

The Dermatitis Family Impact questionnaire: a review of its measurement properties and clinical application

S.R. Dodington,¹ M.K.A. Basra,² A.Y. Finlay² and M.S. Salek¹

¹Centre for Socioeconomic Research, School of Pharmacy and Pharmaceutical Sciences and ²Department of Dermatology and Wound Healing, School of Medicine, Cardiff University, Cardiff, U.K.

Summary

Correspondence

Andrew Y. Finlay.

E-mail: finlayay@cf.ac.uk

Accepted for publication

5 January 2013

Funding sources

None.

Conflicts of interest

A.Y.F. is joint copyright owner of the Dermatitis Family Impact (DFI) questionnaire and the Family Dermatology Life Quality Index (FDLQI). M.K.A.B. is joint copyright owner of the FDLQI. Cardiff University gains income from the use of the DFI and FDLQI if used by pharmaceutical companies.

DOI 10.1111/bjd.12232

The Dermatitis Family Impact (DFI) questionnaire is a disease-specific measure to assess the impact of atopic eczema on the quality of life (QoL) of the parents and family members of affected children. We set out to review the published literature and to collate data on the clinical and psychometric aspects of the DFI questionnaire from its development in 1998–2012, in order to create a single source of reference for users of the DFI. A literature search was performed of publications, including abstracts, describing the use of the DFI between 1998 and 2012. In total, we identified 53 publications (37 full articles and 16 abstracts) describing the use of the DFI in 50 studies. Only one study demonstrated test–retest reliability ($r = 0.95$). Three studies demonstrated internal consistency, with Cronbach α ranging from 0.85 to 0.90. Fifteen studies showed sensitivity to change of DFI scores, with significant differences between baseline and the end of the study. Twenty-six studies correlated the DFI to other objective and subjective instruments to demonstrate its construct (convergent) validity. Seventeen validated translations of the DFI have been used in 16 different countries (including two multinational studies). Nine clinical studies have assessed the effectiveness of five different topical drugs and one probiotic supplement. Two studies have assessed the effectiveness of care by dermatology nurses and dermatologists. The use of the DFI has revealed the major impact of atopic eczema on the QoL of families of affected children. The strengths of the DFI include wide international experience of its use, defined test–retest reliability, good internal consistency, sensitivity to change, and good construct (convergent) validity. Areas requiring further research include creation of validated score descriptors, assessment of minimum important clinical difference and testing of dimensionality, factor structure and differential item functioning.

Dermatologists are aware of the major impact that having a child with atopic dermatitis (AD) can have on the quality of life (QoL) of other family members.^{1,2} It is therefore not surprising that the first method described to measure the impact of a skin disease on the family, the Dermatitis Family Impact (DFI) questionnaire, was concerned with AD.³ The DFI has since been widely used in both methodological and clinical research.

Another validated questionnaire, the Family Dermatology Life Quality Index (FDLQI),⁴ can also be used to measure this impact on the family (the 'Greater Patient' concept),⁵ but despite the availability of the FDLQI since 2007, the DFI has continued to be used in the setting of AD studies and in other diseases.

The published descriptions of the use of the DFI contain aspects of validation data that add to the strength of this instru-

ment, but are not readily accessible. The aim of this study was therefore to review all publications describing the use of the DFI between 1998 and 2012, in order to bring together all clinical and validation data to assist potential users of the DFI.

Methods

Description of the Dermatitis Family Impact questionnaire

The DFI was the first instrument documenting the impact of having a child with AD on family QoL.³ The 10-item disease-specific questionnaire was formed after ethnographical interviews and focus groups revealed the areas of family QoL affected by AD. The self-administered instrument is completed

by an adult family member of a child affected by dermatitis. The items inquire about housework, food preparation, sleep, family leisure activity, shopping, expenditure, tiredness, emotional distress, relationships and the impact of helping with treatment on the main carer's life.³ The DFI questions are scored on a four-point Likert scale ranging from 0 to 3, so that the total DFI score ranges from 0 to 30. The time frame of reference is the past week. A higher DFI score indicates greater impairment in family QoL as affected by AD.⁶

Literature search

All articles and abstracts published in English between 1998 and 2012 and mentioning the use of the DFI were collected and analysed. The literature search was performed using PubMed and Google Scholar using the search terms 'DFI' and 'Dermatitis Family Impact'. Articles were also accessed via Cardiff University libraries, interlibrary journal requests or through direct contact with authors.

Data extraction and synthesis

Validation data were extracted from the articles and recorded using two standardized data collection sheets as used in a previous similar review.⁷ Psychometric data were extracted concerning country, study setting, sample size, reliability analysis, sensitivity to change, validity, cross-cultural adaptations and the statistical methods employed. Clinical data were extracted concerning study design and setting, country, skin condition, disease duration, sample size, age and sex, disease severity assessment, intervention specifics and the mean or median DFI scores at baseline and post-intervention.

Results

In total, 53 publications were identified (37 articles and 16 abstracts). The data in three abstracts were subsequently pub-

lished in full articles and so there were 50 studies identified using the DFI. The DFI has primarily been used in secondary care settings. Other settings include cosmetic science laboratories, academic medical centres and five community-based studies.

Test-retest reliability and internal consistency

Only one study demonstrating test-retest reliability was identified (Table 1).⁸ This study confirmed good reliability.

Three studies confirmed that all items of the DFI measure the same domain, with Cronbach α -values ranging from 0.85 to 0.90.^{9–11} These are high mean values and indicate good reliability and consistency (Table 1).

Sensitivity to change

Fifteen longitudinal studies have demonstrated that DFI scores change in the expected direction in response to changes in the clinical condition of the affected child (Table 2).^{6,8,12–25}

Interpretability or clinical meaningfulness of the scores

There are no published validated score-banding descriptors for the DFI. Despite this, four publications describe the use of non-validated DFI score-banding descriptors (Table 3).^{11,26–28}

Validity

Twenty-six studies have correlated the DFI to other instruments, demonstrating its convergent validity (Table 4).^{3,6,8–11,14,15,25,27–42} Correlations have been reported with QoL instruments, an eczema sign severity instrument and a generic visual analogue scale; the strongest correlation demonstrated was with the Infants' Dermatitis Quality of Life Index (IDQoL).^{8,29,32,33,36}

Table 1 Test-retest reliability and internal consistency studies

Study	Clinical	Country	n	Time interval	Method used	Results
Lewis-Jones <i>et al.</i> ⁸	Hospital (outpatients)	U.K.	72	24 h	Spearman rank correlation (test-retest) Bland-Altman plot (test-retest)	$r = 0.95$ between first and second assessment of DFI Mean of differences between pairs was negligible, mean = 0.11 (no bias between assessments)
Aziah <i>et al.</i> ⁹	Hospital	Malaysia	70	Baseline and 2 weeks later, study interval: March–April 2000	Cronbach α	$\alpha = 0.85$. Study was part of validation and translation of Malay version of DFI
Al Robaee ¹⁰	Hospital	Saudi Arabia	503	NA, study interval: March–June 2009	Cronbach α	$\alpha = 0.90$. Good reliability and consistency
Ho <i>et al.</i> ¹¹	Hospital	Singapore	104	NA, study interval: April 2007 – February 2008	Cronbach α	$\alpha = 0.89$

DFI, Dermatitis Family Impact questionnaire; NA, not available.

Table 2 Sensitivity-to-change studies

Study	Clinical setting	Country	n	Study time interval	Method used	Results
Ben-Gashir <i>et al.</i> ¹³	Primary care (community based)	U.K.	106	6 months, study interval: March 2008 – October 2009	Tobit regression	Mean DFI: first visit: 2.4, second visit: 1.9; mean difference: 0.5; $P = 0.1037$ (NS)
Chinn <i>et al.</i> ¹⁴	Primary care	U.K.	197	DFI completed at 4 weeks and 12 weeks postintervention	t-test	Controls: -0.41 ± 4.0 , intervention: -0.07 ± 4.1 . Mean difference = 0.34 (range -0.8 – 1.5); $P = 0.5$
Thomas <i>et al.</i> ¹⁵	Primary/secondary: general practices and hospital	U.K.	169	DFI completed at baseline and 18 weeks later	Student t-test	Mean $\pm$ SD change from baseline after 18 weeks. Mild: -0.5 ± 2.4 , potent: -0.6 ± 2.2 . Difference = -0.1 (range -0.60 – 0.80); $P = 0.78$
Lewis-Jones <i>et al.</i> ⁸	Hospital (outpatients)	U.K.	25	DFI completed at baseline and 24 h later	Wilcoxon signed-rank test	Before treatment: 11.08 ± 7.74 , after treatment: 7.28 ± 6.33 ; $P = 0.0161$
Baron <i>et al.</i> ¹⁶	Hospital	U.K.	9	DFI completed at 3, 6 and 12 months	NA	Baseline: mean DFI score 18.0, 12-month follow-up 2.5; mean difference 15.5
Beattie and Lewis-Jones ⁶	Hospital	U.K.	49	50 infants completed the DFI within an interval of 10–86 weeks, study interval: March 2001 – June 2004	Wilcoxon matched-pairs signed-rank test	Median DFI scores fell from 9 ± 6.45 to 3 ± 6.56 (95% CI 2–5.5). Mean DFI scores fell from 9.62 ± 6.45 to 5.49 ± 6.56
Grillo <i>et al.</i> ¹⁷	Hospital (medical centre)	Australia	61	DFI completed at weeks 4 and 12 after educational intervention (study duration 3 months)	Analysis of covariance	Baseline: 11.09 ± 8.02 , week 4: 9.63 ± 7.27 , week 12: 7.47 ± 5.79
Grimalt <i>et al.</i> ¹⁸	Hospital	France	78	6 weeks, study interval: January–July 2004	Student t-test	Improvement in QoL from baseline to 6 weeks. Control: 45%, intervention: 56%
Weber <i>et al.</i> ¹⁹	Hospital	Brazil	36	DFI completed at baseline and after follow-up (within 24 months)	Means of SMD	Mean difference (after – before) in SMD: $-0.8 - (-1) = 0.7$
Gerasimov <i>et al.</i> ²⁰	Hospital	Ukraine	90	8 weeks, study interval: June 2007 – June 2008	Paired t-test (two sided)	By week 8, DFI changed from baseline by 35.2% in probiotic group and 23.8% in the placebo group, $P < 0.05$
Schuttelaar <i>et al.</i> ²¹	Hospital (outpatients)	Netherlands	152	DFI completed at baseline and 4, 8 and 12 months, study interval: May 2005 – August 2008	Paired t-test	Mean change from baseline: -4.7 ± 5.5 , $P < 0.001$. Control and intervention group mean DFI scores both improved significantly
Farina <i>et al.</i> ²²	Hospital/community based	Italy	104	2 weeks' treatment and 4 months' follow-up, study interval: August–September 2008	Paired t-test	Reduction in DFI scores from baseline to day 15 and 4 months. Statistically significant reduction compared with baseline ($P < 0.05$)
Thomas <i>et al.</i> ²³	Home based	U.K.	323	16 weeks (12-week trial duration + 4-week observational period)	t-test	Difference between water-softener use and usual care between week 0 and week 12: -1.33 (95% CI -2.63 – 0.03)

Table 2 Continued.

Study	Clinical setting	Country	n	Study time interval	Method used	Results
De Belilovsky <i>et al.</i> ²⁴	Hospital	France	80	DFI completed at baseline and 3 weeks	Wilcoxon test	DFI improved by 67% in the control group and 75% in the intervention group, 3 weeks from baseline ($P < 0.01$)
Wootton <i>et al.</i> ²⁵	Community	U.K.	226	DFI completed at baseline and 12 weeks	Difference of means Correlation between eczema severity and DFI score Comparison of change of DFI scores from baseline to week 12 with change in accelerometer scores, Spearman rank test	Difference (week 12 to week 0): -2.4 ± 5.7 23% reduction in DFI scores was associated with 20% improvement in eczema severity (SASSAD) and 27% reduction in POEM score Low, negative correlation; $r = -0.01$, $P = 0.87$

DFI, Dermatitis Family Impact questionnaire; NS, not significant; NA, not available; QoL, quality of life; SMD, standardized mean difference; CI, confidence interval; SASSAD, Six Area, Six Sign Atopic Dermatitis severity score; POEM, Patient-Orientated Eczema Measure.

Table 3 Studies demonstrating the clinical meaningfulness of the Dermatitis Family Impact scores

Study	Type	Country	n	Study specifics	Results	Comments
Ricci <i>et al.</i> ²⁶	Banding system	Italy	45	March–June 2003, cross-sectional	0–5, normal QoL; 6–10, low alteration in QoL; 11–20, moderate alteration; > 20 , high alteration	No statistical validation process performed
Ho <i>et al.</i> ¹¹	Banding system	Singapore	104	April 2007 to February 2008, cross-sectional	0–5, normal QoL; 6–10, minor alteration in QoL; 11–20, moderate alteration; > 20 , high alteration	No statistical validation process performed. Cronbach $\alpha = 0.89$
Al Shobaili ²⁷	Banding system	Saudi Arabia	447	April–July 2009, cross-sectional	0–5, normal QoL; 6–10, low alteration; 11–20, moderate alteration; > 20 , high alteration in QoL	No statistical validation process performed. Author assumed the banding was already validated in the Italian 2007 trial
Amaral <i>et al.</i> ²⁸	Point range system	Brazil	50	January 2009 to September 2010	0–1, no impact; 2–6, moderate impact; 7–12, high impact; 13–30, higher impact	Point range taken from the CDLQI questionnaire.

QoL, quality of life; CDLQI, Children's Dermatology Life Quality Index.

Table 4 Validation studies – correlation of the Dermatitis Family Impact (DFI) questionnaire with other measures

Study	Clinical settings	Country	n	Validity type	Methods	Results
Lawson <i>et al.</i> ³	Hospital	U.K.	82	Convergent: score of total number of problem areas correlated with total severity score	Correlation method not stated	$r = 0.55$, $P = 0.002$
Lewis-Jones <i>et al.</i> ²⁹	Hospital (outpatients)	U.K.	84	Convergent: correlation of the IEIQL/IDQoL with DFI	Spearman rank correlation coefficient	$r = 0.90$ (95% CI 0.84–0.94)
Foo and Schofield ³⁰	Hospital	U.K.	52	Construct: correlation of disease severity with DFI	NA	NA, disease severity correlated positively with pretreatment DFI scores in group 1
Shin <i>et al.</i> ³¹	Hospital	Korea	NA	Convergent: DFI linearly related to severity	Regression analysis	$R^2 = 0.161$ ($P = 0.003$)
Aziah <i>et al.</i> ⁹	Hospital	Malaysia	70	Convergent	Kappa analysis of agreement	NA, an average of moderate agreement between the interviews at a 2-week interval
Thomas <i>et al.</i> ¹⁵	Hospital	U.K.	106	Convergent: correlation between DFI and SCORAD-D at visits 1 and 2	Multiple regression	Each unit increase in SCORAD-D was associated with a 0.21-unit increase in the quality of family life on the first visit (95% CI 0.06–0.37, $P = 0.008$). On the final visit each unit increase in SCORAD-D led to a 0.37-unit increase (95% CI 0.15–0.59, $P = 0.001$). At 6 months, each unit change in SCORAD-D was associated with a 0.17-unit change in family QoL (95% CI 0.06–0.29, $P = 0.002$)
Chinn <i>et al.</i> ¹⁴	Primary care	U.K.	120 197	Convergent: correlation of CDLQI with DFI Convergent: correlation of DFI with change in QoL at 4 weeks from baseline Convergent: correlation of DFI with change in QoL at 12 weeks from baseline	NA t-test	$r = 0.67$, $P < 0.001$, positive correlation 97 younger children: $r = 0.40$ ($P < 0.001$); 100 older children: $r = 0.45$ ($P < 0.001$); 97 younger children: $r = 0.63$ ($P < 0.001$); 100 older children: $r = 0.83$ ($P < 0.001$) $r = 0.87$ (95% CI 0.82–0.92), high correlation
Lewis-Jones <i>et al.</i> ⁸	Hospital (outpatients)	U.K.	89	Convergent: correlation between IDQoL and DFI	Spearman rank correlation coefficient	$r = 0.50$ (95% CI 0.32–0.64)
Beattie and Lewis-Jones ⁶	Hospital	U.K.	203	Correlation of DFI with clinical severity as assessed by parents Convergent: correlation of the DFI with IDQoL Correlation of the parental assessment of global severity of AD with the DFI	Spearman rank correlation coefficient	$r = 0.776$ (95% CI 0.73–0.84), $P < 0.001$ $r = 0.394$ (95% CI 0.27–0.51), $P < 0.001$
Gånemo <i>et al.</i> ³²	Hospital	Sweden	77	Convergent: correlation of DFI with (i) Rajika and Langeland score, (ii) objective SCORAD, (iii) IDQoL, (iv) CDLQI	Spearman correlation coefficient	(i) 0.44 ($P < 0.01$), (ii) 0.18 ($P > 0.05$), (iii) 0.78 ($P < 0.01$), (iv) 0.44 ($P < 0.01$)
Park and Lee ³³ Chernyshov ³⁴	Hospital –	Korea Ukraine	101 60	Convergent: correlation of DFI with EASI Discriminant	Linear regression NA	$R^2 = 0.154$ ($P < 0.001$) Use of Trixera emollient cream led to decrease in SCORAD and improvement in family QoL ($P < 0.01$)
Ahmad and Ramsay ³⁵	Hospital	Ireland	51	Convergent: correlation of DFI with disease severity (TIS)	NA	'Strong positive correlation between severity and QoL scores'
Alvarenga and Caldeira ³⁶ Chernyshov ³⁷	Hospital NA	Brazil Ukraine	86 21	Convergent: correlation of DFI with EASI Correlation between mean DFI score and SCORAD (mothers vs. fathers)	Pearson correlation coefficient Wilcoxon matched-pairs test	$r = 0.337$ Mothers: 10.38 ± 6.25 , fathers: 9.86 ± 4.28 ; 'no significant difference'

Table 4 Continued.

Study	Clinical settings	Country	n	Validity type	Methods	Results
Msika ³⁸	NA	France	86	Correlation of DFI with SCORAD	Pearson correlation coefficient	Significant correlation (no value) after 21 days of treatment with new emollient ($P < 0.01$)
Al Robaee ¹⁰	Hospital	Saudi Arabia	379	Discriminant	Independent Student t-test	DFI mean score had a highly significant difference in cases vs. controls, 13.84 ± 2.98 vs. 3.0 ± 1.5 ($P = 0.00$). A statistically significant rise in DFI mean scores with increasing severity of AD ($P < 0.01$) $P = 0.0048$. DFI used in unapproved disease: congenital ichthyosis $r = 0.35$ ($P < 0.01$) $\beta = 0.089$, SE = 0.024 ($P < 0.001$) SF-12 PH: $r = -0.24$ ($P < 0.05$); SF-12 MH: $r = -0.52$ ($P < 0.01$) age 5–8 years: $r = 0.004$; 9–16 years: $r = 0.34$; 5–16 years: $r = 0.04$. DFI used in unapproved disease: psoriasis $P = 0.0001$ (no value) $P = 0.04$ (no value) $r = 0.414$ ($P = 0.001$) $r = 0.755$ ($P < 0.0001$) DFI as a criterion variable ($P < 0.008$) with SCORAD explained 31% of variance (adjusted $R^2 = 0.308$). 'Mean DFI scores differed in relation to AD severity levels ($P < 0.0005$)' $r = 0.79$, worse QoL with increasing severity of disease
Gånemo ³⁹	NA	Sweden	15	Convergent: correlation of DFI and CDLQI	No method stated	Girls ($n = 25$): $r = 0.05$ ($P = 0.74$); boys ($n = 25$): $r = 0.21$ ($P = 0.32$)
Ho <i>et al.</i> ¹¹	Hospital	Singapore	104	Correlation of DFI with SCORAD Correlation of DFI with SF-12 PH (physical) and SF-12 MH (mental)	Pearson correlation coefficient Univariate linear regression analyses Pearson correlation coefficient	Girls ($n = 25$): $r = 0.32$ ($P = 0.12$); boys ($n = 25$): $r = 0.50$ ($P < 0.05$) (i) 41-item: $P = 0.68$; (ii) 33-item: $P = 0.66$
Gånemo <i>et al.</i> ³²	Hospital	Sweden	45	Convergent: correlation of DFI with CDLQI for different age ranges	Spearman rank-order correlation coefficient	(i) 41-item: $P = 0.68$; (ii) 33-item: $P = 0.66$
Monti <i>et al.</i> ⁴⁰	Hospital	Italy	60	Correlation with PASI Correlation with VAS itch Correlation between SCORAD and DFI Correlation between DFI and IDQoL/CDLQI Objective SCORAD and DFI	Pearson correlation coefficient Multiple linear regression analyses	0.29 ($P < 0.0001$), statistically significant but weak association
Al Shobaill ²⁷	Hospital	Saudi Arabia	447	Convergent: correlation between SCORAD and DFI	NA	$r = 0.635$, $P = 0.0001$
Chernyshov ⁴¹	Hospital	Ukraine	50	Correlation between SCORAD and DFI score	Spearman correlation coefficient	
Neri <i>et al.</i> ⁴²	Hospital	Italy	126	Correlation between patient age (months) and DFI score Convergent: correlation between DFI and (i) 41-item CADIS domain; (ii) 33-item CADIS domain Discriminant/divergent: correlation between DFI score at baseline and percentage of the night spent moving (Actiwatch scores)	Spearman ρ correlation coefficient	
Wootton <i>et al.</i> ²⁵	Community	U.K.	235	Convergent: correlation between CDLQI and DFI scores	Spearman rank test	
Anaral <i>et al.</i> ²⁸	Hospital	Brazil	50		Spearman correlation coefficient	

IELQI, Infants' Eczema Life Quality Index; IDQoL, Infants' Dermatitis Quality of Life index; CI, confidence interval; NA, not available; SCORAD-D, objective Scoring Atopic Dermatitis; CDLQI, Children's Dermatitis Life Quality Index; QoL, quality of life; AD, atopic dermatitis; EASI, Eczema Area and Severity Index; TISS, Therapeutic Intervention Scoring System; PASI, Psoriasis Area Severity Index; VAS, visual analogue scale; SF-12, 12-item Short-Form Health Survey; CADIS, Childhood Atopic Dermatitis Impact Scale.

Table 5 Studies reporting cross-cultural adaptations of the Dermatitis Family Impact questionnaire

Study	Clinical setting	Country	n	Study specifics	Method used	Results	Comments
Aziah <i>et al.</i> ⁹	Hospital	Malaysia	70	Longitudinal study. Severity assessment: SCORAD	Forward translation, back translation, translation re-examined to ensure exact equivalence	Kappa analysis showed moderate agreement	No value given, translation not yet accepted as valid
Gånemo <i>et al.</i> ⁴⁴	Hospital	Sweden	78	Longitudinal. Severity assessment: SCORAD	Forward translation, back translation (professional)	Identical except minor adjustments needed to one question. Pilot study confirmed it was comprehensible and clear	No statistical analysis of translation
Ricci <i>et al.</i> ²⁶	Hospital	Italy	45	Cross-sectional study. Severity assessment: SCORAD	Forward translation, back translation	'Validated'	No statistical analysis of translation, nor in-depth explanation of process
Chernyshov, ^{34,37,41}	—	Ukraine	60	Cross-sectional and longitudinal/psychometric studies. Severity assessment: SCORAD	Forward translation (independent), back translation. Repeated six times. Final translation accepted	—	Test-retest reliability, validity and sensitivity were 'checked'
Al Robaee ¹⁰	Hospital	Saudi Arabia	503	Cross-sectional survey. Severity assessment: SCORAD	Forward translation (independent), back translation. Final translation accepted. Small pilot study to assure comprehensibility	'Approved'	Translated version is established as an efficient tool in terms of reliability and validity
Jiráková <i>et al.</i> ⁴⁵	Hospital	Czech Republic	20	Cross-sectional	Forward translation, professional back translation. Pilot study (n = 20)	Copyright holder notified	Confirmed comprehensive and clear

SCORAD, Scoring Atopic Dermatitis.

Translations and cross-cultural adaptations

The DFI has been translated from English into 17 languages using a process of independent forward and back translation, and the direct translations were confirmed as accurate by the Department of Dermatology in Cardiff.⁴³ The translations available are in Arabic, Chinese, Czech, Dutch, Dutch for Belgium, French, Greek, Italian, Japanese, Norwegian, Polish, Portuguese, Portuguese for Brazil, Spanish, Swedish, Taiwanese and Ukrainian.

However, only six publications mentioned the process of cross-cultural adaptation to culturally and linguistically adapt the DFI to the target country (Table 5).^{9,10,26,34,37,41,44,45} In these cross-cultural adaptations of the DFI, steps four and five of a recommended methodology for cross-cultural adaptation, 'pre-testing' and 'weighting of scores', were not described.⁴⁶

Clinical data

Thirty-seven studies describe the use of the DFI in clinical studies, with mean DFI scores ranging from 0.4 to 18.0 (Table 6).^{3,6,8,10,13–28,30,32,33,35,36,39–41,44,45,47–52} The DFI has been used in 16 countries (including two multinational studies in Europe), in therapeutic interventions, descriptive studies, drug clinical trials, psychometric studies or clinical practice research studies (Table 7).^{3,6,8–11,13–42,44,45,47–58} Even though the DFI is specifically for use in AD, it has been used in eight skin diseases other than AD. These include melasma, lentigo, psoriasis, ectodermal dysplasia and congenital ichthyosis.^{32,39,50,54} It has been used in nine therapeutic interventions, including two structured educational programmes (Table 8),^{16,17,19,21–23,25,49,51,53,58} and two studies assessing the effectiveness of dermatology-trained nurses, specialist nurses and dermatologists in clinical practice (Table 9).^{14,48}

Table 6 Utility: the use of the Dermatitis Family Impact (DFI) questionnaire in controlled studies

Study	Clinical setting	Country	n	Patient age range	Mean DFI score before intervention	Mean DFI score after intervention	Comments
Lawson <i>et al.</i> ³	Hospital	U.K.	82	6 months to 10 years 1 month	Intervention: 9.6 ± 7.0 ($n = 56$). Control: 0.4 ± 0.9 ($n = 26$)	NR	NR
Foo and Schofield ³⁰	Hospital	U.K.	52	5 months to 14 years	Group 1 (first attendance): 11.4 ± 7.2 ($n = 24$). Group 2 (review): 12.4 ± 7.6 ($n = 28$)	NR	NR
Lewis-Jones <i>et al.</i> ⁸	Hospital (outpatients)	U.K.	89	NA. M: mean 1.68 years ($n = 61$). F: mean 2.02 years ($n = 28$)	8.87 ± 7.06	NR	Follow-up patients ($n = 25$): first visit: 11.08 ± 7.74 , second visit: 7.28 ± 6.33 ; Wilcoxon $P = 0.0161$
Al Robaee ¹⁰	Hospital	Malaysia	70	6 months to 15 years	First interview: 9.4 ± 5.3	Second interview: 7.8 ± 4.8	NR
Ben-Gashir <i>et al.</i> ¹³	Primary care (community based)	U.K.	106	NA. Mean 8.0 (first visit), mean 8.2 (second visit)	2.4	1.9	No significant improvement as seen by the parents.
Chinn <i>et al.</i> ¹⁴	Primary care (general practitioners)	U.K.	119	Younger children: 6 months to 4 years ($n = 115$); older children: 4–16 years ($n = 120$)	Younger children: 4.6 ± 5.4 ; older children: 4.8 ± 4.9	NR	NR
Thomas <i>et al.</i> ¹⁵	Primary/secondary. General practices and hospital setting	U.K.	172	NA	Hospital: mild 4.9 ± 6.1 ; potent 4.1 ± 5.3 . Community: mild 2.5 ± 3.2 ; potent 2.9 ± 3.9	Hospital: NA. Community: (n = 169): mild -0.5 ± 2.4 ; potent -0.6 ± 2.2	Mean change from baseline. Difference: -0.1 (range $-0.60-0.80$) ($P = 0.78$)
Balkrishnan <i>et al.</i> ⁴⁷	Hospital (academic medical centre)	U.S.A.	49	1–12 years	9.7 ± 7.3 (range 0–30)	NR	NR
Balkrishnan <i>et al.</i> ⁴⁸	Hospital (academic medical centre)	U.S.A.	35	1–12 years	10.0 ± 7.5 (range 1–30)	5.7 ± 4.1 (range 1–18)	DFI scores were reduced by 43% after the medical-care episode ($P < 0.01$)
Beattie and Lewis-Jones ⁴⁹	Hospital	U.K.	19	Intervention: mean = 1.77. Control: mean = 1.44	Intervention: 11.2 (range 7.6–14.8). Control: 13 (range 5.6–20.4)	Intervention: 6.7 (range 3.5–9.9). Control: 5.4 (range 1.1–9.8)	WWT. Median change in DFI score: intervention = 2, control = 5, ($-14-2$, $P = 0.42$)
Baron <i>et al.</i> ¹⁶	Hospital	U.K.	2	One 12-year-old F. One 5-year-old M	18.0	2.5	Baseline to 12-month follow-up
Beattie and Lewis-Jones ⁶	Hospital	U.K.	202	1 month to 4 years	8.47 ± 6.5	NR	NR
Grillo <i>et al.</i> ¹⁷	Hospital	Australia	61	5 months to 13 years	Intervention: 11.09 ± 8.02 . Control: 10.86 ± 6.47	Intervention: 7.47 ± 5.79 . Control: 7.89 ± 5.85	Marginal improvements between week 4 and week 12; however, no significant differences
Gånemo <i>et al.</i> ⁴⁴	Hospital	Sweden	77	2–15 years	8.3 ± 6.0	NR	Median = 8.0 (range 0–27)

Table 6 Continued

Study	Clinical setting	Country	n	Patient age range	Mean DFI score before intervention	Mean DFI score after intervention	Comments
Grimalt <i>et al.</i> ¹⁸	Hospital	France	78	1–12 years	Intervention: 5.30 ± 5.23 , Control: 6.42 ± 5.32	NR	DFI mean scores higher in control than intervention group
Ricci <i>et al.</i> ²⁶	Hospital	Italy	44	3–7 years	Intervention: 11, Control: 7.4	NR	NR
Park and Lee ³³	Hospital	Korea	101	0–6 years	10.05	NR	NR
Rice <i>et al.</i> ⁵⁰	Hospital	U.S.A.	28	NA, Mean = 6.9 years	7.7 $\pm$ 7.4	NR	Unapproved disease: ectodermal dysplasia
Weber <i>et al.</i> ¹⁹	Primary care	Brazil	36	NA	Intervention: 7.56 ± 4.94 , Control: 12.87 ± 8.59	NR	DFI scores failed to show differences/improvements in QoL of patients' relatives after treatment
Ahmad and Ramsay ³⁵	Hospital	Ireland	51	NA, Mean = 23 months	8.70 (range 0–27)	NR	NR
Alvarenga and Caldeira ³⁶	Hospital	Brazil	86	NA, Median = 25.2 months	Intervention: 8.5 ± 4.4 (range 1–17), Control: 1.0 ± 1.3 (range 0–5)	NR	Medians: intervention = 8.5, control = 1.0
Ricci <i>et al.</i> ⁵¹	NA	Italy	30	5 months to 5 years	8.8	4.4	NR
Al Robaee ¹⁰	Hospital	Saudi Arabia	503	NA, Mean = 5.48 years	Patients: 13.84 ± 2.98 (n = 379), Controls: 3.0 ± 1.50 (n = 124)	NR	NR
Gånemo ³⁹	NA	Sweden	15	5–16 years	9 (range 3–21)	NR	Unapproved disease: congenital ichthyosis
Gerasimov <i>et al.</i> ²⁰	Hospital	Ukraine	90	12–36 months	Intervention: 12.2 ± 4.0 , Control: 12.6 ± 3.6	Change from baseline at 8 weeks: Intervention: -4.3 ± 1.7 , Control: -3.0 ± 2.7	Medians: intervention = 13.0 (range 5.2–18.9), control = 11.0 (range 6.0–20.7)
Schuttelaar <i>et al.</i> ²¹	Hospital (outpatients)	Netherlands	152	< 4 years (n = 35), 4–16 years (n = 20)	Intervention: 8.0 ± 5.6 , Control: 9.2 ± 6.7	Intervention: 4.0 ± 4.8 , Control: 5.1 ± 5.5	NR
Gånemo <i>et al.</i> ³²	Hospital	Sweden	45	4–16 years	5.6 ± 5.8	NR	Median = 4 (range 0–25) 'replaced the word eczema with word psoriasis'
Monti <i>et al.</i> ⁴⁰	Hospital	Italy	60	1–12 years	7.95 ± 6.21 (range 0–23)	NR	NR
Thomas <i>et al.</i> ²³	Home based	U.K.	323	6 months to 16 years	Intervention: 10.0 ± 6.8 , Control: 11.2 ± 7.3	Intervention: 6.8 ± 6.0 , Control: 9.3 ± 7.1	Mean change: intervention -3.2 ± 6.2 , control -1.8 ± 5.4
Farina <i>et al.</i> ²²	Hospital/community based	Italy	104	NA, Intervention: mean = 7.8, Control: mean = 7.2	Intervention: 8.5 ± 5.8 , Control: 8.2 ± 3.3	NA (graph only, no absolute values given) intervention: ~ 1, control: ~ 4	Reduction in DFI scores at day 15 and 4 months were significant compared with baseline for both intervention and control groups
Al Robaee and Shahzad ⁵²	Hospital	Saudi Arabia	774	1 year 5 months to 10 years 10 months	13.86 ± 4.23 (range 5–21)	NR	Female: 14.12 ± 4.17 , male: 13.67 ± 4.27 , young: 14.17 ± 5.3 , older: 13.59 ± 3.13

Table 6 Continued

Study	Clinical setting	Country	n	Patient age range	Mean DFI score before intervention	Mean DFI score after intervention	Comments
Al Shobaili ²⁷	Hospital	Saudi Arabia	447	1 year 5 months to 10 years 10 months	13.9 (range 2–25)	NR	NR
De Belilovsky <i>et al.</i> ²⁴	Hospital	France	80	5 months to 5 years	Intervention: 9.95 ± 5.6 , control: 7.10 ± 5.0	Intervention: 2.48, control: 2.35	NR
Chernyshov ⁴¹	Hospital	Ukraine	50	Girls: 9–48 months, boys: 10–48 months	Girls: ~ 7	NR	AD had a greater impact on family QoL in the girls' group ($P < 0.05$)
Jiraková <i>et al.</i> ⁴⁵	Hospital	Czech Republic	202	2 months to 18 years	Mean = 7.98 ± 6.41 , median = 6 (range 0–29)	NR	No statistically significant difference in parental assessment of the DFI (t-test, $P = 0.4$). Also, no statistically significant correlation between the sex of the child with AD and influence on DFI score
Wootton <i>et al.</i> ²⁵	Community	U.K.	226	6 months to 16 years	Baseline: 10.4 ± 6.9	Week 12: 8.0 ± 6.8	Difference from baseline to week 12: -2.4 ± 5.7
Amaral <i>et al.</i> ²⁸	Hospital	Brazil	50	5–16 years	Median = 11 (range 1–30)	NR	NR

NR, not reported; NA, not applicable; M, male; F, female; WWT, wet-wrap treatment; QoL, quality of life; AD, atopic dermatitis.

Table 7 Countries in which the Dermatitis Family Impact questionnaire has been used in clinical research

Country	Number of studies	Type of study	References
Australia	1	Therapeutic intervention	17
Brazil	4	Therapeutic intervention	19, 53
		Descriptive study	28, 36
Czech Republic	1	Descriptive study	45
France	6	Drug clinical trial	18, 24, 38, 54, 55
		Descriptive study	56
France, Spain, Netherlands (multinational study)	1	Drug clinical trial	55
France, Italy, Spain (multinational study)	1	Descriptive study	56
Ireland	1	Descriptive study	35
Italy	6	Psychometric study	26, 42
		Descriptive study	26, 40, 56
		Therapeutic intervention	22, 51
Korea	3	Descriptive study	31, 33, 57
Malaysia	1	Psychometric study	9
Netherlands	2	Therapeutic intervention	21
		Drug clinical trial	55
Saudi Arabia	3	Psychometric study	10, 52
		Descriptive study	27, 52
Singapore	1	Descriptive study	11
Spain	2	Drug clinical trial	55
		Descriptive study	56
Sweden	3	Descriptive study	32, 39, 44
		Psychometric study	32, 44
U.K.	13	Clinical practice research	14
		Descriptive study	3, 13, 29, 30
		Psychometric study	6, 8, 25
		Therapeutic intervention	15, 16, 23, 25, 49, 58
Ukraine	4	Psychometric study	34
		Descriptive study	37, 41
		Drug clinical trial	20
U.S.A.	3	Clinical practice research	48
		Descriptive study	47, 50

Assessment of the efficacy of five different topical drugs was carried out in six clinical studies (Table 10).^{15,18,24,38,54,55} A probiotic supplement (*Lactobacillus acidophilus* and *Bifidobacterium lactis*) was given to 96 patients in a randomized double-blind placebo-controlled trial.²⁰ The mean DFI values $\pm$ SD were: at baseline 12.2 ± 4.0 , control 12.6 ± 3.6 ; and after intervention (change from baseline) -4.3 ± 1.7 , control -3.0 ± 2.7 (probiotic vs. control $P < 0.001$).

Table 8 Therapeutic interventions in which the Dermatitis Family Impact (DFI) questionnaire has been used

Therapeutic intervention	Number of patients treated	Mean DFI score		Remarks	Study
		Before	After		
Wet-wrap therapy (WWT)	19	Intervention: 11.2, control: 13	Intervention: 6.7, control: 5.4	Hydrocortisone and emollient treatment alone is as effective as WWT for infants with moderately severe, widespread AD	Beattie and Lewis-Jones ⁴⁹
Hypnotherapy	9	18.0	2.5	NR	Baron <i>et al.</i> ¹⁶
	19	NA	NA	DFI did not demonstrate any differences or findings	Weber <i>et al.</i> ⁵³
Support-group intervention	36	Intervention: 7.56 ± 4.94, Control: 12.87 ± 8.59	NA	NR	Weber <i>et al.</i> ¹⁹
	61	Intervention: 11.09 ± 8.02, Control: 10.86 ± 6.47	Intervention: 7.47 ± 5.79, Control: 7.89 ± 5.85	No significant differences between the groups. QoL measures did not significantly improve with decreasing severity of disease. Educational intervention decreased the severity of eczema	Grillo <i>et al.</i> ¹⁷
Educational programme (2-h workshop)	30	8.8	4.4	Data showed an improvement in QoL in both parents and children	Ricci <i>et al.</i> ⁵¹
Education programme (six 90-min meetings, one per week)	152	Intervention: 8.0 ± 5.6, Control: 9.2 ± 6.7	Intervention: 4.0 ± 4.8, Control: 5.1 ± 5.5	Intervention: nurse practitioner. Control: conventional care from dermatologist. Care provided by nurse practitioner was comparable with dermatologist	Schutelaar <i>et al.</i> ²¹
Installation of an ion-exchange water softener	323	Intervention: 10.0 ± 6.8, Control: 11.2 ± 7.3	Intervention: 6.8 ± 6.0, Control: 9.3 ± 7.1	Water softeners provided no additional benefit to usual eczema care (observer-blind, parallel-group, randomized trial)	Thomas <i>et al.</i> , ²³ Thomas and Sach ⁵⁸
Balneotherapy (treatment of disease by bathing in mineral springs)	104	Intervention: 8.5 ± 5.8, Control: 8.2 ± 3.3	NA (graph only, no absolute values given), Intervention: ~ 1, control: ~ 4	Intervention: balneotherapy. Control: topical corticosteroids (TCS). Balneotherapy had higher efficacy at month 4 compared with TCS ($P < 0.01$). Study confirms efficacy and safety of balneotherapy in treatment of AD	Farina <i>et al.</i> ²²
Accelerometers to measure disease activity (itch assessment)	336	10.4 ± 6.9	8.0 ± 6.8	Actigraphy did not correlate well with disease severity or QoL. Difference: -2.4 ± 5.7	Wootton <i>et al.</i> ²⁵

AD, atopic dermatitis; NA, not applicable; NR, not reported; QoL, quality of life.

Table 9 Clinical practice research in which the Dermatitis Family Impact (DFI) questionnaire has been used

Clinical practice research	Study specifics	Number of patients treated	Mean of means – DFI score		Remarks	Study
			Before	After		
Dermatology-trained nurse intervention	Cross-sectional study. Severity assessment: five-point parental assessment	119	4.60 4.80	NA NA	Younger children Older children	Chinn <i>et al.</i> ¹⁴
Specialist care given by dermatologist and specialist nurse	Longitudinal study. Atopic dermatitis severity assessed by 47-item questionnaire	35	10.0 ± 7.5	5.7 ± 4.1	DFI scores were reduced by 43% after the medical-care episode	Balkrishnan <i>et al.</i> ⁴⁸

NA, not available.

Discussion

The effect of AD on the QoL of family members of patients has been documented through the establishment of the FDLQI and the 'Greater Patient' concept.^{4,5} There are many far-reaching effects on the family of having a child with AD. Through the understanding of the effect of AD on the QoL of the family as a whole, more emphasis can be focused on treatment compliance and discovering what matters in particular to individual families.

Lengthy physician appointments and the financial expenditure associated with childhood AD both contribute to an increased burden on the family of a child with AD.^{59,60} Carers may experience high stress levels associated with feelings of helplessness regarding their child's symptoms.¹ Families experience financial difficulties in managing AD, yet the cost to society is also significant, estimated at £1240 per year for a patient with severe AD.¹ The 'full breadth of the burden of AD' must be understood.¹ For example, targeting families, with participation in educational programmes, may reduce the personal and family burden of AD, thus helping to reduce the overall cost to society through improved medical, family and psychosocial outcomes.^{17,19}

The acceptance of the DFI has been demonstrated through its widespread inclusion in studies in different countries and settings, and even in other skin diseases. There is evidence of its reliability (Table 1), validity (Table 4) and responsiveness to change (Table 2). It can accurately measure what it intends to measure, i.e. the family impact of AD, over separate points in time.

The use of the DFI as an outcome measure started slowly, being used in only three studies by 2000. In 2001 Lewis-Jones *et al.*⁸ demonstrated further DFI validation, perhaps contributing to its increased use thereafter. Until recently most studies using the DFI have been in the U.K., with a further study supporting the validation of the DFI for use in routine management in 2006.⁶ The use of the DFI outside the U.K.

increased following its use several French studies⁵⁵ from 2003. There appears to be a pattern of author familiarity with the DFI, as research teams with an interest in QoL issues use the DFI repeatedly.

The majority of DFI studies occur in the environment of secondary care hospitals. Increased severity of AD and a better response to therapy in a hospital setting compared with a primary-care setting may maximize the chances of the DFI scores showing significant improvement following intervention.¹⁴

The psychometric properties of the DFI are less well established than other measures such as the Dermatology Life Quality Index. After a dermatology consultation the items of the DFI did not improve to as great an extent as those of the IDQoL.⁶ This may be due to the inherent nature of the DFI, in that it aims to measure the wider family impact of AD as assessed by the parent – a more subjective concept than other, more conventional dermatology measures. This raises the possibility of there being confounding biases such as which parent completes the questionnaire or whether the same parent completes it on subsequent assessments.⁹ One study³⁷ demonstrated that the sex of the parent did not significantly influence the assessment of QoL by the DFI. In a more recent study from the same centre it was also found that the impact of AD on QoL and family QoL was more severe for girls ($P < 0.05$).⁴¹

Another possibly important variable is the number of siblings present in a family, a dimension that could potentially affect DFI responses. Moreover, the DFI question time frame is the assessment of family QoL 'over the previous week'. It is not known how closely respondents bear this in mind when completing the questionnaire. This may introduce some bias when the questionnaire is used at longer intervals in clinical studies. In the majority of studies, the DFI was used in conjunction with other QoL measures such as the Children's Dermatology Life Quality Index or IDQoL. Recall bias cannot be ruled out, because of the similarity of the items in these questionnaires.⁶¹ The use of the DFI has an additional benefit, in that through measuring the family impact of AD it helps to

Table 10 Topical drugs for which the Dermatitis Family Impact (DFI) questionnaire has been used

Drug	Dosage regimen	Study design	Number of patients		Mean DFI		After	Remarks	Study
			Initial	Final	Before				
Betamethasone 0.1%	b.d.	Randomized, double-blind, parallel-group study	207	172	Hospital: mild 4.9 ± 6.1 , potent 4.1 ± 5.3 Community: mild 2.5 ± 3.2 , potent 2.9 ± 3.9	Hospital: – Community (n = 169), change in DFI: mild -0.5 ± 2.4 , potent -0.6 ± 2.2 NA	Mean change from baseline. Difference: -0.1 (range -0.60 – 0.80) ($P = 0.78$)	Thomas <i>et al.</i> ¹⁵	
Emollient cream containing Oat Rhealba extract	b.d.	International, multicentre, parallel-group controlled study	98	NA	NA	NA	Combination of emollient cream and products containing Oat Rhealba extract decreased DFI scores, $P = 0.0301$	Humbert <i>et al.</i> ⁵⁵	
Lipid emulsion (5 Alpha Avocuta)	NA	Open/double-blind vs. placebo, controlled study	NA	NA	NA	NA	No results stated in abstract, merely stated use in clinical studies. Miscellaneous skin diseases including AD	De Belilovsky <i>et al.</i> ⁵⁴	
Exomega lotion (emollient emulsion)	b.d.	Randomized, controlled, clinical phase III study	91	78	Intervention: 5.30 ± 5.23 , control: 6.42 ± 5.32	NA	DFI mean scores were higher in control than intervention group at baseline	Grimalt <i>et al.</i> ¹⁸	
PPAR- α agonist emollient containing SOD, dermocorticoid-sparing agent (Stelatopia)	o.d./b.d.	Randomized, controlled study	86	NA	NA	NA	Evaluation of QoL at week 3 showed that PPAR- α and dermocorticoid agent gave most improvement (73%) ($P < 0.001$)	Msika ³⁸	
PPAR- α agonist cream, 2% SOD	b.d.	Open, randomized study	80	NA	Intervention: 9.95 ± 5.6 , control: 7.10 ± 5.0	Intervention: 2.48, control: 2.35	Control: hydrocortisone butyro-propionate 1 mg g^{-1} . Intervention was statistically superior at baseline ($P < 0.01$)	De Belilovsky <i>et al.</i> ²⁴	
b.d., twice daily; NA, not available; AD, atopic dermatitis; PPAR, peroxisome proliferator-activated receptor; o.d., once daily; QoL, quality of life; SOD, sunflower oleodistillate.									

b.d., twice daily; NA, not available; AD, atopic dermatitis; PPAR, peroxisome proliferator-activated receptor; o.d., once daily; QoL, quality of life; SOD, sunflower oleodistillate.

separate the parents' perception of the impact of disease from their perception of the disease's effect on the child.

In 2007 the FDLQI became available as a generic dermatology instrument.⁴ The process of creation of the FDLQI and its subsequent validation have been much more rigorous than for the DFI.⁶² However, despite this, there is still inappropriate use of the DFI in dermatoses other than AD, such as congenital ichthyosis and psoriasis.^{10,32,39}

Until the DFI became available, there was no instrument to measure the specific effects of childhood AD on the lives of other family members. The scores recorded in clinical studies in 16 countries demonstrate that this impact is considerable, and is experienced by families with an affected child across many cultures, emphasizing that the burden of AD is much wider than often recognized. Clinicians should be aware of this burden and seek to develop ways to identify and support those family members most affected. The demonstrated improvement in DFI scores following effective treatment of AD suggests a close relationship between disease severity and impact on family QoL,^{4,13} providing another clinically relevant reason to create high-quality clinical services for children with AD.

One of the limitations of this review is that the data in the various publications reviewed were not presented consistently, affecting the quality of comparisons and making data hard to collate. Currently there is no information to establish the minimal clinically important difference of DFI scores, and there are no validated score-banding descriptors of DFI score meanings. No studies demonstrated dimensionality, factor structure or differential item functioning; future investigation of these aspects of validation would allow a clearer understanding of the properties of the instrument.

In conclusion, the DFI offers relevant insight into the family construct and how the lives of family members can be affected by having a child with AD. The DFI can effectively record the family impact of AD, as demonstrated through its correlation with other instruments and response to clinical change. Despite having certain psychometric limitations, the DFI is a useful, disease-specific tool with demonstrated construct validity for better understanding of the impact of new interventions on the life of the child's family, leading to optimized management of both.

What's already known about this topic?

- The quality of life of family members may be severely affected by having a child with atopic dermatitis.
- A simple questionnaire, the Dermatitis Family Impact (DFI) questionnaire, can measure this impact.

What does this study add?

- Previously scattered information about the use of the DFI in 50 clinical studies has been collated.

- Satisfactory aspects of its validation include test-retest reliability, internal consistency, sensitivity to change, and cross-correlation to other measures.
- No studies were identified describing minimal important difference, validated score bandings, dimensionality, factor structure or differential item functioning.

References

- 1 Carroll CL, Balkrishnan R, Feldman SR *et al.* The burden of atopic dermatitis: impact on the patient, family and society. *Pediatr Dermatol* 2005; **22**:192–9.
- 2 Warschburger P, Buchholz HT, Petermann F. Psychological adjustment in parents of young children with atopic dermatitis: which factors predict parental quality of life. *Br J Dermatol* 2004; **150**:304–11.
- 3 Lawson V, Lewis-Jones MS, Finlay AY *et al.* The family impact of childhood atopic dermatitis: the Dermatitis Family Impact questionnaire. *Br J Dermatol* 1998; **138**:107–13.
- 4 Basra MKA, Sue-Ho R, Finlay AY. The Family Dermatology Life Quality Index: measuring the secondary impact of skin disease. *Br J Dermatol* 2007; **156**:528–38.
- 5 Basra MKA, Finlay AY. The family impact of skin diseases: the Greater Patient concept. *Br J Dermatol* 2007; **156**:929–37.
- 6 Beattie PE, Lewis-Jones MS. An audit of the impact of a consultation with a paediatric dermatology team on quality of life in infants with atopic eczema and their families: further validation of the Infants' Dermatitis Quality of Life Index and Dermatitis Family Impact Score. *Br J Dermatol* 2006; **155**:1249–55.
- 7 Basra MKA, Fenech R, Gatt RM *et al.* The Dermatology Life Quality Index 1994–2007: a comprehensive review of validation data and clinical results. *Br J Dermatol* 2008; **159**:997–1035.
- 8 Lewis-Jones MS, Finlay AY, Dykes PJ. The Infants' Dermatitis Quality of Life Index. *Br J Dermatol* 2001; **144**:104–10.
- 9 Aziah MS, Rosnah T, Mardziah A, Norzila MZ. Childhood atopic dermatitis: a measurement of quality of life and family impact. *Med J Malaysia* 2002; **57**:329–39.
- 10 Al Robaee AA. Clinical trial: reliability and validity of the Arabic version of 'Dermatitis Family Impact' questionnaire in children with atopic dermatitis. *Int J Dermatol* 2010; **49**:1063–7.
- 11 Ho RC, Giam YC, Ng TP *et al.* The influence of childhood atopic dermatitis on health of mothers, and its impact on Asian families. *Pediatr Allergy Immunol* 2010; **21**:501–7.
- 12 Kirshner B, Guyatt G. A methodological framework for assessing health indices. *J Chron Dis* 1985; **38**:27–36.
- 13 Ben-Gashir MA, Seed PT, Hay RJ. Are quality of family life and disease severity related in childhood atopic dermatitis? *J Eur Acad Dermatol Venereol* 2002; **16**:455–62.
- 14 Chinn DL, Poyner T, Sibley G. Randomized controlled trial of a single dermatology nurse consultation in primary care on the quality of life of children with atopic eczema. *Br J Dermatol* 2002; **146**:432–9.
- 15 Thomas KS, Armstrong S, Avery A *et al.* Randomised controlled trial of short bursts of a potent corticosteroid versus prolonged use of a mild preparation for children with mild or moderate atopic eczema. *BMJ* 2002; **324**:768.
- 16 Baron SE, Layton A, Goulden V. A pilot study of hypnotherapy to treat adults and children with moderate to severe atopic dermatitis. *Br J Dermatol* 2005; **153** (Suppl. 1):37.

- 17 Grillo M, Gassner L, Marshman G *et al.* Pediatric atopic eczema: the impact of an educational intervention. *Pediatr Dermatol* 2006; **23**:428–36.
- 18 Grimalt R, Mengeaud V, Cambazard F. The steroid-sparing effect of an emollient therapy in infants with atopic dermatitis: a randomised controlled study. *Dermatology* 2007; **214**:61–7.
- 19 Weber MB, Fontes Neto Pde T, Prati C *et al.* Improvement of pruritus and quality of life of children with atopic dermatitis and their families after joining support groups. *J Eur Acad Dermatol Venereol* 2008; **22**:992–7.
- 20 Gerasimov SV, Vasjuta VV, Myhovych OO, Bondarchuk LI. Probiotic supplement reduces atopic dermatitis in preschool children: a randomized, double-blind, placebo-controlled, clinical trial. *Am J Clin Dermatol* 2010; **11**:351–61.
- 21 Schuttelaar ML, Vermeulen KM, Drukker N, Coenraads PJ. A randomized controlled trial in children with eczema: nurse practitioner vs. dermatologist. *Br J Dermatol* 2010; **162**:162–70.
- 22 Farina S, Gisondi P, Zanoni M *et al.* Balneotherapy for atopic dermatitis in children at Comano spa in Trentino, Italy. *J Dermatolog Treat* 2011; **22**:366–71.
- 23 Thomas KS, Dean T, O'Leary C *et al.* A randomised controlled trial of ion-exchange water softeners for the treatment of eczema in children. *PLoS Med* 2011; **8**:e1000395.
- 24 De Belilovsky C, Roo-Rodriguez E, Baudouin C *et al.* Natural peroxisome proliferator-activated receptor- α agonist cream demonstrates similar therapeutic response to topical steroids in atopic dermatitis. *J Dermatolog Treat* 2011; **22**:359–65.
- 25 Wootton CI, Koller K, Lawton S *et al.* Are accelerometers a useful tool for measuring disease activity in children with eczema? Validity, responsiveness to change, and acceptability of use in a clinical trial setting. *Br J Dermatol* 2012; **167**:1131–7.
- 26 Ricci G, Bendandi B, Bellini F *et al.* Atopic dermatitis: quality of life of young Italian children and their families and correlation with severity score. *Pediatr Allergy Immunol* 2007; **18**:245–9.
- 27 Al Shobaili HA. The impact of childhood atopic dermatitis on the patients' family. *Pediatr Dermatol* 2010; **27**:618–23.
- 28 Amaral CS, March MdeF, Sant'Anna CC. Quality of life in children and teenagers with atopic dermatitis. *An Bras Dermatol* 2012; **87**:717–23.
- 29 Lewis-Jones MS, Finlay AY, Dykes PJ. Measurement of the impact of atopic dermatitis on infant's and their families lives. *Br J Dermatol* 1999; **141** (Suppl. 55):105–6.
- 30 Foo C, Schofield OM. Influences on the quality of family life in atopic eczema. *Br J Dermatol* 2000; **143** (Suppl. 5):45.
- 31 Shin N, Kim SH, Cho S *et al.* The impact of childhood atopic dermatitis on their families. *Korean J Dermatol* 2000; **38**:494–9.
- 32 Gånemo A, Wahlgren CF, Svensson A. Quality of life and clinical features in Swedish children with psoriasis. *Pediatr Dermatol* 2011; **28**:375–9.
- 33 Park CW, Lee CH. Quality of life and the family impact of atopic dermatitis in children. *Korean J Dermatol* 2007; **45**:429–38.
- 34 Chernyshov PV. Creation and cross-cultural adaptation of Ukrainian versions of questionnaires for assessment of quality of life of children with atopic dermatitis and their families. *Lik Sprava* 2008; **2**:124–8.
- 35 Ahmad K, Ramsay B. Measuring the impact on quality of life of infants with atopic dermatitis in a dedicated clinic. *J Am Acad Dermatol* 2009; **60** (Suppl. 1):AB6.
- 36 Alvarenga TM, Caldeira AP. Quality of life in pediatric patients with atopic dermatitis. *J Pediatr (Rio J)* 2009; **85**:415–20.
- 37 Chernyshov PV. May the gender of a parent influence assessment of health-related quality of life, family impact and severity of atopic dermatitis in children? *Pediatr Dermatol* 2009; **26**:99–100.
- 38 Msika P. New natural PPAR- α agonist for childhood atopic dermatitis: dermatocorticoid-sparing and quality of life improvement. *J Am Acad Dermatol* 2007; **56** (Suppl. 2):AB67.
- 39 Gånemo A. Quality of life in Swedish children with congenital ichthyosis. *Dermatol Rep* 2010; **2**:18–20.
- 40 Monti F, Agostini F, Gobbi F *et al.* Quality of life measures in Italian children with atopic dermatitis and their families. *Ital J Pediatr* 2011; **37**:59.
- 41 Chernyshov PV. Gender differences in health-related and family quality of life in young children with atopic dermatitis. *Int J Dermatol* 2012; **51**:290–4.
- 42 Neri E, Agostini F, Gremigni P *et al.* Italian validation of the Childhood Atopic Dermatitis Impact Scale: a contribution to its clinical application. *J Invest Dermatol* 2012; **132**:2534–43.
- 43 Cardiff University, Department of Dermatology & Wound Healing. Dermatitis Family Impact, Different Language Versions, 2012. Available at: <http://www.dermatology.org.uk/quality/dfi/quality-dfi-languages.html> (last accessed 28 January 2013).
- 44 Gånemo A, Svensson A, Lindberg M, Wahlgren CF. Quality of life in Swedish children with eczema. *Acta Derm Venereol* 2007; **87**:345–9.
- 45 Jiráková A, Vojáčková N, Göpfertová D, Hercogová J. A comparative study of the impairment of quality of life in Czech children with atopic dermatitis of different age groups and their families. *Int J Dermatol* 2012; **51**:688–92.
- 46 Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol* 1993; **46**:1417–32.
- 47 Balkrishnan R, Housman TS, Grummer S *et al.* The family impact of atopic dermatitis in children: the role of the parent caregiver. *Pediatr Dermatol* 2003; **20**:5–10.
- 48 Balkrishnan R, Janeen M, Clarke J *et al.* Effects of an episode of specialist care on the impact of childhood atopic dermatitis on the child's family. *J Pediatr Health Care* 2003; **17**:184–9.
- 49 Beattie PE, Lewis-Jones MS. An audit of the usefulness of quality of life measures in secondary care for assessing the impact of atopic dermatitis on infants and their families and the benefit obtained from consultation with a dermatology team. *Br J Dermatol* 2005; **153** (Suppl. 1):82.
- 50 Rice ZP, Pavlis MB, Veledar E *et al.* Family impact of cutaneous disease in the ectodermal dysplasia. *J Invest Dermatol* 2009; **60**:AB5.
- 51 Ricci G, Bendandi B, Aiazzi R *et al.* Three years of Italian experience of an educational program for parents of young children affected by atopic dermatitis: improving knowledge produces lower anxiety levels in parents of children with atopic dermatitis. *Pediatr Dermatol* 2009; **26**:1–5.
- 52 Al Robaee AA, Shahzad M. Impairment quality of life in families of children with atopic dermatitis. *Acta Dermatovenereol Croat* 2010; **18**:243–7.
- 53 Weber M, Mazzotti N, Barzenski B, Silva T. Evaluation of the quality of life in patients with atopic dermatitis participating in support groups. *J Am Acad Dermatol* 2005; **52** (Suppl. 1):70.
- 54 De Belilovsky C, Chdoutaud B, Msika P. Cosmetics and quality of life. *J Am Acad Dermatol* 2007; **56** (Suppl. 2):AB85.
- 55 Humbert PH, Basset-Bresca S, Van der Valk P *et al.* Interest of an emollient combination of two hygiene products and a cream containing oak rhexal extract in atopic dermatitis. *J Eur Acad Dermatol Venereol* 2003; **17** (Suppl. 3):174.
- 56 Taïeb C, Macy G, Sibaud V *et al.* Atopic dermatitis: European evaluation in young children. *J Eur Acad Dermatol Venereol* 2004; **18** (Suppl. 2):300.
- 57 Yang SJ, Yun SJ, Lee JW *et al.* Relationship between severity of childhood atopic dermatitis and subject's characteristics including

- psychological, behavioural and familial problems. *Korean J Dermatol* 2005; **43**:1170–6.
- 58 Thomas KS, Sach TH. A multicentre randomized controlled trial of ion-exchange water softeners for the treatment of eczema in children: protocol for the Softened Water Eczema Trial (SWET). *Br J Dermatol* 2008; **159**:561–6.
- 59 Lapidus CS, Kerr PE. Social impact of atopic dermatitis. *Med Health R I* 2001; **84**:294–5.
- 60 Su JC, Kemp A, Varigos GA, Nolan TM. Atopic eczema: its impact on the family and financial cost. *Arch Dis Child* 1997; **76**:159–62.
- 61 Ben-Gashir MA. Relationship between quality of life and disease severity in atopic dermatitis/eczema syndrome during childhood. *Curr Opin Allergy Clin Immunol* 2003; **3**:369–73.
- 62 Basra MKA, Edmunds O, Salek MS, Finlay AY. Measurement of family impact of skin disease: further validation of the Family Dermatology Life Quality Index (FDLQI). *J Eur Acad Dermatol Venereol* 2008; **22**:813–21.