FACTORS INFLUENCING DIABETES SELF-MANAGEMENT AMONG BHUTANESE PATIENTS WITH TYPE 2 DIABETES MELLITUS

KINLEY YANGDON

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER OF NURSING SCIENCE
IN ADULT NURSING PATHWAY
FACULTY OF NURSING
BURAPHA UNIVERSITY
2020

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The Thesis of Kinley Yangdon has been approved by the examining committee to be partial fulfillment of the requirements for the Master of Nursing Science in Adult Nursing Pathway of Burapha University

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Studies among Bhutanese patients with type 2 diabetes have showed alarming high rates of uncontrolled DM. However, information about diabetes self-management among this group of people is non-existential or minimal in Bhutan. The aims of the study were to examine diabetes self-management and to determine if self-efficacy, health literacy, social support and diabetes distress can predict diabetes self-management among Bhutanese patients with type 2 diabetes mellitus. A total of 105 patients with T2DM visiting the diabetes clinic of Jigme Dorji Wangchuck National Referral Hospital were enrolled in the study by simple random sampling method. Six self-administered questionnaires were used to gather data including the demographic data questionnaire, the Diabetes Self-Management Questionnaire (DSMQ), the Diabetes Self-Efficacy Scale, UK version (DMSES-UK), the 3-level of Health Literacy Scale, the Chronic Illness Resource Survey (CIRS), and the Diabetes Distress Scale (DDS). Descriptive statistics and standard multiple linear regression were used to analyze data.

The results of the study showed that participants' mean score of diabetes self-management was 7.76 (*SD* = 1.03) out of 10. The health care use subscale has the highest mean score of 8.73 (*SD* = 1.60), followed by dietary control (*M* = 7.76, *SD* = 1.03), and glucose management (*M* = 7.59, *SD* = 1.52). Physical activity subscale (*M* = 7.02, *SD* = 2.18) had the lowest mean score among the subscales. Results of the standard multiple linear regression analysis indicated that self-efficacy, health literacy, social support and diabetes distress explained 17.16% in the variance of diabetes self-management among Bhutanese patients with type 2 diabetes mellitus. However, only self-efficacy could significantly predict diabetes

self-management (β = .277, p = .015).

The findings provide an evidence for health care providers to develop the interventional program aimed at improving self-efficacy to promote diabetes self-management activities such as glucose management, physical activity and dietary control in Bhutanese patients with T2DM.

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Kinley Yangdon

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CHAPTER 1
INTRODUCTION

Background and significance of the problems

Diabetes mellitus type 2 [T2DM] is a metabolic disorder resulting from multiple etiologies which results in high blood glucose level. It has become a global issue in past few decades. According to the American Diabetes Association [ADA] (2019), T2DM accounts for 90 to 95% of all diabetes patients around the world. International Diabetes Federation [IDF] in 2019 estimated that approximately 463 million people are living with diabetes in 2019 and it was expected to rise to 700 million in 2045, out of which 153 million people affected will be in South East Asia. The Annual Health Bulletin (2019) of Bhutan reports that the incidence of diabetes mellitus has increased from 9,976 people in 2014 to 12,118 people in 2016 but the number has decreased to 5,716 people in 2018. However, the prevalence of diabetes mellitus is still high in the country. IDF (2019) estimates that the prevalence rate of diabetes mellitus in Bhutan is 10.3% with 1 in every 12 adult people living with diabetes in the country.

Patients with T2DM present with high blood glucose level than the normal population, which is assessed by checking the HbA1c level. The goal of management for diabetes patients is to maintain sustained glycemic control (HbA1c < 7 %). When the HbA1c level exceeds 7% , the patient is said to have uncontrolled diabetes (ADA, 2019b). A study reports that number of people living with uncontrolled diabetes in different countries are high, ranging from 37.4% to as high as 74.6% (López-Navarro et al., 2018). Similar to the rest of the world, Bhutanese patients with T2DM are facing difficulty in maintaining a sustained optimal glycemic target. In a first ever country-wide review of diabetic care in Bhutan, it was revealed that glycemic control was not achieved in 46% of the diabetes patients (Zam et al., 2015). Another study among the Bhutanese diabetics receiving insulin therapy showed that about 72% of the sample were not able to achieve optimal glycemic control (Dorji et al., 2018). Similarly, a study by Dorji, Deenan and Masingboon (2017) showed that 51.1% of Bhutanese patients with T2DM have uncontrolled diabetes. Moreover, Bhutan is

seeing a rapid increase in the number of patients with chronic kidney disease [CKD] requiring hemodialysis, which has become a greatest health burden and challenge, and hypertension and diabetes are the two leading cause of CKD in Bhutan (Abraham et al., 2015)

Patients with uncontrolled diabetes are at higher risk for developing microvascular and macrovascular complications which can lead to increased mortality (Cheng et al., 2017). Microvascular complications include diabetic neuropathy, nephropathy and retinopathy while macrovascular complications include cardiovascular diseases like stroke and heart attack (Blair, 2016). A longitudinal study done in Mexico showed that patients with diabetes had 5.4 times higher death rate than non-diabetic patients due to many causes such as renal disease, cardiac disease, infections and diabetic crisis (Alegre-Díaz et al., 2016). It was found that 1% increase in HbA1c was associated with 7% increase in risk of major cardiovascular event, 20% rise in hospitalization related to heart failure, 12% rise in total mortality and 26% rise in risk of overt nephropathy (Gerstein et al., 2005). In addition, diabetic-related complications contributes to the economic burden of diabetes mellitus, because the increase in complications increases the total health cost (Cannon, Handelsman, Heile, & Shannon, 2018).

Apart from the physical burden, Berenguera and colleagues (2016) found that patients with T2DM experience negative emotions such as frustration, fear, worry, denial and sadness. Similarly, the family members also feel the burden of living with a person who has diabetes. The Diabetes, Attitudes, Wishes and Needs 2 (DAWN 2) study showed that 39.8% of the family member presented with high distress level due to concerns about their relative who have diabetes and 61.3% of them were worried about occurrence of hypoglycemic events (Burns et al., 2013).

American diabetes Association [ADA](2019) and European Association for the Study of Diabetes [EASD](2018) agrees that HbA1c of less than 7% can be achieved by use of glucose lowering medications and other measures such as nutritional therapy and regular physical activity (Davies et al., 2018). As diabetes care shifts from provider-centered care to patient-centered care, diabetes self-management has become the corner stone of diabetes care (ADA, 2019c).

Self-management refers to activities performed by the patients every single day to control the effect of disease on their health and to prevent further illnesses in the future (Adu, Malabu, Malau-Aduli, & Malau-Aduli, 2019). According to the Individual and family self-management theory by Ryan and Sawin (2009), individual and/family takes the responsibility of managing their illness, which is accomplished in collaboration with health care providers. In diabetes self-management [DSM], the patients work along with health care providers and family members for daily management of diabetes by setting goals and developing strategies to fulfill these goals (Baghbanian & Tol, 2012; Dao-Tran, Anderson, Chang, Seib, & Hurst, 2018). DSM mainly includes changing behaviors and life styles such as diet planning, maintaining regular exercise routine and adherence to medications (Abubakari, Cousins, Thomas, Sharma, & Naderali, 2016) and achieving the skills to undertake the self-management activities and to make informed decision about their treatment regime (Baghbanian & Tol, 2012). DSM involves doing activities that are known to help control hyperglycemia which includes adherence to diabetes medication, healthy diet and regular physical activities (ADA, 2019c; Davies et al., 2018). A decrease in HbA1c level by 1.14% was seen in patients who were adherent to diabetes medication compared to only 0.75% decrease in non-adherent patients (Farmer et al., 2016). Similarly, medical nutrition therapy for diabetics (Franz et al., 2017) and increase in physical activity duration (Boniol, Dragomir, Autier, & Boyle, 2017) among the diabetes patients could successfully reduce HbA1c level. Maintaining optimal HbA1c is found to decrease development of microvascular complications and risk for cardiovascular events in many studies (ADA, 2019b).

DSM among diabetic populations varies from one setting to another. Some studies found that patients with T2DM have is sub-optimal DSM (Kurnia, Amatayakul, & Karuncharernpanit, 2017; Niknami et al., 2018), while another study showed high level of DSM among diabetes patients (Maneze, Everett, Astorga, Yogendran, & Salamonson, 2016). There is limited information on the DSM practice among Bhutanese patients with T2DM. However, there is a high percentage of lost to follow-up among the registered patients, with 18% lost follow-up before the initiation of treatment and 21% lost follow-up after initiation of treatment (Zam et al., 2015). A study showed that diabetes patients in Bhutan have poor self-care behaviors where it

was found that 54.7% drinks alcohol, 4.3% were current smokers, and only 34.7% of them engages in vigorous physical activities (Wangdi & Jamtsho, 2018). In a study by Dorji and colleagues (2018), adherence to medication was found to be low to medium in 61.8% of the patients with T2DM studied. Another study by Om, Deenan, and Pathumarak (2013) found that the patients with T2DM have moderate level of eating behavior which included activities such as selecting healthy diet, knowing the amount of calorie need, correct meal planning and effectively managing dietary challenges. Moreover, the study by Dorji, Deenan, and Masingboon (2017) found that Bhutanese patients with T2DM have only moderate level of physical activity. This reflects the poor diabetes self-management practices among the patients, which have ultimately led to more than half of type 2 DM patients to live with uncontrolled DM in Bhutan.

Ryan and Sawin (2009) in the Individual and family self-management theory (IFSMT) explains different factors under three different dimensions such as individual and family characteristics, disease conditions, emotional control, self-efficacy, social influence and social support which might have influence on the self-management. Self-efficacy, self-regulation of behaviors, knowledge of diabetes and social support are some common factors studied which might have effect on diabetes self-management in several studies (Dao-Tran et al., 2018; Gunggu, Thon, & Whye Lian, 2016; Kurnia et al., 2017; Schinckus, Dangoisse, Van den Broucke, & Mikolajczak, 2018). Psychological factors such as diabetes distress and clinical depression are also found to directly or indirectly affect self-management or some component of self-management (Gonzalez, Shreck, Psaros, & Safren, 2015; Pintaudi et al., 2015; Quek et al., 2019; Schinckus et al., 2018). In this study, the effect of four independent variables– self-efficacy, health literary, social support and diabetes distress on the diabetes self-management among patients with T2DM will be studied. These variables were studied because IFSMT suggests that these factors may have influence over self-management (Ryan & Sawin, 2009) and several studies in other countries show that they have high association or can predict DSM among the patients with type 2 DM. (Dao-Tran et al., 2018; Gunggu et al., 2016; Kim, Song, & Kim, 2019; Kurnia et al., 2017; Lalnuntluangi, Chelli, & Padhy, 2017)

Health literacy is the degree to which individuals can obtain, process, understand and communicate about health-related information needed to make informed health decisions (Berkman, Davis, & McCormack, 2010). Low health literacy has been associated with poor diabetic knowledge which can lead to suboptimal DSM (Bailey et al., 2014). Evidences showing association of health literacy with diabetes self-management is inconsistent (Fransen, von Wagner, & Essink-Bot, 2012). Diabetes literacy was found to be significantly associated ($r = .25$, $p < .05$) with self-management in older patients with T2DM (Rachmawati, Sahar, & Wati, 2019). In addition, health literacy was able to significantly predict DSM ($R^2 = 0.32$; $\beta = 0.30$) in another study among patients with T2DM (Schinckus et al., 2018). A study by Niknami and colleagues (2018) found that health literacy affects how difficult a person finds to carry out diabetes self-management activities. In contrast, few studies have shown that health literacy cannot predict diabetes self-management significantly (Gunggu et al., 2016; Maneze et al., 2016).

Self-efficacy is the person's belief in his capacity to controls events that have influence over their life (Bandura, 1994). Self-efficacy in DSM is the confidence in the skills and ability of patients with T2DM to undertake the activities that is required to maintain glycemic control and prevent complications. A study by Jiang and colleagues (2019) showed that self-efficacy can predict DSM significantly among patients with T2DM ($R^2 = 25.4$ %, $\beta = .55$, $p < .001$). Similarly, self-efficacy was able to predict DSM ($R^2 = .42$, $\beta = .53$, $p < .001$) among diabetes patients receiving insulin therapy in Korea (Kim et al., 2019). Apart from direct effect, self-efficacy also mediates the effect of other factors like diabetic knowledge and diabetes distress on self-management (Jiang et al., 2019). Having high self-efficacy makes the diabetes patients more competent, thus the patients are more likely to carry out and complete activities that are essential for self-management of T2DM (Bandura, 1997). This results in optimal DSM among the diabetes patients.

Diabetes distress refers to the various range of negative psychological reactions which arise due to the emotional burden and the worries specific to individual's experience of living with diabetes and having to manage it (ADA, 2019c). ADA (2019) recommends routine evaluation of diabetes distress because it significantly impacts medication adherences and results in poorer dietary and

exercises behaviors and lower self-efficacy. There are contradicting results on the effect of diabetes distress on diabetes self-management. The results from the study by Quek and colleagues (2019) showed that diabetes distress was negatively correlated with self-management ($r = -.48$, $p < .001$). Diabetes distress was found to be significantly related to medication non-adherence, which is a component of DSM in yet another study (Gonzalez et al., 2015). In addition, a qualitative study among diabetes patients identified diabetes distress as a barrier to effective diabetes self-management (Adu et al., 2019). On the other hand, the result of study by Schinckus and colleagues (2018) showed that there was no direct correlation between diabetes distress and DSM, but diabetes distress moderated the effect of health literacy on DSM. Contrary to the above studies, a study by Kurnia and colleagues (2017) found that diabetes distress did not have any significant association with DSM among patients with T2DM.

Social support is the resources a person receives from the social environment which can be beneficial to physical and the psychological health (Gottlieb & Bergen, 2010; Lepore, 2012). It is the assistance provided by family and friends in terms of information support, emotional support, instrumental support and appraisal support to a person (Langford, Bowsher, Maloney, & Lillis, 1997). Social support is known to influence physical and mental health and health behaviors (Lepore, 2012), and higher level of social support can increase DSM among patients with type 2 DM (Strom & Egede, 2012). A study by Gungu, Thon & Lian (2016) in Malaysia showed that support from family can significantly predict DSM among patients with T2DM ($R^2 = .13$, $\beta = .20$, $p < .01$). Furthermore, it was found that patients with T2DM who have their partners to help them had significant higher adherence to their diabetes medication than those who have no partners (Haines, Coppa, Harris, Wisnivesky, & Lin, 2018). A study by Koetsenruijter and colleagues (2016) showed that informational support and emotional support provided by family, friends and healthcare providers was associated with higher self-management capabilities of patients with T2DM ($R^2 = .06$, $\beta = .09$, $p < .01$; $R^2 = .06$, $\beta = .11$, $p < .01$ respectively).

Many studies are conducted exploring the above four factors which can affect DSM in the recent years, but literatures show that there are inconsistent results across the studies, especially the association of health literacy and diabetes distress with DSM. It may be because of the different settings where the study was carried out or because each study used different instrument to measure the same variables. This means that the results from these studies cannot be generalized to all populations. Distinctive features among South Asians are seen which includes early occurrence of diabetes at lower BMI, higher rate of insulin resistance and high abdominal obesity (Nanditha et al., 2016). These ethnic features can result in increased difficulty in management of diabetes and attaining optional control of DM compared to other ethnic groups. Therefore, these factors might affect the South Asian population differently than other population groups. Bhutan is a predominately Buddhist country and it is common for Bhutanese to involve spirituality, faith and belief while taking care of their health (Sithey, Li, Wen, Kelly, & Clarke, 2018). Bhutanese culture requires people to help each other and take care of each other especially among family members. Even the food culture in Bhutan is different from the world, where rice and potatoes are the main staple, consumed with large amount of dairy products. Currently, there is no study focusing on diabetes self-management among T2DM patients in Bhutan even though it is established that there are huge number of people living with uncontrolled T2DM.

The results from this study will help to guide the health care providers and policy makers in Bhutan to design a health care model in the hospitals and other clinical settings, which can support and guide patients with T2DM to self-manage their disease effectively. The information might be useful for nurses and health care providers who want to do study the population further and do intervention researches on this group of patients in the future.

Research Objectives

The objectives of this study were as follows:

1. To explore the diabetes self-management among adult Bhutanese patients with type 2 diabetes mellitus.

2. To determine whether self-efficacy, health literacy, social support and diabetes distress combined can predict diabetes self-management among adult Bhutanese patients with type 2 diabetes mellitus.

Research hypothesis

Self-efficacy, health literacy, social support, and diabetes distress combined can predict diabetes self-management among adult Bhutanese patients with type 2 diabetes mellitus.

Scope of the study

This study explored if self-efficacy, health literacy, social support and diabetes distress can predict diabetes self-management among adult Bhutanese patients (age range of 18-60 years old) with type 2 diabetes mellitus who come to diabetes OPD at Jigme Dorji Wangchuk National Referral Hospital [JDWNRH], Thimphu, Bhutan.

Conceptual framework

The study was guided by the individual and family self-management theory [IFSMT](Ryan & Sawin, 2009) along with the information from literature reviews. Ryan and Sawin (2009) views self-management as a complex concept made up of three different dimensions- context, process and outcome, with each dimension making up of different factors. Condition specific factors, physical & social environment factors and individual & family factors make up the context dimension, which have influence on process dimension or directly on the outcome dimension. The process dimension of self-management according to this theory is made up knowledge and beliefs, self-regulation skills and social facilitation that can facilitate the engagement of patient in carrying out health care activities. The third dimension of the theory is the outcome dimension which is divided into proximal and distal outcomes. The engagement of patient in desired self-management activities is considered a proximal outcome while maintaining good health status and higher quality of life is the distal outcomes. Interventions are designed to target the factors in the context and process dimension. When the factors in these dimensions are

manipulated or skills are achieved, it helps the patients to take control over their disease and engage themselves in self-management activities what are expected from the patients.

The IFSMT supports the literatures and show that health literacy, self-efficacy, diabetes distress and social support may have influence on the way patient and family self-manage their disease effectively by engaging in self-management activities. Therefore, in this study, self-efficacy, social support, health literacy and diabetes distress were studied as independent variables. The health literacy falls under the context dimension while self-efficacy, social support and diabetes distress falls under the process dimension of the IFSMT. These variables might be able to predict diabetes self-management, the dependent variable, as shown in figure 1

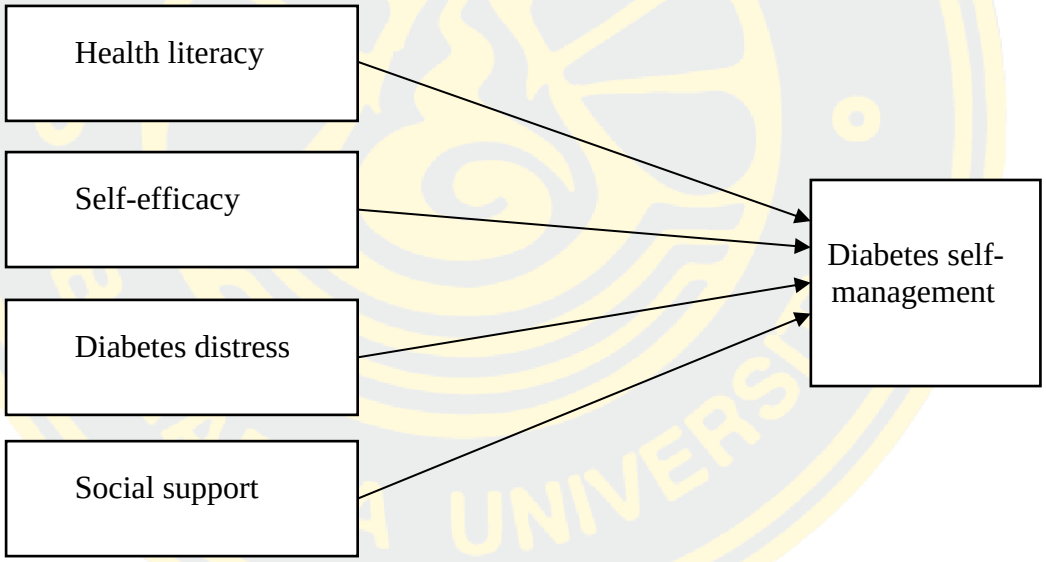

Figure 1 Research framework of the study

Definition of terms

Adults with type 2 diabetes refer to patients with type 2 diabetes mellitus who are between the age range of 18 to 60 years old, who have been diagnosed with T2DM for at least 6 months and who come to the diabetes OPD of Jigme Dorji Wangchuck National Referral Hospital [JDWNRH], Thimphu, Bhutan for regular follow up.

Diabetes self-management (DSM) refers to the activities that patients with T2DM and families carry out every day which helps control blood sugar and prevent complications related to T2DM. The activities include glucose level monitoring and management, adhering to healthy diet, regular physical activities, and health care use. DSM was measured by the Diabetes Self-Management Questionnaire [DSMQ] developed by Schmitt and colleagues (2013).

Health literacy refers to ability of the patients with T2DM to access, understand and analyze health information related to diabetes and its management in order to make decisions each day to help control T2DM and prevent further complications. It was measured by the Functional, Communicative and Critical health literacy scale developed by Ishikawa, Takeuchi and Yano (2008).

Self-efficacy refers to the confidence the patients with T2DM have in their skills and ability to perform and complete diabetes self-management activities such as adjusting diet and exercise plan according to situations, choosing the correct kind of food to eat or adhering the medication that was prescribed, in an effort to control T2DM. It was measured by the Diabetes Management Self-Efficacy Scale, UK version [DMSES-UK] developed by Sturt, Hearnshaw and Wakelin (2010).

Diabetes distress refers to the unpleasant emotions such as concern, burden, stress, lack of enthusiasm, feeling defeated or losing control to the disease experienced by patients as a response to threats of having to live with T2DM and manage it every day. Diabetes distress was measured by Diabetes Distress Scale [DDS], a scale which was developed by Polonsky and colleagues (2005)

Social support refers to the perception of assistant received by patients from family, friends and health care providers in management of T2DM. Four types of support are emotional, instrumental, informational and appraisal support. Social support was measured by two subscales (Family & friends' and 'Doctor and health care team) of Chronic Illness resource survey [CIRS] developed by Glasglow, Strycker, Toobert and Eakin (2000).

CHAPTER 2
LITERATURE REVIEWS

This chapter describes the theoretical findings related to type 2 diabetes mellitus [T2DM] and diabetes self-management in T2DM. The review is presented as follows:

1. Type 2 diabetes [T2DM]
2. Self-management in patients with T2DM
   2.1 Definition
   2.2 The individual and family self-management theory [IFSMT]
   2.3 Self-management among patients with T2DM
3. Factors influencing self-management in patients with T2DM
   3.1 Self-efficacy
   3.2 Health literary
   3.3 Social support
   3.4 Diabetes distress
4. Summary of the literature review

Type 2 diabetes mellitus [T2DM]

The number of people living with type 2 diabetes mellitus is increasing in many countries, with 90 to 95% of the total diabetes patients being diagnosed with T2DM (ADA, 2019). IDF (2019) predicts that there will be 51 % in the people living with diabetes in 2045 when compared to 2019 in the world, and the region of South East Asia is expected to see 74% rise in the people diagnosed with T2DM. According the WHO (2016), the low and middle-income countries sees rapid rise in the incidence rate of diabetes compared to high-income countries. It is estimated that 1.6 million people died due to diabetes in 2016 alone (WHO, 2018) and diabetes caused death of 4.2 million people in 2019 (IDF, 2019). The health care cost due to diabetes is also on the rise and the IDF (2019) shows that at least 760 million USD dollars is spent on managing diabetes around the world. The Annual Health Bulletin (2019) of Bhutan shows that the incidence of people diagnosed with diabetes in the country

increased every year from the year 2014 to 2016 but the year 2017 and 2018 has seen a decreasing trend. However, Bhutan still has large number of people living with diabetes, where 1 in every 12 people is diagnosed with diabetes as per the report from IDF (2019). The prevalence rate of DM in Bhutan is estimated as 10.1 %, which is higher compared to other South Asian counties like Nepal (7.2%) and Bangladesh (9.2%) (IDF, 2019).

Definition

Type 2 diabetes mellitus is a chronic and progressive metabolic disease characterized by hyperglycemia in absence of treatment (WHO, 2018). In T2DM, the body cannot use glucose effectively. It occurs as a result of progressive impaired glucose regulation due to combined action of dysfunctional pancreatic beta cell and insulin resistance. Patients with T2DM have relative insulin deficiency and peripheral insulin resistance (ADA, 2019a).

Risk factors of T2DM

The metabolic factors and genetic factors play an important role in the development of T2DM. Ethnicity and family history of diabetes combined with overweight, unhealthy diet and sedentary lifestyle disposes a person to development of T2DM (WHO, 2016). Ali (2013) suggests that the estimated chances of developing T2DM due to heredity disposition ranges from 20-80% as per evidences from several studies. Apart from genetics, various life style factors such as sedentary lifestyle, physical inactivity, smoking and alcohol consumption are known to induce development of T2DM (Wu, Ding, Tanaka, & Zhang, 2014). People with central obesity and higher body mass index (BMI) are at increased risk of developing T2DM. Dietary practices such as higher consumption of saturated fatty acids and total fat, intake of sweeten beverages and less intake of dietary fiber is associated with unhealthy body weight (WHO, 2016). WHO estimates that almost 90% of diabetics develop T2DM due to increased body weight (as cited in Wu, Ding, Tanaka, & Zhang, 2014). Inactivity can also result in unhealthy body weight, ultimately increasing the risk for T2DM. Active smoking is another important risk factor which has a part in the development of T2DM (WHO, 2016).

Signs and symptoms of T2DM

The classic symptoms of T2DM are excessive thirst (polydipsia), excessive urine (polyuria), excessive eating (polyphagia) and fatigue and tiredness (Ramachandran, 2014). Other signs of T2DM include unexplained weight loss, irritability, frequent fatigue, slow wound and repeated infections in the urinary tract and the skin. In T2DM, these symptoms are less marked or absent, therefore T2DM remained underdiagnosed and is diagnosed only when complications have started to develop (MOH, 2016).

Diagnosis of T2DM

T2DM is diagnosed using short-term and long-term serum glucose level. According to ADA (2019), T2DM is diagnosed as per either of the following criteria:

1. Fasting plasma glucose (FPG) ≥ 126 mg/dl.
2. 2-hour plasma glucose (2-h PG) ≥ 200mg/dl during oral glucose tolerance test (OGTT).
3. A1C ≥ 6.5 %.
4. Random blood sugar (RBS) ≥ 200mg/dl accompanied by classis symptom of hyperglycemia or hyperglycemic crisis.

If the presence of hyperglycemia is not pronounced and is doubtful, diagnosis of T2DM is confirmed only when there is two abnormal test results of same sample or from two separate test samples (ADA, 2019a).

Complications

When diabetes is not managed effectively, the patients with T2DM develop uncontrolled diabetes mellitus, which is indicated by the HbA1c level of more than 7%. Diabetes related complications develop as a result of this abnormally high blood glucose level, which can be life threatening. Acute complications such as diabetes ketoacidosis [DKA] and hyperosmolar hyperglycemic state [HHS] as a result of abnormally high serum glucose level contributes to mortality and high cost of care (MOH, 2016). Abnormally high blood sugar can cause chronic complications those results in permanent damage to various organs in the body (ADA, 2019). Diabetic related chronic complications can be widely divided into 2 categories. The pathological changes in the blood vessels due to high blood glucose level results in

both microvascular and macrovascular complications. The complications are discussed below:

1. Microvascular complications

Hyperglycemia causes changes in the microvasculature affecting the arteriole of glomeruli, retina, myocardium, skin by increasing their thickness leading to microangiopathy. This thickening eventually leads to abnormality in the vessel function (Chawla, Chawla, & Jaggi, 2016). These complications occur due to the damage of small blood vessels such as vessels in the kidneys, the eyes and the nerves causing nephropathy, retinopathy and neuropathy. Good blood glucose control can bring long lasting reduction in the onset and progression of microvascular complications (Davies et al., 2018).

Diabetes is the leading cause of blindness in adults as a result of diabetic retinopathy (Blair, 2016). Diabetic retinopathy has a prevalence rate of 16-35% among diabetics in the Asian countries (Zheng, Ley, & Hu, 2017). Diabetic retinopathy can be divided in to proliferative and non-proliferative, both of which can lead to blindness if the macula becomes involved. The prevalence of diabetic retinopathy is strongly related to the duration of the diabetes (Molinaro & Dauscher, 2017). Prevention of diabetic retinopathy is obtained through tight control of blood glucose level and controlling blood pressure.

Diabetic neuropathy develops as a result of nerve ischemia due to microvascular disease, direct effects of hyperglycemia and intracellular metabolic changes that disturbs nerve function (Molinaro & Dauscher, 2017). About two third of all diabetes patients are affected by some form of diabetic neuropathy (Blair, 2016). The risk of development of diabetic neuropathy is directly proportional to the duration and management of high blood sugar level (Chawla et al., 2016). Patients who have neuropathy experience numbness and pain in various parts of the body hands and leg. There is loss of sensation in the extremities which can lead to complications such as ulcers or loss of fine movement. Diabetic foot is one common presentation seen in patient with diabetic neuropathy which starts as an infected ulcer (Blair, 2016), which ends in requiring amputation of the lower limps in many cases.

Diabetic nephropathy develops due to damage to the small vessels in the glomeruli of the kidneys, affecting its ability to filter waste. Abnormally high level of

albumin in the urine without known kidney disease is seen with patients developing diabetic neuropathy. Approximately 20-40% of patients with diabetes develop chronic kidney disease (CKD) as a result of diabetic nephropathy which can progress to End Stage Renal Disease (ESRD) requiring renal replacement therapy (ADA, 2019d). Diabetic nephropathy is the leading cause of ESDR and 10% of deaths among diabetes patient is as a result of renal failure (Zheng et al., 2017).

2. Macrovascular complications

Macrovascular complications develop as a result of atherosclerosis which causes narrowing of arteries throughout the body. Microvascular disease which developed a result of hyperglycemia promotes atherosclerosis via process of hypoxia and changes in vasa vasorum, thus leading to macrovascular complications (Chawla et al., 2016). Patients with diabetes are likely to develop cardiovascular diseases (CVD) twice as much as non-diabetic patients and have more than doubled risk of death from vascular abnormalities (Zheng et al., 2017). Atherosclerotic cardiovascular disease (ASCVD) is the leading cause of death in patients with T2DM (Davies et al., 2018). Approximately 65% of deaths among pateints living with diabetes are caused by coronary artery disease or cerebrovascular disease (Molinaro & Dauscher, 2017).

Diabetic-related complications contribute to increased morbidity, mortality, health care cost and reduced quality of life of the patients with T2DM. It increases economic burden of diabetes mellitus, because the increase in complications increases the total health cost (Cannon et al., 2018). For example, the health care cost to treat diabetes related complications have increased from €4,688 to €4,949 (by 5.6%) from 2013 to 2015 in Germany (Kähm et al., 2018). The burden of diabetes and its complication is not only restricted to the patients themselves, but it impacts the family members who have to live with the patients. A study by Burns and colleagues (2013) discovered that family members of patients with diabetes experiences high level of distress and fear related to the health status of the patient, which can cause depression in some of the family members. This shows that diabetes is a family illness and it impacts many lives.

Diabetes and its complications have lots of negative impact on the individual, the family and the health system as whole. This indicates that priority must

be given to find ways to effectively manage T2DM, in an attempt to prevent major issues in the future.

Therapeutic Management of T2DM

As people with T2DM increases each year, management of T2DM has become a priority globally. The goal of treatment in T2DM is to control high blood glucose level by keeping the HbA1c level below 7% in all non-pregnant adults, while a tighter control (HbA1c < 6.5%) can be suggested for selected individuals if the target HbA1c can be achieved without the patients experiencing periods of hypoglycemia (ADA, 2019b). Blood glucose is lowered to alleviate the symptoms associated with T2DM such as thirst, frequent urination, blurred vision and fatigue and to reduce long-term complication of diabetes (Davies et al., 2018). A consensus report by the American Diabetes Association (2019) and the European Association for Study of Diabetes (2018) states that management of T2DM involves pharmacological management and lifestyle management which includes medical nutrition therapy, physical activity and management of psychosocial issues. The details of management are as follows:

1. Pharmacological management

Different types of oral medication and injectable insulin are available to help control serum glucose level in patients with T2DM. The choice of glucose lowering medication for each individual depends on glycemic targets, comorbidities, polypharmacy, tolerability and safety of the medicines, complexity of the regimen and patient preferences (Davies et al., 2018) with the target of obtaining optimal glucose level and avoiding hypoglycemia. A combination therapy of more than one medication is used if HbA1c target is not achieved after 3 months of initiation of medication therapy. A consensus report between ADA and EASD guidelines recommends the following glucose lowering medications (Davies et al., 2018):

1.1 Oral medication

1.1.1 Biguanides: Metformin falls in this class of medicine and it acts by reducing the hepatic glucose production. Patient on metformin experiences no hypoglycemia, but may experience mild GI symptoms. Since metformin has good safety profile, low cost and high efficiency in lowering HbA1c, it is the first line medication for management of T2DM.

1.1.2 SGLT2 inhibitors: Canagliflozin and Dapagliflozin are the example of this class of medication. The drugs block reabsorption of glucose by the kidney, thus increasing excretion of glucose in the urine. It also helps in reducing blood pressure and body weight and does not cause significant hypoglycemia. Some of the side effects include genital infection, UTI and volume depletion. The efficacy of this group of drugs depends on glomerular filtration rate (GFR).

1.1.3 DPP-4 inhibitors: The drugs in this group helps in increasing the secretion of insulin and reduces secretion of glucagon. They are well-tolerated and do not result in hypoglycemia. However, some drugs such as saxaliptin may exacerbate health failure resulting in increased frequency in hospitalization. Sitagliptin and Vildagliptin are the drugs in this group.

1.1.4 Sulfonylureas: Glibenclamide and Glipizide are some examples of sulfonylureas. They reduce blood glucose level by increasing insulin secretion from pancreatic beta cells. They are inexpensive and found to be effective in reducing microvascular risks, but can cause hypoglycemia.

1.1.5 Thiazolidinedione: Pioglitazone and Rosiglitazone helps control hyperglycemia by increasing the insulin sensitivity of muscles and fat cells. These drugs pose low risk for hypoglycemia and are cheaper. However, this drug increase edema and increases the risk for heart failure.

1.1.6 Meglitinides: Repaglinide and Nateglinide are the drugs in this group. They work by increasing insulin secretion. They are safe to use in advanced renal disease with cautious dosing. However, they are known to cause hypoglycemia and their cardiovascular safety is uncertain.

1.1.7 α -Glucosidae inhibitors: Drugs in this class (Acarbose and Miglitol) slows down carbohydrate digestion and absorption, thus slows the rise of blood glucose after a meal. The drugs cause frequent GI side effects such as diarrhea.

1.1.8 Bile Acid Sequestrants: Colesevelam is the drug in this class. Its action causes decrease in hepatic glucose production and increase in incretin level. No hypoglycemia is reported from this drug, but it can cause constipation and interfere with the absorption of other medications.

1.1.9 Dopamine-2 agonist: Bromocriptine (quick release) controls hypothalamic regulation of metabolism and helps in increasing insulin sensitivity. It causes a variety of side effects that includes headache, nausea, fatigue and rhinitis.

1.2 Insulin

Insulin is injectable medication to lower serum glucose level. Its mechanism of action includes activation of insulin receptors, increasing glucose disposal and reducing glucose production. Main advantage of insulin over other medications is that insulin lowers glucose in dose-dependent manner to achieve the required glycemic target (Davies et al., 2018). Insulin can be divided into long acting insulin (Detemir, Glargine), intermediate acting insulin (Human NPH), rapid acting insulin (Aspart, Lispro), short acting insulin (Human regular) and premixed. All the types of insulin have very high efficacy. The most common side effect of insulin is hypoglycemia. Another disadvantage of insulin is the need for frequent glucose monitoring and titration of dose to maintain the best efficacy.

The appropriate use of insulin is utmost importance. The effectiveness of the insulin in controlling blood glucose level depends on factors such as correct patient selection, correct administration of the insulin, adjustment of dose according to the changes in diet, physical activity and body weight (Davies et al., 2018). Different formulation of insulin has different timings of onset, peak and duration and it is very important for the patients using insulin to administer insulin correctly (dose, timing and correct technique) in order to improve effectiveness of the therapy and reduce complications.

2. Lifestyle management

Changing the way how a person manage their daily life is an important aspect of people living with T2DM in optimizing their diabetes care. It involves diabetes self-management education and support, medical nutritional therapy, physical exercise and psychosocial issue managements (ADA, 2019c)

2.1 Diabetes self-management education and support (DSMES)

DSMES provides the patients with knowledge and skills to make informed decision, perform self-care and work with collaboration with the health care providers to help improve diabetes care. DSMES had seen to increase the use of preventive and primary health care services (ADA, 2019c).

2.2 Medical nutrition therapy (MNT)

MNT consists of education and support to help the patients with T2DM to adapt and adhere to healthy eating pattern. MNT can reduce serum glucose and cardiovascular risks. There is no one single fixed combination of carbohydrates, proteins and fat intake that can fit all T2DM patients. MNT has to be tailored to an individual depending in their preference, glycemic target and metabolic needs (ADA, 2019c). The goal of MNT is to encourage healthy eating pattern in appropriate quantity and address individual nutritional need rather than focusing on single type of food (ADA, 2019c).

2.3 Physical activity

Any movement that increases energy use is defined as physical activity while exercise is type of physical activity to improve physical fitness. Patients with T2DM should perform aerobic and resistance training regularly (ADA, 2019c). Special considerations should be made for patients with cardiovascular disease [CVD] and other microvascular complications in severe stage while choosing an exercise regime. A wide range of physical activity such as walking, swimming, gardening, yoga, taichi can reduce HbA1c significantly (Davies et al., 2018).

2.4 Psychosocial issues management

The environment in which the patients with T2DM live in and the different emotions they feel can influence the way they live with their diseases. Psychological and social issue can reduce the ability of the patients and their family to self-manage T2DM (ADA, 2019). A collaborative and patient centered psychosocial care should be provided to all patients with T2DM as a part of routine care (ADA, 2019). Health care providers should routinely access psychosocial issue among patients with T2DM using standards tools and arrange a referral to mental health care provider when the patient show positive findings such as overall stress related to work-life balance, diabetes distress, anxiety, depression and cognitive dysfunction (ADA< 2019).

The management of T2DM is achieved by combination of pharmacological and non-pharmacological interventions. This is done by collaboration among the patients, family and different groups of health care professions. However, all the care

and management provided are patient-centered and each care plan is uniquely individualized.

Self-management in patients with T2DM

Management of many chronic diseases has shifted from hospital-based to home-based or community-based care. Effective management of the diseases focuses on the self-management of the diseases by the patient and family with support from the health care professionals (Ryan & Sawin, 2009). Patients are responsible for adhering to recommendations made by the healthcare professional regarding medications and sustaining healthy lifestyle changes.

Definition

Self-management refers to activities performed by the patient every single day to control the effect of disease on their health and to prevent further illnesses and complications in the future (Adu et al., 2019). Neither curative model nor compliance model seem to be effective in diabetic care but the choices made by diabetics each day have a larger impact on the outcome (reducing HbA1c and preventing complications) compared to prescribed care from the health care providers (Baghbanian & Tol, 2012). As people living with chronic diseases increase and health care becomes home-based care, the need to manage this chronic condition and engage in behavior that promote health have become the responsibility of the concerned individual and the family (Ryan & Sawin, 2009). Self-management requires integrated effort from the individual, family and the health care person and it is seen as an important component of treatment of person with chronic illness (Udlis, 2011).

In self-management, the individuals control are responsible for managing healthy behavior by engaging purposefully in carrying out learned behavior to achieve set goals (Ryan & Sawin, 2009). Technical skills and problem solving competencies to make adjustment according to changing situations is required for an individual to self-manage chronic diseases effectively (Baghbanian & Tol, 2012). Udlis (2011) identifies five dimensions that make up the concept of self-management: Resources, knowledge, adherence to a plan, active participation and informed decision making. Decision making skills related to daily illness management depends on the

knowledge, resources and the experience gathered through active participation in previous situation requiring problem solving. Lorig and Holman (2003) divides self-management into three sets of tasks. The first task is the medical management which consists of taking prescribed medications or adhering to special kind of diet. Role management requires people to adapt the way they do their regular activities like cleaning house less often or changing the kind of sports they play according to health needs. The final task is the emotional management where the patient needs to manage emotions such as fear, frustration and stress every day, related to illness and illness management (Lorig & Holman, 2003).

Effective management of T2DM emphasizes on diabetes self-management (DSM). It requires commitment and input from the healthcare providers, but the most important person in managing T2DM are the patients themselves. DSM has been seen effective on controlling serum glucose level. A study with 295 patients with T2DM found that improved diet ($R^2 = .46$, $\beta = -0.20$, $p < .01$) and medication adherence ($R^2 = .46$, $\beta = -.13$, $p < .05$) can significantly predict improvement of HbA1c at 6 months (Houle et al., 2015). A meta-analysis report by Cheng and colleagues (2017) showed that interactive self-management interventions which includes goal setting and providing feed-back resulted in statistically significant reduction in HbA1c. A study among 401 Thai patients with T2DM found that self-management activities was negatively associated with HbA1C ($\beta = -2.05$, $p < .001$) (Thojampa & Mawn, 2017).

In the current study, self-management is defined as everyday practice of glucose management by visiting the health care settings periodically, taking diabetic medications, controlling dietary intake and participation in physical activity by patients with T2DM with the aim to control blood sugar level (HbA1c) and prevent diabetes-related complications.

The Individual and Family Self-Management Theory [IFSMT]

The individual and family self-management theory is a descriptive mid-range theory proposed by Ryan and Sawin (2009). The theory describes self-management [SM] that focuses on individuals, individuals and caregiver or a family unit as a whole. According to the theory, the individual or/and family takes the responsibility of managing their illnesses, which is accomplished in collaboration with healthcare providers. Health related behaviors are learnt and then incorporated

into the individuals and family's daily functioning, to self-manage a chronic disease (Ryan & Sawin, 2009).

Ryan and Sawin (2014) describes self-management as a complex concept made up of three different dimensions- context, process and outcome. The factors that make up the context dimension affects the process of self-management directly or indirectly impacts the outcome. Improving the self-management process will improve the outcomes. Interventions for improving self-management are aimed either at improving the contextual or the process factors. The dimensions of self-management according to IFSMT are described below:

1. Context dimension

This dimension consists of risk or protective factors that can affect the process or the outcome of self-management. The risk and protective factors are divided into three groups: Condition specific factors, physical and social environmental factors and the individual and family factors (Ryan & Sawin, 2009). Condition specific characteristics include the nature and complexity of a disease and the treatment regime. The degree of complexity and severity of each disease is different which requires different levels of management that results in varying difficulty and effectiveness while carrying out self-management activities. The physical or social environment includes factors such as easy accessibility to healthcare, availability of transportation to go seek health care whenever necessary or the cultural background which encourages seeking help for managing one's condition. The third group is the individual and family factors which include the unique characteristics of individual patients and their family such as age, learning ability, literacy and family structure and functioning. All of these factors can affect the way patients and families learn to manage their illness and how they actually manage their illness.

2. Process dimension

The patient and family engage themselves in learning new behaviors and skills which in consistent with what they are required to do to manage their illness. According to Ryan and Sawin (2009), individuals are more inclined to take up self-management if they have enough information to develop knowledge and health belief in line with the required health behavior. With enough knowledge, self-efficacy in

carrying out a certain health behavior develops and increases. The self-management process is also influenced by self-regulation skills and ability which includes how well the patients can self-evaluate, set goals and make decisions related to health behavior changes needed to manage disease based on the information they have gathered (Ryan & Sawin, 2009). The ability to self-regulate and control emotions related to diseases and the management regimes also influences the self-management process. Another important component in the process dimension is the presence of social guidance while learning how to self-manage a condition. It consists of social influences, different kinds of social support (emotional, instrumental and informational) and the collaboration between the patient, family and the healthcare professional in taking decisions and making plans on how best to self-manage their disease. Patients learn the behaviors that are required of them with help of support from their social environment.

3. Outcome dimension

The outcome in IFSMT is divided into proximal and distal outcome. The proximal outcome is measured as self-management behaviors of individual or family which consists of patients and family engaging in the health care activities which are specific to each disease such as dietary control or physical activity, adhering to recommended medications and managing symptoms when necessary. Cost of health care services is also one proximal outcome according to this theory. Distal outcome is achieved when proximal outcomes are successfully achieved. Final health status, quality of life and cost of health make up the distal outcomes.

The IFSMT along with support of evidences from the literature reviews about diabetes self-management will help to guide this study.

Self-management among patients with T2DM

Diabetes self-management is the key to effective management of T2DM. It mainly includes changing behaviors and lifestyle such as diet planning, maintaining regular exercise routine, blood glucose monitoring and adherence to medications (Abubakari et al., 2016). Self-management also involves achieving the skills to undertake the self-management activities and to make informed decision about their treatment regime (Baghbanian & Tol, 2012). Psychosocial issue management such as stress management is also one important part of diabetes self-management (ADA,

2019). However, for this study, diabetes self-management is represented by activities carried out by patients with T2DM, which includes effective glucose management by visiting the health care centers periodically, adhering to glucose-lowering medications, dietary control and adherence to regular physical activity. These activities will be explored in this study as a component of self-management because literature reviews among Bhutanese diabetes patients have shown sub-optimal level of these healthy behaviors, which might be causing ineffective control of blood glucose level among this population.

1. Glucose management using glucose lowering medications

Marked hyperglycemia is associated with symptoms of frequent urination, thirst, blurred vision and recurrent infection and in the long run lead to diabetic related complication. Good glycemic management can reduce the onset and progression of microvascular complication of diabetes (Davies et al., 2018). For people with T2DM, glucose monitoring is the key to achievement of glycemic target. Glycemic management is mainly assessed with HbA1c test and the treatment target is HbA1c < 7% (ADA, 2019; Davies et al., 2018). Proper glucose level monitoring can evaluate individual response to therapy and guide the patient and the health care provider to adjust other measure such as diet control, physical activity and adjustment of medications. ADA (2019) recommends getting HbA1c level tested at least two times in a year for T2DM patients who achieved glycemic target but people with unstable serum glucose or who do not achieve the target have to get tested four times in a year.

Glucose management or lowering the blood glucose level is achieved with glucose lowering medications. Patients with T2DM either receives insulin injection subcutaneously or several classes of oral medications or combination of insulin and oral medications to maintain the target HbA1c (Blair, 2016). A retrospective study among 32,634 diabetes patients found that, in one year, there was a reduction in HbA1c level by 1.14% in adherent-to-medication group, while there was only 0.75% reduction in the HbA1c level in non-adherent to medication group (Farmer et al., 2016). Similarly, in another study, 46.7% of diabetes patients with good adherence to medication had controlled HbA1c but only 16.9% of diabetes patients with poor medication adherence achieved good glycemic control (Hammad, Mohamed Noor, &

Syed Sulaiman, 2017). Many studies show that diabetes medication adherence among diabetes patients are negatively related to HbA1c value and glucose management (Huang, Shiyanbola, & Smith, 2018; Osborn, Mayberry, & Kim, 2016; Tominaga et al., 2018). Therefore, glucose management is one activity which the patients can carry out on their own to self-manage T2DM and prevent many complications associated with it.

A systemic review of 27 studies found that the prevalence of adherence to diabetes medications ranged from 38.5 to 98.1% (Krass, Schieback, & Dhippayom, 2015). A study in Malaysia showed that 53% of the diabetics in the study were non-adherent to diabetes medication (Ahmad, Ramli, Islahudin, & Paraidathathu, 2013). All T2DM patients in Bhutan have access to free diabetes care services and free diabetic medications in health care centers of Bhutan. However, a study showed that there was high percentage of loss of follow up among the patients (Zam et al., 2015). A study among patients with T2DM receiving insulin therapy in Bhutan showed that, adherence to medication was found to be low to medium in 61.8% of the patients studied (Dorji et al., 2018). Another study among the Bhutanese patients with T2DM found that only 60.2% reported of never missing a dose of diabetic medicine in the last three month (Dorji, Deenan, & Masingboon, 2017).

Effective glucose management by adhering to glucose-lowering medication is one important activity that is a part of diabetes self-management, but evidences indicate that Bhutanese diabetics are doing poorly in adhering to diabetes medication and control glucose.

2. Dietary control

The most challenging part of treatment for patients with T2DM is to decide on what kind of food to eat and what to avoid eating during different situations. There is no definite combination of carbohydrate, protein or fat that is ideal for all patients with T2DM to get calories as required. Each diet treatment for diabetes patients should be tailored to need of an individual person (ADA, 2019c). Canadian Diabetes Association [CDA] guidelines (2018) recommends that patients with T2DM should get 45% to 60% of total energy required from carbohydrates, 15% to 20% from proteins and 20% to 30% from fats (Sievenpiper, Chan, Dworatzek, Freeze, &

Williams, 2018). The range will allow individualization of nutrition therapy according to patient's preferences and goal of treatment.

Monitoring carbohydrates and taking into account the response of glucose regulation to carbohydrate intake is crucial in managing blood glucose level. The recommended dietary allowance for carbohydrates is no less than 130g/day for adult men and women (Sievenpiper et al., 2018). ADA (2019) recommends that patients with T2DM should eat carbohydrates with less glycemic load which is found to reduce HbA1c by 0.2% to 0.5%. CDA nutrition guidelines (2018) recommends eating food with lower glycemic index such as legumes, food grains, fruits and vegetables, to help optimize glycemic control (Sievenpiper et al., 2018). There is no need to reduce the daily level of protein intake (which is recommended at 1-1.5g/kg/day) if it represent 15-20% of total energy intake in a patient with T2DM without chronic kidney disease (ADA, 2019c; Sievenpiper et al., 2018). However, protein should be restricted to 0.8/kg/day in a T2DM patient with CKD. The ideal amount of fat intake for patient is not specified but the quality of fat is more important than the total amount of fat intake (ADA, 2019c; Sievenpiper et al., 2018). The focus is on the reduction of saturated fat and dietary cholesterol and replaced with unsaturated fat such as olive oil, canola oil, avocados and varieties of nuts.

A systemic review on medical nutrition therapy (MNT) for diabetes patients concluded that MNT is effective in reducing HbA1c level approximately by 0.3-2% in patients with T2DM (Franz et al., 2017). Diet low in carbohydrate and fat content was able to reduce HbA1c by an average of 2.6% while high carbohydrate- high fat diet reduced HbA1c level only by average of 1.9 % (Tay et al., 2014). Studies show that some specific dietary pattern such as the Mediterranean diet, vegetarian diet, DASH (dietary approach to stop hypertension) diet and the Nordic diet, which mostly focuses emphases on consumption of legumes, fruits and vegetables are effective in improving glycemic control (ADA, 2019c; Sievenpiper et al., 2018).

Dietary behavior among the Bhutanese is grounded in culture, where the main staple is rice and potatoes and it is eaten in all three meals of the day. Bhutanese diabetics do not limit the amount of rice as required because they are not well acquainted with calorie content in their meal and is not familiar with calorie counting (Om, Deenan, & Pathumarak, 2013). Bhutanese people also consume huge amount of

dairy products like cheese and butter, as evidenced the report which shows that they spend the highest on these products monthly (NSB, 2019). Calorie counting is a necessary skill for patients with T2DM who have to make sure that they are getting the required amount of calorie from correct class of food. A survey by Ministry of health [MOH] (2014) in Bhutan as per the STEPs approach of WHO found that only 33.1% of Bhutanese people eat the recommended 5 servings of fruits and vegetables per day. Another survey shows that only 43% of diabetes people in Bhutan consume fruits in a week (Wangdi & Jamtsho, 2018). Dorji and colleagues (2017) studied the eating behavior among Bhutanese patients with T2DM, which consisted of recognizing caloric needs, selecting healthy food, meal planning and managing dietary behavior challenges and found that the eating behavior was at the moderate level, which resulted in higher HbA1c level. The evidences indicate that Bhutanese patients with T2DM are not following the recommended dietary guidelines.

3. Physical activity

Physical activity is another important component of diabetes self-management. Physical activity can help people with diabetes achieve many goals such as cardiorespiratory fitness and improved glycemic control, blood pressure and weight control. Physical activity is referred to all kinds of movement that increase energy use and it is a very important part of treatment for diabetes patients (ADA, 2019c). Diabetes patients tend to lack physical activities due to many reasons such as lack of confidence, fear and difficulty in exercising or lack of motivation and comfort (Boniol et al., 2017) and also due to presence of many other comorbidities such as cardio vascular diseases and arthritis which reduces mobility. Physical activity helps in controlling hyperglycemia by reducing insulin resistance and causing considerable weight loss (Najafipour et al., 2017). A meta-analysis of randomized trials found that an increase in 100 minutes of physical activity among the T2DM and pre-diabetes patient reduced the level of HbA1c by 0.16% (Boniol et al., 2017). An exercise intervention for duration of 8 weeks among the patient with T2DM was seen to lower the HbA1c by an average of 0.66% (ADA, 2019c).

It is recommended by the American Diabetes Association and Canadian diabetes association (CDA) that adult patients with DM should perform both aerobic exercise and resistance training regularly (ADA, 2019c; Sigal et al., 2018). The initial

goal should be 30 minutes of exercise in a day and gradually progress in intensity, frequency and duration aiming at 150 minutes of moderate intensity exercise in a week. Diabetes patients should engage in 2 to 3 sessions of resistance exercise on alternate days (ADA, 2019c). In addition to achieving physical activity goals, patients with T2DM should reduce the time they spend idle such as prolong sitting (ADA, 2019c; Sigal et al., 2018).

The average level of physical activity among the Bhutanese patients with T2DM is found to be inadequate. The national survey (2014) by Ministry of health [MOH] found that though only 6.4% of the adult population did not fulfill the WHO's recommendation on exercise, 77.8% of Bhutanese people reported low levels of total physical activity, 10.5% reported moderate level of total physical activity, and 11.7% reported high level of total physical activity. Physical activity among the Bhutanese adult mainly are work and transport related and it was found to be more adequate among the people dwelling in rural places compared to urban areas (MOH, 2014). A self-report by the Bhutanese diabetes patient showed that only 34.7% of them engage in vigorous physical activities (Wangdi & Jamtsho, 2018). In Bhutan, diabetes patients had moderate level of physical activity and it was found to be inversely correlated ($r = -.37$, $p < .05$) with HbA1c (Dorji et al., 2017). These few available evidences point out that Bhutanese diabetes patients might not be achieving the recommended daily dose of exercise as recommended by the ADA.

Effective glucose management, correct dietary behavior and adequate physical activity are found to be related to reducing HbA1c, which is the main goal of treatment for T2DM. Controlled DM (HBA1c< 7%) is associated with lower rate and progression of diabetic-related complications. The treatment regimen of T2DM is focused on optimal management of glycemic level by using different medications and changing lifestyle which includes adherence to healthy eating behavior and regular physical activity. Therefore, in this study, DSM is defined as carrying out effective glucose management, exhibiting correct dietary behavior and adherence to adequate physical activities.

Factors influencing self-management in patients with T2DM

Diabetes self-management (DSM) in T2DM can be affected by variety of factors ranging from sociodemographic factors to individual factors (Dao-Tran et al., 2018; Gunggu et al., 2016; Kurnia et al., 2017; Ryan & Sawin, 2009). Diabetes patients with higher level of self-efficacy, more knowledge about T2DM, better understanding their disease condition show optimal DSM and optimal glycemic control (Zulman, Rosland, Choi, Langa, & Heisler, 2012). According to the IFSMT by Ryan & Sawin (2009), these factors have impact on diabetes self- management directly or indirectly. The factors can be changed and intervened with, so that the desired and effective self-management among patient with T2DM can be achieved (Ryan & Sawin, 2009).

According to the literature reviews and the IFSMT, the following factors - health literacy, self-efficacy, diabetes distress, and social support are found to have an impact on the diabetes self-management:

Health literacy

The concept of healthy literacy was first introduced by Simonds (Simonds, 1974). As the time passed by, the definition of health literacy have changed from the basic ability to read and write to ability of a person to collect and analyze those health information to make decisions related to health and wellbeing (Edwards, Wood, Davies, & Edwards, 2012). Health literacy can occur at three level - functional, communication and critical health literacy and progression from functional level to critical level require cognitive development and gathering of information related to the particular condition (Nutbeam, 2000). As a patient, it is important to know how to read and understand medicine labels, appointment slips, complete health forms, follow instructions for diagnostic tests, and understand other essential health-related materials (Andrus & Roth, 2002). Patients with low healthy literacy have limited knowledge and information about their health which will in turn limit them to self-manage and make decision about their health (Edwards et al., 2012).

In the IFSMT by Ryan and Sawin (2009), the ability of the patient to read and write health information is affected by the general literacy level of the patient, which is a unique characteristic of individual patients. However, health literacy involves the process dimension, where the patient and family have to gather and

analysis the health information they receive, to make decision and set goals. Patients need the ability to collect information from different sources and use that information to help change behavior and involve in self-management activities, with the aim to improve health status (Ryan & Sawin, 2009).

Many studies that explored the health literary among patients with T2DM showed that the prevalence of adequate health literacy level ranged from 14 to 40% and level of limited health literacy among patients with T2DM varied vastly between countries ranging from 7.3% to 82% (Abdullah, Liew, Salim, Ng, & Chinna, 2019). Literature about association between health literacy and the activities related to self-management are divided and inconsistent (Fransen et al., 2012). A study by Niknami and colleagues (2018) found that health literary can predict 22.5% of variance in difficulty in diabetes self-management activities which included eating right food at right time, exercising regularly, monitoring blood sugar, remembering to take medicine and going for doctor's appointment. A study in Belgium showed that health literacy can significantly predict ($R^2 = .32$; $\beta = .30$, $p < .01$) diabetes self-management (Schinckus et al., 2018). In another study in Indonesia, self-management in older diabetes patient was found to be significantly associated ($r = .25$, $p < .05$) with diabetic literacy (Rachmawati et al., 2019). A systematic review on effectiveness of health literacy-oriented program on physical activity found that the programs were able to increase the frequency and duration of physical activity (Lam & Leung, 2016). In addition, results from the study by Van der Heide and colleagues (2014) showed that low health literacy was significantly associated with low physical activity and higher HbA1c level but it was not significantly associated with monitoring of glucose level or smoking habit. On the other hand, a study among patients with T2DM in Australia showed that health literacy cannot predict diabetes self-management significantly (Maneze et al., 2016).

From the review, it was found that there is an inconsistency across the studies regarding the predictive relationship between health literacy and diabetes self-management among patients with T2DM. In this study, it was expected that health literacy would be able to predict DSM significantly as evidence by some study.

Self-efficacy

Patients with T2DM are given much information about their disease and treatment regime and taught many skills which are mandatory in management of the disease. Management of T2DM becomes effective if patients with T2DM are able to carry out activities that are recommended for them. Self-efficacy is a concept developed from the social cognitive theory which is defined as the person's belief in his capacity to controls events that have influence over their his life (Bandura, 1994). According to Bandura (1994), self-efficacy can develop from four sources of information which includes task mastery, vicarious experience, verbal persuasion and emotional arousal. Self-efficacy in diabetes self-management is the confidence in the skills and ability of patients with T2DM to undertake the activities that is required to maintain glycemic control and prevent complications. Diabetes self-management requires major behavior changes in order to line-in with the recommended management guidelines. People who have high self-efficacy feel they are competent to carry out tasks and sees the complex and difficult tasks as challenges to overcome (Bandura, 1994). Therefore, patients with T2DM who have high self-efficacy are likely to carry out self-management activities more effectively and enthusiastically. This leads to increased self-initiation and completion of diabetes self-management activities, thus improving glycemic control (Bandura, 1994).

According to the Individual and Family Self-Management Theory by Ryan & Sawin (2009), self-efficacy is an important process factor which can have influence on the self-management activities in the outcome dimension. Self-efficacy can develop and improve through acquisition of knowledge when diabetes patients receive information about T2DM and the treatment regimens that are available. This knowledge gained encourages them to engage in activities that are recommended for management of their disease, thus improving diabetes self-management.

Many cross-sectional studies suggest that self-efficacy is associated with better diabetes self-management (Jiang et al., 2019). A study among 265 patients with T2DM in hospitals in China showed that self-efficacy was had the strongest direct effect on self-management ($R^2 = 25.4$ %, $\beta = .55$, $p < .001$) and self-efficacy also had an indirect effect on self-management by mediating the effect of diabetes distress and knowledge on self-management (Jiang et al., 2019). The results from a

study by Lalnuntluangi, Chelli, and Padhy (2017) showed that self-efficacy was significantly corelated to glucose management, dietary control, physical activity, health care and total self-management ($r = .32$, $p < .05$; $r = .50$, $p < .05$; $r = .39$, $p < .05$; $r = .38$, $p < .05$; $r = .54$, $p < .05$ respectively). The same study showed that self-efficacy can predict self-management ($R^2 = .30$, $\beta = .54$. $p < .001$) significantly among T2DM patients in India (Lalnuntluangi et al., 2017). A study by Kim, Song & Kim (2019) among Korean diabetes patients receiving insulin therapy found that self-efficacy can significantly predict diabetes self-management ($R^2 = .42$, $\beta = .53$, $p < .001$). In another study, self-efficacy for diabetes management was significantly associated with blood glucose testing ($R^2 = .09$, $\beta = .31$, $p < .05$), exercise ($R^2 = .09$, $\beta = 0.31$, $p < .05$) and adherence to healthy diet ($R^2 = .26$, $\beta = 0.51$, $p < .001$) (Wooldridge & Ranby, 2019). Many other studies among patients with T2DM in different countries show that self-efficacy is a strong predictor of either one of the component of diabetes self-management or the total diabetes self-management (Dao-Tran et al., 2018; Gunggu et al., 2016; Kurnia et al., 2017; Phetarvut, Watthayu, & Suwonnaroop, 2012; Schinckus et al., 2018).

All the studies about self-efficacy and DSM show that self-efficacy is a strong predictor of DSM among patients with T2DM.

Diabetes distress

Patients with T2DM are faced with the challenge to do several activities such as routine self-management of T2DM, periodic visit to the doctor, adhering to complex medication regimes on daily basis. Diabetes distress refers to the various range of negative psychological responses which arise due to the emotional burden and the worries specific to individual's experience of living with diabetes and having to manage it (ADA, 2019c). These challenges impact the patient mentally, which can reduce the self-efficacy of the patients thus leading to reduced DSM. A meta-analysis demonstrated an overall 36% prevalence of diabetes distress in patient with T2DM (Perrin, Davies, Robertson, Snoek, & Khunti, 2017). There are no reports of diabetes distress among the Bhutanese T2DM patients to compare to the world prevalence. However, a study among Bhutanese patients with chronic illness (30.8% of study sample had T2DM) showed that 41% of the patients had depression (Tshomo & Chaimongkol, 2019). Diabetes distress is found to negatively impact DSM, which

occurs because diabetes distress lowers self-efficacy and lowers the perception of patient's ability to control diabetes (ADA, 2019c; Gonzalez et al., 2015). ADA (2019) recommends routine evaluation of diabetes distress because it significantly impacts medication adherence and results in poorer dietary and exercises behaviors and lower self-efficacy. Diabetes distress, which is a form of stress specific to people with diabetes is also found to be moderately related to poor glycemic control, because stress can increase glucose level though physiological mechanism (Hilliard et al., 2016). This leads to increasing difficulty in controlling blood sugar level among T2DM patients presenting with diabetes distress.

According to IFSMT by Ryan and Sawin (2009), effective control of emotions can have an impact on self-management activities and self-management outcomes. Worries and fears related to disease and treatment regimens needs to be addressed appropriately, in order to improve self-management of a disease.

Diabetes distress was found to be significantly and negatively associated with dietary control ($r = -.41$, $p < .001$), physical activity ($r = -.43$, $p < .001$) and total self-management ($r = -.48$, $p < .001$) among patients with T2DM in Singapore (Quek et al., 2019). In another study, diabetes distress was found to predict medication non-adherence significantly ($\beta = -4.19$, $se = 1.47$, $p < .01$) (Gonzalez et al., 2015). A study among low income patients with T2DM showed that patients with high diabetes distress has less adherence to medications compared with patient with low diabetes distress level significantly ($p < .001$) and patient with diabetes distress have significantly higher level of HbA1c (Pandit et al., 2014). A longitudinal study among diabetes patients over the age of 50 showed that diabetes distress was significantly associated with self-management ($r = -.41$, $p < .01$), which lead to the perceived worsening diabetes status after one year (Zulman et al., 2012). However, Schinckus and colleagues (2017) found that diabetes distress do not predict diabetes self-management directly but moderated the influence of health literacy on diabetes self-management, thus making the positive impact of health literacy less important. A qualitative study among diabetes patients identified diabetes distress as a barriers to effective diabetes self-management (Adu et al., 2019). On the other hand, a study by Kurnia and colleagues (2017) found that diabetes distress did not have any significant association diabetes self-management. The literature review on diabetes distress and

diabetes self-management among patients with T2DM shows contrasting results in different studies, thus making it a need to study the variables in Bhutanese diabetic population for this study.

Social support

One complementary strategy to contribute to individual self-management is to improve the support patients receive from the people around them. Social support is the assistance provided by friends and family to a person in need, which can be informational support, appraisal support, emotional support or instrumental support (Langford et al., 1997). Social support can come from different sources including friends and family which are informal support and health care professional which are formal support (Strom & Egede, 2012). Social support is known to influence physical and mental health and health behaviors (Lepore, 2012). People on social network can help the patients identify the source of the support they require for managing T2DM or it can happen when the patients copy healthy behaviors of the person who is able to effectively manage T2DM (Koetsenruijter et al., 2016). Social support can improve self-management and benefit patients' health by reducing the impact of stress, increasing self-efficacy, and bringing about change in negative health behaviors (Miller & Dimatteo, 2013).

Ryan & Sawin (2014) considers social support as an important part of the self-management process. Social support helps in improving knowledge and increasing self-regulation skills among the patients. An engagement in self-care behavior supported by knowledge gained from social facilitations and support helps the patients to indulge themselves in effective self-management (Ryan & Sawin, 2009).

A systemic review by Strom & Egede (2012) found that higher levels of social support increased diabetes self-management, medicine adherence and adaption of healthy and nutritional lifestyle and improved clinical outcomes (HbA1c and blood pressure). A study among 400 patients with T2DM in Malaysia found that family support could significantly predict diabetes self-management ($R^2 = .13$, $\beta = .20$, $p < .01$) which included diet habits, exercise, medication compliance and foot care (Gunggu et al., 2016). Another study in Vietnam found that family and friend support ($\beta = .13$, $p < .001$) and support from health care professional ($\beta = 0.43$, $p < .001$)

directly influenced self-management in T2DM patients (Dao-Tran et al., 2018). Haines, Coppa, Harris, Wisnivesky & Lin (2018) compared self-management among diabetes patients with partners and without partners and found that diabetes patient who have their partners to help them had significantly higher rate of adherence to their diabetes medication ($p = .03$) than those who have no partners. The study also found non-significant increase in diet and exercise adherence. From the literature review, it is seen that presence of higher level of social support can get positively influence diabetes self-management among patients with T2DM.

From the literature review, the four variables chosen are found to influence self-management of DM type 2 in varying degrees in many studies. Therefore, these variables were used for this study to determine whether all the variables combined can predict diabetes self-management in Bhutanese people with T2DM.

Summary of the literature review

The ultimate goal of treatment in type 2 DM is to maintain optimum serum glucose level, indicated by blood HbA1c level less than 7% and prevent long-term complication related to hyperglycemia. This goal can be made possible by empowering patients with T2DM to self-manage their illness. To effectively manage their illness, T2DM patients need to perform activities (glucose monitoring and management, adhering to healthy diet and regular physical activity) with collaboration with family, friends and healthcare providers. Successful self-management of T2DM can improve patient outcomes and reduce the burden of the disease on the health care system.

From the literature review, health literacy, self-efficacy, diabetes distress, and social support were found to influence diabetes self-management among T2DM patients directly or indirectly, which is supported by the IFSMT by Ryan & Sawin (2014). However, few inconsistencies in the relationship among few variables (such as relationship of health literacy and diabetes distress with DSM) across the studies were also seen. This can be due to the different setting where the study was done or due to use of different instruments in measuring the variables. Information about diabetes self-management among Bhutanese T2DM patients is lacking even though there are evidences that blood glucose control is not optimal among patients in this

population. This study addressed this lack of information, which could give way for many other studies and projects focusing on improving the diabetes care provided to the patients with T2DM in Bhutan.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter presents the research methodology of the study which includes information of research design, population and sampling, setting of the study, research instruments, protection of human rights, data collection, and data analysis process used in the study.

Research design

A predictive correlational study was used for the study. The objectives of the study were to explore diabetes self-management and to examine whether self-efficacy, health literacy, social support, and diabetes distress can predict diabetes self-management of among adult Bhutanese patients with T2DM.

Population and sample

Population

The population of the study was adult patients with T2DM who came to attend the diabetes outpatient department (OPD) at Jigme Dorji Wangchuk National Referral Hospital [JDWNRH] in Thimphu, Bhutan. The information collected from this diabetic OPD in JDWNRH showed that approximately 500 to 600 diabetes patients visit this OPD every month.

Sample

The sample for the study was selected from the adult patients with T2DM who came to attend the diabetes OPD at JDWNRH in Thimphu, Bhutan as per the following inclusion criteria.

1. ≥ 18 years of age, ≤ 60 years old.
2. Diagnosed with T2DM for minimum of 6 months.
3. Have the ability to read and write basic English
4. Have good orientation to place and time and has no history of mental illness.

5. Have no major physical disability such as blindness or reduced physical mobility requiring assistant.

Sample size

Sample size was calculated using the G*power 3.9.1.4 (Faul, Erdfelder, Buchner, & Lang, 2009). The small effect size of .12 was used to increase the sample size for generalization (Gray, 2017), the alpha of .05 and power of .80 was applied for computing the sample size. The power analysis showed that appropriate sample size for this study was to have at least 105 participants.

Sampling technique

All diabetes patients who come to the diabetic OPD of JDWNRH were informed about the study that would be conducted in the diabetes OPD by posting flyers on the notice board of the diabetes OPD and displaying poster in the hospital. Informational flyers calling for volunteers to be part of the study were distributed to the patients. When the patients who want to be part of the study contacted the diabetic nurse, the nurses directed the patients to the researcher. Eligible volunteers were recruited for the study after getting their informed consent. The queue number of the volunteers were placed in a container and randomly drawn to recruit, maximum of 15 participants in a day, two days in a week. When the participants reach the required sample size, the recruitment was stopped for next phase of the study.

Setting of the study

The study was conducted at the diabetes OPD of JDWNRH which is located in Thimphu, Bhutan. The diabetes OPD is open two days in a week (Tuesdays and Thursdays) which provides services to average of 50-60 patients in a day. Most of the patients are accompanied by a member of their family to visit the clinic. The clinic is run by two nurses under a physician in collaboration with the dieticians. Diabetes patients are expected to visit this OPD every 2 to 3 months depending on their glycemic control level. The physician in the OPD is mostly responsible for adjusting medication doses and addressing the health problems and concerns raised by the patients and family. The nurses provide routine basic health education to the patients and family members on general self-care such as providing information about how to take their medications (dosage and frequency), or reminder about what kinds of food

to eat or avoid and reminder about the next appointment with the physician. The nurses provide this information when the patients are waiting for their turn to meet the physician. They also do basic physical examination such as measuring vital signs, body weight, checking of the foot and managing patient referral to other departments such as the renal or the ophthalmic department as needed.

Research instruments

The data for the study were collected using six questionnaires which were all in English. The details of the research instruments are as follows:

1. The demographic data questionnaires [DDQ]

DDQ which is specific to this study was developed by the researcher. There were two parts in the DDQ. Part 1 of the DDQ contained information about the characteristics of the participants which included age, sex, marital status, education level, income and living arrangement at home. Part 2 of the DDQ contained health information of the participants which included the duration of diagnosis, current treatment regime including diabetic medications and medications for other health conditions (if present), laboratory reports showing the glycemic control status (HbA1c, FBS and 2 hours post prandial blood sugar level) and the presence of co-morbidities and diabetic related complications. Part 1 of the DDQ was self-reported by the participants and the researcher collected the information for part 2 from the medical record of the patients.

2. The diabetes self-management questionnaires [DSMQ]

The DSMQ developed by Schmitt and colleagues (2013) was used to measure self-management among the patients with T2DM in this study. The content of the instrument is based on literatures which showed that these factors are confirmed or promising predictors of glycemic control (Schmitt et al., 2013).

The instrument contains 16 items divided into four subscales. The glucose management subscale consists of 5 items (item 1,4, 6, 10, 12), dietary control subscale has 4 items (item 2,5,9,13), physical activity subscale has 3 items (item 8,11,15) and the health care use subscale has 3 items (items 3,7,14) (Schmitt et al., 2013). One item (item 16) is included only in the ‘sum score’ and doesn’t fall into a sub category. Depending on what is considered good self-management activity, 7 items are worded

positively (item 1, 2, 3, 4, 6, 8, 9) while 9 items are worded negatively (items 5, 7, 10, 11, 12, 13, 14, 15, 16). The scale showed good internal consistency where Cronbach's α was .84 for 'sumscore', .77 for 'glucose management', .76 for 'physical activity', .77 for 'dietary control' and .60 for 'health care use' (Schmitt et al., 2013). In another study by Schmitt and colleagues (2016), Cronbach's α was .83 for 'glucose management', .74 for 'physical activity', .78 for 'dietary control' and .72 for 'health care use'.

The respondents rate how each item applied to them on a 4-point Likert type scale (0 = doesn't apply to me, 1 = applies to me to some degree, 2 applies to me to considerable degree, 3 = applies to me very much). Negatively worded items should be reversed scored so that higher score indicate better self-management. The score can be given for each subscale or can be summed up for the whole instrument as a 'sum score'. Score from each item (as subscale or total sum score) are added up as total raw score and the raw score is converted to score ranging from 0 to 10 using a formula (Raw score/ Theoretical maximum score * 10). A score of 10 shows the highest rating of the self-managing activities and higher score shows optimal diabetes self-management (Schmitt et al., 2013). If the "not required as part of treatment" for some items are marked, the scoring is adjusted by reducing the theoretical maximum by 3 points for each marked items, while calculating the scores (Schmitt et al., 2013).

3. The diabetes management self efficacy scale- UK version [DMSES-UK]

The DMSES-UK developed by Sturt, Hearnshaw and Wakelin (2010) was used to measure the self-efficacy of diabetes management among patient with T2DM in this study. This scale was adapted from 20-item Dutch/US DMSES, which is used to measure individual's efficacy for engaging in diabetes self-management activity (Sturt, Hearnshaw, & Wakelin, 2010), which was developed based on Bandura's concept of self-efficacy. DMSES- UK measures the confidence of the patient to carry out activities that are part of diabetes self-management.

The DMSES- UK have 15 items and it is reported as one overall score (Sturt et al., 2010). Cronbach's α for the scale was .89 and good criterion and construct validity was demonstrated when testing on 175 participants (Sturt et al., 2010).

Each item is scored between 0 to 10 (0-1 cannot do at all, 4/5 Maybe yes, maybe no, 9/10 certain can do), which can give a total score range from 0-150, where higher score showed higher self-efficacy (Sturt et al., 2010). If a patient score between 0 to 50, they are grouped as having low self-efficacy, score of 51 to 100 shows moderate self-efficacy and score of 101-150 shows high self-efficacy. (Sturt et al., 2010).

4. The functional, communicative and critical health literacy scale [3-level HL scale]

The 3-level HL scale was developed by Ishikawa, Takeuchi & Yano (2008) to measure the health literacy level among diabetes patients. The items of the scale are developed to directly reflect the three levels of health literacy as described by Nutbeam (2000) (Ishikawa, Takeuchi, & Yano, 2008). The items of the scale were adapted through discussion with clinicians, public health researchers and social science researchers (Ishikawa et al., 2008).

The scale is made up of 14 items which are divided into 3 subscales. The functional subscale comprises of 5 items, communicative domain has 5 items and the critical domain has 4 items. The reliability and validity of the scale was tested on 157 type 2 diabetes patients in a hospital in Tokyo Japan. The reliability of the scale was found to be adequate as shown by Cronbach's α of .78 for total health literacy scale (Ishikawa et al., 2008). The Cronbach's α for the subscales of functional, communicative and critical health literacy were .84, .77 and .65 respectively. The 3-level health literacy scale demonstrated good content and construct validity (Ishikawa et al., 2008).

Each of the items are scored on a 4-point Likert type scale ranging from 1 (never) to 4 (often). The 5 items in the functional health literacy subscale needs to be reversed scored. The score from all the items are added up and then divided by the number of items in the scale. Scores can be given either as mean for all 14 items or as mean of each subscale, where the final score will range from 1 to 4. Higher score indicate higher health literacy level (Ishikawa et al., 2008).

5. The chronic illness resource survey [CIRS]

The CIRS is a 64-item self-report instrument developed by Glassgow and colleagues (2000) which can be used to measure support across different chronic

illness at 8 different levels of psychosocial environment support- physician and health care team, family and friends, personal action, neighborhood, community, media and policy, community organization and workplace (Glasgow, Strycker, Toobert, & Eakin, 2000). This division of levels is based on the social-environmental support model by Glasgow and Eakins (1998) and the items of CIRS are based on experience while using the "Chronic illness support scale" with diabetes patients previously (Glasgow et al., 2000).

For the present study, only two out of the 8 levels, the subscale 'doctor and health care team' comprising of 7 items and subscale 'Family and friends' comprising of 8 items were used. The people in this two group are the most common source of support for the patients and group of people who are closest to the patients either personally or professionally(Glasgow et al., 2000). Even in Bhutan, patients with T2DM commonly receive support from health professionals when they visit the diabetes OPD, and from friends and family when they are at home.

Each item of the scales is scored on 5-point Likert scale, ranging from 1 (Not at all) to 5 (great deal). The subscale 'physician/health care team' showed Cronbach's α of .91 and while the subscale 'Family and friends" showed Cronbach's α of .75 in a study with 123 individuals have one or more than one chronic illness (Glasgow et al., 2000). The instrument has showed good construct and moderate concurrent validity during the study (Glasgow et al., 2000). (Glasgow et al., 2000). The possible range of score for these 2 subscales is 15 to 75. High score indicate higher level of support (Dao-tran et al., 2018).

6. The diabetes distress scale [DDS]

DDS, a 17-item scale was used to measure the diabetes distress experienced by patients living with T2DM. The scale was developed by Polonsky and colleagues in 2005. The items in the scale was developed by asking for suggestions from patients, diabetic nurse specialists, dietician, diabetologists and diabetics-knowledgeable psychologist after they were asked to review the items previously developed for other similar scales (Polonsky et al., 2005).

The 17 items can be divided into four subscale- 5 item emotional burden subscale (EB), 4 item physician-related subscale (PD), 5 item regime related distress subscale (RD) and 3 item diabetes-related interpersonal subscale (ID). The Cronbach

α for overall 17-item DDS is .93, while the subscales EB, PD, RD and ID had Cronbach's α of .88, .88, .90 and .88 respectively. (Polonsky et al., 2005). The scale showed good validity (Polonsky et al., 2005).

Each item is scored on 6-point Likert type scale (1= Not a problem, 2= A slight problem, 3= a moderate problem, 4= Somewhat serious problem, 5= A serious problem and 6 = A very serious problem). The patients with type 2 DM area asked to indicate the degree to which each item may be bothering them in their life. DDS can be scored as a total DDS score or by each subscale. DDS is scored by summing up the score from the patient's response and dividing the score by the number of items. A score of less than 2.0 shows no or little diabetes distress, score of 2.0-2.9 shows moderate diabetes distress and score of 3 or more shows high diabetes (Fisher, Hessler, Polonsky, & Mullan, 2012).

Psychometric properties of instruments

The original versions of all the instruments were used for the study, which were tested and validated by the experts in many previous studies. This meant that all the instruments had good validity. The reliability of all the instruments were found to be optimal as shown by the Cronbach's alpha in previous studies. For this study, the reliability of the instruments was tested with 30 participants and Cronbach alpha of DSMQ was .75, the DMSES- UK was .88, the 3 level HL scale was .83, the CIRS was .83, and the DDS was 0.93. For this study with 105 participants, the Cronbach's alpha for the DSMQ, the DMSES-UK, the 3 level HL scale, the CIRS, and the DDS were .66, .82, .89, .73 and .68 respectively.

Protection of human rights

This research was carried out only after the research proposal was approved by the Institutional Review Board (IRB), Burapha University (Protocol code G-HS 005/2563) and the Research Ethical board of Ministry of Health, Bhutan (MOH). The data collection process began only after the concern authority of the setting (JDWNRH) gave the researcher permission to collect data in the hospital setting.

During the process of data collection, all potential participants were informed carefully about the aims of the study and procedures involved in the data collection process, emphasizing on the patient's right to agree or disagree to be a part of the study. Patients were informed that their denial to be a part of this study will not affect the quality of care they receive from the hospital. Data was collected from only those patients who were willing to take part in the study, after taking their informed written consent. They were informed that they have to right to change their mind and decide to discontinue being a part of the study. No names or identification were used which might be able to trace and identify the participants, during the process of data collection and documentation.

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

Data collection

The data collection process for the study was carried out by the researcher and it was conducted as follows:

1. The researcher asked approval to conduct this research from the Faculty of Nursing, Burapha University [FON, BUU]. After the approval, the researcher submitted research proposal to the Institutional Review Board [IRB] of Burapha University and Research ethical board of Ministry of Health, Bhutan for ethical clearance.

2. Researcher asked a letter from the FON, BUU addressed to Medical Superintendent of JDWNRH to seek permission to collect data from the research setting.

3. The letter from FON, BUU was given to the Medical Superintendent of JDWNRH. Permission to collect data was asked from the Medical Superintendent of Jigme Dorji Wangchuk National Referral Hospital [JDWNRH] Thimphu, Bhutan and in charge of the diabetic OPD, JDWNRH where the data was collected.

4. The process of data collection was explained to the staffs in the diabetes OPD and permission to collect data were asked from the staffs of diabetes OPD. The researcher talked to the staffs and physician beforehand and ensured that the patients turn to see the physician is protected if the patient remains occupied when their queue number was called.

5. Researcher was at diabetic OPD of JDWNRH on every Tuesdays and Thursdays from 9 am to 3pm, which is the regular OPD time. Information about study and call for volunteers to be part of the study was posted in the notification boards of the diabetic OPD and posters were displayed in the hospital.

6. Diabetic nurses in the diabetic OPD informed the diabetic patients who come to OPD about the study and distributed flyers asking for volunteers to be a part of the study.

7. Volunteers who were interested to be the part of the study were directed to the researcher by the diabetic nurses. The researcher took written consent from the eligible participants chosen randomly on each day (by drawing random queue numbers of volunteers from a container) and questionnaire was distributed.

8. The data were collected via self-report questionnaires which were handed over to the participants in room prepared by the researcher. Each participant took an average of 40 minutes to complete the whole set of questionnaires. The researcher made sure that the participants were seen by the physicians as soon the filling of questionaries' was completed.

9. The researcher asked the participants to check if the questionnaires have been completely filled before the participants leave the room. All the participants were informed that if they chose not to answer some of the questions purposely, they can leave it unanswered.

10. Participants who scored high on the DDS indicating high level of diabetes distress were supposed to be referred to the diabetic nurse in the diabetic OPD, so that the nurse can arrange consultation of the patient with the concerned care providers. However, in this study, none of the participants reported having high diabetes distress,

11. The researcher continued collecting data until the required sample size was achieved.

Data analysis

Data was analyzed using statistical software, Minitab 17 at alpha (α) level of.05. The following statistical functions were used for analysis of the data:

1. Descriptive statistics (frequency, percentage, mean and standard deviation) was used to explain the demographic characteristics of the sample and the variables.

2. Various function of the statistics was used to test the assumptions of multiple regression (normality of variables, linearity, homoscedasticity, no outlier, no autocorrection and no multicollinearity

3. Standard multiple regression was performed to identify the predicting factors of diabetes self-management among Bhutan patients living with T2DM.

CHAPTER 4
RESULTS

This chapter presents the finding of the study. The purposes of the study was to ascertain diabetes self-management and examine if self-efficacy, social support, health literacy and diabetes distress can predict diabetes self-management among Bhutanese patients with type 2 diabetes mellitus. The finding of the study is presented as follows:

1. Description of participant characteristics
2. Health information of the participants
3. Description of independent and dependent variables
4. Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus

Description of participant characteristics

A total number of 105 patients with type 2 diabetes mellitus visiting the diabetic clinic of JDWNRH, Thimphu participated in this study. The sample consisted of 47 males (44.8%) and 58 females (55.2 %). The age of participants ranged from 29 years old to 60 years old with a mean age of 49.6 years. It was observed that 84.8 % of the participants were older than 40 years old. Almost half of the participants had completed primary level of education (43.8 %), while small percentage of participants (9.5%) have graduate degree. Majority of the participants (92.4 %) is married and living with family or friends (96.2%). 89.5% of participants claimed to have adequate monthly income and more than half of family (54.3%) earned between Nu 10,000 to 30,000 in a month. A small percentage of participants currently drank alcohol (8.6%) and smokes cigarettes (4.8%). Table 1 shows the details about the demographic data of the participants.

Table 1 Demographic characteristics of participants (n = 105)

Characteristics	**Number (*n*)**	**Percentage (%)**
Gender		
Male	47	44.8
Female	58	55.2
Age (*M* = 49.6, *SD* = 8.06, Min = 29, max = 60)		
18-30 years	2	1.9
31-40 years	14	13.3
41-50 years	32	30.5
51-60 years	57	54.3
Education		
Less than Primary school	22	21.0
Primary school	46	43.8
Secondary/High school	27	25.7
Bachelor degree and higher	10	9.5
Marital status		
Married	97	92.4
Single	2	1.9
Divorced	1	0.9
Widowed	5	4.8
Monthly family income (*n* = 102)		
(1 Nu = 0.013 USD)		
Less than Nu 5000	11	10.8
Nu 5000-10000	11	10.8
Nu 10,000-30,000	57	55.9
More than Nu 30,000	23	22.5

Table 1 (Continued)

Characteristics	**Number (*n*)**	**Percentage (%)**
Adequacy of family income (*n* = 103)		
Adequate	94	91.3
Inadequate	9	8.7
Living arrangements		
Living alone	4	3.8
Living with family or friends	101	96.2
Assistant required for ADL		
None	94	89.5
Minimal	7	6.7
Moderate	1	1.0
Maximum	3	2.8
History of alcohol drinking		
Current user	9	8.6
Former user	29	27.6
No history	67	63.8
History of smoking		
Current user	5	4.8
Former user	11	10.5
No history	89	84.7

Health information of the participants

The results showed that 51.4% of the participants were overweight and 23.8% were obese. Only 24.8 % of the participants had normal body weight (BMI 18.5 – 24.9). The diabetes diagnosis duration of the participants ranged from 6 months to 348 months [29 years] (*M* = 74.72, *SD* = 75.75). Most of the participants (88%) visited the diabetes clinics more than 4 times in the year (*M* = 8.07, *SD* = 3.34), as a part of their regular follow up and for refilling their medications. 90.5% of the

participants were currently on diabetic oral medications. More than half of the participants (n = 58, 61.9%) had hypertension along with T2DM. Diabetic related complications such as retinopathy, nephropathy and neuropathy were seen in some of the participants (20.9 %). 61.9% of the participants had controlled T2DM, while 36.2 % of them had uncontrolled DM (*M* = 7.21, *SD* = 2.16). The details of the health information of the participants are shown in table 2.

Table 2 Health information of the participants (n = 105)

Health information	**Number (n)**	**Percentage (%)**
BMI (*M* = 27.9, *SD* = 4.6 , Min = 20.4, max = 49.6)		
Normal weight (18.5 – 24.9)	26	24.8
Overweight (25-29.9)	54	51.4
Obese (> 30)	25	23.8
Diagnosis duration (*M* = 74.72, *SD* = 75.75, Min = 6, Max = 348 [29 years]		
Less than 1 year (< 12 months)	9	8.6
1-5 years (12- 60 months)	58	55.2
6 – 10 years (61 -120 months)	12	11.4
More than 10 years (> 120 months)	26	24.8
Number of visit to diabetic clinic/1 year (*M* = 8.07, *SD* = 3.34, Min = 2, Max = 12)		
1 – 4 times	17	16.2
4 – 8 times	44	41.9
More than 8 times	44	41.9
Diabetic Medication		
Oral medications	96	91.5
Insulin	3	2.8
Combined therapy	4	3.8
None	2	1.9

Table 2 (Continued)

Health information	**Number (n)**	**Percentage (%)**
Comorbidities		
None	34	32.4
1 comorbidity	64	60.9
Hypertension	58	90.6
Others (Heart diseases, Arthritis, Gout)	6	9.4
More than 1 comorbidity	7	6.7
Diabetic related complications		
None	83	79.1
Retinopathy	5	4.8
Neuropathy	11	10.5
Nephropathy	3	2.8
More than 1 complication	3	2.8
Glycemic control (n = 103) (M = 7.21, SD = 2.16, Min = 4.3, Max = 16.3)		
Controlled T2DM (HbA1c ≤ 7%)	65	63.1
Uncontrolled T2DM (HbA1c > 7%)	38	36.9
Moderately uncontrolled (7.1 - 8%)	19	50
Highly uncontrolled (> 8%)	19	50

Description of independent and dependent variables

The variables studied in this study were diabetes self-management, self – efficacy, health literacy, social support and diabetes distress. Table 3 shows the description of the dependent variable and its subscales while table 4 shows the details of the independent variables that were studied.

Table 3 Mean and standard deviation of diabetes self-management (DV) and its subscales (n = 105)

DV and subscales	Possible score	Actual score	*M*	*SD*
Diabetes self-management	0 – 10	5.4 – 9.8	7.76	1.03
Glucose management	0 – 10	3.3 – 10	7.59	1.52
Dietary control	0 – 10	1.7 – 10	7.61	1.45
Physical activity	0 – 10	1.1 – 10	7.02	2.18
Health care use	0 - 10	3.3 - 10	8.73	1.60

Table 3 illustrates that the overall score of diabetes self-management ranged from 5.4 to 9.8 (out of possible score is 0 to10). The mean score of diabetes self-management among participants was 7.76 out of 10 (*SD* = 1.03). The health care use subscale had the highest mean score of 8.73 (*SD* = 1.60), followed by dietary control (*M* = 7.61, *SD* = 1.45), and glucose management (*M* = 7.59, SD = 1.52). The physical activity subscale (*M* = 7.02, *SD* = 2.18) had the lowest mean scores of the subscales.

Table 4 Mean and standard deviation of the independent variables (n = 105)

Independent variables	Possible score	Actual score	*M*	*SD*	Level
Health literacy	1 – 4	1.3 – 4	2.61	0.65	-
Self-efficacy	0 - 150	70 - 143	106.9	15.73	High
Diabetes distress	1 – 6	1 – 2	1.40	0.23	No or little DDS
Social support	15 – 75	43 – 72	58.99	5.90	-

Table 4 illustrates that health literacy score ranged from 1.3 to 4, with mean of 2.61 (*SD* = .65). Self-efficacy level of the participants ranged from 70 to143, with mean score of 106.9 (*SD* = 15.73), which indicated high level of self-efficacy. The overall score of diabetes distress (DDS) ranged from 1 to 2, which indicated no or

little distress, with a mean of 1.40 (*SD* = 0.23). The social support score ranged from 43 to 72 with a mean of 58.99 (*SD* = 5.90).

Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus

Preliminary analysis was conducted to test the assumptions of the regression analysis which included checking the normality of the variables being studied, checking for outliers, autocorrelation, multicollinearity, homoscedasticity and linearity. The normality test done with Andersan darling test showed the variables (diabetes self-management, self-efficacy, health literary, social support and diabetes distress) were distributed normally at the significant level of .05. Grubb's test showed that there were no univariate outliers and leverage and cook's distance showed that there were no multivariate outliers. The absence of multicollinearity was determined by looking at the VIF value which were all less than 10 and by correlation test which showed that no correlation among the variables were greater than .85. The scatter plot of the residuals showed that the assumption of linearity and homoscedasticity were met.

The Pearson's correlation test was performed to check the relationship among the variables that were studied. A Standard multiple regression was performed to check whether self-efficacy, health literacy, social support and diabetic distress was able to predict diabetes self-management. Table 5 illustrates the correlation matrix among the variables studied.

Table 5 Correlation matrix among the independent and dependent variables (n = 105)

	Diabetes self-management	**Self-efficacy**	**Health literacy**	**Social support**	**Diabetes distress**
Diabetes self-management	1.000				
Self-efficacy	0.365***	1.000			
Health literacy	0.059	0.428***	1.000		
Social support	0.351***	0.525***	0.326***	1.000	
Diabetes distress	-0.300**	- 0.314***	-0.094	-0.416***	1.000

*** p < .001 ** p < .01

From the correlation matrix, diabetes self-management was significantly correlated with self-efficacy (r = .365, p < .001), social support (r = .351, p < .001) and diabetes distress (r = .30, p < .01) but there was no significant correlation between diabetes self-management and health literacy (r = .059, p = .55)

Results from the standard multiple linear regression analysis indicated that self-efficacy, health literacy, social support and diabetes distress explained 17.16% in the variance of diabetes self-management among Bhutanese patients with type 2 diabetes mellitus (Adj R^2 = 17.16 %, $F_{(4, 100)} = 6.39$, p < .001). The analysis also showed that diabetes self-management among Bhutanese patients with type 2 diabetes mellitus was significantly predicted by self-efficacy (β = .277, p = .015). However, health literacy (β = .135, p = .181), social support (**β** = .188, p = .096) and diabetes distress (β = .146, p = .140) could not predict diabetes self-management significantly. The summary of regression analysis is presented in Table 6.

Table 6 Summary of regression analysis for variables predicting diabetes self-management among Bhutanese patients with type 2 diabetes mellitus (n = 105)

Predicting variables	***B***	***SE***	**β**	***T***	***p*-value**
Self-efficacy	.018	.007	.277	2.48	.015
Health literacy	-.214	.158	-.135	-1.35	.181
Social support	.033	.019	.188	1.68	.096
Diabetes distress	-.653	.439	-.148	-1.49	.140
Constant = 5.34, Adj R^2 = 17.16 %, $F_{(4, 100)}$ = 6.39, p < .001					

CHAPTER 5
CONCLUSION AND DISCUSSION

This chapter provides the summary and discussion of the study. The chapter also discusses the implication of the study findings in nursing practices and research. Recommendations for future researches are also provided towards end of the chapter.

Summary of findings

This study was carried out to explore diabetes self-management and examine the factors that predict diabetes self-management among Bhutanese people with T2DM. Predicting factors were self-efficacy, health literacy, social support and diabetes distress. The study was guided by the Individual and family self-management theory (IFSMT) by Ryan and Sawin (2009) and concepts from literature reviews about diabetes self-management. A total of 105 adult Bhutanese with T2DM were recruited by a simple random sampling method from the diabetes outpatient department (OPD) at Jigme Dorji Wangchuk National Referral Hospital [JDWNRH] in Thimphu, Bhutan. Data were collected by self-report questionnaires using the demographic data questionnaire, the DSMQ (Schmitt et al., 2013), the DMSES-UK (Sturt, Hearnshaw & Wakelin, 2010), the 3 level HL Scale (Ishikawa, Takeuchi & Yano, 2008), the CIRS (Glassgow et al., 2000) and the DDS (Polonsky et al., 2005). Cronbach's alpha for the DSMQ, the DMSES-UK, the 3 level HL scale, the CIRS and the DDS were .66, .82, .89, .73 and .68 respectively.

From the analysis, the findings revealed that 44.8% of participants were male (n = 47) while 55.2 % were female (n = 58). 84.8 % (n = 89) of the participants were above the age of 40, with the mean age of 49.6 years. Most of the participants were married (92.4%) and living with family or friends (96.2%). More than half of the participants (64.7%) have education level of primary school or less than primary school. 89.5 % (n = 94) of the participants claimed that they earn adequate income per month for daily living, with 54.3% of the participants earning between Nu 10,000 to Nu 30,000 in a month (1 Nu = 0.013 US$). A small percentage of the participants engaged themselves in drinking alcohol (8.6%) and smoking cigarettes (4.8%).

The results also showed that only 24.8% of the participants had normal body weight (BMI 18.5 – 24.9), while 51.4% of them were overweight and 23.8% of them were obese. The participants had varying periods of diagnosis duration which ranged from 6 months to 348 months [27 years] (M = 74.72, SD = 75.75). Participants visited the diabetes clinic at JDWNRH frequently with 84% (n = 88) visiting the clinic more than 4 times in a year. All of the visits were scheduled visits for regular follow up and for refilling their medications. Majority of the participants (90.5%) were using oral antidiabetic drugs to help control their blood sugar level while the other used either insulin or combined therapy of both oral medication and insulin. More than half of the participants (61.9%) also had hypertension along with T2DM. 79% (n = 83) of the participants had no diabetic-related complications while 21% (n = 22) had developed one or more diabetic related complications. The HbA1c level of the participants ranged from 4.3% to 16.3% and showed that 61.9 % (n = 65) have controlled DM (HbA1c ≤7 %), while 36.2% of them had uncontrolled DM (HbA1c > 7%).

The mean score of diabetes self-management among the participants was 7.76 out of 10 (SD = 1.03). The health care use subscale had the highest mean score of 8.73 (SD = 1.60), followed by dietary control (M = 7.61, SD = 1.45), and glucose management (M = 7.59, SD = 1.52). Physical activity subscale (M = 7.02, SD = 2.18) had the lowest mean scores of the subscales. The results indicated adult Bhutanese with T2DM had high self-efficacy with the mean score of 106.9 (SD = 15.73). The mean score of perceived social support was 58.99 out of 75 (SD = 5.90) and mean score of health literacy was 2.61 out of 4 (SD = 0.65). In addition, participants reported low diabetes distress (M = 1.40 SD = 0.23).

Results from a standard multiple linear regression revealed that only self-efficacy can predict diabetes self-management significantly in this study (β = .277, p < .05). The final regression model indicated that self-efficacy, health literacy, social support and diabetes distress can explain 17.16% in the variance of diabetes self-management among Bhutanese patients with type 2 diabetes mellitus (Adj R^2 = 17.16 %, $F_{(4, 100)} = 6.39$, $p < .001$).

Discussion

1. Diabetes self-management (DSM) among adult Bhutanese patients with T2DM

For this study, the mean score of diabetes self-management among adult Bhutanese patients with type 2 DM was 7.76 out of 10 (*SD* = 1.03), which close to the highest score. When looking at the subscale of DSM, it was found that the mean score of health care use (HCU) was the highest score (*M* = 8.73, *SD* = 1.60), followed by dietary control (DC) (*M* = 7.61, *SD* = 1.45), and glucose management (GM) (*M* = 7.59, *SD* = 1.52). The mean score of physical activity (PA) was the lowest score (*M* = 7.02, *SD* = 2.18). The overall mean score and the mean scores of each DSM subscale were higher than 7 (out of 10), which indicate that adult Bhutanese patients with type 2 DM had relatively higher diabetes self-management behavior. A similar study in Iran showed that the mean score of DSM, GM, DC, HCU and PA were 6.92, 6.25, 7.48, 7.23 and 7.05 respectively (Khalooei & Benrazavy, 2019), which showed almost similar mean score of DC and PA subscale of the current study. Additionally, a study in Thailand showed that the mean score of DSM, GM, DC, HCU and PA were 7.11, 6.80, 7.34, 7.13 and 7.79 respectively (Boonsatean, Carlsson, Rosner, & Östman, 2018), where HCU subscale had the highest mean score, which is similar to the current study. The result of this study is consistent with the study in Australia by Maneze & colleagues (2016), who also found that diabetes patients had high diabetes self-management.

The study result can be explained by the IFSMT (Ryan & Sawin, 2009) which proposed that physical and individual factors such as age, marital status, income, diagnosis duration, and comorbidities, have influence directly on the self-management outcome, which is diabetes self-management in this study. One possible reason for higher mean score of diabetes self-management for this study could be most of participants (84.8%) in this study were middle-aged adults (mean age was 49.36 years). They had no physical limitations and no cognitive impairment, thus they were able to perform self-management activities effectively. Most of older people presents with cognitive impairment, which is worse in people with diabetes, and it affects their performance (Tuligenga et al., 2014). Consistently, results from previous

studies which show that cognitive dysfunction is associated with poorer capacity to self-manage diabetes (Sinclair, Girling, & Bayer, 2000; Tomlin & Sinclair, 2016).

Most of the participants of this study are married (92.4%) and living with family/friend (96.2 %). This could be another reason for high mean score of diabetes self-management among participants in this study. The participation of spouse is often required in self-management care of diabetes to improve glycemic control (Gonzalez-Zacarias, Mavarez-Martinez, Arias-Morales, Stoicea, & Rogers, 2016) and people with spouse were found to perform diabetes self-management better than those who are single, widowed or divorced (Gunggu et al., 2016).

A few studies with T2DM patients have shown that increase income can affect diabetes self-management positively (Adwan & Najjar, 2013; Gonzalez-Zacarias et al., 2016). High cost of medications, test kits or healthy foods associated with T2DM management makes it difficult for patients with low income to self-manage their T2DM (Gonzalez-Zacarias et al., 2016). The data of this study shows that 54.3% of them earned in a range of 10,000-30,000 ngultrum in a month and 21.9% earned more than 30,000 ngultrums in month, with 89.5% of the participants claiming that they have adequate income for their use. In Bhutan, the poverty line was estimated at Nu. 2195 (US $ 28.5) per person per month in 2017 (NSB, 2017). Furthermore, the health services are provided free of cost in all healthcare centers of Bhutan, which includes the treatment of T2DM in the diabetes clinic. Since most of the participants of this study claim to have adequate family income to cover the diabetes care cost, the level of diabetes self-management might be relatively higher. Free health care services provided had encouraged high level of health care use by the participants in the study

The duration of diagnosis with T2DM can also be one cause of higher mean score of DSM found in this study. A study by Adwan and Najjar (2013) found that as the duration of T2DM increase, level of self-management decreases, because adherence to self-management activities reduces. A similar result was found in another study where people who experienced longer duration of diabetes has lower adherence of frequency of physical activity and good dietary habits (Ko et al., 2012). On the contrary, longer duration of diagnosis reflect that patients had long time to understand the disease, thus resulting in lower negative response to it (Abubakari et

al., 2016). Majority of the participants (55.2%) in the study had been diagnosed with T2DM for more than a year but less the than 5 years. This shows that the participants have gained enough experience to self-manage their diseases effectively but it has not been too long of a period for them to see much decline in the level of self-management. As the patient's duration of T2DM increase, it is necessary to provide re-enforcement and support from family and health care team, to maintain the desired high level of diabetes self-management.

The presentation of less co-morbidities and the number of diabetes-related complication could also explain the high level of self-management among the participants in this study. The study results showed that 32.4% of participants reported having no co-morbidities and 60.9% (*n* = 64) had only 1 comorbidity, out of which 90.6% (*n* = 58) had hypertension. Additionally, 79% of the participants reported having no diabetes-related complications. A study by Kerr & colleagues (2007) found out that patients give low priority to diabetes care when they face with increased number and severity of co-morbidities, thus leading to decrease level of diabetes self-management. Similarly, a study in China reported that diabetes self-management was inversely associated with number of complications that patients developed (Lin et al., 2017). According to the IFSMT, Ryan and Sawin (2009) suggested that the complexity of a disease can influence the self-management efforts of individuals and family. In this study, 60.9% of participants reported only 1 comorbidity and they reported higher mean score of diabetes self-management.

Though the study result revealed that participants had higher mean score of diabetes self-management, the results also revealed that 36.2% of the participants had uncontrolled diabetes mellitus. Additionally, 74.2% (*n* = 79) of the participants had high BMI (overweight and obesity). Having relatively lower mean score of physical activity among the participants might have been one of the factors for these participants to have high BMI. Nursing interventions in the future should focus on activities such as encouraging regular and adequate physical activity which can help the participants maintain normal body weight.

2. Factors influencing diabetes self-management among adult Bhutanese patients with T2DM

Results from standard multiple linear regression revealed that self-efficacy, health literacy, social support and diabetes distress can explain 17.16% variance in diabetes self-management among Bhutanese patients with type 2 diabetes mellitus (Adj R^2 = 17.16 %, $F_{(4, 100)} = 6.39$, $p < .001$). However, only self-efficacy can predict diabetes self-management significantly ($\beta = .277$, $p < .05$). Additionally, relationships between variables showed that self-efficacy and social support were positively and significantly associated with diabetes self-management ($r = .365$, $p < .001$; $r = .351$, $p < .001$ respectively), while diabetes distress was negatively and significantly associated with diabetes self-management ($r = .300$, $p < .01$). There was no significant association between health literacy and diabetes self-management in this study.

For this study, self-efficacy was the only variable that could significantly predict diabetes self-management ($\beta = .277$, $p = .015$). The finding of the study suggested that participants with higher confidence in performing self-management activities had higher diabetes self-management score. This result is similar to many other studies which show that self-efficacy is a strong predictor of diabetes self-management in many countries and across many different settings (Dao-Tran et al., 2018; Gunggu et al., 2016; Kim et al., 2019; Kurnia et al., 2017; Lalnuntluangi et al., 2017).

The relationship between self-efficacy and diabetes self-management can be explained by the IFSMT (Ryan & Sawin, 2009) which suggest that individuals and family develop self-efficacy when they start gaining knowledge and belief about certain self-care activity, which in-turn will help improve self-management. High percentage of participants in this study have been diagnosed with T2DM for long duration, which can be imply that they had time to learn and develop their self-management skills. The time to learn and develop these necessary skills might have helped to increase diabetes self-efficacy among this people. The study result revealed that participants had high mean score of self-efficacy ($M = 106.9$, $SD = 15.73$). In addition, high level of self-efficacy had results in higher mean score of diabetes self-management among the participants in this study.

The study findings also revealed that diabetes distress, social support, and health literacy could not predict diabetes self-management among adult Bhutanese with T2DM which rejected the hypotheses of this study. The results can be explained by various reasons as discussed below.

All the participants of this study reported 'no to little' distress related to diabetes and diabetes care. The analysis result for this study shows that diabetes distress is negatively and significantly associated with diabetes self-management (r = -.300, p = .002) but it could not predict diabetes self-management. In the previous study by Quek & colleagues (2019), diabetes distress was found to be negatively and significantly associated with diabetes self-management, which is similar to the current study. However, the results contradicts results from another studies, where there was no direct association between diabetes distress and diabetes self-management (Kurnia et al., 2017; Schinckus et al., 2018).

Ryan and Sawin's IFSMT (2014) shows that effective emotional control is required to effectively self-manage diabetes. Diabetes distress can impact the mental wellbeing of the patient, thus resulting in non-adherence to tasks necessary for self-management among the patients with T2DM. The association between diabetes distress and diabetes self-management in this study can be explained by human tendency to not take care of oneself when they are preoccupied by stress and worries. Diabetes distress can lower self-efficacy, thus resulting in reduction in diabetes self-management. However, the low level association and reason why diabetes distress cannot predict diabetes self-management might be due to the tradition and belief of the Bhutanese people. The IFSMT by Ryan and Sawin (2009) suggests that culture plays a role in self-management capabilities of individual and family. One reason can be from the culture where most of the Bhutanese people live with family and are surrounded by the people they love and people who love them back. Another reason might be due to the belief system of Bhutanese population. Most of the Bhutanese people are religious (mainly Buddhist) and believe in the law of 'Karma' (Sithey et al., 2018). They tend to believe that the suffering they face is a result of some bad karma from their past life. Bhutanese people with T2DM accepts being diagnosed with T2DM and the difficulty that follows in managing it as natural part of life. They also believe that "nothing is permanent', not even the distress of having to live with

T2DM. Therefore, social support from family and the belief in ‘Karma’ acts as a buffer to reduce the impact on diabetes distress on DSM in people exhibiting signs of diabetes distress.

The study result shows that social support cannot significantly predict diabetes self-care management. The mean score of social support in this study was 58.99 (*SD* = 5.90) which was closer to the optimal score of 75. Previous studies among people with T2DM showed that social support can predict diabetes self-care management significantly (Dao-Tran et al., 2018; Gunggu et al., 2016; Karimy, Koohestani, & Araban, 2018). However, in this study, social support was not a significant predictor for diabetes self-management though there was a moderate significant association between social support and diabetes self-management ($r = .351$, $p < .001$). This result is similar to a results of studies conducted by Kurnia et al. (2017) in Indonesia and Wattanakul (2012) in rural Thailand which found that social support cannot predict DSM, even though there was significant association between the two variables.

Self-management capabilities can be associated with informational and emotional support (Koetsenruijter et al., 2016). The increase in amount of social support received by the patients with T2DM can increase the level of diabetes self-management of these people. Ryan and Sawin (2014) explains in the IFSMT that social support helps improves knowledge, increases self-regulation skills and increases level of self-efficacy, thus resulting in increased self-care management. This can explain why there was association between social support and diabetes self-management. The inconsistency of support from the family and friends and the health care providers might be able to explain why social support cannot predict diabetes self-management in this group of participants. Due to increased number of diabetes patients coming to visit the diabetes clinic on some days than the others, the health care providers are not able to invest enough time in some of the patients discussing about the health care needs and providing information compared to another patient, thus leading to inconsistency in providing support to patients. Another reason for this different result might because only the support received from family/ friends and health care providers were measured in this study, even though participants may have received support from other sources. People can receive social support from other

areas such as the community, organizations, media and policy (Glasgow et al., 2000). Lastly, since most of the participants in this study were middle aged adult, who were capable of carrying out self-management activities on their own, they perceived less support from the others (mean score of social support = 58.99 out of 75). Therefore, social support cannot predict DSM in this study.

The results of analysis showed that health literacy was not significantly associated with diabetes self-management (r = .059, p = .551) and it could not predict diabetes self-management, though the mean score of health literacy level of participants in this study was 2.61 out of 4 (SD = 0.65). The result of this study is not in line with previous studies which showed that health literacy was either associated significant with diabetes self-management (Rachmawati et al., 2019; Van der Heide et al., 2014) or that health literacy could significantly predict diabetes self-management (Niknami et al., 2018; Schinckus et al., 2018). However, the result of the study was supported by one previous study which showed that health literacy cannot predict diabetes self-management (Maneze et al., 2016).

One possible reason for the absence of any relation between health literacy and diabetes self-management might be due to the mechanism of how health literacy can influence diabetes self-management. High level of health literacy will help improve knowledge level thus increasing diabetes management. It was the lack of knowledge, not health literary that predicted low self-management (Maneze et al., 2016). For this study, ability of participants to access, extract and analysis information was assessed instead of the actual knowledge they have about diabetes management and care. Moreover, most of the participants lived with their family, thus health literacy of the family could also have affect the DSM among the participants, which was not assessed in this study. This similar phenomenon showing the importance of level of family health literacy level was also seen among Bhutanese patients with chronic kidney diseases (Rai, Deenan, & Krungkraipetch, 2019).

The results of this study showed that only self-efficacy can predict diabetes self-management significantly, while health literacy, social support and diabetes distress could not predict diabetes self-management significantly. However, the results showed that all independent variables interact with each other, thus directly or indirectly helping improve self-efficacy. Ryan and Sawin (2009) in their IFSMT

suggests that all of these factors might have influence on one another, thus ultimately influencing diabetes self-management. The theory shows that health literacy can help improve self-management by increasing knowledge level and that social support can increase health literacy and self-efficacy. Similarly, it also shows that self-efficacy can increase when family and individual are able to have control over their emotions.

Implications of the findings

Nursing practice

The finding of the study revealed that, despite having relatively higher mean score of DSM, large percentage of participants were overweight or obese, and some of them were not able to control the diabetes and had developed diabetes-related complications. Healthcare providers should educate the patients, focusing in the importance of weight control and glycemic control. A physical activity program led by the hospital or the ministry of health for individuals and family in the community, especially targeting people with chronic illness might be helpful in maintaining the minimum physical activity requirement as suggested by the ADA. Programs aimed at increasing the self-efficacy of T2DM patients may help the patients improve and maintain high level of diabetes self-management among the patients with T2DM in Bhutan.

Nursing research

For this study, the variables studied could explain only 17.16% of the variance in diabetes self-management in this study, which indicates that there are other factors that may have influence on DSM, as discussed by the IFSMT of Ryan and Sawin (2009). Future research should focus on studying those variables such as diabetes knowledge and physical and social environment.

In the future, similar study should be carried out in other hospitals in Bhutan since this study cannot be generalized to other setting. The same variables from the current may be studied using different tools, which may be adapted to fit the Bhutanese more correctly. A similar study involving older adults (Age > 60 years) should be done to see the full picture of the diabetes self-management among all Bhutanese patients, since most of the older adults in Bhutan have T2DM. Finally,

experimental research incorporating the finding for this study should be carried out to measure the impact of the study.

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APPENDICES

APPENDIX A

Questionnaires in English

1. Demographic data questionnaire [DDQ]

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

Part 1: Personal profile (To be completed by the participant)

1. Age: ……. Years
2. Weight…….. Height…….
3. Gender

   ☐ Male ☐ Female
4. Marital Status

   ☐ Single ☐ Married ☐ Divorced ☐ Widowed
5. Living arrangement

   ☐ Living alone ☐ Living with family members or friends
6. Highest level of education

   ☐ Less than primary ☐ Primary school ☐ Secondary school

   ☐ Graduate and up
7. Average individual income (income/month in ngultrum)

   ☐ Less than Nu. 5000 ☐ Nu. 5000 - 10,000

   ☐ Nu. 10,000 – 30,000 ☐ More than Nu. 30,000
8. Average family income (income/month in ngultrum)

   ☐ Less than Nu. 5000 ☐ Nu. 5000 - 10,000

   ☐ Nu. 10,000 – 30,000 ☐ More than Nu. 30,000
9. Adequacy of individual and family income

   9.1 Individual income ☐ Adequate ☐ Inadequate

   9.2 Family income ☐Adequate ☐ Inadequate
10. Assistance required by you from others to carry out daily activities at home

    ☐ None ☐ Minimal ☐ Moderate ☐ Maximum

    Relationship with caregiver (if assistance is required)

    ……

11. Alcohol drinking status

☐ Current alcohol drinker

Duration ……. years Quantity……... glass/day

☐ Former alcohol drinker

Duration ……. years Quantity (in the past) ……..... glass/ day

☐ No history of drinking alcohol

12. Smoking status

☐Current tobacco smoker

Duration……. years Quantity……. cigarettes/day

☐Former tobacco smoker

Duration……. years Quantity (in the past)…..…cigarettes/day

☐No history of smoking

Part 2: Health Information (To be collected by researcher from patient record)

1. Duration of diagnosis of T2DM (in years) ……
2. Frequency of visit to diabetes clinic (in 1 year) ……..
3. Last date of admission to hospital due to T2DM (if applicable) ……
4. Medications

4.1 ☐ Oral medication

○ Metformin (Dose/frequency/day…….……..…)

○ Sulfonylureas (Dose/frequency/day…….)

○ Others ……(Dose & frequency/day…….....)

4.2 ☐ Insulin

Specify……. (Dose & frequency/day…….....)

5. Co-morbidities

☐None ☐ Hypertension ☐ Chronic kidney disease

☐ Heart diseases ☐ Others, specify…….

○ Medications for managing co-morbidities (if present)

……

……

……

……

6. Diabetes-related complications

☐ None

☐ Retinopathy ○Mild ○ Moderate ○ Severe

☐ Nephropathy

☐ Neuropathy

☐ Others, specify…….

7. Latest HbA1c ……...… ……...% (Date: ____/_____/_____)
8. Latest FBS and 2 hours PP……...…. mg/dl (Date: ____/_____/_____)
9. Latest blood pressure ……. mmHg (Date:_____/_____/_____)

2. Diabetes self-management questionnaire (DSMQ)

Direction: The following statement describes self-care activities related to your diabetes. Thinking about your self-care over the last 1 month, please specify the extent to which each statement applies to you.

	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 management is not required as a part of my treatment*	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
………………..	☐3	☐2	☐1	☐0
16. My diabetes self-care is poor	☐3	☐2	☐1	☐0

3. Diabetes management self-efficacy scale U K [DMSES-UK]

Directions: Below is a list of activities you have to perform to manage your diabetes. Please read each one and then put a cross [**X**] through the number which best describes how **confident** you usually are that you could carry out that activity.

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

3. Functional, Communicative and Critical Health literacy scale [FCCHL]

Direction: For each item, chose one options (never, rarely, sometimes, often) which best describes your situation

Functional health literacy

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
……..	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4
4. Needed someone to help you read them	1	2	3	4

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

Communicative health literacy

You have	Never	Rarely	Sometimes	often
1. Collected information from various sources	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4

Critical health literacy

You have	Never	Rarely	Sometimes	often
1. Considered whether the information was applicable to your situation	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4
4. Collected information to make decisions about your health	1	2	3	4

4. The chronic illness resource survey [CIRS]

Direction: For each item, please select the number that best indicates your experience over the past 1 month.

Family and friend's subscale

		Not at all	A moderate amount			A great deal
	Over the past 1 month, to what extent….	1	2	3	4	5
1.	Have friends or family exercised with you?					
2	……..					
3	……..					
4	……..					
5	……..					
6	……..					
7	……..					
8	How important is family and friends support in managing your illness?					

Doctor and health care team subscale

		Not at all	A moderate amount			A great deal
	Over the past 1 month, to what extent….	1	2	3	4	5
9	……..					
10	……..					
11	……..					
12	……..					
13	……..					
14	……..					
15	How important are health care team resources to you in managing your illness?					

5. The Diabetes Distress scale (DDS)

Direction: Consider the degree to which each of the 17 items may be bothered or distressed you during the past 1 month and circle the appropriate number. **Please note that you have to indicate the degree to which each of the item maybe bothering you in your life, not whether the item is merely true for you**. If you feel that a particular item is not a bother or a problem for you, you can circle '1'. If it is very bothersome to you, you might circle '6'

	Not a problem	A slight problem	A moderate problem	Somewhat serious problem	A serious problem	A very serious problem
1. Feeling that diabetes is taking up too much of my mental and physical energy everyday	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
……………………………..	1	2	3	4	5	6
17. Feeling that friend and family don't give me the emotional support that I would like	1	2	3	4	5	6

APPENDIX B

Additional information about dependent and independent variables

1. Table showing frequency of each score in each items of DSMQ

	Applies to me very much (3) n (%)	Applies to me to a considerable degree (2) n (%)	Applies to me to some degree (1) n (%)	Does not apply to me (0) n (%)
1. I check my blood sugar levels with care and attention ☐ *Blood sugar management is not required as a part of my treatment*	71 (71.7)	24 (24.2)	3 (3.03)	1 (1.01)
……				
……				
……				
……				
……				
……				
……				
……				
……				
……				
……				
……				
……				
……				
……				
15. My diabetes self-care is poor	1 (0.9)	17 (16.2)	40 (38.1)	47 (44.8)

2. Mean and standard deviation of the subscales of independent variables (*n* = 105)

Independent Variables	Possible score	Actual score	$\bar{X}$	*SD*
Health literacy	1 – 4	1.3 – 4	2.61	0.65
Functional HL	1 – 4	1.6 – 4	3.04	0.85
Communicative HL	1 – 4	1 – 4	2.35	0.82
Critical HL	1 - 4	1 - 4	2.41	1.00
Social support	15 – 75	43 – 72	58.99	5.90
Family/ friends	8 – 40	18 – 34	32.56	4.20
Health care professionals	7 - 35	19 - 30	27.42	3.10
Diabetes distress	1 – 6	1 – 2	1.40	0.23
Emotional Burden (EB)	1 – 6	1 - 3	1.81	0.49
Physician related (PD)	1 – 6	1 – 2	1.16	0.25
Regimen related (RD)	1 – 6	1 – 2	1.34	0.31
Interpersonal (ID)	1 - 6	1 - 2	1.16	0.31

APPENDIX C

Permission letters

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

From Sturt, Jackie <jackie.sturt@kcl.ac.uk>

Tue 11/5/2019 3:24 PM

To Kinley Yangdon

Subject: DMSES

Dear Kinley,

Yes, I am happy for you to use the DMSES and I have attached the scale and interpretation instructions.

Best wishes

Jackie

Permission letter to use the Functional, communicative and health literacy scale

From <hirono-tky@umin.ac.jp>

Wed 11/6/2019 10:35 AM

Dear Ms Kinley Yangdon,

Thank you for your interest in our health literacy scale.
I am attaching a copy of the English version of the scale.
You are welcome to use it in your research.
I would appreciate if you could cite our original article as a reference when you publish your study.

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
email: hirono-tky@umin.ac.jp

Permission letter to use Diabetes Distress scale (DDS)

From William Polonsky <whp@behavioraldiabetes.org>

Sent Tue 11/5/2019 4:31 AM

To Kinley Yangdon

Subject: DDS

Hi Kinley,

How nice to hear from you. And I am so envious that you are doing a study with people in Bhutan. That is the one country I have always wanted to visit!

And yes, you are more than welcome to use the DDS. For more information, see: https://behavioraldiabetes.org/scales-and-measures/#1448434304099-9078f27c-4106

If you need to create a new translation of the DDS, could you please send us a copy when it is completed? As you can see from the link above, we are doing our best to bring together a library of all translated versions of the DDS in the world.

Thanks, and good luck with your project,

Bill

William H. Polonsky, PhD, CDE | President | Behavioral Diabetes Institute | Associate Clinical Professor | University of California, San Diego | 760.525.5256

APPENDIX D

Participant information sheet and consent form

Participant Information Sheet

IRB approval number : ……..

Title of study : Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus

Dear participants

I am Miss Kinley Yangdon, a graduate student at the Faculty of Nursing, Burapha University Thailand. My study is entitled, "Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus". The objectives are to examine the diabetes self-management and examine the factors influencing diabetes self-management of patients with type 2 diabetes mellitus who come to receive services related to diabetes care at diabetic OPD of Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) in Thimphu, Bhutan.

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

You have the right to end your participation in this study at any time, without having to inform the researcher, and it will not affect the quality of services you receive from the diabetes OPD. 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 participant will be disclosed. All data will be accessible only to the researcher which 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 Kinley Yangdon under supervision of my major-advisor, Assistant Professor Dr. Khemaradee Masingboon. If you have any

questions, please contact me at mobile number: + 97517479450 or by email dyna775@hotmail.com, and/or my advisor's e-mail address khemarad@hotmail.com. Or you may contact Burapha University Institutional Review Board (BUU-IRB) telephone number 038 102 561-62**.** Your cooperation is greatly appreciated. You will be given a copy of this consent form to keep.

Kinley Yangdon

PARTICIPANT'S CONSENT FORM

IRB number: ……..

Title of the study: Factors influencing diabetes self-manangment in Bhutanese patients with type 2 diabetes mellitus

Date of data collection …….....…Month…….....…….……Year …….

Before giving my signature below, I have been informed by researcher Miss Kinley Yangdon about purposes, method, procedures, benefits and possible risk associated with participation in this study thoroughly, and I understood all of the explanation. I consent voluntarily to participate in this study. I understand that I have the right to leave the study any time I want, without fearing that it might affect the quality of health care services that I will receive from the hospital and diabetes OPD hereafter.

The researcher Miss Kinley Yangdon has explained to me that all data and information of the participants will be kept confidential and only be used for the purpose of this study. I have read and understood the information related to participation in this study clearly and I am signing this consent form.

Signature

……..……..

Participant

(…….)

APPENDIX E

Ethical approval letter and data collection letter

Certificate Number 002/2020

Certificate of Human Research Approval
Burapha University

BUU Ethics Committee for Human Research has considered the following research protocol

Protocol Code : G-HS 005/2563
Protocol Title : Factors Influencing diabetes self management among Bhutanese patients with tape 2 diabetes mellitus
Principal Investigator : Miss Kinley Yangdon
Affiliation : Graduate Program of Faculty of Nursing

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 : 24 February 2020
2. Research Protocol	Version 2 : 24 February 2020
3. Participant Information Sheet	Version 2 : 24 February 2020
4. Informed Consent Form	Version 2 : 24 February 2020
5. Research Instruments	Version 1 : 24 January 2020
6. Others (if any)	Version 1 : 24 February 2020

Approval Date : 6 March 2020
Valid Date : 5 March 2021

Sign Witawat Jangiam
(Associate Professor Dr. Witawat Jangiam)
Chairperson
The Burapha University Institutional Review Board
Panel 1 (Clinic / Health Science / Science and Technology)

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF HEALTH
RESEARCH ETHICS BOARD OF HEALTH
THIMPHU : BHUTAN
P.O. BOX : 726

Ref. No. REBH/Approval/2020/001 13/02/2020

REBH APPROVAL LETTER (valid through 13/02/2021)

PI: Kinley Yangdon **Institute:** Jigme Dorji wangchuk National Referral Hospital (JDWNRH) Thimphu, Bhutan	**Study Title:** led "Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus"
Co-Investigator(s): 1. Dr Khemaradee Masingboon, Dr Niphawan Samarkit	
Mode of Review: Initial Review : ✔ *Expedited Review* resubmitted Review : ✔ *Expedited Review*	
Date of continuing review: 13/02/2021 Note: Please submit continuing review report along with application form AF/01/015/05 at least seven days before the date of continuing review. If the study is completed then please submit final report of the study.	
List of document(s) approved: Protocol : Approved, (V2) informed Consent Form (ICF) : ICF approved Tools (Questionnaire/forms/guides/etc) : Approved	
Conditions for Approval: 1. *This approval is granted for the scientific and ethical soundness of the study. The PI shall be responsible to seek all other clearances/approvals required by law/policy including permission from the study sites before conducting the study.* 2. *Report serious adverse events to REBH within 10 working days after the incident and unexpected events should be included in the continuing review report or the final report.* 3. *No biological material shall be used for other research purpose beyond which is specified in this protocol.* 4. *Any new research study with stored biological material from this study will need a new approval from the REBH before study begins.* 5. *Any changes to the proposal or to the attachments (informed consent and research tools such as forms) shall be approved by REBH before implementation.* 6. *Final report of the study shall be submitted to REBH at the end of the study for review and protocol file closure.*	

(Dr. Neyzang Wangmo)
Chairperson, REBH

For further information please contact: *REBH Secretary:* **at** *Tel: +975-2-322602* **or email at** magurung@health.gov.bt or tashidema@health.gov.bt

Office of International Strategic Affairs
Faculty of Nursing, Burapha University
169 Longhad Bangsaen Rd., Chon Buri, THAILAND 20131
Tel : +66 38 102 808 Fax: +66 38 393 476

MHESI 8106/ 0261

March 16th, 2020

Medical Superintendent
Jigme Dorji Wangchuck National Referral Hospital
Gongphel Lam, Thimphu,
Bhutan

Subject: Asking permission for data collection to test the reliability of research instruments

Dear Medical Superintendent

Ms. Kinley Yangdon is a master degree student of Faculty of Nursing, Burapha University, Thailand. Presently, she is in the process of conducting her master thesis entitled "*Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus"* under supervision of Assistant Professor Dr. Khemaradee Masingboon .

In this regard, I am writing to ask your permission to allow Ms. Kinley Yangdon to collect data in order to test the reliability of research instruments from 30 participants from Diabetic OPD (Diabetic Clinic) at Jigme Dorji Wangchuck National Referral Hospital, Bhutan during the period of March 18th – 27th, 2020. Participants will be asked to complete questionnaires on their own. Should you need further information of this research project, please contact Ms. Kinley Yangdon at dyna775@hotmail.com.

Your kind cooperation for this matter will be highly appreciated.

Yours sincerely,

Pornchai Jullamate, RN, PhD,
Assistant Professor & Dean
Faculty of Nursing, Burapha University
Chon Buri, 20131, THAILAND
E-mail: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

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Tel : +66 38 102 808 Fax: +66 38 393 476

MHESI 8106/ 0262

March 16th, 2020

Medical Superintendent
Jigme Dorji Wangchuck National Referral Hospital
Gongphel Lam, Thimphu,
Bhutan

Subject: Asking permission for data collection

Dear Medical Superintendent

Ms. Kinley Yangdon is a master degree student of Faculty of Nursing, Burapha University, Thailand. Presently, she is in the process of conducting her master thesis entitled "*Factors influencing diabetes self-management among Bhutanese patients with type 2 diabetes mellitus*" under supervision of Assistant Professor Dr. Khemaradee Masingboon .

In this regard, I am writing to ask your permission to allow Ms. Kinley Yangdon to collect data from 105 participants from Diabetic OPD (Diabetic Clinic) at Jigme Dorji Wangchuck National Referral Hospital, Bhutan during the period of March 30th – April 30th, 2020. Participants will be asked to complete questionnaires on their own.

Should you need further information of this research project, please contact Ms. Kinley Yangdon at dyna775@hotmail.com.

Your kind cooperation for this matter will be highly appreciated.

Yours sincerely,

Pornchai Jullamate

Pornchai Jullamate, RN, PhD,
Assistant Professor & Dean
Faculty of Nursing, Burapha University
Chon Buri, 20131, THAILAND
E-mail: pornchai@buu.ac.th
Tel: 66 38 102 809 Fax: 66 38 393 476

To

The Medical Superintendent

Jigme Dorji Wangchuck National Referral Hospital (JDWNRH)

Thimphu, Bhutan

Subject: Requesting permission for data collection for master thesis

Respected Sir

I am Kinley Yangdon, a clinical nurse who is doing my master degree in Nursing in Burapha University in Thailand. Currently I am in the process of conducting my master thesis titled "Factors influencing Diabetes self-management among Bhutanese patients with diabetes mellitus type 2". Therefore, I would like to seek permission for data collection in the diabetic OPD (Diabetic clinic) of JDWNRH, Thimphu.

A copy of ethical review certificate and administrative clearance from Ministry of Health has been attached for your kind reference.

Thanking you

Yours sincerely

K Yangdon

Kinley Yangdon

Contact Number: 17479450

Email: dyna775@hotmail.com

Approved for data collection

THIMPHU BHUTAN

Dr. Gosar Penjor
Medical Superintendent
Jigme Dorji Wangchuck
National Referral Hospital
Thimphu

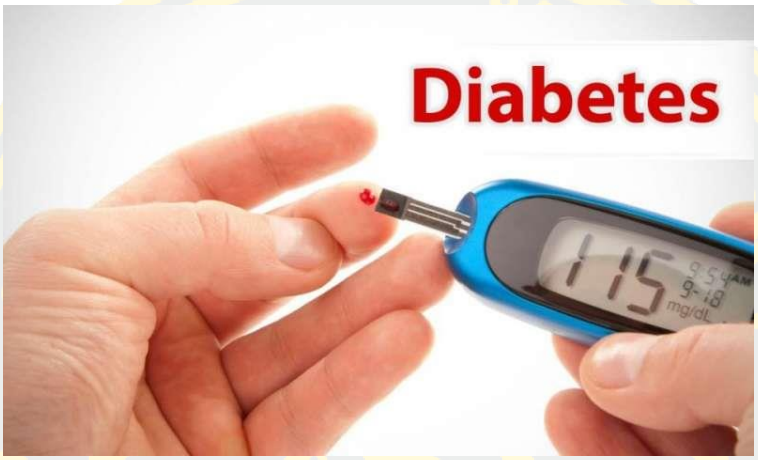
12020.

APPENDIX F

Miscellaneous

Volunteer recruitment flyer

DO YOU HAVE TYPE 2 DIABETES?



We are studying how Bhutanese adults with type 2 diabetes are self-managing their diabetes. We are inviting volunteers to join our research study.

Who are needed?

- Volunteers who have had diabetes for at least 6 months
- Volunteers who are between the age of 18-60 years
- Volunteers who can read and write basic English

For more information, please contact diabetic OPD nurses during OPD hours (every Tuesday and Thursday) or principle investigator Miss Kinley Yangdon, Clinical Nurse at 17479450

BIOGRAPHY

NAME	Kinley Yangdon	
DATE OF BIRTH	03 March 1988	
PLACE OF BIRTH	Thimphu, Bhutan	
PRESENT ADDRESS	Thimphu, Bhutan	
POSITION HELD	2012 - Present	Clinical Nurse Jigme Dorji Wangchuck National Referral Hospital Thimphu, Bhutan
EDUCATION	2008 - 2011	Bachelor of Science in Nursing Naresuan University, Thailand
	2018 - 2020	Masters degree in Nursing science Burapha University, Thailand