

REGULAR ARTICLE

Quality of life in infants with atopic dermatitis and healthy infants: a follow-up from birth to 24 months

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Keywords

Atopic dermatitis, Child, Follow-up study, Infant, Life quality

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Received

8 November 2010; revised 11 January 2011; accepted 15 February 2011.

DOI:10.1111/j.1651-2227.2011.02229.x

ABSTRACT

Aim: To evaluate quality of life (QOL) in infants with atopic dermatitis (AD) by comparison with healthy infants to find treatment modalities contributing most to QOL in these patients.

Methods: The population (N = 134) was recruited in the context of an on-going prospective mother–infant study. QOL was measured using the Infant Dermatitis Quality of Life Index for the infants with AD and a modification of this for the healthy infants.

Results: The index scores of infants with AD were 4.15 (SD 2.96), 3.89 (SD 3.62) and 3.23 (SD 2.71) at 6, 12 and 24 months, respectively, the QOL being significantly poorer at 6 ($p < 0.001$) and 12 ($p = 0.01$) months compared to healthy infants. The principal impairments were itching, scratching and sleep disturbances at 6 and 12 months and treatment difficulties at 6 months. Problems with getting to sleep were reported at all stages irrespective of AD.

Conclusions: Simple treatment regimens targeting itching in particular are likely to contribute most to the QOL of infants with AD; however, sleeping problems may remain as an age-related phenomenon. Early detection of symptoms and effective parent guidance contributed to the well-being of the child.

INTRODUCTION

Atopic dermatitis (AD) is the most common chronic disease in children in Western societies (1), its incidence being highest during the first 2 years of life (2). Fifteen to 30% of children and 2–10% of adults are affected by AD; its prevalence has doubled or tripled in industrialized countries during the past few decades (3). Nevertheless, a large proportion of children with AD have a spontaneous remission before adolescence. The period of rapid growth and physical development of early childhood with contemporary onset of allergic disease affects the well-being of the child and is likely to detract from the quality of life (QOL).

QOL is an individual perception of the nature of life in the context of culture and values, health being the major component. Health may be defined as ‘a state of complete physical, mental and social well-being’ (4). Thus, QOL depicts the burden of illness (5). In allergic diseases, measurements of QOL may be used to evaluate the success of treatment and the care provided for the disease within the public health system, especially collaboration between primary and secondary care and the families concerned.

Previous cross-sectional studies have suggested that QOL is impaired in children with allergic diseases (6–8). This

may be because of a range of conditions, including restrictions on physical activity in cases of asthma (9–11) and intensive scratching (12,13) on account of AD. Food allergies, with their associated risk of anaphylactic reaction, cause particular anxiety with regard to eating (14). QOL is most likely to be affected in cases of multiple conditions such as food allergies and concomitant atopic disease (7). The precise factors contributing to QOL as distinct from AD in children of different ages are poorly known, however. The objectives of this study were therefore to evaluate QOL in infants with AD by comparison with healthy infants and to evaluate changes in QOL over the first 24 months of age.

Key notes

- Simple treatment regimens targeting itching in particular are likely to contribute most to the QOL of children with AD.
- Early detection of symptoms and effective parent guidance contributed to the well-being of the child.
- Problems in getting the child to sleep seemed to be related more to age than to the disease.

METHODS

Subjects and protocol

The population was recruited in the context of an on-going prospective mother–infant nutrition and probiotic study (15). In brief, pregnant women were recruited from maternal welfare clinics in the area of Turku, Southwest Finland, in the first trimester of pregnancy. Pregnant women with any form of chronic disease except allergic disease were excluded. At the first study visit, the mothers were randomized to the dietary intervention and the control group. Additionally, the women in the intervention group were further randomized in a double-blind manner to receive probiotic or placebo. After the delivery, clinical examinations of the children were conducted by a physician at the ages of 6, 12 and 24 months. The children were from families with allergic disease in the mother, the father or an older sibling.

The inclusion criterion was that the parents should consent to complete the QOL index questionnaire appropriately. The QOL of the children was likewise evaluated at the ages of 6, 12 and 24 months (Fig. 1), and the presence of AD was defined according to the criteria of Hanifin and Rajka (16). The severity of AD was determined using SCORAD assessment (17) and classified as mild (SCORAD < 15), moderate (15 < SCORAD < 40) or severe (SCORAD > 40) (18). Skin prick tests were performed (19) at the same points in time (20). The antigens tested included fresh cow's milk (3.3 g/100 g), raw hen's egg white, wheat and rice flour both diluted 1/10 (w/v) with 0.9% (w/v) sodium chloride and gliadin 1 mg/mL (University Pharmacy, Helsinki, Finland). Furthermore, cod, soya bean,

birch, six grasses, cat, dog, *Dermatophagoides pteronyssinus* allergen Der p1 (Allergologisk Laboratorium A/S, Horsholm, Denmark) and latex (Starallergens SA, Anthony Cedex, France) were tested, as well as raw potato using prick-to-prick technique.

The children were classified as healthy if they had no signs of AD or any other chronic disease. Length and weight were evaluated at each point in time. Written informed consent was obtained from the parents in each case and the protocol was approved by the Ethics Committee of the Hospital District of Southwest Finland.

Quality of life measurement

After the clinical evaluation, the QOL of the children with AD was measured using the Infant Dermatitis Quality of life index form (IDQOL), filled in by the parents (13). The IDQOL index depicts the effects of AD on the child's physical and emotional health and physical and social functioning over the previous week. The questions evaluate difficulties because of eczema, including itching and scratching, mood, difficulties with sleep, play, family activities, mealtimes, eczema treatment, dressing and bathing. The scoring of each question ranges from 0 to 3, with a total index score ranging from 0 to 30, the latter indicating the poorest QOL. A total score of 0–5 was considered to reflect a normal QOL, 6–10 a minor alteration in QOL, 11–20 a moderate alteration and >20 as marked alteration (21). The IDQOL index also included a separately scored question in which parents were asked to evaluate the severity of dermatitis in their child, ranging from none to extremely severe (scored 0–4).

Prior to the study conduct, the IDQOL-index was evaluated in infants aged 6–12 months, who had been referred to hospital on account of AD with suspected food allergy or food allergy with gastrointestinal symptoms. The suspected food had been eliminated from the infant's diet, and in a case of favourable elimination response, the food challenge was carried out at hospital to confirm the diagnosis of food allergy. The index was found to be easy and quick to complete, but the evaluation confirmed the need for a separate questionnaire for infants with no AD. A modified index questionnaire was thus formulated to evaluate the QOL of healthy infants, because no validated index for healthy infants was available for this age group. The first four questions on the IDQOL index form, concerning itching and scratching, mood, difficulties in getting to sleep and sleep disturbance, remained the same, but the question on treatment of AD was excluded and the word 'eczema' was changed to 'state of health' in the other questions. For example, the original question 'Has your child's eczema interfered with playing and swimming over the last week?' was changed to 'Has your child's state of health interfered with playing and swimming over the last week?'

Evaluation of the indices

The indices were further evaluated by interviewing mothers who had either an infant with AD (n = 13) or a healthy infant (n = 9) aged 12 months. They were allowed to

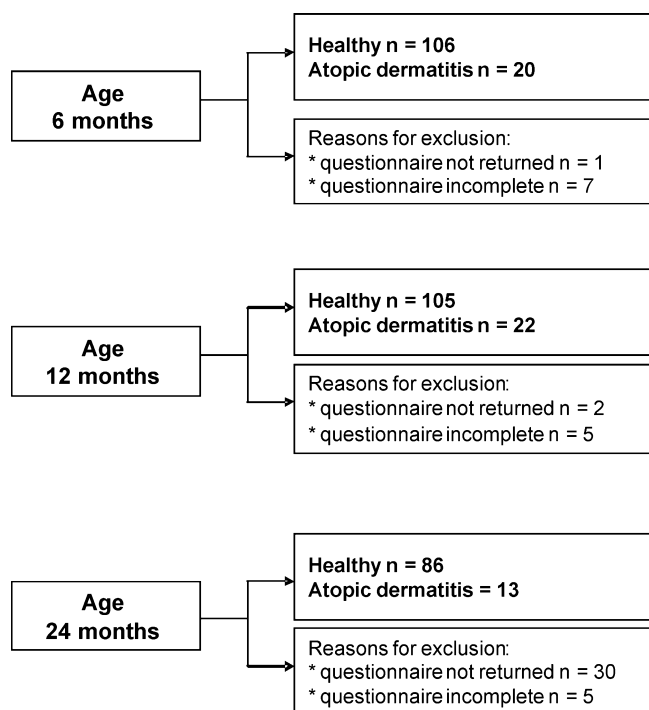


Figure 1 Children eligible for the evaluation of quality of life.

comment freely on the clarity and sufficiency of the indices in depicting their child's QOL. The mothers expressed a need for an additional open question concerning the child's overall state of health, and consequently, a separate open question inquiring the health of the child was added to evaluate the possible impact of random life events such as acute illnesses, teething and deviations from daily routines, including exceptional events in the child's daily life, on the scoring of the index.

Statistical analysis

To evaluate the usage of the index for healthy children, the first four questions of the index, which were the same in both questionnaires, were first compared with all the questions as explainers of the total index score by linear regression analysis. Comparisons of the group difference indices were tested with the independent samples *t*-test. The values were logarithmically transformed ($\ln + 1$) and *p*-values ($p < 0.05$) were used to evaluate their significance. The differences in QOL between infants with and without food allergy and ADs were tested with non-parametric Mann-Whitney's *U*-test. Fisher's exact test was used to assess the differences between the groups and the Spearman correlation coefficient to test associations between the severity of dermatitis as evaluated by the parents and SCORAD. In the evaluations of children with AD and all the QOL measurements, the differences at each time point were analysed with Friedman's test. The statistical analyses were carried out using SPSS for Windows (version 17.0; SPSS Inc., Chicago, IL, USA).

RESULTS

Descriptions of the QOL measures were obtained altogether from 134 infants during the first 24 months of age (Fig. 1). The growth of both the healthy and infants with AD was within the normal reference ranges (data not shown). AD had been diagnosed in 15.9% ($n = 20$), 17.3% ($n = 22$) and 13% ($n = 13$) of the infants at the three points in time. The mean age at diagnosis of AD was 4.3 (range 1–24) months. The severity of dermatitis (Fig. 1) was mild in 70%, 62% and 67% of children and moderate in 30%, 38% and 33% at the ages of 6, 12 and 24 months, respectively. There were no children with severe dermatitis. Positive skin prick test results were detected in 50%, 68% and 58% of the children with AD at the three points in time. To consider the parents' ability to evaluate the severity of eczema, correlations were calculated between the dermatitis severity score as reported by the parents and SCORAD. These correlations were statistically significant only when the child was aged 12 months (6 months, $r = 0.42$; 12 months, $r = 0.66$, $p < 0.001$, 24 months, $r = 0.2$).

QOL in infants with atopic dermatitis

The total mean scores on the IDQOL index were 4.15 (SD 2.96), 3.89 (SD 3.62) and 3.23 (SD 2.71) in the children with AD at the ages of 6, 12 and 24 months (Fig. 2). The total score was within the normal range in 65% (13/20),

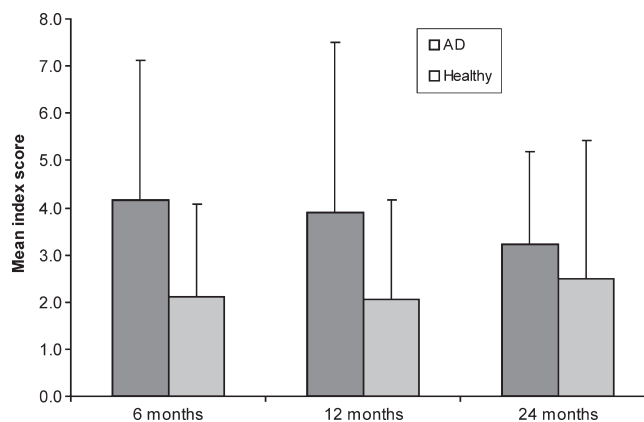


Figure 2 Mean infant dermatitis quality of life index score in infants with atopic dermatitis ($n = 20$, $n = 22$, $n = 13$, respectively) and modified index score in healthy infants ($n = 106$, $n = 105$, $n = 86$, respectively) at the age of 6, 12 and 24 months.

81.8% (18/22) and 84.6% (11/13) of the children, respectively. The QOL was impaired by itching and scratching in all three points in time, by sleep disturbances at the ages of 6 and 12 months and by difficulties with the treatment at the age of 6 months. Children with AD associated with food allergy had significantly poorer ($p = 0.005$) QOL at 12 months compared to those with AD but no food allergy. Problems in getting the child to sleep were reported at all the time points (Fig. 3). No change in QOL with time was detected when the children with AD for whom all three QOL measurements were available were evaluated ($n = 13$, $p = 0.40$).

QOL in healthy infants

The modified index scores for the healthy infants were 2.11 (SD 1.96), 2.05 (SD 2.12) and 2.50 (SD 2.94) at 6, 12 and 24 months, respectively (Fig. 2). The total score was within the normal range (score 0–5) in 93.4% (99/106), 93.3% (98/105) and 92% (79/86) of the children at the three time points, respectively. Difficulty in getting the child to sleep was reported at all stages and disturbed sleep at 6 and 12 months (Fig. 3).

Comparisons of QOL between children with atopic dermatitis and healthy infants

The sum of the four questions that were the same in the IDQOL index and the modified index was found to differ statistically significantly between the infants with AD and the healthy infants at 6 months of age ($p = 0.009$, 95% CI -0.64 to -0.09) and 12 months ($p = 0.02$, CI -0.55 to -0.05), but not at 24 months ($p = 0.08$, 95% CI -0.55 to 0.05).

To assess whether comparison between these different instruments was possible, the regression model including these four questions that were the same in both indices was compared with that for all the questions (Table 1). These

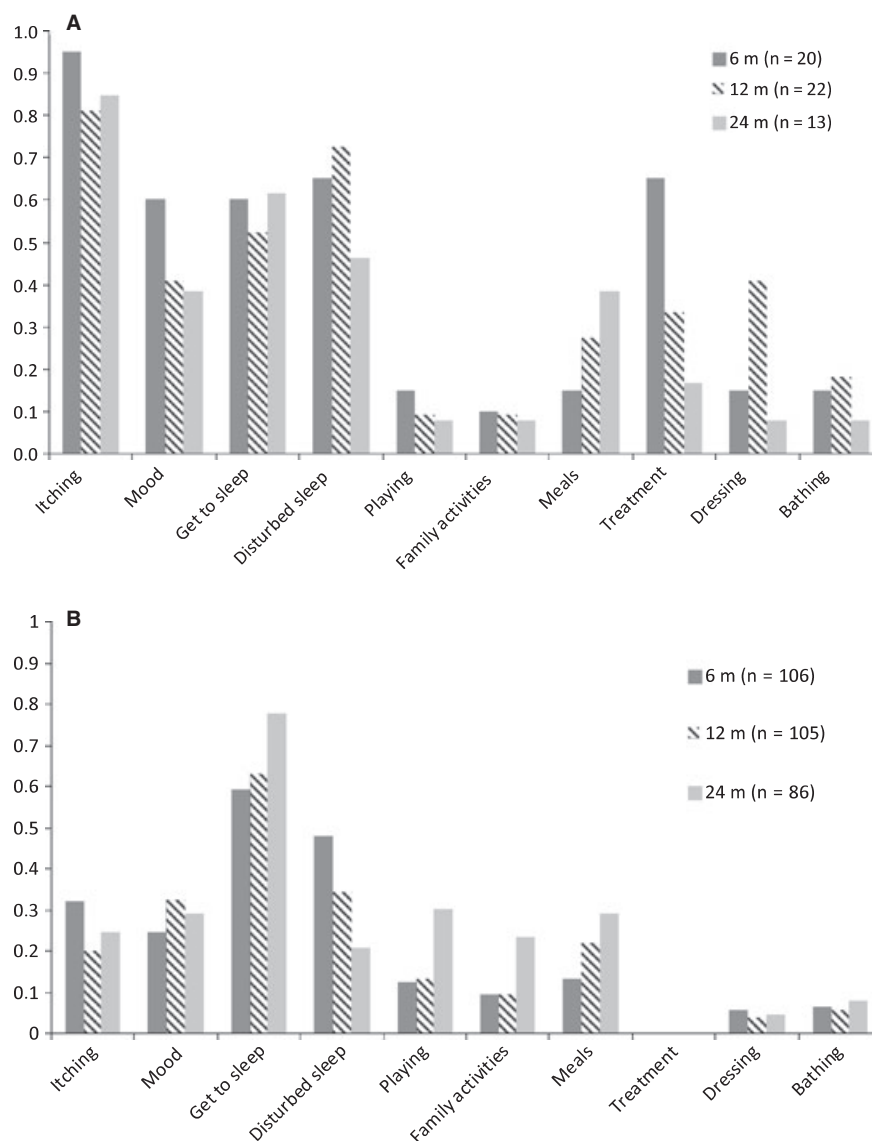


Figure 3 Mean score on each question in the index in (A) infants with atopic dermatitis (n = 20, n = 22, n = 13) and (B) healthy infants (n = 106, n = 105, n = 86) at the ages of 6, 12 and 24 months.

questions explained a significant proportion of the index in both the allergic ($R^2 = 0.76$) and the healthy infants ($R^2 = 0.73$), and thus, comparisons were made between the children with AD and healthy children, indicating that the QOL was significantly poorer in the infants with AD at the ages of 6 ($p < 0.001$, 95% CI -0.84 to -0.21) and 12 months ($p = 0.01$, 95% CI -0.71 to -0.095) but that there was no difference at 24 months ($p = 0.28$, 95% CI -0.59 to 0.17) (Fig. 2).

The parents reported in the separate open question concerning the child's overall state of health that factors such as tooth eruptions, birthdays, family vacations and recent acute sickness had detracted from the QOL. Recent acute sickness and/or teething was reported in 10%, 9.1% and 15.4% of the allergic children at the three time points and

17.1%, 13.5% and 18.8% in the healthy children (6 months, $p = 0.74$; 12 months, $p = 0.74$; 24 months, $p = 1$).

DISCUSSION

This study set out to characterize the differences in QOL between children with AD and healthy infants and to specify the factors that detract from the QOL during the first 24 months, indicating focal points for improvements in the care provided. It may be seen from the results that although the participating infants with mild or moderate AD had a normal QOL on average as measured by the IDQOL index, their QOL was significantly impaired at the ages of 6 and 12 months compared with healthy infants. The situation was worst at the age of 6 months, with an improvement

Table 1 Linear regression model of the power of the questions for explaining the total index score in infants with AD and healthy infants at the age of 12 months
Model 1 (questions 1–4)

Allergic: n = 22

Q1: Itching and scratching	$R^2 = 0.76$, $F = 17.99^*$
Q2: Mood	
Q3: Getting the child off to sleep	
Q4: Sleep disturbance	

Healthy: n = 105

Q1: Itching and scratching	$R^2 = 0.73$, $F = 71.47^*$
Q2: Mood	
Q3: Getting the child off to sleep	
Q4: Sleep disturbance	

Model 2 (questions 1–10)

Allergic: n = 22

Q1: Itching and scratching	$R^2 = 0.99$, $F = 196.54^*$
Q2: Mood	
Q3: Getting the child off to sleep	
Q4: Sleep disturbance	
Q5: Playing and swimming	
Q6: Family activities	
Q7: Problems at mealtimes	
Q8: Treatment	
Q9: Dressing and undressing	
Q10: Problems at bathtime	

Healthy: n = 105

Q1: Itching and scratching	$R^2 = 0.998$, $F = 5385^*$
Q2: Mood	
Q3: Getting the child off to sleep	
Q4: Sleep disturbance	
Q5: Playing and swimming (eczema → health state)	
Q6: Family activities (eczema → health state)	
Q7: Problems at mealtimes (eczema → health state)	
Q8: Treatment-question excluded	
Q9: Dressing and undressing (eczema → health state)	
Q10: Problems at bathtime (eczema → health state)	

* $p < 0.001$.

towards 24 months. This deterioration in QOL was a result of itching and scratching, sleep disturbances, the treatment and difficulties in getting the child to sleep, the last-mentioned being a problem for the healthy children as well.

The QOL in infants with AD was better here than in earlier studies performed using the same IDQOL index (13,22–24), largely because the majority of the present children had mild dermatitis, as is typical of this age group (25). The previous studies had concerned children with moderate or severe AD, often recruited from hospital in-patient or out-patient clinics or a dermatologist's practice. Also, the present children were participating in a follow-up project, which enabled early detection of their symptoms and initiation of treatment by means of regular contacts at the early stages. Effective guidance of the parents regarding the care of their children has been shown previously to play an important

role in reducing the severity of dermatitis (23). Contradictory results have been reported, however, regarding parents' capabilities for evaluating the severity of eczema in their children, as earlier studies have found either that parents overrate the severity of dermatitis (21) or that they are successful in their evaluation (26,27). The present evaluations by parents showed significant positive correlations with SCORAD at the age of 12 months. At 6 months, the parents may have so little experience of dermatitis that the evaluation is not likely to be successful, and by 24 months, their evaluations may be disturbed by recent acute bouts of sickness.

Owing to the longitudinal nature of the study, the measurement of QOL in the children with AD was affected by the changing nature of the disease (28), and consequently, the sample with all three QOL measurements for the same subjects remained small. Nevertheless, no differences in this longitudinal QOL were found. It is particularly significant that the QOL was measured here in all the children over the first 2 years of life with little age variation. The growing number of missing index values from 12 to 24 months, at the same time as a tendency for remission of AD is seen, might be because of the lack of motivation to fill in questionnaires in the case the child is healthy. Furthermore, by the age of 24 months of the infant, an increased number of mothers have started working again which may lead to difficulties in arranging the study visits.

The results support earlier findings that itching and scratching and sleep disturbance are specific features detracting from the QOL in cases of AD (13,21). Difficulties with the treatment scored high at 6 months, suggesting that the parents of young children may need simple treatment regimens and additional, effective support in managing their child's AD. The greatest improvements in response to treatment were in the problems encountered at mealtimes and the time taken to get the child to sleep (27). Our findings nevertheless indicate that the time taken to get children to sleep at the ages of 6, 12 and 24 months may reflect their age-related development irrespective of AD.

The IDQOL index was chosen because it has been validated and designed to cover QOL in the age group concerned here. Separate assessments and a regression analysis were performed to confirm that it could be used in this study to assess healthy children and to compare the two groups. The first four questions in the index already explained 73–76% of the total scores. Both the infants with AD and the healthy children had had recent acute infections, but the QOL was good despite these, and it is accepted that infections are part of life at this age. It is recommended that a separate open question concerning the child's overall state of health should be included in all QOL indices for this age group.

Owing to the changing nature of AD in later years, the QOL in toddlers remains a subject for future study, especially as it would require a discussion of the differences in QOL and impairing factors between healthy and allergic children of the same age. AD and food allergy often occur simultaneously and the questionnaires could be adjusted to

include both, so that they could possibly be used to evaluate QOL in a broader context.

CONCLUSIONS

The present regular follow-up study showed that the QOL of children with mild to moderate AD was poorer at 6 and 12 months than that of healthy infants, mainly because of itching, scratching, laborious treatment regimens and sleep disturbances. However, problems in getting the child to sleep seemed to be related more to age than to the disease. The measurement of QOL at the ages of 12 and 24 months may be disturbed by acute sicknesses and teething. The findings indicate that simple treatment regimens targeting itching in particular are likely to contribute most to the QOL of children with AD in this age group. An evaluation of these differences is essential in clinical practice.

ACKNOWLEDGEMENTS

We thank all the families who consented to participate in this study, Sue Lewis-Jones for permission to use the ID-QOL index, the NAMI Research group, Ulla-Maija Eriksson for contacting the subjects, Teiju Hietikko for statistical advice and Malcolm Hicks for revising the English language of the text. The study was supported financially by the Social Insurance Institution of Finland, the Sigrid Juselius Foundation and personal EVO funding from Seinäjoki Central Hospital, the Finnish Cultural Foundation and the Juho Vainio Foundation for S. Alanne.

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