

## A Study of Health Literacy and Clinical Outcomes of Older Adults with Hypertension and Diabetes in Northeastern Communities, Thailand

Ratchanee Piwpong<sup>1</sup>, Supaporn Marungsee<sup>2</sup>,  
Thripnaraporn Sungsrirakaw<sup>3</sup>, Boonyika Jhornlumkone<sup>4</sup>

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<sup>1,2</sup> Faculty of Nursing, Buriram Rajabhat University, Thailand

<sup>3,4</sup> Nursing Department, Khandong Hospital, Thailand

Corresponding author: ratchanee.pp@bru.ac.th, ORCID iD 0000-0001-8054-9252

### Abstract

Health literacy is a crucial factor in self-management of health which affects older adults' behaviors and health outcomes. This study is a cross sectional descriptive research aimed at studying health literacy, correlations between personal factors and health literacy and correlations between health literacy and clinical outcomes among older adults with hypertension and diabetes in northeastern communities of Thailand. The findings revealed four personal factors were positively correlated with health literacy among older adults with hypertension and diabetes consisting of gender ( $\chi^2 = 6.16$ ,  $p < 0.05$ ), age ( $\chi^2 = 7.53$ ,  $p < 0.05$ ), income sufficiency ( $\chi^2 = 11.88$ ,  $p < 0.05$ ) and cognitive capacity ( $\chi^2 = 13.43$ ,  $p < 0.001$ ). Health literacy was correlated with performance of 3 Or. 2 Sor. behaviors with statistical significance ( $\chi^2 = 5.88$ ,  $p < 0.05$ ) and health literacy was correlated with clinical outcomes such as triglyceride ( $r = -.19$ ,  $p < 0.05$ ) and risk of stroke and cardiovascular disease in the future (CVD Risk Score) ( $r = -.18$ ,  $p < 0.05$ ) with statistical significance. In improving health literacy, healthcare teams should give consideration to older age, income sufficiency and cognitive capacity to help older adults gain health literacy to the level of literacy and effective self-care along with improving health literacy among hypertensive older adults for good health behaviors in order to reduce triglyceride levels and risk of stroke and cardiovascular disease in the future.

**Keywords:** health literacy, older adults with diabetes and hypertension, older adults, clinical outcomes

### Introduction

Currently, the world is becoming an aging society with 651 million older adults worldwide in 2022 or 14 percent out of the entire population. This percentage is expected to quickly increase to one out of four or 22 percent by 2050 (WHO, 2021). The countries with the highest percentages of older adults are Japan (33.4%), followed by Italy and Germany (29.4% and 28.0%, respectively). Thailand became a completely aging society in 2022 with an elderly population numbering more than 20 percent of the total population which is also expected to increase to 33 percent by 2040 (Thai Gerontology Research and Development, 2019; HelpAge Global Network, 2022;). Buriram is also a province that has become an aging society and will become an aged society with an older adult population at 17.25 percent of the total population (Department of Health, Ministry of Public Health, 2022; Department of Government, Ministry of Home Affairs, 2022). Due to rapid increases in the elderly population, the ratio of dependent older adult to working-aged people is likely to increase with subsequent effects on the country's economic and social developments.

Older adults have higher rates of illness with non-communicable chronic illnesses, particularly diabetes and hypertension. According to a report on diabetes and hypertension prevalence among the Thai population aged 15 years and up and among older adults aged 60 years and up (Division of Non-Communicable Diseases, 2020), hypertension and diabetes create losses in terms of medical treatment expenses and loss of productivity due to premature death. Furthermore, according to data from the Department of Disease Control, Ministry of Public Health, 2018), Thailand was found to have spent as much as 198,152 million baht in expenses to treat illnesses caused by chronic diseases or 2.2 percent of the national income. Health can be seen as a basic factor contributing to quality productivity, long-term income, and sustainable occupations. Diabetes and hypertension also cause the lives and quality of life of patients to change.

Health literacy is important in self-management in the area of health with effects on health behaviors and outcomes. Patients with health literacy will change behaviors and use health services, which reduces expenses

and creates opportunities to access, understand and benefit from healthcare systems with equality. Studies of factors influencing health literacy found the factors with influence to be personal factors such as older adulthood (60-74 years), residency in urban areas, education at the high school level, treatment rights, life insurance, occupations, and income (Xie et al., 2022; Thummaphol, et al., 2016). In addition, health literacy was correlated with clinical outcomes with statistical significance such as HbA1C levels, lipid profiles (Thummaphol, et al., 2016), blood pressure control (systolic and diastolic blood pressure), self-care behaviors, perceived self-efficacy, medication adherence, interactions and communication between patients and doctors (Du et al., 2018). Older adults with literate levels of health literacy can be seen to have good control of diabetes and hypertension.

Older adults were found to have lower levels of health literacy than people of other ages and studies on correlations between health literacy, personal factors and clinical outcomes among older adults with hypertension and diabetes in Thailand remain limited. Therefore, the researcher was interested to study health literacy among older adults with diabetes and hypertension in communities. The findings from this study will benefit development and promotion of health literacy among older adults by improving clinical outcomes and quality of life.

## **Material and Methods**

### ***Study Design***

This study is a cross-sectional research. In this study, data was collected by interviewing older adult subjects for the purpose of studying health literacy, correlations between personal factors and health literacy, and correlations between health literacy, 3 Or. 2 Sor. behaviors and clinical outcomes of older adults with hypertension and diabetes in northeastern communities of Thailand.

### ***Setting***

This study was conducted in the communities of Khaen Dong, Buriram, in northeastern Thailand.

### ***Research Instruments and Reliability Verification***

Research instruments consisted of the following three assessment forms: 1) the cognitive capacity assessment form with 6 questions (6CIT) developed by Brook & Bullock, which was translated into Thai and tested for quality by Suphap Aree-ua and Pitpra-orn Youngjarern with a score range of 0-28 points and the following scoring criteria: 0-7 points meant no cognitive impairment and 8 points and up meant potential cognitive impairment. Testing of the aforementioned instrument resulted in a reliability score of  $r = .64, p < .001$ ; 2) the ability to perform basic activities of daily living assessment form for older adults created by Mahoney & Barthel in 1965, which was translated into Thai and modified by Suttichai Jitapankun et al. (1998). The instrument had a total of 10 points with a score range of 0-20 points. Scores of  $> 12$  points meant no dependence; and 3) the interview form for health literacy. Instruments for measuring health literacy among diabetic and hypertensive patients were used. The researcher used health literacy interview forms developed by the Division of Health Education, Department of Health Services Support, Ministry of Public Health, in collaboration with Mahidol University (2015). The form had nine sections consisting of: Section 1 – General Information; Section 2 – Health Information Support Needs (2 questions); Section 3 – Reading Basic Terms (66 questions); Section 4 – Ability to Read and Understand Numbers; Section 5 – Ability to Access or Seek Health Information (5 questions); Section 6 – Knowledge and Understanding (36 questions; 14 questions for diabetic and/or hypertensive respondents; 16 questions for diabetics; 6 questions for hypertensive patients); Section 7 – Practices When Being Asked About Problems (17 questions); Section 8 – Correct Decisions on Future Practices or Conditions for Living (11 questions); and Section 9 – Performance of Behaviors (8 questions). The researcher added questions used in collecting data about laboratory test results consisting of HbA1C levels, lipid profile, sugar levels, and blood pressure. Testing of content validity resulted in an index of consistency (IOC) of .80). Afterwards, the instruments were tested among 30 older adults with qualifications similar to the sample. Reliability was determined by Cronbach's method and found to have a score of 0.81.

### ***Participants***

The sample was older adults with hypertension and diabetes. Data were collected in October 2021 – May 2022. The sample size was calculated by power analysis by using the G\*power program for correlation analysis statistics with effect size set at 0.3, power of test set at .95 and statistical significance set at .05. A sample size of 111 subjects was obtained and the sample was enlarged by 20 percent, which brought the sample size to 135 subjects. Inclusion criteria were as follows: person aged 60 years and up, diagnosed with diabetes and hypertension, and consented to participate in the project.

### ***Ethical Considerations***

This study was approved by the Institutional Review Board, Rajabhat Buriram University (Confirmation Document No. 020/2564, dated 25 November 2021). The researchers explained research objectives, expected benefits, and data collection steps including how data in this study will be kept confidential and used for only this research. The data were presented in an overall view in detail before conducting the study and the sample signed informed consent forms before data collection. The researchers considered privacy and respected the decisions of the sample including the right to withdraw from the study. The findings from this study and the following moral principles were also considered: 1) respect for persons; and 2) beneficence or non-maleficence and justice.

### ***Data Collection and Data Analysis***

Data were collected in January – May 2022 by interviewing 135 older adults and spending 30-45 minutes to interview each person. Data were analyzed with a computer program (SPSS Version 21) and descriptive statistics such as mean, standard deviation, frequency distribution, and percentage. Correlations between health literacy, personal factors and 3 Or. 2 Sor. behaviors were analyzed using the chi-square test and Fisher's exact test while correlations between health literacy and clinical outcomes were analyzed with Spearman's Rho correlation because data of certain variables did not have a normal distribution.

### **Results**

The findings were divided into three parts as follows: 1) demographic data and health literacy; 2) correlations between personal factors and health literacy; and 3) correlations between health literacy, 3 Or. 2 Sor. behaviors and clinical outcomes.

#### **Part 1 – Demographic Data and Health Literacy of the Sample**

Concerning demographic data of older adults with hypertension and diabetes in the sample, the sample was found to be aged 60-93 years at a mean of 69 years ( $SD \pm 6.75$ ) with most of the sample being older adults in early older adulthood (aged 60-69 years) (65.9%), followed by older adults in middle older adulthood (aged 70-79 years) (25.9%) and older adults in late older adulthood (80 years and up) (8.1%), respectively. Most of the older adults were female (70.40%). The top three levels of education among older adults was elementary education or lower (1-7 years) (91.10%), followed by no education (3%), junior high school (1-3 years) and senior high school/vocational certificate (1-3 years) equally (2.20%). Most of the sample was housewives (48.10%), followed by unemployed subjects (21.50%) and subjects who were farmers (5.60%). In the area of income sufficiency, most of the sample had insufficient income (38.5%), followed by sufficient income without savings (34.1%) and sufficient income with savings (16.3%), respectively. Most of the older adults had no community or social roles (77.8%). The top three feelings toward personal health among older adults were unhealthy but able to perform self-care (55.60%), healthy (36.30%) and unhealthy and unable to perform self-care while public health volunteers or community members and relatives provided care (5.90%). In the area of participation in health education activities, most of the older adults talked at home (51.10%), followed by participating in THPH or TAO campaigns or community activities (31.90%) and talking directly at THPHs (28.10%), respectively.

**Older Adults' Health** – The sample had diabetes (11.1%), hypertension (51.9%) and both diabetes and hypertension (37.0%). The sample had complications from diabetes and hypertension (13%) consisting of kidney disease (52.9%) and stroke (47.1%). According to laboratory test results, the sample had a mean FBS of 113.24 mg/dl ( $SD = 61.36$ ). Most of the sample had normal blood glucose levels (65.20%) and renal function with a mean BUN of 13.48 mg/dl. ( $SD = 4.86$ ). Most of the sample had normal renal functions (83.7%) and a mean creatinine of 1.27 mg/dl. ( $SD = 5.28$ ), causing most of the sample to be categorized in the group with normal renal functions (94.07%) and a mean HbA1C level of 9.60 mg/dl. ( $SD = 10.97$ ). Most of the sample had abnormal accumulated sugar levels (57.10%) with lipid profiles consisting of cholesterol at a mean of 202.62 mg/dl. ( $SD = 178.94$ ), triglyceride at a mean of 150.69 mg/dl. ( $SD = 105.00$ ), HDL at a mean of 44.01 mg/dl. ( $SD = 11.74$ ) and LDL at a mean of 114.27 mg/dl. ( $SD = 35.91$ ). Most of the samples had normal lipid levels. Concerning urine micro albumin scores, most of the samples were not found to have protein in the urine (59.3%) and had a CVD risk score of 20.58 ( $SD = 7.35$ ). Most of the sample had medium risk (48.4%). Most of the sample had normal cognition (56.3%) and most of the sample was society-bound older adults ( $ADL \geq 12$  points (97.0%).

Overall, most of the sample had health literacy scores at the level of awareness or total scores below 75% of the full score (78.5%). In separate areas, the top three areas of health literacy at the level of awareness were knowledge and understanding of diabetic and hypertensive patients (96.0%), knowledge and understanding of

hypertensive patients (95.7%), ability to read and understand numbers (95.6%), respectively, and the top three areas of health literacy in which the sample had literate health literacy were practices when being asked about problems (85.90%), need for health information support (54.8%) and reading basic terms (49.6%) (Table 1). In the area of performance of 3 Or. 2 Sor. behaviors, the top three activities performed for three days per week and up were found to be eating vegetables and fruits (69.9%), controlling emotions/minds to not become overly stressed or anxious (66.2%) and choosing/cooking foods that are not excessively salty (60%).

**Table 1**  
 Frequencies and Percentages of Health Literacy (n = 135)

Health Literacy	Aware (Score < 75%)	Literate (Score: > 75%)
	Amount (percent)	Amount (percent)
Health Information Support Needs	61 (45.2)	74 (54.8)
Reading of Basic Terms	68 (50.4)	67 (49.6)
Ability to Read and Understand Numbers	129 (95.6)	6 (4.4)
Ability to Access or Seek Health Information	81 (60.0)	54 (40.0)

  

Health Literacy	Aware (Score < 75%)	Literate (Score: > 75%)
	Amount (percent)	Amount (percent)
Knowledge and Understanding		
Diabetes and Hypertension (n = 50)	48 (96.0)	2 (4.0)
Diabetes (n = 15)	12 (92.3)	1 (7.7)
Hypertension (n = 70)	67 (95.7)	3 (2.2)
Practices When Being Asked about Problems	19 (14.1)	116 (85.9)
Correct Decisions Concerning Future Practices	81 (60.0)	54 (40.0)
Overall Health Literacy	106 (78.5)	26 (21.5)

**Part 2 – Correlations between Personal Factors and Health Literacy**

Five personal factors were positively correlated with health literacy among older adults with hypertension and diabetes with statistical significance consisting of gender ( $\chi^2=6.16, p < 0.05$ ), age ( $\chi^2=7.53, p < 0.05$ ), income sufficiency ( $\chi^2=11.88, p < 0.05$ ) and cognitive capacity ( $\chi^2=13.43, p < 0.001$ ) as shown in Table 2.

**Table 2**  
 Factors Correlated with Health Literacy among Older Adults with Hypertension and Diabetes

	Health Literacy		$\chi^2$	p-value
	Aware	Literate		
<b>Gender</b>				
- Male	26(65)	14(35)	6.16	.01
- Female	80(84.2)	15(15.8)		
<b>Age</b>				
- Early Older Adulthood (aged 60-69 years)	64(71.9)	25(28.1)	7.53	.02
- Middle Older Adulthood (aged 70-79 years)	33 (94.3)	2(5.7)		
- Late Older Adulthood (aged 80 years and up)	9(81.8)	2(18.2)		
<b>Income Sufficiency</b>				
- Sufficient/Savings	12(54.5)	10(45.5)	11.88	.01
- Sufficient/No Savings	35(76.1)	11(23.9)		

	Health Literacy		$\chi^2$	p-value
	Aware	Literate		
Occasionally Sufficient	10(76.9)	3(23.1)		
Insufficient	47(90.4)	5(9.6)		
<b>Cognitive Capacity</b>				
Normal Cognition	51(67.1)	25(32.9)	13.43	<.001
Impaired Cognition	55(93.2)	4(6.8)		
<b>Ability to Perform Basic Activities of Daily Living*</b>				
Housebound/Bedbound Older Adults	4(100)	0(0)		.58
Society-bound Older Adults	102(77.9)	29(22.1)		

\*Fisher's exact test

**Part 3 – Correlations between Health Literacy and Performance of 3 Or. 2 Sor. Behaviors and Clinical Outcomes of Older Adults with Hypertension and Diabetes**

In the area of correlations between health literacy and performance of 3 Or. 2 Sor. behaviors, correlations were found with statistical significance ( $\chi^2=5.88$ ,  $p < 0.05$ ) as shown in Table 3. Concerning correlations between overall health literacy and clinical outcomes, health literacy was found to be correlated with triglyceride ( $r = -.19$ ,  $p < 0.05$ ) and risk of cardiovascular disease and stroke in the future (CVD risk) ( $r = -.18$ ,  $p < 0.05$ ) as shown in Table 3.

**Table 3**

Correlations between Health Literacy and Performance of 3 Or. 2 Sor. Behaviors of Older Adults with Hypertension and Diabetes

Level of Awareness/Literacy	3 Or. 2 Sor. Behaviors		$\chi^2$	p-value
	Performed Every Behavior 3 Times per Week and Up	Performed Behaviors Less Than 3 Times per Week Or Did Not Perform Every Behavior		
Awareness Level	13(17.3)	93(87.7)	5.88	.02
Literate Level	9(4.7)	20(24.3)		

**Table 4**

Correlations between Overall Health Literacy and Clinical Outcomes of Older Adults with Hypertension and Diabetes

Variables	1	2	3	4	5	6	7	8
Overall Health Literacy	1.00							
Blood Glucose	.08	1.00						
HDL	.03	-.11	1.00					
LDL	-.09	.069	-.22*	1.00				
Cholesterol	-.17	.15	-.08	.85*	1.00			
Triglyceride	-.19*	.18*	-.48**	.10	.28**	1.00		
Creatinine	.06	.07	-.17	.04	.01	.03	1.00	
CVD risk	-.18*	.08	.10	.17	.13	-.07	.17	1.00

\*  $p < .05$ , \*\*  $p < .01$

**Discussion**

1. Health Literacy

Most of the sample had health literacy at a level of awareness with an overall score of 75 percent of total scores. Most of the older adults had a level education at the level of elementary education and were aged 60-93 years at a mean of 69 years. Most of the older adults felt in poor health while remaining able to perform self-care.

This showed the sample who had health literacy at the level of awareness may be a limitation to accessing, understanding, thinking, applying data, and seeking knowledge to make decisions about self-care concerning hypertension and diabetes. The findings concurred with previous studies which found people with low health literacy to be likely to have knowledge of hypertension and diabetes in addition to poor hypertension control and glycemic control (Du et al., 2018; Al et al., 2013; Shi et al., 2017; Wang et al., 2017; Sriyasak et al., 2021).

## 2. Correlations between Personal Factors and Health Literacy

Four personal factors were positively correlated with health literacy among hypertensive and diabetic older adults with statistical significance consisting of gender, age, cognitive capacity, and income sufficiency. The findings can be discussed as follows: Gender was correlated with health literacy with statistical significance. Most of the sample in this study was female because females paid more attention to self-care and seeking self-care information than males. This was consistent with many studies which found gender differences to be correlated with differences in health literacy and females had higher health literacy than males (Klangburam, & Jermrod, 2022, Chakraverty, 2022) and different from Thummaphol et al., (2016) Chinta Tachavijitjaru, et al. (2018). Gender was found to be uncorrelated with health literacy and age was correlated with health literacy with statistical significance. In this study, most of the sample was in early older adulthood (60-69 years) with good self-efficacy and life experience, causing the sample to have a good understanding, access to information, and health management decisions, resulting in good health literacy. However, most studies found older age to have effects causing health literacy to decline (Thummaphol et al., 2016; Klangburam, & Jermrod, 2022; Heijmans et al., 2015).

Cognitive capacity is correlated with health literacy with statistical significance. Cognitive capacity is related to awareness of surrounding conditions, intentions and memory. Older people will lose memory and cognition with age (Tanthanapanyakorn et al., 2019). In addition, memory decline and executive function decline reduced health literacy (Kobayashi et al., 2015). In this study, most of the sample had normal cognitive capacity. However, literacy and understanding of numbers were found to be at a low level. Literacy and understanding of numbers is functional health literacy. This causes overall health literacy to be at a low level. Income sufficient was positively correlated with health literacy with statistical significance. In this study, most of the sample had insufficient income and overall health literacy at the level of awareness, which may have been caused by income insufficiency, causing health opportunities or access to health information to be more difficult than groups with sufficient income, which was consistent with previous studies which found income to be positively correlated with health literacy (Thummaphol et al., 2016; Heijmans et al., 2015, Shi et al., 2017).

## 3. Correlations between Health Literacy and Performance of 3 Or. 2 Sor. Behaviors and Clinical Outcomes

Health literacy was correlated with performing 3 Or. 2 Sor. behaviors. The findings can be explained by how high or adequate health literacy will create positive health behaviors and clinical outcomes. In this study, most of the sample had health literacy at the level of awareness, causing the sample to have inadequate 3 Or. 2 Sor. behaviors along with causing the sample to have excessive triglyceride levels ( $\bar{x}=150.69$  mg/dl., S.D.=105.00), causing risk or complications from chronic illnesses. Most of the sample was found to have risk of cardiovascular disease and stroke in the future (CVD risk score) at a low-to-medium level. Low health literacy can be seen to have caused the sample to have lower understanding of information and seek self-care information less, causing inappropriate health behaviors and negative health outcomes. This was consistent with the concept of Don Nutbeam (2000) on health literacy. When a person has good health literacy, the person will have health information and skills in accessing information with knowledge, understanding and ability to seek information for use in making decisions to perform health behaviors. This was consistent with previous studies which found health literacy to be correlated with health behaviors with statistical significance (Ginggeaw & Prasertsri, 2016; Daroon, 2019; Du et al., 2018; Shi et al., 2017). In addition, studies conducted by Thummaphol et al. (2016), Zuercher et al. (2017) and Kesic et al.(2022) found health literacy to be correlated with fat levels and a study conducted by Kesic et al. (2022) found health literacy to be correlated with a higher risk of stroke and cardiovascular disease in the future.

## Limitations of the study

This study was conducted among diabetic and hypertensive older adults. Most of the sample was society-bound and have better access to information and healthcare services with high literacy. However, there are some

limitations for policy makers, health care provider, and stakeholders to promote health literacy of the society-bound older adults.

### **Recommendation**

In improving health literacy, healthcare teams should give consideration to gender, older age, income sufficiency, and cognitive function to help older adults have health literacy and perform effective self-care. Furthermore, quasi-experimental research should be conducted by using the program for improving health literacy among diabetic and hypertensive older adults to develop self-management skills in order to change health behaviors and reduce future risks of hyperlipidemia, stroke, and cardiovascular disease. In addition, more studies should be conducted by having the research participants as the sample, including older adults with diabetes, hypertension, and housebound and bedbound older adults groups.

### **Conflict of interests**

The author has no conflict of interest.

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