

DOI: 10.58490/ctjump.2026i11TA.4892

**A VALIDATED KNOWLEDGE, ATTITUDES, AND PRACTICES QUESTIONNAIRE
FOR CAREGIVERS OF CHILDREN WITH ASTHMA IN SOUTHERN VIETNAM**

**Tran Vinh Thoi, Dang Quoc Cuong, Nguyen Phu Thuan, Nguyen Ha Bao An,
Duong Thai Hoang Hien, Phun Duy Long, Nguyen Dinh Nguyen Chuong,
Le Hoang My, Le Hoang Thang, Tran Cong Ly***

Can Tho University of Medicine and Pharmacy

*Corresponding author: tcly@ctump.edu.vn

Received: 25/3/2026

Reviewed: 31/3/2026

Accepted: 25/6/2026

ABSTRACT

Background: Asthma is a chronic inflammatory airway disease with increasing prevalence, yet pediatric control rates remain low. Caregivers' knowledge, attitudes, and practices are crucial for effective asthma management. However, validated knowledge, attitudes, and practices scales using advanced statistical methods are limited in the Mekong Delta. **Objectives:** To develop and validate a knowledge, attitudes, and practices scale for caregivers of asthmatic children. **Materials and methods:** A cross-sectional study enrolled 260 primary caregivers of children aged 4-16 years with asthma at Can Tho City Children's Hospital from December 2024 to December 2025. Caregivers completed a standardized questionnaire covering sociodemographic characteristics and a 29-item KAP questionnaire. For scale development and validation, the sample was split into two equal subsamples using the Solomon method. Each domain of the knowledge, attitudes, and practices scale was first examined separately by exploratory factor analysis in subset 1, and the retained factor structure was then tested by confirmatory factor analysis in subset 2. **Results:** The mean age of caregivers of children with asthma was 38.32 ± 8.194 years. Exploratory factor analysis and confirmatory factor analysis eliminated 10 items, retaining 19 items with satisfactory psychometric properties. The Knowledge, Attitudes, and Practices domains achieved high composite reliability ($CR = 0.875-0.940$) and good convergent validity ($AVE = 0.503-0.759$). HTMT indices were <0.85 , demonstrating good discriminant validity. All confirmatory factor analysis models showed good data fit. **Conclusion:** The 19-item knowledge, attitudes, and practices questionnaire demonstrated satisfactory validity and reliability, serving as a simple, concise, and highly feasible tool for rapid outpatient assessment. This instrument represents a practical and reliable tool for assessing caregiver knowledge, attitudes, and practices in both clinical and research settings.

Keywords: Asthma, children, caregivers, management, uncontrolled asthma.

I. INTRODUCTION

Asthma, a chronic inflammatory airway disease, affects an estimated 300 million people worldwide, and was projected to reach 400 million by 2025. Among children under 15 years of age, the prevalence ranges from 6-12%. The primary treatment goal is to achieve adequate disease control to minimize exacerbations and improve quality of life, commonly assessed via the Asthma Control Test (ACT) and GINA strategy [2]. However, asthma control in children remains suboptimal in practice. Global reports have shown that only 44.1% of children achieve good control, and a study conducted at Can Tho Children's Hospital in 2023 found that this proportion was only 23.2% [3], [4].

Caregivers' knowledge, attitudes, and practices play a pivotal role in treatment adherence and in the management of asthma attacks [5]. Effective asthma management is often hindered by inappropriate caregiver knowledge, attitudes, and practices, arising from

concerns about medication side effects or misconceptions about disease etiology [6], [7]. Caregiver KAP deficiencies often worsen pediatric treatment adherence and clinical outcomes. Accurately measuring these domains requires rigorously validated tools; however, studies developing and validating KAP scales using advanced methods (EFA and CFA) remain scarce in Vietnam, particularly the Mekong Delta. Therefore, we conducted this study to develop and validate a knowledge, attitudes, and practices scale for caregivers of children with asthma.

II. MATERIALS AND METHODS

2.1. Participants

Study participants comprised all primary caregivers of children with asthma who were receiving preventive treatment and outpatient asthma management at the asthma clinic of Can Tho Children's Hospital.

- **Inclusion criteria:** Primary caregivers of children with asthma aged 4-16 years. The parent or legal guardian and/or the child agreed to participate in the study.

- **Exclusion criteria:** The inability of the child or caregiver to complete the asthma control assessment, enrollment in the outpatient management program for <1 month, or withdrawal from the study.

2.2. Research methods

- **Study design:** Analytical cross-sectional study

- **Study setting and period:** The study was conducted at the asthma clinic of Can Tho Children's Hospital from December 2024 to December 2025.

- **Sample size:** There is currently no universal consensus regarding the minimum sample size required for exploratory factor analysis (EFA). In this study, the sample size for EFA was determined using a conservative cases-per-variable (N/p) ratio of 10:1 [8]. Within our questionnaire, the domain containing the largest number of items comprised 11 items; therefore, the minimum required sample size for EFA was calculated to be 110 participants.

In addition, the sample size for confirmatory factor analysis (CFA) was determined based on the Monte Carlo simulation study by Wolf *et al.* (2013) [1]. For a measurement model comprising one latent factor with anticipated moderate factor loadings (approximately 0.5) and 6-8 observed indicators per factor, a minimum sample size of 90 participants is required to achieve at least 80% statistical power and low parameter estimation bias.

The dataset was intended to be divided into two equal subsets (1:1) for conducting EFA and CFA on independent samples. Therefore, the minimum total sample size required for the study was determined to be 220 participants. In practice, a total of 260 participants were ultimately included.

- **Sampling method:** Convenience sampling.

- **Instrument:** The initial knowledge, attitudes, and practices (KAP) scale for caregivers of children with asthma was developed based on the GINA guidelines and selected items adapted from previously published instruments [9], [10], [11]. The draft scale subsequently underwent forward-backward translation and cross-cultural adaptation to ensure semantic, conceptual, and contextual equivalence for the local setting. The preliminary version contained 33 items. Following expert evaluation of content validity, four items with an item-level content validity index (I-CVI) below 0.78 were removed, yielding a final questionnaire of 29 items. The

finalized KAP questionnaire was available in Vietnamese and was intended for administration to the target population.

- **Data collection:** Eligible caregivers were evaluated using a standardized questionnaire covering sociodemographic characteristics, and the KAP scale. The KAP scale comprised three domains: knowledge (11 items), attitudes (9 items), and practices (9 items). Each item was rated on a 5-point Likert-type response scale ranging from 1 to 5, where 1 indicated “strongly disagree”, 2 “disagree”, 3 “neutral”, 4 “agree”, and 5 “strongly agree”. Depending on item wording, responses were coded so that a consistent scoring direction was maintained across items before domain and total scores were calculated.

- **Statistical analysis:** Data were entered into Microsoft Excel and analyzed using R version 4.5.0. Responses to the KAP items were subsequently dichotomized into inadequate (scores 1-3) and adequate (scores 4-5). These binary-coded items were then used for factor analysis. To validate the scale, the total sample was randomly split into two equivalent subsamples using the SOLOMON method [12]. Each domain of the KAP scale was first examined separately by exploratory factor analysis (EFA) in subset 1, and the retained factor structure was then tested by confirmatory factor analysis (CFA) in subset 2 [1], [13].

In subset 1 (n=130), EFA was used to explore the factor structure of each domain. Sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett’s test of sphericity, with KMO>0.50 and Bartlett’s test $p<0.05$ considered acceptable. Items with factor loadings <0.50 were considered for removal, taking theoretical relevance into account. In subset 2 (n=130), CFA was performed to test the domain structures identified in the EFA. After establishing the measurement structure of the three domains, a final CFA was conducted in the full sample (n=260) to evaluate the overall measurement model. Model adequacy was evaluated using global fit indices and by examining construct reliability and validity, including composite reliability (CR>0.70), convergent validity assessed by average variance extracted (AVE>0.50), and discriminant validity assessed using the heterotrait-monotrait ratio (HTMT), with values <0.90 considered acceptable.

- **Ethical Approval:** The ethical aspects of the study were reviewed and approved by the Ethics Committee in Biomedical Research of Can Tho University of Medicine and Pharmacy (approval No. 24.135.SV/PCT-HĐĐĐ) and by Can Tho Children's Hospital.

III. RESULTS

A total of 260 eligible caregivers were included in the analysis.

Table 1. General characteristics of the study participants (n=260)

Characteristics		Frequency (n)	Percent (%)
Age group	<20	0	0
	20 - 35	105	40.4
	>35	155	59.6
	Mean age $\pm$ standard deviation	38.32 $\pm$ 8.194 (years)	
Sex	Male	68	26.2
	Female	192	73.8
Educational level	Primary to high school	68	26.2
	College - university or higher	192	73.8
Family history of asthma	Yes	63	24.2
	No	197	75.8

The mean age of caregivers of children with asthma was 38.32 $\pm$ 8.194 years. A

family history of asthma was present in 24.2%. Female caregivers (73.8%) and those with a college degree or higher (73.8%) constituted the majority.

Table 2. EFA/CFA factor loadings and model fit indices for the Knowledge domain

Knowledge	EFA		CFA	
	Sampling adequacy and factorability	Factor loading	Factor loading	Model fit indices (scaled)
C1. Asthma is chronic.	KMO = 0.73; Bartlett's test: $\chi^2(df) = 280.5(55)$, $p < 0.001$	0.626	-	$\chi^2(df) = 19.4(14)$, $p = 0.149$ CFI=0.982 TLI=0.973 RMSEA = 0.055 (90% CI: 0.000-0.108, $p = 0.401$)
C2. Symptoms: cough, shortness of breath, wheezing, chest tightness.		0.833	0.893	
C3. Associated with allergic rhinitis.		0.673	0.871	
C4. Triggers: smoke, dust, weather, allergens.		0.750	0.795	
C5. Family history increases risk.		0.502	0.562	
C6. Salbutamol MDI relieves attacks.		-	-	
C7. Inhaled therapy safer/more effective than oral.		0.519	0.665	
C8. Hospital visit if home salbutamol fails.		0.672	0.558	
C9. Regular follow-up needed without symptoms.		-	-	
C10. Continue inhalers after attack recovery.		-	-	
C11. Recording symptoms/medications is important.		0.682	0.684	

Data suitability was confirmed ($KMO = 0.73$; $\chi^2(55) = 280.5$; $p < 0.001$). EFA retained 7 items (C2, C3, C4, C5, C7, C8, C11), explaining 44.2% of the total variance. Subsequent CFA confirmed all standardized loadings were ≥ 0.5 , indicating good model fit ($\chi^2(14) = 19.4$; $p = 0.149$; CFI=0.982; RMSEA = 0.055; 90% CI: 0.000-0.108; $p = 0.401$).

Table 3. EFA/CFA factor loadings and model fit indices for the Attitudes domain

Attitudes	EFA		CFA	
	Sampling adequacy and factorability	Factor loading	Factor loading	Model fit indices (scaled)
C12. Inhaled medications control asthma well.	KMO = 0.74; Bartlett's Test: $\chi^2(df) = 297.5(36)$, $p < 0.001$	0.704	0.895	$\chi^2(df) = 12.6(5)$, $p = 0.027$ CFI=0.980 TLI=0.959 RMSEA = 0.109 (90% CI: 0.033-0.185, $p = 0.085$)
C13. Inhaled medications improve quality of life.		0.890	0.906	
C14. Inhaler use is easy/satisfactory.		0.846	0.826	
C15. Correct technique ensures drug delivery.		0.872	0.883	
C16. Caregiver's role crucial in medication use.		0.804	0.708	
C17. Consult doctor before altering medication.		0.920	-	
C18. Asthmatic children can exercise normally. (Reverse)		-	-	
C19. Children will completely outgrow asthma. (Reverse)		-	-	
C20. Asthma causes stigmatization. (Reverse)		-	-	

Data suitability was confirmed ($KMO = 0.74$; $\chi^2(36) = 297.5$; $p < 0.001$). EFA retained 5 items (C12, C13, C14, C15, C16), explaining 70.9% of the total variance. Subsequent CFA

showed all standardized loadings were ≥ 0.5 , indicating good model fit ($\chi^2(5)=12.6$; $p=0.027$; CFI = 0.980; TLI = 0.959; RMSEA = 0.109; 90% CI:0.033-0.185; $p=0.085$).

Table 4. EFA/CFA factor loadings and model fit indices for the Practices domain

Practice	EFA		CFA	
	Sampling adequacy and factorability	Factor loading	Factor loading	Model fit indices (scaled)
C21. Recognize attack symptoms	KMO = 0.77; Bartlett's test: $\chi^2(df)$ =347.0(36), p <0.001	-		$\chi^2(df) = 11.0$ (14), $p=0.687$ CFI=1.000 TLI=1.012 RMSEA = 0.000 (90% CI: 0.000- 0,067. $p=0.880$)
C22. Identify reliever/controller medications		0.640	0.714	
C23. Keep medication available at home		0.627	0.536	
C24. Attend scheduled doctor appointments		-		
C25. Administer medication as prescribed		0.767	0.687	
C26. Keep a daily asthma record/diary		0.844	0.829	
C27. Use reliever immediately during attacks		0.771	0.712	
C28. Visit ER if initial treatment fails		0.838	0.846	
C29. Follow the prescribed asthma action plan		0.893	0.875	

Data suitability was confirmed (KMO=0.77; $\chi^2(36)=347.0$; $p<0.001$). EFA retained 7 items (C22, C23, C25, C26, C27, C28, C29), explaining 60.0% of the total variance. Subsequent CFA confirmed all standardized loadings were ≥ 0.5 , indicating a good model fit ($\chi^2(14) = 11.0$; $p = 0.687$; CFI = 1.000; RMSEA=0.000; 90% CI: 0.000-0.067; $p = 0.880$).

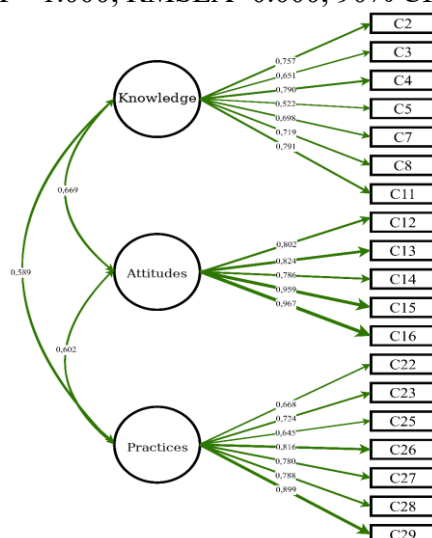


Figure 1. Integrated CFA model of Knowledge, Attitudes, and Practices

All retained items exhibited strong factor loadings well above 0.5. Notably, C4 (0.790) and C11 (0.791) emerged as robust indicators of Knowledge. In the Attitude domain, C15 (0.959) and C16 (0.967) shows the highest loading factors. Furthermore, C29 (0.899) served as the primary indicator reflecting treatment adherence in the practice domain.

Table 5. Validation results and inter-domain relationships of the KAP scale

Factor	CR	AVE	HTMT			Overall model fit indices
			K	A	P	
K	0.875	0.503	-			$\chi^2(149) = 324.841$, $p<0.001$ CFI=0.963; TLI=0.958 RMSEA = 0.068 (90% CI: 0.058-0.078, $p<0.001$)
A	0.940	0.759	0.67	-		
P	0.907	0.584	0.59	0.604	-	

The three domains demonstrated high composite reliability (CR: 0.875-0.940) and satisfactory convergent validity (AVE: 0.503-0.759). Good discriminant validity was also established, with all HTMT ratios remaining below the 0.90 threshold. Regarding global fit, the CFA results indicated a good model fit to the data.

IV. DISCUSSION

Of the 260 caregivers, the mean age was 38.32 years. Females constituted the majority at 73.8%. Notably, a high proportion of caregivers (73.8%) had attained a college education or higher, and 24.2% of the asthmatic children had a family history of asthma. Compared to international studies conducted in the Netherlands and Colombia [14], [15], differences in these demographic characteristics were largely insignificant. The only notable exception was the proportion of caregivers holding a college degree or higher, which was substantially higher in our cohort compared to the 36.8% in the Saudi Arabian study [16].

When compared to several KAP scales from international studies, our instrument demonstrated distinct advantages regarding scientific rigor and practical applicability. While the scale by Amorha *et al.* (2020) [9] was rather lengthy with 59 items, and the questionnaire by Silvia *et al.* (2022) [10] utilized a binary scoring system that restricts analytical depth, the study by Divecha *et al.* (2020) [11] entirely omitted the practice domain and introduced methodological complexities by concurrently using both binary and 6-point Likert scales. The present study addressed these limitations by employing a uniform 5-point Likert scale across a concise 19-item questionnaire that comprehensively covers all three domains (Knowledge, Attitudes, and Practices). Most notably, in contrast to the aforementioned instruments, our scale was subjected to rigorous psychometric validation, including Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), achieving high composite reliability (CR >0.8). Furthermore, whereas these international scales were tailored to their respective local cultural and linguistic contexts and are predominantly available only in English, our questionnaire has been cross-culturally adapted and refined to align with the specific characteristics of our regional population, offering versions in both English and Vietnamese.

V. CONCLUSION

The present study employed rigorous psychometric methods, including EFA and CFA, to develop and validate a questionnaire assessing the knowledge, attitudes, and practices (KAP) of caregivers of children with asthma. The final questionnaire was reduced from 29 to 19 items, comprising 7 items in the Knowledge domain, 5 items in the Attitudes domain, and 7 items in the Practices domain. With its high reliability and validity, as well as its brevity, this is a convenient tool dedicated to asthma management for both clinical and research purposes.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge Can Tho University of Medicine and Pharmacy for their financial support of this research project, granted under Decision No. 4618/QD-DHYDCT, dated December 17, 2024.

REFERENCES

1. Wolf E.J., Harrington K.M., Clark S.L., Miller M.W. Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety. *Educational and Psychological Measurement*. 2013.73(6), 913-934, <https://doi.org/10.1177/0013164413495237>.
2. 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, <https://doi.org/10.1111/j.1398-9995.2004.00526.x>.
3. The Global Asthma Network. The Global Asthma Report 2022. *The International Journal of Tuberculosis and Lung Disease*. 2022.26(1), S1-S102, <https://doi.org/10.5588/ijtld.22.1010>.
4. Nguyen V.T.K., Thanh O.H., Phuong N.M., Nghia B.Q. Evaluation of the results of asthma control in children 6 - 15 years old at can tho children's hospital in 2023 - 2024. *Vietnam Medical Journal*. 2024.540(2), <https://doi.org/10.51298/vmj.v540i2.10376>.
5. Abdullah A.A., Mohamed A.M., Taha I., AbdullahNawash A., Qureshi S., *et al.* Asthma in the pediatric population: Level of perception among the parents and guardians. *International Journal of Medicine and Public Health*. 2015.5(1), 14-18, <https://doi.org/10.4103/2230-8598.151240>.
6. Zaraket R., Al-Tannir M.A., Abdulhak A.A.B., Shatila A., Lababidi H. Parental perceptions and beliefs about childhood asthma: a cross-sectional study. *Croatian Medical Journal*. 2011.52(5), 637-643, <https://doi.org/10.3325/cmj.2011.52.637>.
7. Zhao J., Shen K., Xiang L., Zhang G., Xie M., *et al.* The knowledge, attitudes and practices of parents of children with asthma in 29 cities of China: a multi-center study. *BMC Pediatrics*. 2013.13(1), 20, <https://doi.org/10.1186/1471-2431-13-20>.
8. Costello A.B., Osborne J. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation*. 2005.10(1), <https://doi.org/10.7275/jyj1-4868>.
9. Amorha K.C., Ayogu E.E., Ngwoke B.A., Okonta E.O. Knowledge, attitudes and quality of life of caregivers towards asthma in their children: a Nigerian perspective. *Journal of Health Sciences*. 2020.10(1), 47-57, <https://doi.org/10.17532/jhsci.2020.860>.
10. Divecha C., Tullu M., Jadhav D. Parental knowledge and attitudes regarding asthma in their children: Impact of an educational intervention in an Indian population. *Pediatric Pulmonology*. 2020.55, <https://doi.org/10.1002/ppul.24647>.
11. Silvia L.C., Podhini J., Palanisamy S. Parental knowledge, attitude toward asthma, and its correlation with compliance of asthma management in children. *Indian Journal of Allergy, Asthma and Immunology*. 2023.36(1), 40-46, https://doi.org/10.4103/ijaai.ijaai_32_22.
12. Lorenzo-Seva U. SOLOMON: a method for splitting a sample into equivalent subsamples in factor analysis. *Behavior Research Methods*. 2022.54(6), 2665-2677, <https://doi.org/10.3758/s13428-021-01750-y>.
13. Henseler J., Ringle C.M., Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*. 2015.43(1), 115-135, <https://doi.org/10.1007/s11747-014-0403-8>.
14. Franken M.M.A., Veenstra-van Schie M.T.M., Ahmad Y.I., Koopman H.M., Versteegh F.G.A. The presentation of a short adapted questionnaire to measure asthma knowledge of parents. *BMC Pediatrics*. 2018.18(1), 14, <https://doi.org/10.1186/s12887-018-0991-4>.
15. Rodriguez-Martinez C., Sossa M., Rand C. Validation of a Questionnaire for Assessing Adherence to Metered-Dose Inhaler Use in Asthmatic Children. *Pediatric Asthma, Allergy and Immunology*. 2007.20, 243-254, <https://doi.org/10.1089/pai.2007.001>.
16. AlOtaibi E., AlAteeq M. Knowledge and practice of parents and guardians about childhood asthma at King Abdulaziz Medical City for National Guard, Riyadh, Saudi Arabia. *Risk Management and Healthcare Policy*. 2018, 67-75.