Relationships between symptom control, medication management, and health literacy of patients with asthma in Vietnam

Doan Thi Kim Cuc[1] [iD]**, Nonglak Methakanjanasak[2]*** [iD]**, and Ho Thi Thuy Trang[3]** [iD]

Abstract

Background: Asthma is a significant health issue among Vietnamese adults in both urban and rural areas. The disease needs serious concern to minimize impact and improve the situation.

Objective: This study aimed to describe the level of health literacy, symptom control, and medication management and determine the relationships among them in patients with asthma in Da Nang, Vietnam.

Methods: A cross-sectional descriptive study was conducted among 84 patients with asthma. The questionnaires were used in this study, including demographic form, the Short-Form Health Literacy questionnaire (HL-SF12), Asthma Control Test (ACT), and Medication Adherence Reporting Scale for Asthma (MARS-A). Pearson product-moment correlation was applied to determine the relationship between health literacy, symptom control, and medication management.

Results: The score revealed for general-health literacy, symptom control, and medication management were 28.70 (SD = 9.66), 17.72 (SD = 4.67), and 3.63 (SD = 0.75), respectively. Health literacy level had moderate positive relationships with symptom control (r = 0.41) and medication management (r = 0.44).

Conclusion: The patients had limited health literacy, partially controlled symptom, and poor adherence to the medication. Health literacy level had moderate positive relationships with symptom control and medication management. These findings are crucial for effective treatment and management of the disease in Vietnam. To improve medication management and symptom control among patients with asthma, nurses should concern patients' health literacy level.

Keywords

asthma; health literacy; medication therapy management; symptom control; adult; nursing; Vietnam

Globally, asthma prevalence is on the rise, such that 339.4 million people were affected in 2018 (The Global Asthma Network, 2018). Of importance, over 80% of asthma-related deaths occur in low-and lower-middle-income countries (World Health Organization, 2019). In Vietnam, asthma is a major health issue among adults in both urban and rural areas. The number of asthma in adults aged 21 to 70 is 3.9% to 5.6% (Lâm et al., 2011). As such, it has caused an enormous impact on the health and economy of the country. According to a study, the total economic burden of asthma is estimated to range from $34.7 to $55.3 for outpatient and $45.1 to $107.2 for inpatient annually (Le et al., 2019). Studies have shown that asthma causes disability, limited activity, poor quality of life, and poor use of medical resources (Alpaydin, Bora, Yorgancioglu, Coskun, & Celik, 2012). Asthma affects individuals and affects both the patient's family and society.

The essential aspects for improving outcomes in patients with asthma are health literacy, symptom control, and medication management. Health literacy (HL) refers to

[1] Faculty of Nursing, Da Nang University of Medical Technology and Pharmacy, Vietnam

[2] Faculty of Nursing, Khon Kaen University, Thailand

[3] Faculty of Nursing, Hue University of Medicine and Pharmacy, Hue University, Vietnam

Corresponding author:
Assistant Professor Nonglak Methakanjanasak
Faculty of Nursing, Khon Kaen University
123 Mittaparp Road, Muang, Khon Kaen, Thailand 40002
Phone: (+66) 926651549 | Fax: 043 – 424809
Email: nonchu@kku.ac.th

a person's ability to respond to the knowledge, motivation, and skills of finding, understanding, appraising, and applying health information to make judgments and decisions in daily life related to health care, disease prevention, and health promotion to improve the quality of life throughout life. Health literacy is crucial but limited among the patients in low-income countries (Sørensen et al., 2015; Sørensen et al., 2012). Although Duong et al. (2019) reported that the health literacy index for the general people in Vietnam was low (29.5 ± 9.5), no study reported health literacy in patients with asthma. Therefore, it is to mention that limited health literacy is significant, and it has a relationship with a low level of symptom control and medication management.

Symptom control refers to monitoring and identifying significant signs that help patients with asthma make suitable changes in their physical activity level and commence appropriate medication regimens (Global Initiative for Asthma, 2020). In Vietnam, only 40.4% of patients are known to have controlled asthma (Nguyen, Huynh, & Chavannes, 2018). Medication management involves self-adjustment of medication to respond to acute symptoms and changes in peak expiratory force. No doubt, adherence to treatment is essential to optimize the benefits of therapy (Sarker et al., 2020).

Studies related to health literacy, symptom control, and medication management in patients with asthma are limited in Vietnam. Therefore, this study was conducted to better understand these aspects in patients. Once the relationships are clarified, it will help understand the difference between what the patients currently do and what the ideal patients should do to manage their disease effectively. More significantly, it can promise an effective nursing strategy to improve symptom control and medication management for asthma adults using education strategies appropriate for populations with limited health literacy.

This study aimed to investigate the level of health literacy, symptom control, and medication management and determine the relationships among them in patients with asthma in Da Nang, Vietnam.

Methods

Study Design and Setting
This cross-sectional descriptive study was conducted among patients with asthma visiting the Internal Respiratory Clinic at C hospital located in central Vietnam city of Da Nang. The city is situated about 764 km from Hanoi's capital city and is inhabited by over a million people. C hospital is a central level hospital under the Ministry of Health with a 700-bed capacity (Da Nang Portal, 2020). This hospital was selected for the study because it is a general hospital located in the city center with a high patient flow, including patients with asthma. Around 200 patients visit the clinic for medical care and follow-up each month.

Participants
The target population of the study was patients diagnosed with asthma by a physician at the respiratory clinic. The participant's inclusion criteria were adults ≥18 years, diagnosed with asthma at least six months prior to the study, and able to communicate, read, and understand the Vietnamese language. Contrarily, the patients who were having cognitive impairment with a score lower than 24 points (out of 30) when measured by Mini-Mental State Examination (MMSE) Vietnamese version, a critical condition such as a sign of asthma attack (such as cough, dyspnoea, wheezing, chest tightness), and requiring emergency care, and unwillingness to participate in the study were excluded.

The sample size was estimated using a power analysis. The level of significance was set at 0.05 and the standard power at 0.80. As reported earlier, a small effect size of 0.28 was applied (Aberson, 2010). The estimated sample size was 76; upon an additional 10% drop-out rate, the final sample size increased to 84 participants.

The participants were selected by a simple random sampling technique from the list of outpatients visiting the hospital clinic. Next, the researcher assigned code numbers for each patient on a paper slip kept them into a box, mixed well, and selected 84 random numbers. Some of the selected patients did not attend the hospital clinic due to the COVID-19 pandemic. The researcher selected other participants repeating the steps described above.

Instruments
The tools used in the research were questionnaires in four parts, including Demographic form, The short-form health literacy questionnaire (HL-SF12), Asthma Control Test (ACT), and Medication Adherence Reporting Scale for Asthma (MARS-A). The questions on the demographic characteristics of participants, such as age, gender, education level, health insurance, occupation, income, duration of asthma, were developed by the researcher.

HL-SF12 was developed by Duong et al. (2019) based on the conceptual framework of the HLS-EU-Q47 (Sørensen et al., 2013). In brief, there are 12 items in four dimensions: assessing (items 1, 5, 9), understanding (items 2,6,10), appraising (3,7,11), and applying (items 4,8,12), which can further be categorized into three domains: health care HL (HC-HL), disease prevention HL (DP-HL), and health promotion HL (HP-HL). Each question was scored by a 4-point Likert-type rating scale (very difficult =1 to very easy=4). The mean score of specific health literacy indices was standardized on a metric between 0 and 50, using a formula described in HLS-EU Consortium (HLS-EU Consortium, 2012). Health literacy was then divided into levels as 0-25: inadequate, >25-33: problematic, >33-42: sufficient, and >42-50: excellent. The values of Cronbach's α and the goodness-of-fit index of the HLS-SF12 in the general Vietnamese population were 0.87 and 0.97.

The Asthma Control Test (ACT) developed by Nathan et al. (2004) was used to measure symptoms for asthmatic

patients under the routine care of a specialist in this study. The ACT has also been reassessed for its reliability, efficacy, and responsiveness in patients not monitored by asthma experts (Schatz et al., 2006). Internal consistency reliability of the ACT was 0.85 (baseline) and 0.79 (follow-up). Test-retest reliability was 0.77. The questionnaire includes five items assessing asthma symptoms (daytime and nocturnal), use of rescue medications, the effect of asthma on daily functioning, and a patient's self-assessed level of asthma control past four weeks. Each item was measured in a 5-point Likert-type rating scale, a score ranging from 5 (poor control) to 25 (complete control) when a higher score indicates better symptom control. The total score of this scale is 25 and is divided into levels as 5–14: uncontrolled, 15–19: partially controlled, 20–25: controlled.

The Medication Adherence Reporting Scale for Asthma (MARS-A) was used to assess medication management in patients with asthma. The scale was developed relying on a generic version of MARS used to measure oral medication adherence (Cohen et al., 2009). The MARS-A is a 10-item tool with several desirable characteristics for assessing inhaled corticosteroid (ICS) use. The MARS-A included both generic and specific questions about medication. It also assesses medication use behaviors, including regular versus as-needed use and intentional versus unintentional non-adherence. The participants expressed their response for 10 statements with 5- points Likert scale ranging as following 1= Always, 2 = Often, 3 = Sometimes, 4 = Rarely, 5 = Never. The participant who had higher mean scores for all items indicates better adherence. The mean score of the questionnaire ranges from 1 to 5. Participants with a mean MARS-A score equal to 4.5 or more were interpreted as having good adherence. The MARS has high inter-item reliability (Cronbach α = 0.85) and good test-retest reliability (r = 0.65; p < 0.001).

Permission to use the instruments in the current research was received from the original authors.

Instrument translation

The original instruments HL-SF12, the ACT, and the MARS in English were translated into the Vietnamese language. The translation process was conducted according to the translation method described earlier (Cha, Kim, & Erlen, 2007). In brief, the original instruments in the English version were independently translated into the Vietnamese language by two bilingual experts. Two Vietnamese versions were then compared and combined into one Vietnamese version. A third bilingual translator translated the Vietnamese version back into English. Finally, the back-translated English version was compared with the original version of the instrument by the researcher and a native English person to determine the linguistic unity among both versions.

Validity and reliability of instruments

The content validity of three instruments was validated by a panel of three experts, including a medical doctor specialized in asthma, a nurse lecturer with expertise in asthma, and a nurse with working experience in patients with asthma. The Content Validity Index for Items (I-CVI) of

each item of HL-SF12, ACT, and MARS-A was higher than 0.83, and I-CVI of the total score of each part for HL-SF12, ACT, and MARS-A were 0.97, 0.96, and 0.96, respectively. According to the report, the CVI higher than 0.79 percent indicates appropriateness (Abdollahpour, Nejat, Nourozian, & Majdzadeh, 2010). The Vietnamese translated versions of HL-SF12, ACT, and MARS-A were tested for their internal consistency and reliabilities through a pilot study in a different set of 30 patients having similar characteristics. The Cronbach's α for each instrument recorded was 0.88 (HL-SF12), 0.88 (ACT), and 0.89 (MARS-A). According to the classification of Lakshmi and Mohideen (2013), Cronbach's α for three instruments was at an acceptable level.

Data Collection

Upon getting ethical clearance and approval from the hospital, data were collected by the researcher between 1 October to 15 November 2020. Initially, the researcher contacted and explained the objectives and procedures of the study to the head nurses and staff nurses and asked them to select participants who meet the study's criteria except for cognitive status. The selected participants were contacted by the head nurse to ask if they allow the researcher to contact for participation. Upon agreement, an appointment was set to meet at the clinic within a month. Next, on the day of the visit to the clinic, the researcher explained the objective, benefits, ethical issues, and human rights protection and invited the patients to participate in the research. On willingness to participate, the researcher requested to use MMSE for their cognitive status. Upon meeting the criteria (score of MMSE ≥ 24), they were asked to sign a consent form. Then the questionnaire was provided to fill up, which took about 30 minutes. The researcher was around to explain any confusion, and when any missing data was found, participant's responses were confirmed before leaving. Participation in the study was voluntary, and they were free to refuse or withdraw without impacting the healthcare service they were receiving in the hospital. The researcher followed guidelines for Human Research during the COVID-19 outbreak issued by Khon Kaen University Thailand and the Ministry of Health of Vietnam during data collection.

Data Analysis

Data were analyzed by Statistical Package for Social Science (SPSS) version 23.0. Descriptive statistics, including frequency, percentage, range, mean, and standard deviation, were used to describe demographic characteristics, health literacy levels, asthma symptom control, and medication management. Pearson product-moment correlation was computed to explore the relationship between health literacy and symptom control, medication management. The Pearson analysis assumptions were tested, including normality of variables health literacy, symptom control, and medication management. All variables were normally distributed. The

strength of correlations was classified as $r > 0.50$ (strong relationship), $r \geq 0.30$ to 0.50 (moderate relationship) and $r > 0$ to 0.30 (weak relationship) (Grove, Burns, & Gray, 2013).

Ethical Consideration

The study was approved by the Ethical Committee of Human Research, Khon Kaen University, Thailand (HE632191), and the Institutional Ethics Committee of Hue University of Medicine and Pharmacy, Vietnam (H2020/441). Furthermore, the research was authorized by C Hospital before instigation. All data collected was anonymous and was used only for research purposes.

Results

Characteristics of the Participants

The age of the participants in the study ranged from 21 to 87 years, with a mean age of 62 years ($SD = 13.43$). The percentage of female participants (53.57%) was higher when compared to males (46.43%). More than half of the participants (57.14%) were in the job retirement group, followed by the officer group (21.43%). The most common educational levels were college or higher, high school, and secondary school, with 34.52%, 32.14%, and 26.20 %. A total of 97.62 % of participants had health insurance, whereas income varied between 1 million VND and 30 million VND, with an average of 5.42 ($SD = 3.41$). The majority of participants (47.62 %) had asthma for five or more years (Table 1).

Table 1 Demographic characteristics of the study participants ($N = 84$)

Characteristic			Number		Percentage
Age (years)	Mean = 62.67	SD = 13.43	Min = 21	Max = 87	
Gender	Female		45		53.57
	Male		39		46.43
Education level	No school		0		0
	Primary school		6		7.14
	Secondary school		22		26.20
	High school		27		32.14
	College or higher		29		34.52
Occupation	Officer		18		21.43
	Housewife		9		10.72
	Small business		7		8.33
	Famer		2		2.38
	Retire		48		57.14
Income (million VND)	Mean = 5.42	SD = 3.41	Min = 1	Max = 30	
Having health insurance	Yes		82		97.62
	No		2		2.38
Duration of asthma	6 months-1 year		6		7.14
	1-3 years		23		27.38
	3- 5 years		15		17.86
	≥ 5 years		40		47.62

Level of Health Literacy, Symptom Control, and Medication Management

The General – Health Literacy (GEN-HL) among the study participants ranged from 8.33 to 47.22 with a mean of 28.70 ($SD = 9.66$). Moreover, a mean score of three domains of health literacy, including HC-HL, DP-HL, and HP-HL, was revealed to be 28.31 ($SD = 10.88$), 26.73 ($SD = 9.79$), and 31.25 ($SD = 11.62$), respectively. The mean score of health literacy was similar to general health literacy (Table 2).

Table 2 Domain of health literacy ($N = 84$)

The domain of health literacy	Mean ± SD	Minimum	Maximum
General HL (GEN-HL)	28.70 ± 9.66	8.33	47.22
Healthcare (HC-HL)	28.13 ± 10.88	8.33	45.83
Disease prevention HL (DP-HL)	26.73 ± 9.79	0	50
Health promotion HL (HP-HL)	31.25 ± 11.62	4.17	50

Figure 1 shows that health literacy levels in four dimensions, namely inadequate, problematic, sufficient, excellent, were 35.72 %, 28.57%, 29.76%, and 5.95%, respectively. Limited health literacy (index of health literacy ≤ 33) of the participants was 64.29%. The disease-prevention domain was highest with 67.86%, whereas the health care and health promotion domains were quite similar, 53.57% and 54.77%.
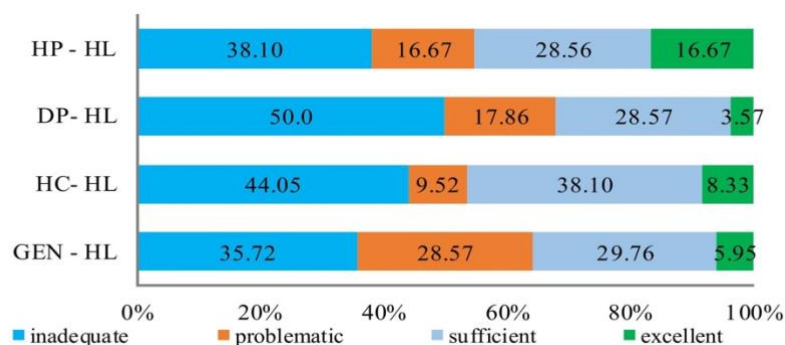
Figure 1 Level of health literacy index

The score of symptom control among respondents ranged from 8 to 25, with a mean of 17.72 (*SD* = 4.67). The participants who had controlled asthma were the highest with 39.29%. Moreover, the patients in the partially controlled group were higher than the uncontrolled group, 35.71% compared to 25.00%. Next, the mean score of medication management measured by the MARS-A was 3.63 (*SD* = 0.75). The majority of the participants (81%) had poor adherence to the medication. The percentage mentioning that *I only use it when I felt breathless* was highest (62.00%), followed by *I forgot to take it* (61.91%).

Furthermore, about half of patients who reported that they either used the ICS when needed, altered the dose, stopped taking it for a while were 54.77%, 52.38%, 51.19%, respectively. One-third of the participants reported that they decided to miss out on a dose (36.91%) or only used the ICS before performing something that might make them breathless (32.10%). The percentages of participants who reported that they tried to avoid using it and used it as a reserve if other treatment did not work were low, with 25% and 20.25%, respectively (Table 3).

Table 3 Patients' engagements in each action of poor adherence (*N* = 84)

MARS-A item	Always, Often, Sometimes (%)	Rarely (%)	Never (%)	Mean ± SD
I only use it when I need it	54.77	33.33	11.90	3.07 ± 1.22
I only use it when I feel breathless	62.00	19.00	19.00	3.14 ± 1.24
I decide to miss out a dose	36.91	26.19	36.90	3.83 ± 1.13
I try to avoid using it	25.00	23.80	51.20	4.21 ± 0.93
I forget to take it	61.91	23.81	14.28	3.29 ± 1.01
I alter the dose	52.38	22.62	25.00	3.56 ± 1.05
I stop taking it for a while	51.19	21.43	27.38	3.58 ± 1.08
I use it as a reserve if my other treatment doesn't work	20.25	33.33	46.42	4.18 ± 0.96
I use it before doing something which might make me breathless	32.10	31.0	36.90	3.92 ± 1.08
I take it less than instructed	55.95	19.05	25.00	3.46 ± 1.12

Relationship between Health Literacy and Symptom Control, Health Literacy, and Medication Management
As shown in Table 4, there was a significant relationship between health literacy with symptom control and medication management. The relationship with symptom control (*r* = 0.41), and medication management (*r* = 0.44) were moderately positive (*p* < 0.001).

Table 4 Relationship of health literacy with symptom control and medication management (*N* = 84)

Variable	Symptom control	Medication management	Health literacy
Symptom control	1.000		
Medication management	0.18	1.000	
Health literacy	0.41**	0.44**	1.000

**Correlation is significant at the 0.01 level (2-tailed)

Discussion

This study aimed to investigate the level of health literacy, symptom control, and medication management among

patients with asthma in Da Nang, Vietnam. The results revealed that the HL score in the patients was problematic (28.57%), which was similar to decade-old research in the country reporting the score of 29.70 ± 8.20 in participants

aged 66.9 years (Van Hoa, Giang, Vu, Van Tuyen, & Khue, 2020). Another report also revealed a low HL score in Vietnam when Taiwan had the highest level in Asian countries (Duong et al., 2019). The HL score of participants in this study was lower than in Europe (33.8 ± 8.0) (Sørensen et al., 2015). Moreover, the mean score of disease prevention HL was low (26.73 ± 9.79) in the study. This emphasizes the need to consider the effectiveness of disease prevention interventions in the community.

Limited health literacy (index of health literacy ≤33) of participants in this study was 64.29%. This result was similar (63.7%) to the study from the Northern Province of Vietnam in 2014 (Pham, 2014). However, the limited HL in this study was much higher than international findings. A survey among 353 asthmatic adults in Chicago showed 34.2% limited literacy skills (Curtis, Moore, Patton, O'Connor, & Nugent, 2018). This could be due to the age factor. More than half (57.1%) were retired from the job and were having difficulties accessing the medical information and understanding, appraising, and applying in the study. This finding demonstrated that the participants who have high limited HL might lead their health behavior to become poor in the future.

Moreover, the symptom control among the patients in the study was partially controlled. A total of 39.29% of participants had controlled asthma. When combined, the number of partially controlled and uncontrolled patients was 60.71%. These findings are similar to previous studies reported from Vietnam, Bangladesh, and Japan (Adachi et al., 2019; Mohammod, Kunsongkeit, & Masingboon, 2019; Nguyen et al., 2018). On the other hand, there are studies reporting a low level of controlled asthma (21-29.4%) than our study (Gebremariam et al., 2017; Tarraf et al., 2018). Our high scores could be due to many factors such as health insurance, duration of asthma, and education level of the patients. In the study, about 97.62 % of participants had health insurance, nearly half of the participants had more than five years of asthma, and 66.66% were above high school education. More importantly, patients in the study were recruited from a central level hospital, and it has previously been shown that patients with asthma attended by a specialist doctor are more likely to manage better (Gebremariam et al., 2017).

There are no published studies evaluating medication management in asthmatic patients in Vietnam, and the findings in the study have identified existing problems. Only 19% of the participants had good medication management, with a mean MARS-A score of 3.63 (SD = 0.75). Similar to us, a study from Kuwait reported merely 17.4% of participants having good adherence to medicine (Albassam, Alharbi, & Awaisu, 2020). It is estimated that only one-third of patients with asthma in Saudi Arabia are poorly controlled (BinSaeed, 2015). Vietnamese people often have the habit of buying medicine by themselves without following the instructions of their doctors. In addition, policies on drug trading are not yet strict. Therefore, patients often do not take asthma controller medications as prescribed. Additionally, social distancing

and lockdown during data collection in the COVID-19 pandemic may have caused poor medication management in this study.

Of importance, health literacy was significantly related to symptom control. This relationship was positively moderate ($r = 0.41$, $p < 0.001$). Earlier, a study indicated that 14% of the children whose parents scored low HL had less controlled asthma compared with 30% of those who had adequate HL (OR: 2.66 (95% CI: 1.55–4.56). This relationship remained significantly associated with health insurance and age (Krishnan, Rohman, Welter, & Dozor, 2018). Limited HL has also been associated with increased symptoms, impaired function, significant health care use, and significant adverse outcomes in adults with asthma (Paasche-Orlow et al., 2005).

Furthermore, health literacy was significantly related to medication management. This relationship was positively moderate ($r = 0.44$, $p < 0.001$). Patients with low HL often have negative beliefs about asthma medications, such as not believing they need as many medications as their doctor prescribed or misconceptions about asthma medications. A report in 2015, including eight outpatients clinics in the USA, revealed that participants with limited HL were significantly associated with medication management (22.5% versus 46.4%, $p < 0.001$) (Federman et al., 2014). However, a meta-analysis study has shown that health literacy is positively and weakly associated with medication management ($r = 0.14$, 95% CI = 0.08, 0.19) (Miller, 2016).

The current findings imply that health policymakers and health care providers, especially nurses, should design and implement education programs on symptom control and medication management among patients with asthma to improve outcomes. Meanwhile, it is to mention that this study has some limitations. Firstly, as a cross-sectional descriptive study, data were collected only once, but the symptom control, medication management among patients with asthma may get changed. Secondly, the self-report questionnaire used may have caused the introspective ability and social desirability effect. Finally, because of the impact of the COVID-19 pandemic, the pulmonary function parameters such as forced exhalation volume in one second, peak expiratory flow were not measured in this study to assess the asthma classification, which in turn may have affected symptom control and medication management.

Conclusion

The study revealed that patients with asthma had limited HL, including partially controlled symptoms and poor adherence to medication in Vietnam. Moreover, a moderate positive relationship between health literacy and symptom and medication management was discovered. Health education programs based on the level of health literacy among patients are suggested. Additionally, a study with a large sample size, including participants from various parts of the country and predicting other significant

factors related to symptom control and medication management, is recommended.

Authors' Contribution
DTKC developed the research proposal, conducting data collection, data management, and analysis and drafting the manuscript. NM and HTTT supervised the proposal development, ethical approval process, questionnaire validation process, data collection, data management, and analysis. All authors have read and approved the final manuscript.

Authors' Biographies
Doan Thi Kim Cuc, RN is a Lecturer at the Faculty of Nursing, Da Nang University of Medical Technology and Pharmacy, Vietnam.
Nonglak Methakanjanasak, PhD is an Assistant Professor at the Faculty of Nursing, Khon Kaen University, Thailand.
Ho Thi Thuy Trang, PhD, RN is a Doctor at the Faculty of Nursing, Hue University of Medicine and Pharmacy, Hue University, Vietnam.

Data Availability Statement
The data that support the findings of this study are available on request from the authors. The data are not publicly available due to privacy or ethical restrictions.

References

Abdollahpour, E., Nejat, S., Nourozian, M., & Majdzadeh, R. (2010). The process of content validity in instrument development. *Iranian Epidemiology, 6*(4), 66-74.

Aberson, C. L. (2010). *Applied power analysis for the behavioral sciences*. New York: Routledge Taylor & Francis Group.

Adachi, M., Hozawa, S., Nishikawa, M., Yoshida, A., Jinnai, T., & Tamura, G. (2019). Asthma control and quality of life in a real-life setting: A cross-sectional study of adult asthma patients in Japan (ACQUIRE-2). *Journal of Asthma, 56*(9), 1016-1025. https://doi.org/10.1080/02770903.2018.1514628

Albassam, A., Alharbi, A., & Awaisu, A. (2020). Assessing adherence to inhaled corticosteroids among adults with asthma in Kuwait using the medication adherence report scale for asthma. *Patient Preference and Adherence, 14*, 963. https://doi.org/10.2147/PPA.S248655

Alpaydin, A. O., Bora, M., Yorgancioglu, A., Coskun, A. S., & Celik, P. (2012). Asthma control test and asthma quality of life questionnaire association in adults. *Iranian Journal of Allergy, Asthma and Immunology*, 301-307.

BinSaeed, A. A. (2015). Asthma control among adults in Saudi Arabia: Study of determinants. *Saudi Medical Journal, 36*(5), 599-604. https://doi.org/10.15537/smj.2015.5.10929

Cha, E. S., Kim, K. H., & Erlen, J. A. (2007). Translation of scales in cross-cultural research: Issues and techniques. *Journal of Advanced Nursing, 58*(4), 386-395. https://doi.org/10.1111/j.1365-2648.2007.04242.x

Cohen, J. L., Mann, D. M., Wisnivesky, J. P., Horne, R., Leventhal, H., Musumeci-Szabó, T. J., & Halm, E. A. (2009). Assessing the validity of self-reported medication adherence among inner-city asthmatic adults: The Medication Adherence Report Scale for Asthma. *Annals of Allergy, Asthma & Immunology, 103*(4), 325-331. https://doi.org/10.1016/S1081-1206(10)60532-7

Curtis, A., Moore, Z., Patton, D., O'Connor, T., & Nugent, L. (2018). Does using a cellular mobile phone increase the risk of nosocomial infections in the Neonatal Intensive Care Unit: A systematic review. *Journal of Neonatal Nursing, 24*(5), 247-252. https://doi.org/10.1016/j.jnn.2018.05.008

Da Nang Portal. (2020). Retrieved from http://www.danang.gov.vn/portal/page/portal/danang/chinhquyen/gioi_thieu/tong_quan_da_nang.

Duong, T. V., Nguyen, T. T. P., Pham, K. M., Nguyen, K. T., Giap, M. H., Tran, T. D. X., . . . Su, C.-T. (2019). Validation of the short-form health literacy questionnaire (HLS-SF12) and its determinants among people living in rural areas in Vietnam. *International Journal of Environmental Research and Public Health, 16*(18), 3346. https://doi.org/10.3390/ijerph16183346

Federman, A. D., Wolf, M. S., Sofianou, A., O'Conor, R., Martynenko, M., Halm, E. A., . . . Wisnivesky, J. P. (2014). Asthma outcomes are poor among older adults with low health literacy. *Journal of Asthma, 51*(2), 162-167. https://doi.org/10.3109/02770903.2013.852202

Gebremariam, T. H., Binegdie, A. B., Mitiku, A. S., Ashagrie, A. W., Gebrehiwot, K. G., Huluka, D. K., . . . Schluger, N. W. (2017). Level of asthma control and risk factors for poor asthma control among clinic patients seen at a Referral Hospital in Addis Ababa, Ethiopia. *BMC Research Notes, 10*(1), 1-6. https://doi.org/10.1186/s13104-017-2887-z

Global Initiative for Asthma. (2020). Retrieved from https://ginasthma.org

Grove, S. K., Burns, N., & Gray, J. (2013). *The practice of nursing research: Appraisal, synthesis, and generation of evidence* (7th ed.). St Louis, MS: Elsevier Saunders.

HLS-EU Consortium. (2012). Comparative report of health literacy in eight EU member states: The European Health Literacy Project 2009–2012. Retrieved from https://www.healthliteracyeurope.net/hls-eu

Krishnan, S., Rohman, A., Welter, J., & Dozor, A. J. (2018). Relationship between health literacy in parents and asthma control in their children: A prospective study in a diverse suburban population. *Pediatric Allergy, Immunology, and Pulmonology, 31*(4), 221-225. https://doi.org/10.1089/ped.2018.0929

Lakshmi, S., & Mohideen, M. A. (2013). Issues in reliability and validity of research. *International Journal of Management Research and Reviews, 3*(4), 2752-2758.

Lâm, H. T., Rönmark, E., Tường, N. V., Ekerljung, L., Chúc, N. T. K., & Lundbäck, B. (2011). Increase in asthma and a high prevalence of bronchitis: Results from a population study among adults in urban and rural Vietnam. *Respiratory Medicine, 105*(2), 177-185. https://doi.org/10.1016/j.rmed.2010.10.001

Le, N. Q., Van Tran, T., Tran, T. T. M., Dang, N. T., Truong, Q.-K., & Vo, T. Q. (2019). The economic impact of asthma treatment on patients, 2014-2017: The Vietnamese experience from a public hospital. *JPMA. The Journal of the Pakistan Medical Association, 69*(6), S2-S9.

Miller, T. A. (2016). Health literacy and adherence to medical treatment in chronic and acute illness: A meta-analysis. *Patient Education and Counseling, 99*(7), 1079-1086. https://doi.org/10.1016/j.pec.2016.01.020

Mohammod, K., Kunsongkeit, W., & Masingboon, K. (2019). Factors related to self-care practice in asthmatic patients at rajshahi in Bangladesh. *Bangladesh Journal of Medical Science, 18*(1), 57-62. https://doi.org/10.3329/bjms.v18i1.39549

Nathan, R. A., Sorkness, C. A., Kosinski, M., Schatz, M., Li, J. T., Marcus, P., . . . Pendergraft, T. B. (2004). Development of the asthma control test: A survey for assessing asthma control. *Journal of Allergy and Clinical Immunology, 113*(1), 59-65. https://doi.org/10.1016/j.jaci.2003.09.008

Nguyen, V. N., Huynh, T. T. H., & Chavannes, N. H. (2018). Knowledge on self-management and levels of asthma control among adult patients in Ho Chi Minh City, Vietnam. *International Journal of General Medicine, 11*, 81-89. https://doi.org/10.2147/IJGM.S157050

Paasche-Orlow, M. K., Riekert, K. A., Bilderback, A., Chanmugam, A., Hill, P., Rand, C. S., . . . Krishnan, J. A. (2005). Tailored education may reduce health literacy disparities in asthma self-management. *American Journal of Respiratory and Critical Care Medicine, 172*(8), 980-986. https://doi.org/10.1164/rccm.200409-1291OC

Pham, M. K. (2014). *Health literacy survey in Haiphong City, Vietnam using validated version of HLS-Asia Questionnaire in Vietnamese*. Paper presented at the the 2nd International Conference on Health Literacy, Haiphong Medical University, Vietnam.

Sarker, M. A. S., Salma, U., Zafrin, N., Kashem, M. A., Deb, S. R., & Kabir, A. K. M. H. (2020). Factors affecting the non-adherence to inhalational medication in bronchial asthma: A cross sectional study in a tertiary care hospital. *Journal of Medicine, 21*(1), 41-45. https://doi.org/10.3329/jom.v21i1.44108

Schatz, M., Sorkness, C. A., Li, J. T., Marcus, P., Murray, J. J., Nathan, R. A., . . . Jhingran, P. (2006). Asthma control test: Reliability, validity, and responsiveness in patients not previously followed by asthma specialists. *Journal of Allergy and Clinical Immunology, 117*(3), 549-556. https://doi.org/10.1016/j.jaci.2006.01.011

Sørensen, K., Pelikan, J. M., Röthlin, F., Ganahl, K., Slonska, Z., Doyle, G., . . . Uiters, E. (2015). Health literacy in Europe: Comparative results of the European health literacy survey (HLS-EU). *European Journal of Public Health, 25*(6), 1053-1058. https://doi.org/10.1093/eurpub/ckv043

Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H. (2012). Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health, 12*(1), 1-13. https://doi.org/10.1186/1471-2458-12-80

Sørensen, K., Van den Broucke, S., Pelikan, J. M., Fullam, J., Doyle, G., Slonska, Z., . . . Brand, H. (2013). Measuring health literacy in populations: illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). *BMC Public Health, 13*(1), 1-10. https://doi.org/10.1186/1471-2458-13-948

Tarraf, H., Al-Jahdali, H., Al Qaseer, A. H., Gjurovic, A., Haouichat, H., Khassawneh, B., . . . Behbehani, N. (2018). Asthma control in adults in the Middle East and North Africa: Results from the ESMAA study. *Respiratory Medicine, 138*, 64-73. https://doi.org/10.1016/j.rmed.2018.03.024

The Global Asthma Network. (2018). *The Global Asthma Report 2018*. Retrieved from http://globalasthmareport.org/Global%20Asthma%20Report%202018.pdf?fbclid=IwAR2TbItNWzgSDFPnP5z1j-sWGOPVMT0IY_iRZEIAEKlh0kgl93KAKyJnMKc

Van Hoa, H., Giang, H. T., Vu, P. T., Van Tuyen, D., & Khue, P. M. (2020). Factors associated with health literacy among the elderly people in Vietnam. *BioMed Research International, 2020*. https://doi.org/10.1155/2020/3490635

World Health Organization. (2019). Asthma. Retrieved from https://www.who.int/news-room/fact-sheets/detail/asthma