

Factors Associated with Health Literacy in Suburban Bangkok Type 2 Diabetics (T2DM): A Cross-Sectional Survey

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Background: Health literacy encompasses an individual capacity to make health decision. Low health literacy has been linked to poorer diabetes outcome as health problem in Thailand.

Objective: To evaluate health literacy levels and determine associated factors among diabetics in suburban Bangkok, Thailand.

Materials and Methods: A cross-sectional study was carried out amongst type 2 diabetics (T2DM) followed up at a public primary healthcare centre in Sai Mai, Bangkok. Simple random sampling was used to obtain an adequate sample as 312 T2DM who were administered with a locally-adapted questionnaire to determine three skill domains of health literacy, which are functional, interactive, and critical. One-way ANOVA, t-tests were used to assess the relationship of various associated factors with the three domains of health literacy. Analytical was performed using SPSS 16.

Results: Of the 312 patients sampled, almost two-thirds had moderate health literacy levels across functional, interactive, and critical skills domains. Despite these health literacy levels, 61.5% of the samples had poor glycemic control. Education was the only factor significantly associated with health literacy across all three skill domains.

Conclusion: In Thai diabetics, the study showed moderate levels of health literacy. Besides education, other factors may be affecting such as health numeracy. Targeted future research may pinpoint a strategy that directly impact diabetes disease outcomes.

Keywords: Health literacy, Health education, Health promotion, Diabetes mellitus, Thailand

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Health literacy is defined as the capability of individual to receive, understand, and interpret health information; helping them make informed health decisions⁽¹⁾. It encompasses a set of distinct skills such as; (i) functional skill, which is the individual's ability to find, read, and process health information; (ii) interactive skills where individuals are able to listen and communicate health information; and (iii) critical skills, which are the ability to navigate the health system and make correct health

decisions⁽²⁾. The critical importance of health literacy has become more evident in recent years, making it an increasingly important component of global health promotion efforts today⁽³⁾. This is because low health literacy has been clearly established as a strong predictor of health when compared to other social determinants as well as being strongly associated with worse health outcomes⁽⁴⁻⁶⁾. Health literacy is especially important in chronic diseases such as diabetes, where extensive self-care is required from patients to manage their condition. This is because much of the information will only be obtainable via the utilization of advanced health literacy skills. A framework exploring the relationship between health literacy and health actions postulates that health literacy influences socio-cognitive and psychological acceptance such as knowledge that determine an individual's actions on health, including in areas of

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self-care and disease management⁽⁷⁾. Interestingly, while contextual literature has found consistent associations between low health literacy and poorer knowledge of diabetes, there is a lack of evidence to suggest that it is independently associated with poorer disease outcomes in terms of diabetes⁽⁸⁾.

Thailand is a Southeast Asian middle income nation facing a growing diabetes epidemic, fueled in part by urbanization and rising socio-economic levels, changing dietary practices leading to high obesity rates, and an increasingly aging society⁽⁹⁾. The national prevalence of diabetes, for example, has risen four-fold since 2005 with glycemic control remaining poor⁽¹⁰⁾. Recognizing the growing burden of diabetes, from the late 1990s, the government has aggressively pursued a nationwide health promotion program that incorporates health literacy initiatives⁽⁹⁾. Health literacy levels in Thailand remain low as reported by the Ministry of Public Health (MOPH) cross-sectional survey in Thais aged 15 to 60 years old, and based on the results from other Thai health-literacy studies⁽¹¹⁻¹³⁾.

Little is known about health literacy levels among Thai diabetics due to a scarcity of research in this area. Evaluating health literacy levels amongst this population and determining predictors of health literacy for them will prove to be important for formulating strategies to improve community health literacy levels. A better health literacy would provide a beneficial impact on diabetic outcomes. The present study aimed to evaluate the level of health literacy amongst type 2 diabetes mellitus (T2DM) patients in suburban Bangkok, Thailand, as well as to determine factors associated with health literacy in this population.

Materials and Methods

The present study was a cross-sectional survey of T2DM patients followed-up at a public primary healthcare center in Sai Mai District, a suburban area of Bangkok. Sai Mai is similar to other Bangkok suburbs in that it is home to largely lower socio-economic Thais and immigrants who worked in the city but live in the suburbs due to significant lower living costs. Inclusion criteria for the study were (i) diagnosed T2DM, (ii) undergoing regular treatment at the Sai Mai primary healthcare center, and (iii) resided in Sai Mai for at least a year at the time of study. Exclusion criteria were (i) illiterate i.e., could not read or write, (ii) suffered from hearing loss, and (iii) diagnosed with mental disabilities or had diminished mental facilities. Based on the findings of a previous study with a power of 80%, a significance of $p=0.05$, and a drop-out rate

of 20%, the required sample size was calculated to be 312⁽¹⁴⁾. A list of patients who fit the inclusion criteria was prepared according to their clinic registration numbers and the samples were randomly selected using a freely available online software (<http://stattrek.com/statistics/random-number-generator.aspx>).

Health literacy levels of the studied sample were measured using the tool that had been adapted, translated, and utilized for this purpose in Thai settings by the Ministry of Public Health^(15,16). The questionnaire, locally-adapted from the Test of Functional Health Literacy in Adults (TOFHLA) and the Functional, Communicative, and Critical Health Literacy (FCCHL)⁽¹⁷⁾, had a demonstrated reliability with a Cronbach's alpha of 0.73 and a validity of 0.85^(15,16). The tool assessed health literacy via three separate skill domains, which are functional, interactive, and critical.

The section measuring functional skills consisted of 15 questions on health knowledge and understanding as well as access to information and services. Correct answers received one point while wrong answers for this section were given no points, with possible scores between zero and thirty. Interactive health literacy skills were measured using 11 questions that assessed participants' ability to communicate for improving understanding of health information and management of their own health conditions, with a score range between zero and 44. The third domain of critical skills were measured using a set of 10 questions that assessed ability to obtain media and health information as well the ability to make appropriate health decisions, with a possible score ranging from 0 to 40. The patients were categorized into three categories as defined in the questionnaire according to marks received in each domain, namely low, moderate, and high levels of health literacy.

In addition, socio-demographic data such as age, gender, education, marital status, levels of social support (whether residing with family or having a care-taker), current medical history such as duration of diabetes, and current HbA1c levels were also captured using separate questions attached as part of the questionnaire.

Selected participants were approached during their scheduled follow-up visit at the public primary healthcare center to obtain their consents for participation. Upon receiving written informed consent, research team members who had received training on the methods of administering the questionnaire, conducted face-to-face interviews with them. In addition, necessary medical data was

Table 1. Characteristics of study sample

Characteristics (n=312)	n (%)	Characteristics (n=312)	n (%)
Sex		Having care taker	
Male	94 (30.1)	Yes	208 (66.7)
Female	218 (69.9)	No	104 (33.3)
Age (years)		BMI (normal 18.5 to 22.9)	
<50	24 (7.7)	<18.5	2 (0.6)
50 to 59	73 (23.4)	18.5 to 22.9	49 (15.7)
≥60	215 (68.9)	23.0 to 24.9	53 (17.0)
Education		25.0 to 29.9	144 (46.2)
Uneducated	16 (5.1)	≥30.0	64 (20.5)
Lower than high school	191 (61.2)	Duration with T2DM (years)	
High school and higher	105 (33.7)	≤5	122 (39.1)
Marital status		6 to 10	106 (33.9)
Single	36 (11.3)	>10	84 (27.0)
Widow	68 (21.8)	Comorbidity	
Married	197 (63.1)	Yes (more than one)	277 (88.7)
Divorce	11 (3.5)	• Hypertension	222 (81.0)
Income per month (THB)		• Dyslipidemia	121 (44.2)
≤5,000	121 (38.8)	• Diabetic retinopathy	23 (8.4)
5,001 to 15,000	142 (45.5)	• Cardiovascular disease (CVD)	17 (6.2)
>15,000	49 (15.7)	• Kidney disease	3 (1.1)
Welfare health care		• Other	53 (16.9)
UCS	266 (85.9)	No	35 (11.3)
Government	31 (9.9)	HbA1c (%)	
Payment	12 (3.8)	<7.0	120 (38.6)
Other	3 (0.9)	7.0 to 7.9	96 (30.7)
Stay with family		8.0 to 9.9	72 (23.1)
Yes	295 (95.6)	≥10.0	24 (7.7)
No (home alone)	17 (5.4)		

THB=Thai baht; UCS=universal coverage scheme; BMI=body mass index; T2DM=type 2 diabetes mellitus; HbA1c=hemoglobin A1c

extracted from the patient's clinical case notes. The study was carried out between April and July 2016.

Statistical analysis

The general characteristics of the sample as well as their health literacy levels according to domain were compiled using descriptive statistics. From extensive reviewed of literatures, certain independent factors were identified as being significantly associated with health literacy levels in various settings. To

assess the association between sex and each of health literacy domain, student t-test was used. One-way ANOVA was used to study the relationship of other characteristics and Scheffé test for pair-wise comparison in post-hoc analysis. Significance was set at p-value less than 0.05. Analyses were completed using SPSS version 16. The present study received ethical approval from the Research Ethics Review Committee for Research Involving Human Research Participants, Health Science Group, Chulalongkorn

Table 2. Levels of patients' health literacy by domains

Components of health literacy (n=312)	Low n (%)	Moderate n (%)	High n (%)
Functional	(0 to 14.9)	(15.0 to 23.9)	(24.0 to 30.0)
Overall	17 (5.4)	202 (64.7)	93 (29.8)
• Health knowledge and understanding	20 (6.4)	232 (74.4)	60 (19.2)
• Accessing health information and services	14 (4.5)	197 (63.1)	101 (32.4)
Interactive	(0 to 21.9)	(22.0 to 35.1)	(35.2 to 44.0)
Overall	67 (21.5)	238 (76.3)	7 (2.2)
• Communicating for improved understanding	118 (37.8)	187 (59.9)	7 (2.2)
• Managing health condition	198 (63.4)	100 (32.1)	14 (4.5)
Critical	(0 to 19.9)	(20.0 to 31.9)	(32.0 to 40.0)
Overall	66 (21.2)	221 (70.8)	25 (8.0)
• Obtaining media and health information	113 (36.2)	171 (54.8)	28 (9.0)
• Making appropriate health decisions	29 (9.3)	226 (72.4)	57 (18.3)

University (COA No.060/2016).

Results

Of the 312 T2DM sample, almost 70% were female and aged over 60 years old. Sixty-six-point-three percent received education lower than high school, 84.3% earned less than 15,000 baht a month, and 85.9% were on the universal coverage scheme (UCS). A little more than 95% lived with their family, 83.7% of the patients had body mass index (BMI) over normal levels, 60.9% of them had had diabetes more than five years, with 88.7% of the total sample having at least one other comorbid disease besides diabetes. Diabetes control in these samples was also not up to recommended levels, with 61.5% having HbA1c levels higher than the optimum recommended levels of below 7% (Table 1).

Most of the sampled patients had moderate levels of health literacy in terms of functional skills (64.7%), interactive skills (76.3%), and critical skills (70.8%). High levels of health literacy were seen in few of the patients across the three domains, with a particularly low percentage of patients (2.2%) having high health literacy in terms of interactive skills (Table 2).

Of the assessed factors, age, education, marital status, monthly income, and duration of time suffering from diabetes were significantly associated with functional health literacy. Some of these factors, with the exception of age and duration suffering from diabetes mellitus, were also similarly associated with interactive health literacy skills, with gender being associated with this domain. Factors associated with

critical health literacy were age, education, and HbA1c levels. Overall, only education was significantly associated with all three domains of health literacy (Table 3).

Discussion

The present study found that more than half of T2DM in Sai Mai District, Bangkok, Thailand, had moderate levels of health literacy in terms of functional, interactive, and critical skills. Education levels was the factor significantly associated with all three health literacy domains. The higher-than-average levels of health literacy may be the result of exposure to prolonged health promotion efforts, as most of these patients' suffered from long-standing diabetes (60.9% over five years) that necessitated them attending regular clinical follow-ups in which health education was a key component^(9,10). These findings were similar to the 2014 Brazilian study, with health literacy levels reported to be around two-thirds of the sample. However, in that study, only age and education were found to be significantly associated with health literacy levels⁽¹⁸⁾.

In the present study, it was shown that above-average health literacy rates did not reflect into improved diabetes outcomes, with more than half of the sample had poorly controlled diabetes levels. While some studies reported a similar finding to this one^(8,19), the results remain mixed with some others reported direct correlation between low health literacy and worsened diabetes disease outcomes⁽²⁰⁾. Some authors had related that the unclear relationship

Table 3. Factors associated with health literacy domains

Characteristics	Health literacy domains, Mean (SD)					
	Functional	p-value	Interactive communication	p-value	Critical	p-value
Sex		0.09		0.04		0.60
Male	22.2 (3.8)		22.2 (6.6)		23.4 (4.9)	
Female	21.4 (3.8)		20.4 (7.1)		20.4 (7.1)	
Age (year)		<0.01		0.09		0.02
<50	23.3 (2.9)		23.8 (8.1)		25.8 (6.0)	
50 to 59	22.6 (3.5)		21.1 (7.1)		22.6 (5.5)	
≥60	21.1 (3.8)		20.1 (6.8)		23.7 (4.6)	
Education		<0.01		<0.01		0.04
Uneducated	18.6 (2.1)		17.3 (5.9)		23.6 (3.9)	
Lower than high school	21.2 (3.8)		20.0 (6.7)		23.9 (4.6)	
High school and higher	22.8 (3.6)		23.2 (7.1)		24.7 (5.5)	
Marital status		<0.01		<0.01		0.08
Single	21.8 (3.8)		19.9 (8.0)		22.4 (4.9)	
Widow	20.1 (3.7)		18.5 (6.3)		23.5 (4.5)	
Married	22.1 (3.7)		22.1 (6.8)		24.0 (5.1)	
Divorce	22.2 (3.8)		19.3 (6.0)		20.9 (4.7)	
Monthly income (THB)		<0.01		<0.01		0.08
≤5,000	20.3 (3.5)		19.4 (6.4)		23.2 (4.9)	
5,001 to 15,000	22.3 (3.9)		21.9 (4.4)		24.4 (4.8)	
>15,000	23.0 (3.1)		21.8 (6.5)		22.5 (4.9)	
Duration with DM (years)		<0.01		0.13		0.35
≤5	22.7 (3.3)		21.9 (7.6)		23.9 (5.2)	
6 to 10	20.8 (4.0)		20.3 (6.8)		23.0 (4.6)	
>10	21.2 (3.9)		20.3 (6.1)		23.8 (4.9)	
HbA1C (%)		0.17		0.73		<0.01
<7.0	22.2 (3.5)		22.1 (7.2)		24.6 (5.1)	
7.0 to 7.9	21.6 (3.8)		20.6 (6.5)		23.5 (4.5)	
8.0 to 9.9	20.8 (4.1)		19.3 (6.6)		21.7 (4.6)	
≥10.0	21.9 (3.8)		19.6 (7.7)		23.1 (4.8)	

SD=standard deviation; THB=Thai baht; DM=diabetes mellitus; HbA1c=hemoglobin A1c

between health literacy and clinical outcomes in diabetes as observed in the present study is due to the lack of inclusion of another variable, called health numeracy⁽²¹⁾.

Health numeracy is another multidimensional skill that requires an individual to be able to (i) assess appropriateness in using numerical skills, (ii) making a decision on type of skills to use, (iii) utilizing solving problems using these skills, and (iv) appropriately

interpreting the results⁽²²⁾. Although health literacy and numeracy are related, various studies have found that while patients may have adequate health literacy, they may lack basic numerical abilities⁽²³⁾. This may also be true in this population where overall education levels were low on average.

The impact of health literacy and numeracy on self-care activities and health outcomes may vary according to the respective disease⁽²³⁾. In diabetics,

for example, health numeracy may include skills in interpreting glucose monitoring results, calculating appropriate food-caloric intake, and calculation of insulin doses⁽²³⁾. Some aspects of health numeracy may be contained within the questions asked of patients pertaining to the critical skills domain, which explains why it alone, of the three domains, reflected a significant relationship to disease outcomes i.e., the mean HbA1c levels. Further long-term research is needed to capture individually the effects of health numeracy on this population, which will help focus interventions designed to improve disease outcomes.

The present study was limited that it was conducted in a single site, made the findings specific to this setting. In addition, the cross-sectional design of the study rendered the findings to be of a ‘point-prevalence’ nature, with the population restricted to patients who were interviewed during the time that the study was conducted. Furthermore, as the exclusion criteria removed individuals who were illiterate, the sample may have been reflected only those of high literacy, with some vulnerable groups excluded from the study.

Despite these limitations, there are some aspects to the present study that make it of singular importance. First, this study provided an important ‘first-look’ into the depth of the problem of health literacy amongst Thai T2DM. Second, the study used an adequately powered sample size and robust analytical techniques to clearly identify factors affecting health literacy levels. Finally, the study used a comprehensive validated questionnaire designed to capture each separate domain of health literacy separately to provide a holistic picture of health literacy among the sampled population.

From the present study, further research is needed focusing the educational deficiencies that may be the drivers of both health literacy and hitherto unexplored relationships with health numeracy in the Thai diabetic population. The results of these studies will play a crucial role in directing strategies to improve the levels of health literacy and numeracy that will have a positive impact on the endgame, which is better diabetes disease outcomes.

What is already known on this topic?

“Health literacy” is well known and used to explain the problem of patients that do not understand health information or lack the intelligence on health. Optimal management of diabetes mellitus requires collaboration between multidisciplinary healthcare providers and patients to achieve effective self-care

in many tasks including adherence and manipulation of complex medication schedules, executing detailed dietary recommendations, promoting physical activity, and participation in preventative care strategies (Funnell et al, 2010)⁽²⁴⁾. Although, there are many determinants that contribute to the process of care and health outcomes for patients with complex chronic disease such as diabetes mellitus, over the past two decades, the literature has been growing, illustrating the concept of health literacy as a relevant and influential factor related to diabetes mellitus. However, studies of health literacy in Thailand, especially in older adult and elderly patients with diabetes, are limited.

What this study adds?

The level of health literacy in type 2 diabetics in suburban Bangkok depict the condition of barriers for glycemic control. Factor related health literacy is described by the intersection between the demands and complexity of the condition and the skills and ability necessary to manage the condition. There were several factors related to the three domains of Health literacy. Discovery was meaningful to develop the intervention support achievement goal of T2DM management and the interactive communication booklet toolkit for the limited capacity to learn, understand, apprise, and transfer health information.

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Conflicts of interest

The authors declare no conflict of interest.

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