

Mental health among parents and their children with eczema in Hong Kong

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ABSTRACT

Introduction: This cross-sectional survey research investigated mental health symptoms and quality of life among Chinese parents and their children with eczema at a paediatric dermatology clinic in Hong Kong from November 2018 to October 2020.

Methods: Health-related quality of life, eczema severity, and mental health among children with eczema, as well as their parents' mental health, were studied using the Children's Dermatology Life Quality Index (CDLQI), Infants' Dermatitis Quality of Life Index (IDQOL), Nottingham Eczema Severity Score (NESS), Patient-Oriented Eczema Measure (POEM), and the Chinese version of the 21-item Depression, Anxiety, and Stress Scales (DASS-21).

Results: In total, 432 children and 380 parents were recruited. Eczema severity (NESS and POEM) and health-related quality of life (CDLQI) were significantly positively associated with parental and child depression, anxiety, and stress levels according to the DASS-21, regardless of sex (children: $r=0.28-0.72$, $P<0.001$ to 0.007 ; parents: $r=0.20-0.52$, $P<0.001$ to 0.034). Maternal depression was marginally positively associated with increased anxiety in boys with eczema ($r=0.311$; $P=0.045$). Younger parents had higher risk of developing more anxiety and stress compared with the older parents (adjusted odds ratio [aOR] = -0.342 , $P=0.014$ and aOR = -0.395 , $P=0.019$, respectively). Depression level of parents with primary to secondary education was 58% higher than their counterparts with post-secondary education or above (aOR = -1.579 ; $P=0.007$).

Conclusion: Depression, anxiety, and stress among children with eczema and their parents were associated with eczema severity and impaired quality of life in those children. These findings regarding impaired mental health in children with eczema and their parents highlight the need to include mental well-being and psychosocial outcomes in future studies and clinical practice.

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New knowledge added by this study

- Depression, anxiety, and stress among children with eczema and their parents were associated with eczema severity and impaired quality of life in those children.
- Higher parental education level and advanced parental age could be the protective factors in dealing with emotional distress among parents whose children had eczema.

Implications for clinical practice or policy

- The findings regarding impaired mental health in children with eczema and their parents highlight the need to include mental well-being and psychosocial outcomes in future studies and clinical practice.

Introduction

Atopic eczema (AE) is a common childhood skin disease associated with pruritus and sleep disturbance.¹⁻⁵ Childhood AE can substantially influence quality of life (QOL) among affected children and their parents. The extent of QOL impairment is often correlated with eczema

severity, skin dehydration, and staphylococcal infection.⁶ Additionally, many affected children and their parents develop depression, anxiety, and stress symptoms.¹ These mental health issues are correlated with disease severity, impaired QOL, and therapeutic non-compliance.^{1,7,8} A study using the 42-item Depression, Anxiety, and Stress Scales

(DASS-42) found that depression, anxiety, and stress symptoms were present in 21%, 33%, and 23% of Hong Kong adolescent patients with AE, respectively.¹ These psychological symptoms were significantly correlated with poor QOL.¹ A study of Japanese children showed eczema severity was associated with mental health.⁹ Furthermore, a retrospective, cross-sectional population-based survey of childhood eczema in the United States revealed that increased eczema severity was associated with a higher risk of mental disorders.¹⁰ School-aged children with moderate and severe AE have a higher risk of psychosocial problems that can influence their quality of sleep and cognitive development.¹¹ Emotion, attention, interpersonal relationships, and conduct can also be affected by AE.^{10,12} Moreover, parents are often unaware of potential psychosocial health issues in their children with eczema.¹³ Most affected children and their parents do not receive appropriate psychological help and support; they also exhibit low symptom recognition. The impacts of childhood eczema on the parent-child dyad have not been extensively studied in terms of health-related quality of life (HRQOL), eczema severity, or mental health status.¹⁴

This study was performed to examine associations between mental health issues and disease severity in children or adolescents with AE and their parents using the concise validated 21-item Chinese version of DASS-42 (DASS-21).^{1,15-17}

Methods

Study design and participant recruitment

This 2-year cross-sectional survey was conducted between November 2018 and October 2020. Participants with a diagnosis of AE and their parents were recruited at the paediatric dermatology clinic of a university-affiliated hospital in Hong Kong. Eczema was clinically diagnosed in accordance with the United Kingdom Working Party's Diagnostic Criteria for Atopic Dermatitis.¹⁸ Participants and their parents received information about the study including objectives, procedures, voluntary participation, and right of withdrawal. Non-Chinese participants and individuals aged <11 years who were not accompanied by a parent during recruitment were excluded from the study.

The questionnaires were self-administered and supervised by research staff. Parents would help complete the Children's Dermatology Life Quality Index (CDLQI), Infants' Dermatitis Quality of Life Index (IDQOL), Nottingham Eczema Severity Score (NESS), and Patient-Oriented Eczema Measure (POEM) for their younger children. The DASS-21 was individually administered to all parents and to children aged >11 years.

到香港一所兒科皮膚科診所求診的濕疹兒童及其父母的心理健康探討

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引言：這項橫向問卷研究於2018年11月至2020年10月期間進行，調查到香港一所兒科皮膚科診所求診的濕疹兒童及其華裔父母的心理健康狀況和生活質素。

方法：本研究採用兒童皮膚炎影響生活質素指數（CDLQI）、幼兒皮膚炎影響生活質素指數（IDQOL）、諾丁漢濕疹嚴重程度評分（NESS）、以患者為中心的濕疹測量（POEM）和中文版情緒自評量表-21（DASS-21）來探討濕疹兒童的健康相關生活質素、濕疹嚴重程度和心理健康，以及他們父母的心理健康。

結果：是次研究招募了432名兒童及380名家長。DASS-21問卷結果顯示，無論性別如何，濕疹嚴重程度（NESS及POEM）和健康相關生活質素（CDLQI）與父母和兒童的抑鬱、焦慮和壓力水平都明顯呈正相關性（兒童： $r=0.28-0.72$ ， $P<0.001$ 至 0.007 ；父母： $r=0.20-0.52$ ， $P<0.001$ 至 0.034 ）。母親的抑鬱程度與濕疹男童的焦慮水平上升稍呈正相關性（ $r=0.311$ ； $P=0.045$ ）。與較年長的父母相比，年輕父母產生更多焦慮和壓力的風險較高（分別為調整後勝算比=-0.342， $P=0.014$ 及調整後勝算比=-0.395， $P=0.019$ ）。受過小學至中學教育的父母的抑鬱程度比受過高等教育或以上的父母高58%（調整後勝算比=-1.579； $P=0.007$ ）。

結論：父母和濕疹兒童的抑鬱、焦慮和壓力水平與濕疹兒童的濕疹嚴重程度和生活質素受損有關。這些關於兩者心理健康受損的研究結果，反映了將精神健康和社會心理影響納入未來研究和臨床實踐的必要性。

Clinical assessment of eczema

The validated Chinese version of the three-item NESS, completed by children aged >11 years or the parents of children aged ≤11 years, was used to determine eczema severity in participating children.^{19,20} The presence of eczema and number of nights affected by skin itchiness each week in the past 12 months were rated from 1 to 5. A higher score indicated greater eczema severity. Additionally, areas of skin with eczematous lesions (eg, rash, lichenified skin, and/or bleeding) were recorded. Scores on the NESS were categorised as mild (3 to 8), moderate (9 to 11), and severe (12 to 15) eczema. Subjective measurements were determined using the validated seven-item Chinese translation of the POEM, which was also completed by children aged >11 years or the parents of children aged ≤11 years.^{21,22} Each item was scored from 0 to 4, with a maximum aggregate score of 28. A higher score indicated greater eczema severity in the past week (ranges of 0-2, 3-7, 8-16, 17-24, and 25-28 correspond to clear, mild, moderate, severe, and very severe levels of eczema, respectively).

Assessment of health-related quality of life

Health-related QOL was evaluated using the Chinese version of the 10-item CDLQI²³ and the 10-item IDQOL.²⁴ The CDLQI was completed by children aged ≥4 years with guidance from parents, whereas the IDQOL was completed by parents of children aged <4 years. Each item on the two scales was scored from 0 to 3, with a maximum aggregate score of 30. A higher score indicated greater eczema-related HRQOL impairment in the past week (CDLQI ranges of 0-1, 2-6, 7-12, 13-18, and 19-30 correspond to no, small, moderate, very large, and extremely large effects on HRQOL, respectively; these ranges for IDQOL are 0-1, 2-5, 6-10, 11-20, and 21-30, respectively).

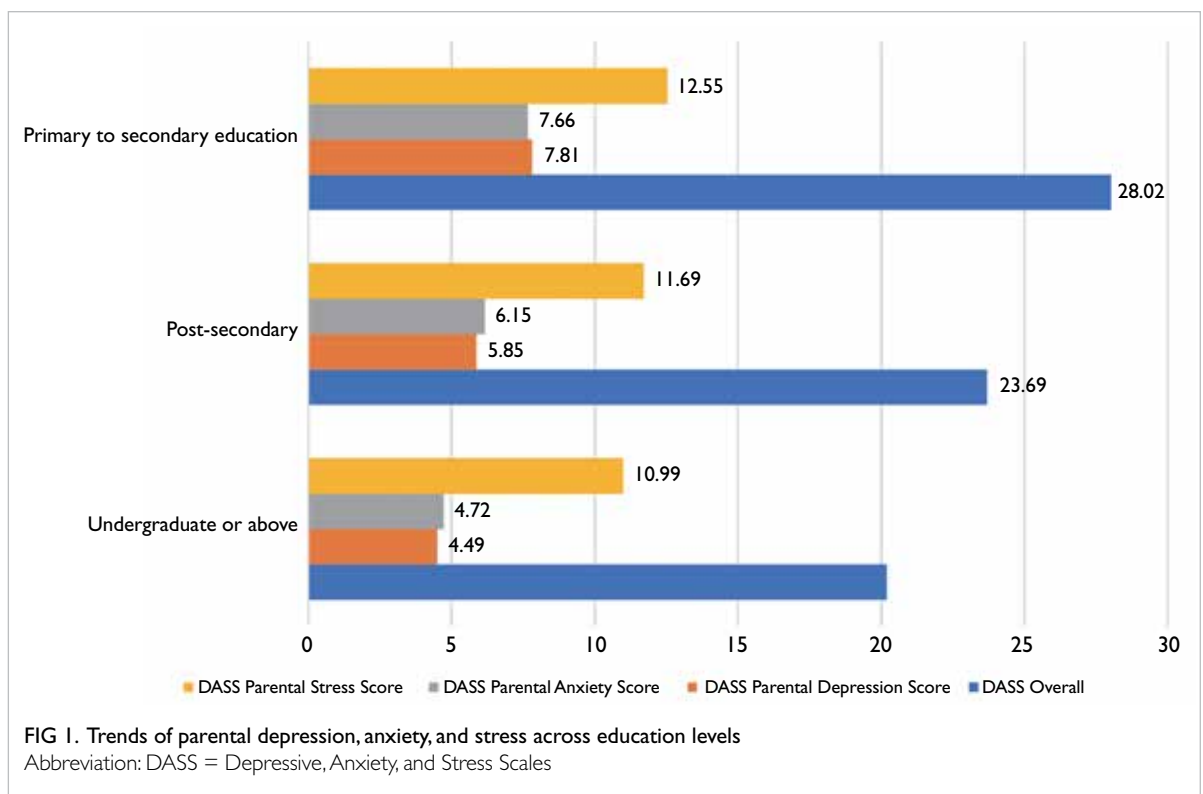
Assessment of mental health

Mental health was assessed by measuring depression, anxiety, and stress in children with eczema and their parents using the validated Chinese version of the DASS-21. This scale has been used to examine symptoms of depression, anxiety, and stress among individuals with dermatitis or eczema.^{1,17} The DASS-21 was individually administered to all parents and to children aged >11 years. The DASS-21 composite score can be divided into the DASS Depression, DASS Anxiety, and DASS Stress domains. The total score for each domain ranges from 0 to 42.²⁵ A higher score indicates greater emotional

distress in that domain (DASS Depression ranges of 0-9, 10-13, 14-20, 21-27, and ≥28 correspond to normal, mild, moderate, severe, and extremely severe levels, respectively; these ranges for DASS Anxiety are 0-7, 8-9, 10-14, 15-19, and ≥20, whereas they are 0-14, 15-18, 19-25, 26-33, and ≥34 for DASS Stress).

Statistical analysis

Clinical data were de-identified and analysed using SPSS (Windows version 25.0; IBM Corp, Armonk [NY], United States). Frequency distributions were used to describe the demographic and clinical characteristics of participants. Continuous variables with normal distributions were expressed as means±standard deviations (corrected to 1 decimal place). Nominal and ordinal variables were expressed in numbers with percentage (corrected to 1 decimal place). Independent samples *t* tests were used to explore sex differences regarding age, education level, disease severity, QOL, and emotional distress in parents and children. Pearson correlation analysis was utilised to examine associations among mental health, eczema severity, and HRQOL in parents and children of both sexes. Multiple linear regression was performed to adjust for variations in parental and child DASS scores and HRQOL according to demographic and clinical variables. P values <0.05 were considered statistically significant.



Results

Demographic information, disease state, and mental well-being among children and parents

Among 380 parents (mean age=41.13±6.52 years), 49 were fathers (mean age=42.50±7.49 years) and 331 were mothers (mean age=40.95±6.36 years). Parents' education levels were primary to secondary (n=124, 13 males), post-secondary (n=26, 1 male), and undergraduate or above (n=81, 14 males) [Table 1]. Parents reported moderate to extremely severe depression (n=58, 2 males), moderate to extremely severe anxiety (n=101, 5 males), and moderate to extremely severe stress (n=90, 6 males). Parents with a higher education level had lower levels of depression, anxiety, and stress (Fig 1). Compared with fathers, mothers generally had higher overall DASS-21 depression, anxiety, and stress scores (P<0.001-0.005) [Table 1].

Among 432 children (mean age=9.61±5.41 years), 218 were boys (mean age=9.15±5.44 years) and 214 were girls (mean age=10.06±5.35 years). Most children had moderate to severe/very severe disease according to the POEM (n=290) and NESS (n=291). Over half of the children displayed a moderate to extremely large impact on QOL in the CDLQI (n=171, 50.4%) and IDQOL (n=56, 62.9%). Small numbers of children had moderate to extremely severe depression (n=36), anxiety (n=43), and stress (n=30). There were no significant sex differences in disease severity, HRQOL, or emotional distress in the DASS (Table 2).

Eczema severity, health-related quality of life, and mental health among children

Disease severity in terms of NESS, POEM, and HRQOL (ie, CDLQI and IDQOL) was generally worse among infants than among older children (Fig 2). Thus, eczema severity and QOL generally appeared to improve with age. Correlation analysis demonstrated that depression, anxiety, and stress levels were significantly associated with NESS, POEM, and CDLQI, regardless of sex (Table 3).

Eczema severity, health-related quality of life, and mental health among parents

Correlation analysis revealed that eczema severity (NESS and POEM) and HRQOL (CDLQI) were associated with depression, anxiety, and stress levels (DASS-21) among children and parents, regardless of sex (Table 3 and Fig 3). Moreover, depression, anxiety, and stress levels in mothers were significantly correlated with NESS, POEM, IDQOL, and CDLQI. Paternal anxiety and stress levels were correlated with NESS, POEM, and CDLQI (P<0.001 to 0.034). However, paternal depression was only correlated with POEM (P=0.014) [Table 3].

TABLE 1. Parents' demographic and socio-economic characteristics (n=380)*

	Overall	By sex		P value
		Male (n=49)	Female (n=331)	
Age, y	41.13±6.52	42.50±7.49	40.95±6.36	0.148
Education level	231	28 (12.1%)	203 (87.9%)	
Primary	5	0	5 (100%)	
Junior secondary	30	4 (13.3%)	26 (86.7%)	
Senior secondary	89	9 (10.1%)	80 (89.9%)	
Post-secondary	26	1 (3.8%)	25 (96.2%)	
Undergraduate	54	7 (13.0%)	47 (87.0%)	
Postgraduate	27	7 (25.9%)	20 (74.1%)	
Income, HKD	231	28 (12.1%)	203 (87.9%)	
<10 000	97	1 (1.0%)	96 (99.0%)	
10 000-19 999	32	3 (9.4%)	29 (90.6%)	
20 000-29 999	43	12 (27.9%)	31 (72.1%)	
30 000-39 999	19	0	19 (100%)	
≥40 000	40	12 (30.0%)	28 (70.0%)	
DASS Overall†	23.77±23.30	16.00±14.82	24.92±24.11	0.001
DASS Depression†	5.90±7.34	3.88±4.39	6.20±7.64	0.003
Normal	278	41 (14.7%)	237 (85.3%)	
Mild	43	6 (14.0%)	37 (86.0%)	
Moderate	35	2 (5.7%)	33 (94.3%)	
Severe	17	0	17 (100%)	
Extremely severe	6	0	6 (100%)	
DASS Anxiety†	6.18±7.14	3.59±4.26	6.57±7.40	<0.001
Normal	252	40 (15.9%)	212 (84.1%)	
Mild	26	4 (15.4%)	22 (84.6%)	
Moderate	55	4 (7.3%)	51 (92.7%)	
Severe	22	1 (4.5%)	21 (95.5%)	
Extremely severe	24	0	24 (100%)	
DASS Stress†	11.68±10.51	8.53±7.66	12.15±10.80	0.005
Normal	253	39 (15.4%)	214 (84.6%)	
Mild	36	4 (11.1%)	32 (88.9%)	
Moderate	40	5 (12.5%)	35 (87.5%)	
Severe	34	1 (2.9%)	33 (97.1%)	
Extremely severe	16	0	16 (100%)	

Abbreviations: DASS = Depressive, Anxiety, and Stress Scales; HKD = Hong Kong dollars
* Data are shown as No., No. (%) or mean±standard deviation, unless otherwise specified

† n=379 as one participant completed demographic information but did not complete the 21-item DASS and other surveys

Mental health among children and parents

Maternal depression showed a marginal association with higher anxiety levels in boys with eczema (n=42, r=0.311; P=0.045) [Table 3]. However, considering the small number of pairs, no clinical or statistical

TABLE 2. Children’s demographic and clinical characteristics (n=432)*

	Overall	By sex		P value
		Male (n=218)	Female (n=214)	
Age, y	9.61±5.41	9.15±5.44	10.06±5.35	0.080
NESS	10.00±3.51	10.16±3.62	9.84±3.39	0.351
Mild	141	65 (46.1%)	76 (53.9%)	
Moderate	131	63 (48.1%)	68 (51.9%)	
Severe	160	90 (56.3%)	70 (43.8%)	
POEM	12.42±7.82	12.72±7.85	12.13±7.79	0.434
Clear	39	20 (51.3%)	19 (48.7%)	
Mild	103	47 (45.6%)	56 (54.4%)	
Moderate	157	80 (51.0%)	77 (49.0%)	
Severe	98	55 (56.1%)	43 (43.9%)	
Very severe	35	16 (45.7%)	19 (54.3%)	
CDLQI (n=339)	8.11±6.63	8.41±6.50	7.82±6.76	0.718
No effect	38	19 (50.0%)	19 (50.0%)	
Small effect	130	58 (44.6%)	72 (55.4%)	
Moderate effect	101	49 (48.5%)	52 (51.5%)	
Very large effect	40	22 (55.0%)	18 (45.0%)	
Extremely large effect	30	15 (50.0%)	15 (50.0%)	
IDQOL (n=89)	8.16±5.69	7.94±5.00	8.46±6.60	0.205
No effect	9	3 (33.3%)	6 (66.7%)	
Small effect	24	15 (62.5%)	9 (37.5%)	
Moderate effect	27	19 (70.4%)	8 (29.6%)	
Very large effect	27	14 (51.9%)	13 (48.1%)	
Extremely large effect	2	1 (50.0%)	1 (50.0%)	
DASS Overall (n=163)	22.74±25.29	23.54±24.78	22.15±25.79	0.731
DASS Depression (n=163)	7.14±9.86	7.33±9.64	7.00±10.07	0.832
Normal	113	47 (41.6%)	66 (58.4%)	
Mild	14	7 (50.0%)	7 (50.0%)	
Moderate	21	10 (47.6%)	11 (52.4%)	
Severe	4	1 (25.0%)	3 (75.0%)	
Extremely severe	11	4 (36.4%)	7 (63.6%)	
DASS Anxiety (n=163)	6.04±7.47	6.20±7.16	5.91±7.72	0.809
Normal	112	46 (41.1%)	66 (58.9%)	
Mild	8	4 (50.0%)	4 (50.0%)	
Moderate	23	10 (43.5%)	13 (56.5%)	
Severe	8	4 (50.0%)	4 (50.0%)	
Extremely severe	12	5 (41.7%)	7 (58.3%)	
DASS Stress (n=163)	9.56±10.02	10.00±9.70	9.23±10.28	0.631
Normal	121	51 (42.1%)	70 (57.9%)	
Mild	12	5 (41.7%)	7 (58.3%)	
Moderate	13	8 (61.5%)	5 (38.5%)	
Severe	11	3 (27.3%)	8 (72.7%)	
Extremely severe	6	2 (33.3%)	4 (66.7%)	

Abbreviations: CDLQI = Children’s Dermatology Life Quality Index; DASS = Depression, Anxiety, and Stress Scales; IDQOL = Infants’ Dermatitis Quality of Life Index; NESS = Nottingham Eczema Severity Score; POEM = Patient-Oriented Eczema Measure
 * Data are shown as No., No. (%) or mean±standard deviation, unless otherwise specified

inferences should be made regarding sex differences in mental health among children and parents. Additionally, there were no statistically significant associations between the mental health of children and parents concerning depression, anxiety, and stress levels in the DASS-21 (Table 3). Regression analysis showed that the child’s HRQOL and parental age mostly explained variation in parental anxiety and stress, whereas parental education level explained variation in parental depression (Table 4). Younger parents had higher risk of developing more anxiety and stress compared with the older parents. Depression level of parents with primary to secondary education was 58% higher than their counterparts with post-secondary education or above. Conversely, the child’s eczema severity and HRQOL mostly explained the child’s emotional distress. Eczema severity and parental emotional distress significantly affected HRQOL in children of all ages (Table 4).

There was no psychological or physiological discomfort resulted from administration of the surveys.

Discussion

Psychological symptoms of depression, anxiety, and stress were prevalent among children with AE and their parents. Our findings indicate associations between the mental health of children and parents and the eczema severity in those children. Increased eczema severity in children and adolescents led to greater emotional distress in parents and children, regardless of sex. Similarly, psychological symptoms in children and their parents were negatively correlated with the child’s eczema severity (NESS and POEM) and HRQOL impairment (CDLQI or IDQOL), regardless of sex. These strong correlations suggest that psychological symptoms, eczema severity, and impact on QOL have mutually detrimental effects. The DASS depression, anxiety, and stress scores were generally higher among mothers than among fathers, suggesting that mothers (the primary caregivers for children with eczema) were more strongly affected. The present study showed that eczema severity can adversely affect emotions and QOL among parents and children, highlighting the need for further exploration of biopsychosocial interactions among children and adolescents with eczema. Children with severe disease reportedly have more problems with depression and internalising behaviour.²⁶ Behavioural issues can lead to adverse social interactions with peers, further reducing self-esteem and HRQOL. Therefore, interactions among parental perception of the child’s disease severity, the child’s treatment adherence, the child’s social influence by peers, and the child’s school environment should be considered when clinicians make comprehensive decisions about holistic treatments.

Our results using the DASS-21 are consistent with findings in previous studies^{1,27} that used the more comprehensive DASS-42. As in previous studies,^{1,27} we found that caregivers were especially likely to experience anxiety related to care provision in the home.^{28,29} In the present study, maternal depression was associated with a higher anxiety level, particularly in relation to boys with eczema. Accordingly, the Harmonising Outcome Measures for Eczema initiative recommends documentation of disease severity and QOL impairment in eczema cases.^{25,30} However, there have been few international initiatives and clinical trials regarding the psychological symptoms of caregivers and patients, particularly in the context of childhood eczema. Therefore, we suggest that clinicians should consider these important measurable domains in terms of therapeutic interventions and psychological support. Childhood eczema treatments mainly focus on pharmacological control of physical symptoms, but they often completely neglect the psychological symptoms of affected children and their parents. A more holistic treatment approach is needed for this potentially devastating common childhood disorder. Given the increasing numbers of proposed assessment tools, we advocate a holistic and comprehensive approach for eczema management that considers children and their families. This treatment tool should use a composite score to continuously evaluate disease severity (in objective and subjective manners), QOL impairment, psychological symptoms, and miscellaneous disease surrogates in affected children and their parents.^{1,16,21,26}

Strengths and limitations

A strength of this study was that compared with the DASS-42, the DASS-21 demonstrated better performance with 50% fewer questions and a shorter completion time. Findings from the DASS-21, but not the DASS-42, were correlated with disease severity as measured by the NESS and POEM.¹ These discrepancies could have arisen because the sample size in the present study (using the DASS-21) was threefold greater than the sample size in the previous DASS-42 study.¹ In the present study, the DASS-21, especially in child and mother, was moderately to strongly correlated with the CDLQI, IDQOL, NESS, and POEM. Thus, the DASS-21 can effectively represent the degree of emotional distress among parents and children or adolescents with eczema. This questionnaire is available in different languages, potentially allowing it to be used for assessment of patients with other ethnicities. To our knowledge, this is the first study to use the DASS-21 to assess the mental health of parents and children

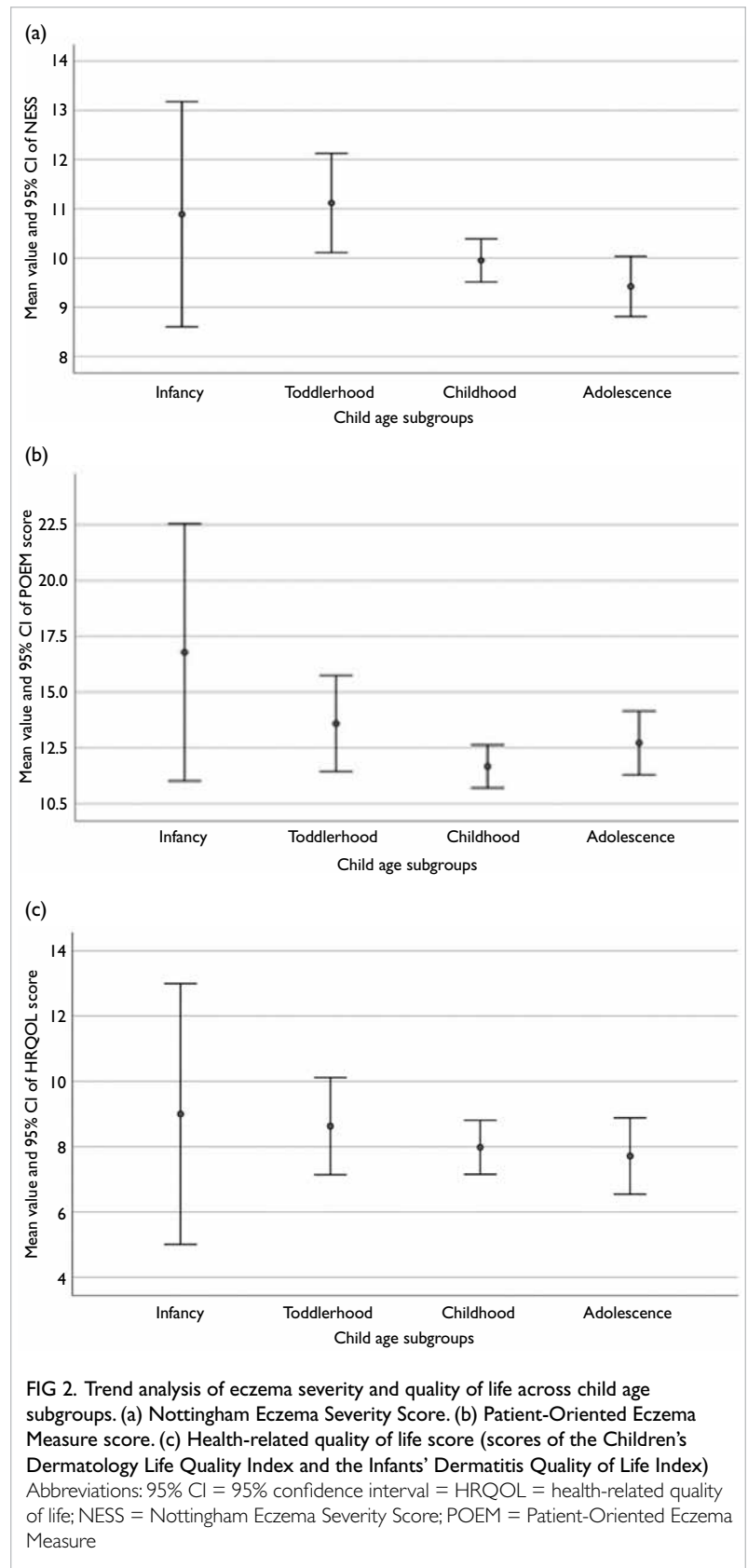


TABLE 3. Correlations among parent-child mental health, eczema severity, and health-related quality of life*

	Boy DASS overall	Boy depression	Boy anxiety	Boy stress	Girl DASS overall	Girl depression	Girl anxiety	Girl stress	NESS	POEM	CDLQI	IDQOL
Paternal DASS overall	0.226 (0.590)	0.174 (0.680)	0.207 (0.623)	0.300 (0.471)	-0.295 (0.705)	0.173 (0.827)	0 (1.000)	-0.503 (0.497)	0.334 (0.019)	0.446 (<0.001)	0.454 (0.005)	-0.205 (0.502)
Paternal depression	-0.185 (0.662)	-0.256 (0.541)	-0.205 (0.626)	0.057 (0.893)	-0.094 (0.906)	0.426 (0.574)	0.091 (0.909)	-0.275 (0.725)	0.208 (0.152)	0.350 (0.014)	0.290 (0.086)	-0.471 (0.104)
Paternal anxiety	0.137 (0.747)	0.112 (0.792)	0.108 (0.798)	0.191 (0.650)	-0.236 (0.764)	0.284 (0.716)	-0.020 (0.980)	-0.417 (0.583)	0.304 (0.034)	0.339 (0.017)	0.380 (0.022)	-0.186 (0.542)
Paternal stress	0.434 (0.282)	0.392 (0.337)	0.422 (0.297)	0.412 (0.310)	-0.451 (0.549)	-0.132 (0.868)	-0.050 (0.950)	-0.672 (0.328)	0.358 (0.012)	0.473 (<0.001)	0.494 (<0.001)	-0.041 (0.895)
Maternal DASS overall	0.095 (0.551)	-0.062 (0.695)	0.265 (0.091)	0.091 (0.567)	0.167 (0.214)	0.180 (0.181)	0.077 (0.568)	0.193 (0.150)	0.276 (<0.001)	0.256 (<0.001)	0.405 (<0.001)	0.528 (<0.001)
Maternal depression	0.160 (0.312)	-0.017 (0.917)	0.311 (0.045)	0.180 (0.255)	0.115 (0.394)	0.125 (0.354)	0.054 (0.688)	0.130 (0.335)	0.223 (<0.001)	0.196 (<0.001)	0.345 (<0.001)	0.520 (<0.001)
Maternal anxiety	0.008 (0.959)	-0.105 (0.509)	0.174 (0.269)	-0.021 (0.897)	0.154 (0.251)	0.165 (0.220)	0.087 (0.519)	0.167 (0.215)	0.217 (<0.001)	0.214 (<0.001)	0.319 (<0.001)	0.467 (<0.001)
Maternal stress	0.102 (0.521)	-0.048 (0.762)	0.257 (0.100)	0.103 (0.517)	0.197 (0.141)	0.211 (0.115)	0.079 (0.560)	0.238 (0.074)	0.309 (<0.001)	0.285 (<0.001)	0.448 (<0.001)	0.469 (<0.001)
NESS	0.446 (<0.001)	0.384 (<0.001)	0.416 (<0.001)	0.451 (<0.001)	0.405 (<0.001)	0.391 (<0.001)	0.279 (0.007)	0.423 (<0.001)	N/A	N/A	N/A	N/A
POEM	0.513 (<0.001)	0.452 (<0.001)	0.465 (<0.001)	0.517 (<0.001)	0.554 (<0.001)	0.496 (<0.001)	0.468 (<0.001)	0.551 (<0.001)	0.766 (<0.001)	N/A	N/A	N/A
CDLQI	0.610 (<0.001)	0.550 (<0.001)	0.585 (<0.001)	0.581 (<0.001)	0.717 (<0.001)	0.602 (<0.001)	0.645 (<0.001)	0.724 (<0.001)	0.651 (<0.001)	0.706 (<0.001)	N/A	N/A
IDQOL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.642 (<0.001)	0.639 (<0.001)	N/A	N/A

Abbreviations: CDLQI = Children's Dermatology Life Quality Index; DASS = Depression, Anxiety, and Stress Scales; IDQOL = Infants' Dermatitis Quality of Life Index; N/A = not applicable; NESS = Nottingham Eczema Severity Score; POEM = Patient-Oriented Eczema Measure

* Data are shown as r (P value), unless otherwise specified

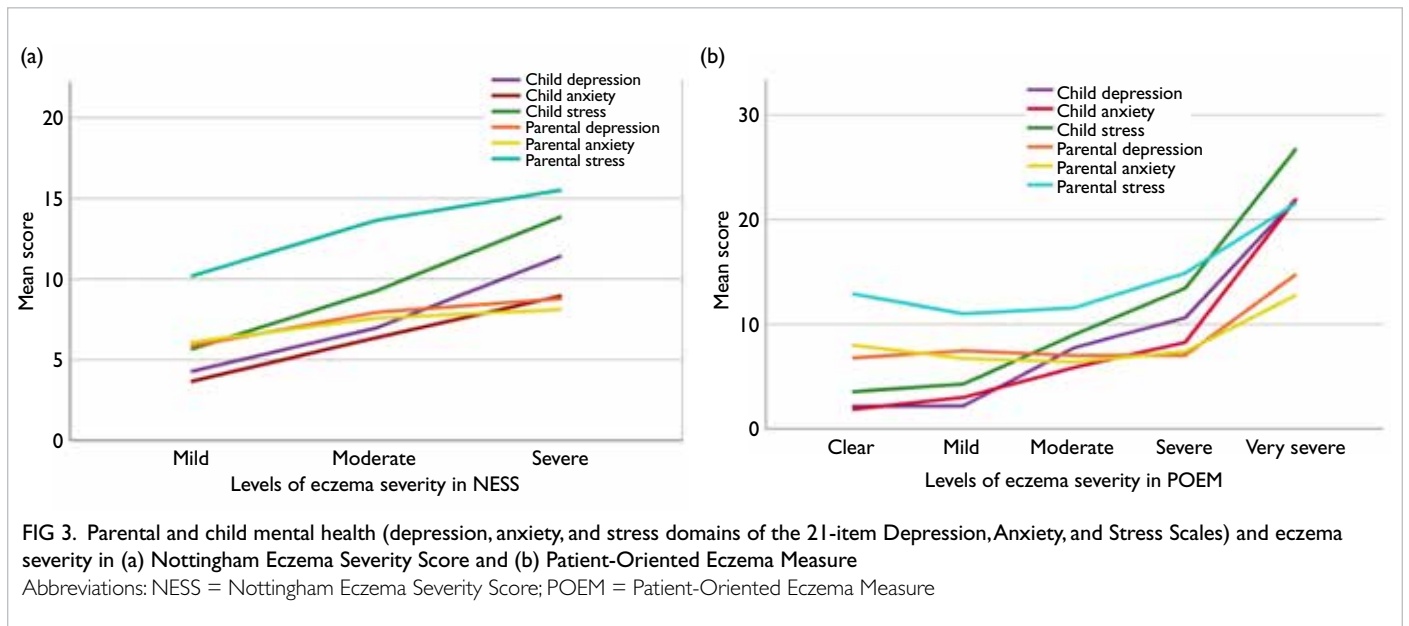


FIG 3. Parental and child mental health (depression, anxiety, and stress domains of the 21-item Depression, Anxiety, and Stress Scales) and eczema severity in (a) Nottingham Eczema Severity Score and (b) Patient-Oriented Eczema Measure

Abbreviations: NESS = Nottingham Eczema Severity Score; POEM = Patient-Oriented Eczema Measure

with eczema in a paediatric setting. This study revealed the presence of childhood eczema-related depression, anxiety, and stress in affected children and their parents.

This study had a few limitations including its relatively small sample size, especially concerning father-child pairs. A greater proportion of mothers participated in this study, which is expected because mothers are the main caregivers for children with eczema; they typically accompany their children during medical consultations. Considering that paediatric dermatological clinics also cater adolescent patients aged ≥16 years, a few participants aged 16 to 19 years completed the CDLQI on their HRQOL; although these participants exceeded the suggested age range of ≤16 years, the overall results were not affected.

Another limitation is that the number of recruited mothers, who are normally regarded as the main child caregiver, much outweighs that of recruited fathers. In addition, compared with fathers, mothers may know their child's health more and get anxious or depressed as the eczema severity of their child escalates over time. Thus, the difference of the role in childbearing, sample size and the understanding of child's health may affect the findings in parental-child correlations. It should be cautious when the results regarding parental-child correlations are studied and presented. The CDLQI (n=339) is a questionnaire for children, and the IDQOL (n=89) is for infants. The different numbers of participants who completed each of these questionnaires is consistent with the CDLQI coverage of a broader age range, whereas the IDQOL is only suitable for children aged <4 years. Although maternal depression was correlated with boys with anxiety, it is important to note that statistical significance should not be used to infer that there is a sex difference between parent and child groups in terms of mental health; such an inference would constitute overgeneralisation.

Conclusion

Children with eczema and their parents demonstrated mental health impairment, which was correlated with disease severity. Eczema-induced anxiety, stress, and other mental health issues in affected children and their parents should be considered by healthcare professionals during comprehensive assessments for the treatment of eczema. In addition to primary eczema, possible secondary psychiatric symptoms should be monitored in children with moderate to severe eczema and their parents. Childhood eczema severity and the mental health of affected children and their parents should be simultaneously evaluated to prevent and manage secondary psychological problems.

TABLE 4. Regression model of Depressive, Anxiety, and Stress Scales scores of parents and children by demographic information, eczema severity, and health-related quality of life

Outcome variables	Predictors	Adjusted odds ratio (95% CI)	P value
Parental stress*	CDLQI	0.508 (0.193-0.824)	0.002
	Parental age	-0.395 (-0.724 to -0.066)	0.019
Parental anxiety†	Parental age	-0.342 (-0.613 to -0.70)	0.014
Parental depression‡	CDLQI	0.328 (0.069-0.586)	0.014
	Education level	-1.579 (-2.722 to -0.436)	0.007
Child stress§	CDLQI	0.722 (0.357 to 1.088)	0.000
	POEM	0.300 (0.015-0.584)	0.039
Child anxiety¶	CDLQI	0.784 (0.575-0.994)	0.000
Child depression¶	CDLQI	0.943 (0.642-1.244)	0.000
	CDLQI**	0.278 (0.106-0.450)	0.002
	NESS	0.375 (0.030-0.719)	0.033
IDQOL††	Child anxiety	0.272 (0.162-0.382)	0.000
	Parental depression	0.108 (0.011-0.205)	0.029
	POEM	0.282 (0.171-0.392)	0.000
	NESS	0.276 (0.039-0.514)	0.023
	Child age	-0.120 (-0.219 to -0.021)	0.017
	Parental stress	0.086 (0.033-0.139)	0.002

Abbreviations: 95% CI = 95% confidence interval; CDLQI = Children's Dermatology Life Quality Index; DASS = Depressive, Anxiety, and Stress Scales; IDQOL = Infants' Dermatitis Quality of Life Index; NESS = Nottingham Eczema Severity Scale; POEM = Patient-Oriented Eczema Measure

- * Adjusted for IDQOL, NESS, POEM, child DASS overall score, child depression, child anxiety, child stress, monthly income, and education level
- † Adjusted for IDQOL, CDLQI, NESS, POEM, child DASS overall score, child depression, child anxiety, child stress, monthly income, and education level
- ‡ Adjusted for IDQOL, NESS, POEM, child DASS overall score, child depression, child anxiety, child stress, parental age, and monthly income
- § Adjusted for IDQOL, NESS, parental DASS overall score, parental depression, parental anxiety, parental stress, monthly income, child age, and education level
- ¶ Adjusted for IDQOL, NESS, POEM, parental DASS overall score, parental depression, parental anxiety, parental stress, monthly income, child age, and education level
- ** Adjusted for parental DASS overall score, parental anxiety, parental stress, child DASS overall score, child depression, child stress, monthly income, child age, parental age, and education level
- †† Adjusted for NESS, POEM, parental DASS overall score, parental depression, parental anxiety, parental stress, monthly income, child age, and education level

Author contributions

Concept or design: KL Hon.
 Acquisition of data: PH Lam.
 Analysis or interpretation of data: PH Lam, P Ip.
 Drafting of the manuscript: PH Lam, KL Hon.
 Critical revision of the manuscript for important intellectual content: KL Hon, S Loo, MJ Koh, CHY Chan, CK Li, P Ip.

Conflicts of interest

As an editor of the journal, KL Hon was not involved in the peer review process. Other authors have disclosed no conflicts of interest.

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Ethics approval

This research was approved by the Joint Chinese University of Hong Kong–New Territories East Cluster Clinical Research Ethics Committee, Hong Kong (Ref No.: CRE.2018.401). Written informed consent was obtained from participants and parents prior to the research.

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