

Original Article



Quality of Life in Food Allergy: Validation of the Korean Version of the Food Allergy Quality of Life Questionnaire Parent Form (K-FAQLQ-PF) and Risk Factor Analysis

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Correspondence to

Jihyun Kim, MD, PhD

Department of Pediatrics, Samsung Medical Center, 81 Irwon-ro, Gangnam-gu, Seoul 06351, Korea.

Tel: +82-2-3410-1035

Fax: +82-2-3410-0043

Email: jhlovechild@gmail.com

*Sukyung Kim and Minji Kim contributed equally to this work.

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ORCID iDs

Sukyung Kim

<https://orcid.org/0000-0002-3204-1398>

Minji Kim

<https://orcid.org/0000-0001-5588-5414>

Jiwon Kim

<https://orcid.org/0000-0001-8821-1440>

Boram Park

<https://orcid.org/0000-0003-2683-8795>

Minyoung Jung

<https://orcid.org/0000-0003-2851-9480>

Sukyung Kim ^{1†}, Minji Kim ^{2†}, Jiwon Kim ³, Boram Park ⁴, Nuri Min,³ Minyoung Jung ⁵, Seoyoung Yu,⁵ Ji Young Lee ⁶, Hye Won Yoo ⁷, Hye-Young Kim ⁷, Kangmo Ahn ^{3,8}, Jihyun Kim ^{3,8*}

¹Department of Pediatrics, Hallym University Dongtan Sacred Heart Hospital, Hallym University School of Medicine, Hwaseong, Korea

²Department of Pediatrics, Chungnam National University Sejong Hospital, Chungnam National University College of Medicine, Sejong, Korea

³Department of Pediatrics, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

⁴Biomedical Statistics Center, Research Institute for Future Medicine, Samsung Medical Center, Seoul, Korea

⁵Department of Pediatrics, Kosin University Gospel Hospital, Kosin University School of Medicine, Busan, Korea

⁶Department of Pediatrics, Hallym University Chuncheon Sacred Heart Hospital, Chuncheon, Korea

⁷Department of Pediatrics, Pusan National University School of Medicine, Busan, Korea





⁸Department of Health Sciences and Technology, Samsung Advanced Institute for Health Sciences & Technology, Seoul, Korea

ABSTRACT

Purpose: This study aimed to evaluate the reliability and validity of the Korean version of the Food Allergy Quality of Life Questionnaire-Parent Form (K-FAQLQ-PF) and to identify clinical characteristics related to low quality of life (QoL) in Korean children with food allergy (FA).

Methods: Parents of 0–12-year-old patients with FA were enrolled. The English version of FAQLQ-PF was translated into Korean. Construct validation was confirmed by the Food Allergy Independent Measure-Parent Form (FAIM-PF) and the Child Health Questionnaire Parent Form 28 (CHQ-PF28). Logistic regression analyses were used to evaluate associations between potential risk factors and QoL outcomes.

Results: A total of 182 patients with a median age of 5.0 years were enrolled in the study. Cronbach's α coefficient values indicating internal consistency were higher than 0.8. Intraclass correlation coefficient values for test-retest reliability were good for all age groups ($r > 0.6$). Total K-FAQLQ-PF scores were positively correlated with the FAIM-PF ($r = 0.56$, $P < 0.05$) and were negatively correlated with the parental impact-emotional domain in the CHQ-PF28 ($r = -0.44$, $P < 0.05$). In multivariable logistic regression analysis, low QoL was significantly associated with female sex (adjusted odds ratio [aOR], 2.07; 95% confidence interval [CI], 1.03–4.18), age ≥ 5 years (aOR, 2.84; 95% CI, 1.31–6.16), FA diagnosis before the age of 3 years (aOR, 3.96; 95% CI, 1.13–13.93), the presence of atopic dermatitis (aOR, 2.21; 95% CI, 1.07–4.57), and residence in non-metropolitan areas (aOR, 3.44; 95% CI, 1.73–6.85).

Ji Young Lee <https://orcid.org/0000-0002-2260-9939>Hye Won Yoo <https://orcid.org/0000-0002-5014-3494>Hye-Young Kim <https://orcid.org/0000-0001-7125-8840>Kangmo Ahn <https://orcid.org/0000-0001-7751-9829>Jihyun Kim <https://orcid.org/0000-0001-8493-2881>**Disclosure**

There are no financial or other issues that might lead to conflict of interest.

Conclusions: According to parental perceptions, the K-FAQLQ-PF is a valid and reliable tool to assess psychosocial QoL in Korean children with FAs. Age, sex, residential area, and comorbid AD can affect the QoL of pediatric patients with FA.

Keywords: Food allergy; food hypersensitivity; quality of life; children; questionnaires; caregivers; daily life; risk factors; anxiety

INTRODUCTION

Food allergy (FA) is a steadily rising public health problem, with a worldwide prevalence of approximately 10%.^{1,2} According to the nationwide anaphylaxis registry in Korea, food is the most important cause of anaphylaxis in children and adolescents visiting emergency departments.³ In the United States, the economic burden of FA patients has been reported to be \$4,184 per year for each patient, including direct medical expenses, time off work of caregivers for medical visits, and loss of opportunities.⁴ A recent study found that patients who have experienced anaphylaxis are more likely to develop psychiatric diseases, such as posttraumatic stress disorder, anxiety, and depression.⁵

The way to prevent food-induced allergic reactions is strict avoidance of the causative foods or oral immunotherapy.^{6,7} However, strict restrictions of eggs, milk, wheat, and soy, the leading causes of FA, are very difficult, as these ingredients are included in various processed foods.⁸ Moreover, restricting essential protein sources in the diets of children and adolescents in the growing stages of youth puts a burden on patients and their families.² Caregivers have to check food ingredient labels every time a food is prepared or served, and thus simple household tasks can be time-consuming and stressful. Additionally, alternative foods for FA patients should be prepared during parties or picnics, which causes extra anxiety and stress on family members. Despite these precautions, accidental ingestion of offending foods still occurs. In a previous report, up to 7.5% of FA patients had been accidentally exposed to an offending food within the past year.⁹ Repeated food-related accidents cause patients to fear attending school or social activities and avoid dining out to prevent exposure to unsafe situations.¹⁰ Therefore, FA can cause significant quality of life (QoL) impairments for patients and their families.^{11,12}

Although FA QoL questionnaires were initially developed in specific forms for children, teenagers, and adults, the Food Allergy Quality of Life Questionnaire Parent Form (FAQLQ-PF) was designed to measure parental perceptions of QoL in pediatric FA patients aged 12 years and younger. Sensitive and multidimensional, the parent form is intended to compensate for natural limitations in language abilities, lack of cognition and limited comprehension on the part of young patients with FA.¹³ FAQLQ-PF is regarded as an age-appropriate indicator for evaluating the impact of social and dietary restrictions and the emotional influence on daily life in children with FA.¹⁴ The FAQLQ-PF has been translated into various languages, including Spanish, Malay, Thai, Japanese, and Turkish, and is used worldwide as a valid and reliable tool to evaluate QoL in children with FA.¹⁵⁻²⁰ Nevertheless, it has not yet been translated or validated in the Korean language. Therefore, we aimed to adapt, translate, and validate the Korean version of the FAQLQ-PF (K-FAQLQ-PF) and to identify clinical characteristics related to low QoL in Korean children with FAs.

MATERIALS AND METHODS

Study population

Diagnosis of FA was based on a positive oral food challenge test within 12 months or a convincing history of allergic reactions within 2 hours of food ingestion plus positive serum specific immunoglobulin E (≥ 0.35 kU/L) within 12 months. Children with oral allergy syndrome were excluded from this study. At the time of enrollment, parents were asked to respond to a questionnaire regarding basic demographic information, including the parental history of allergic diseases. Immediate allergic reactions included mucocutaneous symptoms (urticaria, eyelid edema, facial edema, or lip edema), respiratory symptoms (cough, wheezing, or dyspnea), gastrointestinal symptoms (vomiting, diarrhea, or abdominal pain), cardiovascular symptoms (chest pain, paleness, sweating, or hypotension), and neurologic symptoms (dizziness or unconsciousness). Anaphylaxis was defined as the occurrence of two or more symptoms following exposure to food allergens, including involvement of the skin, respiratory compromise, cardiovascular symptoms, and gastrointestinal symptoms.²¹ Written informed consent was obtained from patients or their parents prior to participation in this study. The protocol was reviewed and approved by the Institutional Review Boards of each hospital (IRB No. SMC 2020-06-124, SMC 2020-08-090, CNUH 2020-10-010-005, KUGH 2020-10-011, HKS 2020-12-005, CHUNCHEON 2020-10-009 and PNUH 2101-026-099).

Translation and language validation of FAQLQ-PF in Korean

The FAQLQ-PF consists of 30 items classified into 3 domains: emotional impact (EI), food anxiety, and social and dietary limitations (SDL).¹³ The number of questions varies according to the age of the patient; 14 questions (6, 3, and 5 items) for children aged 0–3 years, 26 questions (10, 7, and 9 items) for children aged 4–6 years, and 30 questions (13, 8 and 9 items) for children aged 7–12 years. The score of each domain is calculated as the average of each item included in the corresponding domain. Higher scores signify lower QoL (the score range of each domain, 0–6). The English version of FAQLQ-PF was translated into the Korean language according to World Health Organization (WHO) guidelines.²² The forward translation into Korean was completed by 2 independent native Korean speakers who speak fluent English without consulting each other. Easy-to-understand words or phrases with the same concept as in the original text were selected in the translation. If there is a discrepancy between the 2 translators, the most appropriate expression was selected through a panel discussion consisting 6 pediatric allergists. After discussing the translated items, the revised version of the translated FAQLQ-PF was back-translated into English by an independent translator. The back-translator was not aware of the intended content of the original questionnaire to avoid bias. The translated questionnaires were reviewed by 3 parents of children with FA in each age group as the intended respondents to confirm clarity and understandability. The respondents gave feedback on whether the terms were difficult to understand or whether the questions were ambiguous. The 10-member expert committee, including pediatricians, a professor of child health nursing, and an elementary school teacher majoring in English education, revised and finalized the questionnaire (**Supplementary Data S1**). Tools including the Food Allergy Independent Measure-Parent Form (FAIM-PF) and Child Health Questionnaire-Parent Form 28 (CHQ-PF28) were also completed by parents of children with FA.^{23,24}

Statistical analyses

Patient characteristics were presented as medians with interquartile ranges (IQR) for continuous variables and relative frequencies for categorical variables. Statistical analyses consisted of internal consistency, floor or ceiling effects, intra-observer reliability, concurrent

validity, discriminant validity, and logistic regression analyses. Internal consistency of the questionnaire was evaluated using Cronbach's α coefficients. Values of α between 0.70 and 0.95 were considered an adequate coefficient for reliability analysis.²⁵ Floor and ceiling effects were evaluated by the proportion of respondents with the lowest and highest score in all questionnaires, respectively. The presence of floor or ceiling effects was defined when the percentage of subjects who achieved the lowest or highest possible score was $> 15\%$.²⁵ A subset of 10 randomly selected participants was asked to complete the questionnaire again 7–14 days following the initial response. For test-retest reliability, the intraclass correlation coefficient (ICC) was analyzed with an ICC > 0.7 serving to indicate good stability.²⁶

The K-FAQLQ-PF was compared to FAIM-PF and generic CHQ-PF28 using Spearman correlations to establish construct validity. For discriminant validity, Mann-Whitney U tests and Kruskal-Wallis tests were performed to assess differences in K-FAQLQ-PF scores according to the clinical characteristics of participants. Univariable and multivariable logistic regression analyses were used to test associations between potential risk factors and QoL outcomes. Low QoL is defined as the score of each domain and total scores lower than the median value. Covariates with a $P < 0.2$ in univariable analyses were chosen for multivariable analysis.

All data were analyzed using SPSS Windows software version 27.0 (IBM Corp., Armonk, NY, USA). A P value < 0.05 was considered statistically significant results.

RESULTS

Study population

One hundred eighty-two patients were enrolled in the study (**Table 1**). Patients were classified into 3 different age groups of 0–3 years ($n = 49$), 4–6 years ($n = 70$), and 7–12 years ($n = 63$). The median age of enrolled patients was 5.0 years, and 118 patients (64.8%) were boys. Egg whites (63.7%) were the most common cause of FA, while 51 patients (28.0%) reported avoiding 4 or more food allergens in diets. The most prevalent symptoms were mucocutaneous reactions (95.6%), with 113 patients (62.1%) having experienced anaphylaxis. Among patients with anaphylaxis, 81.3% had one or more comorbid allergic diseases, such as atopic dermatitis (AD) (65.9%), allergic rhinitis (39.0%), and asthma (17.0%).

Internal consistency and floor/ceiling effect

Cronbach's α coefficient values for total and subscale scores ranged from 0.85 to 0.94, indicating excellent internal consistency of the K-FAQLQ-PF (**Table 2**). Regarding floor/ceiling effects, one patient aged 0–3 years (2.1%) completed the questionnaire with the lowest possible score in the EI domain (**Table 2**). While the questionnaire responses of 2 patients aged 0–3 years earned the lowest and highest possible scores in the food anxiety domain, one patient aged 7–12 years (1.6%) responded to the questionnaire with the highest possible score in the same domain. However, no patient responded with the lowest or highest possible scores in the SDL domain or total scores.

Test-retest reliability

Test-retest reliability of EI, food anxiety, SDL, and total scores was evaluated by 10 patients' parents at intervals of 7–14 days. The ICCs associated with EI, food anxiety, SDL and total scores were 0.71 (95% confidence interval [CI], 0.36–0.89), 0.83 (95% CI, 0.60–0.94), 0.69 (95% CI, 0.33–0.88), and 0.73 (95% CI, 0.39–0.90), respectively, indicating good reliability.

Validation of K-FAQLQ-PF

Table 1. Baseline clinical characteristics of subjects

Characteristics	Number of patients (%)			
	All patients (n = 182)	0–3 years (n = 49)	4–6 years (n = 70)	7–12 years (n = 63)
Sex (male)	118 (64.8)	32 (65.3)	43 (61.4)	43 (68.3)
Age at diagnosis of food allergy				
< 3	163 (89.6)	48 (98.0)	64 (91.4)	51 (81.0)
≥ 3	19 (10.4)	1 (2.0)	6 (8.6)	12 (19.0)
Offending food allergen				
Egg whites	116 (63.7)	30 (61.2)	49 (70.0)	37 (58.7)
Cow's milk	90 (49.5)	25 (51.0)	34 (48.6)	31 (49.2)
Wheat	67 (36.8)	23 (46.9)	27 (38.6)	17 (27.0)
Soybeans	12 (6.6)	5 (10.2)	4 (5.7)	3 (4.8)
Peanuts	30 (16.5)	4 (8.2)	14 (20.0)	12 (19.0)
Walnuts	34 (18.7)	6 (12.2)	11 (15.7)	17 (27.0)
Number of restricted foods				
< 4	131 (72.0)	40 (81.6)	51 (72.9)	40 (63.5)
≥ 4	51 (28.0)	9 (18.4)	19 (27.1)	23 (36.5)
Symptoms				
Mucocutaneous	174 (95.6)	48 (98.0)	66 (94.3)	60 (95.2)
Gastrointestinal	80 (44.0)	20 (40.8)	31 (44.3)	29 (46.0)
Respiratory	81 (44.5)	19 (38.8)	37 (52.9)	35 (39.7)
Anaphylaxis	113 (62.1)	20 (40.8)	56 (80.0)	37 (58.7)
Comorbid conditions				
Atopic dermatitis	120 (65.9)	35 (71.4)	41 (58.6)	44 (69.8)
Allergic rhinitis	71 (39.0)	6 (12.2)	25 (35.7)	40 (63.5)
Asthma	31 (17.0)	2 (4.1)	12 (17.1)	17 (27.0)
Family history of allergic diseases	105 (57.7)	33 (67.3)	42 (60.0)	30 (47.6)
Residential area				
Seoul, Gyeonggi-do, and Incheon	95 (52.2)	22 (44.9)	32 (45.7)	41 (65.1)
Others*	87 (47.8)	27 (55.1)	38 (54.3)	22 (34.9)

Data are presented as numbers (%).

*Other stands for areas excluding Seoul, Gyeonggi-do, and Incheon: i.e., Gangwon-do, Chungcheongnam-do, Chungcheongbuk-do, Jeollanam-do, Jeollabuk-do, Gyeongsangnam-do, Gyeongsangbuk-do, Jeju, Sejong city, Busan, Ulsan, Daegu, and Daejeon.

Table 2. Internal consistency and floor/ceiling effects

K-FAQLQ-PF	Age group (year)	No.	Item	Mean ± SD	Cronbach's α	Floor (%)	Ceiling (%)
Total score	0–3	48	14	2.70 ± 1.39	0.95	0	0
	4–6	70	26	3.18 ± 1.19	0.96	0	0
	7–12	62	30	2.96 ± 1.41	0.97	0	0
Emotional impact	0–3	48	6	2.31 ± 1.49	0.91	2.1	0
	4–6	70	10	2.74 ± 1.20	0.91	0	0
	7–12	62	13	2.59 ± 1.36	0.94	0	0
Food anxiety	0–3	48	3	2.58 ± 1.59	0.85	4.2	4.2
	4–6	70	7	3.20 ± 1.26	0.90	0	0
	7–12	62	8	3.31 ± 1.49	0.92	1.6	0
Social and dietary limitations	0–3	48	5	3.22 ± 1.54	0.89	0	0
	4–6	70	9	3.59 ± 1.37	0.90	0	0
	7–12	62	9	2.96 ± 1.59	0.94	0	0

K-FAQLQ-PF, Korean version of the Food Allergy Quality of Life Questionnaire Parent Form; SD, standard deviation.

Concurrent validity

In all age groups, significant correlations were observed between total K-FAQLQ-PF scores and FAIM-PF scales (**Table 3**). FAIM-PF was positively related to EI, food anxiety, and SDL domains in 4–6-year-olds ($r = 0.55$, $r = 0.52$, and $r = 0.66$, respectively; all $P < 0.001$) and 7–12-year-olds ($r = 0.47$, $r = 0.59$, and $r = 0.63$, respectively; all $P < 0.001$). However, food anxiety domain scores were not significantly related to FAIM-PF outcomes in 0–3-year-olds ($r = 0.25$, $P = 0.088$), while EI and SDL domains were positively associated with FAIM-PF scores in this age group ($r = 0.60$ and 0.74 ; all $P < 0.001$).

Table 3. Spearman's correlation between FAQLQ-PF and FAIM-PF

K-FAQLQ-PF	Age group (year)		
	0–3	4–6	7–12
Total score	0.58*	0.62*	0.60*
Emotional impact	0.60*	0.55*	0.47*
Food anxiety	0.25	0.52*	0.59*
Social and dietary limitations	0.74*	0.66*	0.63*

FAQLQ-PF, Food Allergy Quality of Life Questionnaire Parent Form; FAIM-PF, Food Allergy Independent Measurement-Parent Form; K-FAQLQ-PF, Korean version of the Food Allergy Quality of Life.

* $P < 0.05$.

For concurrent validity, K-FAQLQ-PF was compared to the CHQ-PF28 questionnaire, including mental health, self-esteem, general health perception, parental emotional impact, and family activities, with high scores indicating a good QoL. As a result, negative correlations were observed between all domains of CHQ-PF28 and K-FAQLQ-PF (all $P < 0.05$) (Table 4). In particular, the EI domain showed the strongest correlation with all domains of K-FAQLQ-PF ($r = -0.43$ in the EI domain, $r = -0.42$ in the food anxiety domain, $r = -0.42$ in the SDL domain, and $r = -0.44$ in total scores, respectively; all $P < 0.001$) (Table 4).

Discriminant validity

All 182 patients were analyzed for total and subscale K-FAQLQ-PF scores according to clinical characteristics (Table 5). In the food anxiety domain, patients aged 7–12 years had significantly higher scores than patients in the other age groups ($P = 0.012$) (Table 5). Total K-FAQLQ-PF scores were significantly higher in patients diagnosed with FA before the age of 3 years than in those diagnosed with FA at the age of 3 years or older ($P = 0.013$). Additionally, total scores of patients allergic to egg whites, cow's milk, and/or wheat were higher than those allergic to other food allergens ($P = 0.005$). Moreover, total K-FAQLQ-PF scores in patients with restriction of 4 or more food allergens were significantly higher than those with restriction of fewer than 4 allergens ($P = 0.043$).

The total scores, EI domain, food anxiety domain, and SDL domain scores were higher in patients who had experienced anaphylaxis than those who had not experienced anaphylaxis ($P = 0.001$, $P = 0.012$, $P = 0.011$, and $P < 0.001$, respectively). Total K-FAQLQ-PF scores tended to increase as the number of food items causing anaphylaxis increased ($P_{\text{trend}} = 0.003$). Similarly, higher K-FAQLQ-PF total scores were observed in patients who carried epinephrine auto-injectors than in those who did not ($P = 0.035$). Scores in domains of EI and SDL as well as total K-FAQLQ-PF scores were lower in patients living in metropolitan areas including Seoul, Gyeonggi-do, and Incheon than those in patients living in the other areas ($P = 0.005$, $P = 0.001$, and $P = 0.004$, respectively). However, there were no differences in total K-FAQLQ-PF scores according to family history of allergic diseases or comorbid allergies such as AD, asthma, or allergic rhinitis.

Table 4. Spearman's correlation between FAQLQ-PF and CHQ-PF28

K-FAQLQ-PF	CHQ-PF28				
	Mental health	Self-esteem	General health perceptions	Parental impact-emotional	Family activities
Total score	-0.43*	-0.37*	-0.40*	-0.44*	-0.37*
Emotional impact	-0.45*	-0.42*	-0.44*	-0.43*	-0.34*
Food anxiety	-0.40*	-0.34*	-0.30*	-0.42*	-0.32*
Social and dietary limitations	-0.41*	-0.30*	-0.39*	-0.42*	-0.40*

FAQLQ-PF, Food Allergy Quality of Life Questionnaire-Parent Form; CHQ-PF28, Child Health Questionnaire-Parent Form 28; K-FAQLQ-PF, Korean version of the Food Allergy Quality of Life.

* $P < 0.05$.

Table 5. Discriminant validity of the K-FAQLQ-PF

Variable	Total score	<i>P</i> value	Emotional impact	<i>P</i> value	Food anxiety	<i>P</i> value	Social and dietary limitations	<i>P</i> value
Sex		0.118		0.120		0.475		0.077
Male	2.81 (1.86, 3.69)		2.38 (1.51, 3.17)		3.13 (1.73, 4.13)		3.33 (1.80, 4.37)	
Female	3.43 (1.98, 3.87)		2.85 (1.69, 3.67)		3.00 (2.50, 4.38)		3.78 (2.63, 4.60)	
Age (year)		0.134		0.221		0.012		0.124
0–3	2.61 (1.57, 3.62)		2.33 (1.00, 3.29)		2.67 (1.08, 3.58)		3.40 (1.85, 4.55)	
4–6	3.23 (2.18, 3.99)		2.65 (1.78, 3.50)		3.27 (2.45, 4.13)		3.67 (2.59, 4.53)	
7–12	3.05 (1.86, 4.07)		2.46 (1.75, 3.63)		3.56 (2.19, 4.41)		3.39 (1.53, 4.22)	
Age at diagnosis of food allergy (year)		0.013		0.027		0.060		0.008
< 3	3.18 (2.06, 3.78)		2.57 (1.70, 3.50)		3.13 (2.29, 4.13)		3.65 (2.20, 4.50)	
≥ 3	1.78 (0.99, 3.32)		1.44 (0.83, 2.89)		2.00 (1.00, 3.62)		2.04 (0.83, 3.72)	
Offending food allergen		0.005		0.010		0.159		< 0.001
EW, CM, or wheat	3.18 (2.09, 3.87)		2.60 (1.70, 3.50)		3.14 (2.06, 4.13)		3.67 (2.35, 4.54)	
Foods other than EW, CM, and wheat	1.91 (1.05, 3.52)		1.77 (0.81, 2.52)		2.94 (1.19, 3.72)		1.56 (0.67, 3.28)	
Number of restricted foods		0.043		0.152		0.025		0.081
< 4	2.97 (1.75, 3.74)		2.40 (1.40, 3.32)		3.00 (1.69, 4.00)		3.40 (1.80, 4.44)	
≥ 4	3.43 (2.34, 4.13)		2.67 (1.90, 3.69)		3.50 (2.75, 4.63)		3.78 (2.40, 4.60)	
Anaphylaxis		0.001		0.012		0.011		< 0.001
Yes	3.31 (2.27, 4.12)		2.73 (1.86, 3.60)		3.29 (2.38, 4.29)		3.79 (2.53, 4.62)	
No	2.41 (1.40, 3.54)		2.16 (1.11, 3.08)		2.87 (1.34, 3.75)		2.84 (1.40, 3.79)	
Carriage of epinephrine auto-injectors		0.035		0.164		0.027		0.026
Yes	3.16 (2.04, 3.91)		2.50 (1.70, 3.45)		3.14 (2.33, 4.13)		3.67 (2.24, 4.53)	
No	2.47 (1.29, 3.63)		2.40 (1.33, 3.30)		2.75 (1.13, 4.00)		3.13 (1.56, 3.89)	
Atopic dermatitis		0.111		0.015		0.196		0.269
Yes	3.23 (2.09, 3.87)		2.80 (1.78, 3.58)		3.13 (2.33, 4.13)		3.67 (2.03, 4.59)	
No	2.70 (1.67, 3.65)		2.13 (1.33, 2.92)		2.87 (1.63, 4.09)		3.17 (1.88, 4.08)	
Asthma		0.188		0.416		0.039		0.648
Yes	3.34 (2.46, 4.11)		2.46 (1.90, 3.80)		3.88 (2.75, 4.38)		3.67 (2.50, 4.44)	
No	3.02 (1.83, 3.73)		2.50 (1.50, 3.33)		3.00 (1.71, 4.00)		3.50 (1.94, 4.50)	
Allergic rhinitis		0.422		0.496		0.618		0.361
Yes	2.96 (1.74, 3.91)		2.43 (1.47, 3.53)		3.13 (1.69, 4.13)		3.47 (1.64, 4.47)	
No	3.20 (2.12, 3.76)		2.60 (1.70, 3.33)		3.13 (2.28, 4.13)		3.55 (2.31, 4.50)	
Family history of allergic disease		0.511		0.528		0.445		0.720
Yes	3.02 (1.83, 3.76)		2.46 (1.40, 3.42)		3.00 (2.00, 4.06)		3.60 (1.80, 4.50)	
No	3.30 (1.98, 3.86)		2.77 (1.70, 3.40)		3.29 (1.75, 4.13)		3.50 (2.25, 4.44)	
Residential area		0.004		0.005		0.060		0.001
Seoul, Gyeonggi-do, and Incheon	2.71 (1.68, 3.64)		2.15 (1.36, 3.05)		3.00 (1.73, 3.75)		2.89 (1.65, 4.00)	
Others	3.43 (2.13, 4.21)		2.80 (1.83, 3.77)		3.33 (2.00, 4.67)		3.80 (2.75, 4.67)	

Data are represented as median (interquartile ranges). Bold *P* values are lower than 0.05.

K-FAQLQ-PF, Korean version of the Food Allergy Quality of Life Questionnaire Parent Form; CM, cow's milk; EW, egg whites.

Factors affecting QoL of FA patients in Korea

Univariable and multivariable logistic regression analyses were performed to identify risk factors for lower QoL in Korean children with FA (**Table 6**). Univariable analysis showed that female sex, having a history of anaphylaxis, and residence in non-metropolitan areas were associated with low QoL scores ($P = 0.043$, $P = 0.032$, and $P = 0.002$, respectively). In the univariable analysis, however, patient age, age at diagnosis of FA, offending food allergens, number of restricted food allergens in diet, and comorbid allergic diseases were not associated with impaired QoL. In multivariable analysis, female sex (adjusted odds ratio [aOR], 2.07; 95% CI, 1.03–4.18), age ≥ 5 years (aOR, 2.84; 95% CI, 1.31–6.16), FA diagnosis before the age of 3 years (aOR, 3.96; 95% CI, 1.13–13.93), the presence of AD (aOR, 2.21; 95% CI, 1.07–4.57), and residence in non-metropolitan areas (aOR, 3.44; 95% CI, 1.73–6.85) significantly increased K-FAQLQ-PF scores.

Table 6. Logistic regression model to assess risk factors that contribute to high total scores of FAQLQ-PF

Variable	Univariable analysis		Multivariable analysis	
	OR (95% CI)	P value	aOR (95% CI)	P value
Sex (female)	1.90 (1.02–3.54)	0.043	2.07 (1.03–4.18)	0.041
Age (\geq 5 years)	1.67 (0.92–3.06)	0.094	2.84 (1.31–6.16)	0.008
Age at diagnosis of food allergy (< 3 years)	2.87 (0.98–8.42)	0.055	3.96 (1.13–13.93)	0.032
Offending food allergen (EW, CM, or wheat)	2.58 (0.94–7.05)	0.065	2.50 (0.78–8.08)	0.125
Number of restricted foods (\geq 4)	1.84 (0.95–3.56)	0.071	1.22 (0.58–2.58)	0.595
Anaphylaxis (yes)	1.95 (1.06–3.60)	0.032	1.38 (0.68–2.82)	0.377
Comorbidity				
Atopic dermatitis (yes)	1.66 (0.88–3.10)	0.115	2.21 (1.07–4.57)	0.031
Asthma (yes)	1.74 (0.79–3.84)	0.170	1.39 (0.55–3.53)	0.489
Allergic rhinitis (yes)	0.69 (0.38–1.26)	0.222		
Family history of allergic disease (yes)	0.73 (0.40–1.32)	0.290		
Residence in non-metropolitan area (yes)	2.59 (1.42–4.73)	0.002	3.44 (1.73–6.85)	< 0.001

FAQLQ-PF, Food Allergy Quality of Life Questionnaire-Parent Form; OR, odds ratio; CI, confidence interval; aOR, adjusted odds ratio; CM, cow's milk; EW, egg whites.

DISCUSSIONS

The FAQLQ-PF has been known as a relevant and valid measure for FA-specific psychosocial outcomes.¹³ This questionnaire can be used to evaluate the influence of interventions such as oral food challenges and immunotherapy and provide a meaningful important difference score for interpreting clinical cut-offs in pediatric FA patients.²⁷⁻²⁹ The K-FAQLQ-PF showed good reliability, constructive validity, and internal consistency in assessing the psychosocial burden of patients with FA in the present study. Our K-FAQLQ-PF had no floor or ceiling effects. The psychosocial impact of FA can be accurately assessed in children with FA and their families using our valid and reliable K-FAQLQ-PF. We also found that patients' age, sex, area of residence, and comorbid AD were associated with QoL of Korean children with FA.

Correlations between the K-FAQLQ-PF, FAIM-PF, and CHQ-PF28 were shown to be acceptable, similar to the findings of previous studies in Turkey and the United States.^{13,19} The FAIM-PF is a disease-specific questionnaire to evaluate the health status of pediatric subjects, while the CHQ-PF28, a generic QoL questionnaire, consists of variable domains including items to assess physical, emotional, and social well-being.¹³ Similar to findings from a Spanish study, for patients aged 3 years or younger, the correlation between subjects' scores in the food anxiety domain and FAIM-PF scores was close to being statistically significant with a *P* value of 0.088, while only EI and SDL domain scores were positively associated with FAIM-PF scores.¹⁵ Significant correlations between K-FAQLQ-PF and FAIM-PF outcomes were observed in the age groups of 4–6-year-olds and 7–12-year-olds in this study. These results suggest that the K-FAQLQ-PF less accurately evaluates food anxiety in younger children and is more suitable for assessing QoL in children aged 4 years and older. However, this is not limited to our questionnaire because children's fears and anxiety are difficult to recognize in parental reports, which are the main channels of nuanced communication for children of this age.³ In addition, among CHQ-PF28 domains, mental health and parental impact-emotional domains showed a relatively high correlation with K-FAQLQ-PF. This means that our K-FAQLQ-PF may help measure QoL related to parental emotions and concerns.

This study showed age as one of the main risk factors for lower QoL associated with pediatric FA. These results are consistent with previous studies, in which psychological burden was more remarkable in older children with FAs than in younger patients.¹⁸⁻²⁰ Lower QoL in children aged 5 years or older is likely due to high levels of vigilance around exposure to food

allergens in school life, and consequent severe anxiety. This is supported by the results of our current study, showing higher scores in the food anxiety domain in older age groups of respondents. In parents of FA patients aged 5 years or older, the highest scores were placed on concern that the child should be careful about eating food at school and participating in preschool/school activities involving food. In contrast, regarding the age of diagnosis with FA, younger ages were shown to have an increased likelihood of impairment in QoL. Probably FA diagnosis at a young age and subsequent restrictions for an extended period, especially until school age, will pose a tremendous psychological burden on FA children and their families. Consistent with these findings, previous research also revealed a significant relationship between longer durations of cow's milk-restricted diets and reduced QoL.³⁰

Additionally, the female sex was associated with impaired QoL in the present study. It has generally been accepted that emotional changes and psychological distress may be affected by sex and social factors.³¹ It is inferred that FAQLQ-PF scores may be influenced by sex as the questionnaire includes evaluation of frustration, feeling different from other children, anxiety, and fear of trying new foods. However, there has been disagreement regarding the relationship between sex and FA-associated QoL. For example, DunnGalvin *et al.*¹³ demonstrated that parents of boys aged 0–6 years reported higher mean FAQLQ-PF scores than parents of girls, while parents of girls aged 7–12 years reported higher mean FAQLQ-PF scores compared to parents of male patients. Unsurprisingly, it is well documented that QoL is more impaired in children with multiple food restrictions or comorbid AD compared to those with only one food restriction or without comorbid diseases, which is similar to the results of our present study.^{14,32} The greater the number of allergens in the diets of growing children and adolescents, the more stringent the avoidance of food allergens must be, which can be stressful for patients and their caregivers.^{2,33}

Importantly, QoL was lower in children living in non-metropolitan areas than those living in metropolitan areas where medical resources are readily available. It has been demonstrated that higher levels of social support and greater access to healthcare services contribute to better health-related QoL in patients with chronic diseases.³⁴ Large cities have advantages in high-quality, up-to-date medical information, availability of healthcare resources, and proficiency in medical staff, leading to safe and effective care of patients.^{35,36} FAs require a long-term management plan and emergent healthcare standards for the potential occurrence of anaphylaxis. Quality and accessibility to medical services are critical to reducing the psychological burden and improving QoL in FA patients. Therefore, healthcare systems and policies to minimize disparities in medical access and quality of medical services across regions are needed.

In conclusion, the K-FAQLQ-PF is a valid and reliable tool for parental perceptions of QoL in children with FAs. Our K-FAQLQ-PF could be used to assess the effects of dietary restrictions, oral immunotherapy, and healthcare policies on QoL in pediatric FA patients in Korea. Moreover, lower levels of QoL are associated with female sex, age of 5 years or older, FA diagnosis before the age of 3 years, coexistent AD, and residence in non-metropolitan areas. Our results indicate the need for ways to improve QoL in these patients.

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SUPPLEMENTARY MATERIAL

Supplementary Data S1

Korean version of the Food Allergy Quality of Life Questionnaire Parent Form (K-FAQLQ-PF).

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