DIABETES SELF-MANAGEMENT AND ITS INFLUENCING FACTORS AMONG ADULTS WITH TYPE 2 DIABETES MELLITUS IN RURAL SRI LANKA

SAMANTHA SANDAMALI PREMADASA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER DEGREE OF NURSING SCIENCE
(INTERNATIONAL PROGRAM)
IN ADULT NURSING PATHWAY
FACULTY OF NURSING
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The Thesis of Samantha Sandamali Premadasa has been approved by the examining committee to be partial fulfillment of the requirements for the Master Degree of Nursing Science (International Program) in Adult Nursing Pathway of Burapha University

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SAMANTHA SANDAMALI PREMADASA : DIABETES SELF-MANAGEMENT AND ITS INFLUENCING FACTORS AMONG ADULTS WITH TYPE 2 DIABETES MELLITUS IN RURAL SRI LANKA. ADVISORY COMMITTEE: KHEMARADEE MASINGBOON, DSN NIPHAWAN SAMARTKIT, Ph.D. 2024.

Type 2 diabetes mellitus (T2DM) continues to be an escalating health problem among Sri Lankans. Poor engagement in diabetes self-management (DSM) was seen, especially in rural settings. Thus, the identification of factors influencing DSM is warranted. This study aimed to describe DSM and to examine whether perceived stress, health literacy, self-efficacy, and family support can predict DSM among adults with T2DM in rural Sri Lanka.

A correlational predictive study was conducted in a noncommunicable disease (NCD) clinic at base hospital Kalawana (BHK), Sri Lanka. 160 adults with T2DM were recruited by using a simple random sampling. The data were obtained using a socio-demographic questionnaire (SDQ), The diabetes self-management questionnaire (DSMQ), the Sinhalese version of the perceived stress scale (S-PSS-10), the functional, communicative, and critical health literacy scale (FCCHL), the diabetes management self-efficacy scale – UK version (DMSES-UK), and the family/friend involvement in adults' diabetes (FIAD) scales after translation into Sinhala language. Data were analyzed using descriptive statistics and standard multiple regression analysis.

The findings revealed that 48.8% of the adults with T2DM had uncontrol Fasting plasma glucose (FPG > 126) levels and reported a sub-optimal overall mean score of DSM (M = 5.84 out of 10, SD = 1.25). The healthcare use subscale had the highest mean score (M = 9.38, SD = 1.06) while the physical activity subscale had the lowest mean score (M = 2.47, SD = 2.61). The perceived stress, health literacy, self-efficacy, and family support could explain 39.3 % of the variance in DSM ($F_{(5, 154)} = 21.611$, $p < .001$) and self-efficacy better explained the variance ($\beta = .530$, $p = .001$) followed by harmful family involvement ($\beta = -.169$, $p = .038$) and health literacy ($\beta = -.162.$, $p = .020$).

The findings of the study provided the foundation for further development of the intervention to enhance DSM by increasing self-efficacy and reducing harmful family involvement among this population.

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Samantha sandamali Premadasa

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CHAPTER 1
INTRODUCTION

Background and Significance of the Problem

Diabetes Mellitus (DM) is a major, fastest-growing global health challenge associated with morbidity and mortality, and it is one of the health emergencies of the twenty-first century (International Diabetes Federation [IDF], 2021). Type 2 diabetes mellitus (T2DM) is a more common type of diabetes, and it accounts for the vast majority (90% - 95%) of diabetes globally which results from the body's ineffective use of insulin (American Diabetes Association [ADA], 2023c). Approximately 10.5% of the world's population was afflicted by DM in the year 2021 (between ages 20–79 years) and it is predicted to rise to 11.3% by 2030. Three in four adults with diabetes live in low- and middle-income countries. When compared with the world, Sri Lankan T2DM prevalence is higher than that and it was 11.3% in 2021 which rapidly increased by 68.3% from 2011 (IDF, 2021). Approximately 80% of the Sri Lankan people dwell in rural areas of Sri Lanka (Sri Lanka Health System Review, 2021), and an estimated 15% - 20% diabetes prevalence was reported in Rathnapura district in 2019 (Rannan-Eliya et al., 2023).

Diabetes is a complex and chronic illness and is identified by the presence of hyperglycemia in the absence of treatment (WHO, 2019) and can be diagnosed by two consecutive abnormal test results of either fasting plasma glucose level (FPG ≥ 126 mg) or HbA1C level (≥ 6.5%) (ADA, 2023c). International and local guidelines recommend an HbA1c target for adults with T2DM of less than 7% (ADA, 2023c; National Guideline for Management of Diabetes, 2021). However, many patients worldwide continue to have inadequate diabetes control (Arambewela et al., 2018). In Sri Lanka, approximately two out of five adults with T2DM in urban settings had their blood glucose levels under control (Nair et al., 2023), and nearly half (45%) of rural adults had uncontrolled FPG (Mettananda et al., 2023). Persistent hyperglycemia or uncontrolled glucose management in T2DM is associated with further serious microvascular and macrovascular complications (Bako et al., 2022). The consequences of T2DM and its complications are the leading cause of end-stage renal

disease, blindness, nontraumatic lower limb amputations, and coronary heart disease (Arambewela et al., 2019). Thus, approximately 6.7 million adults (20–79 years) are estimated to have died worldwide and 10% of the total deaths were reported in Sri Lanka in 2021(IDF, 2021). Moreover, diabetes imposes a substantial economic burden on individuals, families, society, and countries representing 11.5% of total global health spending (IDF, 2021) and draining a large amount of the national health budget (Arambewela et al., 2019). Therefore, successful diabetes management needs to reduce morbidity, mortality, and economic burden.

Building positive health behaviors, maintaining psychological well-being and pharmacological management are foundational for achieving goals of treatment for diabetes and maximizing quality of life (QoL) (ADA, 2023d; IDF, 2021). Promoting Healthy lifestyle behaviors includes a healthy diet, regular physical activity, smoking cessation, and maintenance of healthy body weight (IDF, 2021). To achieve these goals, diabetes self-management (DSM) has become a cornerstone of diabetes care (ADA, 2023d).

Self-management (SM) refers to the ability of the individual, in conjunction with family, community, and healthcare professionals, to manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions (particularly chronic diseases) (Richard & Shea, 2011). According to the individual and family self-management theory (IFSMT) (2009), engaging and enhancing SM processes of the individual and family results in more positive outcomes (Ryan & Sawin, 2009). Diabetes self-management (DSM) is the key to the effective management of T2DM, and it incorporates behavioral, personal, and environmental factors into the daily performance of recommended activities and promotes optimal diabetes health outcomes, including quality of life (QoL) (ADA, 2023c; Bushra et al., 2022; B. P. R. Cooray et al., 2017). Successful DSM leads to control the blood glucose level, minimizes the risk of serious complications, improves patient quality of life, and lowers healthcare costs (Akmal et al., 2022; Bako et al., 2022; Maina et al., 2023).

To promote optimal diabetes health outcomes the American Association of Diabetes Educators (AADE) recommends healthy coping, healthy eating, being active, taking medication, monitoring, reducing risk, and problem-solving as

components of DSM education and support (American Association of Diabetes Educators [AADE], 2020). National guidelines adhere to the ADA recommendations and it is recommended that all patients with diabetes should be educated and trained in DSM (National Guideline for Management of Diabetes, 2021). However, adherence to guidelines and achieving standards in care is often challenging among Sri Lankans (Arambewela et al., 2019), and still unclear the reasons.

DSM practices among adults with T2DM differ among different cultural settings. Prior studies suggest that DSM was suboptimal among Pakistan, Southeast Iran, and Qatar adults with T2DM (Ansari et al., 2019; Hassan et al., 2022; Khalooei & Benrazavy, 2019; Rahmatullah et al., 2021). Women of Arab descent with T2DM reported Moderate levels of DSM (Alanazi, 2021) and African Americans reported high levels of DSM (Tseng et al., 2022). Adherence to oral diabetes medication was found to be better than other components of DSM (Ansari et al., 2019; Rahmatullah et al., 2021), and poor adherence with SM concerning exercise (Khalooei & Benrazavy, 2019; Kumar & Mohammadnezhad, 2022; Rahmatullah et al., 2021; Ravi et al., 2018). Several prior Sri Lankan studies revealed that components of the DSM were suboptimal among adults with T2DM. Especially, in rural settings components of DSM were lower than the urban settings. As an example, around 60% of participants in an urban setting (Arambewela et al., 2018) and only 10.4% in a rural setting performed the HbA1c test as mentioned in the guideline. Because HbA1c checking facilities are not freely available in secondary care Hospitals and peripheral units in rural settings (Mettananda et al., 2023). Besides, nearly 64% and 54% of rural adults with T2DM reported poor dietary control and inadequate physical activity respectively. Poor drug compliance was seen among 60.3% of the participants. The associated reasons for suboptimal management were poor compliance, misconceptions, culture, lack of up-to-date knowledge and non-adherence to treatment guidelines by physicians, overcrowding of clinics, very short consultation times due to busy outpatient clinics, and non-availability of some newer and efficacious medicines and investigations in rural hospitals (Mettananda et al., 2023). These findings reflect that most adults with T2DM reported sub-optimal practices in components of DSM, especially in rural Sri Lankan settings which can lead to multisystem physical, and psychological complications and mortality (Lin X et al.,

2020). Also, data were sparse in the overall DSM among adults in rural Sri Lanka. Therefore, ways to improve the impact of DSME on glycemic control need to be explored further for better prevention of diabetes-related long-term complications (B. P. R Cooray et al., 2017).

Self-management of chronic conditions by individual and their families is paramount to assuring the best possible outcomes (Grey M et al., 2014). Therefore, this study is guided by the Individual and family self-management theory (IFSMT) by Ryan and Sawin (2009). This theory describes various factors under the context and process dimension including condition-specific factors, physical and social environmental factors, individual and family factors, knowledge and beliefs, Self-regulation skills and abilities, and social facilitation (Ryan & Sawin, 2009). These factors impact the engagement in SM behaviors as a proximal outcome in this theory.

Prior literature shows that factors including competence, social support, awareness of benefits, attitudes towards medication, perceived health status, diabetes duration, diabetes-related knowledge, financial status, cultural beliefs, social norms, stigma, relationships with health care professionals (HCPs), environmental factors, and SM skills directly led to DSM as facilitates, barriers and challenges (Banasiak et al., 2020; Liu et al., 2022; Whittemore et al., 2019). Reviewed literature also found that perceived stress, health literacy, self-efficacy, and family support are the common and key modifiable factors that affecting DSM (Bushra et al., 2022; Eshete et al., 2023; Ojewale et al., 2019; Tang et al., 2023; Yang et al., 2022). Therefore, this study determined the influencing factors namely perceived stress, health literacy, self-efficacy, and family support with DSM among adults with T2DM in Rural Sri Lanka.

Perceived stress is defined as the degree to which individuals appraise situations as stressful in their lives when the demands exceed the individuals' ability to cope with them (Cohen et al., 1983). Diabetes itself is an additional stressor for people (Pouwer et al., 2010). Therefore, stress management practice is the preferred strategy for DSM (Zhao et al., 2018). Perceived stress is the individual perception that belongs to the condition-specific factor in the context dimension of IFSMT. Stress management behavior had a positive association ($X^2 = 17.7$; $p < .001$) with DSM and perceived stress was significantly predicted in DSM ($\beta = -.220$, $p = .001$) (Eshete et al., 2023). Thus, the reviewed literature indicated that perceived stress is an

influencing factor for DSM. However, little is known about perceived stress and its influences on DSM among adults with T2DM in Rural Sri Lanka.

Health literacy (HL) is defined as entailing people's knowledge, motivation and competencies to access, understand, appraise, and apply health information to make judgments and decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course (Sorensen et al., 2012). HL is the factor under the individual and family factors, in the context dimension of IFSMT and it challenges or protects individuals' and families' engagement in SM (Ryan & Sawin, 2009). HL is a major driver of DSM and Assessing and strengthening the HL level is important because it influences SM skills, glycemic control, and patients' Quality of life (QoL) (Bushra et al., 2022; Dahal & Hosseinzadeh, 2019). Previous studies found that most of the adults with T2DM had low level to average levels of HL and limited HL leads to poorer DSM skills, while sufficient HL leads to better DSM (Bushra et al., 2022; Levic et al., 2023). A Saudi Arabian cross-sectional study revealed that HL positively affects DSM ($\beta = .360$; $p < .01$) (Bushra et al., 2022). Even though, Almigbal et al.'s findings stated that participants with limited health literacy appeared to better DSM (Almigbal et al., 2019). However, previous studies have obtained inconsistent findings about the predictive relationship between health literacy and DSM.

Self-efficacy is a key psychosocial factor that seems to lead to better adherence to DSM (Chindankutty & Dhanalakshmi, 2022). Self-efficacy refers to a degree of confidence one has in his/her ability to successfully engage in behavior under normal and stressful situations. It is the factor under the condition-specific knowledge and beliefs in the process dimension of IFSMT and it directly impacts SM behavior (Ryan & Sawin, 2009). A systematic review revealed that 11 studies reported a significant positive correlation ranging from modest to a strong association between self-efficacy and self-care behaviors (r varied from 0.121 to 0.742). Another Chinese study revealed that DSM was significantly related to perceived self-efficacy ($r = .447$, $p < .01$), and DSM was significantly predicted by perceived self-efficacy ($\beta = .184$, $p < .05$) (Yang et al., 2022). Without having sufficient self-efficacy, adults with T2DM will not be able to carry out DSM effectively (Clara et al., 2021). Therefore, self-efficacy is a strong predictor of DSM among adults with T2DM.

Nevertheless, it should be explored further in Rural Sri Lanka since, a paucity of data available regarding the influence of self-efficacy and DSM

Family refers to a "group of persons united by the ties of marriage, blood, or adoption, constituting a single household and interacting with each other in their respective social positions, usually those of spouses, parents, children, and siblings"(Barnard, 2024). Family support is essential in DSM because most diabetes management takes place within the home environment (Wulandari et al., 2021). Family support is mentioned under the social facilitation in the process dimension of IFSMT. Family-centered interventions directly encourage and support engagement in SM behaviors (Ryan & Sawin, 2009). Family support had a positive statistically significant relationship with DSM which can lead to better health outcomes (Habibi Soola et al., 2022; Ojewale et al., 2019; Ravi et al., 2018; Snouffer, 2018). Successful DSM is based on family member involvement in diabetic care and it would significantly help the patient and the family (Alanazi, 2021). Family members offer either helpful or harmful involvement which is independently associated with greater and less DSM respectively (Mayberry et al., 2019). A rural Chinese study revealed supportive behaviors ($r = .405$, $p < .01$) and obstructive behaviors ($r = .267$, $p < .01$) were positively associated with DSM (Tang et al., 2023). A study in the USA reported that helpful and harmful family involvement was associated with greater and less DSM respectively but could not predict DSM (Mayberry et al., 2019). In Sri Lanka, family members also play an important aspect in adherence to DSM by providing medications, diabetic meals, and participating clinics (Wijesinghe et al., 2017). However, previous studies showed contradictory findings and are still not clear on the helpful and harmful family involvement with DSM among adults with T2DM especially in rural Sri Lankan contexts.

While there is a large body of published studies worldwide related to the above four factors influencing DSM, specific gaps of knowledge still exist. Previous studies showed inconsistent findings and most of the studies used correlational designs. In Sri Lanka, compared to other countries, Sri Lankan culture, dietary habits, and health care system are different, and individuals and their families have their own unique beliefs and experiences regarding DSM. 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 were different from urban settings. To bridge these gaps of knowledge, this study was conducted among adults with T2DM in rural Sri Lanka. The findings of this study will be beneficial for nurses and other healthcare workers to obtain a better understanding of DSM among Sri Lankan rural adults with T2DM which will be helpful to make necessary interventions to promote DSM.

Research Purpose

1. To determine diabetes self-management among adults with T2DM in rural Sri Lanka.

2. To examine whether perceived stress, health literacy, self-efficacy, and family support could predict diabetes self-management among adults with T2DM in rural Sri Lanka.

Research Hypotheses

Perceived stress, health literacy, self-efficacy, and family support could predict diabetes self-management among adults with T2DM in rural Sri Lanka.

Scope of the Study

The purposes of this study were to assess diabetes self-management among adults with T2DM and to examine whether Perceived stress, health literacy, self-efficacy, and family support could predict diabetes self-management among adults with T2DM. This study was conducted with adults with T2DM who were attending the diabetes clinic at the outpatient department at Base Hospital Kalawana, Sri Lanka from March to April 2024

Conceptual Framework

This study was guided by the Individual and Family Self-Management Theory (IFSMT) by Ryan and Sawin (2009) and a literature review. This theory proposed that SM is a complex dynamic phenomenon consisting of 3 dimensions including context, processes, and outcomes (Ryan & Sawin, 2009). Factors in the

contextual dimension consist of risk or protective factors which include condition-specific factors, physical and social environments, and individual and family characteristics. These factors influence individual and family engagement in the process of SM as well as directly impact outcomes. The process dimension consists of three major concepts including knowledge and beliefs, Self-regulation skills and abilities, and social facilitation. Factors in the process dimension impact outcomes. (Ryan & Sawin, 2009). The outcome has 2 categories such as proximal and distal. The proximal outcome includes actual engagement in SM behaviors, use of recommended pharmacological therapies, and cost associated with healthcare use. Distal outcomes are related to partial or the achievement of proximal outcomes. Distal outcomes include health status, quality of life or perceived well-being, and both direct and indirect costs of health care (Ryan & Sawin, 2009).

According to IFSMT, Perceived stress belongs to the condition-specific factor and health literacy belongs to the individual and family factors in the context dimension. Self-efficacy is the factor under the condition-specific knowledge and beliefs and family Support is an important factor of the social facilitation subcategory in the process dimension. The aforementioned four factors are presented as the independent variables and it might be able to predict the dependent variable DSM, as shown in Figure 1

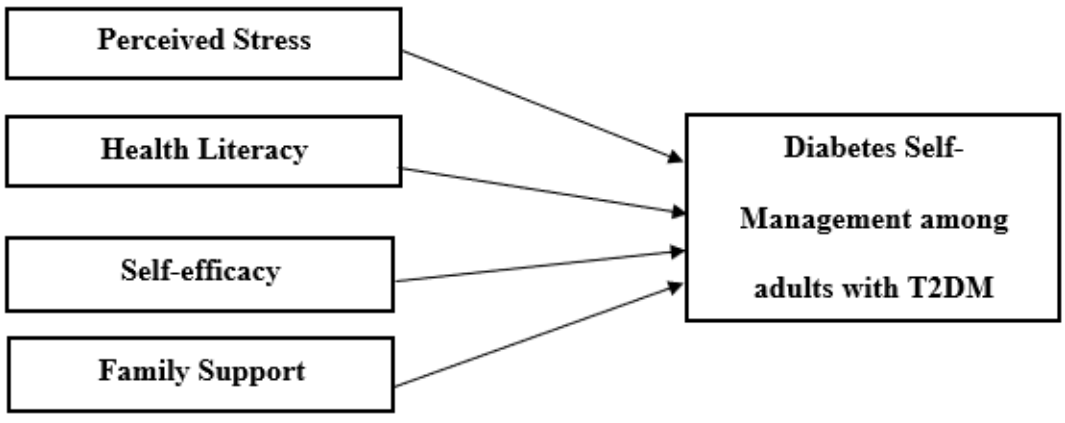

Figure 1 Research Framework

Definition of Terms

Adults with type 2 diabetes mellitus refer to those who are aged 18-64 years, who have been diagnosed with T2DM (as mentioned in their medical records) for at least six months, and who come to the diabetes clinic for regular follow-up their health status at the Base Hospital Kalawana, Sri Lanka.

Diabetes self-management is defined as the ability of adults with T2DM and their families to actively participate in everyday activities including diabetes-related dietary management, glucose management on blood glucose monitoring and medication adherence, physical activity, and physician contact on adherence to diabetes-related doctors' appointments which helps to control blood sugar levels and prevent complications as mentioned in the ADA guideline (2023) and national guideline of Diabetes in Sri Lanka (2021). DSM was measured by the Diabetes Self-Management Questionnaire (DSMQ) developed by Schmitt and colleagues (2013).

Perceived stress refers to the degree to which adults with T2DM appraise situations as stressful in their lives when the demands exceed their ability to cope with them. It was measured by the Perceived Stress Scale (PSS) – 10 developed by Cohen et al. (1983).

Health Literacy refers to the ability of adults with T2DM to extract, understand, and use health-related information to decide their daily lives to manage T2DM and prevent further complications. It was measured by the Functional, Communicative, and Critical Health Literacy Scale (FCCHL) developed by Ishikawa et al. (2008).

Self-efficacy refers to adults with T2DM who have a degree of confidence in living with T2DM in managing their diabetes by successfully engaging in diabetes self-management behaviors. Self-efficacy was assessed by the Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK) developed by Sturt and colleagues (2010).

Family Support refers to perceived helpful and harmful family members' involvement in the self-management of adults with T2DM. It was measured by the Family Involvement in Adults' Diabetes (FIAD) scale developed by Lindsay S. Mayberry and colleagues (2019).

CHAPTER 2
LITERATURE REVIEW

This chapter describes the literature findings related to T2DM and diabetes self-management among adults with T2DM. The literature review is presented as follows.

1. Overview of T2DM
2. Diabetes self-management among adults with T2DM
   2.1 Definition of self-management
   2.2 Components of DSM
   2.3 Diabetes self-management among adults with T2DM
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5. Factors related to diabetes self-management among adults with T2DM
   4.1 Perceived Stress
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   4.3 Self-efficacy
   4.4 Family support
6. Summary of the literature review

Overview of Diabetes Mellitus

DM is a major chronic public health challenge worldwide associated with morbidity and mortality. T2DM accounts for the vast majority (90% - 95%) of diabetes worldwide (ADA, 2023c). Approximately 10.5% of the world's population (537 million adults) were afflicted by DM (2021) and it is predicted to rise by 643 million (11.3%) and 783 million (12.2%) by 2030 and 2045 respectively. Low- and middle-income countries show higher incident rates and three in four adults with diabetes adults live in these countries. The high burden of diabetes is in the working-

age (below age 60) population and as a result of DM and its complications, approximately 6.7 million adults (20–79) are estimated to have died in 2021.

Sri Lanka is a global hotspot for diabetes, having the highest diabetes prevalence in South Asia (Rannan-Eliya et al., 2023) with one in four Sri Lankan adults (Aged > 18 years) had T2DM (23.0%) (both diagnosed [14.3%] and undiagnosed [8.7%]) in the year 2019 (Rannan-Eliya et al., 2023). IDF (2021) stated that Sri Lankan diabetes prevalence is 11.3% (aged 20–79 years) which is higher compared to worldwide prevalence (10.5%) and other South Asian countries like India (9.6%) and Nepal (8.7%). NCDs account for 81% of all deaths and the three leading causes of death in the country are ischemic heart disease (IHD), cerebral vascular disease (CVD), and diabetes (Rajapaksa et al., 2021). IDF stated that Approximately 10% of the total deaths (12,084) were reported in the year 2021 due to diabetes. As well as diabetes also imposes a considerable economic burden on countries representing 11.5% of total global health spending and at least 9% of total expenditure on adults. Similar to the rest of the world total diabetes-related health expenditure in Sri Lanka has increased it was 285.8 (USD million) in 2021 and will rise by 302.4 in 2030 (IDF, 2021). Economic burden influences individuals, families, and societies all around the world.

Definition and Classification of Diabetes

Diabetes is a complex and chronic illness that cannot be cured and it is defined as a group of metabolic disorders characterized and identified by the presence of hyperglycemia in the absence of treatment. It occurs as a result of defects in insulin secretion, insulin action, or both, and disturbances of carbohydrate, fat, and protein metabolism (WHO, 2019). ADA classified Diabetes into four general categories namely, Type 1 Diabetes Mellitus (T1DM), Type 2 Diabetes Mellitus (T2DM), Specific types of diabetes, and Gestational Diabetes Mellitus (GDM). Approximately 90%- 95% of people with diabetes have T2DM which results from the body's ineffective use of insulin and is formerly called non-insulin-dependent, or adult-onset diabetes (ADA, 2023c). T2DM is associated with insulin secretory defects related to genetics, inflammation, and metabolic stress. This type of diabetes is largely the result of excess body weight and physical inactivity (WHO, 2019). All types of diabetes manifest clinically as hyperglycemia (ADA, 2023c).

Diagnostic Criteria and Glycemic Targets of Diabetes Mellitus

Diagnosis of diabetes is based on plasma glucose criteria. According to ADA (2023) recommendations, fasting plasma glucose (FPG) ≥ 126 mg or 2-h plasma glucose (2-h PG) value during a 75-g oral glucose tolerance test (OGTT) ≥ 200 mg/dL or HbA1C level ≥ 6.5% needed for diagnosis of diabetes. As well as in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis random plasma glucose ≥200 mg/dl can be used as a diagnostic criterion for diabetes. These criteria are equally appropriate and two abnormal consecutive test results are needed for the diagnosis of diabetes (ADA, 2023c).

Sri Lankan national guidelines adhere to the ADA recommendations and mention that Fasting plasma glucose 70-130 mg/dL and HbA1c goal for many nonpregnant adults of < 7% is adequate and it should be performed at least twice a year in patients who have stable glycemic control and quarterly in patients whose therapy has changed between the two HbA1c tests or who are not meeting glycemic goals (National Guideline for Management of Diabetes, 2021).

Risk Factors Associated with T2DM

The causes of T2DM are not completely understood but there is a strong link with several risk factors including, family history of diabetes, unhealthy diet, physical inactivity, increasing age, high blood pressure, impaired glucose tolerance (IGT), history of gestational diabetes, emotional distress, poor nutrition during pregnancy, and being overweight or obese. Moreover, certain racial/ethnic subgroups such as African American, Native American, Hispanic/Latino, and Asian American were more prone to develop T2DM. Rapid development and urbanization, certain medications (glucocorticoids, thiazide diuretics, some antiretroviral (ARV) therapies, and atypical antipsychotics) are known to increase the risk of diabetes (ADA, 2023c., IDF, 2021).

Signs and Symptoms of T2DM

Persons with T2DM were undiagnosed for many years due to hyperglycemia developing gradually and it is often not severe enough at earlier stages. As a result of that one-third to one-half of people with T2DM in the population may be undiagnosed (IDF, 2021). The later stage patient can notice the classic diabetes symptoms: polydipsia (excessive thirst and dry mouth), polyuria (frequent urination), polyphagia

(increased hunger), and dehydration or unintentional weight loss that are caused by hyperglycemia. Other symptoms include lack of energy, tiredness, slow healing wounds, recurrent infections in the skin, blurred vision, and tingling or numbness in hands and feet. Therefore, the standard goal of treatments is to control the signs and symptoms of T2DM.

Management of T2DM

Successful diabetes management requires a systematic approach to supporting the behavior change efforts of the patient's healthy lifestyle behaviors. The goals of treatment for diabetes include promoting positive healthy lifestyle behaviors, pharmacological management, and maintaining psychological well-being. Achieving these goals of treatments influences maximizing QoL (ADA, 2023d; IDF, 2021).

1. **Promoting Healthy Lifestyle**

To promote optimal diabetes health outcomes, healthy lifestyle behaviors are the foundation of the management of T2DM which includes: a healthy diet, regular physical activity, smoking cessation, and maintenance of healthy body weight (IDF, 2021).

1.1. Diet management

A healthy diet is a fundamental part of diabetes management. ADA emphasizes that medical nutrition therapy (MNT) is fundamental in the overall diabetes management plan and it should be reassessed frequently by healthcare professionals (HCP) in collaboration with people with diabetes across the lifespan (ADA, 2019). Dietary advice is essential for people with T2DM, to avoid snacks, sweets, sugar, and sweetened beverages and eat out, and reduce the daily caloric intake. As well as people with T2DM should be advised to prefer three to five daily portions of vegetables and/or fruits, fish, grains, and monounsaturated fats. IDF also mentioned the Mediterranean diet (A diet high in plant-based foods such as vegetables, fruits, whole grains, beans, nuts, seeds, and olive oil. Foods not allowed include processed red meats, heavily processed foods, refined grains, alcohol, butter, and refined/processed/hydrogenated oils) as beneficial examples for people with T2DM (IDF, 2017).

1.2. Physical Activity

People with T2DM should increase their physical activity for better management of diabetes. ADA (2023) recommended that Physical activity starts with moderate aerobic physical activity such as walking for at least 150 minutes per week at intervals of no longer than 48 hours. Resistance exercises such as moderate weight lifting or yoga can also be beneficial. Overweight people with T2DM may need a more intensive physical activity program to facilitate weight loss and avoid regaining. Moreover, ADA emphasizes that the amount of time spent in daily sedentary behavior such as prolonged sitting should be decreased and interrupted every 30 min for blood glucose benefits. As well as should increase in nonsedentary activities including walking, yoga, housework, gardening, swimming, and dancing above baseline for sedentary individuals with 2 diabetes (ADA, 2023d).

1.3. Smoking cessation and Alcohol consumption

Smoking should be stopped whenever present and avoiding excess alcohol intake is also essential (IDF, 2017). ADA emphasizes that moderate alcohol consumption does not have major detrimental effects on long-term blood glucose management in people with diabetes. As an example recommended alcohol consumption for women, is no more than one drink per day, and for men, no more than two drinks per day (one drink is equal to a 12-oz beer, a 5-oz glass of wine, or 1.5 oz of distilled spirits). However, those who consume excessive amounts of alcohol are at risk for developing hypoglycemia, weight gain, and hyperglycemia (ADA, 2023d).

1.4. Body weight maintenance

Maintenance of healthy body weight is also helpful for better management of T2DM. IDF recommended that moderately obese people have to lose at least 10 kg (22 pounds) within 6 months with diet control. However, severely obese people (BMI 30 - 35) may not be able to achieve this with diet and may need bariatric surgery. Effective and approved anti-obesity drugs may be indicated in people with T2DM and a BMI ≥27 (IDF, 2017). If lifestyle modifications are insufficient to control blood glucose levels, pharmacotherapy is usually initiated (IDF, 2021).

2. Pharmacotherapy

ADA recommended that Pharmacotherapy should be guided by person-centered treatment factors (comorbidities and treatment goals) and it should be started at the time of diagnosis of T2DM unless there are contraindications (ADA, 2023f). Monotherapy (treatment with a single antidiabetic medication), combination therapy, and Insulin therapy are used as pharmacotherapy for treating patients with T2DM (ADA, 2023f). If monotherapy is insufficient to manage T2DM, another option is using a range of combination therapies such as sulfonylureas, alpha-glucosidase inhibitors, thiazolidinediones, dipeptidyl peptidase 4 (DPP-4) inhibitors, glucagon-like peptide 1 (GLP-1) agonists and sodium-glucose co-transporter 2 inhibitors (SGLT2). The most commonly used oral medications for T2DM include Metformin and Sulfonylurea (IDF, 2021)**.** IDF recommended that the preferred combinations may be metformin plus Sulfonylurea (except glibenclamide/glyburide), DPP4 inhibitor, or SGLT2 inhibitor (IDF, 2017).

Metformin is the first choice for initiating pharmacologic treatment as a monotherapy in people with T2DM (IDF, 2017). Metformin is effective, safe, and inexpensive, and may reduce the risk of cardiovascular events and death (ADA, 2023f). Administration of Metformin should be with a meal or after meals, and the use of extended-release (XR) preparations can maximize tolerance, reduce insulin resistance, and allow the body to use its insulin more effectively (IDF, 2017).

Sulfonylurea is a drug that stimulates the pancreas to increase insulin production (ADA, 2023c). Glibenclamide / Glyburide is not recommended as it is associated with the greatest risk for hypoglycemia (IDF, 2017). Many individuals will require dual combination therapy or a more potent glucose-lowering agent if A1C is ≥1.5% (12.5 mmol/mol) above the glycemic target (ADA, 2023f).

Both DPP4 inhibitors and GLP1 receptor agonists have been reported to be more effective in Asians than in white Europid patients in several meta-analyses. GLP1 receptor agonist can be used if weight loss is a priority and the drug is affordable. AGI is also a preferred choice to add to metformin in Asian patients (IDF, 2017). SGLT2 inhibitor and/or GLP-1 RA with demonstrated CVD and renal benefit (ADA, 2023f). When oral medication fails to achieve glycemic control, people with T2DM may require insulin injections (IDF, 2021).

IDF recommended that consider starting insulin alone or in combination with other hypoglycemic drugs when people with T2DM are unstable, with symptoms and signs of acute decompensation (dehydration, acute weight loss, acute illness, very high glucose levels, and presence of ketones) (IDF, 2017). People who present with blood glucose levels ≥ 300 mg/dL or A1C > 10% or if the individual has symptoms of hyperglycemia or evidence of catabolism (weight loss), should initiate insulin therapy. Several types of insulin products are available such as Rapid-acting, Short-acting, Intermediate-acting, Long-acting, Concentrated human regular insulin, Premixed insulin products, and Premixed insulin/GLP-1 RA products (ADA, 2023f).

3. Maintaining Psychological Well-being

Psychological well-being is an essential component of diabetes care and self-management. Psychological problems can impair the individual's or family's ability to continue diabetes care tasks. Therefore, it must be made for comprehensive evaluation, diagnosis, and treatment. The goal of providing psychosocial includes optimizing health-related QoL and health outcomes. Psychological screening should be included for overall stress related to work-life balance, diabetes distress, diabetes management difficulties, depression, anxiety, disordered eating, and cognitive dysfunction (ADA, 2023d).

Despite standard international and national guidelines regarding systematic management of patients with T2DM being widely available, adherence to guidelines and achieving standards of glucose management is often challenging. Also, many patients continue to have inadequate diabetes control worldwide (Arambewela et al., 2019). Once hyperglycemia and uncontrolled diabetes occur, people are at risk of developing chronic complications (ADA, 2023c).

Complications of T2DM

Complications of diabetes can be divided into two types namely macrovascular and microvascular complications. Macrovascular complications occur due to damage to the large blood vessels including atherosclerotic cardiovascular disease (ASCVD) and cerebrovascular disease. ASCVD is the leading cause of morbidity and mortality for individuals with diabetes (ADA, 2023a). Microvascular complications associated with retinopathy, nephropathy, and neuropathy.

Diabetic Retinopathy is a highly specific vascular complication that causes reduced vision or blindness. This is the most frequent cause of new cases of blindness among adults aged 20–74 years in developed countries. Glaucoma, cataracts, and other eye disorders occur in earlier stages of their life and more frequently in people with diabetes (ADA, 2023g). Diabetic nephropathy is a condition caused by damage to small blood vessels in the kidneys leading to the kidneys becoming less efficient or failing altogether. Chronic kidney disease (CKD) is attributed to diabetes in adults, which occurs in 20% – 40% of people with diabetes (ADA, 2023b). Diabetic neuropathy is a heterogeneous group of conditions with diverse clinical manifestations that damage the nerves throughout the body. Up to 50% of diabetic patients with peripheral neuropathy may be asymptomatic (ADA, 2023g) and they are at risk for injuries, diabetic foot ulcers, and amputations (ADA, 2023g). Due to diabetes and its complication mortality rate, direct and indirect costs of diabetes are growing worldwide. However, these serious complications can be delayed or prevented altogether, if appropriate management of diabetes is achieved (IDF, 2021). Therefore, promoting healthy lifestyle behaviors and DSM education and support should be considered in the management of T2DM (ADA, 2023f). DSM education and support have been effective in achieving patient self-management, and satisfaction (ADA, 2023e), clinically significant improvements in metabolic control, and promoting positive health behaviors (Maina et al., 2023).

Diabetes Self-management among Adults with T2DM

Living with a chronic condition and engaging in healthy behavior is complex and requires the integration of self-management (SM) behaviors into the lifestyles of individuals and families (Ryan & Sawin, 2009). T2DM is a complex disease that requires daily self-management to effectively manage blood glucose levels to prevent potentially deadly and costly complications (ADA, 2023d).

Definitions of Self-management

SM is a dynamic, interactive, and daily process in which individuals engage to manage a chronic illness (Lorig & Holman, 2003). SM refers to a multidimensional, complex phenomenon that can be conceptualized as affecting individuals, dyads, or families across all developmental stages (Ryan & Sawin, 2009).

According to Richard and Shea (2011), SM is defined as the ability of the individual, in conjunction with family, community, and healthcare professionals, to manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions (particularly chronic diseases) (Richard & Shea, 2011). Schulman-Green et al. (2012), stated that changes in individual or family health, and changes in psychological, social, spiritual, and financial status, can significantly impact self-management needs, expectations, and routines. Thus, they recommended that future studies are needed to examine how and when individuals engage in self-management processes and to identify similarities and differences in self-management processes across chronic illnesses and illness trajectories (Schulman-Green et al., 2012).

Diabetes Self-management (DSM)

DSM is the key to the effective management of T2DM. Most of the day-to-day disease management practices for diabetes are based on the patients' self-management practices (Maina et al., 2023). DSM incorporates behavioral, personal, and environmental factors into the daily performance of recommended activities (B. P. R Cooray et al., 2017). DSM is important in prevention efforts to minimize the risk of serious complications (Akmal et al., 2022). Furthermore, greater DSM is associated with improved blood glucose control, patient well-being (Bako et al., 2022), improved patients' QoL, and lowering the cost of treatment (Maina et al., 2023).

Components of DSM

To promote optimal diabetes health outcomes ADA recommended that behavioral strategies should be used to support DSM including taking medications, using diabetes technologies, physical activity, and healthy eating (ADA, 2023d). As well seven components are at the cornerstone of DSM education recommended by AADE including healthy coping, healthy eating, being active, taking medication, monitoring, reducing risk, and problem-solving (AADE, 2020). A scoping review revealed four categories of SM practices for preventing complications of T2DM including, the acquisition of diabetes-related knowledge, essential skills to manage diabetes mellitus, lifestyle modification, and availability of psychological support and follow-up (Maina et al., 2023). Sri Lankan national guidelines adhere to the ADA recommendations which mention that dietary control, active lifestyle, regular physical

exercise, and pharmacotherapy are fundamental components of diabetes management. This guideline emphasizes that all patients with DM should be educated and trained in DSM (National Guideline for Management of Diabetes, 2021). Schmitt et al. (2013) developed a global measure of DSM including diabetes-related dietary management, glucose management on blood glucose monitoring and medication adherence, physical activity, and physician contact on adherence to diabetes-related doctors' appointments (Schmitt1 et al., 2013). Therefore, the current study was conducted to assess DSM including the aforementioned five components as mentioned by Schmitt et al. (2013) which help to control blood sugar levels and prevent complications.

1. Diabetes-related Dietary Management

ADA emphasizes that a "one-size-fits-all" eating plan is not evident in diabetes management. Diet plans depend on the cultural backgrounds, personal preferences, co-occurring comorbidities, and socioeconomic settings of the people who live (ADA, 2019). MNT is the fundamental component of DSM among adults with T2DM which aims to manage hyperglycemia and adiposity through nutritional intervention (ADA, 2019). ADA recommended a variety of eating patterns for the management of diabetes. For example, Mediterranean-style, low-fat, or low-carbohydrate eating plans, vegetarian, and dietary approaches to stop hypertension (DASH) (ADA, 2019). Even though, dilatory management is the most difficult part of DSM, especially among patients with low income. Culture, family, socio-economic status, and lifelong habits are some factors that influence dietary management. (Mcewen et al., 2017).

A Scoping Review with Indigenous people with T2DM in Canada, USA, Australia, and New Zealand revealed that barriers to consuming a healthy diet included a lack of affordable food, changes in food sources, and social supports pressuring them to consume unhealthy food choices (Burnside et al., 2023). A study among Chinese Adults with T2DM revealed that higher self-efficacy and older age were found to be significantly more likely to exhibit better adherence to diet therapy (OR = 2.21, P = .01) (Xie et al., 2020). An Indian study among adults with T2DM in the urban population shows that DSM practices were good concerning avoiding fatty foods and carbohydrates (Ravi et al., 2018). Nevertheless, another rural Indian study revealed that consumption of carbohydrates was high (>70%) and satisfactory diet

practice was found in only 35.2% (Karthik et al., 2020). The aforementioned literature emphasizes that diet habits differ among different cultural and social contexts.

Many food habits cause diabetes in South Asians include excess consumption of refined carbohydrates, sweets, sweetened beverages, use of saturated fats for cooking, frequent consumption of fried snacks, low fruit and vegetable intake, and high intake of calorie-dense food (Kapoor et al., 2021; Kusuma et al., 2022; Patel et al., 2021; Subhan et al., 2023). Dietary practices among South Asian cultures depend on personal preferences and priorities, availability of healthy foods, convenience at home and in society, perceptions, cultural practices, tradition and folk beliefs, family structure, peer influence, traveling, celebrations, societal expectations, and influences, seasons, and festivals and social events (Adhikari et al., 2021; Matpady et al., 2020; Patel et al., 2021).

2. Medication Adherence

Taking medication consistently is a crucial part of DSM. Several Indian studies found that adherence to oral hypoglycemic agents (OHAs) was found to be better than other components of DSM (Ansari et al., 2019; Rahmatullah et al., 2021). Especially in rural India study revealed that medication adherence was 70.4% (Karthik et al., 2020). However, the majority of adults with T2DM were found non-adherence with insulin use (Rahmatullah et al., 2021). Men were less concerned about drug adherence than women (Pamungkas et al., 2019). A study among adults with T2DM in Mexico City and Fiji stated that they had misconceptions regarding diabetes medication (Kumar & Mohammadnezhad, 2022; Whittemore et al., 2019). It is also the same in South Asian countries and Sri Lankan context and they have favorable attitudes and beliefs about herbs and a lack of belief in Western medicines (believes that Western medicine damages their internal organs) (Edussuriya et al., 2021; Herath et al., 2017; Patel et al., 2021). The aforementioned literature shows that several cultural beliefs and practices regarding medication adherence among different groups of people with T2DM are influenced differently.

3. Blood glucose monitoring

Blood glucose monitoring is essential for glucose management. Poorly controlled T2DM showed poor engagement in regular blood glucose monitoring (Liu et al., 2022) while participants whose blood glucose was controlled (≤ 7%) and

awareness of the benefits of blood glucose monitoring, were more motivated to monitor their blood glucose levels (Ansari et al., 2019; Liu et al., 2022). Patients with longer diabetes duration were found to be significantly more likely to exhibit better adherence to self-monitoring (Xie et al., 2020). Furthermore, patients who did not adhere to blood glucose testing plans and recommendations, due to blood glucose testing strips being very expensive (Ansari et al., 2019). Men were reported less concerned about blood glucose monitoring than females (Pamungkas et al., 2019). A study in a rural setting in India revealed that nearly 75% of the participants had satisfactory blood sugar monitoring (Karthik et al., 2020). The aforementioned literature indicated that inconsistent results were found in various cultural settings regarding blood glucose monitoring.

4. Physical Activity

In general, Physical activity includes all movement that increases energy use and it is an important part of the DSM. Exercise is a more specific form of physical activity that is structured and designed to improve physical fitness. Exercise has been shown to improve blood glucose levels, reduce cardiovascular risk factors, contribute to weight reduction, and improve well-being (ADA, 2023d).

Several prior studies among adults with T2DM in different countries suggest that poor compliance with SM concerning exercise (Khalooei & Benrazavy, 2019; Kumar & Mohammadnezhad, 2022; Rahmatullah et al., 2021; Ravi et al., 2018). Internationally, adults with T2DM had barriers to engaging in physical activities including lack of access to exercise facilities, lack of time, lack of knowledge, laziness, ill health, and prolonged duration of T2DM (> 5 years) (Burnside et al., 2023; Rahmatullah et al., 2021). An Indian study among rural adults with T2DM reported around 80% of the participants were not doing regular exercise apart from their daily living activities (Karthik et al., 2020). Chinese female patients were less likely to exercise regularly than male patients (Xie et al., 2020) and it is the same among Sri Lankan women (Medagama & Galgomuwa, 2018).

5. Health-Care Use

Effective patient–healthcare provider communication, and appropriate counseling are the major determinants of optimal DSM (Almigbal et al., 2019; Swarna Nantha et al., 2020). Higher levels of self-efficacy and perceived personal

control were seen in adults with T2DM who had meaningful interpersonal communication with their HCPs (Swarna Nantha et al., 2020). The number of annual visits by specialists or general physicians, the duration of treatment, and the main health supporter were predictors of DSM (Habibi Soola et al., 2022; Khalooei & Benrazavy, 2019). Insufficient continuity of counseling from doctors, lack of guidelines and protocols for counseling, and lack of availability and accessibility of resources are the important barriers to DSM among Nepal adults with T2DM (Adhikari et al., 2021).

Diabetes Self-Management among Adults with T2DM

Internationally, review literature suggests that DSM practices among adults with T2DM differ among different cultural settings. Prior studies revealed that DSM was suboptimal among Adults with T2DM in urban and rural Pakistan, Southeast Iran, and Qatar (Ansari et al., 2019; Hassan et al., 2022; Khalooei & Benrazavy, 2019; Rahmatullah et al., 2021). However, African Americans and Saudi Arabians reported high levels of DSM (Almigbal et al., 2019; Tseng et al., 2022) while women of Arab descent (n=118) reported a moderate level of following a healthy diet, level of exercise, level of glucose testing, and low level of foot care and high level of medication (Alanazi, 2021). Some studies mentioned that females reported worse DSM habits than males overall (Almigbal et al., 2019; Hassan et al., 2022) while some women were reported more inclined to undertake appropriate DSM activities (Ansari et al., 2019). The aforementioned literature shows that most adults with T2DM had Suboptimal DSM which can lead to detrimental multi-system physical and mental complications and mortality (Lin X et al., 2020).

DSM needs to focus especially on the adults aged (18-64) because, the high burden of diabetes is in the working-age population (IDF, 2021) might be under employment-related pressure (Bezo et al., 2020). Working-age adults experience a negative impact on DSM due to discrimination and stigmatization from co-workers (Bezo et al., 2020). When they become elderly, more likely to experience cognitive impairment, memory decline, and functional decline (Li et al., 2022), and difficulty engaging in DSM practices. Several prior studies stated that Adults (18-64) with T2DM had poorer adherence to diet therapy and self-monitoring and had poor metabolic control (Whittemore et al., 2019; Xie et al., 2020). Some studies stated that there is no significant

relationship was found between age and DSM (Almigbal et al., 2019; Chen et al., 2022) while another study revealed that DSM had a negative correlation with patients' age (r = -.083, P = .044) (Khalooei & Benrazavy, 2019). Moreover, DSM needs to be assessed after some duration of time (at least 3 months - one year) considering the time needed by newly diagnosed patients to adapt to the illness and practices of DSM (Chen et al., 2022; Khalooei & Benrazavy, 2019; Whittemore et al., 2019).

The previous study among Saudi Arabian adults (n = 352) with T2DM reported a high overall DSM (Measured by Diabetes Self-management Questionnaire [DSMQ]). However, they had low to moderate self-care scores with the subscales of 'healthcare - use' (4.8 ± 1.2) and 'physical activity' (5.8 ± 1.1) (Almigbal et al., 2019). Another study among African Americans reported a mean SM score of 6.7 (2.4) out of a maximum of 8 points (measured by the Researcher diabetes self-management index) (Tseng et al., 2022). Another cross-sectional study among Southeast Iran adults with T2DM (n = 600) reported a mean score of DSM 6.92 (± 1.17) out of 10 indicating a suboptimal DSM (measured by DSMQ) with an interquartile range of 6.25- 7.70. DSM mean score was significantly higher in patients with higher educational levels and household income. Furthermore, DSM was better in patients who received insulin and those with diabetes-related complications. As well as DSM had a direct correlation with the number of visits by specialist physicians (r = .257, P < .001) and treatment duration (r = .103, P = .013) (Khalooei & Benrazavy, 2019). Another study among adults with T2DM in Qatar Shows almost half of the participants (48.6%) reported poor DSM (Assessed by DSMQ) (Hassan et al., 2022).

Diabetes Self-Management among Adults with T2DM in Sri Lanka

Overview of Sri Lankan health system

Sri Lanka is a lower-middle-income country that has a total area of 65,610 Km^2 with 21.89 million population (World Population Review, 2023). It has a multiethnic society with Sinhalese, Tamils, and Muslims and most of them are Sinhalese (75%) (Rajapaksa et al., 2021) and they speak Sinhala language and other ethnicities living in Sri Lanka also can communicate in Sinhala language (Mendis et al., 2023). Sri Lanka is divided into 9 provinces and further divided into 25 districts

and 331 divisional secretary areas (AHB, 2020). Sri Lankan health system consists of the public and private sectors and the public sector provides free health for all citizens including three categories curative, preventive, and rehabilitative services. Curative services are provided at three levels in the public health system: primary (through PMCIs), secondary (Base hospitals), and tertiary (district hospitals and higher facilities) (AHB, 2020). Mainly Diabetes patients are followed up in dedicated diabetes or general medical clinics closer to their residences. However, individuals are free to access services at any state sector institution without a proper referral. The phenomenon of bypassing is based on people's perceptions of better facilities, availability of medicines, and better quality of care and provider competency (Sri Lanka Health System Review, 2021).

Among Sri Lankans, family is an important aspect of adherence to diabetes self-care practices (Wijesinghe et al., 2017). Nuclear families are common among Sri Lankans and 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). Mainly, the father or husband provides economic support to the family, and women cook for family members (Facts and Details, 2022) eating together is a highly valued cultural tradition (Amarasekara et al., 2014).

Health system in rural Sri Lanka

The majority of the Sri Lankan people (81%) live in rural areas of Sri Lanka. Rural areas can be defined as populations living outside the municipal and town council areas (Sri Lanka Health System Review, 2021). The typical Sri Lankan village consists of agricultural land, housing, religious places, schooling, and basic medical amenities, and traditional rural economies were based on agriculture. Nowadays villages tend to be less isolated with the improvement of socioeconomic level and the village context mixes with more urban customs and practices and more people seek sedentary lifestyles which leads to T2DM. (Medagama & Galgomuwa, 2018; Mettananda et al., 2023). Also, rural adults with T2DM had generally low levels of education, high unemployment, and low incomes (Medagama & Galgomuwa, 2018).

The majority of the primary and secondary care hospitals are located in rural areas of Sri Lanka and the availability of investigation and newest medications are

limited in these hospitals. Especially HbA1c checking facilities not available in primary and secondary care hospitals. FPG was the main parameter used to assess glycemic control among the rural Sri Lankan population and almost all (98.6%) have had FPG done at least once every 2 months. However, FPG checking facilities were not available in peripheral units, and it should be done from the private sector (Mettananda et al., 2023). In addition, the unavailability of a regular supply of commonly used medicines at times. Sri Lankan rural culture little bit different when compared with urban setting. For example, rural adults had generally low levels of education, high unemployment, and low incomes (Medagama & Galgomuwa, 2018). Also, males are the sole breadwinners of Sri Lankan families and they have fewer attended to medical clinics with their busy lifestyles (Mettananda et al., 2023). Sri Lankan females are responsible for household chores, thus they have inadequate time to attend to their well-being and they have a lack of motivation from family members for physical activities. Females in rural areas would be too embarrassed to undertake exercise in public areas as they felt this was culturally alien to them (Medagama & Galgomuwa, 2018). The people with T2DM in rural communities were fear and unwilling to be started on insulin and newer medications (Mettananda et al., 2023). Therefore, rural Sri Lankan adults had poor DSM practices.

Diabetes Self-Management in Sri Lanka

Sri Lankan National Guideline for Management of Diabetes (2021), recommended that all diagnosed patients with T2DM should commence lifestyle modification such as focusing on diet, physical activity, exercise, body weight, and blood pressure favorably to improve glycemic control and decrease the risk of cardiovascular disease and other complications (National Guideline for Management of Diabetes, 2021). Even though, despite all efforts to formulate guidelines and newer treatment modalities, diabetes is still an inadequately controlled disease among the Sri Lankan population (Arambewela et al., 2019). Self-care recommendations among Sri Lankan adults with T2DM were not significantly associated with glycemic control and this may be due to the availability of free healthcare services (Saumika & Amarasekara, 2021). The majority of them had either moderate or good knowledge of diabetes management (Herath et al., 2017; Wijesinghe et al., 2017) but it was not reflected in their attitudes toward disease management (Herath et al., 2017). Even

though, one-third of the Sri Lankan individuals with T2DM in urban settings underwent blood glucose assessment as per guidelines only two out of five had their blood glucose levels under control (Nair et al., 2023). A higher prevalence of diabetes in Sri Lankan females due to they are overweight/obese compared to men which leads to more females seeking diabetes treatment (Mettananda et al., 2023). Due to uncontrolled T2DM, more than 63% of Sri Lankan adults were suffering from diabetic-related complications and the most common complication was diabetic retinopathy. Overall QoL is very low among them in all three aspects: physical, mental, and social life (Rathnayake et al., 2017)

The Dietary behavior among Sri Lankan people is grounded in cultural and religious practices, which can affect the satisfactory control of diabetes, where the main staple diet is rice eaten in three meals per day (National Guideline for Management of Diabetes, 2021). The hardest lifestyle adjustment among Sri Lankan adults with T2DM was the adherence to a prescribed diet due to the reasons for their traditional food habits, beliefs, daily lifestyles, and difficulties in eating a smaller portion of rice (Amarasekara et al., 2014). Most of them were aware of the importance of lifestyle and dietary modifications. However, they do not adhere to Sri Lanka's dietary guidelines regarding the consumption of fruits and vegetables, avoiding sweets, and reducing salt in their diet (Manoharan et al., 2022; Mettananda et al., 2023; Waidyatilaka et al., 2019).

Diabetes clinic in state-run hospitals provides metformin, sulphonylurea, and insulin free of charge to the patients (Arambewela et al., 2019). Apart from Western medicine, Sri Lankan people practice Ayurvedic, Unani, Siddha, Homeopathy, Acupuncture, and traditional religious practices (devil dancing, faith healing, spiritual healing) (Broom et al., 2010). Several prior studies revealed that Sri Lankans have favorable attitudes and beliefs about herbs and a lack of belief in Western medicines. Therefore, most of them tend to use alternative medicine (Ayurveda/ traditional treatment/ herbal medicine) rather than drug treatments (Amarasekara et al., 2014; Edussuriya et al., 2021; Herath et al., 2017). Other reasons for the tendency to use alternative medications are the cost-effectiveness, high availability, easy accessibility, encouragement of family members, media availability, and physiological effects on lowering blood glucose (Edussuriya et al., 2021).

Sri Lankan diabetes guidelines recommend an HbA1c measurement at least twice per year in patients with stable glycemic control and quarterly when poor glycemic control or whose therapy has changed between two HbA1c tests (National Guideline for Management of Diabetes, 2021). However, it was measured in only 60% of urban settings due to the limited availability of this investigation in government hospitals (Arambewela et al., 2019). Sri Lankan individuals with good socio-economic status had more regular blood sugar measurements than people with poor socio-economic status ($p = .005$) (Herath et al., 2017).

Engaging in exercise was a difficult task for most Sri Lankan individuals and they had common misconceptions that they had physically active daily lives and did not have time to exercise (Amarasekara et al., 2014; Medagama & Galgomuwa, 2018). Many Sri Lankan women prioritized spending time with the family over exercise (Medagama & Galgomuwa, 2018; Waidyatilaka et al., 2019).

The long waiting time in the clinic, lack of facilities, and difficulty in carrying out prescribed investigations from outside due to financial constraints are also the major barriers related to self-management practices among urban Sri Lankan adults with T2DM (Wijesinghe et al., 2017).

Diabetes Self-Management in Rural Sri Lanka

The components of DSM were sub-optimal among Sri Lankan rural adults with T2DM than urban people with T2DM. A rural Sri Lankan Study among adults with T2DM reported that 98.3% of the participants were aware of the importance of lifestyle and dietary modifications. However, only half (45%) of them achieved glycemic targets at the end of two years. Approximately 64% had poor dietary control with daily consumption of refined sugar or sweets. Inadequate physical activity was reported among 53.9% of them, poor drug compliance was seen among 60.3%, and the Insulin administering technique was not perfect. Only 10.4% of participants had checked HbA1c levels as mentioned in the guidelines due to the unavailability of check-in facilities. Poor engagement in DSM practices was seen due to poor compliance, misconceptions, South Asian culture, lack of up-to-date knowledge of physicians on the latest management options of diabetes, non-adherence of physicians to treatment guidelines, very short consultation times allocated for one patient at

overcrowding clinics, and non-availability of some newer and efficacious medicines and investigations in rural hospitals (Mettananda et al., 2023).

However, data were sparse in overall DSM among adults with T2DM, and still unclear the reasons for poor DSM practices. Therefore, the implementation of DSM education into routine clinical care for Sri Lankan adults with T2DM frequently remains a challenge. Empowering and encouraging adults with T2DM to engage in the DSM is important attention to reduce the burden of the disease on society and individuals in Sri Lanka (Mettananda et al., 2023). As well as ways to improve the impact of DSME on glycemic control needs to be explored further for better prevention of diabetes-related long-term complications (B. P. R Cooray et al., 2017). Thus, this study determined DSM among adults with T2DM in Rural Sri Lanka.

Measurement of Diabetes Self-Management

DSM was assessed by using different instruments including, DSMQ, Summary of Diabetes Self-Care Activities-Revised (SDSCA) researcher-developed index, and so on. But 16-item DSMQ a questionnaire developed by Schmitt et al. (2013) is a reliable and valid instrument that enables an efficient assessment and is valuable for scientific analyses of DSM associated with glycemic control. As well as all correlations with HbA1c were significantly stronger than those obtained with the SDSCA (Schmitt1 et al., 2013). Thus, this study demonstrated SM activities including diabetes-related dietary management, glucose management on blood glucose monitoring and medication adherence, physical activity, and physician contact on adherence to diabetes-related doctors' appointments among adults with T2DM in rural Sri Lankan contexts using the DSMQ questionnaire developed by Schmitt et al. (2013).

Family support is essential for diabetes mellitus patients to support their care at home and family members can be taught to offer concrete support (Ojewale et al., 2019; Wulandari et al., 2021). Therefore, the healthy family function is related to a reduce the sense of the burden of T2DM (Bennich et al., 2020). Thus, this study was guided by the Individual and Family Self-Management Theory (IFSMT) by Ryan and Sawin (2009).

The Individual and Family Self-Management Theory (IFSMT)

The Individual and Family Self-Management Theory (IFSMT) is a descriptive middle-range theory proposed by Ryan and Sawin (2009). Individual and family SM includes the purposeful incorporation of health-related behaviors into an individual or family's daily functioning (Ryan & Sawin, 2009). This theory proposed that SM is a complex dynamic phenomenon consisting of 3 dimensions including context, processes, and outcomes. Factors in the context dimension influence individual and family engagement in the process of SM as well as directly impact outcomes. Enhancing the SM processes of the individual and families results in more positive outcomes (Ryan & Sawin, 2009).

Context Dimension

Context dimension consists of risk or protective factors which include condition-specific factors, physical and social environments, and individual and family characteristics. Condition-specific factors including physiological, structural, or functional characteristics of the condition, its treatment, or prevention of the condition impact the amount, type, and nature of behaviors needed for SM. The complexity of the condition treatment and trajectory are examples of condition-specific factors (Ryan & Sawin, 2009). Physical and social environmental factors include access to healthcare, the transition from one healthcare provider or setting to another, transportation, neighborhood, work, school, culture, and social capital. The individual and family factors are defined as the characteristics of the individual and family that directly influence SM. Which include developmental stages, learning ability, literacy, family structure functioning, and capacity to SM. These factors influence individual and family engagement in the process of SM as well as directly impact proximal and distal outcomes (Ryan & Sawin, 2009).

Process Dimension

The process dimension consists of three major concepts including knowledge and beliefs, Self-regulation skills and abilities, and social facilitation. Knowledge and beliefs include behavior-specific self-efficacy, outcome expectancy, and goal congruence. Self-regulation includes activities such as goal-setting, self-monitoring, reflective thinking, decision-making, planning and engaging in specific behaviors, self-evaluation, and management of physical, emotional, and cognitive

responses. This process is used to change health behavior. Social facilitation includes the concepts of social influence, social support, and negotiated collaboration between individuals' families, and healthcare professionals. Factors in the process dimension impact outcomes (Ryan & Sawin, 2009).

Outcome Dimension

This theory categorized outcomes into proximal and distal. The proximal outcome includes actual engagement in SM behaviors specific to a condition, risk, or transition, in addition to symptom management, use of recommended pharmacological therapies, and cost associated with healthcare use. Distal outcomes are related to partial or the achievement of proximal outcomes. Distal outcomes include three primary categories such as health status, quality of life or perceived well-being, and both direct and indirect costs of health care (Ryan & Sawin, 2009).

This theory provides the foundation for expanding of understanding of the self-management of individuals of families. This IFSMT along with the supporting evidence from the review literature related to the diabetes SM helped to guide this study.

Factors Influencing Diabetes Self-management among Adults with T2DM

Reasons for either adherence or non-adherence of DSM of adults with T2DM were multifactorial. Individual and family self-management theory (IFSMT) by Ryan and Sawin (2009) describes various factors under the context and process dimension including condition-specific factors, physical and social environmental factors, individual and family factors, knowledge and beliefs, Self-regulation skills and abilities, and social facilitation (Ryan & Sawin, 2009). These factors impact the engagement in SM behaviors as a proximal outcome in this theory. Prior literature shows that individual factors (gender, level of education, occupational status, availability of glucometer at home, diabetes distress, diabetes empowerment, belief in the effectiveness, and diabetes self-efficacy), interpersonal factors (main health supporter, joint social networks, family/friends support, and neighborhood support), group and organization factors (organizational support), and community and policy

factors (situational influence and the impact of mass media in health) were significant predictors of DSM ($F = 19.45$, $P < .001$, $R = .51$) (Habibi Soola et al., 2022). Factors including competence, social support, awareness of benefits, attitudes towards medication, perceived health status, diabetes duration, diabetes-related knowledge, financial status, cultural beliefs, and social norms, stigma, relationships with their Health care professionals (HCPs), environmental factors, and SM skills directly led to DSM as facilitates, barriers and challenges (Adhikari et al., 2021; Banasiak et al., 2020; Chen et al., 2022; Kumar & Mohammadnezhad, 2022; Liu et al., 2022; Pamungkas et al., 2019; Whittemore et al., 2019; Xie et al., 2020).

Based on IFSMT and the reviewed literature, perceived stress, health literacy, self-efficacy, and family support, are common and key factors influencing DSM among adults with T2DM. Perceived stress and health literacy are in the context dimension of IFSMT and self-efficacy and family support are in the process dimension. Therefore, this study examined the influencing factors (perceived stress, health literacy, self-efficacy, and family support) for DSM as a dependent variable among adults with T2DM.

Perceived stress

Perceived stress is defined as the degree to which individuals appraise situations as stressful in their lives when the demands exceed the individuals' ability to cope with them (Cohen et al., 1983). Perceived Stress encompasses multiple dimensions, including the ability to self-manage, awareness, and coping (González-Ramírez et al., 2013). As a chronic disease, diabetes itself is an additional stressor for people. Perceived stress affects the immune system in the long run and has been widely linked to poor health outcomes (Pouwer et al., 2010). Stress management practice is the preferred strategy for DSM and people who do not have proper stress management skills may not behave appropriately (Eshete et al., 2023).

According to the IFSMT by Ryan and Sawin (2009), Perceived stress is the individual perception under the condition-specific factor that belongs to the context dimension enhances or diminishes SM (Ryan & Sawin, 2009).

A study among Indonesian adults with T2DM shows that 83% of them experienced a moderate level of stress (assessed by the perceived stress scale [PSS]) (Amelia et al., 2020). Ethiopian adults (aged 20 – 70 years) with T2DM revealed that

over half of the adults (51%) demonstrated good stress-coping behavior. Moreover, stress management behavior had a positive association ($X^2 = 17.7$; $p < .001$) with DSM and better stress management behaviors twice more likely to engage in DSM than their counterparts (OR = 2.0, 95% CI = (1.3, 3.0) (Eshete et al., 2023). Another Chinese study revealed that participants had slightly below middle-level perceived stress and a high level of diabetes self-care practices was significantly predicted with lowered perceived stress ($\beta = -.220$, $P = .001$). Furthermore, sex was significantly influenced by perceived stress ($\beta = .149$, $P = .019$) and women were more susceptible to stress (Zhao et al., 2018). However, findings were inconsistent in previous studies conducted in other countries and little is known about perceived stress and its influences on DSM among adults with T2DM in Rural Sri Lanka.

Health Literacy (HL)

Health literacy (HL) can be defined as linked to literacy and entails people's knowledge, motivation and competencies to access, understand, appraise, and apply health information to make judgments and decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course (Sorensen et al., 2012). HL is a critical concept in healthcare settings as well and it is one of the major drivers of SM behaviors (Dahal & Hosseinzadeh, 2019). It should be considered as a key for health education and healthcare encounters to improve health outcomes (Bushra et al., 2022). The model of HL was introduced by Nutbeam and it includes three levels namely functional literacy, communicative literacy, and critical literacy. Functional literacy refers to the basic level of reading and writing skills that let someone function effectively in everyday situations. Communicative literacy is an advanced skill that allows a person to extract information, derive meaning from different forms of communication, and apply new information to changing circumstances. Critical literacy refers to more advanced skills for critically analyzing information and using information to exert greater control over life events and situations. Literate people can participate more fully in society, both economically and socially, and can understand and exert a higher degree of control over everyday events (Nutbeam, 2008).

HL is one of the factors that include the individual and family factors in the context dimension of IFSMT. Individual and family factors challenge or protect

individuals' and families' engagement in SM and HL that enhance or diminish SM. As an example, persons with poor health literacy experience poorer health outcomes as well as persons with sufficient HL experience better health outcomes (Ryan & Sawin, 2009).

HL level assessment and strengthening are very important because they influence SM skills, blood sugar control, and QoL of the persons (Bushra et al., 2022). Many prior studies revealed that adults with T2DM show low level to average levels of HL among the Saudi Arabian, Iranian, Lebanese, Southeast Ethiopian, Malaysian, and Serbian populations (Almigbal et al., 2019; Bushra et al., 2022; Carine & Pascale, 2021; Levic et al., 2023; Mogessie et al., 2022; Tan & Ismail, 2020; Ziapour et al., 2022). However, Northern Thailand and Nepal studies show that 86% and 91% of the adults with T2DM respectively had sufficient levels of HL (Baral et al., 2022; Singsalasang et al., 2022). Many prior studies revealed that limited HL leads to poorer DSM skills, while sufficient HL leads to better DSM, which may affect the control of blood sugar levels in adults with T2DM (Bushra et al., 2022; Singsalasang et al., 2022; Tseng et al., 2022; Whittemore et al., 2019). Besides, Almigbal et al.'s findings revealed that participants with limited health literacy performed more DSM due to the awareness of the risks of complications from T2DM (Almigbal et al., 2019).

A Saudi Arabian cross-sectional study demonstrated that HL positively affects self-management skills (β = .360; B = .616; p = .00) and negatively affects HbA1c level (β = -.297; B = -.079; p = .00) (Bushra et al., 2022). Another meta-analysis (consisting of 33 studies with 10 259 adults with T2DM) by Guo et al. (2020), shows that HL was positively correlated with disease self-monitoring (r = .19, P = .001), dietary and physical care (r = .12, P = .009), diabetes knowledge (r =.29, P = .001), self-efficacy (r = .28, P = .001) and self-care (r = .24, P =.001), formal education (r = .35, P = .001) and social support (r = .2, P = .001) (Guo et al., 2020). Another systematic review including 14 RCTs revealed that HL leads to significant improvements in DSM among adults with T2DM. However, the associations of HL with glycemic control, self-monitoring of blood glucose, foot care, diet management, and medication adherence were inconclusive. Therefore, further studies are required to explain and address any inconsistency about the role of HL in DSM among adults

with T2DM (Dahal & Hosseinzadeh, 2019). This study expected that HL could be able to predict DSM significantly as evidenced by some studies.

Self-Efficacy

Self-efficacy was first defined by Albert Bandura in 1977, as people's belief in their ability to control their functioning and events that affect their lives. Ryan and Sawin (2009) defined it as a behavior-specific concept and it can be referred to as a degree of confidence one has in his/her ability to successfully engage in behavior under normal and stressful situations (Ryan & Sawin, 2009). In simple, Self-efficacy is a person's belief in their ability to succeed in a particular situation (Garrido, 2023).

According to Ryan and Sawin (2009), self-efficacy is the one of factors under the condition-specific knowledge and beliefs in the process dimension. This factor directly impacts SM as a proximal outcome of this theory (Ryan & Sawin, 2009).

Self-efficacy is a key psychosocial factor and it leads to better adherence in diabetes management (Chindankutty & Dhanalakshmi, 2022). A cross-sectional study among Sudanese adults with T2DM indicated that 49% had high self-efficacy and the mean score of diabetes management self-efficacy across all domains was 136.8 (SD 29.7). As well as Participants with high levels of self-efficacy in nutrition management, physical exercise, weight control, and medical treatments were 48.0%, 51%, and 72%, respectively (Amer et al., 2018). Another cross-sectional study (n = 112) was conducted by Clara et al. (2021) and aimed to identify the relationship between self-efficacy and DSM of adults with T2DM in Indonesia. They found that around 60% had good self-efficacy (assessed by the Diabetes Management Self-Efficacy Scale [DMSES]) and a significant relationship between self-efficacy and DSM (p-value < .001). Furthermore, the study revealed that self-efficacy is predicted to increase DSM because adults with low self-efficacy tend to avoid being involved in specific tasks, while adults with higher levels of perceived self-efficacy tend to be stronger and more persistent in their efforts to perform DSM activities. Finally, they conclude that adults with T2DM will not be able to carry out DSM effectively if they have insufficient self-efficacy (Clara et al., 2021). Another Chinese cross-sectional study showed the same results and indicated that perceived self-efficacy was significantly related to DSM ($r = .447$, $p < .001$). As well as results revealed that

perceived stress was significantly predicted by DSM (β = .184, p = .039) (Yang et al., 2022). The aforementioned literature suggested that self-efficacy is a strong predictor of DSM among adults with T2DM. However, little is known about the relationship between self-efficacy and DSM in Sri Lanka, and this study assessed whether self-efficacy was a predictor of DSM behavior among rural Sri Lankan adults with T2DM.

Family Support

Family can be defined as a "group of persons united by the ties of marriage, blood, or adoption, constituting a single household and interacting with each other in their respective social positions, usually those of spouses, parents, children, and siblings"(Barnard, 2024). Patients needed physical support, psychological (motivational and emotional) support, and spiritual support from their families to strengthen patients for long-term treatment (Wulandari et al., 2021). The healthy family function is related to a lower sense of the burden of T2DM (Bennich et al., 2020).

According to the IFSMT by Ryan and Sawin (2009), Social support is an important factor of the social facilitation subcategory under the process dimension. Social support consists of emotional, instrumental, or informational support provided to a person or family with the explicit goal of assisting or facilitating their engagement in health behaviors. Social facilitation such as family-centered interventions directly encourages and supports engagement in SM behaviors and achievement of proximal and distal outcomes (Ryan & Sawin, 2009).

Successful DSM is based on family member involvement in diabetes care and it would significantly help either patient or family (Alanazi, 2021). As well as family support is essential in DSM due to it takes place within the home environment (Wulandari et al., 2021). Family support had a statistically significant relationship with DSM (Habibi Soola et al., 2022). Northern Ethiopian study revealed that patients with good family support were more likely to have better DSM and DSM can be significantly improved with increased family support (Eshete et al., 2023). Indian and South-West Nigerian studies revealed that family support is positively associated with DSM which can lead to better health outcomes (Ojewale et al., 2019; Ravi et al., 2018; Snouffer, 2018). Family members who had positive attitudes toward assisting the participants in managing diabetes could facilitate SM engagement (Adhikari et al.,

2021) by playing a role of offering healthy diets, promoting physical activity engagement, reminding them to take medicine on time, maintaining foot care, and blood glucose monitoring (Adhikari et al., 2021; Liu et al., 2022). People who had greater family support observed better DSM (Ravi et al., 2018) while people who lived alone were less likely to perform DSM practices such as exercise (Xie et al., 2020). A cross-sectional study among people with T2DM in Eastern Uganda revealed that DSM is significantly associated with the perception of receipt of their family's support (Onyango et al., 2022).

Family members are providing either helpful (Supportive) or harmful (obstructive) involvement in patients' behaviors. The helpful family involvement includes family members who remind or help to perform a behavior, creating an environment and instrumental support to reinforce adherence to diet, exercise, blood glucose testing, diabetes medications, and general self-care. These behaviors are associated with better DSM. The harmful family members' involvement may sabotage or undermine patients' self-management efforts by planning and tempting unhealthy meals, questioning the need for medications, nagging or arguing with patients in an attempt to 'support' adherence, undermining self-efficacy, and creating family conflict (Mayberry & Osborn, 2014). A multi-center cross-sectional study (n = 276) among adults with T2DM in rural areas of China revealed that the total family support was 8.2 ± 5.1, while supportive behaviors were 27.4 ± 7.6 (SD) and obstructive behaviors were 19.2 ± 5.4 (SD). Supportive behaviors were positively related to DSM, as were obstructive behaviors ($r = .405$, $p < .01$, $r = .267$, $p < .01$). Furthermore, the study stated that family support fully mediates the relationship between family function and DSM (Tang et al., 2023). Helpful and harmful family and friends involvement was independently associated with greater and less diabetes DSM respectively (assessed by Family / Friend Involvement in Adults' Diabetes [FIAD]). As well as more helpful involvement and harmful involvement were predicted to increase and worsen HbA1c from enrollment respectively ($\beta=0.17$, $p=.011$, $\beta=0.12$, $p=.046$). However, neither helpful nor harmful involvement predicted DSM. Besides, helpful family/friend involvement was associated with greater diabetes self-efficacy while harmful involvement was associated with less diabetes self-efficacy. Furthermore, when patients have worse glycemic control, family/friends experience

more harmful involvement in patients than experiencing helpful involvement (Mayberry et al., 2019).

Sri Lankan urban study revealed that most of the participants have family support to participate in regular clinic visits and investigations (63.6%), to prepare a diabetic's meal (60%), and to take medications (42%) (Wijesinghe et al., 2017). Another study among adults with T2DM in the Southern province of Sri Lanka revealed that family members have played an important role in terms of helping them to use natural herbs (Edussuriya et al., 2021). However, data on the relationship between family support and DSM and helpful and harmful family involvement need to be explored further since reportedly sparse data among adults with T2DM in rural Sri Lankan contexts. The proposed study assessed that helpful and harmful family involvement could able to predict DSM significantly as evidenced by reviewed literature.

Summary of the Literature Review

Diabetes is an escalating public health challenge associated with mobility and mortality worldwide as well as among Sri Lankan population. Diabetes management of the individual is dependent on their self-management levels. reviewed literature shows that successful DSM includes adherence to healthy diabetes diets, adherence to medications, glucose monitoring, engaging in physical activities, and collaboration with health care professionals. In addition to that family member involvement is more beneficial and it improves the person's outcomes. Reviewed literature also shows that perceived stress, health literacy, self-efficacy, and family support were found to influence DSM among adults with T2DM, which was supported by IFSMT by Ryan and Sawin (2009).

Internationally, a large body of published studies are available related to the factors influencing DSM, but gaps of knowledge still exist. There were limited studies conducted related to factors influencing DSM among adults with T2DM in Sri Lanka; compared to the other countries, Sri Lankan culture and health care system are different, and individuals and their families have their own unique beliefs and experiences regarding DSM. In addition, most of the previous studies were conducted in urban Sri Lankan settings. Rural Sri Lankan socioculture represents different

aspects, and access to health care and health facilities are different. To bridge these gaps of knowledge, this study addressed this lack of information and it will give more information regarding DSM among rural adults with T2DM.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter describes the research methodology of the study including information on the research design, population and sampling, study setting, research instruments, protection of human rights, data collection, and data analysis process used in this study.

Research Design

A predictive correlational design was used for this study. The purposes of the study were to examine DSM and to determine whether perceived stress, health literacy, self-efficacy, and family support can predict diabetes self-management among adults with T2DM in rural Sri Lanka.

Population and Sample

Population

The population of this study was adults (aged 18-64 years old) with T2DM, who attended the non-communicable diseases (NCD) clinic in the Base Hospital Kalawana (BHK), Rathnapura district, Sri Lanka. According to the information collected from this diabetes clinic at BHK, shows that approximately 50-60 patients with diabetes visit this clinic per day (clinic held three days per week) (Hospital statistics from BHK, 2022).

Sample

The sample of this study was adults with T2DM, who attended the diabetes clinic in the outpatient department (OPD) at Base Hospital Kalawana (BHK), Sri Lanka. The inclusion criteria of the sample are as follows:

1. Age 18 - 64 years
2. Diagnosed with T2DM at least 6 months
3. Have the ability to read and write Sinhala
4. Without having cognitive impairment as screening by asking for time, place, and date

5. Have no major physical disability such as blindness or reduced physical mobility requiring assistance such as Paralyses and difficulty in walking

Participants who were not able to complete all questionnaires and participants who were from other urban regions in Sri Lanka were excluded from the study

Sample Size

Sample size calculation was done by using the rule of thumb method. Riley et al. (2020) stated that at least 10 events per variable (EPV) or candidates per predictor fit for multiple regression. Up to 50 EPV may be needed when variable selection is performed (Riley et al., 2020). Therefore, the proposed study used 40 EPV (04 independent variables). Thus, the minimum sample size for this study was 160 participants.

Sample recruitment

1. Simple random sampling was used in this study.

2. The researcher identified the attendees with help from staff at the NCD clinic who met the inclusion criteria (by reviewing the relevant medical records) and asked for permission to participate in the study.

3. The researcher randomly selected 50% of the participants who met the inclusion criteria by preparing the two pieces of paper as same size and material and writing down the “even numbers” and “odd numbers”.

4. These two pieces of paper were folded and mixed well in the prepared container and the researcher selected one paper from the container every clinic day. As an example, if the researcher picked up the paper that mentioned “odd numbers” on that day, and selected the adults with Type 2 Diabetes by odd numbers of queue number.

5. The researcher recruited a maximum of 15 participants per day, three days per week (Tuesday, Thursday, and Friday).

6. The researcher introduced the study simply with the consent of the selected participants and guided voluntary individuals to sign the consent form and complete the questionnaires.

7. When the sample reached the recruited sample size, the recruitment was stopped for the next phase of the study.

Study Setting

The study was conducted at the NCD clinic in the outpatient department (OPD) at Base Hospital Kalawana (BHK), Rathnapura district, Sri Lanka. BHK is the secondary care hospital located in the Kalawana divisional secretary area (DS). Kalawana DS area (379 Km^2) is a rural area (with tea estates) Tea plantation is the main source of income for many families (Department of Census and Statistics, 2012). The bed capacity of this hospital was 88. Clinics for NCD are functioning and a total of 2,168 patients are newly registered in the year 2022 (according to hospital records, 2022). The diabetes patients are followed up in the NCD clinic and it is held three days per week (Tuesday, Thursday, and Friday) from 8:00 a.m. to 3.00 pm. Diabetes patients are attending to the clinic from 8.00 am to 12 noon. Nearly 1240 diabetes persons were registered and follow-up in this clinic and around 50-60 persons (around 30-35 adults between age 18-64) attend sessions per day (according to hospital records, 2022).

The NCD clinic is run by two general physicians, one nursing officer (who specializes in diabetes education), one pharmacist, and 05 healthcare assistants, under the supervision of a consultant physician. Diabetes patients regularly visit the clinic once a month with their FPG report according to the physicians' advice. The hospital provides medications for one month free of charge to all patients Physicians are adhering to the national guidelines for the management of diabetes. They are mainly responsible for adjusting treatment schemes, ordering and screening investigations, and referring patients for special care (eye clinic, nephrology clinic, surgical clinic, psychiatric clinic) if needed. In particular uncontrol diabetes patients and newly diagnosed patients are referred to the nurse for tailoring education. Especially patients who are on insulin therapy were referred to the nurse to observe the injection site.

The nurse provides diabetes education regarding diet management, exercise, foot care, how to inject insulin how to prevent hypoglycemia, and so on. As well as a nurse in this clinic conducts foot examinations, blood pressure monitoring, and BMI calculation, checks insulin injection sites, and reminds of the date of the next visit. Even though, the nurse provides the above diabetes education to patients, always does not involve the family members. The pharmacist provides the medications and instructions for medication use (dosage and frequency) for the patient. There is

neither a dietitian nor a physical therapist appointed to this clinic. Some persons are accompanied by a member of their family to visit the clinic. If they are accompanied, the nurse provides education to both individuals and family members.

Research Instruments

Data collection was conducted by using six questionnaires including the sociodemographic questionnaire (SDQ), the diabetes self-management questionnaire (DSMQ), the Sinhalese version of the perceived stress scale (S-PSS-10), the functional, communicative, and critical health literacy scale (FCCHL), the diabetes management self-efficacy scale – UK version (DMSES-UK), and the family/friend involvement in adults' diabetes (FIAD) scales. The English versions of DSMQ, FCCHL, DMSES-UK, and FIAD were translated into Sinhala using standard forward-backward translation and the translation procedure (Mapi Research Trust, 2018) as follows:

Translation of instruments

Permission to use and translate the DSMQ, FCCHL, DMSES-UK, and FIAD was obtained from either the original authors or companies by e-mail correspondence. The Linguistic Validation Guidance of a Clinical Outcome Assessment (COA) from Mapi Research Trust (2018) guideline was followed for the translation of instruments. The process involves forward translation (includes the production of a "reconciled" version), backward translation, and cognitive interviews (patient testing) (Mapi Research Trust, 2018). Questionnaires were translated into Sinhala by two local nursing professionals (University lecturers) who have experience with questionnaire translations, native Sinhala language speakers, and bilingual in the English language. Then Nursing professor (University Lecturer) reviewed the scales for the appropriateness of the Sinhala version and prepared the reconciled version. After that, the reconciled version was translated back to English by a local professional translator, bilingual in the Sinhala and English languages, and had no access to the original version of the questionnaire. Then a comparison of the backward version with the original instruments was done by the researcher, principal advisor, and native speaker of the English language (Registered Nurse in Australia) to assess its' similarity with the original items. The original questionnaires were

matched, and the Sinhala version was finalized. Lastly, cognitive debriefing (testing) was done with five native speakers of the Sinhala language who have the same characteristics as the study participants.

The Sociodemographic Questionnaire (SDQ)

The SDQ is specific to this study and developed by the researcher. There are two parts to the SDQ. *Part 1*, the general information about the characteristics of the participants which includes age, sex, marital status, educational level, working status, income, weight, height, distance and way of transport from home to hospital, living arrangements at home, use of other complementary therapy (herb, traditional med) and some information of family. The above information was collected from the participants. *Part 2*, the health information of the participants which includes the duration of the diagnosis, current treatment regimen, glycemic control situation (FPG, HbA1c), presence of diabetes-related complications, and comorbidities. The above information was collected from the medical records of the participants.

The Diabetes Self-Management Questionnaire (DSMQ)

DSM was measured by the 16-item DSMQ developed by Schmitt et al. (2013). It was designed to assess DSM activities associated with glycemic control in common treatment regimens for people with type 1 and type 2 diabetes. DSMQ has four subscales including diabetes-related dietary management (items 2, 5, 9, and 13), glucose management on blood glucose monitoring and medication adherence (items 1, 4, 6, 10, and 12), physical activity on activity/exercise for diabetes management (items 8, 11, 15), and physician contact on adherence to diabetes-related doctors' appointments (items 3, 7, 14). For each statement, there are 4-point Likert scale type answers (3 = Applies to me very much, 2 = applies to me to a considerable degree, 1 = applies to me to some degree, and 0 = does not apply to me). Participants were asked to rate to which extent each statement applies to their SM during the past eight weeks If participants were not necessarily required in all treatment regimens, specifically SMBG and anti-diabetic medication, boxes offering to tick '…is not required as a part of my treatment' were available (Schmitt et al., 2013).

The total score of DSMQ is a global measure of DSM which contains 7 positively and 9 negatively keyed items. The negatively keyed items (5, 7, 10, 11, 12, 13, 14, 15, and 16) have to be reverse-scored so that higher values indicate more

effective SM before summing to scale scores. If an item was skipped, the numerator should be corrected by –3. If an item is not required as a part of my treatment stated in an item, that item should not be scored. Based on recorded item scores the scale scores should be computed (scale score = actual sum of items / maximum possible sum of items x 10). The possible scores can vary between 0 and 10. higher score means a high DSM (Schmitt et al., 2013).

DSMQ is a reliable and valid instrument and it is a valuable questionnaire for scientific analyses and clinical use. The items showed appropriate characteristics with HbA1c. Overall Cronbach's alpha was good (.84). Confirmatory factor analysis indicated an appropriate fit of the four-factor model. The scales showed significant convergent correlations with parallel SDSCA scales and all correlations with HbA1c were significantly stronger than SDSCA (Schmitt et al., 2013).

The original English DSMQ questionnaire was translated into the Sinhala Language using a standard forward-backward translation procedure with the permission of the Mapi Research Trust (MRT) and the Sinhala version was used in this study. The Sinhala version questionnaire was reviewed by experts, and a cognitive interview and pre-test were performed to ensure its validity. Reliability testing was performed, and Cronbach's Alpha level was .73 and .72 in the pre-test and main study respectively.

The Sinhalese version of the Perceived Stress Scale (S-PSS) - 10

Perceived stress was measured by the Sinhalese version of the Perceived Stress Scale (S-PSS) – 10. PSS is a 10-item scale first developed by Cohen et al. (1983). It is used to assess the person's perception of stress including their thoughts and feelings about life events and situations during the last month. This instrument measures the level of perception of stress concerning unpredictability, lack of control, and overload with the two-factor structure. Scale assessing negative emotions and the inability to handle stress as well as positive feelings and the ability to take action in stressful situations (Cohen et al., 1983). This scale was translated and validated into the Sinhala language by Mendis et al. (2023), and they mentioned that S-PSS-10 can be used to screen perceived stress among the majority of the Sri Lankan Sinhalese-speaking population, within a short period, and appropriate tool to be used in busy

Sri Lankan clinic settings, especially with chronic illnesses including diabetes (Mendis et al., 2023).

This scale is structured on a five-point Likert-type answer (0-never, 1-almost never, 2-sometimes, 3-fairly often, 4-very often) indicates how often a participant experienced a particular feeling thought over the past month (Cohen et al., 1983). Scoring of this scale was adopted generally for questions 1, 2, 3, 6, 9, and 10 and reverse scoring procedure for questions 4, 5, 7, and 8. Each 10-item rated score from the scale is directly summed to obtain a final score and calculate the perceived stress levels. The possible scores of perceived stress ranged from 0 - 40 and levels are considered 0 -13 ‘Low,’ 14 - 26 ‘Moderate’, and 27 - 40 ‘High’ (Cohen et al., 1983).

The S-PSS-10 possessed high internal consistency and reliability, acceptable concurrent validity, construct validity, and goodness-of-fit for the two-factor model. The Cronbach alpha values of the patient with T2DM were .85 (Mendis et al., 2023). For the current study, reliability testing was performed, and Cronbach’s Alpha level was .93 and .94 in the pre-test and main study respectively.

The Functional, Communicative, and Critical Health Literacy Scale (FCCHL)

Health literacy was measured by a 14-item FCCHL scale that was first developed by Ishikawa et al. (2008). This scale is reliable and valid for measures of three types of HL in diabetic patients. The scale item of the FCCHL tool was constructed to directly reflect Nutbeam’s definitions of three levels of HL including functional, communicative, and critical HL. This questionnaire measures the ability to extract, understand, and use health-related information.

The FCCHL tool consists of 3 subscales namely, Functional (Items 1, 2, 3, 4, and 5), communicative (item 6, 7, 8, 9, and 10), and critical health literacy (item 11, 12, 13, and 14). Each item is rated on a 4-point Likert scale, ranging from 1 (never) to 4 (often). The total and subscale scores are calculated by the mean score for the items in a scale/subscale (theoretical range: 1–4). The scores of functional HL items should be reversed when calculating the total and subscale scores. The possible scores ranged from 1 – 4 and higher scores indicate higher HL (Ishikawa et al., 2008).

FCCHL is reliable and valid for measures of three types of HL in diabetic patients. This original tool had good validity and reliability with Cronbach’s α .78.

Exploratory factor analysis identified three interpretable factors and correlations between health literacy scales and other measures supported the construct validity of the scales (Ishikawa et al., 2008). Validity and reliability of the English version of the FCCHL tool assed by Zegers et al. (2020). It was seen to have good validity and reliability in the identified population and overall Cronbach's alpha was 0.87 (Zegers et al., 2020).

The original English FCCHL tool was translated into the Sinhala Language using a standard forward-backward translation procedure with the permission of the original author and the Sinhala version was used in this study. The Sinhala version questionnaire was reviewed by experts and cognitive interviews and pre-tests were performed to ensure validity. Reliability testing was performed, and Cronbach's Alpha level was .89 and .94 in the pre-test and main study respectively.

The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK)

The self-efficacy was measured by a 15-item DMSES-UK scale which was first developed by Sturt and colleagues (2010). This instrument is suitable for use in research and clinical settings to measure the self-efficacy of people living with T2DM in managing their diabetes. This tool helps to identify in which areas of the DSM a patient's self-efficacy is more or less secure (Sturt et al., 2010).

The DMSES UK incorporated 11-point Likert-type answers and each item scored a 0–10 scale (0–1 Cannot do at all, 4/5 Maybe yes maybe no, 9/10 Certain can do). Substitute missing items with mean score should be done if up to 4 items are missing and if more than 4 items missing then set the total DMSES score for that person to missing and then calculate the total DMSES scores. The possible scores varied from 1 -150 and individual patient total scores can be interpreted as 0-50 = low self-efficacy, 51-100 = moderate self-efficacy, and 101-150 = high self-efficacy (Sturt et al., 2010). The scale has good internal reliability, internal consistency, construct validity, criterion validity, and test-retest reliability (Sturt et al., 2010). Internal consistency of this scale demonstrated Cronbach's alpha of 0.89 overall for 15 items.

The original English DMSES-UK questionnaire was translated into the Sinhala Language using a standard forward-backward translation procedure with the permission of the original author and the Sinhala version was used. The Sinhala

version questionnaire was reviewed by experts in the nursing field and cognitive interviews and pre-tests were conducted to ensure the validity. Reliability testing was performed, and Cronbach's Alpha level was .69 and .83 in the pre-test and main study respectively.

Family / Friend Involvement in Adults' Diabetes (FIAD)

Family support was assessed by the 16-item FIAD scale which was first developed by Lindsay S. Mayberry and colleagues (2019). FIAD was designed to be relevant to adults with T2DM and it is a reliable and valid brief measure of helpful and harmful family/friend involvement. It consists of two subscales and assesses helpful (items 1, 3, 4, 7, 8, 10, 12, 14, 16) and harmful (items 2, 5, 6, 9, 11,13, 15) family/friends' involvement in DSM among adults with T2DM (Mayberry et al., 2019).

Each item of this scale responds according to 5-point Likert-type answers related to how often friends or family members have done the behavior in the past month (1– Never in the past month, 2 – Once in the past month, 3 – Two or three times in the past month, 4– Once each week, and 5 – Twice or more each week). If scores answered fewer than two-thirds of items should be given a missing value. The summary scores range from 1 to 5 and higher scores indicate more supportive or obstructive behaviors, respectively. The authors mentioned examining potential suppression effects for each outcome before analyses to determine whether the FIAD scores should be analyzed together or separately. Also, scales may perform better direction when including both as predictors, this may depend on the outcome (Mayberry et al., 2019).

FIAD found adequate internal consistency reliability, test-retest reliability, convergent validity, criterion, and predictive validity with diabetes self-efficacy, self-care behaviors, and glycemic control. Internal consistency reliability of the tool had Cronbach's $\alpha = 0.87$ and helpful and harmful subscales had Cronbach's $\alpha = .86$ and .72, respectively (Mayberry et al., 2019).

The original English FIAD questionnaire was translated into the Sinhala Language using a standard forward-backward translation procedure with the permission of the original author and the current study was conducted by using the Sinhala version. The Sinhala version of the questionnaire was reviewed by experts in

the nursing field and a cognitive interview and pre-test were performed to ensure validity of the tool. Reliability testing of the Sinhala version was performed, and Cronbach's Alpha level was .83 and .89 in the pre-test and main study respectively.

Psychometric Properties of the Instruments

The original version of the DSMQ, FCCHL, DMSES-UK, and FIAD was used in this study and was tested and validated by the experts in many previous studies. S-PSS-10 was also validated for the Sinhala-speaking population in Sri Lanka. All of the original scales showed good internal reliability, internal consistency, construct validity, criterion validity, and test-retest reliability. The Sinhala version questionnaires was reviewed by nursing researchers who were experts in the nursing field to ensure content validity. The cognitive interviews were conducted with five participants who met the same inclusion criteria as same as main study to to enhance response process validity. A pre-test was performed to ensure face validity and reliability with 30 adults with T2DM in BHK, Rathnapura District, Sri Lanka, who have the same characteristics as the sample of the study. Table 1 shows the pre-test and main study reliability test results of the Sinhala version of each instrument.

Table 1 The reliability test results of the pretest and main study (Cronbach's Alpha)

Questionnaires	**Pre-test (n = 30)**	**Main study (n = 160)**
DSMQ	.731	.725
S-PSS-10	.929	.949
FCCHL	.895	.941
DMSES-UK	.696	.836
FIAD Total	.831	.891
Helpful involvement	.791	.834
Harmful Involvement	.547	.652

Protection of Human Rights

This study was conducted after the approval of the research proposal by the Institutional Review Board (IRB), Burapha University, Thailand (G-HS102/2566). After that, further ethical permission was obtained from the Ethics Review Committee

(ERC) of the Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka (ERC 43/23). Further approval was taken from the Medical Superintendent (MS) BHK, Sri Lanka (Approval letter attached in appendix F).

All the potential participants were informed about the aims of the study and the data collection procedure during the process of data collection, which emphasizes the participant's right to agree or disagree to be a part of the study. Participants were informed that their denial to be part of this study was not affecting the quality of care they received from the clinic. Data were collected from only the participants who were willing to participate in the study, after taking their informed written consent. Participants were informed that they have to right to change their decision to discontinue being a part of the study at any time without any penalty and no identified physical or psychological risk to the person who participated in the study and no risk to society.

Confidentiality of the participants was maintained and no names or other identification was revealed in any of the data collection forms, during the data collection process, or in the research reports after the completion of the study. All paper documents containing data were locked in a secure place and all electronic data were secure under password-protected- with only the researcher having access to it. All documents involved in the data collection will be destroyed five years after the completion of the study.

Data Collection

The data collection procedure in the study was conducted by the researcher as follows:

1. The research proposal was approved by the IRB of BUU. After that, approval was obtained from the Ethics Review Committee (ERC) of the Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka. Further approval was taken from the Medical Superintendent (MS) BHK, Sri Lanka.

2. After obtaining permission from the MS, BHK, Sri Lanka, the data collection process was explained to the Nursing officer and physician at the clinic and asked for permission to collect data. The researcher talked with the physician and

nurses in advance and ensured that if the participant was occupied when the queue number was called, the participant's visit to the doctor was protected.

3. The data collection was conducted with minimum disturbances for the routine work at the clinic.

4. Participants were gathered from the diabetic clinic on Tuesday, Thursday, and Friday from 8:00 am to 12:30 pm which is regular clinic time. The Nurse in the diabetes clinic introduced the researcher to the person who attends the clinic and helped the researcher to recruit the sample.

5. The participants were selected by simple random sampling those who fulfilled the inclusion criteria.

6. The written informed consent was obtained from the eligible willing participants without any force after they fully understood the explained human protection, the aim of the study, and the method used in the study.

7. The data was collected through a self-administrated questionnaire which was taken about 20-30 minutes. Even though, most of the participants requested the researcher to read the questionnaires for them.

8. Each participant was approached in a special private place near the pre-examination sitting area while they were waiting for the examination by a physician. If the participants needed to see the physician while they were answering a questionnaire, the researcher waited for them until finished the examination. The researcher made sure that the participants could see the doctors in time as soon as the questionnaires were completed.

9. Before the participants left the room, the researcher reminded the participants to check the questionnaire had been filled. The researcher informed all the participants that if they decided not to answer some questions purposely, they could leave it without answering.

10. The Researcher was adhering to the COVID-19 prevention guidelines as mentioned by the hospital to prevent the spread of the infectious disease between the investigator and the participants consistent with physical Distancing, maintaining cleanliness during the data collection period, wearing a mask, and using alcohol or disinfectant to clean the device and place used for data storage.

11. The researcher continued conducting the data collection until the required sample size was reached.

Data Analysis

Data analysis was performed using IBM SPSS version 26. Significance level (α) of .05. The following statistical functions were performed as follows;

1. Descriptive statistics were used to describe the frequency, percentage, mean, and standard deviation of the participant's demographic data and variables.

2. To test the assumptions of the multiple regression, various functions of the statistics including normality, linearity, outlier, homoscedasticity, autocorrelation, and multicollinearity of the variables were checked.

3. Standard linear multiple regression was used to recognize the predicting factors of the DSM among adults with T2DM in Rural Sri Lanka

CHAPTER 4
RESULTS

This chapter describes the research findings of the study. The purposes of the study are to determine DSM and to examine whether perceived stress, health literacy, self-efficacy, and family support can predict diabetes self-management among adults with T2DM in rural Sri Lanka. The research findings of this study are described as follows;

1. Description of demographic information: general information and health information
2. Description of independent variable
3. Description of factors influencing DSM among adults with T2DM in rural Sri Lanka

Description of the Socio-demographic characteristics of the participants

This study was conducted at the NCD clinic at OPD in Base Hospital Kalawana, Sri Lanka. 160 adults with T2DM were recruited as the study participants. The participants comprised 51 males (31.9%) and 109 females (68.1%). Ages ranged from 27 to 64 years with an average of 57.5 years, and the majority of the (68.1%) belonged to late adults (Aged between 56 and 64 years). The majority of the participants were married (81.3%) and had lived with family members (91.9%). Approximately half of the participants (45.6%) had four to five members in their families. Mostly have the children as caregivers (53.8%) when they need help. 61.9% had completed their secondary-level education and approximately 58% of their families earned less than 30,000 LKR (Poorest level). 36.9% of the participants reported that they were unemployed, followed by working in their tea estates (35.6%) and laborers (11.9%). The majority of the participants had no history of drinking alcohol (73.7%) and smoking (86.3%) Only 16 (10%) participants reported that a Glucometer is available in their home. Approximately 30% of the participants were in

each category of distance from home to the hospital including 5-10 km, 10-15km, and 15-20km, and the majority of them used public transport (80.6%). Nearly one-third of participants (31.3%) had used other complementary therapies. The Socio-demographic characteristics of the participants are shown in Table 2.

Table 2 Socio-demographic characteristics of the participants (n = 160)

Characteristics	**Number (n)**	**Percentage (%)**
Gender		
Male	51	31.9
Female	109	68.1
Age (*M* = 57.53, SD = 7.003, Min = 27, Max = 64)		
18-35 (Young adults)	2	1.3
36-55 (Middle-aged adults)	49	30.6
56-64 (Late adults)	109	68.1
Marital Status		
Single	5	3.1
Married	130	81.3
Divorced	1	0.6
Widowed	24	15
Living arrangement		
Living alone	13	8.1
Living with family members	147	91.9

Table 2 (Continued)

Characteristics	**Number (n)**	**Percentage (%)**
Number of family members (*M* = 4, SD = 1.39, Min = 1, Max = 7)		
Alone	13	8.1
2 - 3	59	36.9
4 - 5	73	45.6
6 - 7	15	9.4
Caregiver		
Spouse	63	39.4
Children	86	53.8
Siblings	8	5.0
Others (Parents, Nabors)	3	1.8
Highest level of education		
Not attended school	7	4.4
Primary (Grade 1-5)	30	18.8
Secondary (Grade 6-11)	99	61.9
Post-secondary (Grade 12-13)	18	11.3
Vocational Diploma	2	1.3
Tertiary (Graduate and/or up)	4	2.5
Average family income (1 USD = 300 LKR)		
Less than 30000 LKR	93	58.1
30000-80000 LKR	54	33.8
More than 80000 LKR	13	8.1

Table 2 (Continued)

Characteristics	Number (n)	Percentage (%)
Occupation		
Unoccupied	59	36.9
Government officers	4	2.5
Working in the private sector	2	1.2
Working on own tea estates	57	35.6
Laborer	19	11.9
Others (Retired, Business, Farmers, and Drivers)	19	11.9
Working hours per day (n = 93)		
Less than 6 hours	56	60.2
6 -12 hours	37	39.8
Alcohol Drinking status		
No history of drinking alcohol	118	73.7
Current alcohol drinker	2	1.3
Infrequent Alcohol user	12	7.5
Former alcohol drinker	28	17.5
Smoking status		
No history of smoking	138	86.2
Current smoker	3	1.9
Infrequent Smoker	2	1.3
Former smoker	12	7.5
Passive smoker	5	3.1
Availability of the glucometer at the home		
Yes	16	10
No	144	90

Table 2 (Continued)

Characteristics	Number (n)	Percentage (%)
Distance from the Hospital to home		
Less than 1 km	5	3.1
1-5 km	49	30.6
5-10 km	51	31.9
10-20 km	47	29.4
More than 20 km	8	5.0
The way of transport from home to the hospital		
By foot	4	2.5
By public transport	129	80.6
By family vehicle	26	16.3
By hiring vehicle	1	0.6
Use of other complementary therapy		
Yes	50	31.3
No	110	68.8

The health information of the participants

The results show that most of the participants (59.4%) had their BMI at a normal level and 26.9% and 8.8% of them were overweight and obese respectively (*M* = 24.2, SD = 3.8). The duration of the diagnosis of T2DM range varied from 6 months to 30 years (*M* = 8.66, SD = 6.81). 15% of the participants reported that they were hospitalized due to T2DM 1-2 times and the range varied from 1-6 times (*M* = 1.79, SD = 1.2). The majority of the participants (88.7%) had used oral medication and nearly half of them were on dual therapy. The majority (79.4%) of the participants reported that they had T2DM-related co-morbidity (45% had only one co-morbidity and 34.4% had two or three co-morbidities). Hypertension (62.5%) and hyperlipidemia (35.6%) were seen as major comorbidities. One in four adults (26.9%) in this study reported current diabetes-related complications including retinopathy, nephropathy, and neuropathy and 22.5% of them had only one complication. The average FPG level ranged between 52 to 400 mg/dl (*M* = 141.8, SD = 54.8), and

nearly half of the participants (48.8%) showed that uncontrol FPG level. The details of the health information of the participants are shown in Table 3

Table 3 Health information of the participants (n = 160)

Health information	**Number (n)**	**Percentage (%)**
BMI (*M* = 24.2, SD = 3.8, Min = 15.6, Max = 44.1)		
Underweight (< 18.5)	8	5.0
Normal weight (18.5 – 24.9)	95	59.4
Overweight (25-29.9)	43	26.9
Obese (> 30)	14	8.7
Duration of diagnosis of T2DM (*M* = 8.66, SD = 6.81, Min = 6 months, Max = 30 years)		
Less than 1 year	18	11.3
1-5 years	44	27.5
6 – 10 years	50	31.2
More than 10 years	48	30.0
Last year Hospitalizations due to diabetes (*M* = 1.79, SD = 1.2, Min = None, Max = 6)		
None	126	78.8
1 – 2 times	24	15.0
3 - 4 times	9	5.6
5 - 6 times	1	0.6

Table 3 (Continued)

Health information	**Number (n)**	**Percentage (%)**
Diabetic Medication		
Oral medications	142	88.7
Mono drug therapy	50	31.2
Dual drug therapy	74	46.2
Triple therapy	32	20.0
Insulin (Mixtard)	3	1.9
Combined therapy (Oral + Insulin injection)	14	8.8
None	1	0.6
Co-morbidities		
None	33	20.6
Having Co-morbidities*	127	79.4
Hypertension	100	62.5
Hyperlipidemia	57	35.6
Chronic kidney disease	1	0.6
Heart disease	15	9.4
Others (Arthritis, Asthma, Hypothyroidism)	15	9.4
Number of co-morbidities (n = 127)		
Only One co-morbidity	72	45.0
Two comorbidities	46	28.8
Three co-morbidities	9	5.6

Table 3 (Continued)

Health information	Number (n)	Percentage (%)
Current diabetes-related complications		
None	117	73.1
Having complications	43	26.9
Retinopathy	19	11.9
Nephropathy	15	9.4
Neuropathy	2	1.3
Two complications	6	3.7
Three complications	1	0.6
Availability of HbA1c test results		
Yes	4	2.5
No	156	97.5
Glycemic control by FPG level (M = 141.8, SD = 54.8, Min = 52, Max = 400)		
Controlled T2DM (FPG < 126)	82	51.2
Uncontrolled T2DM (FPG ≥ 126)	78	48.8

*Participants were selected for more than one comorbidity

Description of dependent and independent variables

The dependent variable of this study was diabetes self-management and the independent variables were perceived stress, health literacy, self-efficacy, and family support. The description of DSM and its subscales is shown in Table 4. The total score of DSM varied from 2.92 to 8.96 (out of possible scores 0-10) and the mean score of total DSM was 5.84 (SD = 1.25). The healthcare use (HCU) subscale 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 average score (M = 2.47, SD = 2.61).

Table 4 Mean and Standard deviation of Diabetes self-management (DV) and its subscales (n = 160)

DV and subscales	Possible score	Actual score	M	SD
Diabetes self-management	0 – 10	2.92 - 8.96	5.84	1.25
Dietary management	0 – 10	.83 - 10	4.65	2.27
Glucose management	0 – 10	2 - 10	6.71	1.55
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

Table 5 illustrates the range of scores, mean, and SD of the independent variables of perceived stress, health literacy, self-efficacy, and family support. Perceived stress scores ranged from 0 -39 (out of possible scores of 0 - 40) with a mean score of 11.73 (SD = 11.99) indicating low perceived stress. Health literacy scores vary from 1- 4 with a mean score of 2.72 (SD = 0.85) while functional health literacy shows the highest mean score of 3.41 (SD = .98) and critical health literacy had the lowest mean score of 2.07 (SD = 1.15). Self-efficacy scores ranged between 34 to 150 (out of 0 to 150 possible scores) with an 84.5 mean score (SD = 27.15) indicating moderate self-efficacy. The actual score of helpful family involvement ranged between 1-5 while of harmful family involvement ranged from 1-3.86 (out of 0 to 5 possible scores). The mean scores of the helpful family involvement and harmful family involvement are 2.73 (SD = .98) and 2.25 (SD = .77) respectively.

Table 5 Mean and Standard deviation of the independent variables and their subscales (n = 160)

Independent variables	Possible score	Actual score	*M*	SD	Level
Perceived stress	0 – 40	0 – 39	11.73	11.99	Low
Self-efficacy	0 – 150	34 – 150	84.53	27.14	Moderate
Health literacy (FCCHL)	1 – 4	1 – 4	2.72	.85	-
Functional HL	1 – 4	1 – 4	3.41	.98	-
Communicative HL	1 – 4	1 – 4	2.52	1.03	-
Critical HL	1 – 4	1 – 4	2.07	1.15	-
Family support					
Helpful family involvement	1 – 5	1 – 5	2.73	.98	-
Harmful family involvement	1 - 5	1 – 4	2.25	.77	-

Factors influencing DSM among adults with T2DM in Rural Sri Lanka

The assumptions of the multiple regression were checked by using various functions of the statistics, including normal distribution of the variables, linearity, outliers, homoscedasticity, autocorrelation, and multicollinearity. The univariate normality of the data was tested with the Fisher skewness coefficient and the Fisher kurtosis coefficient. The results showed that variables of diabetes self-management, health literacy, self-efficacy, helpful family involvement, and harmful family involvement were in the normal distribution (between -1.96 and + 1.96). The multivariate normality was tested by 1 sample KS and scatter plots (Between -3 and +3) indicating that there were no outliers. The linearity of the variables was checked and the results revealed that the variables had a linear relationship ($\alpha < .05$). The Durbin-Watson test was performed to check the autocorrelation among independent variables and results showed that the Durbin-Watson value was between 1 and 3

indicating there was no autocorrelation among variables. Homoscedasticity was checked with scatter plots. The tolerance test values were higher than .2 and the Variance inflation factor (VIF) values were less than 5 indicating that there was no multicollinearity. Hence, the multiple regression analysis was carried out.

Pearson's correlation test was performed to check the relationship among the variables. Standard multiple regression was used to recognize the predicting factors of the DSM among adults with T2DM in Rural Sri Lanka. Table 6 illustrates the correlation matrix among the variables studied.

Table 6 Correlation matrix among the independent and dependent variables (n = 160)

	DSM	**PS**	**HL**	**SE**	**Helpful FI**	**Harmful FI**
DSM	1.000					
PS	-.311**	1.000				
HL	.139*	-.196**	1.000			
SE	.598**	-.343**	.444**	1.000		
Family Support						
Helpful FI	.244**	-.073	.168*	.355**	1.000	
Harmful FI	-.255**	.178*	-.075	-.270**	.446**	1.000

** P < 0.01, * P < 0.05

[Diabetes self-management (DSM), Perceived stress (PS), Health literacy (HL), Self-efficacy (SE), Helpful family involvement (Helpful FI), Harmful family involvement (Harmful FI)]

Table 6 of the correlation matrix shows DSM was significantly correlated with perceived stress ($r = -.311$, $p < .01$), health literacy ($r = .139$, $p < .05$), self-efficacy ($r = .598$, $p < .01$), helpful family involvement ($r = .244$, $p < .01$), and harmful family involvement ($r = -.255$, $p < .01$).

Standard multiple linear regression analysis revealed that perceived stress, health literacy, self-efficacy, helpful family involvement, and harmful family involvement could significantly explain the DSM by 39.3% of the variance among

adults with T2DM in rural Sri Lanka (Adj R^2 = .393, F (5, 154) = 21.611, p < .001). Besides, the analysis showed that DSM among adults with T2DM was significantly predicted by health literacy (β = -.162, p = .020), self-efficacy (β = .530, p = .001), and harmful family involvement (β = -.169, p = .038). However, perceived stress and helpful family involvement could not predict DSM significantly. The summary of regression analysis results is presented in Table 7.

Table 7 Summary of multiple regression analysis for variables predicting DSM among adults with T2DM in Rural Sri Lanka (n = 160)

Predicting variables	**B**	**SE**	**β**	**T**	**p-value**
PS	-.013	.007	-.120	-1.813	.072
HL	-.238	.101	-.162	-2.349	.020
SE	.024	.004	.530	6.188	.001
Family Support					
Helpful FI	.194	.107	.150	1.819	.071
Harmful FI	-.275	.131	-.169	-2.098	.038
Constant = 4.648, Adj R^2 = .393, $F_{(5, 154)}$ = 21.611, p < .001					

[Perceived stress (PS), Health literacy (HL), Self-efficacy (SE), Helpful family involvement (Helpful FI), Harmful family involvement (Harmful FI)]

CHAPTER 5
DISCUSSION AND CONCLUSION

This chapter describes the summary of the findings, discussion, strengths, limitations, and implications of the study findings for nursing practice and nursing research.

Summary of the findings

This study was conducted to determine DSM and its influencing factors (perceived stress, health literacy, self-efficacy, and family support) among adults with T2DM in rural Sri Lanka. The study was guided by the IFSMT by Ryan and Sawin (2009) and literature reviews related to DSM. It was conducted in the NCD clinic at OPD at Base Hospital Kalawana, Rathnapura district, Sri Lanka. 160 Sri Lankan rural adults were recruited using a simple random sampling method. Data were collected by self-administered questionnaires using SDQ prepared by the researcher, DSMQ (Schmitt et al., 2013), S-PSS-10 (Mendis et al., 2023), FCCHL (Ishikawa et al., 2008), DMSES-UK (Sturt et al., 2010), and the FIAD scale (Mayberry et al., 2019). The aforementioned questionnaires show good reliability with Cronbach's α .72, .95, .94, .84, and .89 respectively.

The findings of this study revealed that the majority of the participants were females, late adults, married, lived with their family members, and cared for their children when they needed help. Most of the participants had Secondary or level education and the poorest level of income. A significant amount of them were unemployed and worked in their tea estates. The majority of the participants did not use alcohol or smoke. Only 10% of participants had Glucometers in their home. Distance from home to the hospital mainly varied from 1-20km (92%) and they used public transport (80.6%). Nearly one-third of participants (31.3%) had used other complementary therapies. The results show that the mean duration of diagnosis of T2DM was 8.66 (SD = 6.81) and most of the participants (59.4%) had their BMI at a normal level. The majority of them on oral medication (88.8%), had comorbidities (79.4%) mainly hypertension. Approximately 27% of the participants had diabetes-

related complications. Nearly half of the participants (48.8%) showed that uncontrol FPG level.

The mean score of overall DSM among Sri Lankan rural adults with T2DM was 5.84 out of 10 (SD = 1.25) and the healthcare use subscale had the highest mean score (*M* = 9.38, SD = 1.06) and the physical activity subscale had the lowest mean score (*M* = 2.47, SD = 2.61). Results of Pearson correlation show that DSM was significantly correlated with perceived stress (r = -.311, p < .01), health literacy (r = .139, p < .05), self-efficacy (r = .598, p < .01), helpful family involvement (r = .244, p < .01), and harmful family involvement (r = -.255, p < .01).

Results of Standard multiple regression analysis revealed that all factors could explain 39.3 % of the variance in DSM (Adj R^2 = .393, F (5, 154) = 21.611, p < .001) among Sri Lankan rural adults with T2DM. Self-efficacy better explained the variance (β = .530, p = .001) followed by harmful family involvement (β = -.169, p = .038) and health literacy (β = -.120, p = .020).

Discussion

1. Diabetes self-management among adults with T2DM in rural Sri Lanka.

For this study, the total mean score of DSM among Sri Lankan rural adults was 5.84 out of 10 (SD = 1.25), which indicates sub-optimal DSM. When considering the subscale of the DSM, the healthcare use subscale has 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 PA subscale had the lowest mean score (*M* = 2.47, SD = 2.61). A similar study in Saudi Arabia shows inadequate DSM whereas the mean scores of DSM, health care use, glucose management, dietary control, and physical activity were 5.04, 5.63, 5.12, 4.96, and 4.46 respectively. This result is consistent with the current study and healthcare use had the highest mean score while physical activity had the lowest mean score. (Al-Qahtani, 2020). Moreover, adults with T2DM in Qatar reported poor overall DSM (Hassan et al., 2022). This study's results were inconsistent with a study done in Iran revealed that the DSM mean score was 6.92 (SD = 1.17) out of 10 and dietary control subscale had the highest mean score of 7.48 (SD = 1.35) and the

glucose management subscale had the lowest mean score (*M*= 6.25, SD = 1.88) (Khalooei & Benrazavy, 2019). Besides, the Chinese study shows incompatible results with the current study and revealed that the overall mean DSM score was 4.85 (SD = 1.42) with medication adherence having the highest mean score (*M* = 6.31, SD = 2.85) and the glucose monitoring subscale had the lowest mean score (*M* = 2.40, SD = 1.95) (Yang et al., 2022).

The results of this study can be explained by the IFSMT by Ryan and Sawin (2009). Individual and family factors and physical, social, and environmental factors influence individual and family engagement in self-management including developmental stages, literacy, family structure functioning, access to healthcare, transportation, neighborhood, work, culture, and social capital (Ryan & Sawin, 2009).

For suboptimal DSM in this study, one possible reason could be most of the participants were women (68.1%). Sri Lankan women are responsible for cooking, caring for children, and taking care of housework, and they have busy lifestyles and inadequate time to attend to their well-being. Another reason may be, that most of the participants (68.1%) were between 56 to 64 years old. Prior literature revealed that DSM had a negative correlation with patients' age (r = -.083, p = .044) (Khalooei & Benrazavy, 2019). For the current study, 81.3% of participants were married which is similar to the Saudi Arabian study. It revealed that married patients were significantly associated with poor DSM, which could lead to reduced time due to increased responsibilities such as daily chores and kids' education (Al-Qahtani, 2020).

Another reason could be the majority of the participants were secondary or low educational level (85.1%). A study among Southeast Iran adults with T2DM shows that the DSM mean score was significantly higher in people with higher educational levels, and household income (Khalooei & Benrazavy, 2019). As well as education level was a strong predictor of better DSM (Hassan et al., 2022; Khalooei & Benrazavy, 2019). Moreover, most of them (58.1%) were at poorer economic levels and their household income was less than 30,000 LKRs. In Rathnapura, Sri Lanka, the poverty line was estimated at 17,051 LKR (US $ 57.17) per person per month in February 2024 (The Department of Census and Statistics, 2024). Income level is affecting diet, medication, and glucose monitoring. In the case of providing free health for all citizens, non-availability of some newer and efficacious medicines and

investigations in rural Sri Lankan hospitals (Mettananda et al., 2023). Furthermore, only 10% of the participants had available glucometers in their homes. This also could be their low economic status. Because the price of a glucose meter and glucose testing strips are high (Rasalingam, 2023). Current results are in line with the rural Pakistan study indicating participants with higher income were more likely to undertake better DSM ($\beta = .118$; $p = .050$) when compared with those who have lower income (Ansari et al., 2019).

The findings of the present study revealed that the dietary control subscale had the second-lowest mean score ($M = 4.65$, SD = 2.27). results are inconsistent with the findings of Iranian adults with T2DM, revealing that dietary control had the highest mean score of 7.48 (Khalooei & Benrazavy, 2019). Findings are in line with the previous Sri Lankan rural study by Mettananda et al. indicating nearly 64% had poor dietary control (Mettananda et al., 2023). It was also similar to the rural Pakisthan study revealed that a low percentage of the participants adhered to healthy dietary practices (Ansari et al., 2019). Poor DSM practices related to dietary control among Sri Lankan rural adults with T2DM could be due to their traditional food habits, beliefs, difficulties in eating a smaller portion of rice, and daily consumption of refined sugar or sweets (Amarasekara et al., 2014; Mettananda et al., 2023). Another reason could be the majority of participants are under the low-income level. Consistently, the hardest part of the DSM is Dietary management, especially among low-income persons with T2DM, which influences lifelong habits, culture, family, and socioeconomic resources (Mcewen et al., 2017).

Current study results showed that the physical activity subscale had the lowest mean score ($M = 2.50$, SD = 2.64) which is in line with the study done in Saudi Arabia (Al-Qahtani, 2020). However, the results are contrary to the Chinese and Iran studies (Khalooei & Benrazavy, 2019; Yang et al., 2022). Lower levels of physical activity among adults in rural Sri Lankan settings could be a common misconception such as they think that they had physically active daily lives and did not have time to exercise and uncertainty about the social acceptance of regimented exercise (Medagama & Galgomuwa, 2018). In this study most of the participants were females and the reason for poor engagement in exercise among women could be they prioritized spending time with the family doing household chores over exercise

(Medagama & Galgomuwa, 2018; Waidyatilaka et al., 2019). As well as they are also embarrassed and uncomfortable exercising in public areas due to wearing exercise attire in public areas is usually not culturally acceptable among the rural Sri Lankan population (Medagama & Galgomuwa, 2018). Similar findings were observed in studies conducted in other South Asian countries including rural Tamil Nādu in India and Pakistan with approximately 80% and 64.6% of the participants not doing regular exercise respectively (Karthik et al., 2020; Rahmatullah et al., 2021).

Even though, participants in this study showed sub-optimal DSM, the healthcare use subscale (M = 9.38, SD = 2.33) and medication adherence subscale had optimal management scores (M = 8.61, SD = 2.33). A Pakisthan and Nepal study revealed similar findings indicating a high level of medication adherence (Kandel & Wichaidit, 2020; Rahmatullah et al., 2021). These results are consistent with Chinese and Saudi Arabian studies (Khalooei & Benrazavy, 2019; Yang et al., 2022). This high level of healthcare use and medication adherence could be due to the free healthcare services provided by the Sri Lankan government. Because, the majority of participants had the poorest income and if they participated in the clinic, they could check their blood sugar and collect their medication from the clinic free of charge. Another reason could be only 10% of the participants had available the glucometer in their home. Therefore, they should come to the clinic to check their blood sugar levels. Another reason high level of medication adherence among the study population could be the majority of them (91.9%) living with their family members. Family members play a role in reminding to take medicine on time (Adhikari et al., 2021; Liu et al., 2022). A significant amount of the participants in this study were unemployed and working in their tea estates. This reason could be affecting to high rate of healthcare use because they have enough time to participate in the clinic.

Unfortunately, approximately of the participants were on uncontrol (FPG > 126) FPG level (48.8%) with a mean FPG level was 141.8 mg/dl. Nearly 80% of the participants had other comorbidities, mainly hypertension and hyperlipidemia. Furthermore, approximately one in four adults (26.8%) had diabetes-related complications and one-third of participants were overweight or obese (BMI > 25). Having sub-optimal overall DSM, especially a lower mean score on the physical activity scale and dietary control scale might have been the factors of uncontrol

diabetes and high BMI. Nursing interventions should be targeted in the future to encourage physical activity and diet management which can lead to controlling the blood sugar level and body weight among adults with T2DM in rural Sri Lanka. Further, it will help to delay or prevent diabetes-related complications among this population.

2. Factors influencing DSM among adults with T2DM in Sri Lanka.

For the current study, the results of Standard multiple regression analysis revealed that all predictors could explain 39.3 % of the variance in DSM (Adj R^2 = .393, F (5, 154) = 21.611, p < .001) among adults with T2DM in rural Sri Lanka. For significant predictors, self-efficacy better explained the variance (β = .530, p = .001) followed by harmful family involvement (β = -.169, p = .038), and health literacy (β = -.120, p = .020). Results of the Pearson correlation show that self-efficacy had a significantly strong positive correlation with DSM (r = .607, p < .01) while helpful family involvement (r = .230, p < .01), and health literacy (r = .139, p < .05) had a significantly positive correlation with DSM. Besides, the DSM with perceived stress and harmful family involvement showed a negative significant correlation of -.316 and -.268 (p < .01) respectively. The results can be discussed as follows:

Perceived stress

The findings of this study revealed that perceived stress could not predict DSM among Sri Lankan rural adults with T2DM which rejected the hypotheses. Even though, perceived stress shows a significant negative relationship with DSM (r = -.316, p < .01). These results are incompatible with the Chinese study in which perceived stress could predict DSM (β = −.220, P = .001) (Zhao et al., 2018). Eshete et al's study indicated that stress management behavior had a positive relationship with DSM (X^2 = 17.7; p < .001) (Eshete et al., 2023). The findings revealed that our participants had low perceived stress levels with a mean score of 11.73 out of 40 (SD = 11.99). Contradictory results were found among the urban Sri Lankan population with T2DM with a mean perceived stress score of 23.9 ± 6.0 which is higher than the current results (Mendis et al., 2023). The reason for the lower level of perceived stress among rural people than urban people could be due to, the majority of them being unemployed, or working in their tea estates and they work less than 6 hours per day. Therefore, they have less under-employment pressure which results in low perceived

stress. Another reason could be the majority of participants lived with their family members and the family support represented a negative correlation with stress levels (Bhandary et al., 2013). Another possible reason could be cultural norms, beliefs, and social structures especially religious ideas (Mainly Buddhist) among Sri Lankans. Sri Lankan people believe that diabetes is caused by their bad 'karma' (Amarasekara et al., 2014) which acts as a buffer to reduce perceived stress.

Perceived stress is the individual perception which is the critical nature of behaviors needed to manage the condition during times of stability (Ryan & Sawin, 2009). Ryan and Sawin (2009) also explained that many factors influence self-management behavior such as personal preferences, culture, social norms, family rules, and boundaries (Ryan & Sawin, 2009). Results of the correctional matrix revealed that perceived stress has a negative correlation with health literacy and self-efficacy and while positive correlation with harmful family involvement. These findings imply that improving health literacy and self-efficacy and reducing harmful family involvement may impact to diminish perceived stress, resulting in enhancing DSM among individuals and families.

Health literacy

The findings of the study revealed that health literacy could predict DSM ($\beta = -.162$, $p = .020$) but it has a negative significant relationship with DSM indicating adults with higher health literacy could perform lesser DSM. The awareness of the risks of complications from health care professionals in the clinic could be the reason for these negative predictions. Conversely, A Saudi Arabian study shows health literacy could predict DSM positively ($\beta = .360$, $p = .001$) (Bushra et al., 2022). Almigbal et al's findings showed somewhat similar results indicating persons with limited health literacy appeared to more practice DSM (Almigbal et al., 2019). However, current findings showed a significant relationship between health literacy and DSM ($r = .139$, $p < .05$). This finding was in line with previous studies conducted among African Americans, Chinese, and Saudi Arabians with T2DM (Bushra et al., 2022; Guo et al., 2020; Tseng et al., 2022). Nevertheless, a Chinese study reported a weak positive relationship between health literacy and self-monitoring ($r = .19$, $P = .001$), dietary control, and physical activity ($r = .12$, $P = .009$) (Guo et al., 2020). Another possible reason for inconsistent findings may be the majority of them lived

with their family members and family members' health literacy could also have affected the DSM. Also, this study assessed functional communicative and critical health literacy instead of actual diabetes health literacy. Further assessments might provide a clear understanding if will use a specific diabetes health literacy scale.

The current study shows functional health literacy subscale had a higher mean score (*M* = 3.41, SD = .98) while Critical health literacy had the lowest mean score (*M* = 2.07, SD = 1.15). As well as communicative health literacy had a positive relationship with DSM (r = .171, p = .031). This could be communicative health literacy improves patients' self-confidence which allows them to effectively communicate with health-care providers (Ziapour et al., 2022) resulting in better DSM. According to IFSMT, persons with poor health literacy experience poorer self-management while persons with sufficient health literacy experience better self-management (Ryan & Sawin, 2009).

Self-efficacy

For this study findings revealed that participants with higher self-efficacy scores would perform better in DSM which is in line with the prior literature in different populations. A Chinese study's findings showed DSM was significantly predicted by perceived self-efficacy (β = .184, p = .039) (Yang et al., 2022). These findings corroborated by studies among Sudanese and Indonesian patients with T2DM, showed Self-efficacy was significantly predicted DSM [(Amer et al., 2018; Clara et al., 2021).

The IFSMT also describes self-efficacy as a behavior-specific concept and it is the confidence one has in his/her ability to successfully engage in behavior under normal and stressful situations which directly impacts SM (Ryan & Sawin, 2009). This suggests that those with higher levels of self-efficacy have good attitudes towards seeing benefits in doing DSM and will have the motivation to perform DSM which controls the T2DM and prevent further diabetes-related complications. Prior literature also suggests that enhanced self-efficacy tends to be stronger and more persistent in their efforts to perform DSM and it is a crucial component of prolonged DSM practices (Chindankutty & Dhanalakshmi, 2022; Clara et al., 2021). The current study findings further validated the IFSMT, the correlational matrix showing self-efficacy has a significant positive correlation with health literacy and helpful family

involvement while the negative relationship is with perceived stress and harmful family involvement.

Current study results indicated that participants had a moderate level of self-efficacy with a mean score of 84.53 (SD = 27.14) resulting in a moderate level DSM with a mean score of 5.84 (SD = 1.25). Also, nearly half of the adults with T2DM in this study were reported to have uncontrolled FPG levels. Ojewale et al's (2021) result consistent with the current findings revealed that FPG level was negatively correlated with self-efficacy (Ojewale et al., 2021). The results corroborate the importance of increasing self-efficacy among rural Sri Lankan adults with T2DM to improve DSM.

Family Support

Family support in this study was assessed by using the FIAD scale which is separated into two parts including helpful family involvement and harmful family involvement. The helpful family involvement includes helping to perform a behavior, creating an environment, and instrumental support to reinforce adherence to DSM behaviors which are associated with better DSM. The harmful family members' involvement may sabotage or undermine DSM by planning and tempting unhealthy foods, questioning the need for medications, nagging or arguing with, undermining self-efficacy with creating family conflict (Mayberry & Osborn, 2014). Current study findings showed harmful family involvement could significantly predict DSM ($\beta = -.169$, $p = .038$). which means participants with high levels of harmful family involvement perform poor DSM. However, helpful family involvement had a significantly positive relationship with DSM ($r = .230$, $p < .01$) but could not predict it. These findings were consistent with a study among adults with T2DM in the USA which showed helpful family involvement was associated with greater DSM while harmful family involvement was associated with less DSM. Though, neither helpful nor harmful involvement predicted DSM (assessed by FIAD) (Mayberry et al., 2019). As well as supportive family behaviors could predict DSM, whereas obstructive family behaviors could predict less adherence to DSM (Mayberry & Osborn, 2014). Findings are inconsistent with the study among adults with T2DM in rural areas of China, which revealed that the supportive behaviors were positively related to DSM, as were obstructive behaviors ($r = .405$, $p < .01$, $r = .267$, $p < .01$) (Tang et al., 2023).

According to the IFSMT, social facilitation including person/family-centered interventions directly encourage and supports engagement in SM behaviors, and this factor also relates to another factor such as self-efficacy (Ryan & Sawin, 2009). Prior literature supported evidence with these findings, Northern Ethiopian, Urban South Indian, and South-West Nigerian studies revealed that patients with good family support were more likely to have better DSM (Eshete et al., 2023; Ojewale et al., 2019; Ravi et al., 2018; Snouffer, 2018). The correlational matrix shows further evidence of this theory and shows harmful family involvement has a negative significant correlation with self-efficacy. These results were in line with the previous literature suggesting obstructive family behaviors were associated with decreased self-efficacy (Mayberry & Osborn, 2014). Therefore, Nurses should target family members for diabetes education and should focus on family engagement to improve helpful family involvement and reduce harmful family involvement in rural Sri Lankan adults with T2DM.

The current study results revealed that Self-efficacy is the strongest predictor followed by harmful family involvement for DSM. Besides, helpful family involvement had a positive correlation while perceived stress had a negative correlation with DSM. Thus, all independent variables showed interaction with each other resulting in directly or indirectly affecting DSM. Moreover, IFSMT described that these factors might influence one another and finally all these affecting SM (Ryan & Sawin, 2009).

Strengths and Limitations

According to the best of our knowledge, this study is the first study to describe factors influencing DSM among adults with T2DM in rural Sri Lanka. This study is a predictive correlational study; therefore, determination of causality is impossible. Another limitation is the factors could explain only 39.3% of the variance of DSM, which means other factors should be researched further. The study findings could not be generalized to the whole population of rural Sri Lanka due to the study was conducted in only one secondary care hospital in rural Sri Lanka. For this study, the researcher used previously validated and developed questionnaires from different cultures, especially based on Western cultures which can lead to cultural bias.

Because of Sri Lankan cultural norms values, experiences, beliefs, and communication styles are different.

Implications of the findings

Nursing Practice

The findings of this study indicate suboptimal DSM, especially in physical activity and dietary control. Unfortunately, nearly half of the participants reported uncontrol FPG levels and approximately 80% of adults had comorbidities. Therefore, urgently relevant interventions are needed to improve DSM for adults with T2DM to control blood glucose and comorbidities that delay diabetes-related complications. Nursing interventions should be targeted to encourage physical activity and diet management. Tailored educational programs should be arranged according to the ADA guidelines with a multidisciplinary approach is essential.

Self-efficacy and family support were found to be predictive factors among Sri Lankan rural adults with T2DM. therefore, programs should be aimed at increasing the self-efficacy of people with T2DM in achieving DSM. Nurses and other health care providers should target family members for diabetes education and should focus on family engagement to improve helpful family involvement and reduce harmful family involvement. Further, it will help to optimize the DSM and delay or prevent diabetes-related complications among this population in rural Sri Lankan adults with T2DM. Government policies and support are also crucial to reversing the T2DM rising trends among rural Sri Lankans. Especially equal distribution of the newest medication and HbA1c checking facilities for secondary and primary care hospitals in rural areas is crucial to improving DSM. In addition, the government needs to be concerned about reducing the price of glucometers and glucose strips to affordable amounts for the poorest income level people.

Nursing Research

The current result indicated that the studied variables could explain 39.3% of the variance in DSM, which indicates other factors may influence DSM, as explained by Ryan and Sawin (2009) in the IFSMT and future studies should focus on studying other factors. Future studies should be carried out in other rural areas of Sri Lanka since the results cannot be generalized to the whole rural population in Sri Lanka. A

similar study should target older adults and urban settings to see the overall picture of the DSM among Sri Lankans with T2DM. Previously, many studies were focused on overall family support. Thus, both helpful and harmful family involvement need to be explored further to understand cultural influence and the relationships between them and DSM. Furthermore, designing and implementing effective family-based, culturally-adapted diabetes interventions is needed and it should be targeted to improve DSM through increasing self-efficacy among adults with T2DM in rural Sri Lanka.

Conclusion

The findings of the current study revealed suboptimal DSM with a lower mean score on physical activity and dietary control among adults with T2DM in rural Sri Lanka. All factors were significantly predicted by DSM 39.3 % of the variance in DSM. The self-efficacy better explained the variance followed by harmful family involvement. Therefore, DSM practices could be increased by enhancing perceived self-efficacy and helpful family involvement.

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APPENDICES

APPENDIX A

Questionnaires in English

01. Socio-Demographic Questionnaire (SDQ)

Direction: Please read the questions in part 1 carefully and give an honest answer. Answers to Questions Part 2 will be collected from the medical record by the researcher. **Please "√" in the box of your answer or write your information in the space provided.**

Part 1: General Information (To be completed by the participant)

1. Age: ……Years
2. Gender
   ☐ Male ☐ Female
3. Marital Status
   ☐ Single ☐ Married ☐ Divorced ☐ Widowed
4. Living arrangement
   ☐ Living alone ☐ Living with family members ☐ Other
5. How many members are in your family? ……
6. Who is your main caretaker?
   ☐ Spouse ☐ Children ☐ Siblings ☐ Parents
   ☐ Relatives ☐ Friends ☐ Neighbors
   ☐ Paid caregiver ☐ None
7. Highest level of education
   ☐ Not attended to school ☐ Primary (Grade 1-5)
   ☐ Secondary (Grade 6-11) ☐ Post-secondary (Grade 12-13)
   ☐ Vocational Diploma ☐ Tertiary (Graduate and/or up)
8. Average individual income (income Rupees per month)
   ☐ Less than 30000 Rs ☐ 30000-80000 Rs ☐ More than 80000 Rs
9. Average family income
   ☐ Less than 30000 Rs ☐ 30000-80000 Rs ☐ More than 80000 Rs
10. Occupation
    ☐ Working in the Government sector ☐ Working in the private sector
    ☐ Working on own tea Estate ☐ Retired ☐ Business
    ☐ Laborer ☐ Farmer ☐ Driver
    ☐ Not working
11. Working hours per day: …….
12.

13. Alcohol Drinking status

☐ Current alcohol drinker Duration: ……Years

Quantity: …… glass/day (glass = 25 ml)

☐ Infrequent Alcohol user Duration: ……. Years

Quantity: ……. glass/day (glass = 25 ml)

Alcohol drinking frequency: ……

☐ Former alcohol drinker Duration: ……. Years

Quantity: ……. glass/day (glass = 25 ml)

☐ No history of drinking alcohol

14. Smoking status

☐ Current smoker Duration: ……. Years

Quantity…. cigarettes/day

☐ Infrequent Smoker Duration: ……. Years

Quantity……Cigarettes/day

Smoking frequency: …….

☐ Former smoker Duration: ……. Years

Quantity……Cigarettes/day

☐ Passive smoking (another person smoking around you)

☐ No history of smoking

15. Availability of the glucometer at the home

☐ Yes ☐ No

If Yes, How often monitor blood sugar ……

16. Distance from the Hospital to home

☐ Less than 1km ☐ 1-5km ☐ 5-10km

☐ 10-20km ☐ 20- 30km

17. The way of transport from home to the hospital

☐ By foot ☐ By Bus ☐ By family vehicle

☐ By hiring vehicle

18. Use of other complementary therapy (herbs, traditional medicine, …)

☐ Yes ☐ No

If yes, What type of complementary therapy…….

Part 2: Health information (To be collected by researcher from patient records)

1. Weight: …… Height: ……
2. Duration of diagnosis of T2DM (in years/months): …….
3. How many times hospitalized due to diabetes in the last year: …….
4. Medications

4.1. Oral medication

☐ Metformin ☐ Gliclazide ☐ Sitagliptin

☐ Other ……

4.2. Insulin

☐ Soluble ☐ Mixtard ☐ Lente ☐ Other…….

5. Co-morbidities

☐ None ☐ Hypertension ☐ Hyperlipidemia

☐ Chronic kidney disease ☐ Heart disease ☐ Others, Specify …….

6. Current diabetes-related complications

☐ None ☐ Retinopathy ☐ Nephropathy

☐ Neuropathy ☐ Other, specify ……

7. Latest HbA1c ……. % (Date: ……/……/…….)
8. Latest FBS ……. mg/dl (Date: ……/……/…….)
9. Latest Blood pressure…… mmHg (Date: ……/……/…….)

02. Diabetes self-management questionnaire (DSMQ)

Directions: The following statements describe self-care activities related to your diabetes. Thinking about your self-care over the **last 8 weeks**, please specify the extent to which each statement applies to you.

Note: If you monitor your glucose using continuous interstitial glucose monitoring (CGM), please refer to this where 'blood sugar checking' is requested.

	Applies to me very much	**Applies to me to a considerable degree**	**Applies to me to some degree**	**Does not apply to me**
1. I check my blood sugar levels with care and attention. ☐ *Blood sugar measurement is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
2. ……	☐3	☐2	☐1	☐0
3. ……	☐3	☐2	☐1	☐0
4. ……..	☐3	☐2	☐1	☐0
5. ……	☐3	☐2	☐1	☐0
6. ……	☐3	☐2	☐1	☐0
7. ……	☐3	☐2	☐1	☐0
8. ……	☐3	☐2	☐1	☐0
9. ……	☐3	☐2	☐1	☐0
10 ……	☐3	☐2	☐1	☐0
11 ……	☐3	☐2	☐1	☐0
12 ……	☐3	☐2	☐1	☐0
13 ……	☐3	☐2	☐1	☐0
14 ……	☐3	☐2	☐1	☐0
15 ……	☐3	☐2	☐1	☐0
16 My diabetes self-care is poor.	☐3	☐2	☐1	☐0

03. Perceived Stress Scale (PSS) – 10

Direction: The questions in this scale ask you about your feelings and thoughts during the last month.

In each case, you will be asked to indicate by **"√" in the box** how often you felt or thought a certain way.

You have…	Never	Almost Never	Some times	Fairly Often	Very Often
1). In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2). ……..	0	1	2	3	4
3). ……..	0	1	2	3	4
4). ……..	0	1	2	3	4
5). ……..	0	1	2	3	4
6). ……..	0	1	2	3	4
7). ……..	0	1	2	3	4
8). ……..	0	1	2	3	4
9)……..	0	1	2	3	4
10). In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

04. Functional, Communicative and Critical Health Literacy Scale (FCCHL)

3.1) Functional health literacy

Direction: In reading instructions or leaflets from hospitals/pharmacies, have you had following experiences during the past one year

You have	Never	Rarely	Sometimes	Often
1) found that the print was too small to read	1	2	3	4
2) ……	1	2	3	4
3) ……	1	2	3	4
4) ……	1	2	3	4
5) needed someone to help you read them	1	2	3	4

Since being diagnosed with [DISEASE ("diabetes" in the original)], have you had following experiences in seeking the information related to [DISEASE] (e.g. diagnosis, treatment, self-care issues, alternative therapy, etc.)

3.2) Communicative health literacy

You have	Never	Rarely	Sometimes	Often
6) collected information from various sources	1	2	3	4
7) ……	1	2	3	4
8) ……	1	2	3	4
9) ……	1	2	3	4
10) applied the obtained information to your daily life	1	2	3	4

3.3) Critical health literacy

You have…	Never	Rarely	Sometimes	Often
11) considered whether the information was applicable to your situation	1	2	3	4
12) ……	1	2	3	4
13) ……	1	2	3	4
14) collected information to make decisions about your health	1	2	3	4

05. Self-Efficacy (or confidence) Questionnaire for People Living with Type 2 Diabetes

Directions : Below is a list of activities you have to perform to manage your diabetes. Please read each one and then put a [√] through the number which best describes how **confident** you usually are that you could carry out that activity.
For example, if you are completely confident that you are able to check your blood sugar levels when nessessary, put a [√] through 10. If you feel that most of the time you could not do it, put a [√] through 1 or 2.

I am confident that…….

	Cannot do At all				Maybe yes Maybe no					Certain can do
1	I am able to check my blood sugar if necessary									
	0	1	2	3	4	5	6	7	8	9	10
2	……									
	0	1	2	3	4	5	6	7	8	9	10
3	……									
	0	1	2	3	4	5	6	7	8	9	10
4	……									
	0	1	2	3	4	5	6	7	8	9	10
5	……									
	0	1	2	3	4	5	6	7	8	9	10
6	……									
	0	1	2	3	4	5	6	7	8	9	10
7	……									
	0	1	2	3	4	5	6	7	8	9	10
8	……									
	0	1	2	3	4	5	6	7	8	9	10
9	……									
	0	1	2	3	4	5	6	7	8	9	10
10	……									
	0	1	2	3	4	5	6	7	8	9	10
11	……									
	0	1	2	3	4	5	6	7	8	9	10
12	……									
	0	1	2	3	4	5	6	7	8	9	10
13	……									
	0	1	2	3	4	5	6	7	8	9	10
14	……									
	0	1	2	3	4	5	6	7	8	9	10
15	I am able to adjust my medication when I am ill									
	0	1	2	3	4	5	6	7	8	9	10

06. Family / Friend Involvement in Adults' Diabetes (FIAD)

Directions: The following questions are about certain things your family members may or may not do to try to help you take care of your diabetes. Just think about the people closest to you in your everyday life – it doesn't matter if they live with you. For each item, respond according to how often your family members have done the behavior in the past month. **Please "√" in the box of your answer or write your information in the space provided.**

How often do your family members . . .

Never in the past month 1	Once in the past month 2	Two or three times in the past month 3	Once each week 4	Twice or more each week 5

1) Exercise with you or ask you to exercise with them?	1	2	3	4	5
2) ……	1	2	3	4	5
3) ……	1	2	3	4	5
4) ……	1	2	3	4	5
5) ……	1	2	3	4	5
6) ……	1	2	3	4	5
7) ……	1	2	3	4	5
8) ……	1	2	3	4	5
9) ……	1	2	3	4	5
10) ……	1	2	3	4	5
11) ……	1	2	3	4	5
12) ……	1	2	3	4	5
13) ……	1	2	3	4	5
14) ……	1	2	3	4	5
15) ……	1	2	3	4	5
16) Take on one of your responsibilities, so you can have time to exercise?	1	2	3	4	5

APPENDIX B

Questionnaires in Sinhala

1.iudc - ck jsldYk m%Yakdj,sh (SDQ)

උපදේශය **#** 1.1 fldgfia m%Yak fyd|ska lshjd wjxl ms<s;=rla fokak' 1.2 fldgසේ m%Yakj,g ms<s;=re mrAfhaIlhd jsiska ffjoH jdrA;dfjka tl;= lr.kq ,efnz' **lreKdlr Tnf.a ms<s;=re wod< fldgqfjz fyda ,nd oS we;s fldgfia "√" i|yka lrkak'**

1.1 fldgi # idudkH f;dr;=re ^iyNd.Sjkakd jsiska iuzmQrAK l< hq;=h&

1. jhi: ……අවුරුදු
2. ia;%S mqreINdjh: ☐ mqreI ☐ ia;%S
3. jsjdyl ;;a;ajh

   ☐ wjsjdyl ☐ jsjdyl ☐ oslalido ☐ jekaoUq
4. cSjk ie,eiau

   ☐ ;kshu cSj;a fjus ☐ mjqf,a idudcslhska iu. cSj;a fjus

   ☐ වෙනත් .....
5. ඔබේ පවුලේ සාමාජිකයින් කී දෙනෙක් සිටීද? .....
6. ඔබට උදවු අවශ්‍ය විට ඔබව රැක බලා ගන්නේ කවුරුන් විසින්ද?

   ☐ සැමියා / බිරිඳ ☐ දරුවන් ☐ සහොදරයින් ☐ දෙමවුපියන්

   ☐ නෑදෑයින් ☐ යහලුවන් ☐ අසල්වැසියන්

   ☐ මුදල් ගෙවා රැකබලා ගන්නෙක් ☐ කිසිවෙක් නැත
7. by< wOHdmk ;;a;ajh

   ☐ mdi,a .sfha keye ☐ m%d:usl (1-5 ශ්‍රේණිය)

   ☐ oajs;Shsl (6-11 ශ්‍රේණිය) ☐ mYapd;a oajs;Shsl (12-13 ශ්‍රේණිය)

   ☐ jD;a;Sh vsmaf,daud ☐ ;D;Shsl (WmdOsOdrS iy $fyda by<
8. idudkH mqoa., wdodhu ^uilg wdodhu re' &

   ☐ re' 30000 wvq ☐ re' 30000-80000 ☐ re' 80000 jevs
9. idudkH mjqf,a wdodhu

   ☐ re' 30000 wvq ☐ re' 30000-80000 ☐ re' 80000 jevs
10. /lshdj

    ☐ rdcH wxYfha fiajh lsrSu ☐ fm!oa.,sl wxYfha fiajh lsrSu ☐ තමාට අයත් තේ වතුවල සේවය කිරීම ☐ jsY%dusl

    ☐ ව්‍යාපාර ☐ luzlre

☐ ගොවිතැන් ☐ රියදුරු ☐ /lshdjක් ke;

11. දිනකට වැඩ කරන පැය ගණන: .....

12. u;ameka mdkh lsrSfuz ;;a;ajh

☐ j;auka u;ameka mdkh lrak flfkla ld,h: …… අවුරුදු

m%udKh:……jS\qre/ osklg (jS\qreවක් = 25 ml)

☐ කලාතුරකින් u;ameka mdkh lrak flfkla ld,h: …… අවුරුදු

m%udKh:……jS\qre/ osklg (jS\qreවක් = 25 ml)

☐ l,ska u;ameka mdkh l< flfkla ld,h: …… අවුරුදු

m%udKh:……jS\qre/ osklg (jS\qreවක් = 25 ml)

☐ u;ameka mdkh l< b;sydihla ke;

13. \quzmdk ;;a;ajh

☐ j;auka \quz mdkh lrkakd ld,h: ….. wjqre\:…is.rgz/osklg

☐ කලාතුරකින් \quz mdkh lrkakd ld,h: ….. wjqre\:…is.rgz/osklg

☐ l,ska \quz mdkh l< flfkla ld,h: ….. wjqre\:…is.rgz/osklg

☐ WodiSk \quz mdkh lrkafkls (;j;a flfkl= Tn jgd \quz mdkh lrhs

☐ \quzmdkh ms<sn| b;sydihla ke;

14. ksjfia .ලfldauSgrhla ;snSu

☐ Tjz ☐ ke;

Tjz kuz” fldmuK jdrhla රැඩිරගත සීනි මට්ටම මැන බලනවාද @ ……..

15. frdayf,a isg ksjig we;s \qr

☐ ls’uS’ 1 ට wvq ☐ 1-5 ls’uS’ ☐ ls’uS’ 5-10

☐ ls’uS’10-20 ☐ ls’uS’ 20 jvd jevs

16. ksjfia isg frday,g m%jdykh lsrSfuz udrA.h

☐ mhska ☐ nifhka ☐ mjqf,a jdykhlska

☐ jdykhla l=,shg .ekSfuka

17. fjk;a wkqmQrl psls;aidjන් භාවිතය (T!IO me<Egs” iduzm%odhsl ffjoH…)

☐ Tjz ☐ ke;

ඔව් නම්, ඔබ භාවිතා කරන wkqmQrl psls;aidjන් මොනවාද? .....

1.2 fldgi # fi!LH f;dr;=re ^frda.shdf.a jdrA;dj,ska mrAfhaIlhd jsiska /ia l< hq;=h&

1. nr: …… Wi: ……
2. දියවැඩියාව (T_2DM) frda. jsksYaph ld,h (jir j,ska): ……..
3. ÿhjevshd frda.h fya;=fjka miq.sh jifrA frday,a .; jQ jdr .Kk: …….
4. T!IO

4.1.uqLfhka .kakd T!IO jrA.

☐ Metformin ☐ Sulfonylurea ☐ fjk;a

4.2. bkaishq,ska

☐ Soluble ☐ Mixtard ☐ Lente ☐ වෙනත්.....

5. වෙනත් රෝග තත්ත්ව

☐ lsisjla ke; ☐ wOs reOsr mSvkh

☐ Hyperlipidemia ☐ ksoka.; jl=.vq frda.h

☐ yDo frda. ☐ fjk;a" i|yka lrkak ……

6. jrA;udk oshjevshd frda.h wdY%s; ixl=,;d

☐ lsisjla ke; ☐ රෙටිනොපති (Retinopathy)

☐ jl=.vq frda. (Nephropathy) ☐ iakdhq frda. (Neuropathy)

☐ fjk;a" i|yka lrkak ……

7. kj;u HbA1c …….. % (oskh: ……/……/……..)
8. kj;u FBS …….. mg/dl (oskh: ……/……/……..)
9. kj;u reOsr mSvkh…… mmHg (oskh: ……/……/……..)

02. oshjevshdj iajhx- l<ukdlrK m%Yakdj,sh (DSMQ)

උපදේශය: my; m%ldYhka Tfnz oshjevshd frda.hg wod< iajhx පාලන l%shdldrluz jsia;r lrhs' **miq.sh i;s 8la** ;=< Tfnz iajhx පාලනය .ek is;uska" lreKdlr tla tla m%ldY ඔබට කොපමන තුරට අදාල වන්නේ දැයි සඳහන් lrkak' lreKdlr Tnf.a ms<s;=re wod< fldgqfjz "√" i|yka lrkak'

igyk # Tn wLKav wka;rd, .a,Qfldaia ksrSlaIK Ndjs;fhka Tfnz .a,qfldaia ksrSlaIKh lrkafka kuz" lreKdlr 'reOsr iSks mrslaIdj' ms<sn|j wod< jk foa fj; fhduq jkak'

		ug බොහෝ දුරට අදාල වේ	ie,lsh hq;= ugzgulg ug wod< fjz	huz ugzgulg ug wod< fjz	ug wod< fkdfjz
1.	uu uf.a reOsrfha isks ugzgu mrsiaiuska iy wjOdkfhka mrSlaId lrus' *uf.a m%;sldrfha fldgila f,i reOsrfha iSks මට්ටම uekSu wjYH fkdfjz'* ☐	☐3	☐2	☐1	☐0
2.	……	☐3	☐2	☐1	☐0
3.	……	☐3	☐2	☐1	☐0
4.	……..	☐3	☐2	☐1	☐0
5.	……	☐3	☐2	☐1	☐0
6.	……	☐3	☐2	☐1	☐0
7.	……	☐3	☐2	☐1	☐0
8.	……	☐3	☐2	☐1	☐0
9.	……	☐3	☐2	☐1	☐0
10	……	☐3	☐2	☐1	☐0
11	……	☐3	☐2	☐1	☐0
12	……	☐3	☐2	☐1	☐0
13	……	☐3	☐2	☐1	☐0
14	……	☐3	☐2	☐1	☐0
15	……	☐3	☐2	☐1	☐0
16	uf.a oshjevshd iajhx සත්කාරය \qrAj,hs'	☐3	☐2	☐1	☐0

03. ප්‍රත්‍යක්ෂ ආතති මැනුම් ප්‍රශ්නාවලිය

උපදේශය: පහත ප්‍රශ්නාවලිය **පසුගිය මාසය** තුල ඔබට ඇතිවූ සිතිවිලි හා හැගීම් පිලිබඳව විමසනු ඇත. පහත සෑම ප්‍රශ්නයක් සඳහාම පිළිතුරු වශයෙන් ඔබට කෙතරම් වාර ගණනක් දැනුනාද? / හැඟුනේද යන්න ඊට අදාළ **අංකය "√" i|yka lrkak'** ඇදීමෙන් ලකුණු කරන්න.

ඔබ....	කිසිවිටෙක නොමැත	ආසන්න වශයෙන් නොමැත	සමහර විට	කිහිප වරක්	බොහෝ වරක්
1). ගිය මාසයේ නිතරම වාගේ ඔබට සිද්ධ වුණු ඔබ බලාපොරොත්තු නොවූ දේවල් නිසා කණගාටුවෙන් සිටියාද?	0	1	2	3	4
2). ……..	0	1	2	3	4
3). ……..	0	1	2	3	4
4). ……..	0	1	2	3	4
5). ……..	0	1	2	3	4
6). ……..	0	1	2	3	4
7). ……..	0	1	2	3	4
8). ……..	0	1	2	3	4
9)……..	0	1	2	3	4
10). ගිය මාසයේ නිතරම වගේ ඔබට විසඳගන්න බැරි තරම් ප්‍රශ්න / ගැටළු ගොඩ ගැසුණ බවක් ඔබට දැනුනාද?	0	1	2	3	4

04. l%shdldrS” ikaksfjzok iy jsfjzpkd;aul fi!LHh idlaIr;d mrsudKh (FCCHL)

4.1. l%shdldrS fi!LH idlaIr;djh

උපදේශය: frday,a$*duisj,ska ලබාදෙන Wmfoia fyda m;%sld lshjSfuzoS **miq.sh jirl** ld,h ;=< Tn my; w;aoelSuz j,g uqyqK oS ;sfnzo@ **lreKdlr Tnf.a ms<s;=re wod< fldgqfjz “√”i|yka lrkak’**

	ljodj;a නැත	l,d;=rlska	iuyr jsg	fndfyda jsg
1) uq\%Kh lshjSug fkdyels ;ruz l=vd බවට සොයා ගන්නා ලදී.	1	2	3	4
2) ……	1	2	3	4
3) ……	1	2	3	4
4) ……	1	2	3	4
5) tajd lshවා ගැනීමට වෙනත් කෙනෙකුගේ Wojz wjYH jsh	1	2	3	4

ඔබ uq,skau oshjevshdj frda. jsksYaph l< od isg” frda.h iuznkaO f;dr;=re fijSfuzoS Tng my; w;aoelSuzj,g uqyqK oSug is\qjS ;sfnzo@ ^Wod# frda. jsksYaph” m%;sldr” iajhx පාලන ගැටළු” jsl,am m%;sldr” fjk;a&

4.2. ikaksfjzok fi!LH idlaIr;djh

Tn	ljodj;a නැත	l,d;=rlska	iuyr jsg	fndfyda jsg
6& jsjsO uQ,dY%j,ska f;dr;=re /ia කරන ලදී. .	1	2	3	4
7) ……	1	2	3	4
8) ……	1	2	3	4
9) ……	1	2	3	4
10) ,nd .;a f;dr;=re Tfnz ffoksl cSjs;hg fhdod ගන්නා ලදී.	1	2	3	4

4.3. jsfjzpkd;aul fi!LH idlaIr;djh

Tn	ljodj;a නැත	l,d;=rlska	iuyr jsg	fndfyda jsg
11& එම f;dr;=re Tnf.a ;;a;ajhg wod< fjzo hkak i,ld n,k ,oS .	1	2	3	4
12)……	1	2	3	4
13)……	1	2	3	4
14& Tfnz fi!LH ms<sn| ;SrK .ekSug f;dr;=re /ia lrන ලදී.	1	2	3	4

04. oshjevshdj we;s mqoa.,hska i|yd iajhx-ldrAhlaIu;dj ^fyda jsYaවාih& i|yd jQ m%Yakdj,sh

Wmfoia**:** my; oelafjkafka Tfnz oshjevshdj md,kh lsrSu i|yd Tn jsiska l< hq;= l%shdldrluz ,ehsia;=jls' lreKdlr ish,qu m%Yak lshjd" tu l%shdldrlu is\q l< yels njg Tn idudkHfhka fl;ruz jsYajdi lrkjdo hkak jvd;a fyd|ska jsia;r flfrk **wod< wxlh "√" i|yka lrkak' 'WodyrKhl**a f,i Tng wjyH jsg Tfnz reOsrfha iSks ugzgu mrSCId l< yels nj Tng yef.kafka kuz" **10 "√" i|yka lrkak.** Tng fndfydajsg th l< fkdyels hehs Tng yef.kafka kuz" **1 fyda 2 "√" i|yka lrkak**

එය ug jsYajdihs……..

කිසිසේත්ම නොහැක				iuyrjsg Tjz iuyrjsg keත					නිශ්චිතවම කල හැක	
1	wjYH kuz uf.a reOsr iSks ugzgu mrSlaId lsrSug ug yelshdj we;									
	0	1	2	3	4	5	6	7	8	9	10
2	……									
	0	1	2	3	4	5	6	7	8	9	10
3	……									
	0	1	2	3	4	5	6	7	8	9	10
4	……									
	0	1	2	3	4	5	6	7	8	9	10
5	……									
	0	1	2	3	4	5	6	7	8	9	10
6	……									
	0	1	2	3	4	5	6	7	8	9	10
7	……									
	0	1	2	3	4	5	6	7	8	9	10
8	……									
	0	1	2	3	4	5	6	7	8	9	10
9	……									
	0	1	2	3	4	5	6	7	8	9	10
10	……									
	0	1	2	3	4	5	6	7	8	9	10
11	……									
	0	1	2	3	4	5	6	7	8	9	10
12	……									
	0	1	2	3	4	5	6	7	8	9	10
13	……									
	0	1	2	3	4	5	6	7	8	9	10
14	……									
	0	1	2	3	4	5	6	7	8	9	10
15	uu wikSm jQ jsg uf.a T!IO භාවිතා කරන ආකාරය ilia lr .ekSug ug yelshdj we;.									
	0	1	2	3	4	5	6	7	8	9	10

05. jevsysgshkaf.a oshjevshd frda.h i|yd mjqf,a $us;=rkaf.a දායකත්වය (FIAD)

my; i|yka m%Yak Tnf.a oshjevshd frda.h ms<sn| ie<ls,su;ajSug Wmldr lsrSug Tfnz mjqf,a idudcslhska l< yels fyda fkdl< yels iuyr foaj,a .ekh' Tnf.a iuSm;u mqoa.,hska .ek muKla is;kak' tosfkod cSjs;h - Tjqka Tn iu. cSj;a jqjo m%Yakhla ke;' iEu whs;uhlau i|ydu Tfnz mjqf,a idudcslhska **miq.sh udifha** yeisrSu fldmuK jdrhla lr we;ao hkak ms<sn|j m%;spdr olajkak.

lreKdlr Tnf.a ms<s;=re wod< fldgqfjz fyda ,nd oS we;s fldgfia "√" i|yka lrkak'

Tfnz mjqf,a idudcslhska fldmuK jdrhla පහත සඳහන් ක්‍රියාකාරකම් වල නිරත වන්නේද?...

miq.sh udih ;=< ljodj;a is\qlr fkdue;. 1	miq.sh udifha tla jrla muKla is\q lrk ,oS 2	miq.sh udifha fo;=ka j;djla is\q fldg we; 3	iEu i;shlgu jrla is\q lrk ,oS 4	iEu i;shlu fojrla fyd ඊට jevs .Kkla 5

1) Tn iu. jHdhdu කිරීම හෝ Tjqka iu. jHdhdu lsrSug Tfnka b,a,d isgskjdo@	1	2	3	4	5
2) ……	1	2	3	4	5
3) ……	1	2	3	4	5
4) ……	1	2	3	4	5
5) ……	1	2	3	4	5
6) ……	1	2	3	4	5
7) ……	1	2	3	4	5
8) ……	1	2	3	4	5
9) ……	1	2	3	4	5
10) ……	1	2	3	4	5
11) ……	1	2	3	4	5
12) ……	1	2	3	4	5
13) ……	1	2	3	4	5
14) ……	1	2	3	4	5
15) ……	1	2	3	4	5
16) ඔබට jHdhdu කිරීමට කාලය ලැබෙන පරිදි ඔබට පැවරී ඇති වගකීම් වලින් එකක් හෝ බාර ගන්නවාද?	1	2	3	4	5

APPENDIX C

Permission letters

Permission Letter to use Diabetes Self-management Questionnaire (DSMQ)

QualityMetric
We measure health

NON-COMMERCIAL LICENSE AGREEMENT

Office of Grants and Scholarly Research (OGSR)

License Number: QUO-03066-B2F4X5

Licensee Name: Samantha Premadasa c/o Burapha University

Licensee Address: Long Hard Bangsaen Road, Saensuk TH

Approved Purpose:
Purpose: Academic Publication Submission
Study Name: Factors Influencing Diabetes Self-Management among Adults with Type 2 Diabetes Mellitus in Rural Sri Lanka
Study Type: Academic Research with no commercial funding
Survey Admin Method: An interviewer will read the questions to the subject
Data Collection Workflow: Captured using QualityMetric Desktop Software

Therapeutic Area: Disease Management

Indication: Diabetes, or high blood sugar

Royalty Fee: None, because this License is granted in support of the non-commercial Approved

License Term: 9/21/2023 and ending on 12/31/2024

A. Effective Date: This Non-Commercial License Agreement (the "Agreement") from the Office of Grants and Scholarly Research (OGSR) is made by and between QualityMetric Incorporated, LLC, a Delaware limited liability company, with offices at 1301 Atwood Avenue, Suite 216E, Johnston, RI 02919 dba QualityMetric ("QualityMetric") and Licensee. This Agreement is entered into as of the date of last signature below and is effective for the Study Term set forth on page one of this agreement.

QualityMetric
We measure health

document has been changed since the electronic signature was incorporated in, attached to or associated with the electronic document.
EXECUTED by the duly authorized representatives as set forth below.

QualityMetric Incorporated, LLC
Signature:
Name: Gus Gardner
Title: CEO
Date: 06-Sep-2023

Samantha Premadasa c/o Burapha University
Signature: Samantha
Name: Samantha Sandamali Premadasa
Title: Student (MNS), Burapha University
Date: 02 / 09 /2023

QualityMetric Incorporated, LLC Reviewer
Signature: Maria Williams
Name: Maria Williams
Title: Client Success Representative
Date: 05-Sep-2023

Permission Letter to use Sinhalese version of Perceived stress scale – 10 (S-PSS-10)

Re: Permissioni to use the Sinhalese version of the perceived stress scale questionnaire » Instument permission letters ×

Arosha Dissanayake <arosha@med.ruh.ac.lk> Fri, Oct 6, 2023, 3:10 PM
to Arosha, me

Dear Samantha,
Please go ahead and use the questionnaire our group validated.
I shall be much obliged if you could acknowledge the use of this questionnaire in your future publications.
You may acknowledge us as "Music therapy research group Sri Lanka".
Good luck on your study.
Best
Arosha

On Tue, 3 Oct 2023 at 06:13, Samantha Premadasa <spremadasa9@gmail.com> wrote:

From MRT Company behalf of the original author permission

SPECIAL TERMS No88073

These User License Agreement Special Terms (Special Terms) are issued between Mapi Research Trust ("MRT") and Samantha Premadasa (User).

Name of the COA	PSS-10 - Perceived Stress Scale - 10 items
Author	Cohen S, Williamson GM
Copyright Holder	RST Assessments, LLC (USA)
Copyright notice	© Copyright RST Assessments, LLC. All Rights Reserved (2022)

MRT grants the License to use the COA on the following countries and in the languages indicated in the table below:

Version/Module	**Language**	**For use in the following country**
PSS-10	English	the UK

The User understands that the countries indicated above are provided for information purposes. The User may use the COA in other countries than the ones indicated above.

Permission Letter to use Functional Communicative and Critical Health Literacy Scale (FCCHL)

Hirono Ishikawa <hirono@med.teikyo-u.ac.jp> Aug 9, 2023, 10:49 PM

to me

Dear Ms. Samantha Sandamali Premadasa,

Thank you for your interest in our health literacy scale.
I am attaching a copy of the English version of the scale with scoring instructions.
You are welcome to translate it and use it for your research.

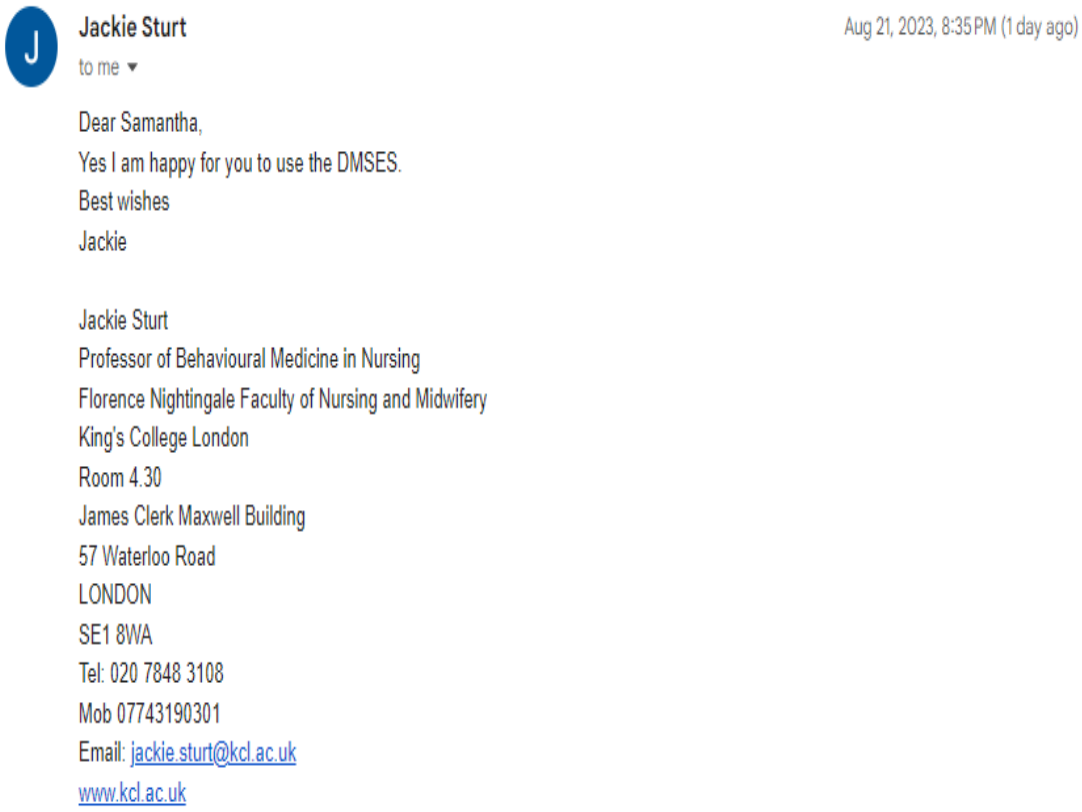
Let me know If you have any questions about the scale or its use.

Best regards,
Hirono Ishikawa

Hirono Ishikawa, PhD
Graduate School of Public Health, Teikyo University
Address: 2-11-1 Kaga, Itabashi-ku, Tokyo, 173-8605, Japan
Phone: +81-3-3964-1211 (ext. 46161)
Fax: +81-3-3964-1058
e-mail: hirono@med.teikyo-u.ac.jp

2023年8月9日(水) 18:18 Samantha Premadasa <spremadasa9@gmail.com>:

Permission Letter to use Diabetes Management Self-Efficacy Scale (DMSES-UK)



Jackie Sturt Aug 21, 2023, 8:35 PM (1 day ago)

to me

Dear Samantha,
Yes I am happy for you to use the DMSES.
Best wishes
Jackie

Jackie Sturt
Professor of Behavioural Medicine in Nursing
Florence Nightingale Faculty of Nursing and Midwifery
King's College London
Room 4.30
James Clerk Maxwell Building
57 Waterloo Road
LONDON
SE1 8WA
Tel: 020 7848 3108
Mob 07743190301
Email: jackie.sturt@kcl.ac.uk
www.kcl.ac.uk

Permission Letter to use Family/friend Involvement in Adults' Diabetes (FIAD)

M

Mayberry, Lindsay <lindsay.mayberry@vumc.org> Jul 10, 2023, 10:24 PM

to me

Hi Samantha,
Honestly, in 2019 we published a new measure that is used more often for these purposes, called the Family/friend Involvement in Adults' Diabetes or FIAD. The FIAD has a helpful and harmful scale included. You're free to use this measure for your work. The scoring instructions and items are included in the attached validation paper. Let me know if you have any questions about it.
Lindsay

From: Samantha Premadasa <spremadasa9@gmail.com>
Sent: Sunday, July 9, 2023 12:50 AM
To: Mayberry, Lindsay <lindsay.mayberry@vumc.org>

APPENDIX D

Instrument translation proof letters

01. Forward translation of English instruments into the Sinhala Language

Dr. Nirosha Edirisinghe
Senior Lecturer (Grade II)
Department of Fundamentals of Nursing
Faculty of Nursing
University of Colombo,
Sri Lanka.
07 October 2023.

To whom it may concern,

Re; The translation of study instruments

I, Nirosha Edirisinghe (PhD, B.Sc.N., Dip in IT, RN), Senior Lecturer (Grade II), Department of Fundamentals of Nursing, Faculty of Nursing, University of Colombo, Sri Lanka, hereby certify that I get involved in the translation of the study instruments listed below (1 to 4) from English to Sinhala. Those 04 instruments will be used in the study of Samantha Sandamali Premadasa titled **"Diabetes Self-Management and its Influencing Factors among Adults with Type 2 Diabetes Mellitus in Rural Sri Lanka".**

01. The Diabetes Self-Management Questionnaire (DSMQ)
02. The Functional, Communicative, and Critical Health Literacy Scale (FCCHL)
03. The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK)
04. The Family/friend Involvement in Adults' Diabetes (FIAD) Scale

Yours sincerely

Dr. Nirosha Edirisinghe

Dr. R.H.M.P.N. Rathnayake
PhD in Nursing (RUH, SL), BSc in Nursing Hon Sp (SJP, SL), RN
Senior Lecturer
Department of Nursing
Faculty of Allied Health Sciences
University of Ruhuna
Sri Lanka.
07 October 2023.

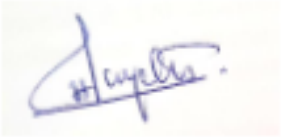
To whom it may concern,

Re; Translation of study instruments

I, Dr. R.H.M.P.N. Rathnayake (PhD in Nursing [RUH, SL], BSc in Nursing Hon Sp [SJP, SL], RN), Senior Lecturer, Department of Nursing, Faculty of Allied Health Sciences, University of Ruhuna Sri Lanka, hereby certify that I get involved in the translation of the study instruments listed below (1 to 4) from English to Sinhala. Those 04 instruments will be used in the study of Samantha Sandamali Premadasa with the title "**Diabetes Self-Management and its Influencing Factors among Adults with Type 2 Diabetes Mellitus in Rural Sri Lanka**".

01. The Diabetes Self-Management Questionnaire (DSMQ)
02. The functional, communicative, and critical Health Literacy Scale (FCCHL)
03. The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK)
04. The Family/friend Involvement in adults' diabetes (FIAD) scale

Best Regards



Dr. R.H.M.P.N. Rathnayake

02. Preparation of Reconciled Sinhala version

24th of October 2023

To whom it may concern

Re:the translation of study instruments

I hereby certify that I get involved to prepare the reconciled Sinhala version of the study instruments listed below (1 to 4). The aim of the reconciled Sinhala version is the production of a translation that is conceptually equivalent to the original questionnaire and the language used should be colloquial and easy to understand by the target population. Those 04 instruments will be used in the study of Samantha Sandamali Premadasa with the title **"Diabetes Self-Management and its Influencing Factors among Adults with Type 2 Diabetes Mellitus in Rural Sri Lanka".**

01. The Diabetes Self-Management Questionnaire (DSMQ)
02. The functional, communicative, and critical Health Literacy Scale (FCCHL)
03. The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK)
04. The Family/friend Involvement in adults' diabetes (FIAD) scale

Best Regards

Prof. Thushari Damayanthi Dassanayake.
Professor in Nursing
Department of Nursing,
Faculty of Allied Health Sciences,

03. Backward translation of Sinhala into the English Language

S U. Rajapaksha.

Sworn translator (Sinhala- English).

63/1 A, Near the hospital,

Gangodagama

Sri Lanka.

To whom it may concern,

Re; the translation of study instruments

I, S U. Rajapaksha, Sworn translator (Sinhala- English), 63/1 A, Near the hospital, Gangodagama Sri Lanka, hereby certify that I get involved in the translation of the study instruments listed below (01 to 04) from Sinhala to English. Those 04 instruments will be used in the study of Samantha Sandamali Premadasa with the title **"Diabetes Self-Management and its Influencing Factors among Adults with Type 2 Diabetes Mellitus in Rural Sri Lanka".**

01. The Diabetes Self-Management Questionnaire (DSMQ)
02. The functional, communicative, and critical Health Literacy Scale (FCCHL)
03. The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK)
04. The Family/friend Involvement in adults' diabetes (FIAD) scale

Best Regards

.....

S U. Rajapaksha

Sworn translator (Sinhala- English)

63/1 A, Near the hospital

Gangodagama

Sri Lanka.

S.U. Rajapaksha
Sworn Translator (B.A) University of Kelaniya
Reg.No: 2022/SE/MT/022
Sinhala-English
63/1A, Near the Hospital, Gangodagama, Hakmana
Tel: 077 1337759

04. Comparing the Backward translation English items with the original items of the questionnaires

Joy Booth.
RN3 Nurse Educator,
C/o Royal Adelaide Hospital.
Port Road,
Adelaide,
South Australia.

To whom it may concern,

Re; the Comparison of original items of the questionnaires with back-translated items

I, Joy Booth, RN3 Nurse Educator, Royal Adelaide Hospital, Port Road, Adelaide, South Australia, hereby certify that I get involved in comparing the original items with the back-translated English items of the study instruments listed below (1 to 4). Those 04 instruments will be used in the study of Samantha Sandamali Premadasa with the title **"Diabetes Self-Management and its Influencing Factors among Adults with Type 2 Diabetes Mellitus in Rural Sri Lanka".**

01. The Diabetes Self-Management Questionnaire (DSMQ)
02. The functional, communicative, and critical Health Literacy Scale (FCCHL)
03. The Diabetes Management Self-Efficacy Scale – UK version (DMSES-UK)
04. The Family/friend Involvement in adults' diabetes (FIAD) scale

Best Regards.
Joy Booth.
RN3 Nurse Educator,
C/o Royal Adelaide Hospital.
Port Road,
Adelaide,
South Australia.

APPENDIX E

Participant information sheet and consent form

Participant Information Sheet

Research Code: G-HS102/2566.....

Title of the study: Diabetes Self-management and its influencing factors among adults with Type 2 diabetes mellitus in Rural Sri Lanka.

Dear Participants

I am Miss Samantha Sandamali Premadasa, a graduate student at the Faculty of Nursing, Burapha University Thailand. My study is entitled, "Diabetes Self-management and its Influencing Factors among Adults with Type 2 diabetes mellitus in Rural Sri Lanka.". The objectives are to assess diabetes self-management and examine the Factors influencing diabetes self-management among Adults with Type 2 diabetes mellitus who come to regular follow-ups at the diabetes clinic at OPD of Base Hospital Kalawana, Sri Lanka.

Participation in this study is voluntary. If you agree to participate in this study, you will be asked to answer a set of questions which take about 30-40 minutes. You will not get any direct benefits from participating in this study. However, the information collected from this study may be valuable in developing interventions that can help the hospital and the healthcare workers to provide advanced and better care to adults living with Type 2 diabetes mellitus. There will be no identified physical or psychological risk to the person participating in the study and no risk to society.

You can withdraw from the research project at any time without giving a reason, and it will not affect the quality of services you receive from the diabetes clinic. Any information collected from this study, including your identity, will be kept confidential. A code number will be assigned to you and your name will not be used. Findings from the study will be presented as a group of participants and no specific information from any individual participants will be disclosed. All data will be accessible only to the researcher who will be destroyed one year after publishing the findings. You will receive a further explanation of the nature of the study upon its completion if you wish.

The research will be conducted by Miss Samantha Sandamali Premadasa under the supervision of my major advisor, Assistant Professor Dr. Khemaradee Masingboon. If you have any questions, please contact me at my mobile number: +94712374879, or by email at spremadasa9@gmail.com. Or you may contact the Burapha University Institutional Review Board (BUU-IRB) at telephone number 038-102620. Your cooperation is highly appreciated. You will be given a copy of this consent form to keep.

Samantha Sandamali Premadasa

iyNd.S jkakkaf.a f;dr;=re m;%sldj

mrAfhaIK fla;h : G-HS102/2566.....

mrAfhaIK ud;Dldj: Y%S ,xldfjz .%duSh m%foaYfha fojk jrA.fha oshjevshd frda.fhka fmf<k jevsysgshka w;r oshjevshd frda.h iajhx l<ukdlrKh lsrSu iy thg n,mdk idOl ys;j;a iyNd.Sjkakka fj;"

iuka;d i|ud,s fm%auodi jk uu ;dhs,ka;fha nqrd*d (Burapha) jsYajjsoHd,fha fyo mSGfha WmdOsOdrsKshla jk w;r" " Y%S ,xldfjz .%duSh m%foaYfha fojk jrA.fha oshjevshd frda.fhka fmf<k jevsysgshka w;r oshjevshd frda.h iajhx l<ukdlrKh lsrSu iy thg n,mdk idOl" hk ud;Dldj hgf;a jk mrAfhaIKh i|yd iyNd.S jk f,i uu Tng wdrdOkd lsrSug leue;af;us' fulS mrAfhaIKhg tlÛ jS iyNd.S jSug fmr tlS mrAfhaIK jsia;r my; i|yka lrkq leue;af;us'

Y%S ,xldfjz l,jdk uQ,sl frdayf,a ndysr frda.S wxYfha oshjevshd idhkfha ksrka;r miq jsmruz i|yd meusfKk fojk jrA.fha oshjevshd frda.Ska w;r oshjevshd frda.h iajhx l<ukdlrKh ;SrKh lsrSu iy oshjevshdj iajhx md,khg n,mdk idOl mrSlaId lsrSu fuys wruqK fjz'

fuu wOHhkhg iyNd.S jSu iafjzpzPdfjka is\q fjz' Tn fuu wOHhkhg iyNd.S jSug tl. jkafka kuz" jskdvs 30-40 l muK .; jk m%Yak ud,djlg ms<s;=re oSug is\qjkq we;' fuu wOHhkhg iyNd.SjSfuka Tng lsis\q m%;s,dNhla ysus fkdfjz' flfiafj;;a" fuu wOHhkfhka tla/ia lr .kakd f;dr;=re fojk jrA.fha oshjevshd frda.fhka fmf<k jevsysgshkag Wiia iy jvd fyd| /ljrKhla ,nd oSug frday,g iy fi!LH fiajlhskag Wmldr l< yels ueosy;ajSuz jrAOkh lsrSfuzoS fuzjd n,mdkq we;'

lsis\q fya;=jla fkdolajd TskEu fjz,djl mrAfhaIK jHdmD;sfhka bj;a jSug Tng whs;shla we;s w;r" th oshjevshd idhkfhka Tng ,efnk fiajdjkays .=Kd;aulNdjhg lsis\q n,mEula is\q fkdjkq we;' Tnf.a wkkH;djh we;=Z fuu wOHhkfhka /ia lrk TskEu f;dr;=rla ryis.;j ;nd .kq ,efnz' iyNd.Sjkakka jsiska wjir ,nd oSfuka miq" y\qkd.; yels lsis\q f;dr;=rla jdrA;d fkdflfrA' ta i|yd Tng fla; wxlhla mjrkq ,nk w;r lsis\q wjia:djl Tnf.a ku Ndjs;d fkdflfrA' wOHhkfhka fidhd .ekSuz iyNd.Sjkakka lKAvdhula f,i bosrsm;a lrkq ,nk

w;r” lsis\q ;ks iyNd.sjkafkl=f.ka ksYaps; f;dr;=rla wkdjrKh fkdflfrA’ fulS o;a; i|yd mrAfhaIlhdg muKla we;=Z jsh yels w;r mrAfhaIKh wjidkfha jirlg miqj wod< ish,q f;dr;=re yd o;a; jskdY lrkq ,efnz’ Tng wjYH kuz” wOHhkh wjika jQ miq tys iajNdjh ms<sn| jevs\qr meyeos,s lsrsula Tng ,nd fokq ,efnz’

m%Odk WmfoaYl iyldr uydpdrAh Khemaradee Masingboon fufkjshf. wOSlaIKh hgf;a iuka;d i|ud,s fm%auodi fufkjsh jk ud jsiska fulS mrAfhaIKh is\q lrkq ,efnz’ Tng fuz ms<sn|j lsishuz m%Yakhla we;akuz” lreKdlr uf.a cx.u \qrl;k wxlfhka +94712374879 fyda spremadasa9@gmail.com. hk jsoHq;a ;EmEf,ka udj iuznkaO l< yelsh’

iyNd.Sjkakkaf.a f;dr;=re m;%sldfjz olajd we;s mrsos mrAfhaIlhka mrAfhaIK fm%dfgdaflda,h wkq.ukh fkdlrkafka kuz” lreKdlr nqrd*d Burapha jsYajjsoHd, wdh;ksl iudf,dapk uKav, ldrAhd,h” nqrd*d jsYajjsoHd,h ^mrAfhaIK iy kfjda;amdok wxYh&” 038-102620 hk \qrl;k wxlh wu;kak’

Tnf.a iyNd.S;ajh b;d w.h fldg i,lk i,lus’ Tng <. ;nd .ekSug fuu leu;s m;%sfha msgm;la ,nd fokq we;’

iuka;d i|ud,s fm%auodi

Consent Form

Research Code: G-HS102/2566……

Research Title: Diabetes Self-management and its influencing factors among adults with Type 2 diabetes mellitus in Rural Sri Lanka

Date ……..…….. Month ……..…….…… Year …….

Before signing the consent form for this research participation, I was provided the information about the purposes and the processes of the research in the participant information sheet, which the researcher has given to me. I have fully understood the preceding explanation and the researcher has undertaken to answer my questions willingly and without concealment to my satisfaction.

I voluntarily agree to participate in this research project. I understand that I can withdraw from the research project at any time without giving a reason, it will not affect the quality of services that I receive from the diabetes clinic.

I have been given explicit guarantees that my information and identity will be kept confidential and will be shared only in the summary of research results. Disclosure of my information to the relevant authorities requires my permission.

I have read and fully understood the above statements in all respects and have signed this consent document willingly.

In the case that I cannot read or write, the researcher has read the statement in the consent form to me until I fully understand it well. Therefore, I willingly signed or stamped my thumb on this consent form

Participant's signature

(…….)

Researcher's signature

(…….)

Note: If the participant gave a thumbprint as their consent, a witness signature will be needed.

leue;a; m%ldY lsrSfuz fmdAruh

mrAfhaIK fla;h (IRB approval number): G-HS102/2566……

mrAfhaIK ud;Dldj: Y%S ,xldfjz .%duSh m%foaYfha fojk jrA.fha oshjevshd frda.fhka fmf<k jevsysgshka w;r oshjevshd frda.h iajhx l<ukdlrKh lsrSu iy thg n,mdk idol

oskh ……..…..…. udih ……..…..…… wjqreoao …….

fuu mrAfhaIK iyNd.s;ajh i|yd jk tl.;d m;%h w;aika lsrSug fmr" mrAfhaIlhd ud fj; ,nd oS we;s iyNd.Sjkakkaf.a f;dr;=re m;%sldfjz mrAfhaIKfha wruqKq iy l%shdj,Ska ms<sn| f;dr;=re ug ,nd fok ,oS' uu by; i|yka l< meyeos,s lsrSu iuzmQrAKfhkau f;areuz f.k we;s w;r mrAfhaIlhd udf.a leue;a; wkqj ms<s;=re oSug lghq;= lr we;'

fuu mrAfhaIK jHdmD;shg iyNd.S jSug uu iafjzpzPdfjka tlÛ fjus' fuhg iyNd.S jSfuka ug lsis\q m%;s,dNhla fkd,efnk w;r" lsis\q fya;=jla fkdolajd TskEu fjz,djl mrAfhaIK jHdmD;sfhka bj;a jsh yels nj ug jegfya' th oshjevshd idhkfhka ug ,efnk fiajdjkays .=Kd;aulNdjhg lsis\q n,mEula is\q fkdjk nj f;areuz ගන්නා ලදී. uf.a f;dr;=re iy wkkH;djhka ryis.;j ;nd .kakd njg;a" mrAfhaIK m%;sM,j, idrdxY muKla fnod .kakd nj;a ug meyeos,sh' uf.a f;dr;=re wod< n,OdrSkag fy<s lsrSug uf.a wjirh wjYH jk nj oksus'

uu by; m%ldYhka iEu w;skau lshjd iuzmQrAKfhka wjfndaO lrf.k udf.a leue;af;ka w;aika lrus' ug lshjSug fyda ,sjSug fkdyels wjia:djloS' mrAfhaIlhd ug m%ldYfha we;s foaj,a fyd|ska wjfndaO lr lshjd oS we;' tuksid" uu leue;af;ka fulS tlÛ;d m;%hg w;aika lf<us$udmg we.s,af,a i,l=K ;nus'

iyNd.Sjkakdf.a w;aik

(……)

mrAfhaIlhdf.a w;aik

(……)

<u>igyk</u> # iyNd.Sjkakd ;u leue;a; f,i udmg we.s,af,a i,l=Kla ,nd \qkafka kuz" idlaIslrefjl=f.a w;aikla wjYH fjz'

APPENDIX F

Ethical approval letters and Permission letters for data collection

สำเนา

ที่ IRB3-004/2567

เอกสารรับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์
มหาวิทยาลัยบูรพา

คณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา ได้พิจารณาโครงการวิจัย

รหัสโครงการวิจัย : G-HS102/2566

โครงการวิจัยเรื่อง : Diabetes Self-management and its influencing factors among adults with Type 2 diabetes mellitus in Rural Sri Lanka.

หัวหน้าโครงการวิจัย : MISSSAMANTHA SANDAMALI PREMADASA

หน่วยงานที่สังกัด : คณะพยาบาลศาสตร์

อาจารย์ที่ปรึกษาโครงการหลัก (สารนิพนธ์/ งานนิพนธ์/ วิทยานิพนธ์/ ดุษฎีนิพนธ์) : ผู้ช่วยศาสตราจารย์ ดร.เขมารดี มาสิงบุญ

หน่วยงานที่สังกัด : คณะพยาบาลศาสตร์

อาจารย์ที่ปรึกษาโครงการร่วม (สารนิพนธ์/ งานนิพนธ์/ วิทยานิพนธ์/ ดุษฎีนิพนธ์) : รองศาสตราจารย์ ดร.นิภาวรรณ สามารถกิจ

หน่วยงานที่สังกัด : คณะพยาบาลศาสตร์

วิธีพิจารณา : ☐ Exemption Determination ☐ Expedited Reviews ☑ Full Board

BUU Ethics Committee for Human Research has considered the following research protocol according to the ethical principles of human research in which the researchers respect human's right and honor, do not violate right and safety, and do no harms to the research participants.

Therefore, the research protocol is approved (See attached)

1. Form of Human Research Protocol Submission Version 2: 12 December 2023
2. Research Protocol Version 1: 19 October 2023
3. Participant Information Sheet Version 2: 12 December 2023
4. Informed Consent Form Version 2: 12 December 2023
5. Research Instruments Version 1: 19 October 2023

สำเนา

ลงนาม *Assistant. Professor Ramom Yampratoom*

(Assistant. Professor Ramom Yampratoom)

Chair of The Burapha University Institutional Review Board

Panel 3 (Clinic / Health Science / Science and Technology)

**** หมายเหตุ การรับรองนี้มีรายละเอียดตามที่ระบุไว้ด้านหลังเอกสารรับรอง ****

Research Ethics Committee

A SIDCER *(Strategic Initiative for Developing Capacity in Ethical Review) recognized REC*

Faculty of Medical Sciences, University of Sri Jayewardenepura
Gangodawila, Nugegoda, Sri Lanka

Chairperson
Prof. Renu Wickramasinghe
BSc, PhD

Secretary
Dr. Sithara Dissanayake
MBBS, MD (ORL)
DOHNS (UK)

Committee Members

Prof. S. Prathapan
MBBS, MSc, MD (Com.Med)

Prof. Chandima Kulathilake
MBBS(Col), Diploma in Pathology, MD Hematology

Dr. Chandana Hewage
MBBS, PhD

Dr. Thushari Dissanayake
MBBS, Dip (Med. Micro), MD (Med. Micro)

Dr. Lukshika Amarakoon
MBBS, MD (Psychiatry)

Dr. Madura Jayewardene
MBBS, MD (OBS AND GYN), MRCOG(UK)

Dr. Vajira Seneviratne
BAMS (Hons), Pharm.D (Hons), R Ph, MD (Ayu) Pharmacology

Date: 04.03.2024 our ref: ERC 43/23

REC meeting date: 22nd of February 2024

Ms. Samantha Sandamali Premadasa,
Faculty of Nursing,
Burapha University,
Long Had Bangsean Road,
Saensuk,
Thailand.

Dear Ms. Premadasa,

Application Number: 43/23

Title: Diabetes Self-management and its influencing factors among adults with Type 2 diabetes mellitus in Rural Sri Lanka.

I am pleased to inform you that the FMS/USJP REC at its meeting held on the above-mentioned date has granted ethical approval for your project as per details given below.

Secretary
Dr. Sithara Dissanayake
MBBS, MD (ORL)
DOHNS (UK)

Committee Members

Prof. S. Prathapan
MBBS, MSc, MD (Com.Med)

Prof. Chandima Kulathilake
MBBS(Col), Diploma in Pathology, MD Hematology

Dr. Chandana Hewage
MBBS, PhD

Dr. Thushari Dissanayake
MBBS, Dip (Med. Micro), MD (Med. Micro)

Dr. Lukshika Amarakoon
MBBS, MD (Psychiatry)

Dr. Madura Jayewardene
MBBS, MD (OBS AND GYN), MRCOG(UK)

Dr. Vajira Seneviratne
BAMS (Hons), Pharm.D (Hons), R Ph, MD (Ayu) Pharmacology

Dr. Nilanka Perera
MBBS, MD (Col), FRCP(Lon), DPhil (Oxon)

Dr. Nilangika Sandakumari
MBBS, MD(Medicine), MRCP (London)

Dr. Lakmal Kulasekara
BDS, MD (Restorative Dentistry)

Dr. Rinukshi Wimalasekara
BSc (Hons), MSc, PhD (Plant Biotechnology)

Mr. Chamath Fernando
LLB, LLM, Attorney at Law

Mrs. Chandani S Perera
LLB, LLTC.DIP.LIM, CIM (Cert); Sworn Translator, LTC(CALSDA)

The ethical approval for your project is effective from the above-mentioned REC meeting date.

We affirm that none of the proposed study team members were present during the decision-making process of the REC. The quorum requirements were met.

The approval is valid until one year from the date of sanction. You may make a written request for renewal / extension of the validity, along with the submission of annual status report. Please note that ethical approval would be revoked if any alteration is made to the project without obtaining prior written consent from the research ethics committee.

As the Principal Investigator, you are expected to ensure that procedures performed under the project will be conducted in accordance with all relevant national and international policies and regulations that govern research involving human participants.

Please note that this approval is subjected to the following condition:

- Progress reports to be submitted annually.
- All serious adverse events (SAEs) that may occur in Sri Lanka should be reported within 07 calendar days of their occurrence to the REC, FMS USJ
- Any serious adverse event, which has arisen during the clinical trial, or which has come to your knowledge from reports other participating trial sites should be informed in writing to REC FMS, USJ within 30 working days.
- The adverse events should be reported in the format of the attached adverse events reporting form.
- The final report to be submitted at the completion of the study.
- In the event of any complaints from the participants, these should be reported to the Secretary, REC FMS USJ.
- In the events of any protocol amendments, REC must be informed, and the amendments should be highlighted in clear terms as follows:

Chairperson
Prof. Renu Wickramasinghe
BSc, PhD

Secretary
Dr. Sithara Dissanayake
MBBS, MD (ORL)
DOHNS (UK)

Committee Members

Prof. S. Prathapan
MBBS, MSc, MD (Com.Med)

Prof. Chandima Kulathilake
MBBS(Col), Diploma in Pathology, MD Hematology

Dr. Chandana Hewage
MBBS, PhD

Dr. Thushari Dissanayake
MBBS, Dip (Med. Micro), MD (Med. Micro)

a. The exact alteration/amendment should be specified and indicated where the amendment occurred in the original project. (Page no. etc.)

b. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Research Ethics Committee for approval.

Thank you.

Yours Sincerely,

Prof.Renu Wickremasinghe,
Chairperson

Dr. Sithara Dissanayake
Secretary

Dr. W.M.Susil Kumara
Medical Superintendent (Acting)
Base Hospital,
Kalawana.

[illegible]

Graduate School, Burapha University
169 Longhard Bangsaen Rd.
Saensuk, Muang, Chonburi
Thailand 20131

January 19th, 2024

To Medical Superintendent of Base Hospital Kalawana, Sri Lanka

Enclosure 1. Certificate ethics document of Burapha University
2. Research Instruments (1 set each)

On behalf of the Graduate School, Burapha University, I would like to request permission for Ms. Samantha Sandamali Premadasa to collect data for testing the reliability of the research instruments.

Ms. Samantha Sandamali Premadasa, [illegible], a graduate student of the Master of Nursing Science program (International Program) in Adult Nursing Pathway, Faculty of Nursing, Burapha University, Thailand, was approved her thesis proposal entitled "Diabetes Self-management and Its Influencing Factors among Adults with Type 2 Diabetes Mellitus in Rural, Sri Lanka" under supervision of Assoc. Prof. Dr. [illegible] as the principle advisor. She proposes to collect data from 30 adults with T2DM who will attend the diabetes clinic in the outpatient department at Base Hospital Kalawana, Sri Lanka.

The data collection will be carried out from January 22, 2024 to February 2, 2024. In this regard, you can contact Ms. Samantha Sandamali Premadasa via mobile phone [illegible] or E-mail [illegible]

Please do not hesitate to contact me if you need further relevant queries.

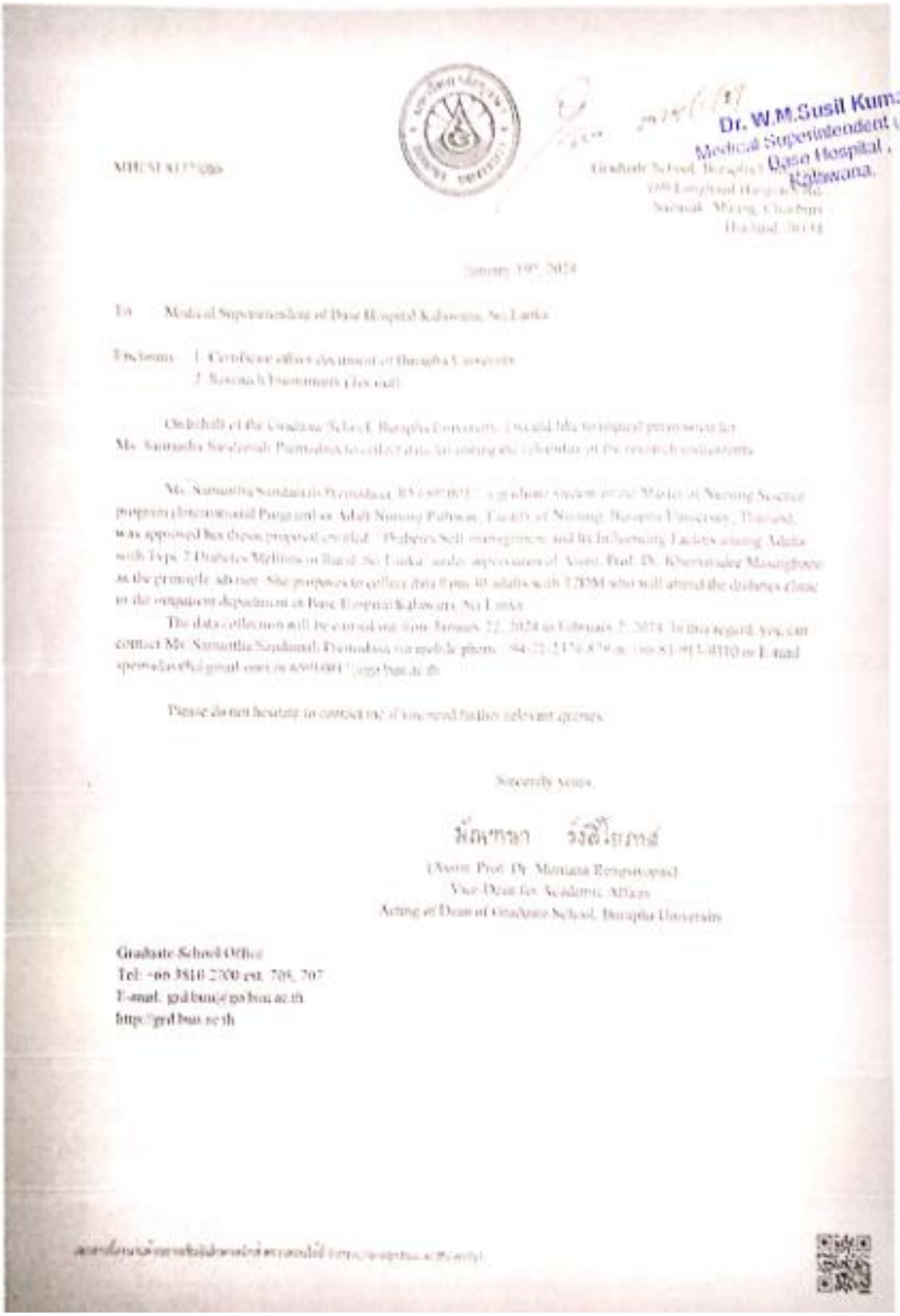
Sincerely yours,

นัฏพาษา รังษีไพบูลย์

(Assoc. Prof. Dr. [illegible])
Vice Dean for Academic Affairs
Acting of Dean of Graduate School, Burapha University

Graduate School Office
Tel: +66 3810 2700 ext. 705, 707
E-mail: [illegible]
http://grd.buu.ac.th

[illegible]



Dr. W.M.Susil Kumara
Medical Superintendent (Acting)
Base Hospital,
Kalawana.

BIOGRAPHY

NAME	Meneripitiya Acharige Samantha Sandamali Premadasa
DATE OF BIRTH	11 February 1988
PLACE OF BIRTH	Rathnapura, Sri Lanka
PRESENT ADDRESS	No 224 E, Pothupitiya, Kalawana, Rathnapura, Sri Lanka.
POSITION HELD	2014-2021 Registered Nurse, National Hospital, Colombo, Sri Lanka 2021- Present Registered Nurse, Base Hospital Kalawana, Sri Lanka
EDUCATION	2010 - 2013 Diploma in Nursing, School of Nursing, Rathnapura, Sri Lanka 2016-2018 Bachelor of Science Honors in Nursing (BSc Nursing), KAATSU International University, Battaramulla, Sri Lanka 2022-2024 Master of Nursing Science (International Program) (MNS), Faculty of Nursing, Burapha University, Chonburi, Thailand
AWARDS OR GRANTS	Award for the overall best performance of the Bachelor of Science Honors in Nursing degree, Batch 2, KAATSU International University of Sri Lanka (2018) The Outstanding Students Award of the academic year 2023 In the program of Master of Nursing Science (International Program), Faculty of Nursing, Burapha University, Chonburi, Thailand