



Diabetes self-management and its influencing factors among adults with type 2 diabetes mellitus in rural Sri Lanka: A cross-sectional study

Samantha Sandamali Premadasa¹ , Khemaradee Masingboon^{2*} , and Niphawan Samartkit² 

¹Master of Nursing Science Program Adult Nursing (International Program), Faculty of Nursing, Burapha University, Chon Buri, Thailand

²Faculty of Nursing, Burapha University, Chon Buri, Thailand

Abstract

Background: Diabetes Self-Management (DSM) is pivotal in managing diabetes. However, poor engagement in DSM has been observed in rural Sri Lankan settings. Thus, identifying factors influencing DSM is crucial for nurses and other healthcare professionals.

Objectives: This study aimed to describe DSM among adults with Type 2 Diabetes Mellitus (T2DM) in rural Sri Lanka and to examine whether perceived stress, health literacy, self-efficacy, and family support can predict DSM among adults with T2DM in rural Sri Lanka.

Methods: This correlational predictive study used a simple random sampling technique to recruit 160 adults with T2DM from an outpatient clinic at a secondary care hospital in a rural area of Sri Lanka. Data were collected from March to April 2024 using socio-demographic and standardized questionnaires to examine predictive factors of DSM, including perceived stress, health literacy, self-efficacy, and family support. Data analysis was conducted using descriptive statistics and standard multiple linear regression analysis.

Results: Approximately half of the participants had uncontrolled T2DM (Fasting Plasma Glucose (FPG) >126) and sub-optimal DSM. The analysis revealed that all variables could explain 39.3% of the variance in DSM among rural Sri Lankan adults with T2DM. However, DSM was significantly predicted by self-efficacy ($\beta = 0.530, p = 0.001$), harmful family involvement ($\beta = -0.169, p = 0.038$), and health literacy ($\beta = -0.162, p = 0.020$).


Conclusion: The findings emphasized the need for further development of interventions to increase self-efficacy and reduce harmful family involvement to enhance DSM among adults with T2DM. Nurses and other healthcare providers should target family members' engagement to improve self-efficacy among this population.

*Corresponding author:

Khemaradee Masingboon, RN, DSN, Assistant Professor
Faculty of Nursing, Burapha University, 169, Longhard Bangsaen Road, Muang District, Chon Buri, 20131, Thailand
Email: khemaradee@nurse.buu.ac.th

Article info:

Received: 16 May 2024
Revised: 21 June 2024
Accepted: 17 July 2024

 This is an Open Access article distributed under the terms of the [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/), which allows others to remix, tweak, and build upon the work non-commercially as long as the original work is properly cited. The new creations are not necessarily licensed under the identical terms.

E-ISSN: 2477-4073 | P-ISSN: 2528-181X

Keywords

Sri Lanka; type 2 diabetes mellitus; diabetes self-management; perceived stress; health literacy; self-efficacy; family support; blood glucose; adult

Background

Diabetes is a major, fastest-growing global health challenge, accounting for 10.5% of the population worldwide, with the vast majority (90% - 95%) suffer from Type 2 Diabetes Mellitus (T2DM) ([International Diabetes Federation \[IDF\], 2021](#)). Sri Lanka reported the highest diabetes prevalence in South Asia, with 23% of people over 18 years suffering from either diagnosed or undiagnosed diabetes in 2019 ([Rannan-Eliya et al., 2023](#)). Additionally, uncontrolled diabetes prevalence is higher among Sri Lankans, especially in rural settings, with around 45% of the participants having uncontrolled Fasting Plasma Glucose (FPG) levels following two years of treatment ([Mettananda et al., 2023](#)). Consequently, serious multisystem macrovascular and microvascular complications are arising, claiming lives and imposing a considerable economic burden on individuals, families, and societies ([International Diabetes Federation \[IDF\], 2021](#)).

As a key to the effective management of T2DM, nurses and other healthcare providers should address behavioral strategies to support Diabetes Self-Management (DSM) ([American Diabetes Association Professional Practice Committee, 2024](#)). DSM is crucial to minimizing the risk of serious complications, improving patient well-being and Quality of Life (QoL), and lowering healthcare costs ([Akmal et al., 2022](#); [Bako et al., 2022](#); [Maina et al., 2023](#)). DSM includes healthy coping and eating, being active, adhering to medication, monitoring glucose, reducing risk factors, and problem-solving ([American Association of Diabetes Educators, 2020](#)). However, sub-domains of DSM were sub-optimal among Sri Lankans with T2DM. For example, around 64% of individuals had poor dietary control, 60% had poor drug adherence, only 10.4% monitored blood glucose levels as recommended in guidelines, and 54% were physically inactive ([Mettananda et al., 2023](#)). The reason for suboptimal DSM is multifactorial ([Cooray et al., 2017](#)), and the reasons for

suboptimal DSM among rural Sri Lankans remain unclear due to the lack of data available regarding overall DSM and its influencing factors.

Among Sri Lankans, in addition to the individuals, family is an essential aspect of adherence to DSM practices (Wijesinghe et al., 2017). Sri Lankan culture is based on family bonds; mainly, the father or husband provides economic support, women cook for family members, children live with their parents until their late 20s to early 30s, and children care for their parents in their old age (Facts and Details, 2022). This study was guided by the Individual and Family Self-Management Theory (IFSMT) (Ryan & Sawin, 2009) and reviewed literature. Various factors under the context and process dimensions, including individual and family factors, health literacy, self-efficacy, and family support, may impact engagement in self-management behaviors (Ryan & Sawin, 2009).

Prior literature has provided contradictory evidence on perceived stress, health literacy, self-efficacy, and family support, and little is known about rural Sri Lankan adults with T2DM. Perceived stress is an individual's ability to cope with stressful situations and the degree to which they appraise situations as stressful in their lives when the demands exceed (Cohen et al., 1983). DSM is significantly influenced by lowered perceived stress, and stress management behavior has a positive association with DSM (Eshete et al., 2023; Zhao et al., 2018). However, studies on the influence of perceived stress on DSM are sparse among Sri Lankans.

Health literacy refers to the knowledge, motivation, and competencies of people to access, understand, appraise, and apply health-related information to make decisions and judgments concerning healthcare, prevention of disease, and health promotion in everyday life to improve or maintain QoL (Sørensen et al., 2012). Limited health literacy leads to poorer DSM practices, while sufficient health literacy leads to better DSM (Alsharif & Alhalal, 2022; Guo et al., 2021; Tseng et al., 2022). Further research is required to elucidate any inconsistency about the role of health literacy in DSM (Dahal & Hosseinzadeh, 2020).

Self-efficacy refers to a person's confidence in their ability to successfully engage in behavior under stressful and normal situations (Ryan & Sawin, 2009). Higher perceived self-efficacy tends to result in stronger and more persistent efforts to perform DSM, and it significantly predicts increased DSM (Clara et al., 2021; Yang et al., 2022). Nevertheless, the availability of data regarding the influence of self-efficacy on DSM is scant among Sri Lankans.

According to the literature review, successful DSM is based on family member involvement, and they provide either helpful or harmful involvement in patients' behavior (Alanazi, 2021; Mayberry & Osborn, 2014). Family members' helpful and harmful involvement were independently related to greater and lesser DSM and predicted to improve and worsen HbA1c, respectively (Mayberry et al., 2019). Family support might either hamper or facilitate DSM, it was vital for those with a strong cultural focus on family bonds (Tang et al., 2023). Many prior studies focused on overall family support, but little is known about helpful and harmful family member involvement in DSM.

Globally, a large body of published studies related to the factors influencing DSM exists, but specific gaps in knowledge

remain. There is a paucity of data available regarding the influencing factors of DSM among adults with T2DM in rural Sri Lanka. When compared with other countries, Sri Lankans have their own unique culture, beliefs, and experiences, and the healthcare systems are different. Besides, most Sri Lankan studies were conducted in urban settings, and cultural beliefs, healthcare access, and availability of facilities for investigations and medicines in rural contexts are different from those in urban settings. Thus, nurses and other healthcare professionals are crucial in identifying these issues, providing the scientific foundation for evidence-based practice, and making necessary interventions to promote DSM among this population.

Therefore, the purposes of this study were to describe DSM and examine whether perceived stress, health literacy, self-efficacy, and family support could predict DSM among adults with T2DM in rural Sri Lanka.

Methods

Study Design

This study used a correlational predictive design to establish the direction and strength of the association among or between variables to predict the value of one variable based on another variable (Sutherland, 2017).

Samples/Participants

A simple random sampling method was used to recruit 160 adults diagnosed with T2DM who visited the Non-Communicable Disease (NCD) clinic at a secondary care hospital in a rural area of Sri Lanka. The researcher randomly selected a maximum of 15 participants per day who met the inclusion criteria by preparing two pieces of paper of the same size and material and writing "even numbers" on one and "odd numbers" on the other. These two pieces of paper were folded and mixed well in a prepared container, and the researcher picked a paper that mentioned either "odd numbers" or "even numbers" and selected queue numbers accordingly. The inclusion criteria were: 1) aged 18 - 64 years; 2) diagnosed with T2DM for at least six months; 3) ability to read and write Sinhala; 4) no mental illness and the ability to orient to time, place, and date; 5) no serious physical disabilities, including blindness or impaired mobility requiring assistance such as paralysis or difficulty walking. Participants from other urban regions in Sri Lanka were excluded from this study.

Sample size calculation was done using the rule of thumb method. Ten to 50 candidates per variable (EPV) are suitable for multiple regression (Riley et al., 2020). Thus, to ensure generalizability, the sample size was determined to be 40 candidates for four independent variables, resulting in 160 participants.

Instruments

Six instruments were used to collect data. All instruments, except the sociodemographic questionnaire, were used with permission from the original authors. Additionally, four instruments, except the Sinhalese version of the Perceived Stress Scale, were translated into Sinhala using a standard forward-backward translation procedure (Mapi Research Trust, 2018). The questionnaires were translated into Sinhala by two local nursing professionals who are native Sinhala

speakers and bilingual in English. Then, a nursing professor reviewed the Sinhala versions to ensure appropriateness and prepared reconciled versions. After that, the questionnaires were translated back into English by a local professional translator who was bilingual in Sinhala and English and did not have access to the original questionnaire. The research team and a native English speaker then compared the backward version with the original instruments to assess its similarity with the original items. The original scales were matched, and the Sinhala version was finalized. Lastly, cognitive debriefing (testing) was done with five native Sinhala speakers who had the same characteristics as the study participants, and pre-tests were performed with 30 participants. A reliability test of the Sinhala version was performed, and all instruments had acceptable reliability with Cronbach's alpha of more than 0.7.

The researcher developed the Sociodemographic Questionnaire, which includes two parts: 1) general information about the participants' characteristics and some information about the family; 2) participants' health information collected from medical records, including the duration of T2DM, current treatment, glycemic control, presence of complications, and comorbidities.

Participants' DSM was assessed using the Diabetes Self-Management Questionnaire (DSMQ), which was developed by [Schmitt et al. \(2013\)](#). The DSMQ contains 16 items with five subscales, including dietary management, blood glucose monitoring, medication adherence, physical activity, and healthcare use. Participants were asked to rate four-point Likert-type answers (3 = Applies to me very much to 0 = Does not apply to me) for the past eight weeks. The nine negatively keyed items were reversed, and scale scores were computed according to the formula (the actual sum of items / maximum possible sum of items x 10). A higher score means a higher DSM. It is a reliable and valid instrument with a Cronbach's alpha of 0.84 in the original version ([Schmitt et al., 2013](#)) and it was 0.72 in the Sinhala version.

The Sinhalese version of the Perceived Stress Scale -10 (S-PSS-10) was used to assess perceived stress, which was validated for Sinhala-speaking Sri Lankans by [Mendis et al. \(2023\)](#). This scale was first developed by [Cohen et al. \(1983\)](#), and the scale is structured on a five-point Likert-type answer (0 = Never to 4 = Very often) indicating experiences over the past month ([Mendis et al., 2023](#)). Items 4, 5, 7, and 8 are reversed, and each item is summed to obtain a final score. Perceived stress levels are considered 0 - 13 'Low,' 14 - 26 'Moderate,' and 27 - 40 'High' ([Cohen et al., 1983](#)). The S-PSS-10 had high internal consistency and reliability, with a Cronbach's alpha of 0.85. It showed acceptable concurrent and construct validity ([Mendis et al., 2023](#)). For this study, the Cronbach's alpha level was 0.94.

Participants' Health Literacy (HL) was measured using the Functional, Communicative, and Critical Health Literacy Scale (FCCHL), which was developed by [Ishikawa et al. \(2008\)](#). This scale consists of 14 items with three subscales, namely Functional HL, Communicative HL, and Critical HL, rated on four-point Likert-type answers (1 = Never to 4 = Often). The scores of functional HL items are reversed, and total and subscale scores are calculated using the mean score. The total score ranges from 1-4, with higher scores indicating higher HL ([Ishikawa et al., 2008](#)). The original tool and Sinhala

version had good validity and reliability, with a Cronbach's alpha of 0.78 and 0.94, respectively.

The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK), developed by [Sturt et al. \(2010\)](#), was used to assess self-efficacy. It incorporates 15 items with 11-point Likert-type answers, and each item is scored on a 0–10 scale (0–1 Cannot do at all, 4/5 Maybe yes maybe no, 9/10 Certain can do). Individual patient total scores ranged from 0–150 and can be interpreted as 0–50 “low self-efficacy,” 51–100 “moderate self-efficacy,” and 101–150 “high self-efficacy.” The scale has good internal reliability (Cronbach's alpha of 0.89), internal consistency, construct, and criterion validity ([Sturt et al., 2010](#)). The Cronbach's alpha level of the Sinhala version was 0.83.

Family support was assessed using the Family/Friend Involvement in Adults' Diabetes (FIAD) scale, which was first developed by [Mayberry et al. \(2019\)](#). It consists of 16 items with two subscales that assess helpful and harmful family/friends' involvement in DSM among adults with T2DM. Each item is responded to according to 5-point Likert-type answers related to how often family members behaved in the past month (1 = Never to 5 = Twice or more each week). The summary scores of this tool range from 1 to 5, with higher scores indicating more supportive or more obstructive behaviors. It had adequate internal consistency and reliability with a Cronbach's alpha of 0.87, test-retest reliability, convergent validity, criterion, and predictive validity ([Mayberry et al., 2019](#)). The reliability of the Sinhala version (Cronbach's alpha) was 0.89.

Data Collection

Data were collected between March and April 2024 at the NCD clinic of a Secondary care Hospital in a rural area of Sri Lanka. Participants who met the inclusion criteria were gathered by simple random sampling, with a maximum of 15 participants per day, three days per week. Data were collected through self-administered questionnaires; when participants requested, the researcher read the questionnaires to them. All data were gathered from participants and their medical records in a special private area near the pre-examination sitting area, which took 20–25 minutes.

Data Analysis

Data were analyzed using IBM SPSS version 26 with a significance level of <0.05. Descriptive statistics were used to describe participants' demographic data and variables. Multiple regression (ENTER method) analysis was used to identify the predicting factors of DSM.

All assumptions of multiple regression were met, including normal distribution, linearity, outliers, homoscedasticity, autocorrelation, and multicollinearity. Univariate normality was tested with the Fisher skewness coefficient and the Fisher kurtosis coefficient, both of which were between -1.96 and +1.96. Multivariate normality was tested by One-Sample Kolmogorov-Smirnov and scatter plots (between -3 and +3), indicating no outliers. The linearity of the variables was checked, revealing that the variables had a linear relationship ($\alpha < 0.05$). Autocorrelation among independent variables was checked using the Durbin-Watson test, which was between 1 and 3, indicating no autocorrelation. Homoscedasticity was checked with scatter plots. The tolerance test values were

higher than 0.2, and multicollinearity was checked by the Variance Inflation Factor (VIF), which was less than 5, indicating no multicollinearity.

Ethical Considerations

Ethics committee approval was obtained from Burapha University, Thailand (G-HS102/2566) and the Faculty of Medicine, University of Sri Jayewardenepura, Sri Lanka (ERC 43/23). Local site approval was obtained from the Medical Superintendent, Base Hospital Kalawana, Sri Lanka. In addition, informed written consent from the eligible voluntary participants was obtained before data collection.

Results

Characteristics of the Participants

A total of 160 study participants ranged in age from 27 to 64 years, with a mean age of 57.5 years. Of these, 51 (31.9%) were men and 109 (68.1%) were women. The majority of participants were married (81.3%), lived with family members (91.9%), had completed secondary-level education (61.9%), and earned a lower family income (58.1%). Only 10% had a

glucometer at home. Approximately 30% and 9% of the participants were overweight and obese, respectively. The majority used oral medications only (88.7%). Unfortunately, 48.8% of the participants had uncontrolled FPG (>126 mg/dl), 79.4% had comorbidities, and 26.9% had current diabetes-related complications.

Description of the Dependent and Independent Variables

The DSM (overall) score varied from 2.92 to 8.96, with a Mean (M) score of 5.84 (Standard Deviation [SD] = 1.25). Among the subscale scores, healthcare use reported the highest mean score (M = 9.38, SD = 1.06), followed by medication adherence (M = 8.58, SD = 2.37), glucose monitoring (M = 5.44, SD = 1.73), and dietary control (M = 4.65, SD = 2.27). The physical activity subscale reported the lowest mean score (M = 2.47, SD = 2.61). In this study, four independent variables (IVs) were examined: perceived stress, health literacy, self-efficacy, and family support. The results revealed that the mean score of perceived stress was 11.73 (SD = 11.99), health literacy was 2.72 (SD = 0.85), self-efficacy was 84.5 (SD = 27.15), helpful family involvement was 2.73 (SD = 0.98), and harmful family involvement was 2.25 (SD = 0.77) (see [Table 1](#)).

Table 1 Description of the dependent and independent variables ($n = 160$)

Study variables	Range		M	SD
	Possible	Actual		
Overall diabetes self-management	0 – 10	2.92 - 8.96	5.84	1.25
Dietary management	0 – 10	0.83 – 10	4.65	2.27
Glucose monitoring	0 - 10	0 -10	5.44	1.73
Medication adherence	0 – 10	1.67 – 10	8.58	2.37
Physical activity	0 – 10	0 – 10	2.47	2.61
Health care use	0 - 10	5.56 - 10	9.38	1.06
Perceived stress	0 – 40	0 – 39	11.73	11.99
Health literacy	1 – 4	1 – 4	2.72	0.85
Self-efficacy	0 – 150	34 – 150	84.53	27.14
Family support				
Helpful family involvement	1 – 5	1 – 5	2.73	0.98
Harmful family involvement	1 – 5	1 – 4	2.25	0.77

Table 2 Correlation matrix of the study variables ($n = 160$)

	Diabetes Self-Management (DSM)	Perceived Stress (PS)	Health Literacy (HL)	Self-Efficacy (SE)	Helpful Family Involvement (Helpful FI)	Harmful Family Involvement (Harmful FI)
DSM	1.000					
PS	-0.311**	1.000				
HL	0.134*	-0.196**	1.000			
SE	0.598**	-0.343**	0.444**	1.000		
Helpful FI	0.244**	-0.073	0.168*	0.355**	1.000	
Harmful FI	-0.255**	0.178*	-0.075	-0.270**	0.446**	1.000

Note: ** $p < 0.01$, * $p < 0.05$

Table 3 The regression analysis results of factors influencing DSM ($n = 160$)

Factors	B	Standard Error	β	t	p-value
Perceived stress	-0.013	0.007	-0.120	-1.813	0.072
Health literacy	-0.238	0.101	-0.162	-2.349	0.020
Self-efficacy	0.024	0.004	0.530	6.188	0.001
Helpful family involvement	0.194	0.107	0.150	1.819	0.071
Harmful family involvement	-0.275	0.131	-0.169	-2.098	0.038
Constant = 4.648, Adj R ² = 0.393, F _(5, 154) = 21.611, $p < 0.001$					

Influencing Factors of DSM

Table 2 shows that all study factors were significantly correlated with DSM. There were no issues of multicollinearities among the independent variables.

The results of the multiple regression analysis (ENTER method) revealed that all factors (perceived stress, health literacy, self-efficacy, helpful family involvement, and harmful family involvement) together could explain 39.3% of the variance in DSM among rural Sri Lankan adults with T2DM ($F_{(5, 154)} = 21.611, p < 0.001$). Specifically, self-efficacy was the strongest predictor of variance ($\beta = 0.530, p = 0.001$), followed by harmful family involvement ($\beta = -0.169, p = 0.038$). However, perceived stress and helpful family involvement did not significantly predict DSM, as shown in **Table 3**.

Discussion

The results of the current study indicated that the overall DSM mean score reflects sub-optimal DSM, consistent with studies from Saudi Arabia and China, where mean scores were reported as 5.04 and 4.85 out of 10, respectively (Al-Qahtani, 2020; Yang et al., 2022). In contrast, findings from Iran showed a higher DSM mean score of 6.92 (SD = 1.17), with the dietary management subscale scoring the highest and the glucose management subscale scoring the lowest (Khalooei & Benrazavy, 2019).

According to the IFSMT, individual factors and physical and social environmental factors influence DSM in the present study, including gender, age, education, family structure, income level, beliefs, and culture (Ryan & Sawin, 2009). For instance, the predominance of women participants, who typically manage household duties such as cooking and childcare in Sri Lankan culture, may contribute to less time dedicated to regular DSM practices (Facts and Details, 2022). Additionally, the older age group (56 to 64 years) in this study showed a negative correlation with DSM, consistent with previous findings (Khalooei & Benrazavy, 2019). Married status was also significantly associated with poorer DSM, likely due to increased responsibilities in daily chores and childcare (Al-Qahtani, 2020).

Comparatively, participants with higher levels of education and household income demonstrated significantly higher mean DSM scores compared to those with lower levels, aligning with previous research (Ansari et al., 2019; Khalooei & Benrazavy, 2019). Low economic status adversely affects DSM among rural Sri Lankans due to the high cost of glucose strips and the limited availability of newer and effective medicines and diagnostic facilities in rural Sri Lankan hospitals (Mettananda et al., 2023; Rasalingam, 2023). Additionally, Sri Lankan culture contributes to sub-optimal DSM, including challenges such as difficulties in reducing rice portions, misconceptions about daily physical activity requirements, and discomfort exercising in public places where traditional attire may not be appropriate (Amarasekara et al., 2014; Medagama & Galgomuwa, 2018; Waidyatilaka et al., 2019).

Self-efficacy was identified as a strong significant predictor of DSM in this study, consistent with findings from China, Indonesia, and Sudan (Amer et al., 2018; Clara et al., 2021; Yang et al., 2022). According to the IFSMT, self-efficacy directly influences SM by fostering positive attitudes toward the benefits of DSM and motivating individuals to engage in

these behaviors (Ryan & Sawin, 2009). The correlation matrix in this study further supports the IFSMT, showing significant relationships with all other variables. Participants in the current study had moderate levels of self-efficacy, which corresponded to a moderate level of DSM, despite half of them having uncontrolled FPG levels.

In this study, harmful family involvement significantly predicted DSM, indicating that participants with higher levels of harmful family involvement showed poorer DSM performance. However, helpful family involvement did not predict DSM, but it showed a significant relationship with it. Harmful family involvement may hinder DSM through actions such as planning and tempting unhealthy foods, questioning medication necessity, nagging or arguing, and creating family conflicts (Mayberry & Osborn, 2014). Contrary findings were found in a study by Mayberry et al. (2019), where neither helpful nor harmful involvement predicted DSM. Supportive family behaviors were correlated with better DSM, whereas obstructive behaviors were associated with poorer DSM and worsened blood sugar control (Mayberry & Osborn, 2014). These findings contrast with a rural Chinese study where both supportive and obstructive behaviors were positively associated with DSM ($r = 0.405, p < 0.01, r = 0.267, p < 0.01$) (Tang et al., 2023). These findings further validate the IFSMT, indicating that family members' involvement directly influences engagement in SM behaviors and related outcomes (Ryan & Sawin, 2009).

Surprisingly, health literacy could predict DSM, but it shows a negative significant prediction, indicating that adults with higher health literacy may perform less DSM. This could be attributed to increased awareness of the risks of complications, diet management, and foot care from healthcare professionals in the clinic. This finding contradicts studies among African Americans, Chinese, and Saudis, which found a statistically significant positive correlation between health literacy and DSM (Alsharif & Alhalal, 2022; Guo et al., 2021; Tseng et al., 2022). Similar results were found in a study by Almigbal et al. (2019), where no significant relationship between health literacy and DSM was observed. Possible explanations for these findings include scales assessing overall health literacy rather than diabetes-specific literacy, family members' health literacy variations, and other confounding factors potentially influencing DSM. Another contributing factor could be similar to previous findings in Sri Lanka, where despite higher diabetes knowledge among participants, it did not translate into improved attitudes toward diabetes management (Herath et al., 2017).

Perceived stress could not predict DSM in this study, thus rejecting the hypothesis. It was negatively correlated with DSM, indicating that adults with higher perceived stress may perform less DSM. These results contrast with a Chinese study where perceived stress predicted DSM ($\beta = -0.220, p = 0.001$) (Zhao et al., 2018). The IFSMT suggests that individual cognitive states can enhance or diminish self-management (Ryan & Sawin, 2009). Prior findings by Eshete et al. (2023) further support the IFSMT, showing a positive relationship between stress management behavior and DSM.

Furthermore, the correlation matrix indicates that perceived stress negatively correlates with health literacy and self-efficacy while positively correlates with harmful family involvement. Perceived stress reported a low mean score in

this study, possibly due to the majority living with family members, where family support was negatively associated with stress levels (Bhandary et al., 2013). Another possible explanation could be cultural norms, beliefs, and social structures, particularly religious ideas (mainly Buddhist) such as “diabetes is caused by their bad karma” (Amarasekara et al., 2014), which act as buffers to reduce perceived stress among Sri Lankan adults.

The IFSMT describes how certain factors may influence each other, finally affecting self-management outcomes (Ryan & Sawin, 2009). The current findings further validate the IFSMT, as the correlation matrix shows significant relationships between perceived stress, self-efficacy, helpful family involvement, health literacy, and DSM.

Strengths and Limitations

To the best of our knowledge, this study was the first study to describe factors influencing DSM among adults with T2DM in rural Sri Lanka, laying the groundwork for future research. However, the study’s limitations include the factors explaining only 39.3% of DSM variance, suggesting the need for further investigation into additional variables. The cross-sectional design restricts causal conclusions. Generalizability is constrained as the study was conducted in a single rural secondary care hospital. Questionnaires, except S-PSS-10, were validated and developed primarily in Western cultures, potentially introducing cultural bias. Marginal p-values for perceived stress and helpful family involvement highlight the potential for type I errors. The exclusion of participants with major physical disabilities may overestimate DSM capabilities among the broader rural Sri Lankan T2DM population; their inclusion could offer deeper insights into DSM challenges. Finally, self-reported measures used in the study may be susceptible to biases like social desirability, recall, and response biases, possibly impacting result accuracy.

Implications of the Findings

Based on the findings, urgent interventions are needed to enhance DSM for controlling blood glucose levels, managing comorbidities, and preventing or delaying diabetes-related complications. Tailored nursing interventions should prioritize increasing self-efficacy and promoting family engagement while mitigating harmful family involvement. These interventions should encourage adherence to physical activity and dietary management aligned with ADA guidelines, employing a multidisciplinary approach. Future studies ought to explore additional factors such as diabetes knowledge and the physical and social environment, extending research into diverse rural regions of Sri Lanka. Research should also target older adults and urban settings to understand DSM among Sri Lankans with T2DM comprehensively. Additionally, future investigations should explore helpful and harmful family involvement to elucidate their distinct impacts on DSM. Moreover, government policies and support play a critical role in addressing the escalating trends of T2DM among Sri Lankans.

Conclusion

Findings indicated suboptimal DSM among adults with T2DM in rural Sri Lanka, particularly in physical activity and dietary

control, which scored lower on average. Self-efficacy was identified as the strongest predictor of DSM variance, followed by harmful family involvement. Perceived stress showed a negative correlation with DSM, while helpful family involvement had a positive correlation. Additionally, all independent variables demonstrated interrelationships. Enhancing perceived self-efficacy, helpful family involvement, and health literacy while reducing harmful family involvement and perceived stress could potentially increase DSM practices. This approach may lead to more effective glucose management and contribute to delaying or preventing diabetes-related complications.

Declaration of Conflicting Interest

All authors declared no potential conflicts of interest in this study.

Funding

No specific funding has been received for this research.

Acknowledgment

The authors would like to acknowledge the Thailand International Development Cooperation Agency (TICA), the Ministry of Health, Sri Lanka, and Burapha University, Thailand, for providing the scholarship. Also, special thanks to Prof. Tamara Dilhani Amarasekara and Base Hospital Kalawana, Sri Lanka, for supporting this study and to all authors who granted permission to use their instruments, including the Music Therapy Research Group Sri Lanka. Our sincere gratitude goes to all participants for their cooperation and willingness to participate in this study.

Authors’ Contributions

All authors contributed substantially to the conception or design of the manuscript, acquisition, analysis, or interpretation of data. Additionally, all drafted the manuscript, critically revised it, and approved the final version for publication. They also agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part are appropriately investigated and resolved.

Authors’ Biographies

Ms. Samantha Sandamali Premadasa, BSC, RN is a Master’s Student in the Nursing Science Program Adult Nursing (International Program), Faculty of Nursing, Burapha University, Thailand.

Dr. Khemaradee Masingboon, DSN, RN is an Assistant Professor at the Faculty of Nursing, Burapha University, Thailand.

Dr. Niphawan Samartkit, PhD, RN is an Associate Professor at the Faculty of Nursing, Burapha University, Thailand.

Data Availability

The datasets generated during and analyzed for the current study results are available from the first and corresponding authors upon reasonable request.

Declaration of Use of AI in Scientific Writing

Nothing to disclose.

References

- Akmal, A., Syarif, H., & Husna, C. (2022). The relationship between patient characteristics diabetes self-care management with diabetic peripheral neuropathy in type 2 DM patients in regional general hospital in Indonesia. *International Journal of Nursing Education*, 14(4), 31-37. <https://doi.org/10.37506/ijone.v14i4.18679>
- Al-Qahtani, A. M. (2020). Frequency and factors associated with inadequate self-care behaviors in patients with type 2 diabetes mellitus in Najran, Saudi Arabia: Based on diabetes self-management questionnaire. *Saudi Medical Journal*, 41(9), 955-964. <https://doi.org/10.15537/smj.2020.9.25339>
- Alanazi, M. (2021). Determinants of successful diabetes self-management behaviors among women of Arab descent with Type 2 Diabetes.

- Primary Care Diabetes*, 15(2), 306-313. <https://doi.org/10.1016/j.pcd.2020.10.009>
- Almighal, T. H., Almutairi, K. M., Vinluan, J. M., Batais, M. A., Alodhayani, A., Alonazi, W. B., Sheshah, E., & Alhoqail, R. I. (2019). Association of health literacy and self-management practices and psychological factor among patients with type 2 diabetes mellitus in Saudi Arabia. *Saudi Medical Journal*, 40(11), 1158–1166. <https://doi.org/10.15537/smj.2019.11.24585>
- Alsharif, B. A., & Alhalal, E. A. (2022). Effects of health literacy on type 2 diabetic patients' glycemic control, self-management, and quality of life. *Saudi Medical Journal*, 43(5), 465-472. <https://doi.org/10.15537/smj.2022.43.5.20210917>
- Amarasekara, A., Fongkaew, W., Turale, S., Wimalasekara, S. W., & Chanprasit, C. (2014). An ethnographic study of diabetes health beliefs and practices in Sri Lankan adults. *International Nursing Review*, 61(4), 507-514. <https://doi.org/10.1111/inr.12136>
- Amer, F. A., Mohamed, M. S., Elbur, A. I., Abdelaziz, S. I., & Elrayah, Z. A. (2018). Influence of self-efficacy management on adherence to self-care activities and treatment outcome among diabetes mellitus type 2. *Pharmacy Practice (Granada)*, 16(4), 1274. <https://doi.org/10.18549/PharmPract.2018.04.1274>
- American Association of Diabetes Educators. (2020). An effective model of diabetes care and education: Revising the AADE7 Self-Care Behaviors®. *The Diabetes Educator*, 46(2), 139-160. <https://doi.org/10.1177/0145721719894903>
- American Diabetes Association Professional Practice Committee. (2024). 5. Facilitating positive health behaviors and well-being to improve health outcomes: Standards of care in diabetes—2024. *Diabetes Care*, 47(Supplement_1), S77-S110. <https://doi.org/10.2337/dc24-S005>
- Ansari, R. M., Harris, M., Hosseinzadeh, H., & Zwar, N. (2019). Factors associated with the self-management practices of Type 2 diabetes among the middle-aged population of rural area of Pakistan. *Research Square*, 1-19. <https://doi.org/10.21203/rs.2.14605/v3>
- Bako, K. R., Reynolds, A. N., Sika-Paotonu, D., Signal, L., & Mohammadnezhad, M. (2022). Identifying factors which enhance the self-management of type 2 diabetes: A systematic review with thematic analysis. *Global Journal of Health Science*, 15(1), 1-18. <https://doi.org/10.5539/gjhs.v15n1p1>
- Bhandary, B., Rao, S., & Sanal, T. S. (2013). The effect of perceived stress and family functioning on people with type 2 diabetes mellitus. *Journal of Clinical and Diagnostic Research: JCDR*, 7(12), 2929-2931. <https://doi.org/10.7860/JCDR/2013/7414.3689>
- Clara, H., Irawaty, D., & Dahlia, D. (2021). Self-efficacy as a predictor of self-management behavior practice among people with type 2 diabetes mellitus (T2DM). *KnE Life Sciences*, 6(1), 440-453. <https://doi.org/10.18502/kls.v6i1.8633>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385-396. <https://doi.org/10.2307/2136404>
- Cooray, B. P. R., Morrissey, H., Ball, P., & Waidyaratne, E. (2017). The effects of health education in the management of type 2 diabetes and the Sri Lankan perspective: A review. *Sri Lanka Journal of Diabetes Endocrinology and Metabolism*, 7(1), 33-38. <https://doi.org/10.4038/sjdem.v7i1.7325>
- Dahal, P. K., & Hosseinzadeh, H. (2020). Association of health literacy and diabetes self-management: A systematic review. *Australian Journal of Primary Health*, 25(6), 526-533. <https://doi.org/10.1071/PY19007>
- Eshete, A., Mohammed, S., Deresse, T., Kifle-yohans, T., & Assefa, Y. (2023). Association of stress management behavior and diabetic self-care practice among diabetes type II patients in North Shoa Zone: A cross-sectional study. *BMC Health Services Research*, 23(1), 767. <https://doi.org/10.1186/s12913-023-09752-6>
- Facts and Details. (2022). *Women, families, and gender in Sri Lanka*. https://factsanddetails.com/south-asia/SriLanka/People_SriLanka/entry-7984.html
- Guo, X.-m., Zhai, X., & Hou, B.-r. (2021). Adequacy of health literacy and its effect on diabetes self-management: A meta-analysis. *Australian Journal of Primary Health*, 26(6), 458-465. <https://doi.org/10.1071/PY20079>
- Herath, H. M. M., Weerasinghe, N. P., Dias, H., & Weeraratna, T. P. (2017). Knowledge, attitude and practice related to diabetes mellitus among the general public in Galle district in Southern Sri Lanka: A pilot study. *BMC Public Health*, 17, 535. <https://doi.org/10.1186/s12889-017-4459-5>
- International Diabetes Federation [IDF]. (2021). *IDF Diabetes Atlas 2021*. International Diabetes Federation. https://diabetesatlas.org/idfawp/resource-files/2021/07/IDF_Atlas_10th_Edition_2021.pdf
- Ishikawa, H., Takeuchi, T., & Yano, E. (2008). Measuring functional, communicative, and critical health literacy among diabetic patients. *Diabetes Care*, 31(5), 874-879. <https://doi.org/10.2337/dc07-1932>
- Khalooei, A., & Benrazavy, L. (2019). Diabetes self-management and its related factors among type 2 diabetes patients in primary health care settings of Kerman, Southeast Iran. *Journal of Pharmaceutical Research International*, 29(4), 1-9. <https://doi.org/10.9734/jpri/2019/v29i430241>
- Maina, P. M., Pienaar, M., & Reid, M. (2023). Self-management practices for preventing complications of type II diabetes mellitus in low and middle-income countries: A scoping review. *International Journal of Nursing Studies Advances*, 5, 100136. <https://doi.org/10.1016/j.ijnsa.2023.100136>
- Mapi Research Trust. (2018). *Linguistic Validation Guidance of a Clinical Outcome Assessment (COA)*. Mapi Research Trust. <https://www.mapi-trust.org/services/translation-linguistic-validation>
- Mayberry, L. S., Berg, C. A., Greevy Jr, R. A., & Wallston, K. A. (2019). Assessing helpful and harmful family and friend involvement in adults' type 2 diabetes self-management. *Patient Education and Counseling*, 102(7), 1380-1388. <https://doi.org/10.1016/j.pec.2019.02.027>
- Mayberry, L. S., & Osborn, C. Y. (2014). Family involvement is helpful and harmful to patients' self-care and glycemic control. *Patient Education and Counseling*, 97(3), 418-425. <https://doi.org/10.1016/j.pec.2014.09.011>
- Medagama, A., & Galgomuwa, M. (2018). Lack of infrastructure, social and cultural factors limit physical activity among patients with type 2 diabetes in rural Sri Lanka, a qualitative study. *PLoS One*, 13(2), e0192679. <https://doi.org/10.1371/journal.pone.0192679>
- Mendis, B. I. L. M., Paliheru, P. A. D. S., Karunanayake, P., Satharasinghe, D. A., Premaratne, J. M. K. J. K., Dias, W. K. R. R., Rajapakse, I. H., Hapugalle, A. S., Karunaratne, W. R. S. A., & Binendra, A. G. Y. N. (2023). Validity and reliability of the Sinhalese version of the perceived stress scale questionnaire among Sri Lankans. *Frontiers in Psychology*, 14, 1152002. <https://doi.org/10.3389/fpsyg.2023.1152002>
- Mettananda, C., Chathuranga, U., Rathnayake, T., Luke, N., & Meegodavidanage, N. (2023). Glycaemic control and avenues for improvement among people with type 2 diabetes mellitus from rural Sri Lanka—a retrospective cohort study. *The Lancet Regional Health-Southeast Asia*, 12, 100169. <https://doi.org/10.1016/j.lansea.2023.100169>
- Rannan-Eliya, R. P., Wijemunige, N., Perera, P., Kapuge, Y., Gunawardana, N., Siger, C., Jayatissa, R., Herath, H. M. M., Gamage, A., & Weerawardana, N. (2023). Prevalence of diabetes and pre-diabetes in Sri Lanka: A new global hotspot—estimates from the Sri Lanka Health and Ageing Survey 2018/2019. *BMJ Open Diabetes Research and Care*, 11(1), e003160. <https://doi.org/10.1136/bmjdr-2022-003160>
- Rasalingam, G. (2023). The acute economic recession: WHO diabetes target 2030 becoming unrealistic in Sri Lanka. *Health Science Reports*, 6(1), e1027. <https://doi.org/10.1002/hsr2.1027>
- Riley, R. D., Ensor, J., Snell, K. I. E., Harrell, F. E., Martin, G. P., Reitsma, J. B., Moons, K. G. M., Collins, G., & Van Smeden, M. (2020). Calculating the sample size required for developing a clinical prediction model. *BMJ*, 368, m441. <https://doi.org/10.1136/bmj.m441>
- Ryan, P., & Sawin, K. J. (2009). The individual and family self-management theory: Background and perspectives on context, process, and outcomes. *Nursing Outlook*, 57(4), 217-225. <https://doi.org/10.1016/j.outlook.2008.10.004>
- Schmitt, A., Gahr, A., Hermanns, N., Kulzer, B., Huber, J., & Haak, T. (2013). The Diabetes Self-Management Questionnaire (DSMQ): Development and evaluation of an instrument to assess diabetes self-care activities associated with glycaemic control. *Health and Quality of Life Outcomes*, 11, 138. <https://doi.org/10.1186/1477-7525-11-138>
- Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Brand, H., & Consortium Health Literacy Project, E. (2012). Health literacy and public health: A systematic review and

- integration of definitions and models. *BMC Public Health*, 12, 80. <https://doi.org/10.1186/1471-2458-12-80>
- Sturt, J., Hearnshaw, H., & Wakelin, M. (2010). Validity and reliability of the DMSES UK: A measure of self-efficacy for type 2 diabetes self-management. *Primary Health Care Research & Development*, 11(4), 374-381. <https://doi.org/10.1017/S1463423610000101>
- Sutherland, S. (2017). Quantitative Methodology: Noninterventional Designs and Methods. In J. R. Gray, S. K. Grove, & S. Sutherland (Eds.), *Burns and Grove's the practice of nursing research: Appraisal, synthesis, and generation of evidence* (8th ed.). Elsevier.
- Tang, R., Luo, D., Li, B., Wang, J., & Li, M. (2023). The role of family support in diabetes self-management among rural adult patients. *Journal of Clinical Nursing*, 32(19-20), 7238-7246. <https://doi.org/10.1111/jocn.16786>
- Tseng, H. H. K., Nkimbeng, M., & Han, H. R. (2022). Gender differences in psychosocial characteristics and diabetes self-management among inner-city African Americans. *Nursing Open*, 9(5), 2425-2433. <https://doi.org/10.1002/nop2.1259>
- Waidyatilaka, I., Lanerolle, P., de Silva, A., Wickremasinghe, R., Somasundaram, N., & Atukorala, S. (2019). Diabetes mellitus, lifestyle and nutrition in urban women: Need for baseline knowledge, attitudes and practices guided programs. *International Journal of Medical Research & Health Sciences*, 8(7), 142-147.
- Wijesinghe, H., Wijekoon, A. I. K., Sooriyaarachchi, M. P., Jayasinghe, H., Nuwansala, H. U. C., & Priyanthi, W. N. (2017). *Factors related to self-care practices among patients with type 2 diabetes mellitus: A descriptive study*. Proceeding of the 15th Open University Research Sessions (OURS 2017), Sri Lanka.
- Yang, N., Masingboon, K., & Samartkit, N. (2022). Factors influencing diabetes self-management among adults with type 2 diabetes mellitus in China. *Belitung Nursing Journal*, 8(5), 389-395. <https://doi.org/10.33546/bnj.2199>
- Zhao, F.-F., Suhonen, R., Katajisto, J., & Leino-Kilpi, H. (2018). The association of diabetes-related self-care activities with perceived stress, anxiety, and fatigue: A cross-sectional study. *Patient Preference and Adherence*, 12, 1677-1686. <https://doi.org/10.2147/PPA.S169826>

Cite this article as: Premadasa, S. S., Masingboon, K., & Samartkit, N. (2024). Diabetes self-management and its influencing factors among adults with type 2 diabetes mellitus in rural Sri Lanka: A cross-sectional study. *Belitung Nursing Journal*, 10(4), 448-455. <https://doi.org/10.33546/bnj.3441>