

This article was downloaded by: [Uppsala University Library]

On: 11 September 2009

Access details: Access Details: [subscription number 786945401]

Publisher Informa Healthcare

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Journal of Asthma

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713597262>

Development and Evaluation of an Asthma-Specific Quality of Life (A-QOL) Questionnaire

Eun-Hyun Lee ^a; Sang-Ha Kim ^b; Jeong-Hee Choi ^c; Young-Koo Jee ^d; Dong-Ho Nahm ^e; Hae-Sim Park ^e

^a Graduate School of Public Health, Ajou University, Suwon, Republic of Korea ^b Yonsei University Wonju College of Medicine, Wonju, Republic of Korea ^c Hallym University College of Medicine, Seoul, Republic of Korea ^d Dankook University School of Medicine, Cheonan, Republic of Korea ^e Ajou University School of Medicine, Suwon, Republic of Korea

Online Publication Date: 01 September 2009

To cite this Article Lee, Eun-Hyun, Kim, Sang-Ha, Choi, Jeong-Hee, Jee, Young-Koo, Nahm, Dong-Ho and Park, Hae-Sim(2009)'Development and Evaluation of an Asthma-Specific Quality of Life (A-QOL) Questionnaire',Journal of Asthma,46:7,716 — 721

To link to this Article: DOI: 10.1080/02770900903067887

URL: <http://dx.doi.org/10.1080/02770900903067887>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

ORIGINAL ARTICLE

Development and Evaluation of an Asthma-Specific Quality of Life (A-QOL) Questionnaire

EUN-HYUN LEE, PH.D.,^{1,*} SANG-HA KIM,² JEONG-HEE CHOI,³ YOUNG-KOO JEE,⁴ DONG-HO NAHM,⁵
AND HAE-SIM PARK⁵

¹Ajou University, Graduate School of Public Health, Suwon, Republic of Korea

²Yonsei University Wonju College of Medicine, Wonju, Republic of Korea

³Hallym University College of Medicine, Seoul, Republic of Korea

⁴Dankook University School of Medicine, Cheonan, Republic of Korea

⁵Ajou University School of Medicine, Suwon, Republic of Korea

Background. Few health-related quality of life (HRQOL) studies of asthma patients have been conducted in Korea, mainly due to the lack of a psychometrically validated asthma-specific instrument. **Objective.** The aims of the present study were to develop and evaluate an instrument for assessing HRQOL in Korean asthma patients (asthma-specific quality of life, [A-QOL]). **Methods.** Items were generated using in-depth interviews and a review of the literature and were subsequently reviewed by a panel of experts. Content-validated items were evaluated psychometrically with the aid of 422 asthma patients who were recruited from university hospitals in South Korea. The participants were asked to complete a preliminary A-QOL questionnaire (comprising the content-validated items), the Asthma Control Test, the Center for Epidemiologic Studies-Depression Survey (CES-D), and the Short Form-36 Health Survey. The Global Initiative for Asthma Guideline classification was also used to classify the severity of asthma. The psychometric properties of the data were analyzed. **Results:** Thirty-six preliminary items were generated, from which factor analysis extracted a six-factor solution. Six of the items were not loaded significantly on any of the factors, such that they were not heterogeneous items. Multi-trait scaling analysis supported item convergence and discriminant validity. The A-QOL was associated significantly with the CES-D. Patients with controlled asthma had higher A-QOL scores than those whose asthma was not controlled. The quality of life measured by the A-QOL was more sensitive than that measured by the generic Short Form-36 Health Survey. The values of Cronbach's alpha for the subscales of the A-QOL were all greater than 0.70. The responsiveness of all subscales, excluding the "environmental distress" subscale, was established. **Conclusions.** The A-QOL is an easily applied tool that exhibits good psychometric properties for asthma patients. The A-QOL questionnaire is valid for and can be used reliably in both practice and clinical trials.

Keywords asthma, quality of life, measurement, reliability, validity

INTRODUCTION

Asthma is a health problem worldwide that affects 300 million individuals (1). The prevalence of the disease in adults is about 6.7% in the United States (2), but only 4.5% in Korea (3). However, even in Korea asthma represents a significant socioeconomic burden, with about 0.26% of the gross domestic product being spent on the direct costs (e.g., hospital admissions or cost of pharmaceuticals) and the indirect costs (e.g., sick leave from work) associated with the disease (4).

Asthma exerts adverse effects both socioeconomically and at the level of the individual patient, which has led many researchers and clinicians to make considerable efforts toward developing and evaluating more effective treatments for the condition. The most commonly used outcome parameters for evaluating the effectiveness of treatments in clinical trials or in practice are pulmonary function, symptom severity, and degree of airway hypersensitiveness. However, these conventional physical and clinical outcome measures do not quantify how asthma patients feel about their treatment or their ability to function in their everyday lives (5). Thus, it

has recently been recommended that health-related quality of life (HRQOL) should also be measured.

When measuring HRQOL, it is important to consider its types, psychometric properties, and culture. HRQOL is categorized into generic and disease-specific types (6). The former is appropriate for comparing patient groups across different diseases and comparing patients with healthy subjects. However, this has the disadvantage of focusing on issues that are of particular concern to patients with disease and might lack the sensitivity for detecting changes induced by treatments. The latter is suited to determining the effectiveness of treatments or interventions for a specific disease. Therefore, if a purpose is to identify which treatments or interventions are effective, it is better to use an instrument to measure HRQOL that applies to the specific disease. The second consideration is psychometric properties, since this confirms the internal validity of clinical trials (7). Culture is also an important point factor to consider since patients appraise their HRQOL in the context of the cultures, in which they are living (8).

The few HRQOL studies on asthma patients that have been conducted in Korea, have generally used generic or other types of disease-specific HRQOL instruments, mainly due to the lack of a psychometrically validated asthma-specific instrument for Korean patients. This has led to the now

*Corresponding author: Professor Eun-Hyun Lee, Ph.D., Ajou University, Graduate School of Public Health, San 5, Wonchon-Dong, Yeongtong-Gu, Suwon, 443-721 Korea, Republic of Korea; E-mail: ehlee@ajou.ac.kr

commonly held view that there is a strong need to develop a psychometrically validated asthma-specific HRQOL instrument for these patients (9, 10). The purpose of this study was to thus develop and evaluate an asthma-specific quality of life instrument (A-QOL) for assessing the HRQOL of Korean asthma patients.

METHODS

Item Generation and Pilot Test of the A-QOL

There are several ways to generate items for inclusion in a questionnaire: by literature review, selecting items from existing scales, and/or interviewing a target population. We decided to use the interview method since there are a few HRQOL studies on asthma and no psychometric questionnaire for measuring HRQOL in Korean patients with asthma. A qualitative method (the grounded theory approach) using in-depth interviews with asthma patients was applied to gain insight into how people define their reality via sociocultural interactions (11). Seventeen patients with asthma were interviewed over a 12-week period at a University hospital by a Ph.D.-qualified researcher who is an expert in qualitative analysis. Audio recordings of the interviews were transcribed verbatim. The obtained qualitative data were analyzed to generate properties of quality of life in patients with asthma. The derived properties were then used to determine the contents of preliminary items on the questionnaire. Each item was described considering the reading level, ambiguity, double-barreled statements, jargon, and value-laden words (12). The response format for each item used the following 5-point Likert-type scale: "not at all," "a little bit," "somewhat," "quite a bit," and "very much." The content validity was assessed by five experts who were asked to determine the degree to which the items were relevant to the properties of quality of life in asthma patients, using four response categories (13) and open questions aimed at refining or adding items. A pilot test was conducted with a convenience sample of 15 asthma patients at a university hospital. The patients were asked to complete the content-validated items and to report any difficulties with comprehending the items or the response options.

Evaluation of the A-QOL

Sample. A total of 422 subjects were recruited from four university hospitals in South Korea. Inclusion criteria were being over 18 years of age, being articulate in Korean, having current symptoms of asthma, having airway hyperresponsiveness ($PC_{20} < 8.0$ mg/mL), and being diagnosed with asthma on the basis of a normal chest radiograph and documented evidence of a forced expiratory volume in 1 second (FEV_1) of $>15\%$ and 200 mL that was reversible with a β -agonist or steroid reversibility. Patients with other chronic diseases or conditions were excluded.

Study Design and Data Collection Procedure. A methodological research design was used for the psychometric evaluation of the A-QOL. After approval from the IRBs, potential participants were met by research assistants who explained to them the purpose of the study and the nature of their participation in it. If a potential subject articulated an understanding of the study and agreed to participate, they were asked to sign

a consent form and to complete questionnaires. Newly diagnosed patients were surveyed twice at baseline and 1 month later after their treatments to test the responsiveness of the A-QOL.

Measures. With the content-validated preliminary items for A-QOL, the following questionnaires were used: Asthma Control Test (ACT), Center for Epidemiologic Studies-Depression (CES-D), Short-Form Health Survey (SF-36) (version 2), and Global Initiative for Asthma Guideline (GINA).

The ACT (16) is designed to measure the following dimensions of asthma control: asthma symptoms, utilization of rescue medications, and impact of asthma on everyday functioning. It has established internal consistency reliability, known-groups validity, and responsiveness. ACT scores of over 19 indicate well-controlled asthma, while lower scores indicate not-controlled asthma.

The CES-D is a self-reported questionnaire with 20 items measuring depression (15). The total score ranges from 0 to 60, with a higher score indicating a higher degree of depression.

The SF-36, which measures general health status, consists of 36 items on 8 scales (physical functioning, role physical, bodily pain, vitality, social functioning, role emotional, mental health, and general health) (16). The responses to the questions for each scale are added and then transformed into the range from 0 to 100, with higher scores indicating a better health status.

Asthma severity was assessed based on the Global Initiative for Asthma Guideline (17). The severity was classified into four groups: intermittent, mild persistent, moderate persistent, and severe persistent.

Data Analysis. The SPSS (version 13) was used to analyze the data. The zero-order correlation matrix among the preliminary items was computed using Pearson's correlations. To ensure the comprehensiveness of items, values of missing items were computed using frequencies and percentages.

Factorial construct validity was analyzed using a principal-components analysis with varimax rotation after the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity to determine whether the data were suitable for a factor analysis (18). After the varimax rotation, factors with eigenvalue >1 were retained. The loading criterion was set at $\geq .50$ (19).

The multi-trait scaling analysis of item convergent and discriminant validity was performed based on item-scale correlations. Pearson's correlation coefficients of an item with its own scale (corrected for overlap) and other scales were calculated.

Convergent validity was analyzed using Pearson's correlation between scores on the A-QOL and the CES-D. The t test was used to assess the known-groups validity. Sensitivity was tested using analysis of variance (ANOVA) for the subscale means of the A-QOL and the generic SF-36 by asthma-severity groups. Then, the relative efficiency (RE) was calculated based on the ratio of the F statistic with the smallest F value as the denominator. Responsiveness was evaluated using the paired t test, which is the ratio of the mean change to its standard error, and the standardized

response mean (*SRM*), which is the ratio of the mean change to its standard deviation (6). Cronbach's alpha was computed to test the internal consistency reliability.

The scores of the total A-QOL and its subscales were obtained by averaging all items, with a higher score indicating a better HRQOL.

RESULTS

Item Generation and Pilot Test of the A-QOL

The in-depth interviews with asthma patients resulted in the derivation of 47 properties of HRQOL, each of which was used as an item for the preliminary A-QOL. Evaluation by an expert group resulted in the deletion of 5 of the items, leaving 42 items with a content validity of >80%. Four of the 42 items were then modified slightly to improve and simplify the vocabulary. The 5-point Likert-type responses were kept unchanged.

The mean age of the 15 patients who participated in the pilot study was 40.8 years ($SD = 19.25$). They comprised 9 females (60%), approximately half of whom were married or living with their spouses (53.3%) and had an education level of elementary or middle school (46.7%). None of the patients reported difficulties with understanding the items or the response options.

Evaluation of the A-QOL

Characteristics of the Subjects. The characteristics of the subjects who participated in the evaluation phase are presented in Table 1. Approximately half of the subjects were male. One hundred seven subjects were in their 40s. About two thirds of the subjects were married and had graduated from high school or had completed higher education. Around 60% had a monthly income of more than 2,000 USD.

Zero-Order Correlation Matrix. The results from the 42 $\times$ 42 zero-order correlation matrix revealed 6 items with low ($r < 0.30$) or high ($r > 0.80$) correlation coefficients. These items were deleted (20).

Comprehensiveness of Items. The rate of missing values for each item was low, ranging from 0.1% to 2.6% (Table 2) and with a mean of 0.67% for all items.

Factor Analysis. The sampling adequacy and suitability of the obtained data for a factor analysis were tested using the KMO test and Bartlett's test of sphericity (18). The value of the KMO test was 0.95, which was sufficiently high to justify a factor analysis. Bartlett's test of sphericity produced $\chi^2 = 7306.53$ ($p < 0.001$), indicating that the data were suitable for a factor analysis. Principal-components analysis with varimax rotation extracted a six-factor solution (eigenvalue > 1) (Table 2). Six items were not significantly loaded on any of the factors. A principal-components analysis with 30 items was computed again (Table 2). A six-factor analysis revealed that all 30 items were significantly loaded on one of the six factors. This solution explained 71.10% of the total variance.

Eight items were loaded significantly on the first factor, representing physical and social activities that were named "physical and social activities" (PSA). Five items that significantly loaded on the second factor were named "difficulties

TABLE 1.—Characteristics of subjects.

Variable	<i>n</i>	(<i>N</i> = 422) %
Gender		
Male	204	48.3
Female	218	51.7
Age in years		
≤19	22	5.2
20–29	71	16.8
30–39	73	7.3
40–49	107	25.4
50–59	90	21.3
60–69	51	12.1
≥70	8	1.9
(Mean = 43.05, <i>SD</i> = 14.38)		
Marital status		
Single (never married)	110	26.1
Married	281	66.6
Divorced	7	1.7
Widow(er)	14	3.3
Separated	2	.5
Living together	6	1.4
Missing	9	0.5
Education		
Elementary school	43	10.2
Middle school	64	15.2
High school	151	35.8
College and above	125	29.6
Other	34	8.1
Missing	5	1.2
Income [†]		
≤1,000,000 KW	62	14.7
1,000,001–1,999,999 KW	77	18.2
2,000,000–2,999,999 KW	100	23.7
3,000,000–3,999,999 KW	66	15.6
≥4,000,000 KW	90	21.3
Missing	27	6.4

[†]1,000 KW = 1USD.

related to cough" (DC). Six items that significantly loaded on the third factor were named "emotional status" (ES). Four items related to breath, which significantly loaded on the fourth factor, were named "symptoms related to breath" (SB). Another four items that significantly loaded on the fifth factor were named "uncertain future" (UF). The remaining three items loaded significantly loaded on the sixth factor were named "environmental distress" (ED).

Multi-Trait Scaling Analysis. Table 3 presents the results of multi-trait scaling analysis for item convergent and discriminant validity (21). The correlation coefficient for each item and its own scale was >0.40 after correcting for overlap, implying the presence of item convergent validity. Item discriminant validity was assessed by comparing the magnitude of the correlation coefficient of an item on its own scale compared to that on all other scales. There was no definite scaling error, implying that the correlation coefficient of an item with another scale exceeded the correlation coefficient on its own scale by two standard errors. However, the item "concerns about asthma worsening" was subject to a probable scaling error since the correlation coefficient between the item and another scale exceeded the correlation coefficient on its own scale (0.66), but by less than two standard errors.

Convergent Validity. The depression level as measured using the CES-D were significantly correlated with the A-QOL ($r = -0.64$, $p < 0.001$) and its subscales ($r = -0.48$ with PSA, $r = -0.45$ with DC, $r = -0.62$ with ES, $r = -0.47$ with SB, $r = -0.52$ with UF, and $r = -0.55$ with

TABLE 2.—Factor loadings, Cronbach's alpha coefficients, and frequencies and percentages of missing values.

No.	Item	Missing (%)	Factor loading I						Factor loading II					
			Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	PSA	DC	ES	SB	UF	ED
1	Difficulties in breathing	1 (0.2)				0.73						0.74		
2	Feeling of tightness in the chest	9 (2.1)				0.78						0.79		
4	Breathlessness	3 (0.7)				0.74						0.74		
5	Feeling of oppression in the chest	8 (1.9)				0.78						0.78		
6	Difficulty in patience with coughing	6 (1.4)			0.69					0.70				
7	Side aches or incontinence due to cough	5 (1.2)			0.58					0.58				
9	Fatigue	5 (1.2)												
10	Difficulty sleeping at night	5 (1.2)			0.69					0.70				
11	Sleeping at night in a sitting position	5 (1.2)			0.66					0.65				
12	Wheezing	4 (0.9)			0.71					0.69				
13	Depression	5 (1.2)		0.76							0.76			
14	Temper	3 (0.7)		0.53							0.53			
16	Anxiety	8 (1.9)		0.59							0.58			
17	Fear of asthma attack	2 (0.5)												
18	Loneliness	1 (0.2)		0.78							0.79			
19	Sense of inferiority	1 (0.2)		0.63							0.65			
20	Feeling of frustration	2 (0.5)		0.58							0.59			
21	Difficulty performing housework for 15 minutes	3 (0.7)	0.71						0.71					
22	Difficulty lifting objects	1 (0.1)	0.69						0.68					
23	Difficulty shampooing hair	3 (0.7)	0.61						0.59					
25	Difficulty going up two flights of stairs	1 (0.2)	0.76						0.78					
26	Difficulty walking on the flat	3 (0.7)	0.79						0.79					
27	Difficulty running	2 (0.5)	0.69						0.70					
28	Difficulty working	2 (0.5)	0.58						0.55					
29	Difficulty communicating with others	4 (0.9)												
31	Difficulty performing hobbies or leisure activities	1 (0.2)	0.59						0.58					
32	Difficulty concentrating	3 (0.7)												
33	Poor memory	4 (0.9)												
34	Concern about asthma worsening	3 (0.7)					0.56						0.59	
35	Concern about a dependent life on medications	0 (0.0)					0.72						0.72	
36	Hope	1 (0.2)					0.70						0.68	
37	Uncertainty in illness	0 (0.0)					0.81						0.79	
39	Stimulating smell	2 (0.5)						0.67						0.72
40	Temperature change	3 (0.7)						0.74						0.68
41	Dust, smoke, etc.	1 (0.2)						0.74						0.79
42	Difficulty with sex	11 (2.6)												

Loading criterion = 0.50; PSA = physical and social activities; DC = difficulties related to cough; ES = emotional status; SB = symptoms related to breath; UF = uncertain future; ED = environmental distress.

ED; $ps < 0.001$). That is, depression and A-QOL scores were moderately and negatively correlated.

Known-Groups Validity. Known-groups validity was assessed by comparing mean differences of the A-QOL between well-controlled and not-controlled asthma groups (Table 4). As expected, the mean scores were significantly higher for well-controlled asthma than for not-controlled asthma.

Sensitivity. Table 5 indicates that the F statistic was lowest for the ED subscale. Thus, RE values were calculated using this as the denominator. The DC, PSA, ES, and SB subscales of the A-QOL had the highest RE , whereas the physical functioning, vitality, and mental health subscales of the SF-36 exhibited low RE values.

Responsiveness. Table 6 indicates that the A-QOL scores were significantly higher at the second assessment than at baseline. The SRM was 0.74 for the total A-QOL and >0.43 for all subscales except for ED.

Internal Consistency Reliability. Cronbach's alpha was 0.95 for the total A-QOL and ranged from 0.91 to 0.82 for its

subscales (PSA = 0.91, DC = 0.85, ES = 0.91, SB = 0.89, UF = 0.87, and ED = 0.82). All Cronbach's alpha values exceeded the commonly used criterion of 0.70, implying that the A-QOL exhibited internal consistency reliability.

DISCUSSION

The A-QOL developed in the present study consists of 30 items scored on a 5-point Likert type. The rate of missing values for each item of the A-QOL was very low, which indicates that the questionnaire is highly comprehensible to patients, making it easy for them to complete it (22).

There is no universally accepted definition of HRQOL, but it is considered to be a multidimensional construct comprising physical, emotional, and social aspects of life. This is also the case for the asthma-specific HRQOL. The Asthma Quality of Life Questionnaire developed by Marks et al. (AQLQ-M) with Australian patients involves four dimensions: breathlessness, mood, social, and concerns (23). Juniper et al. (24) noted that the Asthma Quality of Life Questionnaire (AQLQ) developed with Canadian patients also consists of four dimensions: activity limitations, symptoms, emotional functions, and exposure to environmental stimuli. The A-QOL developed in the present study with Korean patients consists

TABLE 3.—Multi-trait scaling analysis.

No.	Item	PSA	DC	ES	SB	UF	ED
21	Difficulty performing housework for 15 minutes	0.74	0.46	0.55	0.46	0.48	0.46
22	Difficulty lifting objects	0.77	0.51	0.60	0.53	0.53	0.50
23	Difficulty shampooing hair	0.63	0.51	0.54	0.46	0.42	0.41
25	Difficulty going up two flights of stairs	0.78	0.46	0.47	0.48	0.49	0.44
26	Difficulty walking on the flat	0.73	0.44	0.44	0.40	0.42	0.41
27	Difficulty running	0.75	0.51	0.48	0.48	0.53	0.47
28	Difficulty working	0.72	0.59	0.63	0.54	0.55	0.53
31	Difficulty performing hobbies or leisure activities	0.72	0.56	0.62	0.50	0.61	0.50
6	Difficulty in patience with coughing	0.47	0.71	0.48	0.56	0.40	0.34
7	Side aches or incontinence due to cough	0.44	0.58	0.49	0.42	0.44	0.40
10	Difficulty sleeping at night	0.54	0.71	0.56	0.58	0.38	0.39
11	Sleeping at night in a sitting position	0.47	0.64	0.52	0.49	0.32	0.32
12	Wheezing	0.50	0.65	0.54	0.48	0.45	0.31
13	Depression	0.49	0.52	0.78	0.44	0.52	0.43
14	Temper	0.55	0.66	0.74	0.52	0.54	0.47
16	Anxiety	0.55	0.58	0.78	0.52	0.58	0.51
18	Fear of asthma attack	0.56	0.48	0.78	0.38	0.54	0.47
19	Loneliness	0.60	0.54	0.74	0.43	0.64	0.52
20	Feeling of frustration	0.62	0.53	0.72	0.45	0.63	0.55
1	Difficulties in breathing	0.52	0.60	0.45	0.77	0.43	0.35
2	Feeling of tightness in the chest	0.46	0.50	0.46	0.73	0.34	0.34
4	Breathlessness	0.59	0.60	0.50	0.80	0.45	0.36
5	Feeling of oppression in the chest	0.48	0.55	0.47	0.75	0.32	0.30
34	Concern about asthma worsening	0.66	0.53	0.66	0.49	0.62	0.51
35	Concern about a dependent life on medications	0.59	0.44	0.64	0.39	0.79	0.56
36	Hope	0.58	0.42	0.65	0.36	0.74	0.49
37	Uncertainty in illness	0.45	0.36	0.53	0.30	0.75	0.48
39	Stimulating smell	0.52	0.40	0.57	0.33	0.54	0.66
40	Temperature change	0.52	0.43	0.55	0.39	0.52	0.70
41	Dust, smoke, etc.	0.48	0.33	0.43	0.31	0.50	0.65

of six domains (Tables 2 and 3) : PSA, DC, ES, SB, UF, and ED.

Although the A-QOL is multidimensional, its dimensions differ from those of the other instruments. Associated with symptoms, the A-QOL is clustered into two cough and breath-focused dimensions, while the AQLQ-M and the AQLQ are not. Each of the A-QOL and AQLQ-M contains dimensions related to emotion (e.g., frustration, depression, and anxiety) and concerns (e.g., asthma worsening, future health, and dependent life on medications), but these are combined together into “emotional functioning” (e.g.,

TABLE 4.—Known-groups validity: Mean scores of the Asthma-Specific Quality of Life (A-QOL) based on the Asthma Control Test.

	Not-controlled asthma (n = 235)	Controlled asthma (n = 186)	$t^{\dagger}$	p
	Mean (SD)	Mean (SD)		
Toatal A-QOL	2.53 (0.89)	3.34 (0.54)	-11.58	<.001
PSA	2.72 (1.06)	3.51 (0.62)	-9.45	<.001
DC	2.68 (1.01)	3.61 (0.58)	-11.65	<.001
ES	2.76 (1.10)	3.55 (0.66)	-8.98	<.001
SB	2.28 (1.09)	3.25 (0.75)	-10.73	<.001
UF	2.41 (1.25)	3.19 (0.89)	-7.42	<.001
ED	2.29 (1.23)	2.96 (0.96)	-6.26	<.001

$^{\dagger}t$ test with equal variance not being assumed.

TABLE 5.—Sensitivities of the A-QOL and Short-Form Health Survey (SF-36) by asthma severity.

	Intermittent (n = 33)	Mild persistent (n = 226)	Moderate persistent (n = 144)	Severe persistent (n = 19)	F	RE
SF-36						
PF	76.81 (22.94)	73.82 (23.62)	63.99 (23.95)	63.68 (27.12)	6.31*	1.97
RP	86.93 (13.38)	79.72 (25.96)	69.01 (28.54)	60.85 (30.95)	8.83*	2.75
BP	77.90 (16.64)	77.09 (16.81)	66.97 (24.22)	59.84 (28.01)	10.70*	3.34
GH	49.06 (16.82)	51.29 (16.81)	43.44 (24.22)	39.21 (28.01)	6.41*	2.00
V	54.92 (20.89)	56.99 (22.74)	49.86 (25.29)	46.71 (22.08)	3.33*	1.04
SF	91.28 (9.62)	85.84 (19.65)	76.30 (5.84)	75.00 (25.50)	8.15*	2.54
RE	86.36 (19.18)	82.70 (24.27)	72.28 (29.26)	61.40 (26.38)	8.55*	2.67
MH	63.93 (19.18)	70.37 (24.27)	63.85 (29.26)	70.00 (26.54)	3.67*	1.14
A-QOL						
PSF	3.54 (0.54)	3.24 (0.87)	2.75 (1.06)	2.56 (1.20)	12.52*	3.91
DC	3.62 (0.56)	3.28 (0.84)	2.77 (1.06)	2.30 (1.05)	17.50*	5.46
ES	3.57 (0.39)	3.29 (0.87)	2.81 (1.17)	2.50 (1.12)	12.19*	3.80
SB	2.92 (0.88)	2.95 (0.92)	2.37 (1.15)	2.14 (1.45)	11.70*	3.65
UF	3.15 (0.80)	2.94 (1.07)	2.44 (1.27)	2.30 (1.39)	8.10*	2.53
ED	2.95 (0.83)	2.67 (1.13)	2.45 (1.26)	2.10 (1.23)	3.20*	1.00

* $p < 0.05$.

RE = relative efficiency;

PF = physical functioning; RP = role physical; BP = bodily pain; V = vitality; SF = social functioning; RE = role emotional; MH = mental health; GH = general health.

frustrated, afraid, and having concerns) in the AQLQ. An environmental-stimuli dimension is included in the A-QOL and the AQLQ, but not in the AQLQ-M. Aspects about social and daily physical activities are clustered together in the AQLQ but are separated in the AQLQ-M into social and breathlessness domains. These discrepancies in the domains may be attributable to cultural differences since the HRQOL perceptions of individuals vary from culture to culture (25). Future studies should therefore identify the cultural uniqueness and commonalities of the A-QOL among countries. Schmier, Chan, and Leidy (26) also emphasized the need to consider different valuations of the quality of life that might exist for asthmatics from different ethnic groups.

Convergent validity relates to how closely a new measure is related to other variables and other measures of the same construct to which it should be related (27). The depression level was used in the present study for the convergent validity of the A-QOL since it has been reported that HRQOL is lower in asthma patients who are more depressed (28, 29). The correlation coefficients between depression and the A-QOL and its subscales fulfilled the range of coefficients (from 0.40 to 0.80) required for convergent validity (30). That is, convergent validity was established because the correlation coefficients were neither too low nor too high. Therefore, the A-QOL and its subscales might be similar to the CES-D but

TABLE 6.—Responsiveness analysis between two assessments of the A-QOL.

	First assessment (baseline)	Second assessment (1 month)	Mean score change	SD of change	t	SRM (standardized response mean)
	Mean (SD)	Mean (SD)				
Total A-QOL	2.75 (0.86)	3.19 (0.73)	-0.44	0.59	-7.89*	0.74
PSF	2.93 (0.97)	3.24 (0.87)	-0.31	0.71	-4.51*	0.43
DC	2.93 (0.97)	3.50 (0.69)	-0.58	0.86	-7.08*	0.67
ES	2.99 (0.99)	3.46 (0.74)	-0.46	0.75	-6.45*	0.61
SB	2.47 (1.10)	3.14 (0.84)	-0.67	0.99	-7.08*	0.67
UF	2.73 (1.15)	3.14 (0.96)	-0.41	0.81	-5.36*	0.50
ED	2.44 (1.20)	2.67 (1.17)	-0.24	0.80	-3.09*	0.30

* $p < 0.05$.

may reflect different traits that are not detected by measuring depression.

Known-groups validity refers to whether certain specified groups of patients are anticipated to score differently from others (6). A valid instrument should show differences in the anticipated direction. It was expected that the HRQOL would be better in our patients with well-controlled asthma than in those whose asthma was not controlled (31), which was found to be the case (with statistical significance). In other words, the known-groups validity of the A-QOL was established.

The sensitivity of a quality-of-life instrument reflects its ability to detect HRQOL differences between patients with mild and severe disease (6). In this study the relative efficacies of two instruments (A-QOL and SF-36) were compared in groups with differing severities of asthma. As expected, the A-QOL was clinically more sensitive than the generic SF-36 in detecting differences in asthma severity. In other words, the A-QOL assesses additional information about HRQOL beyond what is measured by a generic type of questionnaire.

Responsiveness is the ability of an instrument to detect small but significant changes in outcomes over time (32). In the present study, significant clinical changes in the A-QOL in individual patients were evident within 1 month for a moderate *SRM*. However, the *SRM* of the ED subscale was low, at 0.30, which might be due to distressing environmental stimuli (e.g., temperature or dust).

The coefficients for the internal consistency reliability of the total A-QOL and its subscales were well above 0.70, which is the criterion commonly used for newly developed questionnaires (33). This indicates the homogeneity of the items of the A-QOL.

CONCLUSION

This study developed an A-QOL questionnaire for measuring HRQOL in Korean patients with asthma. The questionnaire consists of 30 items that are rated using a 5-point Likert type. The items are clustered into six subscales: physical and social activity (8 items), difficulties related to cough (5 items), emotional status (6 items), symptoms related to breath (4 items), uncertain future (4 items), and environment distress (3 items). The questionnaire was found to be easily understood by patients and can be used to estimate psychometric properties. It will therefore be useful as an outcome measure for both clinical trials and in clinical practice.

REFERENCES

1. Masoli M, Fabian D, Holt S, Beasley R. The global burden of Asthma: Executive summary of the GINA Dissemination Committee Report. *Allergy* 2004; 59:469–478.
2. Martinez FD. Trends in asthma prevalence, administration rates, and asthma deaths. *Respir Care* 2008; 53:561–567.
3. Kim YY, Cho SH, Kim WK, Park JK, Song SH, Kim YK, Jee YK, Ha MN, Ahn YO, Lee SI, Min KU. Prevalence of childhood asthma based on questionnaires and methacholine bronchial provocation test in Korea. *Clin Exp Allergy* 1997; 27:761–768.
4. Cho S-H, Kim Y-K, Chang Y-S, Kim S-S, Min K-U, Kim Y-Y. Asthma insights and reality in Korea. *Korean J Med* 2006; 70:69–77.
5. Blaiss MS. Outcomes analysis in asthma. *JAMA* 1997; 278:1874–1880.

6. Fayers PM, Machin D. *Quality of Life: Assessment, analysis, and interpretation of patient-reported outcomes*. Chichester, UK: Wiley, 2007.
7. Pedhazuer EJ, Schmelkin LP. *Measurement, design, and analysis: An integrated approach*. Hillsdale, NJ: Lawrence Erlbaum Association, 1991.
8. Padilla GV, Kagawa-Singer M. Quality of life and culture. In: King CR, Hinds PS, eds. *Quality of life*. Sudbury, MA: Jones and Bartlett, 1998:74–92.
9. Kim CW, Chung HW, Shin JI, Bae SW, Park JW, Cho SY, Hong CS. Generic health-related quality of life in patients with bronchial asthma. *Korean J Asthma Allergy Clin Immunol* 2002; 22:558–566.
10. Rho HJ, Park MS, Park CW, Yun YY, Park JW, Hong CS, Suh JY, Kim DK. Factors influencing quality of life of asthmatic patients in Korea. *Korean J Asthma Allergy Clin Immunol* 2000; 20:209–221.
11. Strauss A, Corbin J. *Basics of qualitative research: Techniques and procedure for developing grounded theory*. 2nd ed. London: Sage, 1998.
12. DeVellis RF. *Scale development: Theory and application*. Thousand Oaks: Sage, 2003.
13. Lynn MR. Determination and qualification of content validity. *Nurs Res* 1986; 35:382–385.
14. Kosinski M, Bayliss MS, Turner-Bowker DM, Fortin EW. *Asthma Control Test: A user's Guide*. Lincoln (RI): QualityMetric Incorporated, 2004.
15. Radloff LS. The CES-D Scale: A self report depression scale for research in the general population. *Appl Psychol Meas* 1977; 1:385–401.
16. Ware JE, Josinski M, Gandek B. *SF-36 Health survey: Manual & interpretation guide*. Lincoln, RI: QualiMetric, 2000.
17. Global Initiative for Asthma. *Global strategy for asthma management and prevention*, 2000. Available at <http://www.ginasthma.com>
18. Kaiser HF. An index of factorial simplicity. *Psychometrika* 1974; 39:31–36.
19. Tabachnick BG, Fidell LS. *Using multivariate statistics*. 3rd ed. New York: Harper Collins, 1996.
20. Pett MA, Lackey NR, Sullivan JJ. *Making sense of factor analysis*. Thousand Oaks: Sage, 2003.
21. Ware JE Jr, Gandek B. Methods for testing data quality, scaling assumption, and reliability: The IQOLA project approach International quality of life assessment. *J Clin Epidemiol* 1998; 51:945–952.
22. McHorney CA, Ware JE, Lu JF, Sherbourne CD. The MOS 36-item Short-Form health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care* 1994; 32:40–66.
23. Marks GB, Dunn SM, Woolcock AJ. A scale for the measurement of quality of life in adults with asthma. *J Clin Epidemiol* 1992; 45:461–472.
24. Juniper EF, Guyatt GH, Epstein RS, Ferrie PJ, Jaeschke R, Hiller TK. Evaluation of impairment of health related quality of life in asthma: development of a questionnaire for use in clinical trials. *Thorax* 1992; 47:76–83.
25. King CR. Quality of life and controversial issues. In: King CR, Hinds PS, eds. *Quality of life*. Sudbury, MA: Jones and Bartlett, 1998:23–34.
26. Schmier JK, Chan KS, Leidy NK. The impact of asthma on health-related quality of life. *J Asthma* 1998; 35:585–597.
27. Fayers PM, Machin D. *Quality of Life: Assessment, analysis, and interpretation of patient-reported outcomes*. Chichester, UK: Wiley, 2001.
28. Mancuso CA, Peterson MG, Charlson ME. Effects of depressive symptoms on health-related quality of life asthma patients. *J Gen Intern Med* 2000; 15:301–310.
29. Rimington LD, Davies DH, Lowe D, Pearson MG.. Relationship between anxiety, depression, and morbidity in adult asthma patients. *Thorax*. 2001; 56:266–271.
30. Fletcher A, Gore S, Jones D, Fitzpatrick R, Spiegelhalter D, Cox D. Quality of life measures in health care. II: Design, analysis, and interpretation. *BMJ* 1992; 305:1145–1148.
31. Leidy NK, Coughlin C. Psychometric performance of the asthma quality of life questionnaire in a US sample. *Qual Life Res* 1998; 7:127–134.
32. Mishoe SC, Maclean JR. Assessment of health-related quality of life. *Respir Care* 2001; 46:1236–1257.
33. Nunnally J, Bernstein I. *Psychometric theory*. 3rd ed. New York: McGraw-Hill, 1994.