

Development of a health literacy hypertension test in Thailand

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Abstract

Purpose – The purpose of this study is to develop a reliable test metric that can ascertain health literacy as it relates to hypertension in the population of Thailand.

Design/methodology/approach – One thousand five hundred patients from hypertension clinics in hospitals under the Ministry of Public Health, Thailand were recruited to this study. The test was developed and divided into three latent variables and four observed variables for health literacy concepts. Indexes of Item-Objective Congruence (IOC) from seven experts and Cronbach's alpha coefficient of the entire questionnaire were evaluated for content validity and reliability. The Confirmatory Factor Analysis with LISREL also analyzed for construct validity.

Findings – The result illustrates that the Item-Objective Congruence was 0.68, and Cronbach's alpha coefficient was 0.87. The result also shows that Bartlett's Test of Sphericity was 3129.31 ($p < 0.01$), and the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.83. The model was fit to empirical data (Chi-square = 0.02).

Originality/value – This study concludes that the Thai Hypertension Health Literacy Assessment Tool (THHLA) created as a result of the study is valid and reliable. The test can be used to evaluate health literacy for hypertension patients in Thailand.

Keywords Health literacy, Hypertension test, Thailand

Paper type Research paper

Introduction

High blood pressure, or hypertension, is a noncommunicable chronic disease and is a key risk factor for cardiovascular diseases and stroke, which can lead to death. In Thailand, the Bureau of Policy and Strategy, in the Ministry of Public Health, reported hypertension as the leading cause of death in 2013, ranked second in 2015, and was recorded as one of the first 10 diagnoses for inpatients per 100,000 of the population [1, 2]. This evidence from the statistical

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data supported the need for improved levels of high blood pressure health literacy for the population of Thailand.

Health literacy has been defined by the World Health Organization (WHO) as the cognitive and social skills, which determine the motivation and ability of individuals to gain access to, understand, and use information in a way, which promotes and maintains good health [3]. Health literacy is important for everyone because, at some point in our lives, we all need to be able to find, understand, and use health information and services. Health literacy can help to prevent health problems and protect overall health [4]. For more than two decades, scientists and practitioners alike have acknowledged health literacy as a major determinant of individuals' health status and disease prevention behaviors [5]. In addition, the WHO in 2008, paid specific attention to health literacy in their national health promotions because the study showed that individuals with low health literacy had poor health and spent more for clinical treatment with a high rate of hospital admission, as well as higher rates of chronic disease [6].

The World Health Organization at their 7th global meeting, in Nairobi, Kenya, 2009 [7], addressed the development of an assessment tool for health literacy, including a progress report of the health literacy assessment tool creation and development, corresponding to the Medicine Institute of USA in 2009, which stresses the importance of health literacy measurement and evaluation. Health literacy has become a determining factor by which society can evaluate trends, which increases the need for studies that include health literacy evaluation. Health literacy has come to be recognized as a significant component within many definitions and conceptual models. According to Sorensen [8], the result of a literature review was that health literacy as a health determining factor could be found in 17 definitions of health literacy and 12 conceptual models based on the content analysis. An integrative conceptual model was developed containing 12 dimensions referring to the knowledge, motivation, and competencies of accessing, understanding, appraising, and applying health-related information within healthcare, disease prevention, and health promotion settings, respectively. This is consistent with the concept of this research.

Measurement of health literacy capacity began in the early 1990s [9]. Davis *et al.* [10] developed the Rapid Estimate of Adult Literacy in Medicine (REALM), which used a reading test form. Most health literacy measures now utilize the REALM, the Test of Functional Health Literacy in Adults (TOFHLA) [11], the Medical Achievement Reading Test (MART) [12], Newest Vital Sign (NVS) [13], and the Health Literacy Skills Instrument (HLSI) [14]. In Thailand, there have been studies about health literacy measurement, some of which were translated from foreign sources, such as Benjamas [15]. The study focused on health literacy and work situations, which promotes the health literacy of Thai nationals to fit with the Association of South East Asian Nations (ASEAN), by utilizing a health literacy interview form and health literacy assessment interview form according to a number behavior principles: food, exercise, emotion, smoking, and alcohol. Moreover, Jindawong *et al.* [16] conducted REALM studies translating the test from English to Thai to investigate groups of patients in Thai hospitals. Petprayoon *et al.* [17] studied a Type II diabetic patient group by using questionnaires that relate to health literacy, adapted from TOFHLA. In 2015, the Health Education Division, Ministry of Public Health of Thailand and Mahidol University developed a health literacy tool for testing diabetes and hypertension in Thailand with 153 items separated into 8 parts including (1) Read medical vocabulary (REALM) (2) The numeracy scale (3) Personal information (4) Behavior principles: food, exercise, emotion, smoking and alcohol (5) Access to information (6) Communication (7) Making decisions regarding health (8) Knowledge and understanding [18]. Analysis of the aforementioned research noted that knowledge and understanding in that study contained six items from a total of 36 items that did not seem to address health literacy in hypertension. A need for hypertension-specific metrics is evident, based on this observation.

Presently in Thailand, there is no health literacy metric used as a standard instrument for Thai nationals. Implementing such a metric can help with the improvement of the patient's overall health conditions, a reduction of healthcare costs, and the duration of the length of stay in the hospital for treatment plus reduced usage of public health services if health literacy levels are improved. This research, based on Sorensen's model, addresses the development of a reliable health literacy test relating to high blood pressure in Thai nationals. This test could be used in the Thai medical sector to continue developing and promoting health literacy in the public health sector.

Materials and methods

The multistage random sample of participants for the development of instrumentation was defined as 1,200 Thai people who have hypertension and were treated in hospitals. The population of Thailand can be divided geographically into five groups, including four regions i.e. North, Central, South, and North-east, plus Bangkok. The multistage random sampling was made proportionately to a number of the population having hypertension in such provinces according to the health service zones. In 2014, information was sought from the Policy and Strategy Bureau, Office of the Permanent Secretary (the Ministry of Social Development and Human Security in 2013). 3.89 per cent were from Bangkok; 23.98 per cent from the Central region; 27.24 per cent from the North-eastern region; 26.70 per cent from the Northern region; and 18.19 per cent from the Southern region. All participants gave informed consent via forms previously approved by the ethical review committee for research in human subjects, Thai Ministry of Public Health (Ref. no. 3/2560).

The random sample by pickup was conducted by selecting one province for each region and then selecting from three hospitals based on size where the size was determined by Ministerial Regulation Re: determination of characteristics of healthcare clinics and their services, B.E. 2558 [19]. The sizes were defined as:

Large hospitals of 91 beds or more.

Medium hospitals of 31 beds or more but not more than 91 beds.

Small hospitals of no more than 30 beds.

The stages of instrumentation, quality checks, and construct validities were analyzed by confirmatory factor analysis using the LISRELL Model. Determination of proper sample size was suggested by an application of the LISRELL Model to a set of 100-150 persons, with satisfactory results. In addition, Hair *et al.* [20] suggested that at least 50 persons should be determined as samples or five persons per research factor. The study concepts were divided into three stages including:

Stage 1. Determining the health literacy factors of people having hypertension:

The researchers studied health literacy concepts and found that Sorensen's [8] research analyzed factors from relevant health literacy units and researchers. The relationship between health literacy and hospitals was suggested. This is in line with the concept of health literacy held by the World Health Organization [21], including Lee *et al.* [22]. Hence, this researcher applied the concept of Sorensen [8] to this study comprising three issues: hypertension knowledge and health care, disease prevention, and risk behavior and promotion. Health literacy, as it relates to hypertension, can be divided into four levels: Access, Understand, Appraise, Apply. Subsequently, the researchers were given the operational definition of such terms according to the factors and hypertension knowledge levels. A matrix of literacy components and their definitions are as follows: (Table 1)

Stage 2. Development of the health literacy of hypertension test:

The adapted Sorensen model for a health literacy of hypertension test was developed by drafting questionnaires using the health literacy factors and information, including the following:

Table 1.
Operational definition
of the factors (Adapted
from Sorensen [8])

	Access	Understanding	Appraise	Apply
Health care	Ability to access relevant medical information or published printings, including the ability to access health service for their own health care in relation to hypertension	Ability to interpret, clarify, and understand medical meanings proper health care of patients having hypertension	Ability to interpret, screen, and evaluate medical information relating to health care of patients having hypertension	Ability to decide whether to use medical information for the health care of patients having hypertension
Disease prevention	Ability to ascertain risk factors for health, which may be a cause of complications from hypertension disease	Ability to interpret, clarify, and understand meanings of risk factor or health risk behavior, which may be a cause of complication from hypertension disease	Ability to interpret, screen, and evaluate medical information relating to risk factors or health risk behavior, which may be a cause of complication from hypertension disease	Ability to decide whether to use the information to prevent health risk, which may be a cause of complication from hypertension disease
Health promotion	Ability to access updated information on social determinants of health and physical environment on health promotion of patients having hypertension	Ability to interpret, clarify, and understand information on social determinants of health and physical environment on health promotion of patients having hypertension	Ability to interpret, screen, and evaluate information on social determinants of health and physical environment on health promotion of patients having hypertension	Ability to decide whether to use the information on social determinants of health and physical environment on health promotion of patients having hypertension

- (1) Manual for self-management of hypertension (Medical Technology Research and Evaluation Institute, 2013) [23];
- (2) Guidelines on the treatment of hypertension in general practice (Thai Hypertension Society, 2015) [24];
- (3) Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (Joint National Committee, 2003) [25];

Stage 3. Quality check of the questionnaire for the health literacy of hypertension test:

- (1) The original draft questionnaire tested for this research consisted of 66 questions. It was presented to internists (physicians), professors, and nurses working in health care and the health literacy field. The aim was to collate Indexes of Item-Objective Congruence (IOC) and to consider the compatibility of the questions and the definitions of each factor plus observed indicators or variables. For each answer, there were a number of choices. Points were assigned to each chosen answer, with a value between -1 and +1. This researcher made a calculation of IOC at 1 point and selected only the questions with IOC equal to or higher than 0.5. From the 66 questions in the questionnaire, the researcher redacted them and decided on 52 relevant questions. The researchers gathered the data of 246 participants from the 4 areas of the hospitals under the Ministry of Public Health.
- (2) Cronbach's alpha coefficient was used to evaluate the reliability of the entire questionnaire. The construct validity was verified by the Criterion-Related with

Pearson product-moment and the Confirmatory Factor Analysis with LISREL. The Sorensen [8] concept was applied for the development of the test model to study relations between observed variables and then determine how the latent variables were factors of the health literacy in relation to hypertension. The original 52 questions in the health literacy test were reviewed, lowered down to 41 questions as a final product, and then used in the collection of data from a sample group of 1,200 subjects from thirteen different hospitals during a period of nine months.

Results

The model developed by this researcher for a health literacy of hypertension test in Thailand was as follows:

Result of basic statistics analysis

General data from the sample group of 1,200 people: The average age of the sample group was 63 years old with an average weight of 63 kilograms, an average height of 158 cm., an average body mass index of 25, and average blood pressure of 137/80 mmHg (see [Table 2](#)).

Content validity

Health literacy factors were placed into three categories i.e. self-health care, complication prevention, and health promotion. There are 12 indicators or observed variables. The content validity was reviewed by the three types of experts listed above. The item Objective Congruence (IOC) was at 0.68.

Reliability test

For the reliability of the Health literacy questionnaire, 41 questions were given to 1,200 hypertension patients. Results showed that the health promotion factor received the highest reliability value at 0.75. The second highest was complication prevention, with an accuracy value of 0.73. The third was self-health care, with an accuracy value of 0.71. Thus, for the entire questionnaire, the accuracy value was 0.87 ([Table 3](#)).

Construct validity test

The construct validity of the questionnaire was determined by confirmatory factor analysis from the sample group of 1,200 people. The researcher divided the questionnaire into two parts. The first part was an analysis of relations between the observed variables. The second part was an analysis of the validity of the questionnaire. Details are shown below: ([Table 4](#))

The analysis of observed variables was extracted from 41 questions. There were 12 observed variables. This part aims to study and review the correlation matrix of variables in each factor with the statistics values of Barlett's Test of Sphericity. The index value of the Kaiser-Meyer-Olkin measure of sampling adequacy presents that such variables were suitable for the analysis of such factors. The index value of the Kaiser-Meyer-Olkin measure of sampling adequacy should be 0.50 or more. The construct validity of the questionnaire was verified. Synthesis of the structure of the questionnaire was carried out according to Sorensen's concepts [8]. Two model factors were made, comprising of health literacy variables, i.e. the first rank variable and the second rank variables.

The result validates the structural accuracy of the questionnaire that determines a health literacy test matrix for hypertension diagnoses in the population of Thailand. The statistic

Description	Number (persons)	(%)
<i>Period of hypertension treatment</i>		
Less than one year	106	8.83
1-2 years	157	13.08
3-4 years	157	13.08
4-5 years	119	9.92
Over 5 years	661	55.08
<i>Education level</i>		
Lower than primary school	457	38.08
Primary school	459	38.25
Junior high school	89	7.42
Senior high school	82	6.83
Vocational certificate	18	1.50
Certificate of technical vocation	17	1.42
Diploma	11	0.92
Bachelor's degree	57	4.75
Higher than Bachelor's degree	10	0.83
<i>Smoking</i>		
Smoking	91	7.58
Nonsmoking	1,109	92.42
<i>Alcohol drinking</i>		
Drinking	150	12.50
Nondrinking	1,050	87.50
<i>Having received hypertension disease knowledge from various sources</i>		
Leaflets from the ministry of health	395	32.92
Television program	268	22.33
Internet, facebook	117	9.75
Doctors	1,088	90.67
Nurses	856	71.33
Village health volunteers	652	54.33
Others	21	1.75
<i>Health behavior as advised by others</i>		
Family members (son/daughter, niece, wife, husband)	532	44.33
Friends	205	17.08
Television programs	192	16.00
Doctors, nurses	1,162	96.83
Village health volunteers	705	58.75
Others	4	0.33

Note(s): The general data gathered from 1,200 people determined that the group, which had undergone hypertension treatment for a period greater than five years, was highest ranked at 55.08 per cent. Participants educated to primary school level was at 38.25 per cent. Nonsmoking was at 92.42 per cent, and smoking was at 7.58 per cent. Nonalcoholic drinking was at 87.50 per cent, and alcohol consumption was at 12.50 per cent. The group that received hypertension knowledge from doctors was at 90.67 per cent and from nurses at 71.33 per cent. The group who would change health behavior according to the advice of doctors and nurses was highest at 96.83 per cent and the group that took advice from their family members, such as son/daughter, niece, husband, wife, was second highest at 44.33 per cent. (Table 2)

Table 2.
General data of the
sample group of 1,200
people

value used in verifying the consistency of the empirical information model found that the model is valid and consistent with empirical information. This was considered from χ^2 equals to 0.02, degree of freedom (*df*) equals to 57, probability (*p*) equals to 1.00, RMSEA equals to 0.00, GFI equals to 1.00, and A GF equals to 1.00.

Latent variables	Observed variables	Number of items	Reliability: Cronbach α	Health literacy hypertension test in Thailand
Health care	Access	2	0.63	
	Understanding	4	0.68	481
	Appraise	4	0.41	
	Apply	3	0.43	481
	Total	13	0.71	
Disease prevention	Access	2	0.68	481
	Understanding	2	0.80	
	Appraise	5	0.62	481
	Apply	3	0.53	
	Total	12	0.73	481
Health promotion	Access	5	0.80	
	Understanding	3	0.64	481
	Appraise	4	0.55	
	Apply	4	0.31	481
	Total	16	0.75	
Total		41	0.87	

Table 3.
Reliability of the health literacy of hypertension test in Thailand ($n=1,200$)

Confirmatory factor analysis	Index	Table 4. Confirmatory factor analysis
Kaiser-Meyer-Olkin measure of sample adequacy (KMO)	0.83	
Barlett's test of sphericity approx. Chi-square	3129.31	481
df	66	
Sig	0.00	

Discussion

This study develops a reliable test metric that can ascertain health literacy as it relates to hypertension in the population of Thailand. The health literacy test of hypertension developed as a result of this research was assessed by the three types of professionals listed (physicians, professors, nurses) on validity and reliability. The results show that The Item Objective Congruence (IOC) in this study was 0.68. The reliability of the test with 41 questions collecting information from 1,200 hypertension patients found that each of the variables demonstrated high reliability ($r = 0.71 - 0.75$). For the entire questionnaire, the reliability value was 0.87, and the construct validity of our test was analyzed by confirmatory factor analysis. It was found that Barlett's test of Sphericity was statistically significant and consistent with the Kaiser-Meyer-Olkin measure of sampling adequacy (0.83). This study found that content validity was consistent with Kaufhold [26], and the criteria for the acceptable content validity value was 0.5 or higher. The reliability is an acceptable value in the determination of the quality of the test [27]. In addition, the construct validity test in which the acceptable per cent is greater than 0.50 and just under 1.0 is suitable for use. Moreover, the result is also validated by LISREL analysis that determines a health literacy test matrix for hypertension diagnoses in the population of Thailand.

The potential benefit from the use of this tool is supported by the data from hypertension patients in the hospitals under the Ministry of Public Health. There is diversity represented in each group, including factors, such as age, education, culture, and sex. This reflects hypertension and health literacy across the population of Thailand. This tool uses the specific name, the Thai Hypertension Health Literacy Assessment (THHLA). Therefore, we are confident that the THHLA can be a clinical utility. The scale is relatively easy to use and requires only 15-20 minutes to complete. Moreover, our finding suggested that this

constructed scale can be used as an effective measurement tool in terms of three domains: health care, risk prevention, and health promotion. This is expressed in terms of accessing, understanding, appraising, and applying for hypertensive patients. We believe the efforts to assess and improve the level of patients' health literacy are essential to the management of disease and to mitigate the risks of disability and death. According to the World Health Organization, cognitive, and social skills determine the motivation and ability of individuals to gain access to, understand, and use information in a way that promotes and maintains good health [3]. One limitation of this tool is the required ability to read and understand some basic medical terms. Therefore, the test has been developed within the specific context of Thailand and may not be as beneficial in the current form if used in other countries. However, our findings suggested that public health officers caring for hypertensive patients can benefit by using this as a tool in testing, improving health literacy, and planning future treatment for the patients under their care. Moreover, it could also be developed as a short form for more convenient use.

Conclusions

The results of this study suggest that the Thai Hypertension Health Literacy Assessment (THHLA) can be used in clinical settings as a self-administered questionnaire. The test provides valuable information on patients' health literacy to disseminate knowledge and indicate the hypertension literacy of the population. The result of the test may promote public health policy and decrease the hypertension rate of the Thai population.

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