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Factors Predicting Attitude, Sense of Coherence, Self-Care Management and Perceived Social Support Among People with Type 2 diabetes mellitus

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Abstract

Type 2 Diabetes Mellitus (T2DM) is a major global public health issue, including in Thailand. Most people with T2DM face difficulties in self-care and lack sufficient social support, leading to diabetes-related complications. This study aimed to investigate factors affecting sense of coherence (SOC), self-care management in the community, and social support among people with T2DM in Thailand. A cross-sectional analytical study was conducted by 276 people with T2DM using questionnaires. Data were analysed using descriptive and inferential statistics, such as frequency, analysis of variance, and independent sampled t-test. Most of the participants were females (70.6%), while SOC, self-care management and social support were in high level. Factors associated with self-care management were occupation, regular exercise, and having T2DM complications, whilst those with attitude were having a lower secondary school level of education, being a freelance worker, individuals with an average monthly income of more than 30,000 THB, and those with social support scores were oral medication intake and having family history of T2DM. People with T2DM need an appropriate intervention program, either modern or Thai traditional program, and those need healthcare accessibility in the community to improve their quality of life.

Keywords: factor; type 2 diabetes mellitus; self-care management; sense of coherence; social support

1. Introduction

Type 2 Diabetes Mellitus (T2DM) is a major global public health issue, including in Thailand, where the prevalence of the disease continues to rise. Effective interventions and support systems require an understanding of the factors influencing how people manage their conditions. These factors include both modifiable and unmodifiable factors, which can either be improved or focused on people with T2DM in terms of their consequences, like health and well-being.

Many studies demonstrate that program related to diabetes self-management education (DSME), including cultural-sensitive program, improves personal self-care effectively by improving knowledge and skills of the people with T2DM (Fortmann et al., 2011; McEwen et al., 2010). In addition, psychological factors, such as diabetes-related distress, depression, and stress may impact on self-care management, which are needed to be in an intervention for the people to prevent complications, such as diabetes retinopathy (Ji, 2018; Walker et al., 2018).

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Feeling supported by social and environment, like from family, friends, partner and community may improve blood sugar control and self-care management (Costa et al., 2012; Fortmann et al., 2011). Community public health workers (CPHWs) also play as health promotors for people with T2DM in terms of enhancing self-care and blood sugar management (Fortmann et al., 2011; McEwen et al., 2010). The culturally sensitive approach of CPHWs in the interventions for people with T2DM is well-received, resulting in improved self-efficacy and more positive attitudes among participants. Trusting relationships typically resulted from a positive difference from relationships with clinical providers and the people (Grant & Litchfield, 2024).

Improved diabetes self-management is significantly associated with higher Sense of Coherence (SOC) and is critical for effective management, especially important for those newly diagnosed with T2DM. Improvements in SOC are associated with significant improvements in health outcomes, such as self-care (diet, medication). Better diabetes emotional and physical strain management is linked to stronger SOC (Ramos-Valle et al., 2023; Vega-Martínez et al., 2025) found that people newly diagnosed with T2DM were five times more likely to have low SOC scores than non-diabetics, highlighting a key moment for intervention. The association between high SOC and improved metabolic control remains unclear, with some studies reporting a correlation and others showing no significant relationship with glycemic control (e.g., HbA1c) (Çoban et al., 2021; Guevara C. et al., 2018). Further research is needed to explore these relationships within the context of managing T2DM in Thailand.

Research reveals that many Thai people with T2DM struggle to keep their blood sugar under control; a national cross-sectional study showed that 24% of participants had uncontrolled type 2 diabetes (HbA1c of 9% or higher) (Lertwanichwattana et al., 2024). Only 23.4% of participants attained the American Diabetes Association (ADA) HbA1c target of less than 7% (Taweepolcharoen et al., 2006). A steady increase in diabetes prevalence in Thailand is evident, rising from 2.3% in 1991 to 8.0% by 2015 (Tappo et al., 2022). Diabetes creates a significant financial strain on both patients and the healthcare system. Direct and indirect costs, including complications such as cardiovascular disease, kidney failure, and blindness, worsen the situation (Tappo et al., 2022; Weerasinghe, 2016) used spatial analysis to reveal high diabetes prevalence clusters in parts of Thailand, especially the upper northeast, influenced by environmental factors including food shops, alcohol outlets, and high elderly density. Diabetes prevalence showed an association with night-time light density, used as an urbanization measure (Tappo et al., 2022).

Access to diabetes prevention and management services is difficult for many Thai patients, especially in rural and semi-urban areas. Community health-care workers (CHCWs) are vital in bridging this gap, however, motivation, training, and policy support deficiencies limit their effectiveness (Sranacharoenpong & Hanning, 2011). Clinical settings still struggle to achieve optimal glycemic control. Diabetes care is further complicated by insufficient microalbuminuria screening and inadequate low density lipoprotein (LDL) management (Taweepolcharoen et al., 2006). Effective diabetes care is hindered by cultural beliefs, traditional practices, and a lack of health literacy. Dietary adherence is often difficult because of cultural factors and negative perceptions of diabetes (Sachdeva et al., 2015). Furthermore, the common use of complementary treatments may interfere with standard diabetes care (Sachdeva et al., 2015). Collaborative strategies will empower patients and build a sustainable model for better community health. The data may be used to develop appropriate service plans and improve patient self-care management in the future. A proactive approach allows for the identification of specific community needs, resulting in customized resources and support to remove barriers to healthcare and promote long-term wellness (Corwin et al., 2012). Focusing on prevention and education helps communities overcome health disparities and promotes the well-being of everyone (Williams et al., 2021). Focusing on shared health responsibility, health equity efforts strengthen both individual and community well-being (Loewenson et al., 2023). Community collaboration and participation enhance individual health management using programs, thus improving resource distribution and overall population health (Davis & Flores, 2022). Strong social cohesion significantly impacts T2DM management in Thailand (Suavansri et al., 2022). Therefore, this

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study aimed to investigate factors predicting SOC, self-care management in the community, and social support among people with T2DM in Thailand. For improved health and quality of life among people with T2DM, it is vital to understand how these factors interact.

2. Materials and Methods

2.1. Setting

This cross-sectional analytical study was conducted at Subdistrict Health Promoting Hospitals (SHPHs) in Sakon Nakhon, a northeastern province in Thailand with a population of approximately 1.2 million (Sakon Nakhon Provincial Statistical Office, 2021). Sakon Nakhon has a significant burden of T2DM, with a prevalence ranging from 5.2% to 6.8% between 2015 and 2020; the estimated number of registered people with T2DM was approximately 17,000 (Sakon Nakhon Provincial Statistical Office, 2021).

2.2. Participants

The sample size was calculated using a formula (Daniel & Cross, 2013) with a significance level=95%, p=0.2 (Abouammoh & Alshamrani, 2020), N = 16,036 (Sakon Nakhon Provincial Statistical Office, 2021), and d = 0.05. Thus, the minimum sample size required was 243 participants. To prevent loss of data, 10% of lost data was added, accounting for 276 samples for data collection. A systematic random sampling method was employed to select participants from lists of registered individuals with T2DM at two SHPHs. The participants included individuals who: (1) have been diagnosed with T2DM for at least one year, (2) were of Thai ethnicity, (3) could communicate in Thai, (4) were aged between 18 and 75 years, and (5) be registered at the selected SHPHs. Participants were excluded if they: (1) declined to participate in the study or (2) exhibited signs of cognitive impairment.

2.3. Procedure

The study protocol was reviewed and approved by ethics committees in Thailand. Permission to collect data and access lists of individuals with T2DM was obtained from the directors of selected SHPHs. Data collection was conducted by three research assistants trained by the principal investigator, who distributed the questionnaire to randomly selected participants. Participants received oral and written study information and provided voluntary informed consent before participation. Data were collected using a self-reported questionnaire between July and August 2021, with each participant requiring approximately 15 to 20 minutes to complete in a private setting. All completed questionnaires were reviewed for accuracy and completeness.

2.4. Ethical Approval

Ethical approval for this study was obtained from the Kasetsart University Chalermphrakiat Sakon Nakhon Province Campus Ethics Committee (Kucsc.HE-62-029). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Permissions were also granted by the directors of the selected SHPHs. Prior to participation, all participants received both oral and written information about the study and voluntarily provided written informed consent in a designated room near the selected SHPHs. Participants were informed of their right to withdraw from the study at any time without consequences. Confidentiality was strictly maintained, and participant data were anonymized throughout the study.

2.5. Measurement

A structured questionnaire, written in Thai, was utilized for data collection. A comprising five sections: socio-demographic, attitude, SOC, self-care management (SCM), and the Revised Thai Multi-Dimensional Scale of Perceived Social Support (r-T-MSPSS). The questionnaire was evaluated

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for content validity by three experts and pretested for reliability with a sample of 30 participants. Both the content validity and reliability scores were found to be acceptable.

The socio-demographic details of the participants, including information on age, gender, marital status, education level, occupation, monthly income, monthly savings, years of disease diagnosis, type of disease management, disease complication, family history of the disease, weekly exercise, smoking, and alcohol consumption.

The attitude of T2DM section developed by Anderson et al. (2003) was backward-forward translated into Thai by the researcher (NP). It consisted of 8 items on a 5-point Likert scale. A total score ranged from 8 to 40, with higher scale scores indicating a better attitude of T2DM.

The SOC section utilizes a shortened version of the original 13 items (SOC-13) developed by Antonovsky (1987) and translated into Thai by Phoosuwan et al. (2018). Responses are recorded on a 7-point semantic scale, where 1 and 7 represent extreme feelings regarding statements about one's life experiences (e.g., "Has it happened that people whom you counted on disappointed you?" is scored from 1 = never have this feeling to 7 = always have this feeling). The total score ranges from 13 to 91, with higher scores indicating a higher SOC. The Cronbach's alpha coefficient was 0.75 (Phoosuwan et al., 2018).

The SCM assesses five dimensions: food habits, diabetes medication habits, exercise habits, stress management habits, and ongoing care. It was developed by Siangdung (2017). It consisted of 20 items measured on a three-point Likert scale, with total scores ranging from 20 to 60. Higher scores indicated greater SCM. The Cronbach's alpha coefficient for this scale was 0.70 (Siangdung, 2017).

The r-T-MSPSS, originally developed by Zimet et al. (1988) and translated into Thai by Wongpakaran et al. (2011), was used in this study to assess perceived social support (family, friend, and significant others). It consisted of 12 items scored on 7-point Likert scale (1=very strongly disagree, 7=very strongly agree) ranging from 12 to 84, with higher scale scores indicating a higher perceived social support. The Cronbach's alpha coefficient of the Thai version scale was 0.91 (Wongpakaran et al., 2011).

2.6. Data Analysis

The data were analyzed using SPSS version 29 (SPSS Inc, Chicago, IL, US). Descriptive statistics (e.g. frequency, mean, standard deviation (SD), and percentage), were used to present the data. Inferential statistics were utilized to examine the associations between dependent and independent variables using multivariable linear regression analysis. The dependent variables included attitude, SOC, SCM, and r-T-MSPSS. The independent variables comprised socio-demographic factors. The regression model assumptions were assessed, including tests for normality of the dependent variables, multicollinearity, and the Variance Inflation Factor (VIF). Univariable regression analysis was initially performed by entering each independent variable separately. Significant variables identified in the univariable regression analysis were then included in the multivariable regression analysis using the enter method. Adjusted models were developed to control potential confounders. Regression coefficients (B), 95% confidence intervals (CIs), and p-values were reported, with a significance level set at 0.05.

3. Results

3.1. Characteristics

The total number of participants was 276, participants had a mean age of 65.59 (±9.37) years with about 62% of them ranging from 50-69 years. Approximately 71% of them were females and mostly married (84.1%). Majority had an elementary level of education (75.4%) and were farmers (62.3%). About 55% have been living with the T2DM condition for the past decade or more; however, most manage the disease condition by taking oral medication (85.1%). 21.7% have a family history of diabetes and the presence of disease complication(s) was found in about 40% of the participants. Regarding physical

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activity, only 10.5% of the participants exercise 5 times or more weekly (not less than 30 mins each time). Majority do not report having any addictive behaviour like smoking or alcohol consumption. See Table 1.

Table 1. General characteristics of the participants (n=276).

Characteristics	Frequency, n (%)
Gender	
Female	195 (70.6)
Male	81 (29.4)
Age (years)	
≤50	21 (7.6)
51 - 60	73 (26.4)
61 – 70	116 (42.1)
≥ 71	66 (23.9)
Range=34-87, Mean=63.59, S.D.=9.39	
Marital status	
Married	232 (84.1)
Widowed	31 (11.2)
Single	8 (2.9)
Divorced	5 (1.8)
Educational level	
Primary school	208 (75.4)
Secondary school	45 (16.3)
High School	15 (5.4)
Vocational school	6 (2.2)
Bachelor's Degree	2 (0.7)
Employment	
Farmer	172 (62.4)
Unemployed	43 (15.6)
Daily employer	37 (13.4)
Merchant	20 (7.2)
Government officer	4 (1.4)
Religion	
Buddhism	276 (100.0)
Treatment	
Oral medication	235 (85.1)
Insulin use	28 (10.1)
Oral medication and insulin use	13 (4.7)
Diagnosis (years)	216 (78.3)
1-5	79 (28.6)
6-10	54 (19.6)
>10	83 (30.1)
Range=1-53 $\bar{x}$=11.67 S.D.=10.38	
Comorbidity	84 (30.4)
Hypertension	51 (18.5)
Dyslipidemia	23 (8.3)
Stroke	6 (2.2)
Peripheral Neuropathy	4 (1.4)
Diabetes-related complication	55 (19.9)
Kidney	24 (8.7)
Eye	14 (5.1)
Foot	11 (4.0)
Heart	6 (2.1)

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Characteristics	Frequency, n (%)
Family history of Type 2 Diabetes Mellitus	
No	216 (78.31)
Yes	60 (21.69)
Weekly exercise	
No exercise	65 (23.58)
1 - 4 times	182 (65.92)
5 times or more	29 (10.50)
Smoking Habit	
No smoker	256 (92.83)
Ex- smoker	8 (2.89)
Current smoker	12 (4.28)
Alcohol Consumption	
No drinker	235 (85.13)
Ex- drinker	27 (9.79)
Current drinker	14 (5.08)
Monthly income (n=274)	
≤ 1,600 baht (50 dollar)	78 (28.26)
1,601 – 3,200 baht (51-100 dollar)	59 (21.38)
3,201 – 4,800 baht (101-150 dollar)	28 (10.14)
4,801 – 6,400 baht (151-200 dollar)	38 (13.77)
≥ 6,401 baht (≥201 dollar)	71 (25.72)
Range= 500-100,000 (15.62-3,125 dollar) $\bar{x}$ = 6,224.82 (194.52 dollar)	
S.D. = 12,457.73 (389.30 dollar)	
Monthly expenses (n=273)	
≤ 1,600 baht (50 dollar)	103 (37.32)
1,601 – 3,200 baht (51-100 dollar)	65 (23.55)
3,201 – 4,800 baht (101-150 dollar)	33 (11.96)
4,801 – 6,400 baht (151-200 dollar)	39 (14.13)
≥ 6,401 baht (≥201 dollar)	33 (11.96)
Range= 400-50,000 (12.50-1,562.25 dollar) $\bar{x}$ = 3,745.05 (117.03 dollar)	
S.D. = 5,357.12 (167.41 dollar)	

Note. S.D. = Standard Deviation

Data analysis reveals the following average outcome variable scores as follow: self-care behaviour has a mean score of 49.39 (SD=4.3, Min=30, Max=58). The data analysis reveals that moderate level of adherence to self-care practices among the participants. The score range suggests that while some participants are doing better in managing their self-care, others may need more support or intervention. The average score for the attitude variable is 28.24 (SD=4.6, Min=16, Max=40). The results show a generally positive view of self-care, although attitudes vary considerably. This indicates that there might be a subset of individuals with less favorable attitudes toward self-care, which could influence their ability to effectively manage their health conditions. The mean score for social support is 61.24 (SD=11.8, Min=18, Max=83), reflecting a moderately high level of support from family, friends, and other sources. This indicates that a significant proportion of participants perceive the existence of a solid support system, which is critical for enhancing health outcomes and sustaining consistent self-care practices. The mean score of SOC, recorded at 54.93 (SD=5.7, Min=34, Max=68), implies a generally strong SOC among participants, which can be regarded as a beneficial factor in the management of chronic conditions.

Overall, the results indicate moderate to high levels of self-care behavior, attitude, social support, and SOC across the participants. See Table 2.

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Table 2. Descriptive characteristics of outcome variables.

Outcome Variable	Mean	Std. Deviation	Minimum score	Maximum score
Self-care behaviour score	49.39	4.31	30	58
Attitude score	28.24	4.55	16	40
Social support score	61.24	11.75	18	83
Sense of coherence score	54.93	5.70	34	68

3.2. Regression Analysis for Self-Care Behavior Scores and Attitude Scores

There were some factors significantly influence self-care behaviors and attitudes toward managing health. The variable of occupation, and more precisely the role of a farmer (β=0.13, 95% CI 0.04, 0.21, p=0.05), was a predictor of higher self-care behavior scores. The frequency of weekly exercise played a crucial role in self-care behavior. Participants who exercised four times a week or less (β=0.17, 95% CI 0.03, 0.21, p=0.01) and those who exercised five times a week or more (β=0.18, 95% CI 0.03, 0.23, p=0.009) also demonstrated higher self-care behavior scores. The presence of T2DM complications was found to be statistically significant predictor of lower self-care behavior scores (β=-0.133, 95% CI -0.24, -0.01, p=0.01). Having a lower secondary school level of education (β=-0.20, 95% CI -0.38, -0.18, p=0.02) was associated with lower attitude scores. Being a freelance worker (β=-0.12, 95% CI -0.31, -0.09, p=0.04) was significantly linked to lower attitude scores. Individuals with an average monthly income of more than 30,000 THB (β=0.12, 95% CI 0.07, 0.21, p=0.05) showed significantly higher attitude scores. See Table 3.

Table 3. Regression analysis for self-care behavior scores and attitude scores.

Variable	Subcategory	Self-care behaviour scores		Attitude scores	
		Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)
Gender	Male	Ref	Ref	Ref	Ref
	Female	0.07 (-0.05, 0.19)	-	0.07 (-0.04, 0.18)	-
Age	30-49	Ref	Ref	Ref	Ref
	50 – 69	0.07 (-0.13, 0.10)	-	0.05 (-0.17, 0.06)	-
	70 and above	0.09 (-0.09, 0.14)	-	0.12 (-0.05, 0.18)	-
Marital status	Not married	Ref	Ref	Ref	Ref
	Married	-0.09 (-0.21, 0.03)	-	-0.05 (-0.17, 0.07)	-
Education level	Primary school	Ref	Ref	Ref	Ref
	Lower Secondary	-0.09 (-2.49, 0.29)	-	-0.29 (-0.38, -0.18)*	-0.20 (-0.38, -0.18)*
	Upper Secondary and above	0.10 (-0.24, 3.46)	-	-0.04 (-0.12, 0.12)	-
Occupation	Unemployed	Ref	Ref	Ref	Ref
	Farmer	0.17 (0.08, 2.96)*	0.13 (0.04, 0.21)*	0.05 (-0.01, 0.22)	-

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	Salary worker	0.14 (0.02, 4.32)*	0.11 (-0.04, 0.17)	0.07 (-0.03, 0.17)	-
	Freelance worker	0.05 (-1.25, 2.54)	-	-0.16 (-0.31, -0.08)*	-0.12 (-0.31, -0.09)*
Average monthly income (THB)	<10,000	Ref	Ref	Ref	Ref
	10,000 – 30,000	0.11 (-0.10, 2.93)	-	-0.05 (-0.16, 0.06)	-
	>30,000	0.06 (-1.99, 5.65)	-	0.14 (0.07, 0.21)*	0.12 (0.07, 0.21)*
Years of disease diagnosis	Less than 10yrs	Ref	Ref	Ref	Ref
	10 - 19yrs	0.08 (-0.04, 0.19)	-	0.13 (0.11, 2.70)*	0.03 (-0.02, 0.21)
	20yrs and above	0.01 (-0.13, 0.12)	-	0.13 (0.03, 2.87)*	0.01 (-0.04, 0.21)
Type of disease management	Oral	Ref	Ref	Ref	Ref
	Insulin	0.004 (-0.10, 0.10)	-	-0.04 (-0.18, 0.09)	-
	Both	0.04 (-0.05, 0.15)	-	0.08 (-0.07, 0.21)	-
Presence of disease complication	No	Ref	Ref	Ref	Ref
	Yes	-0.13 (-2.14, -0.06)*	-0.13 (-0.24, -0.01)*	0.21 (0.09, 0.32)*	0.12(-0.09, 0.33)
Family history of the disease	No	Ref	Ref	Ref	Ref
	Yes	0.05 (-0.05, 0.15)	-	0.02 (-0.10, 0.13)	-
Weekly exercise	Don't exercise	Ref	Ref	Ref	Ref
	1 - 4 times	0.17 (0.04, 0.22)*	0.17 (0.03, 0.21)*	0.10 (-0.04, 0.18)	-
	5 times or more	0.18 (0.03, 0.22)*	0.18 (0.03, 0.23)*	0.06 (-0.12, 0.13)	-
Smoking Habit	Never smoked	Ref	Ref	Ref	Ref
	Quit smoking	0.06 (-0.03, 0.14)	-	0.05 (-0.07, 0.15)	-
	Current smoker	0.01 (-0.09, 0.13)	-	0.04 (-0.09, 0.16)	-
Alcohol intake	Never had alcohol	Ref	Ref	Ref	Ref
	Quit alcohol	0.08 (-0.03, 0.19)	-	-0.003 (-0.12, 0.11)	-
	Currently take alcohol	-0.03 (-0.12, 0.05)	-	0.013 (-0.13, 0.14)	-

3.3. Regression Analysis for Social Support Scores and Sense Of Coherence Scores

For social support, two key factors were identified as significant predictors. First, the use of both injectable and oral medication (β=0.13, 95% CI 0.03, 0.22, p=0.034) was associated with higher social support scores. Having a family history of diabetes (β=0.16, 95% CI 0.05, 0.30, p=0.007) was also linked to higher social support scores.

Regarding the SOC, two factors were significantly associated with higher scores. First, exercising five times a week or more (β=0.14, 95% CI 0.05, 0.24, p=0.03) was positively related to a stronger SOC. Having a current smoking habit (β=0.11, 95% CI 0.02, 0.19, p=0.04) was also found to be significantly

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related to higher SOC scores. In contrast, using only insulin to manage the disease (β=-0.15, 95% CI -0.30, -0.01, p=0.01) was significantly associated with lower SOC scores. See Table 4.

Table 4. Regression analysis for social support scores and sense of coherence scores.

Variable	Subcategory	Social support scores		Sense of coherence scores	
		Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)
Gender	Male	Ref	Ref	Ref	Ref
	Female	0.12 (0.01, 0.25)*	0.11 (-0.07, 0.24)	-0.09 (-0.20, 0.01)	-
Age	30-49	Ref	Ref	Ref	Ref
	50 – 69	-0.03 (-0.17, 0.08)	-	0.03 (-0.15, 0.09)	-
	70 and above	0.02 (-0.08, 0.16)	-	0.06 (-0.08, 0.15)	-
Marital status	Not married	Ref	Ref	Ref	Ref
	Married	0.02 (-0.12, 0.15)	-	-0.07 (-0.18, 0.04)	-
Education level	Primary school	Ref	Ref	Ref	Ref
	Lower Secondary	-0.11 (-0.24, -0.02)*	-0.10 (-0.23, 0.02)	-0.21 (-0.33, -0.08)*	-0.10 (-0.33, 0.08)
	Upper Secondary and above	0.06 (-0.03, 0.17)	-	-0.05 (-0.14, 0.09)	-
Occupation	Unemployed	Ref	Ref	Ref	Ref
	Farmer	0.10 (-0.04, 0.21)	-	-0.11 (-0.13, 0.15)	-
	Salary worker	0.04 (-0.14, 0.12)		-	
	Freelance worker	0.0002 (-0.17, 0.06)	-	-0.20 (-0.29, -0.004)*	-0.09 (-0.28, 0.01)
Average monthly income (THB)	<10,000	Ref	Ref	Ref	Ref
	10,000 – 30,000	0.01 (-0.11, 0.12)	-	-0.10 (-0.22, 0.03)	-
	>30,000	0.07 (0.02, 0.13)*	0.04 (-0.02, 0.10)	0.02 (-0.05, 0.08)	-
Years of disease diagnosis	Less than 10yrs	Ref	Ref	Ref	Ref
	10 - 19yrs	0.06 (-0.07, 0.18)	-	0.14 (0.01, 0.20)*	0.07 (-0.01, 0.22)
	20yrs and above	0.01 (-0.14, 0.12)	-	0.16 (0.012, 0.22)*	0.10 (-0.02, 0.20)
Type of disease management	Oral	Ref	Ref	Ref	Ref
	Insulin	-0.05 (-0.21, 0.08)	-	-0.15 (-0.30, -0.01)*	-0.15 (-0.30, -0.01)*
	Both	0.12 (0.03, 0.22)*	0.13 (0.03, 0.22)*	0.07 (-0.02, 0.18)	-
	No	Ref	Ref	Ref	Ref

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Variable	Subcategory	Social support scores		Sense of coherence scores	
		Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)
Presence of disease complication	Yes	0.06 (-0.07, 0.19)	-	0.12 (0.01, 0.23)*	0.05 (-0.80, 1.94)
Family history of the disease	No	Ref	Ref	Ref	Ref
	Yes	0.15 (0.05, 0.25)*	0.16 (0.05, 0.30)*	-0.17 (-0.31, -0.04)*	-0.11 (-3.20, 0.20)
Weekly exercise	Don't exercise	Ref	Ref	Ref	Ref
	1 - 4 times	0.06 (-0.03, 0.20)	-	0.16 (0.08, 0.18)*	0.06 (-0.08, 0.18)
	5 times or more	-0.03 (-0.18, 0.06)	-	0.22 (0.05, 0.24)*	0.14 (0.05, 0.24)*
Smoking Habit	Never smoked	Ref	Ref	Ref	Ref
	Quit smoking	-0.02 (-0.10, 0.06)	-	0.09 (-0.01, 0.18)	-
	Current smoker	-0.04 (-0.18, 0.08)	-	0.11 (0.02, 0.20)*	0.11 (0.014, 0.19)*
Alcohol intake	Never had alcohol	Ref	Ref	Ref	Ref
	Quit alcohol	0.08 (-0.01, 0.16)	-	-0.12 (-0.28, -0.05)*	-0.07 (-0.29, 0.04)
	Currently take alcohol	0.06 (-0.03, 0.13)	-	0.03 (-0.04, 0.11)	-

3.4. Regression Analysis for Self-Care Behaviour Dimensions

In Dimension 1, which likely reflects a specific aspect of self-care behavior, exercising one or more times a week was a significant predictor of higher scores (β=0.24, 95% CI 0.02, 0.26, p=0.001). Regular physical activity appears to be correlated with better adherence to this specific self-care practice. Similarly, in Dimension 3, which could represent another critical component of self-care, exercising once a week or more also predicted higher scores (β=0.24, 95% CI 0.01, 0.25, p<0.001). Being a salaried worker was significantly associated with higher scores in Dimension 3 (β=0.24, 95% CI 0.12, 0.32, p<0.001). Furthermore, the use of both injectable and oral medication as part of the treatment was a predictor of higher scores in Dimension 3 (β=0.10, 95% CI 0.02, 0.26, p=0.05) and Dimension 5 (β=0.11, 95% CI 0.06, 0.15, p=0.05).

In Dimension 3, a family history of diabetes was linked to lower scores (β=-0.10, 95% CI -0.29, -0.03, p=0.05). However, a family history was linked to higher scores in Dimension 4 (β=0.13, 95% CI 0.05, 0.29, p=0.03) and Dimension 5 (β=0.14, 95% CI 0.05, 0.19, p=0.02). In Dimension 4, the presence of disease complications was a significant predictor of lower scores (β=-0.20, 95% CI -0.35, -0.11, p=0.001). In Dimension 5, being female (β=0.13, 95% CI 0.001, 0.26, p=0.03) was associated with higher scores. Being a farmer (β=0.13, 95% CI 0.04, 0.21, p=0.02) was linked to higher scores. Having a lower secondary education was a predictor of lower scores in Dimension 5 (β=-0.16, 95% CI -0.40, -0.09, p=0.01). See Table 5.

Table 5. Regression analysis for Self-care behaviour dimensions.

		Self-care behaviour scores									
		Dimension 1		Dimension 2		Dimension 3		Dimension 4		Dimension 5	
Variable	Subcategory	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)
Gender	Male	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Female	-0.06 (-0.12, 0.06)	-	0.05 (-0.07, 0.17)	-	0.003 (-0.12, 0.14)	-	0.07 (-0.05, 0.20)	-	0.12 (0.003, 0.26)*	0.13 (0.001, 0.26)*
Age	30-49	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	50 - 69	-0.15 (-0.25, -0.02)*	-0.02 (-0.12, 0.11)	0.14 (-0.17, 0.25)	-	0.10 (-0.03, 0.20)	-	0.09 (-0.08, 0.14)	-	-0.16 (-0.17, 0.05)	-
	70 and above	-0.05 (-0.15, 0.10)	-	0.22 (-0.02, 0.24)	-	0.02 (-0.20, 0.04)	-	0.06 (-0.13, 0.09)	-	-0.10 (-0.12, 0.15)	-
Marital status	Not married	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Married	-0.08 (-0.20, 0.04)	-	-0.06 (-0.18, 0.07)	-	-0.03 (-0.16, 0.10)	-	-0.03 (-0.14, 0.09)	-	-0.07 (-0.14, 0.01)	-
Education level	Primary school	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Lower Secondary	-0.15 (-0.25, -0.03)*	-0.09 (-0.25, 0.03)	-0.004 (-0.14, 0.10)	-	0.01 (-0.10, 0.11)	-	0.07 (-0.08, 0.19)	-	-0.25 (-0.40, -0.10)*	-0.16 (-0.40, -0.09)*
	Upper Secondary and above	-0.05 (-0.16, 0.09)	-	0.11 (-0.02, 0.23)	-	0.08 (-0.04, 0.21)	-	0.09 (-0.05, 0.19)	-	0.06 (0.04, 0.15)*	0.11 (-0.04, 0.14)

		Self-care behaviour scores									
		Dimension 1		Dimension 2		Dimension 3		Dimension 4		Dimension 5	
Variable	Subcategory	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)
Occupation	Unemployed	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Farmer	0.06 (-0.03, 0.21)	-	0.09 (-0.07, 0.17)	-	-0.04 (-0.16, 0.09)	-	0.13 (-0.10, 0.14)	-	0.20 (0.07, 0.31)*	0.14 (0.08, 0.32)*
	Salary worker	-0.10 (-0.26, 0.01)	-	0.09 (-0.08, 0.17)	-	0.23 (0.12, 0.34)*	0.24 (0.12, 0.32)*	0.17 (0.01, 0.22)*	0.08 (-0.01, 0.22)	0.03 (-0.22, 0.10)	-
	Freelance worker	0.03 (-0.11, 0.13)	-	0.02 (-0.15, 0.07)	-	0.04 (-0.10, 0.12)	-	0.08 (-0.13, 0.12)	-	-0.03 (-0.28, 0.01)	-
Average monthly income (THB)	<10,000	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	10,000 – 30,000	0.04 (-0.05, 0.14)	-	0.07 (-0.04, 0.17)	-	0.09 (-0.03, 0.21)	-	0.03 (-0.09, 0.16)	-	0.10 (0.002, 0.17)*	0.05 (-0.001, 0.17)
	>30,000	0.03 (-0.002, 0.07)	-	0.05 (-0.09, 0.16)	-	0.06 (-0.04, 0.16)	-	-0.03 (-0.07, 0.01)	-	0.06 (0.01, 0.10)*	-0.02 (-0.03, 0.10)
Years of disease diagnosis	Less than 10yrs	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	10 - 19yrs	0.10 (-0.03, 0.21)	-	0.08 (-0.06,)	-	0.02 (-0.12, 0.13)	-	-0.06 (-0.15, 0.09)	-	0.11 (0.02, 0.19)*	0.05 (-0.01, 0.19)
	20yrs and above	0.02 (-0.13, 0.11)	-	0.08 (-0.06,)	-	0.04 (-0.06, 0.14)	-	-0.11 (-0.20, 0.02)	-	0.01 (-0.13, 0.09)	-
Type of disease management	Oral	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Insulin	-0.07 (-0.20, 0.07)	-	-0.004 (-0.12, 0.10)	-	-0.12 (-0.25, -0.001)*	-0.03 (-0.25, 0.01)	0.03 (-0.09, 0.15)	-	0.15 (0.08, 0.19)*	0.09 (-0.09, 0.19)
	Both	-0.10 (-0.22, 0.04)	-	0.01 (-0.09, 0.11)	-	0.14 (0.02, 0.26)*	0.10 (0.02, 0.26)*	0.01 (-0.11, 0.12)	-	0.11 (0.05, 0.15)*	0.11 (0.06, 0.15)*

		Self-care behaviour scores									
		Dimension 1		Dimension 2		Dimension 3		Dimension 4		Dimension 5	
Variable	Subcategory	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)	Crude analysis co-efficient B (95%CI)	Adjusted Analysis co-efficient B (95%CI)
Presence of disease complication	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Yes	-0.11 (-0.23, 0.01)	-	-0.01 (-0.13, 0.11)	-	-0.01 (-0.13, 0.11)	-	-0.23 (-0.34, -0.12)*	-0.20 (-0.35, -0.11)*	0.05 (-0.07, 0.15)	-
Family history of the disease	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Yes	0.01 (-0.10, 0.11)	-	-0.04 (-0.15, 0.07)	-	-0.16 (-0.29, -0.03)*	-0.10 (-0.29, -0.03)*	0.17 (0.04, 0.29)*	0.13 (0.05, 0.29)*	0.14 (0.06, 0.21)*	0.14 (0.05, 0.19)*
Weekly exercise	Don't exercise	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	1 - 4 times	0.26 (0.02, 0.28)*	0.24 (0.02, 0.26)*	0.04 (-0.09, 0.16)	-	0.38 (0.01, 0.40)*	0.38 (0.02, 0.42)*	-0.09 (-0.17, 0.06)	-	0.03 (-0.09, 0.14)	-
	5 times or more	0.25 (0.01, 0.26)*	0.24 (0.01, 0.25)*	-0.001 (-0.15, 0.12)	-	0.49 (0.20, 0.53)*	0.47 (0.20, 0.51)*	-0.09 (-0.17, 0.07)	-	0.03 (-0.11, 0.10)	-
Smoking Habit	Never smoked	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Quit smoking	0.03 (-0.09, 0.11)	-	0.07 (-0.06, 0.19)	-	0.02 (-0.06, 0.13)	-	-0.02 (-0.10, 0.06)	-	0.08 (0.04, 0.12)*	0.11 (-0.04, 0.12)
	Current smoker	0.04 (-0.08, 0.17)	-	-0.01 (-0.16, 0.14)	-	0.01 (-0.14, 0.14)	-	-0.01 (-0.13, 0.12)	-	0.01 (-0.16, 0.11)	-
Alcohol intake	Never had alcohol	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	Quit alcohol	0.06 (-0.06, 0.18)	-	-0.04 (-0.15, 0.07)	-	0.01 (-0.12, 0.14)	-	0.12 (0.0s2, 0.23)*	0.09 (-0.02, 0.22)	0.09 (-0.01, 0.17)	-
	Currently take alcohol	-0.08 (-0.21, 0.04)	-	-0.002 (-0.10, 0.10)	-	0.05 (-0.05, 0.15)	-	-0.04 (-0.17, 0.07)	-	0.03 (-0.05, 0.08)	-

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3.5. Characteristics of the Five Dimensions of Self-Care Management

The five different dimensions in self-care management include food habit score (Mean score=11.9±1.42, Min=8, Max=15); diabetes medication habit score (Mean score=11.92±1.82, Min=7, Max=15); exercise habit score (Mean score=4.35±1.11, Min=2, Max=6); stress management habit score (Mean score=9.98±1.77, Min=4, Max=12); and lastly ongoing care (Mean score=11.24±1.31, Min=4, Max=12). See Table 6.

Table 6. Descriptive characteristics of the five dimensions of Self-care management.

Self-care Mgt. dimensions	Mean	Std. Deviation	Minimum score	Maximum score
Food habit score	11.90	1.42	8	15
DM medication habit score	11.92	1.84	7	15
Exercise habit score	4.35	1.11	2	6
Stress Mgt. habit score	9.98	1.77	4	12
Ongoing care	11.24	1.31	4	12

4. Discussion

Analysis of participant demographics in diabetes research highlights the prevalence and lifestyle risk factors associated with T2DM. The average age of participants, mostly women and married, supports the idea that older adults, especially women, have a greater chance of getting diabetes because of their lifestyles and health differences. The average age of participants in our study suggests a population at high risk of type 2 diabetes, mirroring the findings of Zhao et al. (2023) who reported a higher prevalence in older adults. Gender disparities are evident, with females generally having a lower likelihood of diabetes compared to males, yet they experience a higher health burden. This paradox highlights the need for targeted interventions that address the unique risk factors and health challenges faced by women, ensuring equitable access to healthcare resources and support (Deng et al., 2024). A large majority of participants only completed elementary school, correlating with poor health literacy and a higher prevalence of diabetes (Hammami et al., 2012). A predominantly farming population implies a physically active lifestyle. An active lifestyle is often linked to better physical health, lower obesity rates, and stronger community ties. Consistent with University of Agriculture research, thriving rural agriculture is linked to improved well-being and stronger community bonds in rural areas compared to urban areas (Saikia & Mittal, 2022). A majority of participants have a history of T2DM exceeding a decade, highlighting chronicity and the need for long-term management strategies (Hammami et al., 2012). On the contrary, while the data shows challenges for older adults with T2DM, lifestyle changes and education can significantly improve outcomes, suggesting targeted programs could be beneficial. Older adults can improve blood sugar control and well-being by following structured exercise and nutrition plans.

T2DM management is significantly challenged, especially by issues related to physical activity and its complications. About half of T2DM participant have had the condition for over 10 years, and most manage it using oral medication. It is essential to recognize that only a small proportion of participants satisfy the defined criteria for physical activity, while encountering harmful health

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effects, highlighting a concerning trend in lifestyle management. Most people with T2DM rely on oral medications for their blood glucose management and complication prevention. A minority of participant experience complications, emphasizing the significance of low effective management. The low rate of weekly exercise among participants reveals a considerable gap in meeting recommended physical activity guidelines. This divergence underscores the necessity for specific interventions and initiatives aimed at fostering more regular engagement in physical activity among individuals, thereby enhancing overall health outcomes (Majumdar et al., 2019; Olbeci et al., 2020). Although medication is commonly used, it could lead to neglecting lifestyle changes vital for long-term health. Ma et al. (2021) demonstrated that customized exercise programs markedly elevated participation rates and augmented overall fitness levels in sedentary adults. Therefore, an intervention program targeting lifestyle modification, such as regular exercise should be implemented nationwide.

Moderate self-care behaviour, important for heart failure management, was shown by the results. The relationship between poor self-care and increased frailty necessitates targeted interventions (Matsui et al., 2024). Contrasting perspectives reveal the difficulties of heart failure self-care, emphasizing the need for targeted interventions to boost patient compliance and results. This study reveals attitude of patients on managing their health, impacting their commitment to self-care. Positive attitudes correlate with improved self-care practices and results (Jiang et al., 2023). To improve heart failure care, interventions must be targeted to address these perceptions to improve self-care and patient outcomes. We found a link between high social support and better self-care. This emphasizes how vital strong support systems are to promoting good health practices and improved patient results (Babygeetha & Devineni, 2024). The connection between social support and self-care behaviours is influenced by self-care confidence, which is enhanced by social support (Jiang et al., 2023). We discovered a correlation between strong coherence and improved health and coping. Improving patient coherence might boost self-care and overall well-being. Enhancing educational programs that focus on building coherence among patients could lead to more effective self-management of heart failure and a higher quality of life. Better health and coping skills are associated with strong coherence (Pouresmali et al., 2022). We also discovered a correlation between strong coherence and improved health and coping. This suggests that fostering a SOC among patients may enhance their ability to adhere to self-care regimens and improve their overall quality of life. Healthcare providers should incorporate coherence-enhancing interventions in treatment plans, building on the understanding that this empowers patients to manage their health more effectively. Moreover, the results indicate the significance of understanding, dealing with, and deriving meaning from life's difficulties, particularly for effectively managing chronic diseases (Pouresmali et al., 2022).

Alternatively, although these scores show a largely positive view of self-care, they also point to areas needing work, especially in developing better attitudes and stronger social support for better health. As an illustration, establishing community support groups combats patient isolation and promotes consistent self-care. These programs build community, encourage the exchange of experiences and strategies among patients, resulting in better health outcomes and increased resilience against chronic conditions.

The results showed occupation and exercise significantly affect self-care behaviours and attitudes, especially for farmers. This relationship highlights the significance of socioeconomic factors on health outcomes. Self-care behaviour scores showed a positive association with farmers. The implication is that agricultural communities would benefit from the development of specific self-care programs to address their particular requirements and promote more healthful practices. According to Adebisi et al. (2024), their research indicates that their job could encourage healthier lifestyle habits. Furthermore, the research shows farming boosts physical health, potentially improving chronic disease management (Ohta et al., 2024). Our data showed that regular exercise, which was defined as four times a week or less and five times a week or more. This association with improved self-care behavior scores stresses the importance of exercise in health (Ohta et al., 2024). This supports the conclusion that regular exercise is vital for managing chronic illnesses, especially among the elderly (Ohta et al., 2024). A personalized program combining aerobic and strength training, for instance,

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could improve participants' health. Lower secondary education and freelancing correlated with less positive attitudes towards health. It's suggested that perceived health is influenced by educational attainment and job security. On the other hand, increased monthly income had a positive effect on attitude scores (Adebisi et al., 2024; Wheeler & Lobley, 2022). Adebisi et al. proposed in 2024 that financial stability may improve attitudes related to health (Adebisi et al., 2024).

Although this research shows that work and exercise improve health, farmers face significant health obstacles (like higher disease rates and fewer check-ups) that may negate these advantages. To overcome these challenges, we need focused interventions and support systems. These systems should encourage physical activity and improve healthcare access for farmers, maximizing the health benefits of exercise.

Health outcomes in diabetic patients are significantly predicted by medication management, family history of diabetes, and social support scores. Importantly, higher social support scores are linked to injectable and oral medications, plus a family history of diabetes, suggesting these factors strengthen patients' social networks. In contrast, relying solely on insulin correlates with lower social support, implying that this dependence may restrict social engagement and available support. People with T2DM using both injectable and oral medications reported higher social support scores. A family history of diabetes was associated with increased social support and a greater likelihood of adherence to treatment plans. This highlights the importance of community engagement and education in fostering an environment where individuals feel empowered to manage their health effectively (Deepanchakravarthi et al., 2024). Insulin-only patients had lower levels of social support. The absence of adequate support negatively impacts mental health and overall well-being, emphasizing the need for strong social networks in effectively managing chronic conditions. Improved coherence was associated with more frequent physical activity (at least five times a week). Regular exercise improves physical and mental health by boosting social interaction and emotional stability (Almubaid et al., 2024). Furthermore, higher coherence scores correlated with current smoking habits. According to research by Deepanchakravarthi et al. (2024), improving lifestyle factors such as stopping smoking and encouraging physical activity significantly benefits the mental well-being and social networks of patients with chronic conditions.

The study shows that the type of medication and lifestyle significantly impact social support and a SOC. It is crucial to remember that the connection between social support and blood sugar control isn't always strongly supported by research, suggesting diabetes management is complex. Improved patient outcomes in diabetes care result from healthcare professionals' understanding of these subtleties, enabling them to develop personalized treatment plans addressing medical and psychosocial factors. Programs with personalized treatment plans, regular monitoring, dietary adjustments, and psychological support help patients manage their health, boosting autonomy and adherence.

Our findings emphasize the significance of both exercise and occupational status. It's crucial to remember that disparities in access to exercise and healthcare can affect self-care management outcomes. To ensure everyone benefits from physical activity and healthcare, inclusive health policies must address these disparities. For instance, community programs offering affordable fitness classes can improve health equity by increasing access to exercise for underserved groups (Sathiabalan & Saranya, 2024; Vermeesch et al., 2022).

5. Conclusions

Type 2 Diabetes Mellitus (T2DM) is a major public health concern and many people with T2DM face difficulties in self-care management, lack sufficient social support, and low attitude towards T2DM. The results revealed that most of the participants were females (70.6%), were agriculturists (62.4%). Some of the people with T2DM were diagnosed with type 2 diabetes mellitus for more than 10 years (30.1%), and had hypertension as a co-morbidity (18.5%). Sense of coherence was in the high level (161 people, 58.3%), the self-care was in high level (56.1%), and social support was also in the high level. Occupation (farmer), regular exercise, and having T2DM complications were factors

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associated with self-care behavior among people with T2DM. Factors associated with attitude were having a lower secondary school level of education, being a freelance worker, individuals with an average monthly income of more than 30,000 THB, whilst taking oral medication and having family history of T2DM were associated with social support scores. People with T2DM are at-risk of low self-care behavior, social support and attitude, and they need an appropriate intervention program, such as diabetes self-management and education program. In addition, they are also in need of healthcare accessibility in their community to engage and improve their quality of life.

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Abbreviations

The following abbreviations are used in this manuscript:#

ADA	American Diabetes Association
CHCW	Community health-care worker
CI	confidence interval
CPHW	Community public health worker
DSME	Diabetes self-management education
LDL	Low density lipoprotein
r-T-MSPSS	Revised Thai Multi-Dimensional Scale of Perceived Social Support
SCM	Self-care management
SD	standard deviation
SHPH	Subdistrict Health Promoting Hospital
SOC	Sense of Coherence
T2DM	Type 2 Diabetes Mellitus
VIF	Variance Inflation Factor

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