).

Table 3 displays the correlations among clinical severity (EASI), SF-36 and DLQI scales, measured by Spearman's rank correlation coefficients.

Table 1. Details of the study population

	Children (4–16 years) <i>n</i> = 64 (49%)	Adults (>16) <i>n</i> = 66 (51%)	<i>P</i>
Sex, <i>n</i> (%)			
Female	28 (43.8)	37 (56.1)	0.160 [†]
Male	36 (56.2)	29 (43.9)	
Age, years, mean (SD)	10.89 (4.01)	34.18 (13.43)	
Age, years, at onset of disease, mean (SD)	1.55 (1.27)	13.95 (11.91)	
Duration of disease, years, mean (SD)	9.34 (3.81)	20.23 (13.34)	
EASI, mean (SD)	24.09 (14.25) [§]	11.77 (8.71)	0.000 [‡]
Disease severity, <i>n</i> (%)			
Mild	13 (20.3)	22 (33.3)	0.084 [†]
Moderate	32 (50.0)	24 (36.4)	
Severe	19 (29.7)	30 (30.3)	
CDLQI/DLQI score, mean (SD)	12.75 (6.29)	7.44 (5.10)	0.024 [‡]

[†] χ^2 -Test. [‡]Student's *t*-test. [§]Only for children (*n* = 46) older than 8 years. EASI, Eczema Area and Severity Index; CDLQI, Children's Dermatology Life Quality Index; DLQI, Dermatology Life Quality Index; SD, standard deviation.

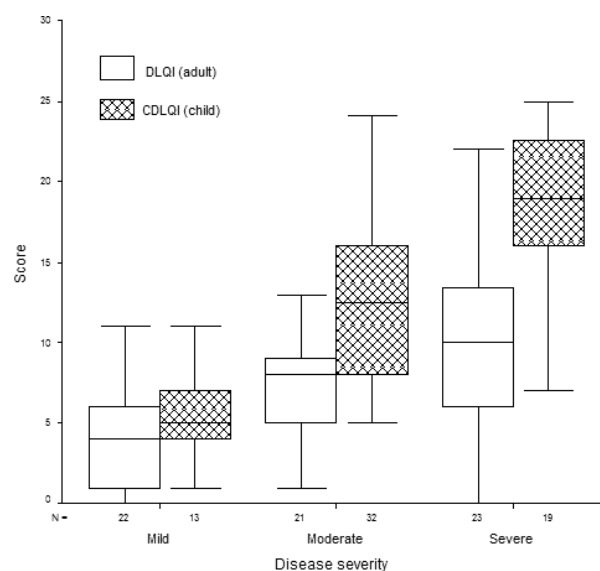


Figure 1. Dermatology Life Quality Index (DLQI) and Children's Dermatology Life Quality Index (CDLQI) scores stratified by disease severity. Patients were divided according to the Eczema Area and Severity Index (EASI) in adults (as mild [<7.07], moderate [7.071 – 15.60] and severe [>15.61]) and physician's assessment in children (as mild [1], moderate [2] and severe [3]).

Table 2. Correlation matrix of clinical severity and Children's Dermatology Life Quality Index (CDLQI)

	CDLQI					
	Symptoms and feelings	Leisure	School or holiday	Personal relationships	Sleep	Treatment
EASI	0.72*	0.72*	0.74*	0.65*	0.65*	0.60*
CDLQI						
Treatment	0.57*	0.68*	0.55*	0.57*	0.45*	
Sleep	0.69*	0.54*	0.43*	0.47*		
Personal relationships	0.65*	0.81*	0.63*			
School or holiday	0.65*	0.75*				
Leisure	0.67*					

* $P < 0.01$. EASI, Eczema Area and Severity Index.

Table 3. Correlation matrix of clinical severity, Short Form 36 (SF-36) and Dermatology Life Quality Index (DLQI) instruments

	SF-36						DLQI							
	PF	RF	BP	GH	VT	SF	RE	MH	Symptoms and feelings	Daily activities	Leisure	Work/school	Personal relationships	Treatment
EASI	-0.16	-0.23	-0.24	-0.11	-0.03	-0.09	-0.14	0.01	0.42**	0.41**	0.47**	0.47**	0.14	0.37**
DLQI	-0.38**	-0.20	-0.31*	-0.27*	0.08	-0.22	-0.20	-0.07	0.37**	0.31*	0.26*	0.64**	0.42**	
Treatment	-0.27*	-0.34**	-0.31*	-0.22	-0.13	-0.35**	-0.29*	-0.15	0.42**	0.32**	0.46**	0.33**		
Personal relationships	-0.21	-0.33**	-0.13	-0.30*	-0.34**	-0.36**	-0.11	-0.17	0.56**	0.42**	0.53**			
Work/school	-0.33**	-0.33**	-0.27*	-0.23	-0.01	-0.24	-0.21	0.02	0.44**	0.43**				
Leisure	-0.21	-0.20	-0.10	-0.11	-0.31*	-0.34**	-0.10	-0.21	0.75**					
Daily activities	-0.27*	-0.24	-0.08	-0.14	-0.32**	-0.24	-0.16	-0.26*						
Symptoms and feelings														
SF-36														
MH	0.10	0.25*	0.24	0.39**	0.49**	0.48**	0.29							
RE	0.21	0.55**	0.44**	0.19	0.04	0.38**								
SF	0.30*	0.47**	0.33**	0.59**	0.50**									
VT	0.13	0.19	0.07	0.31*										
GH	0.33**	0.29*	0.25*											
BP	0.31*	0.45**												
RP	0.42**													

* $P < 0.05$; ** $P < 0.01$. PF, physical functioning; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health; EASI, Eczema Area and Severity Index.

The highest correlations were seen between symptoms and feelings and daily activities ($\rho = 0.75$; $P < 0.01$), symptoms and feelings and work/school ($\rho = 0.56$; $P < 0.01$), and leisure and work/school ($\rho = 0.53$; $P < 0.01$) for subscales of the DLQI; and between social functioning and general health ($\rho = 0.59$; $P < 0.01$), role emotional and role physical ($\rho = 0.55$; $P < 0.01$), and social functioning and vitality ($\rho = 0.50$; $P < 0.01$) for domains of the SF-36. Spearman's correlation coefficients between SF-36 and the DLQI scales ranged between -0.26 and -0.38 and were mainly moderate. The correlation was observed between clinical severity and all DLQI subscales except personal relationships, but no correlation was observed between clinical severity and SF-36 subscales.

The results of linear regression analyses are shown in Table 4. Clinical severity was significant for all DLQI scales (symptoms and feelings, daily activities, leisure, work and school, personal relationships and treatment) and only for one of the eight SF-36 scales (bodily pain). Age was significant for SF-36 physical functioning and role physical, while age of onset was not significantly related to SF-36 and DLQI scores. Family history of disease was significant for SF-36 bodily pain and DLQI personal relationships, while sex was significant only for one of the four DLQI scales (daily activities), and stressful life events only for SF-36 role emotional.

The mean overall scores on the SF-36 for our AD patients ranged 51.3–80.5 across the different SF-36 subscales, with the lowest scores for mental health and vitality (Table 4).

DISCUSSION

Atopic dermatitis is a chronic relapsing condition that can have considerable effects on the QOL of sufferers. This study examined the impact of AD on HRQOL using three instruments: the SF-36 and DLQI for adults and CDLQI for children. All the instruments showed good internal consistency with mean Cronbach's alpha coefficients of 0.73 for the SF-36, 0.84 for DLQI and 0.92 for CDLQI.

One strategy for interpreting HRQOL scores is to compare generic scores from the studied population with the average values for a general population. This is the strength of using generic instruments, compared with disease-specific instruments where the questions may not be relevant to a healthy population.²² The SF-36 scores for study patients were significantly lower for social functioning and mental health while the SF-36 physical functioning, bodily pain and general health scores were higher than corresponding SF-36 scores in the general Croatian population.¹⁸ Those findings are similar to the published data.²³ According to the results of the US study, patients with AD showed significantly impaired HRQOL compared with the general US population in the vitality, social functioning and mental health subscales of the SF-36.²³

In comparison with psoriatic patients,²⁴ our AD patients showed better QOL in almost all SF-36 domains. In one Swedish study, there was no significant difference on the SF-36 between patients with AD and patients with psoriasis (excluding patients with psoriatic arthritis), but patients with psoriatic arthritis had significantly lower HRQOL than patients with AD.²² Some of the previous studies found AD patients to have poorer HRQOL than patients with psoriasis.^{12,25} However, those studies did not state whether they included psoriatic arthritis patients.

Table 4. Standardized regression coefficients in multiple linear regression models of scores on Short Form 36 (SF-36) and Dermatology Life Quality Index (DLQI) subscales

	SF-36								DLQI					
	PF	RP	BP	GH	VT	SF	RE	MH	Symptoms and feelings	Daily activities	Leisure	Work/school	Personal relationships	Treatment
Mean scores	80.5	56.1	74.1	62.0	54.2	67.2	57.1	51.3	2.58	1.29	1.42	0.58	0.62	0.94
Sex	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.23*	ns	ns	ns	ns
Age	-0.37*	-0.37*	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Age at onset	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
EASI	ns	ns	-0.33**	ns	ns	ns	ns	ns	0.46**	0.55**	0.54**	0.43**	0.40**	0.39**
Stressful life events (mean)	ns	ns	ns	ns	ns	ns	-0.27*	ns	ns	ns	ns	ns	ns	ns
Family history of AD	ns	ns	-0.35**	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.26*	ns

* $P < 0.05$; ** $P < 0.01$. AD, atopic dermatitis; PF, physical functioning; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health; EASI, Eczema Area and Severity Index.

Our study also examined impact of AD on HRQOL in association with disease severity. In order to assess the disease severity of AD we used the EASI, while in children, beside the EASI, we also used physician assessment of disease severity. The reason is that according to recommendation, the EASI was used only for children 8 years of age and older. The EASI is an easily understood and simple system that can be used by practitioners and investigators to standardize the baseline evaluation of AD and track changes in AD over time.¹⁰ Because the EASI is a composite score, it allows for individual components to be assessed either separately or in combination, which provides a more complete evaluation of the patient's condition. However, it is worth noting that the EASI does not attempt to include symptoms, such as pruritus, sleep disturbance and soreness, in the overall score. That was why these symptoms were recorded and included in the assessment of clinical severity of our patients.

According to the overall EASI scores, children showed more severe disease than adults. However, there was no difference in disease severity when we compared adults and children distributed between the three groups (mild, moderate and severe). The reasons could be as following: (i) children younger than 8 years ($n = 18$) for whom the EASI was not assessed had less severe disease than older children; and (ii) our decision to divide adult patients into EASI tertiles (mild, moderate and severe), as no cut-off scores have been recommended, could not be appropriate.

A significant correlation was observed between the EASI and symptoms and feelings, daily activities, leisure, work or school and treatment QOL scales of the DLQI. In all cases, greater severity of disease was associated with greater impairment in HRQOL, which is in accordance with published data.²⁶

Our study has shown that there was strong correlation between disease severity assessed by physician and by the EASI and all domains of the DLQI. Our results are in agreement with the findings of the previous studies.^{23,27,28}

It is important to note that QOL and disease severity, while related, are different constructs with different functions, because QOL instruments are valid and valuable outcomes in themselves and should not be seen as indirect measures of disease severity.²⁹

To detect functional and psychological problems in adult AD patients that may have been omitted, we used the generic QOL questionnaire (SF-36). For assessment of relevant skin-specific aspects of disease-related QOL, we used a dermatology-specific QOL instrument (DLQI). The DLQI scores found in this study were somewhat higher than in other studies.^{22,23}

This study also provides a cross-validation of the SF-36 and DLQI. The correlation coefficients between the scales of the two questionnaires ranged from -0.26 (DLQI symptoms and feelings and SF-36 mental health) to -0.38 (DLQI treatment and SF-36 physical functioning). The strongest correlations were found between DLQI scales and SF-36 social functioning and vitality, which is highly relevant, because psychosocial domains have been shown to be very important for patients with skin diseases.³⁰⁻³² Our results are in accordance with the published data.^{22,23} The correlations between the DLQI and SF-36 suggest that both instruments can yield important information about HRQOL in patients with skin diseases.

According to our results, age (for SF-36 physical functioning and role physical), sex (only for DLQI daily activities), family history of the disease (for SF-36 bodily pain and DLQI personal relationships), and stressful life events (only for SF-36 role emotional) were found to be correlated with the QOL of patients with AD.

The decrease of physical domains of HRQOL measured by the SF-36 was seen with increasing age, but the influence of age on mental health of our patients was not seen. This is in concordance with previous findings for AD and other dermatology patients,^{22,33} where age was inversely related to HRQOL.

The present study found no sex effect on HRQOL, except on the daily activities, and this is in line with other studies.²² We noticed the influence of the family history of AD on the HRQOL of our patients only for bodily pain. One explanation could be that we did not find

any significant difference in QOL between patients with or without a family history of AD.

The onset or exacerbation of AD often follows stressful life events.^{34,35} Divorce or separation of parents and severe disease of a family member have been identified as particularly increasing risk.³⁴ In some severe cases of adult patients with AD, psychosocial stresses such as human relations, pressure of work, worries about career and anxieties for independence may be involved.³⁶ Consequently, patients who have AD might respond to emotional stress with increased pruritus and scratching, which could aggravate the lesion of AD.¹ Intractable itching also causes significant insomnia, and sleep deprivation leads to fatigue, mood lability and impaired functioning.³¹ It is already known that adults with AD are more anxious and depressed compared with clinical and healthy control groups,^{37,38} which all could lead to poor QOL. Our study found the influence of the stressful life events on the role emotional of AD patients.

In conclusion, our study has shown that AD influences HRQOL, especially in children. Greater severity of disease was associated with greater impairment in HRQOL. The correlations between the DLQI and SF-36 were found for the mental components of the QOL. This study also provides a cross-validation of the SF-36 and DLQI.

Our study further supports the decision to use both generic and skin-specific instruments to assess the impact of AD on patients' QOL.

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