

Exploring the Factors Related to Health Literacy among People with Type 2 Diabetes Mellitus in a Tertiary Care Hospital in Thailand

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Abstract Patients having Type 2 Diabetes Mellitus (T2DM) face a substantial long-term challenge, impacting services, systems, communities, and individuals. Health literacy (HL) is acknowledged as a crucial skill in understanding individuals with T2DM. This study attempts to explore the association between age, gender, marital status, education level, individual income, family income, comorbidity and HL among individuals with T2DM receiving care at a tertiary hospital in Thailand. This research, employing a cross-sectional design, took place from March to August 2022, through a self-administered questionnaire which included participant characteristics and the 14-item Health Literacy Scale. We employed multiple linear regression analysis to investigate the pivotal factors that significantly forecast health literacy scores. Among the 159 adults diagnosed with T2DM, the mean health literacy (HL) score was 52.2 (SD 7.24), with 61.6% of participants demonstrating higher HL scores. Education level ($B = 3.062$, $p = 0.012$) and individual income ($B = 4.318$, $p = 0.005$) were found to be as significant predictors of HL. Comprehending health literacy (HL) can provide insights into the disparities observed among people having T2DM. In light of this understanding of its role, HL initiatives present an avenue to enhance diabetes nursing care. To enhance the quality of care and reduce morbidity and mortality rates among individuals with diabetes mellitus, nurses, healthcare providers, policymakers, and

decision-makers must acknowledge and address the diverse health literacy needs.

Keywords Health Literacy, Type 2 Diabetes Mellitus, Nurse and Healthcare Providers

1. Introduction

The increasing number of individuals with Type 2 Diabetes Mellitus (T2DM) is becoming a significant public health issue worldwide, including in Thailand. As a major non-communicable disease (NCD), T2DM exerts substantial economic burdens on individuals, healthcare services, and healthcare systems [1]. This condition is often associated with various comorbidities and adverse health outcomes, such as increasing risk of cardiovascular disease, stroke, kidney disease, and diabetic retinopathy [2]. Those with T2DM together with its complications contribute significantly to the global burden of disability and mortality, resulting in markedly worse overall health outcomes [3]. The literature on T2DM clinical practice underscores the importance of comprehensive management strategies [4]. Effective plans to delay diabetes progression and prevent comorbidities involve several key components: blood glucose monitoring and

control, regular physical activity, healthy eating, medication adherence, and problem-solving related to diabetes self-care [5]. Evidence indicates that optimal control of T2DM necessitates individuals engaging in lifestyle behavior changes, which influence factors such as diabetes self-management, self-efficacy, and health literacy [1, 5, 6].

The term "Health Literacy (HL)" is identified as the intellectual and social abilities that affect a person's motivation and ability to find, understand, and use health information to support and maintain their health. It is a critical factor influencing diabetes' self-management behaviors and clinical outcomes [7]. Low levels of HL are linked to inferior healthcare processes, inadequate diabetes knowledge, decreased self-efficacy, poor self-care practices, substandard glycemic control, and negative health outcomes [5]. A systematic review has highlighted that limited Health literacy in individuals having T2DM negatively impacts diabetes self-management and empowerment, leading to poorer health outcomes [8]. Conversely, higher HL positively influences health results and enhances life quality [9]. The burden of T2DM presents a significant long-term challenge for individuals, communities, healthcare services, and systems. Understanding the role of HL is necessary for developing strategies to improve diabetes care and inform services and policies that address the HL needs of T2DM [10]. Over the past decade, HL has garnered significant global attention, including in Thailand, as researchers and practitioners recognize the importance of assessing and optimizing HL in people with T2DM [8, 10, 11]. The Thai Ministry of Public Health has introduced a national strategic plan with the goal of transforming all communities into health-literate societies by 2035 [2]. Achieving optimal health outcomes hinges on bridging the gap between healthcare professionals' knowledge and patients' understanding. When individuals are able to find, evaluate, and use essential health care services, they are better in making well-informed health decisions, adopting healthy behaviors, and enhancing their overall well-being [12]. Therefore, addressing HL is vital for sustained healthcare service improvement, with the goal of routinely assessing and enhancing HL among patients. Nonetheless, there remains a significant disparity in HL levels among individuals with T2DM across different populations and healthcare settings.

HL is a crucial skill for people having T2DM in managing their health status and minimizing diabetes-related complications [13]. Research indicates that limited HL is often associated with low socioeconomic status, low education levels [14], and advanced age [15].

In response to the high prevalence and rising burden of T2DM, Thailand's national health policy emphasizes preventive measures, treatment strategies, and rehabilitation services preventive measures, treatment strategies, and rehabilitative care [16]. The National Health Examination Surveys V and VI underscore the significance

of psychological and social aspects, including health-seeking behaviours and healthcare provision in influencing policy formulation and healthcare delivery [17-19]. Improving HL is essential, as it mediates access to healthcare and enhances individuals' ability to perceive healthcare needs and manage their diabetes [1]. Low HL is common among T2DM patients and correlates with unfavorable health behaviors and results [20]. Therefore, nurses and healthcare providers should focus on enhancing HL through nursing care and healthcare activities, ultimately improving health outcomes for T2DM patients. However, investigations regarding knowledge of diabetes and its contributing factors among patients with T2DM in Thailand are scarce. The aim of this study is to investigate the association between age, gender, marital status, education level, individual income, family income, comorbidity and HL among patients with T2DM in a tertiary care hospital in Thailand.

2. Materials and Methods

2.1. Study Design

This research employed cross-sectional approach, conducted between March and August 2022 at the endocrinology outpatient department of Phramongkutklao Hospital in Bangkok, Thailand. Participants were selected using purposive sampling. Inclusion criteria were Thai individuals diagnosed with T2DM aged 20 years and above, who expressed willingness to participate and could provide informed consent. The 159 subjects fulfilled these requirements and were enrolled in the investigation. Patients with sepsis, psychosis, or cognitive impairment were excluded. All participants were explained of this research's rationale and methodology.

2.2. Measurements

The participant demographics encompassed age, gender, marital status, educational attainment, individual income, family income, duration of diabetes mellitus and presence of comorbidities.

HLS-14 was used to measure the level of health-related knowledge, adapted from the study of Ishikawa and colleagues [21]. The questionnaire comprises three domains: functional literacy, communicative literacy, as well as critical literacy using a five-point Likert scale from "strongly disagree" to "strongly agree" [22]. The overall HL score, including scores for functional, communicative, and critical HL, was calculated by summing the item scores for each respondent. Greater scores indicate higher HL [23]. Our findings indicated that the Cronbach's alpha for internal consistency was 0.90. Participants were divided into two groups depending on the mean total HL score of 52.

2.3. Statistical Analysis

The data analysis was carried out employing SPSS software version 28 (version 28, Chicago, IL, USA). We utilized descriptive statistics to present the characteristics of the participants and their health literacy scores, expressed as mean (standard deviation), frequencies, and percentages. The study conducted multiple linear regression analysis to identify the factors that significantly predicted health literacy in individuals with T2DM. P-value below 0.05 was regarded as statistically significant.

2.4. Ethical Consideration

This study was ethically approved by the Institutional Review Board of the Royal Thai Army Medical Department (Approval No. IRBRTA 1654/2564). Prior to data gathering, written informed consent was collected from all respondents to ensure protection of their identities and confidentiality. The research followed the principles outlined in the Helsinki Declaration

3. Results

This study included 159 individuals diagnosed with T2DM, aged between 24 and 59 years (50.8 ± 7.23). The largest group of respondents aged 55 years and above (34.6%), male (52.2%), and married (61.6%). Most participants had attained a higher education (61.0%), with individual and family incomes ranging $\leq 40,000$ THB (79.9%) and (52.8%), respectively. Additionally, a significant proportion of participants reported having comorbidities (88.7%) (See Table 1).

Overall, the mean score of HL of 159 people with T2DM was 52.2 (7.24), of which 38.4% (n=61), and 61.6% (n=98) had lower HL score, and higher HL score, respectively. The mean score for functional literacy was the highest (19.2), whereas that for critical literacy was the lowest (14.8) (Table 2).

The statistical method used for the associating between the factors and HL was linear regression analysis among individuals with T2DM. The findings suggested that education level had a significant positive effect on HL scores ($B = 3.062$, $p = 0.012$), indicating that for each unit increasing in education level, HL scores in individuals with

T2DM increased by 3.062 points. Similarly, individual income positively influenced HL scores ($B = 4.318$, $p = 0.005$), indicating that each unit increase in individual income corresponded to a 4.318-point increase in HL scores among individuals with T2DM (Table 3).

Table 1. The participant's characteristics (n=159)

Characteristics	Frequency	Percentage
Age, years		
≤ 45	36	22.6
46 - 50	27	17.0
51 - 55	41	25.8
> 55	55	34.6
Gender		
Male	83	52.2
Female	76	47.8
Marital status		
Unmarried	61	38.4
Married	98	61.6
Education level		
≤ High School	62	39.0
> High School	97	61.0
Individual income (THB)		
≤ 40,000	127	79.9
> 40,000	32	20.1
Family income (THB)		
≤ 40,000	84	52.8
> 40,000	75	47.2
DM duration, years		
< 10	120	75.5
10-15	15	9.4
> 15	24	15.1
Comorbidity		
No	18	11.3
Yes	141	88.7

THB: Thai Baht; DM: Diabetes Mellitus

Table 2. The 14-item Health Literacy Scale (HLS-14)

Questions	Mean (SD)	Strongly disagree n (%)	Disagree n (%)	Not sure n (%)	Agree n (%)	Strongly agree n (%)
Functional literacy	19.2(4.5)					
Q1 find characters that I cannot read	3.7(1.05)	41(25.8)	70(44.0)	21(13.2)	24(15.1)	3(1.9)
Q2 the print is too small for me (even though I wear glasses)	3.8(1.20)	62(39.0)	46(28.9)	16(10.1)	32(20.1)	3(1.9)
Q3 the content is too difficult for me	3.7(1.01)	38(23.9)	70(44.0)	26(16.4)	23(14.5)	2(1.3)
Q4 it takes a long time to read them	3.8(1.09)	48(30.2)	68(42.8)	16(10.1)	23(14.5)	4(2.5)
Q5 I need someone to help me read them	4.0(1.09)	77(48.4)	40(25.2)	20(12.6)	21(13.2)	1(0.6)
Communicative literacy	18.1(3.1)					
Q6 I collect information from various sources	3.2(1.03)	8(5.0)	33(20.8)	46(28.9)	59(37.1)	13(8.2)
Q7 I extract the information I want	3.5(0.86)	4(2.5)	14(8.8)	46(28.9)	81(50.9)	14(8.8)
Q8 I understand the obtained information	3.5(0.83)	1(0.6)	11(6.9)	68(42.8)	58(36.5)	21(13.2)
Q9 I tell my opinion about my illness to my doctor, family, or friends	4.0(0.68)	2(1.3)	3(1.9)	12(7.5)	110(69.2)	32(20.1)
Q10 I apply the obtained information to my daily life	3.7(0.80)	2(1.3)	9(5.7)	36(22.6)	90(56.6)	22(13.8)
Critical literacy	14.8(2.4)					
Q11 consider whether the information is applicable to me	3.7(0.64)	2(1.3)	2(1.3)	36(22.6)	108(67.9)	11(6.9)
Q12 I consider whether the information is credible	3.7(0.68)	1(0.6)	6(3.8)	44(27.7)	97(61.0)	11(6.9)
Q13 I check whether the information is valid and reliable	3.6(0.74)	2(1.3)	3(1.9)	55(34.6)	81(50.9)	18(11.3)
Q14 I collect information to make my healthcare decisions	3.6(0.86)	2(1.3)	14(8.8)	41(25.8)	81(50.9)	21(13.2)

Table 3. Association between HL and related factor using linear regression analysis

Variables	Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	95%(CI)		<i>p</i>	Tolerance	VIF
	<i>B</i>	<i>SE</i>	<i>Beta</i>		lower	upper			
Intercept	55.236	4.954		11.155	45.474	65.051	<0.001***		
Age	-0.118	0.083	-0.118	-1.427	-0.281	0.045	0.156	0.843	1.186
Gender	0.928	1.156	0.064	0.802	-1.357	3.212	0.424	0.898	1.114
Marital Status	0.065	1.197	0.004	0.054	-2.300	2.430	0.957	0.884	1.131
Education level	3.062	1.210	0.207	2.532	0.672	5.453	0.012*	0.860	1.163
Individual income	4.318	1.503	0.240	2.874	1.349	7.287	0.005**	0.824	1.212
Family income	0.042	1.130	0.003	0.037	-2.191	2.275	0.970	0.941	1.063
duration	-0.008	0.090	-0.007	-0.087	-0.186	0.171	0.931	0.956	1.046
Comorbidity	-0.608	1.836	-0.027	-0.331	-4.235	3.019	0.741	0.885	1.30

T2DM: Type 2 Diabetes Mellitus; *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

4. Discussion

The research's objective aimed to explore the association between the age, gender, marital status, education level, individual income, family income, comorbidity and HL among individuals diagnosed with T2DM receiving care at a tertiary hospital in Thailand. Notably, we found significant associations between education level, individual income, and HL. Our results underscore the necessity of taking into consideration these key factors in planning diabetes education and information provision. They align with prior research indicating that education and income are key determinants of HL among individuals with T2DM [8]. Overall, 61.6% of T2DM participants demonstrated higher levels of HL. However, 38.4% of participants exhibited low HL, highlighting a concerning disparity. As previously noted, the implications of low HL are profound, representing a significant global challenge [5, 24]. This finding is particularly concerning given the high occurrence of low HL among low-income and less-educated T2DM patients.

Studies investigating the association between HL and relevant factors have demonstrated that individuals with T2DM and limited HL exhibit poorer diabetes knowledge [25] and are more prevalent in low- and middle-income countries [26]. Given that individuals with T2DM must stick to lifelong clinical recommendations, apart from keeping a balanced diet, regular physical activity, and followed prescribed medication schedules, managing glycemic control, optimizing their health and quality of life while reducing diabetes-related complications [25]. T2DM is a chronic condition necessitating continuous care, placing financial burdens on patients and management. Failure to adequately address these demands may lead to T2DM complications, resulting in significant social and economic repercussions [27]. In 2002, Thailand established Universal Health Coverage (UHC), which provides access to health services and financial protection without causing financial hardship [3]. This initiative reduced the likelihood that sick individuals would forgo formal treatment and increased the use of both outpatient (OP) and inpatient (IP) services at public hospitals. The most substantial increase in OP service use was observed among the low-income groups [4]. Numerous studies, including those conducted in Thailand, have established an association between T2DM and income level as well as educational attainment [28-30]. Low income or educational attainment levels can significantly impact individuals' lives, leading to a higher prevalence of diabetes complications and limited health literacy [31].

Furthermore, addressing the ability of individuals with T2DM to manage healthcare costs is crucial. Hence, there is a need to focus on devising strategies to improve equity in healthcare financing and promote the utilization of health services among those with T2DM, particularly in lower income groups. In the context of healthcare provision in Thailand, nurses and other healthcare

professionals predominantly offer T2DM health information and education during patients' follow-up visits. However, the advent of the COVID-19 pandemic has presented significant challenges for healthcare providers in optimizing the utilization of digital platforms and mobile applications to facilitate the self-care for patients and their families [32]. Integrating mobile technology tools into healthcare management systems represents a pivotal strategy for enhancing HL and ultimately achieving improved health outcomes [24]. Healthcare initiatives must prioritize enhancing diabetes knowledge, diabetes self-management, and HL. Rather than solely relying on on-site health education and promotional services and written materials, programs should focus on providing targeted education and clinical decision-making interventions tailored to individuals' socioeconomic backgrounds and their ability to cope with the costs associated with their disease [33, 34]. Moreover, using communication technology tools such as telemedicine, mobile health applications and online health resources can enhance effective coordination and communication among patients, their families, and healthcare providers [35].

HL serves as a crucial determinant of health, representing an essential skill utilized by individuals across their lifespan for obtaining, understanding, assessing, and utilizing health-related information and services. Such factors as education and income are known to be associated with HL scores. Besides, there is insufficient evidence concerning the association between individual and/or family income and HL, as well as healthcare outcomes, among individuals with T2DM. Moreover, in Thailand, research investigating the efficacy of mobile technology tools in improving HL is scarce [36]. There is a pressing need for studies examining the impact of education and income on the HL of Thai individuals with T2DM to fully comprehend the burden of this chronic disease. Additionally, exploring the potential of online health tools in enhancing HL among individuals with T2DM is imperative.

5. Conclusions

Health literacy is pivotal in the education of individuals with chronic diseases like T2DM. Our study findings underscored that the level of income and educational attainment significantly elevate health knowledge scores among individuals with T2DM. Moreover, HL may shed light on racial disparities observed in patients with T2DM. Individuals with adequate HL possess the capacity to assume responsibility for their own health, comprehend the ramifications of chronic illness, and actively engage in diabetes self-management. Strategies designed to tackle health literacy, recognizing its key role, offer a pathway to improve diabetes care. It is imperative for nurses, healthcare providers, policymakers, and decision-makers to acknowledge and address diverse HL needs,

particularly to mitigate morbidity and mortality among individuals with T2DM. Providing educational materials that are both comprehensible and actionable, along with integrating nursing care plan strategies to reach those with lower HL levels, can serve as effective means to deliver high-quality diabetes nursing care to patients with T2DM.

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Conflict of Interest Statement

The researchers declare that they have no relevant conflicts of interest regarding this research

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