ORIGINAL RESEARCH ARTICLE

Health Literacy and Associated Factors Patients with Type 2 Diabetes Mellitus in Rural Thailand

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a chronic disease that poses a significant public health challenge. Effective management requires patients to engage in self-care behaviors, including medication adherence, a healthy diet, and regular blood glucose monitoring. Health literacy plays a crucial role in enabling patients to understand and apply health information, reducing complications, and improving outcomes. This study aims to assess the health literacy of T2DM patients in rural Samut Songkhram Province, Thailand.

Methods: This cross-sectional descriptive study involved 403 T2DM patients from Samut Songkhram Province. Data were collected using a health literacy questionnaire assessing knowledge, information access, and decision-making abilities. Participants were selected through multi-stage random sampling, and data were analyzed using descriptive and inferential statistics, including stepwise multiple linear regression.

Results: The study revealed that the overall health literacy of patients was low (M = 34.72, SD = 6.28). Three factors significantly predicted health literacy: education level (Beta = 0.427), complications (Beta = 0.316), and occupation (Beta = 0.218). These factors accounted for 58.4% of the variance in health literacy, with statistical significance ($R^2 = 0.584$, $p < 0.05$).

Conclusion: The study highlights low health literacy among T2DM patients. To address this, public health agencies should implement community-based educational programs, and healthcare providers should offer personalized health education to improve diabetes management and self-care behaviors.

Keywords: Health Literacy, Type 2 Diabetes Mellitus, Patients with Type 2 Diabetes Mellitus

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic, non-communicable disease that poses a significant threat to global health. Its increasing prevalence is a growing concern, particularly due to its impact on cardiovascular health and the risk of premature mortality.[1] Globally, approximately 537 million people have diabetes, with over 90% diagnosed with T2DM. Nearly half of these cases remain undiagnosed. It is estimated that by 2030, the number of diabetes cases will rise to 643 million, and by 2045, it will reach 783 million. The countries with the highest diabetes prevalence include Pakistan, where nearly 33 million adults (31%) are affected, followed by French Polynesia (25.23%) and Kuwait (24.94%). Meanwhile, China has approximately 140 million people with diabetes, with a prevalence rate of 10.6%, largely due to its vast population.[2,3] In Thailand, the incidence and prevalence of diabetes continue to rise annually. In 2023, there were 300,000 new cases of diabetes, and in 2022, the total number of diabetic patients reached 3.3 million, reflecting an increase of 150,000 from 2021. Screening for new patients in 2023 indicated that individuals aged 35 and older should undergo annual diabetes screening, with the recommended blood sugar level not exceeding 126 milligrams per deciliter.[4,5] The primary cause of the increasing prevalence of diabetes in Thailand is a shift in lifestyle marked by higher fast-food consumption and more sedentary work environments involving prolonged sitting. This lifestyle reduces physical activity, accumulating sugar and fat in the body, which is a major factor in the development of diabetes.[6] Research indicates that approximately 30% of the Thai population is not at risk of developing the disease, while the majority is at some level of risk. This aligns with research findings linking low health literacy to poor health outcomes. The rise in chronic diseases can, in part, be attributed to a limited understanding of health information, resulting in inadequate knowledge of proper self-care practices.[7]

The World Health Organization defines health literacy as the cognitive and social skills determining an individual's motivation and ability to access, understand, and use information to promote and maintain their health. Health literacy plays a crucial role in health-related behaviors across a spectrum from wellness to illness, enhancing self-care and ultimately leading to improved quality of life and physical well-being.[6,8] Changing health behaviors requires health literacy, which enhances the knowledge and understanding necessary for effective self-care. A literature review found that health literacy plays a significant role in managing T2DM. When examining health literacy levels by gender, males generally had higher health literacy than females. This disparity is attributed to the higher educational attainment among males, contributing to better health literacy.[9] Additionally, increasing age is inversely related to health literacy, as older individuals tend to have slower learning and perception abilities. Research indicates that older individuals generally have lower health literacy than younger ones, and individuals with low health literacy tend to experience poorer health outcomes than those with higher education levels. These findings underscore the importance of education in achieving good health.[8,10,11] The literature review conducted abroad found that a cross-sectional study in Malaysia, specifically in Perak, revealed that 65.3% of T2DM patients had limited health literacy. Factors such as ethnicity, education level, income, language proficiency, attendance at diabetes education sessions, and perceived social support were significantly associated with health literacy levels. Notably, patients who were not fluent in English were more likely to have limited health literacy, while those with high perceived social support and those who attended diabetes education sessions demonstrated better health literacy.[12]

According to the summary report from the Samut Songkhram Provincial Public Health Office, data on diabetes cases over the past three fiscal years (2020–2022) indicate an increasing trend in the incidence of new diabetes cases per 100,000 population, with rates of 567.25, 567.60, and 612.26, respectively. In the fiscal year 2023, the rate of new diabetes cases was recorded at 512.07 per 100,000 population.[13] Studies of patients with T2DM in rural areas reveal that some individuals still engage in inappropriate health behaviors, and their knowledge and understanding of self-care are insufficient. Many of these patients are elderly and have limited access to health information. This may result from inadequate health literacy for self-management. The data indicate a significant annual increase in diabetes patients seeking treatment at community health promotion hospitals in Samut Songkhram Province. Therefore, the researcher is interested in studying the health literacy of T2DM patients in Samut Songkhram to utilize the findings for targeted problem-solving and to provide a foundational basis for planning educational initiatives and recommendations that effectively promote health literacy within this patient population.

METHODOLOGY

This cross-sectional descriptive study examines the health literacy of patients with T2DM in Samut Songkhram Province, Thailand. Data collection was conducted from May to July 2024. This study received ethical approval from the Human Research Ethics Committee, Suan Sunandha Rajabhat University, COA.1-024/2024, and approval from the schools to approach students and parents for data collection. Parents' consent was received before assent from the sample.

Participants:

The population for this study comprises patients with Type 2 diabetes mellitus (T2DM) in Samut Songkhram Province, Thailand. These patients are

distributed across three districts: Samut Songkhram District, Amphawa District, and Bang Khonthi District, totaling 13,095 individuals. The sample size was calculated using the Krejcie and Morgan formula, assuming a proportion of 0.5, an acceptable error of 5%, and a reliability level of 95%.[14] This calculation yielded a result of 373.18, leading to a final sample size of 373 individuals. To account for potential errors and inaccuracies during data collection, the researcher included an 8% margin of error, resulting in an adjusted sample size of approximately 403 individuals. The inclusion criteria specified that participants must be diabetic individuals aged 35 years and older with a blood sugar level of ≥ 126 milligrams per deciliter. The exclusion criteria included individuals who were unable to care for themselves and those with cognitive impairments. A multistage sampling method was then employed as follows:

Step 1: Samut Songkhram Province is divided into 3 districts, all of which were sampled to ensure an even distribution across the province.

Step 2: Simple random sampling was used to select 4 sub-districts from each district, giving a total of 12 sub-districts.

Instruments:

The questionnaire used in this research was based on a literature review, with its structure and content divided into the following two parts as follows:

Part 1 General Information: The questionnaire's general information section includes seven items addressing respondents' gender, age, educational level, occupation, marital status, duration of diabetes, and presence of complications.

Part 2 Health literacy of patients with T2DM was divided into six components as follows:

Health cognitive skills of T2DM are assessed through 10 true-or-false items in questionnaire format. Scoring is as follows: a correct answer is awarded 1 point, while an incorrect answer receives 0 points. Score interpretation is divided into three levels: a score range of 4.80–6.00 indicates the highest level of accuracy, a range of 3.60–4.79 indicates moderate accuracy, and a score below 3.60 indicates low accuracy.

Access to health information and services consists of 2 items, with a total score of 10 points. The questionnaire utilizes a 5-point Likert scale: always, often, sometimes, rarely, and never. The scoring levels are divided into three categories: a score below 6.00 indicates a low level, a score ranging from 6.00 to 7.99 indicates a moderate level, and a score between 8.00 and 10.00 indicates a high level.

Health communication consists of 3 items, with a total score of 15 points. The questionnaire employs a 5-point Likert scale: always, often, sometimes, rarely, and never. For type 2 diabetes, the scoring levels are categorized into three groups: a score below 9.00 indicates a low level, a score ranging from 9.00 to 11.99 indicates a moderate level, and a score between 12.00 and 15.00 indicates a high level.

Self-management consists of 3 items, with a total score of 15 points. The questionnaire employs a 5-point Likert scale: always, often, sometimes, rarely, and never. The scoring levels are categorized into three groups: a score below 9.00 indicates a low level, a score ranging from 9.00 to 11.99 indicates a moderate level, and a score between 12.00 and 15.00 indicates a high level.

Media and information literacy consists of 2 items, with a total score of 10 points. The questionnaire employs a 5-point Likert scale: always, often, sometimes, rarely, and never. The scoring levels are categorized into three groups: a score below 6.00 indicates a low level, a score ranging from 6.00 to 7.99 indicates a moderate level, and a score between 8.00 and 10.00 indicates a very high level.

Informed decision-making for T2DM patients consists of 10 items. Scoring is based on adherence to recommended practices: 4 points for items performed at the highest level of accuracy, 3 points for items performed at a moderate level, 2 points for items performed at an acceptable level, and 1 point for items that require improvement. The total score for the 10 items is 40 points, and the scoring levels are divided into three categories: a score below 7.20 indicates a low level, a score ranging from 7.20 to 9.59 indicates a moderate level and a score between 9.60 and 12.00 indicates a high level.

The reliability of the whole questionnaire was tested using Cronbach's Alpha coefficient, which was 0.97 and 0.94, respectively.

Statistical analysis:

Statistical analyses were conducted using SPSS (SPSS Inc., Chicago, IL, USA) software for Windows. Descriptive statistics were used to analyze the general information of the sample, i.e., frequency, percentage, median, arithmetic mean (M), and standard deviation (S.D.). The stepwise multiple regression analysis was used to analyze factors influencing health literacy in patients with T2DM. For statistical tests, the significance level was set at 0.05.

RESULTS

The research participants consisted of 403 patients with T2DM residing in Samut Songkhram Province. Most were female (64.52%), with a mean age of 43 years (SD = 0.93). Most participants had an elementary education level (64.76%), were unemployed (30.27%), and were married (80.99%). They had been living with diabetes for at least 1 year (SD = 0.53). Regarding diabetes-related complications, the majority had no complications (65.51%) (Table 1).

Most participants had a low overall level of health literacy (M = 34.72, SD = 6.28). Among specific aspects assessed in patients with T2DM, the highest accuracy

Table 1: Characteristics of participants (n= 403)

Demographic variables	Participants (%)
Gender	
Male	143(35.48)
Female	260(64.52)
Age (years)	
35-45	31(7.7)
46-56	54(13.4)
57-67	143(35.5)
≥ 68	175(43.4)
Education	
Unlettered	20(4.96)
Primary	261(64.76)
Secondary	80(19.85)
Certificate/ Diploma	23(5.71)
Bachelor	19(4.71)
Occupation	
Unemployment	122(30.27)
Government Official	8(1.99)
Company Employee	3(0.74)
Agriculture	74(18.36)
General	107(26.55)
Employment	89(22.08)
Marital status	
Single	47(11.66)
Married	326(80.99)
Separated/Divorce/Widowed	30(8.81)
Duration of diabetes [Mean±SD]	1.22±.53
Complications from diabetes	139(34.49)

was found in health cognitive skills, where participants demonstrated correct comprehension (M = 5.62, SD = 1.95). However, access to health information and utilization of health services was low (M = 3.36, SD = 0.80), as were health communication (M = 3.28, SD = 0.73) and self-management for T2DM (M = 3.00, SD = 0.81). Media and information literacy was also low (M = 2.93, SD = 1.04), as was informed decision-making among T2DM patients (M = 33.39, SD = 0.37) (Table 2).

From the analysis of factors associated with health literacy, it was found that educational level, occupation, and complications from diabetes were significantly associated with health literacy at p <0.05. Among these factors, educational level had the strongest association with health literacy (r = 0.466, p <0.05). (Table 3)

The analysis of factors influencing health literacy among patients with T2DM identified three key variables with the strongest predictive power: education level (Beta = 0.427, p-value < 0.001), complications (Beta = 0.316, p-value <0.001), and occupation (Beta = 0.218, p-value = 0.021). These three factors collectively accounted for (58.40%) of the variance in health literacy of T2DM patients, indicating statistical significance with a *P*-value < 0.05. (Table 4)

Table 2: Health literacy of participants (n= 403)

Variables	M	SD	Level
Health cognitive skills	5.62	1.95	highest accuracy
Access to health information and services	3.36	0.80	Low
Health communication	3.28	0.73	Low
Self-management for T2DM	3.00	0.81	Low
Media and information literacy	2.93	1.04	Low
Informed decision-making for T2DM patients	3.39	0.37	Low
Total HL	34.72	6.28	Low

Table 3: Factors Associated with Health Literacy in Patients with Type 2 Diabetes Using Pearson's Correlation Coefficient (n = 403)

Variables	1	2	3	4
Education	1			
Occupation	.328*	1		
Complications	.106*	.246*	1	
Health literacy	.466*	.304*	.126*	1

*p<0.05

Table 4: Results of analysis of factors influencing health literacy in patients with T2DM by the stepwise multiple regression analysis

Variables	B	Beta	t	P-value	95% CI	VIF
Education levels	21.100	0.427	8.925	<0.00*	0.032-0.169	1.082
Complications	22.713	0.316	6.128	<0.001*	0.091-0.253	1.062
Occupation	1.176	0.218	2.350	0.021*	0.004-0.065	1.070

Constant =38.853, Adjusted R^2 = 0.584, *Significant at the 0.05 level

DISCUSSION

Participants exhibited an overall low level of health literacy (M = 34.72, SD = 6.28), which may be attributed to the fact that the majority of this group is over 43 years old and has an education level at the elementary level. This demographic characteristic likely contributes to the low level of health literacy. When examining the specifics, it was found that healthy cognitive skills among patients with T2DM

are at an acceptable level. This is likely due to their possession of essential skills that help them retain information, enabling them to understand and correctly follow the instructions given by their doctors and nurses. Additionally, these patients have valuable experience visiting healthcare providers regularly, which includes reading consent forms, understanding medication labels, and documenting their health care information.[1,10] This finding is consistent with the study by Jiraporn Ariyasit (2021), which reported that health literacy, in terms of knowledge skills and accurate interpretation, was predominantly at a good level.[15]

The findings regarding access to health information and services indicate that the sample group has a low level of health communication related to diabetes. This situation arises from a lack of information sources and an inability to assess, explain, filter, or make decisions about health information. Furthermore, the group lacks the skills to communicate effectively and utilize health information to manage and improve their health. As a result, they engage in inappropriate health behaviors in areas such as health promotion, disease prevention, and the use of health services.[8] This contrasts with the study by PongSiri Ngamumphanara (2017), which examined health literacy among patients with T2DM in the Bangkok metropolitan area. That study found that access to health information and services was moderate, suggesting that patients could seek some information and services but still struggled to apply this information in their decision-making. Overall, these findings indicate that patients with T2DM continue to lack the knowledge and understanding needed to critically evaluate accurate information before acting on it.[6]

The findings regarding health communication related to T2DM indicate that the sample group exhibits a low level of health communication skills. Although the public shows some ability in listening, speaking, reading, and writing for both self-communication and communication with others, they do not demonstrate proficiency in these areas.[4] This is consistent with the study by Sunee Sukserm (2023), which examined the relationship between health literacy and preventive behaviors for complications among diabetes patients at Somdej Phra Yuhparat Chom Bueng Hospital in Ratchaburi Province. That study found that health communication skills among patients with T2DM were at the lowest level.[16]

In terms of self-management for T2DM, the sample group exhibited a low level of self-management skills. This is primarily due to the public's limited ability to address various factors, including emotional issues, internal needs, and environmental challenges that hinder their health. This finding aligns with the study by Natenapa Kabmanee (2021), which explored the relationship between health literacy and self-care behaviors among patients with T2DM in Non-Sung Subdistrict, Mueang District, Udon Thani Province. That study similarly found that the sample group had low levels of self-management for T2DM.[17]

Regarding media and information literacy related to T2DM, the sample group demonstrated a low level of competency. This is due to the public's tendency to accept and trust information disseminated through the media without critically analyzing or verifying it before use. This indicates that patients with T2DM cannot engage selectively with media and do not verify the information before accepting its content as true.[7] This finding is consistent with the study by PongSiri Ngamumphanara (2017), which examined health literacy among patients with type 2 diabetes in the Bangkok metropolitan area. That study found that the sample group had poor media and information literacy regarding T2DM.[5]

Regarding decision-making regarding appropriate actions for patients with T2DM, the sample group exhibited a low level of competence. This is due to the public's insufficient decision-making, which does not adequately consider the importance of actions that would specifically benefit their health.[11] This finding is consistent with the study by Ungsumarin Pakwiset and Somsak Intamat (2023), which examined the relationship between health literacy and health care behaviors in preventing diabetes among at-risk populations. The results indicated that the decision-making regarding appropriate actions for patients with T2DM was at a poor level.[18]

The factors influencing health literacy among patients with T2DM include education level, which has been found to have a significant impact on health literacy. This may be because education helps individuals develop essential skills such as reading, writing, information-seeking, and accessing health-related data, as well as communication, self-management, and media literacy skills. Additionally, individuals can use this information to make informed decisions regarding appropriate health actions.[19] Furthermore, studies have identified education level as the strongest predictor of health literacy, with the majority of participants having only a primary school education. Education plays a crucial role in equipping individuals with knowledge, and literacy is fundamental to understanding health information. Individuals with limited literacy skills may struggle to comprehend health-related materials. Conversely, those who are literate can analyze, interpret, and respond to various health-related issues, enabling them to make informed choices that benefit their well-being.[20,21] This finding aligns with the study by Wannarat Rattanawarang (2018), which indicated that individuals with higher education levels tend to have greater health literacy. Additionally, the presence of disease complications also influences health literacy. Patients with T2DM who experience complications often engage in more self-care compared to those without complications. This suggests that while complications may present additional challenges, they may also serve as a motivator for patients to seek and apply health-related knowledge in managing their condition.[22] As

a result, this group may have enhanced self-management skills and better access to health information to prevent further complications. This is consistent with previous studies that found a relationship between disease complications and health literacy.[23] Another study found that patients with higher education levels had better media and information literacy skills compared to those who had only completed primary education or had no formal education.[20]

Regarding occupation, patients with T2DM in different professions exhibit varying levels of health literacy. This variation may be attributed to increased access to learning opportunities and health information through online media, which is now widely available across all professions. Additionally, certain occupations may provide employees with structured health education programs, employer-sponsored healthcare benefits, or regular health screenings, all of which can contribute to higher health literacy levels. Consequently, occupational differences can influence an individual's ability to obtain, process, and understand health information, ultimately impacting their overall health literacy.[9] This finding is supported by Thanalak Sukprasan's (2016) study, which identified a relationship between occupation and health literacy levels.[24] Similarly, research by Bodur et al. (2017) on health literacy among adults in Turkey found that occupation significantly correlates with health literacy ($p < 0.05$).[25] These findings suggest that employment status may serve as a pathway for improving health literacy, either directly through workplace health initiatives or indirectly through increased socioeconomic status and educational opportunities. Future research should further explore the specific occupational factors that contribute to higher health literacy among employed individuals.[21]

Conclusion

The results of this study indicate that health literacy among patients with T2DM is at a low level. The research suggests that public health agencies should develop strategies to promote, support, and establish policies aimed at enhancing health literacy for this patient group. This will enable T2DM patients to access health information and develop the ability to analyze and differentiate health-related information, thereby increasing their awareness of the importance of self-care. Health promotion programs for T2DM patients should focus on dietary choices, medication adherence, and self-monitoring of blood glucose levels, leading to appropriate and effective self-care behaviors. Additionally, emphasis should be placed on skill-building, expanding access to health information, improving communication, promoting disease self-management, and enhancing media literacy for T2DM patients. These efforts aim to improve health literacy levels and benefit both individuals and the national healthcare system. Regarding the limitations of this study, reliance on self-reported data may introduce bias, as patients might overestimate their health literacy or self-management capabilities. Additionally, possible recall bias could affect the accuracy of the information provided by participants, limiting the generalizability of the findings.

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