

Pediatric asthma quality of life questionnaire (PAQLQ): Validation among asthmatic children in Thailand

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Quality of life (QoL) is an important consideration among asthma sufferers. The Pediatric Asthma Quality of Life Questionnaire (PAQLQ) is one of the most widely used instruments for measuring health-related QoL in children with asthma. The standardized version of PAQLQ contains 23 questions in three domains, i.e., activity limitation, symptoms and emotional function. The objective of this study was to validate the Thai-translated version of the PAQLQ. The study design consisted of a five-week single cohort study. Patients recorded symptoms, and peak expiratory flow rate (PEFR) each morning and evening during the first and fifth week of the study in asthma diary. At each clinic visit, a trained-interviewer administered the PAQLQ and performed spirometric measurements. Fifty-one children, ages between 7 and 17 yr participated in the study. Scores from the asthma diary were used to classify patients into stable vs. unstable groups. The construct validity of the questionnaire was confirmed in both cross-sectional and longitudinal studies by demonstrating correlations between various PAQLQ domains with clinical asthma parameters (asthma diary, β -agonist use and PEFR). There was high internal consistency for scores of the three domains (Cronbach's α -coefficient = 0.83–0.95). For those with stable asthma, the reliability of PAQLQ was good for the rating scale (intra-class correlation coefficient – ICC = 0.84) and for total score (α = 0.97) indicating high reproducibility of the PAQLQ. The significant difference of changes QoL scores between stable and unstable groups was observed in all domains. We conclude that the Thai version of PAQLQ is valid and reliable for implementing in Thai children with asthma.

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Asthma is the most common chronic disease in childhood and its prevalence is increasing worldwide (1, 2). In Thailand, prevalence of childhood asthma increased from 4.2% to 13% within the last decade (3, 4). The burden of the disease is placed not only on patients but also on their families and the society alike (5, 6). Childhood asthma accounts for a significant number for hospitalizations, school absenteeism as well as interference in other daily activities (7). It has also been associated with poor school performance, low self-image of patients, and disruption of family life (8, 9). Moreover, parents' quality of

life (QoL) was also affected (10). With its increasing incidence and burden associated with pediatric asthma, the assessment of QoL among patients and their parents has gained rapid interest among practitioners and researchers. Such assessment yields several benefits such as aiding in the monitoring of treatment, in combination with clinical measures (11), in giving a better understanding on the patient's feelings on his/her condition, and in enhancing communication between clinicians and patients (12). It is believed that the use of a standard quality of questionnaire will help clinicians to be able to

focus on the important dimensions of patient care, allowing them to develop a more relevant medical plan directed at improving patient-reported functioning and well-being (13). The Pediatric Asthma Quality of Life Questionnaire (PAQLQ), developed and validated by Juniper et al. (14) reveals areas of functions that are important to patients with asthma including physical and emotional function. It is reproducible when the clinical state is stable and is responsive to small changes (15). The PAQLQ was also designed to be an evaluative instrument that is sensitive to small changes over time, within the patient and therefore is appropriate for capturing the effect of an intervention in a clinical trial (16). PAQLQ has been validated and applied to the assessment of the QoL of asthmatic children in USA, Europe and some Asian countries (14, 17, 18). Although the questionnaire has been translated into Thai by means of standard methods of translation along with the original author, differences in cultures and behavior may affect the consistency of properties of the instrument. We would like to explore dimensions of QoL in Thai patients, which may not be the same as in the English speaking. The objective of this study is to test the ease of application and to establish the validity, reliability and responsiveness of PAQLQ (Thai version) among children with asthma in Thailand.

Materials and methods

Subjects

The study was conducted between October 2002 and September 2003. Children who were diagnosed as having asthma for at least 6 months from the Pediatric Allergy Clinic, Siriraj Hospital, Bangkok, were enrolled. Patients aged between 7 and 17 yr were eligible. Children with illnesses other than asthma that might have an impact on health-related QoL, or had recurrent chest infections were excluded from the study. All patients were able to communicate directly with the interviewer and were capable of performing a reliable maneuver of PEFR and spirometry. Parents and patients when appropriate signed an informed consent. The study was approved by the Ethics Committee of the Faculty of Medicine Siriraj Hospital, Mahidol University.

Study design

This was a 5-week period cohort study. Patients were seen in the clinic at enrollment, at week #1

and #5. At enrollment, eligible patients were instructed on how to record their symptoms and β -agonist use, how to use the peak flow meter to measure lung function before taking asthma medication, and to record values into their asthma diaries. Each patient was provided with an asthma diary and a portable peak flow meter for recording morning and evening PEFR at home 1 wk before each follow-up clinic visit. At baseline, interviews included an assessment of demographic characteristics by a single and trained researcher was conducted. Patients were interviewed on PAQLQ by the same interviewer at one and 5 wk after baseline without parents being present. Lung function was measured by spirometry at each follow-up visit before and 20 min after bronchodilator administration. Patients whose asthma was adequately controlled continued to take their established asthma medications throughout the study. Patients whose asthma was not adequately controlled (day-time and night-time of asthma symptoms, or use of β -agonist, or impact of asthma on activities) (19) at week #1 or #5 were advised to increase their reliever and controller medications according to clinician's recommendation.

Outcome measures

Pediatric asthma quality of life questionnaire. The PAQLQ is a disease-specific questionnaire for children with asthma. It is intended to assess QoL in children between 7 and 17 yr old (14). In this study, the standardized version of the interviewed-administered versions was used. It was shown that children as young as 7 yr old could easily complete the questionnaire and could accurately understand questions (19). It includes 23 items in three domains, i.e., activity limitation, symptoms and emotional functions. The activity limitation domain comprised five items relating to play, sports and other daily activities. There were 10 items in the symptoms domain including cough, wheezing and nocturnal awakening. The emotional function domain contained eight relating items such as being frightened, frustrated or feeling different, being irritable or worried, etc. Response to each item ranged from 1 (indicating maximum impairment) to 7 (no impairment at all). Translation into Thai, encompassing forward and backward translations, was carried out in consultation with the original author (EF Juniper).

Patients were asked to recall the physical and emotional impairments that they experienced during the previous week. There are two types of questions. The first concerns the level of

bothersome and the second concerns the frequency of bothersome. Both sets of questions were answered verbally by the patients. Each item was equally weighted. Scores of items belonging to each domain were summed and divided by the number of items of that domain. Scores on all items were summed and divided by 23, giving the overall score. Results were expressed as a mean score per item in each domain and for all 23 questions, ranging from 1 to 7.

Asthma diary (asthma control questionnaire). The asthma control questionnaire used in this study was adapted from that developed by Juniper et al. (20). It consists of questions regarding asthma symptoms and β -agonist use in the week prior to the clinic visit. The questions specifically related to (i) awakening by symptoms at night (ii) awakening by symptoms in the morning (iii) limitation in activities (iv) shortness of breath (v) wheezing, and (vi) β -agonist use. Response options in each item were adapted to a five points scale (score range per day = 1–30). A higher score indicated more symptoms. Patients or parents completed the form at each clinic visit and before PAQLQ interview. Differences in scores between two assessments were used to classify patients' condition as a 'stable' group among those with a score difference of less than one and those with score difference of more than one being in the 'unstable' group.

Clinical assessments. Three PEFr measurements were conducted by patients in the morning and evening. The highest value of the three blows was recorded in the asthma diary. Percent predicted values of FEV1 for height were assessed at the clinic.

Statistical analysis

In this study, we measure the properties of the questionnaire as follows:

- (i) Validity (accuracy of the measuring tools) was determined by correlation coefficients consisting of Pearson's Product Moment correlation and Spearman's rank correlation as appropriate. Cross-sectional validity was determined using Pearson's Product Moment correlation between the PAQLQ domains and clinical assessments, i.e., asthma diary, PEFr, FEV1% predicted. Longitudinal validity was determined using Pearson's Product Moment correlation between changes of scores at week

#1 and #5. Spearman's rank correlation was used to assess the correlation between QoL scores and β -agonist use.

- (ii) Reliability refers to the consistency of the questions with regard to the measurement of the same individual. The internal consistency (Cronbach's α -coefficient) was assessed in all patients at week #1 and #5. The intraclass correlation coefficient was calculated using QoL scores of three domains (activities, symptoms and emotions) and their total scores obtained from stable patients at week #1 and #5.
- (iii) Responsiveness refers to the ability of the instrument to detect changes of scores. To assess the responsiveness, the Mann–Whitney *U* test was used to compare the changes of QoL scores at week #1 and #5 between stable and unstable patients.

All statistical calculations were performed using SPSS Version 10 (Chicago, USA). A *p* value of <0.05 was considered statistically significant.

Results

Demographics and baseline characteristics

Fifty-five patients were enrolled. However, four patients were excluded due to incomplete data. Fifty-one patients completed the study and their data formed the report of this study. The mean age of patients was 11.4 ± 2.7 yr (ranges 7–17 yr). There were 38 boys (74.5%) and 13 girls (25.5%). There were five patients with mild intermittent asthma, 32 with mild persistent asthma and 14 with moderate persistent asthma according to GINA criteria (21). Detailed demographic and health status data of the two groups at enrollment are shown in Table 1. Twenty-eight patients remained stable during the period of the study and twenty-three patients were classified as being unstable (differences in asthma diary scores between two visits more than one). More patients in the unstable group were from low family income classes. PEFr, FEV1, asthma diary scores and PAQLQ scores were lower among the unstable group as compared to the stable group ($p < 0.05$).

Ease of questionnaire administration

The time taken for an interview lasted 15 min on the average. Two children aged 7 and 9 yr old had difficulty in understanding questions requiring assistance from their parents. Most parents had been advised not to keep pets in the home

Table 1. Clinical characteristics and PAQLQ scores of all patients (n = 51)

Variable	Stable group	Unstable group
Number	28	23
Gender: M/F	24/4	14/9
Age (yr)	11.5 ± 2.6	11.3 ± 2.8
Total family income (1:2:3:4)*	1:6:11:10	7:5:8:3†
Classification of asthma (MI:MP:MoP)	2:21:5	3:11:9
PEFR morning	95.9% ± 19.4	78.9% ± 13.4‡
FEV1	90.4% ± 13.5	85.1% ± 19.5‡
Asthma diary scores	6.5 ± 0.5	8.2 ± 2.6‡
PAQLQ scores	6.2 ± 1.9	5.4 ± 1.3‡

MI, mild intermittent; MP, mild persistent; MoP, moderate persistent.

*1 = < 5000 baht/month, 2 = 5000–10,000 baht/month, 3 = 10,001–30,000 baht/month, 4 = > 30,000 baht/month.

†Chi-square test.

‡Mann-Whitney *U* test, *p* < 0.05

leading to overall negative responses to item #2 ('How much bothersome were you when being with pets?').

Psychometric properties of PAQLQ

Correlations between PAQLQ scores and changes in clinical assessment were documented in the cross-sectional analysis (Table 2). At week #1, correlations between PAQLQ domains, asthma diary, PEFR and β -agonist use were found to be moderate ($r = 0.31$ – 0.69). Poor correlation between domains of PAQLQ and FEV1% predicted was observed ($r = 0.01$ – 0.03). The same trend was observed at week #5. At week #5, correlations were moderate between the Global

Table 2. Cross-sectional construct validity among all patients as expressed as correlation coefficients (*r*)†

Change in clinical asthma	Asthma quality of life scores		
	Activities	Symptoms	Emotions
Week 1			
Asthma diary	−0.58*	−0.58*	−0.69*
FEV1% predicted	0.03	0.01	0.03
PEFR morning, l/min	0.42*	0.31*	0.32*
PEFR evening, l/min	0.47*	0.36*	0.32*
β-agonist use	−0.40*	−0.39*	−0.32*
Week 5			
Asthma diary	−0.43*	−0.50*	−0.57*
FEV1% predicted	0.24	0.25	0.28
PEFR morning, l/min	0.40*	0.32*	0.28
PEFR evening, l/min	0.40*	0.33*	0.30
β-agonist use‡	−0.25	−0.31	−0.25
Global rating of change	0.31*	0.22	0.36*

A minus sign shows an opposite direction of scores.

**p* < 0.05.

†Spearman rank correlation was used for determining construct validity of β -agonist use.

‡Construct validity of all variables except β -agonist use was assessed using Pearson product moment correlation.

Table 3. Longitudinal construct validity in all patients (n = 51) as indicated by correlation coefficient

	Changes in PAQLQ scores		
	Activities	Symptoms	Emotions
Change in clinical outcomes			
Clinical asthma control (diary card)	−0.35*	−0.41*	−0.63*
FEV1% predicted	0.40*	0.31*	0.32*
PEFR morning, l/min	0.09	0.31*	0.42*
PEFR evening, l/min	0.19	0.32*	0.40*

Note: A minus sign shows an opposite direction of scores.

Pearson correlation coefficient were used, **p* < 0.05.

Table 4. Internal consistency in all patients (n = 51) and test – retest reliability of PAQLQ among stable patients

Domains	Cronbach's α -coefficient (n = 51)		Patients with stable condition (n = 28)		Intraclass correlation coefficient
	Week 1	Week 5	Within-subject s.d.	Between-subject s.d.	
Overall QoL	0.97	0.97	0.33	0.75	0.84
Symptoms	0.92	0.94	0.42	0.78	0.78
Activities	0.83	0.87	0.34	0.75	0.83
Emotions	0.95	0.91	0.38	0.81	0.82

rating of change with activity ($r = 0.31$) and with emotional function ($r = 0.36$) domains. However, it was lower with symptoms domain ($r = 0.22$).

Table 3 shows correlations between changes in scores of PAQLQ during the two visits (week #1 and #5) and clinical outcome measures. The symptoms and emotional function domains showed moderate correlations with asthma diary, predicted FEV1% and PEFR ($r = 0.31$ – 0.63). The activity limitation domain had moderate correlations with asthma diary, predicted FEV1% but showed weak correlations with PEFR values.

Cronbach's α -coefficients for the overall and all domains at week #1 were 0.83–0.97 and week #5 were 0.87–0.97 (Table 4). The questionnaire also established high intra-class correlation coefficients (0.78–0.84) indicating good reproducibility in patients with stable condition.

Table 5 showed the differences in the scores between week #1 and #5 in the stable and in the unstable groups. However, the changes in the unstable group were not significantly different.

Discussion

Although the PAQLQ has been translated through standard methods, validity, reliability

Table 5. Responsiveness: Mean $\pm$ s.d. of changes in PAQLQ scores of sub-groups

Domains	Absolute mean differences between visits		p value*
	Stable group (n = 28)	Unstable group (n = 23)	
Overall QoL	0.30 $\pm$ 0.38	1.24 $\pm$ 1.13	<0.001
Symptoms	0.34 $\pm$ 0.50	1.08 $\pm$ 1.05	0.002
Activities	0.34 $\pm$ 0.35	1.04 $\pm$ 0.92	0.002
Emotions	0.38 $\pm$ 0.40	1.63 $\pm$ 1.35	<0.001

*The test between groups: Mann-Whitney *U* test.

and responsiveness testing are required in order to confirm that culture difference does not influence the results of measurement. The results of our study suggest that the Thai-translated version of the PAQLQ is a valid, reliable tool and is also responsive to change. In the cross-sectional validity, significant correlations were observed in all three domains with asthma diary scores, peak expiratory flow rates and β -agonist use, similar to results reported with the original questionnaire (14). Such correlation in our study was even better than in those demonstrated in other studies (18, 22). However, weak correlations between PAQLQ scores and predicted FEV1 were observed, similar to others (17, 18, 23–25). Since a single measurement FEV1 in asthma may not accurately reflect clinical condition throughout an entire week such parameter could have a poor correlation with QoL (26).

In our study, the lowest ICC was on the symptoms domain, a finding, which is similar to that of Elizabeth et al. (18). Our study did not subgroup patients in different age groups as performed by Juniper et al. (14). due to a small number of subjects in each group. We could not demonstrate any significant difference in any of the domains in the unstable group among scores between week #1 and #5. Surprisingly, the same trend was found in the study by Elizabeth et al. (18) indicating that clinical outcomes may not affect QoL. In addition, a QoL study among Hungarian children demonstrated that symptomatic patients even with few symptoms could experience significantly poorer QoL than their asymptomatic peers. Moreover, allergen prevention regimen and use of prophylactic drugs could possibly restrict their QoL (27).

Some problems in implementing questionnaires were observed in our setting. Since most patients did not have pets in the homes, their responses to item #2 were always negative. Perhaps alteration of such questionnaire item is needed for Thailand. Another concern is in regard to its application in young children.

Although the questionnaire was previously shown to be useful among children as young as 7 yr old (20), two of our children were too young to concentrate to respond to the interviewer in our study. In addition, children in our study had difficulty differentiating the difference of response options (15-point scale) in the Global rating of change questionnaire. Moreover, most patients were so considerate that their answers seemed to favor their interviewers. Therefore, we decided not to use the scores for grouping patients into stable and unstable groups as was done in other studies (13, 18). There was some evidence suggesting that clinical measures (predicted FEV1% and peak flow rate) and asthma diary were more closely correlated to parents' than to children's global rating of change (28). One study showed that the short-term QoL could be obtained from children themselves, while for longitudinal information should be collected from parents (29). An assessment in parents' perceptions could be considered more reliable in younger children.

In conclusion, the Thai-translated PAQLQ is proved to be valid and reliable among our study group. However, the weakness on responsiveness was uncovered so further modifications may be necessary before full implementation in our culture.

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