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CLINICAL REPORT

Mild Eczema Affects Self-perceived Health among Pre-adolescent Girls

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The aim was to assess the impact of eczema on health-related quality of life in the population-based birth cohort BAMSE with 2,756 pre-adolescent children. All answered the following questions on self-perceived health; "How are you feeling?", "How healthy do you consider yourself to be?" and "How happy are you with your life right now?". Children with ongoing eczema answered the "Children's Dermatology Life Quality Index (CDLQI)" questionnaire. In total, 350 (12.7%) of the children had eczema. Girls with eczema reported impaired self-perceived health as evaluated in the 3 questions; adjusted OR 1.72 (95% CI 1.16–2.55), 1.89 (95% CI 1.29–2.76) and 1.69 (95% CI 1.18–2.42). Eczema among boys was not associated with impairment of self-perceived health. The mean CDLQI score was 3.98 (95% CI 3.37–4.58). Since eczema affects up to 20% of pre-adolescent girls, the findings have implications both for health care providers and for society as a whole. ***Key words: atopic dermatitis; asthma; comorbidity; eczema; general health; HRQoL; rhinitis; self-perceived health.***

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Eczema (atopic dermatitis) (1) is common and estimated to affect 15–30% of children at some time during childhood (2). The fact that so many children are affected makes childhood eczema a major health problem. Living with a chronic disease such as eczema affects several dimensions of life. Sleep disturbance due to itching is common and it is estimated that up to 60% of children with eczema have disturbed sleep, with numbers increasing to 83% during periods of exacerbations (3). Treatment is demanding and often includes daily time-consuming topical treatments. In many cases eczema is a visible disease, sometimes affecting social life and interaction with others.

To measure the impact of eczema on health-related quality of life (HRQoL) in the child as well as in the rest of the family, both disease-specific and generic instruments have been constructed. Generic instruments have the advantage of being applicable in both healthy and chronically ill subjects across a wide range of populations (4, 5). Self-perceived health is a generic method frequently used in health studies. By asking a simple question such as "How are you feeling?" an overall assessment of health, both mental and physical, is obtained. In addition, the reliability of self-perceived health has been found to be good (6). Disease-specific questionnaires investigate the areas of HRQoL considered to be most relevant for one particular disease or condition. These questionnaires often have high response rates, since directly disease-related questions are highly meaningful to those affected (7).

Most studies of the burden of childhood eczema have been performed in selected populations, such as dermatology outpatient clinics or hospital settings (8–11), but less is known for unselected populations. This is of importance, since the majority of children with eczema have a mild disease and are generally treated within primary care; only children with severe eczema are treated at specialist clinics. It is also important to consider that many children with eczema have concomitant diseases such as asthma or rhinitis. In most previous studies the authors have used either a generic or a disease-specific instrument. The aim of this paper is to assess the burden of childhood eczema in a population-based birth cohort using both self-perceived health and a disease-specific instrument – the Children's Dermatology Life Quality Index (CDLQI) – for measuring HRQoL, thus taking both eczema severity and comorbidity into account.

METHODS

Study design

The BAMSE study consists of 4,089 children that have been followed prospectively since birth. Parents to all new-borns in a predefined geographic area in the Stockholm area were asked to participate at one of the first visits to child health care centres, and 75% of the eligible children were included. The enrolment and inclusion criteria have been described in detail by Wickman et al. (12). Briefly, data on family history of allergic disease, key environmental factors and life style factors were obtained through parental questionnaires when children were at a median age of 2 months. Follow-up questionnaires were sent to the families when children were 1, 2, 4, and 8 years old.

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For the 12-year follow-up, all questionnaires were sent out on one occasion in springtime 2008, when the children were between 11 and 14 years (mean age 12.9 years), hereafter called the 12-year follow-up. This time both the parent and the child were asked to participate (13). Parents and children completed one questionnaire each, aiming to collect information about symptoms related to eczema, asthma, rhinitis, life style factors and key exposures.

The study population in the present study ($n = 2,756$) consisted of children that completed the 12-year questionnaire. In addition, we required parentally reported data about backgrounds factors from questionnaires answered at baseline, and complete data on parentally reported eczema symptoms during the last year.

Assessment of self-perceived health

In the 12-year follow-up, the child questionnaire began with 3 questions for evaluation of self-perceived health;

- How are you feeling?
- How healthy do you consider yourself to be?
- How happy are you with your life right now?

For response alternatives; see Table I.

Assessment of disease-specific quality of life

Children with itchy rash in the preceding 7 days were also asked to answer the "Children's Dermatology Life Quality Index (CDLQI)" questionnaire (www.dermatology.org.uk) in order to collect information on the impact of disease on HRQoL. The CDLQI includes 10 questions, each scoring 0–3, giving a maximum of 30; the higher score, the more negative effect on QoL.

Definition of explanatory variables

Eczema defined as dry skin, itchy rashes with age-specific location (i.e. flexures of arms/legs or wrist/ankles or neck) and/or doctor's diagnosis of eczema since the age of 10 years.

Asthma defined as at least 4 episodes of wheeze in the past 12 months or at least one episode of wheeze in combination with occasional or regular use of prescribed inhaled glucocorticoids (14).

Rhinitis defined as sneezing, runny or blocked nose, or itchy, red and watery eyes after exposure to furred pets or pollen during the last 12 months, or doctor's diagnosis of allergic rhinitis since the age of 10 years (15).

Severity of eczema

Eczema severity was evaluated using the BAMSE Eczema Severity Score (BESS), scale 3–14, which divides children into categories of mild (score 3–7), moderate (score 8–10) and severe eczema (score 11–14) (16). The evaluation was made using responses to 3 questions based on and modified from the Rajka and Langeland eczema severity score (17); (*i*) total time with eczema during the last 12 months, (*ii*) disturbed sleep due to itch and (*iii*) number of affected body sites.

Statistical methods

Comparisons between the study population and the original cohort concerning background factors were made by comparing the percentage of children with each background factor in the 2 populations and calculating 95% confidence intervals (CI). Intervals that did not overlap were considered statistically significant. The association between eczema, asthma, rhinitis and self-perceived health was analysed using multivariate logistic regression. The results are expressed as adjusted odds ratios and 95% CI. To identify potential confounding factors, low socio-economic status defined as parents being blue collar workers, parental allergy, having a young mother and parental smoking were tested using backwards selection. Factors that changed the OR more than 10% for any of the tested exposures were considered confounders. Concurrent asthma, rhinitis and eczema were *a priori* kept for all analyses. Parental allergy, having a young mother and low socio-economic status were found to be confounders for at least one of the outcomes and were therefore kept in the final model, together with eczema, asthma and rhinitis at the 12-year follow-up. Effect modification was tested and sex was found to be an effect modifier. The analysis was therefore stratified by sex. Differences between groups with regard to mean score of CDLQI was tested with two-sample Wilcoxon–Mann-Whitney's test and considered significant at a p-value of < 0.05. To test the correlation between eczema severity and disease-specific health-related quality of life (CDLQI), we used Spearman correlation test. For evaluation of correlation between CDLQI and self-perceived health, the response alternatives for self-perceived health were assigned a numerical value and thereafter Spearman correlation test was used. All statistical analyses were performed with STATA Statistical Software (release 11.1; StataCorp, College Station, Texas, USA).

RESULTS

Background characteristics of the study population consisting of 2,756 children are shown in Table SI[1]). A comparison between the original cohort and the study population concerning selected background factors shows that the groups are comparable. In total, 350 (12.7%) of the children fulfilled the eczema criteria for the last year (Fig. 1). Among these, 120 children had ongoing symptoms when answering the 12-year questionnaire. Of the 350 children with eczema, 274 had mild eczema and 76 had moderate-to-severe disease (Fig. 1). The proportion of children with moderate-to-severe eczema was 40.8% in the group with ongoing eczema at the time of the 12-year questionnaire and 11.7% among children without ongoing skin symptoms. Among children with moderate-to-severe eczema, 88% had ever had a doctor's diagnosis of eczema up to 12 years of age, compared with 57% of the children with mild eczema ($p = 0.001$).

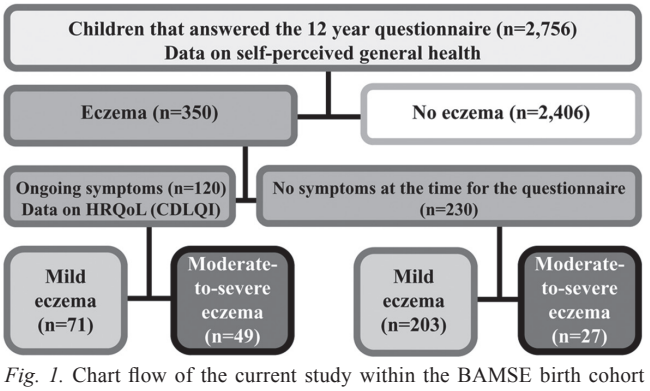

Fig. 1. Chart flow of the current study within the BAMSE birth cohort ($n = 4,089$).

[1]http://www.medicaljournals.se/acta/content/?doi=10.2340/00015555-1738

Self-perceived health

A majority of children reported good self-perceived health. Seventy-nine percent responded "Excellent" or "Very good" to the question "How are you feeling?" and 72% reported that they were completely healthy, while 66% responded "I am very happy" to the question "How happy are you with your life right now?" However, girls with eczema had impaired self-perceived health, as evaluated by all 3 questions, compared with girls with no allergy-related disease; adjusted OR 1.72 (95% CI 1.16–2.55), 1.89 (95% CI 1.29–2.76) and 1.69 (95% CI 1.18–2.42) (Table I). This impairment was further accentuated when we restricted the analyses to the sub-group of girls with ongoing eczema; adjusted OR 2.32 (95% CI 1.26–4.27), 2.44 (95% CI 1.34–4.43) and 3.20 (95% CI 1.72–5.95). Furthermore, we restricted the analyses to include only girls with mild eczema and found that they reported significantly impaired self-perceived health for all 3 questions; adjusted OR 1.73 (95% CI 1.14–2.64), 1.90 (95% CI 1.27–2.86) and 1.63 (95% CI 1.11–2.40). Finally, we evaluated the impact of asthma and rhinitis for self-perceived health among girls and found these diseases to be associated with significantly impaired self-perceived health for the question "How healthy do you consider yourself to be?"(Asthma; adjusted OR 2.79 [95% CI 1.30–6.00] and rhinitis; adjusted OR 1.78 [95% CI 1.22–2.59]), but not for the other questions (Table I). Eczema among boys was not associated with impaired self-perceived health (Table I), in contrast to the reports from girls. However, as for girls, boys with asthma and rhinitis reported significantly impaired self-perceived health for the question "How healthy do you consider yourself to be?" (Asthma; adjusted OR 1.97 [95% CI 1.06–3.64] and rhinitis; adjusted OR 2.31 [95% CI 1.67–3.19]) (Table I).

Comparison of self-perceived health between girls and boys with and without eczema did not reveal significantly differing responses to the question "How healthy do you consider yourself to be?", but girls rated self-perceived health significantly more poorly on the other 2 questions, regardless of whether they had eczema or not.

Disease-specific quality of life

The mean total score of CDLQI for all children with eczema was 3.98 (95% CI 3.37–4.58). Children with moderate-to-severe eczema reported a total score of 5.12 (95% CI 4.21–6.04), compared with 3.18 (95% CI 2.42–3.95) for children with mild eczema. Both girls with mild eczema (mean CDLQI score of 3.35 [95% CI 2.41–4.28]) and girls with moderate-to-severe eczema (mean CDLQI score of 5.71 [95% CI 4.41–7.02]) tended to report higher impairment compared with the corresponding groups of boys; mean CDLQI scores of 2.74 (95% CI 1.38–4.09) and 4.33 (95% CI 3.06–5.61), respectively. Ninety-five percent of the 120 children with ongoing eczema reported that they were troubled by itching and scratching, mean score 1.46 (95% CI 1.33–1.59). Other questions with high scores among both boys and girls were the questions about (*i*) being embarrassed or upset because of skin symptoms, mean score 0.72 (95% CI 0.56–0.88) (*ii*) trouble with treatment, mean score 0.45 (95% CI 0.32–0.57) and (*iii*) disturbed sleep, mean score 0.35 (95% CI 0.25–0.46). There was a significant correlation ($r = 0.493$) between CDLQI scores and eczema severity (Fig. S1[1]), as well as between CDLQI scores and health impact as assessed in the 3 questions on self-perceived health, all $p < 0.05$.

DISCUSSION

This study, comprising 2,756 pre-adolescents from a population-based cohort, among whom 350 had eczema, shows that eczema among girls is associated with impaired self-perceived health. This negative effect on HRQoL was seen both in girls with mild eczema and in girls with more severe disease and cannot be explained by related comorbidities. Eczema among boys was not associated with impaired self-perceived health. A majority of children with eczema reported being completely healthy and very happy with life. However, since eczema is a common disease affecting up to 20% of pre-adolescent girls (18), our findings have implications for health care providers as well as for society as a whole.

Strengths and weaknesses

The major strengths of the present study are the population-based design, the large sample size and the detailed information on background factors, enabling adjustment for potential confounders. Furthermore, we used both a disease-specific instrument (CDLQI), enabling comparison with other studies including children with eczema, and a generic instrument, making it possible to compare self-perceived health between healthy children and children with eczema and other allergy-related diseases. CDLQI is a highly validated instrument that has been widely used to evaluate the impact of eczema and other skin diseases on QoL (19) and self-perceived health has been shown to correlate well with objective measures of both physical and psychological health status (6, 20). In adults, self-perceived health has been shown to be a powerful predictor for subsequent mortality (21). Furthermore, the method has been both validated and used among teenagers and young adults for evaluation of physical and mental health (22, 23). A limitation of the study is that disease classification was based on questionnaire data only. The eczema definition used in this study has not been validated at

Table I. *Adjusted odds ratios (aOR) for impaired self-perceived health among pre-adolescent girls (*n *= 1,375) and boys (*n *= 1,381) in relation to eczema, asthma and rhinitis in the BAMSE birth cohort*

Questions asked	How are you feeling?	How healthy do you consider yourself to be?	How happy are you with your life right now?
Response alternatives	Not good/fairly good/good vs. Excellent/very good	Not very healthy/fairly healthy vs. Completely healthy	I am not happy at all/I am not very happy/ I am fairly happy vs. I am very happy
	aOR[a] (95% CI)	aOR[a] (95% CI)	aOR[a] (95% CI)
Girls			
No eczema, asthma or rhinitis (n=972)	1	1	1
Eczema (n=210)	**1.72 (1.16–2.55)**	**1.89 (1.29–2.76)**	**1.69 (1.18–2.42)**
Subgroup with ongoing eczema (n=80)	**2.32 (1.26–4.27)**	**2.44 (1.34–4.43)**	**3.20 (1.72–5.95)**
Mild eczema (n=171)	**1.73 (1.14–2.64)**	**1.90 (1.27–2.86)**	**1.63 (1.11–2.40)**
Moderate to severe eczema (n=39)	1.79 (0.70–4.58)	1.84 (0.74–4.56)	2.14 (0.88–5.19)
Asthma (n=68)	1.18 (0.48–2.86)	**2.79 (1.30–6.00)**	0.57 (0.24–1.35)
Rhinitis (n=228)	1.05 (0.68–1.61)	**1.78 (1.22–2.59)**	1.20 (0.84–1.73)
Eczema, asthma and rhinitis (n=16)	1.85 (0.63–5.44)	**3.72 (1.35–10.2)**	1.74 (0.64–4.73)
Boys			
No eczema, asthma or rhinitis (n=951)	1	**1**	1
Eczema (n=140)	0.78 (0.40–1.52)	0.70 (0.38–1.29)	0.73 (0.41–1.27)
Subgroup with ongoing eczema (n=40)	0.94 (0.26–3.41)	0.88 (0.28–2.76)	0.62 (0.19–1.98)
Mild eczema (n=103)	0.68 (0.31–1.50)	0.51 (0.24–1.10)	0.66 (0.34–1.26)
Moderate to severe eczema (n=37)	1.26 (0.39–4.10)	1.53 (0.55–4.25)	0.94 (0.32–2.70)
Asthma (n=116)	1.17 (0.57–2.42)	**1.97 (1.06–3.64)**	0.83 (0.43–1.62)
Rhinitis (n=300)	1.42 (0.98–2.07)	**2.31 (1.67–3.19)**	1.00 (0.71–1.40)
Eczema, asthma and rhinitis (n=23)	**7.84 (3.32–18.5)**	**6.37 (2.66–15.3)**	1.60 (0.68–3.75)

[a]Adjusted odds ratios (aOR) were calculated by multiple logistic regression with adjustment for parental allergy, low socio-economic status, having a young mother and co-morbidity (eczema, asthma and rhinitis at the 12-year follow-up).
Statistically significant differences are written in bold.

the follow-up at 12 years of age. However, at age 2 years, our diagnostic criteria for eczema were found to have high sensitivity (92%) and specificity (100%) in relation to clinical diagnosis by a dermatologist (24). Another limitation is that all questionnaires were sent out on one occasion in April 2008. As a result, 83% of the questionnaires were filled out during the time-period April to August, corresponding to spring and summertime as well as pollen season in Sweden. In wintertime, eczema is far more prevalent, as seen in our own material (data not shown). Thus, it is possible that if the study had been performed during wintertime the impact on general health and CDLQI among children with eczema would have been larger, while the impact of rhinitis and possibly asthma might have been smaller. The study population seems to be representative of the source population, thus it is plausible to assume that the results are generalisable to paediatric populations in other high-income and urban-industrial settings with comparable rates of allergy-related diseases and background factors but probably not to other populations.

HRQoL comparison to previous studies

Previous studies, using generic instruments, have shown that generalised childhood eczema causes impairment of QoL that is greater than or equal to other childhood diseases, such as asthma, epilepsy and diabetes (25, 26). A relationship has also been reported between impaired quality of family life and eczema severity (27), with the highest impact in families with children with severe eczema. Another study carried out in an outpatient paediatric dermatology setting, reported impairment of quality of family life among mild eczema cases to be equal to that of families having children with diabetes (28). Thus, mild eczema may also have a profound impact on QoL. Since most children with eczema are treated by general practitioners and only more severe cases by specialists, findings from these settings cannot be generalised to all children with eczema. Our study design allows us to include even the mildest eczema cases in the population. In the group with mild eczema, only 57% had ever had a doctor's diagnosis of eczema, indicating that many of these children might not have been in contact with the health care system with regard to their skin symptoms. The mean score of CDLQI was 3.98 in the present study. In another Swedish study performed in dermatology outpatients, the corresponding score was 7.1 (8), and in a Czech study of outpatient dermatology patients, the corresponding score was 8.58 (10). However, a study performed in a primary care setting in the UK gave a mean score of CDLQI of 4.66 among boys and 4.26 among girls (29).

In this study, the proportion of mild cases was high – 59.2% among the 120 children with ongoing eczema that completed the CDLQI and 88.3% among the 230 children without ongoing symptoms but with data concerning self-perceived health – making it evident that we evaluated HRQoL and particularly self-perceived health in children with very mild disease. With this in

mind, it is remarkable that we found a significant impact of self-perceived health in girls having mild eczema only, of which a majority did not have skin symptoms at the time of filling out the questionnaire. From disease-specific instruments we know that impaired QoL among eczema cases is due to itching, sleep deprivation and embarrassment caused by skin symptoms (8, 29), which correlates with the results from CDLQI in our study. However, it is hard to believe that these factors are the entire explanation in the group of girls with mild disease. Other factors may be of importance for the impaired general health and QoL. We found that boys rated their health better than girls, which is consistent with findings in previous studies (22, 23). One possible explanation could be that girls mature earlier and at this age become self-conscious with a desire to be like everyone else.

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