

# Psychological Stress of Parents of Children With Atopic Dermatitis: The Korea National Health and Nutrition Examination Survey

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## Research Article

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# Abstract

**Background:** Atopic dermatitis (AD) is a chronically relapsing inflammatory skin condition that has profound impacts on patient and family quality of life.

**Objectives:** To investigate the psychological stress of parents of children with AD in Korea using data from the Korean National Health and Nutrition Examination Survey (KNHANES).

**Methods:** The cross-sectional study included parents of 8,575 participants under age 19 (970 with AD and 5,733 without AD) from the 2009–2012 KNHANES. Self-perception of stress, depressed mood, suicidal ideation, and diagnosis of depression by a physician were assessed for determination of psychological distress.

**Results:** After adjusting for age, gender, education level, occupation, and marital status, logistic regression analyses indicated that mothers of children with AD showed higher frequency of stress perception (adjusted odds ratio [aOR] 1.458 [95% confidence interval (CI), 1.223-1.739],  $p < 0.0001$ ) and suicide ideation (aOR 1.403 [95% CI 1.099-1.791],  $p = 0.0066$ ) than those without AD. In contrast, fathers of children with AD did not show a significant difference compared to those of children without AD.

**Conclusions:** Understanding the psychological stress of parents of children with AD is important for clinicians as evaluation, management, and support for parents, especially mothers, of children with AD are required.

## Introduction

Atopic dermatitis (AD) is a chronic pruritic inflammatory skin disease with high prevalence in childhood and adolescents. Recent studies reported that the prevalence of AD in these populations (6 months to < 18 years) was 2.7–20.1% across countries.<sup>1</sup> Also, the prevalence and incidence have increased persistently over the past decades.<sup>2</sup> AD is aggravated by variable factors such as stress, physical activities that cause sweating, and inadequate humidity.<sup>3</sup> The chronic course of the disease including recurrent acute exacerbations, treatment burden such as frequent moisturizing and steroid-phobia, dermatological complications, and coexisting medical comorbidities, as well as psychiatric conditions, degrade the quality of life (QOL) of patients and their families.<sup>4,5</sup>

A child's chronic illness adversely affects the primary caregiver.<sup>6</sup> In a prospective questionnaire-based study of 55 parents of children with AD, both mothers and fathers showed greater sleep loss, anxiety, and depression than parents of children with asthma.<sup>7</sup> A recent paper reviewing 3,436 journals on the QOL of families of children with AD described caring for children with AD as a considerable, time-consuming task that impairs personal relationships, decreases psychosocial functioning, and produces sleep disturbance.<sup>8</sup>

The Korea National Health and Nutrition Examination Survey (KNHANES) is conducted by the Korea Centers for Disease Control and Prevention (KCDCP). This nationally representative cross-sectional survey includes approximately 10,000 individuals each year as a survey sample and collects information on socioeconomic status, health-related behaviors, QOL, health care usage, anthropometric measures, biochemical and clinical profiles for non-communicable diseases, and dietary intake with three component surveys: health interview, health examination, and nutrition survey.<sup>9</sup>

Although several journals have reported on the psychological stress of parents of children with AD, there has been no large-scale, well-designed statistical study. Therefore, this study aims to investigate the psychological stress of parents of children with AD in Korea using the KNHANES data.

## Methods

### Study design and participants

The study design was cross-sectional, using data from KNHANES (2009-2012) (<https://knhanes.cdc.go.kr/knhanes/index.do>) with the national representative sample through the multi-stage probability sampling method and a structured and validated questionnaire. Data were collected in a variety of ways, including household interviews, physical examinations, laboratory tests, and nutritional status assessments. All survey protocols were approved by the KCDCP Institutional Review Board (IRB). Written informed consent was obtained from all participants before the survey began. This study included 8,575 people under 19 years of age from KNHANES (2009-2012). We excluded 541 participants with no parental information and 399 participants with no atopic disease evaluation. Also, we excluded 732 participants with no information on parental psychological stress. The remaining 6,903 participants were included in the final analyses. Those who had been diagnosed with AD by a physician were assigned to an AD group, and the rest were assigned to a without AD group (Figure 1).

### Data and measurements

In this study, the presence or absence of AD was investigated with the question, "Have you ever been diagnosed with AD by a physician?". Psychological stress status was defined by the yes or no answers to four questions: Q1, "Do you feel stress in your daily life?"; Q2, "Have you experienced suicidal ideation within the last year?"; Q3, "Have you ever suffered from feeling down, depressed, or hopeless for two consecutive weeks or longer during the last year?"; and Q4, "Have you ever been diagnosed with depression by a doctor?". Additional questionnaires, the EQ-5D index (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) and the LQ-VAS, were performed.

Data obtained from the survey and anthropometric measurements for children included the following: socio-demographic factors of gender (male, female), age (< 10,  $\geq 10$  and < 15, and  $\geq 15$  years), household income (lowest quartile or others), and BMI ( $\text{kg}/\text{m}^2$ ). Data for parents included the following: socio-demographic factors of gender (male, female), age, education level (high school or more; or not), BMI (obese:  $\geq 25 \text{ kg}/\text{m}^2$  or not), abdominal obesity ( $\geq 90 \text{ cm}$  for men and  $\geq 85 \text{ cm}$  for women);

behavioral factors of smoking status (current smoker or not), alcohol consumption per month (the percentage of drinking more than once a month in the last year), and physical activity (active, engaging in moderate or vigorous physical activity; inactive); allergic disease status such as AD and asthma, systemic illness of hypertension (systolic blood pressure  $\geq$  140 mmHg, diastolic blood pressure  $\geq$  90 mmHg or taking antihypertensive drugs), diabetes mellitus (fasting blood sugar  $\geq$  126 mg/dL or taking diabetes medication or insulin injection or a diagnosed from a doctor), and hypercholesterolemia (fasting total cholesterol  $\geq$  240 mg/dL or taking cholesterol medication).

## **Statistical analysis**

Chi-square tests were used to analyze frequencies of the distribution of baseline characteristics of the study participants, and the effect of size on the difference of the frequency distribution in each variable was measured. The prevalence ratio and associations between factors and psychological states including stress were evaluated using multivariate logistic regression analysis adjusted by age in model 1 and age, gender, education level, occupation, and marital status in model 2. All statistical tests were two-tailed with a 5% level of significance and performed using SAS version 9.3.

## **Declaration of Helsinki**

All methods were carried out in accordance with relevant guidelines and regulations.

## **Ethics approval**

All KNHANES surveys were conducted with informed consent of participants by KCDCP, and the IRB of KCDCP approved the protocols of the KNHANES. In this study, we used a dataset of the KNHANES that is open to the public for retrospective analysis that did not include personally identifiable information.

# **Results**

## **Clinical characteristics of the study subjects**

The number of children with AD was 970, which accounted for 16.3% of the total. The average age of children with AD was 9.75, and the average age of the control group was 10.48. Because of the demographic characteristics of AD, most of the children with AD (48.18%) were less than 10 years old, which caused a difference in age composition from the control group ( $P < 0.0001$ ). The difference in income level or BMI ( $\text{kg}/\text{m}^2$ ) between the two groups was not significant (Table 1).

Table 1  
Demographic characteristics of children.

Group	With AD	Without AD	P-value
Number	970	5933	
Sex_male (%)	51.49(1.88)	53.36(0.78)	0.3615
Age (year)	9.75±0.21	10.48±0.11	0.0007
Age group (year)			<.0001
<10	49.18(2.13)	40.65(0.97)	
≥10 and <15	30.56(1.85)	30.69(0.72)	
≥15	20.26(1.71)	28.66(0.9)	
Income_low (%)	8.77(1.48)	9.63(0.76)	0.5888
BMI_obesity (kg/m <sup>2</sup> )	18.74±0.17	19.2±0.07	0.0094
* Atopic dermatitis, AD			
††Values are expressed as mean ± standard error by independent t test (continuous variables) or % (standard error) by $\chi^2$ test (dichotomous variables).			
‡‡Low income is defined as household income ≤ 20% of the median.			

In parental characteristics, the age of parents of children with AD was lower than that of parents of the control group (41.26 vs. 42.72 for fathers and 38.9 vs. 39.77 for mothers). Mothers of children with AD consumed alcohol less frequently than did mothers of the control group (43.37% vs. 49.11%,  $P = 0.0084$ ), and fathers of children with AD were more educated than fathers of the control group (93.64% vs. 88.64%,  $P = 0.0032$ ). The mothers of the control group were significantly more obese (19.04% vs. 25.03%,  $P = 0.0007$ ). The diagnosis rate of AD was significantly higher in mothers of children with AD (3.27 vs. 1.58,  $P = 0.0034$ ). Differences in other characteristics including smoking rate; physical activity level; abdominal obesity; and prevalence of hypertension, diabetes, and hyperlipidemia were not significant (Table 2).

Table 2  
Demographic characteristics of parents.

Group	Parents of children with AD	Parents of children without AD	P value
<b>Father</b>			
Age (year)	41.26±0.31	42.72±0.15	<.0001
Smoking _ Current smoker (%)	52.34(2.53)	50.74(1.21)	0.5569
Drinking _ Monthly (%)	78.56(2.14)	79.71(0.98)	0.5867
Physical activity _ Regular (%)	21.58(2.01)	23.36(1.13)	0.4226
Education level _ High school graduate or higher (%)	93.64(1.25)	88.64(0.84)	0.0032
Obesity	30.3(2.05)	30.51(0.99)	0.92
Abdominal obesity	19.03(1.69)	19.02(0.85)	0.9927
Diagnosed with AD	2.76(0.88)	1.46(0.32)	0.0704
Hypertension	23(2.13)	28.01(1.07)	0.0291
Diabetes mellitus	5.07(1.27)	7.53(0.71)	0.0978
Dyslipidemia	9.48(1.34)	12.25(0.84)	0.085
<b>Mother</b>			
Age (year)	38.9±0.27	39.77±0.12	0.0012
Smoking _ Current smoker (%)	4.72(0.97)	5.18(0.5)	0.6621
Drinking _ Monthly (%)	43.37(2.03)	49.11(1.06)	0.0084
Physical activity _ Regular (%)	19.02(1.68)	19.75(0.92)	0.6943
Education level _ High school graduate or higher (%)	19.04(1.62)	25.3(0.99)	0.0007

\* Atopic dermatitis, AD

† Values are expressed as mean ± standard error by independent t test (continuous variables) or % (standard error) by  $\chi^2$  test (dichotomous variables).

‡ Low income is defined as household income  $\leq$  20% of the median. Monthly drinking is defined as the percentage of drinking more than once a month in the last year. Regular physical activity is defined as engaging in moderate or vigorous physical activity. Abdominal obesity is defined as  $\geq$  90 cm for men and  $\geq$  85 cm for women.

Group	Parents of children with AD	Parents of children without AD	<i>P</i> value
Obesity	13.07(1.34)	17.19(0.85)	0.0078
Abdominal obesity	3.27(0.72)	1.58(0.24)	0.0034
Diagnosed with AD	3.22(0.76)	2.04(0.3)	0.0717
Hypertension	7.38(1.21)	9.24(0.67)	0.1556
Diabetes mellitus	2.1(0.63)	3.24(0.41)	0.1647
Dyslipidemia	3.86(0.83)	6.26(0.55)	0.0281
* Atopic dermatitis, AD			
† Values are expressed as mean ± standard error by independent t test (continuous variables) or % (standard error) by $\chi^2$ test (dichotomous variables).			
‡ Low income is defined as household income $\leq$ 20% of the median. Monthly drinking is defined as the percentage of drinking more than once a month in the last year. Regular physical activity is defined as engaging in moderate or vigorous physical activity. Abdominal obesity is defined as $\geq$ 90 cm for men and $\geq$ 85 cm for women.			

The answers to the four questions to evaluate the subject's psychological state included in the KNHANES are shown in Table 3. After adjusting for age, gender, education level, occupation, and marital status, logistic regression analyses indicated that mothers of children with AD showed a significantly higher frequency of stress perception (adjusted odds ratio [aOR] 1.458 [95% confidence interval (CI), 1.223-1.739],  $P < 0.0001$ ) and suicide ideation (aOR 1.403 [95% CI 1.099-1.791],  $P = 0.0066$ ) than did mothers of children without AD. In contrast, fathers of children with AD did not show a significant difference from those of children without AD.

Table 3

Adjusted odds ratios of psychological distress (stress perception, depressed mood, suicidal ideation, and diagnosed with depression) in parents of children with atopic dermatitis compared to parents of children without atopic dermatitis.

Questions	Model 1		Model 2	
	OR	P	OR	P
<b>Father</b>				
Stress Perception				
No	1(ref.)		1(ref.)	
Yes	1.065(0.86,1.32)	0.5627	1.103(0.883,1.379)	0.3871
Depressive mood				
No	1(ref.)		1(ref.)	
Yes	0.965(0.677,1.376)	0.8444	1.115(0.778,1.6)	0.5517
Suicidal ideation				
No	1(ref.)		1(ref.)	
Yes	1.084(0.769,1.528)	0.6456	1.192(0.84,1.692)	0.3238
Diagnosed with depression				
No	1(ref.)		1(ref.)	
Yes	1.066(0.43,2.644)	0.8896	1.26(0.493,3.221)	0.6284
<b>Mother</b>				
Stress Perception				
No	1(ref.)		1(ref.)	
Yes	1.469(1.231,1.753)	<.0001	1.458(1.223,1.739)	<.0001
Depressive mood				
No	1(ref.)		1(ref.)	
Yes	1.205(0.95,1.528)	0.1241	1.201(0.94,1.534)	0.1435
Suicidal ideation				
No	1(ref.)		1(ref.)	
Yes	1.386(1.087,1.766)	0.0085	1.403(1.099,1.791)	0.0066

\* Model 1 was adjusted for age. Model 2 was adjusted for age, gender, education level, occupation, and marital status.

Questions	Model 1		Model 2	
Diagnosed with depression				
No	1(ref.)		1(ref.)	
Yes	1.485(0.937,2.354)		0.0923	1.485(0.944,2.334) 0.0868
* Model 1 was adjusted for age. Model 2 was adjusted for age, gender, education level, occupation, and marital status.				

Additionally, the results of evaluating the mother's QOL with the EQ-5D index and LQ-Vas questionnaires are shown in Table 4. The QOL of mothers of children with AD was significantly lower than for mothers of children without AD in both the EQ-5D index (adjusted mean 0.9594 vs. 0.9716,  $P = 0.0002$ ) and the LQ-Vas questionnaire (adjusted mean, 76.3544 vs. 74.5357,  $P = 0.0131$ ). The mean EQ-5D index of the mothers of children with AD was 0.9594, which was significantly lower than that of mothers of children without AD (the mean EQ-5D index was 0.9716,  $P = 0.0002$ ). The mean LQ-Vas of mothers of children with AD was 74.5357, which was significantly lower than that of mothers of children without AD (the mean EQ-5D index was 76.3544,  $P = 0.0131$ ).

Table 4  
Quality of life as measured by EQ-5D index and LQ-Vas questionnaires of mothers of children with atopic dermatitis compared to mothers of children without AD.

Questionnaires	Adjusted Mean		Standard errors	
	Model 1	Model 2	Model 1	Model 2
EQ-5D Index				
No	0.971	0.9716	0.001407	0.00136
Yes	0.959	0.9594	0.003317	0.00315
P value	0.0004	0.0002		
LQ-Vas questionnaire				
No	76.2383	76.3544	0.3373	0.3357
Yes	74.358	74.5357	0.7413	0.7025
P value	0.0148	0.0131		

## Discussion

In this study, we investigated the psychological stress of parents of children with AD using nationally representative survey data (KNHANES). Mothers of children with AD responded that they experienced

stress perception and suicidal ideation more frequently than did mothers of children without AD. In contrast, fathers of children with AD showed no significant difference in experience frequency from that of fathers of children without AD. These data are statistically more meaningful when adjusted for variables that show significant differences among socio-demographic factors, behavioral factors, and underlying disease status.

The increase only in mothers of children with AD is consistent with the literature, which has held that parenting stress increases in mothers rather than in fathers.<sup>10,11</sup> One plausible explanation for our findings on the psychological stress of mothers of children with AD is the time needed to care for children with AD. For all disease stages of AD, including eczema-free intervals, general measures such as use of moisturizers, therapy for skin infection, avoidance of triggers, and education for children and caregivers are recommended. Patients with AD need lifestyle management, such as washing their hands frequently, showering every day, and keeping away from everyday objects that could be a source of infection. Education such as behavioral therapy techniques and relaxation techniques should be provided, and caregivers should be aware of them.<sup>4,12-14</sup> A questionnaire study on the time taken to manage children with moderate or severe AD reported an average of 63 minutes per day.<sup>15</sup> However, another study of the same group showed an average of 17 minutes per day.<sup>16</sup> Variations in the results of these studies are probably due to the study design, which had a relatively small sample size and was conducted in a single institution. Nevertheless, there is no doubt that caring for a child with AD is a time-consuming task.

The average daily housework time for men in Korea is 49 minutes, and the average daily housework hours for women is 215 minutes. Compared to the international average difference of 118 minutes, the difference in housework hours between Korean women and men was 215 minutes, far exceeding the global average.<sup>17</sup> This bias toward women in housework could be the cause of the increased psychological stress in mothers compared to fathers. Also, prior studies have reported that mothers, who are more commonly involved in child-rearing than are fathers, feel guilty about the children's symptoms and exhibit greater parenting stress than do fathers.<sup>18</sup>

Many reports have studied parenting stress and degraded QOL of caregivers represented by parents of children with AD. One was a prospective comparative study of 55 children and 92 parents. The authors found that parents of children with AD showed sleep disturbances and increased anxiety level and depression scores.<sup>7</sup> In addition, a survey-based study was conducted to investigate the QOL for parents of school children in a region in Korea. Although 22,904 children were included, the reliability of the study was low because the definition of AD was ambiguous.<sup>19</sup> To overcome the limitations of those studies, the design of this study secured a large sample size using a national representative sample. Also, based on the demographic characteristics accessible from the KNHANES, we tried to improve the reliability by adjusting the potential confounding factor.

Parents of young children with AD can be particularly burdened because of the lack of sleep and the emotional stress of seeing their child's distress.<sup>20,21</sup> In a study of 270 AD patients and parents in the

United States, 61% of parents said their children's AD interfered with their sleep.<sup>22</sup> In a study of parents with inpatient AD patients in Germany, the parental mental health score on the SF-12 health survey, a general measure of overall mental health, was significantly lower than the average. Because patients with moderate-to-severe AD usually require inpatient treatment, it is difficult to apply it to the entire family of children with AD.<sup>23</sup> A prospective comparative study of 26 families with children with AD and 29 families with children with asthma compared the effects of these two diseases on parent sleep. Parents of children with AD spent more than 1 hour caring for their children at night, whereas parents with asthma did not need additional care time.<sup>7</sup> In addition, prolonged AD has been associated with depression, anxiety, attention deficit hyperactivity disorder, and suicidality.<sup>24-26</sup> Also, it is well known that decreased productivity at school, irritable mood, aggressive behavior, sleep disturbance, and detrimental effects on emotional and social life at school accompany AD.<sup>27</sup> Mothers of children with eczema, who have severe sleep disruption, have significantly higher levels of anxiety and depression.<sup>7</sup>

The findings of the present study need to be interpreted considering the following limitations. First, psychological stress of parents was evaluated only by simple self-reporting measures on the nature of data on the national population study. Furthermore, since the evaluation was performed only in the last 1 year regarding depressed mood and suicidal ideation, the evidence may be insufficient considering that AD is a chronic disease. Second, in this study design we did not have access to other factors including personality or family history of psychiatric disease even though we controlled several factors as potential confounding factors of psychological stress. Third, because this was a cross-sectional study, there are restrictions on the evaluation of cause-and-effect relationships between raising children with AD and psychological stress.

Despite these limitations, the primary strength of the present study is that all the data were obtained from a nationwide population study with a high response rate and sufficient sample size, and the data provided representative information regarding the general Korean population. It is meaningful that analysis of the results of mothers and fathers separately showed the need to focus more on mothers, who are the main caregivers in Korean society, regarding stress management of parents. Furthermore, the findings have important implications for clinical practice in need for evaluation, management, and support for parents, especially mothers, of children with AD, along with education and stress relief programs managed by the government.

## Declarations

### Disclosure statement:

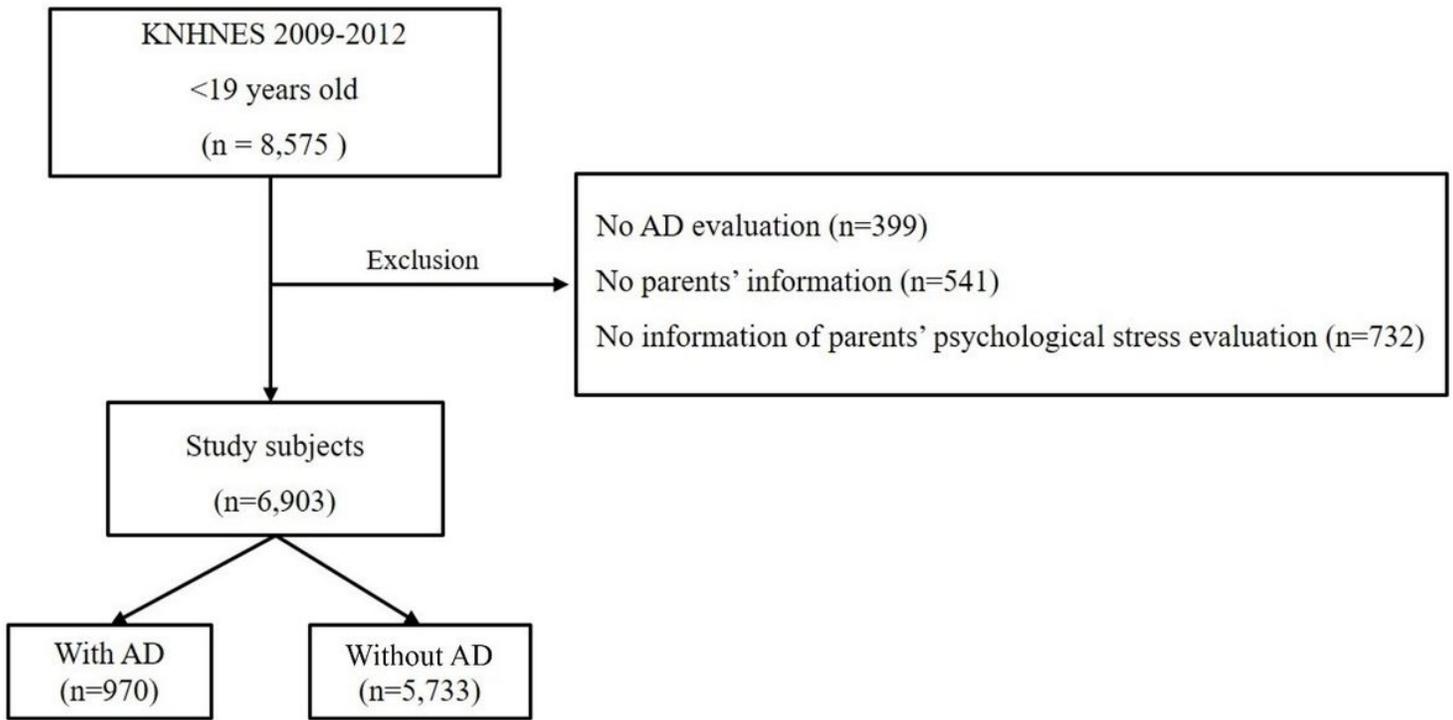
The authors declare no conflicts of interest.

## References

1. Silverberg, J. I. *et al.* Atopic dermatitis in the pediatric population: A cross-sectional, international epidemiologic study. *Annals of Allergy, Asthma & Immunology* **126**, 417-428.e412, <https://doi.org/https://doi.org/10.1016/j.anai.2020.12.020> (2021).
2. Asher, M. I. *et al.* Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. *Lancet* **368**, 733-743, [https://doi.org/10.1016/s0140-6736\(06\)69283-0](https://doi.org/10.1016/s0140-6736(06)69283-0) (2006).
3. Yew, Y. W., Thyssen, J. P. & Silverberg, J. I. A systematic review and meta-analysis of the regional and age-related differences in atopic dermatitis clinical characteristics. *J Am Acad Dermatol* **80**, 390-401, <https://doi.org/10.1016/j.jaad.2018.09.035> (2019).
4. Ständer, S. Atopic Dermatitis. *N Engl J Med* **384**, 1136-1143, <https://doi.org/10.1056/NEJMra2023911> (2021).
5. Lawson, V., Lewis-Jones, M. S., Finlay, A. Y., Reid, P. & Owens, R. G. The family impact of childhood atopic dermatitis: the Dermatitis Family Impact Questionnaire. *Br J Dermatol* **138**, 107-113, <https://doi.org/10.1046/j.1365-2133.1998.02034.x> (1998).
6. Chow, M. Y., Morrow, A. M., Cooper Robbins, S. C. & Leask, J. Condition-specific quality of life questionnaires for caregivers of children with pediatric conditions: a systematic review. *Qual Life Res* **22**, 2183-2200, <https://doi.org/10.1007/s11136-012-0343-z> (2013).
7. Moore, K., David, T. J., Murray, C. S., Child, F. & Arkwright, P. D. Effect of childhood eczema and asthma on parental sleep and well-being: a prospective comparative study. *Br J Dermatol* **154**, 514-518, <https://doi.org/10.1111/j.1365-2133.2005.07082.x> (2006).
8. Yang, E. J., Beck, K. M., Sekhon, S., Bhutani, T. & Koo, J. The impact of pediatric atopic dermatitis on families: A review. *Pediatr Dermatol* **36**, 66-71, <https://doi.org/10.1111/pde.13727> (2019).
9. Lee, J. H. *et al.* Prevalence of Atopic Dermatitis in Korean Children Based on Data From the 2008-2011 Korean National Health and Nutrition Examination Survey. *Allergy Asthma Immunol Res* **8**, 79-83, <https://doi.org/10.4168/aair.2016.8.1.79> (2016).
10. Holmbeck, G. N., Coakley, R. M., Hommeyer, J. S., Shapera, W. E. & Westhoven, V. C. Observed and perceived dyadic and systemic functioning in families of preadolescents with spina bifida. *J Pediatr Psychol* **27**, 177-189, <https://doi.org/10.1093/jpepsy/27.2.177> (2002).
11. Han, J. W. & Lee, H. Actor and partner effects of parenting stress and co-parenting on marital conflict among parents of children with atopic dermatitis. *BMC Pediatr* **20**, 141, <https://doi.org/10.1186/s12887-020-02035-7> (2020).
12. Eichenfield, L. F. *et al.* Guidelines of care for the management of atopic dermatitis: section 2. Management and treatment of atopic dermatitis with topical therapies. *J Am Acad Dermatol* **71**, 116-132, <https://doi.org/10.1016/j.jaad.2014.03.023> (2014).
13. Wollenberg, A. *et al.* Consensus-based European guidelines for treatment of atopic eczema (atopic dermatitis) in adults and children: part I. *J Eur Acad Dermatol Venereol* **32**, 657-682, <https://doi.org/10.1111/jdv.14891> (2018).

14. Katayama, I. *et al.* Japanese guidelines for atopic dermatitis 2017. *Allergol Int* **66**, 230-247, <https://doi.org/10.1016/j.alit.2016.12.003> (2017).
15. Holm, E. A. & Jemec, G. B. Time spent on treatment of atopic dermatitis: a new method of measuring pediatric morbidity? *Pediatr Dermatol* **21**, 623-627, <https://doi.org/10.1111/j.0736-8046.2004.21601.x> (2004).
16. Jemec, G. B., Esmann, S., Holm, E. A., Tycho, A. & Jørgensen, T. M. Time spent on treatment (TSOT). An independent assessment of disease severity in atopic dermatitis. *Acta Dermatovenerol Alp Pannonica Adriat* **15**, 119-124 (2006).
17. OECD. OECD Gender Data Portal <http://www.oecd.org/gender/data> (2021).
18. Pustišek, N., Vurnek Živković, M. & Šitum, M. Quality of Life in Families with Children with Atopic Dermatitis. *Pediatr Dermatol* **33**, 28-32, <https://doi.org/10.1111/pde.12698> (2016).
19. Hwang, T. Y., Kim, S. K., Kim, S. H. & Kim, M. A cross sectional survey on health-related quality of life among parents of children with allergic symptoms using the EQ-5D-5L. *J Asthma* **56**, 1239-1245, <https://doi.org/10.1080/02770903.2019.1571086> (2019).
20. Zuberbier, T. *et al.* Patient perspectives on the management of atopic dermatitis. *J Allergy Clin Immunol* **118**, 226-232, <https://doi.org/10.1016/j.jaci.2006.02.031> (2006).
21. Drucker, A. M. *et al.* The Burden of Atopic Dermatitis: Summary of a Report for the National Eczema Association. *J Invest Dermatol* **137**, 26-30, <https://doi.org/10.1016/j.jid.2016.07.012> (2017).
22. Chamlin, S. L. *et al.* The price of pruritus: sleep disturbance and cosleeping in atopic dermatitis. *Arch Pediatr Adolesc Med* **159**, 745-750, <https://doi.org/10.1001/archpedi.159.8.745> (2005).
23. Warschburger, P., Buchholz, H. T. & Petermann, F. Psychological adjustment in parents of young children with atopic dermatitis: which factors predict parental quality of life? *Br J Dermatol* **150**, 304-311, <https://doi.org/10.1111/j.1365-2133.2004.05743.x> (2004).
24. Silverberg, J. I. Comorbidities and the impact of atopic dermatitis. *Ann Allergy Asthma Immunol* **123**, 144-151, <https://doi.org/10.1016/j.anai.2019.04.020> (2019).
25. Kage, P., Zarnowski, J., Simon, J. C. & Treudler, R. Atopic dermatitis and psychosocial comorbidities - What's new? *Allergol Select* **4**, 86-96, <https://doi.org/10.5414/alx02174e> (2020).
26. Deckert, S., Kopkow, C. & Schmitt, J. Nonallergic comorbidities of atopic eczema: an overview of systematic reviews. *Allergy* **69**, 37-45, <https://doi.org/10.1111/all.12246> (2014).
27. Kahn, D. *et al.* Sleep quality in children with atopic dermatitis during flares and after treatment. *Sleep Sci* **13**, 172-175, <https://doi.org/10.5935/1984-0063.20190139> (2020).

## Figures



**Figure 1**

Flow chart for study subject selection. \* AD, atopic dermatitis. † The presence or absence of AD was investigated with the question, “Have you ever been diagnosed with AD by a physician?”.