

# Relationships of Selected Factors, Health Literacy and Clinical Outcomes in Community Dwellers with Hypertension

Orathai Piamsiri, RN,MNS<sup>1,2</sup> ; Chularak Kaweevithchai ,RN,PhD<sup>2</sup> ; Nareemarn Neelapaichit, RN,DrPH<sup>2</sup>



Orathai Piamsiri, RN,MNS

## Abstract

**OBJECTIVE:** This study was undertaken to examine the relationship among selected factors, health literacy and clinical outcomes among community dwellers with hypertension.

**MATERIALS AND METHODS:** The samples of 360 persons with hypertension aged 20 years old and over were selected using proportional stratified random sampling with simple random sampling from 6 sub-district Health Promoting Hospitals in Muang District, Prachinburi Province. The instrument was used to screen subjects who were 60 years old and older with The Short Portable Mental Status Questionnaire (SPMSQ). Health literacy was used for hypertension questionnaires and record clinical outcomes to elicit data regarding blood pressure levels, body mass index, and waist circumference. The data were analyzed using descriptive statistics and inferential statistics including chi-square test.

**RESULTS:** The findings revealed that most participants had inadequate overall health literacy (53.1%), inadequate health literacy on functional, interactive and critical health literacy subscale (47.8%, 60.3%, 40.0% respectively) and that there was a significant correlation between selected factors and overall health literacy with statistical significance ( $p < 0.01$ ) were age, educational background, income, community roles, and severity of illness whereas gender, having co-morbidity and duration of living with hypertension was not associated. In addition, there was a significant correlation between health literacy level and clinical outcomes with systolic blood pressure with statistical significance ( $p < 0.05$ ) whereas diastolic blood pressure, Body mass index (BM) and waist circumference was not associated.

**CONCLUSION:** This study suggested that healthcare teams should provide health information and hypertension education programs focusing on target populations, particularly to persons with inadequate health literacy including the elderly, those with low education and of low income. They should communicate effectively and make health information accessible and in a language that is easy-to-understand to promote proper decision-making and lead to good clinical outcomes.

**Keywords:** health literacy, selected factors, hypertension, clinical outcomes

Hypertension is the most commonly found chronic illness that constitutes a major public health problem all over the world, causing people to meet untimely deaths. It has been estimated that by the year 2025 the number of adults who are stricken with hypertension will rise to 1.56 billion.<sup>1</sup> Moreover, each year, the number of adults who died from hypertensive complications is almost eight million.<sup>2</sup> Thus, hypertension is termed a “silent killer.” This is because during the initial stage of hypertension, there are no symptoms.<sup>3</sup>

Data from The Fifth Physical Examination of the Thai Population in 2014 has reported that the prevalence rate of hypertension is 24.7%, and it ranks fourth among the leading causes of death of the Thai population.<sup>4</sup> The incidence rate of hypertension has increased to 66,567 persons per year<sup>5</sup> and approximately one in five persons with hypertension have received treatment but cannot control their blood pressure levels ( $< 140/90$  mmHg).<sup>6</sup>

At present, the health promotion of the world population emphasizes development of fundamental components of health literacy of individuals

<sup>1</sup> Student of Master of Nursing Science Program in Community Nurse Practitioner, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

<sup>2</sup> Ramathibodi School of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

\* Address Correspondence to author:  
Nareemarn Neelapaichit ,RN,DrPH.  
Faculty of Medicine Ramathibodi Hospital,  
Mahidol University,  
Bangkok, 10400, Thailand.  
email:nareemarn.nee@mahidol.edu

and practices that affect determinants of health. The World Health Organization has defined health literacy as various perceptive and social skills that determine individuals' motivation and ability to access, understand, and utilize information to promote and maintain health.<sup>7-9</sup> Health literacy is based on literacy which refers to the ability to read, write, speak, calculate, and solve problems to accomplish life goals and continue self-development.<sup>9,10</sup> It has been documented 16% of the adult population in the world, or approximately 766 million people, lack basic literacy, and this affects their health literacy, leading to poor health.<sup>11,12</sup>

The concept of health literacy became clearer after Nutbeam (2008)<sup>13</sup> has divided health literacy into three levels: functional health literacy, interactive health literacy, and critical health literacy. In Thailand, health literacy has been promoted as a national agenda in the 20-year national strategic plan, specified in the 12th National Economic and Social Development Plan (B.E. 2560-2564) with an aim to lead the population of the whole country to Thailand 4.0 model.<sup>14</sup> Data from health literacy surveys on health behaviors (alcohol, tobacco, coping, diet, and exercise) of Thai Adults found that 72% had a fair level of overall health, 22.9% had a poor level of overall health, and only 5.1% had an excellent level of overall health.<sup>15</sup> Later, it was documented that people with chronic disease (hypertension and diabetes) with uncontrolled disease had an 'inadequate' level of health literacy (< 75%), making up approximately 90.0% of the total. Only 10.0% of patients had an 'adequate' level of health literacy ( $\geq$  75%). Such findings reflect the fact that overall health education needs to be improved to link understanding to actual practice that is in line with the contexts of the target groups and the health service provision zones.<sup>16</sup>

Prachinburi Province is located in the eastern region of Thailand. There are 482,454 people living in the province which has both agricultural and industrial zones.<sup>17</sup> It is under the health service provision zone 6 where 55% of the residents do not have enough health literacy to adhere to the ABCDE health principle.<sup>18</sup> The number of patients with chronic non-communicable diseases in the province has risen. A survey of the target population of 379,241 residents of the province has shown that the total number of patients with hypertension is 29,590 with the prevalence rate of 9.23%.<sup>19</sup> The severity of hypertension has also increased. Therefore, Prachinburi Public Health Provincial Office has a policy to improve the quality of the NCD (non-communicable disease) clinics with sub-district Health Promoting Hospitals working as a key player to promote health behavioral adaptation among community members in accordance with the Non-communicable Disease Prevention Action Plan (B.E. 2558-2562).<sup>20</sup>

Previous studies show many factors related to health literacy such as age, gender, education level, Income, Community roles, Co-morbidity, number of years having hypertension, and level of severity of hypertension.<sup>16,21-27</sup> Most of the studies aim to assess health literacy and investigate the link between health literacy and factors in the general public,

only a few have been conducted in people with hypertension and its health outcomes. However health literacy is based on the interaction of the individual's skills with health contexts such as the health care system, the education system, and broad social and cultural factors at home, at work, and in the community.<sup>12</sup> Therefore the objectives of this study were to: 1) examine the health literacy in community dwellers with hypertension of Prachinburi Province, 2) determine the relationship between selected factors (age, gender, educational level, income, community roles, co-morbidity, number of years having hypertension, and levels of severity of hypertension) and health literacy of community dwellers with hypertension, and 3) explore the relationship between health literacy and clinical outcomes among these people.

## Materials and Methods

### *Population and sample*

The population of the study consisted of persons with hypertension aged 20 years old and over who were registered for treatment at sub-district Health Promoting Hospitals in Muang District, Prachinburi Province. The study samples consisted of 360 persons with hypertension aged 20 years old and over who were registered for treatment at six sub-district Health Promoting Hospitals (Wat Bot, Khok Mai Lai, Non Hom, Baan Toong Talumpuk, Mai Ked, Nern Hom) between October 1, 2016 and May 15, 2017. In this study, proportional stratified random sampling with simple random sampling was used.

The inclusion criteria were as follows:

1. They had been diagnosed with hypertension for at least one year.
2. They were males and females who sought treatment at sub-district Health Promoting Hospitals in Muang District, Prachinburi Province.
3. They were 20 years old and over. If they were older than 60 years of age, they needed to have normal cognitive ability as assessed with the Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer<sup>28</sup>) with a scores of at least 8 points.
4. They were able to read, write, speak in Thai language and did not have visual impairment.

The sample size of the study was determined to ensure representativeness, with the formula proposed by Kelsey as referred to in a previous study by Di Shi, et al.<sup>29</sup> The sample size of the study was 368. However, there were 40 older subjects who did not pass the cognitive assessment, so alternative names were randomly selected, but eight of the subjects gave incomplete data during data collection. Thus, in the end, the final number of subjects was 360.

### *Instrumentation*

The instruments used in this study were divided into three parts as follows:

### Part 1: Screening instrument

The Short Portable Mental Status Questionnaire (SPMSQ) was used to assess the cognitive process of elderly patients in terms of date, time, place, and person; calculation; attention; and decision-making in daily life. It was constructed by Pfeiffer and was subsequently translated into the Thai language by Prakong Intarasombat. In this study, the instrument was used to screen subjects who were 60 years old and older. There were ten items in the questionnaire. The possible total scores ranged from 0 to 10 points. A correct answer was equal to 1 point, while an incorrect answer was equal to 0 points. Older patients with hypertension who were at least 60 years old needed to get a score of at least 8 points in order to pass the cognitive screening.

### Part 2: Data collection instruments

1. The demographic characteristic questionnaire was adapted from the demographic characteristic questionnaire developed by Thanasugarn, C & Neelapaichit, N to ensure suitability with the selected factors of age, gender, income, educational background, co-morbidity, number of years having hypertension, community roles, and severity of illness, as well as data regarding healthcare behaviors. The items in the questionnaire were response-type items and fill-in-the-blank items, totaling 26 items.
2. The health literacy questionnaire was constructed by Thanasugarn C & Neelapaichit N<sup>16</sup> and divided health literacy into three levels.
  - 2.1 The functional level of health literacy was subdivided into five aspects as follows:
    - 1) Need for assistance with health information, with four-point rating scale items totaling 8 points, with 1 point given to the 'always' response, 2 points given to the 'often' response, 3 points given to the 'once in a while' response, and 4 points given to the 'never' response.
    - 2) Reading basic vocabulary, consisting of 66 medical terms, with the score of 0 given to an incorrect answer and 1 point given to a correct answer.
    - 3) Ability to read and understand numbers, with 8 matching of statements related to clinical outcomes, with the score of 0 given to an incorrect answer and 1 point given to a correct answer.
    - 4) Ability to seek or access health information, consisting of five items totaling 5 points, with the score of 0 given to the 'no' response and 1 point given to the 'yes' response.
    - 5) Knowledge and understanding of hypertension and self-care practice, with 20 multiple items with four choices, with the score of 0 given to incorrect answer and 1 point given to correct answer.

The maximum score of functional health literacy was 107 points, with the cut-off score of 75% of the maximum score ( $\geq 80$  points), meaning the subjects had adequate functional health literacy.

- 2.2 The interactive health literacy aspect contained 17 items asking the subjects about what to do when they were asked questions in different situations. The items were arranged in a five-point rating scale, with the scores ranging from 1 (letting the relative answer the questions), 2 (not answering the questions), 3 (trying to answer the questions), 4 (immediately answering the questions by self), to 5 (answering questions and asking further questions). The maximum score of interactive health literacy was 85 points, with the cut-off score of 75% of the total ( $\geq 64$  points), meaning the subjects had adequate interactive health literacy.
- 2.3 The critical health literacy aspect consisted of two aspects:
  - 1) Making the right decision about future practice aspect contained four multiple-choice items with the total score of 4 points, with the score of 0 given to an incorrect answer and 1 point given to a correct answer.
  - 2) The what to do when going out aspect contained seven four-point rating-scale items, with the scores ranging from 4 (very likely), 3 (likely), 2 (unlikely), to 1 (very unlikely). The total score of the critical health literacy aspect was 32 points, with the cut-off point of 75% of the total score ( $\geq 24$  points), meaning the subjects had adequate critical health literacy.
  - 3) The clinical outcomes record form was developed by the researcher. It consisted of fill-in-the-blank items to elicit data regarding blood pressure levels, body mass index, and waist circumference.

### Part 3: Scientific instruments.

The instruments used to evaluate clinical outcomes are weight scale, height scales and digital blood pressure machine.

#### Preparation stage

After the research proposal was approved by the Institutional Review Board on Research Involving Human Subjects of the Faculty of Medicine, Ramathibodi Hospital, Mahidol University, the researcher submitted a letter from the Graduate School of Mahidol University to Prachinburi Public Health Office and directors of the selected sub-district Health Promoting Hospitals (Wat Bot, Khok Mai Lai, Non Hom, Baan Toong Talumpuk, Mai Ked, and Nern Hom) to explain the research objectives and ask for permission and cooperation in data collection. The researcher studied the operations of the NCD clinic, including the number of patients with hypertension who sought treatment at the hospitals, and established rapport with the public health officers working at the selected sub-district Health Promoting Hospitals. In addition, the researcher trained the research assistants for one day on the instruments and data collection process. After that, the research assistants selected the subjects who met the inclusion criteria by randomly selecting from the database of patients with hypertension using a computer program until 368 subjects were recruited in accordance with the proportion of the patients with hypertension who sought treatment at each of the hospitals.

### Implementation stage

The researcher met the subjects who were selected from the database of patients with hypertension, introduced herself, explained the research objectives and data collection procedures, conducted human subject protection, and asked for their cooperation in data collection. After the subjects agreed to take part in the study, the researcher asked them to sign the informed consent form. The subjects who were older than 60 years old had to be screened with the Short Portable Mental Status Questionnaire (SPMSQ) and they needed to have a score of at least 8 points to be eligible to participate in the study. Then, the researcher or research assistants assessed the subjects' clinical outcomes including blood pressure levels, body weight, height, and waist circumference. The researcher also recorded the retrospective blood pressure levels of the subjects in the past three and six months from their medical records to calculate their mean blood pressure levels. After that, the subjects were asked to complete the questionnaires, lasting 30 to 45 minutes. As for the reading basic vocabulary questionnaire, there were 66 words for the subjects to read out loud. The subjects had to read the words one by one, spending four to five seconds on each word. If they were unable to read them or paused to spell them longer than the time specified, they would be asked to skip that word and considered they were unable to read them. In the end, the researcher checked all the questionnaires to ensure completeness, coded them, and thanked the subjects and gave them a token of appreciation.

### Data analysis

It was discovered that there were only 360 questionnaires that were fully completed. A computer program was used in the data analysis. Descriptive statistics were employed to analyze data regarding demographic characteristics of the subjects in terms of percentage, frequency, mean, mode, minimum and maximum, and standard deviation. Furthermore, Chi-square test was utilized to analyze the relationship between selected factors and health literacy and clinical outcomes of the subjects.

## Result

### Part 1: Selected factors of the subjects

According to the study findings, more than two-thirds of the subjects, or 67.5%, were female. Half of them, or 50%, were older than 60 years of age, while 45% were between 40 and 60 years old, with the mean age of 59.29 years (SD = 10.89). The minimum age was 21, whereas the maximum age was 88 years old. All of the subjects were Buddhists, and 76.1% completed elementary education, followed by those who were uneducated and completed early secondary education, at 8.9% and 7.2%, respectively. In terms of occupation, more than one-third, or 36.7%, were agriculturists, 23.3% were wage earners, and 23.1% were unemployed or housewives. Nearly two-thirds of the subjects, or 65.6%, had their mean income lower than 5,000 baht per month. The minimum income was 1,000 baht, while the maximum income was 50,000 baht, with

the mean income of 6,101 baht, and with 30.6% of the subjects having inadequate income. When considering their health status, it could be seen that 72.5% had co-morbidity, mostly hyperlipidemia, at 56.4%, followed by diabetes mellitus at 25.0%. Half of the subjects, or 50.3%, had been diagnosed with hypertension for one to five years, and 38.1% had been diagnosed with hypertension for six to ten years. In addition, 84 subjects, or 23.3%, had a role in their community, with 67.8% of them being a village volunteer and 21.1% being a village working committee member. Finally, with regards to the severity of hypertension as classified based on the seven-color ball guideline,<sup>30</sup> almost three quarters of the subjects, or 73.6%, were in the dark green level (controlled hypertension), whereas 21.7% were in the yellow level (uncontrolled hypertension).

### Part 2: Health literacy

It was found that the largest groups of subjects had functional and critical health literacy at an adequate level, making up 52.2% and 60%, respectively. To explain further, 66.4%, 85%, and 57.2% had scores demonstrating the need for assistance with health information, reading medical vocabulary, and seeking and accessing health information at a sufficient level. However, 53.1% and 60.3% did show inadequate level overall health literacy and interactive health literacy.

### Part 3: Clinical outcomes of persons with hypertension

The study findings showed that the mean systolic blood pressure level was  $131.83 \pm 12.30$  mmHg. Moreover, more than one-fourth of the subjects, or 26.4%, were unable to control their systolic blood pressure (with their systolic blood pressure exceeded 140 mmHg.). Their mean diastolic blood pressure level was  $78.66 \pm 7.83$ , and 8.6% of the subjects were unable to control their diastolic blood pressure (with their diastolic blood pressure exceeded 90 mmHg.). The subjects' mean body mass index was  $25.27 \pm 4.13$  kg/m<sup>2</sup>, and 41.1% of them had body mass index at the obese level (25- 29.9 kg/m<sup>2</sup> and 10.8% of the subjects had body mass index at the very obese level (>30 kg/m<sup>2</sup>). Finally, almost two-thirds of the subjects, or 63%, had waist circumference longer than the standard criteria (longer than 80 centimeters in females and longer than 90 centimeters in males), making up 78.4% and 21.6% of female and male subjects, respectively.

### Part 4: Hypothesis testing

- 1) The analysis of the relationship between the selected factors (age, gender, educational level, income, community roles, co-morbidity, number of years living with hypertension, and severity of illness) and health literacy (overall, functional, interactive, and critical health literacy) of the patients with hypertension revealed that the factors which were related to all three levels of health literacy with statistical significance ( $p < 0.01$ ) were educational background, income, community roles, and severity of illness (Table 1).

2) The analysis of the relationship between health literacy (overall, functional, interactive, and critical health literacy) and clinical outcomes (systolic blood pressure, diastolic blood pressure, body mass index, and waist circumference) of the patients with hypertension indicated that overall

health literacy, functional health literacy, and critical health literacy were related with systolic blood pressure with statistical significance ( $p < 0.05$ ) and functional health literacy was related to diastolic blood pressure with statistical significance ( $p < 0.05$ ) (Table 2).

**Table 1:** Relationship between selected factors and health literacy of the study sample (n = 360)

Selected factors	Overall health literacy n (%)		X <sup>2</sup>	p
	Inadequate	Adequate		
<b>Gender</b>				
Male	64 (54.7)	53 (45.3)	0.103	0.748
Female	127 (52.3)	116 (47.7)		
<b>Age (years)</b>				
< 40	4 (22.2)	14 (77.8)	18.661	< 0.001
40-60	73 (45.1)	89 (54.9)		
> 60	114 (63.3)	66 (36.7)		
<b>Educational level</b>				
Uneducated	26 (81.2)	6 (18.8)	54.935	< 0.001
Elementary	160 (58.4)	114 (41.6)		
Early secondary	5 (9.3)	49 (90.7)		
<b>Income</b>				
More Enough	21 (26.9)	57 (73.1)	37.319	< 0.001
Enough	38 (45.8)	45 (54.2)		
Enough (sometime)	58 (65.2)	31 (34.8)		
Not Enough	74 (67.3)	36 (32.7)		
<b>Having co-morbidity</b>				
Yes	44 (44.4)	55 (55.6)	3.602	0.058
No	147 (56.3)	114 (43.7)		
<b>Number of years living with hypertension</b>				
≤ 5 years	90 (49.7)	91 (50.3)	1.365	0.243
> 5 years	101 (56.4)	78 (43.6)		
<b>Having a role in community</b>				
Yes	169 (61.0)	108 (39.0)	29.158	< 0.001
No	22 (26.5)	61 (73.5)		
<b>Severity of illness *</b>				
Level 0	127 (47.9)	138 (52.1)	9.849	0.002
Level 1-3	64 (67.4)	31 (32.6)		

  

Selected factors	Functional health literacy		X <sup>2</sup> (p)	Interactive health literacy		X <sup>2</sup> (p)	Critical health literacy		X <sup>2</sup> (p)
	Inadequate	Adequate		Inadequate	Adequate		Inadequate	Adequate	
<b>Gender</b>									
Male	55 (47.0)	62 (53.0)	0.008 (0.928)	80 (68.4)	37 (31.6)	4.260 (0.039)	57 (48.7)	60 (51.3)	4.964 (0.026)
Female	117 (48.1)	126 (51.9)		137 (56.4)	106 (43.6)		87 (35.8)	156 (64.2)	
<b>Age (years)</b>									
< 40	4 (22.2)	14 (77.8)	26.848 (< 0.001)	29 (90.6)	10 (55.6)	10.262 (.006)	5 (27.8)	13 (72.2)	4.185 (0.123)
40-60	58 (35.8)	104 (64.2)		172 (62.8)	76 (46.90)		58 (35.8)	104 (64.2)	
> 60	110 (61.1)	70 (38.9)		16 (29.6)	57 (31.7)		81 (45.0)	99 (55.0)	
<b>Educational level</b>									
Uneducated	27 (84.4)	5 (15.6)	57.559 (< 0.001)	8 (44.4)	3 (9.4)	34.205 (< 0.001)	20 (62.5)	12 (37.5)	29.356 (< 0.001)
Elementary	142 (51.8)	132 (48.2)		86 (53.1)	102 (37.2)		119 (43.4)	155 (56.6)	
Early secondary	3 (5.6)	51 (94.4)		123 (68.3)	38 (70.4)		5 (9.3)	49 (90.7)	
<b>Income</b>									
More Enough	24 (30.8)	54 (69.2)	20.136 (< 0.001)	36 (46.2)	42 (53.8)	28.974 (< 0.001)	19 (24.4)	59 (75.6)	30.462 (< 0.001)
Enough	33 (39.8)	50 (60.2)		37 (44.6)	46 (55.4)		21 (25.3)	62 (74.7)	
Enough (sometime)	48 (53.9)	41 (46.1)		69 (77.5)	20 (22.5)		41 (46.1)	48 (53.9)	
Not Enough	67 (60.9)	43 (39.1)		75 (68.2)	35 (31.8)		63 (57.3)	47 (42.7)	
<b>Having co-morbidity</b>									
Yes	33 (33.3)	66 (66.7)	10.634 (0.001)	50 (50.5)	49 (49.5)	4.898 (0.027)	34 (34.3)	65 (65.7)	1.510 (0.219)
No	139 (53.3)	122 (46.7)		167 (64.0)	94 (36.0)		110 (42.1)	151 (57.9)	
<b>Number of years living with hypertension</b>									
≤ 5 years	77 (42.5)	104 (57.5)	3.589 (0.058)	105 (58.0)	76 (42.0)	0.602 (0.438)	67 (37.0)	114 (63.0)	1.112 (0.292)
> 5 years	95 (53.1)	84 (46.9)		112 (62.6)	67 (37.4)		77 (43.0)	102 (57.0)	
<b>Having a role in community</b>									
Yes	154 (55.6)	123 (44.4)	28.087 (< 0.001)	181 (65.3)	96 (34.7)	11.973 (< 0.001)	122 (44.0)	155 (56.0)	7.470 (0.006)
No	18 (21.7)	65 (78.3)		36 (43.4)	47 (56.6)		22 (26.5)	61 (73.5)	
<b>Severity of illness*</b>									
Level 0	113 (42.6)	152 (57.4)	9.852 (0.002)	148 (55.8)	117 (44.2)	7.540 (0.006)	92 (34.7)	173 (65.3)	10.859 (0.001)
Level 1-3	59 (62.1)	36 (37.9)		69 (72.6)	26 (27.4)		52 (54.7)	43 (45.3)	

\*Seven-color ball guideline<sup>30</sup>; level 0 = Dark Green (BP < 140/90 mmHg); level 1-3 = Yellow/Orange/Red (BP > 140/90 mmHg)

**Relationships of Selected Factors, Health Literacy and Clinical Outcomes in Community Dwellers with Hypertension**

**Table 2:** relationship between health literacy and clinical outcomes of the study sample (n = 360)

Clinical outcomes	Overall health literacy n (%)		X <sup>2</sup>	p
	Inadequate	Adequate		
<b>Mean systolic blood pressure (mmHg)</b>				
Controlled blood pressure	131 (49.4)	134 (50.6)	4.752	0.029
Uncontrolled blood pressure (> 140)	60 (63.2)	35 (36.8)		
<b>Diastolic blood pressure (mmHg)</b>				
Controlled blood pressure	169 (51.4)	160 (48.6)	3.618	0.57
Uncontrolled blood pressure (> 90)	22 (71.0)	9 (29.0)		
<b>Body mass index (Kg/m<sup>2</sup>)*</b>				
Underweight (<18.5)	9 (64.3)	5 (35.7)	3.411	0.182
Normal weight (18.5 – 22.9)	54 (60.0)	36 (40.0)		
Over weight (≥ 23)	128 (50.0)	128 (50.0)		
<b>Waist circumference</b>				
Men ≤90 cms, Women ≤ 80 cms	74 (55.6)	59 (44.4)	0.413	0.521
Men >90 cms, Women > 80 cms	117 (51.5)	110 (48.5)		

  

Selected factors	Functional health literacy		X <sup>2</sup> (p)	Interactive health literacy		X <sup>2</sup> (p)	Critical health literacy		X <sup>2</sup> (p)
	Inadequate	Adequate		Inadequate	Adequate		Inadequate	Adequate	
<b>Mean systolic blood pressure (mmHg)</b>									
Controlled blood pressure	111 (41.9)	154 (58.1)	13.087 (<0.001)	153 (57.7)	112 (42.3)	2.323 (0.128)	95 (35.8)	170 (64.2)	6.569 (0.010)
Uncontrolled blood pressure (>140)	61 (64.2)	34 (35.8)		64 (67.4)	31 (32.6)		49 (51.6)	46 (48.4)	
<b>Diastolic blood pressure (mmHg)</b>									
Controlled blood pressure	151 (45.9)	178 (54.1)	4.578 (0.032)	195 (59.3)	134 (40.7)	1.167 (0.280)	126 (38.3)	203 (61.7)	3.825 (0.050)
Uncontrolled blood pressure (>90)	21 (67.7)	10 (32.3)		22 (71.0)	9 (29.0)		18 (58.1)	13 (41.9)	
<b>Body mass index (Kg/m<sup>2</sup>)*</b>									
Underweight (< 18.5)	6 (42.9)	8 (57.1)	0.182 (0.913)	9 (64.3)	5 (35.7)	3.080 (0.214)	7 (50.0)	7 (50.0)	0.632 (0.729)
Normal weight (18.5 – 22.9)	44 (48.9)	46 (51.1)		61 (67.8)	29 (32.2)		35 (38.9)	55 (61.1)	
Over weight (≥ 23)	122 (47.7)	134 (52.3)		147 (57.4)	109 (42.6)		102 (39.8)	154 (60.2)	
<b>Waist circumference</b>									
Men ≤ 90 cms, Women ≤ 80 cms	59 (44.4)	74 (55.6)	0.782 (0.377)	86 (64.7)	47 (35.3)	1.415 (0.234)	53 (39.8)	80 (60.2)	0.000 (1.000)
Men > 90 cms, Women > 80 cms	113 (49.8)	114 (50.2)		131 (57.7)	96 (42.3)		91 (40.1)	136 (59.9)	

**Discussion**

According to the study findings, more than half of the subjects or 53.1%, had an inadequate level of overall health literacy. This was consistent with the finding of a previous study that health literacy of the people to adhere to the ABCDE principle was not good enough<sup>31</sup> and that an individual who has insufficient or a low level of health literacy has restrictions in basic factors for learning, lacking awareness, and overlooking learning about self-care.<sup>32</sup>

When analyzing different levels of health literacy, it could be seen that 52.2% of the subjects had adequate health literacy. It has been found that most of the subjects had functional health literacy in the following five aspects—need for assistance with health information, reading basic medical vocabulary, and

seeking and accessing health information, at 66.4%, 85%, and 57.2%, respectively. As for reading and understanding numbers and understanding hypertension, the subjects' health literacy was not sufficient, at 91.7% and 93.6%, respectively. Results from our study showed that the prevalence was particularly high amongst subjects: 1) who only completed education of elementary school and below; 2) whose income lower than 5,000 baht per month and below; 3) who have inadequate income; 4) aged 60 years and above; and 5) who do not have any role in their community. In addition, 48.9% of the subjects aged 60 years or older had only completed education of elementary school or below. This may explain the prevalence of low health literacy as it may be due to these factors. The findings were consistent with several surveys of adult health literacy, which reported that the most common socio-demographic features associated with health literacy

were education level, age, income, and having a role in the community.<sup>16,21,22,25</sup>

The findings of the present study supported the research hypothesis as it was found that selected factors of educational background, income, community roles, and severity of illness were related to health literacy (functional, interactive, and critical health literacy) with statistical significance ( $p < 0.01$ ). Previous studies have also reported that education was related to health. This could be explained by the fact that individuals who have sufficient health literacy or who are educated highly enough can have more perception of hypertension.<sup>11</sup> The Institute of Medicine has pointed out that health literacy depends on an individuals' encounter with health situations including healthcare systems, educational systems, social factors, and cultures at home, in the workplace, and in the community.<sup>12</sup> Health literacy enables people to better understand healthcare and adopt correct practices. In this study, 73.6% of subjects with hypertension were at the dark green level of the seven-color ball guideline<sup>30</sup> that is, their blood pressure level was 140/90 mmHg., and they had to take medication to control their blood pressure level, which was the lowest level of severity.<sup>33</sup> As for this group of subjects, 52.1% had a sufficient level of overall health literacy, whereas 32.6% of the subjects were at the yellow/orange/black level. Such findings yielded support to the findings of Thanasugarn C and Neelapaichit N<sup>33</sup> that more patients at Level 0 (dark green) had a sufficient level of health literacy compared to those at levels 1-3 (yellow/orange/red). Thus, the seven-color ball guideline<sup>30</sup> should be used to monitor, control, and prevent hypertension through health behavioral modification and the ABCDE principle.<sup>34</sup>

The findings of the present study support the research hypothesis that clinical outcomes of mean systolic blood pressure and diastolic blood pressure were related to health literacy with statistical significance ( $p < 0.001$  and  $p < 0.05$ , respectively). Blood pressure examinations are generally conducted to make people know their own blood pressure levels so as to appropriately control them.<sup>35</sup> In other words, when people have knowledge about the appropriate levels of blood pressure, they are able to make correct decisions and

carry out self-management to control their own blood pressure levels.<sup>36-38</sup>

In summary, the study findings showed that health literacy referred to levels of knowledge and the ability of the individual to screen information to make a decision about self-care practices. In order for community nurse practitioners to access the people, they need to understand their nature, ways of life, and their environment and how much they facilitate health promoting activities to ensure continuity and sustainability. Health literacy can be utilized to ensure that people can appropriately access, understand, and use the information with suitability to their contexts. A key factor that contributes to the success of the health system is healthcare personnel's health literacy including policies related to health literacy, use of instruments to assess health literacy, and application of technology and innovations to ensure that Thai society is a society of health literacy.

## Conclusion

This study suggested that healthcare teams should provide health information and hypertension education programs with a focus on target populations, particularly to persons with inadequate health literacy including the elderly, those with low education and of low income. They should communicate effectively and make health information accessible and in a language that is easy-to-understand in order to promote proper decision-making and lead to good clinical outcomes. Further research needs to focus on the developed program for enhancing health literacy especially for low health literacy people such as using oral and visual communication to convey necessary medical information through photo novella, one-on-one teaching, audiotapes, videotapes or computer multimedia.

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